GOVERNMENT OF WESTERN AUSTRALIA

DevelopmentWA

Ocean Reef Marina Wedge Wave Investigation

MP Rogers and Associates were engaged by DevelopmentWA (previously LandCorp) in April 2019 to investigate the potential for a wedge wave surf break to be incorporated into the Ocean Reef Marina Development.

A summary of the investigation is provided below:

1. The potential for a consistently surfable wedge wave surf break on the **northern side** of the marina is unlikely due to the alignment of the breakwaters sheltering the area from the prevailing west-south westerly swell. The potential for a wedge wave surf break would only occur on a handful of occasions per year during very large swell conditions. Furthermore, patches of shallow rock platforms and nearshore reefs are situated within the surf zone in this area which may result in public safety issues, with large swell potentially breaking directly onto the reefs and rocks.

2. Although more suitable in terms of prevailing swell conditions, the potential for a consistently surfable wedge wave surf break on the **southern side** of the marina was also deemed unlikely with other constraints in existence such as the boundary of the Public Environmental Review (PER), which essentially hugs the existing southern boat harbour breakwater; Water Corporation's outfall pipes (which can't be relocated); non-uniform depth contours to the beach to the south; and no offshore bar present at the beach to the south. For these reasons it is also considered unlikely that a consistent surfable wedge wave break could be achieved along the southern breakwater of the Development. The investigation did consider a realignment of the section of breakwater that could be extended within the above are constraints, which is limited to approximately 50m. By way of comparison, the length of the suitably orientated breakwater at Clayton Beach, Mindarie is approximately 250m. Based on the limited length as well as the relatively steep angle of the potential alignment, this modification is unlikely to achieve sufficient wave focussing to occur in order to produce a sufficiently large reflected wave. Another added complication are the depth conditions on site. As a comparison, if a small wedge wave was reflected off a realigned structure, it would likely interact with the incoming swell in depths of -3 to -5 mAHD. This is considerably deeper than at Claytons Beach, Mindarie where the wedge wave interacts with the incoming swell within the surf zone, at 0 to -2 mAHD. In addition to this, it is unlikely that an offshore bar will form to the south of the southern breakwater, hence, the incoming swell would tend to break on the shore rather than starting shoal offshore as appears to occur at Claytons Beach, Mindarie.

3. The PER boundary and associated coastal processes and marine environmental investigations that formed the basis of the PER approval, prevent significant changes being made to the PER boundary. This therefore limits the ability to create an artificial reef due to the flow on impacts to the surrounding coastal areas and therefore basis of the PER.

4. Consideration was also given to the opportunity to create a wedge wave approximately 150m south of the marine development, outside of the PER boundary. Construction of a large obliquely angled structure extending from the south western corner of the southern breakwater may produce reflected wave within the surf zone in this area of the beach, however, the non-uniform contours and the lack of an offshore bar at this location would lead to the incoming swell breaking on the shoreline, therefore reducing the potential for a consistently surfable wedge wave break even under this scenario. There are also environmental, safety and liability issues due to the rocky nature of the shoreline and nearshore area.

5. The installation of any artificial structure outside of the approved PER boundary would require significant consultation with the relevant Government Departments (e.g. Department of Water and Environmental Regulation, Department of Biodiversity, Conservation and Attractions, Department of Fisheries), and would at a minimum need to consider the following environmental factors:

    i) Impacts to benthic habitat (direct loss/mothering, and indirect loss from scouring around the structure, erosion and accretion) - of note, there are seagrass communities directly to the west of the Development Envelope;
    ii) Changes to coastal processes such as hydrodynamics/sediment movement – with particular consideration to any changes to the north which may result in additional impacts to abalone habitat;
    iii) Increased visitation and usage of the area (which was a key issue raised by the Department of Biodiversity, Conservation and Attractions for the marina itself); and
    iv) Construction phase impacts (likely to be temporary and localised).

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creating better coasts and ports

R1779 Rev 1

April 2023

City of Joondalup

Ocean Reef Artificial Surf Reef Pre-Feasibility Project Plan

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canals
breakwaters
jetties
seawalls
dredging
reclamation
climate change
waves
currents
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water quality
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K2012, Report R1779 Rev 1
Record of Document Revisions

Rev	Purpose of Document	Prepared	Reviewed	Approved	Date
A	Draft for MRA review	T Hunt	B Garvey	T Hunt	28/02/2023
0	Issued as Proposal	T Hunt	B Garvey	T Hunt	2/03/2023
1	Revised and issued as Project Plan	T Hunt	B Garvey	T Hunt	6/04/2023

Form 035 18/06/2013

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1. Introduction

M P Rogers & Associates Pty Ltd (MRA) is pleased to submit this Project Plan to the City of Joondalup (the City) for the *Pre-Feasibility Assessment for an Artificial Surfing Reef at Ocean Reef.*

To develop this project plan we have met with the City, Surfing WA and the Mullaloo Boardriders Club (MBRC), to understand their requests and desires and the aim of the work. We have prepared a scope and project plan for the pre-feasibility assessment in response to these requests.

1.1 Need for Project

The expanded Ocean Reef Marina (ORM) had been considered for many years and construction commenced in 2021. The ORM redevelopment included expansion of the footprint approximately 800 m to the north of the existing boat harbour. This expansion resulted in the loss of at least 3 surf breaks in the area, including two reef breaks. This loss of local surfing breaks limits the opportunities for surfers in the area, increasing pressure on remaining surf breaks such as the beach breaks at Mullaloo, and reducing the range of conditions which are able to be surfed locally.

The MBRC are a representative club of surfers based within the City who hold, among other events, regular surfing competitions at and near Mullaloo and Ocean Reef. Prior to the construction of ORM, the MBRC regularly used the now lost reef breaks to hold events when conditions better suited these breaks and the beach breaks at Mullaloo were unsuitable.

The loss of these breaks has not only reduced the variability and surfing opportunities within the City, but restricted the ability of the Club to hold events locally, resulting in competitions in 2022 being relocated to Lancelin to provide suitable conditions.

Along with the general recreational use and competitions held by MBRC, the local breaks are used by Surfing WA to hold "Learn to Surf" lessons and Ocean Reef High School for their surfing program. Where these lessons and classes were previously spread across the breaks, they are now all located at Mullaloo Beach, increasing congestion and reducing opportunities.

Aside from the current congestion, the additional residences associated with the ORM development will likely increase pressure on the remaining local surf breaks.

As a result, the MBRC, with the assistance of Surfing WA, have been lobbying for an ASR in the vicinity of the ORM development.

2. ASR Proposal

Initial concepts and development plans for the ORM included a potential future Artificial Surfing Reef (ASR), which aimed to offset the loss of these breaks and provide additional recreational surfing opportunities near the development. The adopted concept plan for the ORM, showing an ASR as a potential future feature on the southern side of the development, is presented in Figure 1.1. This concept plan formed the basis of the approved development which is being constructed.

While envisioned as a potential future amenity for the development, to date no funding has been provided for the ASR element and the proposal has not progressed.

As a result, the MBRC and others are continuing to lobby for an ASR in this general area. The MBRC propose an ASR several hundred metres south of the southern breakwater, where it may be surfable under prevailing south-westerly swells.

This area may be within the Marmion Marine Park excision zone, which would offer benefits in the approval process required for the ASR.

Figure 1.1 ORM Concept Plan (TBB 2014)

3. Scope of Pre-Feasibility

MRA met with the MBRC and Surfing WA to discuss their desires and ideas, specifically for an ASR on the southern side of ORM. The scope which has been developed and is outlined below, aims to address the following items.

- Review of ASRs in Western Australia, Australia and globally.
- Liaison and consultation with key stakeholders, along with others involved in recent ASR proposals.
- Consideration of opportunities and constraints for an ASR near ORM.
- A fatal flaw analysis of an ASR at Ocean Reef, considering the local site conditions.
- Preparation of a high level concept for the location, shape and form of an ASR near ORM.
- Determination of potential approval requirements, pathways and investigations to progress the project.

The following sections outlines the general methodology to complete the pre-feasibility assessment.

It is proposed that the project team to complete the assessment would include coastal engineers and specialist environmental consultants, experienced in the area and with similar projects.

Background & Review

The initial phase of the works would require compilation of background data, information and previous assessments and feasibilities of ASRs. Available data would be sourced and is likely to include the following:

- Local coastal processes information and assessments around ORM.
- Regional and local metocean data, including waves, water levels, winds and currents.
- Land and hydrographic surveys, including bathymetry in the area of the ASR.
- Geotechnical information.
- Coastline types and vulnerability.

A kickoff meeting and site visit to ground truth the data, consider potential access to the beach in the area and potentially meet with the City and key stakeholders on site would be completed on commencement.

An important part of the pre-feasibility would be assessment of the likely environmental approvals and investigations required to progress the project. Specialist environmental consultants with a knowledge of the process within the Marmion Marine Park should be used to complete this assessment.

Along with the environmental approval assessment, a desktop review of the available information should be completed to assess any critical constraints, opportunities or gaps in the data.

Literature Review & Summary

Following compilation of the available information, a desktop and literature review of relevant data, analysis, assessments and reports would be completed. The coastal processes at the site would be characterised and assessed. This should initially look for red flags and fatal flaws at the proposed location, along with key requirements of ASRs from other proposals.

Previous ASR proposals and installations in Western Australia, Australia and globally should be considered. This would include consideration of lessons learnt and the approvals process and requirements. As a minimum this should include consideration of proposals at Cables Station, Albany, Bunbury Back Beach, Wanneroo and Geraldton.

The authorities involved in recent proposals and projects, should be consulted with, including the City of Albany. This would provide specific insight into any lessons learnt, opportunities and constraints with similar works.

Further consultation with key stakeholders for the project, specifically including MBRC and Surfing WA, should be completed at this stage. This would provide stakeholders an update on the status of the assessment and seek clarification of any additional questions raised through the process. It would specifically canvas items such as optimum surfing conditions and times for the proposed location. Any available records and statistics of recreational surfing numbers for Perth, the City of Joondalup and specifically Mullaloo and Ocean Reef should be sought.

Preliminary Feasibility Assessment

As the basis of the pre-feasibiity, a high level sketch of the ASR location and size should be developed. This would be highly indicative and subject to change, but would allow consideration of key criteria for the proposal.

The wave climate at the proposed ASR location should be determined, to assess the feasibility and suitability of the location for surfable waves. As an example, a typical year of wave conditions should be modelled with a calibrated and validated wave model.

For comparison, we would recommend that the wave climate is also considered for the following locations:

- Mullaloo Point (in the vicinity of the main break).
- Northern side of the ORM.

Wave height and direction for the sites should be prepared and reviewed. This would assist in assessing the potential surfability of the site, compared to Mullaloo and the northern side of the ORM. This will identify any potential issues with wave climate at the site and also allow the potential of the project to be kept in context.

The bathymetry and geotechnical conditions at the site, and the potential foundation for the ASR, should be reviewed.

The potential impact on coastal processes and coastal hazards from the proposed reef location will require consideration. While there is a rocky shoreline in the area, a high level assessment of the potential changes to the shoreline and sediment transport in the area should be completed.

The environmental impacts and any potential fatal flaws of the proposed ASR should be assessed. This would cover items such as benthic habitat, loss of habitat, marine conditions and other environmental indicators. It would assess any fatal flaws or challenges with the proposal.

The potential form and construction of the proposed ASR should be considered. This would include the potential materials - eg rock, concrete, or other, along with the construction methodology. High level construction and maintenance costs should be developed for the ASR, along with high level pros and cons and safety or other considerations and risks.

Approvals, Project Staging & Pathways

The likely approvals required for the project and the pathway will be dependent on the location and form of the ASR. This should be determined based on the high level location and form of the proposal. This work would include determination of the likely required investigations and assessments, with costs.

The appropriate future project staging should also be determined- eg feasibility, concept, detailed design, tender, construction. Timeframes and costs for each should be considered and included and an indicative project pathway determined.

Reporting & Liaison

Throughout the work, liaison will be required with the City and key stakeholders.

A stand alone, fully referenced Pre-Feasibility report would be required and provided to the City for review and comment. Following review and revisions, a final report would be prepared.

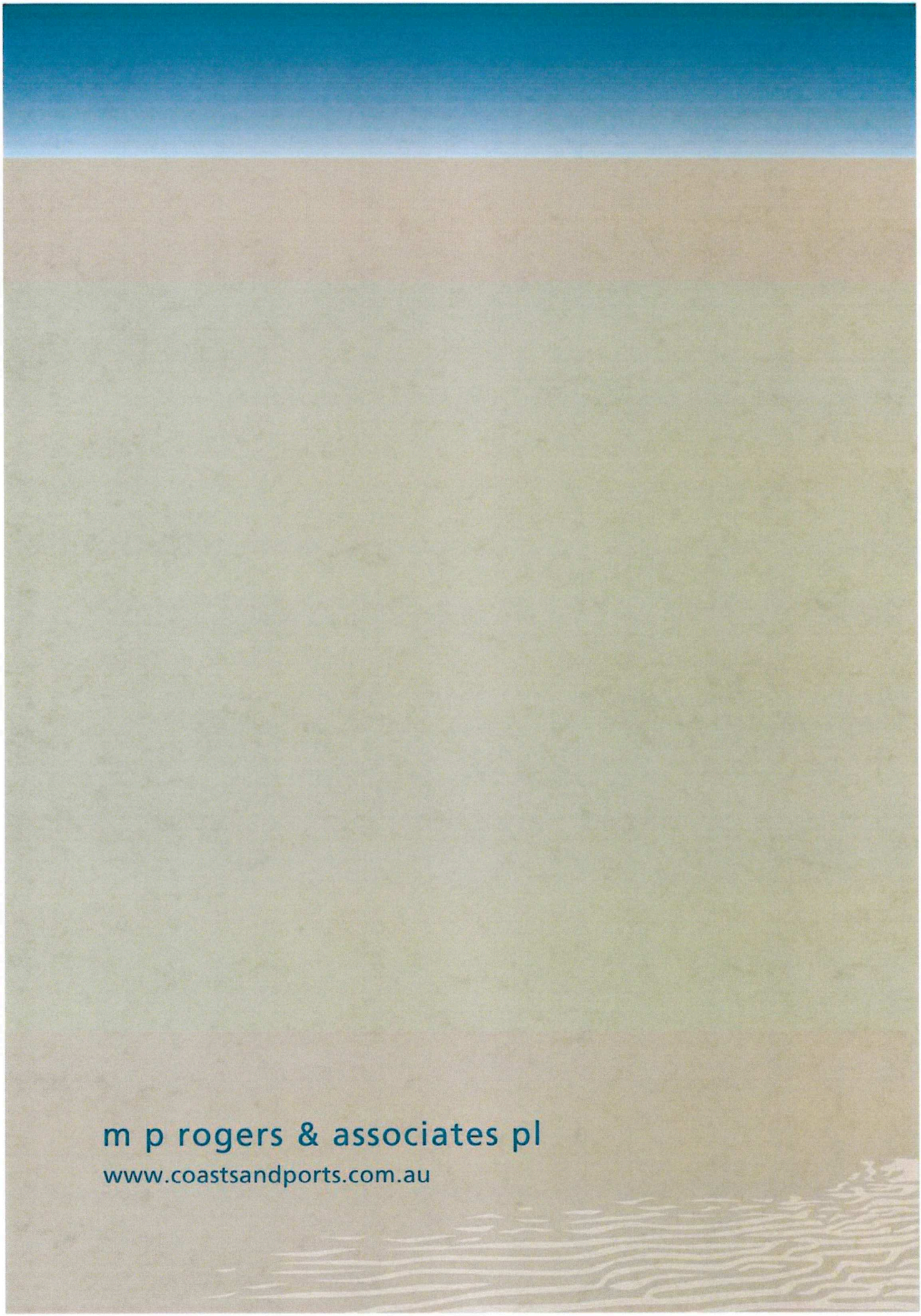
4. Budget Costs & Timing

A Budget Cost for the proposed scope of the Pre-Feasibility has been prepared and is presented below in Table 4.1. This has assumed that the scope above is completed by knowledgeable and experienced coastal and environmental consultants.

Table 4.1 Budget Costs

Item	Task	Budget Cost
1	Background & Review	$5,000
2	Literature & Reef Review & Summary	$10,000
3	Preliminary Feasibility Assessment	$15,000
4	Approvals, Staging & Pathways	$5,000
5	Reporting & Stakeholder Liaison	$10,000
SUB-TOTAL		$45,000
Goods & Services Tax (GST)		$4,500
TOTAL		$49,500

It is expected that the Pre-Feasibility would take approximately 3 months to complete.



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