

# COASTAL MANAGEMENT CASE STUDY - QUINNS BEACH, CITY OF WANNEROO, WESTERN AUSTRALIA

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## BACKGROUND

The Quinns Rocks coastline is an area of ongoing coastal erosion which has been actively managed by the City of Wanneroo (the City) since 1996, ensuring the ongoing protection of coastal assets including public and private infrastructure, beach amenity and the natural dune environment. Quinns Rocks is listed as a coastal erosion hotspot within the Assessment of Coastal Erosion Hotspots in Western Australia, which was published by the Government of Western Australia in 2019.

Historical coastal protection works in Quinns Rocks include the construction of a small detached rock breakwater, three rock groynes, a Geosynthetic Sand Container revetment, multiple beach renourishment activities and ongoing coastal maintenance works. Despite these interventions, coastal erosion has continued at a number of locations threatening coastal infrastructure, dune habitat and beach accessibility. Based on beach and dune survey data, the estimated sediment budget along the Quinns Rocks coastline has a deficit of approximately 20,000m<sup>3</sup> per year. This prompted the need for additional coastal management investigations and coastal protection works.

## COASTAL ENGINEERING DESIGN

The Quinns Beach Coastal Management Study commenced in September 2014 and was completed in April 2017. The study was undertaken by engineering consultant, Cardno WA Pty Ltd (now Stantec), with technical assistance and review by the City and the Government of Western Australia (Department of Transport). The study included a detailed coastal processes assessment including collection of local metocean and geotechnical data and sediment transport modelling including storm induced erosion events using XBeach (Deltares) and long term longshore sediment transport modelling using LITPACK (DHI).

This was followed by a coastal management options assessment which involved a number of options including managed retreat, beach renourishment, new groynes, modifications to existing groynes, revetments, detached breakwaters and artificial reefs. Two preferred options were selected following a detailed multi criteria analysis with consideration of public perception, effectiveness, capital cost, maintenance requirements, safety and adaptability to climate change.

The preferred option was selected following extensive community consultation including consideration of over 500 community survey responses/comments. In August 2016, Council approved the following coastal management option for detailed design:

- No extension to Groyne 1;
- Upgrade and 45m extension to Groyne 2;

- Upgrade and 20m extension to Groyne 3;
- A new 60m groyne (Groyne 4); and
- Beach renourishment (33,600m<sup>3</sup>).

Detailed design was undertaken for a 50 year design life with significantly reduced maintenance requirements, compared with current practices, over this timeframe. Groyne lengths and locations were optimised using LITPACK to assess shoreline response to longshore sediment transport over 50 years. Refer to Figure 1 for a location plan of the final recommended coastal management option and Figure 2 for a depiction of the 50 year shoreline change in response to the proposed works. The proposed groyne construction works were predicted to:

- Have negligible impacts south of Groyne 1;
- Provide a substantially wider beach and increased protection to existing infrastructure between Groynes 1 and 2;
- Stabilise and widen the beach between Groynes 2 and 3;
- Provide a wider and less variable beach between Groynes 3 and 4; and
- Limit the impacts on reduced beach width north of Groyne 4.



Figure 1 - Location Plan of Quinns Beach Coastal Management Works.

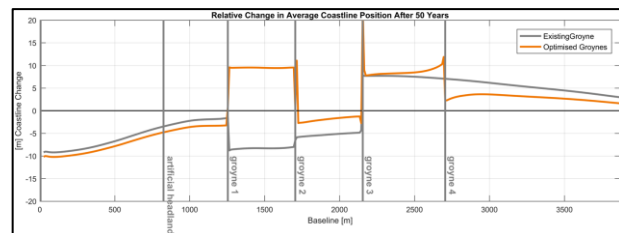


Figure 2 - Predicted 50 Year Shoreline Response to the Proposed Groyne Works.

Completion of the study greatly increased the understanding of local coastal processes and sediment transport along Quinns Beach enabling the prediction of short and long term responses to the recommended coastal protection works. The numerical models and

understanding of sediment transport processes were also utilised in a novel approach for coastal hazard mapping in the City's Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) through the consideration of existing and proposed groyne structures and long term sediment transport modelling. This approach is more detailed than what is currently used for coastal hazard mapping within Western Australian CHRMAPs.

The completion of the Quinns Beach Coastal Management Study also prompted the City to significantly expand its coastal monitoring programme and formalise its beach renourishment programme. This now includes annual scheduled beach renourishment works with locations and quantities based on coastal monitoring analyses and recommendations.

#### COMMUNITY CONSULTATION

The Quinns Rocks community is very passionate and knowledgeable on both historical and current issues relating to the beach and coastal environment. The beach forms a strong part of the history and culture of Quinns Rocks and therefore community interest was extremely high and involvement was essential for the ultimate success of the project.

The project included extensive community consultation throughout both the design study and construction works. This included community information sessions, surveys, media releases, website/social media updates, on-site signage, radio interviews, newspaper articles and presentations to local community groups. Numerous State Government departments and Elected Members were also regularly consulted as required and at major project milestones. The project also included the establishment of a Community Advisory Group to act as a conduit to the wider community and enable prompt community discussion/feedback. The feedback received from the community consultation process was a critical factor in the selection of the recommended coastal management option. Overall, the project was strongly supported by the local community and it greatly improved the City's reputation for coastal management actions.

#### CONSTRUCTION

Construction was staged over three years during summer to reduce weather related construction risks, whilst allowing for monitoring of short term coastal responses to each construction stage. Construction works were undertaken by WA Limestone and Italia Stone Group Joint Venture in the following stages:

- Stage 1 (2017/18) - Construction of Groyne 4, beach access ramp and beach renourishment (Figure 3);
- Stage 2 (2018/19) - Extension and upgrade of Groyne 2 and beach renourishment (Figure 4); and
- Stage 3 (2019/20) - Extension and upgrade of Groyne 3 and beach renourishment (Figure 5).

All works were completed successfully, within schedule and within budget, at a cost of approximately \$7M, of which \$600,000 was funded by the Department of

Transport. Expected long term benefits of the works include a significant reduction in groyne maintenance and beach renourishment requirements in the future.

Following the completion of the Quinns Beach Coastal Management Project, the City actioned a significant upgrade to the remaining existing groyne (Groyne 1) in 2021. These works aimed to improve public safety, reduce maintenance requirements and align all groyne structures to a similar design standard and maintenance regime.



Figure 3 - Site Photograph of Stage 1 Works, Construction of Groyne 4 (January 2018).



Figure 4 - Site Photograph of Stage 2 Works, Extension and Upgrade of Groyne 2 (December 2018).



Figure 5 - Site Photograph of Stage 3 Works, Extension and Upgrade of Groyne 3 (November 2019).

#### CONCLUSION

The Quinns Beach Coastal Management works were completed successfully and to a high standard in January 2020 providing additional protection to public and private infrastructure and natural coastal assets including beach

amenity and the dune environment. These works are expected to reduce future coastal maintenance requirements including beach renourishment and groyne maintenance. The project was strongly supported by the local community and was instrumental in improving community perceptions of the City and its coastal management actions.