

From: Lane John [John.Lane@ehp.qld.gov.au]
Sent: Monday, 17 February 2014 9:43 AM
To: Sultmann Sel; Prenzler Paul
CC: Birch Kerynne
Subject: SEMP's - Coochie & Amity
Attachments: R.B18390.001.01_lowres.pdf

Sel/Paul

Could you please arrange a meeting with Rodney Powell from Redlands early this week to give him some policy and technical advice before the community consultation session this Saturday. I don't expect either of you to attend but Rodney clearly needs to be sure that Redlands and we have an agreed position.

Cheers

John Lane | Director, Environment Planning
Environment Policy and Planning Division
T: (07) 3330 5864 (6) Personal information (6) 3330 5875
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QG graphic



From: Rodney Powell [mailto:Rodney.Powell@redland.qld.gov.au]
Sent: Monday, 17 February 2014 9:35 AM
To: Lane John
Subject: FW: Please see amended draft letter

John,

Thank you for time this morning, it was greatly appreciated. I have attached my most recent correspondence with DEHP below and I have also attached a copy of the Amity Point SEMP.

Please let me know when Paul and Sel will be available for a meeting to discuss the issues arising from the community consultation regarding the draft report.

Rod Powell
Senior Advisor
Marine Projects
Redland City Council
07 3829 8582

4p4(6) Personal information



Winner – 2013 Qld Environmental Innovation and Protection Award
Winner – 2013 Young Legends (Environmental Leadership) Award

From: Birch Kerynne [<mailto:Kerynne.Birch@ehp.qld.gov.au>]
Sent: Tuesday, 11 February 2014 1:42 PM
To: Rodney Powell
Subject: RE: Please see amended draft letter

Hi Rod,

Please excuse my delayed response to your email. I have discussed your request with my manager and she and I feel that it would be more appropriate for someone from EHP coastal policy to attend the SEMP meeting. I have forwarded your email onto coastal.support@ehp.qld.gov.au for their consideration and asked them to contact you directly if they wish to attend the meeting.

Coastal support were involved in developing the shoreline erosion management policies and would be better placed to discuss the decision making behind the policies.

If you don't get a response, please email the coastal support team at the above email address or let me know and I can follow up for you.

I'm sorry I won't be attending, but I hope a more appropriate person from EHP can attend.

Cheers

Kerynne

Kerynne Birch
Principal Environmental Officer
Brisbane North
Department of Environment and Heritage Protection
(07) 3330 6016

From: Rodney Powell [<mailto:Rodney.Powell@redland.qld.gov.au>]
Sent: Wednesday, 5 February 2014 10:11 AM
To: Birch Kerynne; Prenzler Paul
Cc: Toby Ehram
Subject: FW: Please see amended draft letter

Kerynne,

As discussed we are planning a community consultation concerning the draft SEMP.

The SEMP report is available on the webpage at
<http://www.redland.qld.gov.au/AboutRedlands/NorthStradbrokeIsland/Pages/Amity-erosion.aspx>

We believe that it would be extremely beneficial if someone from DEHP could also attend, in particular to provide advice on the State coastal Plan and DEHP policies and their implications regarding the implementation of management options outlined in the SEMP.

1 draft letter below.

- 2 **Booking time for hall** The hall has been booked all day for Saturday 22 February. We recommend that the Open House session be conducted from **10 am to 12 Noon**.
- 3 **Travel arrangements** i.e. vehicles and barge bookings are organised one vehicle will leave on the 7:00am Barge with the set up team. Second contingent will catch the 7:55 am gold Cat Ferry and pick up a vehicle at Dunwich Depot.
- 4 **Order of the day (is a" drop in " information session.) participants and roles.** Murray Erbs, Bernard Houston Community Engagement, Gerard Noon Corporate Communication and Malcolm Andrews SEMP consultant, DEHP representative and divisional Councillor. We need to have the key issues highlighted and historical and current mapping of the area. We will encourage people to add their comments to butcher paper or on survey forms and we will act as scribes for comments as well . A bit like Coochie we should have a baseline of SEMP information and perhaps FAQ's to provide.
- 5 **Comment period for written comments.** 29/12/13 – 30/3/ a couple of weeks afterwards for return of comment and provide a takeaway format for participants to do so.
- 6 **Overall communication strategy** - this forum is by invitation to direct stakeholders (affected property owners) and will not involve minimal advertising or promotion to the wider community.
- 7 **Updates to web site** – to be determined

Dear Sir/Madam

RE: Shoreline Erosion Management for Amity Point

Council acknowledges that as property owners within the urban residential area of Amity Point west of Ballow Street, an area zoned as sub-area UR3, you have a strong interest in the future of the area and in the development and adoption of a final Shoreline Erosion Management Plan (SEMP) for Amity Point.

As previously advised, Council planning currently provides for a policy of 'retreat' for this urban residential area of Amity Point.

In December 2013 following a workshop of Councillors, I wrote to you advising of directions given at the workshop that included making available the Draft Amity Shoreline Erosion Management Plan Report to Council being prepared by BMT WBM Pty Ltd.

In response to Councillor and community feedback, you are now invited to an Open House Forum on Shoreline Erosion Management Plan issues to be held on 22 February in the Amity Pt Hall.

This forum will provide opportunity to review historical and current planning information for erosion issues at Amity Point and respond to proposed actions including those identified in various studies and reports to Council.

Importantly, it is a chance for you to provide your understanding and comments on issues affecting the area that will contribute to the finalisation of the Shoreline Erosion Management Plan report being prepared for Council and as part of any future policy and planning consideration by Councillors.

The forum will commence **at 10 am and conclude at 12 noon**. Please contact Mr Murray Erbs. Group Manager City Infrastructure on 3829 8525 if you have any questions.

Senior Advisor
Marine Projects
Redland City Council
07 3829 8582

ch4p4(6) Personal information



Winner – 2013 Qld Environmental Innovation and Protection Award

Winner – 2013 Young Legends (Environmental Leadership) Award

Winner – 2013 Sustainable Healthy Waterways Award

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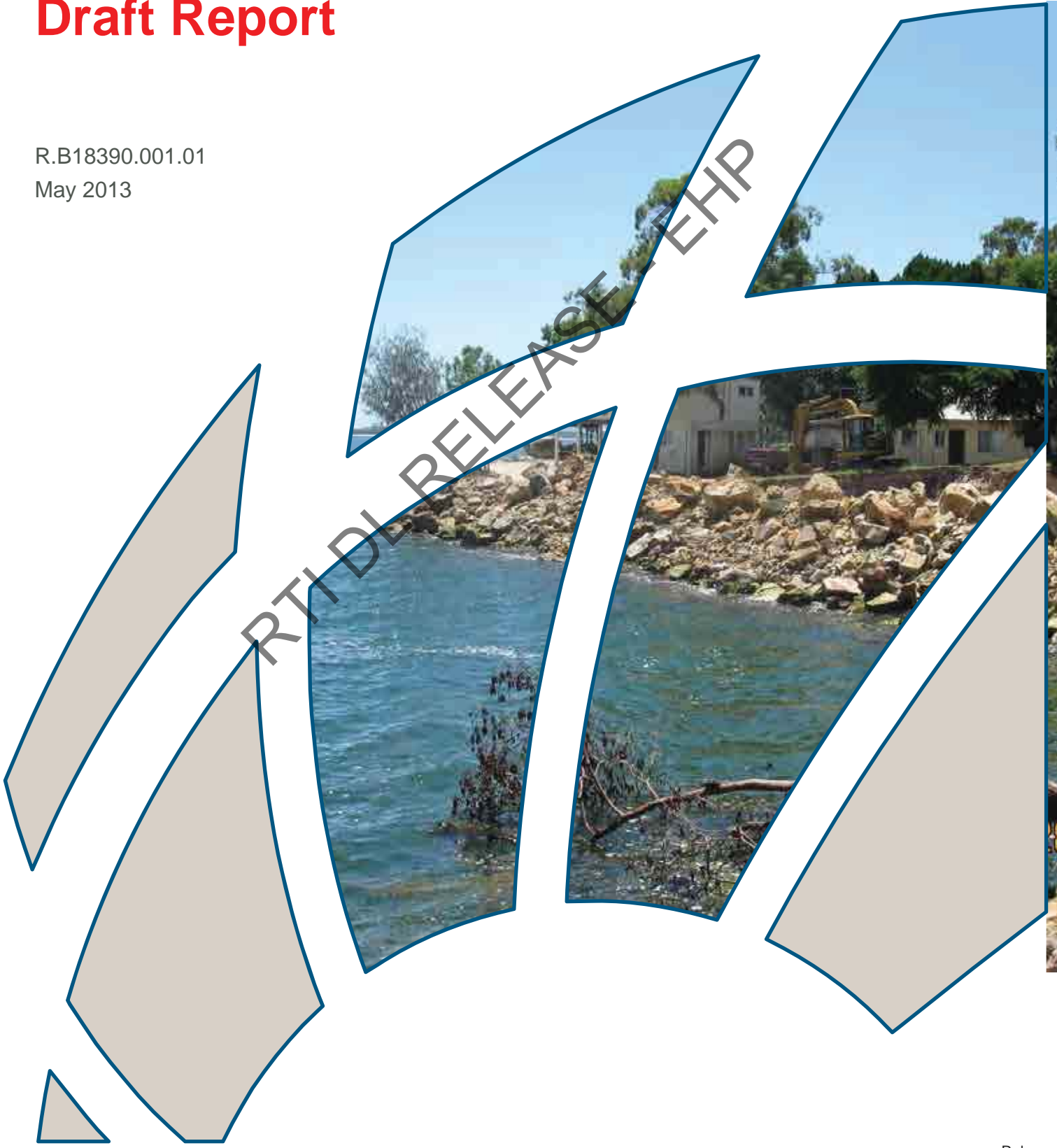
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RTI DL RELEASE - EMP

Amity Point Shoreline Erosion Management Plan **Draft Report**

R.B18390.001.01
May 2013



Amity Point Shoreline Erosion Management Plan Draft Report

DRAFT
RTI/DL RELEASE - EHP

Prepared For: Redland City Council

Prepared By: BMT WBM Pty Ltd (Member of the BMT group of companies)

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Project Manager :	Malcolm Andrews										
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Client Reference	A1023410										

Title :	Amity Shoreline Erosion Management Plan – Draft Report
Author :	Malcolm Andrews, Matt Barnes, Lyn Léger
Synopsis :	This report is a Shoreline Erosion Management Plan for the Amity shoreline and outlines the principal coastal processes, legislative framework and recommended erosion management strategies for this shoreline.

REVISION/CHECKING HISTORY

REVISION NUMBER	DATE OF ISSUE	CHECKED BY	ISSUED BY
0	22/06/2012	MPB	MJA
1	31/05/2013	MPB sch4p4(6) Personal information	MJA sch4p4(6) Personal information

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EXECUTIVE SUMMARY

Background

The Amity community is situated on the north western side of North Stradbroke Island with the commercial centre located at Amity Township immediately south of Amity Point (refer Figure 1-1). A significant part of the study area fronts onto the Moreton Bay Marine Park, a national park with significant environmental values.

The Amity shoreline has a history of active shoreline management as shoreline erosion has threatened development and assets in the past and various protection and rehabilitation works have been carried out in response to the erosion threat. Historical protection measures mostly include the construction of seawalls and groynes.

Redland City Council has recognised the threat of persistent erosion to the cultural and socio-economic welfare of its community and in particular the safety issue related to dramatic bank slumping into Rainbow Channel. The Council has therefore embarked on the process of developing a Shoreline Erosion Management Plan (SEMP) for the Amity shoreline.

This report is prepared as part of the development of a SEM for the Amity shoreline with the aim being to provide a plan for the management of persistent shoreline erosion around Amity Township and more stable conditions in the outlying communities. It is Redland City Council's objective to maintain and increase where possible the amenity of the foreshore.

Planning and Legislative Framework

Proposed management options recommended within this SEM must be consistent with the local government planning scheme, and comply with all relevant legislation (Commonwealth, State and local) and coastal and environmental policies.

The basis and control of management of the coast of Queensland is governed by the *Coastal Protection and Management Act 1995* (Qld). The Queensland Coastal Plan (QCP), including the State Policy for Coastal Management (SPCM), and the Coastal Protection State Regulatory Planning Provision (Coastal SPRP) set out more detailed provisions for the management of the coastal zone and recommendations in this SEM. The SCMP seeks to manage all coastal land and coastal resources and the Coastal SPRP provides a framework for decision-making regarding assessable development in the coastal zone.

At a local level, the Redland City Council Planning Scheme zones the seaward side of the urban residential area of Amity Point as sub-area UR3 (areas west of Ballow Street). Within this area all future buildings and structures are to be demountable and capable of removal. In addition buildings, structures or infrastructure associated with the use of other development are not to extend any further seaward than existing uses and development on the site. This is part of a strategic plan of retreat proposed by RCC whereby the line of development will retreat as shoreline erosion continues, rather than redeveloping within the erosion prone area (RCC 2011a).

Coastal Processes

It has long been known that the coastline at Amity is largely influenced by the ongoing meandering of Rainbow Channel, and to a lesser extent the Rous Channel and South Passage, which all carry the tidal flow between Moreton Bay and the Pacific Ocean. The previous data collection campaigns and numerical modelling undertaken for this study indicate that the ebb tide flow and associated sand transport tends to force the Rainbow Channel current hard against the Amity shoreline from Amity Point to the Amity boat ramp with tidal velocities up to 1.8m/s occurring. Aerial photography shows that the channel in front of Amity Township is deepest with a broadening and shallowing of the channel adjacent to the Amity Caravan Park. Historical aerial photography indicates the channel width at Amity has reduced from over 900m in 1958 to around 750m today.

On the north east coastline ocean swell is significantly attenuated by the time it reaches the western end of Flinders Beach but still transports sand along Flinders Beach towards Rainbow Channel near Amity Point. A small proportion of this sand is caught in the Rainbow Channel flows and progresses along the shoreline of Amity as shoals but does not provide any long term benefit to the shoreline.

The more significant of the local wind waves approaches the shore from the southwest and can reach a height of 0.7m. These waves will tend to cause limited beach erosion at or near high tide level and small scarps in the unrevetted sandy areas will occur as sand is moved offshore. In particular this is of concern in the recessed beaches between the groynes in front of the Amity Caravan Park and to the immediate north of the end of the rock revetment at Amity Point.

The Flinders Beach shoreline continues to receive a supply of sand from the east driven by ocean swell. The continuing rotation of the Rainbow Channel is allowing the South Bank area to the east of Amity Point to grow northwards resulting in accretion on Flinders Beach and foreshore stability in recent times. However, this may reverse at any time in the future dependent on channel movements, offshore shoal configurations and the continued supply of sand around Pt Lookout.

Both mean sea level rise and intensification of the storm occurrences are likely to increase the erosive pressure on the Amity shoreline and may change the historical accretion on Flinders Beach. With mean sea level rise likely to accelerate due to climate change, the tidal compartment of Moreton Bay will increase substantially resulting in greater flows in Rainbow Channel and increased pressure on the Amity shoreline.

In addition to shoreline erosion due to channel alignment and beach profile alterations, increased sea level rise has also the potential to affect the longshore sediment supply to Flinders Beach as the headland at Pt Lookout may tend to interrupt the longshore sand transport. This may decrease the amount of sand current entering the system from the east resulting in changes both at Flinders Beach and Amity Point.

Options Assessment

A full range of management options have been considered for each beach unit including:

- Do nothing;
- Beach nourishment;
- Channel relocation;

- Structures; and
- Retreat.

SEMP Recommendations

Amity Township

It is considered that there are only two options which are likely to be successful at Amity Township.

Firstly, the design and construction of a full rock revetment at an estimated cost of \$15M with the expectation that this will need to be extended in the future as Rainbow Channel continues to realign.

Secondly, planned retreat where the danger zone related to unforeseen slumping of the foreshore into Rainbow Channel is assessed by a Geotechnical Consultant and affected buildings and infrastructure is moved out of the nominated danger zone. To allow a comparison of costs in this report a nominal value of \$3M in relation to building relocation has been allocated to this option. The seaward side (west of Ballow Street) of this area is zoned UR3 in the Council's Town Planning Scheme 1998 which requires future buildings or infrastructure to be demountable and capable of being removed.

Of these it is recommended that the planned retreat strategy be implemented as it has the highest likelihood of success, lower cost and will leave the foreshore in a natural state.

Amity Caravan Park

After assessment of the management options, it is recommended that the beach nourishment option be implemented at this beach. The beach nourishment will provide added protection to the assets and minimise the need for other structural protection measures in the future. It will retain natural processes and provide an improvement to the beach amenity.

The likely minimum quantity of sand required to provide appropriate protection would be in the order of 335 cubic metres. The estimated capital cost of the recommended initial beach nourishment works is estimated to be \$10,000, based on a beach nourishment requirement of 335m³ of sand sourced locally and delivered by truck then spread by backhoe.

For ongoing maintenance beach nourishment, there should be a provision of \$1,000 per annum, which may need to increase in the future if mean sea level rise accelerates due to climate change. In addition, there should be some provision for costs associated with routine dune vegetation and management at this beach.

Flinders Beach

The recommended shoreline erosion management strategy for the communities of Geera Street and Providence Street is to "do nothing" at this time and monitor the location of the shoreline.

After a review of the coastal processes, risks and values at each of section of the shoreline, potential management options for each beach were assessed. A detailed discussion on the possible management options and the recommended strategies for each individual beach is provided above.

Summary

After review of the coastal processes, risks and values for the Amity shoreline and an assessment of the available management options, the following actions have been recommended:

1. Immediate education campaign regarding danger of dramatic slumping into Rainbow Channel;
2. Geotechnical Consultant assessment of slump danger zone;
3. Retreat of assets within danger zone;
4. Nourishment of beaches between the groynes at the Amity Caravan Park; and
5. Ongoing monitoring of beach condition and success of management strategies.

Program of Works and Cost Estimate

Implementation of the recommended Amity Geotechnical Assessment and beach nourishment at the Amity Caravan Park would cost in the order of \$110,000 over 12 months based on present understanding of the required works and sand sourced locally.

Any future costs at Amity will be determined by the method in which the retreat option is implemented. Nourishment maintenance at the Amity Caravan Park would require expenditure of about \$1,000 annually. The monitoring survey costs should be able to be incorporated into routine Council surveying costs. The implementation plan is summarised in the table below.

Note that non-action, or works inconsistent with the recommended SEMP strategy, may result in greater risks and increased rehabilitation costs in the longer term.

<i>Beach/Shoreline Location</i>	<i>Recommended Erosion Management Strategy</i>	<i>Activity and Cost</i>	<i>Timing</i>
Amity Township	Retreat out of assessed danger zone	\$100,000 Geotechnical Consultant definition of danger zone.	Year 1
	Retreat out of assessed danger zone	Remove buildings and infrastructure. Planning Scheme indicates building relocation by owner.	Year 2
Amity Caravan Park	Minor beach nourishment	\$10,000 initial + \$1,000 annual maintenance	Year 1
Flinders Beach Communities	Do nothing and monitor	Routine Council expenditure	Ongoing

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1 INTRODUCTION

1.1 Background

The Amity community is situated on the north western side of North Stradbroke Island with the commercial centre located at Amity Township immediately south of Amity Point (refer Figure 1-1). A significant part of the study area fronts onto the Moreton Bay Marine Park, a national park with significant environmental values.

The coastal zone at Amity is an important recreational and aesthetic asset for both the residents of Amity and the wider community of North Stradbroke Island. The shoreline is diverse and comprises sandy beaches with headlands, groynes and further afield areas where mangroves front the shoreline. Nearby Point Lookout provides rocky outcrops and cliffs. The Amity shoreline has a history of active shoreline management as shoreline erosion has threatened development and assets in the past and various protection and rehabilitation works have been carried out in response to the erosion threat. Historical protection measures mostly include the construction of seawalls and groynes.

Redland City Council has recognised the threat of persistent erosion to the cultural and socio-economic welfare of its community and in particular the safety issue related to dramatic bank slumping into Rainbow Channel. The Council has therefore embarked on the process of developing a Shoreline Erosion Management Plan (SEMP) for the Amity shoreline.

This report is prepared as part of the development of a SEM for the Amity shoreline with the aim being to provide a plan for the management of persistent shoreline erosion around Amity Township and more stable conditions in the outlying communities. It is Redland City Council's objective to maintain and increase where possible the amenity of the foreshore.

1.2 Description of the Amity SEM Study Area

The coastline at Amity is largely influenced by Rainbow Channel and to a lesser extent the Rous Channel and South Passage, which all carry the tidal flow between Moreton Bay and the Pacific Ocean. In particular, Rainbow Channel has been realigning from a southwest-northeast alignment to a more south-north alignment over the last century. A positive aspect of this has been to slow accretion of Flinders Beach on the northeast side of Amity Point.

Because of the asymmetry of the tidal wave a large volume of sand has migrated through the entrance and exists as shoals adjacent to, and many kilometres to the south and west of, Rainbow Channel and Rous Channel but these do not provide any protection to the Amity shoreline. Similarly ocean swell transports a low volume of sand along Flinders Beaches towards Rainbow Channel near Amity Point. A small proportion of this flow enters Rainbow Channel but does not provide any long term benefit to the shoreline at Amity.

The study area of this SEM includes the shoreline which stretches from southern end of Basin Drive to Millers Lane at the northern end of the Amity Township and also includes the small communities at Geera Street and Providence Street facing Flinders Beach.

There are numerous shoreline protection structures along the shoreline at Amity, including several groynes and a range of revetment walls. Furthermore, there is a significant area of land which has been lost to the sea including whole lots and parts of many other lots. This has been despite mitigation measures including groynes and rock revetments since the 1950's.

1.3 Coastal Management Requirements

The coastline at and near Amity is subject to a range of natural and man-made threats and various erosion protection and rehabilitation projects have been carried out in the past. In general the following points can be made regarding the shoreline:

- The shoreline movements at Amity appear to be slowly but persistently erosive and are influenced by the ongoing meandering of Rainbow Channel and to a lesser extent Rous Channel and South Passage;
- The foreshore has substantial development, comprising mostly private residential property and some public infrastructure. Coastal structures in the form of rock revetments have been constructed to protect private property and infrastructure against erosion threats; and
- The depth of the adjacent channel (up to 20m) makes the building of a robust revetment very difficult and the existing rock revetments are perched on the top of the bank which is subject to undercutting and dramatic failure.

The present study is aimed at reviewing the dominant coastal processes, which shape the shoreline, the legislative conditions and values which may restrict the implementation of viable shoreline erosion management options and the existing management options which are currently in use.

An understanding of the coastal processes and legislative conditions is essential for the development of engineering and management options for dealing with risk associated with shoreline erosion. Ongoing policy guidance for identifying and assessing issues, specific objectives and suitable options will be provided through liaison with the Council and other stakeholders.



Figure 1-1 Locality Map (Source: Google Earth)

2 PLANNING AND LEGISLATIVE FRAMEWORK

This chapter outlines legislation, regulation and policies that require consideration in the development of the Amity Point SEMP. It has been compiled based on legislation, regulation and policies current at the time of writing. Further consideration should be given to the requirements current at the time of implementing erosion management recommendations. The legislation, regulation and policies mentioned in this chapter are not meant to be a comprehensive list but should be used as a starting point and guide for determination of considerations at the time of approval and construction.

Proposed management options recommended within the SEMP must be consistent with the local government planning scheme of the Redland City Council (RCC) and comply with all relevant legislation (Commonwealth, State and local) and coastal and environmental planning instruments and policies.

The basis and control of management of the coast of Queensland is governed by the *Coastal Protection and Management Act 1995 (Coastal Act)*. Under this Act, the Queensland Coastal Plan (QCP) is the primary statutory planning instrument giving effect to the objects of the Act. The following planning and legislative framework relates to the provisions of the QCP as they apply to Amity Point. Legislation and policies considered in this SEMP will require consideration of issues including, but not limited to:

- The use of coastal structures for property protection;
- Protection of species listed under State and Commonwealth legislation and conservation of their habitat;
- Management of shoreline erosion in a manner that is not detrimental to the adjacent Moreton Bay Marine Park and Ramsar site; and
- The maintenance of local biodiversity.

These legislative and policy considerations are described in more detail in the following chapters.

2.1 Coastal Act

The Queensland *Coastal Act* provides for management of the coastal zone.¹ The *Coastal Act* recognises the diverse range of resources and values of the coastal zone, and has the following objectives:²

- Provide for the protection, conservation, rehabilitation and management of the coastal zone, including its resources and biological diversity;
- Have regard to the goal of the National Strategy for Ecologically Sustainable Development in the use of the coastal zone;
- Ensure decisions about land use and development safeguard life and property from the threat of coastal hazards; and

¹ Coastal waters and land up to a point 5km landward of the high-water mark or the point nearest the high-water mark where land reaches 10m AHD, whichever is more landward: ss15 and 18A *Coastal Act*

² s3

- Encourage the enhancement of knowledge of coastal resources and the effect of human activities on the coastal zone.

The main means of achieving this management under the *Coastal Act* is the regulation of development and allocations, and the preparation of management plans.

The QCP has been developed as a State Planning Instrument (SPI) under the requirements of the *Coastal Act*.³ The plan consists of the State Policy for Coastal Management (SPCM).

2.1.1 State Planning Instruments

The Queensland Government currently manages development in the coastal zone using two State Planning Instruments: the QCP, consisting of the SPCM, and the Coastal Protection State Planning Regulatory Provision (Coastal SPRP). Both of these instruments have application to the coastal zone as defined by the *Coastal Act*. The SCMP seeks to manage all coastal land and coastal resources within this zone and applies to all management planning, activities, decisions and works that are not assessable development under the *SP Act*, including the development of a SEMP. The Coastal SPRP provides a framework for decision-making regarding assessable development in the coastal zone. In addition, the Draft State Planning Policy (SPP) has been recently released and is intended to replace all other SPPs in the State. While not yet a binding instrument, it should be considered in planning for development.

For the purposes of developing the Amity Point SEMP, the SPCM will be applied. At the time of implementation of recommendations within the SEMP (e.g. submission of development applications for construction of coastal protection works), the Coastal SPRP and Draft SPP will be applied. In this context, all three instruments are considered below.

2.1.1.1 State Policy for Coastal Management

The SPCM provides for the decision-making of managers of State and local coastal land and coastal resources, and for the owners of private coastal land. The policy is based on five (5) overall outcomes for management.⁴ Application of the SPCM is to ensure that management of coastal land:

- Protects, conserves and enhances coastal resources;
- Maintains natural physical coastal processes through appropriate design of works and structures or by setting them back from vulnerable areas;
- Ensures infrastructure and services facilitate managed public use of the coast without having significant adverse impacts on ecological values or physical coastal processes;
- Ensures that management actions on State or local government coastal land is consistent with the policy outcomes of the QCP; and
- Encourages public participation in the management of public coastal land, collaborative actions, knowledge sharing, community awareness and the monitoring, review and reporting of the effectiveness of management.

These overall policy outcomes are further divided into 13 specific policy outcomes:⁵

³ Chapter 2 Part 1

⁴ Part 2

1. *Protection Coastal Processes in Erosion Prone Areas* – natural coastal processes including erosion and accretion are able to occur without interruption;
2. *Buildings and Structures in Erosion Prone Areas* – structures (including all infrastructure) in erosion prone areas are designed, located and managed to ensure the impacts on coastal processes are avoided or minimised;
3. *Dune Management* – dunes are to be protected and dune vegetation is maintained and enhanced;
4. *Management of Areas of Ecological Significance* – protect areas of high ecological significance and conserve other ecological values;
5. *Indigenous Cultural Heritage* – the living culture of Indigenous Traditional Owners and their connection with cultural resources and in marine areas is maintained and enhanced;
6. *Public Access and Use of the Coast* – public access and use of the coast is maintained and enhanced for current and future generations;
7. *Buildings and Structures on State Coastal Land* – buildings and structures (including all infrastructure) are established on State coastal land only where they are essential, provide a public service, and cannot be feasibly located elsewhere;
8. *Driving on Beaches* – driving on beaches is not supported unless required for access and is actively managed to prevent significant impacts on ecological values and ensure a safe environment for other beach users;
9. *Management Planning* – management and use of coastal land is guided by plans of management;
10. *Monitoring and Review* – coastal land managers achieve effective coastal management through regular monitoring, reviewing and reporting mechanisms;
11. *Knowledge Sharing and Information* – knowledge and awareness of coastal resources and their management is shared with the community;
12. *Community Engagement* – the community is engaged in coastal management decision-making processes; and
13. *Review of the State Policy for Coastal Management.*

Each of these specific policy outcomes is given effect by the application of relevant policies. As SEMP are developed for priority areas for shoreline erosion management, the most relevant policy outcomes and related policies to the preparation of the Amity Point SEMP are those regarding buildings and structures and protecting coastal processes in erosion prone areas.

Protecting Coastal Processes in Erosion Prone Areas

Specific policy outcome (SPO) 1, *Protecting Coastal Processes in Erosion Prone Areas*, establishes a framework for the protection of naturally occurring processes of erosion and accretion in the coastal zone. Specifically, the policy prevents the modification of natural coastal processes in the erosion prone area subject to some exceptions. Erosion prone areas are defined as the area included in an erosion prone area plan developed by the Minister under the *Coastal Act*. For Amity Point, the

⁵ Part 3

erosion prone area is marked by a line 145m inland from the seaward toe of the frontal dune. See 2.1.1.2 and Appendix A for details on mapping erosion prone areas. See also Figure 2-3 for the erosion prone area for Amity Point.

Works in the erosion prone area are not to impact upon coastal processes. The means of achieving this outcome required by Policies 1.1, 1.2, 1.4 and 1.5 of SPO1 is the use of native vegetation management to stabilise land and promote dune building processes, the creation of buffer zones free of buildings and structures (see SPO2 below), the preservation of longshore transport processes, the retention of dune and beach system sand volume, and the maintenance of dune crest heights (*Policy 1.1, Policy 1.2, Policy 1.4 and Policy 1.5*). This promotes a system of coastal management relying upon maintenance of coastal features. Where erosion occurs along the coast, soft protection measures involving the relocation and augmentation of natural coastal sediments, such as beach nourishment, beach scraping and beach reprofiling, are preferred.

There are exceptions, however, to these requirements. Buildings and structures are permitted in the erosion prone area where they are temporary and relocatable and for recreation or safety purposes (*Policy 1.2*). Longshore transport processes can also be disrupted where there is no significant impact or any impact can be compensated by nourishment of sand bypassing (*Policy 1.3*). Most importantly, however, total sand volume in the dune and active beach system may be reduced by development where there is no significant impact, adequate beach nourishment, or there is a need to protect property from coastal processes (*Policy 1.4*). Shoreline erosion management works impacting upon the dune and beach system, therefore, are justifiable on grounds of property protection or where there is sufficient beach nourishment. Table 2-1 summarises the requirements and exemptions of SPO1.

Table 2-1 Summary of Requirements and Exemptions of Specify Policy Outcome

Policy	Requirement	Exemptions
1.1	Stabilisation of land/maintenance of foreshore processes by management of native vegetation	N/A
1.2	Natural fluctuations of the coast preserved by coastal buffer free of structures	Temporary and relocatable structures for recreational/safety purposes
1.3	No disruption of longshore transport (e.g. by groynes, dredging)	Activities causing no significant impact or compensated by bypassing or nourishment
1.4	Sand volume in dunes/active beach system preserved	Activities causing no significant impact, compensated by nourishment from outside active system, or necessary to protect property
1.5	Dune crest heights maintained for protection	N/A

Buildings and Structures in Erosion Prone Areas

SPO2, *Building and Structures in Erosion Prone Areas*, aims to ensure that all structures within the erosion prone area are designed, located and managed to ensure a minimal impact on the coastal zone and coastal processes.

To avoid impacts to buildings and structures, new development should be located outside the erosion prone area or as landward as possible in manner minimising the need for future protection works (*Policy 2.1*). Development may still occur in the erosion prone area where it is any of the following: (1) for State reserved coastal land, consistent with the public purpose of the reserve; (2) coastal-dependent access facilities; (3) temporary or relocatable; (4) essential community infrastructure that cannot feasibly be located elsewhere; or (5) redevelopment not increasing the risk of a structure for erosion (*Policy 2.2*).

Where there is a potential threat to structures, beaches or infrastructure on State or local government coastal land, a SEMP must be prepared by the local government (*Policy 2.5*). Appendix 1 Item 1 of the SPCM identifies the Redland City, especially Amity Point, as a priority area for the preparation of a SEMP. These management plans are required to set out an agreed list of options and recommendations to manage response to existing and future potential erosion threats to buildings and structures.

In determining options for shoreline erosion management beach nourishment of foreshores and retreat in the face of coastal erosion is favoured over engineered erosion control structures (*Policy 2.3*). Where beach nourishment or landward retreat is not a practical or cost effective option for permanent buildings and structures at risk, engineered erosion control structures may be considered (*Policy 2.4*). These structures must be located as close as possible to the development under threat to minimise any impact on coastal processes. This creates a hierarchy of management options, shown in Figure 2-1.



Figure 2-1 Hierarchy of Recommended Erosion Management Strategies for Buildings and Structures in the Erosion Prone Area

Annex 5 of the QCP requires final options to be determined only once there has been a thorough analysis of the social, environment and economic aspects of each option.

Management Planning

SPO9, *Management Planning*, establishes a framework for the development of plans and strategies for the management of coastal areas. The framework requires all work on State coastal land to be consistent with the relevant management plan for the local area, the QCP and (where relevant) the purpose for which the land was reserved (*Policy 9.4*). Management plans are those prepared by State coastal land managers in consultation with DEHP, Indigenous Traditional Owners and other relevant interest groups, and approved by DEHP (*Policy 9.1* and *Policy 9.3*) and include SEMP's.

Coastal management plans, including SEMP's, should preferably contain the following:

- Description of physical coastal processes and resources and statement of management practices and actions to maintain processes and conserving or rehabilitating resources;
- Description of the recreational, public access and scenic values of the area and a statement of the management practices and actions to be employed to manage these values;
- Statement of performance indicators; and
- Program of annual works and maintenance.

Issues covered by management plans include resource allocation, tenure decisions, covenants, and development and implementation of management arrangements. Management plans guide the management of coastal land to reflect the requirements of the QCP at a local level. Appendix 1 Item 8 of the SPCM identifies Amity Point as a priority area for local area coastal management planning.

Other Applicable Policies

Other policies under the SPCM applicable to the Amity Point SEMP are:

- *Policy 3.1* – the long-term stability of dune systems and the capacity of the dunes to rebuild after erosion is to be maintained through retaining and enhancing the extent, species composition and natural zonation of coastal dune vegetation;
- *Policy 3.4* – for high-use recreational areas where vegetation retention is not practicable, physical management methods such as beach reprofiling are to be implemented to maintain an erosion buffer zone and the sand volume of the beach and dune;
- *Policy 5.1* – traditional Owners are to be encouraged to participate in planning for the management of the coast; and
- *Policy 6.1* – use of coastal land ensures public access to the coast is maintained or enhanced.

The coastal zone and CMD for Amity Point is shown in Figure 2-2 together with areas of significance under the QCP. The coastal zone covers the entire study area while the CMD includes areas within the Amity Township and the settlements along the north-eastern coast. All lands outside the Townships are areas of ecological significance (AES).



	<p>LEGEND</p> <ul style="list-style-type: none"> Fish Habitat Areas Cadastral Boundary 	<p>Queensland Coastal Plan</p> <ul style="list-style-type: none"> Coastal Management District Areas of High Ecological Significance Areas of General Ecological Significance Strategic Rehabilitation Areas 	<p><i>Note:</i> The Coastal Zone covers the entire area of this map.</p>	<p>Title: Coastal Zone, Coastal Management District and Areas of Planning Interest under Queensland Coastal Plan for Amity Point</p> <p><small>BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.</small></p> <div style="display: flex; align-items: center;"> </div> <p>Approx. Scale</p>	<p>Figure: 2-2</p> <p>Rev: A</p> <p>BMT WBM www.bmtwbm.com.au</p>
<p><small>Based on satellite data provided by the State of Queensland (Department of Environment and Heritage Management) 2012. Coordinates are in decimal degrees. All data is the property of the State and is provided for the sole purpose of accuracy. In addition to the data, including accuracy, reliability, completeness, currency of content and a number of other factors, including without limitation, users are responsible for any use, change or error (including time-sensitivity) arising from the use of the map. Data must not be used for other purposes or for which it was not intended.</small></p>					

2.1.1.2 Coastal Protection State Planning Regulatory Provision

The Coastal SPRP applies to development in a coastal management district (CMD) that is impact assessable or requires referral to DEHP, or that is assessed by DEHP as the assessment manager.

The SPRP provides assessment criteria for coastal hazards, development in an erosion prone area, nature conservation, areas of High Ecological Significance (HES), public access, and coastal-dependent development. The following constraints and requirements are relevant to works under the SEMP:

- Retreat is the default option in areas threatened by erosion in the erosion prone area. The presence of development to a scale and intensity that makes retreat not achievable will justify property protection works. Structural engineering and stabilisation works are a last resort where there is an immediate threat to public safety, property or infrastructure. These works must not cause adverse impacts on coastal resources or natural cycles of erosion and accretion of beaches.
- All tidal works require (a) proof of demonstrated need in the public interest, and (b) a comprehensive investigation that determines no significant adverse impacts on longshore transport of sediments or an increase in coastal hazards (including erosion) to neighbouring foreshore.
- Beach and related areas that contain significant wildlife habitat are to be protected and managed. This includes:
 - Key shorebird roosting and feeding habitat. Where works require the loss of shorebird habitat, offsets are to be provided before the works commence;
 - Fish habitat and movement passages, including those in Myora-Amity Banks Fish Habitat Area (FHA) (see Section 2.2.2.3);
 - Benthic habitat, including seagrass beds as well as benthic communities and tidal flats (see Section 2.2.2.3); and
 - Stands of native vegetation, especially riparian vegetation. Riparian zones are to be maintained as wildlife corridors.
- No development in areas of HES.
- No net loss of public access to the foreshore unless it compromises the protection of coastal resources.
- Dredging must be beneficial to the State in terms of navigation and economics and be proven to maintain the existing physical environment of the area. An application for dredging will only be approved where supported by studies into the nature of dredging spoils and impacts on physical processes, and maintenance dredging requires a dredge management plan.
- Reclamation will only be allowed where clearly justified and where there are no or minimal adverse impacts on coastal resources. Reclamation is justified where it is necessary for erosion control/nourishment purposes, protects the physical environment, or is necessary to reinstate land that has been eroded where the reclamation is coordinated with neighbouring properties.

2.1.1.3 Draft State Planning Policy

The Draft SPP is a preliminary step of the State Government towards a single, centralised development assessment system. The SPP outlines assessment requirements for all State Interests and is intended to replace all other SPPs. There are three State Interests under the Draft SPP of relevance to the SEMP:

- Coastal environment;
- Natural hazards (including coastal erosion); and
- Biodiversity.

The assessment requirements of these State Interests are summarised in Table 2-3. The erosion prone area for the study area, as defined by DEHP, is shown in Figure 2-3.

Table 2-2 State Interests and Assessment Criteria under Draft SPP

State Interest	Assessment criteria
Coastal environment	<ul style="list-style-type: none"> • Avoid or minimise adverse impacts on coastal resources and their values • Maximise opportunities to maintain or enhance natural scenic amenity values of the coast • Maintain or enhance general public access to, or along, the foreshore unless this is contrary to the protection of coastal resources or public safety • Avoid the disposal of material dredged from land into coastal waters unless for reclamation or coastal protection works • Compliance with a dredge management plan that demonstrates how environmental impacts will be managed and mitigated, and complies with requirements of the National Assessment Guidelines for Dredging 2009 • Reclaim tidal land only where it is for coastal protection work or work necessary to protect coastal resources or coastal process
Biodiversity	<ul style="list-style-type: none"> • Any potential adverse environmental impacts are identified and considered • Avoid adverse environmental impacts, or where this is not reasonably possible, minimise impacts and offset residual impacts
Natural hazards	<ul style="list-style-type: none"> • Address the natural hazard and associated risks to people, property, economic activity, social wellbeing and the environment by achieving the following performance outcomes: <ol style="list-style-type: none"> a) the development is compatible with the risk associated with the natural hazard b) the development siting, layout and access responds to a potential natural hazard and minimises risk to personal safety; c) the development is resilient to natural hazard events by ensuring siting and design accounts for the potential risks of natural hazards to property; d) the development directly, indirectly and cumulatively avoids and unacceptable increase in the severity of the natural hazard and does not significantly increase the potential for damage on the site or to other properties; and e) natural processes and the protective function of landforms and/or

State Interest	Assessment criteria
	<p>vegetation are maintained in natural hazard areas</p> <ul style="list-style-type: none"> • Development in a coastal hazard area ensures that: <ul style="list-style-type: none"> a) erosion prone areas in a coastal management district are maintained as development-free buffers or where permanent buildings or structures exist, coastal erosion risks are avoided or mitigated; and b) coastal protection work is undertaken only as a last resort where erosion presents an imminent threat to public safety or property, and (i) the property cannot reasonable be relocated or abandoned, (ii) the coastal protection work is located on private land to the maximum extent reasonable, and (iii) the coastal protection work does not increase coastal hazard risk for adjacent areas • Have regard to SPP mandatory requirements: coastal hazard

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LEGEND

- Cadastral Boundary
- Indicative Erosion Prone Area 2100* (including projected climate change impacts to 2100)
 - Erosion due to storm impact and long term trends of sediment loss and channel migration
 - Erosion and permanent tidal inundation due to sea level rises

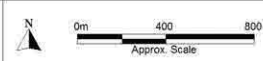
*Based on available data provided by the State of Queensland Department of Environment and Heritage Management (2012), a combination of the data currently on file of the state, sea level rise and other factors. The data provided is an indicative only and should not be used for any other purpose. The data is provided for information only and should not be used for any other purpose. The data is provided for information only and should not be used for any other purpose.

* The erosion prone areas shown on this map are indicative of the erosion and inundation extent that may occur with climate change impacts up to 2100.

Title: **Defined Erosion Prone Area Plan for Amity Point**

Figure: **2-3** Rev: **A**

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



Filepath: \\B18390_1_GML Shoreline Erosion Study\MAJDRGCOA_004_120621_QCP Erosion Prone Area.wor

2.2 Other Legislation and Approvals

The following legislation provides a planning background and framework for the preparation of the SEMP and application of recommended management options for shoreline erosion management at Amity Point.

2.2.1 Commonwealth

2.2.1.1 *Environment Protection and Biodiversity Conservation Act 2009*

Any actions that have or are likely to have a significant impact on a matter of national environmental significance (NES) are to be referred to the Minister administering the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. Matters of NES that *may* be significantly impacted by coastal protection works at Amity Point include (see further Appendix B):

- Wetlands of international importance (Moreton Bay Ramsar Site);
- Listed threatened species and ecological communities; and
- Migratory species.

If coastal protection works are declared a 'controlled action', approval will be required from Minister before the works can commence.

Directory of Important Wetlands in Australia

The Australian, State and Territory governments have jointly compiled a Directory of Important Wetlands in Australia which identifies and recognises Australia's nationally important wetlands. Although not directly protected under Commonwealth legislation, these wetlands are still of planning significance at a Commonwealth level.

The only wetlands within the vicinity of Amity Point listed on the directory are the Moreton Bay Aggregation (QLD134) and NSI itself (QLD191). These wetlands are protected at a State level under marine parks legislation as the Moreton Bay Marine Park (see Section 2.2.2.6).

2.2.1.2 *Native Title Act 1993*

The *Native Title Act 1993* provides for the recognition of Native Title rights of Indigenous Traditional Owners over non-freehold areas in Australia. In 2011, the Federal Court of Australia ruled in favour of a Native Title determination for the Quandamooka people of Minjerribah (NSI). This determination covers all non-freehold land on the island, including areas of unallocated State land and reserve at Amity Point. This grants rights to the Quandamooka people in accordance with their traditional rights over the land, including rights of occupancy and management.

Acts undertaken subsequent to 1 January 1994 that would affect Native Title are termed *future acts*. Future acts are invalid unless allowed under an Indigenous Land Use Agreement (ILUA) or through some other negotiated process with the local Traditional Owners. Two ILUAs have been entered into by the Quandamooka; one with the State government and one with RCC.

In planning and preparing a SEMP it is necessary to consider that any recommendations made over USL and coastal reserves managed by the local government will be subject to the management

consent of the Quandamooka Traditional Owners and the Quandamooka ILUAs. Any development proposed under the SEMP that occurs on private land will be exempt from this requirement as Native Title does not apply to freehold land.

2.2.2 Queensland

2.2.2.1 Sustainable Planning Act 2009

Coastal erosion management works will require development approval under the Integrated Development Assessment System (IDAS) of the *SP Act*. Assessment under the *SP Act* for potential shoreline erosion management recommendations will be required according to triggers including but not limited to:

- Tidal works;
- Fisheries matters (including removal, destruction or damage to marine plants and work in fish habitat areas);
- Dredging;
- Vegetation clearing; and
- Disturbance of acid sulfate soils (ASS).

Approvals triggered under the IDAS process require assessment by both local government and State agencies against relevant statutory instruments and policies. Table 2-3 summarises the main approvals associated with coastal protection works and the relevant administering legislation and agency at the State level. The effects of this legislation are discussed below. Local area requirements are discussed in Section 2.2.2.9.

Table 2-3 Summary of IDAS Form and Administering Legislation and Agency for Common Forms of Coastal Protection Development

Development	IDAS Form	Relevant Legislation	Relevant Agency
Tidal Works	23 or 28	<i>Coastal Protection and Management Act 1995</i>	Department of Environment and Heritage Protection
Dredging	8	<i>Environmental Protection Act 1994</i>	Department of Environment and Heritage Protection
Clearing Native Vegetation	11	<i>Vegetation Management Act 1999</i>	Department of Natural Resources and Mines
Works in Fish Habitat Areas	26	<i>Fisheries Act 1994</i>	Department of Agriculture, Fisheries and Forestry
Clearing Marine Plants			

Development under IDAS may be impact or code assessable, self-assessable, compliance assessable, or exempt. The necessary level of development is identified under the *Sustainable Planning Regulation 2009 (SP Regulation)* and the Redland City Planning Scheme. The instruments required for assessment depend upon the level of assessment required. Necessary instruments for development assessment may include those listed Table 2-3 above as well as other State and local planning instruments discussed below.

In addition to development approval, works in the coastal zone may also require resource allocation authority (RAA). This includes allocation of quarry material taken from tidal waters (i.e. dredged material) and fisheries resources (i.e. marine plants and fish habitats). Whether or not RAAs are required for development depends upon the type of development being undertaken.

Prohibited development is a category of development that cannot occur where certain activities are triggered. Schedule 1 of the *SP Act* lists all prohibited development activities. This includes clearing native vegetation without a relevant purpose (see Section 2.2.2.4 below).

2.2.2.2 *Environmental Protection Act 1994*

The *Environmental Protection Act 1994 (EP Act)* and the *Environmental Protection Regulation 2008 (EP Regulation)* provide the main framework in Queensland for controlling environmental harm and pollution resulting from development.

The *EP Act* sets out a general environmental duty (s319) requiring persons not to cause environmental harm unless all reasonable and practicable measures are taken to prevent or minimise the harm. Compliance with the duty is a defence to causing environmental harm without appropriate authorisation.⁶ In the context of the SEMP, Council must not carry out any activities that cause, or are likely to cause, environmental harm unless they take reasonable and practicable measures to prevent or minimise the harm.

Environmentally relevant activities (ERAs) are a particular type of action causing environmental harm. These activities can only be undertaken with the appropriate approval. Under the *EP Regulation*, ERAs include dredging (ERA 16). Authorisation to undertake ERA 16 may be required where dredging of sand of beach nourishment purposes is recommended under the SEMP.

Environmental protection policies (EPPs) are also prepared under the *EP Act* to protect Queensland's environment. These EPPs seek to protect environmental values (EVs) and objectives identified for various aspects of the environment including water, noise, air quality and waste management. EVs and objectives have been identified under the following policies and instruments for the Amity Point area:

- Environmental Protection (Water) Policy 2009;
 - Moreton Bay environmental values and water quality objectives (Basin No. 144 (part) and adjacent basins 141, 142, 143, 145 and 146, including Moreton Bay, North Stradbroke, South Stradbroke, Moreton and Moreton Bay Islands); and
 - Queensland Water Quality Guidelines 2009;
- Environmental Protection (Air) Policy 2008 (EPP (Air));
- Environmental Protection (Noise) Policy 2008 (EPP (Noise)); and
- Environmental Protection (Waste Management) Policy 2000 (EPP (Waste)).

These guidelines and EPPs set the baseline of water, air and noise quality and waste management to be achieved to ensure ecologically sustainable development in Queensland.

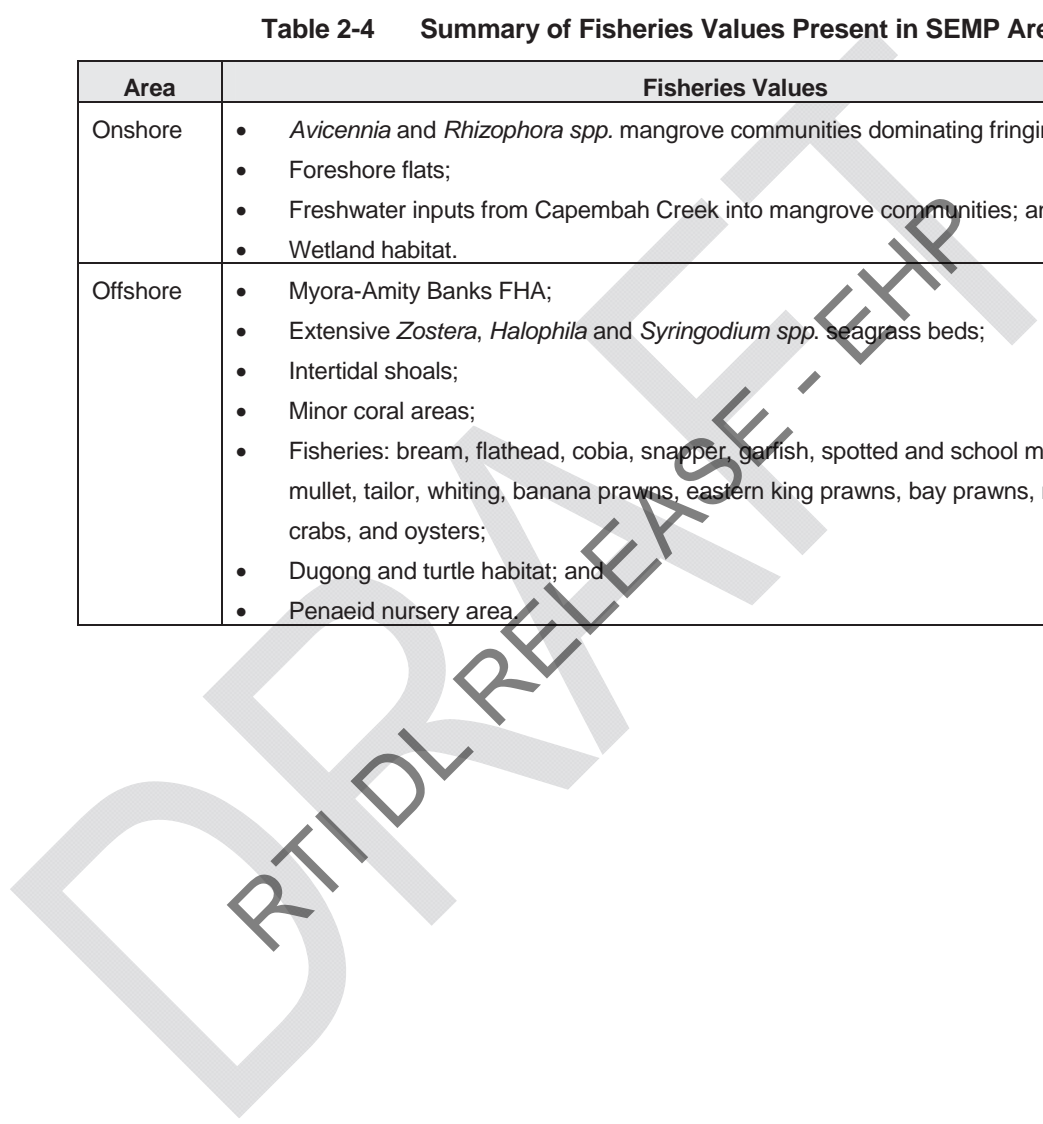
⁶ *EP Act* s493A

2.2.2.3 Fisheries Act 1994

The *Fisheries Act 1994* protects fisheries resources and fish habitats in Queensland. All coastal protection works requiring the clearing of marine plants (including any removal, damage or destruction) or fish habitat areas (FHA) require assessment under the *SP Act* subject to concurrence assessment under the *Fisheries Act*. Figure 2-4 shows the extent of the Myora-Amity Banks FHA which covers the coastal waters offshore and to the south of Amity, Figure 2-5 shows seagrass (i.e. benthic marine plant) mapping for these same waters. The fisheries values of these waters is summarised in Table 2-4 below.

Table 2-4 Summary of Fisheries Values Present in SEMP Area

Area	Fisheries Values
Onshore	<ul style="list-style-type: none"> • <i>Avicennia</i> and <i>Rhizophora</i> spp. mangrove communities dominating fringing shoreline; • Foreshore flats; • Freshwater inputs from Capembah Creek into mangrove communities; and • Wetland habitat.
Offshore	<ul style="list-style-type: none"> • Myora-Amity Banks FHA; • Extensive <i>Zostera</i>, <i>Halophila</i> and <i>Syringodium</i> spp. seagrass beds; • Intertidal shoals; • Minor coral areas; • Fisheries: bream, flathead, cobia, snapper, garfish, spotted and school mackerel, sea mullet, tailor, whiting, banana prawns, eastern king prawns, bay prawns, mud crabs, sand crabs, and oysters; • Dugong and turtle habitat; and • Penaeid nursery area.





	<p>LEGEND</p> <ul style="list-style-type: none"> Myora - Amity Banks Fish Habitat Areas Other Fish Habitat Areas Cadastral Boundary <p><small>Based on available data provided by the State of Queensland, Department of Environment and Heritage Management, 2012. In consultation with the State Planning Unit of the State, and other relevant agencies that provide data or services, in relation to the data including accuracy, reliability, completeness, currency or suitability and a disclaimer is hereby provided without liability, warranty or responsibility for any use, alteration or dissemination of the data. Any use of the data shall not be used for other purposes or in relation to third party claims.</small></p>	<p>Title: Myora - Amity Banks Fish Habitat Area within SEMP Area</p> <p>BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> </div> <div> <p>0km 1.2 2.4</p> <p>Approx. Scale</p> </div> </div> <p>Filepath: \\B18390_1_GML Shoreline Erosion Study\MAJDRGIC0A_005_120621_Myora Amity Banks Fish Habitat Area.wor</p>	<p>Figure: 2.4</p> <p>Rev: A</p> <div style="text-align: right;"> <p>BMT WBM www.bmtwbm.com.au</p> </div>
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	<p>LEGEND</p> <ul style="list-style-type: none"> Seagrass 2004/2005 (DERM/UQ) Wetlands Directory of Important Wetlands in Australia - Moreton Bay Ramsar Site - Moreton Bay 	<ul style="list-style-type: none"> Cadastral Boundary 	<p>Title: Seagrass Beds and Coastal Wetlands of the SEMP Area</p> <p>BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.</p> <p>Filepath: \\B18390_I_GML Shoreline Erosion Study\MA\DRG\COA_008_120622_Seagrass and Coastal Wetlands.wor</p>	<table border="1"> <tr> <td>Figure: 2-5</td> <td>Rev: A</td> </tr> <tr> <td colspan="2" style="text-align: center;"> <p>BMT WBM www.bmtwbm.com.au</p> </td> </tr> </table>	Figure: 2-5	Rev: A	<p>BMT WBM www.bmtwbm.com.au</p>	
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Relevant policies necessary to consider when recommending works involving fisheries matters are summarised in Table 2-5 below.

Table 2-5 Summary of Applicable Fish Habitat Management Operational Policies and Policy Requirements for Erosion Protection Works in the SEMP Area

Policy	Applicable Policy Requirements
<p>FHMOP 001 <i>Management of protection of marine plants and other tidal fish habitats</i></p>	<ul style="list-style-type: none"> • Coastal development proposals should avoid impacts to marine plants and other tidal fish habitats; • All private development works must be set back from tidal lands and fish habitats; • Tenure over tidal fish habitats for private development is not supported; • Erosion protection and dredging activities must be in accordance with FHMOP 010 and FHMOP 040, respectively; and • Revetment works supported only where there is substantiated accelerated bank erosion or slumping threatening buildings or infrastructure.
<p>FHMOP 002 <i>Management of declared Fish Habitat Areas</i></p>	<ul style="list-style-type: none"> • RAA only to be issued in a declared FHA for 'prescribed development purposes' includes maintaining: <ul style="list-style-type: none"> ○ A structure that was constructed before the area was declared to be a FHA under the Fisheries Act; and ○ A lawfully constructed structure; and • Constructing a permanent structure on tidal land or depositing material for beach replenishment is not supported in a FHA.
<p>FHMOP 004 <i>Dredging, extraction and spoil disposal activities. Departmental procedures for provision of fisheries comments</i></p>	<ul style="list-style-type: none"> • Dredging for waterway management (i.e. beach nourishment) is determined on a case-by-case basis but requires community/habitat benefits to outweigh potential losses; • Dredging within FHA prohibited unless in an existing navigation channel; • Spoil disposal on non-tidal land is preferred; • Proposals for dredging for waterway management, dredging for navigational purposes, or spoil disposal will not be opposed where there are: <ul style="list-style-type: none"> ○ No, or very minimal, immediate or foreseeable, permanent, adverse impacts on fisheries resources; or ○ Demonstrated fisheries related benefits; or ○ Essential community benefits (e.g. beach nourishment); and • Dredging or spoil disposal proposal will be opposed where dredging occurs within a FHA and/or feasible alternative exist.
<p>FHMOP 010 <i>Tidal fish habitats, erosion control and beach replenishment</i></p>	<ul style="list-style-type: none"> • Natural shoreline processes and existing tidal fish habitat values are to be maintained by: <ul style="list-style-type: none"> ○ Using erosion buffer zones and managed retreat where there is no significant erosion; ○ Treating the cause of erosion, rather than only

Policy	Applicable Policy Requirements
	<p>attempting to manage the erosion through the use of erosion control structures and beach replenishment, where the erosion is the result of human activities;</p> <ul style="list-style-type: none"> ○ Designating buffer zones; • Erosion control measures are supported where there is significant erosion, inadequate erosion buffer zone and impossibility of managed retreat; • Erosion control structures are to be constructed by parties with as-of-right or approved use of land (for private property) or by local government on behalf of the community; • Erosion control structures not permitted in declared FHA, unless temporary; • Seawalls, revetments and other structures parallel to the shoreline are to be located as far landward as possible; • Depositing material for beach nourishment not permitted in FHA; • Beach nourishment supported only where there is significant erosion or requirement for the protection or effective functioning of erosion control structures; • Nourishment material must be sourced outside the FHA with a buffer zone of at least 100m between extraction site and the FHA boundary; • Nourishment material must be sourced away from locations where there are marine plants and fishing grounds; • Filling of tidal land for creation of a dune or beach at a level above HAT must be an integral part of the erosion control design and minimise renourishment frequency/impact of renourishment of tidal fish habitats, or remove the need for other erosion control works; and • Dredging to comply with FHMOP 004.

2.2.2.4 *Vegetation Management Act 1999*

The *Vegetation Management Act 1999 (VM Act)* prohibits the clearing of native vegetation unless for a relevant purpose. Alternatively, clearing may be exempt from the approval process where listed under Schedule 24 of the *SP Regulation*. Relevant purposes and exemptions relevant to shoreline erosion management for particular land are summarised in Table 2-6 below.

Table 2-6 Relevant Purpose and Exemptions under the Vegetation Management Act 1999 Applicable to Clearing Vegetation for Shoreline Management Works

Type of Vegetation on Regional Ecosystem Map	Colour on RE Map	Relevant Purpose/Exemptions Available for Clearing
<i>Freehold land</i>		
Non-remnant	White	<ul style="list-style-type: none"> For any purpose
Remnant	Green, orange or pink	<ul style="list-style-type: none"> Under a development approval for a material change of use or to reconfigure a lot where the Department administering the VM Act is a concurrence agency to the development application
<i>Leasehold land (other than a lease used for agriculture and grazing)</i>		
Non-remnant	White	<ul style="list-style-type: none"> For any purpose
<i>Road</i>		
Non-remnant or remnant least concern	White or green	<ul style="list-style-type: none"> Any purpose carried out by a local government in an urban area
<i>Trust land</i>		
Non-remnant	White	<ul style="list-style-type: none"> Carried out by the trustee for any purpose
<i>All land types</i>		
All types	White, green, orange or pink	<ul style="list-style-type: none"> Where approval has been obtained for works which are: <ul style="list-style-type: none"> A project declared to be a significant project under the <i>State Development and Public Works Organisation Act 1971</i>, section 26; and For an extractive industry (including dredging and ancillary deposition).

Regional ecosystem (RE) and remnant vegetation mapping for the Amity Point area are shown in Figure 2-6 below. Almost all freehold land at Amity Point is cleared or non-remnant vegetation while State land further inland and to the north is marked as least concern remnant vegetation. Most of this vegetation is also marked as essential habitat for protected species which will restrain the clearing of this vegetation under a development approval. Table 2-7 summarises the REs in the SEMP area.

Table 2-7 Description of Regional Ecosystems and Essential Habitat at Amity Point

RE Number	RE Description	Status	Essential Habitat
12.1.3	Mangrove shrubland to low closed forest on marine clay plains and estuaries	Least concern	-
12.2.5	<i>Corymbia</i> spp., <i>Banksia integrifolia</i> , <i>Callitris columellaris</i> , <i>Acacia</i> spp. open forest to low closed forest on beach ridges	Least concern	Wallum sedgefrog (<i>Litoria olongburensis</i>) Wallum froglet (<i>Crinia tinnula</i>) Wallum rocketfrog (<i>Litoria freycineti</i>)
12.2.6	<i>Eucalyptus racemosa</i> woodland on dunes and sand plains. Usually deeply leached soils	Least concern	-
12.2.7	<i>Melaleuca quinquenervia</i> or <i>M. viridiflora</i> open forest to woodland on sand plains	Least concern	Wallum froglet Wallum rocketfrog
12.2.14	Foredune complex	Least concern	-
12.2.15	Swamps with <i>Baumea</i> spp., <i>Juncus</i> spp. and <i>Lepironia articulata</i>	Least concern	Cooloola sedgefrog (<i>Litoria cooloolensis</i>) Wallum sedgefrog Wallum froglet Wallum rocketfrog

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	<p>LEGEND</p> <ul style="list-style-type: none"> Regional Ecosystem Remnant vegetation that is a least concern regional ecosystem Vegetation Management Act Essential Habitat Vegetation Management Act Essential Regrowth Habitat - Threatened Fauna Cadastral Boundary <p><small>Based on satellite data provided by the State of Queensland (Queensland) Environmental Protection Agency (EPA) in collaboration with the Queensland Department of Environment and Heritage Protection (DEHP) in 2012. The Queensland Department of Environment and Heritage Protection (DEHP) does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.</small></p>	<p>Title: Regional Ecosystems and Remnant Vegetation Mapping for Amity Point</p> <p>BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> </div> <div> </div> </div> <p>Filepath : \\B18390_I_GML Shoreline Erosion Study\MAJ\DRG\COA_007_120622_Regional Ecosystems and Remnant Vegetation.wor</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Figure: 2-6</td> <td style="width: 50%;">Rev: A</td> </tr> <tr> <td colspan="2" style="text-align: center;"> </td> </tr> <tr> <td colspan="2" style="text-align: center;"> www.bmtwbm.com.au </td> </tr> </table>	Figure: 2-6	Rev: A			www.bmtwbm.com.au	
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2.2.2.5 Nature Conservation Act 1992

The object of the *Nature Conservation Act 1992 (NC Act)* is the conservation of nature. This includes the protection of native flora and fauna and the declaration of protected areas. While no protected areas are designated under the *Nature Conservation (Protected Areas) Regulation 1994* for the SEMP area, least concern (LC) and endangered, vulnerable or near threatened (EVNT) species under the *Nature Conservation (Wildlife) Regulation 2006* have been identified as occurring in the area (see Appendix C).

Any action that involves the taking or native flora or fauna is unlawful unless authorised by a permit. Wherever clearing is required for the purposes of coastal protection works, therefore (including clearing to gain access to sand extraction areas) the proponent must obtain the appropriate permit under the *NC Act*. This does not apply, however, to flora covered under the provisions of other Acts (e.g. marine plants). All clearing of koala habitat trees must be in accordance with the *Nature Conservation (Koala) Conservation Plan 2006*.

2.2.2.6 Marine Parks Act 2004

The *Marine Parks Act 2004 (MP Act)* establishes a framework for protecting the marine environment through declaration of marine parks. Under the *MP Act* the Moreton Bay Marine Park (MBMP) has been declared over the tidal waters and tidal land (up to HAT)⁷ of Amity Point (see Figure 2-7). This marine park is managed under the *Marine Parks (Moreton Bay) Zoning Plan 2008*. The tidal land and waters of Amity are marked as 'Yellow' conservation park zone and 'Light Blue' habitat protection zone. Persons may use these zones for carrying out works consistent with the objects of the conservation park zone and habitat protection zone, respectively.

Objects for conservation zones include the provision for the conservation of the areas of the marine park within the zone and to provide opportunities for reasonable use and enjoyment, including limited extractive use.⁸ This includes the use of these areas for nourishment purposes and, arguably, the development of limited coastal protection works so long as the conservation values of the area are not affected.

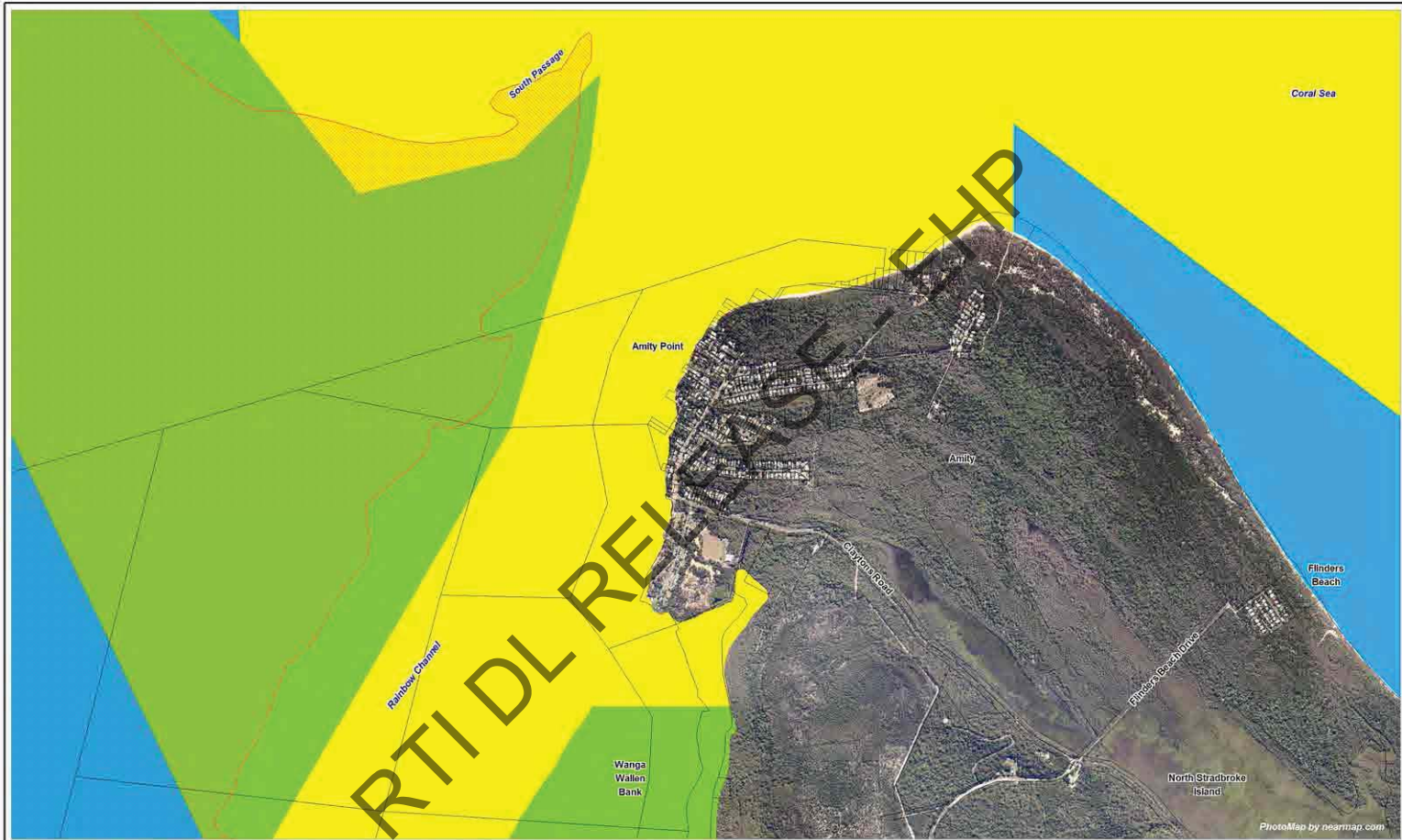
The objects for the habitat protection zone are to provide for the conservation of the areas of the marine park within the zone through the protection and management of sensitive habitats that are generally free from potentially damaging activities, and to providing opportunities for reasonable use of the areas.⁹ Coastal protection works in this area will only be supported where they do not impact upon sensitive habitat, including shorebird roosting locations and offshore benthic habitat.

Before any works can be undertaken below HAT, a permit must be obtained from the Department of National Parks, Recreation, Sport and Racing (DNPRSR).

⁷ Highest astronomical tide

⁸ *Marine Parks Regulation 2006* Schedule 1 Item 4

⁹ *Marine Parks Regulation 2006* Schedule 1 Item 2



	<p>LEGEND</p> <p>Moreton Bay Marine Park Zones</p> <ul style="list-style-type: none"> ■ Habitat Protection ■ Conservation Park ■ Marine National Park 	<ul style="list-style-type: none"> Go Slow Area for Turtles, Dugong and Natural Values Cadastral Boundary 	<p>Title:</p> <p>Moreton Bay Marine Park Waters and Zoning within SEMP Area</p> <p><small>BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.</small></p> <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> </div> <div> <p>0m 400 800</p> <p>Approx. Scale</p> </div> </div>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Figure:</td> <td style="padding: 2px;">2-7</td> <td style="padding: 2px;">Rev:</td> <td style="padding: 2px;">A</td> </tr> <tr> <td colspan="4" style="text-align: center; padding: 5px;"> <p>BMT WBM</p> <p>www.bmtwbm.com.au</p> </td> </tr> </table>	Figure:	2-7	Rev:	A	<p>BMT WBM</p> <p>www.bmtwbm.com.au</p>			
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2.2.2.7 *Native Title (Queensland) Act 1993*

The *Native Title (Queensland) Act 1993* reflects the provisions of the Commonwealth *Native Title Act 1993* at a State level. Native Title determinations and ILUAs made under the Commonwealth Act are valid under the State Act and apply to the SEMP as described in Section 2.2.1.2.

2.2.2.8 *South East Queensland Regional Plan 2009-2031*

The *South East Queensland Regional Plan 2009-2031 (SEQ Regional Plan)* needs to be considered in the SEMP in the context of recommending appropriate shoreline erosion management measures for the SEQ region. The *SEQ Regional Plan* aims to manage growth and associated change in SEQ in the most sustainable way and to protect and enhance the quality of life in the region. Relevant policies and requirements of the *SEQ Regional Plan* in relation to shoreline erosion management at Amity, considered in the development of recommendations are summarised in Table 2-8 below.

Table 2-8 Summary of Relevant Policies and Requirements of the South East Queensland Regional Plan for Shoreline Erosion Management at Amity

Policy	Principle	Relevant Requirements
1.4 Natural Hazards and Climate Change Adaptation	Increase the resilience of communities, development, essential infrastructure, natural environments and economic sectors to natural hazards including the projected effects of climate change	<ul style="list-style-type: none"> Establish adaptation strategies to minimise vulnerability to inundation and coastal erosion; and Development decisions to be in accordance with QCP.
2.1 Biodiversity	Protect, manage and enhance the region's biodiversity values and associated ecosystem services and maximise the resilience of ecosystems to the impact of climate change	<ul style="list-style-type: none"> Avoid impacts on areas with significant biodiversity values (i.e. most of the SEMP terrestrial area) or offset impacts where unavoidable.
2.2 Koala Conservation	Koala populations in the region are enhance through the protection, management and the achievement of a net gain in bushland koala habitat and through managing conflict with urban development	<ul style="list-style-type: none"> Ensure development impacts on koala habitat throughout SEQ (e.g. clearing to source beach nourishment material) are offset through the delivery of a net benefit to koalas.
2.4 Managing the Coast	Maintain, protect and enhance the values of the region's coast, including the foreshore, coastal wetlands, dunes, coastal processes, marine ecosystems, significant coastal values and marine waters	<ul style="list-style-type: none"> Ensure that development on the coast or in tidal waters maintains natural physical coastal processes or ensures that there is no increased risk of shoreline erosion to adjacent areas of coastline; Maintain and enhance safe public access to the foreshore and coastal waters; and Ensure plans are consistent with the Moreton Bay Marine Park zones

Policy	Principle	Relevant Requirements
		and fish habitat zones and management plans for the region.
3.5 Scenic Amenity	Identify and protect important scenic amenity areas, view corridors and viewpoints	<ul style="list-style-type: none"> Identify regionally significant and locally important areas of scenic amenity, view corridors and popular and significant viewpoints, and protect them from intrusive development; and Retain and enhance public access to significant and popular viewpoints.
4.2 Land, Extractive Resources, Minerals, Forestry and Fisheries	Manage the region's natural economic resources to sustainably and efficiently meet the needs of existing and future communities	<ul style="list-style-type: none"> Protect, manage and enhance marine, estuarine and freshwater habitats to sustain fish stock levels and maximise fisheries production for the ongoing benefit of the community.
7.1 Traditional Owner Engagement	Recognise Aboriginal Traditional Owners as stakeholders, involve them in planning, and understand and respect their relationship with the land, sea and natural resources	<ul style="list-style-type: none"> Consult with Traditional Owners in the development of planning schemes and, particularly regarding the inclusion of processes for identifying and conserving Aboriginal cultural heritage sites and landscapes; and Recognise Traditional Owners' procedural rights to be consulted at the outset in relation to matters that may affect their Native Title rights, the alienation of unallocated State land or traditional cultural heritage values.
7.2 Community Engagement	Provide Aboriginal and Torres Strait Islander peoples who have traditional, historical and contemporary connections to SEQ with the opportunity for active involvement in planning processes	<ul style="list-style-type: none"> Recognise the cultural need for Aboriginal representatives to obtain group endorsement of consultation responses, and provide periodic forums for the provision of information to the broader community of Aboriginal peoples.

2.2.2.9 State Planning Policy 2/20 Koala Conservation in South East Queensland

SPP 2/10 *Koala Conservation in South East Queensland* is a SPI designed to protect koala habitat in the SEQ region, including the local government area of RCC. The SPP has application to master plans and planning schemes applied in areas by the local government. While the SEMP is not a planning scheme for Amity Point, recommendations made under the SEMP may have consequences

for existing koala habitat in the SEMP area. For this reason, the requirements of the SPP 2/10 have been taken into account when preparing the SEMP.

The SPP 2/10 requires planning instruments to minimise the impacts of development upon koalas and koala habitat. This can be achieved where the instrument identifies and protects significant areas of koala habitat value and habitat connectivity, in addition to apply other planning based ends (e.g. levels of assessment, offset requirements). As can be seen in Figure 2-8 much of the SEMP area is mapped as having one of the following koala habitat values:

- Medium value bushland habitat;
- Medium rehabilitation suitability value;
- Medium other area value; and
- Generally not suitable for habitat.

It is important for the purposes of the SEMP, therefore, to avoid clearing of areas marked as having bushland or rehabilitation habitat value for koalas. This is applicable in regards to any development requiring clearing in these areas, such as for sourcing sand or for installing development works.

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PhotoMap by nearmap.com



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- Koala Habitat Value Category**
- Bushland Habitat - Medium Value
- Suitable for Rehabilitation - Medium Value
- Other Areas of Value - Generally Not Suitable

Cadastral Boundary

Based on published data provided by the State of Queensland (Department of Environment and Heritage Management) 2012. An acknowledgment of the data ownership and origin of the data is not intended as an endorsement or guarantee of accuracy. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

Title:

**South East Queensland Koala Protection Area
Koala Habitat Value**

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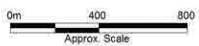


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2.2.2.10 Other Considerations

It may be necessary to liaise with, and obtain permission from, the following agencies regarding the legislation and issues mentioned above:

- DEHP for matters concerning dredging, nourishment, conservation values, tidal quarry material allocations, and management under the QCP;
- DNPRSR for marine park and *NC Act* permits;
- Department of Natural Resources and Mines (DNRM) for matters concerning the allocation of State and use of State land, vegetation management, Indigenous cultural issues, and land title;
- Department of Agriculture, Fisheries and Forestry (DAFF) for matters concerning fisheries resources, marine plants and FHAs; and
- Department of Transport and Main Roads (DTMR) / Regional Harbour Master in relation to navigation and navigation channels for potential dredging within/adjacent to channels and watercourses.

2.2.3 Redland City

Amity occurs within the local government jurisdiction of RCC. This jurisdiction extends seaward to the high water mark under the *Local Government Act 2009 (LG Act)*. The *LG Act* also enables local government to obtain specific jurisdiction from the State over the foreshore, between high and low water mark for special purposes, such as coastal protection works.

RCC controls land use and activity under the local planning scheme (under the *SP Act*) and Local Laws (under the *LG Act*). RCC also has legislative responsibilities under the *EP Act*. Local government generally has responsibilities relevant to coastal management for, *inter alia*:

- Land use control;
- Recreational planning;
- Management of local reserves;
- Environmental protection and rehabilitation; and
- Monitoring.

2.2.3.1 Redlands Planning Scheme

The *Redlands Planning Scheme – Version 4* (the Planning Scheme) is the leading local planning instrument (LPI) governing all planning and development within Redland City. Shoreline erosion management recommendations and planning under the Amity SEMP reflect the requirements of the Planning Scheme outcomes, zones, overlays and codes.

Outcomes

The outcomes sought to be achieved by the Planning Scheme are as follows:

- Desired Environmental Outcomes (DEOs);
- Overall Outcomes that are the purpose of a code;

- Specific Outcomes that contribute to achieving the Overall Outcomes and are the outcomes by which code or impact assessable development are assessed;
- Probable Solutions that are prescriptive requirements and provide a guide to achieving Specific Outcomes; and
- Acceptable Solutions that are prescriptive requirements for self-assessable development.

There are six (6) DEOs identified under the Planning Scheme. These DEOs establish the overarching outcomes that the Planning Scheme seeks to achieve. Relevant aspects of these DEOs to shoreline erosion management are summarised in Table 2-9 below.

Table 2-9 Summary of Relevant Requirements of Redlands Planning Scheme Desired Environmental Outcomes in Relation to Shoreline Erosion Management

DEO	Relevant requirements
1 Natural Environment	Shoreline erosion management works are to: <ul style="list-style-type: none"> • Protect and enhance remnant ecosystems on North Stradbroke Island, koala habitats and species of native fauna and flora that range from internationally to locally significant and threatened to common species; • Maintain the health of drainage systems, water catchments and Moreton Bay minimising the disturbance of ASS; and • Minimise the adverse impacts of natural hazards on environmental values and the Redland Community.
2 Character and Identify	Character and identity is protected and strengthened by: <ul style="list-style-type: none"> • Ensuring significant landform and landscape features of Redland City (e.g. green backdrop provided by NSI) are protected and retained from incompatible development.

Other outcomes identified under the Planning Scheme are achieved through the application of codes, zones and overlays.

Zones and Overlays

Zones and overlays under the Planning Scheme establish the required level of assessment and relevant assessment codes for particular development and uses depending upon their location.

Table 2-10 summarises the applicable zones and overlays and related codes for basic shoreline erosion management activities recommended under the SEMP. See Appendix D for Planning Scheme Maps related to the SEMP area.

It should be noted that part of the urban residential area of Amity Point (west of Ballow Street) has been zoned as sub-area UR3. In this sub-area all future buildings and structures are to be demountable and capable of removal. In addition buildings, structures or infrastructure associated with the use of other development are not to extend any further seaward than existing uses and development on the site. This is part of a strategic plan of retreat proposed by RCC whereby the line of development will retreat as shoreline erosion continues, rather than redeveloping within the erosion prone area (RCC 2011a).

Table 2-10 Level of Assessment and Applicable Assessment Codes for Common Shoreline Erosion Management Activities Based on Zones and Overlays of the SEMP Area

Activity	Zones			Overlays	
	Low Density Residential	Conservation	Open Space	Acid Sulfate Soils	Flood Prone, Storm Tide and Drainage Constrained Land
Uses					
Extractive Industry ¹⁰ (on-shore sourcing of nourishment material)	Impact assessable	Impact assessable	Impact assessable	Self-assessable If complying with AS of Acid Sulfate Soils Overlay Code. Code assessable <ul style="list-style-type: none"> Acid Sulfate Soils Overlay Code. 	Exempt
Works					
Excavation and fill (on-shore sourcing of nourishment material and actual nourishment works)	Exempt If disturbing less than 50m ³ or at a depth less than 300mm.	Impact assessable	Exempt If disturbing less than 50m ³ or at a depth less than 300mm.	Exempt If disturbing less than 50m ³ or at a depth less than 300mm.	Exempt If disturbing less than 50m ³ of soil or at a depth less than 300mm.
	Self-assessable if complying with AS ¹¹ of Erosion Prevention and Sediment Control Code and Excavation and Fill Code.		Self-assessable If complying with AS of Erosion Prevention and Sediment Control Code and Excavation and Fill Code.	Self-assessable If complying with AS of Acid Sulfate Soils Overlay Code.	

¹⁰ Use of premises for dredging, excavating, quarrying, sluicing or otherwise mining materials including sand, gravel, soil, rock, stone and similar substances from the earth and the removal of these materials from the premises

¹¹ Acceptable Solutions

Activity	Zones			Overlays	
	Low Density Residential	Conservation	Open Space	Acid Sulfate Soils	Flood Prone, Storm Tide and Drainage Constrained Land
	Code assessable <ul style="list-style-type: none"> Erosion Prevention and Sediment Control Code; and Excavation and Fill Code. 		Code assessable <ul style="list-style-type: none"> Erosion Prevention and Sediment Control Code, and Excavation and Fill Code. 	Code assessable <ul style="list-style-type: none"> Acid Sulfate Soils Overlay Code. 	Code assessable <ul style="list-style-type: none"> Flood Prone, Storm Tide and Drainage Constrained Land Overlay Code.
Other works	<i>Exempt</i>	<i>Exempt</i>	<i>Exempt</i>	<i>Exempt</i>	<i>Exempt</i>

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While certain works are exempt from assessment under the Planning Scheme they may still be prescribed as assessable development under the *SP Regulation* and subject to assessment as part of the IDAS process.

Code or self-assessable development is required only to comply with the codes identified under the zones and overlays of the Planning Scheme (see Table 2-10 above). Impact assessable development is required to be assessed against the entire Planning Scheme to achieve DEOs and Overall Outcomes of codes. This is discussed in the context of Planning Scheme codes below.

Codes

The following codes are relevant when assessing development related to shoreline erosion management activities:

- Erosion Prevention and Sediment Control Code (acceptable solutions only if self-assessable);
- Excavation and Fill Code (acceptable solutions A1.(1)(b), (c), (d) only if self-assessable);
- Acid Sulfate Soils Overlay Code;
- Flood Prone, Storm Tide and Drainage Constrained Land Overlay Code; and
- Extractive Industry Use Code.

Assessment against these codes is undertaken on a case-by-case basis at the development application and assessment stage or recommendations made under this SEMP. Assessment codes may also trigger the need to undertake works in accordance with planning scheme policies (PSPs) such as PSP 7 (Flood Prone, Storm Tide and Drainage Constrained Land) or PSP 14 (Waterways, Wetlands and Moreton Bay).

2.2.3.2 Other local Instruments

Recommendations of the Amity SEMP have been made taking into account the relevant requirements of the following LPIs and local laws:

- *Corporate Plan 2010-2015* – provides particular objectives and goals of RCC, including 3. Embracing the Bay:
 - Outcome: *The benefits of the unique ecosystems, visual beauty, spiritual nourishment and coastal lifestyle provided by the islands, beaches, foreshores and water catchments of Moreton Bay will be valued, protected and celebrated;* and
 - Strategy 3.2: *Better manage our foreshore through coordinated planning with a special focus on resilience to the impacts of flooding and storm tides;*
- *Flinders Beach Land Management Plan 2005-2009* (Flinders Beach LMP) – a strategy for managing Flinders Beach in order to reduce the impacts of vehicles and campers, enhance the wildlife habitats, ensure safety and amenity for all beach users, administer existing legislation, and monitor management actions into the future;
- *Biodiversity Strategy 2008-2012* – identifies key biodiversity values and threats in Redland City and identifies planning and management framework by which to protect and enhance biodiversity;

- *Confronting Our Climate Future. A strategy to 2030 for Redland City to: Reduce Greenhouse Gas Emissions, Respond to Climate Change, and Achieve Energy Transition* – establishes a framework for mitigating and adapting to climate change, including undertaking coastal studies and identifying key areas and infrastructure for coastal erosion protection;
- *Confronting Our Climate Change – Redland City Council Response to Climate Change* – lists the background and context of various climate change mitigation and adaptation strategies, including coastal erosion and storm-tide inundation;
- *Redland City Disaster Management Plan 2010* – management plan designed at responding to emergency events, including coastal hazards;
- *Redlands Koala Policy and Implementation Strategy 2008* – prioritises the need to protect, enhance and increase koala habitat; and
- *Local Law No. 6 Protection of Vegetation* – where development involves the clearing of 'protected vegetation' a permit for clearing is required.

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3 VALUES

In making recommendations for shoreline erosion management measures in the study area, it is necessary to consider the existing ecological, conservation, cultural, heritage, recreational, economic, amenity and access values. The following value descriptions provide the framework for conducting a triple-bottom line assessment for preparation of the SEMP as required by the Coastal Hazards Guideline. See also the results of the Wildlife Online species database search in Appendix C.

3.1 Amity Township

3.1.1 Environmental Values

The Amity Township is an area of residential development along the coastline of Amity Point. While most of the residential lots have been cleared (but for individual trees) most of the inland ecosystems remain intact, at some points reaching to within 150m of the coastline. Vegetation in close proximity to the coastline is RE 12.2.5: open to low closed *Corymbia* spp., *Bankisa inegrifolia*, *Callitris columellaris* and *Acacia* spp. forest, located on beach ridges (DEHP 2012a). This RE may also contain palustrine wetland (vegetated swamp) in dune swales. Essential habitat associated with the ecosystem includes habitat values for wallum frog species Table 2-7. Potential koala habitat has also been identified in these ecosystems (Figure 2-8).

These wetlands are also part of the NSI nationally listed wetlands (QLD191) and Moreton Bay Aggregation (QLD134). The Moreton Bay Aggregation and parts of the NSI wetlands are protected as a wetland of international importance (Moreton Bay Ramsar site). These wetlands provide habitat for international migratory shorebirds which are protected under international conventions and domestically under the *EPBC Act*.

Offshore of the Township is Rainbow Channel. From the coastline, the channel drops immediately to deep water (approx 20m). No seagrass beds or other fishery values occur in this area. These waters have been mapped as an area of conservation significance under the Moreton Bay Marine Park Management Plan (Figure 2-7).

3.1.2 Socio-Economic Values.

Amity is one of three main urban areas on North Stradbroke Island (Amity Point, Dunwich and Point Lookout). Amity Township is the main settlement of Amity Point and thus represents the centre of social and economic activities for the north-west area of the island. In the 2006 census Amity had a population of 405 persons, 1.5% of which was Indigenous (RCC 2007). Amity is mainly a small residential area, noted for having the atmosphere of a fishing village (RCC 2010a).

Community areas in Amity include the Amity Point Beach along Old Ballow Street, the Old Schoolhouse Park along Ballow Street, and the beginning of Flinders Beach to the north (RCC 2011b). These areas provide local residents with the opportunity to access the beach for fishing and swimming activities and to undertake other recreational activities. As most of the coastline at Amity is private property, access to the water at Amity Point Beach is of high value to the community. Amity benefits economically from the tourist values of the local area and Flinders Beach, with day visitors, locals and tourists contributing to the value of local businesses.

Amity Point Public Hall, located at 16 Ballow Street, is also an area of local heritage value. This site was the former Benevolent Asylum, later converted by community labour in the early 1950s into a hall for public use. This site is protected under the RCC Planning Scheme. Other than this site, no heritage features have been identified at Amity Township. As a small coastal village, however, the houses of Amity along the foreshore are likely of high socio-cultural significance to local residents, especially due to the age of many of these structures.

All of Stradbroke Island, including Amity Township, is subject to the Quandamooka ILUA and Native Title claim (see Section 2.2.1.2). This includes all non-freehold (i.e. State and community) land in the area. The Quandamooka people have a cultural and spiritual connection with this land, as well as over coastal waters.

3.2 Amity Park

3.2.1 Environmental Values

Most of Amity Park has been cleared for development, with the closest vegetation ecosystems and available terrestrial habitat located inland (~300m) or to the south of the site. The vegetation immediately inland of Amity Park is mapped as RE 12.2.15: coastal sedgeland and palustrine swamp dominated by *Baumea* spp., *Juncus* spp. and *Lepironia articulata* (DEHP 2012e). Much of this ecosystem is noted as essential habitat for wallum frogs and the Cooloola sedgefrog (Table 2-7) and also provides habitat for the ground parrot (*Pezoporus wallicus wallicus*) all of which are EVNT species under the NC Act (see Section 2.2.2.5). This vegetation is connected to *Eucalyptus racemosa* and *Melaleuca* spp. woodlands on sandy plains to the east and west (REs 12.2.6 and 12.2.7, respectively) (DEHP 2012b; DEHP 2012c). RE 12.2.7 is also palustrine wetland and provides essential habitat for EVNT frogs. These forested areas also provide medium bushland habitat or medium value sites for rehabilitation in relation to SEQ koala habitat values (Figure 2-8).

To the south of Amity Park are palustrine wetlands mapped by DAFF on the Coastal Habitat Resources Information System (CHRIS) (Fisheries Queensland 2001). These wetlands are composed of closed *Avicennia* spp. and closed *Ceriops* spp. assemblages located along the coast, connected to the Myora-Amity Banks FHA (see Figure 2-4 and Figure 2-5). These coastal tree and mangrove swamps provide important ecosystem functions to the local area, and affect hydrology, microclimate and flooding regimes (Joyce 2006; Joyce 2010). Mangrove wetlands are also extremely important to local fisheries and provide habitat for a range of fish species (see Section 2.2.2.3). These wetlands are also part of the NSI and Moreton Bay Aggregation wetlands and listed internationally as part of the Moreton Bay Ramsar site.

Seagrass meadows have been mapped offshore of Amity Park between 1984 and 1988 by DAFF and benthic assemblages still occur in these marine areas (Fisheries Queensland 2001). These ecosystems, together with mangrove and swampland vegetation, provide feeding and breeding habitat for local fish species. The Myora-Amity Banks FHA does not actually cover these seagrass beds, however, as it is located to the south and west of Rainbow Channel running alongside NSI.

There are also some limited environmental values associated with Amity Park. This area has not been entirely cleared and so offers fragmented and partial feeding and roosting values for avifauna and small terrestrial fauna species. The groyne field located along the coastline has also had the affected of trapping sand, creating an artificial sand deposit, providing some habitat to infauna and

other invertebrate species. It is also likely that the groynes themselves may also provide hard-structure habitat values to species such as barnacles.

3.2.2 Socio-Economic Values

Amity Park is a large area of community land located at Amity which has not been highly developed. This area is the site of the Amity Point Picnic Park and Cabarita Park (RCC 2011) which are popular local parks. This is also the site of the Amity Point camping ground, providing cabins and tent and camper van sites for visitors (RCC nd.a). This park has direct access to the local beach and a range of facilities, including shower and toilet blocks, picnic areas, boat ramps, play grounds and a nearby skate park (RCC nd.a). Recreational activities in this area would include camping, fishing, swimming, skating, and day visits. This camping site provides commercial values to the Amity Park area and also complements the commercial value of local businesses, such as fishing shops and food retailers.

Anecdotal evidence (2012) suggests that the row of trees along the Amity Park foreshore, behind the existing groyne field, represent some of the first trees identified at the location upon first settlement. While not formally protected or recognised under heritage listings, these trees are potentially of cultural significance to the resident Amity community. No other local or cultural heritage sites have been identified at Amity Park but all non-freehold land has recently been recognised as subject to the Native Title rights of the Quandamooka people of NSI, with their rights set forth under the Quandamooka ILUA (see Section 2.2.1.2).

3.3 Flinders Beach

3.3.1 Environmental Values

Flinders Beach is an 8km long beach located along the northern shore of NSI between Amity Point and Rocky Point (Surf Lifesaving Australia (SLA) 2009). The extensive beach foreshore is backed by extensive vegetated areas consisting of RE 12.2.14 and RE 12.2.7. These represent common foredune assemblages (*Spinifex sericeus* grasslands with *Casuarina equisetifolia* subsp. *Incana* woodland open/forest) and *Melaleuca quinqueneriva*/*M. viridiflora* woodlands on sandy plains (DEHP 2012c; DEHP 2012d; Redland Shire Council (RSC) 2005). Behind the foredunes, vegetation consists of RE 12.2.5: *Corymbia* spp., *Banksia integrifolia*, *Callitris columellaris* and *Acacia* spp. open to low closed forest (DEHP 2012a). This vegetation is associated with palustrine swampland, drained east of the settlement (SLA 2009).

Rear dune and inland vegetation has been mapped as essential habitat for wallum frog species (Table 2-7) and has also been noted as potential habitat for the ground parrot. Other habitat values provided on site include the beach area itself, providing foraging and other habitat values to invertebrates and shorebird species (RSC 2005). An EPBC Act protected matters search (undertaken May 9th 2012) showed over 30 migratory avifauna species occurring within the SEMP area and it is likely many of these species feed and roost along Flinders Beach. This area has also been mapped as of habitat significance for the Moreton Bay Marine Park (Figure 2-7), suggesting the occurrence of various important habitat values to terrestrial, marine and avifauna species in the Moreton Bay region (including sea turtles). Loggerhead turtles occasionally nest on the beach (RSC 2005) while dolphins and other cetaceans are noted to occupy waters near Point Lookout (RCC 2010b), with all these marine species occasionally occupying waters offshore of Flinders Beach. Under the Koala SPP,

dune and inland vegetation is medium koala bushland or rehabilitation habitat and so provides additional values to the SEQ population of koalas.

Wetland values through this area are recognised at a national and international scale as part of the NSI and Moreton Bay Aggregation wetlands and the Moreton Bay wetland site of international importance (see discussion above).

3.3.2 Socio-Economic Values

Flinders Beach provides opportunities for locals, day-trippers and longer staying visitors to undertake nature-based activities in a reasonably undeveloped area (RSC 2005). The area provides camping and four wheel drive (4WD) opportunities along an ocean beach (RCC nd.b). There are 16 beach access points between Amity and Rocky Point as well as a number of defined beach driving tracks (RSC 2005). The beach is a common tourist and recreational user destination for persons from across SEQ and further afield (RSC 2005).

The main recreational values at Flinders Beach are (RCC nd.b; RSC 2005):

1. Camping and 4WD driving;
2. Day visits;
3. Fishing; and
4. Swimming and Surfing.

The site also features a number of commercial values. These include commercial fishing based on NSI targeting mullet and other fish species. Tourism is also a key economic activity in the Flinders Beach area and a significant part of the RCC *Sustainable Tourism Development Strategy*. Other commercial values are associated with local businesses at Amity and Point Lookout benefiting from the tourist numbers at Flinders Beach, such as surf shops, food vendors and souvenir shops (RSC 2005).

All of Flinders Beach (with the exception of freehold land) has been successfully claimed by the Quandamooka people of NSI as part of a claim for Native Title. This is also recognised under the Quandamooka ILUA (see Section 2.2.1.2). Other than this cultural connection with the land, no specific cultural heritage sites have been identified by RCC in relation to the area. There are also no known local heritage sites along Flinders Beach.

The settlements along Flinders Beach are also part of Amity, representing the extension of the Township into more isolated areas. Anecdotal evidence suggests the original settlement of these areas represented planning for westward expansion/retreat of Amity. These areas, therefore, hold significant social value for the future of Amity in addition to their current values as more isolated residential areas surrounded by native bushland.

4 COASTAL PROCESSES & CAUSES OF EROSION

4.1 General Considerations

An appropriate understanding of the fundamental coastal processes affecting the Amity shoreline is needed in order to make an informed decision on the most reliable management strategy to be adopted. The Amity shoreline has an extensive history of active shoreline management as persistent shoreline erosion has threatened development and assets in the past and various protection works have been carried out in response to these threats. Historical protection measures primarily include the construction of revetments and groynes.

A number of studies into the coastal processes and options to mitigate erosion along the Amity shoreline have been undertaken and these have been reviewed at part of this study. The coastal processes studies that have been considered in this SEMP include:

- Early Beach Protection Authority Advice Circa 1970;
- Erosion at Amity Point (Eberhardt, 1978);
- Storm Tide Hazard Study – Redland and Logan Shires (Cardno LT, 2009); and
- Redland Shire Council – Rainbow Channel Cross Section Surveys (ongoing).

In addition, previous field measurements have been interpreted, numerical modelling of waves and currents has been carried out, and aerial imagery has been inspected to assess the sand transport processes at the Amity shoreline and the impacts of previous mitigation works. Furthermore, a site inspection was carried out soon after the significant erosion event in early 2011 and discussions were held with Redland City Council staff to collect information in relation to recent shoreline protection works.

On the basis of the above information, it was possible to gain reasonable knowledge of the active coastal processes. A brief outline of this knowledge is presented in this Section.

The key issues affecting these processes and hence the most appropriate management actions are those of:

- The ongoing meandering of Rainbow Channel;
- The depth of the channel and the apparent sudden collapse of banks at Amity;
- Review of the success or otherwise of previous mitigation works;
- The implications of the existence of the Moreton Bay Marine Park and Myora-Amity Fish Habitat Area; and
- The feasibility of different management options.

The nature and rate of the progressive long-term erosion remains uncertain. The uncertainty lies in the complex interaction of coastal and estuarine processes that drive the meanderings of the Rainbow Channel. These processes are a response to the large volume of water exchanged between Moreton Bay and the Ocean with each tide and the considerable momentum contained in these flows.

Also relevant is the existing coastal structures that are present on the shoreline and the impact of these on local processes. A comprehensive investigation over some years and involving substantial cost would be needed to gain a full understanding of those processes and still may not be able to predict the impacts of storms and cyclones.

However, the review of existing coastal studies has provided a level of understanding sufficient to identify the primary cause of the erosion over the last 100 years and the most reliable engineering and/or management options for mitigating the erosion. Within that context, relevant uncertainties and their significance are also identified and discussed.

4.2 Previous Reports and Studies

The Eberhardt study of 1978 was the result of several investigations carried out by the University of Queensland with assistance from the then Beach Protection Authority. The study gathered information from historical surveys and Navigation Charts and other studies being undertaken at UQ to give an indication of the substantial changes to South Passage, Rainbow Channel, Rous Channel and Amity over the period 1892 to 1971 as shown in Figure 4-1 and Figure 4-2 below. Also presented was the shoreline movement of Amity from 1886 to 1971 and it is of note that the original sub-division followed the shoreline of 1886. This study also noted that erosion at Amity was first reported as early as 1922. The first groynes were built in the area in 1955 and surveyed bank profiles of 1976 and 1977 showed continuing erosion. The study also reported southward movement of sand in the channel after a tracer study.

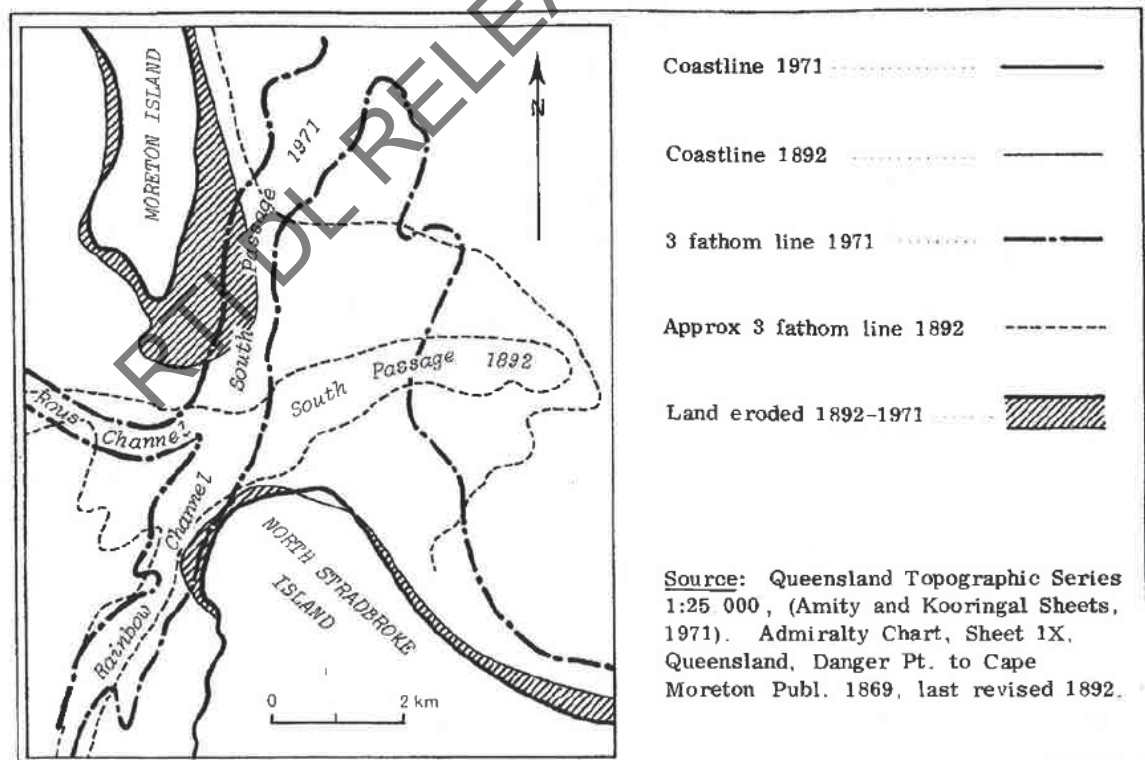


Figure 4-1 Historical Channel Changes in Channels

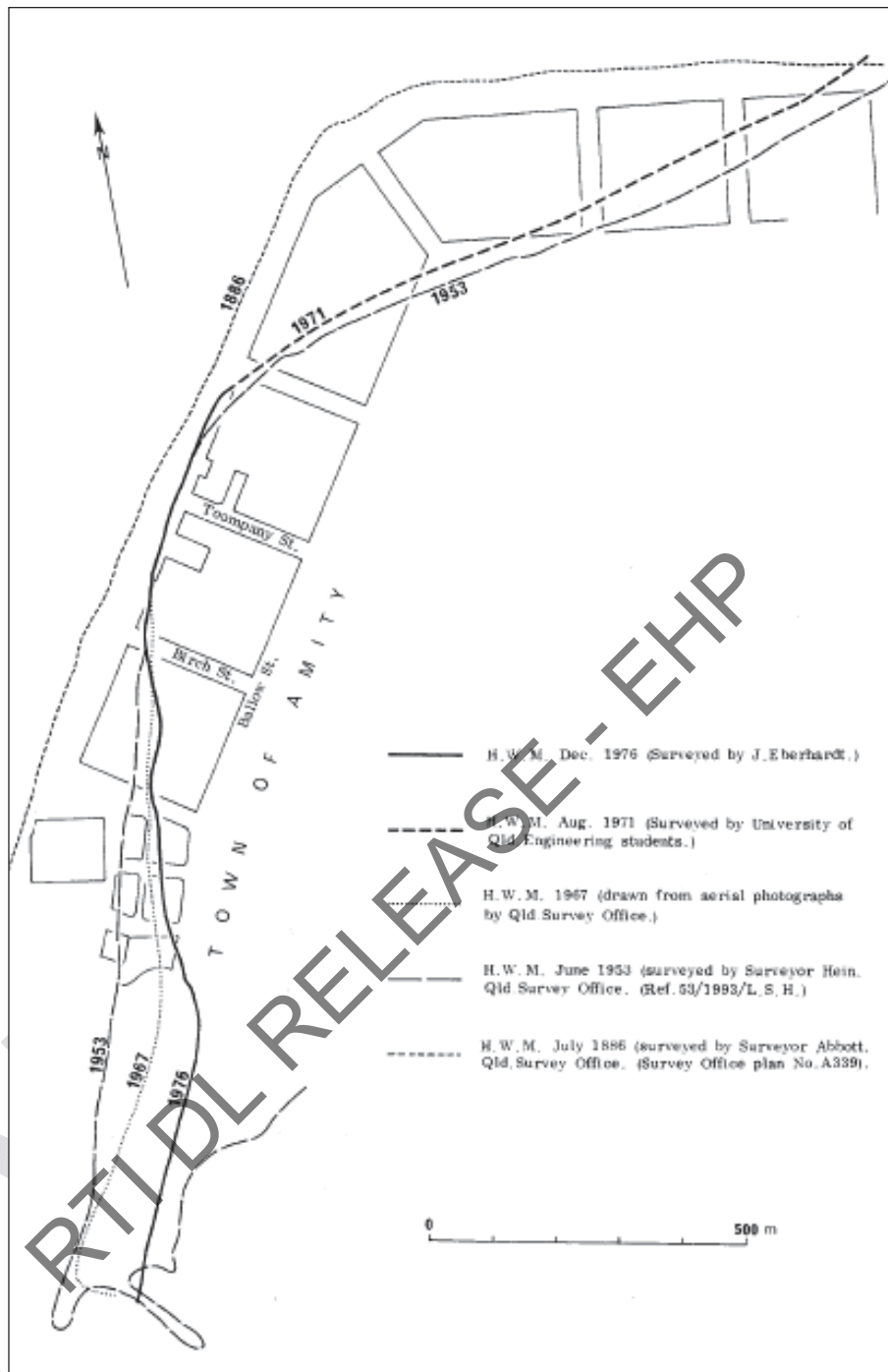


Figure 4-2 Historical Channel Changes near Amity

Another report of note is the Brisbane River and Moreton Bay Wastewater Management Study of 1998 where channel velocities were measured in Rainbow Channel at Amity and Rous Channel in January 1998.

Of note in these studies were the flood and ebb tide velocities with the ebb tide velocity being up to 1.5m/s adjacent to the shore at Amity. Typical plots from the study are shown in Figure 4-3 and Figure 4-4 below. Components from the above reports are included throughout this report when discussing coastal processes.

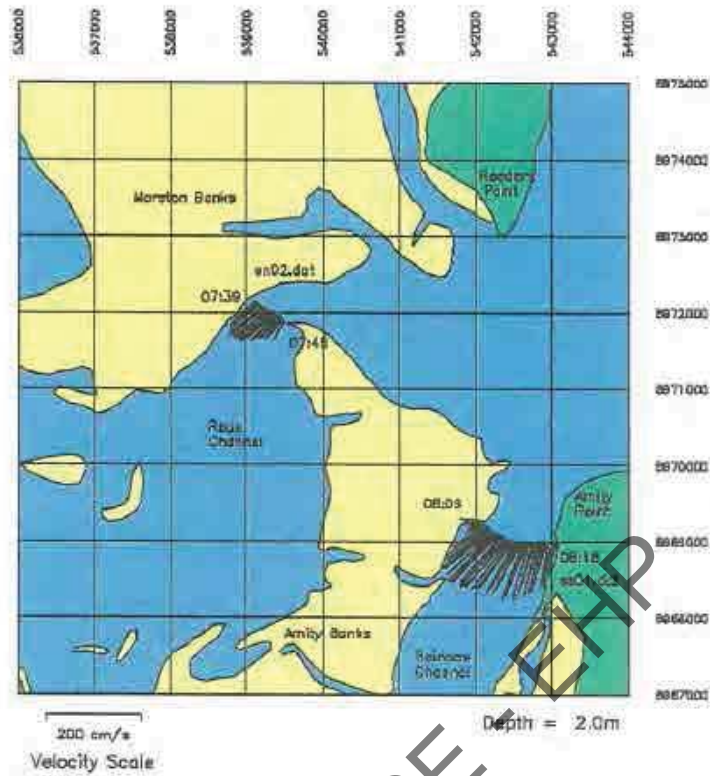


Figure 4-3 Typical Spring Flood Tide Velocities near Amity

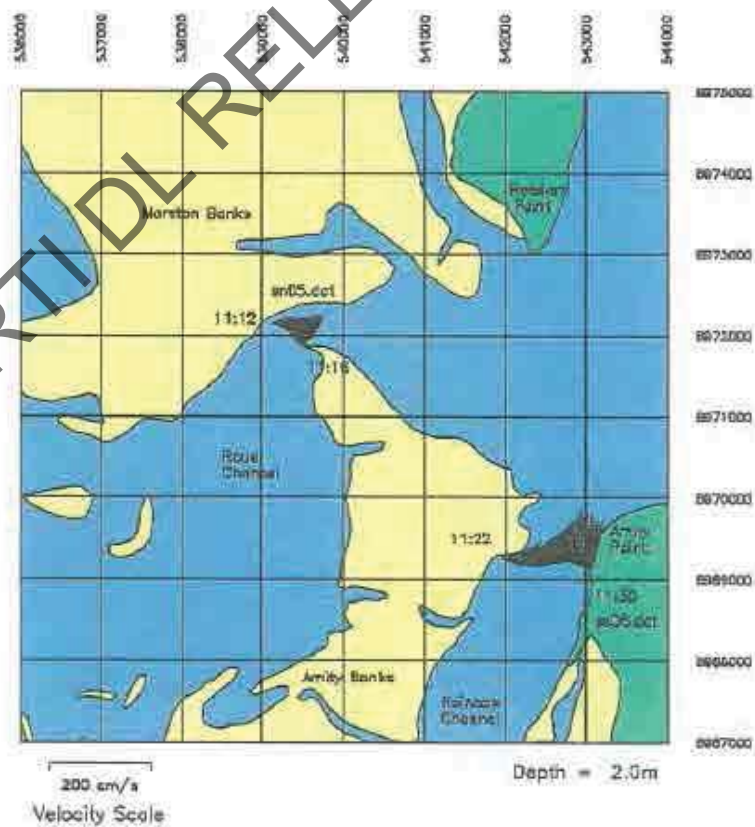


Figure 4-4 Typical Spring Ebb Tide Velocities near Amity

4.3 Coastal and Estuarine Processes

It has been established that the coastline at Amity is heavily influenced by the ongoing meandering of Rainbow Channel, and to a lesser extent the Rous Channel and South Passage, which carry the tidal flow between Moreton Bay and the Pacific Ocean. Also, a large volume of sand has migrated through the entrance and exists as shoals adjacent to and many kilometres to the south and west of Rainbow Channel, Rous Channel and South Passage (refer Figure 4-5). However, these do not provide any protection to the Amity shoreline because of the high velocities in Rainbow Channel which scour the sand out of the channel adjacent to Amity. Similarly ocean swell transports a low volume of sand along Flinders Beach towards Rainbow Channel near Amity Point. A small proportion of this flow progresses along the shoreline of Amity as shoals but does not provide any long term benefit to the shoreline. The following section will look at the individual process contributing to these complex phenomena so that a better understanding of the potential to influence the erosion at Amity is understood.



Figure 4-5 Channels and Shoals near Amity (from Google Maps)

4.3.1 Water Level Variations

Variations in sea level significantly influence coastal behaviour by altering the volume of water entering and leaving Moreton Bay each tide and influencing the level and direction at which waves attack the shoreline. This not only relates to day-to-day tidal influences, but also to storm events that can be experienced along the shoreline. Water levels are likely to be elevated above normal conditions during storm events due the interaction of tide and storm surge.

4.3.1.1 *Astronomical Tide*

The astronomical tide at Amity is semi-diurnal, typically with significant variation in subsequent high and low tides. The ocean tide propagates to the site predominantly via the South Passage, nearby shoals and Rainbow Channel.

The tidal planes at Amity Point relative to Lowest Astronomical Tide (LAT) and Australian Height Datum (AHD) are as listed in Table 4-1 (From the Tide Tables and Boating Safety Guide (MSQ, 2012)).

Table 4-1 Tidal Planes at Amity Point

	Level at Amity Point (For datum shown)	
	mLAT	mAHD
Highest Astronomical Tide	2.24	1.12
Mean High Water Springs	1.78	0.76
Mean High Water Neaps	1.46	0.44
Mean Sea Level	1.09	0.07
Mean Low Water Neaps	0.62	-0.40
Mean Low Water Springs	0.30	-0.72
Lowest Astronomical Tide	0.00	-1.02

4.3.1.2 Storm Tide Levels

The tidal planes are predictions based on the movements of celestial bodies. Local meteorological conditions, which differ from the average, will cause corresponding differences between the predicted and the actual tide. Variations in tidal heights are mainly caused by strong or prolonged winds and by unusually high or low barometric pressure. The increase in sea level resulting from these effects during severe storms and cyclones is called the storm surge. The resulting water level combining the surge with the astronomical tide is referred to as the storm tide.

Within Moreton Bay, a storm surge consists of the following components:-

- Oceanographic processes (including coastal trapped waves);
- Regional wave set-up generated by wave breaking along shoals;
- Inverse barometer (atmospheric pressure);
- Local wind set-up within Moreton Bay; and
- Local wave set-up generated near the shoreline.

Potential storm tide levels for design purposes have been assessed by a review of existing studies including a recent storm tide study for the Redland Shire (Redland and Logan Shires Storm Tide Hazard Study – Cardno LT, 2009). A plot from this study of the land inundated by the 100 year ARI storm tide at Amity is presented in Figure 4-6.



Figure 4-6 Storm Tide Inundation Risk near Amity

4.3.2 Sand Transport Mechanisms

Sand is transported along the western shoreline of North Stradbroke Island by the combined action of currents and waves. Currents generated by the tide flowing in and out of Moreton Bay are the dominant transport mechanism with some assistance from waves both locally generated and as swell from the ocean.

The prevailing waves are locally wind-generated “sea” waves from the westerly directions and as such are of relatively low height and period and limited sand transport capacity compared to tidal currents. The shoals directly north of Amity Point on the eastern side of South Passage will reduce the energy of swell waves penetrating the entrance except in periods of elevated water levels (cyclones and easterly trough lows). However, these swell waves transport sand along Flinders beach providing a small input of sand to South Passage/Rainbow Channel at Amity Point.

The locally generated sea waves are present on a day-to-day basis whereas the swell and storm waves are present irregularly. The wave induced sand re-suspension and currents will interact with tidal currents to provide a complex sand transport regime.

Numerical models of the wave conditions and current conditions at Amity are described in Sections 3.3.4 and 3.3.5 below.

4.3.3 Legislated Erosion Prone Areas

For the Amity area, the DEHP has adopted the CMD shown below in Figure 4-7 which is primarily based on erosion prone areas as defined by the then Beach Protection Authority (BPA) in 1984 (Plan SC3365F). The original Erosion Prone Areas (EPAs) at Amity were defined as a zone measured 145m landward of the mean high water springs line except where approved revetments exist, in which case the zone is 10m landward of the upper edge of the revetment alignment. Further east at Flinders Beach the EPA is defined as 190m. BPA's Erosion Prone Areas width includes allowances for the erosion likely to be experienced by erosion in the event of a major storm or series of storms (short-term erosion), long-term progressive recession if long-term erosion was allowed to occur and shoreline retreat associated with climate change impacts (i.e. mean sea level rise).

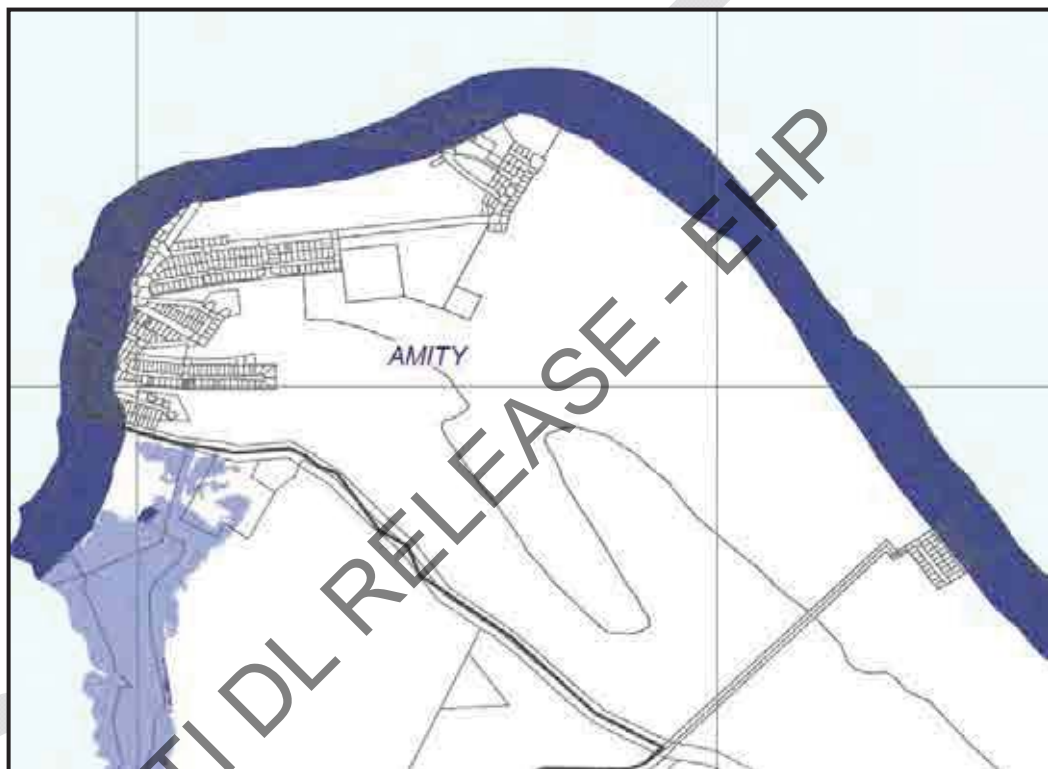


Figure 4-7 Coastal Management District (CMD) near Amity (from DEHP)

4.3.4 Numerical Modelling

To better understand the individual processes contributing to the complex coastal processes driving channel current velocities and sand transport around Amity numerical modelling of waves and tidal currents has been undertaken. This is described in the following sections.

4.3.4.1 Waves

The long term average wind wave climate at Amity Point has been predicted using SWAN, a third-generation wave model developed at Delft University of Technology, Netherlands (Booij, 1999). Wave parameters within the study area were predicted on a grid with a 50m x 50m resolution. The islands and shoals in the vicinity of the study area influence the wave climate at Amity Point. These features significantly reduce the fetch area (that is, the area of the sea surface where the wind can generate

waves). Under normal, prevailing conditions the wave energy reaching the study area from outside Moreton Bay is assumed to be negligible.

The wave assessment is based on the local wind climate obtained from the Bureau of Meteorology (BoM). The wind input data for the wave model was obtained from the BoM weather station at Cape Moreton Lighthouse (site number 040043) recorded between 1996 and 2010. Half-hourly wind recordings are available for this period. The recorded wind magnitude was scaled to 10m above sea level following the Coastal Engineering Manual (US Army Corps., 1996). The wind record was analysed in order to obtain the frequency occurrence of specific wind magnitude and direction scenarios with a total of 137 unique wind scenarios defined. As a conservative approach, each wind scenario was modelled with a water level equivalent to MHWS at Amity Point (0.76m AHD). The influence of currents on the wave height was not considered in the assessment.

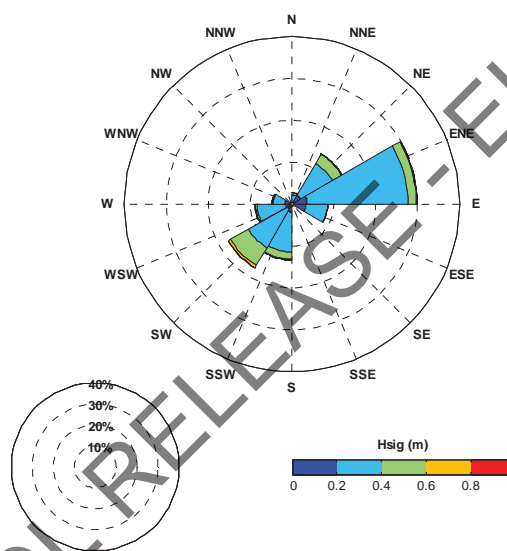


Figure 4-8 Long Term Annual Average Wave Climate Offshore from Amity Point

The wave climate modelling results are summarised as an average annual rose plot in Figure 4-8. The summary is based on results at a location offshore from Amity Point where the water depth is approximately 16m below AHD. Wave height and direction recurrence frequency percentages are presented in Table 4-2.

The wave modelling results indicate the following:

- For approximately 87% of the year the significant wave height is predicted to be less than 0.5m. For these smaller waves, the dominant wave direction is from the east-north-east to easterly sector and will have little impact at Amity.
- The highest percentage of waves with heights above 0.5m is predicted to be from the southwest. These waves generated within Moreton Bay occur less than 1% of the time and will be associated with high wind speeds during episodic storm events. These waves will cause minor erosion on exposed beaches facing west at Amity.

- The model results indicate significant wave energy dissipation across Amity and Moreton Banks. Much of these areas are exposed at low tide and during this time wave breaking occurs offshore with minimal wave energy reaching the Amity Point shoreline.

Table 4-2 Long Term Annual Average Wave Height and Direction Recurrence Frequency (%)

Hs (m)	Wave Direction (Degrees from North)									Total	
	0	30	60	90	120	150	180	210	240		270
0.1 - 0.3	1.9%	8.8%	24.0%	5.1%			9.5%	10.7%	6.9%	2.8%	69.8%
0.3 - 0.5	0.5%	2.5%	2.1%				1.7%	4.9%	0.3%	0.2%	12.2%
0.5 - 0.7	0.0%	0.1%	0.1%				0.2%	0.6%	0.1%	0.0%	1.1%
>0.7		0.0%	0.0%				0.0%	0.0%			0.0%
Total	2.4%	11.4%	26.2%	5.1%	0.0%	0.0%	11.4%	16.2%	7.3%	3.0%	83.2%

Calms (Hs < 0.1m): 16.8%

4.3.4.2 Currents

The tidal currents were assessed using an existing TUFLOW FV model of Moreton Bay with increased resolution in the vicinity of the study area. Figure 4-9 shows a current speed time series at a location offshore from Amity Point and for a typical spring tide. The peak flood current speed is predicted to reach approximately 1.4m/s. A higher peak current speed that exceeds 1.8m/s is predicted during the ebb phase.

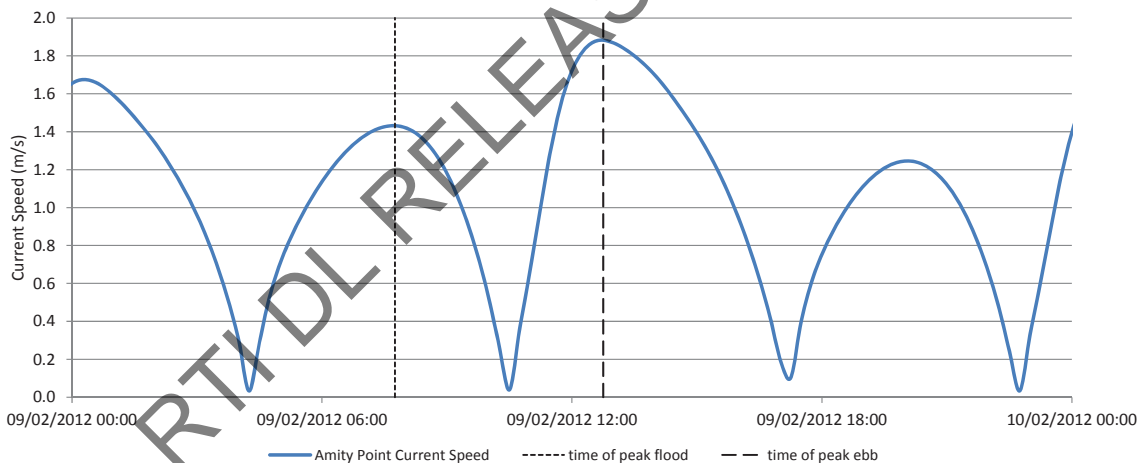


Figure 4-9 Typical Spring Tide Current Speed Time Series at Amity Point

Figure 4-10 and Figure 4-11 provide spatial plots at the time of peak flood and peak ebb current speed (times indicated in Figure 4-9).

Figure 4-10 suggests that during the flood tide phase maximum currents occur opposite Amity Point on the western edge of Rainbow Channel. The flood currents are expected to transport sand in a southern direction and along Rainbow Channel which has led to the formation of shoals to the south of Amity Point.

Figure 4-11 suggests that during the ebb tide phase the current speed progressively increases across Rainbow Channel and reaches a maximum at Amity Point. The distribution of currents also indicates a significant flow from the east which is transporting sand into shoals adjacent to Rainbow Channel resulting in a decrease in the channel width and increased erosive pressure at Amity.

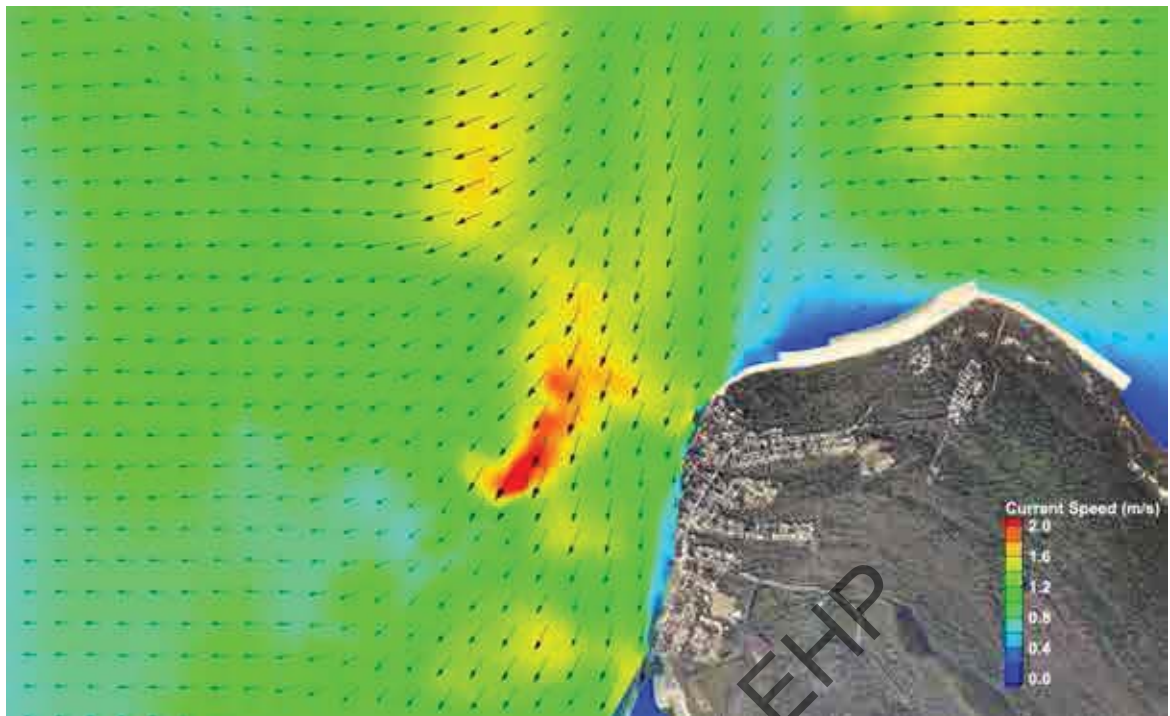


Figure 4-10 Typical Spring Tide Current Speed Contour and Vector Plot – Peak Flood

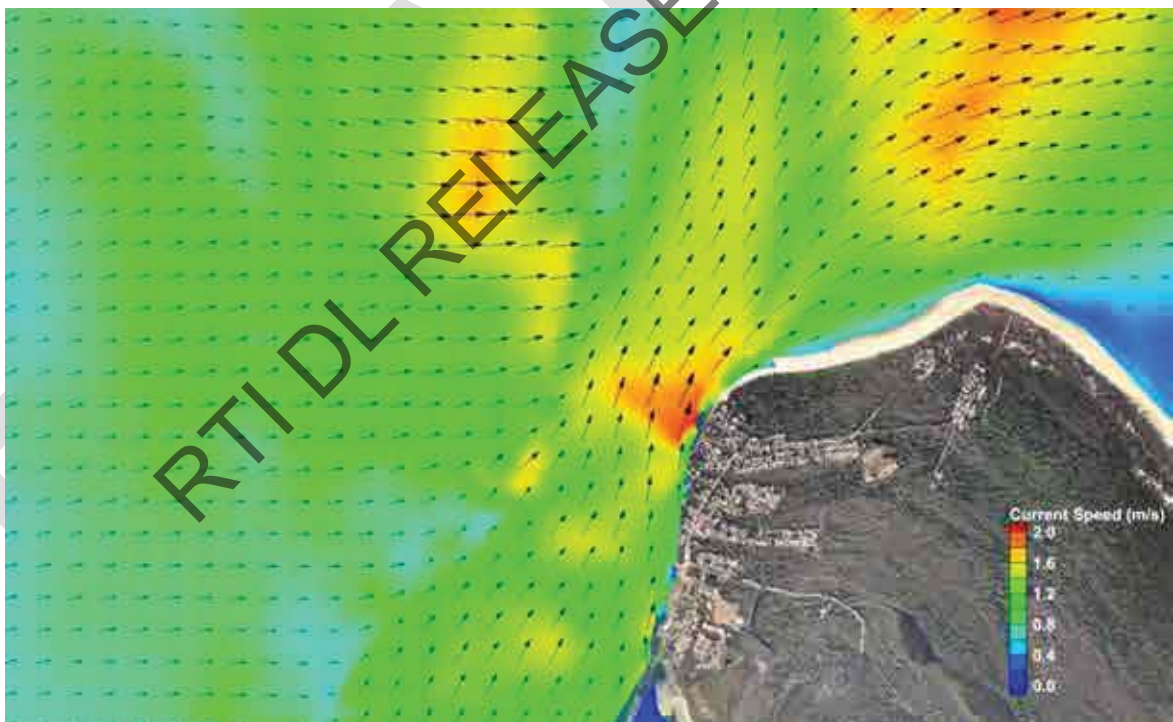


Figure 4-11 Typical Spring Tide Current Speed Contour and Vector Plot – Peak Ebb

4.4 Present and Future Shoreline Erosion

4.4.1 Assessment of Current Erosion

It has long been known that the coastline at Amity is largely influenced by the ongoing meandering of Rainbow Channel, and to a lesser extent the Rous Channel and South Passage, which all carry the

tidal flow between Moreton Bay and the Pacific Ocean. The previous data collection campaigns and numerical modelling undertaken for this study indicate that the ebb tide flow and associated sand transport tends to force the Rainbow Channel current hard against the Amity shoreline from Amity Point to the Amity boat ramp with tidal velocities up to 1.8m/s occurring. It should be noted that velocities above 0.3m/s will initiate sand transport. The aerial photography in Figure 4-12 shows that the channel in front of Amity Township is deepest with a broadening and shallowing of the channel adjacent to the Amity Caravan Park. Historical aerial photography indicates the the channel width at Amity has reduced from over 900m in 1958 to around 750m today. Hydraulically this dictates that either higher velocities or a deeper channel is required to maintain flow volumes.



Figure 4-12 Main Rainbow Channel Location near Amity (Source: DEHP)

On the north east coastline ocean swell is significantly attenuated by the time it reaches the western end of Flinders Beach but still transports sand along Flinders Beach towards Rainbow Channel near Amity Point. A small proportion of this sand is caught in the Rainbow Channel flows and progresses along the shoreline of Amity as shoals but does not provide any long term benefit to the shoreline.

The more significant of the local wind waves approaches the shore from the southwest and can reach a height of 0.7m. These waves will tend to cause limited beach erosion at or near high tide level and

small scarps in the unrevetted sandy areas will occur as sand is moved offshore. In particular this is of concern in the recessed beaches between the groynes in front of the Amity Caravan Park and to the immediate north of the end of the rock revetment at Amity Point.

The Flinders Beach shoreline continues to receive a supply of sand from the east driven by ocean swell. The continuing rotation of the Rainbow Channel is allowing the South Bank area to the east of Amity Point to grow northwards resulting in accretion on Flinders Beach and foreshore stability in recent times. However, this may reverse at any time in the future dependent on channel movements, offshore shoal configurations and the continued supply of sand around Pt Lookout.

4.4.2 Climate Change Impacts

Since 1900, global-average temperatures have increased by about 0.7°C and the global-average sea-level has risen at a rate of 1.7mm/year (Church and White, 2006). Due to anthropogenic greenhouse gas emissions the rates of both temperature increase and Sea Level Rise (SLR) are likely to be presently increasing and are expected to further accelerate in the future (IPCC, 2001; IPCC, 2007).

There are uncertainties as to the actual magnitude and rate of future sea level rise. This has led to various scenarios being adopted by the Intergovernmental Panel on Climate Change (IPCC), based on the range of model results available and dependent upon the amount of future emissions assumed.

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2007) reports that global sea level rise is projected to be 18–59 cm by year 2100 relative to 1990 levels. These projections do not include a contribution from ice flow rates, however if these were to continue to grow linearly with global warming, then the upper ranges of sea level rise would increase by a further 10 to 20 cm (by year 2100 relative to 1990) (IPCC, 2007). There is an acknowledged risk that the contribution of ice sheets to sea level rise this century may be substantially higher than this.

The climate models predict that there will be a not-insignificant regional variation in future sea level rise, predominantly due to spatial variations in the contribution made by ocean thermal expansion. Predictions reported by the CSIRO (2007) indicate that future sea level rise along the eastern Australian coastline may be up to 7 cm greater than the global average due to the greater efficiency in South Pacific Ocean currents (such as the East Australian Current) to disperse thermal energy.

In summary the total mean sea level rise along the eastern Australian coastline is estimated to be in the range 28–86 cm to the year 2100. This will occur gradually at first as we continue to accelerate from the historic rate of 1.7 mm per year and then more rapidly as the year 2100 is approached.

For land use planning purposes, Redland City Council has followed the Queensland Coastal Plan (2011) which has adopted a sea level rise projection of 0.8m by 2100 (relative to the 1990 mean sea level). This value is based on the upper range of projections published by the IPCC (2007) and may be revised following the release of future IPCC report.

Little is known about likely changes to prevailing winds or extreme storm behaviour, although it is likely that cyclones would extend further south under warmer sea temperatures. The effect of changed storm occurrences on storm surges has been investigated by James Cook University as part of the Oceans Hazard Assessment Stage 3 Report (JCU, 2004).

The JCU study assessed the likely impact of a 10% increase in cyclone intensity and frequency including a poleward shift in cyclone track by 1.3 degrees. The predictions by JCU indicate that these potential changes to cyclone intensity, frequency and path may increase the 1% AEP storm tide levels in the study area by 0.30m. This would be in addition to mean sea level rise

Changes in storm conditions and sea level rise may impact on the severity of storm erosion due to more intense or more frequent storms or long term changes in wind directions may cause a re-alignment of the shoreline resulting in accretion at one end of the beach and erosion at the other. A recent report summarising existing theory and high-resolution dynamical climate model output indicates that greenhouse warming will cause the globally averaged intensity of tropical cyclones to increase by 2-11% by 2100. These studies also project decreases in the globally averaged frequency of tropical cyclones by 6-34% (Knutson et al., 2010).

With regard to beach erosion at Amity it is expected that future sea level rise and any change in wind climate (speed and direction) or storminess will exacerbate the existing problem.

4.4.3 Likely Change Due To Climate Change

Both mean sea level rise and intensification of the storm occurrences are likely to increase the erosive pressure on the Amity shoreline and may change the historical accretion on Flinders Beach. With mean sea level rise likely to accelerate due to climate change, the tidal compartment of Moreton Bay will increase substantially resulting in greater flows in Rainbow Channel and increased pressure on the Amity shoreline.

In addition to shoreline erosion due to channel alignment and beach profile alterations, increased sea level rise has also the potential to affect the longshore sediment supply to Flinders Beach as the headland at Pt Lookout may tend to interrupt the longshore sand transport. This may decrease the amount of sand current entering the system from the east resulting in changes both at Flinders Beach and Amity Point.

5 COASTLINE MANAGEMENT CONSIDERATIONS

5.1 Beach Erosion Problem

The Amity shoreline is subject to a threat of erosion associated with:

- The ongoing meandering of Rainbow Channel;
- The depth of the channel and the apparent sudden collapse of banks at Amity;
- The impact of existing mitigation works on shorelines to the south;
- The feasibility of management options in the light of the existing mitigation works;
- Future erosion pressure due to sea level rise; and
- The implications of the existence of the Moreton Bay Marine Park and Myora-Amity Fish Habitat area.

5.1.1 General Considerations

The nature of solution options needed to deal with the coastal erosion problem depends on the nature and level of the threat and consequences if it is left unchecked. The erosion problem to be addressed is jointly one of threat to property and loss of the beach, to varying degrees along the beach. The most appropriate management options may vary along the beaches of the study area.

It must be recognised that some options aimed primarily at protection of property located within the erosion prone area (e.g. rock revetment construction) may be detrimental to the beach. Considerations are set out below in the context of the nature of the erosion threat and the priority objective to be achieved.

5.1.1.1 Undeveloped Areas

In presently undeveloped areas, the key objective is to prevent an erosion problem from occurring in the future. That is, allowing the natural beach processes of erosion and accretion, including any progressive long term trend of shoreline retreat to occur without threat to property.

The most appropriate coastal management strategy is to prevent development within the erosion prone area. The natural processes, including shoreline fluctuations, will thus be allowed to continue unimpeded and the natural amenity and character of the beach will be retained.

This may require a set-back control on any future development. To achieve this, the following coastline management strategies would need to be adopted:

- Ensure appropriate planning controls are in place to prevent infrastructure and residential development occurring in erosion prone areas which are presently undeveloped (preferably over a 100 year planning timeframe);
- Allow natural processes to occur with ongoing monitoring of coastline behaviour; and
- Continue dune management and protection works and controlled access to the shoreline as necessary to maintain the integrity of the dune system and prevent wind erosion.

5.1.1.2 Areas with Existing Development under Erosion Threat

Where present development is not under immediate erosion threat, but may potentially come under threat over time, forward planning is needed to prevent future problems. The degree of natural variability in the coastal processes and the level of uncertainty in predicting future coastline behaviour over long timeframes are such that the need for and nature of any future action will be dependent on factors that are unknown at present such as:

- Realisation of the erosion threat and the likelihood of ongoing recession;
- Effects of potential climate change impacts (e.g. sea level rise); and
- Future opportunities and attitudes towards coastline management and options for dealing with such threat.

The potential future threat from erosion should, however, be recognised in present planning and appropriate strategies put in place that will not compromise future management decisions.

There are two basic strategic approaches for dealing with the problems of erosion threat to the development and loss of the beach, namely:

- Undertaken works to hold or improve the present coastal alignment, thereby preventing future recession of the beach; or
- Allow the shoreline to recede in such a way that the natural processes would maintain the beach characteristics and amenity, but at the expense of existing land and infrastructure.

There are alternative approaches within these two categories, as discussed below.

5.1.2 Channel Relocation Option

The shoreline erosion at Amity Township is related to channel movements with the Rainbow Channel adopting a more north-south alignment over recent times. Consideration at a high level can be given to the option of relocating Rainbow Channel to the west with the possibility of placing the dredged sand in front of Amity Township. Previous studies in other areas have shown that this option involves a large volume of dredging with the likelihood that the system will return to the initial condition over time as this is the natural balance of forces at the time. It is often the case that natural changes can be slow and persistent such as the channel changes over the last 100 years but they can also be dramatic in storm events and cyclones.

It must be noted that experience has shown that the modification of tidal flows in lower estuaries is a major undertaking and would involve substantial costs in studies for approvals, design studies and construction.

Relocating the channel to the west would not be expected to cause any impacts that would not naturally occur to ecological and fisheries values within the Fish Habitat Area and the Marine Park in general. It is expected that relocating the channel to the west would lead to minimal impacts to the natural environment because:

- Fauna communities within the Rainbow Channel are adapted to a dynamic environment;
- No aquatic flora would directly be disturbed during relocation works;

- Turbidity plumes would be limited in extent and duration due to the marine source and hence “cleanliness” of the sand;
- Sediments to be disturbed are unlikely to contain significant contaminant loads; and
- Works would be timed so as to have minimal impact to fish populations and commercial/recreational fisheries. The works would likely be carried out in September/October to prevent impacts to fish spawning and fishing activities.

However, it is recognised that migratory and resident shorebirds may use the area and studies would need to be undertaken to address any impacts to these.

5.1.3 Protection Options

Options to hold the present coastal alignment fall into two sub categories:

- Beach nourishment to rebuild the beach with sand imported from outside the active beach system to make up the deficit, either alone or with other control structures to improve the longevity and give added protection; and
- Structural measures such as rock revetments, groynes to either directly protect the property or trap sand to rebuild the beach in front.

These protection options are discussed in detail below.

5.1.4 Beach Nourishment Options

The primary intent of beach nourishment is to ensure existence of the recreational beach and provide protection to the development by rebuilding the beach with sand imported from outside the active beach system. This effectively replaces the deficit of sand that is causing the erosion. In this way a natural beach and its associated values will be returned and maintained while providing a buffer of sand to accommodate natural beach fluctuations and protect the property and facilities behind.

The quantity of sand required will be dependent on the design philosophy with respect to the level of initial and ongoing protection, the grain size of the material and the use of structures to enhance the longevity of the works.

One of the inherent advantages of beach nourishment is that it maintains the natural character and recreational amenity of the beach while also providing property protection. As such, where the beach is severely depleted, it provides many intangible benefits to the general community, as well as a direct economic benefit to those businesses that rely on tourism and the presence of a usable beach.

However, identification and access to sources of suitable nourishment sand is usually a key issue, as is the ongoing cost to maintain this protection and amenity. Transport of the sand to the beach is most cost-effectively achieved by dredging procedures. Sufficient sand deposits would need to be identified before beach nourishment can be considered a practical shoreline protection option.

5.1.4.1 Sand Recycling

Sand recycling or relocation refers to moving sand within the beach system. Sand recycling differs from beach nourishment as no additional sand is added to system, rather the sand is simply

redistributed to help maintain beach amenity or protect a section of shoreline susceptible to storm erosion.

Sand relocation systems are in place at the Mooloolah River entrance and Noosa Main Beach. The systems trap sand at the downdrift end of the beach and pump it back to the eroded updrift areas. While this system will not prevent erosion it does assist in maintaining the recreational/tourism value of a beach and reduces the threat of erosion for the adjacent development.

5.1.5 Structural Protection Options

Structural options provide protection of property against ongoing erosion either directly through the construction of a seawall or by rebuilding of the beach through the construction of groynes. They are options that could be considered in the event that retreat options are not viable and that conditions are such that beach nourishment is not possible (e.g. high currents) or sand is not available in sufficient quantities. However, there are always some adverse impacts of such an approach where no additional sand is provided, as outlined below.

Such structures would typically be of flexible rubble mound design with rock being sourced and trucked to the site from quarries in the region. While they may be effective in protecting property or providing a localised wider beach, they are generally accompanied by associated costs related to adverse impacts on the adjacent beaches. This cost is typically made up of direct costs associated with lost income from the tourist industry and other intangible costs associated with the natural coastal amenity, beach access, loss of recreational beach area and degradation of ecological values.

5.1.5.1 Seawalls or Rock Revetments

Seawalls or rock revetments are commonly built with the intent of providing terminal protection against shoreline retreat. Seawalls or rock revetments are robust structures constructed along the shoreline which provide a physical barrier separating the erodible material immediately behind the structure from wave and current forces acting on the shoreline. They are typically constructed of loosely placed rock to allow for some flexible movement and need to be designed to withstand severe wave attack.

Where possible, seawalls or rock revetments should be continuous to prevent end effects and/or discontinuities that could threaten the overall integrity of the wall. They also have to be suitably founded for stability against scour at the toe of the structure, particularly on a receding shoreline. This is a major constraint at Amity where the Rainbow Channel is up to 20m deep and tidal currents are high.

While a properly designed and constructed seawalls or rock revetments can protect the landward property from erosion, it effectively isolates the sand located behind the wall from the active beach system and may lead to other adverse consequences.

On a receding shoreline, the seawall or rock revetment becomes progressively further seaward on the beach profile over time. This is the case at Amity where the revetments and protected Township now protrude significantly into Rainbow Channel. Scour of the lower section of the bank below the perched revetment ultimately leads to bank slumping and the need for ongoing maintenance. This slumping can be dramatic with no notice and could cause loss of life.

Seawalls or rock revetments in isolation can thus be effective in protecting the property behind, but at a cost of the loss of the beach in front and exacerbated erosion on the downdrift side.



Figure 5-1 Rock Revetment near Amity Point (Source: NearMap Pty Ltd, 2011)

5.1.5.2 Groyne and Artificial Headlands

Groynes and artificial headlands are impermeable structures constructed at right angles to the shoreline and extend across the beach and the nearshore surf zone. Their function is to trap sand moving along the shoreline under longshore transport processes to build up and stabilise the alignment of the beach on the updrift side. By necessity they require littoral sand transport to be effective and starve the beach of sand supply on the downdrift side causing erosion. The sand trapped on the updrift side provides a buffer of sand to accommodate short term storm erosion. The shoreline alignment will also change providing greater stability and reduced long term erosion immediately updrift of the structure. The extent of accretion and length of shoreline affected is dependent on the length of the structure as well as the characteristics of the longshore transport processes. Generally, the longer the groyne, the more sand it will trap over a longer distance with decreasing influence away from the structure.

Groynes have been used without success to prevent shoreline erosion at Amity since the 1950's (refer Figure 5-2). Over the years the groyne field at Amity has been replaced by rock revetments and the groyne field moved south to protect the caravan park with the result that the area to the south has eroded.



Figure 5-2 Amity Point in 1958 showing Groynes (Source: DEHP)

Often a series of groynes are required to maintain a section of beach as shown in Figure 5-3 and Figure 5-4 at Amity Park. This figure clearly shows that the lack of sand transport has caused the shoreline to retreat even though the groynes are in place. It also indicates that if groynes were to be considered further to the north in front of the Township then a retreat of about 50-60m of urban development would need to accompany the proposal to maintain a consistent channel alignment.

However, there is a physical limit to the length of shoreline affected by each groyne and therefore a number of groynes are needed if protection is required over a long stretch of shoreline. In such a case, there is a balance between the length and spacing of groynes that needs to be optimised as part of a detailed design process.

An artificial headland is a substantial groyne type structure that has a physical width at its head in comparison to a conventional narrow groyne. It is believed that this width alters the mechanisms of sand transport past the end of the structure and may allow a wider/longer beach to be retained on the updrift side for the same protrusion offshore. This could have the benefit of minimising the need for, or maximising the spacing of, additional structures to provide protection for a long stretch of coastline. However, such headland type structures would be larger and more expensive to construct.



Figure 5-3 A Series of Groynes near Amity Park (Source: NearMap Pty Ltd, 2011)



Figure 5-4 Shoreline Recession near Amity Caravan Park (Source: NearMap Pty Ltd, 2011)

Groynes or artificial headlands can thus be used to rebuild a beach and stabilise the shoreline against ongoing recession on the updrift side. However, in the absence of other works such as beach nourishment, this comes at the cost of exacerbated erosion on the downdrift side to where the erosion trend is transferred.

Another significant consideration associated with groynes is their potential visual intrusion to the vista of a long sweeping beach and interruption to direct access along the beach. There are various design options with respect to the style and crest height of the structures that could be considered to minimise such adverse effects.

5.1.6 Retreat Options

The intent of retreat options is to remove the development under threat and allow the shoreline to behave in a natural manner, thus restoring and retaining the natural character and amenity of the shoreline as it recedes. The planned retreat option acknowledges that erosion is an ongoing phenomenon and seeks to address the issue by removal of threatened facilities rather than trying to protect them. This may release a quantity of sand into the active beach from the receding shoreline and provide some additional space for the natural beach movements to occur.

At some locations there may be scope for setting back building lines (retreating within the lot) to give some longer term surety to the assets.

For consideration in this SEMP, there are two different approaches to planned retreat, which essentially relate to the ownership of the land and the responsibility for removal of structures. There are substantial differences between these options in terms of cost, who pays, likelihood of success and ultimate ownership of the beach as discussed below.

5.1.6.1 Retreat under Public Ownership

This option involves the upfront transfer of ownership of all land with an erosion risk to the Crown so that it is under public ownership as recession occurs. Key factors for consideration of planned retreat under public ownership are as follows:

- Transfer of ownership to the Crown should be controlled and implemented via a voluntary acquisition process by government;
- 100% of the affected properties must be obtained in any one beach location for this option to be effective;
- Coastal land values have increased over recent times and could increase further, which may result in high acquisition cost;
- Once implemented, a need will subsequently arise to address the erosion threat of the “new erosion prone area” (the new shoreline after 50 to 100 years will be landward of its current position), and this would entail further significant expenditure to purchase. Unless this land was also purchased, all previous money spent on acquisition could be wasted; and
- At some locations, this retreat option could provide opportunities to establish or enhance public access to and along the beach as land ownership is transferred to the Crown.

5.1.6.2 Retreat under Private Ownership

This option involves the land remaining in private ownership as recession occurs. Key factors for consideration of planned retreat under private ownership are as follows:

- The affected land (currently privately owned) will remain in private ownership when it is lost to erosion and private individuals will be responsible for their own planning in terms of loss of buildings, infrastructure and relocation;
- This option would require regulations to prevent implementation of erosion protection structures by private property owners that comprise coastal principles set out in the State Coastal Plan;
- Ad-hoc loss of private property to erosion typically causes significant adverse visual impacts;

- As the shoreline progressively erodes, the beach could become private property, which could privatise access to and along the beach;
- In terms of equity, it is relevant that the beachfront allotments were historically created by the community (i.e. their representative being the government of the time) for residential use, prior to recognition of the erosion hazard. Accordingly, some responsibility should be shared by the community and the loss of the land for no compensation would be inequitable; and
- It is noted that experience at other coastal Townships where this retreat option has been implemented (e.g. Byron Shire) has been that residents are reluctant to leave their beachfront locations and will utilise legal and practical means to protect their properties.

5.2 Material Sources and Costing Considerations

The implementation of coastal protection works is dependent on suitable material being able to be obtained and placed in a practical, economical and environmentally acceptable manner. General considerations associated with sourcing, cost and applicability of different material types are discussed below, including preliminary estimates in terms of unit costs for capital and ongoing maintenance works provided on the basis of available information.

Cost estimates for the various options are based on these unit rates for comparison purposes. Specific recommended works would be subject to detailed design, impact assessment and tendering processes that may influence the final cost. There will also be on-costs associated with the design, impact assessment and approval processes for the recommended options.

5.2.1 Beach Nourishment

The feasibility of beach nourishment is dependent on the practicality of sand remaining on the beach and cost-effective availability of a suitable source of sand. Sand should be of suitable quality (grain size and colour) and would ideally match the existing beach sand. When nourishment sand is imported from outside the beach system, sufficient quantities of sand should be available for both initial and ongoing nourishment.

Sand for beach nourishments should be able to be obtained and placed without adverse environmental impacts. In environment sensitive areas, this may be challenging. Potential nourishment sand sources have been considered in terms of their location as discussed below.

5.2.1.1 Offshore Marine Sand Sources

Possible offshore sources of sand for nourishment of Amity beaches have not been investigated in detail. Potential sources in nearby areas include Middle Banks south of Caloundra and/or the offshore continental shelf east of South passage.

If viable sand deposits are located in nearby offshore areas, there is still the considerable issue of getting the sand to site. Weather conditions and the delivery distance are likely to ensure the delivered cost is high perhaps as high as \$50-100/m³.

General considerations with respect to use of offshore sand sourcing sites include:

- Identification of sand source(s);

- Suitability of the sand;
- Transport of the sand to the site;
- Rezoning and approval for sand extraction; and
- Potential environmental impacts.

This cost estimate does not consider the associated project costs such as environmental studies, beach profiling, pre and post construction surveys and ongoing monitoring.

5.2.1.2 Land-based Sand Sources

Possible onshore sources of sand for beach nourishment purposes have not been investigated to date but potential locations for consideration are within the lower estuaries of the study area. These areas include the adjacent shoals. Access to sand in these areas is presently constrained by Fish Habitat Areas and other legislation. The use of this sand would require approval from DEHP following detailed assessments that indicate no significant impact on physical or ecological processes.

Considerations with respect to use of such sites include:

- Identification of sand source(s);
- Suitability of the sand;
- Transport of the sand to the site;
- Possible need to purchase the property involved;
- Rezoning and approval for sand extraction;
- Potential environmental impacts including acid sulfate soil considerations; and
- Site rehabilitation.

Transportation of the sand may be an issue, particularly if large quantities are involved. Trucks would cause disruption and damage along access roads. Small suction dredges are only used if the transport distance is less than about 1.0 -1.5 km. Costs of such sources, if viable, are typically around \$10-15/m³ but the transportation costs would raise the price to \$25-30/m³.

Other land sources may include existing quarries. Sand from such sources would be transported to site by conventional equipment and trucks. Costs of such sources, if viable, are typically around \$30-\$50/m³, depending on the distance and method of transport.

5.2.2 Coastal Structures

Coastal protection structures are typically of a flexible mound construction type to allow for some movement and to absorb some of the wave energy. Rock is the dominant material used in such structures and is dependent on suitable local sources being available. Alternative construction materials such as concrete armour units and sand filled geotextile bags could also be considered for such structures but have limitations such as high cost and poor visual amenity of concrete units and short practical life due to decay, failure and vandalism of geotextile units.

Rock armour units would need to be obtained from local hard rock quarries. While the specific extent and limitations of the available resource is not known, it is evident that sufficient rock would be

available but would need to be sourced by truck from quarries at substantial distance and cost. A significant constraint associated with rock armour is the need to truck the material to the site over local roads. For large projects, this can mean frequent truck movements over an extended time frame.

The channel depth at Amity is a significant consideration in the consideration of a rock revetment. A sound design requires a rock revetment to be founded at such a depth that scour cannot undermine the foundation and cause instability. For Amity this will require a foundation depth of at least 18-20m below AHD and a crest height of around 3m above AHD giving a wall height of around 21-23m. For this height the section depth will also need to be significant (approximately 2m) requiring a large volume of rock. Also, to avoid accelerated erosion at the ends of the seawall the structure would need to be in a straight alignment and extend through the entire area at risk.

Groyne structures would not be considered at this site due to the presence of the deep channel with little available sand and high currents.

Indicative cost estimates for the supply and transport to site of rock based on typical experience are as follows:

- Armour rock supply to site: \$40 - \$50/tonne; and
- Quarry run rock supply to site: \$25 - \$35/tonne.

On this basis, typical rock revetment structure costs including design costs and on-site placement are estimated at \$20,000/m with an initial structure length of about 750m. It is expected that this revetment will need to be extended in the future as the Rainbow Channel continues to realign.

For the assessment of the erosion management options, a nominal contingency allowance of 25% has been applied to the above coastal structure cost estimates.

Rock structures by their nature are subject to movement and settlement over time. They are also subject to damage during storm events although they are designed to withstand major wave attack. A typical design criterion is for less than 5% damage during a 50 year storm. As such, ongoing maintenance will be required to ensure the structural stability is not compromised.

This will necessitate maintaining access to the top of any seawall to allow 'top up' works to be carried out. An ongoing maintenance cost of 1% per year is typically adopted for rock structures.

5.2.3 Comparison Summary

A brief comparison of the various alternative means of combating erosion problems is shown in Table 5-1.

In many practical cases, a combination of methods may be more applicable than relying on any single approach. For example, a commonly used combination is beach nourishment and seawall or groyne construction. From the viewpoint of beach protection only, those approaches which do not involve direct interference with the beach system, namely "do nothing" and "planned retreat", are the most desirable. In most cases, however, these options are not viable because of low public acceptance (for lack of long-term property protection) and/or prohibitive long-term costs.

Structural solutions such as rock revetments and groynes are effective in some cases but all cause adverse impacts unless used in conjunction with beach nourishment. Beach nourishment is not possible on a receding shoreline such as Amity.

Table 5-1 Comparison of Erosion Control Measures

Erosion Control Measures	Advantages	Disadvantages	Comments
1.Do Nothing	(a) Shoreline continues to behave naturally (b) No direct expenditure required on protective measures – removal of debris may be required	(a) Property and improvements are lost by continued erosion (b) Limited application in developed areas	This approach is only practical where threatened property is of limited value, and its loss can be accepted
2.Planned Retreat	(a) Effectively solves the beach erosion problem (b) Shoreline continues to behave naturally	(a) Public reaction against relocation is usually strong (b) Compensation payments may be prohibitive	In spite of its apparent drawbacks it may be cheaper in the long run in some areas
3.Seawalls	(a) Well suited to emergency erosion control (b) Provides direct property protection	(a) Only effective if properly designed and constructed (b) Adversely affects the beach; decreased amenity	Should only be used in emergency situations; protects property but not the beach
4.Groynes	(a) May be effective in building beach on updrift side (b) Effective channel training structures	(a) Does not prevent erosion – merely transfers it (b) High level of maintenance	Only useful in conjunction with beach nourishment or if erosion on downdrift side is acceptable; can be used to train tidal channels
5.Beach Nourishment	(a) Increase buffer zone width and therefore increases property protection (b) Enhances natural beach	(a) Sources of nourishment sand not always close to nourishment site (b) Not suitable for receding shoreline	Appears to be the best approach to local erosion problems on beaches
6.Channel Relocation	(a) Removes erosion threat in medium-term	(a) Will need to be repeated High Cost	Will require impact study

5.3 Environmental Considerations

As well as the cost and effectiveness of each management option, environmental impact issues also need to be considered. Applicable legislation (see Section 2) may require detailed environmental assessments (e.g. Environmental Impact Assessments). Other approvals processes and government authorities may require additional studies. Note that a comprehensive list of environmental issues for each site and recommended shoreline erosion management measures cannot be determined until the final details of proposed works are known. However, an indication of likely environmental issues is provided below as a guide.

5.3.1 Beach Nourishment Considerations

Beach nourishment is dependent on being able to source and place suitable sand in an environmentally acceptable, practical and economic manner. Sand can either be obtained from land or marine-based sources with specific considerations as outlined below.

5.3.1.1 Marine-based Sand Extraction

The following is a summary of the potential environmental impacts of marine sand extraction in the study area. This assessment does not include noise, traffic and transport associated impacts, and social and cultural aspects.

Water Quality

The disturbance of the substrata by sand extraction activities generally results in the remobilisation of sediments. The creation of turbid plumes can have indirect effects on aquatic biota and their habitats (e.g. smothering of benthic communities, reduced light in the water column and altered sediment-water dynamics). The extent and magnitude of such increases in turbidity depends on the type of equipment used, the volume and nature of any overflow from the dredge, the material being excavated and the currents present at the excavation site.

The material that would be excavated in marine-based sand supply is typically clean sand from highly active shoal areas with negligible fines content. Hence, turbidity plumes are expected to be of limited spatial and temporal extent.

In areas where there are other materials underlying the clean sands, extraction may result in elevated turbidity, and may potentially release contaminants or elevated oxygen demand into the water column. Wherever possible, disturbance of fine material should be avoided. This requires knowledge of the depths, quantities and characteristics of sand to be dredged.

Ecological Factors

The ecological impacts of sand extraction will vary according to the spatial/temporal scale being considered and the intensity of the disturbance, as well as the resilience of the populations and assemblages to disturbance. Generally, ecological impacts of sand extraction may include:

- Changes to biotope (habitat) structure associated with changes to the morphology of the dredged area. In this regard, shallow banks may be replaced by deep holes/channels;
- Direct effects on seagrass and mangroves due to removal and/or smothering, or indirect effects due to increases in turbidity;
- Disturbance of megafauna and marine turtles. Marine turtles and various cetaceans (dolphins and whales) occur within the study area. Humpback Whales migrate through the broader area. The slow speed of vessels used in sand extraction activities is not anticipated to cause mortality of cetaceans from boat strike. Environment management actions are required to ensure turtles are not harmed by the dredge.
- Changes to the diversity, abundance, and structure of macrobenthic assemblages in and adjacent to the dredged area. Depending on the sand source site, some species of benthic macroinvertebrates may be of commercial importance or may be collected by recreational harvesters for use as bait;

- Changes to the fish assemblages in and adjacent to the dredged area, with potential impacts to commercial and recreational fisheries;
- Changes to the population structure of species;
- Changes to the migration patterns of animals (e.g. crustaceans such as prawns and crabs), with potential impacts to commercial and recreational fisheries;
- Changes to the recruitment dynamics of fish and macrobenthic species. Impacts to recruitment dynamics potentially may have flow-on effects to recreational and commercial fisheries; and
- Mobilisation of contaminants and nutrients following disturbance of sediments.

5.3.1.2 Land-based Sand Extraction

There are a wide range of potential environmental issues associated with land-based extraction, from the natural, social and economic perspectives. Potential impacts to natural environment are considered below.

Groundwater and Surface Water

Sand extraction operations on land have the potential to influence both groundwater and surface water through the release of toxicants and turbidity. The potential for disturbance of acid sulfate soils and the mobilisation of heavy metals is of concern. These contaminants may impact on either the underlying groundwater or surface water adjacent to the operations. Often land based sand extraction results in the creation of an artificial lake at the completion of the works with associated water quality considerations.

Potentially, land-based extraction may also occur in conjunction with development of building sites pursuant to the *Building Act 1975*.

Ecological Impacts

Land-based extraction has the potential to have effects on fauna and flora communities and supporting ecological processes through a variety of means including:

- Loss of species as a direct consequence of habitat removal, reduction in habitat area (e.g. decreased habitat suitability for species requiring large home ranges) and habitat isolation (e.g. reduced opportunity to escape the effect of environmental perturbations and recolonise after such events). This may include impacts to species, habitats or ecological communities listed under the *EPBC Act*, *Native Conservation Act 1992*, *Vegetation Management Act 1999 (VMA)* and *Land Act 1994*;
- Alterations to ecosystem processes due to the development of edge environments, especially areas adjacent to small remnants. This usually involves changes in abiotic and biotic conditions such as microclimate changes (wind, radiation, soil moisture regimes) and increased presence of introduced flora and predatory fauna and disturbance-tolerant aggressive native species);
- Disturbance of acid sulfate soils, which when exposed to air produce sulfuric acid and may release toxic quantities of associated metals into the surrounding environment. Disturbance of other contaminated sediments may also be an issue;

- Negative pressures accompanying development and operations, including disturbance through increased human activity, traffic, noise and light pollution, etc.;
- Potentially, large scale disturbances such as:
 - Reduction of population viability and genetic diversity resulting from disruption of ecological connectivity and population isolation. This results from decreases in, and/or cessation of regular successful dispersal between populations; and
 - Alterations to ground water levels (e.g. rising water table and increased salinity) and surface water hydrology (e.g. changes to runoff patterns and increased erosion). These effects may result in waterway degradation through increased salinity, turbidity and nutrient pollution.

5.3.1.3 Placement of Sand for Beach Nourishment

Change in Benthic Communities and Habitat Loss

The placement of sand on the shoreline has the potential for immediate impacts associated with burial of existing surface sediments and biota (macroinvertebrates and seagrasses). Sandy material that is placed onshore is unlikely to cause significant changes in the composition of surface sediments and habitat type, but would result in the burial of organisms that have colonised the area. Some buried organisms may be able to migrate through appreciable depths of placed material, but other organisms are likely to be lost. Assuming the surface sediments are similar to those prior to nourishment, recolonisation of the placement area would occur within a short time. Opportunistic and/or mobile species would recolonise the nourishment area within a relatively short period of time.

Further Ecological Considerations

Any loss of benthic macroinvertebrates and/or seagrass associated with burial from nourishment would represent a short-term reduction in available food/habitat resources for fish. Most fish species that inhabit the area would be capable to move from the placement area to forage in other parts of the study area.

Further, placement of sand for beach nourishment may temporarily disturb roosting, breeding or feeding activities of wading birds. In the greater South-East Queensland region, the highest number of waders has been recorded in October, during the southern migration when population densities of migratory birds reach an annual peak. The lowest counts are typically recorded during August, a time when mainly resident and juvenile migratory birds (<one year old) stay in the region rather than migrate to breeding grounds in the Northern Hemisphere.

Where nourishment is recommended, studies would need to be conducted to determine species using the impacted areas, and periods when roosting and breeding periods for these species can be avoided.

5.3.2 Considerations of Rocky Shores and Constructed Features

The rocky shores of the study area include limited an existing revetment and groynes. No known studies have been carried out on the flora and fauna assemblages of artificial rocky shores within the study area. This is probably due to the fact that constructed features are not regarded as high priority conservation areas. However, in general, rocky shores are considered important in the maintenance of aquatic ecosystems, and the local richness of habitats and species in the region.

The erosion management options involving constructed features is limited to replacement of existing rock revetments at Amity Township.

Environmental considerations associated with these works are outlined below.

5.3.2.1 Terrestrial Vegetation

Replacement of rock revetments would require access to the foreshore. Where removal of vegetation is required for access to the foreshore, this may result in the loss of habitat and/or habitat change. Rebuilding of rock revetments is likely to require a corridor of about 10 metres along the foreshore. As this work would occur in previously disturbed and cleared areas, this would have a minimal impact.

5.3.2.2 Disturbance of Marine Habitat

Replacement of rock revetments would impact on marine communities. The initial removal of rock required for the replacement of the wall would cause disturbance to benthic communities at the base of the wall and in nearby areas from physical removal and elevated levels of turbidity when works are conducted at high tide. Any areas of seagrass in the broader may also be affected. The effects would depend on the characteristics of the community and the nature of the disturbance. It is likely however, that natural coastal processes such as waves and currents disturb these areas on a regular basis, and as such, are likely to support opportunistic (early successional) communities comprised of species that are capable of rapid recolonisation.

Although benthic communities used as food resources by fish and crustaceans may be removed (temporarily/permanently), it is expected that the high mobility exhibited by most common species in the area may result in fish temporarily moving elsewhere if food is in short supply to forage in other parts of the study region.

5.3.3 Considerations for Channel Relocation

When assessing the ecological impacts/considerations of the impacts of an actual channel relocation at Amity, it needs to be recognised that although relocation/realignment of the channel is artificial, this could occur naturally (i.e. since the 1970's) and lead to similar consequences. However, if these options are considered as an erosion management option, it is likely significant studies will be required.

5.3.3.1 Terrestrial Vegetation

Channel relocation could cause a major impact to terrestrial vegetation communities due to the complete physical removal of an area depending on the alignment. Further assessment of the degree of the impacts would be based on the area of vegetation to be removed and the conservation status of the vegetation. Additionally, fauna species using the terrestrial area as habitat may be disturbed through physical removal of the vegetation. There is likely to be less of an impact in areas where fauna can relocate to alternative habitat nearby.

5.3.3.2 Disturbance of Marine Habitat

Fauna communities in channels are dynamic and are adapted to a mobile environment. They are generally opportunistic and are able to adapt to a wide variety of conditions. Should conditions

become sub-optimal, some particularly mobile species such as fish, crabs and prawns generally relocate from the area of disturbance for a short period and re-establish when conditions become more suitable. The timing of works would need to be considered with respect to fish spawning and fishing activities.

Channel relocation may also result in the loss of marine plants such as mangroves, seagrass and saltmarsh. This may be directly through diversion of waters away from areas supporting these plants, or indirectly through significant changes to the tidal regime.

5.3.4 Considerations for Planned Retreat and the “Do Nothing” Option

Planned retreat or the “do nothing” approach would affect terrestrial communities through the physical loss of vegetation due to erosion. While intact vegetation communities occur in close proximity to the shoreline (approx 150m), residential areas within minimal vegetation would be the initial areas required to retreat. As retreat is a natural process, fauna species using the vegetation as habitat would be likely to move elsewhere as this gradual natural process occurs.

Retreat would also be likely to result in the disturbance of marine fauna species associated with intertidal areas and dune areas. It is probable that these areas would be recolonised by similar fauna as presently occurs. Such a process would occur in association with natural movement of the shoreline. In this regard, impacts resulting from retreat would be short-term and localised.

6 OPTIONS AND RECOMMENDED STRATEGIES FOR AMITY

The existence and nature of shoreline management considerations at Amity can be divided into three basic coastal segments being:

1. Amity Township (existing rock revetments);
2. Amity Park (existing groynes); and
3. Flinders Beach (existing natural beach).

The existing condition for each coastal segment as well as the prevailing coastal processes has been described in Section 3. The dominant coastal processes and the level of risk at the various locations will mean that some management options (Section 4) will be more suitable than others for each coastal segment. In the following sections, potential management options are discussed and the recommended strategy is presented for each coastal segment.

6.1 Amity Township

6.1.1 Introduction

The coastline at Amity is largely influenced by the ongoing meandering of Rainbow Channel, and to a lesser extent the Rous Channel and South Passage, which carry the tidal flow between Moreton Bay and the Pacific Ocean (refer Figure 6-1). The previous data collection campaigns and numerical modelling undertaken for this study indicate that the ebb tide flow and associated sand transport tends to force the Rainbow Channel current hard against the Amity area from Amity Point to the Amity boat ramp with velocities up to 1.8m/s occurring. Aerial photography also shows that the channel in front of Amity Township is deepest with a broadening and shallowing of the channel adjacent to the Amity Caravan Park. Inspection of Historical aerial photography indicates that the channel width at Amity has reduced from over 900m in 1958 to around 750m today. The most recent channel survey in 2002 indicates that the channel adjacent to the Amity shoreline has a depth of about 16m below LWD (about 17m below AHD).

The mitigation practice at Amity involves providing rock free of cost to residents after slips in the shoreline adjacent to Rainbow Channel. The residents then arrange for the rocks to be tipped from the foreshore into the channel until it can support itself on the underlying material.

However, there is an issue of public safety relating to the slippages as the eroded shoreline moves closer to existing buildings.

6.1.2 Shoreline Management Options Considered

Shoreline erosion management strategies for the shoreline between the boat ramp and Ballow Street will need to consider the risks associated with the presence of Rainbow Channel and the effectiveness of current remedial works. Consideration will also be given to the past failure of mitigation strategies including groyne fields and rock revetments since the 1950's and the continued advice from authorities including the then Beach Protection Authority to adopt a policy of retreat.



Title:
Historic Erosion Lines

Figure:
6-1

Rev.:
A

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



0 150 300m
Approx. Scale



Filepath: \\B18390_I_GML Shoreline Erosion Study MJAIDRG\COA_010_Coastline Variation wor

Therefore management options considered for this beach are:

- Do nothing;
- Beach nourishment;
- Channel relocation;
- Structures; and
- Retreat.

General considerations of these management options were presented in Section 4.

Do Nothing

The current mitigation practice at Amity involves providing rock free of cost to residents after slips in the shoreline adjacent to Rainbow Channel. This rock is typically in the upper area of the channel bank which in some cases has a depth of over 20m. This rock provides short term protection against wave attack but is ineffective in mitigating long term recession of lower areas of the bank due to tidal currents.

However, there is an issue of public safety relating to the slippages as the eroded shoreline moves closer to existing buildings. Continuation of the current mitigation strategy cannot be contemplated after consideration of the increasing danger as the shoreline recedes towards exiting occupied buildings.

Beach Nourishment

Beach nourishment alone cannot be supported on a receding shoreline where there is no indication that the processes causing shoreline recession will not diminish or stop in the future. On the contrary predicted sea level rise is likely to exacerbate the problem. Also, the presence on the Moreton Bay Marine Park and Myora-Amity Fish Habitat Area may limit the availability of a cheap marine based sand resource close to the site.

Channel Relocation

The relocation of Rainbow Channel a hundred metres or so would require extensive studies in current movements and sediment morphology over a wide area. This may not be completed with any certainty unless the recent movement of Rainbow Channel was able to be predicted. Also, the impact of predicted sea level rise would add a further level of uncertainty. Therefore, it is considered unlikely that a guaranteed solution could be found.

Also, the presence of Moreton Bay Marine Park and Myora-Amity Fish Habitat Area may require further extensive ecological studies to gain approval.

Based on the above the likelihood of relocation the Rainbow Channel away from Amity is not considered feasible.

Structures

Groyne fields and rock revetments have been used unsuccessfully at Amity for over 60 years. Groyne fields have been abandoned over that time and protection is now provided by ad-hoc perched rock revetments. During that time the pressure of Rainbow Channel erosion has increased and the current depth of the channel adjacent to the shoreline is such that rock revetments need to be significant structures to be successful.

A sound revetment design would require it to be founded at such a depth that scour cannot undermine the foundation and cause instability. For Amity this will require a foundation depth of at least 18-20m below AHD and a crest height of around 3m above AHD giving a wall height of around 21-23m. For this height the section depth will also need to be significant (approximately 2m) requiring a large volume of rock. Also, to avoid accelerated erosion at the ends of the seawall the structure would need to be in a straight alignment and extend through the entire area at risk.

Indicative cost estimates for the supply and transport to site of local rock based on typical experience are as follows:

- Armour rock supply to site: \$40 - \$50/tonne; and
- Quarry run rock supply to site: \$25 - \$35/tonne.

On this basis, typical rock revetment structure costs including design costs and on-site placement are estimated at \$20,000/m with a structure length of about 750m initially (refer Figure 6-2) giving an estimated cost of \$15M. It is expected that this revetment will need to be extended in the future as the Rainbow Channel continues to realign. It is also expected that any future extension of the revetment will interrupt sand supply to the Amity Caravan Park groynes exacerbating the erosion problems there.


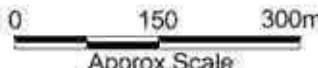



Possible
Rock Wall
Location

RTI DL RELEASED UNDER SECRET

LEGEND

-  Rock Wall
-  Cadastre Boundary

<p>Title: Coastline Mitigation Options</p>	<p>Figure: 6-2</p>	<p>Rev.: A</p>
<p>BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.</p>	<p style="text-align: center;">   Approx. Scale </p>	<p style="text-align: center;">  BMT WBM www.bmtwbm.com.au </p>
<p>Filepath: \\B18390_I_GML Shoreline Erosion Study MJ\DRG\COA_011_Coastline Mitigation Options.wor</p>		

Planned Retreat

One of the major concerns of the current conditions at Amity is the unforeseen and dramatic slumping of sections of the foreshore into Rainbow Channel.

The intent of a retreat option is to remove the public danger and development under threat and allow the shoreline to behave in a natural manner, thus restoring and retaining the natural character and amenity of the shoreline as it recedes. Erosion is acknowledged as an ongoing phenomenon which has not been able to be stopped and planned retreat seeks to address the issue by removal of the danger and threatened facilities rather than trying to protect them. At some locations there may be scope for setting back building lines (retreating within the lot) to give some longer term surety to the development.

At this stage it is considered that the following steps need to be undertaken:

1. Provide adequate warning and education to the public regarding the slumping shoreline danger to reduce the risk of loss of life;
2. Engage a geotechnical consultant to assess the danger zone of the slumping foreshore;
3. Determine within Council how the retreat will be handled (under public or private ownership);
4. Prepare a retreat strategy which includes an assessment of risk (i.e. geotechnical risk, social disruption risk), assessment of options (i.e. triggers to retreat, relocation options), legal advice and policy advice on required changes to RCC planning scheme; and
5. Engage with the affected landholders to facilitate retreat from the danger zone including the removal of buildings and other assets.

It is estimated that a Geotechnical Consultant definition of the danger zoned may cost \$100,000. However, to progress this study a width of 20m has been assumed. Reference to Council plan ES101-1-1 last amended in 2002 and assuming a 20m danger zone it is estimated that about 10 properties will be affected (refer Figure 6-1) . It is expected that the average cost of the assets may be in the order of \$200,000 (buildings only) giving a nominal value for comparison for this option of around \$3M including relevant ancillary costs such as studies, removal and landscaping. The seaward side of this area is zoned UR3 in the Council's Planning Scheme which requires future buildings to be demountable and capable of removal and prevents infrastructure, structures or buildings associated with development extending seaward of the development and existing uses on the site.

6.1.3 Recommended Strategy

It is considered that there are only two options which may possibly be successful at Amity Township.

Firstly, the design and construction of a robust rock revetment at an initial estimated cost of \$15M with the expectation that this will need to be extended in the future as Rainbow Channel continues to realign. However, while technically possible, albeit expensive, there are many implications of constructing a revetment wall such as:

- impact to visual amenity;

- impact to recreational amenity;
- high uncertainty regarding walls effectiveness over medium term;
- legislative constraints in that it disrupts natural coastal processes; and
- Significant State Government advice over decades which recognise protection works are unlikely to be viable long term solution for Amity.

The culmination of these points is that this option cannot be recommended.

Secondly, planned retreat where the danger zone related to unforeseen slumping of the foreshore into Rainbow Channel is assessed by a Geotechnical Consultant and affected buildings and infrastructure is moved out of the nominated danger zone. This option was given a nominal cost of \$3M for comparison with other options in this study. Much of the seaward side of this area (land west of Ballow Street) is zoned UR3 in the Council's Town Planning Scheme 1998 which requires future buildings to be demountable and capable of being removed. All future infrastructure, structures and buildings supporting the development cannot be located further seaward than the existing development of uses on the site.

Of these two options it is recommended that the planned retreat strategy be implemented as it has the highest likelihood of success, lower cost and will leave the foreshore in a natural state. To be successful this strategy will require a well-developed plan which will need to include an assessment of risk (i.e. geotechnical risk, social disruption risk), assessment of options (i.e. triggers to retreat, relocation options), legal advice and policy advice on required changes to RCC planning scheme.

6.2 Amity Caravan Park

6.2.1 Introduction

The existing groyne field appears to have begun in the late 1970's and continued as erosion problems exacerbated. The lack of sand supply to the area, due to the protection measures further north at Amity, have meant that the residual beaches have become recessed at about 50m behind the heads of the groynes. These recessed beaches still suffer minor erosion from wave action from the west in the winter months.

6.2.2 Shoreline Management Options Considered

Shoreline erosion management strategies for the Amity Caravan Park area will need to consider the historical shoreline erosion of the area and the current mitigation provided by the existing groyne field. As discussed in Section 4 the result of a groyne field is to transfer the erosion to the downdrift end of the groyne field. This has been experienced as erosion has occurred in the area to the south resulting in rock revetments being constructed in that area.

The management options considered for the beaches between the groynes are:

- Do nothing;
- Minor beach nourishment; and
- Minor rock revetments.

General considerations of these management options were presented in Section 4.

Do Nothing

Currently the beaches suffer minor erosion in winter months when the dominant westerly wind cause wave action which erodes the beach. The beaches are recessed between the groynes and are not able to recover in the summer months when winds are from the east. Therefore, a slow but persistent recession of the shoreline occurs resulting in loss of high amenity value land and threat to cultural heritage value trees which exist in the caravan park area. If no action is taken then the shoreline will continue to recede resulting in continued loss of an asset.

Beach Nourishment

Beach nourishment as an option will reduce or remove the immediate threat of erosion to public assets as well as providing a means of enhancing the recreational value of the beach. This option would require the importation of beach sand of a grain size and quality similar to the existing beach.

The quantity of nourishment would be subject to detailed design and consideration of the level of protection required, but as a first assessment, the likely minimum quantity of sand required to would be in the order of one (1) cubic metres per metre of beach. The quantity per location would be:

- 75 m³ between the boat ramp and groyne 1;
- 100 m³ between groyne 1 and 2; and
- 160 m³ between groyne 2 and 3.

It must be recognised that the sand placed on the beach will be integrated into the natural processes of erosion from the beach. Ongoing maintenance nourishment of sand will remain necessary to maintain the beach at its current level.

One issue relating to beach nourishment would be the source of sand. Although, it is likely that the quantity of sand required for nourishment can be sourced from the existing quarries, this source is distant and delivery by truck may require a specific management plan to avoid environmental and traffic concerns.

6.2.3 Recommended Strategy

After assessment of the shoreline management options, it is recommended that the beach nourishment option be implemented at this beach. The beach nourishment will provide added protection to the assets and minimise the need for other structural protection measures in the future. It will retain natural processes and provide an improvement to the beach amenity.

The likely minimum quantity of sand required to provide appropriate protection would be in the order of 335 cubic metres.

The cost of implementing the recommended nourishment program will be dependent on the adopted final design, negotiations with suppliers and timing of the works. However, the capital cost that would be involved in the implementation of recommended initial beach nourishment works are estimated to be about \$10,000, based on a beach nourishment requirement of about 335m³ and sand sourced locally and delivered by truck then spread by backhoe.

For ongoing maintenance beach nourishment, there should be a provision of \$1,000 per annum, which may need to increase in the future if mean sea level rise accelerates due to climate change. In addition, there should be some provision for costs associated with dune vegetation and management at this beach.

6.3 Flinders Beach

6.3.1 Introduction

In recent historical time Flinders Beach has slow accretion with some seasonal and storm response changes. The alignment of the beach is strongly related to the position of South Bank which has moved to the north largely in response to the rotation of Rainbow Channel.

6.3.2 Shoreline Management Options Considered

Shoreline erosion management strategies for the communities of Geera Street and Providence Street will need to consider the long term alignment of Flinders Beach. For the last 30 years the beach has shown persistent accretion. However, this cannot be guaranteed into the future.

As this beach has shown persistent accretion in recent time it is appropriate to “do nothing” at this time and monitor the location of the shoreline. If the shoreline begins to recede then consideration will need to be given to the rate of recession and the timeframe for action by Council or the community.

6.3.3 Recommended Strategy

The recommended shoreline erosion management strategy for the communities of Geera Street and Providence Street is to “do nothing” at this time and monitor (refer Section 6.5) the location of the shoreline.

6.4 Summary

After a review of the coastal processes, risks and values at each of section of the shoreline, potential management options for each beach were assessed. A detailed discussion on the possible management options and the recommended strategies for each individual beach is provided above.

A summary of the recommended erosion management strategies for each beach is presented in Table 6-1.

Table 6-1 Recommended Erosion Management Strategy

<i>Beach/Shoreline Location</i>	<i>Recommended Erosion Management Strategy</i>	<i>Cost</i>
Amity Township	Retreat out of assessed danger zone	\$100,000 Geotechnical Consultant definition of danger zone. Town Planning Scheme indicates building relocation by owner.
Amity Caravan Park	Minor beach nourishment	\$10,000 initial + \$1,000 annual maintenance
Flinders Beach Communities	Do nothing and monitor	Routine Council expenditure

6.5 Monitoring and Review Program

There is a need for monitoring in order to:

- Gain an increasing level of basic knowledge of the beach processes and channel movements at the Amity shoreline, particularly the magnitude of shoreline fluctuations and processes that influence change;
- Monitor the response to the proposed works to assess their performance and guide future action; and
- Document long term changes in the shoreline behaviour.

A program of ongoing monitoring as discussed below should be implemented by Council to provide data on channel and beach behaviour and response to works as a basis for future action planning. Some of the beach monitoring work will add to the available knowledge of how the beach behaves can be implemented immediately at low cost, while more comprehensive monitoring surveys require allocation of Council funds.

The proposed investigation and monitoring components are listed below:

Low Cost Beach Monitoring

It is feasible to undertake simple but effective beach monitoring without significant expense. This would be beneficial at Flinders Beach and may involve input from Council staff or volunteer residents, with minimal technical knowledge or expertise. Typically, it could include:

- Volunteer daily observations of waves, currents and sand transport at open beach shorelines using established observation techniques (Patterson and Blair 1983); and
- Regular (say monthly) survey of selected beach cross-sections using simple techniques.

Comprehensive Monitoring Surveys

Comprehensive monitoring needs to be undertaken by appropriately qualified and experienced specialists, with a view to quantifying the processes taking place in the beach system, providing accurate and defensible data for consideration and assessment in any future action. This would

involve detailed channel surveys on an annual basis along the Amity Township area and beach profile surveys at a few nominated locations on Flinders Beach.

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7 PROGRAM OF WORKS AND COST ESTIMATE

After review of the coastal processes, risks and values for the Amity shoreline and an assessment of the available management options, the following actions have been recommended:

1. Immediate education campaign regarding dramatic slumping into Rainbow Channel;
2. Geotechnical Consultant assessment of slump danger zone;
3. Retreat of assets in danger zone;
4. Nourishment of beaches between the groynes at the Amity Caravan Park; and
5. Ongoing monitoring of beach condition and success of management strategies.

Implementation of the recommended Amity Geotechnical Assessment and beach nourishment at the Amity Caravan Park would cost in the order of \$110,000 over 12 months based on present understanding of the required works and sand sourced locally. The actual costs of implementing the works will vary, depending on the adopted scope, circumstances and timing of the works and activities undertaken. Nevertheless, they provide a basis for planning and budgeting purposes.

Any future costs at Amity will be determined by the method in which the retreat option is implemented. Nourishment maintenance at the Amity Caravan Park would require expenditure of about \$1,000 annually. The monitoring survey costs should be able to be incorporated into routine Council surveying costs.

The recommended Implementation plan is summarised in Table 7-1 below. Note that non-action, or works inconsistent with the recommended SEMP strategy, may result in greater risks and increased rehabilitation costs in the longer term.

Table 7-1 Recommended Implementation Plan

<i>Beach/Shoreline Location</i>	<i>Recommended Erosion Management Strategy</i>	<i>Activity and Cost</i>	<i>Timing</i>
Amity Township	Retreat out of assessed danger zone	\$100,000 Geotechnical Consultant definition of danger zone.	Year 1
	Retreat out of assessed danger zone	Remove buildings and infrastructure. Planning Scheme indicates building relocation by owner.	Year 2
Amity Caravan Park	Minor beach nourishment	\$10,000 initial + \$1,000 annual maintenance	Year 1
Flinders Beach Communities	Do nothing and monitor	Routine Council expenditure	Ongoing

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Aerial photography courtesy of **DEHP**

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APPENDIX A: EROSION PRONE AREA CALCULATIONS FOR AMITY POINT

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Erosion Prone Area

Redland City Local Government Area

Erosion Prone Area Definition

1. Erosion prone areas are deemed to exist over all tidal water to the extent of Queensland Coastal Waters and on all land adjacent to tidal water.
2. Erosion prone areas include areas subject to inundation by the highest astronomical tides (HAT) by the year 2100 or at risk from sea erosion.
3. On land adjacent to tidal water the landward boundary of the erosion prone area shall be defined by whichever of the following methods gives the greater erosion prone area width:
 - a. a line measured 40 metres landward of the plan position of the present day HAT level except where approved revetments exist in which case the line is measured 10 metres landward of the upper seaward edge of the revetment, irrespective of the presence of outcropping bedrock;
 - b. a line located by the linear distance shown on Table 1 and measured, unless specified otherwise, inland from:
 - i. the seaward toe of the frontal dune (the seaward toe of the frontal dune is normally approximated by the seaward limit of terrestrial vegetation or, where this cannot be determined, the level of present day HAT); or
 - ii. a straight line drawn across the mouth of a waterway between the alignment of the seaward toe of the frontal dune on either side of the mouth
 - c. the plan position of the level of HAT plus 0.8 m vertical elevation.

Except:

- i. where the linear distance specified in 3b is less than 40 metres, in which case section 3a. does not apply and the erosion prone area width will be the greater of 3b and 3c; or
 - ii. where outcropping bedrock is present and no approved revetments exist, in which case the line is defined as being coincident with the most seaward bedrock outcrop at the plan position of present day HAT plus 0.8m; or
 - iii. in approved canals in which case the line of present day HAT applies, irrespective of the presence of approved revetments or outcropping bedrock.
4. Erosion prone areas defined in accordance with the above are deemed to exist throughout all the local government areas, irrespective of whether the entire local government area is depicted on erosion prone area plans for the area.

Notes to clarify the definition

1. The specific location along the coast to which each erosion prone area linear distance applies (a segment) is shown in Table 1.
2. A map indicating the approximate location along the coast of each linear distance segment is shown on Maps 1 to 3.
3. Each erosion prone area segment is located on the coastline between 2 points defined by latitude and longitude. A projection of each point to the nearest actual coastline and continuing inland perpendicular to the coast defines the erosion prone area segment.
4. "Present day HAT" in the definition is always taken to be the present day level of HAT for the coastline as defined in the Queensland Tide Tables for that year or as defined by empirical methodology at the site.
5. The extent of the erosion prone area where it is defined by "HAT plus 0.8m" is the HAT coastline at the year 2100 and includes sea level rise to that time. It is determined by the area of land inundated to the level HAT of the nearest adjacent open coast or river tide gauge plus 0.8m vertical elevation. Site based HAT is not to be used as present day attenuation of inland HAT level due to flow constraints may not persist to 2100 with coastline response to sea level rise. For further explanation see the Coastal Hazard Guideline.
6. Where noted on Table 1 (and the map) the specified linear distance applies except where a revetment has been constructed and maintained to the approved design in which case the landward boundary of the erosion prone area is at the upper seaward edge of the revetment (A-line).
7. The approximate erosion prone area footprint is shown on Coastal Hazard Area Maps available on the Department of Environment and Resource Management's website at www.derm.qld.gov.au. These footprints are indicative only and the definition in this plan prevails for any inconsistency between the two.
8. This erosion prone area plan may be updated from time to time and a new revision created. Please check with the Department of Environment and Resource Management or the local government that this copy is the current version prior to using the contained information in any way.

Date of Erosion Prone Area Declaration: 26 January 2012 CTS18073/11

Date of Erosion Prone Area Amendment:

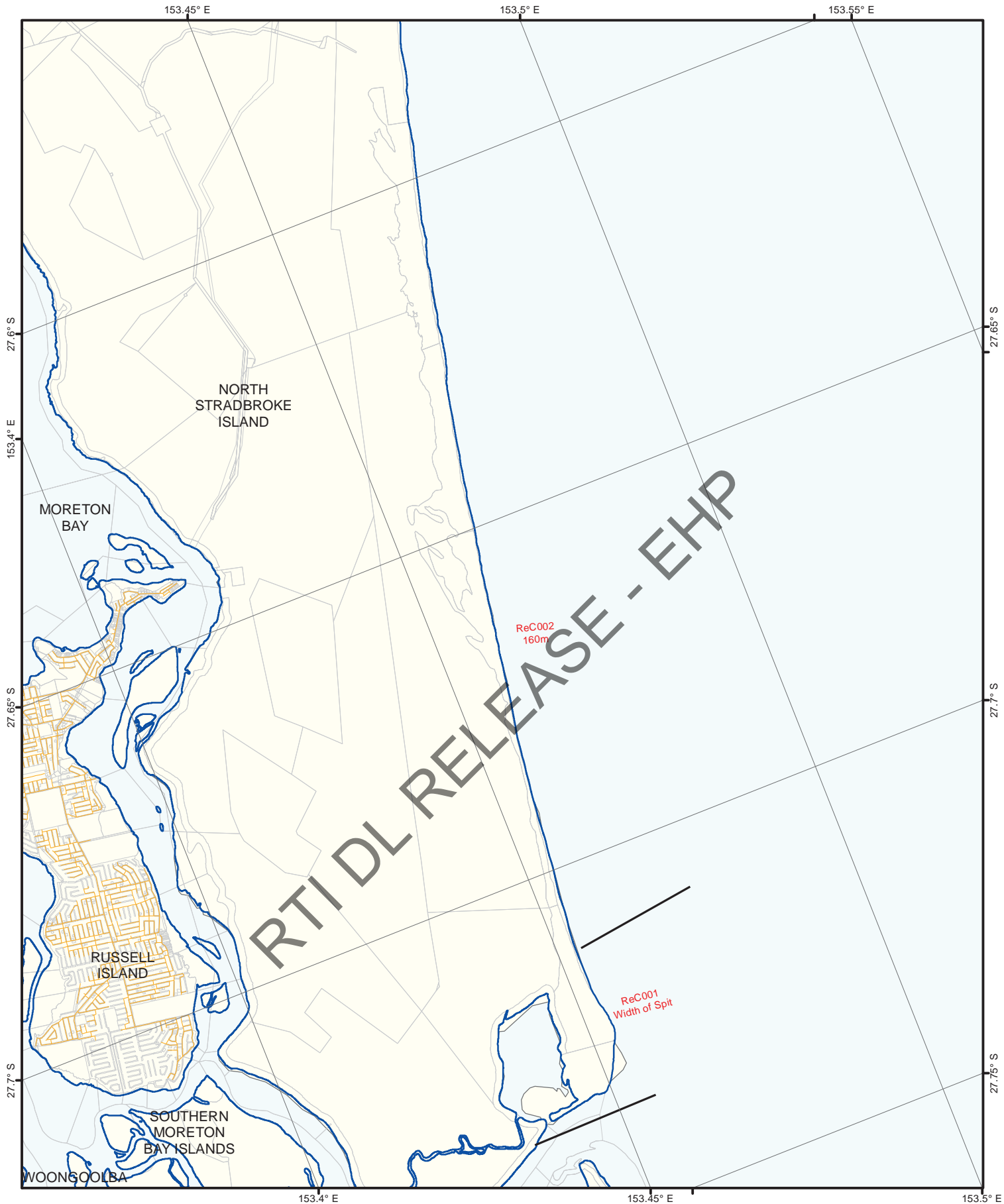
Plan No:

REC 1A

REC1A Table 1: Linear distances for the erosion prone area and the specific location of each segment

Erosion prone area segment number	Segment start latitude (degrees)	Segment start longitude (degrees)	Segment end latitude (degrees)	Segment end longitude (degrees)	Erosion prone area linear distance (Width in metres)
ReC001	-27.72766	153.43672	-27.71197	153.45385	Width of Spit
ReC002	-27.71197	153.45385	-27.43691	153.54241	160m
ReC003	-27.43691	153.54241	-27.43246	153.54420	0m
ReC004	-27.43246	153.54420	-27.42668	153.54339	160m (Possible Bedrock)
ReC005	-27.42668	153.54339	-27.42503	153.54035	0m
ReC006	-27.42503	153.54035	-27.42435	153.53629	160m (Possible Bedrock)
ReC007	-27.42435	153.53629	-27.42488	153.53466	0m
ReC008	-27.42488	153.53466	-27.42121	153.51422	160m
ReC009	-27.42121	153.51422	-27.38868	153.45328	190m
ReC010	-27.38868	153.45328	-27.40581	153.43728	145m

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Erosion Prone Area Linear Distances and their Locations for Redland City Local Government Area

Note:

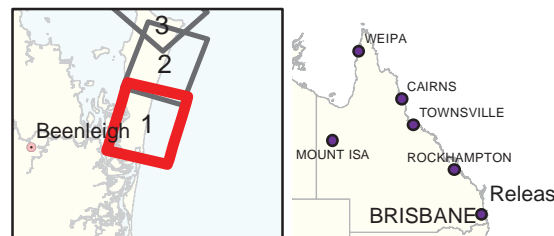
This map is a representation of the erosion prone area segment locations provided in Table 1 and should be used as a guide only.

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REC1A Map 1



- ReC006** Segment number and linear 100m distance for erosion prone area
- EPA segment start/stop location
- ↗ Freeways / highways
- ↘ Streets
- ⋄ Cadastral boundaries
- ⋈ Queensland coast





Erosion Prone Area Linear Distances and their Locations for Redland City Local Government Area

Note:

This map is a representation of the erosion prone area segment locations provided in Table 1 and should be used as a guide only.

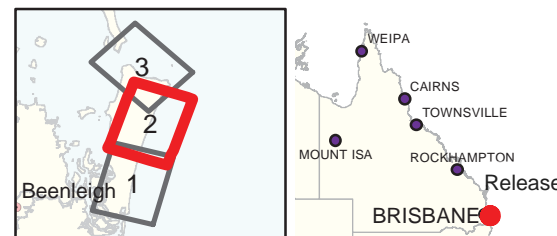
Disclaimer:
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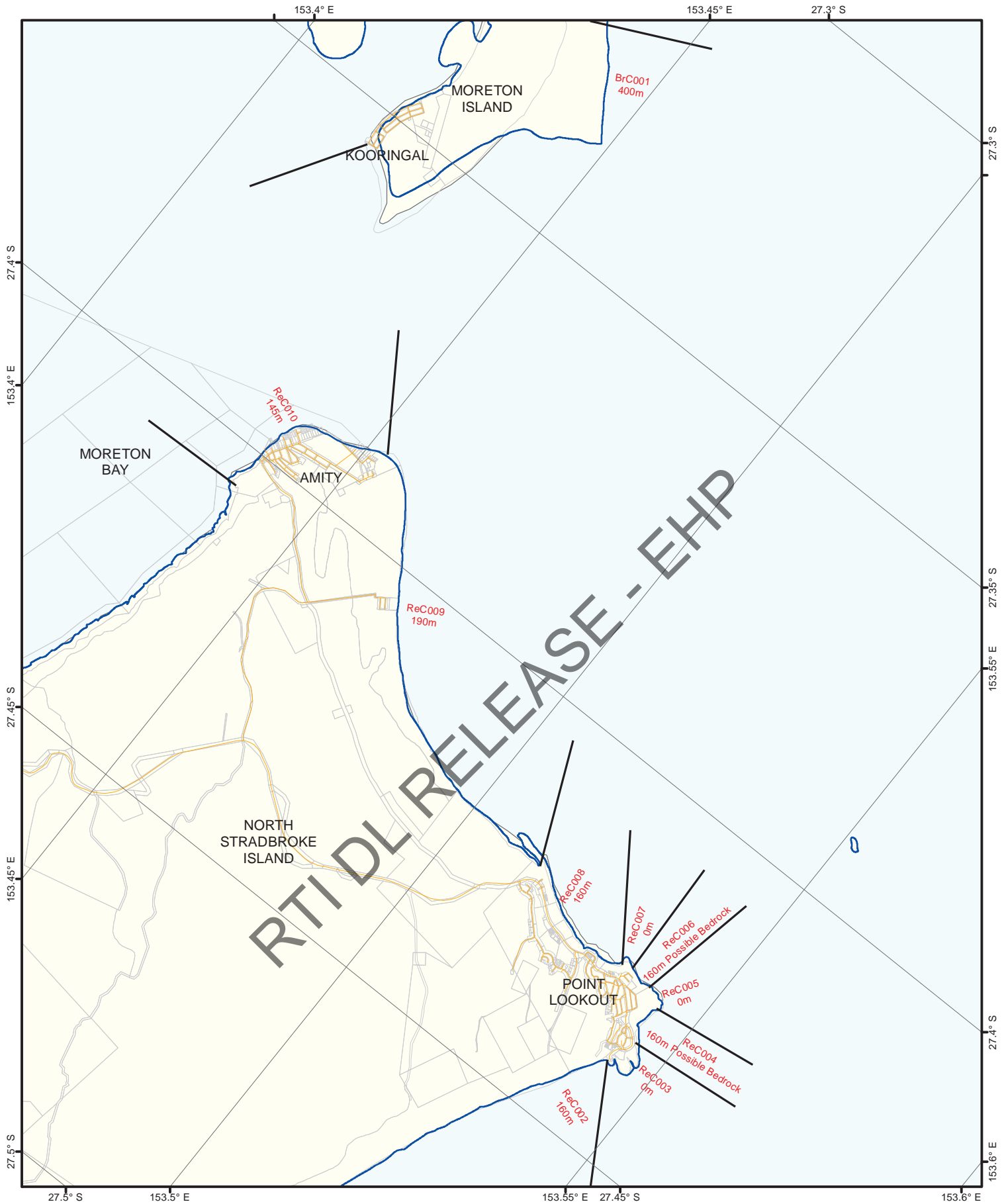
REC1A Map 2

- ReC006** Segment number and linear 100m distance for erosion prone area
- EPA segment start/stop location
- ↗ Freeways / highways
- ↘ Streets
- ⬜ Cadastral boundaries
- 🌊 Queensland coast



Projection: Albers. Datum: GDA 1994.





Erosion Prone Area Linear Distances and their Locations for Redland City Local Government Area

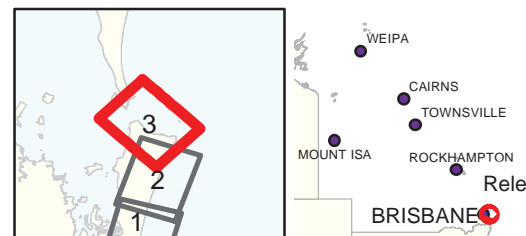
Note:
This map is a representation of the erosion prone area segment locations provided in Table 1 and should be used as a guide only.

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REC1A Map 3 

- ReC006** Segment number and linear 100m distance for erosion prone area
- EPA segment start/stop location
- ↗ Freeways / highways
- ↘ Streets
- ⋄ Cadastral boundaries
- ⋄ Queensland coast

Projection: Albers. Datum: GDA 1994.



APPENDIX B: EPBC ACT PROTECTED MATTERS REPORT FOR SEMP AREA

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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

Report created: 09/05/12 14:04:05

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

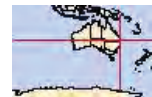
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 1.0Km



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Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see <http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	33
Migratory Species:	55

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage/index.html>

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov>.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	87
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

Place on the RNE:	3
State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	6
Nationally Important Wetlands:	2

Details

Matters of National Environmental Significance

Wetlands of International Significance (RAMSAR)		[Resource Information]
Name		Proximity
Moreton bay		Within Ramsar site
Threatened Species		[Resource Information]
Name	Status	Type of Presence
BIRDS		
Anthochaera phrygia		
Regent Honeyeater [82338]	Endangered	Species or species

Name	Status	Type of Presence
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	habitat may occur within area Species or species habitat may occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris impavida Campbell Albatross [82449]	Vulnerable	Species or species habitat may occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat likely to occur within area
FISH		
Epinephelus daemeli Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat may occur within area
FROGS		
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat known to occur within area
MAMMALS		
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Xeromys myoides Water Mouse, False Water Rat [66]	Vulnerable	Species or species habitat known to occur within area
PLANTS		
Allocauarina defungens Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat may occur within

Name	Status	Type of Presence area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat likely to occur within area
Olearia hygrophila Swamp Daisy, Water Daisy [5631]	Endangered	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat likely to occur within area
Taeniophyllum muelleri Minute Orchid, Ribbon-root Orchid [10771]	Vulnerable	Species or species habitat may occur within area

REPTILES

Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area

SHARKS

Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat may occur within area
Carcharodon carcharias Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Migratory Species

[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
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Migratory Marine Birds

Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
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Name	Threatened	Type of Presence
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Puffinus leucomelas Streaked Shearwater [66541]		Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
Migratory Marine Species		
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Carcharodon carcharias Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Breeding likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding likely to occur within area
Xanthomyza phrygia Regent Honeyeater [430]	Endangered*	Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris tenuirostris Great Knot [862]		Species or species habitat known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]		Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]		Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew [847]		Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Arenaria interpres		
Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba		
Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]		Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]		Species or species habitat known to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis		
Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris		
Great Knot [862]		Species or species habitat known to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat may occur within area
Charadrius bicinctus		
Double-banded Plover [895]		Species or species habitat known to occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]		Species or species habitat known to occur within area
Charadrius mongolus		
Lesser Sand Plover, Mongolian Plover [879]		Species or species habitat known to occur within area
Charadrius ruficapillus		
Red-capped Plover [881]		Species or species habitat known to occur within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur

Name	Threatened	Type of Presence
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		within area Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Heteroscelus incanus Wandering Tattler [59547]		Species or species habitat known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat may occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Breeding likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding likely to occur within area
Numenius madagascariensis Eastern Curlew [847]		Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Species or species

Name	Threatened	Type of Presence
Numenius phaeopus Whimbrel [849]		habitat known to occur within area Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Thalassarche impavida Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
Thinornis rubicollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish		Species or species

Name	Threatened	Type of Presence
[66228]		habitat may occur within area
Hippichthys heptagonus		
Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus		
Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus kelloggi		
Kellogg's Seahorse, Great Seahorse [66723]		Species or species habitat may occur within area
Hippocampus kuda		
Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons		
Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus whitei		
White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat may occur within area
Lissocampus runa		
Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata		
Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Micrognathus andersonii		
Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area
Micrognathus brevirostris		
thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Microphis manadensis		
Manado Pipefish, Manado River Pipefish [66258]		Species or species habitat may occur within area
Solegnathus dunckeri		
Duncker's Pipehorse [66271]		Species or species habitat may occur within area
Solegnathus hardwickii		
Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus spinosissimus		
Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus		
Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paegnius		
Rough-snout Ghost Pipefish [68425]		Species or species habitat may occur within area
Solenostomus paradoxus		
Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora nigra		
Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within

Name	Threatened	Type of Presence
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		area Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area

Mammals

Dugong dugon Dugong [28]		Species or species habitat known to occur within area
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Reptiles

Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Laticauda laticaudata a sea krait [1093]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans

[[Resource Information](#)]

Name	Status	Type of Presence
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Mammals

Name	Status	Type of Presence
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Places on the RNE [\[Resource Information \]](#)

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
North Stradbroke Island (Myora section)	QLD	Interim List
North Stradbroke Island (northern section)	QLD	Interim List
Southern and Eastern Moreton Bay	QLD	Registered

State and Territory Reserves [\[Resource Information \]](#)

Name	State
Moreton Bay	QLD
Myora - Amity Banks	QLD

Invasive Species

[[Resource Information](#)]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit,

Name	Status	Type of Presence
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Frogs

[Bufo marinus](#)

Cane Toad [1772]

Species or species habitat likely to occur within area

Mammals

[Felis catus](#)

Cat, House Cat, Domestic Cat [19]

Species or species habitat likely to occur within area

[Vulpes vulpes](#)

Red Fox, Fox [18]

Species or species habitat likely to occur within area

Plants

[Chrysanthemoides monilifera](#)

Bitou Bush, Boneseed [18983]

Species or species habitat may occur within area

[Lantana camara](#)

Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]

Species or species habitat likely to occur within area

[Salvinia molesta](#)

Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]

Species or species habitat likely to occur within area

Nationally Important Wetlands

[[Resource Information](#)]

Name	State
Moreton Bay	QLD
North Stradbroke Island	QLD

Coordinates

-27.4121 153.443,-27.41203 153.43835,-27.40601 153.43675,-27.4118 153.43348,-27.41127 153.4318,-27.40449 153.43569,-27.40114 153.43729,-27.39573 153.43767,-27.39261 153.43896,-27.39132 153.44254,-27.39086 153.44292,-27.38964 153.44216,-27.38949 153.443,-27.38949 153.44345,-27.39101 153.44444,-27.3904 153.44597,-27.38941 153.44604,-27.38934 153.44719,-27.39025 153.44711,-27.3888 153.44977,-27.38926 153.45031,-27.38911 153.45076,-27.38751 153.45343,-27.38797 153.45594,-27.38957 153.45853,-27.39017 153.45769,-27.38842 153.4545,-27.39063 153.45,-27.39086 153.44726,-27.39292 153.44109,-27.39589 153.43919,-27.40053 153.43851,-27.40175 153.43896,-27.40495 153.43721,-27.4099 153.43942,-27.41096 153.44132,-27.41165 153.44079,-27.41066 153.43911,-27.41142 153.43965,-27.41165 153.43965,-27.41203 153.44292,-27.4121 153.443

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [Department of Environment, Climate Change and Water, New South Wales](#)
- [Department of Sustainability and Environment, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment and Natural Resources, South Australia](#)
- [Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [Environmental and Resource Management, Queensland](#)
- [Department of Environment and Conservation, Western Australia](#)
- [Department of the Environment, Climate Change, Energy and Water](#)
- [Birds Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- [Natural history museums of Australia](#)
- [Museum Victoria](#)
- [Australian Museum](#)
- [SA Museum](#)
- [Queensland Museum](#)
- [Online Zoological Collections of Australian Museums](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Atherton and Canberra](#)
- [University of New England](#)
- [Ocean Biogeographic Information System](#)
- [Australian Government, Department of Defence](#)
- [State Forests of NSW](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us page](#).

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APPENDIX C: WILDLIFE ONLINE DATABASE SEARCH RESULTS FOR SEMP AREA

DRAFT
RTI/DL RELEASE - EHP



Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: Native
Status: All
Records: All
Date: All
Latitude: 27.4001
Longitude: 153.4497
Distance: 2
Email: jeremy.visser@bmtwbm.com.au
Date submitted: Friday 11 May 2012 16:16:11
Date extracted: Friday 11 May 2012 16:20:02

The number of records retrieved = 355

Disclaimer

As the DERM is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Hylidae	<i>Litoria caerulea</i>	common green treefrog		C		1
animals	amphibians	Hylidae	<i>Litoria sp. cf. cooloolensis</i> (North Stradbroke Is population)			NT		2
animals	amphibians	Hylidae	<i>Litoria olongburensis</i>	wallum sedgefrog		V	V	25/13
animals	amphibians	Hylidae	<i>Litoria fallax</i>	eastern sedgefrog		C		6
animals	amphibians	Hylidae	<i>Litoria nasuta</i>	striped rocketfrog		C		8
animals	amphibians	Hylidae	<i>Litoria peronii</i>	emerald spotted treefrog		C		4
animals	amphibians	Hylidae	<i>Litoria gracilentia</i>	graceful treefrog		C		3/2
animals	amphibians	Hylidae	<i>Litoria cooloolensis</i>	Cooloola sedgefrog		NT		21/9
animals	amphibians	Limnodynastidae	<i>Limnodynastes terraereginae</i>	scarlet sided pebblebonk		C		1
animals	amphibians	Limnodynastidae	<i>Limnodynastes peronii</i>	striped marshfrog		C		4
animals	amphibians	Myobatrachidae	<i>Crinia tinnula</i>	wallum froglet		V		5
animals	birds	Acanthizidae	<i>Acanthiza pusilla</i>	brown thornbill		C		2
animals	birds	Acanthizidae	<i>Gerygone albugularis</i>	white-throated gerygone		C		1
animals	birds	Acanthizidae	<i>Gerygone levigaster</i>	mangrove gerygone		C		10
animals	birds	Accipitridae	<i>Haliastur indus</i>	brahminy kite		C		10
animals	birds	Accipitridae	<i>Haliaeetus leucogaster</i>	white-bellied sea-eagle		C		20
animals	birds	Accipitridae	<i>Aquila audax</i>	wedge-tailed eagle		C		2
animals	birds	Accipitridae	<i>Pandion cristatus</i>	eastern osprey		C		8
animals	birds	Accipitridae	<i>Circus approximans</i>	swamp harrier		C		1
animals	birds	Accipitridae	<i>Haliastur sphenurus</i>	whistling kite		C		26
animals	birds	Aegothelidae	<i>Aegotheles cristatus</i>	Australian owl-nightjar		C		1
animals	birds	Alcedinidae	<i>Ceyx azureus</i>	azure kingfisher		C		1
animals	birds	Anatidae	<i>Anas superciliosa</i>	Pacific black duck		C		2
animals	birds	Anatidae	<i>Anas castanea</i>	chestnut teal		C		1
animals	birds	Anatidae	<i>Chenoneitta jubata</i>	Australian wood duck		C		1
animals	birds	Anhingidae	<i>Anhinga novaehollandiae</i>	Australasian darter		C		1
animals	birds	Ardeidae	<i>Ardea pacifica</i>	white-necked heron		C		1
animals	birds	Ardeidae	<i>Egretta garzetta</i>	little egret		C		10
animals	birds	Ardeidae	<i>Butorides striata</i>	striated heron		C		3
animals	birds	Ardeidae	<i>Ixobrychus flavicollis</i>	black bittern		C		1
animals	birds	Ardeidae	<i>Nycticorax caledonicus</i>	Nankeen night-heron		C		1
animals	birds	Ardeidae	<i>Ardea modesta</i>	eastern great egret		C		6
animals	birds	Ardeidae	<i>Egretta novaehollandiae</i>	white-faced heron		C		14
animals	birds	Artamidae	<i>Strepera graculina</i>	piebald currawong		C		1
animals	birds	Artamidae	<i>Cracticus torquatus</i>	grey butcherbird		C		8
animals	birds	Artamidae	<i>Artamus leucorhynchus</i>	white-breasted woodswallow		C		7
animals	birds	Artamidae	<i>Cracticus nigrogularis</i>	piebald butcherbird		C		2
animals	birds	Artamidae	<i>Cracticus tibicen</i>	Australian magpie		C		8
animals	birds	Burhinidae	<i>Esacus magnirostris</i>	beach stone-curlew		V		5
animals	birds	Cacatuidae	<i>Calyptorhynchus lathami lathami</i>	glossy black-cockatoo (eastern)		V		64
animals	birds	Cacatuidae	<i>Calyptorhynchus lathami</i>	glossy black-cockatoo		V		2
animals	birds	Cacatuidae	<i>Eolophus roseicapillus</i>	galah		C		13
animals	birds	Cacatuidae	<i>Cacatua galerita</i>	sulphur-crested cockatoo		C		3
animals	birds	Campephagidae	<i>Coracina lineata</i>	barred cuckoo-shrike		C		1
animals	birds	Campephagidae	<i>Lalage leucomela</i>	varied triller		C		7

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Campephagidae	<i>Coracina papuensis</i>	white-bellied cuckoo-shrike		C		1
animals	birds	Campephagidae	<i>Coracina novaehollandiae</i>	black-faced cuckoo-shrike		C		13
animals	birds	Campephagidae	<i>Coracina tenuirostris</i>	cicadabird		C		1
animals	birds	Charadriidae	<i>Pluvialis squatarola</i>	grey plover		C		6
animals	birds	Charadriidae	<i>Vanellus miles novaehollandiae</i>	masked lapwing (southern subspecies)		C		15
animals	birds	Charadriidae	<i>Charadrius leschenaultii</i>	greater sand plover		C		2
animals	birds	Charadriidae	<i>Charadrius ruficapillus</i>	red-capped plover		C		38
animals	birds	Charadriidae	<i>Vanellus miles miles</i>	masked lapwing (northern subspecies)		C		1
animals	birds	Charadriidae	<i>Charadrius bicinctus</i>	double-banded plover		C		98
animals	birds	Charadriidae	<i>Elsayornis melanops</i>	black-fronted dotterel		C		5
animals	birds	Charadriidae	<i>Charadrius mongolus</i>	lesser sand plover		C		4
animals	birds	Charadriidae	<i>Pluvialis fulva</i>	Pacific golden plover		C		15
animals	birds	Charadriidae	<i>Vanellus miles</i>	masked lapwing		C		2
animals	birds	Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	black-necked stork		NT		1
animals	birds	Cisticolidae	<i>Cisticola exilis</i>	golden-headed cisticola		C		1
animals	birds	Climacteridae	<i>Cormobates leucophaea metastasis</i>	white-throated treecreeper (southern)		C		1
animals	birds	Columbidae	<i>Ptilinopus regina</i>	rose-crowned fruit-dove		C		1
animals	birds	Columbidae	<i>Ocyphaps lophotes</i>	crested pigeon		C		7
animals	birds	Columbidae	<i>Geopelia striata</i>	peaceful dove		C		11
animals	birds	Columbidae	<i>Geopelia humeralis</i>	bar-shouldered dove		C		8
animals	birds	Columbidae	<i>Phaps chalcoptera</i>	common bronzewing		C		1
animals	birds	Coraciidae	<i>Eurystomus orientalis</i>	dollarbird		C		6
animals	birds	Corvidae	<i>Corvus orru</i>	Torresian crow		C		24
animals	birds	Cuculidae	<i>Centropus phasianinus</i>	pheasant coucal		C		9
animals	birds	Cuculidae	<i>Cacomantis flabelliformis</i>	fan-tailed cuckoo		C		1
animals	birds	Cuculidae	<i>Cacomantis variolosus</i>	brush cuckoo		C		3
animals	birds	Cuculidae	<i>Cacomantis pallidus</i>	pallid cuckoo		C		1
animals	birds	Cuculidae	<i>Chalcites minutillus minutillus</i>	little bronze-cuckoo		C		1
animals	birds	Cuculidae	<i>Eudynamis orientalis</i>	eastern koel		C		1
animals	birds	Dicruridae	<i>Dicrurus bracteatus</i>	spangled drongo		C		3
animals	birds	Estrildidae	<i>Neochmia temporalis</i>	red-browed finch		C		3
animals	birds	Estrildidae	<i>Taeniopygia bichenovii</i>	double-barred finch		C		1
animals	birds	Falconidae	<i>Falco peregrinus</i>	peregrine falcon		C		1
animals	birds	Haematopodidae	<i>Haematopus fuliginosus</i>	sooty oystercatcher		NT		4
animals	birds	Haematopodidae	<i>Haematopus longirostris</i>	Australian pied oystercatcher		C		103
animals	birds	Halcyonidae	<i>Todiramphus macleayii</i>	forest kingfisher		C		5
animals	birds	Halcyonidae	<i>Todiramphus sanctus</i>	sacred kingfisher		C		7
animals	birds	Halcyonidae	<i>Todiramphus chloris</i>	collared kingfisher		C		5
animals	birds	Halcyonidae	<i>Dacelo novaeguineae</i>	laughing kookaburra		C		13
animals	birds	Hirundinidae	<i>Hirundo neoxena</i>	welcome swallow		C		23
animals	birds	Hirundinidae	<i>Petrochelidon nigricans</i>	tree martin		C		11
animals	birds	Laridae	<i>Thalasseus bengalensis</i>	lesser crested tern		C		10
animals	birds	Laridae	<i>Chroicocephalus novaehollandiae</i>	silver gull		C		30
animals	birds	Laridae	<i>Gelocheidon nilotica</i>	gull-billed tern		C		18
animals	birds	Laridae	<i>Onychoprion fuscata</i>	sooty tern		C		1
animals	birds	Laridae	<i>Sternula albibrons</i>	little tern		E		11

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animals	birds	Laridae	<i>Hydroprogne caspia</i>	Caspian tern		C		82
animals	birds	Laridae	<i>Thalasseus bergii</i>	crested tern		C		54
animals	birds	Laridae	<i>Chlidonias leucopterus</i>	white-winged black tern		C		1
animals	birds	Laridae	<i>Anous minutus</i>	black noddy		C		1
animals	birds	Laridae	<i>Sterna hirundo</i>	common tern		C		5
animals	birds	Meliphagidae	<i>Caligavis chrysops</i>	yellow-faced honeyeater		C		1
animals	birds	Meliphagidae	<i>Phylidonyris niger</i>	white-cheeked honeyeater		C		13
animals	birds	Meliphagidae	<i>Lichmera indistincta</i>	brown honeyeater		C		22
animals	birds	Meliphagidae	<i>Philemon corniculatus</i>	noisy friarbird		C		22
animals	birds	Meliphagidae	<i>Myzomela sanguinolenta</i>	scarlet honeyeater		C		11
animals	birds	Meliphagidae	<i>Philemon citreogularis</i>	little friarbird		C		7
animals	birds	Meliphagidae	<i>Anthochaera chrysoptera</i>	little wattiebird		C		10
animals	birds	Meliphagidae	<i>Gavicalis fasciogularis</i>	mangrove honeyeater		C		15
animals	birds	Meliphagidae	<i>Melithreptus albogularis</i>	white-throated honeyeater		C		6
animals	birds	Meropidae	<i>Merops ornatus</i>	rainbow bee-eater		C		9
animals	birds	Monarchidae	<i>Grallina cyanoleuca</i>	maggie-lark		C		13
animals	birds	Monarchidae	<i>Myiagra rubecula</i>	leaden flycatcher		C		3
animals	birds	Monarchidae	<i>Myiagra inquieta</i>	restless flycatcher		C		1
animals	birds	Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian pipit		C		3
animals	birds	Nectariniidae	<i>Dicaeum hirundinaceum</i>	mistletoebird		C		9
animals	birds	Oriolidae	<i>Sphecothebes vieilloti</i>	Australasian figbird		C		8
animals	birds	Oriolidae	<i>Oriolus sagittatus</i>	olive-backed oriole		C		4
animals	birds	Pachycephalidae	<i>Colluricincla harmonica</i>	grey shrike-thrush		C		4
animals	birds	Pachycephalidae	<i>Colluricincla megarhyncha</i>	little shrike-thrush		C		3
animals	birds	Pachycephalidae	<i>Pachycephala rufiventris</i>	rufous whistler		C		6
animals	birds	Pachycephalidae	<i>Pachycephala pectoralis</i>	golden whistler		C		6
animals	birds	Pardalotidae	<i>Pardalotus striatus</i>	striated pardalote		C		3
animals	birds	Pardalotidae	<i>Pardalotus punctatus</i>	spotted pardalote		C		1
animals	birds	Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian pelican		C		26
animals	birds	Petroicidae	<i>Petroica rosea</i>	rose robin		C		1
animals	birds	Phalacrocoracidae	<i>Phalacrocorax carbo</i>	great cormorant		C		1
animals	birds	Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>	little black cormorant		C		18
animals	birds	Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	little pied cormorant		C		13
animals	birds	Phalacrocoracidae	<i>Phalacrocorax varius</i>	pied cormorant		C		16
animals	birds	Podargidae	<i>Podargus strigoides</i>	tawny frogmouth		C		4
animals	birds	Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian grebe		C		2
animals	birds	Procellariidae	<i>Ardenna tenuirostris</i>	short-tailed shearwater		C		1
animals	birds	Psittacidae	<i>Trichoglossus chlorolepidotus</i>	scaly-breasted lorikeet		C		6
animals	birds	Psittacidae	<i>Trichoglossus haematodus moluccanus</i>	rainbow lorikeet		C		12
animals	birds	Rallidae	<i>Amauornis moluccana</i>	pale-vented bush-hen		C		4
animals	birds	Rallidae	<i>Porphyrio porphyrio</i>	purple swamphen		C		1
animals	birds	Recurvirostridae	<i>Himantopus himantopus</i>	black-winged stilt		C		2
animals	birds	Rhipiduridae	<i>Rhipidura leucophrys</i>	willie wagtail		C		16
animals	birds	Rhipiduridae	<i>Rhipidura rufifrons</i>	rufous fantail		C		2
animals	birds	Rhipiduridae	<i>Rhipidura albiscapa</i>	grey fantail		C		9
animals	birds	Scolopacidae	<i>Limosa limosa</i>	black-tailed godwit		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Scolopacidae	<i>Calidris alba</i>	sanderling		C		8
animals	birds	Scolopacidae	<i>Calidris canutus</i>	red knot		C		7
animals	birds	Scolopacidae	<i>Limosa lapponica</i>	bar-tailed godwit		C		448
animals	birds	Scolopacidae	<i>Numenius minutus</i>	little curlew		C		1
animals	birds	Scolopacidae	<i>Tringa nebularia</i>	common greenshank		C		26
animals	birds	Scolopacidae	<i>Numenius phaeopus</i>	whimbrel		C		66
animals	birds	Scolopacidae	<i>Actitis hypoleucos</i>	common sandpiper		C		1
animals	birds	Scolopacidae	<i>Arenaria interpres</i>	ruddy turnstone		C		12
animals	birds	Scolopacidae	<i>Calidris acuminata</i>	sharp-tailed sandpiper		C		3
animals	birds	Scolopacidae	<i>Calidris ferruginea</i>	curlew sandpiper		C		34
animals	birds	Scolopacidae	<i>Calidris ruficollis</i>	red-necked stint		C		22
animals	birds	Scolopacidae	<i>Calidris tenuirostris</i>	great knot		C		11
animals	birds	Scolopacidae	<i>Numenius madagascariensis</i>	eastern curlew		NT		108
animals	birds	Scolopacidae	<i>Tringa brevipes</i>	grey-tailed tattler		C		185
animals	birds	Spheniscidae	<i>Eudyptula minor</i>	little penguin		C		1
animals	birds	Strigidae	<i>Ninox boobook</i>	southern boobook		C		4
animals	birds	Sulidae	<i>Morus serrator</i>	Australasian gannet		C		7/1
animals	birds	Threskiornithidae	<i>Threskiornis molucca</i>	Australian white ibis		C		16
animals	birds	Threskiornithidae	<i>Platalea regia</i>	royal spoonbill		C		9
animals	birds	Timaliidae	<i>Zosterops lateralis</i>	silveryeye		C		9
animals	bony fish	Eleotridae	<i>Hypseleotris klunzingeri</i>	western carp gudgeon				1
animals	bony fish	Eleotridae	<i>Ophiocara porocephala</i>	spangled gudgeon				1
animals	bony fish	Mugilidae	<i>Mugil cephalus</i>	sea mullet				1
animals	bony fish	Sparidae	<i>Acanthopagrus australis</i>	yellowfin bream				1
animals	insects	Hesperiidae	<i>Hesperilla donnysa icaria</i>	varied sedge-skipper				1
animals	insects	Lycaenidae	<i>Nesolycaena albosericea</i>	satin opal				1
animals	insects	Lycaenidae	<i>Candalides erinus erinus</i>	small dusky-blue				1
animals	insects	Lycaenidae	<i>Candalides hyacinthina hyacinthina</i>	varied dusky-blue (southern subspecies)				1
animals	insects	Lycaenidae	<i>Candalides acasta</i>	blotched dusky-blue				1
animals	insects	Lycaenidae	<i>Neolucia agricola agricola</i>	fringed heath-blue				1
animals	insects	Nymphalidae	<i>Hypocysta adiante adiante</i>	orange ringlet				1
animals	mammals	Delphinidae	<i>Grampus griseus</i>	Risso's dolphin		C		1/1
animals	mammals	Delphinidae	<i>Sousa chinensis</i>	Indo-Pacific humpback dolphin		NT		7
animals	mammals	Delphinidae	<i>Tursiops aduncus</i>	Indo-Pacific bottlenose dolphin		C		2
animals	mammals	Delphinidae	<i>Stenella longirostris</i>	spinner dolphin		C		1
animals	mammals	Dugongidae	<i>Dugong dugon</i>	dugong		V		5
animals	mammals	Macropodidae	<i>Macropus giganteus</i>	eastern grey kangaroo		C		3
animals	mammals	Macropodidae	<i>Wallabia bicolor</i>	swamp wallaby		C		8/1
animals	mammals	Muridae	<i>Xeromys myoides</i>	water mouse		V	V	5
animals	mammals	Peramelidae	<i>Isoodon macrourus</i>	northern brown bandicoot		C		1
animals	mammals	Petauridae	<i>Petaurus norfolcensis</i>	squirrel glider		C		3
animals	mammals	Petauridae	<i>Petaurus sp.</i>					2
animals	mammals	Phalangeridae	<i>Trichosurus vulpecula</i>	common brushtail possum		C		2
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala		C	V	2
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus (southeast Queensland bioregion)</i>	koala (southeast Queensland bioregion)		V	V	16

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	mammals	Pteropodidae	<i>Pteropus scapulatus</i>	little red flying-fox			C	1
animals	mammals	Pteropodidae	<i>Pteropus alecto</i>	black flying-fox			C	1
animals	mammals	Pteropodidae	<i>Pteropus poliocephalus</i>	grey-headed flying-fox			C	V
animals	mammals	Tachyglossidae	<i>Tachyglossus aculeatus</i>	short-beaked echidna			C	1
animals	reptiles	Boidae	<i>Morelia spilota</i>	carpet python			C	2
animals	reptiles	Cheloniidae	<i>Eretmochelys imbricata</i>	hawksbill turtle			V	V
animals	reptiles	Diplodactylidae	<i>Amolosa lesueurii</i>	Lesueur's velvet gecko			C	1
animals	reptiles	Elapidae	<i>Demansia psammophis</i>	yellow-faced whip snake			C	1
animals	reptiles	Elapidae	<i>Cryptophis nigrescens</i>	eastern small-eyed snake			C	1
animals	reptiles	Scincidae	<i>Bellatorias frerei</i>	major skink			C	1
animals	reptiles	Varanidae	<i>Varanus gouldii</i>	sand monitor			C	1
animals	uncertain	Indeterminate	<i>Indeterminate</i>	Unknown or Code Pending			C	2
fungi	sac fungi	Cladoniaceae	<i>Cladonia rigida</i> var. <i>rigida</i>				C	1/1
fungi	sac fungi	Collemataceae	<i>Collema rugosum</i>				C	1/1
fungi	sac fungi	Collemataceae	<i>Physma</i>				C	1/1
fungi	sac fungi	Collemataceae	<i>Collema glaucophthalmum</i>				C	2/2
fungi	sac fungi	Lecanoraceae	<i>Lecanora austrotropica</i>				C	1/1
fungi	sac fungi	Lecanoraceae	<i>Lecanora helva</i>				C	1/1
fungi	sac fungi	Lecanoraceae	<i>Lecanora</i>				C	1/1
fungi	sac fungi	Lecanoraceae	<i>Tephromela atra</i>				C	2/2
fungi	sac fungi	Lecideaceae	<i>Lecidea russula</i>				C	1/1
fungi	sac fungi	Melaspileaceae	<i>Melaspilea</i>				C	1/1
fungi	sac fungi	Pannariaceae	<i>Pannaria lurida</i>				C	1/1
fungi	sac fungi	Parmeliaceae	<i>Hypotrachyna immaculata</i>				C	1/1
fungi	sac fungi	Parmeliaceae	<i>Parmotrema reticulatum</i>				C	3/3
fungi	sac fungi	Parmeliaceae	<i>Parmotrema robustum</i>				C	2/2
fungi	sac fungi	Parmeliaceae	<i>Relicina sydneyensis</i>				C	1/1
fungi	sac fungi	Parmeliaceae	<i>Parmotrema tinctorum</i>				C	1/1
fungi	sac fungi	Parmeliaceae	<i>Bulbothrix goebelii</i>				C	1/1
fungi	sac fungi	Parmeliaceae	<i>Parmotrema crinitum</i>				C	4/4
fungi	sac fungi	Parmeliaceae	<i>Bulbothrix queenslandica</i>				C	1/1
fungi	sac fungi	Parmeliaceae	<i>Austroparmelia conlabrosa</i>				C	1/1
fungi	sac fungi	Parmeliaceae	<i>Flavoparmelia euplecta</i>				C	1/1
fungi	sac fungi	Pertusariaceae	<i>Ochrolechia subpallidescens</i>				C	1/1
fungi	sac fungi	Pertusariaceae	<i>Pertusaria thiospoda</i>				C	1/1
fungi	sac fungi	Pertusariaceae	<i>Pertusaria bispora</i>				C	2/2
fungi	sac fungi	Pertusariaceae	<i>Ochrolechia</i>				C	2/2
fungi	sac fungi	Pertusariaceae	<i>Pertusaria</i>				C	4/4
fungi	sac fungi	Physciaceae	<i>Buellia bahiana</i>				C	1/1
fungi	sac fungi	Physciaceae	<i>Heterodermia</i>				C	1/1
fungi	sac fungi	Physciaceae	<i>Buellia</i>				C	2/2
fungi	sac fungi	Physciaceae	<i>Dirinaria confluens</i>				C	2/2
fungi	sac fungi	Physciaceae	<i>Pyxine subcinerea</i>				C	1/1
fungi	sac fungi	Physciaceae	<i>Buellia demutans</i>				C	2/2
fungi	sac fungi	Physciaceae	<i>Dirinaria picta</i>				C	2/2
fungi	sac fungi	Physciaceae	<i>Heterodermia obscurata</i>				C	3/3

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fungi	sac fungi	Ramalinaceae	<i>Ramalina inflata</i> subsp. <i>perpusilla</i>			C		5/5
fungi	sac fungi	Ramalinaceae	<i>Ramalina confirmata</i>			C		6/6
fungi	sac fungi	Ramalinaceae	<i>Ramalina peruviana</i>			C		1/1
fungi	sac fungi	Ramalinaceae	<i>Ramalina pacifica</i>			C		3/3
fungi	sac fungi	Sphinctrinaceae	<i>Sphinctrina</i>			C		1/1
plants	conifers	Cupressaceae	<i>Callitris columellaris</i>			C		3/1
plants	ferns	Blechnaceae	<i>Blechnum indicum</i>	swamp water fern		C		2
plants	ferns	Dennstaedtiaceae	<i>Pteridium esculentum</i>	common bracken		C		2
plants	ferns	Gleicheniaceae	<i>Gleichenia microphylla</i>	scrambling coral fern		C		1
plants	ferns	Nephrolepidaceae	<i>Nephrolepis oblitterata</i>			C		2/2
plants	ferns	Polypodiaceae	<i>Microsorium grossum</i>			C		1/1
plants	ferns	Polypodiaceae	<i>Microsorium punctatum</i>			C		1/1
plants	ferns	Pteridaceae	<i>Acrostichum speciosum</i>	mangrove fern		C		1/1
plants	ferns	Schizaeaceae	<i>Lygodium microphyllum</i>	snake fern		C		2/2
plants	ferns	Thelypteridaceae	<i>Thelypteris confluens</i>			V		1/1
plants	ferns	Thelypteridaceae	<i>Cyclosorus interruptus</i>			C		2/1
plants	higher dicots	Acanthaceae	<i>Brunoniella australis</i>	blue trumpet		C		1
plants	higher dicots	Apiaceae	<i>Centella asiatica</i>			C		1/1
plants	higher dicots	Apiaceae	<i>Platysace ericoides</i>	heath platysace		C		1/1
plants	higher dicots	Apocynaceae	<i>Cynanchum carnosum</i>			C		1/1
plants	higher dicots	Apocynaceae	<i>Parsonia straminea</i>	monkey rope		C		1/1
plants	higher dicots	Araliaceae	<i>Schefflera actinophylla</i>	umbrella tree		C		1/1
plants	higher dicots	Asteraceae	<i>Senecio pinnatifolius</i> var. <i>pinnatifolius</i>			C		1/1
plants	higher dicots	Asteraceae	<i>Podolepis longipedata</i>	tall copper-wire daisy		C		1/1
plants	higher dicots	Casuarinaceae	<i>Allocauarina torulosa</i>			C		1
plants	higher dicots	Casuarinaceae	<i>Allocauarina littoralis</i>			C		1
plants	higher dicots	Dilleniaceae	<i>Hibbertia vestita</i>			C		1/1
plants	higher dicots	Dilleniaceae	<i>Hibbertia scandens</i>			C		1
plants	higher dicots	Dilleniaceae	<i>Hibbertia linearis</i> var. <i>floribunda</i>			C		1/1
plants	higher dicots	Droseraceae	<i>Drosera binata</i>	forked sundew		C		1/1
plants	higher dicots	Ericaceae	<i>Monotoca scoparia</i>	prickly broom heath		C		1
plants	higher dicots	Ericaceae	<i>Leucopogon pimeleoides</i>			C		1/1
plants	higher dicots	Ericaceae	<i>Leucopogon margarodes</i>	pearl beard heath		C		1
plants	higher dicots	Ericaceae	<i>Leucopogon ericoides</i>			C		1/1
plants	higher dicots	Ericaceae	<i>Epacris microphylla</i>			C		1
plants	higher dicots	Euphorbiaceae	<i>Aleurites moluccanus</i>	candlenut tree		C		1/1
plants	higher dicots	Euphorbiaceae	<i>Homalanthus nutans</i>			C		1/1
plants	higher dicots	Fabaceae	<i>Abrus precatorius</i> subsp. <i>precatorius</i>			C		1/1
plants	higher dicots	Haloragaceae	<i>Gonocarpus micranthus</i> subsp. <i>ramosissimus</i>			C		1/1
plants	higher dicots	Lamiaceae	<i>Vitex trifolia</i> var. <i>trifolia</i>			C		1/1
plants	higher dicots	Melastomataceae	<i>Melastoma malabathricum</i> subsp. <i>malabathricum</i>			C		1
plants	higher dicots	Mimosaceae	<i>Acacia leiocalyx</i>			C		2
plants	higher dicots	Molluginaceae	<i>Macarthuria neocambrica</i>			C		1/1
plants	higher dicots	Moraceae	<i>Ficus benjamina</i> var. <i>benjamina</i>	weeping fig		C		1/1
plants	higher dicots	Myrtaceae	<i>Leptospermum liversidgei</i>			C		1
plants	higher dicots	Myrtaceae	<i>Eucalyptus resinifera</i> x <i>E. tereticornis</i>			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Myrtaceae	<i>Eucalyptus robusta</i>	swamp mahogany		C		2/1
plants	higher dicots	Myrtaceae	<i>Austromyrtus dulcis</i>	midgen berry		C		2
plants	higher dicots	Myrtaceae	<i>Ochrosperma lineare</i>			C		1/1
plants	higher dicots	Myrtaceae	<i>Homoranthus virgatus</i>	twiggy homoranthus		C		1/1
plants	higher dicots	Myrtaceae	<i>Lophostemon confertus</i>	brush box		C		2
plants	higher dicots	Myrtaceae	<i>Melaleuca pachyphylla</i>			C		1/1
plants	higher dicots	Myrtaceae	<i>Eucalyptus tereticornis</i>			C		1
plants	higher dicots	Myrtaceae	<i>Melaleuca quinquenervia</i>	swamp paperbark		C		3
plants	higher dicots	Oxalidaceae	<i>Oxalis rubens</i>			C		1
plants	higher dicots	Phyllanthaceae	<i>Poranthera microphylla</i>	small poranthera		C		2/2
plants	higher dicots	Phyllanthaceae	<i>Glochidion sumatranum</i>	umbrella cheese tree		C		1
plants	higher dicots	Picrodendraceae	<i>Petalostigma pubescens</i>	quinine tree		C		1/1
plants	higher dicots	Plumbaginaceae	<i>Plumbago zeylanica</i>	native plumbago		C		1/1
plants	higher dicots	Polygonaceae	<i>Persicaria decipiens</i>	slender knotweed		C		1
plants	higher dicots	Proteaceae	<i>Conospermum taxifolium</i>	devil's rice		C		1/1
plants	higher dicots	Proteaceae	<i>Banksia integrifolia</i>			C		2
plants	higher dicots	Proteaceae	<i>Persoonia virgata</i>	small-leaved geebung		C		1/1
plants	higher dicots	Rhamnaceae	<i>Alphitonia excelsa</i>	soap tree		C		1
plants	higher dicots	Rosaceae	<i>Rubus parvifolius</i>	pink-flowered native raspberry		C		1/1
plants	higher dicots	Rubiaceae	<i>Pomax umbellata</i>			C		1
plants	higher dicots	Rubiaceae	<i>Timonius timon var. timon</i>			C		1/1
plants	higher dicots	Rutaceae	<i>Zieria smithii</i>			C		6/5
plants	higher dicots	Rutaceae	<i>Boronia rosmarinifolia</i>	forest boronia		C		1/1
plants	higher dicots	Sapindaceae	<i>Cupaniopsis anacardioides</i>	tuckeroo		C		1
plants	higher dicots	Sapindaceae	<i>Dodonaea triquetra</i>	large-leaved hop bush		C		4/2
plants	higher dicots	Thymelaeaceae	<i>Pimelea linifolia</i>			C		1/1
plants	higher dicots	Verbenaceae	<i>Phyla nodiflora</i>	carpetweed		C		2/2
plants	lower dicots	Lauraceae	<i>Cassytha pubescens</i>	downy devil's twine		C		1
plants	monocots	Commelinaceae	<i>Callisia</i>			C		1/1
plants	monocots	Commelinaceae	<i>Commelina diffusa</i>	wandering jew		C		1
plants	monocots	Cymodoceaceae	<i>Halodule uninervis</i>			C		1/1
plants	monocots	Cymodoceaceae	<i>Syringodium isoetifolium</i>			C		2/2
plants	monocots	Cymodoceaceae	<i>Cymodocea serrulata</i>			C		2/2
plants	monocots	Cyperaceae	<i>Baumea rubiginosa</i>	soft twigrush		C		2/2
plants	monocots	Cyperaceae	<i>Cyperus eglobosus</i>			C		1/1
plants	monocots	Cyperaceae	<i>Gahnia sieberiana</i>	sword grass		C		2
plants	monocots	Cyperaceae	<i>Carex fascicularis</i>	tassel sedge		C		1/1
plants	monocots	Cyperaceae	<i>Scleria sphacelata</i>			C		1
plants	monocots	Cyperaceae	<i>Cyperus polystachyos</i>			C		1
plants	monocots	Cyperaceae	<i>Lepironia articulata</i>			C		3/1
plants	monocots	Cyperaceae	<i>Abildgaardia vaginata</i>			C		1/1
plants	monocots	Cyperaceae	<i>Cyperus stradbrogensis</i>			C		3/2
plants	monocots	Cyperaceae	<i>Fimbristylis ferruginea</i>			C		1/1
plants	monocots	Cyperaceae	<i>Trachystylis stradbrogensis</i>			C		1/1
plants	monocots	Cyperaceae	<i>Cautis blakei subsp. blakei</i>			C		1/1
plants	monocots	Cyperaceae	<i>Cladium procerum</i>	leafy twigrush		C		2/2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Cyperaceae	<i>Cyperus lucidus</i>			C		2/2
plants	monocots	Cyperaceae	<i>Ficinia nodosa</i>			C		1/1
plants	monocots	Cyperaceae	<i>Cyperus scaber</i>			C		2/2
plants	monocots	Cyperaceae	<i>Cyperus haspan</i>			C		1
plants	monocots	Cyperaceae	<i>Baumea juncea</i>	bare twigrush		C		3/2
plants	monocots	Dracaenaceae	<i>Dracaena sanderiana</i>			C		1/1
plants	monocots	Hemerocallidaceae	<i>Dianella caerulea</i>			C		1
plants	monocots	Hydrocharitaceae	<i>Halophila ovalis</i>			C		2/2
plants	monocots	Juncaceae	<i>Juncus continuus</i>			C		2/2
plants	monocots	Laxmanniaceae	<i>Cordylina fruticosa</i>			C		1/1
plants	monocots	Laxmanniaceae	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>			C		1/1
plants	monocots	Laxmanniaceae	<i>Lomandra longifolia</i>			C		1/1
plants	monocots	Orchidaceae	<i>Geodorum densiflorum</i>	pink nodding orchid		C		1
plants	monocots	Orchidaceae	<i>Acianthus fornicatus</i>	pixie caps		C		1/1
plants	monocots	Poaceae	<i>Digitaria parviflora</i>			C		1/1
plants	monocots	Poaceae	<i>Eragrostis pubescens</i>			C		1/1
plants	monocots	Poaceae	<i>Paspalum scrobiculatum</i>	ditch millet		C		1
plants	monocots	Poaceae	<i>Aristida calycina</i> var. <i>calycina</i>			C		1/1
plants	monocots	Poaceae	<i>Panicum simile</i>			C		1/1
plants	monocots	Poaceae	<i>Entolasia stricta</i>	wiry panic		C		1/1
plants	monocots	Poaceae	<i>Eragrostis brownii</i>	Brown's lovegrass		C		2/1
plants	monocots	Poaceae	<i>Eriachne insularis</i>			C		1/1
plants	monocots	Poaceae	<i>Ischaemum australe</i>			C		1
plants	monocots	Poaceae	<i>Oplismenus aemulus</i>	creeping shade grass		C		1
plants	monocots	Poaceae	<i>Paspalidium gausum</i>			C		3/2
plants	monocots	Poaceae	<i>Imperata cylindrica</i>	blady grass		C		2
plants	monocots	Poaceae	<i>Cymbopogon refractus</i>	barbed-wire grass		C		1
plants	monocots	Poaceae	<i>Digitaria longiflora</i>			C		1/1
plants	monocots	Restionaceae	<i>Empodisma minus</i>	spreading rope rush		C		1
plants	monocots	Restionaceae	<i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i>			C		1/1
plants	monocots	Restionaceae	<i>Sporadanthus interruptus</i>			C		1/1
plants	monocots	Smilacaceae	<i>Smilax australis</i>	barbed-wire vine		C		2
protists	blue-green algae	Cyanophyceae	<i>Lyngbya majuscula</i>			C		1/1
protists	green algae	Chlorophyceae	<i>Caulerpa peltata</i>			C		1/1
protists	green algae	Chlorophyceae	<i>Codium spongiosum</i>			C		2/2

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992*. The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ().

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records - The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.

This number is output as 999 if it equals or exceeds this value.

APPENDIX D: REDLANDS PLANNING SCHEME ZONE AND OVERLAY MAPS INCLUDING SEMP AREA

DRAFT
RTI/DL RELEASE - EHP

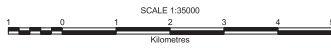
NORTH STRADBROKE ISLAND

LEGEND

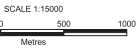
RESIDENTIAL	CENTRE	CONSERVATION
Low Density Residential	District Centre	Park Residential
Medium Density Residential	Local Centre	Environmental Protection
Point Lookout Residential	Major Centre	Conservation
Point Lookout Tourist	Neighbourhood Centre	
SMBI Residential	Point Lookout Centre	Sub-Areas
Urban Residential	SMBI Centre	Suburb Boundaries
INDUSTRY	OTHER	Land Designated for
Commercial Industry	Community Purposes	Community Infrastructure
General Industry	Emerging Urban Community	Outline of RCC
Island Industry	Open Space	Cadastral Properties
Marine Activity	Rural Non Urban	Adjoining Shires
	Investigation Zone	



Produced by
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REDLAND CITY COUNCIL

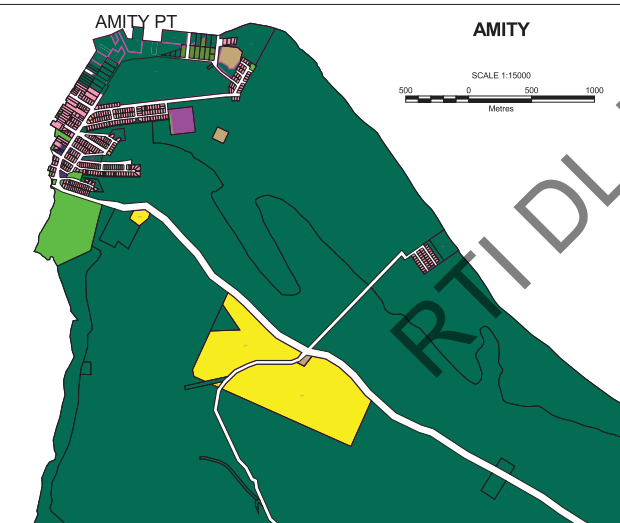
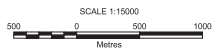


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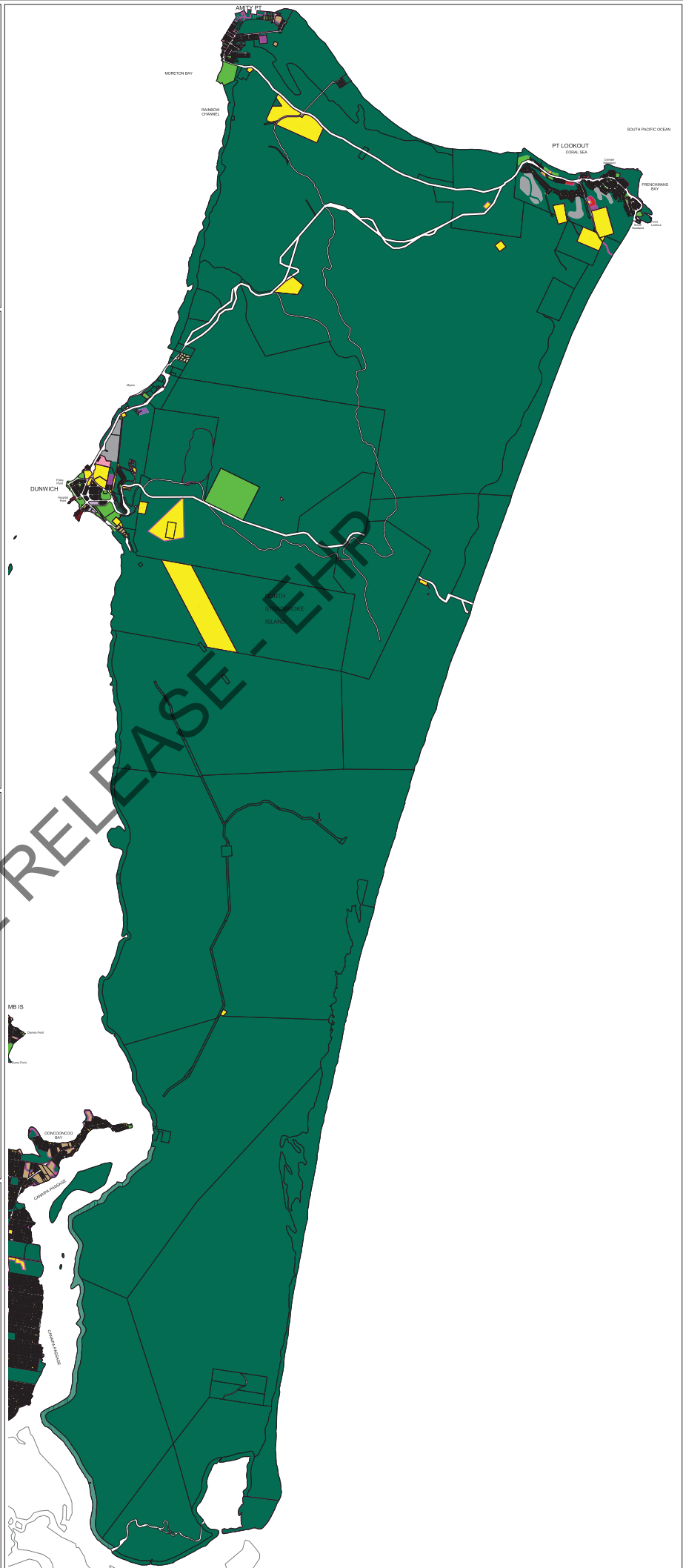
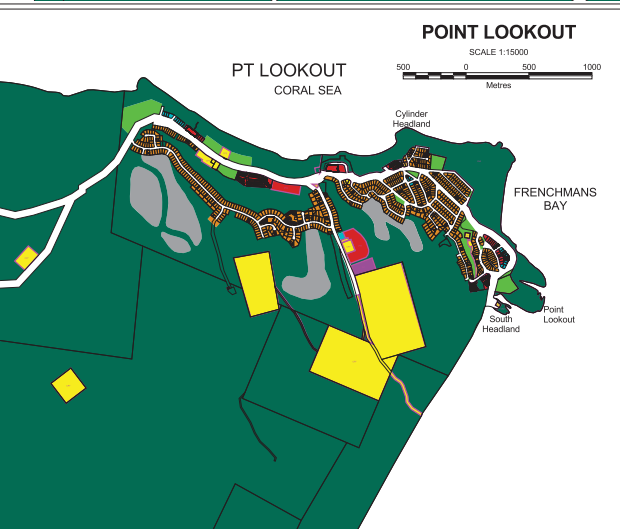
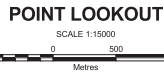


AMITY PT

AMITY



**PT LOOKOUT
CORAL SEA**

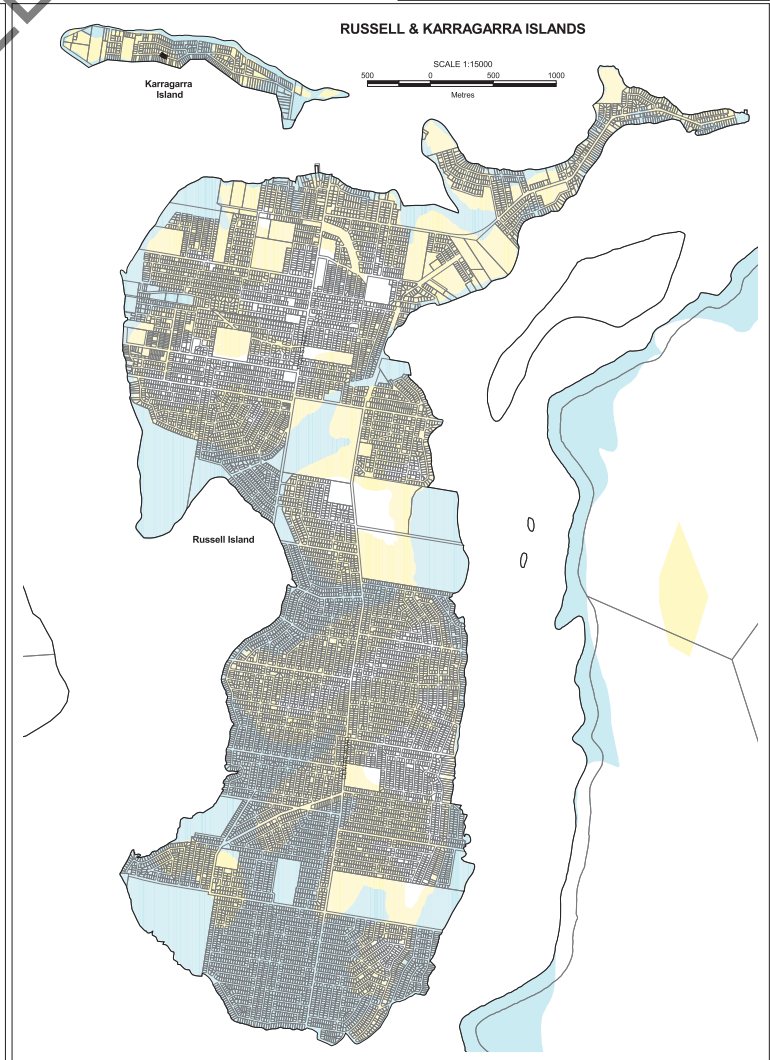
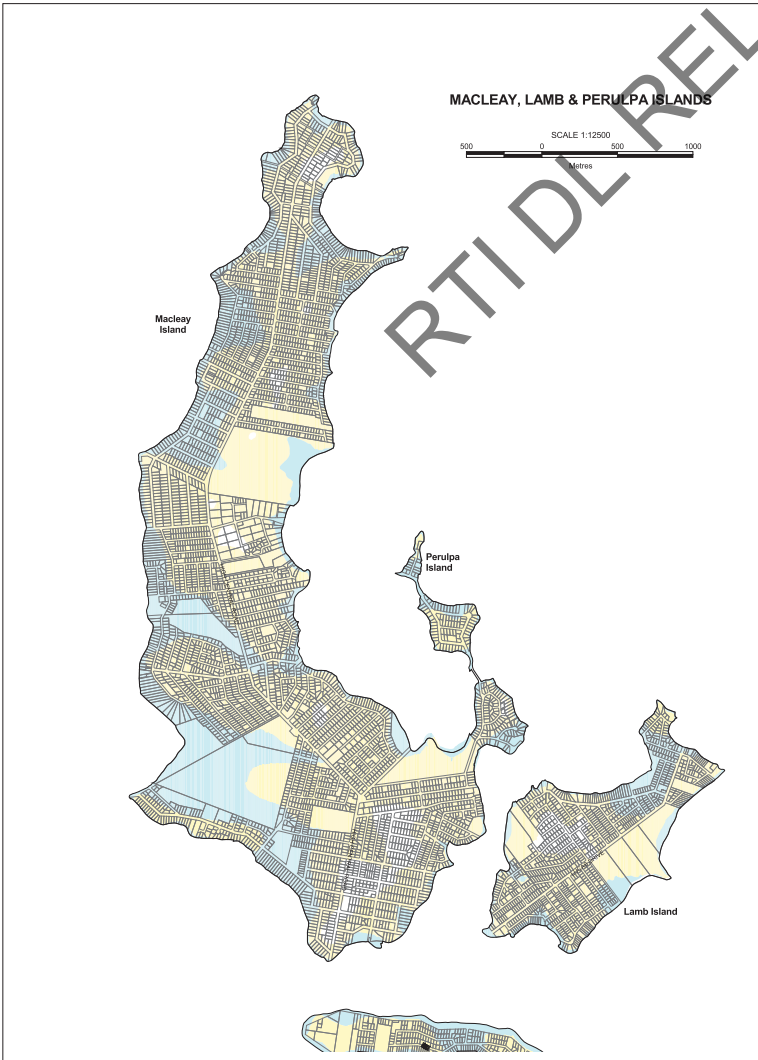
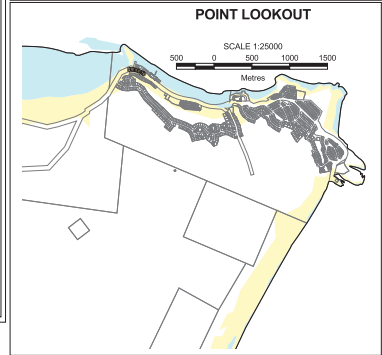
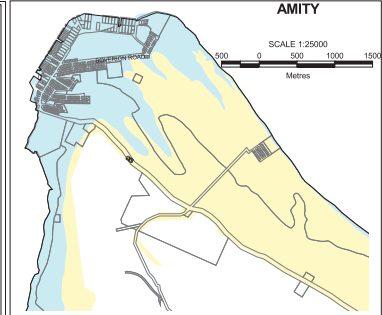
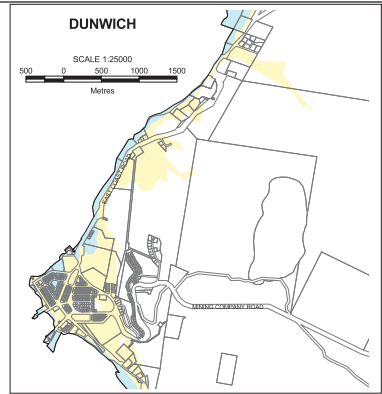
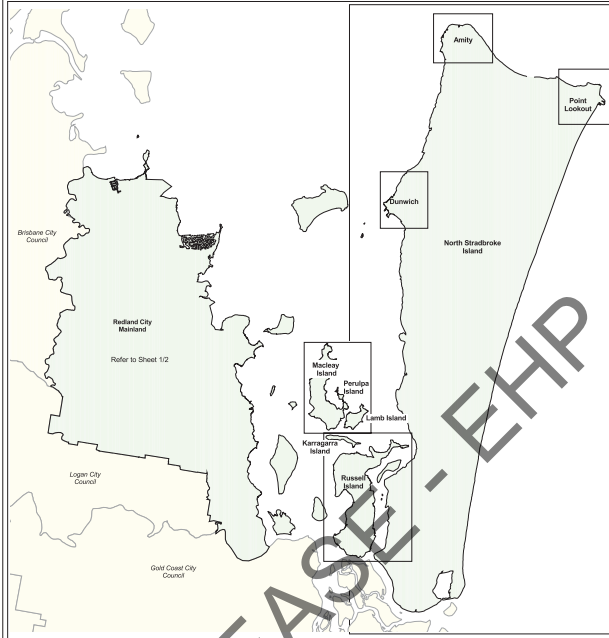
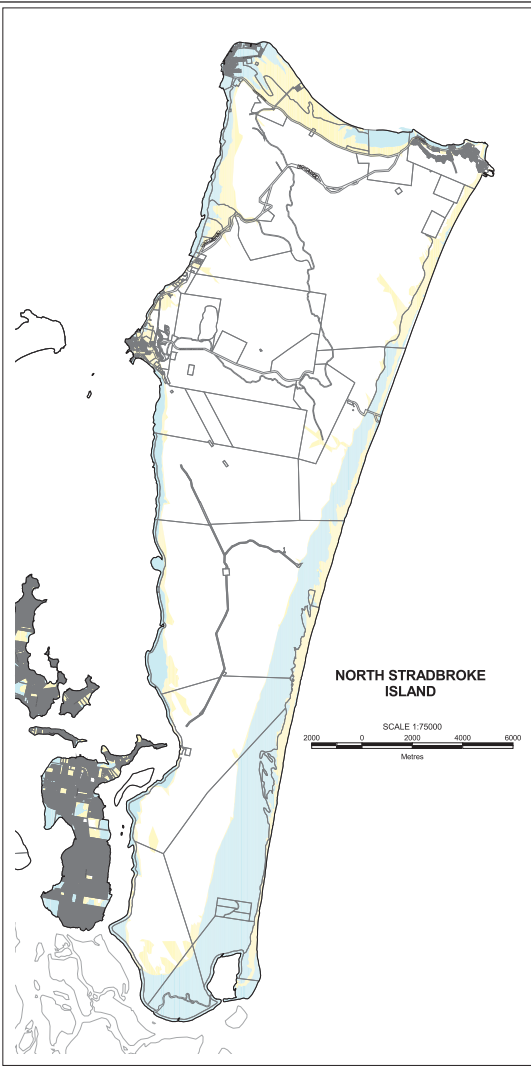


Redlands Planning Scheme - Version 4
ACID SULFATE SOILS OVERLAY
 SHEET 2/2

- LEGEND
- Below 5 metres AHD
 - Between 5 and 20 metres AHD
 - Cadastral Properties
 - Outline of RCC
 - Local Authorities Outside RCC



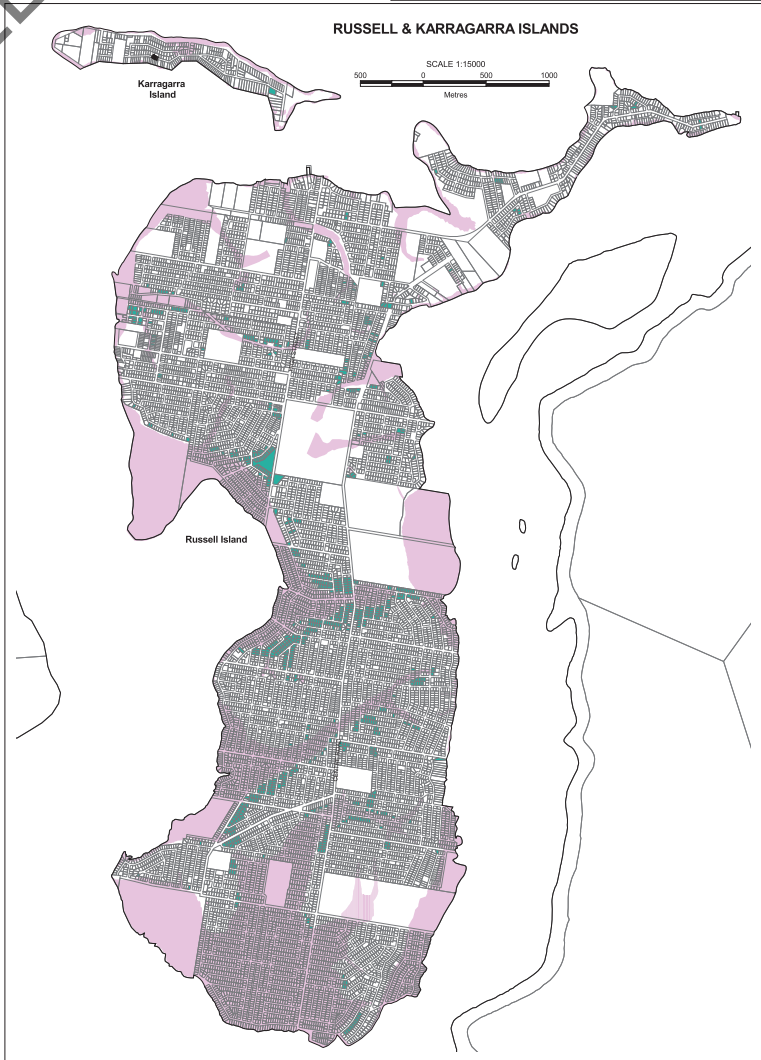
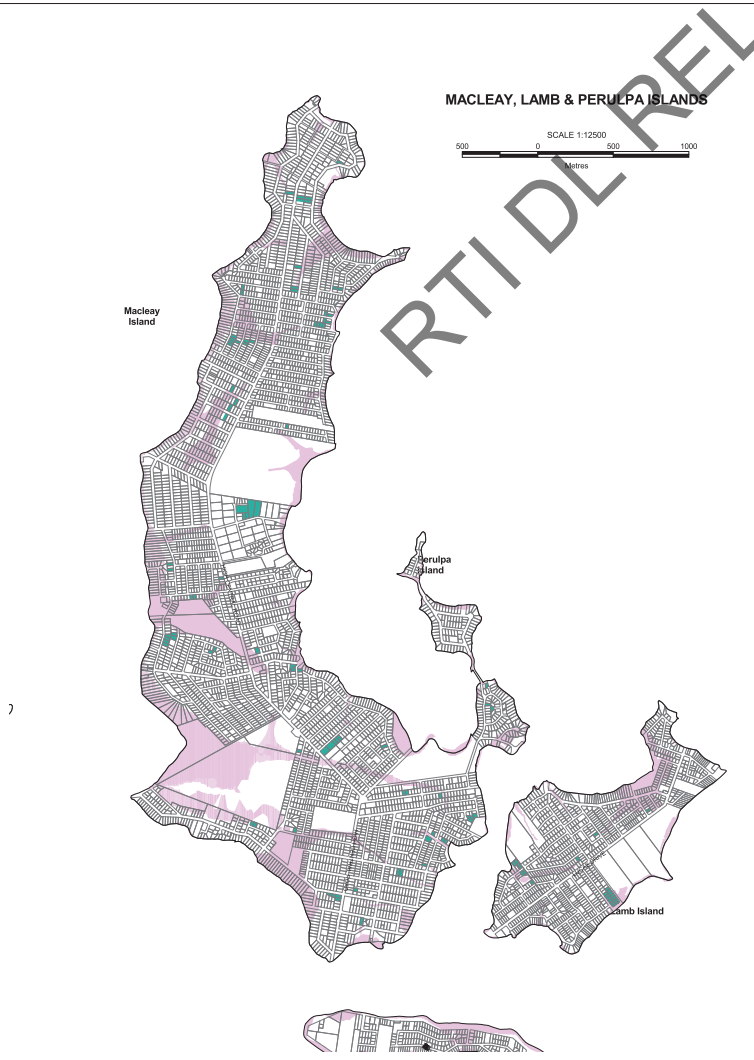
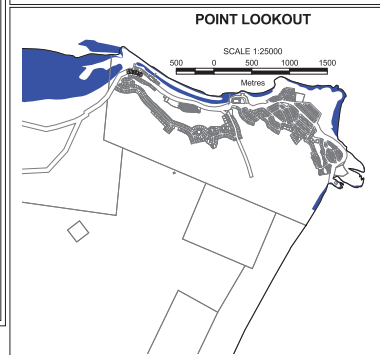
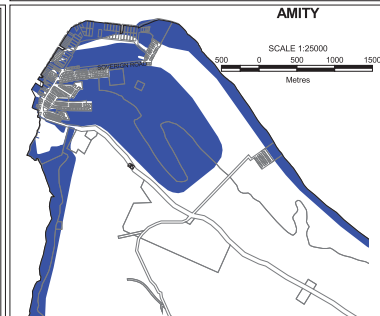
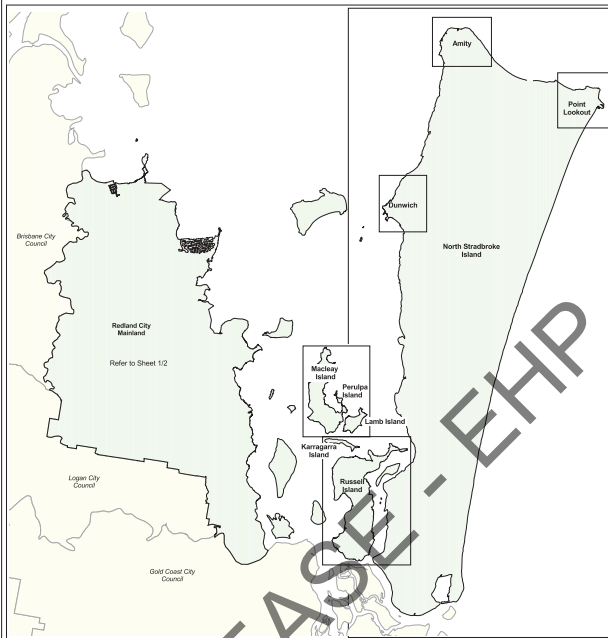
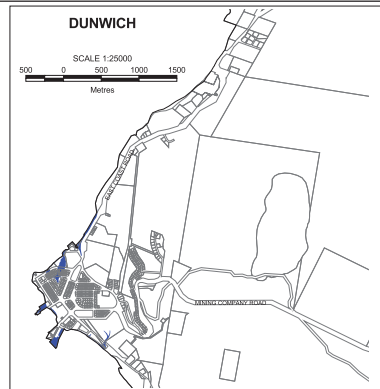
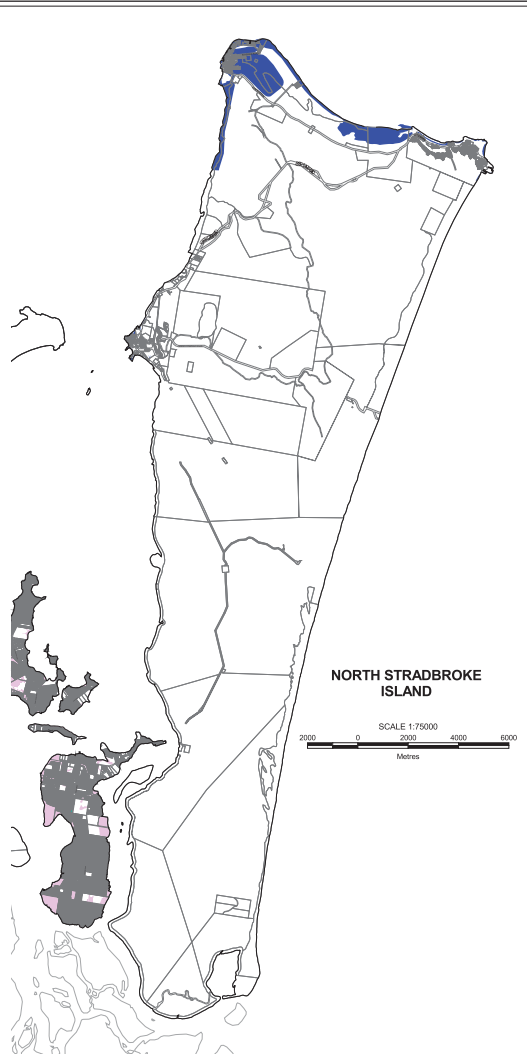
N
 January 2012



Redlands Planning Scheme - Version 4
**FLOOD PRONE, STORM TIDE AND DRAINAGE
 CONSTRAINED LAND OVERLAY**
 SHEET 2/2

- LEGEND**
- Storm Tide Area
 - SMI Flood Prone and Storm Tide Area
 - Drainage Constrained Land
 - Cadastral Properties
 - Outline of RCC
 - Local Authorities Outside RCC

Notation
 For the purpose of this planning scheme overlay mapping the defined flood event (DFE) for the planning scheme area is the 1 percent Annual Exceedance Probability (1 in 100 year Average Recurrence Interval) for flood and storm tide (R.L. 4 metre Australian Height Datum) level.



APPENDIX E: AERIAL PHOTOGRAPHY

DRAFT
RTI/DL RELEASE - EHP



1958



1970



1972



1978



2002



2008



2011

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Email [wbmvancouver@wbmpl.com.au](mailto:wbm-vancouver@wbmpl.com.au)
Web www.wbmpl.com.au

From: Sultmann Sel [Sel.Sultmann@ehp.qld.gov.au]
Sent: Wednesday, 12 February 2014 10:39 AM
To: Prenzler Paul
CC: coastal support; Birch Kerynne
Subject: RE: Please see amended draft letter

This is your I think Paul.

I don't think there will be many questions on 'shoreline erosion management planning policy and development of SEMPS'. It seems to be about SEMP issues at Amity, and what 'retreat' means and its implementation through the planning scheme. One question will be whether the planning scheme is consistent with the new SPP, so this would require some analysis. I'm not sure if the SEMP can prevent property owners from trying to protect their property so implementation of retreat without a buyback becomes problematic. Seems to me the approach should be badged as 'risk minimisation through development control' Happy to discuss.

Sel Sultmann
Principal Coastal Scientist
Environment Policy and Planning
Dept of Environment and Heritage Protection
Ph: (07) 33305768
E-mail: sel.sultmann@ehp.qld.gov.au
GPO Box 2454 BRISBANE, QLD, 4001
Level 10 400 George St Brisbane
www.ehp.qld.gov.au.



From: Polzi Nicole **On Behalf Of** coastal support
Sent: Tuesday, 11 February 2014 2:52 PM
To: Sultmann Sel
Subject: FW: Please see amended draft letter

Hi Sel,

This request came through Coastal Support – looks like it's one for you.

Could you please cc coastal support into your response?

Cheers,
Nic

From: Birch Kerynne
Sent: Tuesday, 11 February 2014 1:37 PM
To: coastal support
Cc: Prenzler Paul
Subject: FW: Please see amended draft letter

Hello Coastal Support,

I received the below request from Rod Powell of Redland City Council for an EHP representative to attend the below meeting

regarding the Draft Amity SEMP. I have spoken to my manager and we thought it may be more appropriate for someone from coastal policy within EHP to attend such a meeting to field potential questions regarding shoreline erosion management planning policy and development of SEMPS.

If you are interested in attending the meeting on 22 February can you please contact Rod Powell directly.

Happy to discuss

Cheers

Kerynne

Kerynne Birch
Principal Environmental Officer
Brisbane North
Department of Environment and Heritage Protection
(07) 3330 6016

From: Rodney Powell [<mailto:Rodney.Powell@redland.qld.gov.au>]
Sent: Wednesday, 5 February 2014 10:11 AM
To: Birch Kerynne; Prenzler Paul
Cc: Toby Ehram
Subject: FW: Please see amended draft letter

Kerynne,

As discussed we are planning a community consultation concerning the draft SEMP.

The SEMP report is available on the webpage at <http://www.redland.qld.gov.au/AboutRedlands/NorthStradbrokeIsland/Pages/Amity-erosion.aspx>

We believe that it would be extremely beneficial if someone from DEHP could also attend, in particular to provide advice on the State coastal Plan and DEHP policies and their implications regarding the implementation of management options outlined in the SEMP.

- 1 **draft letter below.**
- 2 **Booking time for hall** The hall has been booked all day for Saturday 22 February. We recommend that the Open House session be conducted from **10 am to 12 Noon**.
- 3 **Travel arrangements** i.e. vehicles and barge bookings are organised one vehicle will leave on the 7:00am Barge with the set up team. Second contingent will catch the 7:55 am gold Cat Ferry and pick up a vehicle at Dunwich Depot.
- 4 **Order of the day (is a " drop in " information session.) participants and roles.** Murray Erbs, Bernard Houston Community Engagement, Gerard Noon Corporate Communication and Malcolm Andrews SEMP consultant, DEHP representative and divisional Councillor. We need to have the key issues highlighted and historical and current mapping of the area. We will encourage people to add their comments to butcher paper or on survey forms and we will act as scribes for comments as well . A bit like Coochie we should have a baseline of SEMP information and perhaps FAQ's to provide.
- 5 **Comment period for written comments.** 29/12/13 – 30/3/ a couple of weeks afterwards for return of comment and provide a takeaway format for participants to do so.

- 6 Overall communication strategy - this forum is by invitation to direct stakeholders (affected property owners) and will not involve minimal advertising or promotion to the wider community.
- 7 Updates to web site – to be determined

Dear Sir/Madam

RE: Shoreline Erosion Management for Amity Point

Council acknowledges that as property owners within the urban residential area of Amity Point west of Ballow Street, an area zoned as sub-area UR3, you have a strong interest in the future of the area and in the development and adoption of a final Shoreline Erosion Management Plan (SEMP) for Amity Point.

As previously advised, Council planning currently provides for a policy of 'retreat' for this urban residential area of Amity Point.

In December 2013 following a workshop of Councillors, I wrote to you advising of directions given at the workshop that included making available the Draft Amity Shoreline Erosion Management Plan Report to Council being prepared by BMT WBM Pty Ltd.

In response to Councillor and community feedback, you are now invited to an Open House Forum on Shoreline Erosion Management Plan issues to be held on 22 February in the Amity Pt Hall.

This forum will provide opportunity to review historical and current planning information for erosion issues at Amity Point and respond to proposed actions including those identified in various studies and reports to Council.

Importantly, it is a chance for you to provide your understanding and comments on issues affecting the area that will contribute to the finalisation of the Shoreline Erosion Management Plan report being prepared for Council and as part of any future policy and planning consideration by Councillors.

The forum will commence at 10 am and conclude at 12 noon. Please contact Mr Murray Erbs. Group Manager City Infrastructure on 3829 8525 if you have any questions.

Rod Powell
Senior Advisor
Marine Projects
Redland City Council
07 3829 8582

h4p4(6) Personal information



Winner – 2013 Qld Environmental Innovation and Protection Award
Winner – 2013 Young Legends (Environmental Leadership) Award
Winner – 2013 Sustainable Healthy Waterways Award

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RTI DL RELEASE - EHP

From: Rodney Powell [Rodney.Powell@redland.qld.gov.au]
Sent: Wednesday, 5 February 2014 10:10 AM
To: BIRCH Kerynne; PRENZLER Paul
CC: Toby Ehrsam
Subject: FW: Please see amended draft letter

Kerynne,

As discussed we are planning a community consultation concerning the draft SEMP.

The SEMP report is available on the webpage at
<http://www.redland.qld.gov.au/AboutRedlands/NorthStradbrokeIsland/Pages/Amity-erosion.aspx>

We believe that it would be extremely beneficial if someone from DEHP could also attend, in particular to provide advice on the State coastal Plan and DEHP policies and their implications regarding the implementation of management options outlined in the SEMP.

- 1 **draft letter below.**
- 2 **Booking time for hall** The hall has been booked all day for Saturday 22 February. We recommend that the Open House session be conducted from 10 am to 12 Noon.
- 3 **Travel arrangements** i.e. vehicles and barge bookings are organised one vehicle will leave on the 7:00am Barge with the set up team. Second contingent will catch the 7:55 am gold Cat Ferry and pick up a vehicle at Dunwich Depot.
- 1 **Order of the day (is a " drop in " information session.) participants and roles.** Murray Erbs, Bernard Houston Community Engagement, Gerard Noon Corporate Communication and Malcolm Andrews SEMP consultant, DEHP representative and divisional Councillor. We need to have the key issues highlighted and historical and current mapping of the area. We will encourage people to add their comments to butcher paper or on survey forms and we will act as scribes for comments as well . A bit like Coochie we should have a baseline of SEMP information and perhaps FAQ's to provide.
- 2 **Comment period for written comments.** 29/12/13 – 30/3/ a couple of weeks afterwards for return of comment and provide a takeaway format for participants to do so.
- 3 **Overall communication strategy** - this forum is by invitation to direct stakeholders (affected property owners) and will not involve minimal advertising or promotion to the wider community.
- 4 **Updates to web site** – to be determined

Dear Sir/Madam

RE: Shoreline Erosion Management for Amity Point

Council acknowledges that as property owners within the urban residential area of Amity Point west of Ballow Street, an area zoned as sub-area UR3, you have a strong interest in the future of the area and in the development and adoption of a final Shoreline Erosion Management Plan (SEMP) for Amity Point.

As previously advised, Council planning currently provides for a policy of 'retreat' for this urban residential area of Amity Point.

In December 2013 following a workshop of Councillors, I wrote to you advising of directions given at the workshop that included making available the Draft Amity Shoreline Erosion Management Plan Report to Council being prepared by BMT WBM Pty Ltd.

In response to Councillor and community feedback, you are now invited to an Open House Forum on Shoreline Erosion Management Plan issues to be held on 22 February in the Amity Pt Hall.

This forum will provide opportunity to review historical and current planning information for erosion issues at Amity Point and respond to proposed actions including those identified in various studies and reports to Council.

Importantly, it is a chance for you to provide your understanding and comments on issues affecting the area that will contribute to the finalisation of the Shoreline Erosion Management Plan report being prepared for Council and as part of any future policy and planning consideration by Councillors.

The forum will commence **at 10 am and conclude at 12 noon**. Please contact Mr Murray Erbs. Group Manager City Infrastructure on 3829 8525 if you have any questions.

Rod Powell
Senior Advisor
Marine Projects
Redland City Council
07 3829 8582

ch4p4(6) Personal information



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RTI DL RELEASE - EHP

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From: Prenzler Paul [Paul.Prenzler@ehp.qld.gov.au]
Sent: Tuesday, 7 January 2014 4:35 PM
To: Rodney Powell
CC: Birch Kerynne
Subject: RE: Date Claimer Meeting to Discuss Amity Point SEMP

Rod,

The advice would have related to the placement method (dumped rock) and possible instability. Also the undermining of the structure overtime as the channel moves.

Paul

From: Rodney Powell [mailto:Rodney.Powell@redland.qld.gov.au]
Sent: Tuesday, 7 January 2014 4:27 PM
To: Prenzler Paul
Subject: RE: Date Claimer Meeting to Discuss Amity Point SEMP

Paul,

That is OK. One of the things Conrad is disputing is advice concerning the safety of the rocks placed on the foreshore. There was a letter from BPA to RCC advising that this practice was unsafe and that it potentially made the situation worse.

More detail if available, supporting this advice would be helpful.

Rod Powell
Senior Advisor
Marine Projects
Redland City Council
07 3829 8582

n4p4(6) Personal information



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Winner – 2013 Young Legends (Environmental Leadership) Award
Winner – 2013 Sustainable Healthy Waterways Award

-----Original Appointment-----

From: Prenzler Paul [mailto:Paul.Prenzler@ehp.qld.gov.au]
Sent: Tuesday, 7 January 2014 4:06 PM
To: Rodney Powell
Subject: Declined: Date Claimer Meeting to Discuss Amity Point SEMP
When: Tuesday, 28 January 2014 9:30 AM-10:30 AM (GMT+10:00) Brisbane.
Where: RCC Offices Peel Room

Rod,

Unfortunately I won't be able to attend as I'm acting as a Manager in another team over January. I've asked Kerynne Birch and Ben McKenzie to attend in my place.

Kerynne will be in contact with you to discuss,

Paul

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RTI DL RELEASE - EPR

From: Prenzler Paul [Paul.Prenzler@ehp.qld.gov.au]
Sent: Wednesday, 13 November 2013 2:56 PM
To: 'Toby Ehrsam'
Subject: RE: Norfolk Beach SEMP Steering Committee

Toby

I just spoke to Malcolm Andrews from WBM and he mentioned a couple of upcoming meetings for Amity Pt and Coochie SEMP. Did you want me to attend these?

Paul

From: Toby Ehrsam [mailto:Toby.Ehrsam@redland.qld.gov.au]
Sent: Tuesday, 5 November 2013 9:44 AM
To: Prenzler Paul
Cc: Rodney Powell
Subject: RE: Norfolk Beach SEMP Steering Committee

Hi Paul,

Please find attached the final draft of the Norfolk Beach SEMP and a comments register.
Any comments and guidance would be greatly appreciated.

Kind regards,

Toby Ehrsam
Advisor Coastal and Waterway Infrastructure

City Infrastructure | Marine Infrastructure Planning
REDLAND CITY COUNCIL
T 07 3829 8228
E toby.ehrsam@redland.qld.gov.au

From: Prenzler Paul [mailto:Paul.Prenzler@ehp.qld.gov.au]
Sent: Tuesday, 5 November 2013 9:29 AM
To: Toby Ehrsam
Cc: Briggs Lorraine
Subject: RE: Norfolk Beach SEMP Steering Committee

Hi Toby

I'm happy to assist as a EHP rep. My calendar tends to get pretty full from week to week so at least a fortnights notice would be good for any meetings.

Regards

Paul

From: Toby Ehrsam [<mailto:Toby.Ehrsam@redland.qld.gov.au>]
Sent: Monday, 4 November 2013 2:36 PM
To: Prenzler Paul
Cc: Rodney Powell
Subject: Norfolk Beach SEMP Steering Committee

Hi Paul,

Rod Powell has passed on your details to myself as a point of contact for our current SEMP project.

As you may have been aware, we have commissioned a Shoreline Erosion Management Plan for Norfolk Beach on Coochiemudlo Island.

As part of our investigation for the area we would like to create a steering committee to provide guidance and direction for the long term management of Norfolk Beach.

We would like ensure that the all relevant stakeholders have been contacted and have had the ability to provide comment. Would you be interested and able to provide comment on the current Norfolk Beach SEMP Draft?

I've tried to call this afternoon but it seems you're out of the office.

I will try to call you again in the office tomorrow morning. Are you free at some stage around 10am?

Kind Regards,

Toby Ehrsam
Advisor Coastal and Waterway Infrastructure

City Infrastructure | Marine Infrastructure Planning
REDLAND CITY COUNCIL
T 07 3829 8228
E toby.ehrsam@redland.qld.gov.au

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From: Malcolm Andrews [Malcolm.Andrews@bmtwbm.com.au]
Sent: Friday, 18 October 2013 3:18 PM
To: PRENZLER Paul
Subject: FW: assistance with the Amity Report

Hi Paul
How are you?
Some jobs never go away!
Can you have any comment on the question below?
Cheers
Malcolm

Malcolm Andrews
Associate
Manager Coastal Discipline

Tel: +61 7 3831 6744
Mob: sch4p4(6) Personal information
Fax: +61 7 3832 3627
Website: www.bmtwbm.com.au



[LinkedIn](#) | [Twitter](#) | [Facebook](#) | [YouTube](#)

BMT WBM Pty Ltd, Level 8, 200 Creek Street, Brisbane QLD 4000 Australia

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From: Rodney Powell [mailto:Rodney.Powell@redland.qld.gov.au]
Sent: Friday, 18 October 2013 3:14 PM
To: Malcolm Andrews
Subject: assistance with the Amity Report

Malcolm,

We are trying to develop a strategy in response to your report to which will set the strategy to go forward.

The following comment has come from one of our town planners. Do you know if there was ever really any traction on this or was it just a "motherhood" statement with no practical demonstration of commitment ?

Also where do we stand with the legislation now?

- While no longer in force the *SEQ Regional Coastal Management Plan* which commenced around 2006 included the following reference to erosion at Amity Point:

"For land located within the erosion prone area at Amity Point, the Queensland Government in partnership with the Redland Shire Council and property owners will investigate a long-term strategy of development

control to minimise the future loss of property as the adjacent tidal channel continues to erode this coast”.

The inclusion of this point in the *SEQ Regional Coastal Management Plan* demonstrates that at the time the State Government did accept they had some responsibility and would potentially even lead a strategy development process. This needs to be looked into.

Rod Powell
Senior Advisor
Marine Projects
Redland City Council
07 3829 8582

ch4p4(6) Personal information



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RTI DL RELEASE/EHP

From: Prenzler Paul [Paul.Prenzler@ehp.qld.gov.au]

Sent: Friday, 8 June 2012 2:27 PM

To: Malcolm Andrews

Subject: RE: 1958 Photo - Amity Point

Attachments: QAP2469-9(PRENZLPA): Receipt No 101210161339129524766466; DIG7001-267(PRENZLPA): Receipt No 101210161339129487312424; QAP2141-119(PRENZLPA): Receipt No 101210161339129459704397; QAP5931-103(PRENZLPA): Receipt No 101210161339129403032354; QAP5931-62(PRENZLPA): Receipt No 101210161339129392470345

Mal

1960's haven't been scanned as yet so I'll have to go and get them and scan one myself. In the meantime I've attached ones from early 1970's, 2002 & 2008

Paul

From: Malcolm Andrews [mailto:Malcolm.Andrews@bmtwbm.com.au]

Sent: Friday, 8 June 2012 2:20 PM

To: Prenzler Paul

Subject: RE: 1958 Photo - Amity Point

Awesome – can you do a couple more please – maybe 2002 is (last time RCC did a cross section of the channel) and maybe something in the 60's.

Thanks

Malcolm

Malcolm Andrews

Associate

Manager Coastal Discipline

From: Prenzler Paul [mailto:paul.prenzler@derm.qld.gov.au]

Sent: Friday, 8 June 2012 2:16 PM

To: Malcolm Andrews

Subject: 1958 Photo - Amity Point

From: SMISSupport@nrm.qld.gov.au [mailto:SMISSupport@nrm.qld.gov.au]

Sent: Friday, 8 June 2012 2:15 PM

To: Prenzler Paul

Subject: QAP768-104(PRENZLPA): Receipt No 101210161339128925213100

Your aerial photograph as ordered through the SmartMap Information Service (SMIS) is attached!

Aerial Photograph Information

Photo Title: 9543 BRISBANE-NORTH STRADBROKE 58 PROGRAM AERIAL PHOTOGRAPHY

Film No: QAP768

Frame No: 104

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RTI DL RELEASE - EHP

From: SMISsupport@nrm.qld.gov.au [SMISsupport@nrm.qld.gov.au]
Sent: Friday, 8 June 2012 2:25 PM
To: Prenzler Paul
Subject: QAP2469-9(PRENZLPA): Receipt No 101210161339129524766466
Attachments: QAP2469-9.jpg

Your aerial photograph as ordered through the SmartMap Information Service (SMIS) is attached!

Aerial Photograph Information

Photo Title: 9543 BRISBANE 72 PROGRAM AERIAL PHOTOGRAPHY

Film No: QAP2469

Frame No: 9

RTI DL RELEASE - EHP

BRISBANE I-IV
RUN 13

LENS 464
152.23mm

MAG 300
2-7-1972

12000'

© The State of Queensland 2007
Dept of Natural Resources and Water



92469
×

6784

9
×

×

×

From: SMISsupport@nrm.qld.gov.au [SMISsupport@nrm.qld.gov.au]
Sent: Friday, 8 June 2012 2:24 PM
To: Prenzler Paul
Subject: DIG7001-267(PRENZLPA): Receipt No 101210161339129487312424
Attachments: DIG7001-267.jpg

Your aerial photograph as ordered through the SmartMap Information Service (SMIS) is attached!

Aerial Photograph Information

Photo Title: 9543 BRISBANE 2008 50CM WHOLE OF GOVERNMENT DIGITAL PHOTOGRAPHY

Film No: DIG7001

Frame No: 267

RTI DL RELEASE - EHP



From: SMISsupport@nrm.qld.gov.au [SMISsupport@nrm.qld.gov.au]
Sent: Friday, 8 June 2012 2:24 PM
To: Prenzler Paul
Subject: QAP2141-119(PRENZLPA): Receipt No 101210161339129459704397
Attachments: QAP2141-119.jpg

Your aerial photograph as ordered through the SmartMap Information Service (SMIS) is attached!

Aerial Photograph Information

Photo Title: 9543 NORTH STRADBROKE ISLAND 70 PROJECT AERIAL PHOTOGRAPHY

Film No: QAP2141

Frame No: 119

RTI DL RELEASE - EHP



0244

119

NTH, STRADBROKE ILS.
RUN. 1.

LENS 439
152.71 mm

MAG. 411
18.5.70

12380'

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Dept of Natural Resources and Water

From: SMISSupport@nrm.qld.gov.au [SMISSupport@nrm.qld.gov.au]
Sent: Friday, 8 June 2012 2:23 PM
To: Prenzler Paul
Subject: QAP5931-103(PRENZLPA): Receipt No 101210161339129403032354
Attachments: QAP5931-103.jpg

Your aerial photograph as ordered through the SmartMap Information Service (SMIS) is attached!

Aerial Photograph Information

Photo Title: 9543 BRISBANE 2002 PROGRAM AERIAL PHOTOGRAPHY

Film No: QAP5931

Frame No: 103

RTI DL RELEASE - EHP



8 3 2 3

WILD 15/4 UAG
M113038 152.08

040
5931

BRISBANE 9543
1:25,000



RUN 11
083-107



MAG 3509-3510
21.02.02



4310m ASL
500m DATUM

Queensland Government
© The State of Queensland
Locked Bag 40 Coorparoo DC Qld 4151

103

RTI DL RELEASE - EHP

From: SMISsupport@nrm.qld.gov.au [SMISsupport@nrm.qld.gov.au]
Sent: Friday, 8 June 2012 2:23 PM
To: Prenzler Paul
Subject: QAP5931-62(PRENZLPA): Receipt No 101210161339129392470345
Attachments: QAP5931-62.jpg

Your aerial photograph as ordered through the SmartMap Information Service (SMIS) is attached!

Aerial Photograph Information

Photo Title: 9543 BRISBANE 2002 PROGRAM AERIAL PHOTOGRAPHY

Film No: QAP5931

Frame No: 62

RTI DL RELEASE - EHP



062

OAP
6931

RTI DL RELEASE - EHP

WILD 15/4 0A8
N418088 152.88

8 2 8 2

From: Prenzler Paul [Paul.Prenzler@ehp.qld.gov.au]
Sent: Friday, 8 June 2012 2:16 PM
To: Malcolm Andrews (Malcolm.Andrews@bmtwbm.com.au)
Subject: 1958 Photo - Amity Point
Attachments: QAP768-104.jpg

From: SMISsupport@nrm.qld.gov.au [mailto:SMISsupport@nrm.qld.gov.au]
Sent: Friday, 8 June 2012 2:15 PM
To: Prenzler Paul
Subject: QAP768-104(PRENZLPA): Receipt No 101210161339128925213100

Your aerial photograph as ordered through the SmartMap Information Service (SMIS) is attached!

Aerial Photograph Information

Photo Title: 9543 BRISBANE-NORTH STRADBROKE 58 PROGRAM AERIAL PHOTOGRAPHY

Film No: QAP768

Frame No: 104

RTI DL RELEASE - EHP

0768-104

BRISBANE NORTH STRADBROKE IS. RUN 1 16.5.58 LENS 201702 152.09M/M 12.500 ↑

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RTI DL RELEASE - EHP



From: Prenzler Paul [Paul.Prenzler@ehp.qld.gov.au]
Sent: Friday, 8 June 2012 2:14 PM
To: Malcolm Andrews (Malcolm.Andrews@bmtwbm.com.au)
Subject: 1978 Photo - Amity Pt
Attachments: QAP3604-2994.jpg

From: SMISsupport@nrm.qld.gov.au [mailto:SMISsupport@nrm.qld.gov.au]
Sent: Friday, 8 June 2012 2:14 PM
To: Prenzler Paul
Subject: QAP3604-2994(PRENZLPA): Receipt No 10121016133912881055558

Your aerial photograph as ordered through the SmartMap Information Service (SMIS) is attached!

Aerial Photograph Information

Photo Title: 9543 BRISBANE 78 PROGRAM AERIAL PHOTOGRAPHY

Film No: QAP3604

Frame No: 2994

RTI DL RELEASE - EHP

BRISBANE
9543.
2990-3011
RUN 12.
MAG. 1820/21
14.8.78 UT
3800m AMGL
350m DATUM

© The State of Queensland 2007
Dept of Natural Resources and Water



2994

03604

UAG 1075 152.09

2994

From: Murray Erbs [Murray.Erbs@redland.qld.gov.au]
Sent: Tuesday, 21 June 2011 3:04 PM
To: Prenzler Paul; 'Malcolm Andrews'
Subject: RE: Amity Point - Redland Conversations

Hi Paul/Malcolm

We are working out the time for departure and whether it is possible to collect a car at Dunwich or whether I have to take a car. At this stage it is looking like we need to be at the ferry terminal at 11.15am to catch the barge/ferry. The barge leaves at 11.30am. My mobile number is [redacted] (6) Personal information

Regards
Murray

From: Prenzler Paul [mailto:paul.prenzler@derm.qld.gov.au]
Sent: Tuesday, 21 June 2011 11:54 AM
To: Murray Erbs
Subject: RE: Amity Point - Redland Conversations

Murray

I'm going to be out of the office all day tomorrow and also on Friday

Is there any word on travel arrangements. I assume I'll meet you at the ferry terminal on Saturday morning and travel over together.

My mobile number is [redacted] (6) Personal information

Regards

Paul

From: Murray Erbs [mailto:Murray.Erbs@redland.qld.gov.au]
Sent: Wednesday, 15 June 2011 3:58 PM
To: 'Malcolm Andrews'; Prenzler Paul
Subject: FW: Amity Point - Redland Conversations

Malcolm/Paul

Please find attached a copy of the flyer that has gone out to Amity Point for Saturday 25th June. I will speak to you both next week to finalise travel arrangements and presentation requirements.

Regards
Murray

From: Jessie Lee
Sent: Wednesday, 15 June 2011 3:43 PM
To: Murray Erbs
Subject: FW: Amity Point - Redland Conversations

As requested,

Jessie Lee

Infrastructure Planning | A/Research and Administration Coordinator

Redland City Council

☎: 07 3829 8533

✉: jessie.lee@redland.qld.gov.au

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From: Justin Stone
Sent: Wednesday, 15 June 2011 3:34 PM
To: Jessie Lee
Subject: RE: Amity Point - Redland Conversations

From: Jessie Lee
Sent: Wednesday, 15 June 2011 3:24 PM
To: Justin Stone
Subject: Amity Point - Redland Conversations

Hi Justin,

Would you be able to send me the electronic copy of the flyer you did up for the Amity Point Sessions regarding Erosion Issues?

Many Thanks,

Jessie Lee

Infrastructure Planning | A/Research and Administration Coordinator

Redland City Council

☎: 07 3829 8533

✉: jessie.lee@redland.qld.gov.au

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3 sheets of A4 paper = 1 litre of water

+-----+

RTI DL RELEASE - EHP

From: Prenzler Paul [Paul.Prenzler@ehp.qld.gov.au]
Sent: Tuesday, 21 June 2011 11:49 AM
To: Biggs Ian; Thomas Mike
Subject: FW: Amity Point - Redland Conversations
Attachments: RedlandConversationsWordDL_June25.pdf

FYI, I'll be attending this meeting on Saturday

From: Murray Erbs [mailto:Murray.Erbs@redland.qld.gov.au]
Sent: Wednesday, 15 June 2011 3:58 PM
To: 'Malcolm Andrews'; Prenzler Paul
Subject: FW: Amity Point - Redland Conversations

Malcolm/Paul

Please find attached a copy of the flyer that has gone out to Amity Point for Saturday 25th June. I will speak to you both next week to finalise travel arrangements and presentation requirements.

Regards
Murray

From: Jessie Lee
Sent: Wednesday, 15 June 2011 3:43 PM
To: Murray Erbs
Subject: FW: Amity Point - Redland Conversations

As requested,

Jessie Lee

Infrastructure Planning | A/Research and Administration Coordinator
Redland City Council
☎: 07 3829 8533
✉: jessie.lee@redland.qld.gov.au

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From: Justin Stone
Sent: Wednesday, 15 June 2011 3:34 PM
To: Jessie Lee
Subject: RE: Amity Point - Redland Conversations

From: Jessie Lee
Sent: Wednesday, 15 June 2011 3:24 PM
To: Justin Stone
Subject: Amity Point - Redland Conversations

Hi Justin,

Would you be able to send me the electronic copy of the flyer you did up for the Amity Point Sessions regarding Erosion Issues?

Many Thanks,

Jessie Lee

Infrastructure Planning | A/Research and Administration Coordinator

Redland City Council

☎: 07 3829 8533

✉: jessie.lee@redland.qld.gov.au

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RTI DL RELEASE - RHP



Join the conversation

Redland City Mayor

Melva Hobson

Invites you to join her and fellow councillors
at the next

Redland Conversations

Saturday June 25

1pm – Amity Point Community Club

Join in the Redland Conversations to hear expert environmental consultant, Malcolm Andrews present and outline the history and factors creating erosion at Amity Point, and discuss with Council and the Department of Environment and Resource Management (DERM) the current policy for managing the coastline at the point.

www.redland.qld.gov.au/Haveyoursay

Join the conversation

Redland City Mayor

Melva Hobson

Invites you to join her and fellow councillors
at the next

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www.redland.qld.gov.au/Haveyoursay



From: Prenzler Paul [Paul.Prenzler@ehp.qld.gov.au]

Sent: Monday, 6 June 2011 3:08 PM

To: Biggs Ian

Subject: FW: Amity Point Erosion

Attachments: Item1.5_AttachmentD_ApprovalsforDevelopmentofaSeawallatAmityPoint.pdf; AMITY POINT EROSION.pdf; Item1.5_AttachmentA_ReportbyJMEberhardtAmityPoint.pdf; Item1.5_AttachmentB_AmityForeshoreProtectionKing&Co.pdf; Item1.5_AttachmentCBMTWBNReport_AmityTechnicalBackground2011.pdf

Ian

Can you please review this for me to see if WBM missed anything in relation to the approvals (see Attach D)

Thanks

Paul

From: Murray Erbs [mailto:Murray.Erbs@redland.qld.gov.au]

Sent: Monday, 23 May 2011 11:02 AM

To: 'Malcolm Andrews'; Prenzler Paul

Subject: Amity Point Erosion

Malcolm/Paul

Please find attached a copy of the report that went to the May Planning and Policy Committee of Council. It is anticipated that the recommendation will be confirmed at the Monthly meeting of Council on Wednesday. If everything goes to plan we would then need to meet with the Amity Community 2 or 3 weeks later, probably on a Saturday.

Malcolm - Could you please confirm availability? I would suggest options are: Sat 11th, Sat 18th or Sat 25th.

Paul – DERM would also be invited to be present.

Regards

Murray Erbs

Manager Infrastructure Planning

Redland City Council

ph 07 3829 8525

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AMITY POINT EROSION

Datworks Filename: RTT Coastal Management Shoreline Erosion

Attachments: [Attachment A Report by J M Eberhardt Amity Point \[PDF 400KB\]](#)
[Attachment B Amity Foreshore Protection King Co \[PDF 1.6MB\]](#)
[Attachment C BMT WBN Report Amity Technical Background 2011 \[PDF 600KB\]](#)
[Attachment D Approvals for Development of a Seawall at Amity Point \[PDF 50KB\]](#)

Responsible Officer: **Greg Underwood**
General Manager Planning and Policy

Author: **Murray Erbs**
Manager Infrastructure Planning

EXECUTIVE SUMMARY

During the January Natural Disaster significant erosion occurred at Amity Point, North Stradbroke Island putting land and property at risk. Council staff responded by making rock available for the use of residents to protect their property's and by placing rock to protect Public land at the old School House Park. Council at that time undertook to organise a meeting with residents and DERM present to address issues that included:

- An understanding of roles and responsibilities
- An understanding of site specific erosion causes
- Capability and resources to implement a solution
- The current approvals process to implement solutions
- Preparation of a Coastal Erosion Management Plan

This report recommends that Council now meet with the property owners affected by erosion at Amity Point to provide this information.

PURPOSE

The purpose of this report is to provide Council with the relevant information regarding the causes of erosion at Amity Point including the history and the strategies that have been implemented for its continued management.

BACKGROUND

Erosion at Amity has been occurring for many years. Survey mapping records show a steady retreat of the fore shore since 1970. The area at Amity point from Geera Street to Wallum Inlet is identified in the South East Queensland Coastal Plan Erosion Prone Area Plan SC 3365F with a landward boundary of 145 metres. This is

reflected in the Redlands Planning Scheme; with properties along the foreshore in this Erosion Prone Area being zoned UR3.

The Abstract from the 1978 paper for the Department of Geology, University of Queensland by J.M. Eberhardt titled "*Erosion at Amity Point – An Example of Shoreline Recession in a Tidal Inlet*" which is appended states:

"Erosion at Amity Point on North Stradbroke Island is related to the eastward migration of Rainbow Channel resulting from the realignment of South Passage to the North-South orientation. Available survey records, aerial photographs, and recent research document this change. Slumping of the channel banks occurs and erosion is greatest where Rainbow Channel is closest to shore. Rock groynes constructed since 1972, have interrupted the southward movement of beach sediment thereby increasing erosion."

The UR3 zoning requires buildings and structures to be demountable and capable of being moved. It is also a requirement of this zone that new structures will not extend beyond the current building line.

The Department of Environment, Beach Protection Authority has given Redland City Council advice concerning this area in 1997(BPA Letter 8 March 1997). In this advice the erosion prone area was increased from the nominal value of 40metres to 145metres (which it is still) measured inland from the seaward toe of the frontal dune. It also advised that the nature of erosion in this area is for a sudden slump to occur such as had occurred at Toompany Street in January 1997. The recent slump at Birch St was of a similar nature. The Beach Protection Authority advised at that time (1997), that rocks placed on the visible part of the beach had little structural integrity below the water and would therefore have little mitigating effect on the long term erosion. The authority further advised that overloading the upper foreshore with rocks may exacerbate the erosion.

Guiding Principles

The State Coastal Plan provides a hierarchy of approaches to address the impact of coastal erosion:

- Avoid- focus on locating new development in areas not vulnerable to coastal processes and future climate change. This option is not relevant to the existing situation where development has already occurred.
- Planned retreat – focus on systematic abandonment of land and structures in vulnerable areas; this has traditionally been the case at Amity as evidenced by the number of lots already abandoned to the sea.
- Accommodate – focus on continued occupation of near coastal areas but with adjustments such as altered building design. This is supported by the requirement for removable dwellings in the Redland Planning Scheme.
- Protect – Focus on the defence of the vulnerable areas

Erosion Prone Area width

The erosion prone area width must accommodate both long term and short term erosion plus the effect of climate change over the planning period. When setting the erosion prone area at Amity Point the planning period was 50 years.

Council Planning Schemes in relation to Amity Point

The Shire of Redland Town Planning Scheme 1998 states:

“The designated area is considered suitable only for dwelling houses which are capable of removal if threatened by erosion or for low-key recreational uses which, apart from minor buildings, involve only the erection of buildings which likewise are readily capable of removal.”

The Redlands Planning Scheme

“In sub-area UR3 –

Buildings or structures are removable or demountable;

Buildings, structures or infrastructure associated with the use or other development do not extend any further seaward than existing uses and development on the site.”

The key strategy of these planning schemes for Amity Point is for strategic retreat.

Legal Responsibility

Council received legal advice in 2001 that in paraphrase concluded:

- That Council has a duty of care to provide landowners with the advice, that existing and future rock wall construction may constitute a hazard, and that this duty extends to providing this information to landowners as part of the process of supplying them with rock, and
- That for foreshores under Council's legal control a duty to take all reasonable steps to ensure that known hazards on such areas are eliminated or minimised. This may be achieved by warning persons who may be injured or who may suffer property damage by warning of the hazard and keeping them away.

A full copy of the legal advice received at that time is appended.

ISSUES

- The site at Amity point is already developed. Avoidance is not possible except in the case of future development proposals. The RCC planning scheme does not prevent further development at this site however the zoning UR3 imposes conditions which require future developments to be relocatable. By adapting the development on the site it should be possible to retreat as land is lost by moving houses further landward on the affected lots. However there may come a time when this is no longer possible. In that event the house will need to be completely relocated to a new site.
- The state government has consistently refused to accept any responsibility for the site (see File Note: Amity Point erosion 26 February 2002) and would not assist in any project to protect private property.

- Acquisition of the affected land (planned retreat) to create a buffer zone would be an expensive option and is not feasible unless State Government financial support was available.
- Installation of rock walls in response to short term events may in fact exacerbate the erosion problem and constitute a hazard. Quoting from the legal advice received, Council “has a duty to provide that information to landowners as part of the process of supplying them with rock (or possibly even a duty to cease supplying the rock)”.

RELATIONSHIP TO CORPORATE PLAN

3. Embracing the bay

The benefits of the unique ecosystems, visual beauty, spiritual nourishment and coastal lifestyle provided by the islands, beaches, foreshores and water catchments of Moreton Bay will be valued, protected and celebrated.

- **3.2 Better manage our foreshores through coordinated planning with a special focus on resilience to the impacts of flooding and storm tides.**

FINANCIAL IMPLICATIONS

The preparation of a desktop review of the causes of erosion at Amity Point and attendance by a consultant to present the findings has an estimated cost of \$10,000.

The preparation of Shoreline Erosion Management Plan for the hotspot at Amity Point has been estimated to cost \$40,000.

CONSULTATION

Internal consultation has been undertaken with Land Use Planning and Operations and Maintenance. External consultation has been undertaken with DERM and consultants BMT WBM.

OPTIONS

Preferred

That Council resolve to:

1. Proceed in organising a meeting with the property owners of land in the erosion affected area at Amity Point for BMT WBM to present “Amity Point Erosion Review 2011.
2. Present Councils current guiding position for Amity Point of strategic planned retreat.
3. Undertake in 2011/12 the preparation of a Shoreline Erosion Management Plan for the erosion hotspot at Amity Point.

Alternative

No alternative is proposed.

OFFICER'S RECOMMENDATION

That Council resolve to:

- 1. Proceed in organising a meeting with the property owners of land in the erosion affected area at Amity Point for BMT WBM to present "Amity Point Erosion Review 2011;**
- 2. Present Council's current guiding position for Amity Point of strategic planned retreat; and**
- 3. Undertake in 2011/12 the preparation of a Shoreline Erosion Management Plan for the erosion hotspot at Amity Point.**

RTI DL RELEASE - EHP

EROSION AT AMITY POINT – AN EXAMPLE OF SHORELINE RECESSION IN A TIDAL INLET

by J.M. Eberhardt

(with 5 Text-figures)

ABSTRACT. Erosion at Amity Point on North Stradbroke Island is related to the eastward migration of Rainbow Channel resulting from the re-alignment of South Passage to a North-South orientation. Available survey records, aerial photographs, and recent research document this change. Slumping of the channel banks occurs and erosion is greatest where Rainbow Channel is closest to the shore. Rock groynes constructed since 1972, have interrupted the southward movement of beach sediment thereby increasing erosion.

INTRODUCTION

Amity Point, at the northwest extremity of North Stradbroke Island, forms the southern margin of the South Passage tidal inlet (Text-fig. 1)

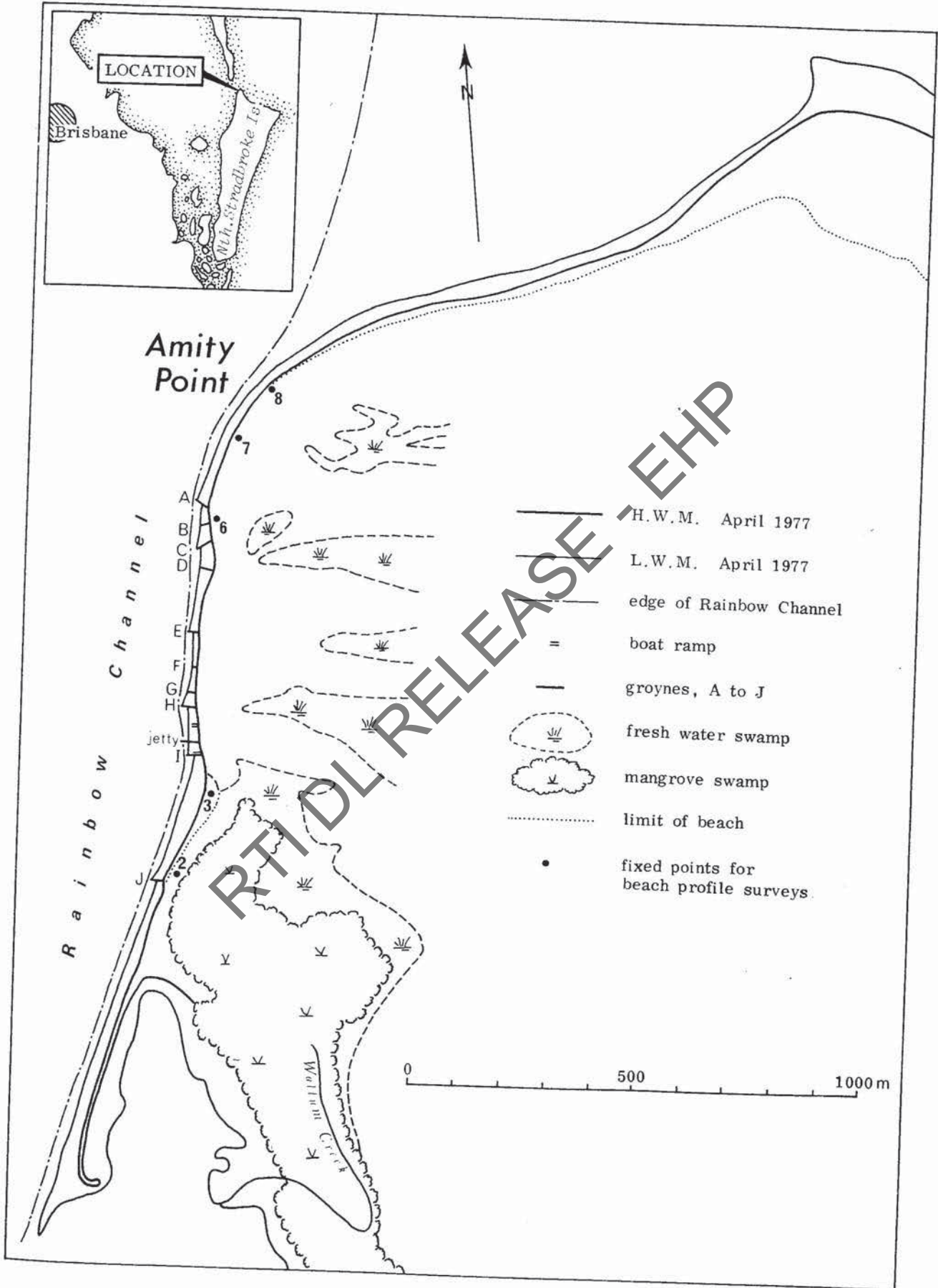
The months of November to June are dominated by south easterly winds with frequent strong north easterlies, whereas from July to October the winds are more variable tending south westerly to north westerly. Waves from the southeast, west and northwest, are refracted by shoals in the South Passage tidal delta; those from the northeast and southwest having a less restricted approach along Rainbow Channel. Spring tide range averages 1.8 m and the neap tide range averages 1 m. Tidal velocities of 4½ knots have been recorded in the South Passage (Maxwell 1970), and both ebb and flood tides affect the channel inshore at Amity Point, with ebb velocities being the greater of the two (Edwards 1971; Higgins 1971).

ACKNOWLEDGEMENTS

Mr M. Ekins (surveyor) and the officers of the Beach Protection Authority, Department of Harbours and Marine, Queensland, assisted in the re-establishment of survey marks and the compilation of historical data. Dr A. Falconer commented on the manuscript; my husband Noel provided support and assistance; Mr E. Savage drafted the figures.

HISTORY OF EROSION

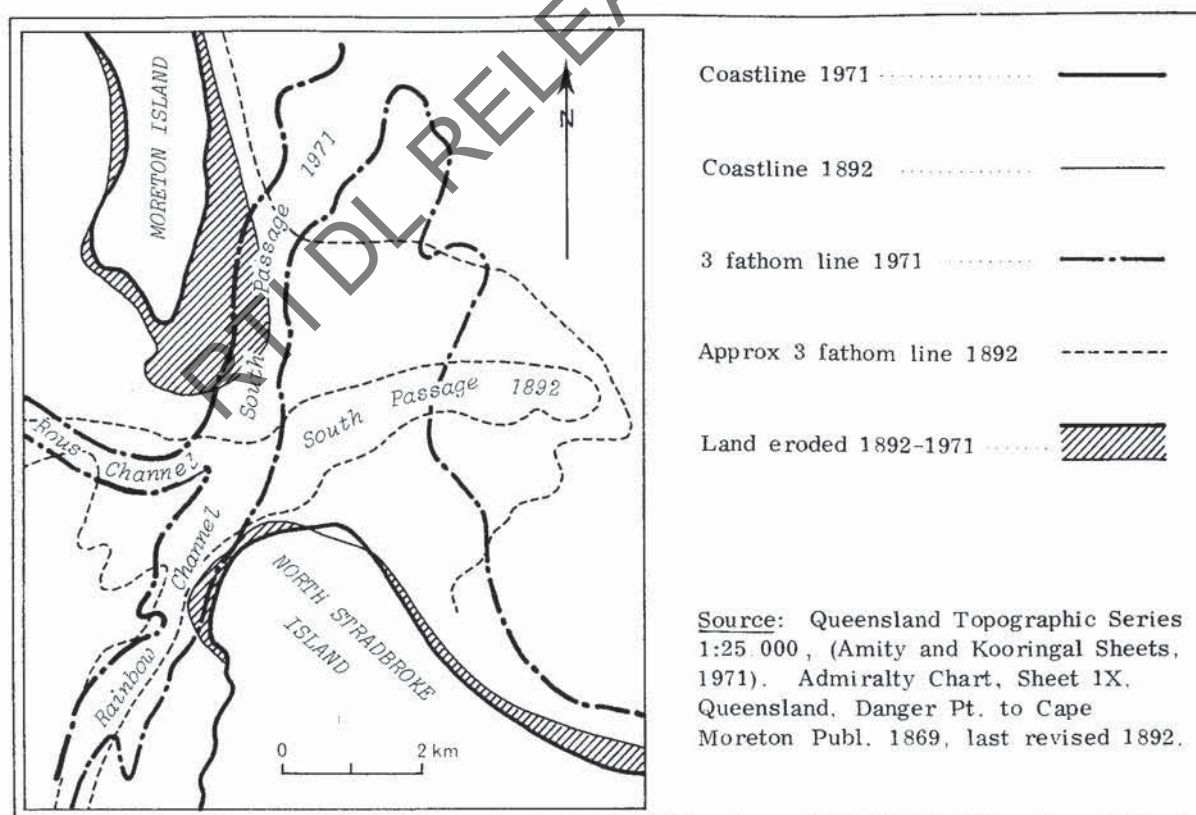
Rainbow Channel is shown on the revised (1892) Admiralty chart of the South Passage. Since 1892 South Passage has moved northward, whilst Rainbow Channel has meandered towards the shore at Amity Point inducing erosion (Text-figs 2, 3). Corroborating evidence of erosion is available in *Pap. Dep. Geol. Univ. Qd*, 8(2):82 – 88, October 1978.



Text-fig. 1 Amity Point – Physical Features

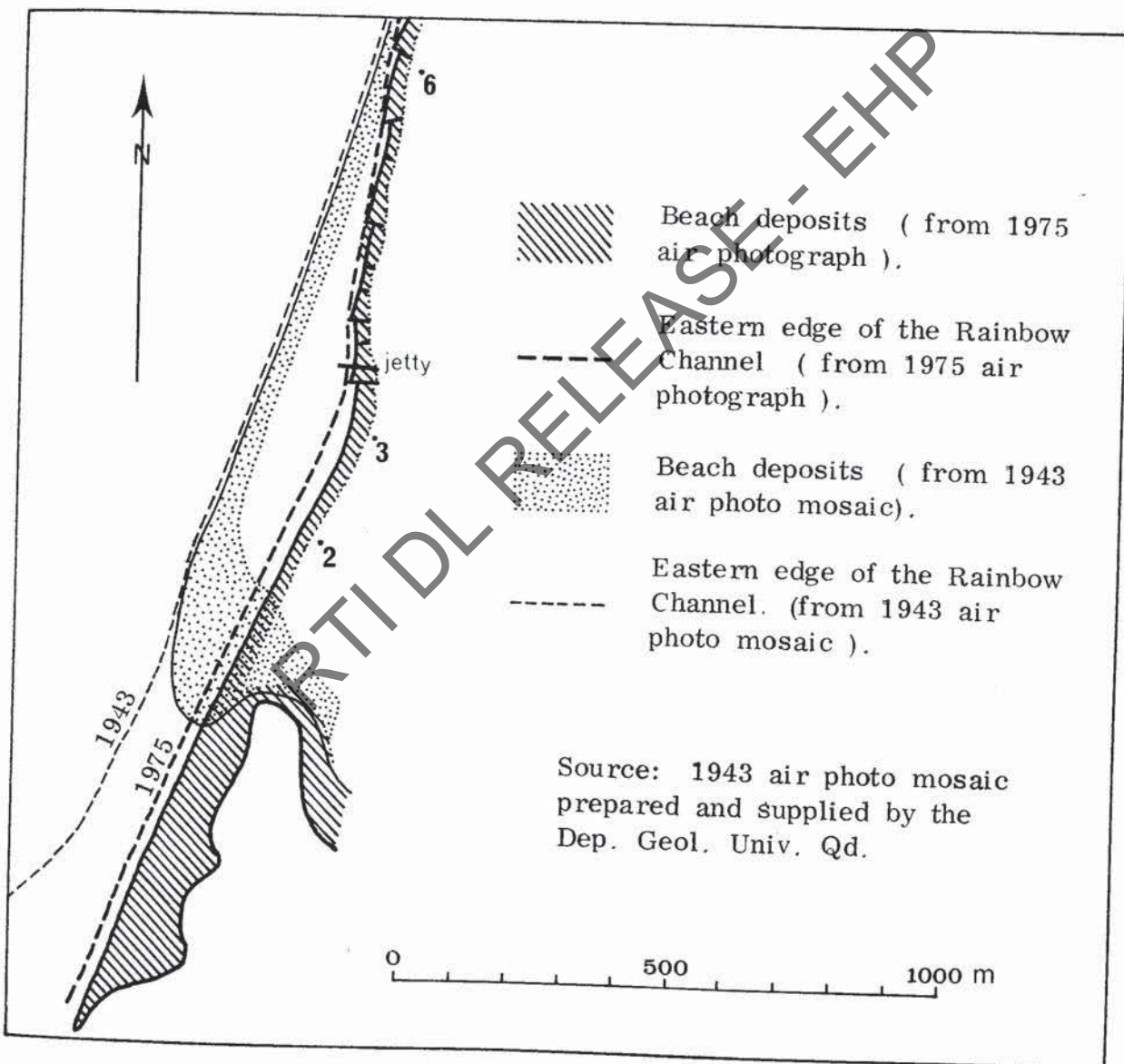
historical writings, survey records and sequential aerial photographs. In 1913 Thomas Welsby, local historian and yachtsman, stated that he had known large ships which had carried away tons of sand at Amity. In a later work (1922) he also recorded how those who obtained land in the subdivision of 1886, became watertitle-holders after Rainbow Channel had moved eastwards. The easterly displacement of the channel is evident on aerial photographs (Text-fig. 3), and successive positions of high water mark (Text-fig. 4) shown on the Town Plan provide evidence of the substantial and continuing erosion.

Slumping is not the only process effecting channel migration. Erosion of the channel side progresses steadily with time, and may be related to tidal scour (see Brunn & Gerritson 1960). Aerial photographs show the development of a shelf extending from above low water mark to the edge of the channel following the construction of groynes in 1955. Wooden groynes were in use at Amity Point prior to the investigations of Patterson (1970), Edwards (1971), and Higgins (1971) but the construction of substantial rock groynes since 1972, has added a new dimension to the pattern of erosion.

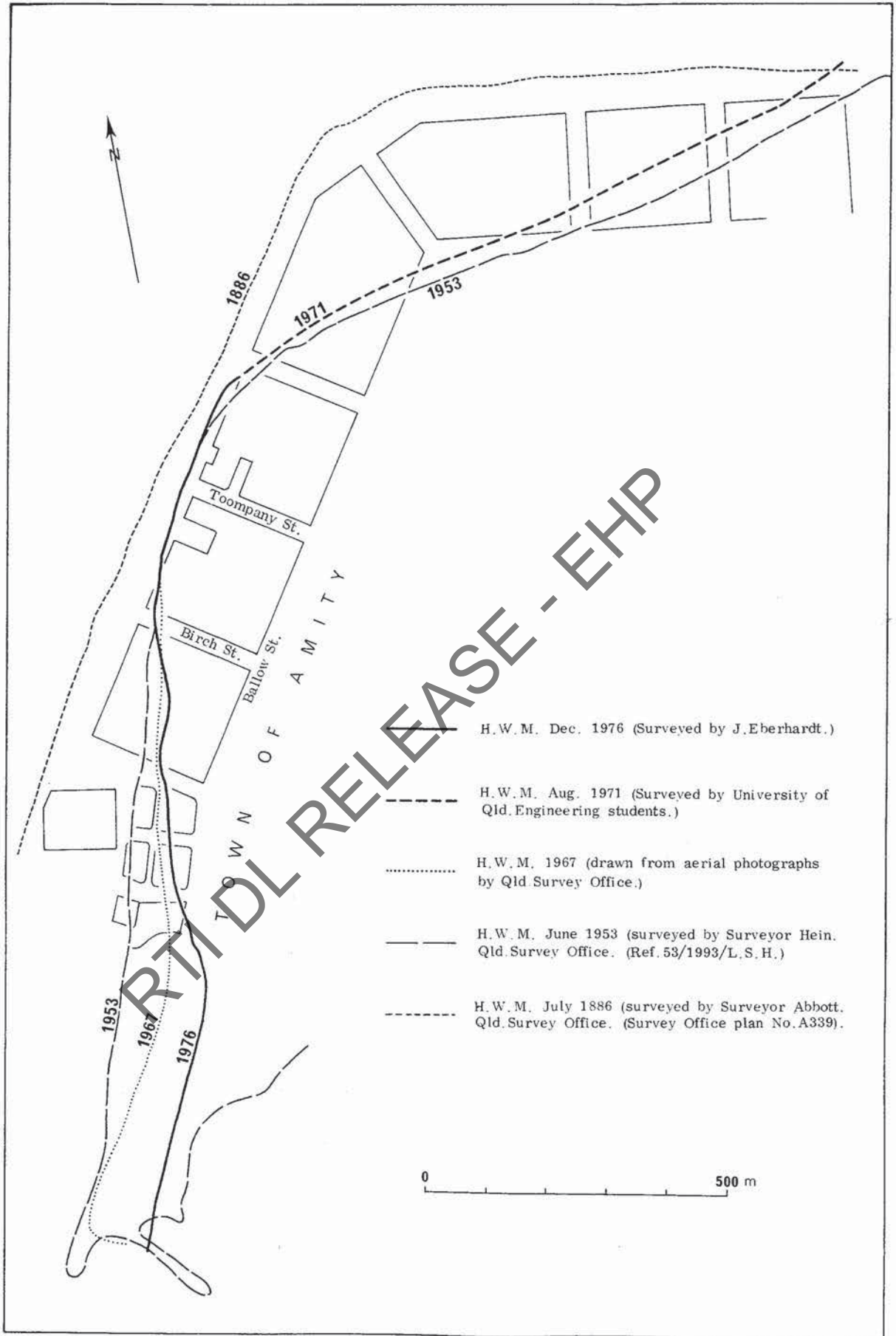


Text-fig. 2 Inlet changes (1892-1971)

Beach profiles surveyed in January 1972 by Beach Protection Authority, have been compared with profiles surveyed during the current investigations. These confirm an easterly migration of the edge of the channel, at an average rate of 1.5 m per year for all points south of survey point 7 (Text-fig. 1). The position of high water mark has receded at unequal rates, averaging 3 m per year (approximately) in the southern area, and less than 2 m per year on profiles 6 and 7. Beach profile changes over the past year do not conform to this longer trend, since positive changes have been recorded on profiles 2, 7 and 8 (see Text-fig. 5).

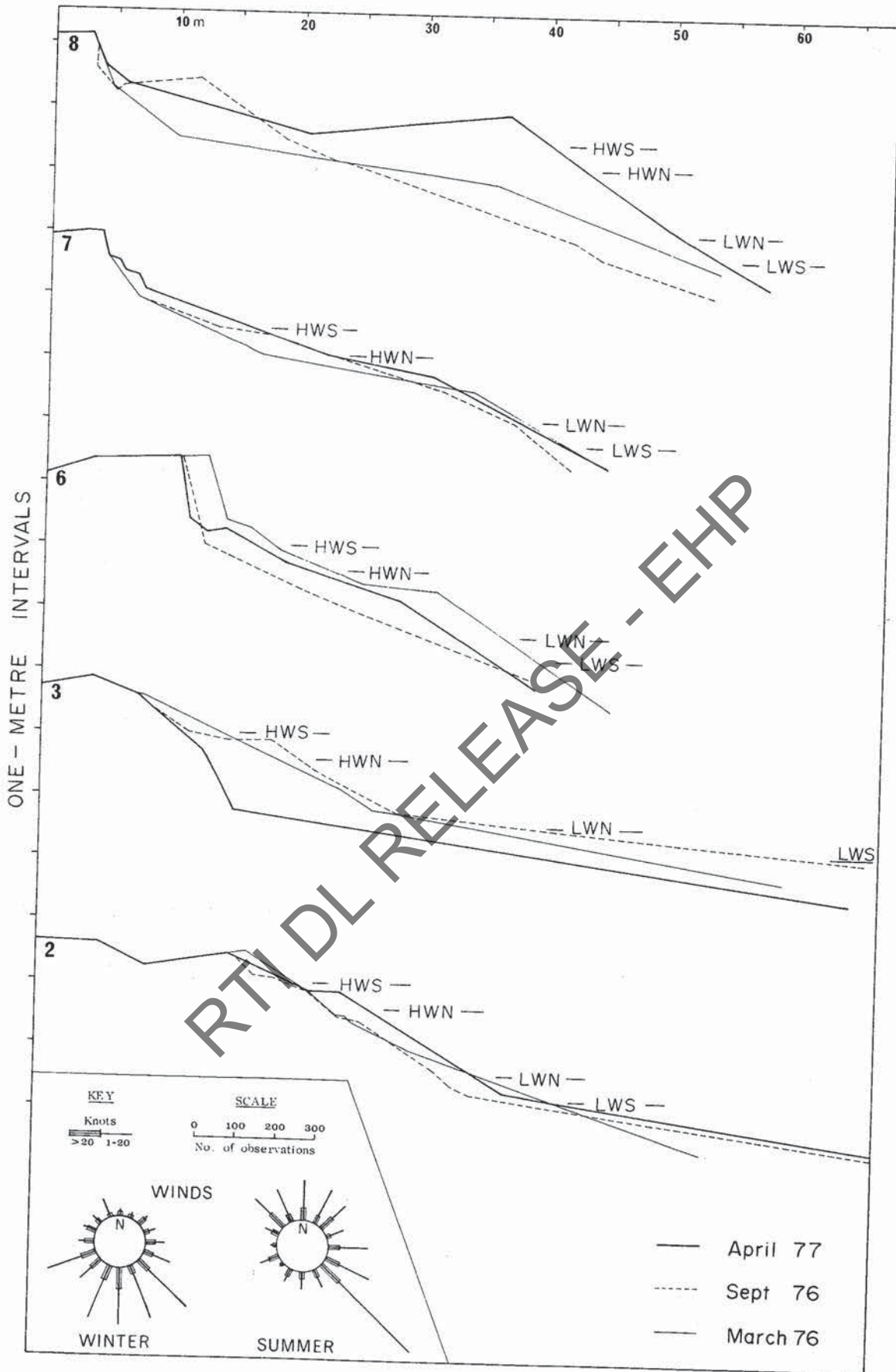


Text-fig. 3 Shoreline changes at southern Amity Point (1943-1975)



Text-fig. 4. Coastline variations at Amity Point (1886-1976).

Source - Beach Protection Authority, map number Sc881.



Text-fig. 5 Beach profiles at Amity Point to show seasonal changes. For locations of profiles see Text-fig. 1, page 83. Note that the profiles are oriented east to west as viewed from the north.

Tracing of sediment movements on the beach under north-easterly and south-easterly conditions, over the complete tidal cycle using the technique of Flood (1974) showed net movement of sediment southwards along the beach. Only small numbers of fluorescent sand grains were detected south of groyne A in the weeks following the release of tracers on profile 7. It is, therefore, possible that the groynes serve to deflect sediment from the beach into the channel, where it is carried away by strong tidal currents. To the south of groyne A the increasing width of the shallow shelf allows the deposition of sand. This is returned to the beach during periods of constructive wave action, and has promoted the elongation of the southern spit (see Text-fig. 3).

CONCLUSIONS

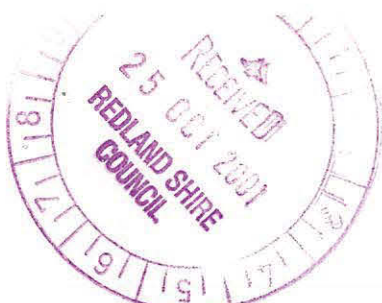
The erosion of Amity Point is primarily due to the easterly migration of Rainbow Channel and this is associated with a shift in the alignment of the South Passage. Rainbow Channel is also affected by strong tidal flow and occasional slumping, due to over-steepening of the channel banks. Strong wave action causes sand to be lost from the shore to the channel, so that erosion is at a maximum where the channel is closest inshore.

The construction of rock groynes across the beach has accelerated erosion in the area most affected by the migrating channel. Limited local stability has been achieved in the area immediately to the north of the groyne system but increased recession of the shoreline has occurred on the down-drift side of each groyne.

REFERENCES

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- EDWARDS, B.N. 1971. An investigation into the erosion problem at Amity Point. Univ. Qd B. Eng. Thesis (unpubl.)
- FLOOD, P.G. 1974. Sand movements on Heron Island - a vegetated sand cay. Great Barrier Reef Province, Australia. *Proc. Int. Symp. Coral Reefs. 2nd, 1973* 2, 387-394. Gt. Barrier Reef Comm., Brisbane.
- HIGGINS, R.J. 1971. The erosion of Amity Point Beach, Univ. of Qd B. Eng. Thesis (unpubl.).
- MAXWELL, W.G.H. 1970. The sedimentary framework of Moreton Bay, Queensland. *Aust. J. Mar. Freshwat. Res.*, 21, 77-88.
- PATTERSON, D. 1970. Amity Point erosion. Beach Protection Authority, Qd, Rept. 21 (unpubl.).
- THOMSON, A.K. (Ed.) 1967. *The Collected Works of Thomas Welsby, II*, Jacaranda Press Pty. Ltd., Brisbane.

J.M. Eberhardt
Department of Geography
University of Queensland
St. Lucia, Queensland, 4067.



KING & COMPANY
SOLICITORS

Phil I have asked Steve to ascertain if we have control of these foreshores. FIT
145/002/002
2001

OUR REF: SFC:AC:AA5049

YOUR REF: WO04 002

DATE: 25 October, 2001

Level 6, Quay Central
95 North Quay, Brisbane Qld 4000
[PO Box 758, Brisbane Qld 4001]
Phone: (07) 3236 1199
Fax: (07) 3236 1885

Received 30.10.01

Keith Do you have stock advice yet?

Page 1 of 3

To: The Chief Executive Officer
Redland Shire Council

Attention: **Keith Ingerman**

Facsimile: 3829 8765

From: Stephen Fynes-Clinton

AMITY FORESHORE PROTECTION

Thank you for your facsimile dated 10 October 2001.

The circumstances outlined in your instructions indicate that Council has a duty of care in relation to the risk of persons or property being injured or damaged by a rock wall collapse. That duty has two possible bases:-

- A duty based on the fact that, although Council is neither a construction or approving authority for the rock walls, Council has actual knowledge (based on advice from the Beach Protection Authority) that existing and future rock wall construction may constitute a hazard, and therefore has a duty to provide that information to landowners as part of the process of supplying them with rock (or possibly even a duty to cease supplying the rock).
- On the assumption that the foreshores had been placed under Council's legal control under s 936 of the *Local Government Act 1993*, a legally distinct duty of care, similar to the duty owed by Council in relation to other public places under its control, to take all reasonable steps to ensure that known hazards on such areas are eliminated or minimised or, if that is not possible, to ensure that persons who may be injured or who may suffer property damage are warned about the hazard and effectively kept away from it.

In relation to the first basis for the suggested duty, we do believe that Council is under a duty to make the residents aware of the information which it has received and to impress upon them the necessity to obtain appropriate professional advice about the level of hazard and about steps which they should take to minimise or eliminate the hazard. Given that these works are being undertaken at the free choice of the property owners, and for their own direct personal and financial benefit, and that Council has no role to play in terms of being a statutory approval authority or in terms of giving any kind of statutory direction that the work be carried out, we do not think that Council's duty of care goes any further than this.

If the residents, having been clearly and explicitly warned of the risks and the necessity to obtain appropriate advice, knowingly choose to continue the existing practice, there is no basis in legal principle by which Council can be held liable for the consequences merely on the basis that Council has supplied the rock. The rock itself is not a defective, hazardous or inherently dangerous product, so that no products liability type issue can arise. Outside the field of products liability, a party which sells (or donates) goods or services which are then used or transformed for some particular purpose by the recipient is not

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2A

responsible for the legal consequences of what the recipient does. The property owners are in no sense agents of the Council or otherwise carrying out work or taking actions which can in any legal sense be linked back to actions or decisions by the Council. Accordingly, if matters were to end there, our advice to Council would be simple advice that the supply of rock may continue subject to Council ensuring that each landowner has been explicitly notified about the risks identified by the Beach Protection Authority and the necessity, in their own interest, to engage professional advice to assess the likely magnitude of the risk which they do in fact face, and whether there are ways in which the existing work could be modified or rectified (and different ways in which future work could be carried out) to minimise any risk which does exist.

It is, however, necessary to consider the second basis for possible liability. This discussion begins with the assumption that a gazette notice has been made under s 936 of the *Local Government Act 1993* (or that a notice was made under the corresponding provision in s 45 of the previous Act) placing all foreshores within the Shire, including the Bay Islands foreshores, under Council's legal control. If that is not the case, or at least is not the case for the Amity Point locality, the following discussion is academic and can be disregarded.

However, if (as we suspect) the relevant foreshore is technically under Council's legal control under s 936 of the current Act (or s 45 of the previous Act), we then have a situation where a public area which is under Council's day to day control and management contains a hazard to persons or property of which Council is aware. In these circumstances, apart from having knowledge of the risk, Council also has the legal ability to take positive action to remedy or minimise the risk. That legal power arises as part of the powers that go with statutory management regulation and control under s 936. Council's local law dealing with parks and reserves (which includes foreshores) also contains powers which enable Council to take positive action to remedy or minimise the hazard which may exist.

This is a much higher order duty of care than under the first alternative. You will be generally aware of the recent High Court decision which abolished the "non feasant" immunity in relation to the repair and maintenance of roads. The decision was not in fact limited to roads, and the majority judgement outlined general principles about determining the scope of a local government's duty of care for a range of public places under its control. As with all legal principles of this kind, the court did not lay down anything prescriptive or "black and white", but the basic thrust of the majority judgement is that a local government which knows of a potentially serious hazard on land under its control is under a duty of care to take all reasonable steps, having regard to its resource constraints and other priorities, to minimise or eliminate that hazard or, if that is not possible, to take all reasonable steps to effectively warn about the existence of the hazard and to keep people who might be injured (or who might suffer property damage) physically away from that hazard.

Applying those principles to Council's situation, and taking a conservative view as one must do in cases where a duty of care clearly exists and the only question is that of how far Council needs to go in discharging that duty, we think that Council's duty of care requires it to commission a consultant's report of the type referred to in the last paragraph of the letter from the Beach Protection Authority. We obviously appreciate that this is not something for which Council will have budgeted, and that Council has both limited resources and a range of other priorities. However, in circumstances where we are talking about a study which would presumably cost something in the thousands or low ten thousands of dollars, and where that matter is considered against the background of the possible magnitude of the risk to life and property and against Council's overall financial resources, we think that there is little doubt that Council's duty of care as statutory authority with control of the foreshore requires it to undertake this study.

This conclusion is not affected by the fact that part or all of the rock walls may be on surveyed private property rather than on areas which legally form part of the foreshore. On our understanding of the material, the foreshore area is clearly an area of risk, and that is sufficient to invoke Council's duty. To

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Release

the extent that it is necessary for Council or its consultant to enter onto private property to carry out the study, s 1070 of the *Local Government Act 1993* provides ample authority for that entry.

The foregoing takes the matter as far as is possible on our present limited instructions. Clearly, the first step to be undertaken is to determine one way or the other whether the Amity Point foreshore is legally under Council's control under s 936 of the Act (or s 45 of the previous Act). If not, Council's duty of care can be discharged simply by providing the landowners with appropriate information about the risks identified and about what they should do in their own interests to have those risks investigated and assessed.

However, if the foreshore is under Council's legal control, the only legally safe view is that Council has a duty of care to take more pro-active action which starts, unless the cost is absolutely prohibitive, with obtaining a consultancy report of the type referred to in the letter from the Beach Protection Authority.

Please contact Stephen Fynes-Clinton if you wish to discuss any aspect of this advice, or require further assistance generally.

Yours faithfully
KING & COMPANY

sch4p4(6) Personal information

Writer's e-mail: sfc@kingandcompany.com.au

H:\Amanda\SPC\Daily\2001\October\2502.doc

RTI DL RELEASE - EHP

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"Where will our knowledge take you?"

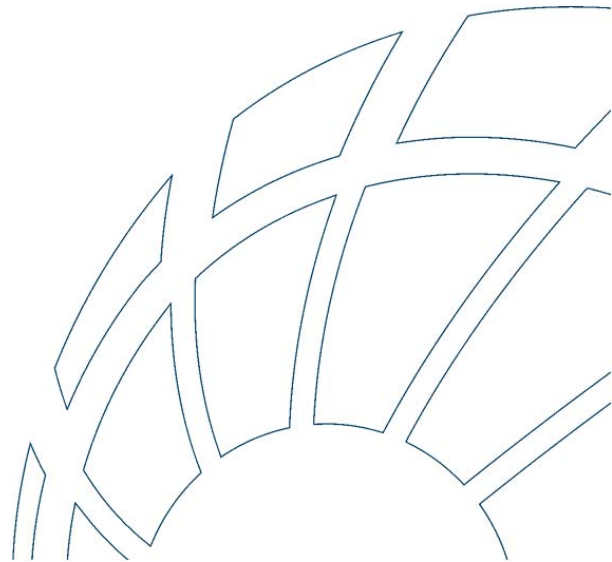
Amity Point Erosion

Review 2011

Malcolm Andrews

March 2011

RTI DL RELEASE - EHP



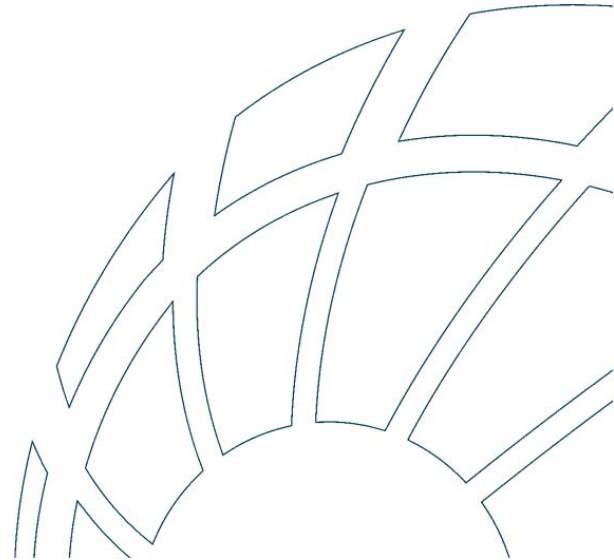
Content of Presentation

Part 1 – Understand Coastal Processes

Part 2 – Consider Management Options and Approval Process

Part 3 – Council's Position

RTI/DI RELEASE - EHP



Coastal Process Considerations

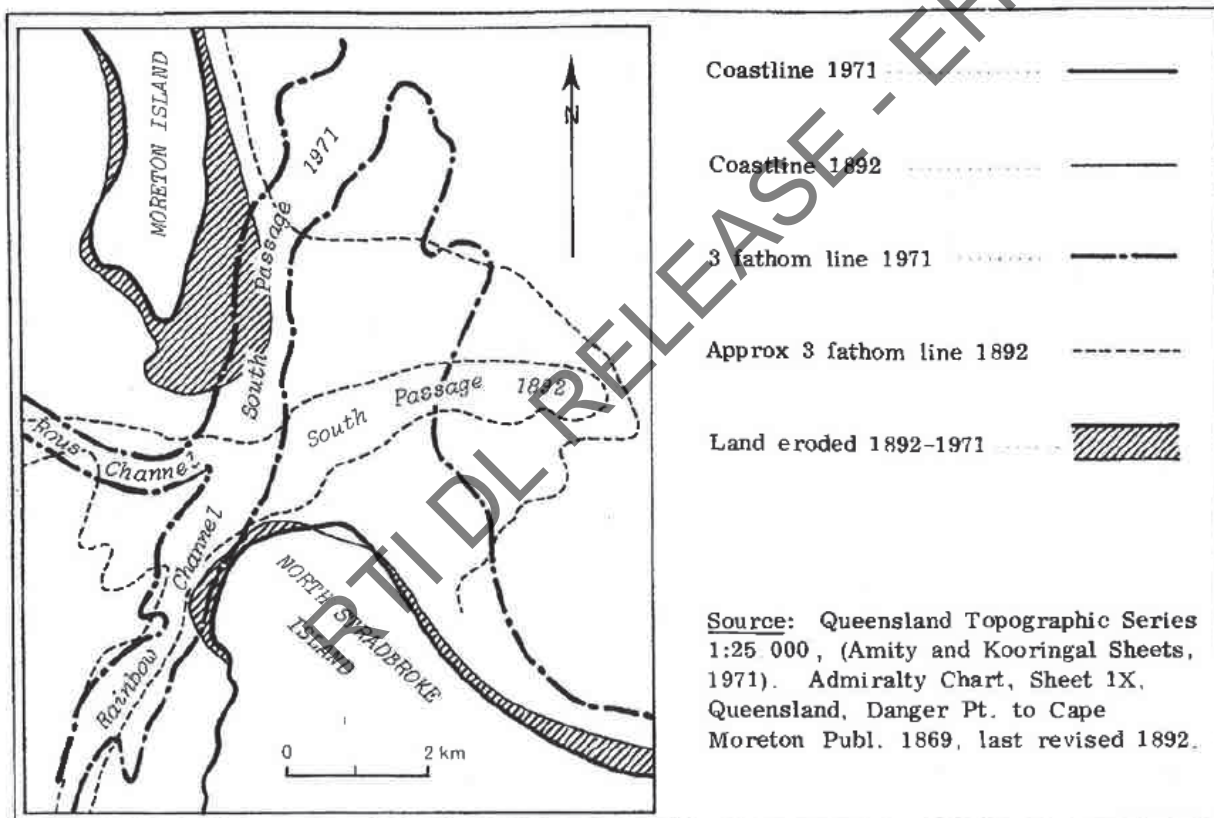
Regional Coastal Processes

- Historical
- Winds and Waves
- Tide
- Channel depth and sand transport

Options and Approvals

- State and Regional Coastal Plans
- Local Conservation Zones
- LGA Plans

Historical Changes

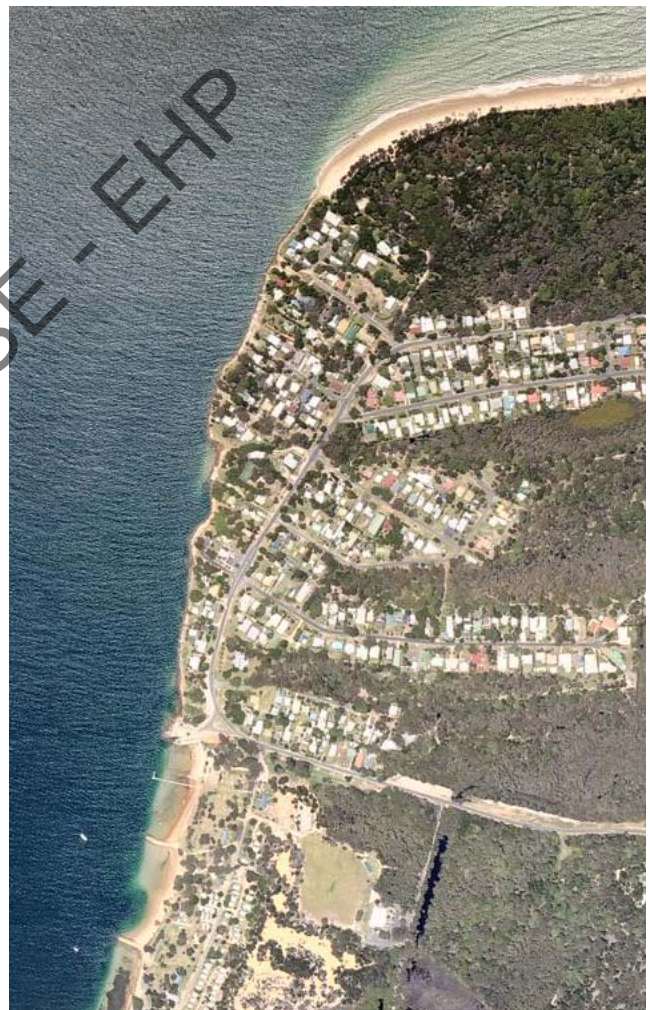


Historical Changes (cont)

- Channel alignment rotating
- Rainbow Channel becoming more dominant
- Extra pressure on Amity and Koorringal
- Recession limited by rock walls at Amity
- Loss of amenity and translated erosion problems

Recent Conditions

(Nov 2010 NearMap)

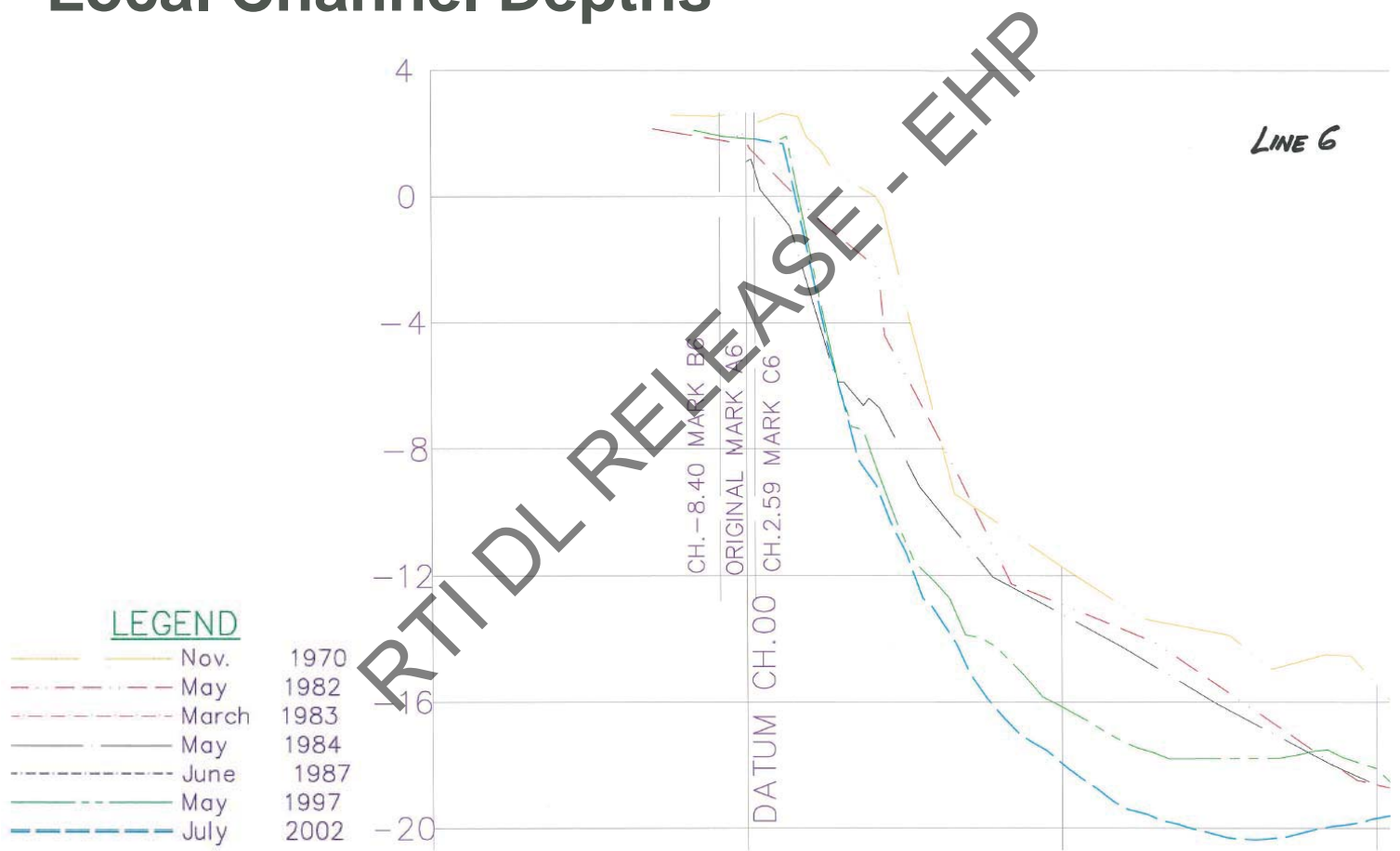


Wind, Waves and Tides

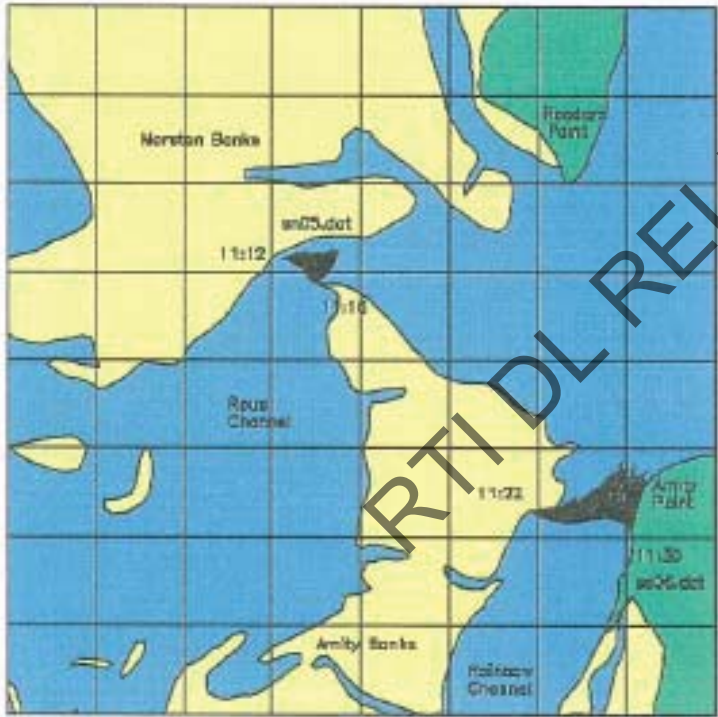
- Exposed to NW to SW winds
- Larger fetch to NW resulting in larger waves from that direction – however less frequent winds for the west
- Waves bigger at high tide as more water over shoals – can undermine walls in events
- Tides will keep channel scoured in front of rock walls
- Translated erosion problems



Local Channel Depths



Currents



- Flood tide evenly distributed across channel
- Ebb tide concentrated against seawalls at Amity exacerbating erosion

January Winds at Brisbane Airport

Date	Day	Temps		Rain mm	Evap mm	Sun hours	Max wind gust			9 am					3 pm						
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C				km/h	local	°C	%	g th	km/h	hPa	°C	%	g th	km/h	hPa			
1	Sa	20.9	27.4	2.6	6.6	0.0	SSE	33	07:17	22.1	96	8	SSE	15	1014.4	23.6	95	8	SSE	11	1012.8
2	Su	22.1	28.4	13.4	2.2	11.2	NE	28	11:22	26.5	80	4	ENE	15	1014.2	27.9	72	3	E	17	1010.8
3	Mo	23.0	29.9	0	6.2	6.9	ESE	31	13:16	27.9	72	5	SSW	13	1009.8	27.0	65	5	ESE	13	1006.5
4	Tu	21.9	28.7	0	5.4	7.8	ESE	37	15:32	26.9	62	6	SSE	11	1008.0	26.9	70	7	ESE	19	1006.3
5	We	21.6	27.9	5.0	5.2	0.0	SW	48	21:12	26.2	68	6	ESE	9	1008.2	26.6	71	6	NE	19	1004.9
6	Th	20.0	24.1	48.6	4.6	0.0	SSW	39	12:17	22.1	95	8	E	13	1005.7	19.3	93	8	SSW	6	1005.3
7	Fr	18.4	26.6	65.8		0.8	ENE	50	07:38	21.3	95	8	ESE	17	1007.6	25.7	69	7	ESE	19	1006.6
8	Sa	21.2	26.6	8.6	2.0	2.1	SSE	37	16:30	25.2	70	7	S	15	1008.1	24.4	84	8	SSE	17	1005.3
9	Su	22.1	27.1	11.6	2.4		ESE	52	15:04	23.9	92	8	SE	19	1006.9	23.9	93	8	ESE	24	1006.0
10	Mo	22.9	26.7	112.4	1.4		ENE	54	19:13	24.0	96	8	ESE	17	1006.7	25.8	88	8	E	20	1005.0
11	Tu	23.9	27.8	19.2	2.0	0.0	E	50	10:12	25.0	90	8	E	20	1008.0	24.2	96	8	E	20	1007.3
12	We	23.5	28.5	27.2	2.4		ENE	39	11:43	27.5	76	4	E	19	1010.7	27.7	77	5	ENE	22	1009.8
13	Th	23.5	28.0	0	7.8	6.9	E	41	11:35	25.9	62	3	SE	17	1013.2	26.7	56	5	SE	19	1010.9
14	Fr	21.3	28.0	0	8.2	11.8	ENE	35	11:32	25.7	62	7	SE	19	1011.6	27.2	56	5	E	17	1009.2
15	Sa	20.3	27.8	0	7.2	9.2	E	31	09:30	25.3	70	7	S	11	1009.2	26.7	53	5	ESE	17	1007.0
16	Su	18.9	28.3	0	6.2		ESE	35	12:35	26.6	62	3	SSE	17	1007.2	27.0	60	5	ESE	20	1005.1
17	Mo	18.6	31.3	0	7.0		NNE	35	16:07	26.8	52	1	SSW	11	1005.5	28.6	58	2	NE	24	1001.2
18	Tu	22.4	33.5	0	7.2	10.1	ESE	37	12:25	31.2	59	1	SW	13	1003.9	29.9	65	3	ENE	22	1003.8
19	We	24.2	30.0	0.6	4.6	10.3	ENE	35	16:06	28.0	76	6	SE	11	1007.6	28.3	74	7	ENE	20	1006.0
20	Th	20.8	28.6	9.6	4.2	8.6	SE	43	15:15	26.0	78	6	SSW	13	1008.8	27.0	70	7	ESE	24	1008.6
21	Fr	20.6	27.6	9.2	6.0	8.0	ESE	43	13:06	23.4	84	7	S	13	1012.1	26.7	62	5	SE	22	1010.9
22	Sa	18.0	28.3	0	6.4	12.5	ESE	44	14:25	25.9	58	3	S	17	1012.8	26.5	55	4	ESE	28	1011.8
23	Su	18.4	27.6	0	9.8	11.6	ESE	41	14:58	25.0	49	3	SSE	17	1010.9	26.8	51	2	ESE	24	1008.7
24	Mo	17.8	27.6	0	8.4	12.5	NNE	26	14:19	25.5	58	1	ESE	11	1010.4	27.1	52	1	NE	19	1007.7
25	Tu	19.6	28.0	0	5.8	12.8	NNE	35	15:52	25.6	67	1	N	15	1011.6	27.0	65	1	NNE	26	1010.2
26	We	21.8	28.7	0	7.4	12.8	NNE	31	13:47	26.6	65	3	NNE	9	1015.4	27.9	61	1	NE	19	1013.9
27	Th	21.2	28.7	0	7.0	12.6	NE	31	14:15	26.7	65	3	SE	13	1015.6	27.8	63	1	NE	19	1012.7
28	Fr	21.4	28.9	0	8.2	9.6	SSE	43	18:13	26.6	68	5	ESE	11	1013.5	28.4	58	3	ESE	22	1013.4
29	Sa	21.6	28.2	2.6	8.0	10.4	ESE	52	10:48	25.8	64	5	S	22	1017.6	27.1	54	2	SE	26	1016.1
30	Su	21.6	29.2	0	8.0	4.1	E	35	09:12	26.4	65	7	ESE	20	1019.7	26.4	68	7	E	17	1017.8
31	Mo	23.5	29.6	0.4	5.8	12.4	ENE	31	14:34	27.3	69	3	ENE	15	1018.4	28.6	60	3	NE	24	1015.5
Statistics for January 2011																					
Mean	21.2	28.3		5.8	7.9					25.8	71	5	14	1010.8	26.6	68	4	19	1008.9		
Lowest	17.8	24.1	0	1.4	0.0					21.3	49	1	#	9	1003.9	19.3	51	1	SSW	6	1001.2
Highest	24.2	33.5	112.4	9.8	12.8	ENE	54			31.2	96	8	S	22	1019.7	29.9	96	8	ESE	28	1017.8
Total			346.8	173.6	205.0																

IDCJDW4020.201101 Prepared at 16:20 GMT on Wednesday 2 March 2011

Local Coastal Processes

- Channel encroaching on township
- Wave exposure to NW undermines rock walls
- Channel depth ~20m
- Tidal assymetry pushes sand to south – ebb tide pushes sand to north – result = no sand and deep channel
- Erosion problems at boat ramps is a consequence of sand starvation due to seawalls

Management Options

- **Do Nothing**

- No change to present

- **Retreat**

- Will allow natural processes to occur
- Some owners will lose property

- **Rock Wall**

- Design difficult due to depth of channel
- High cost

- **Groynes**

- Design even more difficult due to depth of channel and high currents
- Very high cost

- **Sand Nourishment**

- Large quantity required initially
- Careful design required
- Susceptability to events

Approvals

To build a seawall to protect private property, residents will need a Development Approval (DA) and a Marine Park Permit.

DEVELOPMENT APPROVAL

The process for approval of development is managed under the *Sustainable Planning Act 2009* (SPA). To undertake development a person must place an application through the Integrated Development Assessment System (IDAS). The aim of a development application is to provide all the information necessary about a development for the Assessment Manager to make a decision as to whether or not the project can proceed.

The process of development application includes the following steps:

- Preparation
- Lodgement
- Referral
- Assessment

MARINE PARK PERMIT

Amity Point is adjacent to the Conservation Park zone of the Moreton Bay Marine Park. The landward boundary of this park is marked by the highest astronomical tide (HAT). A marine park permit is required for excavation and disposal works undertaken below HAT in this area of the park. An application for a permit is made to the Tourism Services – Permits section of DERM and must include sufficient information about the activity and the location to allow an understanding of the activity and assessment of its impacts. An application is made by way of a written letter to the department.

CHECKLIST OF REQUIRED INFORMATION

Development Approval

Form 1 Application Details

http://smartforms.business.qov.au/eForms03/getForm?formName=Qld_dip_spa_20091218_ver1-Form1_PF.pdf

- Applicant details
- Works details
- Owners' consent
- Resource entitlement
 - Form LA00 and Form LA08

http://www.derm.qld.gov.au/land/state/pdf/form_la00.pdf AND http://www.derm.qld.gov.au/land/state/pdf/form_la08.pdf

- Supporting information and proof of no impacts on neighbouring access

Form 6 Operational Works

http://smartforms.business.qov.au/eForms03/getForm?formName=Qld_dip_spa_20091218_ver1-Form6_PF.pdf

- Site plan
- Addressed planning scheme
- Earthworks drawings

Form 28 Prescribed Tidal Works

http://smartforms.business.qov.au/eForms03/getForm?formName=Qld_dip_spa_20091218_ver1-Form28_PF.pdf

- RPEQ plans of works
- Certificate of title
- Addressed prescribed tidal works code
- Letter of support from neighbour/ water allocation area plan

Marine Park Permit

http://www.derm.qld.gov.au/services_resource/s/item_details.php?item_id=203713

- Application to Tourism Services – DERM

Council's Position

- Supply rock from quarry including a stockpile for emergency?
- Liaise with DERM on residents behalf?
- Support DA applications?

RTI DL RELEASE - EHP

Approvals for Development of a Seawall at Amity Point

To build a seawall to protect private property, residents will need a Development Approval (DA) and a Marine Park Permit.

DEVELOPMENT APPROVAL

The process for approval of development is managed under the *Sustainable Planning Act 2009* (SPA). To undertake development a person must place an application through the Integrated Development Assessment System (IDAS). The aim of a development application is to provide all the information necessary about a development for the Assessment Manager to make a decision as to whether or not the project can proceed.

The process of development application includes the following steps:

- Preparation
- Lodgement
- Referral
- Assessment

Preparation and Lodgement

Development applications require the preparation and submission of IDAS forms and other supporting information. The forms required to be submitted are dependent on the type of development.

The development of a seawall is classed as operational works and prescribed tidal works. Works also require entitlement to State resources. This triggers the following IDAS forms and requirements:

- Form 1: *Application details* which includes evidence of entitlement to a State resource
- Form 6: *Building or operational work assessable against a planning scheme*
- Form 28: *Prescribed tidal works*

Form 1 requires details of the development application to be provided including plans from a registered professional engineer of Queensland (RPEQ), and evidence of a resource entitlement.

Development of a seawall in this location will potentially require resource entitlement for two State resources: 'quarry material' (e.g. sand and soil) and unallocated State land. That is, if the development required

allocation of quarry material below the high water mark, and/or use of land other than freehold, leased or protected land the applicant must apply for the entitlement to the State.

To gain an entitlement, an applicant must prepare Form LA00 *Contact and Land Details Part A* and Form LA08 *Application for evidence of resource entitlement Part B*. This must be submitted to the Department of Environment and Resource Management alongside IDAS Form 1 and any evidence that the works will not interfere with neighbouring access to land (such as a letter of consent).

Form 6 requires the applicant to show the works comply with the Redlands Planning Scheme. This requires showing how works meet the requirements of the Infrastructure Works, Erosion Prevention and Sediment Control, and Excavation and Fill Codes (General Codes under <http://rpsdocs.redland.qld.gov.au/>).

It must also be demonstrated how the development complies with the State Coastal Management Plan and SEQ Regional Coastal Management Plan.

Form 28 requires the applicant to show the works comply with the Prescribed Tidal Works code of the *Coastal Protection and Management Regulation 2003*. Applicants must also prove that there will be no impact on neighbouring properties or receive the consent of neighbouring owners.

All IDAS forms are to be lodged with the Assessment Manager. The Assessment Manager for prescribed tidal works is the Redlands City Council (RCC).

Referral and Assessment

All development applications are assessed by the Assessment Manager. Due to risk of the development disturbing acid sulphate soils (common in all low-lying coastal land) DERM is required to provide advice to RCC regarding the application. The applicant is able to make changes to their application in response to advice provided.

In assessing an application the Assessment Manager must take into account all applicable codes and State planning instruments identified in the above IDAS forms. The advice provided by DERM must also be considered.

The Assessment Manager must either grant approval (either in full or part) or reject the application.

MARINE PARK PERMIT

Amity Point is adjacent to the Conservation Park zone of the Moreton Bay Marine Park. The landward boundary of this park is marked by the highest astronomical tide (HAT). A marine park permit is required for excavation and disposal works undertaken below HAT in this area of the park. An application for a permit is made to the Tourism Services – Permits section of DERM and must include sufficient information about the activity and the location to allow an understanding of the activity and assessment of its impacts. An application is made by way of a written letter to the department.

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- Applicant details
- Works details
- Owners' consent
- Resource entitlement
 - Form LA00 and Form LA08

http://www.derm.qld.gov.au/land/state/pdf/form_la00.pdf AND http://www.derm.qld.gov.au/land/state/pdf/form_la08.pdf

- Supporting information and proof of no impacts on neighbouring access

Form 6 Operational Works

http://smartforms.business.gov.au/eForms03/getForm?formName=Qld_dip_spa_20091218_ver1-Form6_PF.pdf

- Site plan
- Addressed planning scheme
- Earthworks drawings

Form 28 Prescribed Tidal Works

http://smartforms.business.gov.au/eForms03/getForm?formName=Qld_dip_spa_20091218_ver1-Form28_PF.pdf

- RPEQ plans of works
- Certificate of title
- Addressed prescribed tidal works code
- Letter of support from neighbour/ water allocation area plan

Marine Park Permit

http://www.derm.qld.gov.au/services_resource/item_details.php?item_id=203713

- Application to Tourism Services – DERM

From: Rogers Ken William [Ken.W.Rogers@dnrm.qld.gov.au]
Sent: Wednesday, 2 March 2011 2:41 PM
To: Prenzler Paul
Subject: RE: Amity Point

Paul,

Sorry for not getting back to you sooner. I missed this email from you. I can't recall talking to you about this matter but my memory some times fails me if I have.

Most of the current properties at Amity Point have a right line boundary as they are lots that were created way back from the original HWM. The question to be considered is is the erosion at Amity slow and imperceptible - probably not, so the original property boundaries would remain as the erosion is caused by a fast occurring event, the change of the course of the channel?

Give me a call if this information confuses you in anyway.

Ken

Ken Rogers
Principal Land Officer, Land Management, Land Services
South East Region
Telephone: 07 3884 8069 **Facsimile:** 07 3884 8024
Mobile: 0414 444 444 (6) Personal information
Email: ken.w.rogers@derm.qld.gov.au
www.derm.qld.gov.au

Department of Environment and Resource Management
32 Tansey Street, Beenleigh Q 4207
PO Box 1164, Beenleigh Q 4207

RTI DL RELEASE - EHP

From: Prenzler Paul
Sent: Monday, 21 February 2011 4:17 PM
To: Rogers Ken William
Subject: Amity Point

Ken

I've just received a Ministerial in response to Amity Point erosion from the Progress Assoc.

Could you confirm that the eroded properties extend out over the water and therefore the foreshore is freehold and not part of the MP. I'll call you tomorrow to discuss further.

Thanks

Paul Prenzler
A/Principal Coastal Management Officer
Department of Environment and Resource Management
Floor 4, Corner Main and Vulture Streets, Woolloongabba
GPO Box 2771 BRISBANE QLD 4001
P: (07) 3238 3715
E: paul.prenzler@derm.qld.gov.au
W: www.derm.qld.gov.au

From: Prenzler Paul [Paul.Prenzler@ehp.qld.gov.au]
Sent: Thursday, 24 February 2011 1:57 PM
To: Sultmann Sel
Subject: Amity Point Photos

Due By: Monday, 5 December 8907 6:42 PM

Sel

Could you do me a favour!

Mal Andrews needs to access some aerial photos of Amity Point to assist RCC with a review of coastal processes. On my desk I left all the aerial photos from my assessment at Kooringal and they should cover amity.

He's also after the most recent photos – I thought Evan had these digitally.

Can you give me a call about this.

Thanks

Paul Prenzler

A/Principal Coastal Management Officer

Department of Environment and Resource Management

Floor 4, Corner Main and Vulture Streets, Wooloongabba

GPO Box 2771 BRISBANE QLD 4001

P: (07) 3238 3715

E: paul.prenzler@derm.qld.gov.au

W: www.derm.qld.gov.au

RTI DL RELEASE - EHP

From: Prenzler Paul [Paul.Prenzler@ehp.qld.gov.au]
Sent: Wednesday, 9 February 2011 4:17 PM
To: 'Murray Erbs'
Subject: Amity Point Info
Attachments: p02041aa.pdf

Due By: Monday, 5 December 8907 6:42 PM

<<...>>

Murray

Attached is a copy of the guideline on the preparation of a shoreline erosion management plan.

In relation to emergency works the following should be noted:

Works which are constructed in an emergency are provided for under section 585 of the *Sustainable Planning Act 2009* (SPA) and need to be assessed (post construction) under IDAS if they are identified as assessable development.

The construction of a revetment wall is assessable development and is defined as "prescribed tidal works". In this case RCC would be assessment manager for the development and DERM would be a concurrence agency.

Section 585 of the SPA applies if:

- (a) the emergency work is tidal works;
- (b) other than for this section, a development permit or compliance permit would have been required to carry out the emergency work;
- (c) the emergency work is necessary to ensure the following are not, or are not likely to be, endangered by a coastal emergency —
 - (i) the structural safety of an existing structure for which there is a development permit or compliance permit for operational work that is tidal works; or
 - (ii) the life or health of a person; or
 - (iii) the structural safety of a building.

This section of SPA requires that the person who carries out the emergency work must do the following:

- (a) prepare and comply with a safety management plan for the emergency work which considers the safety of members of the public who have access to the emergency work, and if practicable, the advice of a registered professional engineer who has conducted an audit of the emergency work;
- (b) the person takes reasonable precautions and exercises proper diligence to ensure the emergency work, and any structure to which the emergency work relates, are in a safe condition;
- (c) as soon as reasonably practicable after starting the emergency work, the person must make a development application for any development permit that would otherwise be required for the work;
- (d) the person must also provide the assessment manager (in this case Council) for the application written notice of the work and a copy of the safety management plan

Regards

Paul Prenzler

A/Principal Coastal Management Officer

Department of Environment and Resource Management

Floor 4, Corner Main and Vulture Streets, Woolloongabba

GPO Box 2771 BRISBANE QLD 4001

P: (07) 3238 3715

E: paul.prenzler@derm.qld.gov.au

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RTI DL RELEASE - EHP

Preparation of a Shoreline Erosion Management Plan

The purpose of this guideline is to provide advice to local governments in preparing a Shoreline Erosion Management Plan (SEMP) to proactively plan for erosion management in erosion hotspot areas. Key elements of a SEMP include obtaining a sound technical understanding of the physical coastal processes at the site, involving the community and engaging agencies responsible for making development application decisions. This guideline does not provide definitive advice on the development of SEMP's. A flexible approach is required to suit local circumstances.

Context

Queensland's beaches and foreshore areas are highly valued by local communities and visitors for their recreational value and they are the basis of an economically valuable tourism industry. However some of these scenic landscapes, along with the valuable development constructed on or nearby them, are under threat from shoreline erosion. Various beaches in Queensland are experiencing recurring or persistent shoreline erosion problems as a result of the dynamic nature of the coastal environment. The coastal processes of sediment transport, land building and erosion, driven by an interaction of tidal currents, waves, river flows and vegetation, continuously shape and reshape our coastline.

Developed areas impacted by erosion require balanced management to protect infrastructure and preserve coastal values and amenity. However, it is important that natural coastal processes are maintained in the process of protecting development, and where practical development is located away from areas of active coastal processes. Maintaining natural coastal processes is the most cost effective and least impacting action to protect beach environments.

Management of coastal areas that are vulnerable to erosion is complex due to varying land tenure, high recreational and ecological values, competing interests in the land and immutable coastal processes. Long term planning for these areas must also consider the potential for coastal hazards such as storm tide events and flooding and the need for adaptation to climate change induced sea level rise. In order to strike the delicate balance between providing protection for development, maintaining public access to the coast and making provisions for adaptation to climate change whilst allowing for dynamic natural coastal processes to continue, proactive planning and effective management strategies are required.

Purpose of Shoreline Erosion Management Plans

A Shoreline Erosion Management Plan (SEMP) is a non-statutory planning document that sets out an agreed framework and management strategy for responding to current erosion or potential future erosion problems. SEMPs provide a framework for the sustainable use, development and management of land vulnerable to erosion by considering the environmental, social and economic values of the land and the physical coastal processes acting on the foreshore. SEMP's also outline the appropriate uses of erosion prone land, and long term management goals as agreed upon by governments and the community.

The purpose of a SEMP is to:

Preparation of a Shoreline Erosion Management Plan

1. enable local government to proactively plan for erosion management in hotspot areas in a way that is consistent with the policies of the *State Coastal Management Plan 2001* and the relevant Regional Coastal Management Plan (where applicable).
2. investigate and address the underlying causes of shoreline erosion and likely future progression at the local scale;
3. determine cost effective and sustainable erosion management strategies that maintain natural coastal processes and resources and consider community needs in both the short- and long-term.

When is a SEMP useful?

A SEMP may be of benefit when:

- natural coastal processes in an area pose a threat to existing development such as roads and other community infrastructure or multiple private properties along a coastal sector;
- existing or proposed land uses are disrupting natural coastal processes, or are increasing the erosion risk by destroying native vegetation, removing sand or altering land levels, or changing currents and wave actions which transfer erosion to other areas; or
- natural coastal processes need to be allowed to proceed by managing an area as an erosion buffer zone or by maintaining areas free of permanent development.

Such areas may be identified in Regional Coastal Management Plans as priority areas for coastal erosion management. Local governments are encouraged to develop long-term management strategies for of these areas through a SEMP.

The preparation of a SEMP provides the following benefits to local governments and the community:

- Individual and ad-hoc property protection works can be expensive and time consuming as additional detailed information is often required to adequately assess the impacts of each proposal on coastal management. The preparation of a SEMP provides for a holistic and integrated approach to shoreline management in a local government area, streamlining the assessment process and reducing the need for multiple, costly investigations and reports.
- A SEMP can form the basis for a preliminary approval or development application for a scheme of works throughout the local government area, removing the administrative burden of managing multiple development applications and permits.
- By developing a SEMP in consultation with relevant government agencies and the community, local government can gain a clear understanding of the constraints and opportunities for shoreline management, prior to embarking on development application processes. It can also be a useful tool in managing stakeholder expectations and educating the wider community about coastal processes and available erosion management options.

Land to which SEMP can apply

SEMP's would generally apply to land where there is a community interest¹ in understanding why an area is vulnerable to erosion and how this vulnerable area is best managed. The geographical scope of a SEMP may be confined to a specific coastal section, or include all erosion prone areas within a local government area (as defined by the relevant erosion prone area plan) and land adjacent to the erosion prone area where future

¹ SEMP's are not intended as a tool to investigate erosion threat to individual private development or property.

Preparation of a Shoreline Erosion Management Plan

development is proposed in potential erosion prone areas. Erosion risk is not constrained by tenure and therefore a SEMP should apply to all types of public and private land tenure.

Consideration may also need to be given to the related management of coastal resources such as coastal wetlands and dune systems, particularly those contiguous with, or linked to, the erosion prone area.

Although a SEMP provides a management strategy to deal with shoreline erosion in specific localities, the studies undertaken as part of a SEMP may involve an investigation of the sediment transport process occurring in the broader region.

Contents of a SEMP

A SEMP may include (but not limited by²):

- an assessment, analysis and documentation of the severity of shoreline erosion and the subsequent risks posed for the community and development in the area;
- a description of the local and regional coastal processes impacting the area (specifically sediment transport processes, hydrodynamic regimes and the role of plants in erosion control and land building);
- identification of the cause of shoreline erosion, the geomorphic system responses and likely future trends in a manner that can be understood by all stakeholders;
- review of the effectiveness and suitability of existing erosion responses and strategies being implemented (including an analysis of the structural integrity and effectiveness of any existing protection works) and determine if these are consistent with Government policy;
- identification of any knowledge gaps that may limit management of shoreline erosion;
- provision of technical descriptions of shoreline erosion or buffer zone management options;
- a ranking of management options with regard to environmental, social and economic cost/benefits, sequentially prioritising options having regard to:
 - minimising adverse impacts on coastal processes and biodiversity;
 - preserving areas of high conservation or ecological values with specific reference to areas of state significance (natural resources), coastal wetlands, biodiversity³, environmental values and water quality objectives⁴, and any relevant marine park zoning plan⁵ or declared Fish Habitat Area⁶. Other international (such as Ramsar, JAMBA, CAMBA, World Heritage), national (such as Directory of Important Wetlands in Australia), State and regional designations may also be relevant and should be identified and considered;
 - maintaining or enhancing buffer zones (dunal, mangrove or riparian);
 - maintaining foreshore access and recreational amenity of the site; and
 - minimising the threat to permanent development;
 - minimising risk within storm tide Natural Hazard Management Areas.

² The actions and contents may broader or narrower depending on the extent of the erosion problem and the resources available to local government to complete the SEMP.

³ See the *State Coastal Management Plan 2001* and relevant regional coastal management plan (if any).

⁴ See *Environmental Protection (Water) Policy 1997* and the *Queensland Water Quality Guidelines 2006*.

⁵ prepared under the *Marine Parks Act 2004*

⁶ declared under the *Fisheries Act 1994*

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- a recommendation of the preferred management strategy based on the ranking;
- an outline of the estimated costs associated with the preferred management strategy and possible funding sources;
- a summary of potential sources and costs of materials should a preferred management strategy require the use of sand for nourishment or rock for seawalls;
- a program or strategy to implement preferred erosion/buffer zone management works;
- details of all Federal, State and Local Government development approvals and requirements that may be required to undertake works associated with the recommended management strategies; and
- a summary of how the preferred management strategy complies with all relevant legislation particularly the *Coastal Protection and Management Act 1995* and relevant policies of the State coastal management plan — Queensland's coastal policy (State Coastal Plan) and any Regional Coastal Management Plan (Regional Plan).

Stakeholder roles

Local government

Generally, council will lead and administer a SEMP project and be responsible for implementing erosion mitigation measures. Council's role in developing a SEMP may include⁷ (but not limited by):

- selecting, forming and administering a project Steering Committee;
- establishing a community participation program;
- preparing a terms of reference/expressions of interest (generic template attached) for interested consultants;
- selecting an appropriate consultant and administer the contract of engagement;
- collating preliminary information for the consultant;
- conducting a community consultation/participation program;
- updating the steering committee;
- making final decisions regarding the implementation of management options outlined in the SEMP, based on advice/comments from the Steering Committee and the community; and
- implementing the preferred management strategy including obtaining the relevant statutory approvals, overseeing programs of works, and regularly monitor and review the effectiveness of the preferred management strategy⁸.

Environmental Protection Agency

The EPA is available to provide technical direction and expert coastal advice and ensure the objectives of the *Coastal Protection and Management Act 1995* are met. The key roles of the EPA may include:

⁷ The availability of resources may warrant local government to restrict their role and the outputs of the SEMP or undertake the SEMP in sequential stages.

⁸ The monitor/review/update cycle should be based on a timescale of approximately 5 years

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- assisting council set the terms of reference for any investigation;
- providing access to coastal data held by the EPA;
- providing technical guidance and expert knowledge on coastal processes, coastal resources and their values (including biodiversity and habitat values) and techniques to manage coastal areas;
- addressing any matters affecting the EPA's estate (e.g. National Parks) or State Marine Parks;
- ensuring the erosion mitigation options and the final management strategy are consistent with the State and Regional Coastal Management Plan policies and other relevant policies and guidelines for coastal development; and
- considering the SEMP as a pre-design agreement between the relevant agencies as a means of facilitating future development approvals for proposed works⁹.

Consultant

Consultants may be engaged by local government to undertake the required studies used in preparing a Shoreline Erosion Management Plan. The consultant reports to the Project Manager and the Steering Committee. Generally the consultant is responsible for:

- addressing the terms of reference and abiding by the contract conditions;
- providing progress reports and information regarding key findings and recommendations to council's project manager, the Steering Committee and the community;
- collating and incorporating comments received from stakeholders on draft versions of the SEMP;
- presenting the Shoreline Erosion Management Plan to Council, and the community.

Steering Committee

The local government is responsible for determining membership of the Steering Committee. Based on the role of the Steering committee, membership may include representatives from relevant State Agencies and should include relevant expertise to undertake the roles and responsibilities defined by the project manager. The Steering Committee's role may include (but is not limited by):

- advising on the preparation of the SEMP;
- provide guidance, advice and direction for the Project Manager;
- provide advice on proposed public consultation arrangements;
- evaluate management options presented by the consultant especially with regards to compliance with the relevant legislation and policies; and
- provide feedback to the consultant on draft versions of the SEMP.

To ensure all State Agency interests are appropriately reflected in the final management strategy and in turn streamline future development applications, the following State Agency representatives may be members of the Steering Committee:

- Environmental Protection Agency – Coastal management, environmental protection, cultural heritage management or EPA estate management.

⁹ The completion of an SEMP is not a pre-requisite for assessment of a coastal development proposal by the EPA however, the SEMP process could be used to identify all works requiring approval and one integrated development application could then be prepared for all works required to implement the management strategy.

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- Department of Primary Industries and Fisheries - to ensure the development of the management strategy and any associated works does not impact on fish habitats and marine plant values

Community

The local community should be consulted on the draft SEMP and asked to provide feedback on the management options provided. The Steering Committee may establish a Reference Group of interested community members to carry out this role. It may also be beneficial for a Reference Group to provide scope for the project by contributing to the development of the terms of reference. This will ensure community expectations are met by the consultant when preparing the SEMP. All landholders in areas with a defined problem would be encouraged to participate or express their views.

Procedures for developing a SEMP

In consultation with the Steering Committee, the project manager will prepare a terms of reference (generic template attached) which outlines the specific elements of the SEMP and the respective requirements of any consultant engaged to prepare the SEMP¹⁰. The development of a SEMP should be generally based on the following methodology:

1. If the SEMP is to address more than one erosion "hot spot", divide the coastal section into logical units or localities for individual investigation. This could be based on physical boundaries such as headlands or river entrances or administrative boundaries.
2. Identify coastal resources including wildlife and vegetation communities (such as shoreline vegetation, migratory shorebirds, nesting turtles, and intertidal communities), environmental values and water quality objectives of waters in each locality and their relative importance with regards to biodiversity conservation, water quality protection and maintenance of coastal processes.
3. Identify and describe the physical coastal processes at work in each locality.
4. Determine the threats within each coastal locality and describe present and emerging risks to people, property and the environment from shoreline erosion. In addition, the benefits of the coastal areas to the community should be outlined.
5. This information is then used to outline the processes required to retain a coastal resources and maintain or return a stable coastline. This should be based on a planning period of up to 20 years and would comprise:
 - mapping the erosion prone areas showing the various land uses with particular emphasis on property, infrastructure (including roads and access points), existing coastal protection works and areas of high conservation value (environmental, cultural and recreational);
 - a description of the environmental, economic and social values of the developed and undeveloped areas.
 - identifying zones of present and emerging threats to existing and planned development within the erosion hazard areas. This would include coastal areas subject to active shoreline recession and areas that are apparently stable that may be affected by potential short-term storm erosion. The assessment should take into account potential impacts of coastal hazards (storm tide), natural hazards (flood), climate change and sea level rise.

¹⁰ If local government choose not to engage a consultant to undertake the SEMP, the terms of reference may not be required or would be simplified document such as a project plan.

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- identifying present and emerging pressures for preserving and enhancing public access to foreshore areas and providing additional recreation infrastructure such as walking tracks, viewing platforms, shelters etc.
 - identifying a priority listing for rehabilitating areas to create coastal buffer zones.
 - assessing erosion risks for various localities and determine an approximate ranking of importance¹¹.
6. For each coastal locality determine options for risk treatment, including a discussion of:
- descriptions and conceptual designs of the options available to limit erosion threats to development and coastal values, including the “do nothing” case; and
 - a “triple-bottom line” benefit-cost analysis of the options with specific reference to State and Regional coastal management plan outcomes that will be achieved.
7. Seek stakeholder input on proposed options. The objectives are to:
- gather information and improve estimates of the economic and social values of various coastal localities;
 - obtain feedback from stakeholders on the various options and associated costs, benefits and impacts and incorporate this knowledge into refinements of possible options; and
 - seek advice from the relevant State Agencies¹² with regards to compliance with relevant legislation and policies and approval requirements for any works required to implement the various options identified.
8. Develop a recommended management strategy. This would comprise:
- an assessment of each risk management option taking into account all environmental, economic and social factors;
 - with relevant stakeholder input, determining a priority list of recommended actions including timings and estimated costs; and
 - with relevant stakeholder input, determining the recommended review process for the SEMP including performance criteria, monitoring programs, timings and reporting responsibilities.

The development of a SEMP is likely to require specialist technical and planning advice. The terms of reference for a SEMP should be carefully tailored to suit the coastal section and may not include the complete methodology outlined above.

EPA can assist in the formulation of a SEMP. To obtain further information or a copy of a generic terms of reference template email coastal.support@epa.qld.gov.au.

¹¹ If local government are undertaking the SEMP process as a staged approach, this ranking is used to identify which stages are to be completed first.

¹² In addition to the State Agencies who may be represented on the Steering Committee the following may need to be consulted: Department of Natural Resources and Water regarding acid sulphate soils, the Department of Transport (Maritime Safety Queensland) regarding potential impacts of protection works on navigational safety and the Department of Emergency Services regarding disaster mitigation.

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Disclaimer:

While this document has been prepared with care, it contains general information and does not profess to offer legal, professional or commercial advice. The Queensland Government accepts no liability for any external decisions or actions taken on the basis of this document. Persons external to the Environmental Protection Agency should satisfy themselves independently and by consulting their own professional advisors before embarking on any proposed course of action.

Approved

Tony Roberts

Signature

7/12/06

Date

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