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EXMOUTH TOWN CENTRE AND FORESHORE REVITALISATION PLAN_ FINAL REPORT



Prepared for Shire of Exmouth
April 2012

HASSELL



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Content

Section	Page				
1.0 Executive Summary	vi				
2.0 Introduction	2				
2.1 Purpose	2				
2.2 The Challenge	3				
2.3 Community Engagement	4				
2.4 Document Structure	4				
3.0 Vision and Opportunity	6				
3.1 The Community Vision	6				
3.2 Opportunities	7				
3.2.1 Tourism	7				
3.2.2 Culture and Community	7				
3.2.3 Defining the Core	7				
3.2.4 Containment of Activity	7				
3.2.5 Promoting a Wide Range of Retail and Community Services	7				
3.2.6 Economic Success	8				
3.2.7 Creating a Resilient Town	8				
3.2.8 A Beautiful Town Centre	8				
4.0 The Place	10				
4.1 Regional Context	10				
4.2 Local Context	11				
4.3 Functional and Economic Context	11				
4.3.1 Population Growth Scenarios	11				
4.4 Planning Framework	12				
4.4.1 State Planning Policy 2.6 - State Coastal Planning Policy	12				
4.4.2 State Planning Policy 6.3 - Ningaloo Coast	12				
4.4.3 Local Planning Framework	12				
4.4.4 Exmouth Town Planning Scheme No. 3	12				
4.4.5 Townscape Enhancement Plans and Design Guidelines	12				
4.5 Cultural Heritage	13				
4.6 Natural Heritage	13				
4.7 Site Analysis	14				
4.7.1 Town Centre Built Form Character	14				
4.7.2 Town Centre Landscape Character	15				
4.7.3 Legibility and Wayfinding	16				
4.7.4 Movement and Access	17				
4.8 Town Centre	17				
4.8.1 Town Centre Car Parking	17				
4.8.2 Town Centre Activity Nodes	18				
4.8.3 Land Ownership	18				
		4.8.4 Town Centre Land Use	18		
		4.9 Foreshore	19		
		4.9.1 Foreshore Activity Nodes	19		
		4.9.2 Beach Amenity	19		
		4.9.3 Topography	19		
		4.9.4 Vegetation Communities	19		
		4.9.5 Geology	20		
		4.9.6 Storm Surge	20		
		4.9.7 Surface Water Flow	20		
		4.9.8 Ground Water	20		
		5.0 The Plans	22		
		5.1 Design Drivers and Philosophy	22		
		5.2 Town Centre Framework	23		
		5.2.1 Movement Network	23		
		5.2.2 Legibility	23		
		5.2.3 Town Creek Movement Corridor	23		
		5.2.4 Delineate Streets and Car Parking	23		
		5.2.5 Car Parking	23		
		5.2.6 Improve the Visual Appearance of Car Parking	23		
		5.2.7 Bike Facilities	23		
		5.3 Land Use	26		
		5.3.1 Town Core Axis	26		
		5.3.2 Maidstone Crescent Mixed Use	26		
		5.3.3 Civic Quarter	26		
		5.3.4 Federation Park and Recreation	26		
		5.3.5 Town Creek	27		
		5.3.6 Short Stay Accommodation	27		
		5.3.7 Town Centre Entry Nodes	27		
		5.3.8 Town Centre Floorspace	27		
		5.4 Built Form	28		
		5.4.1 Architecture and Design	28		
		5.4.2 Town Core Form	28		
		5.4.3 Height	28		
		5.5 Town Centre Infrastructure	29		
		5.5.1 Sewer	29		
		5.5.2 Water Supply	29		
		5.5.3 Power Supply	29		
		5.5.4 Lighting	30		
		5.5.5 Telecommunications	30		
		5.5.6 Roads and Footpaths	30		
		5.5.7 Drainage	30		
		5.6 The Foreshore and Open Space Development Plan	31		
		5.6.1 Landscape Master Plan	31		
		5.6.2 Character Zones	31		
		5.6.3 Landscape Typologies	31		
		5.6.4 Movement and Links	31		
		5.6.5 Place Making	31		
		5.6.6 Pedestrian Network	31		
		5.6.7 Cycle Network	31		
		5.6.8 Sight Lines	31		
		5.6.9 Water Sensitive Urban Design	31		
		5.6.10 Irrigation Requirements	31		
		5.6.11 Landscape Elements	31		
		5.6.12 Parklands and Recreation	31		
		5.6.13 Dunes and Bushland	31		
		5.6.14 Vegetation	31		
		5.6.15 Planting Guide	31		
		5.7 Existing Town Beach	36		
		5.8 Beach extension to yacht club	36		
		5.9 Marina Open Space enhancement	36		
		5.10 New Town Beach (Gulf Beach) and Outdoor Interpretation Centre	39		
		5.11 Golf Club and Beach Access	39		
		5.12 Planting	41		
		5.13 Foreshore Materiality	42		
		5.14 Town Centre Materiality	43		
		5.15 Foreshore Infrastructure	44		
		5.15.1 Roads and Footpaths	44		
		5.15.2 Sewer	44		
		5.15.3 Solid Waste Management	44		
		5.15.4 Water Supply	44		
		5.15.5 Power Supply	44		
		5.15.6 Gas Supply	46		
		5.15.7 Telecommunications	46		
		5.15.8 Drainage	46		
		6.0 Environmental Management	48		
		6.1 Environmental Management of the Exmouth Foreshore	48		
		6.1.1 Feral and Domestic Animal Control	48		
		6.1.2 Vegetation Protection and Rehabilitation	48		
		6.1.3 Weed Management and Control	48		
		6.1.4 Fire Management	48		
		6.2 Coastal	49		
		6.2.1 Shoreline Dynamics	49		
		6.2.2 Beach Access	49		
		6.2.3 Foredune	49		
		6.2.4 Dune Access	49		
		6.2.5 Coastal Setbacks	49		
		6.2.6 Flood Protection	49		
		7.0 Recommend and Implement	52		
		7.1 Small Wins	52		
		7.2 Retail Activation Strategy	52		
		7.3 Long Term Strategies and Projects:			
		Town Centre	53		
		7.3.1 Activities	53		
		7.3.2 Environment and Built Form	56		
		7.3.3 Movement	58		
		7.3.4 Car Parking	59		
		7.4 Staging: An Approach	60		
		7.5 Governance and Planning Policy	61		
		7.5.1 Town Planning Scheme	61		
		7.5.2 Policy	61		
		7.5.3 Road Closures and Amalgamation	61		
		7.5.4 Kennedy Street Mall	61		
		7.5.5 Marketing	61		
		7.5.6 Management and Maintenance Strategy	61		
		7.6 Long Term Strategies and Projects:			
		Foreshore	62		
		7.6.1 Environment and Built Form	62		
		7.6.2 Activities	62		
		7.6.3 Movement	62		
		7.6.4 Infrastructure	62		
		7.7 Staging	63		
		Appendices			
		i Appendix A			
		Review of Coastal and Floodplain Processes_Damara WA	65		
		ii Appendix B			
		Summary of Environmental Values, Opportunities and Recommendations_ EcoLogical Australia	85		
		iii Appendix C			
		Foreshore Infrastructure Report_ JDSI	89		
		iv Appendix D			
		Town Centre Infrastructure Report_ JDSI	107		
		v Appendix E			
		Economic Analysis_ Pracsys Economics	129		
		vi Appendix F			
		Indicative Cost Estimates_RBB	135		

A light gray background featuring a white outline map of the Hawaiian Islands. The main island, Hawaii, is the largest and most prominent, with several smaller islands to its east and south. The text "executive summary" is overlaid in white, centered horizontally and positioned in the lower half of the image.

executive summary

1.0 Executive Summary

vi

The Exmouth Town Centre Revitalisation Plan and Foreshore and Open Space Development Plan are two projects initiated by the Shire of Exmouth to improve the way these areas function. The intention is to provide necessary amenities for local residents and visitors and ensure that a considered structure is provided that allows for future growth and development. In particular, the town centre revitalisation plan is required to provide an approach to the expansion of retail floor space to meet the demand of future population growth. Similarly, the foreshore project was required to consider the purpose of existing coastal nodes and provide a framework to link these together whilst also improving connections to the town centre.

To achieve this Exmouth has developed a vision and sense of place that captures its past and present, its unique natural attributes of rich biodiversity, coastal setting and lifestyle. These natural and social assets will lead Exmouth to become a prime regional service and a tourist centre, recreational and cultural destination of world renown.

To sustain this tourist town into the future requires a healthy, vibrant commercial centre that is robust enough to grow and accommodate the ever changing dynamics demanded of a modern town centre in a ecologically blessed and resource rich environment.

The purpose of the Exmouth Town Centre Revitalisation Plan and Foreshore and Open Space Development Plan is to set the agenda for future improvement and development of the town centre and foreshore areas in a manner that meets community expectations, the aspirations of the Shire and guide the staging of works over a period of time.

The Shire of Exmouth specifically requires the plans to address the following:

- _ Provide an approach to the arrangement of town centre land uses
- _ Identify opportunities for retail, commercial and office development

- _ Explore opportunities for expansion of the existing shopping area
- _ Design for local environmental conditions to ensure a comfortable pedestrian environment
- _ Identify design principles that need to be considered for future development
- _ Identify strategies to improve the quality of the town, including by private land owners
- _ Create a landscape / streetscape plan for the town centre, with particular regard given to the function of Federation Park
- _ Create a storm water management plan that provides an approach to drainage throughout the town centre
- _ Improve the approach to car parking with a view to making a simpler and more efficient layout
- _ Provide for pedestrian links

The project was split into a number of phases:

- _ **Understand:** Site visits and analysis of the study area were conducted in this phase of the project. A comprehensive review of the Shire's strategic planning and organizational documents, associated policies and relevant background documentation in accordance with those identified by the Brief and any additional documents identified by the Client.
- _ **Analyse:** Detailed site analysis was undertaken based on the site visit, stakeholder meetings and desktop analysis.
- _ **Engage:** A number of workshops were held with the Shire and the broader community to understand their aspirations for the town centre and foreshore areas. A number of priorities, longer term strategies and quick wins were identified to ensure that the project embodied the spirit of the community.
- _ **Recommend:** A number of recommendations were produced for the project based on stakeholder feedback and analysis. Two draft concept plans were prepared for the town centre, along with concepts for the foreshore for review by the Shire of Exmouth.

_ **Consult:** Final draft plans were prepared and the plans exhibited for public comment. An open day was held in the Ross Street Mall to present the proposals to the community and encourage submissions.

_ **Review:** The plans were reviewed in light of the submissions received and the Shire's objectives for the projects.

_ **Final Plan:** Revised plans were prepared following confirmation of the recommendations and approach to the study area by the Shire. The plans were assessed to provide a staging plan, updated recommendations, a retail activation strategy and potential quick wins.

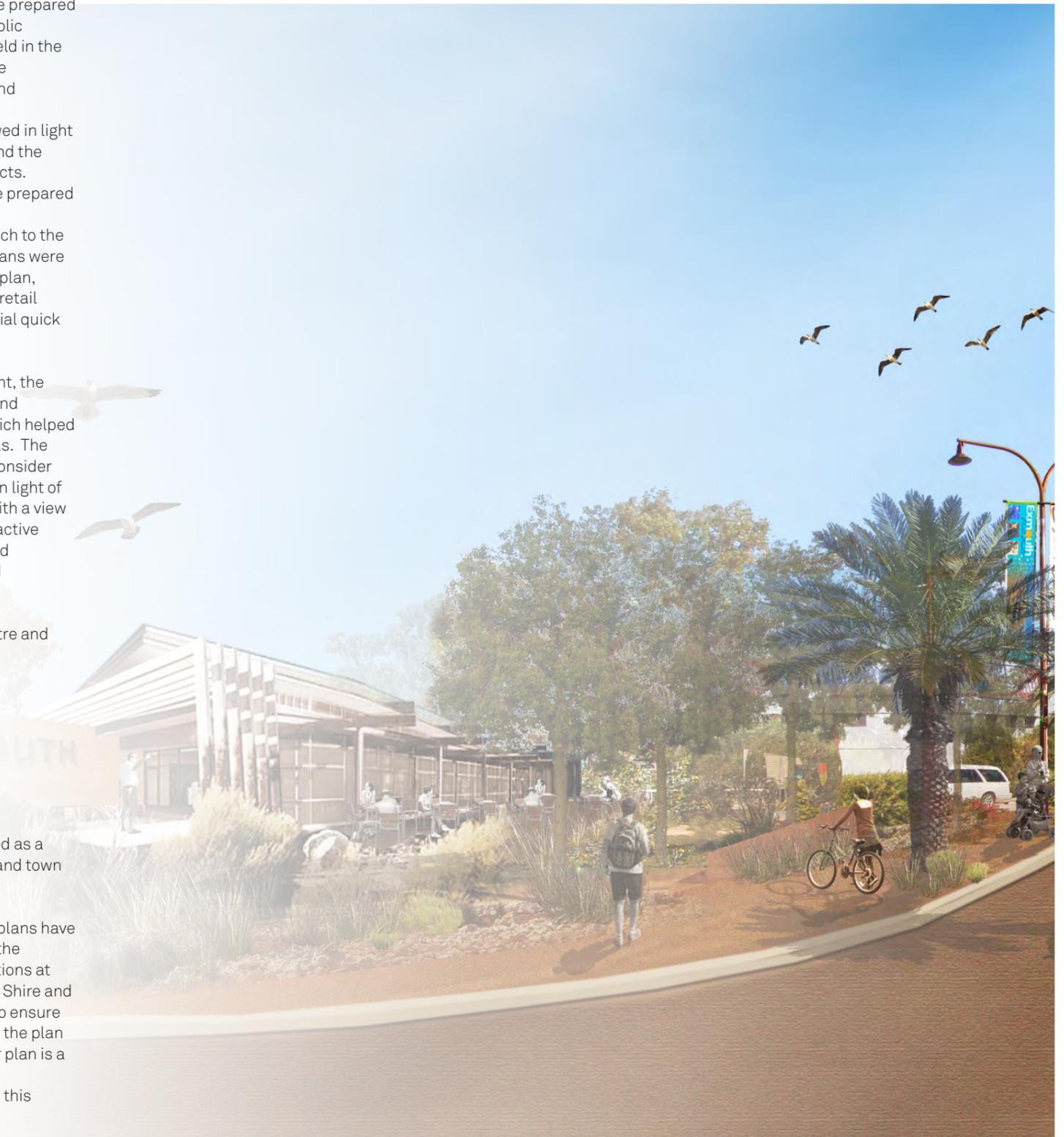
Through community engagement, the objectives for the town centre and foreshore were established, which helped to drive the design for both areas. The objectives enable the Shire to consider future development proposals in light of the desires of the community with a view to ensuring a cohesive and attractive range of functions are developed throughout the town centre and foreshore.

The objectives for the town centre and foreshore are:

- _ Resilient and sustainable
- _ Well connected
- _ Safe community
- _ Seasonal change
- _ Relaxed lifestyle
- _ Nature and environment
- _ Active and vibrant

These objectives have been used as a guide to develop the foreshore and town centre plans.

The town centre and foreshore plans have been developed in response to the evaluation of the existing conditions at Exmouth, the aspirations of the Shire and community as well as a desire to ensure design quality is evident in both the plan and future projects. The master plan is a physical manifestation of the recommendations developed in this report.



Future Entry to Exmouth

1.0 Executive Summary

The physical elements of the plans are:

Town Centre

Federation Park: This important community asset will be enhanced by closing and removing part of Payne Street and connecting the park to the public swimming pool. A community events space will be formalised through development of a multi-use stage, and a water play park will be created to complement the more formalised activity that occurs in the public swimming pool. The park will be rejuvenated to improve the quality of landscape amenity and levels of shading.

Maidstone Crescent: This important road, linking the town centre to Murat Road, will be enhanced with street tree planting and understory planting to improve the streetscape quality and impression of Exmouth. Between the town core retail area and Federation Park, Maidstone Crescent will be narrowed to improve pedestrian connections.

Town creek: The town creek will be cleared of weeds and landscaped to improve its visual quality. And a new shared path will be installed to create a safe and comfortable link into the town centre.

Kennedy Street: This will be enhanced through hard landscaping improvements, formalised street tree planting and creation of new commercial development sites. The street will be redesigned to function initially as a shared street, where vehicles can share a slow speed environment with pedestrians. Over the longer term, once development permits, a pedestrian mall can be created by closing the street to vehicle. Service vehicles would still access the mall at appropriate times.

New public square: A new public square will be created from a current carpark in the town retail core. The square will be well shaded and retain existing trees wherever possible. Urban water features may be incorporated to further cool the area through the warmer months. The square will cater for markets, community

events and informal public gathering, and create a new visitor focus for the town centre.

Retail growth: The plan provides a structure for sustainable retail growth that ensures town centre activity is consolidated around a core area. The plan identifies land the Shire should protect for long term retail expansion which will contribute to recontaining the 'retail health' of the town.

Entry building: A new landmark building to announce entry to the town centre is proposed, accommodating a cafe and visitor orientation and information experience.

Land use: The plan guides the future arrangement of land uses and the scale of built form throughout the town centre.



Renewed Federation Park

1.0 Executive Summary

viii



Exmouth town centre revitalisation plan

1. New roundabouts to mark entry statement to town centre
2. Maidstone Crescent upgraded and landscaped as town promenade
3. 'Central' Maidstone narrowed to create Federation Park link
4. New landmark building at entry to the retail town centre
5. Dual function town square and parking
6. Kennedy Street rejuvenated into a pedestrian mall
7. Short to medium term retail / town centre expansion sites
8. Learmonth Street to incorporate on-street parking
9. New town centre car park (with the potential as the Town grows to develop retail development fronting Kennedy Street in future stages)
10. Thew Street rearranged to improve accessibility to retail, traffic flow and parking
11. Long vehicle parking established
12. Redeveloped potential of Police and Court complex
13. Mixed use frontage to Maidstone Crescent
14. New paving to denote slow speed area and differentiated pedestrian link to improved Federation Park
15. Federation Park upgraded to include market space, a town event space and improved pedestrian paths
16. New water based playground
17. New road and parking to Payne Street
18. Payne Street upgraded
19. New swimming pool car park and link road
20. Town Creek upgraded to provide amenity with lighting and encourage greater pedestrian connectivity and linkages both within and through the town centre
21. War Memorial to move further north with landscape upgraded to create shaded area
22. Potential redevelopment of the Potshot Hotel or other large tourist facilities will be subject to negotiations on setbacks and new access arrangements with the Shire

1.0 Executive Summary

Foreshore

Town beach: The first priority in the staging of the shore is the renovation and enhancement of the existing town beach, which as a popular landmark would provide immediate benefit for the local community and visitors, and signal the intent and commitment of the Shire to implement the master plan.

Planting: A planting palette has been developed to guide all future landscape proposals in the foreshore precinct. The foreshore palette includes trees, shrub and groundcover planting species arranged into the various sub-precincts and individual requirements.

Coastal trails: A series of trails and boardwalks are to be proposed along the primary dune which take advantage of the elevation and views afforded by the natural topography. An interpretation and way finding strategy will be developed in tandem to meet the standards of the WA Trails strategy, including tourist symbols for whales, lookout points and aboriginal heritage.

Murat Road and intersection upgrade: Designed to enhance the entry sequence of incoming visitor traffic from the south, and increase wayfinding clarity from the north. Enhancements could be undertaken sequentially in line adjacent foreshore and town centre enhancement projects.

Truscott Avenue: Truscott Avenue performs a key motorist and pedestrian link between the proposed Ningaloo visitor centre, the town centre and the foreshore. This upgrade will be integral to the development of links to the new town beach.

Marina public open space:

Improvements are planned for the existing public open spaces in the marina precinct to enhance key links to the foreshore amenity zones, and the surrounding residential development.

New town beach (Gulf Beach): Planned to have a strong interpretation focus, the new town beach proposal will create a future vital link within the foreshore precinct, and enhance the proposed Ningaloo Research Centre.



Foreshore Enhancement Plan

1.0 Executive Summary

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Exmouth foreshore and open space development plan: Part 1 (North)

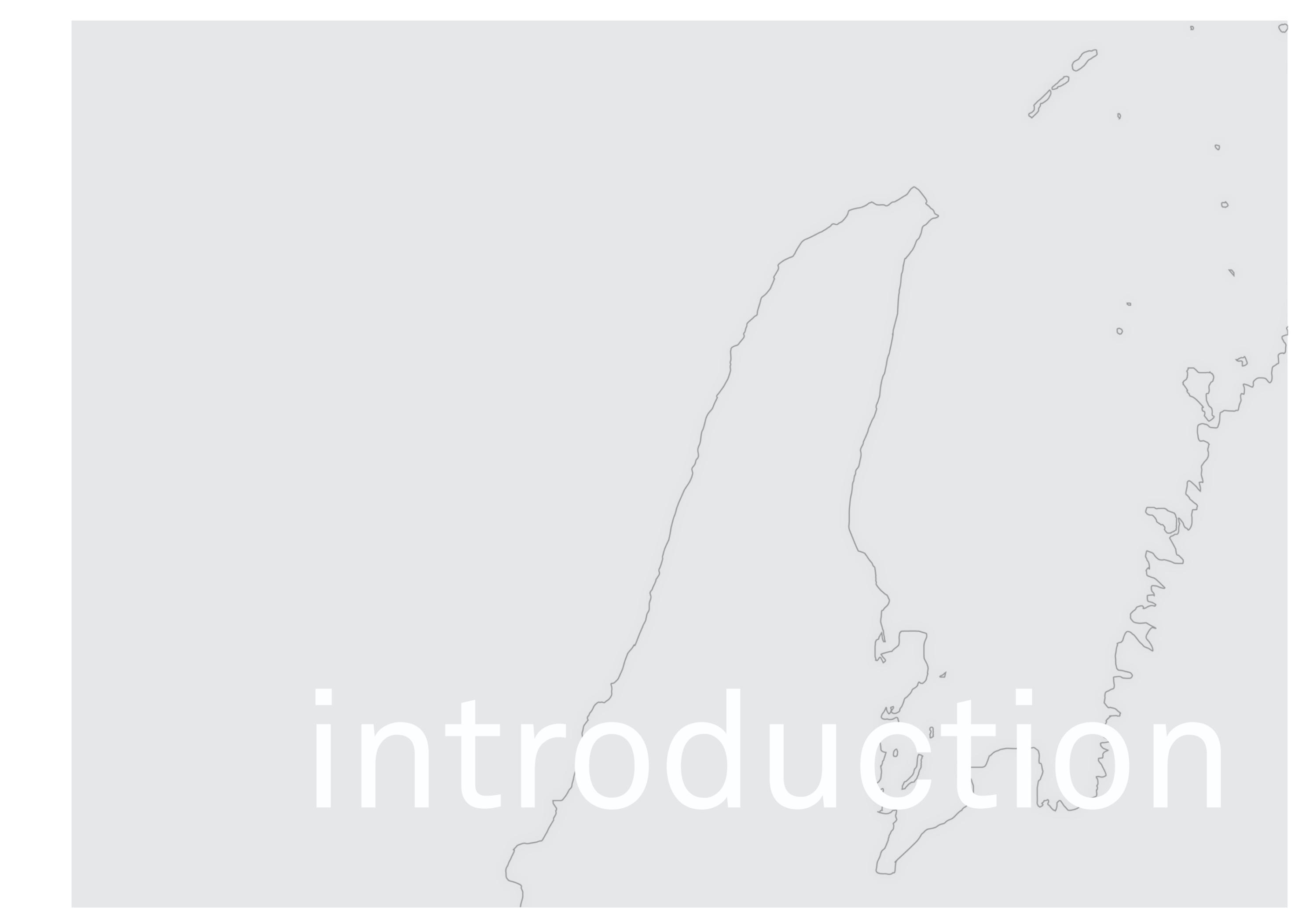
1. Town centre
2. Town centre entry and streetscape enhancement
3. Murat Road/Truscott Ave intersection upgrade
4. Proposed Ningaloo Research Centre
5. Murat Road south streetscape upgrade
6. Proposed relocation of Waste Management Facility
7. Entry to Gulf Beach trail
8. Gravel access road
9. Gulf Park Beach trail parking
10. Viewing platform beach access and outdoor interpretation centre
11. Truscott Ave streetscape upgrade
12. Secondary car park access
13. Existing foreshore trail upgrade
14. Beach access and shelters
15. Potential development of Golf Club
16. Secondary viewing platform to Gulf

1.0 Executive Summary



Exmouth foreshore and open space development plan: Part 2 (South)

1. Murat Road streetscape upgrade
2. Town Beach entry and streetscape upgrade
3. Warne Road / Madaffari Road intersection upgrade
4. Truscott / Warne Road intersection upgrade
5. Potential Caravan park / town street development
6. Potential resort accommodation development
7. Existing foreshore trail upgrade
8. Beach access by future development
9. Town Beach entry feature
10. Proposed revetment to existing carpark upgrade
11. Town beach parkland upgrade
12. Marina public open space upgrade
13. Potential Yacht Club redevelopment
14. Upgrade to existing Yacht club
15. Future proposed boardwalk between Novotel resort and Marina
16. Entry to Novotel Beach
17. Novotel Beach
18. Public open space and pedestrian link to Marina development



introduction

2.0 Introduction

2

The Shire of Exmouth has embarked on the important first stages of revitalising the town centre and its connections with the foreshore and other significant areas of open space in the town and along the foreshore. The project must accommodate and embrace some of the unique characteristics of this working and tourist town, including population growth by up to 200% in the peak of the tourist season. To achieve the ambition of revitalising the town, the Shire released two briefs relating to both the town centre and foreshore. The plans within this report bring together the work of the consultant team led by HASSELL, the Shire of Exmouth and Townscape Committee, and reflect significant community input.

2.1 Purpose

The purpose of this report is to enable the Shire to access a range of funding being made available in the North West. The funding will enable the Shire to revitalise the town centre through adopting appropriate environmental development initiatives; and infrastructure improvements to foster key economic; and social developments.

The Town Centre Master Plan and Foreshore Open Space Development Plans have been prepared to guide planning and decision making in order to improve the functionality, quality and attractiveness of the town centre and foreshore. The master plan builds on work undertaken by the Shire in the District Structure Plan. The master plan will see the town centre transformed from a place surrounded by car parks and under utilised land into a more structured environment that meets the long term retail and recreation needs of the community and tourists attracted to Exmouth.

This document presents the main issues relevant to the future planning of the Exmouth town centre and foreshore and provides a vision for its ultimate long term development. The master plan has been

prepared based on an understanding of the community's requirements and a range of technical documents. Where there is a gap in reporting, this is noted in the report with recommendations made for further analysis.

The document provides a framework that addresses the unique issues applicable to the project area, including the appropriate location for various types of activity, recognising Exmouth's importance as a tourist town and taking into account public realm, events and recreation space and informing the approach to movement and car parking.

The master plan sets out key structural elements that will be essential in realising the opportunities within and around Exmouth. It articulates a vision and intent for the project area and a set of clear planning principles. The master plan will also provide the location for future leasehold development sites and seeks to establish broad design standards for future development so that an integrated built form and public realm can be achieved.

The master plan recognises that a town centre, its public realm and foreshore must be designed to be enjoyed by residents and tourists alike, in a way which communicates how the Shire of Exmouth values its community and its physical and natural assets. A town centre and open space network that is well designed, delivered and maintained adds enormous value to the way a place functions and how its story is expressed. The plan is aimed at ensuring the future functionality, livability, commerciality and prosperity of Exmouth by accommodating future growth in a flexible and robust manner.

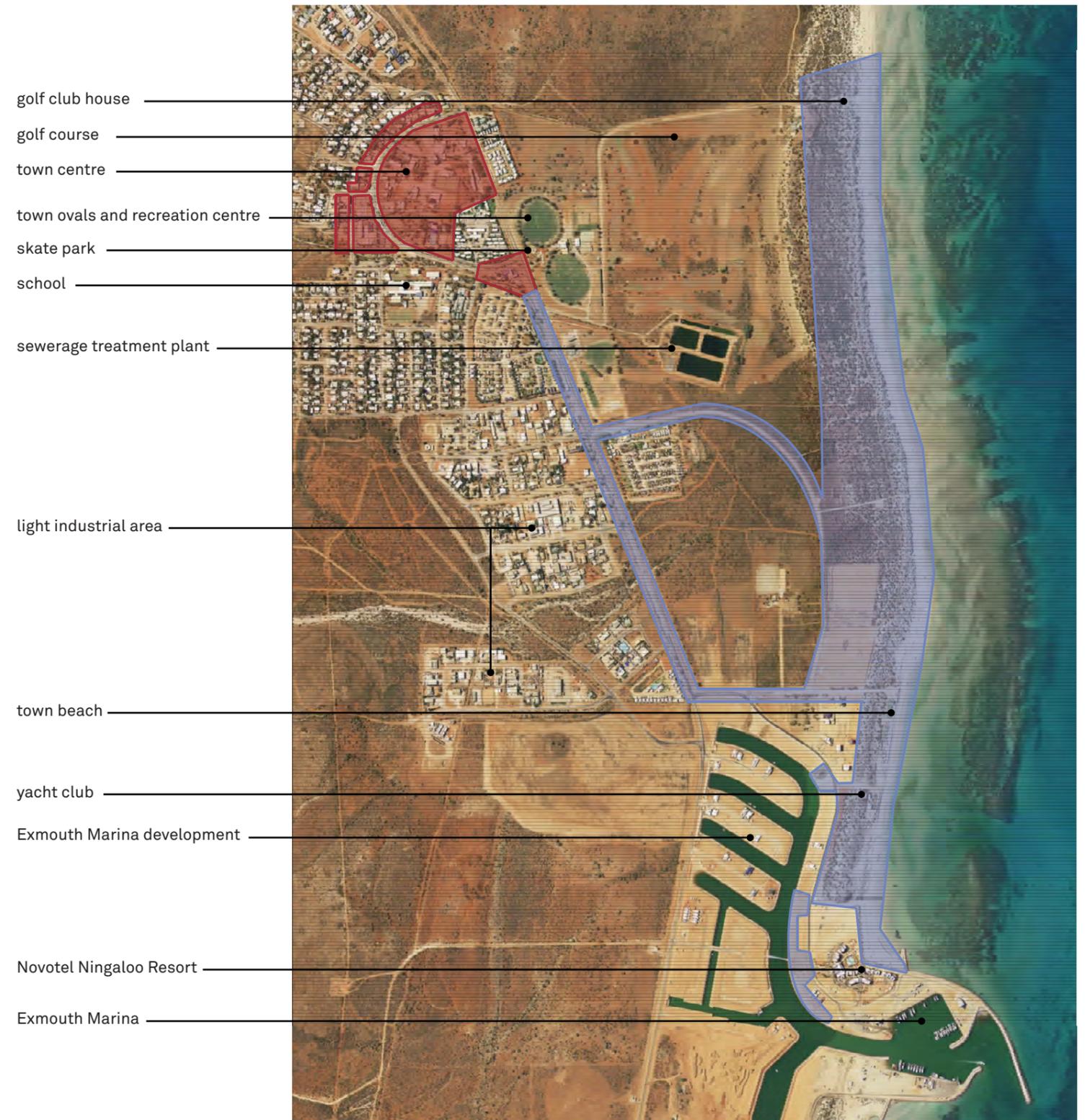


Figure 1: Project Area

Foreshore and Open Space Project Area
 Town Centre Project Area

2.0 Introduction

2.2 The Challenge

The North West Cape, the World Heritage listed Ningaloo Reef and the Cape Range National Park are natural wonders attracting thousands of tourists each year. The pristine wilderness of the North West Cape is contrasted with historic defence activity, most notably at Harold E Holt Naval Communication Station and RAAF Base Learmonth. Exmouth, initially established to service the defence bases, has had to adapt to various challenges, including significantly reduced defence personnel presence in the 1990s and the ravages of cyclones, which affect the way buildings and the landscape appear to current day visitors. Exmouth's location on the eastern side of North West Cape, somewhat removed from the pristine attractions of the west coast and Ningaloo Reef, has meant that the town itself has not been able to capture the full benefit of its tourism status - many visitors still use Exmouth as a short stay base from which to explore the wider appeal of the Cape.

Exmouth's town centre contains a host of important meeting hubs for locals and visitors to town, providing places to shop, eat out, collect daily provisions, attend cultural and social events, and use community facilities. Despite the town centre's prominence, its setting and design quality does not provide for a world class visitor experience. The town was built quickly in the 1960s in response to the defence presence and has not undergone significant redevelopment since. Its low set, concrete block buildings, whilst resistant to cyclones, do not provide an attractive or welcoming presence. Footpaths often don't connect to the foreshore, path lighting is not consistent, and signage does not provide clear direction throughout.

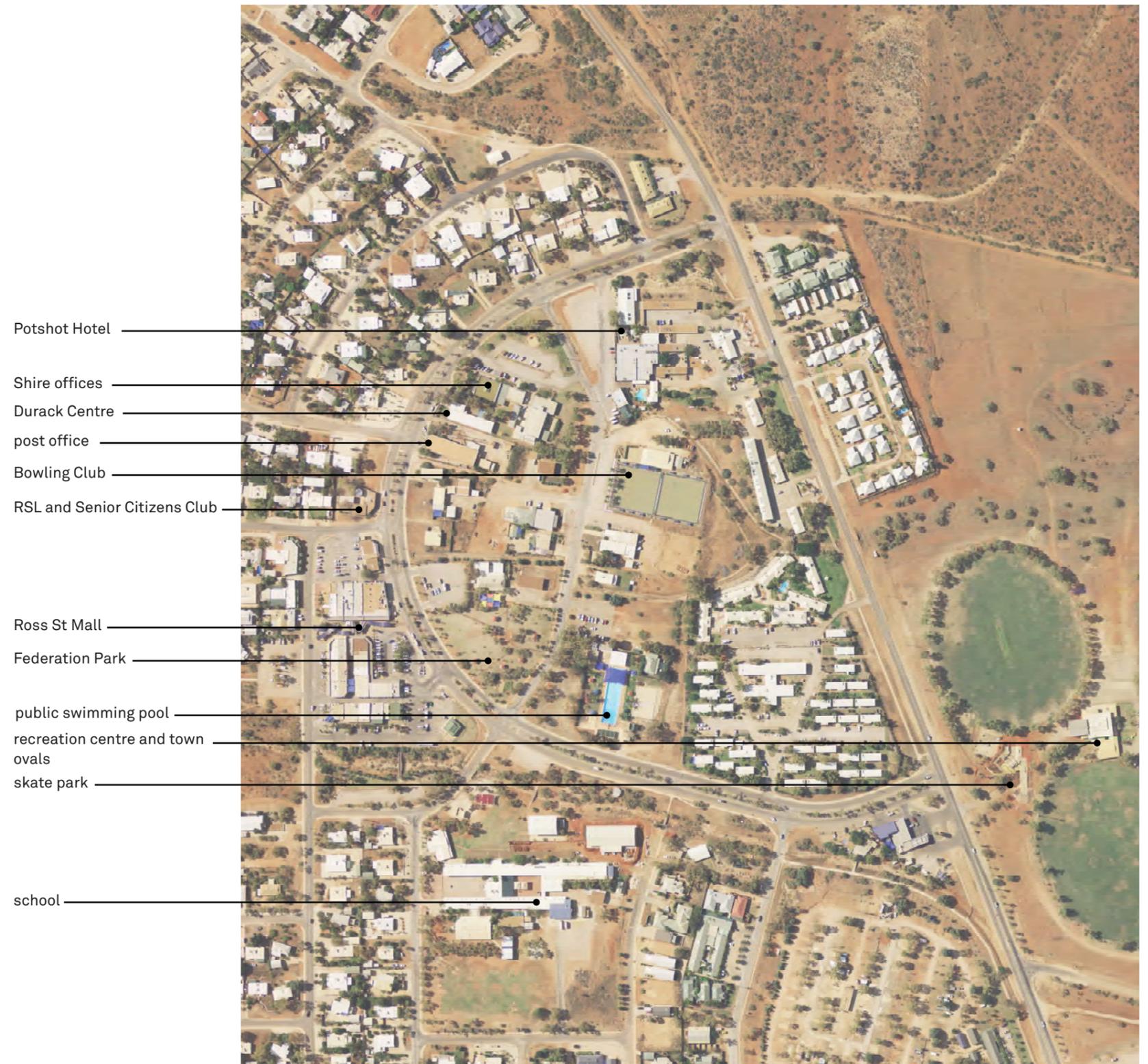
Notwithstanding Exmouth's dry climate, extreme weather events can cause flooding. For this reason, the town is set back from the beach on the Gulf. Exmouth's town centre does not enjoy a coastal setting, meaning the design, amenity and character needs to be of the

highest quality to ensure a positive visitor experience. Connections between the Cape range coast and the town need to be improved to ensure that legible access is provided and a sense of the Cape range and Gulf natural wilderness is captured within the town centre.

Exmouth's town beach is an important recreational area for locals and visitors. It is one of the few beaches in Western Australia where a sunrise can be enjoyed over water; the beach is used for swimming, fishing and contains a protected area for picnics and barbecues. Four wheel drive vehicles are permitted to access the coast north of Town beach, and while this presents some issues in itself, it allows people to easily reach parts of the foreshore that are too far to walk from town. As Exmouth grows, it will be important to manage this type of access so that erosion and potential conflicts between vehicles and people on the beach can be minimised.

The project area relates to Exmouth's town centre and the town beach and foreshore. Connections between these two areas are critical and have also been included. Between the town beach and town centre, flood plains and the sewerage treatment plant limit growth opportunities.

The opportunities highlighted in Section 2 provide a better understanding of the need to prepare a town centre revitalisation plan and foreshore development plan.



Potshot Hotel

Shire offices

Durack Centre

post office

Bowling Club

RSL and Senior Citizens Club

Ross St Mall

Federation Park

public swimming pool

recreation centre and town ovals

skate park

school

Figure 1: Town Centre

2.0 Introduction

2.3 Community Engagement

Through a comprehensive process of engagement with the community and key stakeholders, a set of ideas for Exmouth's future were captured that embraced a collective vision. The aim of the engagement process was to consider all aspects of Exmouth from global perspectives to individual values, across time and culture to deliver succinct and legible design principles and recommendations for the Shire to understand, endorse, and finally implement.

Over a four day period, a number of workshops were held with community groups in Exmouth to help establish an understanding of the critical issues affecting the town, identify opportunities for revitalisation and help formulate a vision for Exmouth's future. Additionally, several one-on-one meetings were held with community members to discuss particular issues relating to the town centre and the foreshore. In total, approximately 100 people were involved in the community workshops. The engagement workshops targeted a number of groups to ensure an appropriate cross section of the community was able to provide their views. The following formal sessions were held:

_Traders workshop: A daytime workshop (half day) with traders in the town centre to consider development options and work towards a vision

_Senior citizens: A round table meeting was held at the RSL Club with interested senior citizens to discuss their aspirations for Exmouth, the facilities and character they would like to see developed

_Community workshop: A two and a half hour evening workshop to gain a community wide understanding of aspirations for Exmouth town centre and foreshore

_Year 10 students: A daytime workshop with students to discuss their aspirations for Exmouth's town centre and foreshore

_Community group session: A round table meeting with relevant community groups to ascertain their aspirations for Exmouth foreshore and town centre

_Summary community workshop: A final workshop open to the public during afternoon of day two to delve further into place making and urban design criteria for Exmouth. Place aspirations and a draft vision statement were presented at this meeting as a way of establishing agreed aims and principles and engender community ownership of the project

The process developed the beginning of a project vision through the formulation of ideas for plans whilst also agreeing a series of strategies to ensure implementation. This included both quick win solutions and longer term strategies to revitalise Exmouth. The resulting plans developed are innovative, but needed to be practical and achievable, in order to meet community aspirations and address local parameters. The Revitalisation Plans aim to promote a range of broad and site-specific land-use options for identified sites, with a strong emphasis on economic activation, appropriate built form, adaptability of space and functions (for peak tourism periods), sustainability and improved access.

After development of the initial ideas, the community were then invited to comment on two options for the town centre and ideas for the foreshore. This round of consultation was commenced by a two day community open day followed by a 21 day period for comments. The final plans have taken on board the comments which were received from community members and stakeholder groups.

2.4 Document Structure

The report is divided into six sections, which can be broadly outlined as follows:

Introduction

This section introduces the project, outlines the purpose of the master plan.

The Vision, Challenges and Opportunity

Sets out the agreed vision for Exmouth and draws on some of the challenges to overcome and implicit opportunities at play.

The Place

Describes the project area as it currently exists through in depth site analysis.

The Plans

Describes the design drivers and philosophy of the proposals for the town centre and foreshore, addressing how the challenges identified in Section 3 have been met.

Environmental Management

Outlines the relevant issues and approaches associated with coastal planning and foreshore environmental management.

Recommendations and Implementation

Recommendations for achieving and implementing the town centre and foreshore development plans are described.



Community workshops



vision and
opportunity

3.0 Vision and Opportunity

3.1 The Community Vision

Through the workshop process the community of Exmouth developed a number of themes that exemplified the key characteristics they value in the town. The community participants identified both the town centre and town beach on the foreshore as being the important meeting places - areas for play and areas that generally represented the heart of their community. Seven themes emerged from the workshops and the items generating most discussion. Ideas and solutions for Exmouth's town centre and foreshore were to engender:

- _Resilient and sustainable
- _Well connected
- _Safe community
- _Seasonal change
- _Relaxed lifestyle
- _Nature and environment
- _Active and vibrant

The themes are essentially the design principles the plan must achieve and against which the success of the plans would be judged. The themes were also strongly reflected in the participants' responses to the question: "What makes Exmouth unique?"

Exmouth is unique for its:

- _Community and safety
- _Environment
- _Relaxed lifestyle
- _Community togetherness
- _Isolation - Exmouth is a destination

The group did not arrive at a single or unified vision that capitalises on Exmouth's unique sense of place, that captured the rich history or the unique natural attributes of rich biodiversity, coastal setting and lifestyle. However, all agreed the natural and social assets Exmouth is overly blessed with should enable it to become a prime regional service and a tourist centre, recreational and cultural destination of world renown, befitting its designated world heritage status.

The participants arrived at a few recurring visions in articulating the aspirations for Exmouth, in essence, Exmouth will be:

"A world heritage destination where the reef meets the range."

"A resilient, safe, can-do community with a vibrant and authentic town centre and foreshore that celebrates the natural assets of our people and place."

"The town and foreshore will have entertainment and activities for all ages and there should be opportunities to enjoy Exmouth at both day and night, in essence....Exmouth will be nature's playground."

Exmouth residents demonstrated a love for their town and foreshore and a great appreciation of the natural beauty of the area. They were an engaged and connected community and expressed their hopes for Exmouth as a place which will retain its character and pristine environment, enhance its retail mix and activity, improve safety and comfort factors in the town centre and the foreshore, and retain the natural beauty and lifestyle of the area.

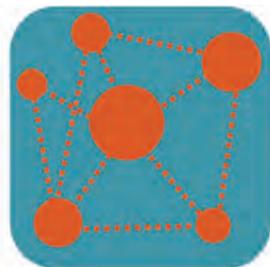
To sustain the themes and visions - making them a reality in the future requires a healthy, vibrant commercial centre that is robust enough to grow and accommodate the ever changing dynamics demanded of a modern town centre in a ecologically blessed environment and resource rich region. Achieving world heritage status is a major step for the town, achieving an economically sustainable town centre will allow it to function at optimum capacity, all year round - making this happen is the real challenge for Exmouth.



Vignettes showing Exmouth's potential



RESILIENT AND SUSTAINABLE



WELL CONNECTED



SAFE COMMUNITY



SEASONAL CHANGE



RELAXED LIFESTYLE



NATURE AND ENVIRONMENT



ACTIVE AND VIBRANT

3.0 Vision and Opportunity

3.2 Opportunities

The challenge for the project is to build on the good elements of Exmouth and the unique opportunities it affords, in a manner that meets the needs of the community now and into the future. It is about creating a sustainable town that functions well and is enjoyable at peak tourist times, as well as in the 'off' season. It is about re-energising the town through providing scope to grow, offering new functions and leveraging of the economic activity of the wider region. It is about capturing the recent investment opportunities available for the North West such that Exmouth gains a competitive advantage within the State. The various issues highlighted below provide an understanding of the need to prepare a master plan and illustrate some of the issues surrounding the revitalisation project.

3.2.1 Tourism

Exmouth is situated centrally to well-recognised Western Australian natural assets including the Ningaloo Reef, the world heritage area of Shark Bay Cape Range National Park and the southern gateway of Coral Bay. Positioned on the gulf, there is significant scope to optimise the town's economic, cultural and environmental reputation. While the study is focused on the town centre and its development potential, we will explore the potential of the important links to the foreshore to enhance the tourist experience of Exmouth and the region. Also important is the need to plan for the annual population influx associated with Exmouth's tourist based economy. The town experiences a growth of up to 200% during peak tourism times and town centre spaces must cater for both the peak and the non-peak periods. Exmouth must appear a cohesive and successful place at all times of the year and so careful consideration of successful place making and planning strategies is vital.

3.2.2 Culture and Community

The interface between the Foreshore and the town centre has the opportunity to be the heart of the Exmouth community. It offers the people a distinctive central place for positive social interaction. There is potential to strengthen the physical, cultural and social links of the surrounding community to bring people together. The Town Centre Revitalisation and Foreshore Development Plans presents a real opportunity to reignite interest and reconnect people with place and strengthen social capital and a sense of belonging.

The plans and strategies have the ability to be a catalyst in attracting people to visit Exmouth and improve the town's image with the aim of enticing people to consider Exmouth as a favourable place to visit and reside. The stories of Exmouth's cultural and natural heritage can enrich the design process and drive outcomes ensuring Exmouth is special and memorable. The layers of history, natural and human both pre and post settlement will create a unique identity, born of geography and circumstance.

Sustainable communities are diverse, affordable, inclusive and healthy; they enhance social interaction and ownership, are safe and caring and improve people's well-being.

3.2.3 Defining the Core

Key to providing a cohesive town centre will be defining its core. The core will be the centre of action, the central meeting place and the area people are naturally drawn to. It will be the magnet of activity in Exmouth's town centre. The core must be tight – that is, it must contain a mix of activities in a defined and accessible area that allows for activation throughout the day and into the evening. Activities must therefore be appropriate to the core and build on each other – retail, entertainment, lifestyle, culture, dining and short stay functions are some activities appropriate to town cores. The built form within the core also must have an intensity and character that contains activity – in this way the core is defined, easily recognisable and the logical heart of Exmouth.

3.2.4 Containment of Activity

Exmouth suffers a dispersion of activity. To create a successful town centre, activity needs to be contained such that opportunities for exchange are promoted, pedestrian movement is easy and a sense of conviviality is harnessed. Activity is contained through the form of buildings, the arrangement of streets, the location of car parking and service areas as well as the location of functions within the town centre. HASSELL worked with the Shire and the community to identify strategies to contain activities within the town centre and allow a successful place strategy to develop over time.

3.2.5 Promoting a Wide Range of Retail and Community Services

A successful town centre, particularly within Western Australia's isolated North West, will provide all necessary services and functions for the convenience of locals and visitors. Exmouth, as a tourist town, has the potential to provide a greater range of services than it currently does. To do this, Exmouth needs to leverage its point of difference and grow its economic base. By improving the economic position of Exmouth, there is potential for more services to be provided over time and less need for these services to be gained elsewhere.



3.0 Vision and Opportunity

8

3.2.6 Economic Success

Economic development is not small business development. Economic analysis, particularly in regional and remote areas, requires the generation or attraction of strategic, export-oriented driver projects that provide the economic foundation for the community and stimulate population retention and growth. An effective economic analysis and development strategy requires a clear understanding of the dual nature of the Exmouth economy. Exmouth developed from an original basis of support for the US Defence Base and retains many of those planning characteristics. The challenge is to expand on that platform by capitalising on the resource based activity in the region, to add to Exmouth's already significant tourism base. Company resource operations include an optimised value chain of suppliers and contractors with limited opportunities (to this point) for involvement by local businesses to become part of the resource operations value chain.

The town's local economy is dominated by employment generated by tourism operations and the subsequent population driven demand for goods and services on offer in the community. For Exmouth to generate increased economic opportunities it is necessary to understand that it cannot force change in the business models with regards to oil and gas and mining operations, but that there may be opportunities for value chain augmentation by understanding how value is created for the companies, what hard and soft infrastructure incentives might be explored and developed to suggest alternative arrangements in company operations. The purpose of the economic analysis is to articulate the relationship between the resources economy and the local town economy. Undoubtedly the resources sector offers the most readily apparent opportunities for diversification of the town's economic base. It is this area of investigation that presents the most favourable opportunities for economic expansion of the town over the medium to longer term, as it seeks to build on the economic comparative advantage of the region for local benefit rather than endeavouring to introduce new industry bases or economic opportunities from scratch.

3.2.7 Creating a Resilient Town

By addressing the challenges there is the real opportunity to create a resilient town for the future. Exmouth can develop other industry bases and economic development beyond the resources driver. Such opportunities might conceivably include further development of tourism opportunities, exploration of local economic development projects, energy generation projects such as geothermal engineering, solar energy, tidal energy and wind turbines. Whilst we have been strongly involved in the consideration of opportunities to arise from the Ningaloo Ocean and Earth Research Centre, there may be opportunities to explore the scope of other research and technology based projects in areas such as remote community water reuse, or in areas of specific technology development as might be suggested by select industry and technology roadmaps.

3.2.8 A Beautiful Town Centre

Like many towns in the north west, Exmouth has developed out of pragmatic need with little focus on high quality urban environments and public realm. Buildings are functional, but not necessarily aesthetically pleasing and the public realm is not developed to tie the town centre functions together. With commencement of the revitalisation plan there is a real opportunity to be focused on creating a high quality public realm, building form that responds to the local environment. There also needs to be an improved movement network for all modes of transport, but one that elevates the pedestrian and cycling experience above that of the car. There is a clear challenge in creating a rationalised but functional approach to dealing with parking that satisfies both residents and in the influx of tourists at peak times. There needs to be stronger and legible links between town and foreshore allowing tourists and locals better access and amenity, thus maximising the immediate coastal experience Exmouth Gulf offers. The plan must build upon all these opportunities and create a local sense of place through design. If this occurs it will be a beautiful place that is loved by locals and visitors alike.



Exmouth's town centre entry and surroundings should be more attractive, comfortable and inviting





the place

4.0 The Place

10

4.1 Regional Context

Exmouth is situated on the North West Cape of Western Australia, approximately 1,270 kilometres north of Perth. Exmouth is isolated from other centres, being the only settlement on the North West Cape and is accessible by only the Minilya - Exmouth Road connecting to the North West Coastal Highway

Historically the North West Cape was used for pastoral and defence purposes. These two functions have diminished over time such that the predominant economic activity within the region is tourism. Exmouth's development was largely as a result of the US Navy Communications Base however this was decommissioned in the early 1990s, causing a significant drop in population. Defence is still an important element to the region, with communications facilities for the United States Navy and RAAF Base Learmonth being near to Exmouth and the potential for these areas to grow into the future.

Exmouth is emerging as a strategically located regional town that could become home to a residential workforce that may service infrastructure projects such as the potential defence bases and the offshore oil and gas industry. With the State's intention to establish Pilbara cities in Port Hedland and Karratha of notionally 50,000 plus residents, and a further significant centre in Newman, it is possible that Exmouth could position itself as a residential source community for the Pilbara.

Under this scenario, workers may choose residency in Exmouth owing to a perceived higher lifestyle amenity than the Pilbara and choose to fly into the Pilbara from their base in Exmouth. For example, with the Carnarvon Basin located only 50km offshore, Exmouth is ideally located to provide supporting infrastructure and services to the offshore resources industry.

An important feature of the Cape is the Cape Range National Park and the Ningaloo Reef – both located on the western coast. This area has recently been recognised as a world heritage site. The pristine nature of the Cape and its waters is the key attractor for tourism within the region.

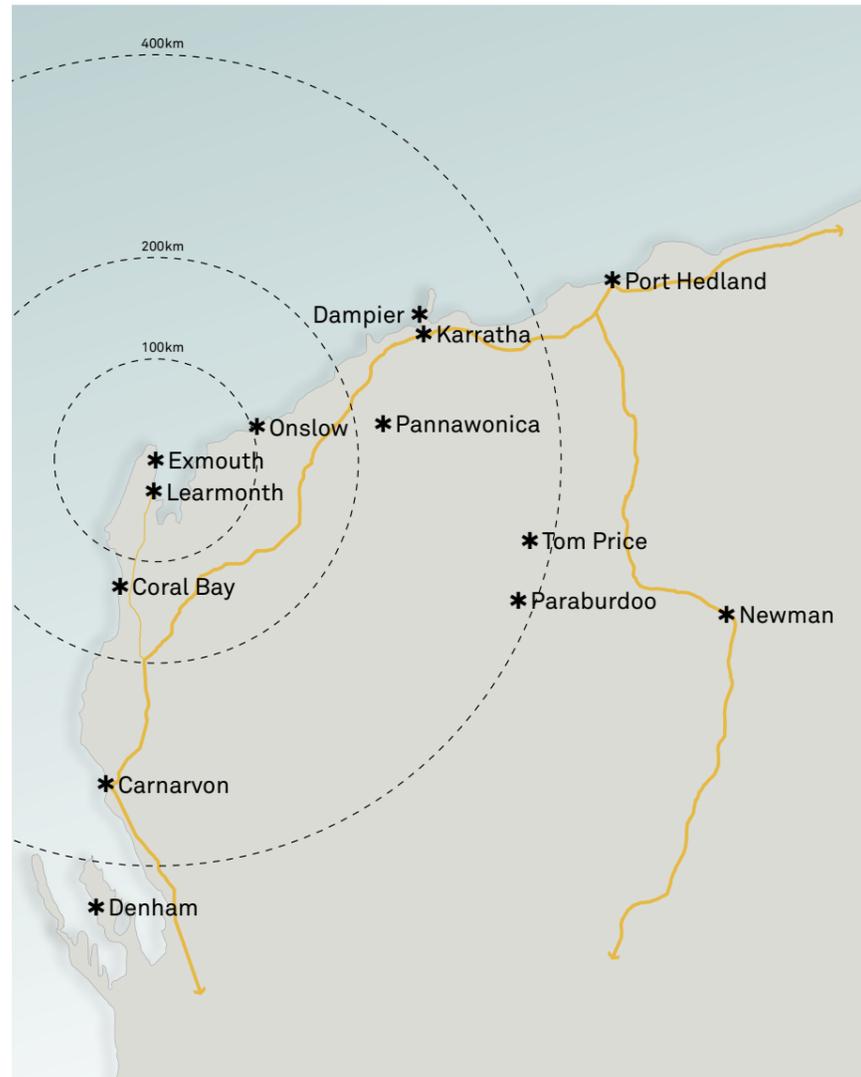


Figure 3: Regional context

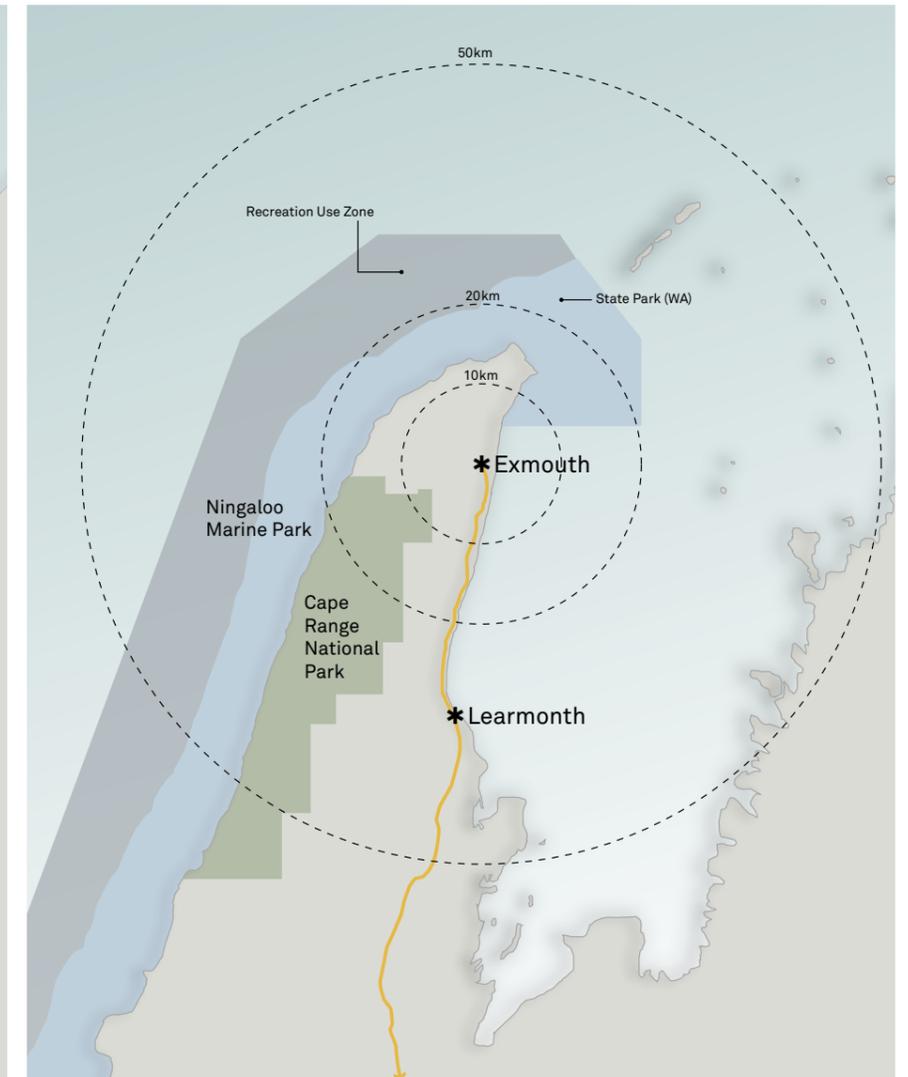


Figure 4: North West Gulf and conservation areas



4.0 The Place

4.2 Local Context

Exmouth is a linear town, with the urban morphology being shaped by the Cape Range hills to the west and the coast and floodway to the east. Murat Road is the entry corridor, defining the eastern edge of the town and connects the North West Cape to Learmonth and the North West Coastal Highway.

The town centre is located to the west of Murat Road on Maidstone Crescent, with residential neighbourhoods stretching to the north and south. Several dry creek beds cut through the Exmouth township providing a drainage function for water running off the Cape Range. During heavy rain events, water collects to the east of Murat Road, with the coastal dunes preventing the water from draining into the ocean.

The major employment nodes other than the town centre include the light industrial area (immediately adjacent to the town), the Exmouth Marina to the south east of the town site and Learmonth, 32 kilometres further south. The important connections are to the coastal nodes at the golf club, yacht club and the marina. Truscott Crescent and Willersdorf Road provide these connections. Existing connections between the town centre and the foreshore are not immediately apparent to visitors, but do exist.

4.3 Functional and Economic Context

The Exmouth economy is dominated by tourism which accounts for an estimated \$44 million of expenditure annually in the area. Other key industries include fishing, the nearby defence communications installations and the developing offshore oil and gas sector.

Exmouth has a relatively stable residential population anecdotally reported to be in the order of 2,500, however the 2006 ABS census data indicated the total population of the Shire was just over 2,000 persons of which 1,844 were resident in the Exmouth town site. The ratio of resident workforce to resident population was a relatively high 55% and it is suggested that a long term strategy towards sustained population growth might reasonably expect to see that ratio decline to around 42%-45%. The growth of Exmouth is dependent on generating strategic employment in key export oriented industries and infrastructure projects in the region.

4.3.1 Population Growth Scenarios

The Exmouth Structure Plan reports that the town of Exmouth has the physical capacity to cater for population growth of approximately 5,500 to just over 7,000 depending on land constraints. This assumes a more or less business as usual approach to land use and residential densities. Pracsys modelling posits population scenarios of 4,000, 6,000 and 8,000 permanent residents notionally by 2031 for the purposes of determining optimal floorspace.

An increase in population to 4,000 presupposes a 76% increase in residential workforce to around 1,800 jobs. Moreover, this would require a disproportionate growth in the areas of strategic employment such as export / driver jobs and producer services jobs. At a population of 4,000, Exmouth could reasonably expect an increase in population driven employment areas such as retail and consumer services of around 1,000 jobs. It should be noted that, Exmouth's population has not grown significantly over the past census period and it is suggested that any substantial growth of the type modelled here would require an intervention strategy designed to attract industry, businesses and residents over the longer term.

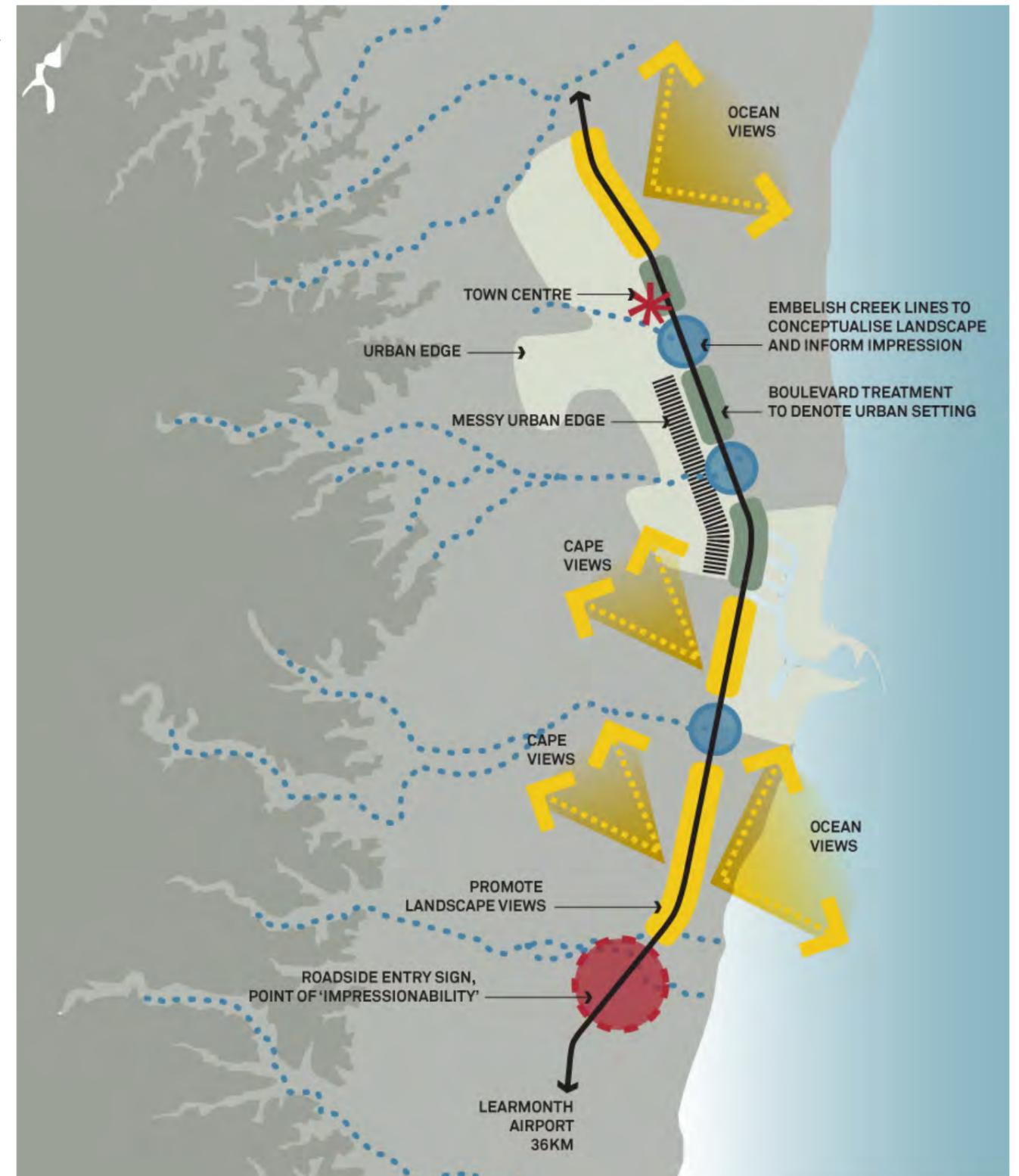


Figure 5: Entry impressions to Exmouth and Local Context

4.0 The Place

4.4 Planning Framework

This section describes the principal State level strategic and statutory considerations that affect the planning and development of the Exmouth Town Centre and Foreshore Revitalisation Plan. As a general rule, State Planning Policies and strategies inform the development of local government planning instruments. No attempt is made to document every applicable policy.

4.4.1 State Planning Policy 2.6 - State Coastal Planning Policy

SPP 2.6 is particularly relevant to the Exmouth foreshore, in that it:

- _Sets requirements for calculating coastal physical process setbacks to protect development and land use from physical coastal processes and the effects of climate change;
- _Limits height of buildings within 300 m of the coast; and
- _Provides guidance relating to development and land use along the beach.

SPP 2.6 is presently under review by the Western Australian Planning Commission. Importantly, the proposed changes in methodology to the measurement of setbacks include a sea level rise to 0.9m by 2110 based on IPCC Assessment Report 4. The revised policy is also likely to include requirement to consider both erosion and inundation when assessing setbacks. The need for the provision of development nodes on the coast is recognised by SPP 2.6. Such nodes may be developed within the setback but should only be located where necessary ancillary coastal protection structures would not result in erosion or destabilisation of adjacent coast.

4.4.2 State Planning Policy 6.3 - Ningaloo Coast

This was prepared to accompany the Ningaloo Coast Regional Strategy and sets out the following key objectives:

- _Clear guidance regarding acceptable and sustainable development on the Ningaloo coast;

- _Maintain the Ningaloo coast as an all-seasons recreation and nature-based tourism destination and limit growth with managed staged development, to ensure that the community continues to enjoy a remote and natural experience;
- _Consolidate future residential, commercial, higher-impact tourism and industrial development in the towns of Carnarvon and Exmouth and provide strategic directions for their future growth; and
- _Preserve and protect the natural environment and enhance and rehabilitate degraded areas.

4.4.3 Local Planning Framework

The Exmouth Structure Plan (2011) sets out to create a legible, identifiable and vibrant development future for Exmouth. It's aim is to facilitate improvement in the quality of the built form and to respond to the existing pressure for land release to cater for residential, commercial, industrial and tourism demand.

The key intent of the Structure Plan is to create a development future for Exmouth that is appropriate to the particular needs of the Town. This includes expanding tourism opportunities beyond the nature based offer, creating a larger permanent residential population, respond to the environmental conditions of the town, and expanding Exmouth's economic base.

The Department of Water (DoW) developed a floodplain management strategy (2007) for the Shire of Exmouth based on detailed hydrologic and hydraulic modelling. The Exmouth Floodplain Management Study has been endorsed by the Shire of Exmouth and the DoW and has enabled a management strategy to be put in place to better understand flood issues and predict potential flood impacts. The strategy identifies land to be identified as 'Floodway', 'Flood Fringe' and 'Area of Special Consideration' determining the level of development and further investigation appropriate within those zones.

4.4.4 Exmouth Town Planning Scheme No. 3

Development within Exmouth is subject to the provisions of the Shire of Exmouth's Town Planning Scheme No. 3. The project area and its surrounds includes the following zones; Residential, Tourist, Town Centre, Public Purpose and Recreation and Open Space.

In association with the Town Planning Scheme No. 3 the Town of Exmouth has a number of Local Planning Policies considered relevant. These include but are not limited to;

- _Colour Palette for Developments
- _Commercial Centre Design Guidelines
- _Murat Road Development Guidelines
- _Landscaping

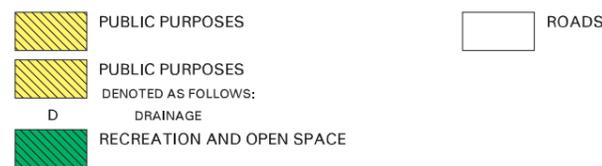
The town centre zone does not allow development of permanent dwellings including as part of mixed use developments. The focus of development within this zone under the current scheme provisions is for commercial and tourist opportunities.

4.4.5 Townscape Enhancement Plans and Design Guidelines

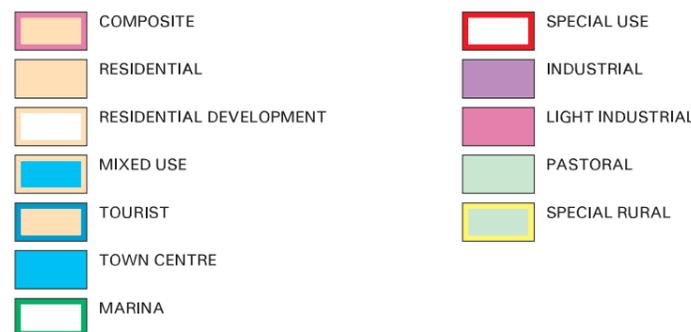
The Shire adopted a document, 'Townscape Enhancement Plans and Design Guidelines 2001' to assist guiding further development in the town centre.



LOCAL SCHEME RESERVES



ZONES



OTHER



Figure 6: Town Planning Scheme

4.0 The Place

4.5 Cultural Heritage

The Cape Range Peninsula is enriched with both indigenous and non-indigenous culture. The peninsula provides the earliest confirmed evidence of Pleistocene marine resource use in Australia and plays an important role in the conservation of Indigenous culture. It is thought that Aboriginal habitation of the North West Cape and Exmouth area is to have commenced 38,000 years ago. Aboriginal habitation of this area continues today further enforcing the cultural significance of the North West Cape area to the Aboriginal People and the Gnulli Native Title Claimants Group, recognised by the Aboriginal community as custodians of Aboriginal culture for the area.

Archaeological surveys have uncovered a plethora of material within this area with there being three registered Aboriginal sites in the Exmouth town site. It is likely that given the rich indigenous history in the area that other sites exist within the town site and region that have not been entered into the register of Aboriginal site however these are still protected under the provisions of the Aboriginal Heritage Act 1972.

The first recorded landing by Europeans on the North West Cape was by the Dutch ship Mauritius in 1618, which arrived at the Australian coast by accident on its way to Java. Two centuries later in 1801, French ships visited the area and named Cape Murat after Napoleon's brother-in-law.

Perhaps the most significant non-indigenous development within Exmouth occurred during the second World War. By 1942 America lost its foothold within the Asia Pacific region anywhere north of Australia and needed a stable base in which to regroup, reform, and initiate a counter attack. In what was to become referred to as Operation Potshot a site at Exmouth was chosen for a US military base that was kept highly secret. The United States continued to occupy Exmouth and utilise these base facilities until 1992. Their departure resulted in an

immediate 30% reduction in the population of Exmouth however the previously developed pearling and commercial prawn fishing industries managed to keep the town alive. Notably, it was during the 1960s that the first tourists began to travel to Exmouth, largely to take advantage of recreational fishing opportunities.

The Vlamingh Head Lighthouse and Quarters is included on the register of the National Estate and the Western Australian Register of Heritage Places, as well as being classified by the National Trust. The Lighthouse was built in 1912, and was operated by two lightkeepers until its decommissioning in 1967. Other historical sites in the Exmouth area include Yardie Station Homestead, the WWII Radar Site, Mildura Wreck, Yardie Creek, the Operation Potshot Site, Rough Range and Cape Range Oil Well Sites and Wapet Creek.

4.6 Natural Heritage

The Ningaloo Reef, whilst not part of the project area, influences greatly the economy of Exmouth and its reputation as a wilderness destination. The reef and surrounding waters were declared a marine park in 1987 and a UNESCO world heritage site in 2011. The world heritage area extends from the Muiron Islands south to Quobba along the western side of the North West Cape.

As a National Heritage area, it is subject to the federal Environment Protection and Biodiversity Conservation Act of 1999 (EPBC) according to which all proposed activities with possible significant impacts on the values of the site require assessments. The EPBC is applicable to activities located outside of the boundaries of the world heritage listed area. While no formal buffer zones have been established for the heritage area, the Act therefore serves as a legal buffer zone. The boundaries encompass the key marine and terrestrial values with the exclusions being small in size and not conflicting with the maintenance of the values if managed adequately.



Range to reef

4.0 The Place

4.7 Site Analysis

4.7.1 Town Centre Built Form Character

Exmouth was initially developed as a Naval Communications base and it follows that the building form within the town centre is overtly functional and utilitarian in nature. The town centre is characterised by a wide, open, sparsely planted landscape containing low, solid buildings that tend to be disassociated from the street network and public realm. The functions within most of the buildings in the town centre do not relate to the original design of the buildings. Each function is therefore generally compromised. More importantly, the buildings have not been designed to provide for activated town centre nodes – the buildings provide internal activity but generally do not promote or enhance external activity. In this regard, street life is generally limited to the town core and could be dramatically improved. Built form is concentrated around the original town centre with new developments opening up to the south (marina and industry) and north.

The streets tend to be open and uncontained, except within the town's retail core where a finer grain of building contains hospitality and retail functions. The retail core is the most successful and active part of the town centre, acting as a social and recreational meeting hub. Buildings through the wider town centre are generally dispersed; leading to an informal and ill-defined pedestrian movement through large street blocks. The form of building is highly utilitarian, most being constructed of cement blocks with having low, flat roofs. Few buildings within the town centre exhibit architectural features that soften their utilitarian form, however the town core is a more positive environment with seating, soft landscaping and ample shade provide by the way of large steel structures. Opposite, the town core is the large lawned Federation Park containing some large trees, pergola structures and barbeques. The park appears to lack purpose or focus at present because of its disconnection from other parts of the town centre.



Figure 7: Town Core analysis

4.0 The Place

4.7.2 Town Centre Landscape Character

A defining feature of the town centre is the system of natural drains that run through it. These intermittent creeks are dry for most of the year and flow only during heavy rainfall events. They provide a drainage function, a visual landscape function and also broadly relate to pedestrian movement lines through the town centre. The condition of the natural drains vary, depending on the level of human intervention, culverts and diverted flow points occur, along with some sections of concreted lining. Rubbish is also known to collect in the drains. There is no formal planting along the drains – any planting that does exist tends to be generally uncontrolled and either native or weeds. There is potential to greatly improve the value of these drains to Exmouth in both an environmental and social manner.

The streets throughout the town centre have varying degrees of public realm treatments. –Some contain median and verge planting, footpaths and lighting, whilst others contain none of these features – merely having an asphalt road base and sandy verge. The simplest and most effective technique to tie the town centre together will be to improve the function and character of the streets so that pedestrian and vehicular movement is safe and legible and the setting is attractive.



Figure 8: Open space areas in the town centre



Figure 9: Landscape interface opportunities



Town creek

4.0 The Place

16

4.7.3 Legibility and Wayfinding

The first impressions of the Exmouth town site are formed by the condition of development along Murat Road, and the wide and slowly curved road of Maidstone crescent which provides the primary connections between activity nodes and the broader urban areas within the town. Roadside planting along Murat road attempts to create boulevard effect, which is partly lost by the inconsistency in planting species and tree placement. The southern extremities of the townsite comprise light industrial development; many yards are contained by cyclone fencing with open storage of materials. This relatively untidy urban form is highly visible from the boulevard of Murat Road, and detracts from the initial impressions of Exmouth. The boulevard planting dwindles towards Maidstone Crescent, which is the key entry road to Exmouth's town centre. The significance of this intersection is lost within the broadly open landscape – the town's recreation precinct lies to the east and the road reserve is very wide and uncontained. The service station and tyre repair shop at this intersection is utilitarian in nature; whilst these businesses benefit from the 'highway' nature of Murat Road and passing traffic, they do not signify the importance of Maidstone Crescent as the 'key' entry road to the town centre.

At present the connection between the town centre and foreshore is distant and is not pedestrian friendly. Whilst these connections do not appear obvious at first they are relatively popular among locals

and visitors to town. Movement north-south along the foreshore is fragmented and there is not a clear sense of destination or distance between activity nodes.

For visitors to Exmouth, an understanding of where the town centre is located in relation to the broader area is not immediately evident. The town centre is located off the main road and there are no markers in either built or landscape form to denote the important paths to it. Additionally, there is poor signage directing visitors to important nodes throughout Exmouth. This results in an illegible urban form. Exmouth's relatively small size is one factor that does assist in this regard – the town centre is eventually located after time is spent moving around the urban settlement. However this is an inefficient way of locating a centre, creates congestion on roads (particularly when large boats and caravans are involved) and makes for a frustrating start to an Exmouth visit.

Clear way finding is important because it:

- _ Allows for ease of movement
- _ Can direct visitors to important nodes and centres such as the hospital and town centre
- _ Minimises traffic congestion
- _ Allows for segregation of vehicle types (such as trailers) from main car parking areas
- _ Allows local businesses to benefit from tourist / passing trade



Figure 10: Town nodes



Figure 11: Pedestrian amenity. Red areas show poor amenity, orange intermittent shade and blue areas with shade and continuous footpaths.



4.0 The Place

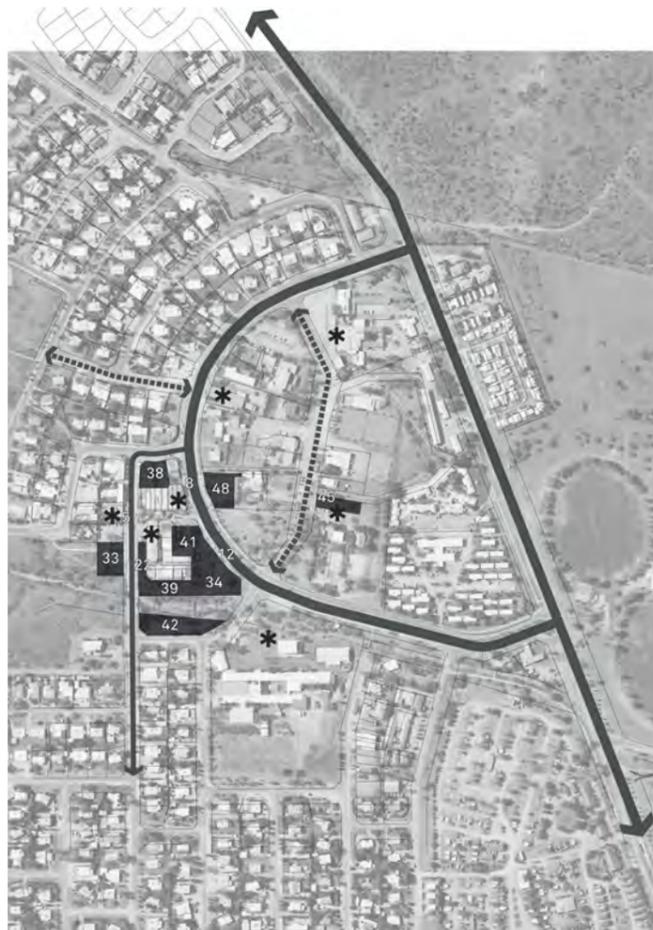


Figure 12: Existing car parking numbers in the town centre



Figure 13: Key pedestrian routes in the town centre

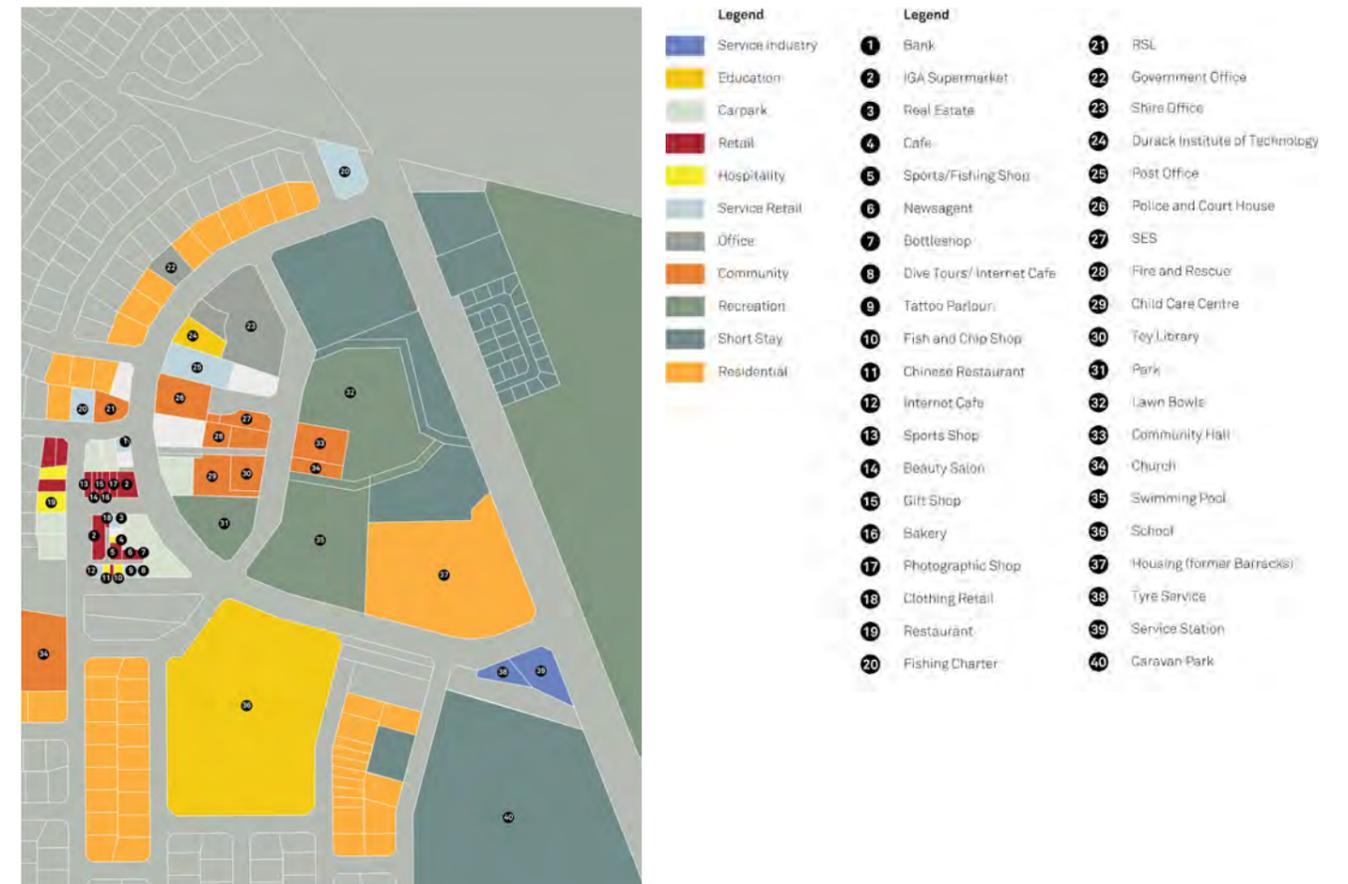


Figure 14: Town Centre land use

4.7.4 Movement and Access

Movement throughout Exmouth's town centre and foreshore is dominated by vehicles. Since Exmouth does not have a public transport system, residents and visitors will generally elect to drive rather than walk or cycle. During cooler months however, walking and cycling becomes a relatively popular option for shorter trips around the town centre and to accommodation precincts.

4.8 Town Centre

The town centre's road network is based on a modified grid, with the defining element of Maidstone Crescent, cutting a large sweeping curve through the otherwise linear street pattern.

Maidstone Crescent connects Murat Road and the town core and is fed by a number of local streets. Kennedy Street also functions as an important access road from the town centre to the southern parts of Exmouth's town site.

The intersections of Maidstone Crescent and Murat Road, are functional but ill-defined on the scale of the townsite, and could provide much clearer entry points into the town centre. Additionally, access to and through the car parks within the town centre is confusing because of a lack of signage and the complicated geometry resulting from the curve of Maidstone Crescent.

Movement for pedestrians and cyclists within the town centre is insufficiently defined since the footpath network is incomplete. In particular, footpaths tend to end abruptly without reaching an appropriate destination. There are no dedicated cycle paths within the town centre.

4.8.1 Town Centre Car Parking

The existing car parking provision within the Exmouth town centre is considered to be good, with ample opportunity to park. However, it can be expected that in a regional area such as Exmouth, there is a much higher expectation that parking can be achieved immediately outside the destination.

Based on current car parking requirement set out in the Shire of Exmouth's Town Planning Scheme (TPS) and other similar Local Government Schemes, there is a shortfall of car parking for the floor area presently provided. Based on the 7,240sqm of commercial floor space, a car parking provision of 434 bays would normally be considered to be 'required' (based on six bays per 100sqm floor area).

Given the potential for cross-visitation and reciprocal uses of the shopping centre that has been considered as part of this study, it is estimated that a car parking requirement of five bays per 100sqm floor area should be sufficient. The current car parking provision of about 250 bays is considered to be a shortfall since it equates to 3.4 bays per 100sqm of

floor area. At the present time this shortfall is not an issue as the underlying population of Exmouth is low and the car parking provided equates to one bay per two dwellings.

At peak holiday periods it can be expected that increased pressure on car parking is experienced. An increase in population would be unlikely to have the same impact, as a transient population can be expected to park for a longer duration than a local resident. Current car parking needs to be managed to provide easy access for the transient community, as well as shorter term car parking closer to the centre for the resident population. This can be managed by introducing time constraints to car parking bays. Bays outside of active frontages to the

shopping centre could be limited to say half an hour, whilst surrounding bays might be limited to an hour. At 100 metres from the shopping centre a limit of two hours could be introduced and those parking bays further than say 300 metres should have no time constraints.

The implementation of such a policy will require careful attention to landscape treatments to ensure that generous, clear and shaded walkways are provided for those customer parking slightly further away.

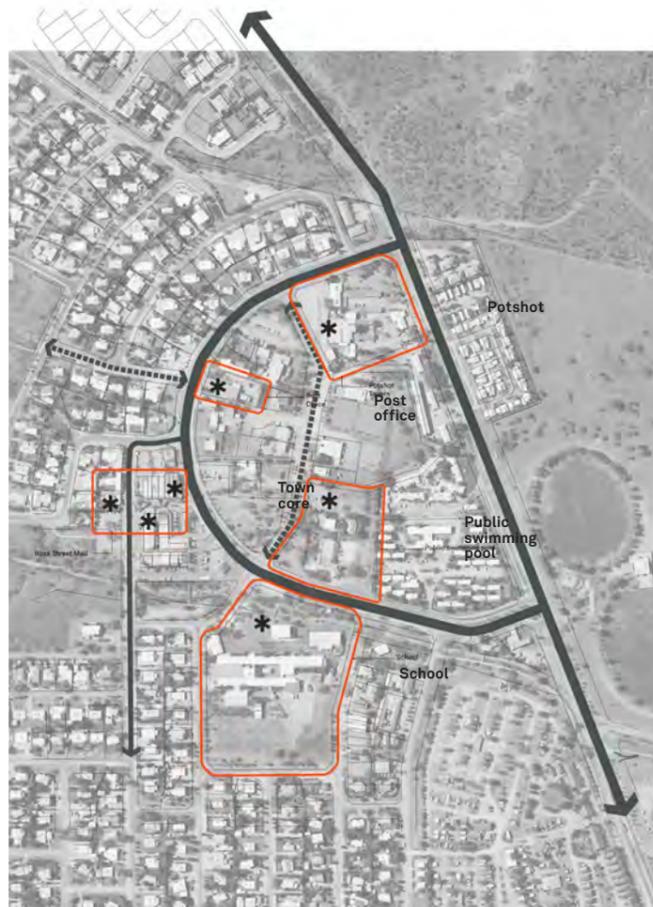


Figure 15: Key precincts and destinations in the town centre



Figure 16: Town core and key structural lines



Figure 17: Development opportunities

4.8.2 Town Centre Activity Nodes

The most important activity node within the town centre area is the town retail core, containing the retail and hospitality functions. This is an important meeting and social point within Exmouth and contributes significantly to the social fabric of the town. An important factor for the town core is the type of businesses that are located within it. These businesses are not large, multi-national chain stores. Each commercial business within the town centre is owned and operated by local residents – even the two supermarkets are locally owned and trade under the Independent Grocers Association (IGA) banner. This gives a particularly local inflection to the character of Exmouth.

Separate from the town core, but related to it is the post office. This is also an important meeting and incidental social node within the town centre as Exmouth does not provide a mail-to-door postal service – all residents and businesses have a post box located at the post office and so regular trips to this node are required. The buildings around the post office are the Durack Centre (former TAFE) and the police / court complex. These two activities are not nearly as active as the post office and so an active connection between the town core and post office does not currently exist. Connecting these two nodes through landscape form and over the longer term, activated development, would be beneficial to maximising the cohesiveness of the town centre.

Other important nodes within the town centre relate to social and recreational functions – the Potshot Tavern, the lawn bowls club and the swimming pool. Each of these functions have differing hours of activity – the tavern tends to be most active in the evenings, the lawn bowls is active in the late afternoon and the swimming pool has intermittent activity throughout the day with peaks in the afternoon (and is closed from May to September). Each of these nodes is separate, but all are located on Payne Street. Improving the public realm along Payne Street through street tree planting and providing consistent footpaths / street lighting would assist in linking these nodes in a better manner.

4.8.3 Land Ownership

A significant proportion of the town centre is reserved land, most notably the area bound by Maidstone Crescent and Payne Street. Importantly, the land surrounding Kennedy Street and the Ross Street Mall are held in freehold and redevelopment of this core retail space will require the involvement of private land owners.

4.8.4 Town Centre Land Use

Whilst Exmouth is relatively small in population terms, its status as a tourist town and it being the only settlement on the North West Cape means that the range of services within the town is quite wide. Current land use in the town is divided into residential, commercial, tourism and light industrial. The focus of intensity for land uses within Exmouth is within the town core- the area around the

pedestrian mall and associated shopping area. These uses largely consist of hospitality and tourism – providing for the tourism focus of the town. The broader town centre contains a range of civic and community uses including a lawn bowls centre, swimming pool and landscaped park as well as the Shire administration building, post office, tertiary education building and police /courts complex. long Murat Road, tourist land uses predominate providing short stay accommodation. Within the 'Town Centre' zone of the Town Planning Scheme, a number of residential dwellings have been converted to offices and similar functions over time. The 'Town Centre' zone does not permit permanent residential development, meaning the existing residential use has non conforming use rights.

There is the potential to create a more consolidated and compact contemporary urban form of development around the town core, maximise access to important services and to consider medium density residential development, this would require an amendment to the town planning scheme.

4.0 The Place

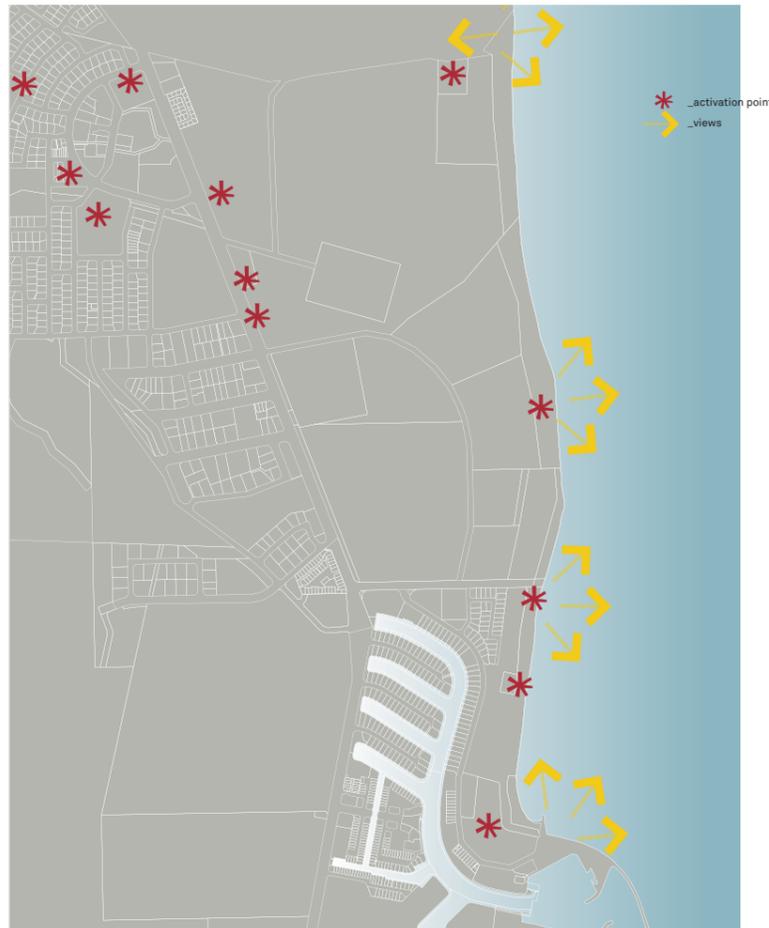


Figure 18: Coastal nodes and views



Figure 19: Landscape typologies



Figure 20: Flood plain

4.9 Foreshore

Movement between the foreshore and the town centre, because of its distance, tends to be by private vehicle. Key connections are Murat Road, Willersdorf Road, Truscott Crescent and Madaffari Drive. Similar to conditions in the town centre, wayfinding to the foreshore is confused by a lack of signage and identification of key intersections along Murat Road.

Key nodes on the foreshore include the golf course club house, the yacht club and adjacent town beach as well as Exmouth Marina. There is no footpath or boardwalk along the foreshore however most foot traffic occurs informally along the beach.

Like many country coastal towns, vehicles are permitted to access the beach and four wheel drives are often seen along town beach and beyond. Access to the beach is by way of informal tracks extending from the connection roads. Whilst there is significant community acceptance of vehicle access, conflict does exist between those on foot, young children and vehicles in this relatively uncontrolled environment.

4.9.1 Foreshore Activity Nodes

There are several activity nodes on the foreshore along its three km stretch. In the north, the golf club overlooks the Exmouth Gulf to the east and the town site to the west. Whilst the buildings are modest, the golf club enjoys a prominent position atop the dunes and is popular

amongst locals. Two km south of the golf club is town beach and the yacht club. A public toilet, small areas of turf and barbeque spots provide a limited degree of amenity. Another one km south is the marina, containing the Novotel Ningaloo Resort and Game Fishing Club.

4.9.2 Beach Amenity

Beach facilities provided in close proximity to the town are minimal and is likely in response to past low key use of this area compared to the west coast. The most popular area of beach adjacent to the Exmouth town site and close to the yacht club is town beach, which has grassed areas, barbeques and shelters.

A car park is situated on the beach face at town beach face as well as public toilets. The access road to town beach is currently unsealed and is marked by wooden railings. The foreshore road is separated from the beach by a row of palm trees approximately seven metres in height. Within the vicinity of the car park is a picnic table with corrugated iron roof shelter.

4.9.3 Topography

The Exmouth town site is located within the Cape Range which forms the spine of the North West Cape. Cape Range Peninsula is approximately 80 km long, 20 km wide, with rugged topography reaching a maximum elevation of 314 m. The range is bordered on the west by the Indian Ocean and a narrow continental shelf

about 12 km wide containing the Ningaloo Reef, and to the east by the shallow Exmouth Gulf. Caves, gorges and other karst features occur throughout the peninsula and are abundant within the Range itself.

4.9.4 Vegetation Communities

The Cape Range Peninsula is located in the Carnarvon Botanical District of the Eremaean Botanical Province, extending from Shark Bay northwards to the Exmouth Gulf, and is dominated by arid, perennial shrub associations. Whilst the distribution of vegetation across the peninsula generally varies with geology and geomorphology, a number of unique vegetation complexes exist within the Cape Range.

Vegetation within the foreshore area is typical of coastal dune vegetation with the incipient foredune and primary dunes are dominated by *Spinifex longifolia* and the secondary dune by *Acacia pyrifolia*. The coastal plain landward of the dune system consists of *Acacia* scrubland dominated by the weed *Cenchrus ciliaris* (Buffel Grass). Searches of The Department of Environment and Conservation's (DEC's) Threatened ecological communities database found no conservation significant vegetation communities, although site based vegetation would be required to confirm this.

4.0 The Place

20



Town drains and potential for mixed use as movement network

4.9.5 Geology

Most of the study area is covered by a shallow veneer of red duplex soils with brownish red loamy sand topsoil overlying red sandy clay to clayey sand which contains numerous calcareous nodules.

Quaternary sediments make up the beach dunes surrounding the peninsula. The foreshore area comprises a primary and secondary dune system which is dominated by Holocene beach sand and shingle. Behind the secondary dune lies a coastal plain system comprising shallow red clayey sands as described above.

4.9.6 Storm Surge

The North West Cape and Exmouth town site are subject to cyclones, which cause strong winds and storms leading to

inundation of the coastal zone. More frequently, flooding of the coastal plain occurs as a result of the combination of rain, high tides and low lying landform. Flooding associated with run-off from the Cape Range and storm/cyclone events is of particular concern, with the Exmouth town site having experienced two recent flood events being tropical cyclone Vance in March 1999 and a significant winter rain event that occurred in June, 2002. Damage to property, roads and the boat harbour was notable during both flood events.

Development within the Exmouth town site has generally taken place based on an existing strategy of recording evidence of past flooding events, with the exception of hydraulic modelling undertaken to

support the development of the Exmouth Marina Village. In 2007, the DoW developed a floodplain management strategy for the Shire of Exmouth based on detailed hydrologic and hydraulic modelling. The Exmouth Floodplain Management Study has been endorsed by the Shire of Exmouth and the DoW and has enabled a management strategy to be put in place to better understand flood issues and predict potential flood impacts.

4.9.7 Surface Water Flow

Hydrology within the Cape Range Peninsula is closely related to its geology and climate. Surface drainage of the coastal plain is well developed with low frequency, high intensity stream flow events creating numerous dendritic

creeks and tributaries all of which are dry for the majority of the year except for a few places close to the coast where beaches have created a damming effect and small pools have developed. These pools are generally brackish to hyper saline.

Specifically, Exmouth has several dry creek beds cutting through the township providing a drainage function for water running off the Cape Range. During heavy rain events, water collects to the east of Murat Road, with the coastal dunes preventing the water from draining into the ocean.

4.9.8 Ground Water

The groundwater of the Peninsula occurs in confined and unconfined aquifers. The unconfined aquifer of porous limestone

along the eastern slopes of Cape Range between Learmonth and Exmouth contains substantial potable groundwater resources and is replenished by direct infiltration of rainfall and runoff from storm events over Cape Range. In general, a 20 – 30 m thick layer of fresh groundwater overlies a saltwater wedge, with the transition zone located about five km from the coast. The Exmouth water supply is sourced from the Cape Range Mound which reaches its maximum depth below the central line of the Cape Range.

In general, groundwater discharges into the Exmouth Gulf and, in addition to the effects of seasonal recharge, there is a natural variation in groundwater levels and the extent of saltwater intrusion due to tidal fluctuations in the Gulf.



the plans

5.0 The Plans

22

5.1 Design Drivers and Philosophy

Consistent with the vision, the town centre is set to become the principal meeting and gathering space for residents and visitors to Exmouth. The plan acknowledges the existing structure and pattern of development and builds on existing use patterns to provide logical growth opportunities. It responds to sense of place by enhancing local attributes of the natural environment, community and the town site.

A revitalised town centre will improve the way it responds to the needs of the local community and visitors alike. It will provide the appropriate setting for community events, for daily activities and the growth of local businesses.

The plan has been developed in direct response to the project opportunities identified in the visioning process and engagement workshops. The key drivers and structural elements that have influenced the preparation of the plan are:

- _Marking key entries to the town centre on Murat Road to improve legibility
- _Improving the entry impression and quality of the landscape along Murat Road and Maidstone Crescent
- _Maximising the potential recreational benefit of landscape elements such as the drainage creeks to create multiple use cycle / pedestrian and drainage corridors
- _Improving connections between the town centre and other key locations, including the town beach
- _Strengthening and consolidating the axis of development along Ross Street Mall, Kennedy Street and Maidstone Crescent
- _Ensuring car parking is provided in locations that support businesses as well as improve the overall function and quality of the town centre
- _Maximising user comfort throughout the town centre



Figure 21 (above): New town entry with landmark building



Figure 22 (below): Town beach

5.0 The Plans

5.2 Town Centre Framework

The town centre framework helps to define design vision, presenting a holistic image of the area whilst focusing on design quality at a local level. Throughout the project area, key elements such as land use, movement networks, and built form outcomes are detailed in order to provide an over arching framework for the area. Statements of desired character are provided which demonstrate the varying and complementary nature of the town centre precincts.

5.2.1 Movement Network

The movement network for the Exmouth town centre provides for pedestrians, cyclists, vehicles, caravans and long vehicles. Pedestrians and cyclists are purposefully prioritised over vehicles throughout the town centre and particularly within the core retail area.

Maidstone Crescent provides a critical link between the town centre and Murat Road and for this reason is the most important entry into the town centre. Maidstone Crescent's curvilinear form provides a point of difference to the grid of streets throughout the rest of Exmouth. This feature will be celebrated through appropriate landscape and urban form treatments, such that the 'crescent' is accentuated.

Intersecting Maidstone Crescent is Ross Street Mall and the important pedestrian link through Federation Park. This axis of movement is strengthened within the town centre plan through an improved pedestrian network, connecting the retail core with the recreation precinct.

A legible movement network within the project area will connect to existing and future buildings to parking spaces which are purposefully located away from the core activity areas, thus maximising pedestrian comfort and amenity.

The potential of pedestrianising Kennedy Street was examined as part of the design process. Over the longer term, as development activates and encloses the street, with retail tenancies this may become possible. The street network in the plan has been designed to provide for this eventual outcome. In the interim, Kennedy Street is designed to function as a shared space, with significantly improved pedestrian amenity, traffic calming measures, and generous shaded areas for alfresco dining.

Movement to the coast is also important. Murat Road will continue to provide a key access line parallel to the coast and connect the various parts of Exmouth back into the town centre. Cross routes to the coast are accentuated through differentiated landscape treatments and directional areas including signage at those intersections.

5.2.2 Legibility

Understanding the location of the town centre in relation to broader Exmouth is important, particularly for new visitors. Similarly, movement throughout the town core should be simple and unconvoluted. In this regard, Maidstone Crescent will act as a clear entry to the town centre, and Thew Street will be redefined as a street, which addresses businesses and makes entries to car parks clear. Ample pedestrian corridors will link important activity nodes and street trees will shade footpaths. On street car parking, slow vehicle zones and central medians will help to slow traffic and maximise pedestrian comfort.

5.2.3 Town Creek Movement Corridor

Whilst Exmouth experiences very hot summers, for nine months its weather is conducive to pedestrian movement. In order to better connect key accommodation nodes, such as the caravan parks with the town centre, the movement corridor along Town Creek is to be strengthened. By improving the visual amenity of this corridor through landscaping, widening footpaths and creating better lighting, pedestrian

movement to the town centre can be significantly enhanced. This strategy also makes good use of the drainage corridor, allowing Exmouth's natural features to provide an enhanced sense of place for locals and visitors alike.

5.2.4 Delineate Streets and Car Parking

The car parking areas throughout Exmouth's town centre are the dominant feature of the landscape. Legibility is minimised and alternative movement patterns are restricted. As a result, the streets do not function as places in their own right, but simply as extensions to the car parks.

The new movement corridors must be reinstated as traditional spaces where trees and footpaths provide both comfort and definition. Road geometry should be designed to minimise vehicle speed. The objective is to create an environment where pedestrians, cyclists and public transport all have equal right to the space. This allows adjacent development to establish improved entry settings and allow opportunities for buildings to relate better to the public realm.

5.2.5 Car Parking

The approach to car parking within the town centre is to prioritise pedestrian and cyclist amenity. In this regard, new parking areas will be located on the periphery of the town centre, whilst still providing primary service access and special needs parking near to shops, restaurants and cafes. Existing car parking within the core of the town centre is appropriate for development and allows key structural elements to be strengthened.

To cater for the projected population expansion of Exmouth a target of five bays for every 100sqm of active shopping centre floor area should be targeted. This car parking ratio is still lower than would be required in the metropolitan region of Perth, but is considered to be an achievable and appropriate target. Car parking should be provided ideally within 200 metres of the shopping centre and no

more than 400 metres from the shopping centre. Associated with any car parking expansion will be a requirement to provide good quality shaded pathways to pedestrians and cyclists.

The car park adjacent to Maidstone Crescent and Ross Street Mall within the town core will be retained in the short to medium term. It is intended that this car park be redesigned to improve movement through it and so that it can be utilised for community events as required. In this regard, the car park is to be designed as a shared space with flush kerbing, ample shade trees and clearly defined movement patterns.

Given Exmouth's function as a tourist town, there is a need to cater for long vehicles and caravans. Dedicated caravan and long vehicle parking is to be provided in a easily accessible location on Bonefish Street that is clearly signposted.

5.2.6 Improve the Visual Appearance of Car Parking

In order to minimise the visual prominence of the car parking and to improve the character of the town centre, tree planting for shade as well as water sensitive urban design principles should be incorporated into the redesigned car parks. This will enable clearer pedestrian links, improved amenity and assist storm water runoff to be filtered and returned to the groundwater aquifer.

5.2.7 Bike Facilities

To accommodate and encourage cycling, additional facilities will be provided including bike parking throughout the town centre. New public toilets will include shower and changeroom facilities for cyclists and visiting tourists. Secure bike parking and bike hire could be incorporated into the community and commercial facilities.

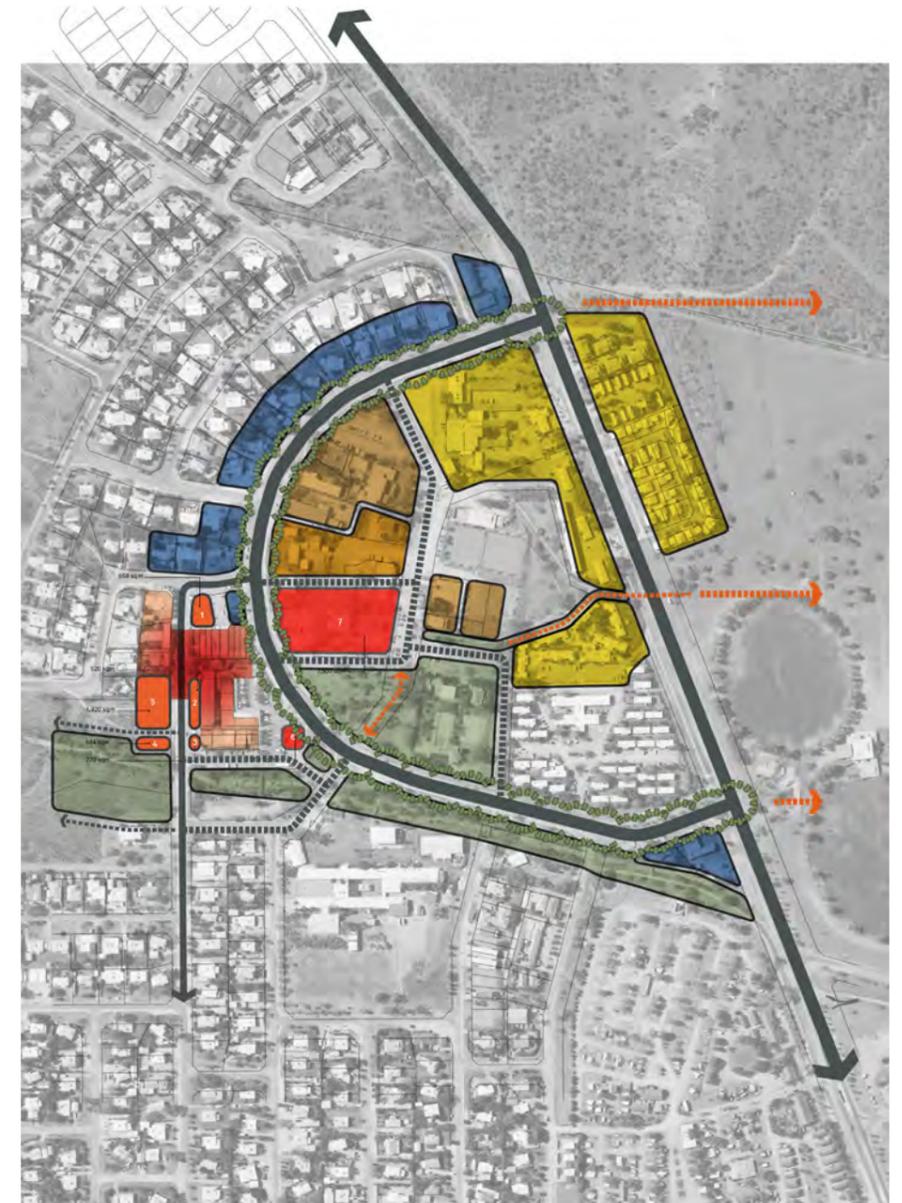


Figure 23: Town centre revitalisation plan framework

5.0 The Plans



- 23. New roundabouts on Murat Road to mark entry points to town centre
- 24. Maidstone Crescent upgraded and landscaped as town promenade
- 25. 'Central' Maidstone Crescent narrowed to create Federation Park link
- 26. New landmark building at entry to the town centre retail core
- 27. Dual function town square and parking
- 28. Kennedy Street rejuvenated into a pedestrian mall
- 29. Short to medium term retail / town centre expansion sites
- 30. Learmonth Street to incorporate on-street parking
- 31. New town centre car park (future potential to develop retail development fronting Kennedy Street as town grows)
- 32. Thew Street reestablished as through street to improve accessibility to retail, traffic flow and parking
- 33. Long vehicle parking established
- 34. Redeveloped potential of Police and Court complex
- 35. Future mixed use development frontage to Maidstone Crescent
- 36. New on road paving to denote slow speed area and differentiate pedestrian link to Federation Park
- 37. Federation Park upgraded to include market space, town event space, improved pedestrian paths and park facilities
- 38. New water based playground
- 39. New road created with parking to connect Payne Street
- 40. Payne Street upgraded
- 41. New swimming pool car park and access road to Maidstone Crescent
- 42. Town Creek upgraded to provide recreational amenity including lighting, pedestrian paths and landscape improvements
- 43. War Memorial relocated further north with landscape upgrades to create shaded formal gathering areas
- 44. Potential redevelopment of the Potshot Hotel or other large tourist facilities (subject to negotiations on setbacks and new access arrangements with Shire of Exmouth)

Figure 24: Town Centre Revitalisation Plan

5.0 The Plans



Figure 25: Maidstone Crescent, northern section



Figure 26: Maidstone Crescent, retail core



Figure 27: Maidstone Crescent, southern section showing integration with town creek



Figure 28: Payne Street



Figure 29: Kennedy Street (preliminary stage as shared street)

5.0 The Plans

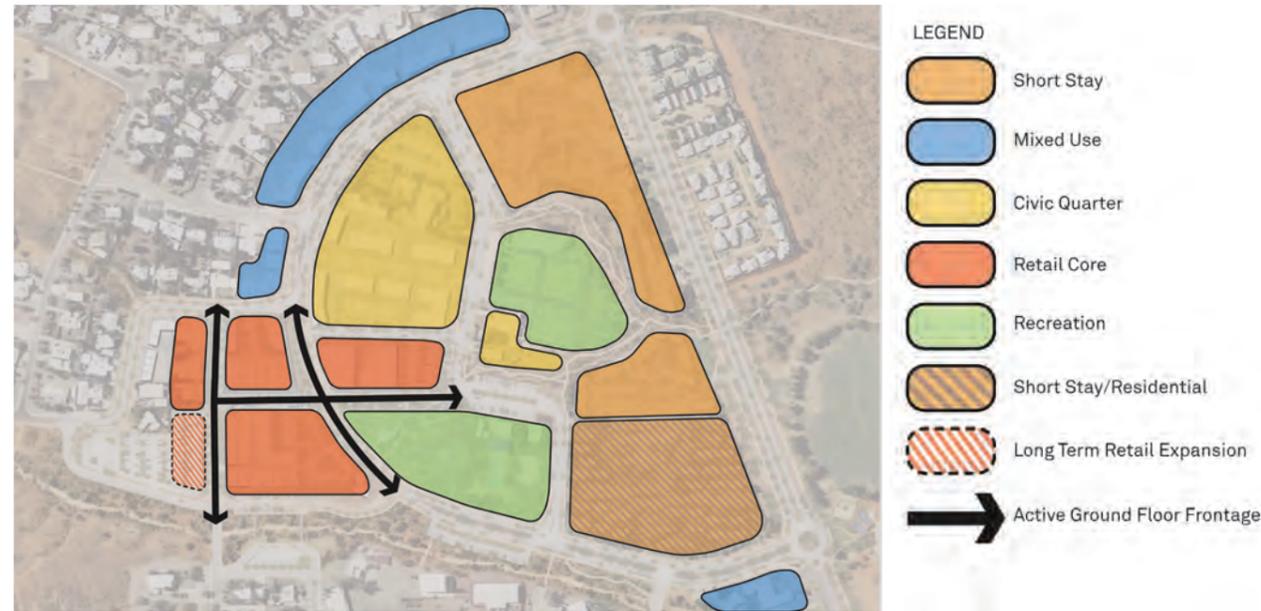


Figure 30: Land use plan

5.3 Land Use

Exmouth's town centre is intended to be a casual and attractive place to meet and undertake a variety of activities required of a town servicing tourists and a permanent population. A key issue for Exmouth is seasonality. This factor is challenging in different ways for different groups. For the traders and tourist operators it means a sustainable operating cycle of four to five months in the tourist season. For senior citizens the tourist season impacts health care and puts pressure on the number of doctors and allied health services. The challenge for Exmouth is to extend the life of the tourist market to 12 months and to minimise the impact of tourism on local services and accommodation costs.

Furthermore, the Exmouth district structure plan demonstrates that the town has capacity to grow from its current population of around 2,500 people to between 4,500 and 6,000 permanent population. Should such population growth occur, there is a need to ensure that any increase in retail and other land use types within the town centre supports the intended character and function of its

various elements. For this reason, sites along the key axis of development with capacity for redevelopment should provide for higher end uses, such as retail and hospitality. In this way, a sense of activity and a cohesive town core can develop over time as the population grows.

These issues have informed the various functions and land uses that are planned for the project area. The rationale for land use is based on the following principles:

- _Reinforcing the town centre as the primary place for retail, hospitality, civic and community facilities
- _Consolidating growth around the town core and existing structural elements
- _Introducing the potential for residential accommodation in the town centre within mixed use development
- _Recognising existing patterns of use and ensuring development responds to the seasonal nature of Exmouth

5.3.1 Town Core Axis

The town core axis of Maidstone Crescent, Ross Street Mall and Kennedy Street provides the necessary structure from which to develop new built form. Importantly this axis functions as the current the town core, accommodating retail and hospitality land uses, particularly along Ross Street Mall and Kennedy Street. Consolidating growth and strengthening activity around this axis will ensure a vibrant and legible town centre eventuates. The axis will provide for highly active hospitality and retail land uses, with potential for upper floors used for office, community and other less active functions.



Figure 31: Heights plan

5.3.2 Maidstone Crescent Mixed Use

Along its northern extent, Maidstone Crescent currently provides an address for a mix of dwellings and offices in converted houses. In order for Maidstone Crescent to function as a town promenade and clear entry road into the town core, strengthening its mixed use function is essential.

The current town centre zone does not permit residential development. Where the ground floor provides for commercial land uses such as offices, residential dwellings should be permitted above, thus providing an alternative form of housing, allowing live-work arrangements and promoting two storey development upon entry to the town centre.

5.3.3 Civic Quarter

There is a strong civic presence within the town centre anchored by the Shire administration and hall, Durack Institute of Technology and Police / Court complex. These institutions provide important functions that serve the community and their location within the town centre creates a sense of permanence and purpose. Whilst the buildings that these institutions inhabit are not of the highest quality, their land use function is appropriate for a town centre and should be recognised through any redevelopment opportunities.

5.3.4 Federation Park and Recreation

Federation Park is located opposite the town retail core and is an important community asset, providing space for events and informal recreation activity. There is opportunity to enhance the presence of Federation Park within the town centre by consolidating it with the adjacent swimming pool upgrade and re-routing Payne Street to create a larger and more useable community space. Federation Park in this manner can complement the function of the town core to create a balance between commercial and non commercial activity.

Adjacent to Federation Park is the lawn bowls club. This facility provides inexpensive recreation opportunities for a significant number of residents and longer term visitors to the town. Its popularity belies its presentation to the public realm, however it does serve an important function within the town centre and complements the activities that will occur in the expanded Federation Park. In the longer term, there may be opportunity to consider a reorganisation of the lawn bowls site so that it has a better address to the street and more efficient use of land.

5.0 The Plans



Figure 32: Town creek is a key landscape feature

5.3.5 Town Creek

A key natural feature of the town centre is Town Creek. Providing a drainage function for storm water, it also has potential to be an attractive and distinct landscape integrated with pedestrian and cycle movement. Landscaping that improves sight lines across the creek bed, pathways and lighting integrated with a new planting regime will enable the Town Creek to become an important natural and recreational asset within the town centre.

5.3.6 Short Stay Accommodation

Exmouth's function as a tourist town means that short stay accommodation is important to its ongoing success as a destination for interstate and overseas visitors. Whilst the town centre will not be the only location in Exmouth for tourist development, good accessibility to hospitality, retail and civic services means that the town centre provides an alternative to more farther removed locations. Short stay accommodation also provides important activity and nightlife to the town centre and so should be strengthened through future redevelopment opportunities.



Figure 33: Murat Road entry to Maidstone is important for entry impression

5.3.7 Town Centre Entry Nodes

The way the town centre is presented at its key entry locations on Murat Road is important for legibility and one's impression of the town centre. Whilst immediate opportunities exist to create a more attractive public realm on entry to Maidstone Crescent, longer term opportunities to utilise these important corner sites for mixed use development should be explored in the future.

5.3.8 Town Centre Floorspace

The Exmouth Structure Plan reports that Exmouth has approximately 5,500sqm of net lettable retail floorspace. Estimates of future requirements of retail floorspace are influenced by:

- _The productivity performance of retail floorspace (i.e. the amount of turnover per square metre)
- _The nature, size and trends in the key user groups of residents, workers and visitors
- _The pool of available expenditure in the town
- _The extent of expenditure leakage from the town



Figure 34: Key retail expansion areas, shown here in white

Total retail floorspace demand, depending on the variables discussed in the report could reach up to 26,615 sqm by 2031 at an estimated residential population of 8,000; commercial / office floorspace requirements could reach 6,400 sqm. These are gross estimates and will need to be further refined in subsequent analysis. As a rule of thumb, the attraction of a major retailer such as a Coles or Woolworths would require that such retailers achieve benchmark turnovers of \$26 million to \$30 million for a 3,500 sqm supermarket. In very broad terms this might be expected when the population reaches approximately 5,000 or when the population and visitor traffic combined justifies the investment.

5.0 The Plans

28

5.4 Built Form

The proposed approach to built form directly responds to the desires of the community expressed through the engagement workshops, and to the objectives of climate appropriate architecture that contributes to Exmouth's sense of place. Buildings will be arranged to frame activity and help to formalise the urban structure within to the project area.

The area of greatest built intensity will be the retail core. Here, single to two storey buildings will frame Ross Street Mall and Kennedy Street whilst also helping to activate Federation Park and the town creek. Buildings along the alignment of Kennedy Street and Ross Street Mall will provide for longer term expansion of the town core.

The existing public toilet facility at the intersection of Maidstone Crescent and Bonefish Street serves as a poor entry marker to the town core. A new cafe and potentially relocated post office will provide a more appropriate marker on entry to the town core. The building will be designed as a landmark that addresses the adjacent town creek and surrounding public realm.

Outside of the core, buildings will be set back from the street, but on a consistent line in order to effectively frame the public realm. In these areas, particularly along Maidstone Crescent, street trees and median planting will help to identify the hierarchy of spaces.

5.4.1 Architecture and Design

Buildings within the project area will reflect their arid climate setting, the context of Exmouth's vernacular and the relatively informal character of the north west. The scale of buildings will reflect their function, from kiosk style pavilions in Federation Park, to two storey mixed use and retail premises.

Openness and informality will be reflected in building design through use of light weight materials, maximising terrace and alfresco areas, and blending indoor and outdoor spaces. Development will contain a sense of quality and permanence; the buildings will lightly touch and belong to the Exmouth landscape. All buildings require a high level of detailing given their public prominence in the town centre, providing visual interest and an appropriate edge to activity. Good lighting, access and visibility will be necessary around the buildings as well as throughout the town centre area and particularly along key movement lines. Surveillance of the public realm will be facilitated by the activity generated as part of the foreshore development.

Development will be contemporary in architectural expression and address adjacent streets and the surrounding public realm through window placement, balconies, terraces and entrance designs. Active frontages will be focused onto appropriate areas in the core and along key movement lines.

5.4.2 Town Core Form

The town core is intended to be a key attraction for residents and visitors to Exmouth. The buildings in the town core will contribute to this attraction and be characterised by:

- _ Pedestrian scale at the street interface up to three storeys in height
- _ Nil setbacks to the street at ground level
- _ A consistent street 'wall' to contain and shelter activity
- _ Pedestrian shelter to provide shade and rain protection along the footpath
- _ Wide eaves
- _ Regular openings (windows and doors) to ground floor tenancies such as shops and restaurants
- _ Alfresco dining on the footpath
- _ Shading devices attached to building facades creating a veil for sun protection
- _ Solid materials such as concrete or brick, mixed with steel, stone, cladding will comprise the majority of building materials, complemented by glazing which is shaded from the direct sun

5.4.3 Height

Building height across the town centre responds to:

- _ The desire for pedestrian scale
- _ Definition of activity nodes particularly within the retail core
- _ The desire for an informal, low-key built form character
- _ Allowing up to three storeys within the town core and two storeys throughout the remainder of the town centre

The community engagement process identified that the scale of development in the town centre should enhance pedestrian comfort and maintain an informal and relaxed character whilst promoting vibrancy, consistent with the town's tourist function. In this regard, two and three storey buildings setback from the road will provide an open and landscaped streetscape on entry to Exmouth along Maidstone Crescent. Within the retail core, buildings will be constructed to the street boundary, creating a strong and shaded activated edge and enclosing the public space with heights between two and three storeys.



Figure 35: Building setbacks plan



Indicative built form precedents

5.0 The Plans

5.5 Town Centre Infrastructure

5.5.1 Sewer

The town Centre is currently serviced by a gravity sewer discharging to a 225DN sewer located in Murat Road. This sewer gravitates to the south and then east down Willesdorf road. A short distance eastwards in Willesdorf Road lies the Exmouth Wastewater Treatment Plant. Existing sewer assets are generally located within road reserves and in alignments in private property. Alignments appear in most cases to be non standard when compared with current requirements. Most lots are served by sewers on alignments in the rear of properties.

Water Corporation owns and maintains the sewerage reticulation system in Exmouth including the Waste Water Treatment Plant. Some use is made of recycled water in the Town for watering recreational areas.

Water Corporation's operating sewer license area currently includes the residential component of the town site which includes the revitalisation study area.

The town centre revitalisation is not constrained by the existing sewer main capacities, since as any increment in commercial floor space will typically generate only low additional sewage flows.

Any sewer mains that are currently in, or become within lots following land use changes, may need to be relocated depending on the final growth plan adopted. Any relocation can be matched to the particular development.

5.5.2 Water Supply

The supply of water and its treatment to potable quality is undertaken by the Water Corporation within their license area. The Water Corporation's license area includes the town site and the town centre. The supply of water comes from a borefield situated on the western side of the town site with a connecting main to the town distribution system.

The town site is reticulated from road reserves with water mains approximately on the standard Water Corporation alignments. Water distribution and reticulation mains are predominantly asbestos cement, and any adjustment would result in these being replaced with PE pipe materials.

Water Corporation has advised that they have undertaken minimal planning of the existing reticulation network with regard to expansion. The current Water License area covers the existing town centre so that services will have to be provided.

The Water Corporation has advised that they will not be able to provide any advice in relation to the planning for the growth of Exmouth until land use planning is defined. Since their current planning considers the town site growth on an annual rate of 2%, any substantial development would require a planning review.

The town centre revitalisation comprises relatively low water demand sites which will need to be individually addressed. To provide service an additional 150 DN looping main from the existing main near the intersection of Learmonth/Maidstone to the existing 150DN main in Payne Street may be required.

5.5.3 Power Supply

The proposed revitalisation project consists of upgrades to roadways, creation of new road links, development of new landscape features and expansion of land usage within the Exmouth town centre.

Based on the estimated load, location of the sites and proximity of each site to the main HV feeders (EX1 Lefroy Feeder & EX3 Kennedy Feeder), there are no constraints for staging. Where additional capacity is required, reinforcement upgrade works are needed on each HV feeder.

Horizon Power requires that all new developments be serviced by underground three phase power where three phase power is available. In a commercial development scenario, this would be by traditional Horizon Power owned and maintained URD 3-phase direct buried underground cabling from spare fuse way at the transformer's Low Voltage frame to Uni-pillars servicing each site on the general basis of one Uni-pillar serving each commercial lot. Where the customer's supply request exceeds 250 amp per phase, three phase, Horizon Power requires a transformer on site with the Site Main Switchboard to be contiguous (i.e. adjacent to the transformer site). This applies to the town core expansion for the case where these sites are considered as single lots.

Due to the anticipated loads, it is unlikely that existing transformers in the vicinity will be capable of servicing the proposed retail expansion. Horizon Power requires any existing High Voltage and Low Voltage aeriels or assets adjacent to or within the land being subdivided or amalgamated to be undergrounded. Along with this requirement, WA Electrical Requirements (WAER) also requires that each lot is to be serviced by a single point of supply only. Existing lots which are currently serviced by multiple points of supply do not need to satisfy this condition unless either one of their supply points is to be modified or upgraded.

5.0 The Plans

30

5.5.4 Lighting

Street lighting of the Exmouth town centre currently consists of a mixture of overhead aerial lighting and underground powered street lighting. Heritage Green 12.5 metre poles complete with High Pressure Sodium (HPS) luminaires have been erected in the last few years for the lighting of Murat Road and Maidstone Crescent southern intersection. There are Heritage red streetlight poles used within the town centre on Maidstone Crescent. The township redevelopment creates an opportunity to replace existing streetlights with alternative solutions such as LED and solar lighting.

5.5.5 Telecommunications

As part of the investigation processes for the town centre revitalisation, Telstra have been made aware of the townsite and town centre's future growth plans. Telstra has completed a desktop network planning study based on the advised growth and while results may vary following field data investigations, the network is capable of managing the likely demand.

Existing Telstra assets are currently on various alignments. As staged works progress in the town centre, Telstra alignments and service points may need to be altered. Planning for this work can only proceed once land uses and land planning has been completed.

5.5.6 Roads and Footpaths

Roads will need to be constructed in accordance with the IPWEA Subdivision Guidelines and in conjunction with the Shire of Exmouth "Guidelines and Standards". Road widths will be derived in accordance with the planning layout and traffic requirements. Footpaths will also be required in accordance with the guidelines from the Department for Planning and Infrastructure.

It is imperative to have good quality footpaths, particularly around the town centre commercial area. A preference was expressed for the use of the locally mixed light colour aggregate concrete. This provides an acceptable finish and appearance and further considered during detail design.

5.5.7 Drainage

The existing town is drained through a combination of pipe network, open drains and creek lines. These connect to open drains which are natural creek lines that discharge into the low lying area behind the dunes lying along the Exmouth gulf coast. Some sections of these creek lines remain in their original condition, although the majority have been modified through realignment and widening/deepening to suit development and increase capacity.

Rainfall events have led to flooding in parts of the town site and this have been extensively modelled by the Department of Water (DoW) and Sinclair Knight Merz (SKM). The resulting report identifies the extent of flooding for various storm events and return periods.

The Shire of Exmouth have commissioned Cardno Consultants to examine the drainage systems and to give advice on improvement works to reduce the time that sections of the town are threatened by floodwaters. Cardno are currently (October 2011) working on the study.

Isolated flooding occurs in the town centre following storm and cyclone events. The flooding which resulted along the creek line next to Thew Street and in Bennett Street with surface flows from drainage of the hospital site affected some of the commercial properties. The extent of the flood plain and flood fringe is shown on the drainage drawing extracted from the DoW/SKM report. Stormwater flows generated in the creek line north of Snapper Loop and south of Reid Street carry the remainder of the stormwater flows around the central town area.

Expansion of the town site can generally utilise the existing major drains for stormwater discharge other than the catchment which feeds the town creek. As the soil types range from gravels to clayey gravels which have limited soakage potential, the existing runoff is high and development would not significantly increase outflows.

It is proposed to improve the drainage of the town centre by incorporating a piped drainage line between Maidstone Crescent and Payne Street to replace the existing open drain. This will create a surface area for a pedestrian linkage, or as a car park area above the piped drain. This system is proposed to be extended into Bennett Street to collect runoff from the hospital site. The piped network will be designed to cater for a one in five year storm event. Current overland flood paths are to be maintained or new flood paths created.

Consideration has been given to reducing the restraints within town creek by removing the existing culvert at Bonefish Street and constructing a culvert at Kennedy Street with sufficient capacity for the major event. A preliminary culvert design has been prepared which utilise box culvert section to provide a flow path for the one in 100 recurrence interval flow volume. A preliminary design section is shown in Attachment 3. The culvert would be designed to accommodate overtopping during more serious rainfall events.

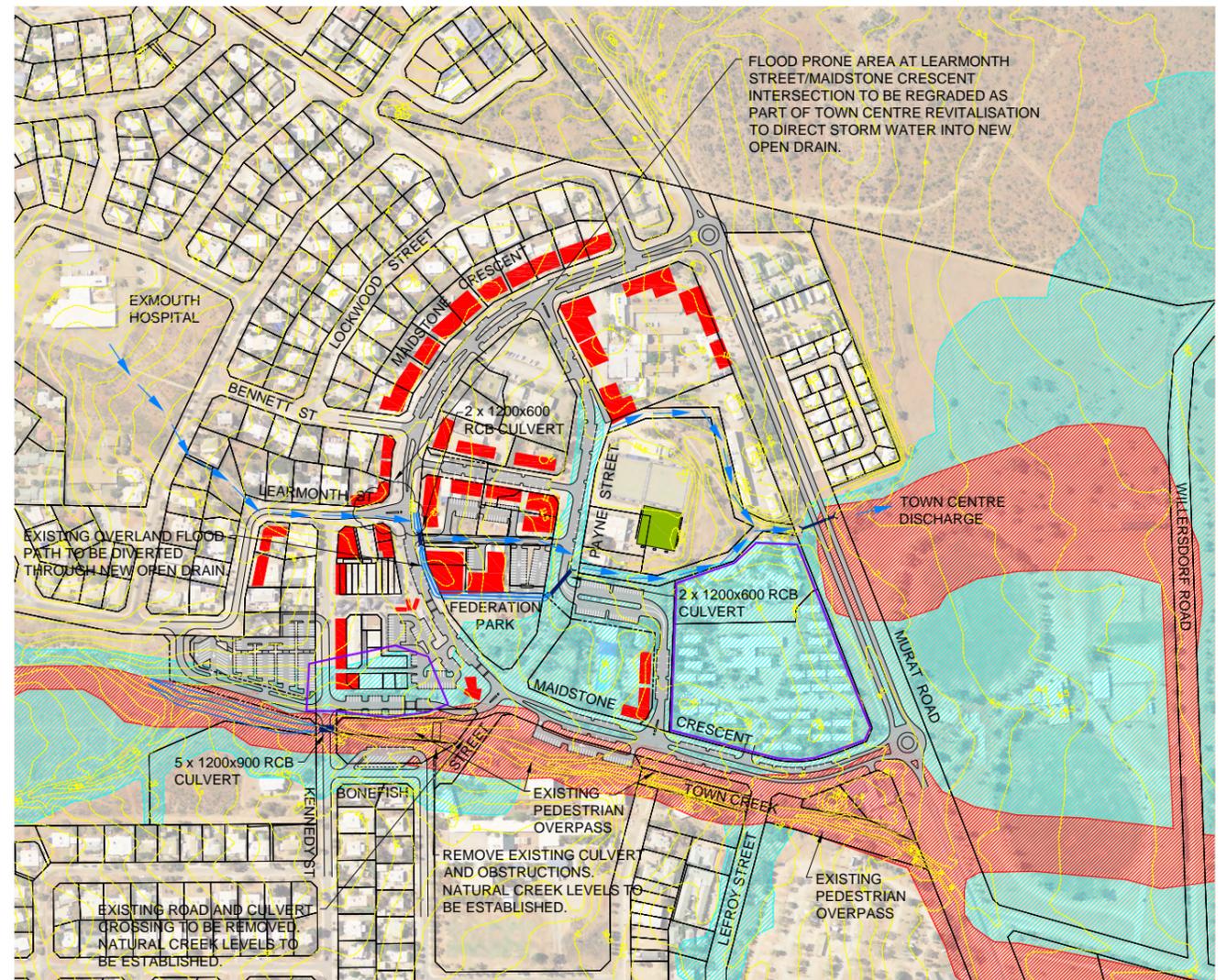


Figure 36: Exmouth town centre drainage plan

LEGEND

- OVERLAND FLOW PATH
- PROPOSED CULVERT
- PROPOSED OPEN DRAIN
- PROPOSED BUILDINGS
- EXISTING LOT BOUNDARY
- PROPOSED NEW LOT BOUNDARY
- EXISTING CONTOURS
- FLOOD WAY
- FLOOD FRINGE
- INUNDATED AREAS 200mm PEAK DURING 1 IN 100 EVENT

NOTE:

1. FLOOD EXTENTS TAKEN FROM EXMOUTH FLOOD PLAN MANAGEMENT STUDY, FLOOD MODELLING REPORT SKM DECEMBER 2007, FIGURE B-3.
2. CULVERT SIZES AND QUANTITIES INDICATIVE ONLY. CULVERT SIZES AND QUANTITIES WILL NEED TO BE CONFIRMED AT THE DETAILED DESIGN PHASE.

5.0 The Plans

5.6 The Foreshore and Open Space Development Plan

The Foreshore and Open Space Development Plan has been developed in close consultation with the local community and Shire of Exmouth, according to the following key objectives:

- _ Improve existing facilities and assets
- _ Create new destinations and activities
- _ Create a recognisable built character
- _ Improve the quality of infrastructure
- _ Enhance the quality of the environment and ecology
- _ Improve links to the town centre through street network and public open space upgrades
- _ Improve wayfinding and enhance points of arrival
- _ Improve safety and amenity

The foreshore master plan will be composed of the following key projects:

Town Beach enhancement

Transforming the town beach from a popular existing but underutilised foreshore parkland.

New Town Beach (Gulf Beach)

Creating a new foreshore park in closer proximity to the town centre with an outdoor interpretation centre.

Yacht Club Beach

Provides key links and infrastructure improvements to safeguard the amenity of this important community asset.

Town Centre Links Streetscapes-Murat Rd-Truscott-Beach entry roads

Links between the town centre and foreshore will be dramatically improved by this streetscape enhancement strategy.

Marina Public Open Spaces

As the Marina precinct continues to develop, the open space network will be enhanced to link the foreshore precinct.

5.6.1 Landscape Master Plan

The foreshore master plan has been developed around a series of key improvement perfects, overlaid by

overarching strategies including access, navigation, and place making. For the purposes of budgeting and implementation, the master plan could be realised sequentially over time, in key phases which reflect the Shire and community priorities established through the workshop process.

5.6.2 Character Zones

The master plan describes a distinct landscape character which will be linked to the town centre enhancement.

5.6.3 Landscape Typologies

A series of typologies have been developed along the foreshore which respond to the context of the existing marina development, future tourism development potential, and the characteristics and ecology of the natural dune system and Exmouth Gulf.

5.6.4 Movement and Links

The foreshore master plan links disconnected recreational uses at the Golf Club, Yacht Club, Town Beach, and Marina, which are relatively underutilised and largely inaccessible to the general public. Likewise it seeks to reconnect people back to the Exmouth Gulf, to the townsite, and to the growing Marina precinct.

5.6.5 Place Making

The master plan will be fully realised by a combination of upgraded and new infrastructure and facilities, landscape improvements, and public realm activation strategies. These will range from the identification of future development proposals, seasonal commercial opportunities, to the role of guidelines in the development of future built form.

5.6.6 Pedestrian Network

Footpaths and beach access plants within the foreshore precinct will be enhanced by navigational and wayfinding signage. Exercise networks can be developed in measured trails and signage. Rest areas should be available at approximately zoom intervals.

5.6.7 Cycle Network

The existing cycle network will be fully connected between the town and foreshore and enhanced by signage, wayfinding elements and pathway maintenance improvements.

5.6.8 Sight Lines

A network of landmark nodes including artworks and shelter structures will be developed. A system of new viewing points along the dune will provide new points of appreciation of the Exmouth Gulf, as well as views back to the Exmouth town site and Cape Range beyond.

5.6.9 Water Sensitive Urban Design

Open spaces and movement networks will be designed to direct and capture drainage, in order to protect infrastructure and supplement the groundwater table.

5.6.10 Irrigation Requirements

The new and upgraded open space network will increase the overall irrigation requirements for the Shire of Exmouth. Landscape proposals will therefore be designed to make the most efficient use of high water use treatments such as turf lawn, and generally aim to reduce water requirements for new landscape planting through the use of local and endemic species. These should be considered within ongoing water supply, operational and maintenance considerations.

5.6.11 Landscape Elements

A new palette of parkland furniture and landscape infrastructure has been developed to improve the recreational and visual amenity of the parks, open space and access networks.

5.6.12 Parklands and Recreation

Existing parks and public open space nodes at the town beach and marina precinct which are subject to improvements, will be designed to match the character and quality of the new proposals. Each will focus on the creation of functional, comfortable, shaded and visually enticing parks to encourage recreation and increase the average length of stay.

5.6.13 Dunes and Bushland

Areas of significant or degraded natural value along the foreshore will be protected and enhanced by each parkland project in order to preserve the ecological and amenity values, particularly of the coastal environment.

5.6.14 Vegetation

The master plan seeks to enhance the natural character and amenity of the foreshore environment through the protection of existing vegetation, and the development of appropriate revegetation and parkland planting strategies suited to the local climate and conditions.

5.6.15 Planting Guide

Indicative species lists and designs have been provided to guide the development of suitable detailed landscape planting designs in parklands, streetscapes and along pedestrian networks.



Foreshore and open space development plan



View back to town from Golf Club, showing potential future access road along foreshore

5.0 The Plans



1. Town centre
2. Town centre entry and streetscape enhancement
3. Murat Road/Truscott Ave intersection upgrade
4. Proposed Ningaloo Research Centre
5. Murat Road south streetscape upgrade
6. Proposed relocation of Waste Management Facility
7. Entry to Gulf Beach
8. Gravel access road and walk trail
9. Gulf Beach parking
10. Viewing platform, beach access and outdoor interpretation centre
11. Truscott Ave streetscape upgrade
12. Secondary beach access and carpark
13. Existing foreshore trail upgrade
14. Beach access and shelters
15. Potential development of Golf Club
16. Secondary viewing platform to Gulf including interpretive trail and beach access

Figure 37: Exmouth Foreshore and Open Space Development Plan (Northern Part Plan)

5.0 The Plans



1. Murat Road streetscape upgrade
2. Town Beach entry and streetscape upgrade
3. Warne Road / Madaffari Road intersection upgrade
4. Truscott / Warne Road intersection upgrade
5. Potential Caravan park / town street development
6. Potential resort accommodation development
7. Existing foreshore trail upgrade
8. Beach access by future development
9. Town Beach entry feature
10. Proposed town bach including new revetment
11. Town beach parkland upgrade
12. Marina public open space upgrade
13. Yacht club overflow parking
14. Upgrade to existing Yacht club
15. Future proposed boardwalk linking Novotel resort and Marina
16. Entry to Novotel Beach
17. Novotel Beach
18. Public open space and pedestrian link to Marina development

Figure 38: Exmouth Foreshore and Open Space Development Plan (Southern part plan)

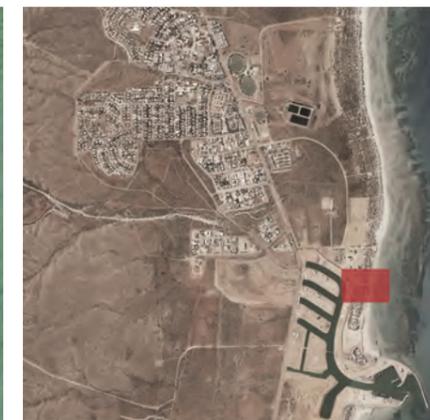


Location Plan

1. Warne Road / Town beach entry streetscape enhancement
2. Existing pedestrian trail upgrade
3. Potential accommodation development
4. Future beach access provided by future development
5. Existing toilet upgrade
6. Existing car park upgrade
7. Formalised vehicle beach access
8. Retaining wall and revetment
9. Boardwalk with pedestrian lighting
10. Showers and seating
11. Formalised beach access
12. Stabilised gravel pedestrian path
13. Irrigated turf parkland behind fore dune with fencing
14. Existing car park/drop-off reduced and formalised
15. Beach access with fencing protecting fore dune rehabilitation
16. Fore dune re vegetation
17. Large shelter area for event use
18. Path link to yacht club
19. Revegetation to primary dune
20. Existing private lots

Figure 39: Existing town beach enhancement

5.0 The Plans



Location Plan

1. Madaffari Drive streetscape enhancement
2. Existing marina open space upgrade
3. Yacht club entry road streetscape
4. Overflow car park for yacht club
5. Potential yacht club facilities upgrade
6. Existing car park upgrade
7. Boardwalk with pedestrian lighting
8. Retaining wall and revetment
9. Water sports e.g. Pontoon, seasonal water playground
10. Yacht club beach access
11. Boardwalk connection to Novotel Resort
12. Formalised beach entry
13. Formalised car park
14. Revegetation to foredune
15. Beach access with fencing protecting foredune rehabilitation
16. Stabilised gravel pedestrian path linking town beach
17. Irrigated turf parkland behind foredune including fencing
18. Re vegetation to primary dune

Figure 40: Yacht club beach and marina POS enhancement

5.0 The Plans

5.7 Existing Town Beach

A range of improvements to the existing town beach will revitalise this important recreational node which is a key driver for the foreshore upgrade project. These include:

- _Town beach entry streetscape including new street lighting and tree planting; identifies arrival to town beaches and the gulf
- _Way finding, and art and interpretation located along pedestrian links and streetscapes
- _Upgraded existing toilet block
- _Formalised existing car park including vehicle access to the town beach
- _Pedestrian links to future development (eg. Norcape site) including beach access and boardwalks
- _Retaining wall and limestone revetment to protect existing infrastructure such as the car park and beach access, and

new boardwalk, beach access and lighting

- _New amenities for beach goers including showers, shade shelters and BBQ facilities, seating, tables and night lighting
- _Irrigated turf parkland to the rear of the existing foredune, designed to cater for seasonal overtopping from foredune to turf. Fencing will be required to protect foredune rehabilitation along turf area and beach access
- _Car park/drop-off to centre of beach parkland
- _Stabilised gravel pathways connecting the town beach and yacht club, continuing the broader existing connections along the foreshore
- _Large sheltered area for event use e.g. weddings
- _Revegetation to both foredune and primary dune to increase stabilisation
- _treeplanting in species mixes and planting groups to increase shade and

limit impact of tree loss in potential cyclones/storms

5.8 Beach extension to yacht club

- _Irrigated turf areas will be increased behind the foredune, including shelters, barbeque facilities, seating, tables and night lighting
- _Formalised car park will be realigned further away from the shore line to allow foredune recovery and provide extra protection to the car park
- _Retaining wall and limestone revetment to protect existing infrastructure including Yacht club, car park, boardwalk, beach access and lighting
- _Yacht club entry streetscape
- _Yacht club overflow car park
- _Future development to yacht club, restaurant/kiosk/water hire
- _Upgrades to the yacht club beach access

_Composite material board walk pedestrian link to Novotel Resort and marina

5.9 Marina Open Space enhancement

The unique local environment and established landscape of the Exmouth Marina and Novotel resort development inform the marina public open space enhancements.

Local materials and low water use plants will be used extensively.

Swales and retention basins enhance the water holding capacity of the landscape while reducing reliance on irrigation.

Local materials, colour and texture inform landscape proposals including rammed earth walls, local gravel/rocks and local plant species.



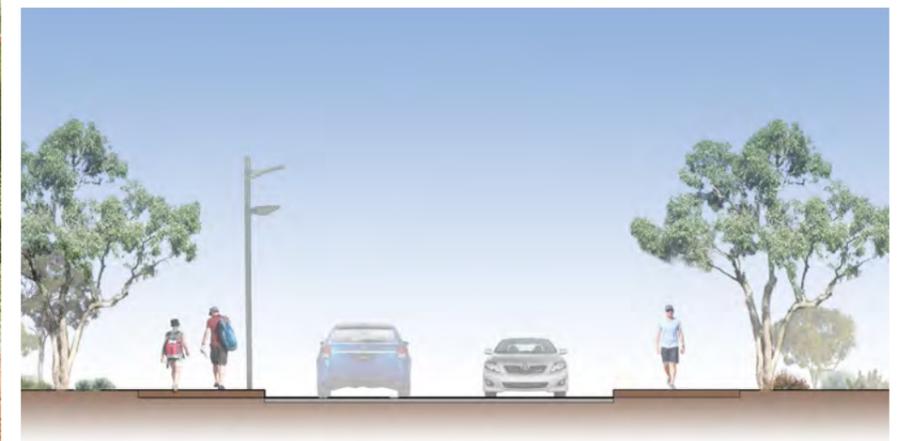
Figure 41: Existing town beach extension to yacht club



Town beach upgrade proposal

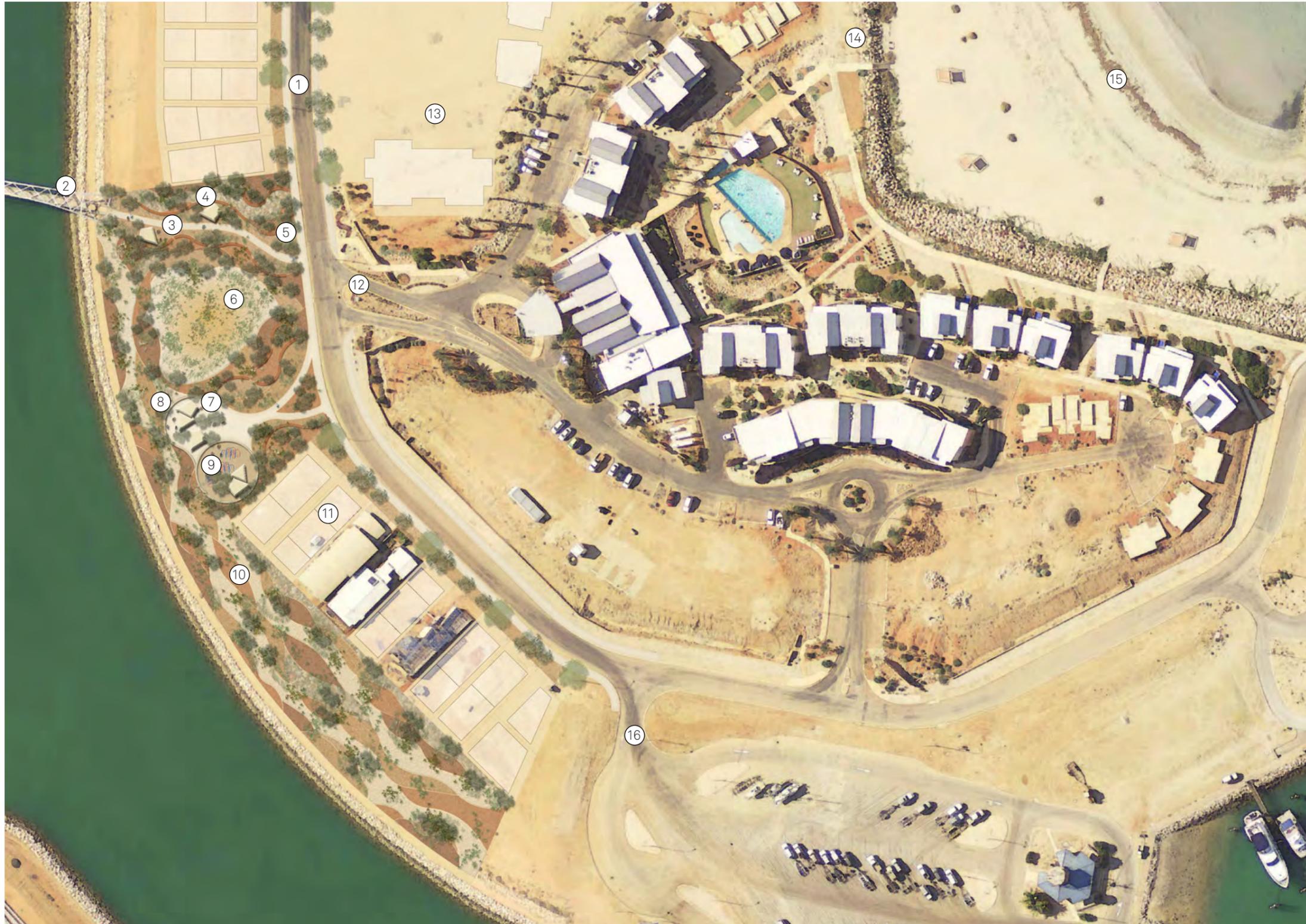


Warne Road/beach entry road streetscape upgrades



Yacht club entry road upgrade

5.0 The Plans



1. Madaffari Drive streetscape upgrade
2. Marina pedestrian bridge
3. Pedestrian link between marina and resort including shelters and seating
4. Rammed earth walls
5. Native planting within swales
6. Planting to retention basin
7. Barbeque, seating and shelters
8. Retaining wall
9. Upgrade existing children playground including shade structures
10. Local gravel swathes to marina edge including coastal ground cover planting
11. Private lots
12. Novotel Resort entry
13. Future Novotel extension
14. Beach access
15. Novotel Beach
16. Boat ramp car park

Figure 42: Marina open space enhancement



Location Plan

1. New gravel road connecting to Ningaloo Research Centre/Truscott Avenue
2. New pedestrian gravel path connecting to Ningaloo Research Centre/Truscott Avenue
3. Existing pedestrian trail upgrade
4. Entry to Gulf interpretation
5. Car parking
6. Long vehicle parking
7. Shelters and educational signage linked to research centre. Self-composting toilet
8. Upgraded pedestrian trail existing
9. Stair access to viewing platforms
10. Ramp access to viewing platforms
11. Composite boardwalk and primary viewing platforms
12. Beach access
13. Secondary viewing platforms
14. Revegetation to fore dune
15. Shelters and seating
16. Upgraded pedestrian trail link to town beach
17. Upgraded pedestrian trail link to golf club

Figure 43: New town beach (Gulf Beach)

5.0 The Plans

5.10 New Town Beach (Gulf Beach) and Outdoor Interpretation Centre

The plan identifies the future opportunity to create a new beach connecting the gulf the with proposed Ningaloo research centre, featuring Interpretation & Art. Proposals include:

- _Composite boardwalk decking and shelters to the top of the primary dune for views across Exmouth Gulf, incorporating beach access points
- _Low impact car parking incorporating vegetation protection and revegetation
- _Stabilised gravel pedestrian pathway network connecting the existing foreshore trails
- _Water sensitive design incorporated car parking and ground modifications
- _Shelters and educational signage linking back to the future proposed research centre

- _Composting toilet to reduce infrastructure to the site, which includes efficient night lighting
- _Landscape planting of the site featuring indigenous species. Tree planting on the pedestrian links will contain larger native species to increase shade and comfort for pedestrians

5.11 Golf Club and Beach Access

Identifies the potential future redevelopment of the golf club and creation of a secondary gulf interpretation and beach access node. The high dunes near the golf club offer significant views to the gulf and back across the town site to the Cape Range, and communication towers to the north. Proposals Include:

- _Composite boardwalk, decking and shelters
- _Beach access and boardwalks staged in conjunction with nearby proposals (golf club, new town beach). Broadwalk, fencing and shelters will be designed to reduce impact on the dune system while providing access to the beach. Nodes to efficient night lighting, way finding and interpretation of the gulf environment and history



Outdoor interpretation centre and Gulf Beach trail access



Viewing platform and boardwalk trail



Entry road proposal

5.0 The Plans



Golf club beach access and trails upgrade



Location Plan

1. Formalised beach access track
2. Reconfigured vehicle traffic circulation
3. Existing Beach access
4. Shelters and seating
5. Boardwalk trail
6. Viewing platform
7. Upgrade trail link to new town beach access node
8. Upgrade trail link to golf club beach access node
9. Shelter, seating and interpretation node
10. Beach access boardwalk

Exmouth cycle and pedestrian network

- _A formalised cycle network which allows a continuous link from 'range to gulf'
- _Low impact efficient night lighting for pedestrian and cyclist comfort and safety
- _Way finding, shade trees and shelters provided at key nodes along the trail



Exmouth cycle and pedestrian network



Foreshore access trail and beach access node



Foreshore access trail and beach access node



Foreshore access trail



Town access trail

5.0 The Plans

5.12 Planting

The open space and streetscape planting strategy which supports the foreshore and town centre revitalisation plans provides an opportunity to create a memorable landscape setting for visitors and the local community. The strategy is based on the following key principles:

- _Use of indigenous and locally sourced planting where possible to best suit local site conditions
- _Retain existing drainage channel vegetation where possible and clear mid storey to increase visual surveillance
- _Street tree planting spacing and selection to maximise visual amenity, shade and temperature control
- _Create landscape structure and a clear sense of place by planting large native trees in appropriate locations



- Murat road and Intersection Streetscape
- Town Beach entry Streetscape
- Truscott Ave/Marina Streetscape
- Maidstone Cres/minor roads Streetscape
- Town Centre/Federation park
- Drain/Pedestrian links
- Town Beach/marina POS

A. Town Centre and Federation Park

- Cassia fitsula
 01 Caesalpinia ferrea
 Cupaniopsis anacariodes
 Delonix regia
 02 Ficus benjamina
 Ficus hillei
 Hibiscus tiliaceus
 Peltophorum pterocarpum
 Phoenix carariensis
 03 Plumeria obtusa
 Spathodea campanulata
 04 Tipuana Tipu

B. Town Beach Entry

- 01 Cupaniopsis anacariodes
 02 Hibiscus tiliaceus
 03 Phoenix carariensis

C. Foreshore/Town Beach POS

- 01 Casuarina equisetifolia
 02 Hibiscus tiliaceus
 03 Metrosideros excelsa
 04 Cupaniopsis anacariodes
 Phoenix carariensis

D. Truscott Ave/Marina Streetscape

- 01 Acacia tumida
 Acacia pyrifolia
 Corymbia flavescens
 Eremophila longifolia
 Eremophila platycalyx
 Eucalyptus prominens / horistes
 02 Eucalyptus ptychocarpa
 Eucalyptus leucophloia
 03 Eucalyptus victrix
 04 Grevillea stenobotrya
 Grevillea varifolia
 Pittosporum phylliraeoides

E. Maidstone Cres/Minor Streetscape

- 01 Brachychiton populneus
 02 Corymbia flavescens
 Eucalyptus prominens / horistes
 Eucalyptus ptychocarpa
 03 Eucalyptus leucophloia
 04 Eucalyptus victrix
 Phoenix carariensis

F. Murat Rd Streetscape

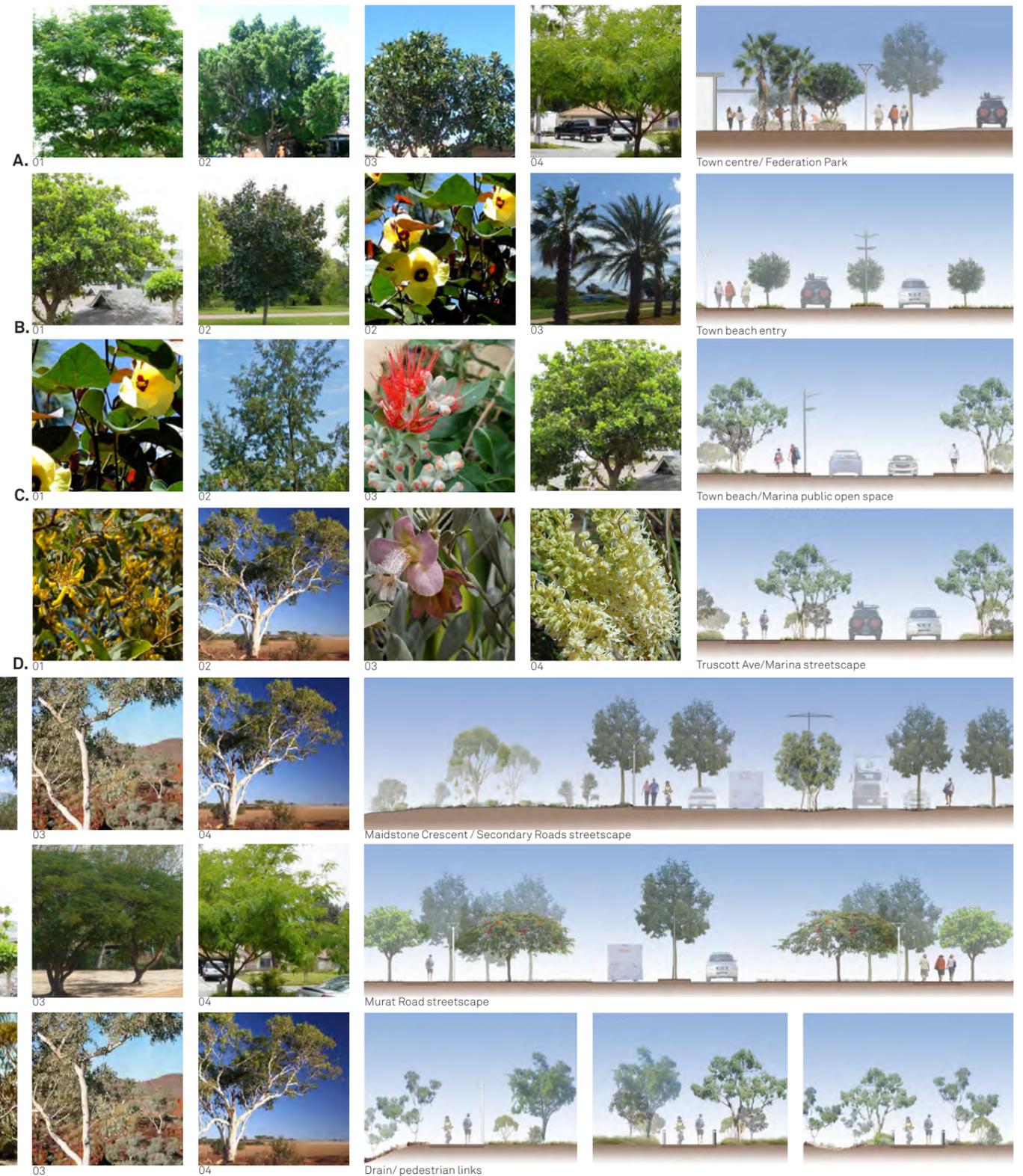
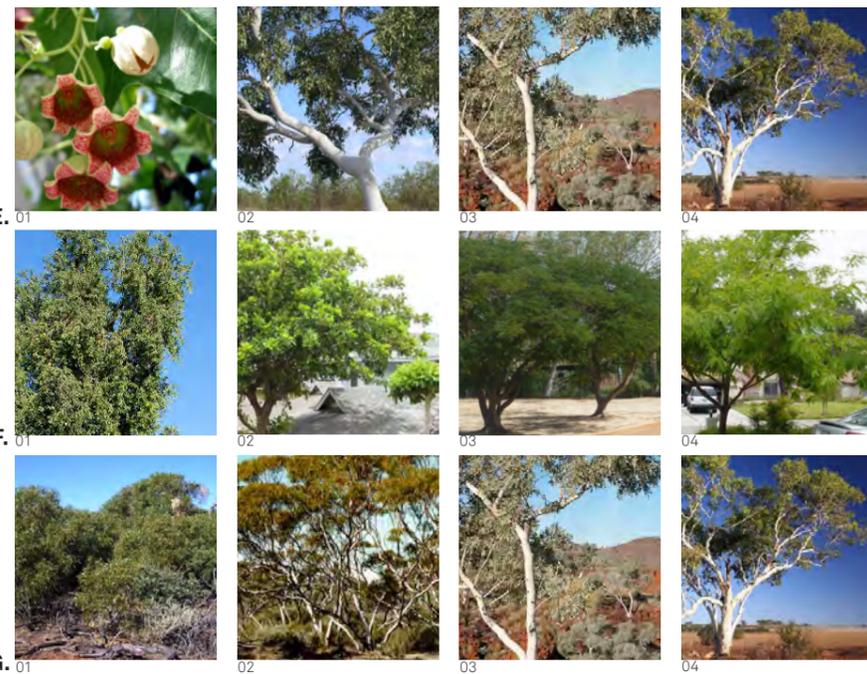
- 01 Brachychiton populneus
 02 Cupaniopsis anacariodes
 03 Delonix regia
 04 Tipuana Tipu

G. Drainage/Pedestrian links

- Acacia aradia
 Acacia tumida
 Acacia pyrifolia
 Corymbia flavescens
 Eremophila longifolia
 Eremophila platycalyx
 Eremophila youngii
 01 Eucalyptus prominens
 02 Eucalyptus horistes
 Eucalyptus ptychocarpa
 03 Eucalyptus leucophloia
 04 Eucalyptus victrix
 Grevillea stenobotrya
 Grevillea varifolia
 Pittosporum phylliraeoides

Streetscape/Pedestrian/Drainage understorey

- Acaia sp.
 Ptolotus species
 Swainsonia formasa
 Swainsonia pterostylis
 Triodia pungens
 Triodia schinzii
 Triodia wiseana



5.0 The Plans

42

5.13 Foreshore Materiality

The foreshore landscape and infrastructure proposals will be based on a locally sourced material palette wherever possible, using the following principles:

- _Select materials for their ability to enhance the design vision, establish a cohesive landscape character and provide a rich journey across the site
- _Use materials that are based on the Exmouth aesthetic using colours such as burnt oranges, limestone and browns
- _Only use materials that council have access to for periodic maintenance and replacement purposes
- _Use robust materials suitable for the local climate, wear and tear, maintenance and potential for vandalism

The material palette is composed of:

Paths

- _Brushed and exposed aggregate poured concretes
- _Crushed and compacted rock/gravel

Structures and Seats

- _Timber/composite timber
- _Steel (galvanised and weathered/corten)
- _Off-form concrete
- _Rammed earth

Informal Verge Parking

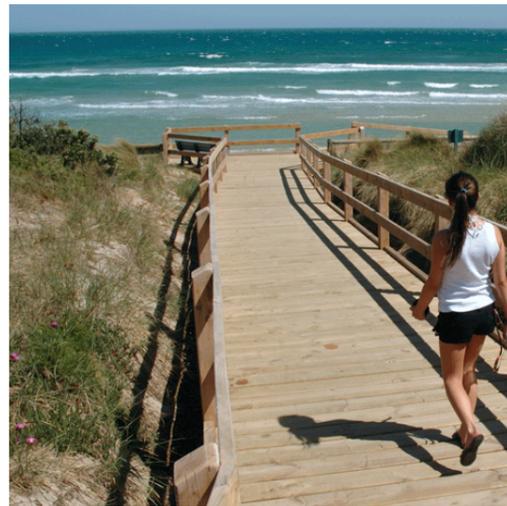
- _Crushed and compacted rock/gravel

Embayment Parking and Thresholds

- _Trafficable paving such as small unit concrete pavers or stone sets

Planting Beds

- _Rocks and boulders
- _Gravels and compacted rock
- _Planting palette (refer separate listing)



5.0 The Plans

5.14 Town Centre Materiality

The town centre landscape and infrastructure proposals will be based on a locally sourced palette wherever possible, using the following principles:

- _ Select materials for their ability to enhance the design vision, establish a cohesive landscape character and provide a rich journey across the site
- _ Use materials that are based on the Exmouth aesthetic using colours such as burnt oranges, limestone and browns
- _ Only use materials that council have access to for periodic maintenance and replacement purposes
- _ Use robust materials suitable for the local climate, wear and tear, maintenance and potential for vandalism

The material palette could be based on the following:

Paths

- _ Brushed and exposed aggregate poured concretes and precast concrete unit pavers
- _ Crushed and compacted rock/gravel

Structures and Seats

- _ Timber/composite timber
- _ Steel (galvanised, corten)
- _ Off-form concrete
- _ Rammed earth

Informal Verge Parking

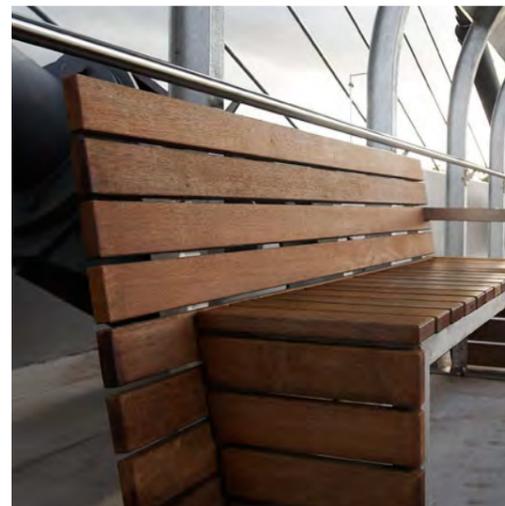
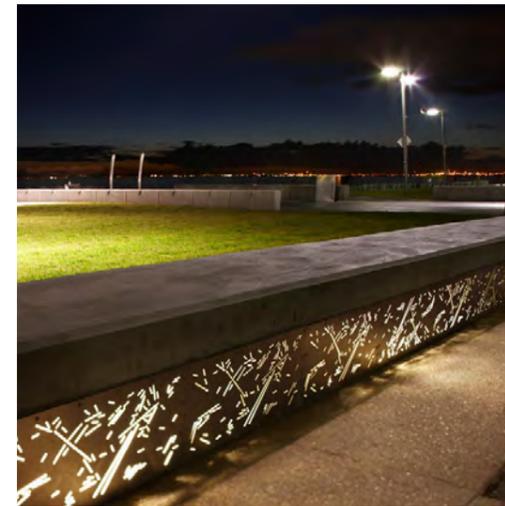
- _ Crushed and compacted rock/gravel

Embayment Parking and Thresholds

- _ Trafficable paving such as small unit concrete pavers or stone setts

Planting Beds

- _ Rocks and boulders
- _ Gravels and compacted rock
- _ Planting palette (refer separate listing)



5.0 The Plans

5.15 Foreshore Infrastructure

5.15.1 Roads and Footpaths

Existing Situation

Roads are owned and maintained by the Shire of Exmouth.

Current Planning

There is no current planning for new road networks or upgrades except for works devised during the Foreshore Revitalisation Plan.

Future Requirements

Roads will need to be constructed in accordance with the IPWEA Subdivision Guidelines and in conjunction with the Shire of Exmouth “Guidelines and Standards”. Road widths will be derived in accordance with the planning layout and traffic requirements. Footpaths may also be required in accordance with the guidelines from the Department for Planning and Infrastructure.

The Shire Officers are keen to have good quality footpaths. A preference was expressed for the use of the locally mixed light colour aggregate concrete. This provides an acceptable finish and appearance and will be considered during detail design.

New Town Beach

A car park is proposed for the New Town Beach. There are some existing tracks in the vicinity, as these are not suitable for reuse; it is proposed that a crowned gravel road with a typical section of a 9m pavement. The selection of this pavement width will allow for any future pavement sealing without too much rework, ie: 6m seal with 1.5m unsealed shoulders. Reflective guideposts, regulatory signs and typical road furniture shall be installed where required.

Car parking shall be designed for one way directional traffic and allow for a variety of vehicle sizes (i.e. standard, caravan, bus) to allow for all ranges of tourists. As the car parking area will be designed around natural vegetation, it is recommended that wheel stops are installed on the standard bays. Buses and caravan bays can allow straight through maneuvers and thus no wheel stops.

It is recommended that where pedestrian paths intersections the pavement, a timber bollard (or similar) is installed to prevent any unauthorized beach access. Pedestrian paths will be of similar standard to existing links which is cleared areas.

Drawing JDS11484_C001 shown in Appendix C provides a conceptual roads and drainage layout to the New Town Beach

Town Beach Upgrade

Car parking upgrade and extensions are proposed for the town beach. The existing car park will be upgraded with minor lighting and drainage services, the existing conditions to remain unchanged. It is recommended at the time of detailed design that the existing conditions be reviewed to determine any efficiency in implementing maintenance work.

The proposed car park to the North is recommended to be sealed due to the close proximity of the ocean and the possibility of scouring in storm events. Wheel stops are recommended to be installed adjacent the footpath for pedestrian protection. Long vehicle parking bays should be accommodated in the carpark design.

It is assumed the car park level will be raised as part of the revetment wall works.

It is noted that the marina engineer recommendations is for a revetment surrounding the car park and beach access, it is therefore recommended that the shire consult with communities on the removal of beach access or amend the car park and revetment design to allow beach access to remain.

Warne Street is proposed to be resealed and dependant on the detail design, kerbing may be an option. For an un-kerbed road, Warne Street shall have a 9m sealed section width and 1.5m unsealed shoulder. The crest prior to the car park will require investigations into the sight

distance requirements. This will need to be checked against typical requirements in the Austroads publications. There may be a requirement to regrade the road and/or install warning signage to meet standard. Reflective guideposts, regulatory signs and typical road furniture shall be installed where required.

Drawing JDS11484_C002 shown in Appendix C provides a conceptual roads and drainage layout to the Town Beach Upgrade.

Yacht Club Beach

A car park is proposed for the Yacht Club Beach. The existing Freedom Way is sealed and kerbed and any improvements can be determined at detail design.

Car parking shall be designed for two way directional traffic and allow for a variety of vehicle sizes (i.e. standard, caravan, bus), to allow for all ranges of tourists. As the car parking area will be designed around a natural dune system, it is recommended that wheel stops are installed on the standard bays.

It is recommended that at proposed pedestrian path intersections a timber bollard (or similar) is installed to prevent any unauthorised beach access.

Reflective guideposts, regulatory signs and typical road furniture shall be installed where required. Specific attention will need to be given to the Yacht Club access where larger vehicles will be using the access.

Drawing JDS11484_C003 shown in Appendix C provides a conceptual roads and drainage layout to the Yacht Club Beach Upgrade.

Truscott Crescent

Street upgrade of Truscott Crescent is proposed. It is recommended to re-grade the road, kerb and seal the road for an 8m width. It is expected that culvert crossings will need to be allowed for the drainage. It is expected that dual use paths (DUP) will be constructed along Truscott Way.

The DUP shall be carefully positioned to not impact overhead power poles, drainage swales and crossings.

Reflective guideposts, regulatory signs and typical road furniture shall be installed where required.

Drawing JDS11484_C004 shown in Appendix C provides a conceptual roads and drainage layout to the Truscott Avenue Streetscape Upgrade.

5.15.2 Sewer

Current Situation

Exmouth in currently serviced by a series of gravity, pressure and vacuum sewers discharging to a wastewater treatment plant located at the southern area of the golf course.

Water Corporation owns and maintains the sewerage reticulation system in Exmouth including the Waste Water Treatment Plant. Some use is made of recycled water in the Town for watering recreational areas. An odor buffer exists over part of the Truscott Crescent and the New Town Beach access road, this does not restrict placement of the access and car park facilities, but odor and prevailing winds should be considered.

Future Requirements

New Town Beach

The proposed toilet facility is not recommended for connection to the Water Corporation sewer, due to the vicinity of connecting sewer. A standard aerobic treatment unit is recommended for sewer management that is approved by the Department of Health.

Town Beach

A vacuum system located on Osprey Way is the closest Water Corporation sewer asset. Due to the costs involved in connecting to a vacuum system for one toilet block, it is recommended to use a standard aerobic treatment unit that is approved by Department of Health.

5.15.3 Solid Waste Management

It is recommended that bins are installed at the foreshore revitalisation areas and the Shire implement suitable waste management services.

5.15.4 Water Supply

Existing Situation

The supply of water and its treatment to potable quality is undertaken by the Water Corporation within their license area. The Water Corporations license area includes the Foreshore Revitalisation Area.

Future Requirements

Town Beach

It is expected that the extension of the Water Corporation 63MDPE water main located on Warne Street will be sufficient to service the toilet block.

5.15.5 Power Supply

Existing Situation

Exmouth Township

Power is generated from a privately owned power station. This is operated by Worley Parsons under an agreement with Horizon Power (HP) as the distributing agency. Any significant increase in power demand is the subject of discussions between Horizon Power and Worley Parsons. Current power distribution is through aerial conductors on poles made from railway line which appear to date from the construction of the town site. The distribution network in Exmouth is 11kV. An increase in power demand may also entail an upgrade of the connecting infrastructure.

This information has been provided informally by officers of Horizon Power.

New Town Beach

No existing power infrastructure is present in this area. The closest HV and LV power infrastructure is located at the intersection of Murat Road and Truscott Crescent which is 500m away from the start of the entry road to New Town Beach.

Town Beach Upgrade

The closest Horizon Power main LV infrastructure is located approximately 450m from the Town Beach at the intersection of Madaffari Drive and Warne Street. Underground powered street light poles exists adjacent to the Town Beach site. This suggests that street light cables extend to the Town Beach. Further discussions with Horizon Power are required to determine the level of LV infrastructure present on Warne Street.

The Town Beach Entry consisting of Madaffari Drive and Warne Street has been currently lit via Horizon Power’s standard underground powered Streetlights. Lighting studies are required to confirm the lighting subcategory of AS1158 the road reserve is being lit to however it appears a flag lighting approach has be utilised on Warne Street.

Yacht Club Beach

A Horizon Power transformer exists in the vicinity of Madaffari Drive and Friedman Way intersection. LV underground cabling extends from the transformer to Exmouth Yacht Club on Friedman Way. The number, type and utilised capacity of the cabling are not known at this stage.

Horizon Power’s standard underground powered street lighting pole setup has been utilised to light the road reserve of Friedman Way. Further lighting studies are required to confirm the lighting subcategory of AS1158 the road reserve is currently being lit to.

Truscott Crescent

Existing LV overhead aerial lines extends approximately 250m north from the Warne Street intersection along the east side of Truscott Crescent. From there, the single phase LV overhead aerials continue for approximately 350m leaving the remainder km of Truscott Crescent without electrical infrastructure.

Overhead aerial lighting currently provides lighting to Truscott Crescent where electrical infrastructure exists (being some 600m of the 1.6km stretch of road).

5.0 The Plans

Murat Road

Existing HV and LV aerials runs along the eastern side of Murat Road. Three phase 11kV HV aerials run the whole length from the northern intersection of Maidstone Crescent to Madaffari Drive. Three phase LV aerials runs in a 150m section heading south from the northern intersection of Maidstone Crescent intersection, then continues as single phase only to Nimitz Street, then three phase to Maley Street and single phase to Madaffari Drive.

From the northern intersection of Maidstone Crescent to Madaffari Drive, Murat Road is currently lit by lights mounted on HP power poles with the exception of the southern intersection of Maidstone Crescent and between Pelias Street and Welch Street where lighting is provided by a combination of power pole mounted lighting and underground powered 12.5m double outreach poles with 250W high pressure sodium (HPS) luminaires. Southern Maidstone Crescent intersection has been lit to sub-category V3 of the AS1158. Lighting studies are required to confirm the lighting subcategory of AS1158 for which the remainder of Murat Road is currently being lit to.

Marina Public Open Spaces

Horizon Power owns and maintains underground HV and LV infrastructure currently exists on the western side of Madaffari Drive. An existing Horizon Power transformer is located in the vicinity of the northern Marina Public Open Space. Discussions with Horizon Power are required to determine the capacity utilised of the transformer, as well as that of the HV and LV cabling.

Future Requirements

Lighting

The foreshore redevelopment creates an opportunity to replace existing streetlights with more environmentally friendly alternative solutions such as LED and solar lighting. Pros and Cons of these alternative solutions are explored below.

It should be noted that any alternative lighting solutions utilised on road reserve will be considered as private lighting by Horizon Power and therefore ownership and maintenance will be the responsibility of the Shire.

Solar LED Lighting	
Pros	Cons
No power bills	Very High initial costs
Low maintenance	High vandal and theft concerns
No trenching and cabling between poles	Lights cannot be located in shaded areas
Operational during power blackouts	Battery related flood concerns
Longer lamp life (up to 5 years)	Battery replacement every 8 -10 years
Environmetnal advantages (no grid power use)	Possible black out during extended periods without full sun

LED Street Lighting

Pros	Cons
Low Maintenance	Slightly higher initial cost
Less power usage	
Longer lamp life (up to 5 years)	
Environmental advantages (lower power use)	

LED Lighting

For slightly higher initial cost compared to Horizon Power standard street lighting, consideration should be given for the utilisation of LED lighting within public open spaces and street lighting. This is on the basis that, pending detail design, lower wattage LED fittings should be able to perform as highly as a higher wattage discharge lamp, therefore reducing power consumption for the life of the asset.

Solar Powered Lighting

Solar lighting's main advantage is that it can operate when it is cost prohibitive to bring grid connected power to the site. It obviously also provides an environmentally solution as it does not use grid power, which is typically non-renewable fuel powered. So, given the high initial costs of installing solar powered lighting and proximity of existing power infrastructure (with the exception of New Town Beach), Solar powered LED lighting will not be as cost effective as distribution connected lighting.

The cost benefits of not using grid connected power are largely offset by the cost of needing to replace batteries of a solar power pole every 8 to 10 years.

Solar panels can be the subject of vandalism, as they are an attractive target for objects to be thrown on to.

Comparison of Direct Lighting and Decorative Reflective Lighting

Comparing Horizon Power's standard lighting (6.5m poles with 1.5m outreach and 42W compact fluoro luminaire) with a typical decorative reflector lighting type, it is evident that a higher quantity of reflector poles are required to obtain the lighting levels of the chosen sub-category, for any given stretch of road. Refer to Appendix C Drawings 3E11176G-03 and 3E11176G-04 for typical lighting layouts of each lighting setup for Truscott Crescent. In this example, to utilise the reflector type lighting, 50% more poles were needed and 400% more power was used to light the road to sub-category P4.

Reflector lighting can provide vandal resistance over a direct light fitting as the lamp is upward facing and more difficult to damage with a thrown object.

Unless preferred for aesthetic or vandal resistance reasons, a reflector lighting system would not be recommended based on its lighting performance. In addition to this, a reflector lighting setup is not recommended for use in proximity to the beach, on the basis of the methodology provided below for turtle friendly lighting.

Recommendations for Specification of Lighting Poles

Redevelopment sites are within close proximity of the sea and with Exmouth located in the Region D cyclonic zone, lighting poles are to be designed and constructed to handle such conditions (footings, mounting hardware, etc.). Poles would also need a suitable surface treatment, such as hot dip galvanising as well as an aliphatic urethane (or similar) final coating.

Methodology of Turtle Friendly Lighting

Exmouth Gulf is known as a feeding ground and possibly a breeding area for marine turtles. With marine turtles listed as threatened fauna deserving of special protection worldwide and that six of seven species of marine turtles in the world occurring in Western Australian waters, special attention is required when producing a lighting solution for the area. Turtles tend to have preferences for dark beaches for breeding and hatchling turtles primarily rely on their vision to find the sea by orienting towards the brightest direction. Artificial lighting can deter turtles from beaches and may disorientate or mis-orientate hatchlings resulting in death by predation, exhaustion or dehydration. Below is a list of some measures which can be taken to reduce light impacts to marine turtles:
 _Avoid lighting where possible (design for minimum number and intensity of lights)
 a. Weigh up importance of human safety vs. turtle friendly

- _Avoid light spill onto beach and sea surfaces
- _Lighting control to be designed for operation of lights when required (time control, motion sensor, etc.)
- _Usage of screens, vegetation and structures to block direct and indirect light to beach
- _Lighting fixtures to be directed downwards to avoid overhead glow on cloudy nights (utilise aero screen type fittings within proximity of the beach)
- _Lighting fixtures to use shields and filters (e.g. amber filters on HPS lights) as required
- _Lighting fixtures to utilise long wavelengths (550-700 nanometers, orange to red) where possible. Short wavelength (blue) and broad spectrum sources such as metal halide, mercury vapour, fluorescent or halogen lights are not desirable
- _Conduct night inspection and monitor turtle behaviour after installation of lights
 - a.Remove problem lights as required
 - b.Create shielding as required
 - c.Turn problem lights off at nesting season

No particular level of light intensity has been identified as being safe for turtles therefore a lighting level, or sub-category of AS1158, that would not affect turtle behaviour, cannot be recommended. The above approach aims to limit to the amount of light, particularly the type of light that can affect turtle behaviour, that can be seen from nesting beaches. Our recommendation would be to select lighting sub-categories that have the lowest lighting level while still meeting the criteria for pedestrian safety and crime deterrence (so ignoring higher lighting levels to enhance prestige). The Shire could complete an assessment of whether lighting levels below the recommendations of AS1158 are appropriate, in an attempt to further limit the possible effects on turtle behaviour.

Drawings 3E11176G-02, 3E11176G-03 & 3E11176G-04 shown in Appendix C show possible lighting options for Truscott Avenue and Murat Road.

Power Distribution

Horizon Power requires that all new developments are to be serviced by underground three phase power. In a green-title development, this is implemented by HP owned and maintained URD 3-phase direct buried underground cabling from a spare fuse way at the transformer LV frame to uni and mini-pillars serving each site on the general basis of one pillar serving two adjacent lots. Horizon Power standard streetlights are then supplied from these pillars or an un-metered supply pit supplied off the pillar.

Further discussions with Horizon Power are required to determine the level of infrastructure in the vicinity of development areas, spare capacity available and voltage drop limitation of their network.

New Town Beach

With the closest Horizon Power 3 phase HV and LV network approximately 500m from start of the development area, solar powered lighting could be considered in this area. A cost comparison exercise should be completed to assist in the consideration.

To provide underground power to the area, applications and discussions with Horizon Power are required to determine HV connection points.

As per AS1158, the decision to light a road lies with the authority (in this case, The Shire of Exmouth). Our recommendation would be to light this road to subcategory P4 for entry roads. This lighting category recommendation is based on the presence of pedestrian traffic, expected low vehicle numbers and to provide a link between Truscott Avenue and the New Town Beach Car Park. This would also be subject to consideration of a compromise on lighting levels due to the presence of turtles as discussed in previous sections. Solar powered lighting could be considered for the lighting of boardwalks, shelters and pedestrian links to minimise impacts to the natural surroundings.

5.0 The Plans

46

Town Beach Upgrade

Low voltage network to be extended from Madaffari Drive and Warne Street intersection if no existing LV infrastructure is adjacent to site. Further discussions required with Horizon Power to determine proximity of HV & LV network.

With the presence of pedestrian traffic and expected low vehicle numbers, lighting subcategory P4 of AS1158 is recommended for the entry road. This recommendation is subject to considerations of a compromise on lighting levels due to presence of turtles as discussed in previous sections. Upgrade works to entry roads provides opportunity to amend existing street lighting to provide a more turtle friendly environment.

Car park lighting sub-category recommendations are subject to Shire requirements of crime deterrence and night time occupancy rates. Typically sub-category P11c would be appropriate for a car park with low night time occupancy rates. This would also be subject to consideration of a compromise on lighting levels due to the presence of turtles as discussed in previous sections.

Yacht Club Beach

The Yacht Club Beach is currently serviced by underground power infrastructure (the type and level of supply is to be confirmed by Horizon Power). Horizon Power LV network to be extended as required to supply upgraded services. Load calculations to be performed once level of upgrades have been defined and finalised. Car park lighting subcategory recommendations are subject to Shire requirements of crime deterrence and night time occupancy rates. Typically sub-category P11c would be appropriate for a car park with low night time occupancy rates. This would also be subject to considerations of a compromise on lighting levels due to the presence of turtles as discussed in previous sections.

Truscott Crescent

LV infrastructure should be extended from Gnandaroo Road and Warne Street intersection to provide power to proposed lighting on south section of Truscott Crescent. Discussions are required with Horizon Power to determine the proximity of LV network to Warne Street and Truscott Crescent intersection. Extension of power infrastructure from Murat Road and Truscott Crescent intersection to supply lights on northern section of Truscott Crescent to be explored with Horizon Power.

While new lighting infrastructure is required through the northern section of Truscott Crescent to meet AS1158, the southern section is already lit with occasional power pole mounted luminaires, but not to AS1158 requirements. This lighting could be left in place, until the existing above ground power infrastructure is replaced with new underground infrastructure.

Murat Road

A Horizon Power transformer is located on northern section of Murat Road. A LV network can be extended to service proposed lighting. Street lighting to the south section of Murat Road is to be supplied by extending existing street lighting circuits (subject to voltage drop). Further discussions with Horizon Power required for alternative connection points.

Lighting studies are required to determine current level of lighting of Murat Road. Southern intersection of Maidstone Crescent and Murat Road has been lit to a lighting sub-category V3 of AS1158. Road revitalisation works provides opportunity to upgrade existing lighting to continue same lighting standards. Refer to Appendix C Drawings 3E11176G-02 for typical lighting layout for Murat Road utilising HP Standard fixtures and poles. Lighting calculations and detailed design can be performed once road layouts and lot boundaries have been confirmed and finalised. Existing HP power poles may cause possible constraints to road works and new light pole locations.

Marina Public Open Spaces

Marina public open spaces are currently supplied via underground infrastructure (to be confirmed by Horizon Power). Power infrastructure to be extended and upgraded as required to supply electrical services. Where electrical load requirements, comprises of lighting only and single barbecue, standard 3 phase pillar supplies may suffice pending input from Horizon Power. Lighting recommendations and calculations to be completed once path layout and electrical equipment requirements have been confirmed and finalised.

5.15.6 Gas Supply

ATCO Gas has advised that there is no gas network available for the Town of Exmouth.

5.15.7 Telecommunications

No further communication assets are expected for the Town Beach Integration.

5.15.8 Drainage

Existing Situation

The existing Town is drained through a combination of pipe network, open drains and creek lines. These connect to open drains which are natural creek lines that discharge into the low lying area on the west side of the dune system. The dune system acts as a natural storage bund and the only relief to the flooding extents is outlets to the North of the town centre and the southern inlets.

Rainfall events have led to flooding in parts of the Town Site and this have been extensively modelled by the Department of Water (DoW) and Sinclair Knight Merz (SKM). The resulting report identifies the extent of flooding for various storm events and return periods and summarises the area east of the inlets to be relatively immune to major flooding and the area to the north of the inlets experiencing flooding.

Current Planning

There is no current planning for new drainage networks or upgrades except for redevelopment works resulting from the town centre revitalization study and the outcomes of the Cardno drainage analysis.

Future Requirements

New Town Beach

The car park appears to be situated on the dune system ridge line and should not experience any flooding. Car park drainage can be controlled via road side swales and median basins.

The access road will experience flooding in major events, and depending on the level of service, filling the road and/or flood ways may be considered. Minor storm events can be catered for via road side swales with turnout's being constructed where possible.

Town Beach

The town beach access and car park is protected from major flooding from the nearby inlets.

The car park can be controlled via road side swales, and any overflow can be via the revetment. It is recommended to consider the existing drainage along Warne Road (west side of dune system) in the detailed design to ensure flow paths are maintained.

Yacht Club Beach

The Yacht Club car park and access should be well protected from flooding from the inlets.

The car park can be controlled via road side swales, and any overflow via revetment and dune system.

Freedman Way is currently kerbed and sealed. On the approach to the carpark it is recommended to install drainage pits to direct water to road side swales via pipe and scour protection.

Truscott Crescent

Truscott Crescent is situated in a flood prone area due to the flows from the creek crossing of Lot 501 and Lot 868 Murat Road. The dune system to the east creates a natural storage area on Lot 1456 (including Truscott Crescent). The only discharge to this flooding is North of the town site or the inlets to the south.

The shire should determine a level of service for Truscott Crescent and fill the road accordingly to prevent major flooding.

Truscott Crescent shall control drainage via road side swales, these swales can also act as conveyance swales for larger events, directing stormwater to the north of the site where flood ways or culvert crossings will need to be installed.



environmental
management

6.0 Environmental Management

48

6.1 Environmental Management of the Exmouth Foreshore

In the implementation of the Exmouth Foreshore Revitalisation Plan, environmental management measures will need to be undertaken to ensure the existing foreshore environment is protected and enhanced as far as possible. Environmental management of the foreshore area broadly would consist of vegetation protection and rehabilitation, weed management and control, fire management, and feral and domestic animal control.

The key environmental management objectives to be considered during implementation of the Exmouth Foreshore Revitalisation Plan and recommended management measures are outlined below.

6.1.1 Feral and Domestic Animal Control

Objectives

The key objectives to consider for feral and domestic animal control in the Exmouth foreshore are to:

- _ Minimise predation pressure on native animals by domestic and feral animals
- _ Determine if grazing pressure on native plants and seedlings by feral fauna is apparent, and if so, consider rabbit proofing or control to prevent grazing of seedlings used in rehabilitation

Recommended management actions

Recommended actions to manage feral and domestic fauna in the Exmouth foreshore are to:

- _ Monitor the foreshore area to determine the impact of feral animals
- _ Implement a community awareness campaign to inform residents who own domestic animals of their responsibilities in regard to control of pets

6.1.2 Vegetation Protection and Rehabilitation

Objectives

Vegetation is a key factor in maintaining dune stability and therefore the maintenance of dune vegetation and associated processes is an essential part of erosion control in foreshore environments. Key objectives to consider for vegetation protection and rehabilitation in the Exmouth foreshore are to:

- _ Minimise the impact of activities that could result in degradation to vegetation communities and dune systems through the use of appropriate management strategies
- _ Improve the overall condition of the foreshore vegetation through dune protection and revegetation
- _ Involve the community in the foreshore rehabilitation programme

Recommended management actions

Recommended management actions for vegetation protection and rehabilitation in the foreshore area are to:

- _ Use existing disturbed informal tracks for formal paths where possible and clearly delineate boundaries through flagging prior to works commencing
- _ Stabilise erosion prone areas using wind fencing, brushing, matting materials and intensive planting of dune stabilising species along the front of the foredune
- _ Retain linkages between areas of native vegetation
- _ Install fencing along foredune area where vegetation is to be protected/rehabilitated
- _ Use species sourced from local propagation stocks (seeds, cuttings, divisions) from nearby foreshore dune communities where possible
- _ Erect signage that is appropriate in location, size and information to inform the public of rehabilitation works
- _ Monitor revegetated areas and any signs of rabbit activity
- _ Encourage community involvement in the rehabilitation programme

6.1.3 Weed Management and Control

Objectives

Weed management and control should be implemented as part of rehabilitation/revegetation works proposed for the Exmouth foreshore. Key objectives to consider for weed control in the Exmouth foreshore are to:

- _ Control degradation processes that increase ecosystem vulnerability to weeds e.g. uncontrolled pedestrian and four wheel drive access
- _ Minimise the fire and health risks associated with any weed species
- _ Identify and control existing weeds and minimise the introduction of additional weed species
- _ Minimise competition of weeds with native plants
- _ Minimise any detrimental effects of the weed control programme on native flora and fauna
- _ Integrate the weed control programme with overall site management

Recommended management actions

Weed management should focus on controlling, reducing or eliminating disturbance factors that increase ecosystem vulnerability. Recommended management actions for weed control in the foreshore area are to:

- _ Control pedestrian and vehicle access through the Exmouth foreshore by delineation of formal access and fencing off and rehabilitation of unauthorised tracks
- _ Undertake inspections annually (or more frequently if required for early detection) for the presence of new significant weed populations
- _ Undertake weed control in areas identified with significant existing and new weed infestations using herbicide where deemed appropriate and safe to apply
- _ Ensure that the public is informed and notified prior to and during weed spraying in the foreshore area
- _ Ensure weed control contractors have adequate experience working in coastal environments

6.1.4 Fire Management

Objectives

Fire prevention and control is an important consideration in management of foreshore areas. Key objectives to consider for fire management in the Exmouth foreshore are to ensure:

- _ Protection of human life
- _ Protection of property and infrastructure
- _ Protection of ecological integrity and biological values

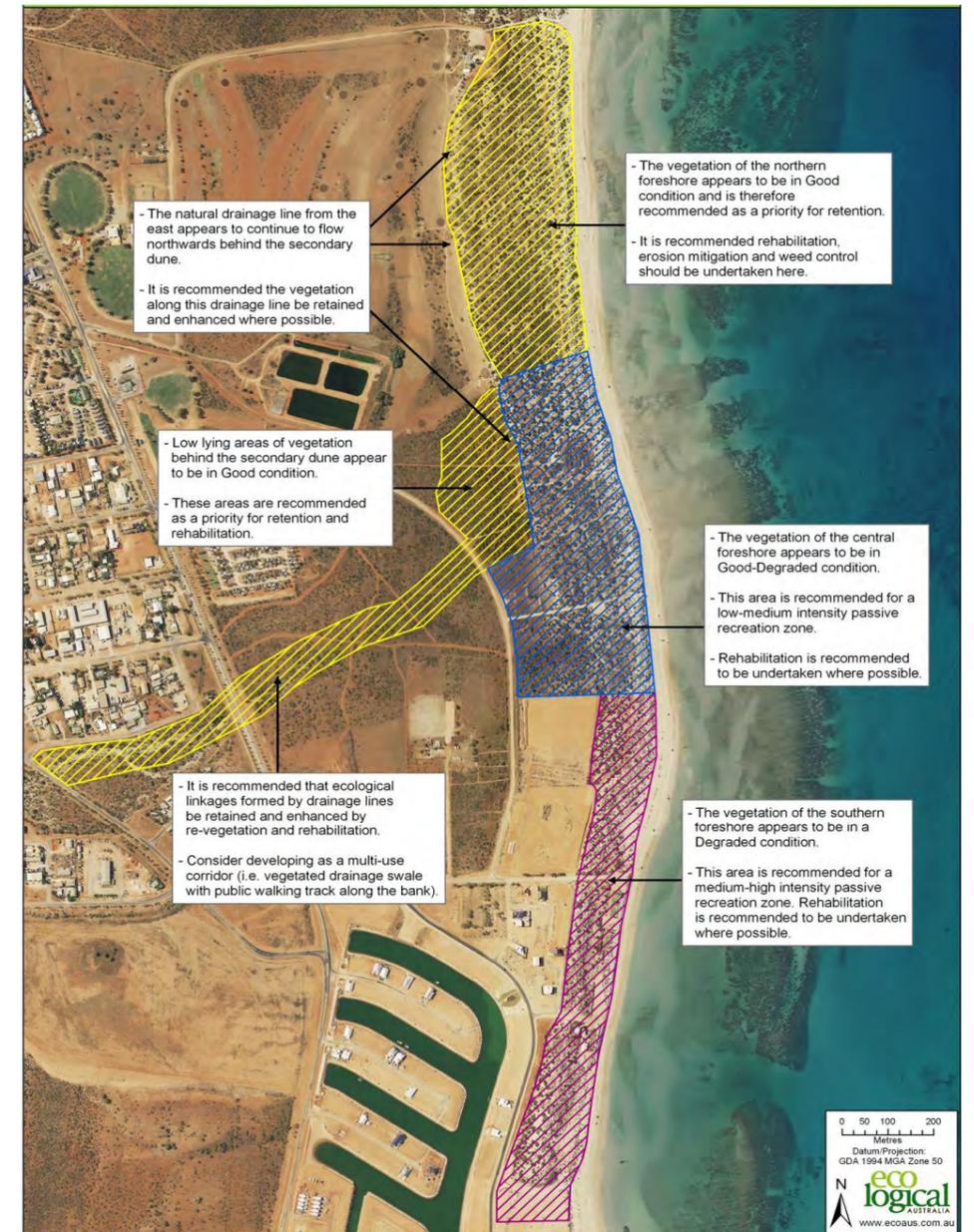
Recommended management actions

Fire prevention and mitigation will be particularly important during construction of pathways, boardwalks and other infrastructure proposed for the Exmouth foreshore. During construction potential fire ignition sources include; construction equipment and machinery, stockpiles of cleared vegetation, litter and deliberately lit fires due to unauthorised third party access. Recommended fire prevention strategies during construction for the foreshore area are to:

- _ Clear all flammable materials from around potential ignition sources
- _ Maintain all machinery so as to comply with relevant fire safety standards
- _ Park all machinery and vehicles not in use in areas free of flammable material and vegetation
- _ Aim to suppress and contain any fires within the foreshore as quickly as possible. Fire mop-up procedures should be instigated to prevent re-ignition
- _ Heed all fire weather warnings and stop any construction activity that may ignite a fire during total fire bans

Recommended fire prevention and management strategies post-construction for the foreshore area are to:

- _ Keep records of the date, time, duration, personnel attending and known cause of all fires within the foreshore
- _ Ensure that the Fire and Emergency Services Authority (FESA) of Western Australia is aware of the management objectives for the Exmouth foreshore and aim to protect the area's biological values and ecological functions when attending fires in the area
- _ Implement a weed control programme as outlined previously
- _ Establish fire breaks adjacent to all property boundaries to FESA and local government standard



Exmouth oreshore: Environmental management opportunities and constraints

6.0 Environmental Management

6.2 Coastal

6.2.1 Shoreline Dynamics

Foreshore works require consideration of the naturally dynamic nature of the coast, which includes the effects of tides, waves and tropical cyclones. The interaction of any proposed infrastructure works with the coast needs to be considered for processes developed by both prevailing and extreme conditions.

_The recommended approach is to minimise interference with coastal sediment transport and as far as practical, to place infrastructure landward of the dynamic coastal area

6.2.2 Beach Access

Access to the beach is required for both vehicles and pedestrians. Erosion or accretion may create scarps or loose sand that requires local management.

_Fixed infrastructure access to the beach shall be limited to existing access points, oriented at a shallow angle to the shore, to limit its interference with coastal processes

_Additional pedestrian access shall use minimal infrastructure, with sufficient flexibility to accommodate shoreline change

6.2.3 Foredune

The foredune is a natural focal area for erosion and deposition, with the majority of shoreline change occurring within this area.

_Foredune vegetation shall be encouraged, with access through the foredune constrained by fencing

_Foreshore infrastructure shall be placed, as far as practical, landward of the foredune

6.2.4 Dune Access

The primary dune is built through Aeolian processes, which will cause gradual sand drift into access pathways.

_Existing access pathways shall be maintained, minimising cutting through the dunes and using vegetation to provide stabilisation as much as practical

6.2.5 Coastal Setbacks

Long-term processes, including sea level rise, are likely to cause permanent landward movement of the shoreline position.

_Permanent or high cost infrastructure shall be located landward of the area likely to be affected by coastal change in the long-term

_Low cost coastal infrastructure required to service foreshore use shall be placed as far landward as practical. Such infrastructure shall either be easily replaced or relocated

6.2.6 Flood Protection

The primary dune provides the eastern boundary to the Exmouth stormwater detention basin, with flow passing through existing breakout pathways. These locations are highly dynamic.

_Flow through the existing breakout pathways shall not be interrupted

_Access pathways shall maintain sufficient height through the primary dune that the potential for formation of a new breakout pathway is minimised



Exmouth foreshore coastal management study



Coastal protection study: retaining and revetment approach

5.0 The Plans



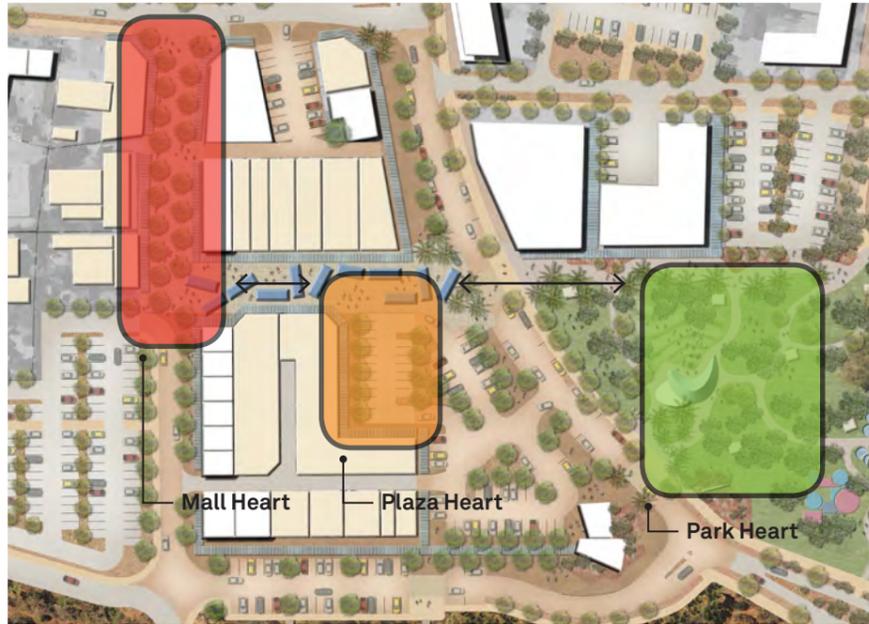
Federation Park and the new community events stage from Maidstone Crescent



recommend
and implement

7.0 Recommend and Implement

52



Town heart elements linked through comfortable and safe paths

The recommendations for the town centre and foreshore are separated into:

- _ Small wins
- _ Retail activation
- _ Activities
- _ Environment and built form
- _ Car parking
- _ Movement
- _ Governance and implementation

The recommendations reflect the consultation that has occurred throughout the design process, the analysis undertaken and community based objectives. The recommendations relate to the intent of the town centre and foreshore plans whilst also suggesting strategies for implementation.

7.1 Small Wins

The small wins themes identified by the various groups as priorities for the town centre were:

- _ Signage, wayfinding, interpretation
- _ Art, expression, history and stories
- _ Connectivity, linkages, access
- _ Retail mix, renewal and activity
- _ Traffic and car parking movement
- _ Seasonality
- _ Landscape and environment

The small wins themes for the foreshore were:

- _ Access and connectivity; ease of movement and legibility
- _ Activity nodes; destinations
- _ Programme of activities
- _ Comfort and safety; lighting, shade and facilities
- _ Environment and seasonality; stories of the wildlife

7.2 Retail Activation Strategy

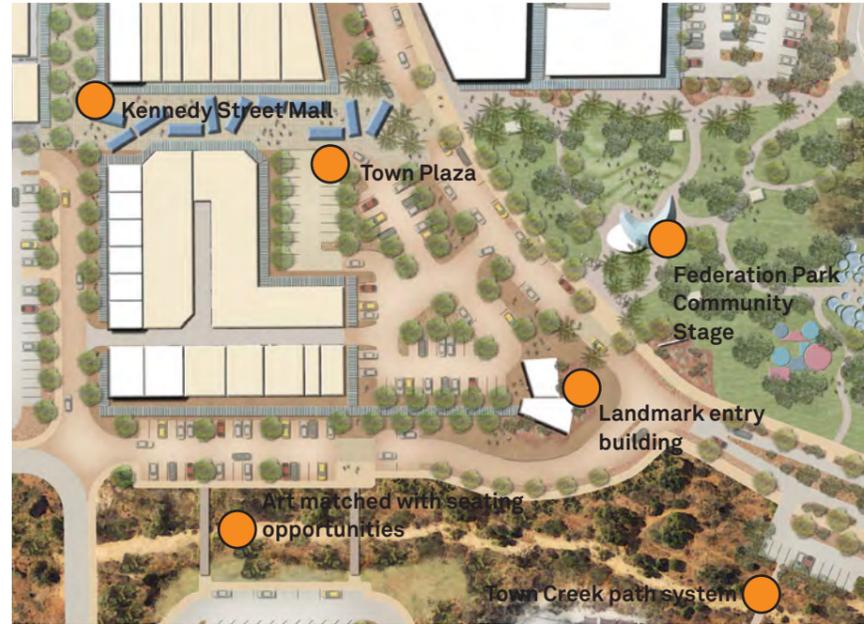
A beautiful town centre loved by locals and visitors which offers great comfort and convenience and provides moments of surprise and delight.

Positioning

Exmouth – nature’s playground (describes the meeting place and the third place for locals and visitors).

Theme Palette

Desert Red – Range
Turquoise Blue – Reef
Green – Desert, gums and bush (colour palettes to be used throughout)



Key public art opportunities - at entrance thresholds, on movement lines and marking destinations

Symbols

Whale shark tail
Whale tail (a symbol unique to the area)
Name
Exmouth Village – where the reef meets the range.

Art Elements

A beautiful town centre that celebrates its natural assets through urban art such as sculptures and murals, historical plaques and informative and creative signage that tells the story of the place and the region.

Town Structure

It is recommended that a main street be created by activating the car park edge and public land and sleeving small retail/ other businesses into the non-active edges. The street becomes a shared space and is pedestrian dominated.

Create a Heart

This will be a comfortable and beautiful meeting place for all. It is recommended that the space between the two IGAs becomes a key focus for the area and for the creation of a space that reflects the story of the region. One way of doing this could be to do a ground plane mosaic.

Role and Function

The community neighbourhood convenience centre will be a tourist edge.

The Mix

The current retail mix provides a level of convenience for the local community and for the population size. The greatest challenge is sustaining a viable retail and business trade for 12 months of the year. The current sustainable cycle for most retailers, e.g. restaurants, cafes, tourist operations and tourist related fashion, only lasts for a four to five month cycle. The future success and sustainability of the town centre rests with the creation, development and implementation of a 12 month events marketing and business plan that extends the life of the tourist market over a 12 month period.

Gaps in the Mix

- _ Menswear and children’s wear
- _ Café and food orientated to a younger market
- _ Family style, children friendly restaurant
- _ Shift the library into the new main street
- _ Need for a second bank ATM
- _ Homeware and giftware



Public Realm Activation plan

Management and Governance

It is recommended that the town centre businesses have their own traders’ association and develop a town centre business and marketing plan. It is important that the traders feel they have their own voice, vision and roadmap for the future. We recommend the Shire employ a four day per month position. The person in this position will take on the role as place manager, responsible for the town centre and foreshore redevelopment and implementing the business and marketing plan. We recommend the Shire contributes a minimum of \$30,000 a year for the implementation of the 12 month plan over a three year period to fund events and activities.

Events, Activation and Marketing

Key recommendations include:
_ Create a 12 month business and marketing plan
_ Develop two or three catalyst events, e.g. night market, farmer’s market
_ Tourism positioning and brand to be developed
_ Develop a town centre logo and brand. These can be part of the welcoming entry as colourful street banners

Target Markets

- _ Locals
- _ Tourists
- _ Grey nomads
- _ Families
- _ Young backpackers
- _ Cultural creatives
- _ Adventure tourists
- _ Nature based tourists
- _ International
- _ National
- _ State

The current town centre experience and product caters for grey nomads, local and state tourists, families and backpackers. These are low value and low cost markets.

There is an opportunity to create a more exclusive value-added product experience of eco/cultural tourism/adventure sports. This is a fast growing and all year round market.

It is recommended that a tourism strategy be developed with a specific activation and events strategy that creates an extended marketing program for the region.

7.0 Recommend and Implement

7.3 Long Term Strategies and Projects: Town Centre

7.3.1 Activities

The recommendations relating to activities seek to improve the performance of the town centre as a destination, support existing businesses, acknowledge and strengthen the importance the key structural axis, and improve the overall impression of the town. Some of these recommendations will require amendments to the Town Planning Scheme, notably to allow residential development as part of mixed used development along the northern part of Maidstone Crescent. Implementation and staging aspects are discussed at the end of this section.

1. Town Centre

The existing town centre must be physically improved, through good urban design as the key focus for activity, and remain the primary location of community and business services, attractions and government functions throughout Exmouth. Retail development should be focused on the town centre, except where it supports an identified local node elsewhere in Exmouth.

Exmouth's town centre provides the key business, retail and community function for local residents and tourists. To maximise its potential, business and community facility growth must be identified within the town centre boundary.

Recommendation: Activity in the town centre should be complementary to its central role in the life of Exmouth, promote its function as a community meeting place – be they permanent structures, commercial premises or temporary event programs.

2. Precincts

The town centre as containing a range of activity precincts, based on the analysis and community engagement process including: an active retail core for locals and tourists; a recreation and open space precinct for families and events; a short stay precinct providing complementary hospitality functions; a mixed use precinct that provides for local office expansion and live-work arrangements; and a civic quarter providing educational and government services.

New infrastructure and programming should support these town centre precincts. The location of precincts will recognise the relationships to each other and the potential synergies offered by merging infrastructure elements.

Recommendations: Infrastructure, activities and community facilities should support the function of distinct town centre precinct.

To reinforce the recreational role of Federation Park, a new water play facility should be developed which complements the adjacent public swimming pool.

The retail expansion strategy should consolidate development around the town's key structural axis along the Ross Street Mall spine, Kennedy Street and Maidstone Crescent.

3. Main Street

A key outcome of community engagement and supported by a Shire of Exmouth directive, is the creation of a future pedestrian mall along Kennedy Street. In order to facilitate this, a staged approach is recommended. Initially, Kennedy Street should function as a two-sided retail street supported by the creation of development sites on its eastern flank. This will require the annexure of part of the existing road reserve into new development sites, and/or amalgamation of these land parcels into the adjacent private property.

Kennedy Street should be remodelled into a 'shared street' where pedestrians have priority. Spaces for on street parking and bicycle parking should be accommodated within the 'shared street'. The character of Kennedy Street will be similar to a pedestrian mall, but wcontain slow moving vehicle traffic.

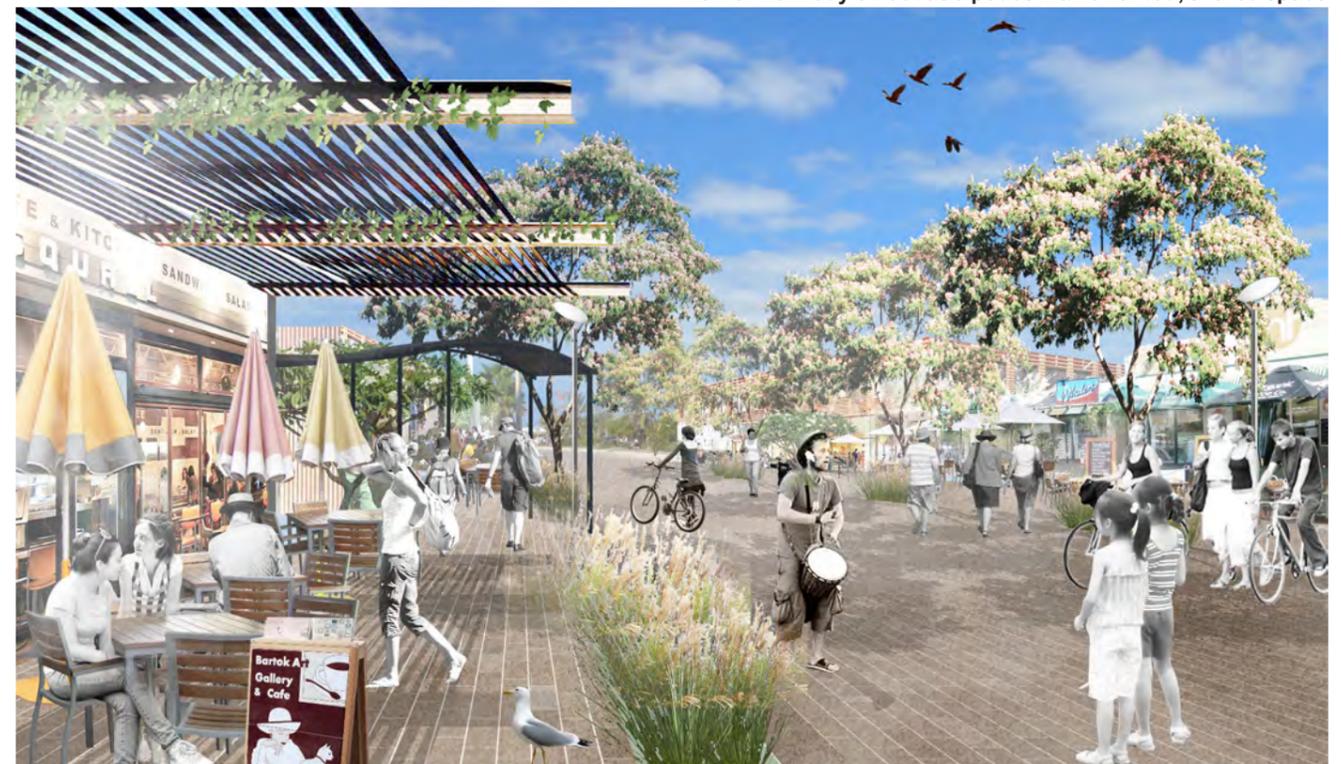
When pedestrian traffic and commercial development is sufficiently high that vehicle movement is no longer required to help activate and support the adjacent businesses, Kennedy Street can be closed to general traffic, which will be redirected along the extension of Thew Street and Learmonth Street.

Recommendation: Kennedy Street should be developed into a pedestrian prioritised streetscape where vehicle access is managed and slowed so that pedestrians have priority, whilst also allowing the service needs of adjacent businesses to be provided.

A mall closed to vehicle traffic should be developed in the future when sufficient commercial/retail growth and demand allows.



View of Kennedy Street as a pedestrian oriented, shared space



View of Kennedy Street as a pedestrian mall

7.0 Recommend and Implement

54

4. An Improved Retail Offer

In conjunction with the road closure and development parcel arrangement, the Shire should seek out appropriate businesses that will complement the existing land use mix and promote pedestrian based retail activity, both throughout the peak tourist period and during the hotter summer months. This will require a marketing strategy to be developed, based on an agreed retail/land use mix consistent with the retail strategy prepared as part of this study.

Recommendation: To support any new businesses within the town centre that are consistent with the desired retail mix, the Shire should develop a start-up strategy to enable businesses to develop over time. The Shire should consider rate relief for a period of two years to allow the desired businesses to develop, along with a streamlined development approval process.

5. Activation and Anchors

An active retail core needs to provide an engaging environment and encourage pedestrian movement and activity. Retail that relates to the Exmouth region as well as food and beverage outlets should be concentrated along the existing Kennedy, Maidstone and Ross Street axis. These functions, be they temporary market sites or more permanent land uses, act as a frame to more informal activity within the town core. The urban design of this area should consist of well-defined and attractive buildings that acknowledge their climate and location, whilst also framing activity along the activated retail core. Single storey kiosks and larger one or two storey buildings should frame pedestrian footpaths and encourage space for alfresco dining.

To further enhance the experience of visitors to Exmouth's town centre and promote pedestrian movement, activity anchors should be located at the northern and southern edges of Kennedy Street as well as eastern and western edges of Ross Street.

Recommendation: Encourage intensive, good quality retail, short stay and commercial activity along the key structural axis of movement spines in the town centre and identify and develop community or commercial anchors at key nodes to act as movement magnets.

6. Retail Expansion

The retail floor space expansion identified in this study provides a structure for its growth and development within the town core. The timing of additional floor space coming on-stream will depend on population growth, developer priorities and market demands.

Recommendation: Allow for retail floor space expansion over the short to medium term of up to 26,615 square metres for a population of 8,000 people.

7. Concentrated Commercial Precinct

There is a need to consolidate a precinct within the town centre that accommodates office and business service development as well as other complementary uses. Often such businesses are owned and managed by local residents with a desire to live on site. Development of live-work buildings that have an activated ground floor and upper level residential floor space would provide an alternative development style not yet explored within Exmouth.

The mixed-use precinct will require an amendment to the town planning scheme allowing residential land uses (and in particular multiple dwellings) to be developed. At present, residential land uses are an 'X' or 'not permitted' use within the town centre zone.

Recommendation: Create a mixed use, live-work precinct along Maidstone Crescent (north) that provides for office expansion and other commercial opportunities not appropriate to the retail core, supplemented by residential accommodation above.



7.0 Recommend and Implement

8 Development Opportunities to Enhance the Town

A new building in the local vernacular should be constructed as a local landmark and should announce one's arrival into the town centre core. The new building is to accommodate a café/restaurant and visitor experience that tells the story of Exmouth and provides a starting point to exploring the town centre. The existing toilet facility can be relocated into Federation Park.

Recommendation: Create a new landmark building at the intersection of Maidstone Crescent and Thew Street, marking the entry to the town centre and announcing an arrival moment into a pedestrian oriented, slow vehicle environment.

9. Maximising the Potential of the Public Realm

Federation Park has traditionally been used for community events. There is opportunity to enhance this role through making it larger by removing the portion of Payne Street and unifying it with the swimming pool. There is the further opportunity to development a community stage and multi use space so that various community activities can be undertaken in shade and relative comfort. The stage/multi use space can be used for large community events, like the Carols by Candle Light, as well as smaller activities like kinder athletics.

Recommendation: Remove Payne Street to enlarge Federation Park. The park will provide a public stage and events space that also provides amenities such as shower and toilets for visitors to the region. This combined with water Play facilities and a new play ground will redefine the value proposition of the Exmouth's park

10. Redefining the Town Heart

An area of existing car park should be converted into a public square that provides additional space for informal public gathering as well as more formal events such as markets and similar events. The public square would enhance the existing retail and hospitality activities that exist within the town centre and provide a significantly more attractive setting than the current car park.

Recommendation: Create a new public square at the heart of the town centre's retail precinct

11. Short Stay Redevelopment

There is a strong presence of short stay development within the town centre in recognition of Exmouth's tourism function. Most notably, the Potshot Hotel and Tavern occupy a significant proportion of the town centre. Any redevelopment of this site should enhance the visitor experience to Exmouth whilst also promoting a strong urban presence within the town centre. New buildings should address adjacent streets, provide a clear and legible edge to the public realm and appear as a high quality visitor accommodation precinct. Any additional short stay facilities should respond to the intended urban form of Exmouth.

Recommendation: Maximise opportunities for short stay development within the town centre.

12 Rejuvenated War Memorial

The current war memorial is an important civic element within Exmouth. Its setting, however, does not contribute to the solemn nature of this facility. Improving the landscaping and the relationship the memorial has with the surrounding urban form, particularly the Shire administration centre and car park, is important.

Recommendation: Refurbish the war memorial to improve landscaping, provide shade and create a larger setting for events.



View of Maidstone Crescent on entry to town centre



View of Federation Park, the new water play area and shaded play space

7.0 Recommend and Implement

56

7.3.2 Environment and Built Form

The recommendations relating to Environment and Built Form within Exmouth's town centre are designed to improve and make better use of important natural landscape elements that will inform its character as it grows and develops. The dry creek beds, which provide drainage during storm events, are a natural asset that can be developed to improve the overall character and impression of Exmouth's town centre for visitors and locals. The harsh climate, with its hot summers yet mild winters, should also inform the planting palette throughout the town centre as well as the built form. Buildings that incorporate significant shading to their external facades, contain large interstitial zones and an openness that allows inside-out living during winter, should be promoted to ensure Exmouth's relaxed way of life is enhanced.

1. Making Better Use of Natural Assets

A key structural element to the town centre should be the improvement of the town creek as a continuous, open and attractive green link from east to west that allows the broader landscape around Exmouth to ribbon through it. The creek also serves an important drainage function and is part of the regional flood path. The creek can function as a landscaped dry bed, in the dry season, and a movement corridor and green entry corridor to the town core.

Recommendation: Create a continuous and open green spine along the length of the town creek incorporating a pedestrian and cycle shared path, provide for open views and retain a sense of informality and openness to the area.

2. Dual Use of Drainage Creeks

There are a number of other drainage lines throughout the town centre. Some have little or no environmental value, being a concrete open drain, which could be buried to make way for future expansion of the town core. The other open drains can be enhanced and alongside pedestrian and cycle movement lines and including new pathways, lighting and landscaping to ensure a safe, comfortable and shaded corridor within which people can move through the town centre.

Recommendation: Maximise the benefit of the drainage lines through the town centre by cleaning and landscape maintenance planting, lighting to provide safe pedestrian/cycling access.

3. Planting the Town

The planting palette needs to be climate responsive, and in particular, use minimal water. The town centre should be more heavily shaded to encourage pedestrians and cooler micro-climatic conditions.

Recommendation: Establish a planting strategy and palette that responds to Exmouth's climate and which enhances the intended urban form through the town centre's streets and public spaces.



View of the town creek, showing viewing platforms and pedestrian bridge



New pedestrian links through the town, integrated with drainage corridors

7.0 Recommend and Implement

4. Development Intensity

Exmouth's town centre area is large relative to its resident and commercial population, and lacks presence due in part to its dispersed nature. Development intensity, particularly for retail and hospitality functions, should be concentrated around the town core. Less intense uses such as office development, live-work developments, recreation and short stay accommodation can be located in other parts of the town centre.

The built form of the town core should reflect its development intensity, with a finer grain of buildings constructed to the street and enclosing public spaces so that a sense of contained activity is generated. Buildings should be allowed to develop two storeys with the potential for additional height to a third storey subject there being no detrimental impact to the street environment. Ample shade awnings should provide pedestrian comfort throughout the town core, be they attached to buildings and projecting over the footpath or detached structures that shade open public spaces such as the proposed town square.

Recommendation: Ensure the town centre core retains the highest intensity of commercial and public use and activity within the broader town centre.

5. Rejuvenate Maidstone Crescent

Maidstone Crescent will develop into important town promenade, announcing the entry into, and providing the first impressions of, the town centre. For this to occur, the existing median and verge planting needs to be enhanced with appropriate canopy tree and ground cover planting. Street trees and associated low level planting are to be developed along each edge of Maidstone Crescent. On street parking, a cycle way and pedestrian footpaths will also feature along Maidstone Crescent.

Buildings along Maidstone Crescent should be set back by 4.5 metres from the street boundary and allowed to be developed up to three storeys. This will allow a continuous landscaped entry into the town core whilst allowing a scale of building that frames Maidstone Crescent. Car parking for development along Maidstone Crescent is to be located at the rear of buildings.

Recommendation: Ensure development along Maidstone Crescent creates an attractive entry into the town core and promotes the development of a town promenade.

6. Promote Appropriate Built Form to Maidstone Crescent

The existing pattern of development along the northern part of Maidstone Crescent is suburban in scale. Single storey residential buildings that were constructed at the time of Exmouth's development are still in place, though many are now being used for commercial or office uses. To promote a more appropriate building form, amalgamation of at least two lots will facilitate a larger building scale, allow sharing of car parking, and limit the access requirements onto Maidstone Crescent. In order to encourage amalgamation, development bonuses should be considered for landowners, be that in additional building height, concessions on car parking, or additional plot ratio/residential density.

Recommendation: Encourage amalgamation of properties along the northern part of Maidstone Crescent in order to provide appropriate development opportunities.

7. Retail Activation

Buildings accommodating additional retail floor space along the expanded town core spine must be appropriately designed to address the surrounding public realm. Of particular importance is the need to activate Maidstone Crescent and Federation Park with shops, cafes and other complementary uses that promote movement and activity between the street and internal tenancies. Front doors and significant proportions of glazing should characterise the ground floor facades of these buildings so that a town centre character can be developed.

Recommendation: The retail core expansion is to create an activated edge to Maidstone Crescent and Federation Park.

8. Civic Quarter: Police and Courts

Like many buildings in Exmouth's town centre, the police and courts are housed in buildings that were built for a different original purpose. The large setbacks detract from their presence and combined with minimal window openings leads to extremely low levels of surveillance and passive. These 'bunker-like' buildings should be replaced with more appropriate forms that promote the intended character of the town centre. The buildings should incorporate vernacular elements that speak of Exmouth and the North West Cape, namely corrugated iron roofing, large verandah spaces, skillion roofs, rammed earth walls, limestone and rock walls, and ample shading of windows.

Recommendation: Redevelop the police and courts complex to appropriately address the surrounding public realm and provide a high quality civic presence within the town centre.

9. Redefine Kennedy Street

New development along Kennedy Street is to create a sense of enclosure, activate the street and provide a comfortable setting for alfresco dining.

Recommendation: encourage new retail and hospitality development to two and three storeys along Kennedy Street, constructed to the street boundary, to contain shade awnings projecting over the footpath, have significant glazing elements at ground level, legible building entries and promote Exmouth's casual style.

10. Bowling Club

The lawn bowls club provides an important recreational and community meeting hub for locals and tourists visiting Exmouth. The lawn bowls club is well used and should be encouraged to remain within the town centre in the medium term. The existing club rooms buildings however do not relate to the street and there is opportunity to expand the built form using design principles that promote legibility, street presence and access.

Recommendation: Retain the Exmouth Lawn Bowls Club and ensure any future redevelopment allows the club rooms to better engage with the street and provide a legible front door entry.



7.0 Recommend and Implement

58

7.3.3 Movement

The recommendations relating to movement are designed to create a simple movement network that promotes pedestrian permeability and legibility along with clear vehicle access. Returning the streets to clear movement pathways and developing a circuit to facilitate the future Kennedy Street Mall are community priorities for the town centre.

1. Redefine Entry to Town Centre

Access from Murat Road to Maidstone Crescent and the town centre could be redesigned to improve legibility and introduce way finding to allow visitors to understand where the centre of town is and direct them accordingly.

Recommendation: Access from Murat Road to Maidstone Crescent will be via well designed roundabouts announcing arrival at the town centre.

2. A Hierarchy of Movement

Exmouth's network of streets should be simple, pedestrian friendly and contribute to the intended character of the area – relaxed, informal, comfortable and vibrant. To improve connectivity and legibility, Thew Street is proposed to be returned to a street (rather than a throughway in a car park) and extended to connect to Learmonth Street. This will create a legible circuit around the town centre core, comprising Maidstone Crescent, Thew Street and Learmonth Street. Kennedy Street can then become a pedestrian focused street in a staged manner.

Recommendation: Promote a simple, logical and pedestrian friendly road system, where streets are shared spaces for pedestrians, cyclists and vehicles respectively.

3. Unifying the Town Centre

Federation Park will grow in importance as a community recreation and events space and the 'lush green lung' of Exmouth. The town core will also become more active as Exmouth's population grows and the design should encourage more people to use its facilities. Linking the town core and Federation Park is therefore a key element of the plan. In this regard, Maidstone Crescent is to become a narrower, slower road, where pedestrians can easily move across it between the town core and Federation Park. This will also ensure that the extension of Ross Street Mall to the new retail area is seamless.

Recommendation: Narrow Maidstone Crescent within the town core to facilitate pedestrian links to Federation Park and promote a slow vehicle environment.

4. Reclaim Streets

To expand Federation Park and make it a more user-friendly space, Payne Street is to be redirected around the public swimming pool and connecting back to Maidstone Crescent. This provides an opportunity to create an improved public entry to the swimming pool, a more legible car park and improved setting for community events and activities.

Recommendation: Re-route Payne Street to allow Federation Park to be expanded and linked within the public swimming pool.

5. Shaded Pedestrian Paths

Exmouth experiences extremes in climate, and very hot summers. Providing adequate shade for pedestrians to move around town in relative comfort is imperative. Where possible, the town core should contain awnings attached to buildings. External to buildings, pedestrian paths can be shaded by way of tree planting and fixed structures which can become design features.

Recommendation: Maximise shade for pedestrians throughout the town centre with tree planting, building awnings and shade structures.

6. A Connected Town

The existing footpath and cycle network throughout Exmouth is incomplete and needs significant investment. A cycle network linking other nodes around Exmouth such as the foreshore, marina and recreation areas is to be provided along Maidstone Crescent and the town creek. This will connect into movement corridors along existing streets and pathways that provide access to the town centre. All streets throughout the town centre should contain high quality footpaths that are shaded and lit at night for safety and comfort.

There is an opportunity to enhance the open character of the town centre and improve linkages whilst also minimising the potential for an urban wall along Murat Road by providing pedestrian links through the large street blocks. Pedestrian routes will be collocated with open and landscape drainage lines to provide an attractive setting.

Recommendations: Strengthen pedestrian links between the existing town centre and broader Exmouth; and

Encourage pedestrian links through the large street blocks which accommodate the short stay accommodation functions and lawn bowls club.

7. A New Town Mall

The recent Ross Street mall upgrade has provided much needed improvements to the town centre retail core and provides a popular gathering and shopping area with shade, and public garden amenities.

As Exmouth continues to grow and retail opportunities begin to be realised along the default/secondary "main street" of Kennedy Street, an extension of the Ross Street mall environment would bring significant benefits to retailers, pedestrian based customers, and the broader community.

Recommendation: Develop Kennedy Street as a shared space and attractive alfresco precinct that accommodates all traffic, provides a comfortable pedestrian environment and brings people into the town centre. Over the



View of Maidstone Crescent and the improved pedestrian connection to Federation Park

7.0 Recommend and Implement

7.3.4 Car Parking

The recommendations relating to car parking deal with issues highlighted during community engagement and through analysis. The recommendations generally seek to relocate car parking from the pedestrian and retail core to peripheral areas.

590 bays are intended to be incorporated in the town centre, which is an increase on the current number, however there will be a greater reliance on street and shared parking areas. XXX bays for long vehicles and trailer parking will also be provided along Maidstone Crescent so that conflicts are minimised with other vehicles and pedestrians in the town core.

1. Legibility of Movement and Car Parking

The car parking areas throughout Exmouth's town centre are the dominant feature of the urban landscape and create a convoluted movement system. As a result, several movement systems do not function as streets or spaces that can support activity. Movement systems must be reinstated as spaces for people that can support access to facilities whilst also supporting activity and businesses. The streets must be created as spaces for people within the town centre, whilst roads on the periphery must act as traditional streets where trees and footpaths provide both pedestrian comfort and definition. Road geometry should be designed to reduce vehicle speed. The objective is to create an environment where pedestrians, cyclists and vehicles can have an equal right to the space. This will allow adjacent development to have a more prestigious address and improve opportunities for buildings to relate to the public realm.

Recommendation: Clearly delineate car parking areas and ensure streets are defined separately to the car parks to improve legibility of the movement network.

2. Distribution of Car Parking

Car parking is currently concentrated within the town core in a way which dominates the space and detrimentally affects one's impression of Exmouth as a tourist destination. People visiting the town centre view a sea of car parking rather than a quality and accessible public realm framed by attractive built form. It is proposed to redistribute the car parking evenly throughout the town centre to effectively service the various activity nodes. Car parking will be provided in the form of short term on-street parking, longer term parking within landscaped car parks, and generally provided as shared facilities where ever possible. This will reduce the visual dominance of the car parking and allow for better traffic management.

Recommendation: Evenly distribute the provision of car parking throughout the town centre. Some parking should be removed from the retail core to its edge in order to improve the quality of the town centre.

3. Promote a Range of Car Parking

Shared public parking is to be actively encouraged throughout the town centre to discourage the allocation of public parking for specific users. Parking for the disabled, bays for parents with prams, dedicated bus and trailer bays and service vehicle bays are to be provided in appropriate locations throughout the town centre in car parking areas.

Recommendation: Provide a range of parking options including short term parking on the street, long term parking in dedicated car parks and on site parking for private development where appropriate.

4. Way Finding

Sophisticated way finding systems are essential to inform motorists of the various parking options available in the town centre. They are to be installed in locations that will inform drivers prior to reaching the area and at the entry to car parks.

Recommendation: Provide suitable signage defining the location and capacity of various car parking areas.

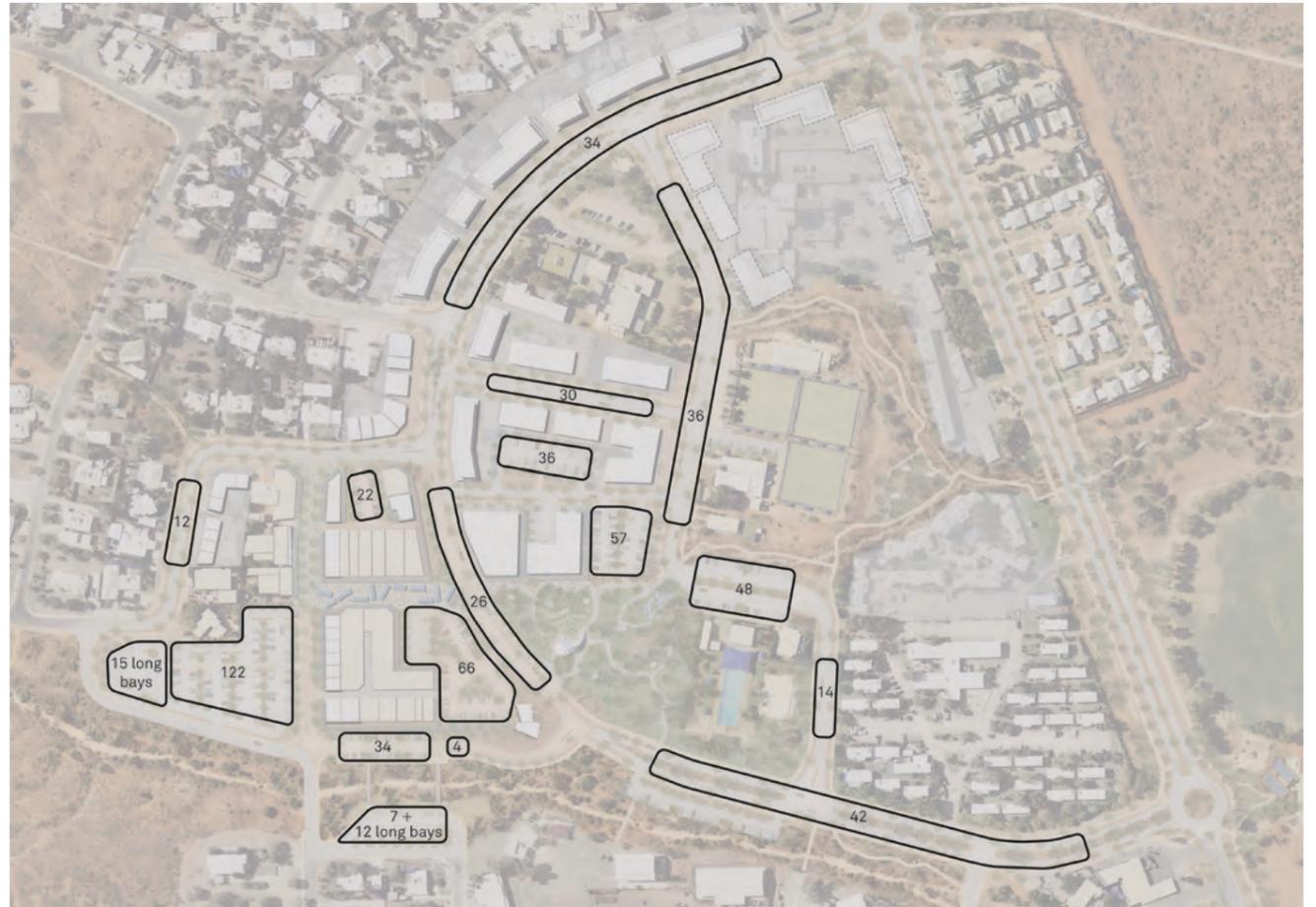


Diagram showing the location of parking areas across the town centre. 590 bays will be available in the town centre, plus any additional parking on private land.



New proposal parking areas within the town centre core

7.0 Recommend and Implement

7.4 Staging: An Approach

This section describes a potential staged approach to bring about the core elements of the vision for redevelopment of the town centre. This staged approach largely reflects an urban design response and logic informed by both an engineering overlay and the Shire's desire to implement various work packages. It should be noted that some of these stages can be undertaken simultaneously, or in an alternative order, depending on priorities of the Shire. The proposed priority of staging is intended to indicate to the community the Shire's intent to undertake change and action key outcomes from the community consultation.

Stage 1: Thew Street and toilet block entry redevelopment

Redevelop the existing toilet block creating a future development lot and immediate area of parking which allows for a road linking Thew Street across Kennedy to Learmonth Street.

Stage 2: Narrow and upgrade Maidstone Crescent

Narrowing the four lanes of road connecting the retail core of the town with Federation Park will make it pedestrian friendly whilst physically and visually linking the two together.

Stage 3 (i): Federation Park redevelopment and Payne Street closure

The key public town centre asset of Federation Park can be significantly improved by removing part of Payne Street and enlarging the park. The park's offer to community can then be improved by building a performance stage with change facilities and WC, landscaping and replanting the park, upgrading the swimming pool, providing new play facilities and creating a new water play park.

Stage 3 (ii): Redevelopment of car park between Kennedy and Learmonth Streets

Ease of parking is a key issue for residents and tourists alike, and this new landscaped and shaded parking facility will add value to all users of the town centre.

Stage 4: Realignment of Payne Street and redevelopment of pool car park

Provides alternative access to the bowling club and swimming pool whilst also creating potential for redevelopment of sites east of the pool.

Stage 5: Create Kennedy Street Mall

This will be a two stage approach to establishing the street as a pedestrian mall, initially broadening pavements to create alfresco opportunities and development parcels on the east side, hence allowing development to activate the street. Once sufficient development occurs cars can be removed from a short section of Kennedy Street either on a permanent or temporary basis.

Stage 6: Link Riggs Street with Maidstone Crescent

Connecting Rigg Street will allow the redevelopment of the police and courts complex in the future. This development action may also involve the relocation of the SES and fire station buildings, creating a new 'civic quarter' adjacent to the Shire's offices.

Stage 7: Bonefish car park and Lefroy Park redevelopment

Lefroy Park and the Bonefish Steert car park will be redeveloped to cater for long vehicles and caravans. Closure of the Bonefish bridge link to Maidstone Avenue will all the continuation of the linear creek parkland.

Stage 8: New roundabouts on Murat Road to Maidstone Crescent

This will improve way finding and legibility of access to the town centre. It will also generate opportunities for public art signifying arrival at Exmouth town centre - 'the Heart of Ningaloo'.

Future Stages

A number of other projects have been identified within the master plan but are not deemed as immediate priorities. They can be brought on stream when future funding allows and include:
 _Upgrading lighting and landscaping along Maidstone Crescent, Learmonth Street and Payne Street
 _Relocating and upgrading the Anzac Memorial near the Shire office
 _Upgrading and landscaping the town creeks



Town centre staging plan

- Stage 1: Thew Street and toilet block entry redevelopment
- Stage 2: Narrow and upgrade Maidstone Crescent
- Stage 3 (i): Federation Park redevelopment and Payne Street closure
- Stage 3 (ii): Redevelopment of car park between Kennedy and Learmonth Streets
- Stage 4: Link Payne Street to Maidstone Crescent and swimming pool carpark
- Stage 5: Create Kennedy Street mall
- Stage 6: Link Riggs Street with Maidstone Crescent
- Stage 7: Bonefish car park and Lefroy Park redevelopment
- Stage 8: New roundabouts on Murat Road to Maidstone Crescent
- Future Stages

7.0 Recommend and Implement

7.5 Governance and Planning Policy

7.5.1 Town Planning Scheme

In order to implement the Exmouth Town Centre Revitalisation Plan, there will be amendments to the Town Planning Scheme will be required. Most notably, amendments will need to provide for:

- _Residential and live-work land uses along the northern part of Maidstone Crescent, where currently residential development is not permitted
- _Restricting shop land uses, as defined by the Scheme, to the identified town core, so that their development is not dispersed across the wider town centre area
- _Acknowledging a precinct based approach to shared public parking across the town centre, which will diminish the requirement for onsite car parking within the town core
- _Allowing reduced car parking ratios by the provision of reciprocal car parking arrangements and where shared access is provided for more than one site
- _Allowing for building heights up to three storeys throughout the town centre

7.5.2 Policy

A policy should be formulated for the town centre that guides development in a more specific manner than the current Scheme provisions. The provisions can be adopted as a Local Planning Policy under clause 9.6 of the Scheme.

Key elements to guide development within the policy should include:

- _Building arrangement and setbacks
- _Building height
- _Building orientation and street address
- _Activation requirements
- _Vernacular elements such as materials, interstitial spaces, screens and openings
- _Servicing requirements
- _Vehicle access arrangements

7.5.3 Road Closures and Amalgamation

In order to facilitate development of Kennedy Street as a primary destination for retail, dining and community uses, activity must be allowed to develop on both sides of the road. Currently, the road reserve is very wide and development only fronts onto the street from the western side.

The eastern side is characterised by blank facades attributed to the adjacent supermarket. By closing part of the road, development land parcels can be created through a subdivision process, or by amalgamation into adjacent lots to enable building extensions that address Kennedy Street.

The road closure process requires Council resolution in accordance with Section 58 of the Land Administration Act 1997. Upon Council resolution of commencing the road closure process, letters advising of the proposed closure are sent to appropriate stakeholders (government departments, service authorities and adjacent land owners) for comment. The closure is duly advertised in the local paper with a 35 day period for objections to be submitted.

Once Council has resolved to proceed with the closure, an application is made to the Minister for Lands to grant the request to formally close the portion of road.

7.5.4 Kennedy Street Mall

The Land Administration Act allows for the creation of a reserve for the passage of pedestrians, vehicles used by adjoining land owners and other vehicles allowed by local government authority by-laws. Such reserves, called Mall reserves, are generally created over existing public roads, effectively closing the road to the public for general vehicular use. The reserve is placed under the care, control and management of a management body with power to lease and make local laws.

7.5.5 Marketing

A marketing and communications strategy needs to be planned, developed and kept updated throughout the implementation of the town centre and foreshore plans. This will allow the community to be continually updated throughout the development process and promote a sense of involvement. Community involvement through active participation as well as through marketing will enable easier implementation of the plans. To date, community involvement has included participation in place making workshops that have informed the design process.

A more important aspect of this component of the implementation plan however, is the need to create a place brand and improved public perception of the Exmouth town centre. This can build on the earlier branding exercises undertaken for the town, and the retail activation strategy prepared as part of this report.

7.5.6 Management and Maintenance Strategy

Another important task for the Shire of Exmouth following implementation of the plans will be ensuring the public realm is maintained to a constant high standard. Maintenance of the public realm will affect the public's perception of the place and assist in its overall success as both townsites and beachside precincts. The Shire of Exmouth should develop a strategy to consider management and maintenance of the public realm and all its component parts. Issues of maintenance and cleaning, replacement, and security need to be considered and all responsibilities clearly outlined. Concurrent and ongoing revenue implications must be factored in by the Shire.

7.0 ____ Recommend and Implement

7.6 Long Term Strategies and Projects: Foreshore

7.6.1 Environment and Built Form

The recommendations relating to environment and built form within Exmouth's foreshore and marina open space precinct are designed to protect and enhance natural assets and open spaces for the enjoyment of future generations.

They are designed to improve and make better use of important natural landscape elements that will continue to inform its character as Exmouth grows and develops. The coastal dunes, which provide protection to the townsite during extreme weather events, are a significant which needs to be protected. They heavily contribute to the overall character and impression of Exmouth's foreshore for visitors and locals.

1. Planting

Planting is a key way to provide shade, visual amenity and improve ecological value. Proposed landscape improvements will require significant new planting works. To ensure the long lasting amenity and success of soft landscape improvements, planting needs to be climate responsive, low maintenance and low water demand.

Recommendation: A planting palette should be developed to guide all future landscape and revegetation proposals in the foreshore precinct. The palette will include trees, shrub and groundcover planting species arranged into the various sub-precincts and respond to the individual requirements of each eg. streetscapes, parks.

Plant procurement methods should be considered within the strategy maximising input from local nurseries, contract growing and links to local land care, community and environmental groups.

3. Revegetation

Protecting and stabilising the dune system will increase the resistance of the townsite to severe storm events, and increase the visual and environmental values of the foreshore.

Recommendation: Revegetation programs should be developed and implemented in line with coastal parkland and/or future foreshore development projects. Contributions should be sought from private development interests where applicable. The program should combine a comprehensive site investigation and flora survey, species selection and seed collection, and promote links to local and state landcare organisations.

5. Drainage

Stormwater flow has the capacity to cause major infrastructural and environmental damage during extreme weather events. Any increase in impermeable surfaces will require a strategy to balance the rate and capacity of land based infiltration.

Recommendation: A drainage strategy should be developed for each of the landscape and streetscape proposals, following water sensitive urban design principles to effectively manage, clean and return stormwater to the groundwater table.

7.6.2 Activities

The success of the foreshore master plan will rely not only on infrastructural improvements and the provision of new facilities, but also by increasing the popularity, patronage and communication of events and activities.

Recommendation: An activities strategy be developed to increase activity and amenity on the foreshore, in consultation with the various user and community interest groups, local business community, and should include a feedback mechanism.

The strategy should be seasonal and designed to maximise the potential of fluctuations in climate and population, and provide a focus on providing events and activities for locals all year round, as well as the seasonal tourism industry.

The strategy should include communication strategies and media, and consider the role of temporary and seasonal installations and events such as outdoor cinema, markets and playgrounds.

7.6.3 Movement

The recommendations relating to movement are designed to create a simple movement network that promotes pedestrian permeability and legibility along the foreshore with clear vehicle access. Improving access to the beach and marina precinct are community priorities for the foreshore.

1. Coastal Trails

The foreshore and dune system are significant assets to Exmouth which could be better utilised by pedestrians and cyclists.

Recommendation: A series of boardwalk trails to be developed along the foreshore which take advantage of the natural topography and elevated aspect of the primary dune. Interpretation and way finding strategies should be developed and implemented to enhance visitor awareness and aid navigation.

2. Beach Access

The Exmouth Gulf is a unique coastal environment which is popular to many locals, but generally hard to find and underutilised from a tourist point of view. Access to the foreshore and beaches are generally hard to find and disconnected from the town centre. Competing uses on the beach can sometimes cause safety issues eg pedestrians and motorists.

Recommendation: Foreshore parks and adjacent tourist development nodes should seek and develop ways to improve connections and access to the beach. Access should be managed within an agreed strategy which limits particular uses in beach zones, requiring signage, maintenance and surveillance. Beach access should enhance any existing or future planned extensions of the coastal trails and tourist accommodation network. Development contributions should be sought where applicable.

3. Wayfinding

Way finding systems are essential to inform motorists of the various parking options available in the foreshore precinct. They should be installed in locations that will inform drivers prior to reaching the area and at the entry to car parks.

Recommendation: Provide suitable way finding signage showing the location and capacity of various car parking areas.

4. Streetscapes

The street network in Exmouth contains disconnected pedestrian footpaths and a variety of lighting and planting styles.

Recommendation: A streetscape strategy be developed and implemented to include a consistent style of street lights, pedestrian scale lights, street trees, clear and connected footpaths, surface material, and verge treatments. Streetscape elements should reflect the road network hierarchy established in the master plan.

7.6.4 Infrastructure

1. Materials

Construction materials need to be carefully considered during the design, specification and implementation of all foreshore infrastructure, to achieve long lasting benefit and the desired outcomes from a community point of view.

Recommendation: A palette of furniture, signage, and landscape elements should be developed which are resistant to the local climate, which establish a clear visual identity, is functional, comfortable and low maintenance.

2. Services

A range of new and existing service upgrades need to be provided to implement the proposals contained in the master plan. The extent, condition and capacity of existing infrastructure needs to be understood first, so future requirements can be met.

Recommendation: A services audit should be undertaken and a responding strategy developed suitable for the phased implementation of the foreshore master plan. Preliminary service authority consultation initiated by the master plan process should be continued and extended during the design and implementation phase.

7.0 Recommend and Implement

7.7 Staging

The foreshore can be implemented in phases according to available funding and timing commitments. Proposed phases are listed in general order of priority.

The staging strategy presents the key foreshore enhancement projects and their immediate connections to the town centre from the north.

Stage 1: Town Beach upgrade

The first priority for the foreshore is the renovation and enhancement of the existing town beach. As an existing popular landmark this project would provide immediate benefit to the community and signal the intent and commitment of the Shire to implement the master plan.

The town beach upgrade could be realised in one or two key phases, based on the northern existing beach, and the southern interface with the yacht club.

Stage 2: Town Beach entry

The town beach upgrade should be developed in conjunction with the development of entry features, and streetscape enhancements, particularly at the intersections of Murat Road.

Stage 3: Murat Road and intersection upgrade

Designed to capture both northbound visitor traffic and make clear southbound traffic from the town site. Streetscape enhancements can be undertaken sequentially in line with adjacent foreshore and town centre enhancement projects.

Stage 4: Truscott Avenue streetscape upgrade

Truscott Avenue performs a key motorist and pedestrian link between the proposed Ningaloo visitor centre, town centre, and the foreshore. This street upgrade will also be integral to the development of future links to the new town beach.

Stage 5: Marina public open space

Improvements to existing public open spaces in the marina development should be completed in line with the adjacent foreshore enhancement projects.

Stage 6: New Town Beach (Gulf Beach)

Planned to have a strong outdoor interpretation focus, timing and design can enhance the function of the proposed Ningaloo Research Centre. Regarded as a good opportunity for a future 'linking' foreshore park which, the project is deemed to be a future opportunity.

Future Phases

A number of proposals have arisen from the consultation process which will either be realised as part of each progressive phase of implementation (e.g. the Town Beach/Novotel connection, existing foreshore trail upgrade), or at a later date according to the Shire or community priorities.

These include future road access and pedestrian trail upgrades to the Golf Club, to the potential redevelopment and/or upgrade of the Golf Club itself, and the broader foreshore enhancement.

The proposed Ningaloo Research and Community Centre is potentially a defining project for Exmouth and the connection between the town centre and the foreshore. The adjacent public realm and infrastructure improvements prepared by the plan should be developed in close conjunction and in order to maximise linkages.

- Stage 1 (i): Existing Town Beach upgrade - stage 1
- Stage 1 (ii): Existing Town Beach/Yacht Club - stage 2 upgrade
- Stage 2: Town Beach entry Streetscape upgrade
- Stage 3: Murat road and Intersection Streetscape upgrade
- Stage 4: Truscott Ave Streetscape upgrade
- Stage 5: Marina POS
- Stage 6: New Town Beach
- Future Streetscape upgrade
- Existing Foreshore path upgrade
- Town Beach/Novotel connection
- Golf Club/Foreshore access upgrade and Foreshore connection by private development
- Foreshore scope extent - Coastal management



Foreshore staging plan



1. Introduction

This document provides a brief review of the coastal and floodplain processes active within the Exmouth foreshore precinct. The influences of these processes are to be considered within the Exmouth Foreshore Development Plan, being conducted by Hassell Pty Ltd. The information provided herein is not comprehensive, but is intended to provide direction towards available information or previously completed studies for Exmouth.

Coastal process information has largely been collected from previous design and management studies for Exmouth Boat Harbour. Analysis of floodplain behaviour has largely been obtained from the detailed analysis by SKM (2007) with additional information based upon documents used to support the design of Exmouth Marina Village and its subdivision developments.

2. Geologic Heritage, Morphology and Coastal Change

Exmouth peninsula is located on the northwest limit of the Australian continent, marking a transition from the westward facing Ningaloo coast, to the north facing North West Shelf. The townsite is located on the eastern side of the peninsula, facing into Exmouth Gulf, which forms a relatively shallow water body of approximately 2,000 km².

2.1. GEOLOGIC HERITAGE

Exmouth peninsula exhibits characteristics of several eras of geologic and geomorphic formation, with the surface geology demonstrating at least three major structures between the townsite and North West Cape (Allen 1993). Cape Range, which forms a spine down Exmouth peninsula, is the oldest formation (Tertiary). Colluvium deposits predating the Pleistocene form the majority of coastal features on the eastern side of the peninsula and a broader plain to the north. Modern features are prevalent on the western coast and northern tip of the peninsula, reflecting reef bioproduction or sediment reworking.

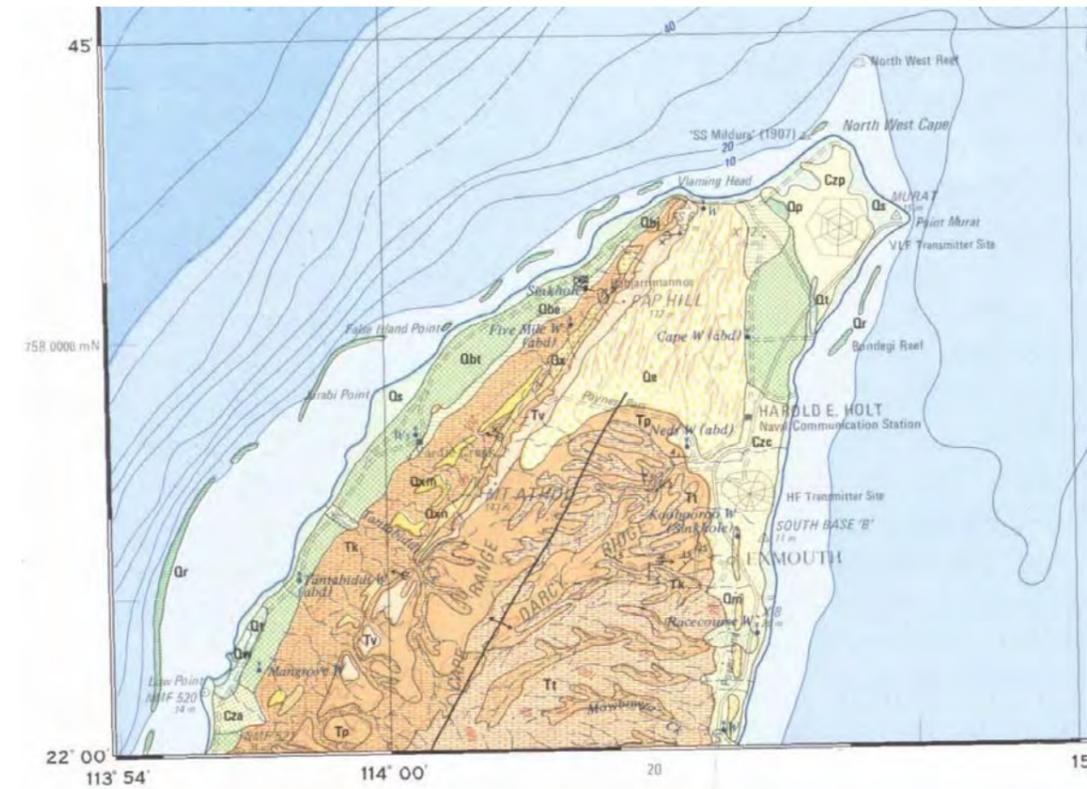


Figure 2-1: Exmouth Surface Geology Map

Extract from Geological Survey of Western Australia 1:250,000 Map Sheet 50-05 Onslow.

2.2. COASTAL MORPHOLOGY

Exmouth coastal structure is strongly defined by the presence of underlying rock features, which generally grade upwards towards Cape Range, with additional local ridges marking the shoreline of a previous era (van de Graaf *et al.* 1976). At the modern shore, the rock is expressed as a subtidal platform, overlain by a dune and sand sheet structure. Sandy deposits also lie immediately offshore from the platform.

The coastal dune is relatively high and comparatively narrow, with primary dune crests typically reaching 6 to 8m AHD elevation. Lower secondary dunes are present for parts of the coast, but occasionally absent, and do not form a dune field characteristic of sequential coastal deposition. Low level foredunes, below 4m AHD, are very recent features, including recovery after tropical cyclone Vance and coastal adjustment to construction of Exmouth Marina.

Landward of the dune field, an extensive series of ephemeral flood basins is present, which acts as a storage area during occasional extreme runoff flooding events. Parts of the basins are below 4m AHD, although they are typically around 5m AHD. The basins drain to the coast through several 'breakout' channels, which provide semi-permanent breaches through the primary dunes. Anecdotally, the breakouts expand rapidly during flood events and contract subsequently, generally through northwards movement of dune material.

2.3. COASTAL CHANGE

2.3.1. Interpretation of Morphology

The existing coastal morphology is comparatively stable due to the presence of broad subtidal rock platforms. Under prevailing conditions and the normal tide range, these features act to limit wave impacts due to depth limitation and narrowing of the wave approach angles during refraction.

The relative stability partly obscures the susceptibility of Exmouth coast to variations outside prevailing conditions, which includes both the impacts of short-term extreme events (such as tropical cyclones) and the effects of climate variation, including projected climate change. The coastal structure is susceptible to higher sea levels as they also facilitate increased wave transmission across the platform.

2.3.2. Modern Record of Change

Exmouth coast has exhibited a high degree of coastal stability, when considered as a whole via aerial photography (Figure 2-2). Changes have typically been 'sub-scale' in nature, the majority of which appear to be responses to human intervention.

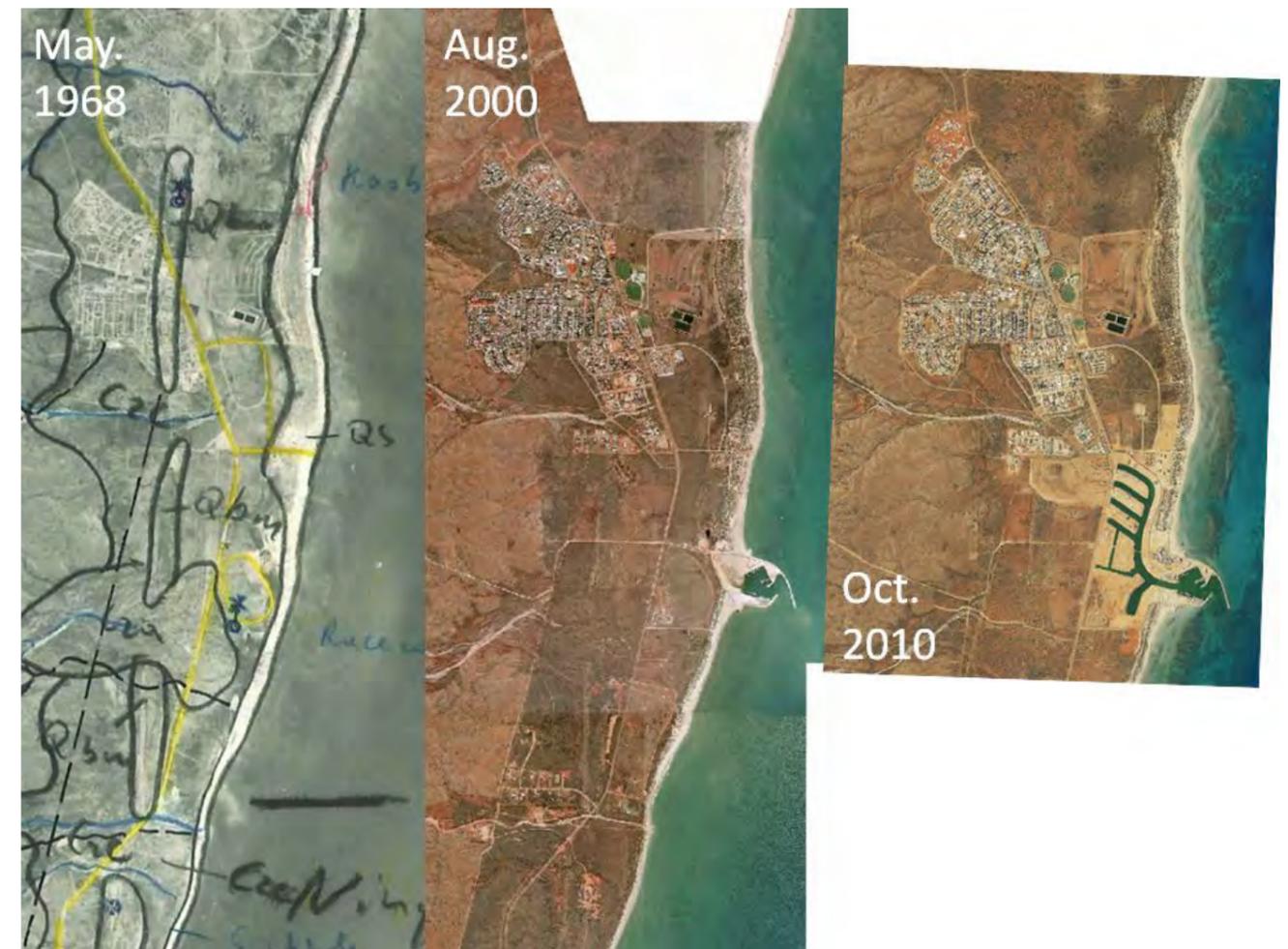


Figure 2-2: Observed Coastal Changes

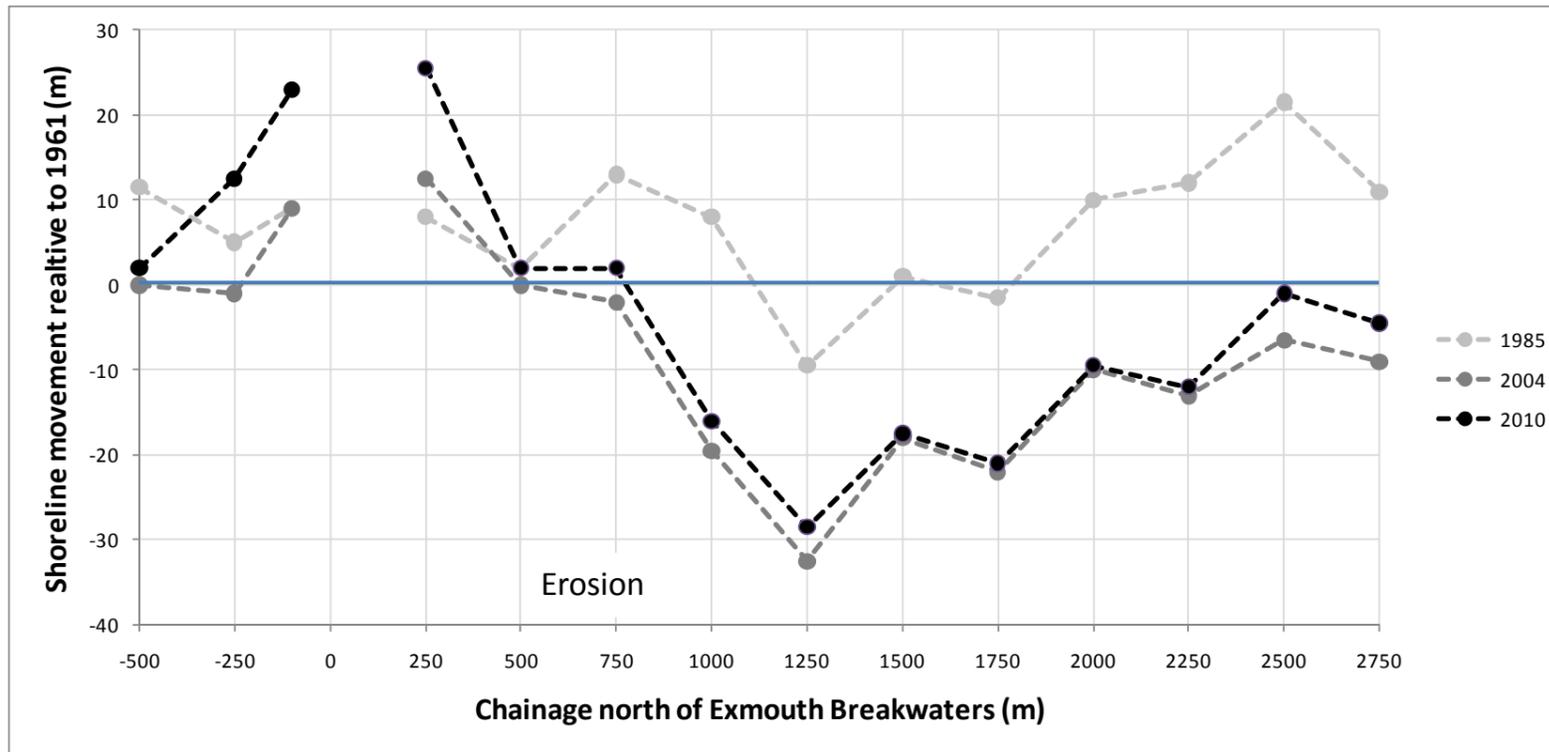


Figure 2-3: Vegetation line movement

Prior to the 1990s, Exmouth coast experienced relatively minor modification, with coastal structures mainly consisting of jetties, coastal carparks and informal boat ramps. Most structures are understood to have performed adequately under typically mild environmental conditions, except for Bundegi boat ramp, which experienced sedimentation issues.

In 1996, Exmouth Boat Harbour was constructed, which incorporated extensive rock breakwaters. Adjustment to this structure has been gradual, with a net pattern of accretion towards the southern side and mild erosion to the north. The influence of the boat harbour was partially obscured by the impact of tropical cyclone Vance in March 1999, which caused extensive coastal erosion, apparent as a 20m retreat in the vegetation lines between 1985 and 2004.

The pattern of coastal change occurring adjacent to Exmouth Boat Harbour, as suggested by the vegetation line changes is for accretion on the southern side, a small area of slight accretion immediately to the north of the breakwaters and erosion further to the north. The area experiencing erosion occurs at 'the point' where the shoreline responds to change in the alignment of the rock platform.

A recent modification of the Exmouth foreshore area has been construction of a rubble armoured carpark in the foredune north of the boat harbour. This area has been anecdotally noted to experience local erosive pressure.

2.3.3. Active Coastal Management

Prior to construction of Exmouth Boat Harbour, site analysis suggested that net annual sediment transport may occur in either direction, and was estimated up to 7,000m³ per year. Sand traps were constructed on either side of the harbour, to reduce the capacity for sand to travel along the breakwaters and enter the navigation channel.

Subsequent to construction of the breakwaters, sediment has generally accumulated slowly on the southern side at 3,500 m³ p.a., with a smaller quantity accreting within the harbour at 2,000 m³ p.a. (JFA Consultants Pty Ltd 2011). Accumulated material has been removed and placed on the north side of the harbour, although this approach is not wholly effective in balancing sediment transport rates, as there has been a net loss from the inshore beach at 600 m³ p.a. and accretion offshore from the rock platform at 2,000 m³ p.a.. A mechanism for this is suggested by the 2010 imagery, with a 'sand halo' along the northern breakwater suggesting an occasional offshore pathway.

The subtlety of the alongshore transport regime has been indicated by the most recent surveys, which indicates southward transport from 2009 to 2011. Material has been captured in the northern sand trap, with minimal change in the southern trap.

2.4. DUNE DYNAMICS

The Exmouth dune system provides a physical barrier which is considered by many to separate the town from the coast. However, the dune system also provides two important roles:

- The dune system defines a series of flood basins. Whilst these may provide a constraint to development, retained freshwater is environmentally albeit ephemerally significant;
- The dunes act as a buffer to extreme events, particularly erosion and storm surge inundation caused by occasional tropical cyclones, but potentially also for tsunami.

The dunes are perforated by a series of breakouts, which act as floodways under extreme rainfall events and may be inlets during extreme coastal flooding events or tsunami.

2.4.1. Foredune Dynamics

Foredunes develop in front of the primary dune when there is a net supply of sediment, a process for onshore sand movement (typically wind) and potential for vegetation growth. On the Exmouth coast, they represent ephemeral structures, which have grown either in response to seasonal or inter-annual variations in sand supply, as post-storm recovery, or through changes brought about by coastal structures¹. Dunes below 4m AHD are lightly vegetated and may be overtopped and deflated during storm events. They should not be considered permanent morphology and are not suitable for installation of permanent facilities.

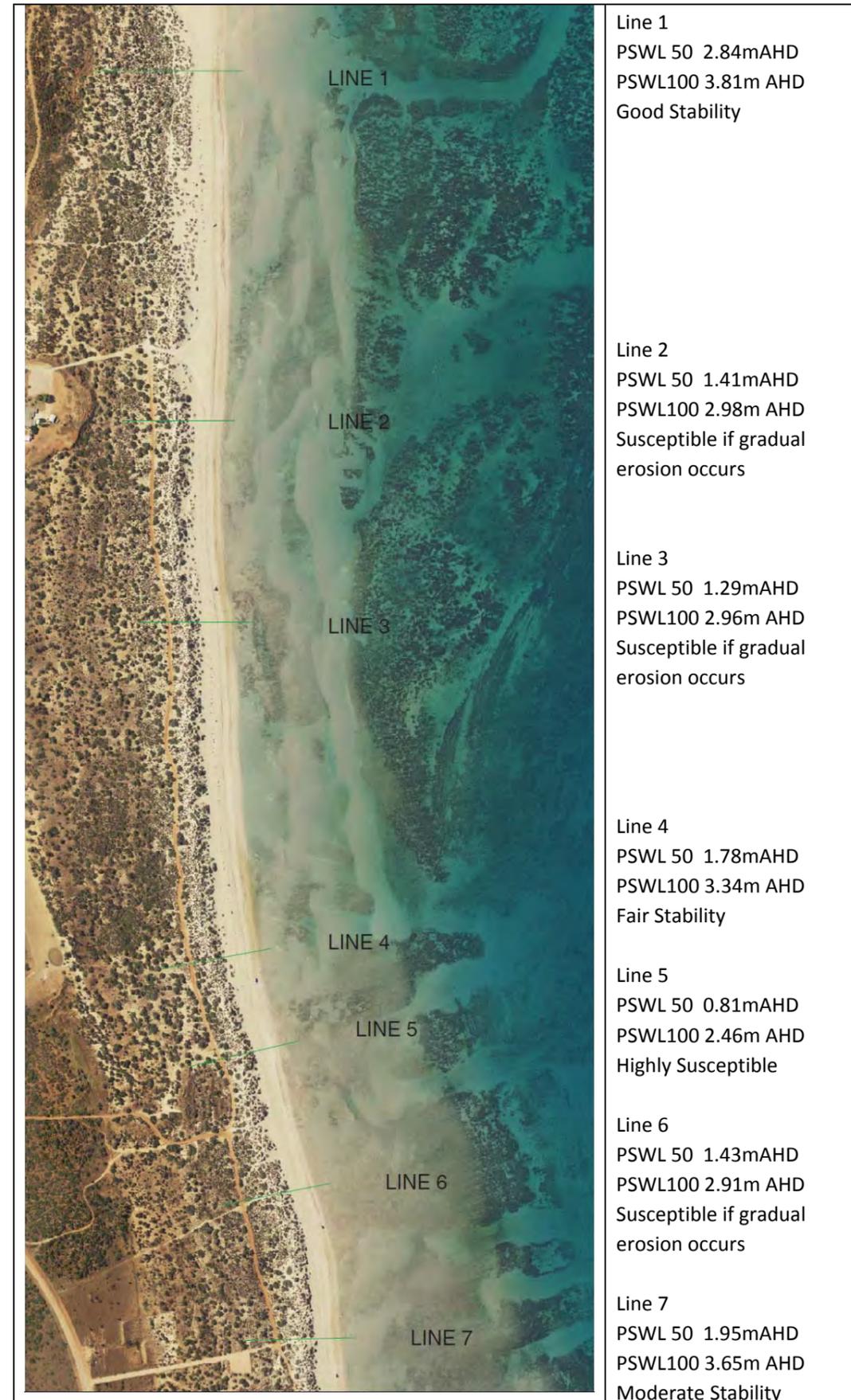
2.4.2. Dune Stability

An assessment of dune stability has been undertaken using the LiDAR data set obtained on behalf of the Department of Water for the Exmouth Flood Management Study. The primary dunes are typically above 6m AHD, presenting a high but not particularly wide barrier. The effectiveness of the dune system to provide a barrier against storm erosion is commonly described by the cross-sectional area forward of the dune crest and above the storm level (FEMA 2003; Dekker *et al.* 2005; Larson *et al.* 2009).

Capacity for the dunes to resist combined erosion and breaching has been examined using the dune storage approach. The dune is considered stable if there is >100m² of cross-sectional area, which is notionally comprised of 50m² erosion allowance (~10m horizontal erosion) and 50m² allowance to resist tropical cyclone overtopping (FEMA 2003). The relative protection afforded by the dune, when considered relative to the 100 year peak steady water level, suggests the appropriate level of coastal management:

- Area >100m² Requires sustained erosion to come under threat. Monitor.
- Area 50-100m² May come under threat after progressive erosion. Manage.
- Area <50m² Under threat from a single extreme storm event. Protect.

¹ On an accretionary coast, these features may progressively grow and expand, until they assume the role of primary dunes, and in turn have foredunes form in front of them.



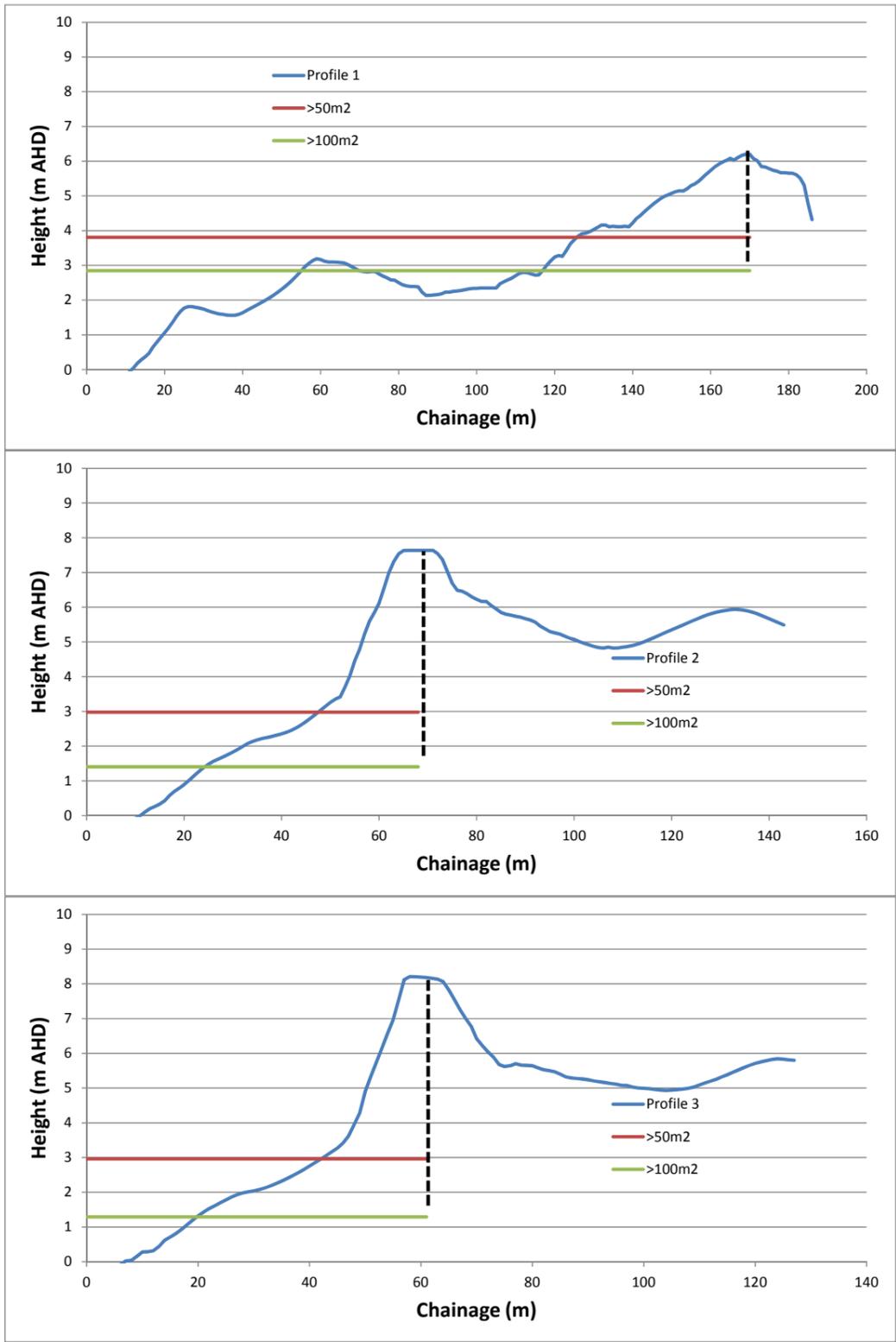


Figure 2-4: Dune Cross-Sections (Northern)

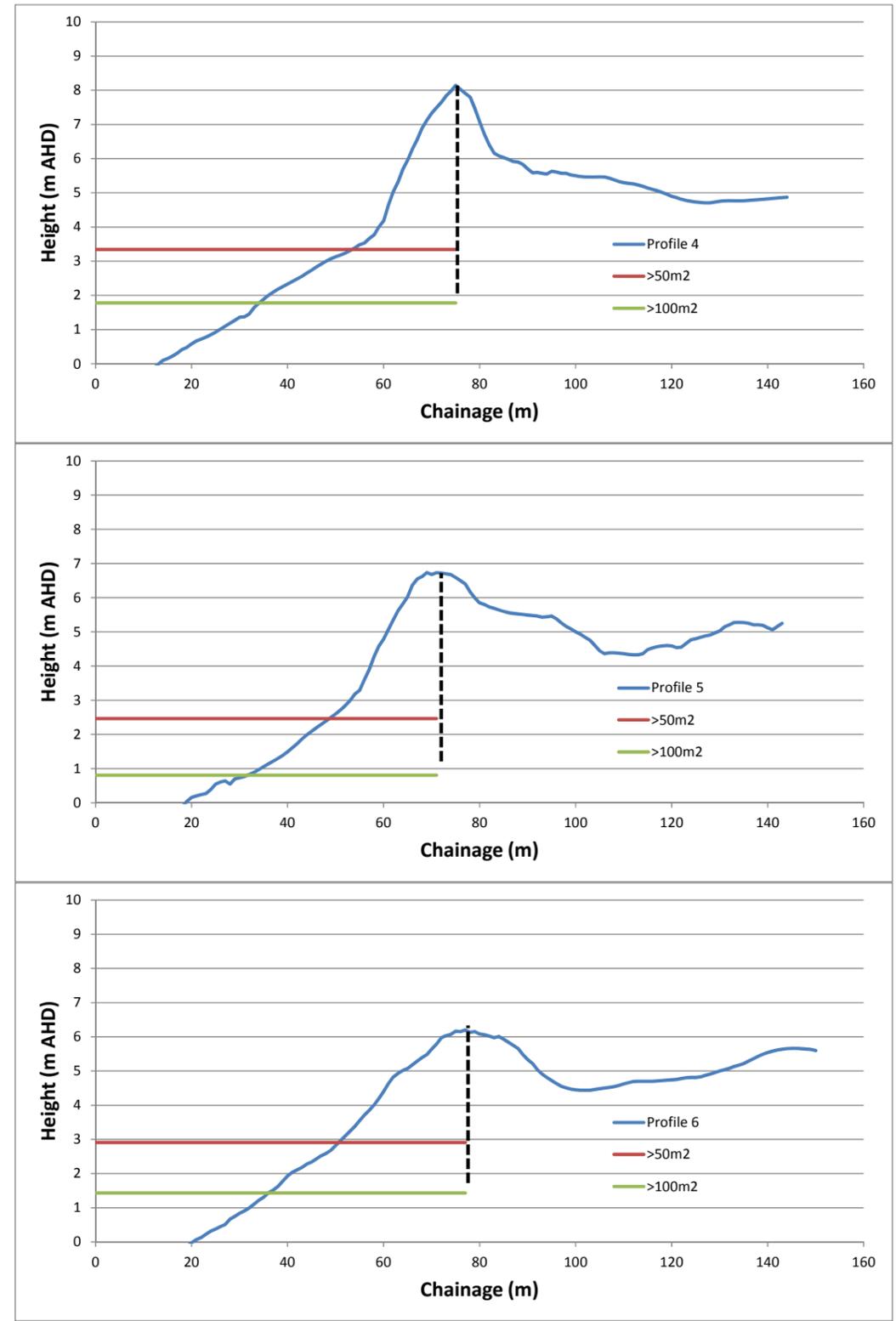


Figure 2-4: Dune Cross-Sections (continued)

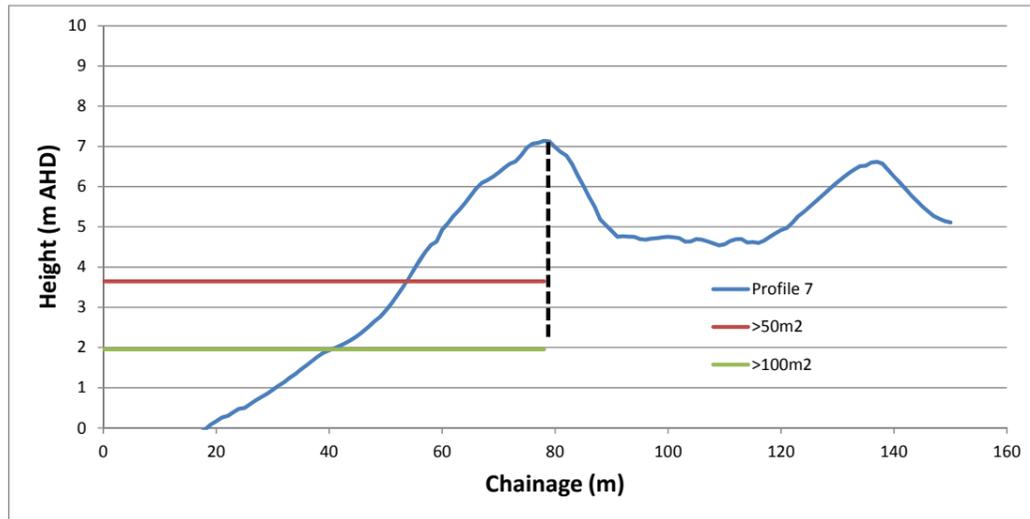


Figure 2-4: Dune Cross-Sections (continued)

Comparison of the levels providing dune storage of 50m² and 100m² suggest that the level of protection provided by Exmouth dunes is variable.

- A highly susceptible section was identified along Line 5, where 50m² dune storage occurs above 2.5m AHD, which is estimated to be a 30-year present-day ARI water level;
- Susceptible sections were identified along Lines 2, 3 and 6, where erosion of the dune face by 50m² results in dune storage less than 50m² above highest astronomical tide.
- Lines 1, 4 and 7 had relatively greater stability, requiring a combination of erosion and subsequent extreme events to provide a risk of deflation.

In addition to the possibility of dune breaching and deflation, the breakouts provide potential pathways for flood waters during an extreme ocean water level. However, this marginal threat is significantly offset by the role of the breakouts as a release mechanism during runoff flooding.

3. Metocean Processes

3.1. CLIMATOLOGY

Exmouth is located at 22°S, towards the north of the extra-tropical ridge and the western limit of the Northwest Shelf. This location enables influence of mid-latitude low pressure systems, extra-tropical high pressure systems and occasional westward-reaching tropical cyclones (Steedman & Russell 1986; Bureau of Meteorology 1998). These systems overlies a strong continental heat trough, which causes background southerly winds for most of the year.

Latitudinal movement provides seasonal variation in the relative influence of synoptic events. During winter months mid-latitude storms affect Exmouth, typically through dry pre-frontal troughs or the wetter influence of cold fronts, occasionally with rainfall enhanced through entrainment of the northwest cloudband. Summer storm events are mainly related to gradient intensification of high pressure systems or thunderstorms, with tropical cyclones tracking across the Pilbara providing a source of occasional heavy rainfall.

3.2. WINDS

The nearest automatic weather station reported by the Bureau of Meteorology is located at Learmonth Airport. This station provides a qualitative description of the wind conditions at Exmouth, although it has previously been recognised that there are local differences in the winds, particularly due to the relative influence of Cape Range.

Winds at Learmonth are moderate throughout the year, with generally stronger and southerly winds experienced over summer months (Figure 3-1 and Figure 3-2). Afternoon winds are marginally stronger, but more variable in direction.

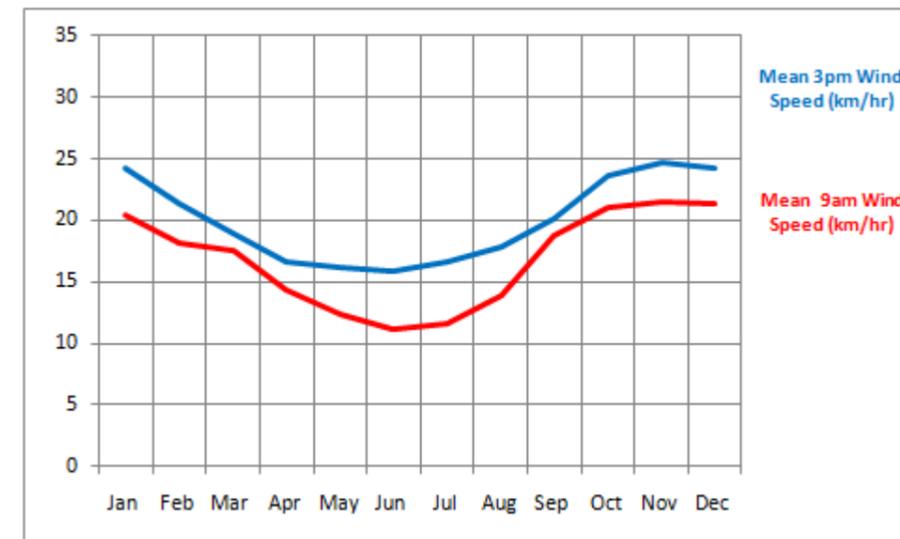


Figure 3-1: Mean Wind Conditions (Learmonth AWS)

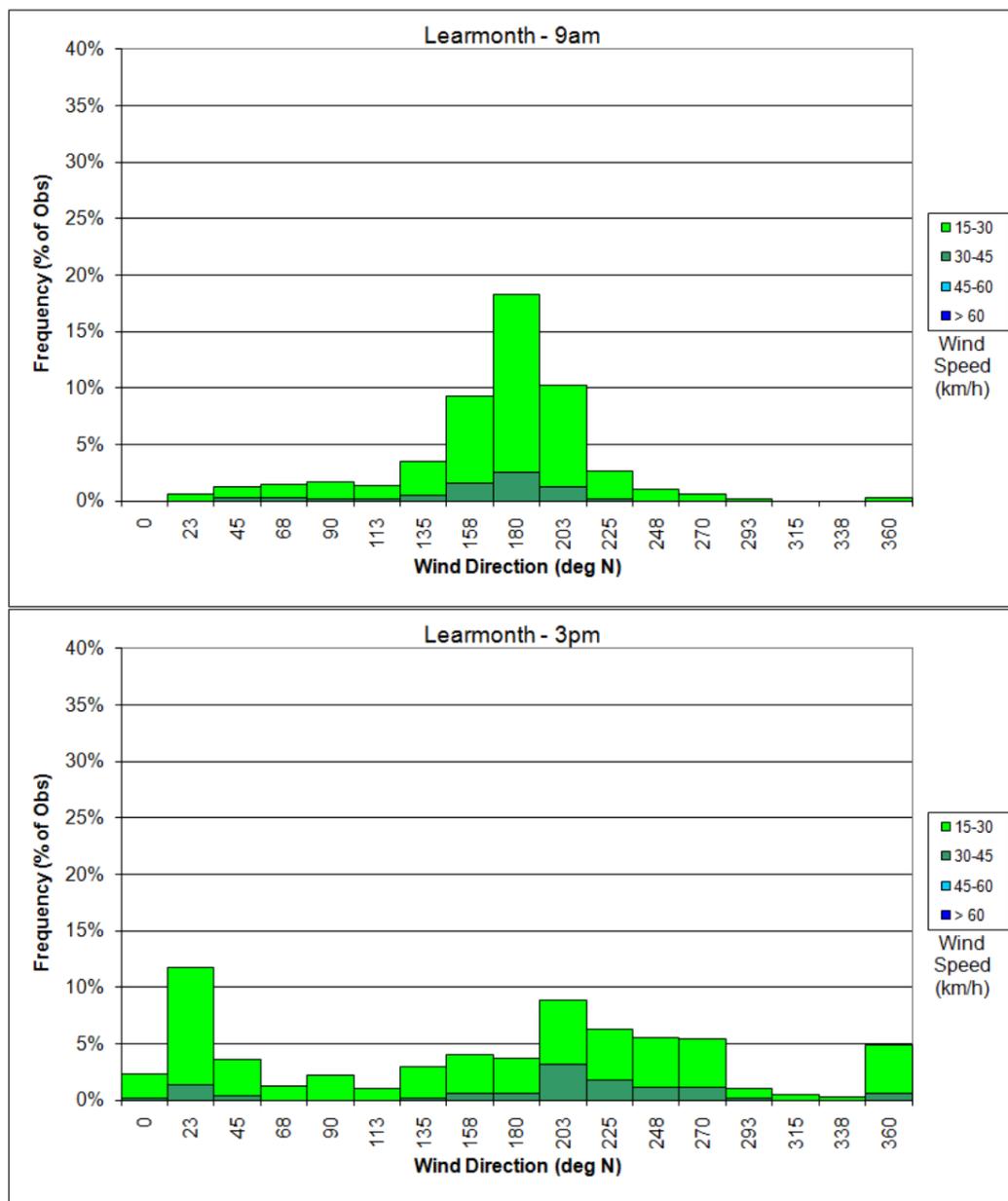


Figure 3-2: Directional Wind Distribution (Learmonth AWS)

Name	Cyc ID	Min CP	Date	Nearest Point	Bearing	Near CP	Speed	Direction	Avg Speed
	1910/3	0	7/02/1911 1:00	62	5	0	30	236	20
	1914/3	0	25/02/1915 1:00	60	310	0	0	0	N/A
	1915/3	0	18/01/1916 16:00	73	4	0	8	253	17
	1917/4	970	2/02/1918	87	265	0	23	194	18
	1926/4	977	20/03/1927	16	292	977	21	173	N/A
	1928/5	0	12/02/1929 10:00	83	175	0	59	207	27
	1941/2	985	27/01/1942 11:00	135	62	985	16	176	14
	1942/6	980	26/02/1943 1:00	114	316	985	6	241	12
	1943/3	970	12/03/1944 1:00	118	272	975	12	205	20
	1944/1	950	2/02/1945 13:00	53	238	950	20	192	22
	1945/1	980	31/12/1945	83	306	985	22	228	18
	1947/4	950	21/02/1948 1:00	134	116	978	14	207	18
	1951/4	980	26/02/1952 1:00	68	304	980	16	211	15
	1952/7	970	22/03/1953 18:00	61	173	970	28	184	21
	1955/12	960	2/03/1956 8:00	46	263	0	13	222	23
	1957/10	960	4/03/1958 8:30	93	71	960	19	133	20
	1957/12	950	15/03/1958 11:20	64	63	950	16	157	13
	1959/6	965	26/03/1960 10:00	90	226	965	19	196	28
	1960/5	920	24/01/1961 19:00	83	69	920	15	186	17
	1960/12	950	2/03/1961 6:40	87	115	964	19	231	21
	1962/19	940	7/02/1963 13:10	130	66	940	12	158	12
KATIE	1963/10	960	29/03/1964 13:00	23	319	960	55	179	24
ELSIE	1966/6	965	20/01/1967 1:00	100	239	965	20	150	19
GLYNIS	1969/3	970	1/02/1970 16:00	129	262	970	22	222	27
TRIXIE	1974/10	925	19/02/1975 11:10	80	101	952	23	222	17
BEVERLEY	1974/14	929	30/03/1975	36	261	969	21	149	23
VANESSA	1975/7	950	25/01/1976 10:00	134	286	978	16	204	17
WALLY	1975/10	973	25/02/1976	107	320	976	18	179	22
KAREN	1976/10	970	7/03/1977 19:00	29	11	986	13	234	14
MABEL	1980/7	930	18/01/1981 18:00	148	289	939	20	204	19
NEIL	1980/10	940	5/03/1981 14:00	94	208	980	42	120	38
BRUNO	1981/6	980	20/01/1982 0:00	94	181	980	21	212	20
IAN	1981/13	964	6/03/1982 6:00	16	292	984	15	192	19
RHONDA	1985/7	968	19/02/1986 18:00	105	291	974	39	179	28
TINA	1989/13	972	27/01/1990 10:00	81	333	972	11	179	23
BOBBY	1994/2	925	24/02/1995	101	79	950	5	222	8
FRANK	1995/3	950	11/12/1995 7:00	98	308	965	15	222	12
VANCE	1998/10	910	22/03/1999 2:00	27	76	920	33	179	30
STEVE	1999/6	975	7/03/2000 4:00	77	141	980	19	246	16
GLENDA	2005/9	910	30/03/2006 15:00	99	86	970	16	204	16

Table 3-1: Significant cyclones occurring at Exmouth within the BOM database

Note: Intense tropical cyclones passing close to Exmouth which pre-date the available wind record have been highlighted in orange (i.e likely to have produced extreme winds), while the cyclones producing wind speeds >60km/hr in the wind record are highlighted in yellow.

3.3. TROPICAL CYCLONES

Tropical cyclones represent a relatively infrequent but potentially severe weather event across the Exmouth region. All recent extreme wind events have been associated with tropical cyclones, including the 267 km/h winds recorded at Learmonth during TC Vance in March 1999. Rainfall associated with tropical cyclones is sometimes high, and has produced the majority of extreme runoff flooding, with more than 700mm of rainfall measured during TC Pancho in March 2008. Tropical cyclones directly affect Exmouth approximately one year in ten, although this incidence is highly irregular.

3.4. WATER LEVELS

Water levels near Exmouth have been recorded by tide gauges at Town Jetty (1989-1993) and within Exmouth Boat Harbour (1997 to present). The two data sets have slightly character, with those observations from the jetty showing greater variability due to greater exposure. Tidal planes derived from the observations are shown in Figure 3-3:

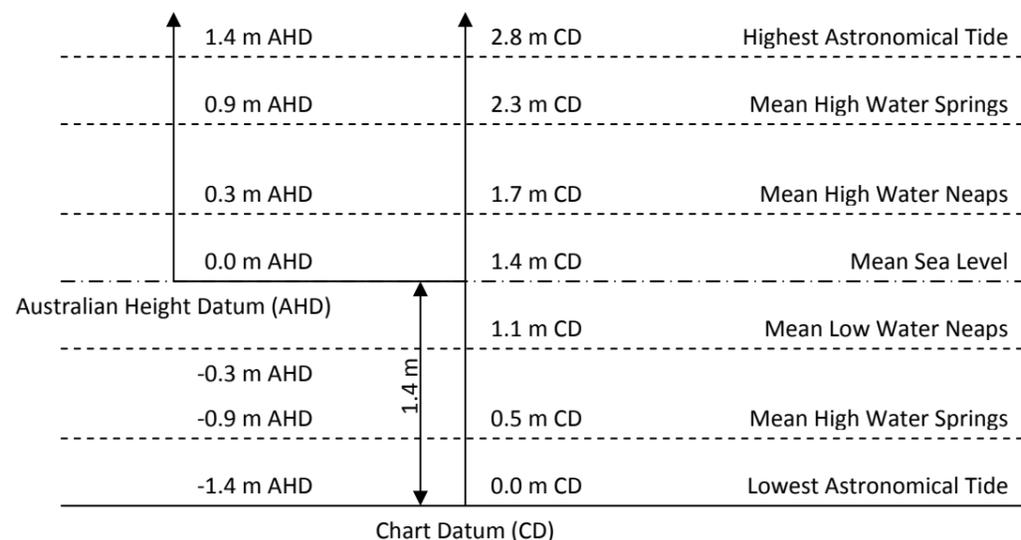


Figure 3-3: Exmouth Tidal Planes

On top of tidal variations, water levels at Exmouth are subject to storm surge (including shelf wave formation), which may be a similar order of magnitude to the tide. The highest recorded water level of 3.5m AHD occurred during TC Vance (March 1999), which occurred at approximately 0.0m AHD tide. The next highest observed water level was 1.6m during TC Billy (December 1998), with a surge of 0.5m generated during TC Vincent, despite remaining very distant from Exmouth.

The majority of estimates of extreme water level for Exmouth have been prepared prior to installation (or evaluation) of the Exmouth tide gauge record. Analysis the tide gauge record has subsequently been undertaken on behalf of Department of Transport (Damara WA 2006), with comparison of observed and modelled surges suggesting that previous estimates are likely to have underestimated water levels, particularly as they fail to fully incorporate the shelf wave component of cyclone surge (Figure 3-4).

Event Recurrence	Modelled (Egis 1999)	Inferred from Data
10 year ARI	below HAT	2.3m AHD (1.7 to 3.1)
30 year ARI	1.8m AHD	2.7m AHD (2.0 to 3.5)
100 year ARI	2.4m AHD	3.0m AHD (2.2 to 4.0)

Table 3-2: Extreme Water Levels

Observed data sets are too short and contain too few tropical cyclones to provide a reliable estimate of the extreme water level distribution

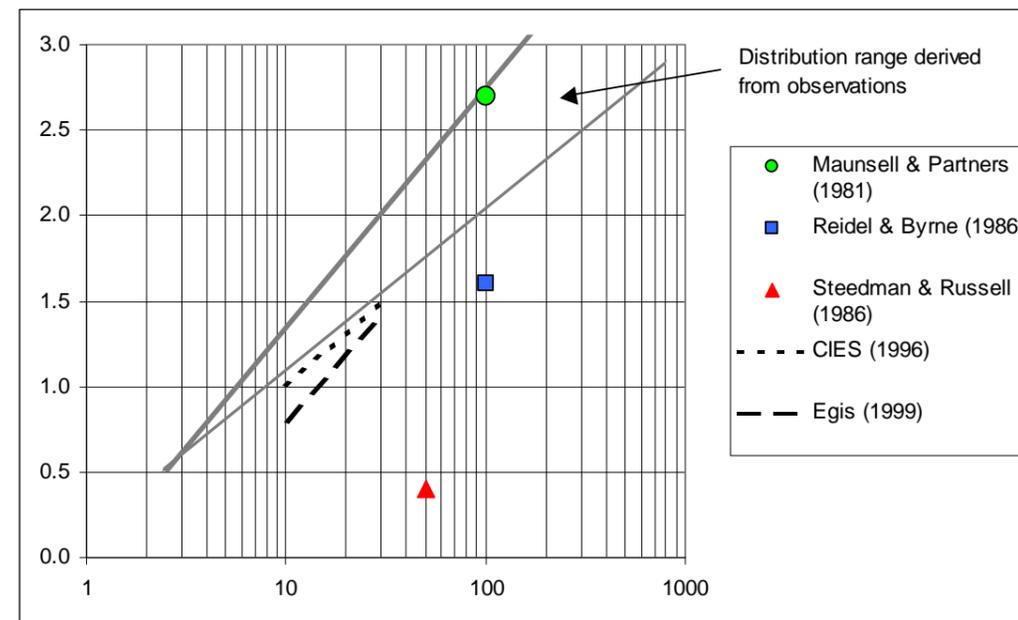
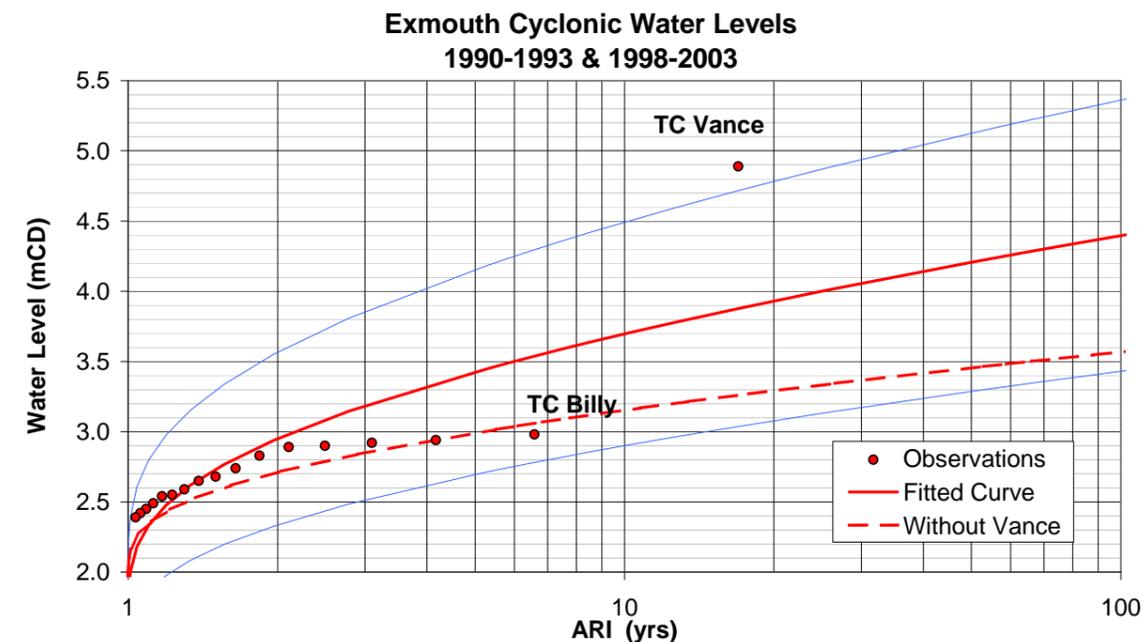


Figure 3-4: Comparison of Modelled & Observed Surges



3.5. TSUNAMI

Tsunami are recognised as a rare extreme phenomena which have the potential to affect the northwest coast of Australia when generated from the southern part of the Indonesian Archipelago (Simpson *et al.* 2007; Burbidge *et al.* 2009). Modelling of tsunami impact on Exmouth has been undertaken by Geoscience Australia (Figure 3-5). Although the nominated recurrence interval is somewhat questionable, it is recognised that the tsunami induced flooding is less than that associated with either tropical cyclone surge or severe runoff flooding. As with surge events, tsunami floodwaters propagate through the dune breakouts.

Modelling of tsunami affecting

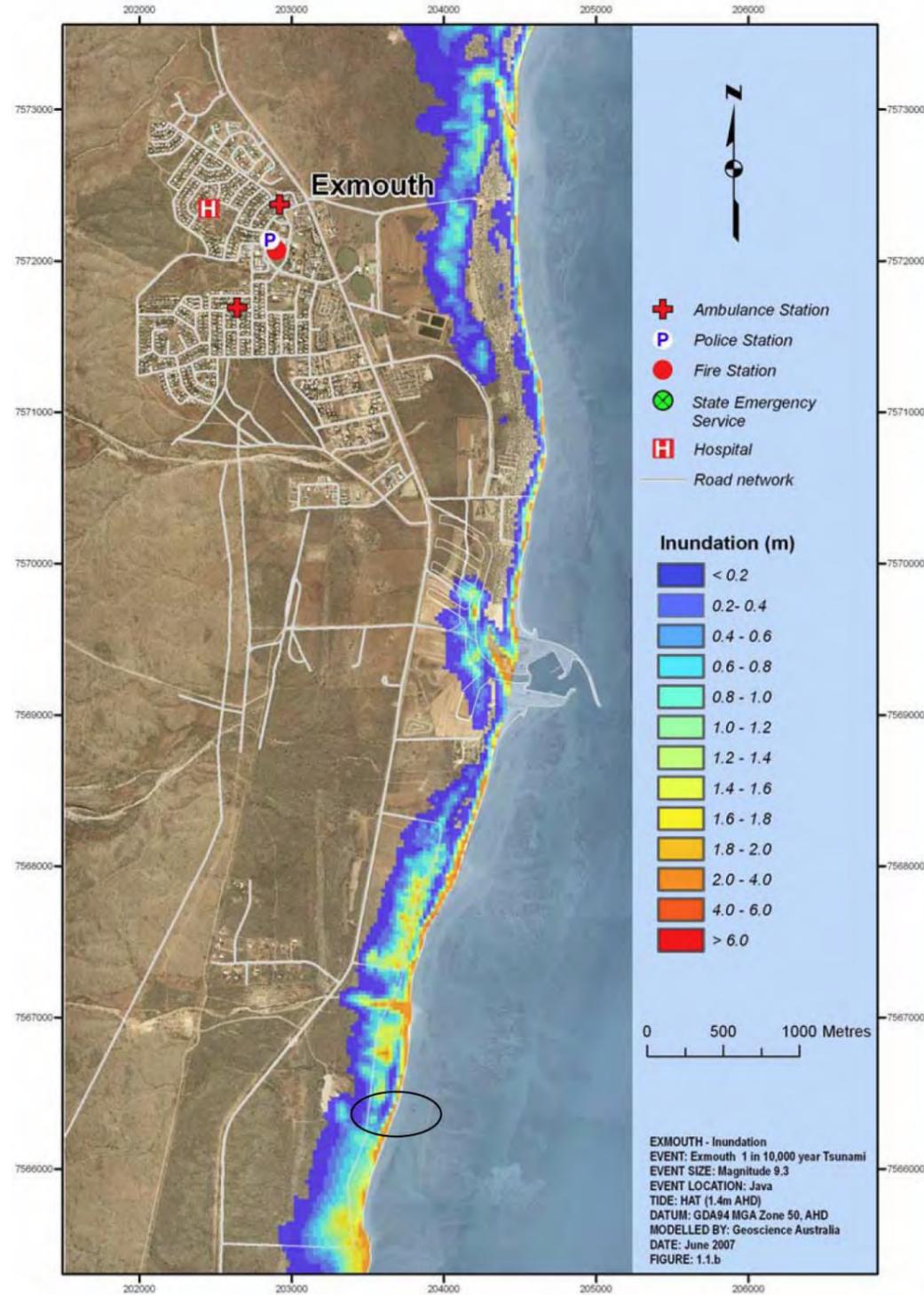


Figure 3-5: Inundation Modelling for Severe Tsunami (from Simpson *et al.* 2007)

4. Floodplain Processes

Preliminary floodplain analysis was undertaken for Exmouth Boat Harbour planning, which incorporated a floodway (Evangelisti & Associates 1995²). Flows exceeding design capacity were experienced during TC Vance, prompting a re-evaluation of the catchment hydrology as part of the Exmouth Marina Development (JDA Consultant Hydrologists 1999, 2002; Martens *et al.* 2000) and later review to consider floodplain management for the wider area (SKM Pty Ltd 2007).

4.1. CATCHMENT AREAS

The effect of the local catchment structure upon geomorphology is suggested by superimposing drainage channels with the geological surface features (Figure 4-1). These indicate the deeply incised upland catchments and the interconnected floodbasin structure on the lowland area, with two perforated ridges at the ancient and modern dune ridges. This formation and the relative low relief terrain enables breakout flow to occur between catchments.



Figure 4-1: Exmouth Catchment Areas and Geological Surface Features

² To be confirmed. Work was done by John Brosnan – may have been through Parsons Brinkerhoff.

4.2. RAINFALL

Rainfall in Exmouth occurs in two distinct periods associated with tropical and mid-latitude synoptic events respectively (Figure 4-2). Summer rainfall mainly occurs from February to March, but intense rainfall is possible throughout the tropical cyclone season, often with the entire month's rainfall occurring over 1-2 days (Figure 4-3). Winter rainfall is also inconsistent, but typically is less intense than during tropical cyclones, excepting the June 2002 rainfall event (Figure 4-3).

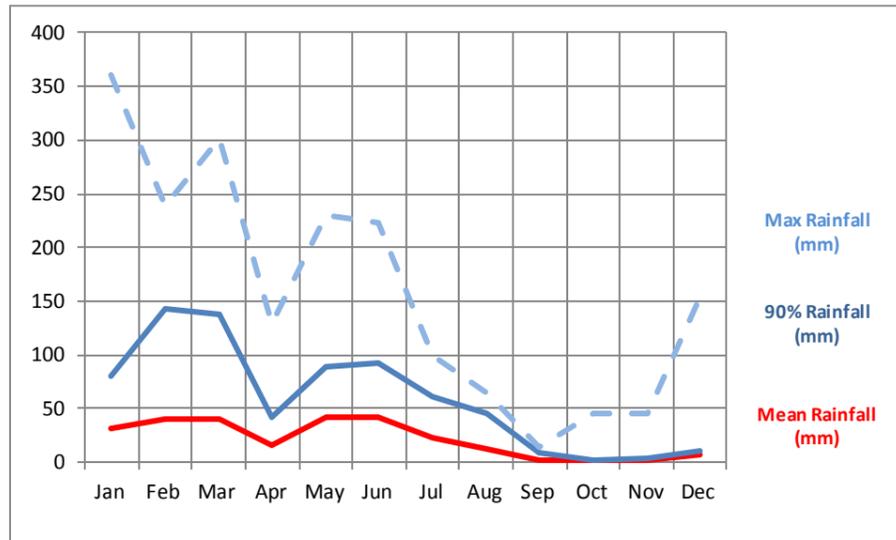


Figure 4-2: Monthly Rainfall Variability

Available Bureau of Meteorology data does not include TC Pancho rainfall

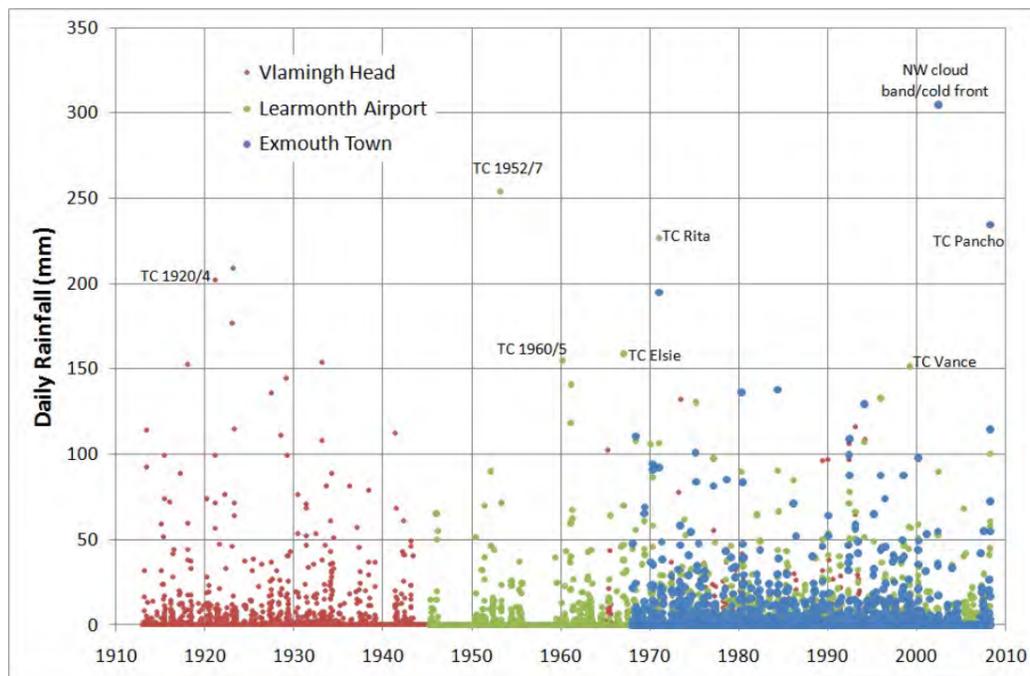


Figure 4-3: Daily Rainfall Record

4.3. RUNOFF FLOODING

Runoff flooding has been modelled by JDA Consultant Hydrologists (1999, 2002) and more comprehensively by SKM (2007) using LiDAR data captured on behalf of the Department of Water (. The latter study clarified the role of the two spillways leading into Exmouth Marina Village, with the structure on Murat Road likely to take the majority of flood flows. The northern spillway, which was originally intended to take a large quantity of flow, was isolated through construction of Market Road at a level 0.5m above the previous channel level. This has redirected flow towards the northern breakout. Development is planned within the deeper areas of this basin, and the implications of raising floor levels (in this area) upon the wider flood extent should be considered.

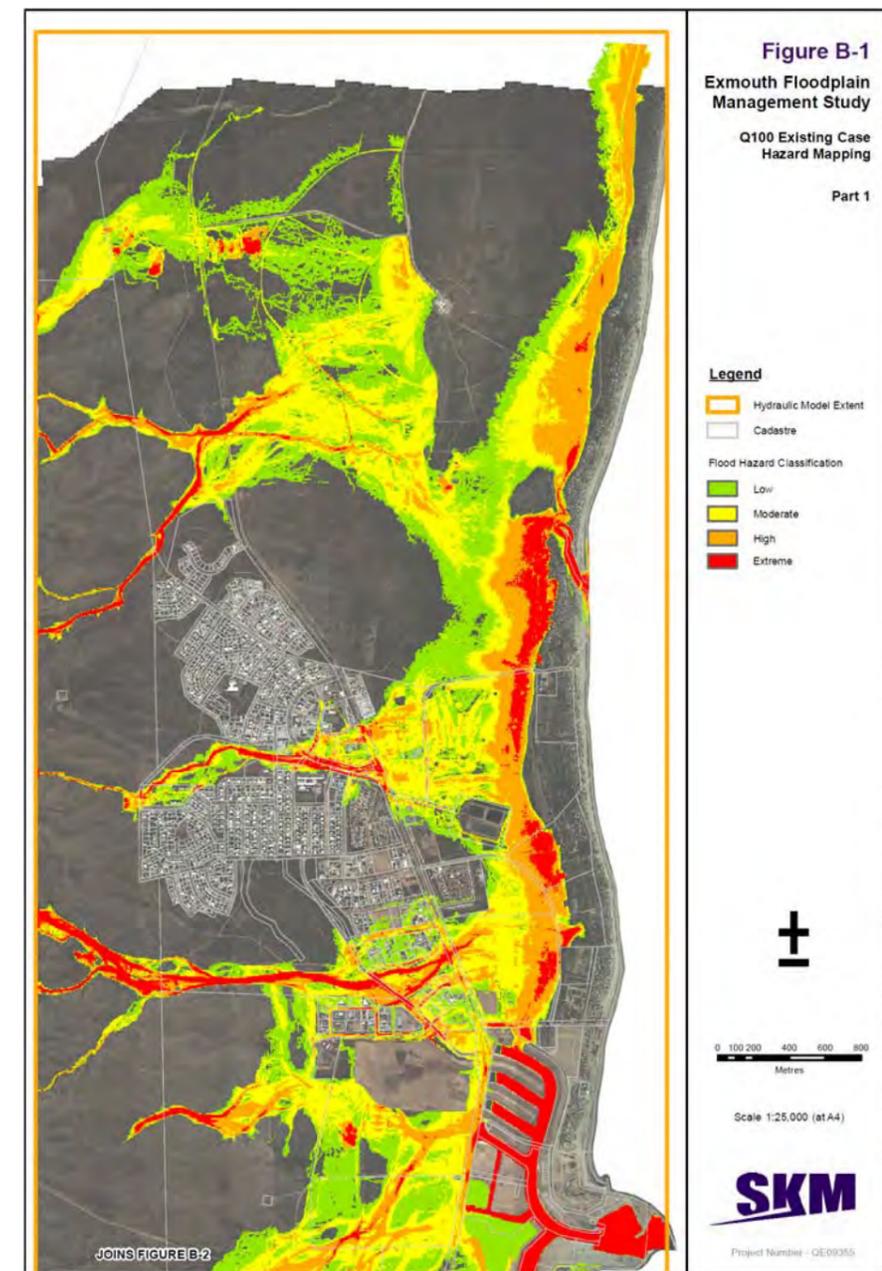


Figure 4-4: Modelled 100-year ARI Flood Extent

5. Coastal Setbacks

Following the Coastal Planning Policy SPP 2.6 (WAPC 2003), setback should be provided relative to a horizontal setback datum (HSD) based upon cyclonic inundation. From previous work, this is arguably between +3.7m AHD (100 yr WL + 0.9m SLR) and +4.3m AHD (TC Vance + 0.9m SLR). Along the Exmouth coast, this level is above the foredunes, but below the level of the floodplain basins.

Derived setbacks are based upon 'storm' erosion (S1), projected trend (S2) and an allowance for sea level response (S3).

- The amount of storm erosion in Exmouth Gulf is arguable, as the most severe situation is likely to come from strong alongshore forcing, whereas previous modelling has only evaluated cross-shore erosion, producing less than 10m.
- The historic shoreline changes show a local accumulation to either side of the harbour (in the wave shadow) with erosion to the north (as expected given the historic drift from south to north). The erosion has focused upon the 'inflection point' 1.25km north of the harbour, likely because of a corresponding change in the subtidal terrace structure, and a local transition in alongshore transport rates. This erosion is likely to be gradually distributed southwards, but can essentially be projected over a 100 year time frame.
- The ratio of sea level rise to shoreline reponse is defined in policy, to give a 90m allowance, although the reality is likely to be something quite different.

Combining the three setback components gives a setback of ~100m adjacent to the harbour, ~160m at the 'inflection point' and 120m to the north.

There are a couple of interesting things to note:

- The combination of hydrographic surveys and the shoreline movements suggests that the bypassing has not been wholly effective, with approximately half of the material ending up offshore;
- 2010 and 2011 have seen a north to south sediment transport, which is the opposite direction to the prevailing condition. This preferentially causes erosion on the south side of the 'inflection point'.



6. Recommendations

Development within the Exmouth coastal area requires consideration of both coastal and floodplain dynamics.

The present day shoreline is strongly controlled by the formation of the subtidal rock platform, with the majority of historical change either associated with erosion and recovery from TC Vance, or through the influence of constructing Exmouth Boat Harbour.

Management of sediment transport from the south side of the harbour to the north has not been wholly effective, and practices should be reviewed to ensure that it does not exacerbate downdrift erosion.

The dynamics of the foredune area need to be clearly recognised, as this area is likely to experience intermittent erosion and accretion for at least a 20m width.

The existing primary dune field is relatively high, but in parts is relatively narrow, making it susceptible to breaching in the event of a prolonged period of erosion. Monitoring of the dune structure should be undertaken to ensure that sufficient dune mass remains to resist extreme events.

Development within the floodplain needs to consider flood risk mitigation techniques, as the potential effect of infilling upon flooding across the wider area needs to be established.

7. References

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8. Extract From WAPC Report (Draft)

Exmouth is the main town for the Shire of Exmouth, located on the western side of Exmouth Gulf. It is located in the secondary compartment of North West Cape to Learmonth, crossing two sediment cells. The military facility is located in the sediment cell from Bundegi to Exmouth North (Cell 19), with the majority of the townsite contained within the sediment cell from Exmouth North to Qualing Pool (Cell 20).

Comparison of historic aerial imagery is shown in Figure 8-1; Oblique aerial photos in Figure 8-2.

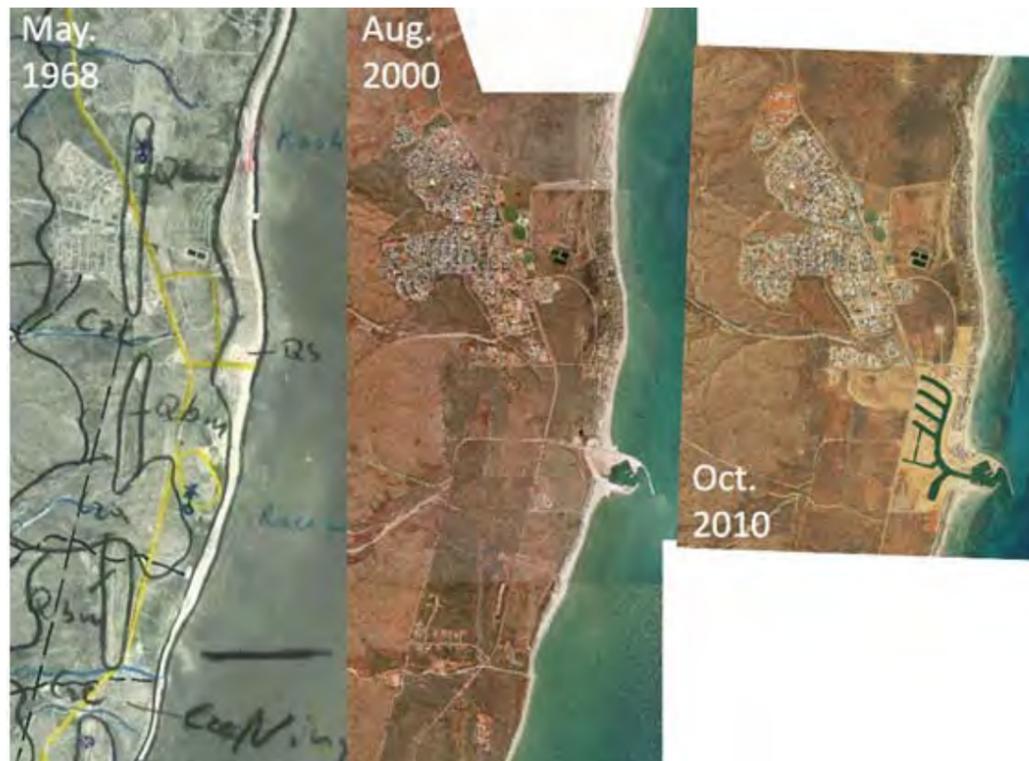


Figure 8-1 : Aerial Photography Exmouth (1968, 2000 and 2010)

Planning context

The planning history and context of the site is summarised in the *Ningaloo Coast Regional Strategy* (DPI 2004), *Regional Hotspots Land Supply Update - Exmouth* (WAPC 2008) and the *Proposed Exmouth Structure Plan* (Taylor Burrell Barnett 2009). These documents also incorporate the relevant policies and plans to be incorporated in the development of future outline development plans or planning applications.

The majority of the town development is set back more than 500m from the coast (Figure 8-1). Recently the *Ningaloo Coast Regional Strategy* (DPI 2004) recommended a structure plan for Exmouth (Figure 8-4; DPI 2004). This shows the intended expansion of the townsite along the coast including the development of a marina and future development of an associated precinct, tourist accommodation and facilities and future long-term urban or

mixed-use sites. Several components of the structure plan have subsequently been constructed or are under development.

The *Town Planning Scheme No. 3* (DoP 2009c) also includes special use (SU) conditions for expansion of a Wilderness Resort SU3 and for an industrial estate SU5 (Figure 8-5). These both require the preparation of a Foreshore Management Plan to the satisfaction of the Western Australian Planning Commission (DoP 2009c). However, a new *Town Planning Scheme* is presently being prepared for the Shire of Exmouth along with a *Local Tourism Strategy* (DoP 2010).



Figure 8-2: Exmouth Obliques 16 May 2011 – South of Harbour
South to North from Top to Bottom
Source: WACoast (Gozzard In prep.)



Figure 8-3: Exmouth Obliques 16 May 2011 – North of Harbour
 South to North from Top to Bottom
 Source: WACoast (Gozzard *In prep.*)



Figure 8-4: Exmouth Structure Plan
 (Source: DPI 2004)

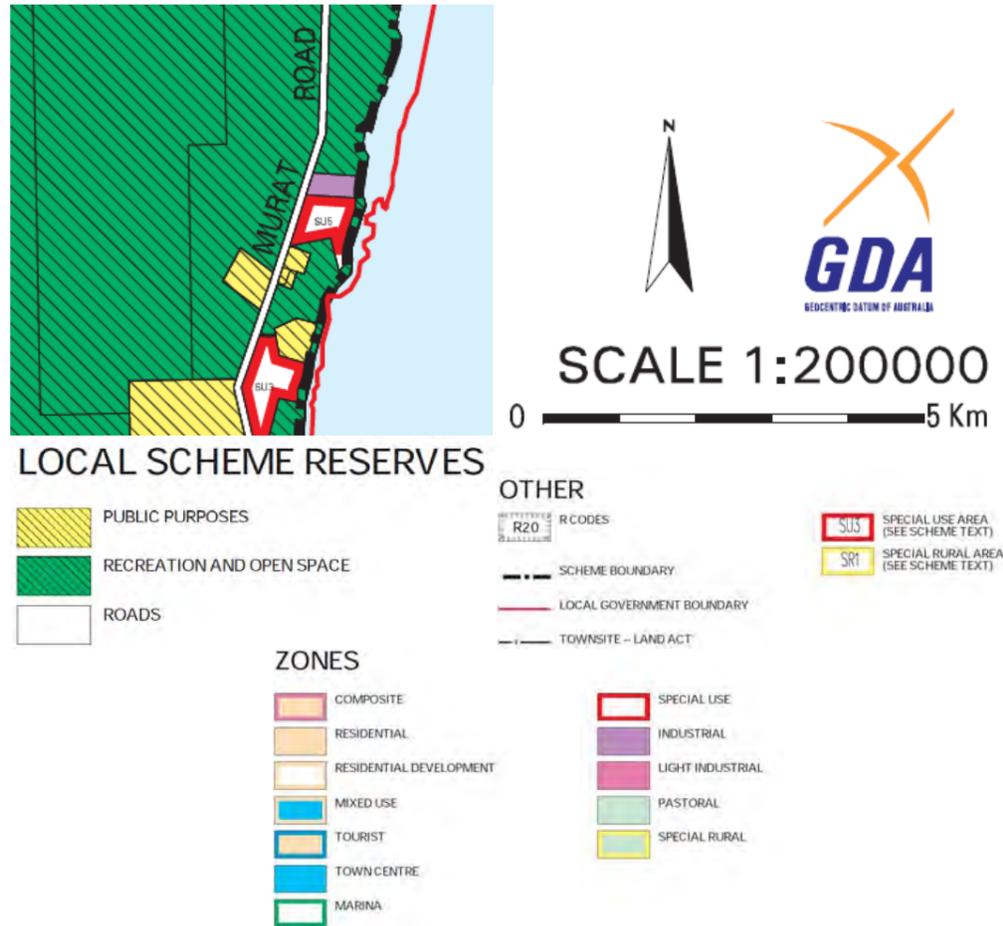


Figure 8-5: South of Exmouth Town Planning Scheme
(Source: DoP 2009c)

The new *Town Planning Scheme* will be revised based on recommendations within the revised Structure Plan by WAPC (2008; Figure 8-6) and the draft Masterplan prepared by Taylor Burrell Barnett (2009; Figure 8-7). This masterplan has not been formally endorsed. The draft Masterplan incorporated coastal constraints related to floodways or flood fringes identified by SKM (2007), landform stability and groundwater of land systems and coastal setbacks (TBB 2009). This information was incorporated along with the potential for expansion of the marina to develop the draft masterplan.

The masterplan identified the land adjacent to the Golf Course precinct with direct access to Exmouth Gulf as a land use constraint. The tourism node requires comprehensive investigation of the 'dunal landform would need to address land capability; storm surge assessment to define coastal setbacks; road access; and restrictions imposed by the floodway' (TBB 2009: 34).

Prior studies incorporating information on metocean forcing at Exmouth have previously been conducted in Exmouth for the purpose of small craft facilities (Maunsell & Partners 1981; Riedel & Byrne 1986; Steedman & Russell 1986; Steedman 1987; Coastal Information & Engineering Services 1996; and Egis Consulting 1999a). The findings of these studies are

summarised and reviewed in Damara WA (2006c), incorporating the longer-term water level record and the influence of TC Vance (Egis Consulting 1999b).

Investigations on flood studies and floodplain mapping have been conducted by SKM (2007) incorporating the March 1999 flooding in Exmouth due to Tropical Cyclone Vance (Martens *et al.* 2000; SKM 2007).

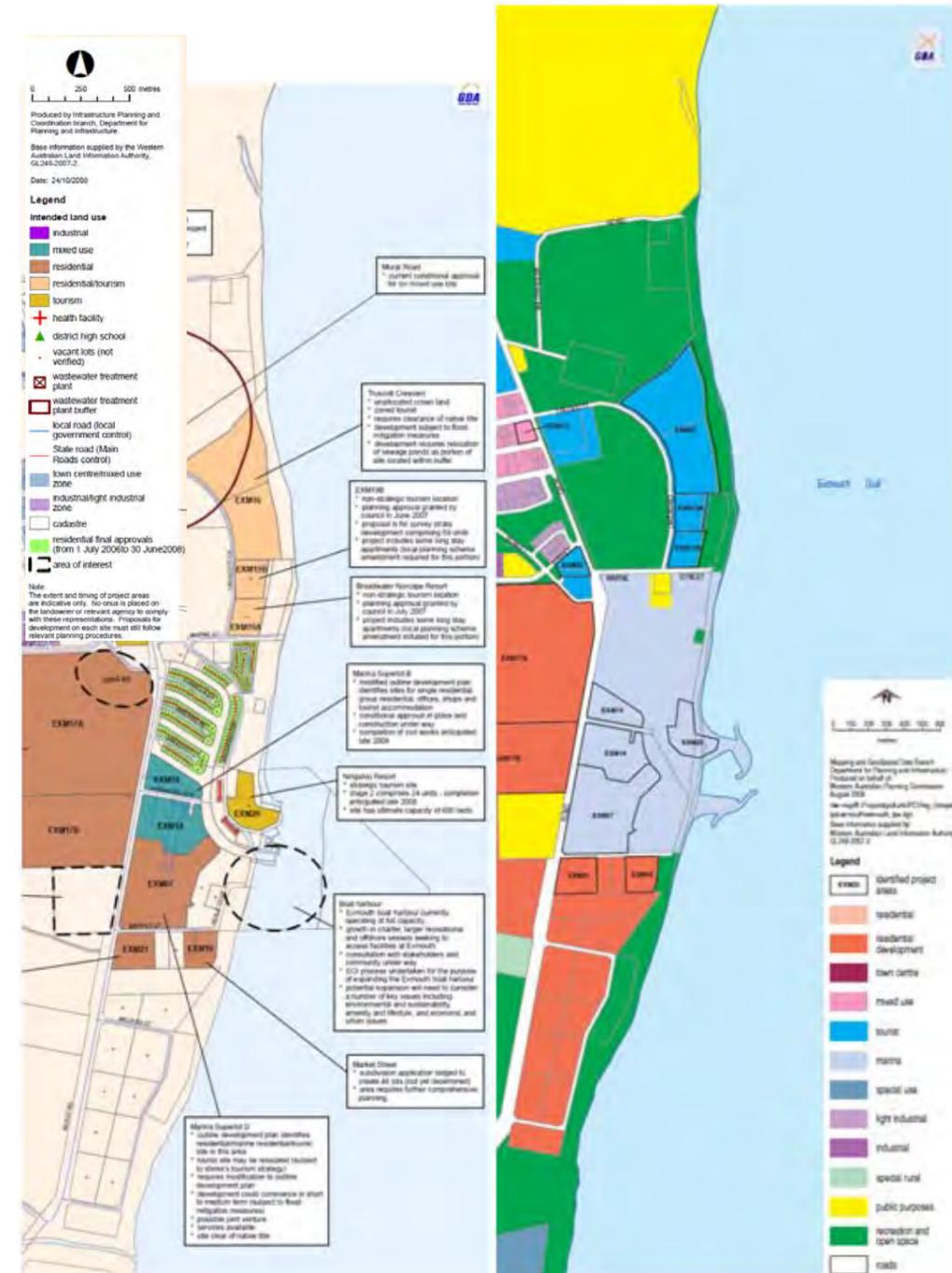


Figure 8-6: Proposed Exmouth Land Use
(Source: WAPC 2008)

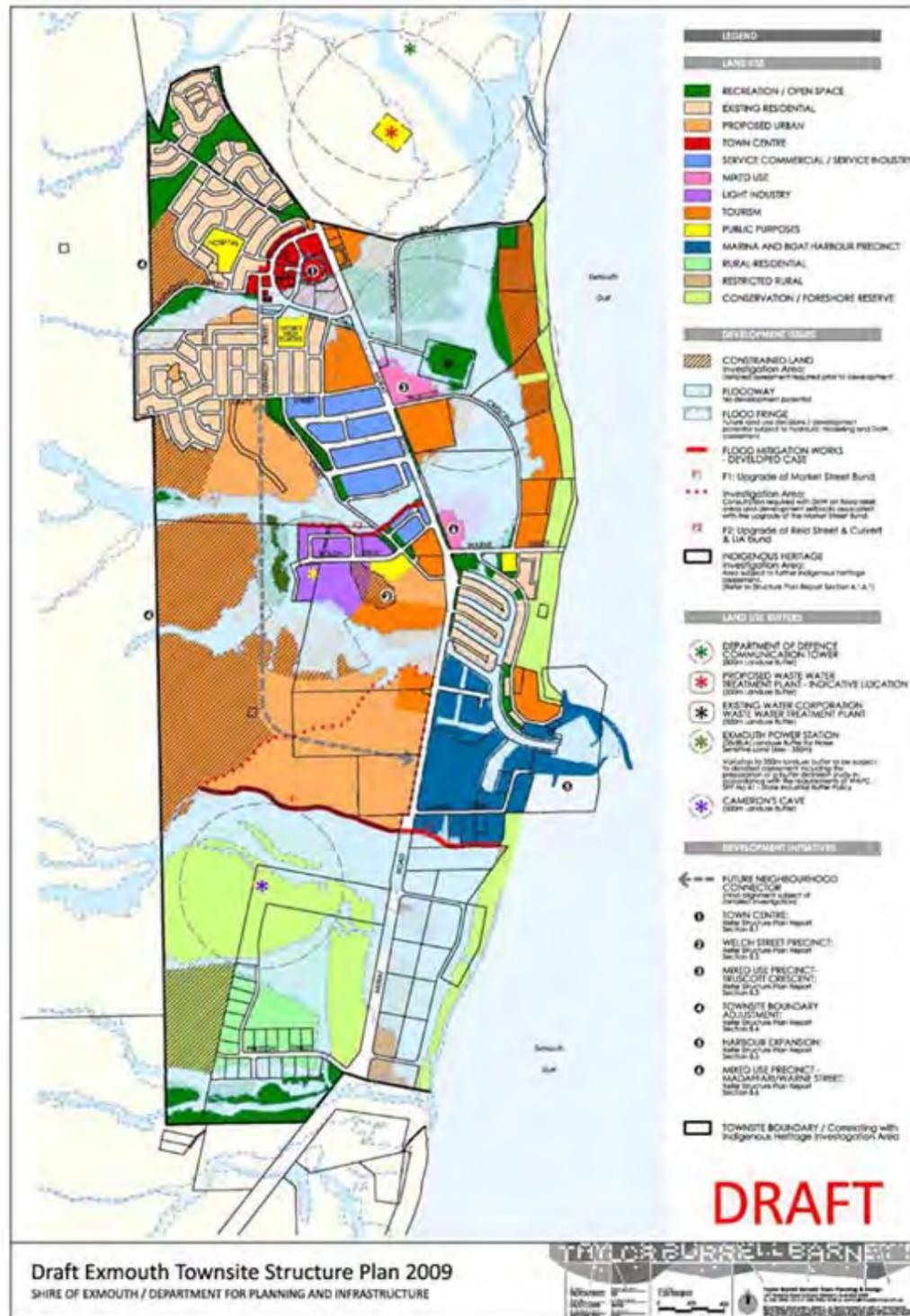


Figure 8-7: Draft Exmouth Townsite Structure Plan
(Source: Taylor Burrell Barnett 2009)

Coastal susceptibility, instability and vulnerability

Both cells have low susceptibility, with moderate instability in the southern cell (Cell 19) and low instability in the northern cell (Cell 20). Across the whole cell containing the townsite (Cell 20), there is low coastal vulnerability, which suggests limited constraints to coastal management. However, when considered at a local scale, there are several low-lying landforms that are more likely to present a coastal planning constraint due to runoff flooding, storm surge inundation and dune stability. The combination of floodbasins of ephemeral creeks fronted by a narrow primary dune potentially provides a significant constraint for coastal management.

Ephemeral creek systems provide a risk of flooding at Exmouth during high rainfall events, demonstrated by the flooding associated with Tropical Cyclone Vance in March 1999 (Martens *et al.* 2000; SKM 2007), a NW cloudband in June 2002 (SKM 2007) and Tropical Cyclone Pancho in March 2008. The six catchments through the townsite flooded during the passage of TC Vance, with increased runoff due to the lack of vegetation in the catchments following a bushfire (Martens *et al.* 2000). The small coastal catchments, totalling 45 km², are fronted by coastal dunes that were formed by alongshore eolian transport and commonly result in deltaic deposition behind the dunes. Inundation of flood basins and dune breakouts can occur during a significant flood, with the location of breaching influenced by areas of historic breakouts, narrow dune width and human intervention. The risk of flooding could be based on the floodplain modelling by SKM (2007; Figure 8-7). However, artificial breaches in the dunes for beach access and any drainage or floodway diversions modify flood behaviour and coastal risk, which may render previous flood studies obsolete.

Dune breaches or low points also provide a pathway for coastal inundation associated with tropical cyclone surge or tsunami (Figure 8-8). These events have erosive capacity for the primary dune.

The primary dune presently provides some protection from tropical cyclone surge and inundation and direct wave attack. The dunes are supplied by eolian transport, overlying a rock pavement foundation. There is alongshore transport on the terrace, beachface and into the dunes that can potentially occur in both directions, but has demonstrated sustained nett northwards transport since the installation of the harbour breakwaters. If there was a significant modification to sediment supply, including an absence of sand bypassing, the risk of dune breaching may increase. In addition, artificial breaching for beach access and diversion of drainage floods could potentially change the flood basin behaviour landward of the dunes.

Any breaches in the dune may widen rapidly, increasing the risk of inundation of the land behind. Dune breaches can also rapidly infill, temporarily acting as a sediment sink and altering the sediment supply of the adjacent coasts. Dune stability is affected by the number, width and locations of breakouts; along with the sediment supply and the potential for further breakouts based on terrestrial and coastal flooding.

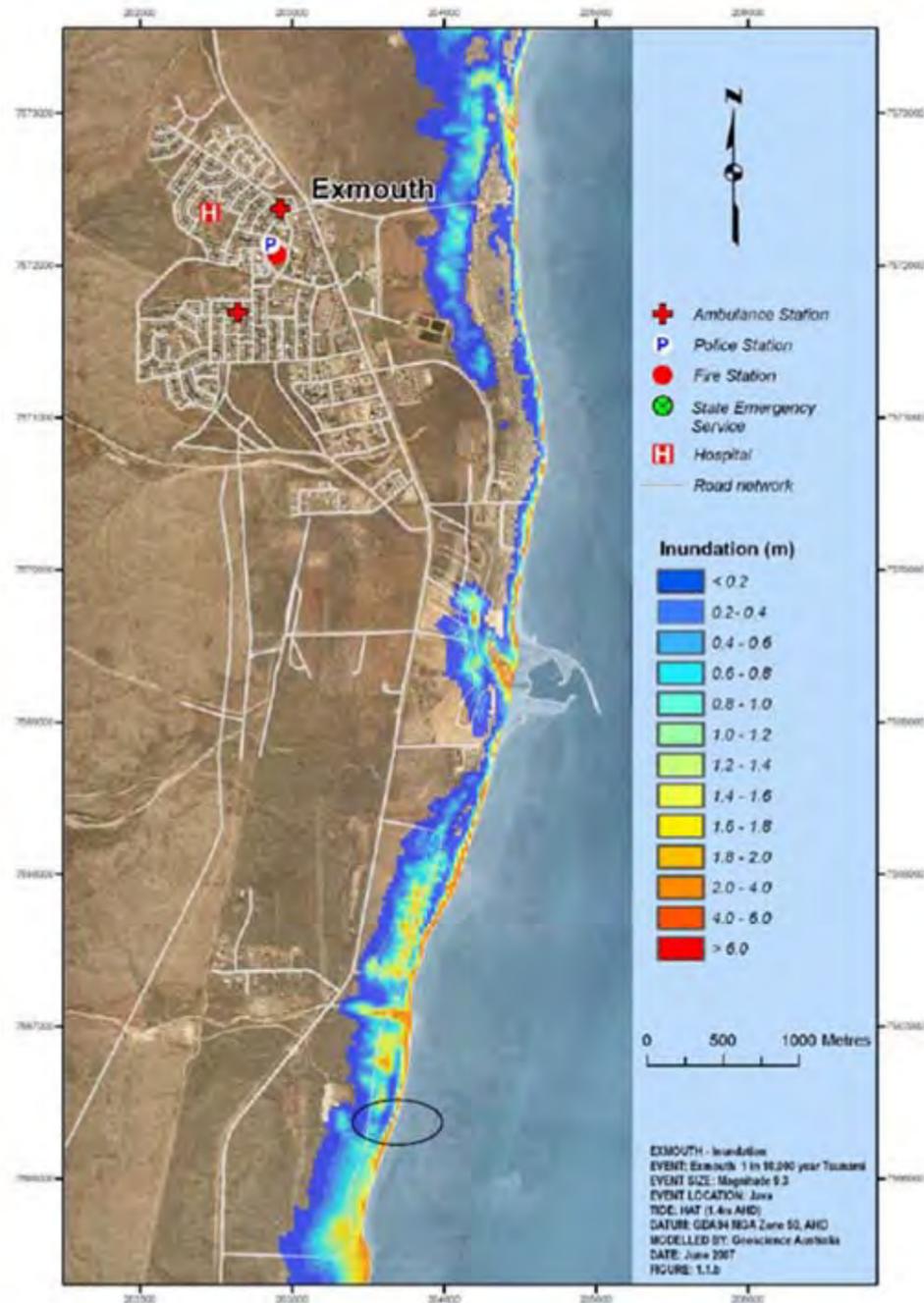


Figure 8-8: Tsunami Inundation Model for Exmouth
The black oval indicates access point that breaches major dunes
(Source: Simpson *et al.* 2007)

Advice

A coastal setback and risk assessment should be conducted for the area encompassed by the *Town Planning Scheme* following SPP No. 2.6 (WAPC 2003). This should consider connectivity with estimation of how a proposed coastal, dune or floodway modification has the potential to transfer risk to the adjacent coasts. This may require detailed determination of the

coastal sediment budget, with a focus on the primary dune stability, and analysis of landform change as a basis for validation of numerical models.

The basis for Schedule F.4 as part of SPP No. 2.6 (WAPC 2003), where infrastructure and development should be set back from any areas potentially inundated from tropical cyclones, is to minimise risk of coastal flooding with minimal allowance for emergency management. An emergency management plan is required for areas with a high risk of experiencing inundation, including monitoring and evacuation planning. In addition, by placing infrastructure within the areas susceptible to inundation, without undertaking measures to reduce risk, imposes future ongoing costs to the Shire of Exmouth.

Risk management and adaptation to mitigate coastal hazards requires planning for reduction of the risks over the full planning time frame. This is especially so in consideration of decisions about coastal land subject to potential inundation and flooding associated with extreme events such as the passage of a tropical cyclone or a tsunami. Any future plans require a coastal hazard and risk assessment, including a definition of acceptable risk. This should include the acceptable risk to property and loss of well being. Risk to property may require consideration of loading due to wind, coastal flooding inundation from tropical cyclones or tsunami, terrestrial flooding including accumulation in floodbasins and the geomorphic response. Such an assessment should follow AS NZS (2009) ISO 31000 processes. An acceptable level of risk may be met through structural design and emergency management plans, and this particularly requires planning.

The risk of ephemeral creek flooding should also include an assessment of the behaviour of dune breakouts, floodbasins and impacts of human intervention on flooding. Examples of intervention include the placement of bunds to divert flood flows, artificial breaching of the dunes and infilling of the flood basin. This may require consideration breakout dynamics, recognising the supply of sediment to the dunes.

An emergency management plan is required due to the high risk of tsunami, tropical cyclone inundation and terrestrial flooding at Exmouth. The preparation of an emergency management plan to reduce risk of loss of life and well being could include monitoring and evacuation planning for tropical cyclones, tsunami and ephemeral creek flooding. The highest risk of loss of life is associated with tsunami inundation. Following GEMS (2009), the steps to be taken could include:

1. Development of a monitoring system that identifies:
 - a. Tropical Cyclones with the potential to threaten Exmouth, and the predicted coincidental tidal conditions. Information available for such an assessment is held by the Bureau of Meteorology and the Department of Transport, although this requires subsequent interpretation to identify the risk at Exmouth;
 - b. Weather systems that have the potential to result in ephemeral creek flooding. Information is held by the Bureau of Meteorology;

- c. Tsunami with the potential to threaten Exmouth. The information for this assessment could be obtained by the Australian Tsunami Warning System, coordinated by the Bureau of Meteorology, Geoscience Australia and Emergency Management Australia;
2. Installation of signage at coastal car parks and within the marina and/or distribution of safety information regarding tsunami to inform the transient visitors to the area of the risk. This information is available from Emergency Management Australia;
3. Definition and dissemination of an evacuation plan, particularly for the areas that may be at greater risk of flooding or inundation.

Further studies

The following studies could be used for a hazard and risk assessment:

1. Risk of tsunami inundation incorporating the modelling by Simpson et al. (2007);
2. A tropical cyclone surge assessment under Schedule F.4 of SPP No. 2.6 (WAPC 2003) for a design cyclone following recommendations by Damara WA (2009) including wave runup;
3. Risk of flooding and flood loading including the behaviour of floodplain basins, floodways and the dune breakouts following the flood study by SKM (2007). The impacts of any potential human intervention on flooding since the SKM (2007) study and proposed as part of future plans should be incorporated; and
4. Determination of a sediment budget with a focus on the dune stability in the context of the underlying geologic framework. Dune stability assessments should investigate the number, width and locations of the breakouts; sediment supply and potential for further breakouts based on terrestrial and coastal flooding. Potential modifications to the sediment budget and dune stability with proposed works should be included.

— B

INTRODUCTION

Eco Logical Australia (ELA) has been engaged by Hassell Limited to provide preliminary environmental advice into the possible development of the Exmouth Foreshore (the foreshore). The following memorandum provides the results of a preliminary desktop assessment undertaken by ELA of environmental values of the foreshore and provides advice on possible opportunities and constraints for potential development of the foreshore.

Information relating to the environmental setting and values of the foreshore has been sourced from CoastWise (2001), Taylor Burrell Barnett (2011) and from visual interpretation of aerial photography.

LOCATION OF EXMOUTH FORESHORE

The foreshore area subject to this preliminary desktop assessment is located on the eastern coastline of the Cape Range Peninsula (the peninsula) and forms part of the western coastline of the Exmouth Gulf. The foreshore is located approximately 1.6 km to the east of the Exmouth town centre and extends approximately 2.6 km north from the Exmouth Marina. The Exmouth Golf Course and waste water treatment plant are located to the immediate west of the northern end of the foreshore area.

ENVIRONMENTAL SETTING – SUMMARY

Physical Environment

Landform and Geology

- Quaternary sediments make up the beach dunes surrounding the peninsula.
- The foreshore area comprises a primary and secondary dune system, which is dominated by Holocene beach sand and shingle. Behind the secondary dune lies a coastal plain system comprising shallow red clayey sands.

Hydrogeology

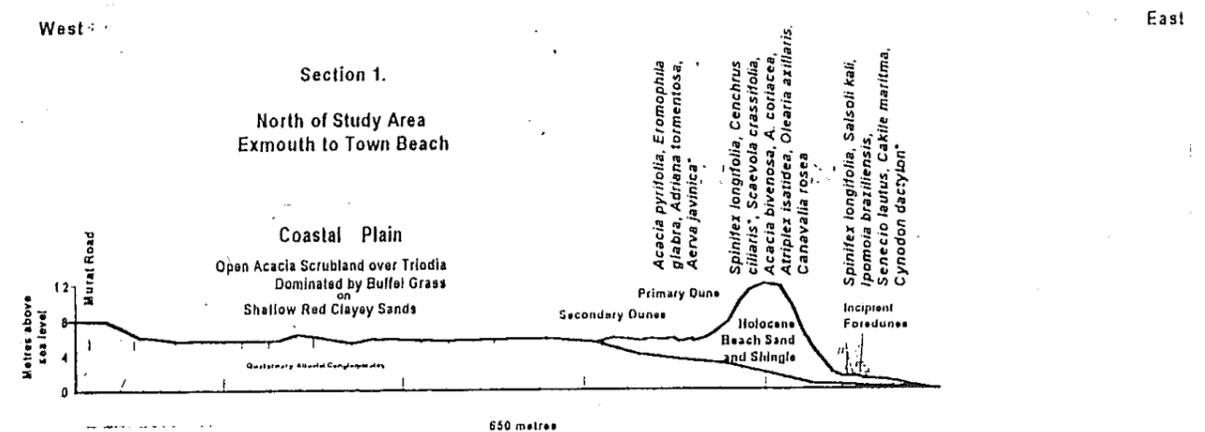
- The groundwater of the peninsula occurs in confined and unconfined aquifers.
- The unconfined aquifer of porous limestone along the eastern slopes of Cape Range between Learmonth and Exmouth contains substantial potable groundwater resources. The Exmouth water supply is sourced from the Cape Range Mound which reaches its maximum depth below the central line of the Cape Range.

- The upper part of the unconfined aquifer is permeable karst, while the underlying limestone is less permeable. In general, a 20 – 30 m thick layer of fresh groundwater overlies a saltwater wedge, with the transition zone located about 5 km from the coast.
- The unconfined aquifer is replenished by direct infiltration of rainfall and runoff from storm events over Cape Range.
- Groundwater discharges into the Exmouth Gulf and, in addition to the effects of seasonal recharge, there is a natural variation in groundwater levels and the extent of saltwater intrusion due to tidal fluctuations in the Gulf.

Biological Environment

Vegetation

- The peninsula is located in the Carnarvon Botanical District of the Eremaean Botanical Province, which extends from Shark Bay northwards to the Exmouth Gulf, and is dominated by arid, perennial shrub associations.
- The distribution of vegetation across the peninsula generally varies with geology and geomorphology, and a number of unique minor vegetation complexes can be found in the areas that are confined to the Cape Range.
- The vegetation of the foreshore area is typical of the coastal dune vegetation found along the eastern coastline of the peninsula. The incipient foredune and primary dune are dominated by *Spinifex longifolia* and the secondary dune by *Acacia pyrifolia*. The coastal plain landward of the dune system consists of an open Acacia scrubland dominated by the weed *Cenchrus ciliaris* (Buffel Grass). A diagrammatic representation of the vegetation occurring on the foreshore is shown in Figure 1.
- A search of the Department of Environment and Conservation's (DEC's) Threatened ecological communities database found no conservation significant vegetation communities (i.e. Priority or Threatened Ecological Communities) listed as occurring in the foreshore area, however a site based vegetation assessment would be required to confirm this.



Source: CoastWise (2001)

Figure 1: Land/vegetation relationships occurring on the Exmouth Foreshore

Flora

- Despite its aridity, the peninsula is very rich in flora with a range of habitat types found.
- A search of DEC's Threatened and Priority flora database identified no Declared Rare Flora (DRF) or Priority flora in the vicinity of the Exmouth Foreshore.
- A search of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Online Search Tool, identified no Threatened flora species in the vicinity of the Exmouth Foreshore.
- Although it is considered unlikely that any conservation significant flora species occur in the foreshore area, it should be noted that the area has not been subject to a flora and vegetation survey and therefore a targeted flora survey would be required to confirm the presence or absence of any such species.

Fauna

- Terrestrial fauna is rich and diverse in the Cape Range Peninsula region, particularly the reptile species.
- A search of the EPBC Act Protected Matters Online Search Tool for the area identified 13 threatened fauna species and 23 migratory species as potentially occurring in the locality of the foreshore. Only two of the 13 threatened fauna species are terrestrial fauna; *Dasyercus cristicauda* (Mulgara) and *Petrogale lateralis lateralis* (Black-flanked Rock-wallaby), and are both unlikely to be present in the foreshore area due to lack of suitable habitat. The remaining 11 threatened fauna species are marine species which are unlikely to be impacted by the proposed development of the foreshore.

Of the 23 migratory species identified, the only group that may utilise habitat in the foreshore area are the migratory bird species listed as follows:

- *Macronectes giganteus* (Southern Giant-petrel)
- *Apus pacificus* (Fork-tailed Swift)
- *Ardea Alba* (Great Egret, White Egret)
- *Ardea ibis* (Cattle Egret)
- *Haliaeetus leucogaster* (White-bellied Sea-eagle)
- *Hirundo rustica* (Barn Swallow)
- *Merops ornatus* (Rainbow Bee-eater)
- *Charadrius veredus* (Oriental Plover, Oriental Dotterel)
- *Glareola maldivarum* (Oriental Pratincole)
- The likelihood of any of the above listed species using the foreshore as roosting or foraging habitat is considered to be low however a fauna assessment would be required to confirm the presence or absence of these species, and/or suitable habitat for these species, in the foreshore area.
- Stygofauna (groundwater dwelling invertebrates), are found in the peninsula area, typically inhabiting the extensive karst formations which have contributed to the possible identification of the region as a World Heritage Site. Two species of stygofauna known to occur in the groundwater resources of the peninsula are listed under the EPBC Act as Threatened species.

- Potential activities likely to impact the stygofauna habitat are excessive pumping of the freshwater lens in which they occur, and groundwater pollution.
- Humpback whales, dugongs and turtles are present in the Gulf seasonally.
- Some turtles have been recorded nesting on the beach of the foreshore however these occurrences are considered to be rare. Turtles prefer nesting sites on the western side of the peninsula and have been recorded on occasion on the eastern side of the peninsula, to the north of the foreshore area.

EXMOUTH FORESHORE DEVELOPMENT – OPPORTUNITIES AND RECOMMENDATIONS

Based on the results of the desktop assessment, the environmental values of the Exmouth Foreshore do not pose a significant constraint to potential development of the area. It should be noted that the published information available at the time of the desktop assessment was limited to CoastWise (2001), and the recommendations provided are based mainly on an analysis of aerial photography. It is recommended that the environmental values of the foreshore area are confirmed through a targeted flora and fauna assessment and an on ground vegetation condition assessment.

The foreshore area appears to support some environmental features which could be considered of conservation value that may require consideration during planning for any development of the foreshore, including:

- It supports areas of vegetation which would appear to be in good condition with limited disturbance.
- It may provide an important ecological linkage north-south along the coastline and an east-west linkage to vegetated areas further inland.
- It may provide habitat for migratory bird species and other native fauna species (noting, this would need to be confirmed by a fauna assessment of the area).

The opportunities identified for consideration during future planning stages are shown on Figure 2 and are outlined as follows:

- Opportunity to retain and rehabilitate representative areas of good quality vegetation within the foreshore area for the possible purpose of creating a 'conservation zone' and retaining other vegetated areas for the possible purpose of 'mixed-use zones'. Retention of vegetation and allowing mixed-use would contribute to maintaining and enhancing ecological linkages and dune vegetation, stabilising dunes, and providing for recreation and access to/across the land.
- Consider designating the vegetation within the north of the foreshore area, over vegetation in other areas, as a priority for retention as a potential conservation zone (minimal development) (Figure 2). This area of vegetation appears to be in good condition with minimal disturbance, compared to other vegetated areas of the foreshore, and may require only minimal rehabilitation efforts.
- Consider designating the central section of the foreshore for a potential low-medium intensity passive recreation zone, which would allow a mix of recreation and conservation use. The vegetation in this area appears to be in a good-degraded condition and has some level of disturbance from vehicle and pedestrian use. It is recommended that rehabilitation of the dune vegetation be undertaken where possible and pedestrian and vehicle access is clearly delineated from areas of vegetation to be retained/rehabilitated.
- Consider designating the southern section of the foreshore for a potential medium-high intensity passive recreation zone, which would allow a mix of recreation activities including areas of Public Open Space (POS) and conservation use. The vegetation in this area appears to be in a degraded condition and has been impacted extensively by vehicle and pedestrian disturbance and by the construction of the Exmouth Marina. It is recommended that rehabilitation of the dune vegetation be undertaken where

possible (and areas of vegetation to be retained/rehabilitated are clearly delineated from recreational/access areas) and incorporated into the design of any proposed POS areas.

- Consider retaining and rehabilitating the ecological link along the drainage line which runs from west to east and then drains towards the Gulf in a northerly direction behind the secondary dune (Figure 2). Rehabilitating the vegetation along this corridor may enhance the visual amenity of the area and retention of the drainage line will maintain the floodway and drainage capacity of the area. Consideration should also be given to developing this as a multi-use corridor, for example, a vegetated drainage swale with a public access track along the bank.
- Consider retaining and enhancing the low-lying vegetated areas where water potentially collects to form wetland areas behind the secondary dune, which appear to be in good condition. These areas form part of the east-west and north-south ecological linkages as described in the dot point above.
- Where possible, dunes should be stabilised through revegetation and rehabilitation and vehicle and pedestrian access clearly delineated from these areas.
- If areas of grassed POS are to be incorporated into the design, care must be taken to ensure grass species do not escape to vegetated areas and establish as weeds. Consideration should also be given to ensuring any groundwater abstraction for irrigation is within the capacity of the aquifer to minimise possible impacts to potential stygofauna populations.

Other recommendations for the foreshore area include:

- Conducting a flora and fauna assessment, including an on-ground vegetation condition assessment to confirm the outcomes of the desktop assessment and to ascertain any additional environmental values of the foreshore area which can only be determined from on-ground observations.
- If and when determining areas of vegetation to be retained, consolidate larger blocks and maintain linkages with other vegetated areas of the dunes (i.e. avoid retaining small isolated 'islands' of vegetation that may have poor long-term viability because of edge effects such as weed invasion, erosion, uncontrolled access).
- Integrating any proposed development with the existing dune vegetation present within the foreshore area (i.e. retain and enhance existing vegetation of the foreshore and incorporate this vegetation into the detailed design rather than clearing and then replanting).
- Using species already present in the foreshore area in rehabilitation planting and dune stabilisation.
- Managing weeds during construction of the foreshore development to prevent further spread to areas of vegetation to be retained or to adjacent areas of vegetation.
- During detailed design of the foreshore development, the passive viewing of marine fauna in the Gulf (e.g. whales, dugongs and turtles) should be promoted through signage and lookout point/s where appropriate.
- Pedestrian and four-wheel drive access to the beach should be restricted where possible by sealing and formalising major tracks and closing off and rehabilitating all other minor tracks.

REFERENCES

CoastWise (2001) *Exmouth Gulf Coastal Plan*: prepared for the Shire of Exmouth and the Exmouth Tourist Bureau, CoastWise Coastal Planning and Management, Subiaco WA.

Taylor Burrell Barnett (2011) *Exmouth Townsite Structure Plan*: prepared for Department of Planning and Shire of Exmouth, Taylor Burrell Barnett Town Planning and Design, Subiaco WA.

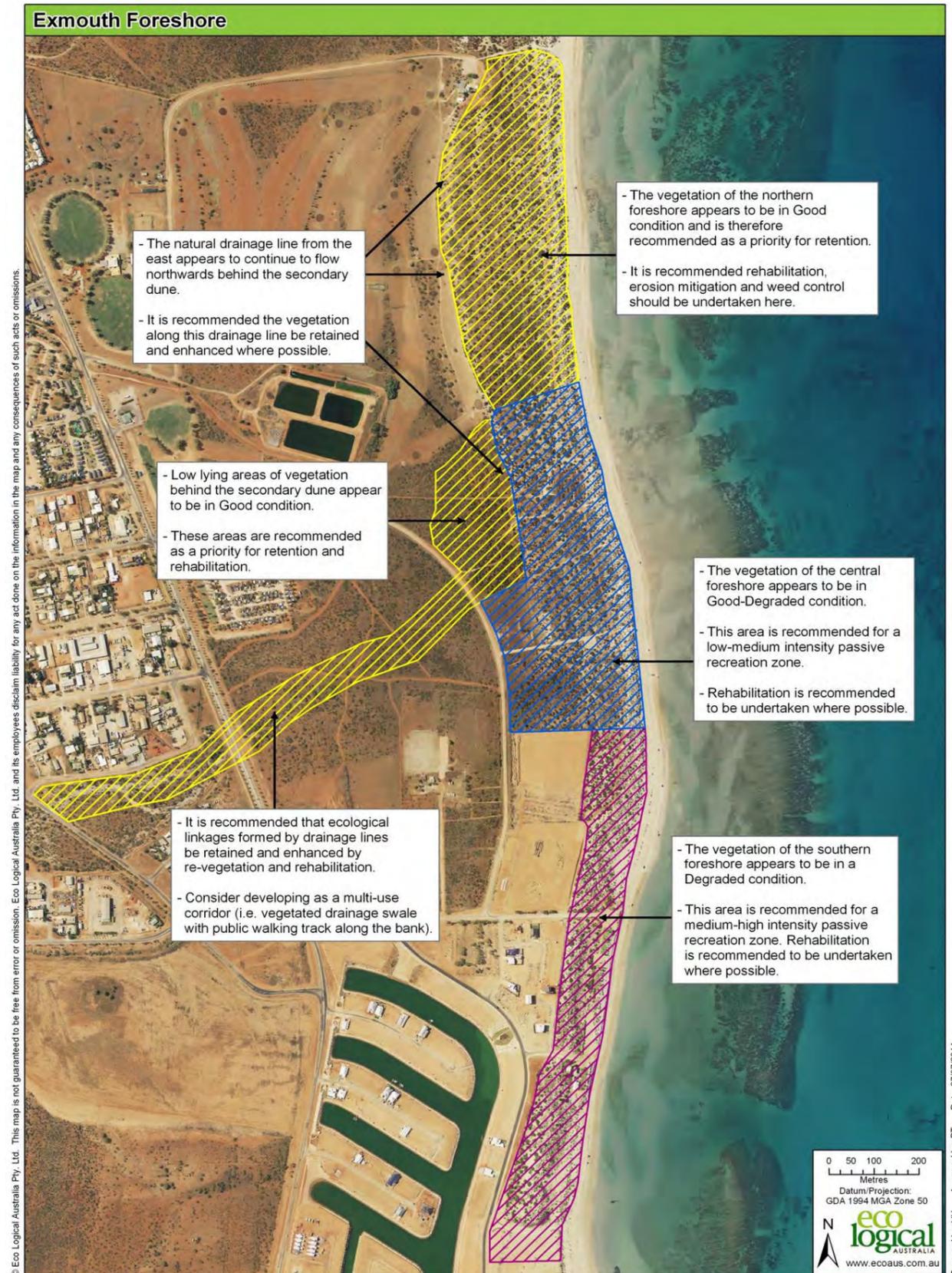


Figure 2: Opportunities and recommendations for the Exmouth Foreshore



1.0 Executive Summary

This report has been prepared by JDSi Consultancy Engineers to assist Hassell with the Exmouth Foreshore Revitalisation Plan.

Currently Exmouth has a stable permanent population in the order of 2,500 where existing infrastructure was largely constructed in conjunction with the original housing in the 1960's. The town's population expands during the tourist season and is enjoying growth from service companies supporting the offshore oil and gas industry.

Exmouth's service and infrastructure ownership includes the normal statutory owners being the Shire of Exmouth (SoE), Horizon Power, Water Corporation and Telstra

The key objectives of this report are to highlight:

- ▶ Existing infrastructure assets.

- ▶ Advice on infrastructure requirements for the revitalisation of the Exmouth Foreshore Revitalisation

- ▶ Advise on the implementation of key infrastructure requirements.

A key issue is that the services are all of c1960 in age and any changes may lead to wider upgrades to meet current servicing requirements, such as the replacement of aerial power with underground systems. It is understood that RBB Construction Cost Consultants have prepared indicative cost estimates for the works.

2.0 Introduction

Exmouth is 1,270 km north of Perth and is the largest town on the North West Cape of Western Australia. It existed as a small isolated town particularly growing during the Second World War and then was expanded under an arrangement between the State and Federal governments to support the communication facility. The Communication facility is a joint operation between the Australian and American governments.

The increasing popularity of the Ningaloo Marine Park is increasing the tourist and sightseeing traffic to the area. The traffic accesses the marine park by travelling through Exmouth.

JDSi was engaged by Hassell who are the lead consultant to the Town Centre Revitalisation and Foreshore Revitalisation Plans. JDSi was commissioned as the Project Teams' Civil Engineering Consultant.

This assessment provides an overview of existing and future servicing requirements to support the Foreshore Revitalisation Plan. It has been based on JDSi's observations, assessment of public information, assumptions and advice from our other partners in the Project Team and discussions with the various infrastructure stakeholders in Exmouth.

3.0 Geographical Characteristics

The Shire of Exmouth has a total land area of 6261 Square Kilometres.

The Town of Exmouth is located on the eastern side of the Cape Range which lies in a north south direction along the North West Cape.

On the western side of North West Cape lies the Ningaloo Marine Park.

The town is situated on the lower slopes of the Cape Range and the Foreshore Revitalisation area is mainly located on the natural dune system. The public open spaces are located away from the natural dune systems and the ground conditions generally comprise a thin covering of sandy soil overlying generally sound limestone. The nature of the limestone provides a sound building foundation, although harder to excavate, and the limited topsoil makes planting and landscaping harder than in other coastal areas with abundant sand layers.

4.0 Roads and Footpaths

4.1 Existing Situation

Roads are owned and maintained by the Shire of Exmouth.

4.2 Current Planning

There is no current planning for new road networks or upgrades except for works devised during the Foreshore Revitalisation Plan.

4.3 Future Requirements

Roads will need to be constructed in accordance with the IPWEA Subdivision Guidelines and in conjunction with the Shire of Exmouth "Guidelines and Standards". Road widths will be derived in accordance with the planning layout and traffic requirements. Footpaths may also be required in accordance with the guidelines from the Department for Planning and Infrastructure.

The Shire Officers are keen to have good quality footpaths. A preference was expressed for the use of the locally mixed light colour aggregate concrete. This provides an acceptable finish and appearance and will be considered during detail design.

4.3.1 New Town Beach

A car park is proposed for the New Town Beach. There are some existing tracks in the vicinity, as these are not suitable for reuse; it is proposed that a crowned gravel road with a typical section of a 9m pavement. The selection of this pavement width will allow for any future pavement sealing without too much rework, ie: 6m seal with 1.5m unsealed shoulders. Reflective guideposts, regulatory signs and typical road furniture shall be installed where required.

Car parking shall be designed for one way directional traffic and allow for a variety of vehicle sizes (i.e. standard, caravan, bus) to allow for all ranges of tourists. As the car parking area will be designed around natural vegetation, it is recommended that wheel stops are installed on the standard bays. (Buses and caravan bays can allow straight through maneuvers and thus no wheel stops.

It is recommended that where pedestrian paths intersections the pavement, a timber bollard (or similar) is installed to prevent any unauthorized beach access. Pedestrian paths will be of similar standard to existing links which is cleared areas.

Drawing JDS11484_C001 shown in Appendix A provides a conceptual roads and drainage layout to the New Town Beach.

4.3.2 Town Beach Upgrade

Car parking upgrade and extensions are proposed for the town beach. The existing car park will be upgraded with minor lighting and drainage services, the existing conditions to remain unchanged. It is recommended at the time of detailed design

that the existing conditions be reviewed to determine any efficiency in implementing maintenance work.

The proposed car park to the North is recommended to be sealed due to the close proximity of the ocean and the possibility of scouring in storm events. Wheel stops are recommended to be installed adjacent the footpath for pedestrian protection. Long vehicle parking bays should be accommodated in the carpark design.

It is assumed the car park level will be raised as part of the revetment wall works.

It is noted that the marina engineer recommendations is for a revetment surrounding the car park and beach access, it is therefore recommended that the shire consult with communities on the removal of beach access or amend the car park and revetment design to allow beach access to remain.

Warne Street is proposed to be resealed and dependant on the detail design, kerbing may be an option. For an un-kerbed road, Warne Street shall have a 9m sealed section width and 1.5m unsealed shoulder. The crest prior to the car park will require investigations into the sight distance requirements. This will need to be checked against typical requirements in the Austroads publications. There may be a requirement to regrade the road and/or install warning signage to meet standard. Reflective guideposts, regulatory signs and typical road furniture shall be installed where required.

Drawing JDS11484_C002 shown in Appendix A provides a conceptual roads and drainage layout to the Town Beach Upgrade.

4.3.3 Yacht Club Beach

A car park is proposed for the Yacht Club Beach. The existing Freedom Way is sealed and kerbed and any improvements can be determined at detail design.

Car parking shall be designed for two way directional traffic and allow for a variety of vehicle sizes (i.e. standard, caravan, bus), to allow for all ranges of tourists. As the car parking area will be designed around a natural dune system, it is recommended that wheel stops are installed on the standard bays.

It is recommended that at proposed pedestrian path intersections a timber bollard (or similar) is installed to prevent any unauthorised beach access.

Reflective guideposts, regulatory signs and typical road furniture shall be installed where required. Specific attention will need to be given to the Yacht Club access where larger vehicles will be using the access.

Drawing JDS11484_C003 shown in Appendix A provides a conceptual roads and drainage layout to the Yacht Club Beach Upgrade.

4.3.4 Truscott Crescent

Street upgrade of Truscott Crescent is proposed. It is recommended to re-grade the road, kerb and seal the road for an 8m width. It is expected that culvert crossings will need to be allowed for the drainage.

It is expected that dual use paths (DUP) will be constructed along Truscott Way. The DUP shall be carefully positioned to not impact overhead power poles, drainage swales and crossings.

Reflective guideposts, regulatory signs and typical road furniture shall be installed where required.

Drawing JDS11484_C004 shown in Appendix A provides a conceptual roads and drainage layout to the Truscott Avenue Streetscape Upgrade.

5.0 Sewer

5.1 Current Situation

Exmouth is currently serviced by a series of gravity, pressure and vacuum sewers discharging to a wastewater treatment plant located at the southern area of the golf course.

Water Corporation owns and maintains the sewerage reticulation system in Exmouth including the Waste Water Treatment Plant. Some use is made of recycled water in the Town for watering recreational areas. An odor buffer exists over part of the Truscott Crescent and the New Town Beach access road, this does not restrict placement of the access and car park facilities, but odor and prevailing winds should be considered.

5.2 Future Requirements

5.2.1 New Town Beach

The proposed toilet facility is not recommended for connection to the Water Corporation sewer, due to the vicinity of connecting sewer. A standard aerobic treatment unit is recommended for sewer management that is approved by the Department of Health.

5.2.2 Town Beach

A vacuum system located on Osprey Way is the closest Water Corporation sewer asset. Due to the costs involved in connecting to a vacuum system for one toilet block, it is recommended to use a standard aerobic treatment unit that is approved by Department of Health.

6.0 Solid Waste Management

It is recommended that bins are installed at the foreshore revitalisation areas and the Shire implement suitable waste management services.

7.0 Water Supply

7.1 Existing Situation

The supply of water and its treatment to potable quality is undertaken by the Water Corporation within their license area. The Water Corporations license area includes the Foreshore Revitalisation Area.

7.2 Future Requirements

7.2.1 Town Beach

It is expected that the extension of the Water Corporation 63MDPE water main located on Warne Street will be sufficient to service the toilet block.

8.0 Power Supply

8.1 Existing Situation

8.1.1 Exmouth Township

Power is generated from a privately owned power station. This is operated by Worley Parsons under an agreement with Horizon Power (HP) as the distributing agency. Any significant increase in power demand is the subject of discussions between Horizon Power and Worley Parsons

Current power distribution is through aerial conductors on poles made from railway line which appear to date from the construction of the town site. The distribution network in Exmouth is 11kV.

An increase in power demand may also entail an upgrade of the connecting infrastructure.

This information has been provided informally by officers of Horizon Power.

8.1.2 New Town Beach

No existing power infrastructure is present in this area. The closest HV and LV power infrastructure is located at the intersection of Murat Road and Truscott Crescent which is 500m away from the start of the entry road to New Town Beach.

8.1.3 Town Beach Upgrade

The closest Horizon Power main LV infrastructure is located approximately 450m from the Town Beach at the intersection of Madaffari Drive and Warne Street. Underground powered street light poles exists adjacent to the Town Beach site. This suggests that street light cables extend to the Town Beach. Further discussions with Horizon Power are required to determine the level of LV infrastructure present on Warne Street.

The Town Beach Entry consisting of Madaffari Drive and Warne Street has been currently lit via Horizon Power's standard underground powered Streetlights. Lighting studies are required to confirm the lighting subcategory of AS1158 the road reserve is being lit to however it appears a flag lighting approach has been utilised on Warne Street.

8.1.4 Yacht Club Beach

A Horizon Power transformer exists in the vicinity of Madaffari Drive and Friedman Way intersection. LV underground cabling extends from the transformer to Exmouth Yacht Club on Friedman Way. The number, type and utilised capacity of the cabling are not known at this stage.

Horizon Power's standard underground powered street lighting pole setup has been utilised to light the road reserve of Friedman Way. Further lighting studies are required to confirm the lighting subcategory of AS1158 the road reserve is currently being lit to.

8.1.5 Truscott Crescent

Existing LV overhead aerial lines extends approximately 250m north from the Warne Street intersection along the east side of Truscott Crescent. From there, the single phase LV overhead aerials continue for approximately 350m leaving the remainder km of Truscott Crescent without electrical infrastructure.

Overhead aerial lighting currently provides lighting to Truscott Crescent where electrical infrastructure exists (being some 600m of the 1.6km stretch of road).

8.1.6 Murat Road

Existing HV and LV aerials runs along the eastern side of Murat Road. Three phase 11kV HV aerials run the whole length from the northern intersection of Maidstone Crescent to Madaffari Drive. Three phase LV aerials runs in a 150m section heading south from the northern intersection of Maidstone Crescent intersection, then continues as single phase only to Nimitz Street, then three phase to Maley Street and single phase to Madaffari Drive.

From the northern intersection of Maidstone Crescent to Madaffari Drive, Murat Road is currently lit by lights mounted on HP power poles with the exception of the southern intersection of Maidstone Crescent and between Pelias Street and Welch Street where lighting is provided by a combination of power pole mounted lighting and underground powered 12.5m double outreach poles with 250W high pressure sodium (HPS) luminaires. Southern Maidstone Crescent intersection has been lit to

sub-category V3 of the AS1158. Lighting studies are required to confirm the lighting subcategory of AS1158 for which the remainder of Murat Road is currently being lit to.

8.1.7 Marina Public Open Spaces

Horizon Power owns and maintains underground HV and LV infrastructure currently exists on the western side of Madaffari Drive. An existing Horizon Power transformer is located in the vicinity of the northern Marina Public Open Space. Discussions with Horizon Power are required to determine the capacity utilised of the transformer, as well as that of the HV and LV cabling.

8.2 Future Requirements

8.2.1 Lighting

The foreshore redevelopment creates an opportunity to replace existing streetlights with more environmentally friendly alternative solutions such as LED and solar lighting. Pros and Cons of these alternative solutions are explored below.

It should be noted that any alternative lighting solutions utilised on road reserve will be considered as private lighting by Horizon Power and therefore ownership and maintenance will be the responsibility of the Shire.

Solar LED Lighting	
Pros	Cons
No power bills	Very high initial costs
Low maintenance	High vandal and theft concerns
No trenching and cabling between poles	Lights cannot be located in shaded areas
Operational during power blackouts	Battery related flood concerns
Longer lamp life (up to 5 years)	Battery replacement every 8-10 years
Environmental advantages (no grid power use)	Possible black out during extended periods without full sun

LED Street Lighting	
Pros	Cons
Low maintenance	Slightly higher initial costs
Less power usage	
Longer lamp life (up to 5 years)	
Environmental advantages (lower power use)	

LED Lighting

For slightly higher initial cost compared to Horizon Power standard street lighting, consideration should be given for the utilisation of LED lighting within public open spaces and street lighting. This is on the basis that, pending detail design, lower wattage LED fittings should be able to perform as highly as a higher wattage discharge lamp, therefore reducing power consumption for the life of the asset.

Solar Powered Lighting

Solar lighting's main advantage is that it can operate when it is cost prohibitive to bring grid connected power to the site. It obviously also provides an environmentally solution as it does not use grid power, which is typically non-renewable fuel powered. So, given the high initial costs of installing solar powered lighting and proximity of existing power infrastructure (with the exception of New Town Beach), Solar powered LED lighting will not be as cost effective as distribution connected lighting.

The cost benefits of not using grid connected power are largely offset by the cost of needing to replace batteries of a solar power pole every 8 to 10 years.

Solar panels can be the subject of vandalism, as they are an attractive target for objects to be thrown on to.

Comparison of Direct Lighting and Decorative Reflective Lighting

Comparing Horizon Power's standard lighting (6.5m poles with 1.5m outreach and 42W compact fluoro luminaire) with a typical decorative reflector lighting type, it is evident that a higher quantity of reflector poles are required to obtain the lighting levels of the chosen sub-category, for any given stretch of road. Refer to Drawings 3E11176G-03 and 3E11176G-04 for typical lighting layouts of each lighting setup for Truscott Crescent. In this example, to utilise the reflector type lighting, 50% more poles were needed and 400% more power was used to light the road to sub-category P4.

Reflector lighting can provide vandal resistance over a direct light fitting as the lamp is upward facing and more difficult to damage with a thrown object.

Unless preferred for aesthetic or vandal resistance reasons, a reflector lighting system would not be recommended based on its lighting performance. In addition to this, a reflector lighting setup is not recommended for use in proximity to the beach, on the basis of the methodology provided below for turtle friendly lighting.

Recommendations for Specification of Lighting Poles

Redevelopment sites are within close proximity of the sea and with Exmouth located in the Region D cyclonic zone, lighting poles are to be designed and constructed to handle such conditions (footings, mounting hardware, etc.). Poles would also need a suitable surface treatment, such as hot dip galvanising as well as an aliphatic urethane (or similar) final coating.

Methodology of Turtle Friendly Lighting

Exmouth Gulf is known as a feeding ground and possibly a breeding area for marine turtles. With marine turtles listed as threatened fauna deserving of special protection worldwide and that six of seven species of marine turtles in the world occurring in Western Australian waters, special attention is required when producing a lighting solution for the area. Turtles tend to have preferences for dark beaches for breeding and hatchling turtles primarily rely on their vision to find the sea by orienting towards the brightest direction. Artificial lighting can deter turtles from beaches and may disorientate or mis-orientate hatchlings resulting in death by predation, exhaustion or dehydration. Below is a list of some measures which can be taken to reduce light impacts to marine turtles:

- 1) Avoid lighting where possible (design for minimum number and intensity of lights)
 - a. Weigh up importance of human safety vs. turtle friendly
- 2) Avoid light spill onto beach and sea surfaces
- 3) Lighting control to be designed for operation of lights when required (time control, motion sensor, etc.)
- 4) Usage of screens, vegetation and structures to block direct and indirect light to beach
- 5) Lighting fixtures to be directed downwards to avoid overhead glow on cloudy nights (utilise aero screen type fittings within proximity of the beach)
- 6) Lighting fixtures to use shields and filters (e.g. amber filters on HPS lights) as required
- 7) Lighting fixtures to utilise long wavelengths (550-700 nanometers, orange to red) where possible. Short wavelength (blue) and broad spectrum sources such as metal halide, mercury vapour, fluorescent or halogen lights are not desirable.

- 8) Conduct night inspection and monitor turtle behaviour after installation of lights.
 - a. Remove problem lights as required
 - b. Create shielding as required
 - c. Turn problem lights off at nesting season

No particular level of light intensity has been identified as being safe for turtles therefore a lighting level, or sub-category of AS1158, that would not affect turtle behaviour, cannot be recommended. The above approach aims to limit to the amount of light, particularly the type of light that can affect turtle behaviour, that can be seen from nesting beaches. Our recommendation would be to select lighting sub-categories that have the lowest lighting level while still meeting the criteria for pedestrian safety and crime deterrence (so ignoring higher lighting levels to enhance prestige). The Shire could complete an assessment of whether lighting levels below the recommendations of AS1158 are appropriate, in an attempt to further limit the possible effects on turtle behaviour.

Drawings 3E11176G-02, 3E11176G-03 & 3E11176G-04 shown in Appendix A show possible lighting options for Truscott Avenue and Murat Road.

8.2.2 Power Distribution

Horizon Power requires that all new developments are to be serviced by underground three phase power. In a green-title development, this is implemented by HP owned and maintained URD 3-phase direct buried underground cabling from a spare fuse way at the transformer LV frame to uni and mini-pillars serving each site on the general basis of one pillar serving two adjacent lots. Horizon Power standard streetlights are then supplied from these pillars or an un-metered supply pit supplied off the pillar.

Further discussions with Horizon Power are required to determine the level of infrastructure in the vicinity of development areas, spare capacity available and voltage drop limitation of their network.

8.2.3 New Town Beach

With the closest Horizon Power 3 phase HV and LV network approximately 500m from start of the development area, solar powered lighting could be considered in this area. A cost comparison exercise should be completed to assist in the consideration.

To provide underground power to the area, applications and discussions with Horizon Power are required to determine HV connection points.

As per AS1158, the decision to light a road lies with the authority (in this case, The Shire of Exmouth). Our recommendation would be to light this road to subcategory P4 for entry roads. This lighting category recommendation is based on the presence of pedestrian traffic, expected low vehicle numbers and to provide a link between

Truscott Avenue and the New Town Beach Car Park. This would also be subject to consideration of a compromise on lighting levels due to the presence of turtles as discussed in previous sections.

Solar powered lighting could be considered for the lighting of boardwalks, shelters and pedestrian links to minimise impacts to the natural surroundings.

8.2.4 Town Beach Upgrade

Low voltage network to be extended from Madaffari Drive and Warne Street intersection if no existing LV infrastructure is adjacent to site. Further discussions required with Horizon Power to determine proximity of HV & LV network.

With the presence of pedestrian traffic and expected low vehicle numbers, lighting subcategory P4 of AS1158 is recommended for the entry road. This recommendation is subject to considerations of a compromise on lighting levels due to presence of turtles as discussed in previous sections. Upgrade works to entry roads provides opportunity to amend existing street lighting to provide a more turtle friendly environment.

Car park lighting sub-category recommendations are subject to Shire requirements of crime deterrence and night time occupancy rates. Typically sub-category P11c would be appropriate for a car park with low night time occupancy rates. This would also be subject to consideration of a compromise on lighting levels due to the presence of turtles as discussed in previous sections.

8.2.5 Yacht Club Beach

The Yacht Club Beach is currently serviced by underground power infrastructure (the type and level of supply is to be confirmed by Horizon Power). Horizon Power LV network to be extended as required to supply upgraded services. Load calculations to be performed once level of upgrades have been defined and finalised.

Car park lighting subcategory recommendations are subject to Shire requirements of crime deterrence and night time occupancy rates. Typically sub-category P11c would be appropriate for a car park with low night time occupancy rates. This would also be subject to considerations of a compromise on lighting levels due to the presence of turtles as discussed in previous sections.

8.2.6 Truscott Crescent

LV infrastructure should be extended from Gndaroo Road and Warne Street intersection to provide power to proposed lighting on south section of Truscott Crescent. Discussions are required with Horizon Power to determine the proximity of LV network to Warne Street and Truscott Crescent intersection. Extension of power

infrastructure from Murat Road and Truscott Crescent intersection to supply lights on northern section of Truscott Crescent to be explored with Horizon Power.

While new lighting infrastructure is required through the northern section of Truscott Crescent to meet AS1158, the southern section is already lit with occasional power pole mounted luminaires, but not to AS1158 requirements. This lighting could be left in place, until the existing above ground power infrastructure is replaced with new underground infrastructure.

8.2.7 Murat Road

A Horizon Power transformer is located on northern section of Murat Road. A LV network can be extended to service proposed lighting. Street lighting to the south section of Murat Road is to be supplied by extending existing street lighting circuits (subject to voltage drop). Further discussions with Horizon Power required for alternative connection points.

Lighting studies are required to determine current level of lighting of Murat Road. Southern intersection of Maidstone Crescent and Murat Road has been lit to a lighting sub-category V3 of AS1158. Road revitalisation works provides opportunity to upgrade existing lighting to continue same lighting standards. Refer to Drawings 3E11176G-02 for typical lighting layout for Murat Road utilising HP Standard fixtures and poles. Lighting calculations and detailed design can be performed once road layouts and lot boundaries have been confirmed and finalised. Existing HP power poles may cause possible constraints to road works and new light pole locations.

8.2.8 Marina Public Open Spaces

Marina public open spaces are currently supplied via underground infrastructure (to be confirmed by Horizon Power). Power infrastructure to be extended and upgraded as required to supply electrical services. Where electrical load requirements, comprises of lighting only and single barbecue, standard 3 phase pillar supplies may suffice pending input from Horizon Power. Lighting recommendations and calculations to be completed once path layout and electrical equipment requirements have been confirmed and finalised.

9.0 Gas Supply

ATCO Gas has advised that there is no gas network available for the Town of Exmouth.

10.0 Telecommunications

No further communication assets are expected for the Town Beach Integration.

11.0 Drainage

11.1 Existing Situation

The existing Town is drained through a combination of pipe network, open drains and creek lines. These connect to open drains which are natural creek lines that discharge into the low lying area on the west side of the dune system. The dune system acts as a natural storage bund and the only relief to the flooding extents is outlets to the North of the town centre and the southern inlets.

Rainfall events have led to flooding in parts of the Town Site and this have been extensively modelled by the Department of Water (DoW) and Sinclair Knight Merz (SKM). The resulting report identifies the extent of flooding for various storm events and return periods and summarises the area east of the inlets to be relatively immune to major flooding and the area to the north of the inlets experiencing flooding.

11.2 Current Planning

There is no current planning for new drainage networks or upgrades except for redevelopment works resulting from the town centre revitalization study and the outcomes of the Cardno drainage analysis.

11.3 Future Requirements

11.3.1 New Town Beach

The car park appears to be situated on the dune system ridge line and should not experience any flooding. Car park drainage can be controlled via road side swales and median basins.

The access road will experience flooding in major events, and depending on the level of service, filling the road and/or flood ways may be considered. Minor storm events can be catered for via road side swales with turnout's being constructed where possible.

11.3.2 Town Beach

The town beach access and car park is protected from major flooding from the nearby inlets.

The car park can be controlled via road side swales, and any overflow can be via the revetment. It is recommended to consider the existing drainage along Warne Road (west side of dune system) in the detailed design to ensure flow paths are maintained.

11.3.3 Yacht Club Beach

The Yacht Club car park and access should be well protected from flooding from the inlets.

The car park can be controlled via road side swales, and any overflow via revetment and dune system.

Freedman Way is currently kerbed and sealed. On the approach to the carpark it is recommended to install drainage pits to direct water to road side swales via pipe and scour protection.

11.3.4 Truscott Crescent

Truscott Crescent is situated in a flood prone area due to the flows from the creek crossing of Lot 501 and Lot 868 Murat Road. The dune system to the east creates a natural storage area on Lot 1456 (including Truscott Crescent). The only discharge to this flooding is North of the town site or the inlets to the south.

The shire should determine a level of service for Truscott Crescent and fill the road accordingly to prevent major flooding.

Truscott Crescent shall control drainage via road side swales, these swales can also act as conveyance swales for larger events, directing stormwater to the north of the site where flood ways or culvert crossings will need to be installed.

12.0 Key Drivers and Pressures

To identify the Foreshore as an attraction, population increase, tourism growth, oil and gas industry support and associated increases in transport, the following are key drivers that need to be considered;

Drainage

- Overland flood paths currently exist through Truscott Crescent and proposed assess roads. The level of service needs to be identified to determine the protection requirements.

Protecting existing Assets

- All existing services locations will need to be confirmed prior to any works to protect these assets.

- The adequacy of current as constructed information will be verified during detailed design.

Asset Life

- Advice will be needed from the asset owners in regard to the service life of the current assets.
- Any relocation would be with new materials to current standards.
- Selection of material shall be based on coastal and cyclone conditions.

Roads

- Adequate road networks should be constructed and well maintained.
- Car bays should be provided to suit the tourists and lighting provisions to suit security.

Amenity

- Facility such as toilets and bins shall be suitably selected to suit the environmental impacts and well maintained

13.0 Implementation Plan

This final section of this Revitalisation Plan concentrates on the short term requirements for implementing infrastructure within the Foreshore Areas.

Due to the locality of the foreshore revitalisation areas, the Shire can bring on infrastructure works to any area without any dependence on other areas to support this. The areas are mutually exclusive.

Table 13.1 lists the actions recommended to progress the infrastructure for the Foreshore Revitalisation Areas. The timeframes for staging are as follows:

Table 13.1 Implementation Actions for Staged Infrastructure Development of the Town Centre.

Short Term - 0 to 6 months

Medium Term - 6 months to 1 year

Long Term - 1 year plus

No	Action	Lead Stakeholder and stakeholders	Staging	Comments
1	Field and Cadastral Survey	Shire of Exmouth	Short Term	Survey required for planning and engineering.
2	Secure Unallocated Crown Land for Public Purposes	Shire of Exmouth Department of Regional Development and Lands	Short Term	Shire needs to seek the necessary approvals (native title etc.) for existing areas of unallocated Crown Land within and adjacent the Town Centre to be secured for purposes identified in the Revitalisation Plan.
3	Design Guidelines	Shire of Exmouth	Short Term	Design guidelines should be prepared to guide development within the Town Centre.
4	Geotechnical Investigations	Shire of Exmouth	Short Term	Geotechnical advice required for infrastructure and structures.
6	Lighting Strategy	Shire of Exmouth Horizon Power	Medium Term	Shire should discuss the lighting options with the consultant team and any relevant stakeholders to prepare a strategy for the areas.
7	Beach Access Strategy	Shire of Exmouth	Medium Term	Shire to review current beach access locations and determine if these are to remain and any upgrades required.

14.0 Disclaimer

This report has been prepared from preliminary planning and informal discussions with service authorities. Information will be confirmed as the land use planning and detailed studies progress.

This report is JDSi's interpretation of the information provided.



Foreshore Revitalisation Plan
Infrastructure Report

APPENDIX A – DRAWINGS

100



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A REV DATE 22.2.12	SJM DRAWN	GPC CHECKED	APPROVED	ISSUED FOR COMMENT

JDSI
CONSULTING ENGINEERS
3/5 Tully Road, East Perth Western Australia 6004
P: (08) 9225 4110 F: (08) 9225 4121



CLIENT:
CITY OF EXMOUTH

PROJECT:
EXMOUTH TOWN CENTRE REVITALISATION

DRAWING TITLE:
EXMOUTH FORESHORE NEW TOWN BEACH

DRAWN S. MACLAREN DESIGNED G. COFFEY PROJECT MANAGER J. GRAY JDSI PROJECT No.: JDS11484	WAPC No. SCALE: A1 AS SHOWN DATUM AHD CO-ORDS DRAWING No C001 REVISION A
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<p>REV A 22.2.12 SJM GPC ISSUED FOR COMMENT</p>					<p>JDSI CONSULTING ENGINEERS 3/5 Tully Road, East Perth Western Australia 6004 P: (08) 9225 4110 F: (08) 9225 4121</p>					<p>PROJECT: EXMOUTH TOWN CENTRE REVITALISATION DRAWING TITLE: EXMOUTH FORESHORE TOWN BEACH UPGRADE</p>					<p>DRAWN: S. MACLAREN DESIGNED: G. COFFEY PROJECT MANAGER: J. GRAY JDSI PROJECT No.: JDS11484</p>					<p>WAPC No.: SCALE: A1 AS SHOWN DATUM: AHD CO-ORDS: DRAWING No.: C002 REVISION: A</p>				
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REV	DATE	DRAWN	CHECKED	APPROVED	ISSUED FOR COMMENT
A	22.2.12	SJM	GPC		ISSUED FOR COMMENT

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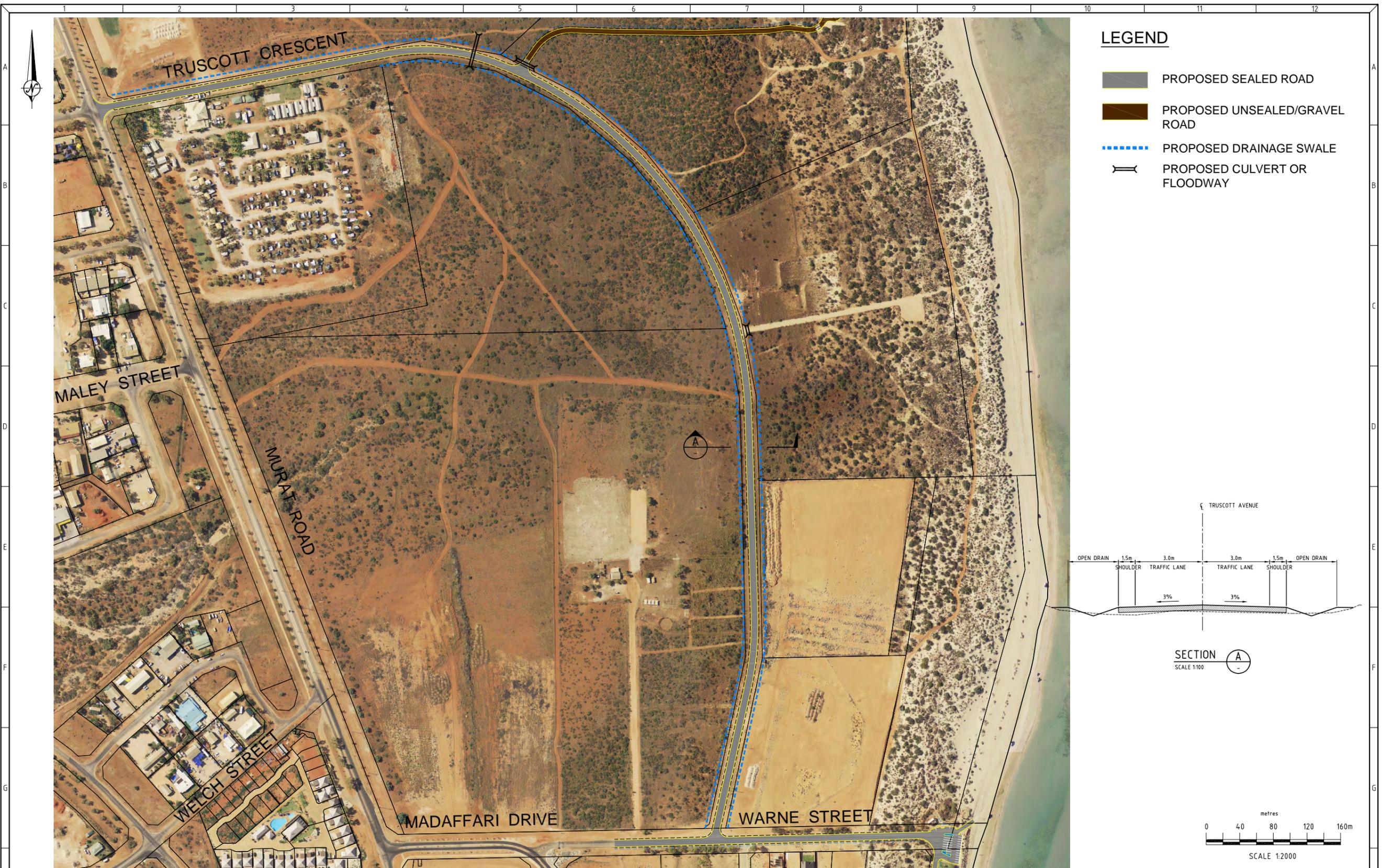
JDSI
CONSULTING ENGINEERS
3/5 Tully Road, East Perth Western Australia 6004
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CLIENT:

PROJECT:
**EXMOUTH TOWN CENTRE
REVITALISATION**

DRAWING TITLE:
**EXMOUTH FORESHORE
YACHT CLUB BEACH UPGRADE**

DRAWN S. MACLAREN	WAPC No.
DESIGNED G. COFFEY	SCALE: A1 1:500
PROJECT MANAGER J. GRAY	DATUM AHD
JDSI PROJECT No.: JDS11484	CO-ORDS C003
	REVISION A



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A	22.2.12	SJM	GPC		ISSUED FOR COMMENT

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CLIENT:



PROJECT:
**EXMOUTH TOWN CENTRE
REVITALISATION**

DRAWING TITLE:
**EXMOUTH FORESHORE
TRUSCOTT AVENUE STREETSCAPE
UPGRADE**

DRAWN S. MACLAREN	WAPC No.
DESIGNED G. COFFEY	SCALE AS SHOWN
PROJECT MANAGER J. GRAY	DATUM AHD
JDSI PROJECT No.: JDS11484	DRAWING No. C004
	REVISION A



NOTE: ALL UNMETERED SUPPLIES (Including CUSTOMER AND HORIZON POWER STREETLIGHTING ASSETS)

TYPE OF EQUIPMENT (POLES & LUMINAIRES HAWTHORN GREEN)	NO of UNITS	UNIT WATTAGE	TOTAL WATTAGE	DAILY HRS OPERATION	HP Asset Yes / No
12.5m HP STANDARD POLE + 3m SOR BRACKET WITH 250W STANDARD HPS LUMINAIRE	10	250W	2500W	DUSK/DAWN	YES
12.5m HP STANDARD POLE + 3m DOR BRACKET WITH 250W STANDARD HPS LUMINAIRES	24	2x250W	12000W	DUSK/DAWN	YES

NOTE: ALL UNMETERED SUPPLIES and STREETLIGHTS MUST BE INCLUDED IN DESIGN DRAWING

REV	DESCRIPTION	DATE	DRAWN	CHKD	REV	DESCRIPTION	DATE	DRAWN	CHKD
1	ISSUED TO CLIENT FOR COMMENT	19-03-12	BR	VH					

3E CONSULTING ENGINEERS PTY LTD
Electrical Engineering Excellence

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22 St George's Tce, Perth WA 6000
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Scale	1:2000	A1 Original Paper Size
Base File Date	21-02-2012	Design Date 21-02-2012
Designed	VH	Drawn BR
Checked	VH	Approved DLJ
Horizon Power Reference No.	TBA	WAPC No. TBA
Local Authority	SHIRE OF EXMOUTH	
Civil Consultant	JDSi	

EXMOUTH FORESHORE REVITALISATION EXMOUTH
MURAT ROAD INDICATIVE HP STANDARD LIGHTING LAYOUT

Sheet	01	3E Drawing Number	3E11176G-02	Revision	1
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REV	DESCRIPTION	DATE	DRAWN	CHKD	REV	DESCRIPTION	DATE	DRAWN	CHKD
1	ISSUED TO CLIENT FOR COMMENT	19-03-12	BR	VH					

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Checked	VH	Approved DLJ
Horizon Power Reference No.	TBA	WAPC No. TBA
Local Authority	SHIRE OF EXMOUTH	
Civil Consultant	JDSI	

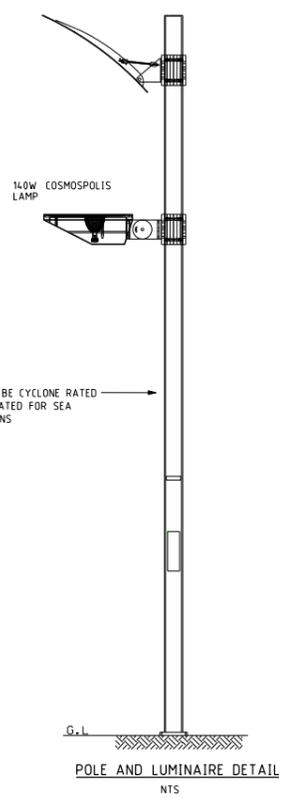
EXMOUTH FORESHORE REVITALISATION EXMOUTH
TRUSCOTT AVENUE INDICATIVE STANDARD HP LIGHTING LAYOUT

Sheet	Of	3E Drawing Number	Revision
1	1	3E11176G-03	1

- NOTES:**
1. ALL LIGHT POLE LOCATIONS ARE INDICATIVE ONLY. PURPOSE OF DRAWING IS TO SHOW INDICATIVE NUMBER OF LIGHTING POLES REQUIRED. POLE SPACING CALCULATED ACCORDINGLY TO SATISFY LIGHTING SUBCATEGORY P4 OF AS158
 2. ALL INFRASTRUCTURE ARE TO BE SURVEYED AND VERIFIED ON SITE
 3. LIGHTING LAYOUT ARE PRELIMINARY ONLY AND NOT FOR CONSTRUCTION USE

LEGEND

○ WE-EF 118-B210 REFLEKTA-D SOR WITH 6m REFLEKTA-SAIL POLE (140W) (POLES TO BE CYCLONE RATED)



NOTE: ALL UNMETERED SUPPLIES (Including CUSTOMER AND HORIZON POWER STREETLIGHTING ASSETS)

TYPE OF EQUIPMENT (POLES & LUMINAIRES)	NO of UNITS	UNIT WATTAGE	TOTAL WATTAGE	DAILY HRS OPERATION	HP Asset Yes / No
WE-EF 118-B210 REFLEKTA-D SOR WITH 6m REFLEKTA-SAIL POLE (140W)	38	140W	5320W	DUSK/DAWN	YES

NOTE: ALL UNMETERED SUPPLIES and STREETLIGHTS MUST BE INCLUDED IN DESIGN DRAWING

REV	DESCRIPTION	DATE	DRAWN	CHKD	REV	DESCRIPTION	DATE	DRAWN	CHKD
1	ISSUED TO CLIENT FOR COMMENT	19-03-12	BR	VH					

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Horizon Power Reference No.	TBA	WAPC No. TBA
Local Authority	SHIRE OF EXMOUTH	
Civil Consultant	JDSi	

EXMOUTH FORESHORE REVITALISATION EXMOUTH
TRUSCOTT AVENUE INDICATIVE REFLEKTA LIGHTING LAYOUT

Sheet	Of	3E Drawing Number	Revision
1	1	3E11176G-03	1

D

1.0 Executive Summary

This report has been prepared by JDSi to assist Hassell with the Exmouth Town Centre Revitalisation and Town Foreshore Revitalisation and alignment study.

Currently Exmouth has a stable permanent population in the order of 2,500 where existing infrastructure was largely constructed in conjunction with the original housing in the 1960s. The town's population expands during the tourist season and is enjoying growth from service companies supporting the offshore oil and gas industry.

Exmouth's service and infrastructure ownership includes the normal statutory owners being the Shire of Exmouth (SoE), Horizon Power, Water Corporation and Telstra

The key objectives of this report are to highlight:

- ▶ Existing infrastructure assets.
- ▶ Advice on infrastructure requirements for the revitalisation of the Exmouth Town Centre.
- ▶ Advice on potential staging of works.
- ▶ Preparation of preliminary estimates of construction costs.
- ▶ Advise on the implementation of key infrastructure requirements.

A key issue is that the services are all of c1960 in age and any changes may lead to wider upgrades to meet current servicing requirements, such as the replacement of aerial power with underground systems.

2.0 Introduction

Exmouth is 1,270 km north of Perth and is the largest town on the North West Cape of Western Australia. It existed as a small isolated town particularly growing during the Second World War and then was expanded under an arrangement between the State and Federal governments to support the communication facility. The Communication facility is a joint operation between the Australian and American governments.

The increasing popularity of the Ningaloo Marine Park is increasing the tourist and sightseeing traffic to the area. All this traffic accesses the marine park by travelling through Exmouth.

JDSi was engaged by Hassell who are the lead consultant to the Town Centre Revitalisation and Town Beach Integration study. JDSi was commissioned as the Project Teams' Civil Engineering Consultant.

This assessment provides an overview of existing and future servicing requirements to support the Exmouth Town Centre Revitalisation. It has been based on JDSi's observations, assessment of public information, assumptions and advice from our other partners in the Project Team and discussions with the various infrastructure stakeholders in Exmouth.

Refer drawing JDS11484-TC01 for Location of the Town Centre Study Area.

3.0 Geographical Characteristics

The Shire of Exmouth has a total land area of 6261 Square Kilometres.

The Town of Exmouth is located on the eastern side of the Cape Range which lies in a north south direction along the North West Cape.

On the western side of North West Cape lies the Ningaloo Marine Park.

The town is situated on the lower slopes of the Cape Range and is set back from the coast line of the Exmouth Gulf. The area immediately behind the coastal dunes becomes inundated with runoff from storms and is largely used for recreational activities. The town is impacted by rainfall events, usually cyclonic, which flow off the Cape Range very quickly and cause short term flooding on the several creek lines which pass through the town. The flooding has been extensively studied by Sinclair Knight Merz in conjunction with the Department of Water so that impacts and risks related to flooding can be understood and managed.

The ground conditions comprise a thin covering of sandy soil overlying generally sound limestone. This material provides a firm base for the water flow in the creek lines that prevents excessive scouring and washouts during storm events.

The nature of the limestone provides a sound building foundation, although harder to excavate, and the limited topsoil makes planting and landscaping harder than in other coastal areas with abundant sand layers.

4.0 Sewer

4.1 Current Situation

The Town Centre is currently serviced by a gravity sewer discharging to a DN225 sewer located in Murat Road. This sewer gravitates to the south and then east down Willesdorf Road. A short distance eastwards in Willesdorf Road lies the Exmouth Wastewater Treatment plant.

Existing sewer assets are generally located within road reserves and in alignments in private property. Alignments appear in most cases to be non standard when compared with current requirements. Most lots are served by sewers on alignments in the rear of properties.

Water Corporation owns and maintains the sewerage reticulation system in Exmouth including the Waste Water Treatment Plant. Some use is made of recycled water in the Town for watering recreational areas.

Water Corporations operating sewer license area currently includes the residential component of the Town site which includes the Town Centre Revitalisation area.

Refer drawing JDS11484-TC02 for the Existing Sewer Reticulation Plan.

4.2 Current Planning Town Site

The Water Corporation has advised that they will not be able to provide any advice in relation to the planning for the growth of Exmouth until land use planning is defined. Their current planning considers the town site growth on an annual rate of 2%; any substantial development would require a planning review.

4.3 Future Requirements

The Town Centre Revitalisation is not constrained by the existing sewer main capacities as any increment in commercial floor space generally only generates low additional sewage flows.

Any sewer mains that are, or become within lots following land use changes, may need to be relocated depending on the final growth plan adopted. Any relocation can be matched to the particular development.

5.0 Solid Waste Management

The town's landfill site is located approximately 5km south of the town site along Murat Road.

The landfill site is not constrained by space and has sufficient airspace for landfill operations to cater for the proposed commercial space growth.

6.0 Water Supply

6.1 Existing Situation

The supply of water and its treatment to potable quality is undertaken by the Water Corporation within their license area. The Water Corporations license area includes the town site and the town centre

The supply of water comes from a bore field situated on the western side of the town site with a connecting main to the town distribution system.

The Town site is reticulated from road reserves with water mains approximately on the standard Water Corporation alignments. Water distribution and reticulation mains are predominantly asbestos cement, and any adjustment would result in these being replaced with PE pipe materials.

Water Corporation has advised that they have undertaken minimal planning of the existing reticulation network with regard to expansion. The current Water License area covers the existing Town Centre so that services will have to be provided

6.2 Current Planning Town Site

The Water Corporation has advised that they will not be able to provide any advice in relation to the planning for the growth of Exmouth until land use planning is defined. Their current planning considers the town site growth on an annual rate of 2%; any substantial development would require a planning review.

6.3 Future Requirements

The Town Centre Revitalisation comprises relatively low water demand sites which will need to be individually addressed. To provide service an additional 150 DN looping main from the existing main near the intersection of Learmonth / Maidstone to the existing 150DN main in Payne Street may be required

Refer drawing JDS11484-TC03 for Town Centre Water Reticulation Plan

7.0 Power Supply

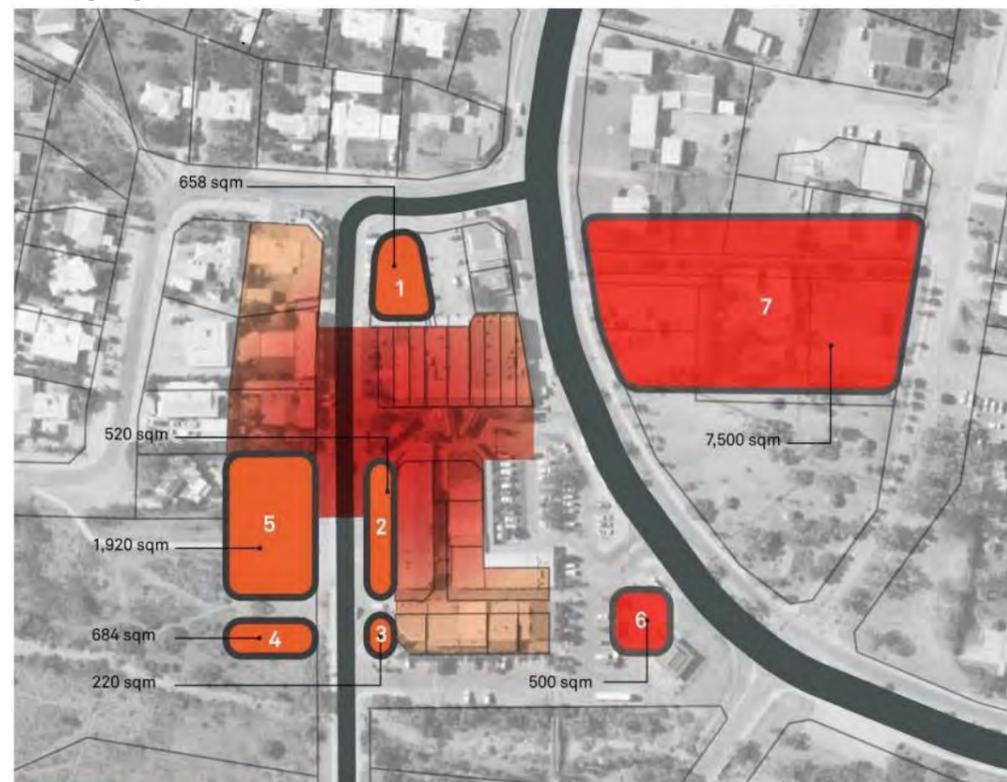
7.1 Introduction

Power is generated from a privately owned power station. This is operated by Worley Parsons under an agreement with Horizon Power as the distributing agency. Any significant increase in power demand is the subject of discussions between Horizon Power and Worley Parsons. Current power distribution is through aerial cables on poles made from railway line which appear to date from the construction of the town site. An increase in power demand may also entail an upgrade of the connecting infrastructure.

This information has been provided informally by officers of Horizon Power.

7.2 Town Centre Current Planning

The proposed revitalisation project consists of upgrades to roadways, creation of new road links, development of new landscape features and expansion of land usage within the Exmouth Town Centre. Areas where land usage can be expanded are highlighted below:



Medium Term Retail (potential floor area)	Longer Term Retail (potential floor area)
2,759 m ²	3,600 m ²
Total	6,359 m²

We understand that the new IGA complex (Site 7) with associated roadway and lighting upgrade is to be built within the next 3 years. The extension of the existing IGA Complex (Sites 1-3) with associated streetscape to Kennedy Street is to commence within 3 to 5 years. All remaining Revitalisation upgrade works is to follow equally within period of 5 to 15 years.

This report investigates the electrical site servicing infrastructure and advises of the network reinforcement works required. In order to investigate the technical constraints/requirements with the electrical services for the proposed Revitalisation development, the following key objectives have been addressed in this report.

- Existing Electrical Services and Power Distribution Network
- Likely Load
- Power Supply Scenario

7.3 Existing Electrical Services and Power Distribution Network

Based on information obtained from Horizon Power (HP) DFIS (Distribution Facilities Information System) and Feasibility Study Report, the existing Horizon Power HV distribution infrastructure in the vicinity of the sites comprises of three-phase 11kV high voltage (HV) aerial conductors along the western side of Payne Street (Feeder EX1) and eastern side of Kennedy Street (Feeder EX3). Horizon Power has advised that after running some basic modeling, each feeder appears to have the capability to supply another 1MVA without reinforcements subject to no other load connections prior this project. A full modeling assessment will need to be conducted to confirm this.

We understand that Site 1 currently consists of a car park with no electrical services. An existing pad mounted 500kVA transformer is located on the adjacent lot to the south. Sites 2, 3, 5 and 6 also comprises of car parks, with Site 4 as a vacant lot. Horizon Power low voltage (LV) overhead aerials currently running through Site 5 and consumer overhead aerials through proposed Sites 2 and 3. Within Site 7, there are a number of lots with each lot supplied by their own overhead consumer connections.

Please refer to the extracts of HP DFIS plans and the drawing [3E11176G-01 Exmouth Town Centre Revitalisation, Exmouth (Rev 2).pdf] in the attachments section of this report.

Street lighting of the Exmouth Town Centre consists of a mixture of overhead aerial lighting and underground powered street lighting. Heritage Green 12.5m poles have been erected in the last few years for the lighting of Murat Road and Maidstone Crescent southern intersection. There are Heritage Red street light poles within the town centre on Maidstone Crescent.

7.4 Load Assessment

The estimated After Diversity Maximum Demand (ADMD) loads for this development have been assessed based on the method defined in AS3000: Wiring Rules and are as follows:

	Orange Zone (Med. Term Retail)	Red Zone (Long Term Retail)
Potential Floor Area	2760	3600
Total Area	4000	8000
% Land Use	69	45

Orange Zone	Area	70% Usage	VA / m2	Estimated Load (kVA)
1	658	460.6	140 (1)	65
2	520	364	140 (1)	51
3	220	154	140 (1)	22
4	684	478.8	140 (1)	68
5	1920	1344	140 (1)	189
			Total	395

Red Zone	Area	45% Usage	VA / m2	Estimated Load (kVA)
1	500	225	140 (1)	31.5
2	7500	3375	140 (1)	472.5
			Total	504

(1) Based on 140VA/m2 for non-domestic installations (Retail shops)

It should be noted that Sites 4 and 5 may be fully utilised as car park areas and therefore the above loadings may not apply for these sites.

Based on the estimated load, location of the sites and proximity of each site to the main HV feeders (EX1 Lefroy Feeder & EX3 Kennedy Feeder), there are no constraints for staging. Where additional capacity is required, reinforcement upgrade works are needed on each HV feeder. Please refer to HV DFIS plan in the attachments section for level of reinforcement works required.

7.5 Power Supply Scenario

Horizon Power requires that all new developments be serviced by underground three phase power where three phase power is available. In a commercial development scenario, this would be by traditional HP owned and maintained URD 3-phase direct buried underground cabling from spare fuse way at the transformer's LV frame to Uni-pillars servicing each site on the general basis of one Uni-pillar serving each commercial lot. Where the customer's supply request exceeds 250 amp per phase, 3 phase, Horizon Power requires a transformer on site with the Site Main Switchboard to be contiguous (i.e. adjacent to the transformer site). This applies to Site 5 and 7 for the case where these sites are considered as single lots.

Due to the anticipated loads, it is unlikely that existing transformers in the vicinity will be capable of servicing these sites.

Horizon Power requires any existing HV and LV aerials or assets adjacent to or within the land being subdivided or amalgamated to be undergrounded. Along with this requirement, WA Electrical Requirements (WAER) also requires that each lot is to be serviced only by a single point of supply. Existing lots which are currently serviced by multiple points of supply do not need to satisfy this condition unless either one of their supply points is to be modified or upgraded.

The likely servicing scenarios for each site are as follows:

Site 1

- Upgrade existing pad mounted 500kVA transformer adjacent to site to 630kVA
- Upgrade transformer fuse on HV aerial network
- Install new Uni-pillar on Site 1
- Install new LV cable from upgraded transformer to new Uni-pillar
- Install new 2+1 HV Switchgear
- Underground LV & HV aerials through proposed mall
- Install new lighting through proposed mall

Site 2-6

- Install a new 2+1 HV Switchgear on Site 5 (to be supplied off EX3 Feeder)
- Install 630kVA non MPS transformer on Site 5
- Install new contiguous site main switchboard on Site 5
- Install new Uni-Pillar on Site 4 or 5 (If site is dedicated to car park)
- Install new Uni-pillars on Sites 2-4 & 6
- No pillar required on Site 4 if Site 4 & 5 is considered as one single lot, power has been installed on site 5 and both sites are dedicated for car park use
- Install new LV cable from transformer on Site 5 to new Uni-pillars on Sites 2-4 & 6
- Remove overhead consumer connections to Lots adjacent Sites 2 & 3
- Install new Uni-pillars for lots adjacent to Sites 2 & 3 and reconnect consumer mains
- Underground HV aerials adjacent to Site 2 & 3 with the use of Switchgear on Site 5
- Underground LV aerials running through proposed Site 5 and resupply existing consumer connections as required
- Install new streetlights for new Road Link of Learmonth Street and Kennedy Street
- Remove LV aerials on Maidstone Crescent adjacent to Site 6
- Relocate/replace street lighting on Maidstone Crescent to suit amended Road Link
- Upgrade lighting of Thew Street

Site 7

- Install a new 2+1 HV Switchgear on Site 7 adjacent to Payne Street (to be supplied by either EX1 feeder)
- Install 630kVA non MPS transformer on Site 7
- Install new contiguous site main switchboard on Site 7
- Remove existing overhead consumer connections
- Underground HV aerials on Payne Street adjacent to Site 7 to suit new link road
 - Install HV switchgear in Federation Park to assist underground of HV aerials
 - Resupply HV network on Bonefish Street
- Remove LV aerials (from Christie Street) running through proposed link road of Payne Street
 - Resupply LV connections as required
- Install Uni-pillar on Federation Park
 - Install LV cable & Supply Uni-pillar from new transformer on Site 7

Maidstone Crescent & Payne Street Upgrade

- Relocate/replace existing street lighting to suit new road layouts
- Realign/relocate/underground existing aerial network to suit new road layouts

Bonefish Street and Thew Street Upgrade

- Upgrade existing lighting to suit new road layouts

Assumptions and Exclusions

More certainty with respect to Horizon Power capacity could be readily determined by the application to and provision of a Design Quotation Application (DQA) from HP at the time of development. Horizon Power does not provide the option of reserving spare capacity in their network and therefore capacity is utilised on a first come first serve basis.

Each Site has been considered as a separate single lot. Power calculations and upgrade requirements have been considered on this basis. More accurate

assessment can be made once Lot Boundaries and Road Layouts have been defined / confirmed.

7.6 Lighting Options

Street lighting of the Exmouth Town Centre currently consists of a mixture of overhead aerial lighting and underground powered street lighting. Heritage Green 12.5m poles complete with High Pressure Sodium (HPS) luminaires have been erected in the last few years for the lighting of Murat Road and Maidstone Crescent southern intersection. There are Heritage Red streetlight poles within the town centre on Maidstone Crescent. The township redevelopment creates an opportunity to replace existing streetlights with alternative solutions such as LED and solar lighting. Pros and Cons of these alternative solutions are explored below.

Solar LED Lighting	
Pros	Cons
No Power Bills	Very high initial costs
Low maintenance	High vandal and theft concerns
No trenching and cabling between poles	Lights cannot be located in shaded areas
Operational during power blackouts	Battery related flood concerns
Longer lamp life (up to 5 years)	Battery replacement every 8-10 years
Environmental advantages	

LED Street Lighting	
Pros	Cons
Low maintenance	Slightly higher initial costs
Less power usage	
Longer lamp life (up to 5 years)	
Environmental advantages	Battery related flood concerns

Alternative lighting solutions utilised on road reserve will be considered as private lighting by Horizon Power and therefore will need to be owned and maintained by the Shire.

For slightly higher initial cost compared to Horizon Power standard street lighting, consideration should be given for the utilisation of LED lighting within public open spaces and street lighting. Given the high initial costs and proximity of existing power infrastructure, Solar LED lighting will not be as cost effective as distribution connected lighting.

8.0 Gas Supply

Alinta Gas has advised that there is no gas network available for the Town of Exmouth.

9.0 Telecommunications

9.1 Existing Situation

Exmouth is primarily serviced by fibre optic cable in the Exmouth Road (Murat Road) reservation and mobile service. The Town site is reticulated with both fibre optic and cable.

Telstra have advised that the current communications system is performing within specified requirements. The system has the necessary capacity to manage the projected 2% per annum growth. Any large development of an area may require some upgrades and Telstra believe that early advice of these projects would enable them to carry out any necessary upgrades and maintain services.

Refer drawing JDS11484-TC06 for existing Telstra Services.

9.2 Current Planning

As part of the investigation processes for the Town Centre Revitalisation, Telstra have been made aware of the Town Site and Town Centre's future growth plans.

Telstra has completed a desktop network planning study based on the advised growth and while results may vary following field data investigations the network is capable of managing the likely demand.

9.3 Future Requirements

Existing Telstra assets are currently on various alignments. As staged works progress in the Town Centre, Telstra alignments and service points may need to be relocated. Planning for this work can only proceed once land uses and land planning has been completed.

10.0 Roads and Footpaths

10.1 Existing Situation

Roads are owned and maintained by the Shire of Exmouth.

The majority of the roads within the Town Centre are typically sealed and kerbed. All roads are in average condition. Any new roads or upgrades will require to be constructed to similar standards as existing.

Pedestrian pathways within the Town Centre are typically in-situ grey concrete broom finish paths. Within the existing mall area two types of footpath have been constructed, one a segmental pavement using brick paving, and one using a locally mixed light colour concrete. The opinion expressed was that the light concrete provides easier cleaning and maintenance than the masonry blocks. Cleaning and appearance is an important consideration in the road infrastructure.

Refer drawing JDS11484-TC04 for Town Centre Road Layout Plan.

10.2 Current Planning

There is no current planning for new road networks or upgrades except for works devised during the Town Centre Revitalisation Planning.

10.3 Future Requirements

Roads will need to be constructed in accordance with the IPWEA Subdivision Guidelines and in conjunction with the Shire of Exmouth [Guidelines and Standards] Road widths will be derived in accordance with the planning layout and traffic requirements. Footpaths may also be required in accordance with the guidelines from the Department for Planning and Infrastructure.

The Shire Officers are keen to have good quality footpaths, particularly around the Town centre commercial area. A preference was expressed for the use of the locally mixed light colour aggregate concrete. This provides an acceptable finish and appearance and will be considered during detail design.

In consultation with the project team and the Shire of Exmouth representatives, the following road and car park construction works areas are proposed:

- Construction of the new Payne Street link to the north and east of the aquatic centre from Maidstone Crescent to existing Payne Street. Existing Payne Street between Federation Park and aquatic centre to be closed and pavements removed. On street parking to be maximised as per road plan.
- Construction of a new southern link road from Maidstone Crescent to Kennedy Street and finishing at Learmonth Street. This will see the need for

the Town Creek to be realigned to the south west of Kennedy Street to accommodate this new road link.

Bonefish Road will need to be closed at the Town Creek crossing. All pavements and drainage structures will need to be removed and the creek rehabilitated to natural levels.

On Street parking will be maximised to the east of Kennedy Street along new road link.

- Maidstone Crescent to be merged to its eastern carriageway and median removed between the new southern link road and the Learmonth Street intersection. The western carriageway pavements to be removed and area rehabilitated. On street parking will be maximised.
- A northern link road and laneway between Maidstone Crescent and Payne Street. On street parking will be maximised along the new link road.
- Roundabouts are proposed at the Murat Road and Maidstone Crescent intersections.
- A new western car park to be constructed the west of the shopping centre and north of the new southern link road. The new car park will include accommodation for approximately 15 long vehicle bays. Existing pedestrian links will be maintained.
- The existing car bays to the east of the shopping centre off Maidstone Crescent will be redesigned and reconstructed allowing for more formalised and motorist / pedestrian friendly parking.
- A car park to be constructed between Bonefish Street and the Town Creek. Pedestrian links will need to be maintained to the Towns shopping area.
- The current road plans show streetscapes and on road car parking improvements along Maidstone Crescent and Payne Street. It is envisaged these works will occur as required, as the Town Centre develops.

11.0 Drainage

11.1 Existing Situation

The existing Town is drained through a combination of culvert networks, open drains and creek lines. These connect to open drains which are natural creek lines that discharge into the low lying area behind the dunes along the Exmouth gulf coast. Some sections of these creek lines remain in their original condition although the majority have been modified through realignment and widening/deepening to suit development and increase capacity.

Rainfall events have led to flooding in parts of the Town Site and this has been extensively modelled by the Department of Water (DoW) and Sinclair Knight Merz (SKM). The resulting report identifies the extent of flooding for various storm events and return periods.

The Shire of Exmouth have commissioned Cardno Consultants to examine the drainage systems and to give advice on improvement works to reduce the time that sections of the town are threatened by floodwaters. Cardno are currently working on this study.

Isolated flooding occurs in the Town Centre following storm and cyclone events. Flooding occurs along the creek line next to Thew Street and in Bennett Street with surface flows from the drainage off the Hospital site affecting some commercial properties. The extent of the flood plain and flood fringe is shown on the drainage drawing and has been extracted from the DoW / SKM report.

Stormwater Flows generated in the creek line north of Snapper Loop and south of Reid Street carry the remainder of the stormwater flows around the central town area.

11.2 Current Planning

There is no current planning for new drainage works or upgrades except for redevelopment works resulting from the Town Centre Revitalisation study and the outcomes of the Cardno drainage analysis.

11.3 Future Requirements

It is proposed to continue with the development of the Town Centre adopting existing practices utilising roadways and open drains for the majority of any stormwater conveyance.

The following Design Criteria is proposed to be adopted:

- Piped drainage system to accommodate 1 in 5 year ARI rainfall events.
- Open drain system to accommodate a minimum of 1 in 10 Year ARI rainfall events.
- Road culvert crossings to be designed to accommodate a minimum of 1 in 10 year ARI rainfall events.
- Overland flood paths are to be established to accommodate 1 in 100 year events and new properties are to be elevated to be protected from this event.

For the implementation of the Town Centre Revitalisation Plan the following drainage upgrades are recommended:

- Upgrade of the Kennedy Street Town Creek crossing. Due to the proximity to public use amenities it is recommended to design the culvert crossing to accommodate 1 in 25 year ARI rainfall events.

Kennedy Street would be required to be designed to direct flows towards the Town Creek and reduce existing inundation to the south of the shopping centre. The culvert crossing will be designed to accommodate overtopping during more serious rainfall events.

Culvert sizes will need to take into consideration the minimum cover on site.

- Maintain the over land flow path from Exmouth Hospital down Learmonth Street.
- Reduce existing flood prone area at the Learmonth Street / Maidstone Crescent intersection via directing the stormwater into a new open drain on the east side of Maidstone Crescent.

This new open drain will be designed to accommodate a minimum of 1 in 10 year ARI rainfall events. The drain will be directed down the north side of Federation Park and into a new culvert crossing at Payne Street. Additional culvert crossings will be required for future driveways from Maidstone Crescent.

The provision of the new open drain will remove the need for an overland drainage route down the proposed laneway between Maidstone Crescent and Payne Street. This will allow for improved interface between the two proposed super lots.

The new culvert crossing at Payne Street will be designed to accommodate a minimum of 1 in 10 year ARI rainfall events. The existing undersized culvert crossing at Payne Street is to be removed.

Provisions will need to be made for the other major events i.e. Building levels above 1 in 100 year flood level freeboard requirements, shaping POS to direct larger flows.

- Consideration should be given to reducing the restraints within Town Creek by removing the existing culvert structures at Bonefish Street and re-establishing natural creek levels.
- Current overland flood paths are to be maintained or new flood paths created.

Refer drawing JDS11484-TC05 for the Town Centre Drainage Plan.

12.0 Staging and Construction Implications

12.1 General Approach

The revitalisation of the Town Centre is achievable by progressively building on the existing lots and road layout. The proposed works can be constructed in a variety of sequences to suit associated commercial activity, community preferences, and available funding. This flexibility is unique amongst revitalisation projects as it provides a wide range of choice without other service constraints.

Provisions for potable water, sewer, power and communications will be installed as required during construction of the staged works areas. No major servicing extensions or upgrades were identified in the Town Centre Revitalisation investigations.

The most crucial service element is the electric power supply and street lighting circuits which will be placed underground in accordance with current authority criteria. As a minimum this will require a design plan and the building of conduits under any pavements being constructed to avoid later disturbance of newly constructed works. Major power infrastructure items such as transformers will be designed to be implemented as developer funded items where possible.

Existing pedestrian pathway networks will be required to be maintained during all stages of works. Temporary pathways will be made available for public use where construction impacts on these existing networks. Permanent pathways will be included in all stages of works.

Refer drawing JDS11484-TC07 for Town Centre Staging Plan

12.2 Stage 1 □ New Southern Link

Construction of a new southern link road includes the following infrastructure:

- Roadworks
New southern link road from Maidstone Crescent to Kennedy Street to Learmonth Street.
- Town Creek Realignment
To accommodate the new road link between Learmonth Street and Kennedy Street the Town Creek will need to be realigned. This section of road will be staged after completion of these works.
- Drainage
Major Town Creek culvert crossing under Kennedy Street. The existing Bonefish Road creek crossing will ultimately be required to be removed. Staging of this works will only occur once the new Kennedy Street culvert crossing has been completed and opened for public use.
- Car park
The upgrade of existing off street car parking and additional on street parking. Timing of construction works within this contract will need to be managed in order to meet public car parking requirements.

12.3 Stage 2 □ Upgrade of Maidstone Crescent

- Roadworks
Maidstone Crescent to be upgraded between the new southern link road and the Learmonth Street intersection to suit the Town Centre Master planning.
- Drainage
Open drain and driveway culverts to be constructed as required.
- Car Park
The upgrade of existing off street car parking and additional on street parking. Timing of construction works within this contract will need to be managed in order to meet public car parking requirements.

- **Water Reticulation**
Installation of a DN150 water main extension may be required to provide diversity in the immediate water reticulation network.

12.4 Stage 3 and 4 □ Upgrade of Federation Park and New Payne Street Link

- **Roadwork**
Construction of the new Payne Street link including on street parking to the north and east of the aquatic centre.
- **Drainage**
Open drain and culvert crossing.

12.5 Stage 5 - Kennedy Street Partial Mall

- **Roadwork**
This Revitalisation Plan recognises the Shire's desire for a mall as part of Kennedy Street. The existing street layout could be modified to create a part mall against the existing commercial premises on the west side. There is a fall across the road reserve which would permit a small retaining wall to divide the mall/pedestrian zone and the trafficked zone. This creates a mall area approximately 9 metres wide which could have planting and seating improvements to make a community area. The trafficked section can also be closed for special events such as street market days. In our opinion this should not be fully closed until the Thew Street / Learmonth Street connecting road is constructed to create a functional traffic movement around the Town Centre.

12.6 Stage 6 □ Northern Road Link and Laneway

- **Roadwork**
A northern link road and laneway between Maidstone Crescent and Payne Street to be constructed. On street parking will be maximised along the new link road.
- **Drainage**
Existing open drain can be reclaimed for other use due to redirection of overland flows through Federation Park.

12.7 Stage 7 □ Bonefish Street Car Park

- **Roadwork**
New long vehicle car park off Bonefish Road. This stage is unconstrained and not reliant on any other staged works and can be completed as required by the Shire.

12.8 Stage 8 □ Western Car Park

- **Car Park**
A new western car park to be constructed the west of the shopping centre and north of the new southern link road.

12.9 Stage 9 - Creation of an Entry Identity.

- **Roadwork**
To meet the advised concern that motorists driving on Murat Road do not easily recognise the location of the Town Centre various ideas such as intersection upgrades and signage were considered. The simplest way may be the creation of an entry type location at the intersection of Murat Road and Maidstone Drive. It is proposed that these intersections are roundabouts.

As the main approach traffic direction was seen to be from the south it is proposed to enhance the southern intersection only at this stage. The southern intersection is also in the vicinity of pedestrian movements across Murat Road to the recreation facilities on the east side of the road. The intersection has the space to include entry walls with signage or motif possibly selected using a public competition process.

The northern intersection could also be similarly treated and this can be a separate decision.

This stage is unconstrained and not reliant on any other staged works and can be completed as required by the Shire.

13.0 Implementation Plan

This final section of this Revitalisation Plan concentrates on the short term requirements for implementing infrastructure within the Town Centre.

The intention is to build the works at a rate that encourages town site development and the ongoing upgrading of existing privately owned commercial buildings. The nature of the individual work items is such that a large degree of flexibility exists in building the works, and that some items can be completed ahead of other parts while making a continuous improvement.

Table 15.7 lists the actions recommended to progress the infrastructure for the staged development of the Town Centre. The timeframes for staging are as follows:

Table 15.7 Implementation Actions for Staged Infrastructure Development of the Town Centre.

- Short Term - 0 to 6 months*
- Medium Term - 6 to 1 year*
- Long Term - 1 year plus*

No	Action	Lead Stakeholder and stakeholders	Staging	Comments
1	Field and Cadastral Survey	Shire of Exmouth	Short Term	Survey required for planning and engineering.
2	Secure Unallocated Crown Land for Public Purposes	Shire of Exmouth Department of Regional Development and Lands	Short Term	Council needs to seek the necessary approvals (native title etc.) for existing areas of unallocated Crown Land within and adjacent the Town Centre to be secured for purposes identified in the Revitalisation Plan.
3	Design Guidelines	Shire of Exmouth	Short Term	Design guidelines should be prepared to guide development within the Town Centre.
4	Geotechnical Investigations	Shire of Exmouth	Short Term	Geotechnical advice required for infrastructure and structures.
5	Sewer and Water Strategy	Shire of Exmouth Water Corporation	Medium Term	Council should prepare a submission to the Water Corporation supported by a civil engineering feasibility and costing, based on staged implementation.
6	Power and Lighting Strategy	Shire of Exmouth Horizon Power	Medium Term	Council should prepare a submission to Horizon Power supported by a civil engineering feasibility and costing, based on staged implementation.

14.0 Disclaimer

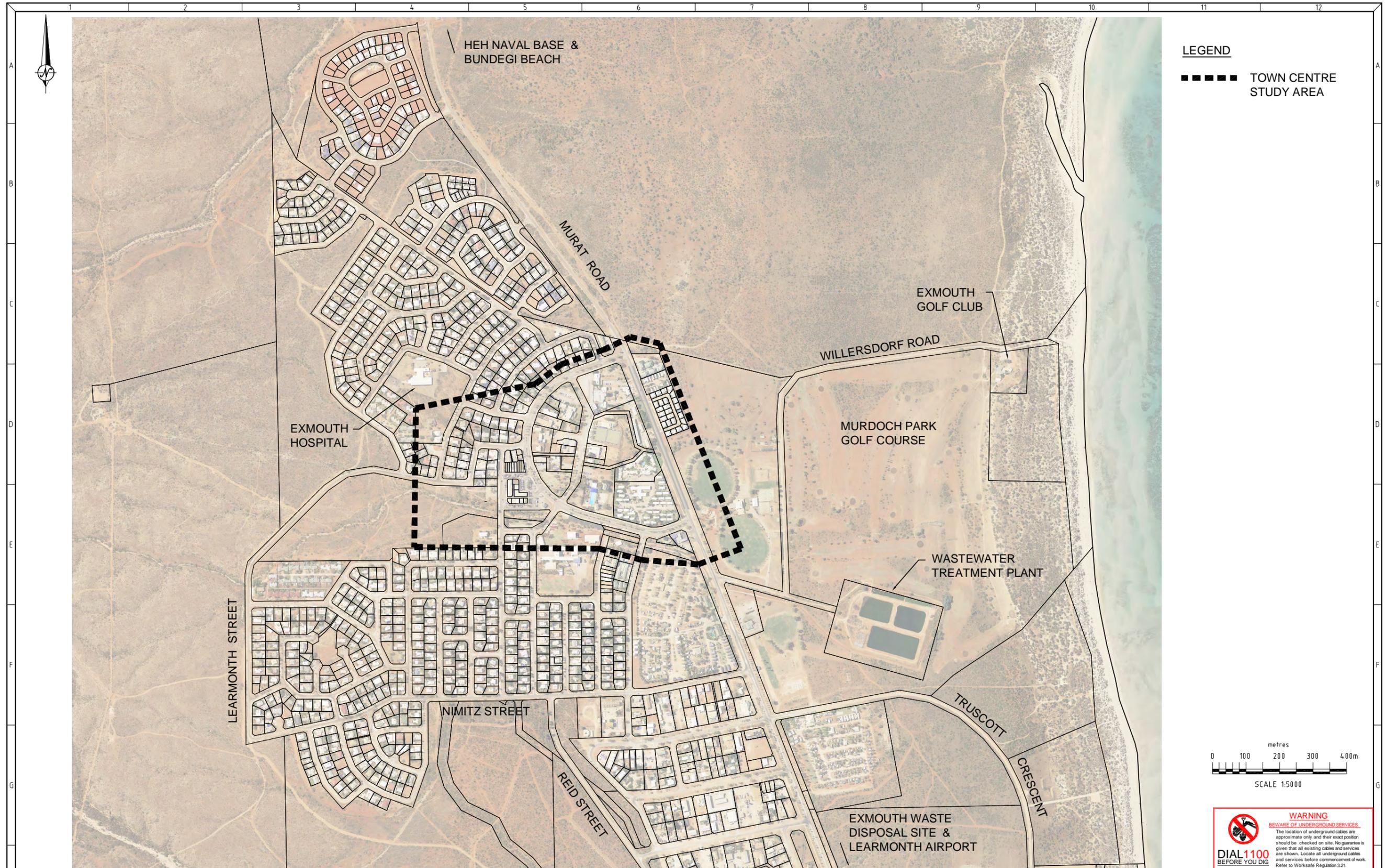
This report has been prepared from preliminary planning and informal discussions with service authorities. Information will be confirmed as the land use planning and detailed studies progress.

This report is JDSi's interpretation of the information provided.

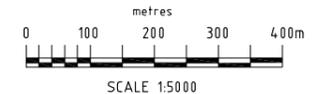


Exmouth Revitalisation Plan
Infrastructure Report

APPENDIX A □ DRAWINGS



LEGEND
 TOWN CENTRE STUDY AREA



WARNING
BWARE OF UNDERGROUND SERVICES
 The location of underground cables are approximate only and their exact position should be checked on site. No guarantee is given that all existing cables and services are shown. Locate all underground cables and services before commencement of work. Refer to Worksafe Regulation 3.21.
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REV	DATE	DRAWN	CHECKED	APPROVED	DESCRIPTION
A	14.3.12	SJM	JHG		ISSUED FOR REPORT

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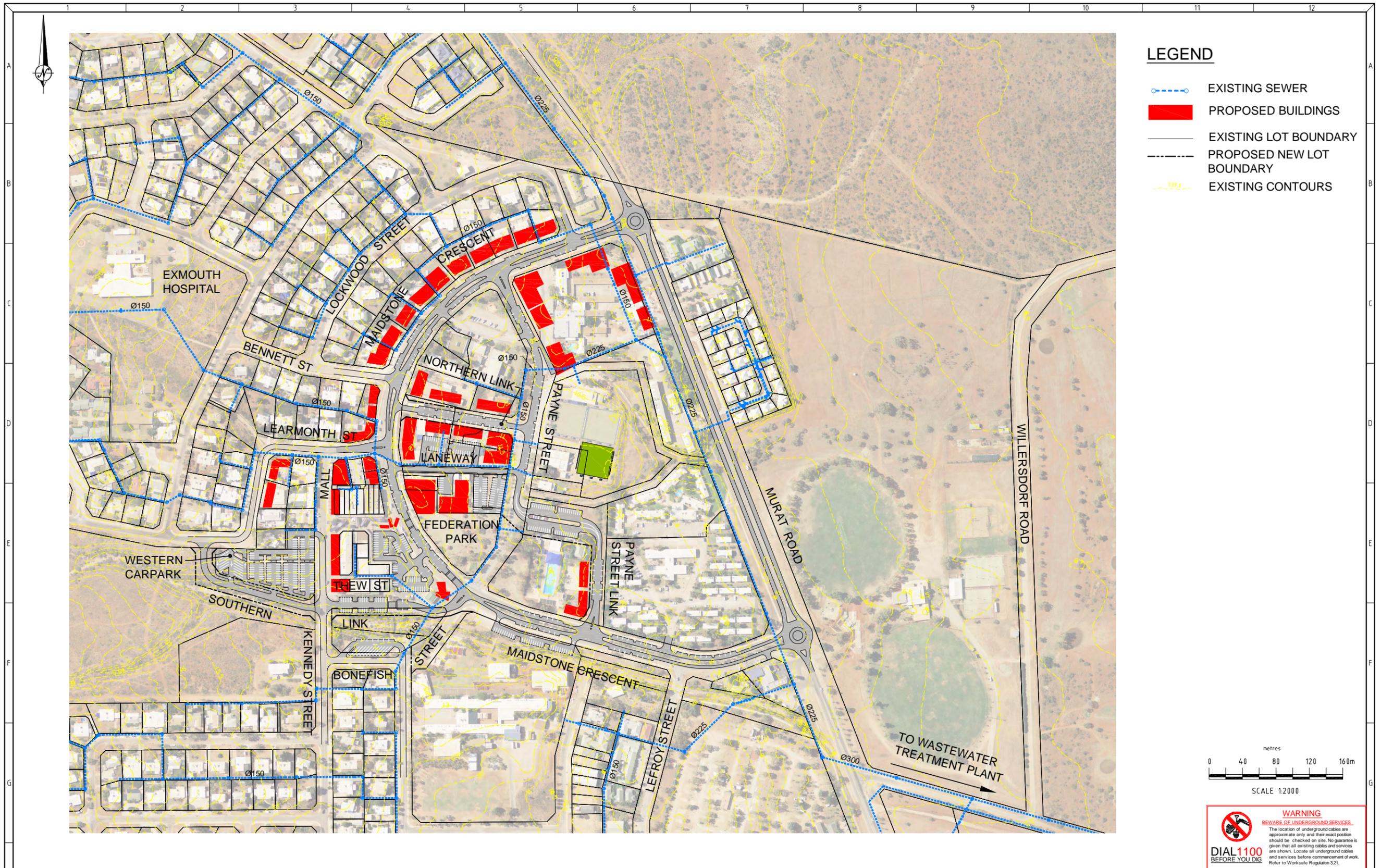
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CLIENT:
SHIRE OF EXMOUTH

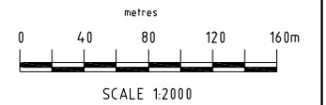
PROJECT:
EXMOUTH TOWN CENTRE REVITALISATION
 DRAWING TITLE:
EXMOUTH TOWN CENTRE LOCALITY PLAN

DRAWN S. MACLAREN	WAPC No.
DESIGNED -	SCALE A1 1:5000
PROJECT MANAGER B. KEAY	DATUM AHD
JDSI PROJECT No.: JDS11484	DRAWING No. TC01
	REVISION A



LEGEND

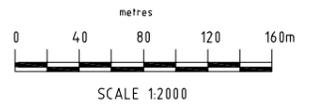
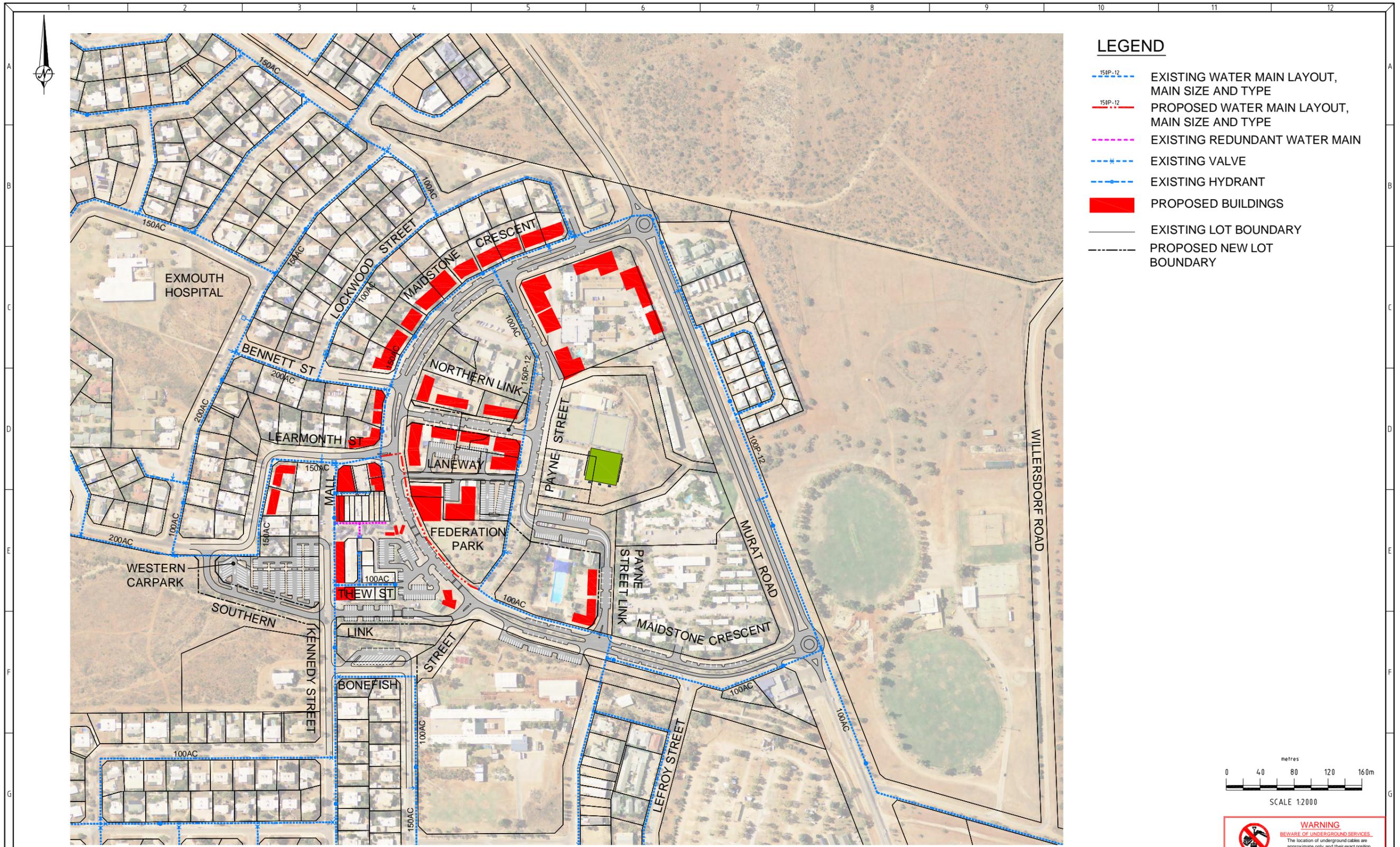
- EXISTING SEWER
- PROPOSED BUILDINGS
- EXISTING LOT BOUNDARY
- PROPOSED NEW LOT BOUNDARY
- EXISTING CONTOURS



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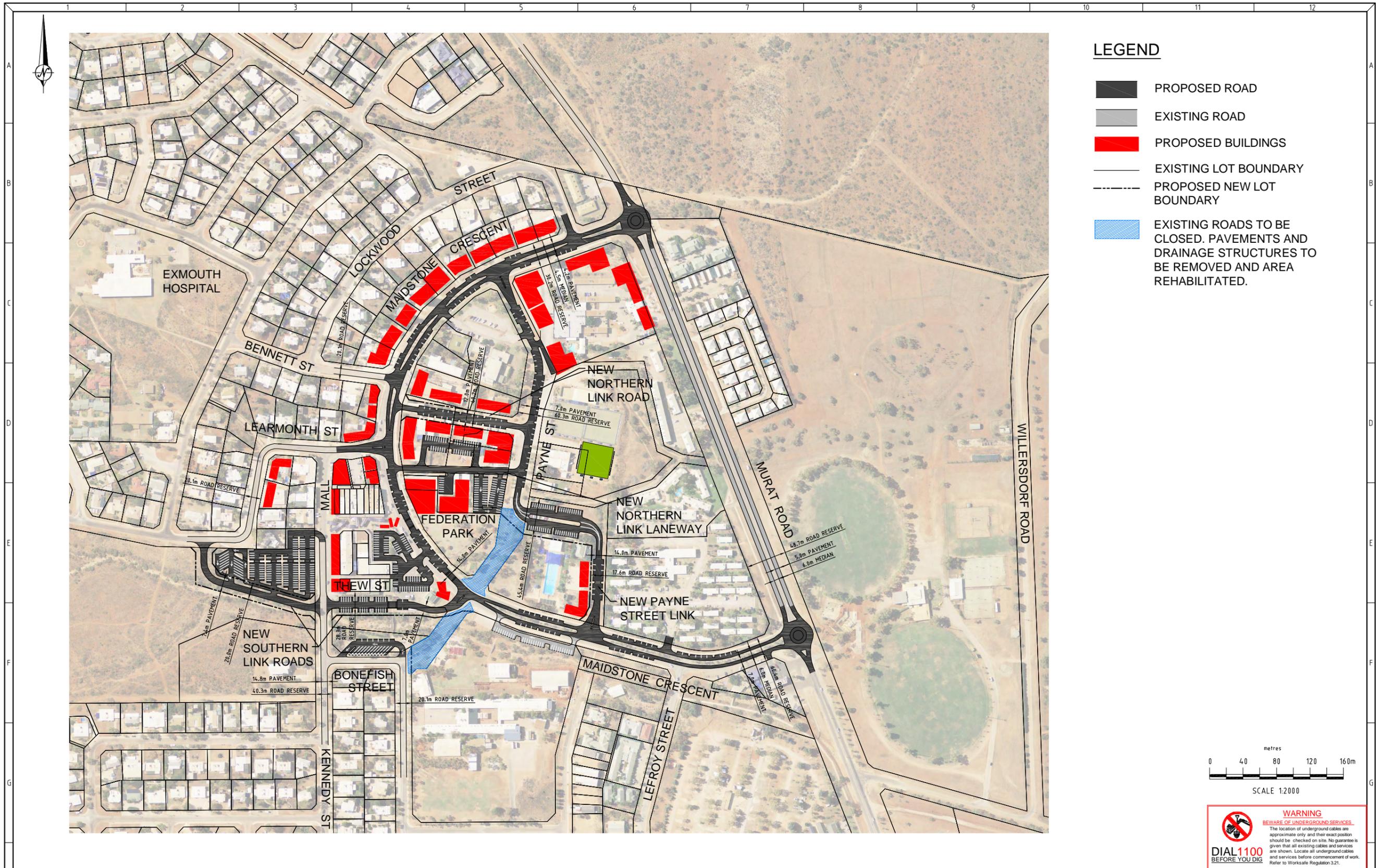
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<p>NOTE: This drawing shall be preliminary only until it is issued for construction. Certified Quality System to ISO 9001</p>					<p>PROJECT TITLE: EXISTING SEWER RETICULATION PLAN</p>					<p>DESIGNED: -</p>		<p>SCALE: A1 1:2000</p>		<p>PROJECT MANAGER: B. KEAY</p>		<p>DATUM: AHD</p>		<p>CO-ORDS</p>			
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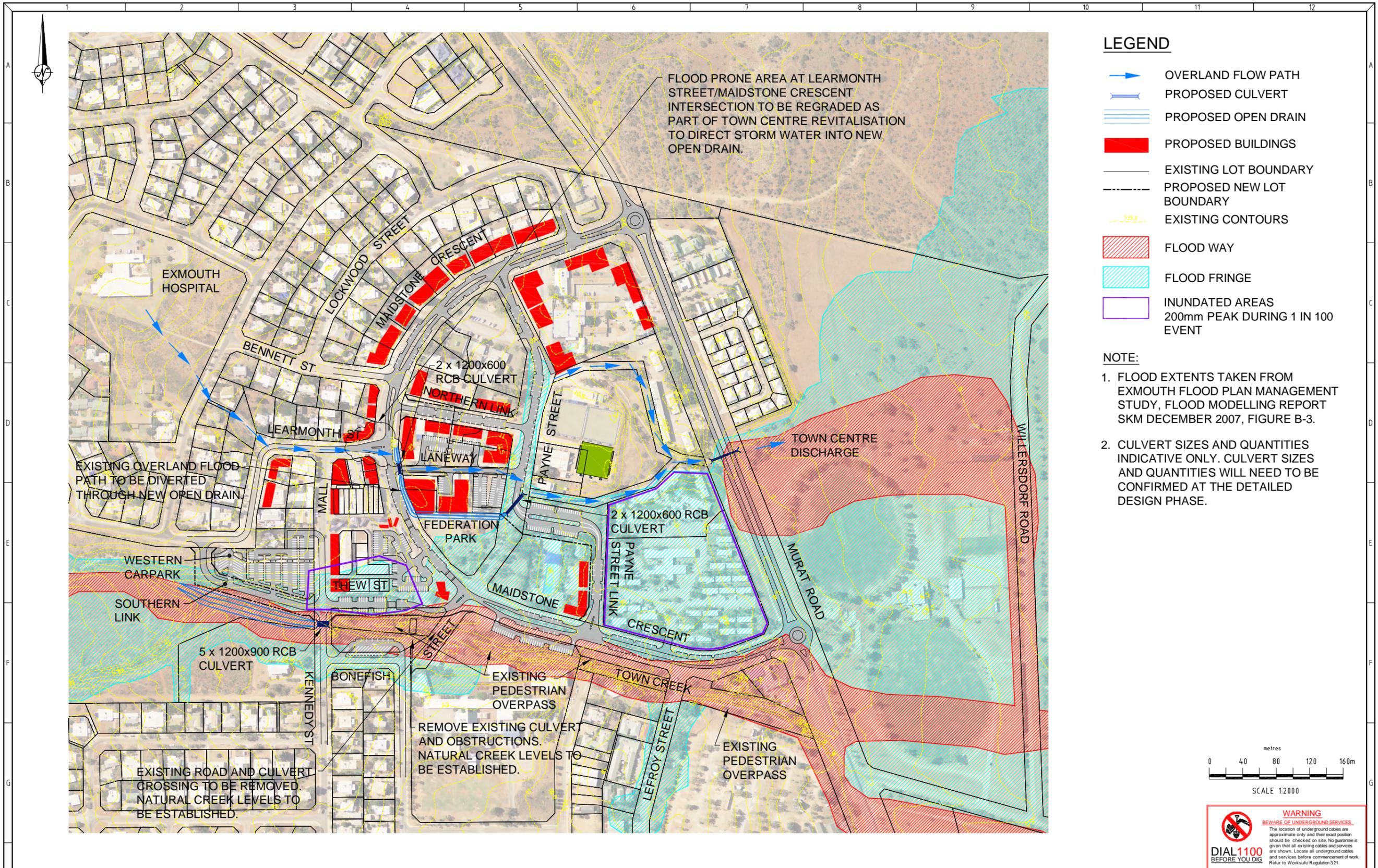
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<p>PROJECT TITLE: ROADS LAYOUT PLAN</p>				<p>PROJECT MANAGER: B. KEAY</p>		<p>DATUM: AHD</p>		<p>CO-ORDS</p>		<p>DRAWING No. TC04</p>		<p>REVISION A</p>	
<p>JDSI PROJECT No.: JDS114.84</p>				<p>3/5 Tully Road, East Perth Western Australia 6004 P: (08) 9225 4110 F: (08) 9225 4121</p>		<p>JDSI</p>		<p>CONSULTING ENGINEERS</p>		<p>DIAL 1100 BEFORE YOU DIG</p>		<p>WARNING BEWARE OF UNDERGROUND SERVICES The location of underground cables are approximate only and their exact position should be checked on site. No guarantee is given that all existing cables and services are shown. Locate all underground cables and services before commencement of work. Refer to Worksafe Regulation 3.21.</p>	

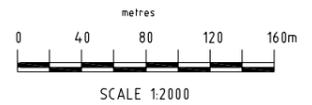


LEGEND

- OVERLAND FLOW PATH
- PROPOSED CULVERT
- PROPOSED OPEN DRAIN
- PROPOSED BUILDINGS
- EXISTING LOT BOUNDARY
- PROPOSED NEW LOT BOUNDARY
- EXISTING CONTOURS
- FLOOD WAY
- FLOOD FRINGE
- INUNDATED AREAS 200mm PEAK DURING 1 IN 100 EVENT

NOTE:

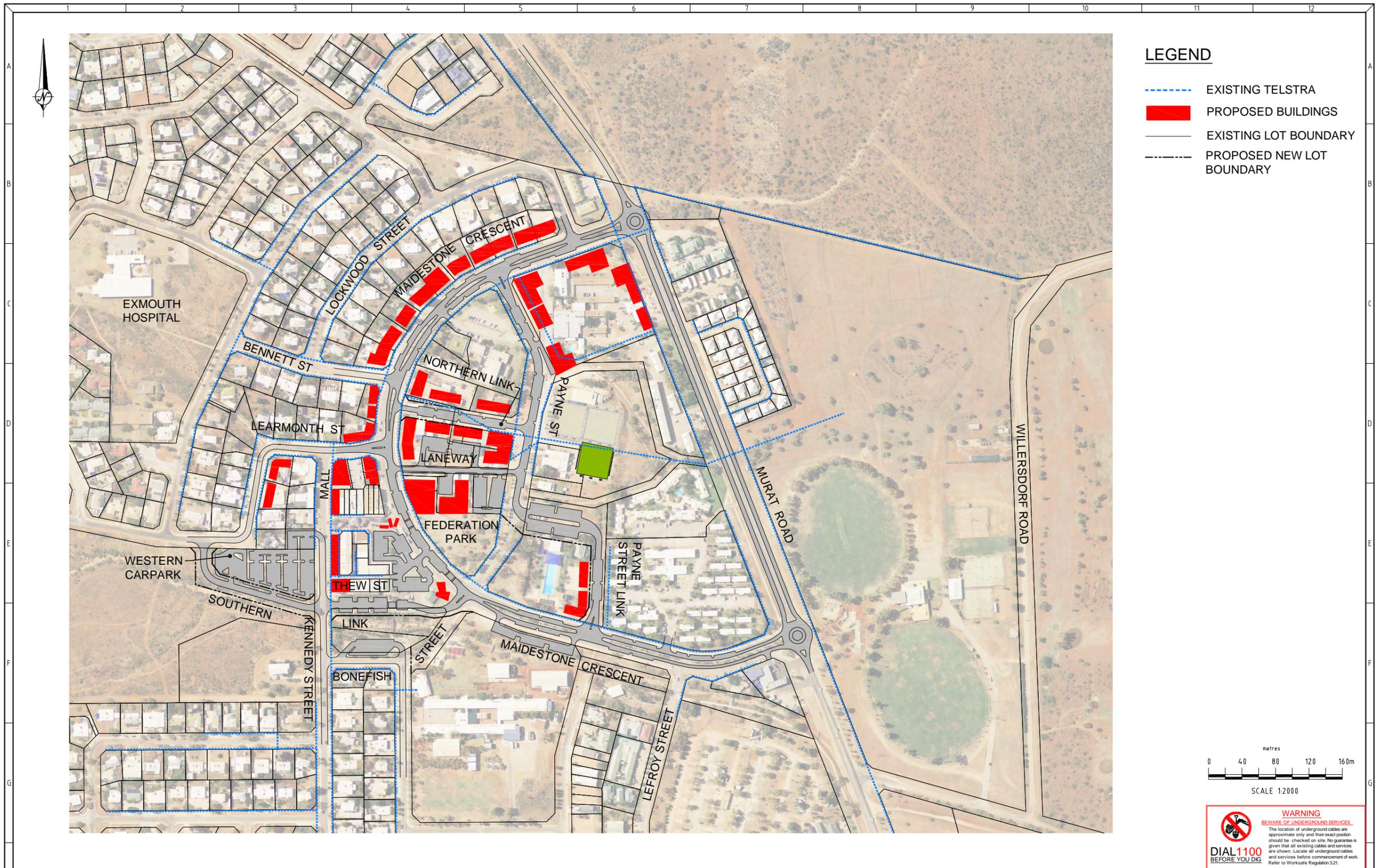
1. FLOOD EXTENTS TAKEN FROM EXMOUTH FLOOD PLAN MANAGEMENT STUDY, FLOOD MODELLING REPORT SKM DECEMBER 2007, FIGURE B-3.
2. CULVERT SIZES AND QUANTITIES INDICATIVE ONLY. CULVERT SIZES AND QUANTITIES WILL NEED TO BE CONFIRMED AT THE DETAILED DESIGN PHASE.



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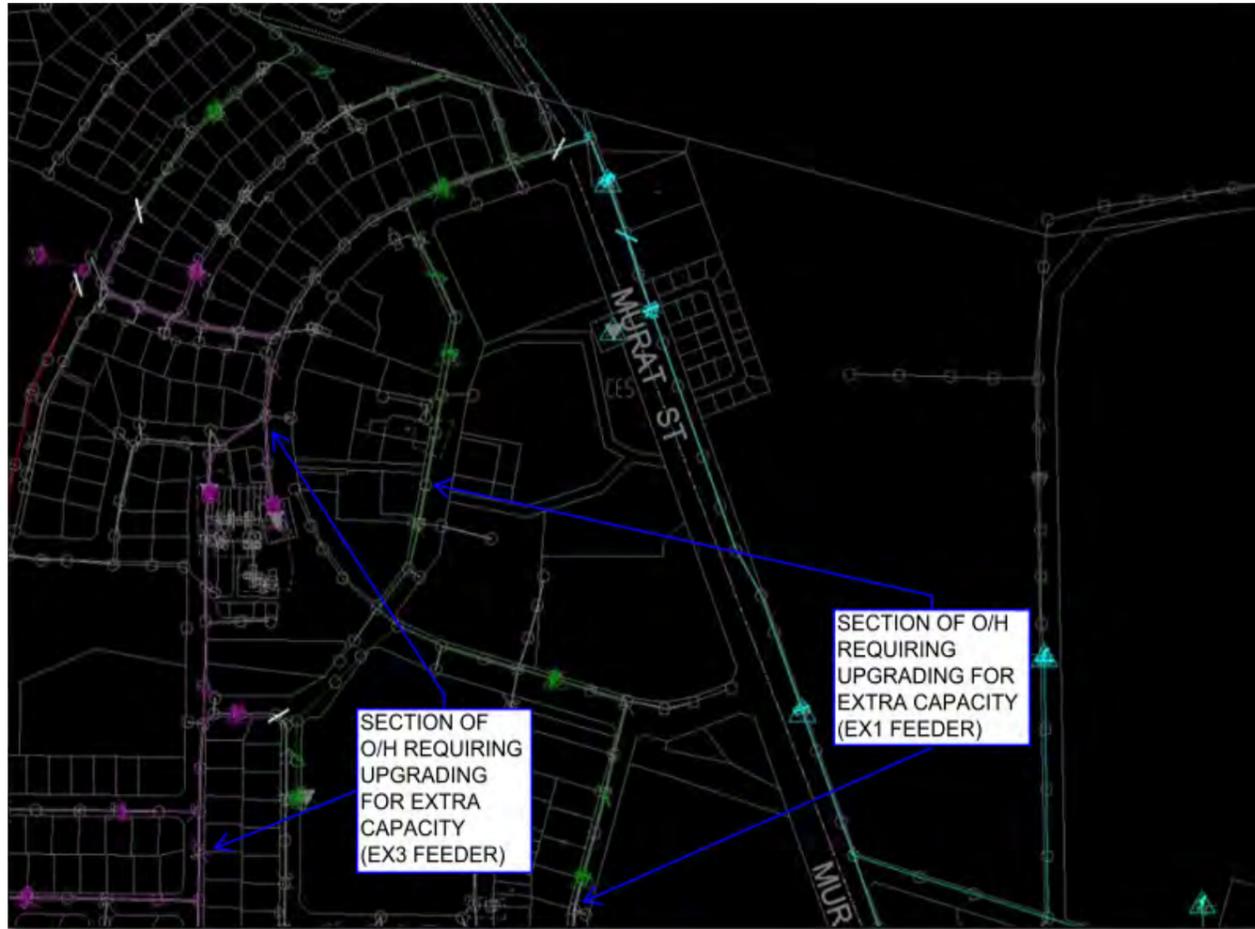
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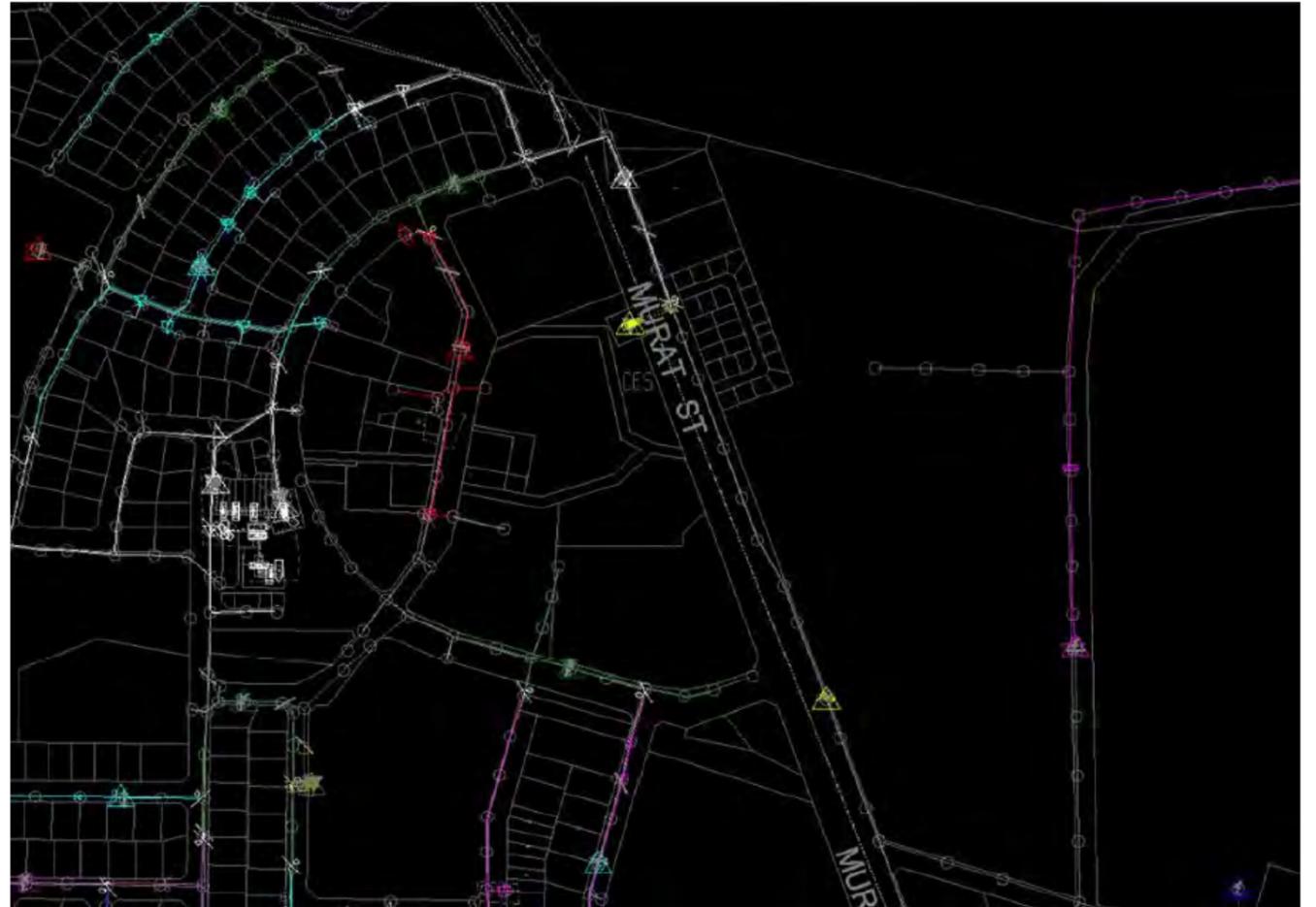


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Exmouth Town Centre, Exmouth – DFIS HV Map



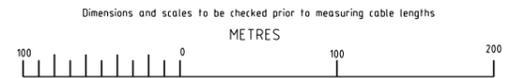
Exmouth Town Centre, Exmouth – DFIS LV Map



NOTES:
1. ALL POLES AND TRANSFORMER LOCATIONS HAVE BEEN OBTAINED FROM HP'S DISTRIBUTION FACILITIES INFORMATION SYSTEM (DFIS). ALL INFRASTRUCTURE ARE TO BE SURVEYED AND VERIFIED ON SITE.
2. TRANSFORMER SIZES TO BE CONFIRMED WITH HORIZON POWER

LEGEND

-  EXISTING HORIZON POWER PADMOUNTED TRANSFORMER
-  EXISTING HORIZON POWER POLE TOP AERIAL TRANSFORMER
-  AERIAL POLE
-  AERIAL CONDUCTOR
-  MEDIUM TERM RETAIL
-  LONG TERM RETAIL
-  PROPOSED MALL
-  REHABILITATED EXISTING ROADS



REV	DESCRIPTION	DATE	DRAWN	CHKD	REV	DESCRIPTION	DATE	DRAWN	CHKD
2	CAD BASE FILE UPDATED	23-02-12	BR	VH					
1	ISSUED TO CLIENT FOR COMMENT	20-12-11	BR	VH					



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EXMOUTH TOWN CENTRE REVITALISATION EXMOUTH EXISTING POWER NETWORK		
Sheet Of	3E Drawing Number	Revision
1 1	3E11176G-01	2



1 Introduction

The purpose of this analysis is to understand the future demand for retail and commercial floorspace in the Exmouth town centre according to different population scenarios. The aim is to ensure that the centre develops in a successful manner and can accommodate an increased scale and quality of sustainable employment.

This preliminary economic analysis by Pracsys is intended to inform the Town Centre Revitalisation Strategy for Exmouth currently being developed by Hassell and is expected to provide guidance on the planning of the optimal quantum and configuration of retail and commercial floorspace in the town centre into the future.

The analysis does not test the viability of suggested population scenarios. It should be considered as an indicator of scale for use in planning for intense, diverse activity centres.

2 Exmouth Economic Profile

With a relatively stable residential population Exmouth's economy is dominated by tourism which accounts for an estimated \$44 million of expenditure annually in the area. Other key industries include fishing, the nearby defence communications installations and the developing offshore oil and gas sector.

The population of Exmouth is anecdotally reported to be in the order of 2,500, however The 2006 ABS census data indicated the total population of the Shire was just over 2,000 persons of which 1,844 were resident in the Exmouth town site. The ratio of resident workforce to resident population was a relatively high 55% and it is suggested that a long term strategy towards sustained population growth might reasonably expect to see that ratio decline to around 42%-45%.

2.1 Drivers of Growth

The growth of Exmouth is dependent on generating strategic employment in key export oriented industries and infrastructure projects in the region. Under this scenario, Exmouth would become home to a residential workforce that may service infrastructure projects such as defence bases and the offshore oil and gas industry.

With the State's intention to establish Pilbara cities in Port Hedland and Karratha of notionally 50,000 plus residents, and a further significant centre in Newman, it is possible that Exmouth could position itself as a residential source community for the Pilbara. Under this scenario, workers may choose residency in Exmouth owing to a perceived higher lifestyle amenity than the Pilbara and choose to fly into the Pilbara from their base in Exmouth. For example, with the Carnarvon Basin located only 50km offshore, Exmouth is ideally located to provide supporting infrastructure and services to the offshore resources industry.

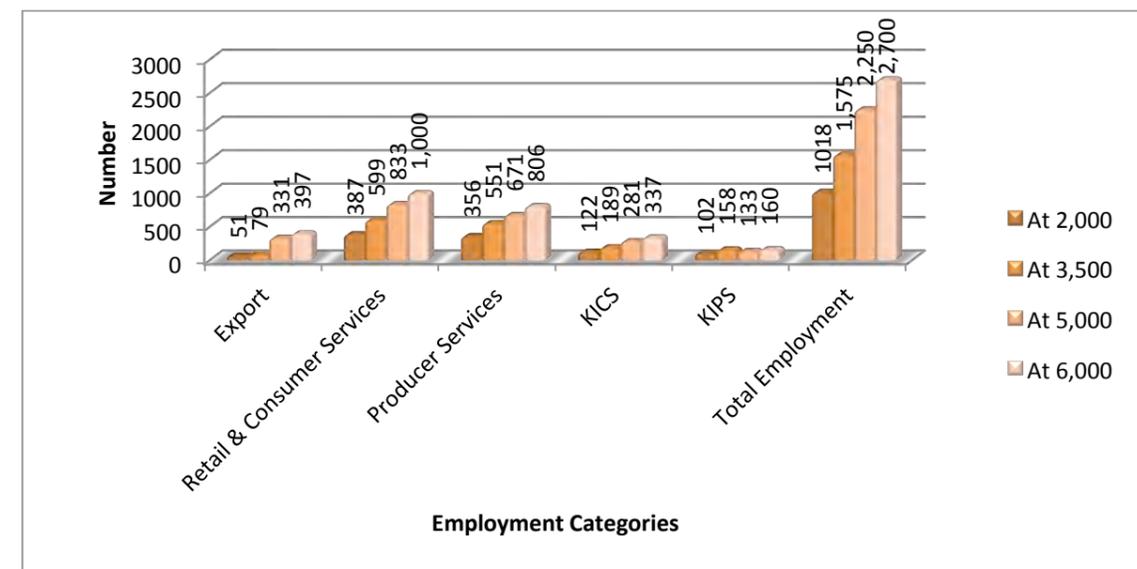
3 Population Growth Scenarios

The Exmouth Town Structure Plan reports that the Town of Exmouth has the physical capacity to cater for population growth of approximately 5,500 to just over 7,000 depending on land constraints. This assumes a more or less business as usual approach to land use and residential densities.

3.1 Employment Implications of Population Growth

Pracsys modelling posits population scenarios of 3,500, 5,000 and 6,000 permanent residents notionally by 2031 for the purposes of determining optimal floorspace.

Figure 1. Exmouth Employment Requirements at Variable Population Points



Source: Pracsys 2011

An increase in population to 3,500 presupposes a 55% increase in residential workforce to around 1,575 jobs. Moreover, this would require a disproportionate growth in the areas of strategic employment such as export / driver jobs and producer services jobs.

It should be noted that, Exmouth's population has not grown significantly over the past census period and it is suggested that any substantial growth of the type modelled here would require an intervention strategy designed to attract industry, businesses and residents over the longer term.

The main driver of growth, particularly in regional areas, is the generation of employment. When assessing employment it is important to consider not only the quantum of jobs being created but also the quality of jobs. The generation of population driven employment will occur in response to the growth in population, which occurs as a result of the generation of strategic employment.

Exmouth needs to focus greater attention on assessing their workforce distribution to ensure they reach an optimal mix of strategic as well as population driven employment. Without the strategic employment generated by major driver and infrastructure projects in the regions, the demand for population driven services would be a fraction of that evidenced by current service provision levels.

4 Floorspace Demand

The following assumptions were used to analyse several possible population scenarios for the Shire of Exmouth. The analysis does not assess the likelihood of the various population scenarios occurring. It is only intended to provide guidance on the planning of the optimal quantum and configuration of retail and commercial floorspace in the town centre into the future.

4.1 Assumptions

4.1.1 Population Scenarios

Population scenarios considered in the analysis are the 2006 baseline population of 1,844 residents and the hypothesized future populations of: 3,500 residents, 5,000 residents and 6,000 residents (Note: the later estimates are not associated with any point in time but rather provide an indication of the floorspace requirements at increasing population points).

4.1.2 Calculating the Number of Households in Exmouth

The population and average household size of Exmouth were taken from the last available census (2006 ABS census, <www.abs.gov.au>); at which time there were 1,844 residents and an average household size of 2.3 persons per household, yielding 802 households in Geraldton. This differs from number of ABS reported occupied private dwellings (1,245) but is more consistent with the use of the household expenditure survey, which is based on the average expenditure of households, instead of the average expenditure per occupied private dwellings; therefore to avoid confusion, the derived 802 households is referred to as the 'effective' number of households.

The household assumptions considered in the analysis do not consider the potential changes in demographic distribution of households at the various population points. Further detailed analysis would be required to determine how households are likely to change in the event of population growth and what impact this would have on the types of goods and services which need to be provided. For example if Exmouth's population growth resulted in an aging population there would be greater demand for related services such as aged care. Similarly growth in the number of children under the age of 18 may require greater education facilities.

4.1.3 Retail Categories under Analysis

Retail demand has been divided into the broad categories of convenience retail, comparison retail, and restaurant, bar and café – it is felt that these three categories appropriately reflect the majority of retail types demanded, in Exmouth.

4.1.4 Household Expenditure

Households will consume a range of goods and services in order to meet the needs, or wants, of the individual which comprise it; everything from food to clothing, medicine, appliances, bottled gas and so on, constitute the households demand function. The household demand function is empirically measured in the Household Expenditure Survey (HHES) produced by the Australian Bureau of

Statistics (Household Expenditure Survey, Australia: Summary of Results, 2009-10, <www.abs.gov.au>).

Items in the HHES are then sorted into groups that correspond to the above mentioned retail categories. Expenditure, by household, on the three categories of retail (convenience retail, comparison retail, and restaurant, bar and café) is then calculated. (Note: household expenditure is directly related to household income. The HHES segments households into income quintiles; Exmouth has an average income in third quintile).

The 'effective' number of households is multiplied by the average spend per household to estimate the total residential expenditure.

Expenditure estimates used in the modelling and analysis is expressed in terms of 2011 values. No adjustment has been made to account for future changes in value.

4.1.5 Workers

Workers are excluded from this analysis, not because we believe either: that they are unimportant, or that there aren't any workers in Exmouth, but because Exmouth is a comparatively closed environment (geographically isolated) and that portraying a distinction between expenditure from households and expenditure from workers is unnecessary.

That is, as all workers, at some stage, constitute part of a household and as the isolation of Exmouth renders regular commuting from outside prohibitive, distinguishing between the two only risks double counting residents; therefore, for the purpose of this analysis, all 'worker' expenditure is assumed to be captured through the measurement of residential expenditure and the HHES.

4.1.6 Tourism

Tourism Statistics were sourced from Tourism WA (Shire of Exmouth Overnight Visitor Fact Sheet: Years Ending December 2008/09/10, <<http://www.tourism.wa.gov.au>>). Tourism figures are used to represent the number of visitors to Exmouth, per annum. Visitor expenditure was calculated as a function of total visitor nights; whereby each visitor night has an associated daily spend across the three retail categories discussed above.

Anecdotally the Exmouth population can swell from 2,000 residents up to 6,000 at the height of the tourist season with an influx of senior and backpacker visitors in particular. Tourism WA statistics show that occupancy rates for accommodation are generally at their highest points in the middle of the year (e.g. April to August). Pracsys demand modeling for Exmouth considers the fluctuations in visitor numbers at different times of the year and the effect this has on expenditure and floorspace demand (refer to section 4.1.7 for an explanation of how expenditure is related to floorspace demand).

4.1.7 Floorspace Productivity

Floorspace productivity is the mechanism by which expenditure is related back to floorspace demand. Floorspace productivity is defined as the turnover per square meter of floorspace, per year; the greater the productivity the more efficiently the floorspace is being used to create revenue.

Anecdotal evidence and Industry data has placed the productivity of retail floorspace in the Perth metropolitan area around \$7000/m². Exmouth is assumed to have lower floorspace productivity than the metropolitan area because land (floorspace) is not as scarce and consequently, productivity per square meter will be lower.

The assumptions in Figure 4 were used when calculating retail floorspace productivity for Exmouth. A range for turnover per square metre has been defined to demonstrate possible floorspace demand given higher or lower productivities.

Figure 2. Floorspace Productivity Assumptions

Floorspace type	Turnover/m ²
Convenience retail	\$5,000 - \$5,500/m ²
Comparison retail	\$4,000 - \$4,500/m ²
Restaurants, bars and cafés	\$3,500 - \$4,000/m ²

Source: Pracsys 2011

Floorspace demand is derived by dividing the sum of expenditure, from residents and visitors, by the floorspace productivity (for each retail category). Estimates of future floorspace demand are also influenced by:

- The nature, size and trends in user groups of residents, workers, visitors and enterprises;
- The pool of available expenditure in the town; and
- The extent of expenditure leakage from the town.

Each of these factors is incorporated into the Pracsys modelling and analysis of future floorspace demand for Exmouth town centre.

4.1.8 Expenditure Leakage

Expenditure leakage refers to the amount of money consumers spend outside of the local market. It is important to take leakage into account when estimating future floorspace demand as it directly affects the amount available in each expenditure pool. For Exmouth the extent of leakage was calculated using a dynamic assumption based on anecdotal evidence and industry data (Figure 3).

Figure 3. Expenditure Leakage Assumptions

Expenditure type	Leakage rate per year
Convenience retail	10%
Comparison retail	40%
Restaurants, bars and cafés	30%

Source: Pracsys 2011

Overall the leakage rates for Exmouth were set lower than those expected in the Perth metropolitan area as the town's relative isolation reduces resident's ability to spend outside their local area. In the Perth metropolitan area we would expect leakage rates to be higher as there is greater opportunity for residents to shop outside their local catchment. Conversely residents in regional communities are not as likely to travel outside of their local area for convenience retail however some restaurant, bar and café spend will be leaked when residents travel for work, holidays etc. Residents may choose to have some comparison goods shipped in from other areas, particularly given the increasing attraction of online shopping. To reflect these conditions in the modeling the lowest leakage rate was assigned to convenience retail (10%) followed by restaurant, bar and café (30%) and then comparison retail (40%).

4.2 Analysis

The following analysis was undertaken using Pracsys modelling of Exmouth's expenditure pools and other assumptions including floorspace productivity and leakage rates. Figure 4 outlines the average expenditure pools across a number of key categories for residents in Exmouth at different population scenarios.

Figure 4. Residential Expenditure Estimates

Population	Current	3,500	5,000	6,000
Convenience Retail	\$7,789,441	\$14,784,730	\$21,121,043	\$25,345,252
Comparison Retail	\$9,947,921	\$18,881,630	\$26,973,757	\$32,368,508
Restaurant, Bar, Café	\$1,079,490	\$2,048,924	\$2,927,035	\$3,512,442
Total residential expenditure	\$18,816,853	\$35,715,284	\$51,021,835	\$61,226,202

Source: Pracsys 2011

Figure 5 outlines the average expenditure pools across a number of key categories for visitors to Exmouth at different growth scenarios.

Figure 5. Visitor Expenditure Estimates

Annual visitors	Current	721,500	725,000	728,500
Convenience Retail	\$9,332,700	\$9,379,364	\$9,426,260	\$9,473,392
Comparison Retail	\$3,589,500	\$3,607,448	\$3,625,485	\$3,643,612
Restaurant, Bar, Café	\$14,358,000	\$14,429,790	\$14,501,939	\$14,574,449
Total visitor expenditure	\$27,280,200	\$27,416,601	\$27,553,684	\$27,691,452

Source: Pracsys 2011

It is important that the expenditure be broken down into separate pools for residents and visitors. This helps to highlight how changes to each expenditure pool will translate to floorspace demand in Exmouth. Figure 4 shows that most of the retail expenditure for residents is on comparison (53%) and convenience goods (41%). Figure 5 indicates that visitors to Exmouth spend most at restaurants, bars and cafés (53%) followed by convenience goods (34%).

Exmouth residential expenditure increases at the same rate as population growth in each of the scenarios. This leads to an increase in the pool of available expenditure in the town for each of the retail categories. However the number of visitors to Exmouth does not grow at the same rate as demonstrated in the population scenarios. This is because annual visitor numbers vary and may rise or fall irrespective of population growth. Therefore the expenditure pools for visitors to Exmouth do not increase at the same rate as the pool for residents.

Figure 6 shows that as residential population grows expenditure on convenience and comparison goods increases at a greater rate than expenditure on restaurants, bars and cafés.

Figure 6. Total Combined Expenditure

Population & Annual Visitors	Current	3,500 population/ 721,500 visitors	5,000 population/ 725,000 visitors	6,000 population/ 728,500 visitors
Convenience Retail	\$17,122,141	\$24,164,094	\$30,547,304	\$34,818,644
Comparison Retail	\$13,537,421	\$22,489,077	\$30,599,241	\$36,012,120
Restaurant, Bar, Café	\$15,437,490	\$16,478,714	\$17,428,974	\$18,086,890
Total expenditure	\$46,097,053	\$63,131,885	\$78,575,519	\$88,917,654

Source: Pracsys 2011

5 Implications for Floorspace and Centre Planning

Based upon the above assumptions and analysis an estimate of retail floorspace demand was derived. Figure 7 outlines the floorspace requirements for Exmouth across a number of key categories at different population scenarios.

Figure 7. Floorspace Estimates

Population & Annual Visitors	Current	3,500 population/ 721,500 visitors	5,000 population/ 725,000 visitors	6,000 population/ 728,500 visitors
Convenience Retail (m ²)	3,100 – 3,420	4,390 – 4,830	5,550 – 6,110	6,330 – 6,960
Comparison Retail (m ²)	3,000 – 3,380	5,000 – 5,620	6,800 – 7,650	8,000 – 9,000
Restaurant, Bar, Café (m ²)	3,850 – 4,410	4,100 – 4,700	4,360 – 4,980	4,520 – 5,170
Total floorspace (m²)	9,950 – 11,210	13,490 – 15,150	16,710 – 18,740	18,850 – 21,130

Source: Pracsys 2011

- At its current population Exmouth can support between 9,950 – 11,210 sqm nla.
- At a population of 3,500 the total floorspace demand estimate is between 13,490 – 15,150 sqm nla. This equates to an increase of 3,540 – 3,940 sqm nla (approximately 35%) when compared to current retail floorspace estimates.
- At a population of 5,000 the total floorspace demand estimate increased to between 16,710 – 18,740 sqm nla. This equates to an increase of between 6,760 – 7,530 sqm nla (approximately 67%) when compared to current retail floorspace estimates.
- At a population of 6,000 total floorspace demand estimate increased to between 18,850 – 21,130 sqm nla. This equates to an increase of between 8,900 – 9,920 sqm nla (approximately 89%) when compared to current retail floorspace estimates.

In all scenarios the largest increase in demand for floorspace is in comparison retail. This is a result of lower productivity per square metre and a large expenditure pool when compared to the other retail types. Comparison retail also generally consumes more floorspace due to the size of the goods being sold. The increase in demand for comparison retail demonstrated in Figure 7 does not have major implications for the Exmouth town centre. Generally increases in comparison floorspace occur in large increments. Smaller increases in demand for comparison goods, such as the increases seen in Figure 7, will generally be satisfied by increased expenditure leakage. Only when demand for comparison retail has reached a suitably high level will it warrant a major increase in floorspace (e.g. attraction of a discount department store).

The next largest increase is seen in convenience retail floorspace estimates. Increased demand for convenience retail will have an additional impact upon existing retailers as population approaches

5,000 people. In general terms, a population of 5,000 people will start to generate the sales turnover per square metre required to attract a major retailer such as a Coles or Woolworths. These larger retailers would be expected to cannibalise some of the expenditure at existing convenience outlets such as IGA and other smaller retailers. This would change the current structure of shopping centre development in the town as the larger retailers became the focus.

Demand for floorspace will vary throughout the year as a result of the high and low tourist seasons. As visitor numbers swell so will demand, particularly for convenience retail and restaurant, bar, café floorspace as these uses attract most visitor expenditure. Generally this will be reflected by an oversupply of floorspace in the low season and an undersupply in the high season. This situation is common in many metropolitan and regional centres although the effects are often more noticeable in the regions.

When assessing floorspace demand there is no certain way of providing adequate permanent floorspace in the high visitor season that does not result in an oversupply in the low season. The key to alleviating floorspace demand pressures is adaptability. Seasonal variations in floorspace demand are commonly reflected by changes to high and low season trading hours. Other methods used to balance this out include allowing for temporary floorspace (e.g. outdoor market pavilions) and adaptable premises capable of increasing their floorspace during the high season.

Figure 8 shows the amount of floorspace attributed to visitor demand in Exmouth and also highlights this as a percentage of total floorspace demand.

Figure 8. Floorspace Demand for Exmouth Visitors

Annual Visitors	Current	721,500 visitors	725,000 visitors	728,500 visitors
Convenience Retail (m ²)	1,700 – 1,870 (55%)	1,700 – 1,875 (39%)	1,715 – 1,885 (31%)	1,720 – 1,895 (27%)
Comparison Retail (m ²)	798 – 897 (27%)	802 – 902 (16%)	806 – 906 (12%)	810 – 911 (10%)
Restaurant, Bar, Café (m ²)	3,590 – 4,100 (93%)	3,600 – 4,120 (88%)	3,625 – 4,140 (83%)	3,644 – 4,164 (81%)
Total floorspace (m ²)	6,080 – 6,860 (61%)	6,110 – 6,90 (45%)	6,145 – 6,935 (37%)	6,176 – 6,970 (33%)

Source: Pracsys 2011

As shown in Figure 8 the visitor user group represents a comparatively small and diminishing proportion of overall demand for floorspace in Exmouth, particularly in the context of overall population growth. It is therefore unlikely that fluctuations in visitor numbers throughout the year will result in significant supply gaps and will be able to be managed through the above methods for flexibility and adaptability.

6 Conclusion

The floorspace demand analysis suggests that the Exmouth town centre could support between 13,490 and 21,130 sqm nla of total retail floorspace assuming a population scenario of between 3,500 and 6,000 residents. This equates to an increase of between 35% and 90% when compared to current retail floorspace estimates.

The Shire of Exmouth should consider this range achievable at baseline productivity only. A sound strategy contemplating spatial and economic development will be required if the Shire is to achieve its population growth targets and for the centre to mature accordingly.





**COST PLAN NO 1
INDICATIVE COST ESTIMATE REV 4**

**EXMOUTH FORESHORE
REVITALISATION PLAN**

23 April 2012

**EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
FORESHORE
CONCEPT ESTIMATE**

23-Apr-12

Ref	Scope	Unit	Qty	Rate	Sub-Total	Total
1	TOWN BEACH					
1.1	TOWN BEACH (STAGE 1)					
	<i>Beach Upgrade</i>					
	Additional fill to raise car park level (assume 0.5m)	m3	1,316	40.50	53,298.00	
	Car park	m2	2,105	105.00	221,025.00	
	Bitumen seal	m2	2,105	15.00	31,575.00	
	Linemarking	Item	1	2,105.00	2,105.00	
	Kerb	m	401	40.00	16,040.00	
	Wheel stops	No	12	200.00	2,400.00	
	Beach cross over	Item	1	1,800.00	1,800.00	
	Concrete path	m2	140	70.00	9,800.00	
	Stabilised gravel path	m2	165	50.00	8,250.00	
	Stabilised gravel paving (around toilet block)	m2	145	50.00	7,250.00	
	Refurbish existing toilet block (7m x 5m)	Item	1	20,000.00	20,000.00	
	Board walk	m2	192	1,200.00	230,400.00	
	Showers (boardwalk)	Item	1	3,000.00	3,000.00	
	Seating (boardwalk)	Item	1	5,000.00	5,000.00	
	Limestone sea wall					
	- excavation	m3	1,070	10.00	10,700.00	
	- sub layer	m3	195	35.00	6,825.00	
	- filter cloth	m2	324	20.00	6,480.00	
	- retaining wall	m2	263	750.00	197,250.00	
	- limestone rock armour	m3	875	65.00	56,875.00	
	Concrete stair (beach access)	No	1	5,000.00	5,000.00	
	Irrigated turf	m2	2,439	69.60	169,754.40	
	Allowance for tree planting	No	25	500.00	12,500.00	
	Allowance for shelters	No	5	25,000.00	125,000.00	
	Allowance for BBQ's	No	3	12,000.00	36,000.00	
	Allowance for benches, bins and sundry street furniture	Item	1	50,000.00	50,000.00	
	Allowance for water supply to BBQ areas	m	200	150.00	30,000.00	
	Allowance for revegetation	m2	5,962	15.00	89,430.00	
	Barriers to formalise beach entry	m	90	200.00	18,000.00	
	Signage, way finding, bollards and sundry items	Item	1	25,000.00	25,000.00	
	Drainage	Item	1	32,000.00	32,000.00	
	Extend water supply from toilet block	Item	1	20,000.00	20,000.00	
	Allowance for power supply	Item	1	150,000.00	150,000.00	
	Car park lighting	m2	2,105	49.88	105,000.00	
	Lighting to boardwalk area	m2	192	156.25	30,000.00	
	Lighting to shelters	No	5	3,000.00	15,000.00	1,802,757.40

EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
FORESHORE
CONCEPT ESTIMATE

23-Apr-12

Ref	Scope	Unit	Qty	Rate	Sub-Total	Total
1.2 TOWN BEACH (STAGE 2)						
<i>Beach Upgrade</i>						
	Additional fill to raise car park level (assume 0.5m)	m3	1,433	40.50	58,036.50	
	Car park	m2	2,292	105.00	240,660.00	
	Bitumen seal	m2	2,292	15.00	34,380.00	
	Linemarking	Item	1	2,292.00	2,292.00	
	Kerb	m	458	40.00	18,320.00	
	Wheel stops	No	49	200.00	9,800.00	
	Beach cross over	Item	1	1,800.00	1,800.00	
	Stabilised gravel path	m2	882	50.00	44,100.00	
	Limestone sea wall					
	- excavation	m3	4,297	10.00	42,970.00	
	- sub layer	m3	782	35.00	27,370.00	
	- filter cloth	m2	1,302	20.00	26,040.00	
	- retaining wall	m2	912	750.00	684,000.00	
	- limestone rock armour	m3	3,516	65.00	228,540.00	
	Concrete stair (beach access)	No	4	5,000.00	20,000.00	
	Irrigated turf	m2	2,940	69.60	204,624.00	
	Allowance for tree planting	No	12	500.00	6,000.00	
	Allowance for shelters	No	3	25,000.00	75,000.00	
	Allowance for BBQ's	No	2	12,000.00	24,000.00	
	Allowance for benches, bins and sundry street furniture	Item	1	20,000.00	20,000.00	
	Allowance for water supply to BBQ areas	m	90	150.00	13,500.00	
	Allowance for revegetation	m2	4,480	15.00	67,200.00	
	Barriers to formalise beach entry	m	60	200.00	12,000.00	
	Signage, way finding, bollards and sundry items	Item	1	25,000.00	25,000.00	
	Drainage	Item	1	34,000.00	34,000.00	
	Allowance for water supply	Item	1	40,000.00	40,000.00	
	Allowance for power supply	Item	1	60,000.00	60,000.00	
	Car park lighting	m2	2,292	65.45	150,000.00	
	Lighting to boardwalk area	m2	882		refer car park	
	Lighting to shelters	No	3	3,000.00	9,000.00	2,178,632.50
<i>Access Road & Gravel Overflow Car Park</i>						
	Upgrade road	m2	875	105.00	91,875.00	
	Bitumen seal	m2	875	15.00	13,125.00	
	Linemarking	Item	1	875.00	875.00	
	Kerb	m	250	40.00	10,000.00	
	Path	m2	500	70.00	35,000.00	
	Signage	Item	1	1,000.00	1,000.00	
	Drainage	Item	1	9,000.00	9,000.00	
	Upgrade street lighting	Item	1	90,000.00	90,000.00	
	Tree planting to verge (assume 1 tree per 10m)	No	25	500.00	12,500.00	
	Gravel overflow car park	m2	1,624	60.00	97,440.00	
	Path to overflow carpark	m2	520	70.00	36,400.00	
	Signage to overflow car park	Item	1	1,000.00	1,000.00	
	Trees to overflow car park	No	20	500.00	10,000.00	408,215.00

EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
FORESHORE
CONCEPT ESTIMATE

23-Apr-12

Ref	Scope	Unit	Qty	Rate	Sub-Total	Total
<i>Link to Novotel</i>						
	Composite boardwalk	m2	915	1,000.00	915,000.00	
	Entry feature rammed earth wall	Item	1	25,000.00	25,000.00	
	Entry gravel mulch	m2	420	35.00	14,700.00	
	Entry planting allowance	Item	1	10,000.00	10,000.00	
	Revegetation	m2	5,600	15.00	84,000.00	
	Existing path - no work	Note			n/a	1,048,700.00
2 STREETScape /INTERSECTION UPGRADES						
2.1 MURAT ROAD (Part A) (500m)						
	Upgrade road	m2	3,500		not required	
	Bitumen seal	m2	3,500		not required	
	Linemarking	Item	1		not required	
	Kerb	m	1,000		not required	
	Form v drain	m	1,000	5.00	5,000.00	
	Path	m2	2,000	70.00	140,000.00	
	Signage	Item	1	1,000.00	1,000.00	
	Upgrade street lighting	Item	1	207,000.00	207,000.00	
	Tree planting to verge (assume 1 tree per 10m)	No	100	500.00	50,000.00	403,000.00
2.2 MURAT ROAD (Part B) (650m)						
	Upgrade road	m2	4,550		not required	
	Bitumen seal	m2	4,550		not required	
	Linemarking	Item	1		not required	
	Kerb	m	1,300		not required	
	Form v drain	m	1,300	5.00	6,500.00	
	Path	m2	2,600	70.00	182,000.00	
	Signage	Item	1	1,000.00	1,000.00	
	Upgrade street lighting	Item	1	264,000.00	264,000.00	
	Tree planting to verge (assume 1 tree per 10m)	No	130	500.00	65,000.00	518,500.00
2.3 MURAT ROAD (Part C) (900m)						
	Upgrade road	m2	6,300		not required	
	Bitumen seal	m2	6,300		not required	
	Linemarking	Item	1		not required	
	Kerb	m	1,800		not required	
	Form v drain	m	1,800	5.00	9,000.00	
	Path	m2	3,600	70.00	252,000.00	
	Signage	Item	1	1,000.00	1,000.00	
	Upgrade street lighting	Item	1	171,000.00	171,000.00	
	Tree planting to verge (assume 1 tree per 10m)	No	180	500.00	90,000.00	523,000.00
2.4 TRUSCOTT AVE (1,650m)						
	Upgrade road	m2	11,550		not required	
	Bitumen seal	m2	11,550		not required	
	Linemarking	Item	1		not required	
	Kerb	m	3,300		not required	
	Form v drain	m	3,300	5.00	16,500.00	
	Path	m2	6,600	70.00	462,000.00	
	Signage	Item	1	1,000.00	1,000.00	
	Upgrade street lighting	Item	1	375,000.00	375,000.00	
	Tree planting to verge (assume 1 tree per 10m)	No	330	500.00	165,000.00	1,019,500.00

EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
FORESHORE
CONCEPT ESTIMATE

23-Apr-12

Ref	Scope	Unit	Qty	Rate	Sub-Total	Total
2.5	WARNE STREET (and part of Madaffari Drive) (550m)					
	Upgrade road	m2	3,850		not required	
	Bitumen seal	m2	3,850		not required	
	Linemarking	Item	1		not required	
	Kerb	m	1,100		not required	
	Form v drain	m	1,100	5.00	5,500.00	
	Path	m2	2,200	70.00	154,000.00	
	Signage	Item	1	1,000.00	1,000.00	
	Upgrade street lighting	Item	1	150,000.00	150,000.00	
	Tree planting to verge (assume 1 tree per 10m)	No	110	500.00	55,000.00	365,500.00
2.6	MADAFFI DRIVE					
	No works	Note				
3	MARINA POS					
3.1	MARINA POS (Part 1)					
	Gravel mulch / planting mix areas	m2	3,943	50.00	197,150.00	
	Native revegetation to detention basin	m2	2,358	10.00	23,580.00	
	Rammed earth retaining walls	m	215	500.00	107,500.00	
	New shelters	No	5	25,000.00	125,000.00	
	BBQ's	No	2	12,000.00	24,000.00	
	Water supply to BBQ area	Item	1	15,000.00	15,000.00	
	Seating, bins and sundry street furniture	Item	1	20,000.00	20,000.00	
	Allowance to upgrade existing paths	Item	1	5,000.00	5,000.00	
	Allowance to upgrade playground	Item	1	5,000.00	5,000.00	
	Signage and way finding	Item	1	10,000.00	10,000.00	
	Lighting	Item	1	100,000.00	100,000.00	632,230.00
3.2	MARINA POS (Part 2)					
	Note: existing facility - minor upgrade works only)					
	Gravel mulch / planting allowance	m2	2,588	50.00	129,400.00	
	Upgrade lighting	Item	1	50,000.00	50,000.00	179,400.00
4	NEW TOWN BEACH					
	Gravel road	m2	5,118	105.00	537,390.00	
	Gravel car bays	m2	776	70.00	54,320.00	
	Pcc wheelstops	No	45	200.00	9,000.00	
	Concrete flush kerb	m	530	40.00	21,200.00	
	Stabilised gravel paving	m2	894	50.00	44,700.00	
	Upgrade of existing path	m2	1,110	10.00	11,100.00	
	New gravel path	m2	1,774	50.00	88,700.00	
	Composite boardwalk	m2	898	1,200.00	1,077,600.00	
	Stair	m	53	1,000.00	53,000.00	
	Viewing platform (4 No) including shelter	m2	128	3,000.00	384,000.00	
	Shelter / way finding - main station	No	1	25,000.00	25,000.00	
	Shelters	No	3	25,000.00	75,000.00	
	Seatings, bins and sundry street furniture	Item	1	10,000.00	10,000.00	
	Self composting toilet	Item	1	50,000.00	50,000.00	
	Revegetation	m2	28,933	15.00	433,995.00	
	Signage, way finding, bollards and sundry items	Item	1	50,000.00	50,000.00	
	Drainage	Item	1	88,000.00	88,000.00	
	Allowance for water supply	Item	1	90,000.00	90,000.00	
	Allowance for power supply	Item	1	140,000.00	140,000.00	
	Lighting to walkways	Item	1	187,500.00	187,500.00	
	Lighting to roads and car parking	Item	1	270,000.00	270,000.00	3,700,505.00

EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
FORESHORE
CONCEPT ESTIMATE

23-Apr-12

Ref	Scope	Unit	Qty	Rate	Sub-Total	Total
5	EXISTING GRAVEL PATH					
	Upgrade of existing path	m2	5,010	10.00	50,100.00	
	Lighting	Item	1	200,400.00	200,400.00	250,500.00
	Sub-Total					13,030,439.90
	Preliminaries	6%				789,560.10
	Net Construction Cost					13,820,000.00
	Design Contingency	10%				1,390,000.00
	Construction Contingency	5%				760,000.00
	Professional fees & Disbursements	15%				2,080,000.00
	Client Costs					excluded
	Land Costs					excluded
	Headworks					excluded
	Public Art					excluded
	Gross Project Cost (at current costs)					18,050,000.00
	Escalation to Tender					excluded
	Total					18,050,000.00
	GST					1,805,000.00
	Total					19,855,000.00

Notes

- All figures exclude GST unless noted otherwise
- These estimates are based on preliminary information and should be considered indicative only
- These estimate are based on the following documentation. Only those works shown on those documents have been included herein:
 - Sketch drawing 1:1000 Existing Town Beach Upgrade
 - Sketch drawing 1:1000 Existing Town Beach Upgrade (Yacht Club)
 - Sketch drawing 1:1000 Novotel to Yacht Club
 - Sketch drawing 1:1000 New Town Beach
 - Exmouth - Marina POS sketch
- Refer to estimate breakdowns for scope of work included
- This estimate is for the Foreshore only and does not include for Town Centre Works
- No allowance has been made for:
 - Golf Club Access Upgrade
 - Golf Club Foreshore Upgrade
 - Area north on Marina POS 1
 - Foreshore connection (Private Development)
 - Madaffi Drive
 - Upgrade of road surfaces
- The allowances for lighting assume standard HP street lights
- No allowance has been made for an incoming sewer or water supply to the Town Beach site as there is an existing toilet block and we have assumed this supply can be used.
- The estimate assumes the car parks to the Existing Town Beach (stage 1 and 2) will be raised with fill by 500mm.



**COST PLAN NO 1
INDICATIVE COST ESTIMATE REV 4**

**EXMOUTH TOWN CENTRE
REVITALISATION PLAN**

23 April 2012

**EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
TOWN CENTRE
CONCEPT ESTIMATE**

23-Apr-12

Ref	Scope	Unit	Qty	Rate	Sub-Total	Total
1 THREW STREET REDEVELOPMENT						
<i>Road</i>						
1.01	Break out existing culvert crossing	Item	1	30,000.00	30,000.00	
1.02	New/ reconstructed road	m2	3,158	105.00	331,590.00	
1.03	Asphalt seal	m2	3,158	40.00	126,320.00	
1.04	Kerb	m	785	40.00	31,400.00	
1.05	Footpath	m2	702	70.00	49,140.00	
1.06	Verge treatment	m2	1,950	10.00	19,500.00	
1.07	Road markings	Item	1	3,000.00	3,000.00	
1.08	Signage	Item	1	3,000.00	3,000.00	
<i>Parking</i>						
1.09	Break out existing car park	m2	3,441		included	
1.10	Sundry demolition	Item	1	30,000.00	30,000.00	
1.11	Site strip, clear and level (landscape areas)	m2	1,068	4.50	4,806.00	
1.12	New car parking formation	m2	3,441	105.00	361,305.00	
1.13	Bitumen seal	m2	3,441	15.00	51,615.00	
1.14	Kerb	m	652	40.00	26,080.00	
1.15	Landscaping	Item	1	85,000.00	85,000.00	
1.16	Signage	Item	1	10,000.00	10,000.00	
1.17	Lighting	Item	1	75,000.00	75,000.00	1,237,756.00
2 MAIDSTONE CRESCENT BETWEEN BONE FISH AND LEARMONTH						
2.01	Remove trees from central reserve	No	11	500.00	5,500.00	
2.02	New/ reconstructed road	m2	2,099	105.00	220,395.00	
2.03	Asphalt seal	m2	1,952	40.00	78,080.00	
2.04	Pedestrian crossing paving	m2	420	225.00	94,500.00	
2.05	Kerb	m	467	40.00	18,680.00	
2.06	Footpath	m2	927	70.00	64,890.00	
2.07	Verge treatment (irrigated)	m2	2,076	75.00	155,700.00	
2.08	Road markings	Item	1	9,000.00	9,000.00	
2.09	Signage	Item	1	9,000.00	9,000.00	
2.10	Lighting	Item	1	60,000.00	60,000.00	715,745.00
3 FEDERATION PARK REDEVELOPMENT						
3.01	Demolition of existing park structures	Item	1	45,000.00	45,000.00	
3.02	Generally clearing debris and vegetation not to be retained including in drainage channel	m2	20,404	3.00	61,212.00	
3.03	Allowance for regrading drainage channel and minor earthworks	Item	1	35,000.00	35,000.00	
3.04	Feature paving	m2	2,115	120.00	253,800.00	
3.05	Foot paths	m2	1,100	70.00	77,000.00	
3.06	Paving outside pool	m2	1,190	70.00	83,300.00	
3.07	Pedestrian bridge approx 10m span	No	1	30,000.00	30,000.00	
3.08	Landscaped area (dryland)	m2	15,848	15.00	237,720.00	
3.09	Irrigated feature landscaping	Item	1	75,000.00	75,000.00	
3.10	Dryland landscaped features	Item	1	75,000.00	75,000.00	
3.11	Amenities building with screening area	m2	150	4,500.00	675,000.00	
3.12	Water feature / interactive park	Item	1	450,000.00	450,000.00	
3.13	Street furniture	Item	1	175,000.00	175,000.00	
3.14	Shade structures	Item	1	175,000.00	175,000.00	
3.15	Wayfinding	Item	1	30,000.00	30,000.00	
3.16	Lighting	Item	1	126,000.00	126,000.00	2,604,032.00

EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
TOWN CENTRE
CONCEPT ESTIMATE

23-Apr-12

Ref	Scope	Unit	Qty	Rate	Sub-Total	Total
4 REALIGNMENT OF PYNE STREET & REDEVELOPMENT OF POOL CARPARK						
4.01	New/ reconstructed road	m2	2,804	105.00	294,420.00	
4.02	Asphalt seal	m2	2,804	40.00	112,160.00	
4.03	Kerb	m	613	40.00	24,520.00	
4.04	Footpath	m2	483	70.00	33,810.00	
4.05	Verge treatment	m2	1,964	10.00	19,640.00	
4.06	Road markings	Item	1	3,000.00	3,000.00	
4.07	Signage	Item	1	3,000.00	3,000.00	
4.08	Lighting	Item	1	63,000.00	63,000.00	553,550.00
5 REDEVELOPMENT OF KENNEDY STREET MALL Note: Between Learmonth and Threw Street)						
5.01	New/ reconstructed road (to receive paving)	m2	756	105.00	79,380.00	
5.02	Paving (trafficable - base included above)	m2	756	100.00	75,600.00	
5.03	Paving (pedestrian)	m2	1,244	70.00	87,080.00	
5.04	Kerb	m	212	40.00	8,480.00	
5.05	Street furniture	Item	1	15,000.00	15,000.00	
5.06	Landscaping	Item	1	15,000.00	15,000.00	
5.07	Signage	Item	1	15,000.00	15,000.00	
5.08	Lighting	Item	1	60,000.00	60,000.00	355,540.00
6 REDEVELOPMENT OF RIGGS STREET						
6.01	New/ reconstructed road	m2	1,591	105.00	167,055.00	
6.02	Asphalt seal	m2	1,591	40.00	63,640.00	
6.03	Kerb	m	434	40.00	17,360.00	
6.04	Footpath	m2	450	70.00	31,500.00	
6.05	Verge treatment	m2	1,120	10.00	11,200.00	
6.06	Road markings	Item	1	1,000.00	1,000.00	
6.07	Signage	Item	1	1,000.00	1,000.00	
6.08	Lighting	Item	1	42,000.00	42,000.00	334,755.00
7 REDEVELOPMENT OF BONEFISH CARPARK & NEW LINK TO MAIDSTONE CRESCENT						
7.01	New culvert and headwall (drain crossing)	Item	1	100,000.00	100,000.00	
7.02	New/ reconstructed road	m2	1,795	105.00	188,475.00	
7.03	Asphalt seal	m2	1,795	40.00	71,800.00	
7.04	Kerb	m	617	40.00	24,680.00	
7.05	Footpath	m2	549	70.00	38,430.00	
7.06	Median paving	m2	304	70.00	21,280.00	
7.07	Verge treatment	m2	651	10.00	6,510.00	
7.08	Road markings	Item	1	2,000.00	2,000.00	
7.09	Signage	Item	1	3,000.00	3,000.00	
7.10	Lighting	Item	1	54,000.00	54,000.00	510,175.00
8 REDEVELOPMENT OF CARPARK BETWEEN KENNEDY & LEARMONTH STREETS						
8.01	New / reconstructed car park base	m2	4,556	105.00	478,380.00	
8.02	Bitumen seal	m2	4,556	15.00	68,340.00	
8.03	Kerb	m	426	40.00	17,040.00	
8.04	Footpath	Note		included with Roads		
8.05	Landscaping	m2	2,148	40.00	85,920.00	
8.06	Road marking	Item	1	5,000.00	5,000.00	
8.07	Signage	Item	1	3,000.00	3,000.00	
8.08	Lighting	Item	1	46,000.00	46,000.00	703,680.00

EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
TOWN CENTRE
CONCEPT ESTIMATE

23-Apr-12

Ref	Scope	Unit	Qty	Rate	Sub-Total	Total
9 NEW ROUNDABOUTS ON MURAT ROAD ENTRIES (2 No)						
9.01	Note: no requirement for bypass roads	Note				
9.02	Remove trees / palms	No	10	500.00	5,000.00	
9.03	New/ reconstructed road	m2	1,221	105.00	128,205.00	
9.04	Asphalt seal	m2	1,221	40.00	48,840.00	
9.05	Concrete paving	m2	171	70.00	11,970.00	
9.06	Kerb	m	676	40.00	27,040.00	
9.07	Road marking	Item	1	3,000.00	3,000.00	
9.08	Signage	Item	1	3,000.00	3,000.00	
9.09	Street lighting	Item	1	120,000.00	120,000.00	347,055.00
10 STORMWATER						
10.01	RCP pipe in trench	m	1,720	750.00	1,290,000.00	
10.02	Stormwater pit	No	35	4,500.00	157,500.00	
10.03	Headwalls	No	10	2,250.00	22,500.00	
10.04	Culverts	Item	1	30,000.00	30,000.00	
10.05	Stone pitching	m2	30	225.00	6,750.00	
10.06	Gabions	Item	1	15,000.00	15,000.00	
10.07	Forming swales	Item	1	7,500.00	7,500.00	1,529,250.00
Sub-Total						8,891,538.00
Preliminaries						533,462.00
Net Construction Cost						9,425,000.00
Design Contingency						945,000.00
Construction Contingency						520,000.00
Professional fees & Disbursements						1,420,000.00
Client Costs						excluded
Land Costs						excluded
Headworks						excluded
Public Art						excluded
Gross Project Cost (at current costs)						12,310,000.00
Escalation to Tender						excluded
Total						12,310,000.00
GST						1,231,000.00
Total						13,541,000.00

Notes

- All figures exclude GST unless noted otherwise
- These estimates are based on preliminary information and should be considered indicative only
- These estimate are based on the following documentation. Only those works shown on those documents have been included herein:
 - Sketch drawing 1:1000 Option Shire
 - Sketch drawing 1:1000 Option Hass
 - Sketch drawing marked up to show work scopes
- Refer to estimate breakdowns for scope of work included
- This estimate is for the Town Centre only and does not include for Foreshore Works
- The estimate assumes asphalt seal to roads and bitumen seal to car parks

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