ORDINARY MEETING 16 DECEMBER 2014	5.8

NEWELL BEACH EROSION MITIGATION

Paul Hoye – General Manager Operations

RECOMMENDATION:

That Council:-

1. **Proceed immediately to construct a geofabric groyne at the southern end of Newell Beach; and**

2. **Fund the groyne works from general revenue; and**

3. **Investigate funding options for the dredging of the sandbar at the Mossman River mouth and report back to Council in February, 2015 on the funding options available for completing the dredging.**

EXECUTIVE SUMMARY:

Newell Beach has been suffering erosion at the southern end of the beach for many years. In the last ten years and in particular the last five years the erosion has reached some property boundaries and threatened minor infrastructure. The erosion is now within 3–10 metres of some structures, including decking. The erosion threatening properties extends along a 500 metre length of beach.

Council engaged the engineering consultancy Projex Partners to investigate the cause of the erosion and identify possible solutions to the erosion.

Projex Partners have identified that the erosion is caused by the northern movement of sand along the beach (longshore drift) and that the presence of a sandbar at the mouth of the Mossman River is preventing sand entering the southern section of the beach.

Projex Partners have recommended a three part solution to the erosion problem. The first part of the solution is the existing sand replenishment that Council has recently undertaken. The second part of the solution is the installation of geotextile bags perpendicular to the beach to form a groyne to trap and hold sand moving along the beach. Dredging of the sandbar at the mouth of the Mossman River onto the beach forms the third part to the solution. The dredging will allow the natural movement of sand onto the beach.

It is recommended that Council resolve to carry out the geotextile bag work as soon as possible with funds to be allocated from general revenue. It is further recommended that Council investigate funding options for undertaking dredging works to remove the sandbar that is believed to be the cause of the erosion.

BACKGROUND:

Erosion of the southern section of Newell Beach has been occurring on and off for in excess of forty (40) years. Significant erosion of the southern section has been continual since approximately 1997 and the high tide line is now up to property boundaries in some instances and within 3-10 metres of decking and other structures. The eroded area is known is Esplanade (dedicated road area).

Both Cairns Regional Council (CRC) and Douglas Shire Council have previously carried out sand replenishment of the beach area. CRC also carried out some dredging of the Mossman River with the dredge sand being placed on Newell Beach. The beach has continued to erode although some sand replenishment has protected properties for many months and only been lost due to storm events. The sand has ultimately been spread further up the Newell Beach in a northerly direction via longshore drift.

Council has received a number of requests from property owners adjacent to the beach to address the erosion of the primary dune. The length of property ownership in the erosion area ranges from in excess of forty (40) years to less than two years. Twenty six houses are located along the beachfront area at Newell and approximately 20 of these properties are at threat of the current erosion that is occurring.

Council staff engaged Projex Partners to provide advice, the Projex Partner staff having experience with beach erosion in south east Queensland. Projex Partners were engaged to assess the likely causes and provide advice on options for preventing erosion from continuing and to replenish the beach sand at Newell. The objectives of this study were:

- Provide a statement on the values of Newell Beach;
- Undertake a desktop review of beach erosion mechanisms;
- Discuss the Newell Beach Erosion Observations;
- Consider possible erosion mechanisms causing sand loss at Newell Beach;
- Undertake a desktop review of options available for replenishing sand at
- Newell Beach based on the identified possible erosion causes and make recommendations on works to improve sand retention at Newell Beach;
- Provide an estimate of cost to undertake the recommended work; and
- Provide advice on further works required.

COMMENT:

The Projex Partners report (Newell Beach Erosion) is attached, with some details of suppliers who provided quotations having been removed. The report confirms that northwards longshore drift, in combination with the ever increasing sandbar at the mouth of the Mossman River is causing the erosion of the beach. The sandbar is interrupting sand movement, creating an imbalance in the longshore drift process because wave action between the sand bar and the beach is continuing to transport sediment away from Newell Beach, but the sand bar is preventing new sand arriving on the beach.

With no sand arriving at the southern end of Newell Beach and sand continuing to depart, the result is a continually eroding beach.

The report contains three recommendations:

Step 1 - Emergent Protection Works
That Council commence sand replacement works as soon as possible to reinstate the eroded portion of the freehold properties to provide immediate protection. (Recently carried out)

Step 2 - Geofabric Groyne
Construct a geofabric groyne with five (5) tonne geofabric (e.g.Elcorock) bags at the northern end of the Newell beach-front properties to prevent the removal of further sand from this area via the long shore drift process. This will provide further protection to these properties (over and above the emergent protection works) by allowing the accumulation of sand against the groyne which will result in beach replenishment along the shore line to the south.

Step 3 - Sand Bar Dredging
The sand bar that has formed at the southern end of Newell Beach at the Mossman River mouth should be dredged to allow the natural longshore drift processes to resume. This will enable the sand that is removed from Newell Beach (long shore drift) to be replenished from the south, improving the Newell Beach's longshore drift balance. It will also prevent the observed increase in sand deposition occurring at the northern section of Cooya Beach.

The dredged sand should be placed on the beach to an appropriate profile so that improved protection is provided from future storm events.

PROPOSAL:

It is proposed that Council immediately allocate $35 000.00 from general revenue to undertake the installation of geofabric groynes at Newell Beach in accordance with the report recommendations, including permit requirements. It is further recommended that Council continue to use sand removed from the Daintree River Ferry channel for sand replacement on the beach at Newell, including the use of this sand for the filling of the geofabric bags and between groynes. Projex partners have confirmed that the groyne cost is for a single groyne at the northern end of the erosion area adjacent to the beachfront properties. The groyne would be higher towards the beach (3 bags high) and lower towards the sea (2 to 1 bag in height). The groyne would be approximately 20 metres in length.

Due the estimated cost of dredging being $480,000.00 it is further proposed that staff investigate funding options to undertake dredging of the sandbar at the mouth of the Mossman River and that a report be brought back to Council with options for the funding of the dredging works.

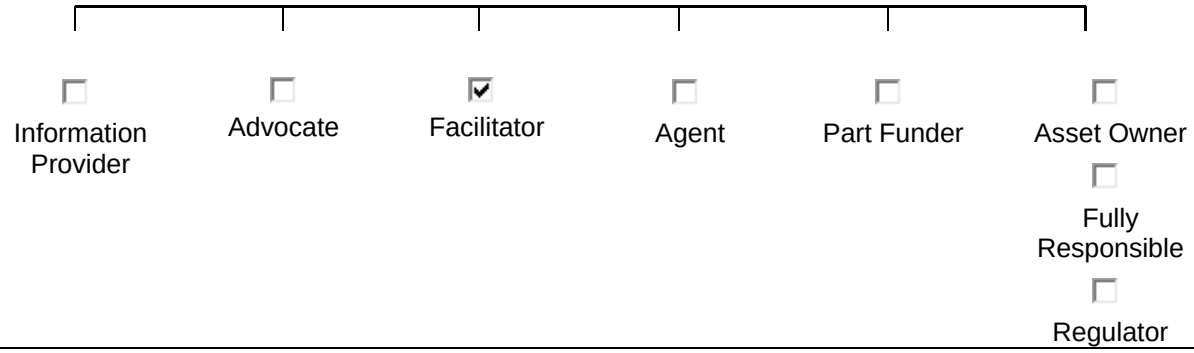
CORPORATE/OPERATIONAL PLAN, POLICY REFERENCE:

Theme 5, Goal 2 To demonstrate leadership in Local Government through sound, transparent, accountable and equitable decision making.

COUNCIL'S ROLE:

Council can play a number of different roles in certain circumstances and it is important to be clear about which role is appropriate for a specific purpose or circumstance. The implementation of actions will be a collective effort and Council's involvement will vary from information only through to full responsibility for delivery.

The following areas outline where Council has a clear responsibility to act:



Facilitator:	Bringing people together to develop solutions to problems.

FINANCIAL/RESOURCE IMPLICATIONS:

The estimated cost of $35,000.00 for installation of the geofabric bags has not been budgeted for in the 2014/15 year. To undertake the works in the current year funding would need to be provided from Council's General Revenue. The alternative would be to budget for the works in the 2015/16 year. Works would be undertaken by a combination of Council and contractors and are within resource capabilities.

RISK MANAGEMENT IMPLICATIONS:

It is anticipated that implementing the recommended works will reduce the erosion that is occurring at the southern end of Newell Beach and will, as a result, assist in reducing the risk of erosion of private property in that area. Council should be clear that the works are to assist in the natural accumulation of sand in the subject area and as a result build back the beach area. The works are not designed to protect property or the remaining dune area from large storms, king tides, cyclones or any anticipated rises in sea level.

SUSTAINABILITY IMPLICATIONS:

ECONOMIC: The works recommended in this report will need to be funded and local contractors engaged to complete the works. A large number of properties in the area are holiday rental and used for commercial activities such as weddings. Improvement of the beach area may have an economic benefit to these properties and property values overall.

ENVIRONMENTAL: It is anticipated that the works will assist in the replenishment of the sand and the beach area and slow or stop the current ongoing erosion. This will improve the aesthetic and recreation qualities of the beach.

SOCIAL: The open space of Newell Beach is easily accessed and provides residents and tourists with recreational opportunities. Combined with the coastal amenity and climate of Far North Queensland, these aspects create the lifestyle and opportunities that attract residents and tourists to the area. It is anticipated that successful mitigation of the erosion will protect and enhance the beach area for the community.

INTERNAL/EXTERNAL CONSULTATION:

Projex Partners were engaged to complete the report. Discussions were also held with staff from the Sunshine Coast Council, drawing on parallel experience in that area.

ATTACHMENTS:

Attachment A - Newell Beach Erosion Report – Projex Partners

Attachment A - Newell Beach Erosion Report – Projex Partners

ProjexPartners

Newell Beach Erosion

Newell Beach

Reference number 62-001-001R

For Douglas Shire Council November 2014

Prepared by:

Projex Partners Pty Ltd
ACN 153 518 971 ABN 62 153 518 971
228 Draper St
Parramatta Park, Qld 4870

Telephone: 07 5041 5118
Facsimile: 07 4041 5113

DOCUMENT ISSUE RECORD

Revision Code	Date Revised	Revision Details	Author	Checked	Approved
A	21/10/14	Draft Issue	DJW	EWK	DJW
B	12/11/14	Final Issue	DJW	TJH	DJW
C	01/12/14	Figure 4.2 Amended	DJW	TJH	DJW

621-001-001R

CONTENTS

CONTENTS

Figures

Photographs

Appendices

1 Introduction

Significant erosion has occurred at Newell Beach over the years. The erosion problem has been progressive with a significant volume of sand having been lost from the beach over the last 20 years as observed by local residents. The erosion is impacting on the values and desirable features of the area and more recently has begun to have an impact on the adjacent beach-front properties with the shoreline eroding into back yards.

The erosion problem at Newell Beach is compounding with the sand loss and resulting steepening in beach profile significantly reducing the beaches natural defence against subsequent storm events. This is increasing the risk to further significant erosion.

Projex Partners have been engaged by Douglas Shire Council to undertake a desktop study into the erosion at Newell Beach.

Newell Beach is identified below in **Figure 1.1**.

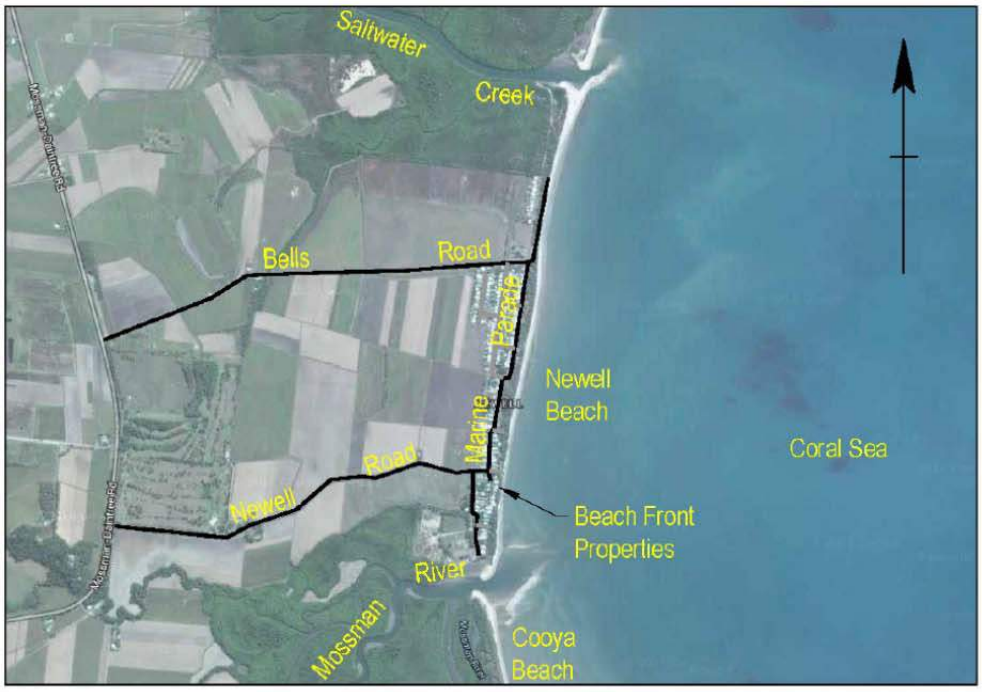


Figure 1.1 – Aerial Photograph of Newell Beach (courtesy of Google Maps)

The purpose of the study will be to assess the likely causes and provide advice on options for preventing erosion from continuing and to replenish the beach sand. More specifically, the objectives of this study are as follows:

- Provide a statement on the values of Newell Beach;
- Undertake a desktop review of beach erosion mechanisms;
- Discuss the Newell Beach Erosion Observations;
- Consider possible erosion mechanisms causing sand loss at Newell Beach;
- Undertake a desktop review of options available for replenishing sand at Newell Beach based on the identified possible erosion causes and make recommendations on works to improve sand retention at Newell Beach;
- Provide an estimate of cost to undertake the recommended work; and
- Provide advice on further works required.

2 Newell Beach Values

Newell Beach is a public access sand beach located within the Douglas Shire that stretches from the Mossman River mouth to Saltwater Creek (a distance of approximately 2.4km) in Newell, Queensland. About 28 residential properties enjoy beach frontage from just north of the Mossman River mouth for a distance of approximately 620m north. The remainder of the foreshore area (Marine Parade) provides public access to Newell Beach for a length of approximately 1.9km. Marine Parade then turns into a dirt road providing access to the Saltwater Creek mouth.

Newell Beach is an important community asset for the region. This section provides brief comment on the values relevant to the study area.

2.1 Social Values

The major social values of the Newell Beach area are recreation, open space and coastal protection.

The open space of Newell Beach is easily accessed and provides residents and tourists with recreational opportunities. Key activities that are undertaken within the study area include socialising, relaxation, kite surfing, ocean kayaking, fishing, swimming, walking and picnicking. Combined with the coastal amenity and climate of Far North Queensland, these aspects create the lifestyle and opportunities that attract residents and tourists to the area.

2.2 Economic Values

In terms of profile and employment, tourism and agriculture (predominantly sugar cane) are the largest industries in the Douglas Shire area, which includes Newell Beach. Tourism attracts a significant number of visitors each year. With the major attractions for visitors being related to the coast line, effective management of these areas is imperative to continued growth of the tourism industry.

2.3 Built Environment

The natural protection that coastal foreshores like Newell Beach provide to the built environment should also be recognised.

2.4 Ecological Values

The coastal foreshores of the Far North Queensland area contain important coastal eco-systems including dunes, beaches and headlands. These systems also support unique species and habitat for flora and fauna.

3 Beach Erosion Mechanisms

Beaches are not static features, but very dynamic and fluctuations in their position are the result of the prevailing coastal processes. These processes are a combination of ocean swell waves and wind generated waves.

Ocean swell waves propagate to the shoreline from the deep ocean. They experience significant modification as they approach the shoreline by refraction, bed friction and shoaling. Wind generated sea waves are not substantially affected by the offshore characteristics prior to breaking near the shoreline.

As waves approach the coastline their energy brings sand into suspension and the ocean currents transport the sand to another location. Sand on the sea-bed is mobilised by every ocean swell wave or wind generated wave passing over it. Under calm conditions the sand may shift only a fraction of a distance, however during an extreme storm event large distance sand migration can cause beaches to change significantly in a short period of time.

Changes in beaches due to extreme events are normally remembered because of the significant change in such a short period. It is obvious to the casual observer. However, slow and gradual changes often go unnoticed. An avid beach observer will notice the constant and continual reshaping of a beach over time.

3.1 Longshore Drift

Longshore drift (also known as longshore transport or littoral drift) is the movement of sand along the coastline. It occurs by the cycle of waves washing up onto the beach and then receding back. Waves (both swell and wind waves) typically meet the beach at an oblique angle. Sand particles are suspended by the waves and moved up the beach at this same angle, being relocated from their original position. Waves then will recede back to the ocean almost perpendicular to the shoreline (they don't recede back to where they came from). The sand particles are therefore once again relocated to a new position. Over many wave cycles sand particles are transported in in a zig-zag pattern through the water alongside the beach. **Figure 3.1** shows this process.

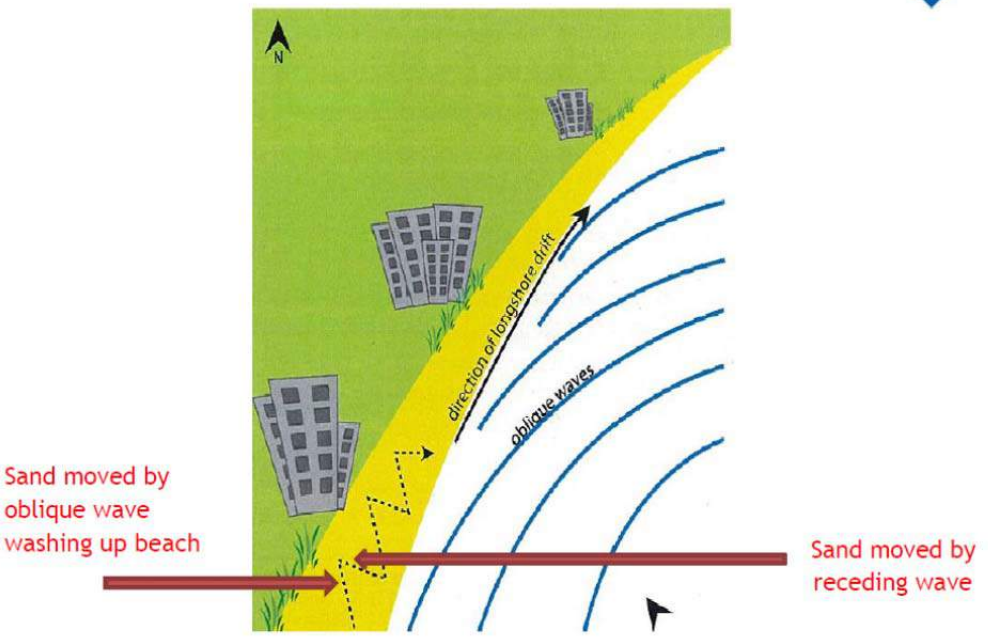


Figure 3.1 – Longshore Drift Mechanism (courtesy of Gold Coast City Council)

Movement of sand by longshore drift is influenced by the strength of the swell (swell waves) and the strength and direction of the prevailing winds (wind waves). The prevailing winds at Newell Beach are south-easterly which results in the longshore drift moving sand in a northerly direction along the beach. The strength of the swell and prevailing winds determine how quickly the sand is transported in this direction, but the movement of sand along a beach by the longshore drift mechanism is typically a slow process and will not be obvious in a short period of time to casual observers.

3.2 Storms

Unlike longshore drift, storms can cause very quick sand movement at a beach. The increased strength of wave action suspends sand particles for longer and can move sand particles much further than the longshore drift process. This can quickly result in sand being transported offshore and once it settles to the ocean bed it can form sand-bars. Parts of the beach may be significantly eroded in a short period of time due to the stronger waves generated by storms.

Once a storm subsides and during periods of calmer weather, the milder wave climate slowly moves this deposited sand back onshore (under the longshore drift process) which can re-establish the beach over time. If the longshore drift sand transport is in balance (ie sand arriving and sand departing is equal) then these processes do not involve any net loss or gain of sediment at the beach. If the longshore transport is not in balance, then this can result in a net loss or gain of sand to a beach.

If the longshore transport imbalance results in more sand leaving than arriving and it is left alone, then the sand loss will eventually result in the beach steepening. This will then result in the beach being exposed to a higher risk of erosion from future storms due to waves impacting the beach at a steeper angle.

4 Newell Beach Observations

Anecdotal advice from a Newell Beach resident has revealed that over the last 15 to 20 years sand loss has resulted in a steepening of the beach profile. Advice is also that a sand bar has formed at the mouth of the Mossman River (on its southern side) and over time it has grown away from the coast and now continues its growth parallel to the coast line. **Figure 4.1** identifies the sand bar.

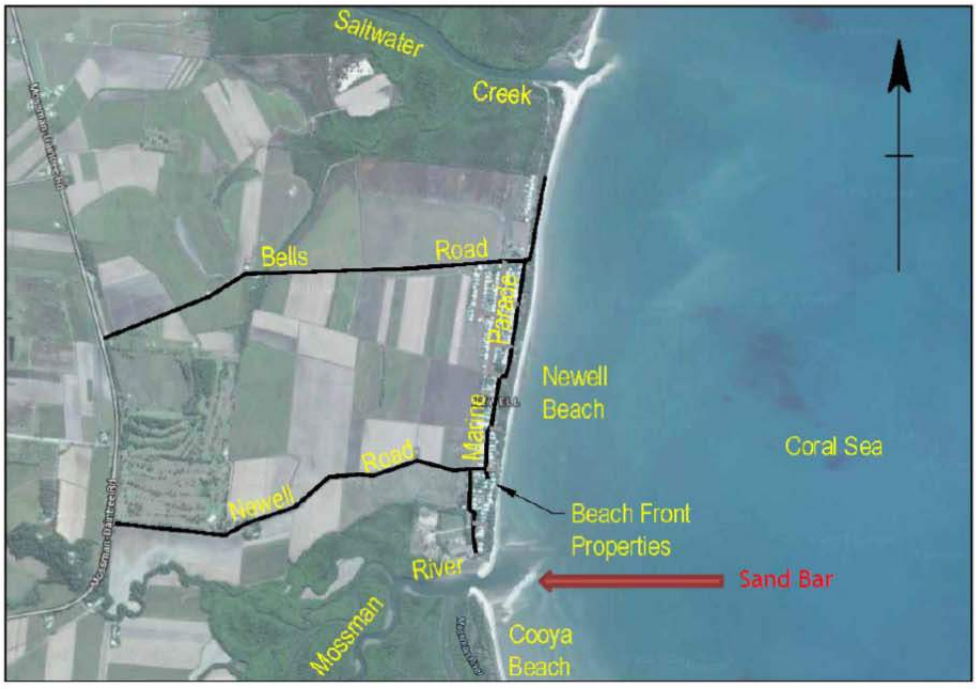


Figure 4.1 – Sand Bar at Newell Beach (photograph courtesy of Google Maps)

An inspection of Newell Beach by Projex Partner and Douglas Shire Council's has revealed that significant erosion is apparent at the beach, particularly in front of the existing residences. This is obvious from the exposed roots of vegetation in the area. Also obvious is the reduction in the beach front properties back yard areas by benchmarking with fence, pool and deck infrastructure being exposed. There does not appear to be any erosion along the beach north of the residences.

The approximate extent of erosion is shown in **Figure 4.2** and the following photographs show the site observations.

Figure 4.2 – Approximate Extent of Erosion (photograph courtesy of Google Maps)

Photo 4.1 – Sand Bar at Southern End of Newell Beach looking from Cooya Beach

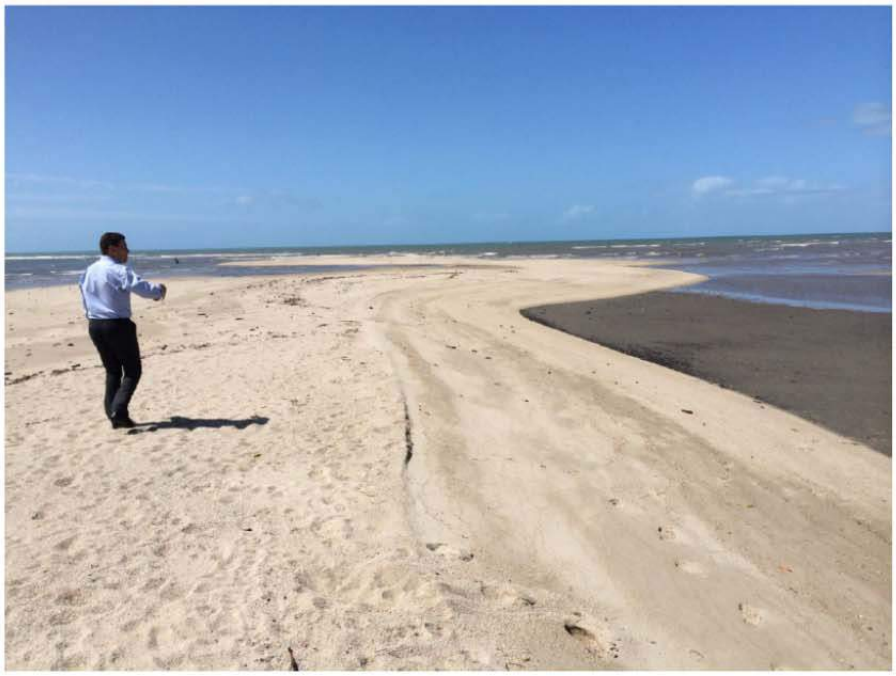


Photo 4.2 – Walking Along the Sand Bar from the Beach

Photo 4.3 – Erosion at Beach Front Property No. 1

Photo 4.4 – Erosion at Beach Front Property No. 2

A Newell Beach resident confirms that over time he has witnessed sand loss at Newell Beach and that beach profile has steepened. During the site visit when comparing the Newell Beach profile to the adjacent beach to the south (Cooya Beach - refer **Figure 1.1** for location) it was observed that the Cooya Beach profile is significantly flatter than that of Newell Beach. Further inspection of Cooya Beach by Projex Partners revealed that Cooya Beach does not have the same erosion issues that are occurring at Newell Beach. In fact, the northern end of Cooya Beach is showing evidence of an increasing sand deposit adjacent to the sand bar.

Photo 4.5 – Cooya Beach

Photo 4.6 – Cooya Beach Sand Deposit with Sand Bar Upper Left of Photo

5 Possible Mechanisms Causing Sand Loss

There have been some significant storms in the area over the last 20 years and more recently those associated with Severe Tropical Cyclone Larry in 2006, Severe Tropical Cyclone Yasi in 2011 and Tropical Cyclone Ita in April of this year. These type of events and other significant storms cause strong wave action on the beaches and also result in significant increase in the flow, velocity and turbulence within the coastal river systems.

It is well documented that during significant storm events, the increased flow, velocity and turbulence within river systems can result in the transport of sediments from upstream within rivers to the river mouth. Once these sediments meet the ocean the flow is dissipated due to the ocean swell and wind generated waves. This reduction in velocity results in the sediments settling to the river/ocean bed near the river mouth creating sand bars.

Council has advised that there are large sand deposits within the Mossman River system and it is possible that over the years this sand has been transported by storm events to the river mouth and has settled to the river/ocean floor creating the observed sand bar. A series of similar events over the years has contributed to the growth of the sand bar. Its growth is exacerbated, not only from storm events re-occurring and depositing further sand, but also by capturing the sand transported north along the coast line by the longshore drift process. This is causing the sand bar to continue increasing in size and growing north and parallel to the beach line. As the sand bar has grown, it has created an ever increasing barrier to these natural longshore drift processes, capturing sand that would otherwise have been deposited on Newell Beach. Not only is this demonstrated by the sand bar extending to the north, but also growing in width (also demonstrated by the sand deposits at the northern end of Cooya Beach as identified in **Section 4**). This interruption of sand movement creates an imbalance in the longshore drift process because wave action between the sand bar and the beach continues to transport sediment away from Newell Beach as described by the process in **Section 3.1**.

With no sand arriving at Newell Beach and sand continuing to depart, the result is a continually eroding beach.

Section 4 of this report identified that Cooya Beach immediately to the south of Newell Beach is not showing the same significant level of erosion as Newell. This is because the longshore drift processes contributing sand to Cooya Beach is not being interrupted by a sand bar or other blockage (refer **Figure 5.1**).

Photo 5.1 – Southern Cooya Beach (courtesy of Google Maps)

6 Newell Replenishment Recommendations

The following works are recommended to be undertaken to protect property and replenish the sand at Newell Beach.

6.1 Step 1 - Emergent Protection Works

It is recommended that Council commence sand replacement works as soon as possible to reinstate the eroded portion of the freehold properties to provide immediate protection. It is understood that Council have access to a sand source which is dredged from the Mossman River and that local operators are available to transport and place the sand. The sand should be placed at a suitable profile from the properties to the existing beach such that pedestrian safety is not compromised.

6.2 Step 2 - Geofabric Groyne

Construct a geofabric groyne with five (5) tonne Elcorock bags at the northern end of the Newell beach-front properties to prevent the removal of further sand from this area via the long shore drift process. This will provide further protection to these properties (over and above the emergent protection works) by allowing the accumulation of sand against the groyne which will result in beach replenishment along the shore line to the south.

Construction may reduce sand movement north of the groyne and therefore temporarily impact on sand deposition immediately north of the groyne. However, this would be a temporary effect until the beach profile in front of the properties is restored. Sand will then migrate over the buried groyne. The groyne should be designed and installed to an extent such that it will result in an ultimate profile that is desirable. It will eventually be submerged by the captured sand and not result in unacceptable beach amenity.

There are a variety of proprietary products available, with an example being the Geofabric Australia Elcorock shoreline protection system. This has proven a popular product in Queensland with it being used successfully for this same application in many beaches along the east coast, including Yamba, Gold Coast, Sunshine Coast, Bundaberg and Russell Heads south of Cairns.

Elcorock utilises robust geotextile containers designed to be filled with sand (or other infill material) that are then placed to form a stable, durable structure. They are a proven system that has been available for over 20 years and have withstood coastal abrasion, vandalism and UV damage during this time. It provides a cost effective alternative to the traditional coastal erosion protection systems made from concrete and rock armour. Elcorock literature is contained within **Appendix A**. Case studies for Elcorock installation are included in **Appendix B**.

The Elcorock bags have a life of approximately 10 years however it is not considered that design life of these items is off importance in this instance. On restoration of the longshore drift balance after dredging works are undertaken (refer **Section 6.3** below) the bags will no longer be required and can either be removed or left in place.

6.3 Step 3 - Sand Bar Dredging

The sand bar that has formed at the southern end of Newell Beach at the Mossman River mouth should be dredged to allow the natural longshore drift processes to resume. This will enable the sand that is removed from Newell Beach (long shore drift) to be replenished from the south, improving the Newell Beach's longshore drift balance. It will also prevent the observed increase in sand deposition occurring at the northern section of Cooya Beach.

The dredged sand should be placed on the beach to an appropriate profile so that improved protection is provided from future storm events.

Monitoring of the Mossman River mouth will be required over time to determine if the sand bar returns. A dredging/maintenance program may require development to prevent reoccurrence in the future. This is not uncommon along the Queensland coast line.

7 Cost Estimate for Recommended Works

We have prepared preliminary cost estimates to undertake the Geofabric Groyne and Sand Bar Dredging works recommended in **Section 6** above based on our experience with similar works undertaken on the Sunshine Coast. Details of the preliminary estimates are provided below.

7.1 Emergent Protection Work

It is understood that Council have commenced emergent protection works and that the cost is being managed through established day labour rates. We have therefore not estimated the cost associated with this work.

7.2 Geofabric Groyne

Based on our experience of supply and installation of these bags in other areas we estimate that each bag can be supplied and installed for a cost of $800 excluding GST.

It is estimated that three bags will be required every 2.4m of groyne length and that a 20m long groyne is required. A total of 30 bags are therefore estimated to be required.

An estimate of cost is:

- Total (excluding GST) $33,600

7.3 Sand Bar Dredging

From site observations it is estimated that the sand bar is approximately 500m long and varies between 20m and 5m in width. The average depth of sand to be removed is estimated to be 2m. This provides an estimated volume of 20,000m^3 sand removal.

We have had preliminary discussions regarding an estimate of cost to undertake dredging works at Newell Beach. The preliminary advice in relation to dredging the sand and pumping it onto Newell Beach is:

- Total $480,000

8 Approvals Required

The following approvals are required to enable works to proceed:

- ERA 16 from the Department of Environment and Heritage Protection for the dredging activity
- Approval from the Department of Transport and Main Roads via the Harbour Master for dredging activities and installation of geofabric bags.
- Operational Works approval from Douglas Shire Council.

9 References

Reeve, D, Chadwick, A, Flemming, C (2012) Coastal Engineering: Processes, Theory and Design Practice, 2nd Edition.

Gold Coast City Council (2014). Longshore Drift: Coastal Processes on the Gold Coast.

Gold Coast City Council (2014). Beach Erosion: Coastal Processes on the Gold Coast.

Gibb, J.G., Depledge, D.R. (1980). Coastal Erosion at Paekakariki, Wellington's West Coast.

GeoResources (2014). Landforms, Erosion and Longshore Drift.

Mikhailov, V.N. Hydrology and formation of river-mouth bars.

Sunshine Coast Council (2012), Maroochydore Beach Nourishment Feasibility Report.

ProjexPartners

Appendix A

Elcorock General Brochure

ELCOROCK®

Shoreline Protection System

General Brochure

QUALITY - SUPPORT - EXPERTISE

GEOFABRICS

Please read the important notice at the end of this brochure

ELCOROCK® is a shoreline protection system utilising robust geotextile containers designed to be filled with sand (or other infill material), that are then placed to form a stable, durable structure.

The versatility and durability of the ELCOROCI<® containers allow construction of a wide variety of coastal structures - including groynes, walls, reef structures and other applications for marine and inland waterways.

ELCO ROCK® is a world-leading system, with structures built on open beaches over 20 years ago surviving Australia's harsh coastal environment. The ELCOROCK® system is supported by extensive research, including design methods, durability reports and environmental analysis.

The ELCOROCK® shoreline protection system is an alternative building material to traditional coastal methods such as concrete, rock armour, steel or timber. Geofabrics supports the ELCOROCK® system with research, specialist installation equipment and design assistance.

The ELCOROCK® sand container product range covers a large range of sizes and systems ranging from hand filled 40kg containers to hydraulically filled mega sand containers and tubes. Specialist filling and placement equipment is available for most container sizes to provide both a consistent and attractive finish.

FUNCTIONS

Erosion control

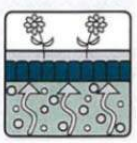
ELCOROCK® structures restrict the loss or movement of sand through wave action, tidal currents and wave currents.

Wave dissipation

ELCOROCK® structures can reduce the size and energy of waves by assisting the wave to break away from the foreshore, thereby providing sheltered waters in the lee of the structure.

Shoreline protection

ELCOROCK® structures protect the shoreline by resisting the erosive forces from wave action or tidal events.



Environmental enhancement

ELCOROCK® structures provide a base upon which organisms grow in the ocean or river systems. Such growth is vital to the health and diversity of the natural environment.

GEOFABRICS

APPLICATIONS

SEA WALLS AND REVETMENTS

The durability, permeability, stability and flexibility of ELCOROCK® sand containers provide an excellent solution for construction of sea walls and revetments. ELCOROCK® sand containers have a number of advantages over traditional rock sea wall construction methods including -

- Reducing beach contamination as there are no rocks to be displaced.
- Lowering the environmental footprint, due to the use of in-situ materials and reduced need for importation of fill materials.
- Increasing the public amenity through increased public access and lower OHS risk.

The use of vandal deterrent geotextile layers in structures where public access is high increases the durability of the ELCOROCK® structures.

CiROVNES AND BREAKWATERS

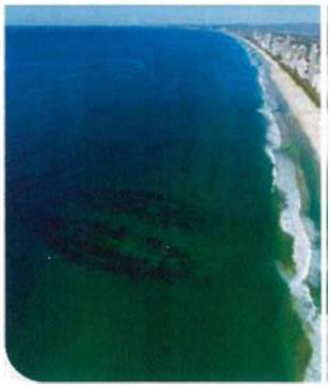
ELCOROCK® containers are widely used in the construction of groynes and breakwaters, which extend into the wave zone to control the movement of sand and provide marina and beach protection. The type of ELCOROCK® container used is dependent primarily upon the wave climate. The ELCOROCK® containers have proven durability over many years in the aggressive, exposed marine environments. The use of vandal deterrent ELCOROCK® containers provides a softer, visually acceptable finish, allowing the structure to blend into the existing environment.

RIVERBANK PROTECTION

Increased boating or flood activity has led to increased erosion of riverbanks and lake shorelines. The ELCOROCK® system helps resist erosive forces, whether it be through revetment structures, river training, groynes or protecting boat ramps. Using locally available fill material enables ELCOROCK® containers to provide a cost-effective solution. The durability, resistance to UV and abrasion and the soft finish of the ELCOROCK® system all provide advantages over rock structures in inland waterways.

CUSTOM STRUCTURES

ELCOROCK® containers have been used for a wide variety of applications, including artificial reefs, bunds, cofferdams and temporary working platforms. The range and capabilities of our manufacturing facilities makes the most difficult application possible. The ELCOROCK® system has been used in many emergency protection works where rapid installation is required, such as sea wall toe protection and sand dune protection. The system can also be removed after the structure has served its purpose, with little risk or inconvenience to beach users.



ADVANTAGES OF THE ELCOROCI<® SYSTEM

Proven Durability	ELCOROCK® structures have been in place for over 20 years in the harsh Australian environment. The durability of ELCOROCK® is proven over many dimensions, including: • UV resistant to the harshest conditions in the world, • Vandal deterrent fabric, • Excellent abrasion resistance. In-field durability research confirms the durability of the ELCOROCK® system in the harshest coastal conditions, including cyclones.
Increased Public Amenity	ELCOROCK® structures enhance the public amenity of the coastal area, through – • Providing a structure that people can easily access and use, • Reducing beach contamination from rock walls displacing and putting rocks over the beach front, • Reducing the OHS risks associated with foreshore structures, • Reducing the site impact during construction through reducing the number of trucks required to visit site.
Structural Stability	ELCOROCK® sea walls and revetments can be designed for structural stability through proven design methods.
Environmentally Friendly	ELCOROCK® structures provide a base upon which marine growth develops, enhancing the local biodiversity. ELCOROCK® structures also use locally available fill material, reducing the need for trucking of fill materials to site.
Cost Effective	ELCOROCK® structures compare favourably to traditional coastal structures, both with initial installed cost and whole-of-life costings.
Design and Installation Support	ELCOROCK® sand containers are supported by technical assistance from our Geofabrics engineers. Installation equipment is also available to help ensure efficient and correct installation.

SUPPORT DOCUMENTATION

Specifications	ELCOROCK® Data Sheets
Installation Guidelines	• ELCOROCK® 0.75m³ Installation Guidelines • ELCOROCK® 2.5m³ Installation Guidelines • ELCOROCK® Mega Containers Installation Guidelines
Support Equipment Documents	• ELCOROCK® 0.30m³ & 0.75m³ Filling Frames • ELCOROCK® 0.75m³ J-Bins • ELCOROCK® 2.5m³ Filling & Placement Apparatus • Sewing Machine
Technical Notes	ELCOROCK® Design Guidelines
Other	• ELCOROCK® CD • ELCOROCK® Online Seminars • ELCOROCK® Cost Calculator • ELCOROCK® Research Reports

GEOFABRICS® is a registered trade mark of Geofabrics Australasia Pty Ltd.

MELBOURNE (03) 8586 9111 Fax: (03) 8586 9186
HOBART (03) 6273 0511 Fax: (03) 6273 0686
SYDNEY (02) 8785 8800 Fax: (02) 9821 3670
BRISBANE (07) 3279 1588 Fax: (07) 3279 1589
NEWCASTLE (02) 4951 2688 Fax: (02) 4951 305
TOWNSVILLE (07) 4774 8222 Fax: (07) 4774 8655
C OFFS HARBOUR (02) 6653 5706 Fax: (02) 6653 5706
BUNDABERG (07) 4155 9968 Fax: (07) 4155 9968
PERTH (08) 9249 5411 Fax: (08) 9249 5447
GOLD COAST (07) 5594 8600
ADELAIDE (08) 8162 5855 Fax: (08) 8162 5755
DARWIN 0407 523 669 Fax: (08) 8984 1614

G EOFABRICS.COM.AU

GEOFABRICS AUSTRALASIA PTY LTD

M114-06 13

ProjexPartners

Appendix B

Elcorock Case Studies

Case Study

Coastal

Project: Maroochy Beach Groyne
Date: November 2001
Client: Maroochy Shire Council
Location: Sunshine Coast, Queensland

Geofabrics AUSTRALASIA PTY LTD

Due to the ongoing erosion of Maroochydore beach, the Maroochy Shire Council instructed WBM Oceanics to assess the cause of the problem and recommend an interim solution. Modelling at the Queensland hydraulics laboratory identified that beach nourishment together with a groyne located at the northern end of the beach would meet the criteria.

Due to the success of the Maroochydore ELCORock® sea wall constructed as emergency protection to the Cotton Tree caravan park, the council called for the design and construction of a groyne constructed from Geosynthetic sand containers. The tender called for a groyne 2.5m high by 100m long which could withstand 3m high waves. Another important criteria was that the geotextile should provide some form of vandal resistance.

Filling and Placement Apparatus

June 2006

The Council selected the ELCO Solutions proposal, designed by ICM, consisting of a multiple container structure, which would maximise flexibility, and minimise the potential effects of vandalism. The design incorporated a number of innovative features, namely:

- Vandal Deterrent Composite Geotextile.
- 5 tonne Sand Containers.
- Specialised Filling & Placing Apparatus.

The groyne was constructed well within schedule, even allowing for the steep learning curve, which is always associated with the development of new technology.

A total of 650 2.5m^3 **ELCORock®** containers were used to construct this visually pleasing and cost effective structure. This structure, a world first, reinforces ELCO Solutions Australia's reputation as the world leaders in the field of construction using Geotextile Sand Containers.

www.geofabrics.com.au

MELBOURNE (03) 8586 9111 Fax: (03) 8586 9186 | SYDNEY (02) 9821 3277 Fax: (02) 9821 3670 | BRISBANE (07) 3279 1588 Fax: (07) 3279 1589 | PERTH (08) 9309 4388 Fax: (08) 9309 4389 | ADELAIDE (08) 8293 3613 Fax: (08) 8293 1306 | NEWCASTLE (02) 4950 5845 Fax: (02) 4950 5895 | HOBART (03) 6273 0511 Fax: (03) 6273 0686 | TOWNSVILLE (07) 4774 8222 Fax: (07) 4774 8655

Technical Enquiries: 1800 4 BIDIM (1800 424 346)

Case Study

Coastal

Project: Maroochy Beach Groynes, 2, 3, & 4
Date: April 2003
Client: Maroochy Shire Council
Location: Sunshine Coast, Queensland

Geofabrics AUSTRALASIA PTY LTD

The first ELCORock groyne constructed using 2.5m^3 containers in November 2001, had proven to be a success. The structure was stable under severe wave attack, was user friendly, aesthetically pleasing and the vandal deterrent geotextile had performed beyond expectations.

This allowed the council to approve the second phase of project which consisted of a further 3 groynes to protect the exposed headland. The groynes were as follows:
Groyne 2 – 92m long & up to 3.9m high
Groyne 3 – 47m long & up to 3.25m high
Groyne 4 – 71m long & up to 3.9m high
The areas between the groynes were nourished with 30,000m^3 of sand from a sand source north of the Maroochy River.

During construction 2003

Completed Project 2003

ELCO Solutions Australia provided the specialised, filling and placement equipment, to ensure effective filling and simplified placement of containers. A total of 2,000 No. 2.5m^3 vandal deterrent containers were used for the construction of the 3 groynes. The construction period was 2 months.

A close working relationship between the client, contractor and supplier ensured the project was completed on time and within budget.

www.geofabrics.com.au

MELBOURNE (03) 8586 9111 Fax: (03) 8586 9186 | SYDNEY (02) 9821 3277 Fax: (02) 9821 3670 | BRISBANE (07) 3279 1588 Fax: (07) 3279 1589 | PERTH (08) 9309 4388 Fax: (08) 9309 4389 | ADELAIDE (08) 8293 3613 Fax: (08) 8293 1306 | NEWCASTLE (02) 4950 5845 Fax: (02) 4950 5895 | HOBART (03) 6273 0511 Fax: (03) 6273 0686 | TOWNSVILLE (07) 4774 8222 Fax: (07) 4774 8655

Technical Enquiries: 1800 4 BIDIM (1800 424 346)