3 EROSION PRONE AREAS

3.1 Overview of Coastal Processes

For much of the study area, Fraser Island shelters the mainland from ocean swell waves, with wave action gradually increasing in magnitude as the beaches become more exposed to the north (BPA, 1989). Accordingly, the Hervey Bay (wave and tide dominated) and Great Sandy Strait (tide dominated only) areas have been considered separately due to the different coastal processes operating within these different parts of the study area.

Hervey Bay Coastline

Both wave and tidal processes contribute to erosion within the Hervey Bay area. Some protection from swell waves is afforded by the presence of Fraser Island and a series of offshore reefs, thereby limiting swell wave heights within Hervey Bay. In addition to providing shelter from swell waves, however, Fraser Island also limits the progress with which beach re-building may occur. As such, the beach may not have sufficient time to re-build to its pre-storm condition prior to another erosion event occurring.

The Hervey Bay coastline is characterised by a gently sloping shoreline with wide intertidal sand flats, particularly to the north. The topography is generally low relief except around Point Vernon, where a rock headland is present. Rock outcropping is limited largely to this area. There are a number of small coastal creeks (e.g. Tooan Tooan and O'Regans Creeks) and some larger estuarine systems (e.g. Beelbi and Eli Creeks). There are some mangrove and saltmarsh systems located along parts of the undeveloped coastline, with freshwater wetlands dominated by wallum heaths, and lesser areas of sedgeland and swamp forests present in the north. Development intensities along the Hervey Bay coastline are highest in the region of Pialba, Scarness, Torquay and Urangan. Most of the residential, business/commercial and tourist development occurs in these suburbs.

Great Sandy Strait Coastline

As outlined above, the coastal processes operating in the southern portion of the study area are predominantly tidally-driven due to the presence of Fraser Island, which provides protection from ocean swell waves. This area is characterised by an extensive tidal delta system formed from mobile sand shoals, and water depths are generally limited to less than 5m AHD (BPA, 1989).

The coastline also has low topographical relief in the Great Sandy Strait area, except for River Heads, which rises significantly in elevation. There are large intertidal sand/mud flats in this area, along with large wetland systems, and extensive saltmarshes and mangrove areas. Development intensities in the Great Sandy Strait are significantly lower than in the Hervey Bay area and are concentrated on small coastal townships. Access in and out of these townships is limited and the hinterland is generally low relief with large wetland areas that flood during the wet season.

3.1.1 Short and Long Term Erosion

The coast is a dynamic system in which shoreline variations and periodic inundation of some coastal areas are part of the natural coastal processes. The natural processes that influence shoreline erosion operate over variable timeframes. Activities undertaken in the coastal zone can interrupt natural sediment transport processes, and it is likely that the construction of the Urangan Boat Harbour, seawalls and other structures have in some way modified the balance of these naturally occurring processes at some distance upstream and downstream of the particular structures.

Short term erosion, which is often referred to as 'storm bite', occurs over a period of hours or days during a particular event, such as a coastal storm or cyclone. It refers to the removal of sand from the beach face due to (swell) wave attack during a storm event. This can create a vertical *erosion scarp*, which may then slump due to instability, representing a geotechnical hazard to any adjacent structures. During calm periods, the sand that was transported offshore during the storm event may be gradually transported back on shore by swell (or ocean) wave activity to re-establish the equilibrium beach profile.

Figures 3.1 shows two erosion scarps from the Hervey Bay area, approximately 0.8-1.0 m high. For the photo on the left, the full depth of the erosion scarp profile is comprised of sand, which shows that this location is an active beach environment where successive short term erosion events and beach re-building have occurred over time.

Figure 3.1: Erosion Scarp - Hervey Bay Area

Short term erosion due to storm bite occurs in the Hervey Bay area, although due to the low energy wave climate, the time necessary for the equilibrium profile to re-establish may be considerable (BPA, 1989). Seasonal changes in the swell wave climate and storm patterns result in seasonal changes in beach volume, whereby the beach volume oscillates around what would be its average or equilibrium profile.

Examples of approximate storm bite extents calculated by DERM have been overlaid on the 2030 and 2100 EPAs and mapped in Figure 3.2 for two different locations. As discussed in Section 2.4.1, storm bite forms a component of the EPA calculation. The green polygons in Figure 3.2 therefore represent that portion of the EPA width that is attributable to potential storm bite, noting however, that if two storms occur in close succession, the amount of observed erosion would be greater than for a single isolated storm event (of the same intensity) because there has been limited beach recovery between storms. If such an event were to occur, the amount of land falling within the storm bite extent would be larger.

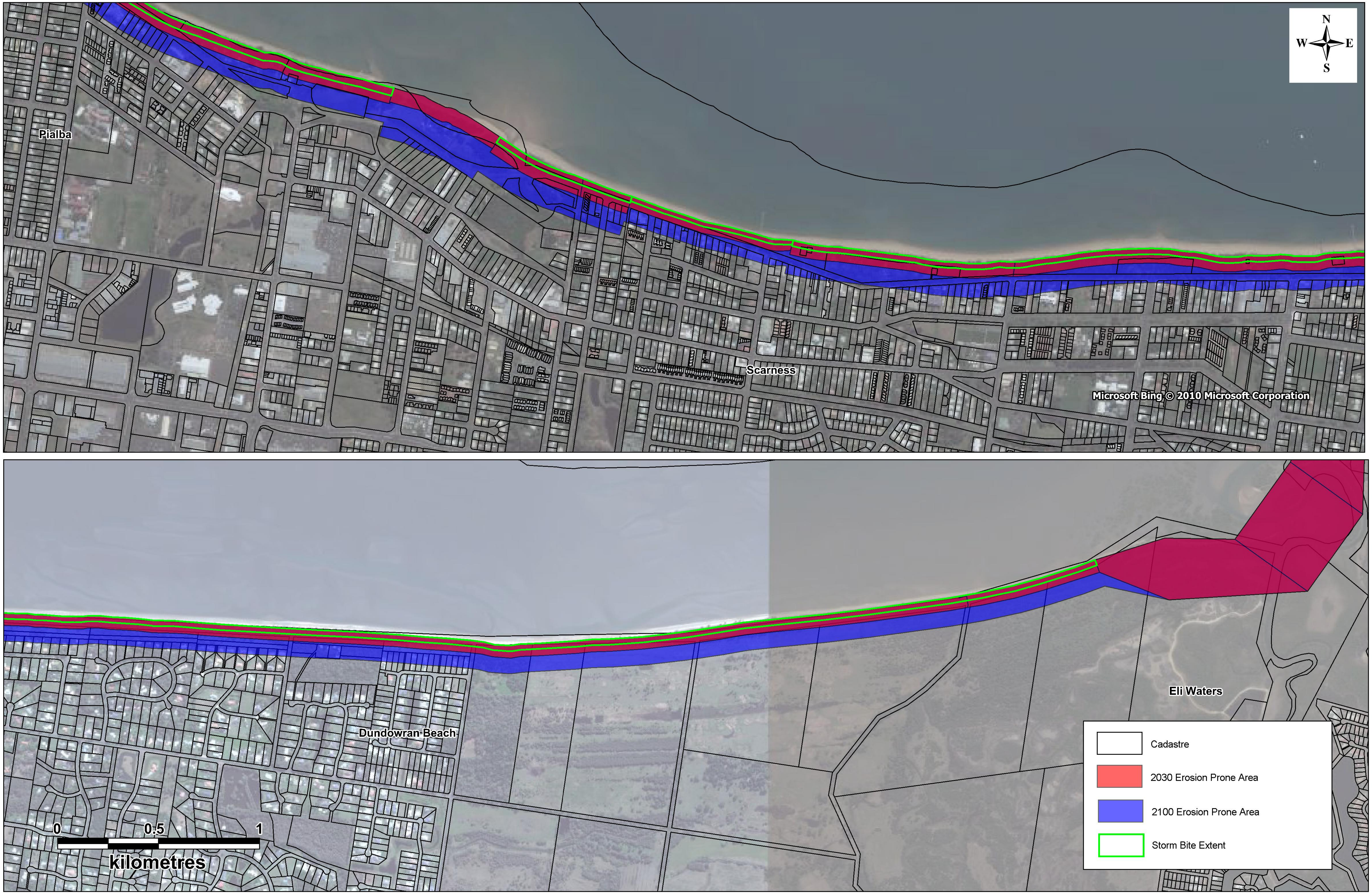

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FIGURE 3.2 STORM BITE EXAMPLE

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The type of swell wave activity that is the major contributor to beach erosion and rebuilding in most locations rarely penetrates the Great Sandy Strait due to the sheltering effect of Fraser Island. Swell waves have a negligible impact on shoreline processes in this location and DEHP have categorised it as a tide dominated area. In the Great Sandy Strait short term erosion occurs when elevated water levels allow the tidal and wind driven currents to attack the upper beach face. The higher water levels that occur during king tides and storm tide events cause the slumping of the shoreline and this small amount of sand material is then transported off the beach face by tidal currents, leaving a small (approx. 20cm high) erosion scarp. Figure 3.3 shows the typical beach profile in the Great Sandy Strait area. The profile is not as steep due to the lack of swell wave action, and a low erosion scarp is present.

Figure 3.3: Erosion Scarp - Great Sandy Strait Area

Some locations within the Great Sandy Strait may be affected by erosion from wind waves. There is sufficient fetch for local sea wave generation to be significant when the wind is coming out of the south-southeast. Those locations with exposure to these processes include parts of Poona and Boonooroo. Winds out of the southeast are strongest in March and April (BoM, 2011), and there is a risk at this time of shoreline erosion, particularly if these conditions coincide with elevated water levels.

Due to the lack of swell wave activity in the Great Sandy Strait area, any beach re-building after an erosion event is negligible and the shoreline erosion resulting from the brief period of elevated water levels (or wind wave activity) typically translates into a long term loss of sand from the beach.

Long term erosion, which is also referred to as recession, is a very gradual landward translation of the shoreline resulting from a net decrease in sediment supply. Recession occurs over periods of decades or hundreds of years. Long term changes in shoreline position have previously been estimated for the Hervey Bay area as being highly variable from location to location. Recorded estimates include 0.94 m/year (positive recession, which represents accretion) between 1868 and 1948 at Pialba, and -0.36 m/year (recession) between 1890 and1965 at Burrum Heads township (BPA, 1989).

Areas around creeks or river mouths are subject to higher rates of fluctuation due to the interaction between coastal and catchment (flooding) processes. BPA (1989) notes a 380 m wide zone of fluctuation of the mouth of Tooan Tooan Creek between 1868 and 1984. This may occur gradually, but often occurs as rapid shoreline movement during a flood event.

The rate of long term erosion or recession will also change under climate change conditions due to *sea level rise* (SLR). Rising sea levels not only result in inundation, but also the landward translation of the shoreline as the beach profile re-adjusts to the higher ocean water levels and establishes a new equilibrium profile.

Some development in the Fraser Coast LGA has occurred within coastal areas that are vulnerable to storm erosion and long term recession, and in many cases this development represents substantial private and public investment. There are a number of locations in the study area where coastal development was established in locations that were at the time considered to be secure from shoreline erosion, but have subsequently been lost or damaged. Figure 3.4 shows a location affected by long term erosion. The cadastre shows that a road previously existed seaward of the current toe of dune line and the accompanying photograph shows evidence of road base in the erosion scarp.

3.1.2 Other Processes Impacting on the Coastal Zone

Storm Tide Inundation and Catchment Flooding

This study focuses on shoreline erosion, in accordance with the requirements of the guidelines for preparing SEMPs (DERM, 2011c). There are, however, other processes operating in the coastal zone that contribute to the overall hazard, including:

- Storm tide inundation (i.e. during a cyclone or storm event); and
- Catchment flooding.

These hazards typically occur at the same time. A single storm event such as a cyclone would cause not only shoreline erosion, but also storm tide inundation and catchment flooding due to heavy rainfall. The coastal zone of the Fraser Coast region is very low lying and is therefore vulnerable to storm tide inundation and catchment flooding. Drainage is a significant issue under these conditions, and the design of any erosion management options for the study area requires careful consideration of these issues.

Climate Change

Climate change is also an important issue that will result in changes in the coastal hazard profile over time. Predicted changes associated with climate change include:

- Sea level rise (Queensland Government, 2009; DERM, 2011a);
- Increase in the intensity of cyclones (Queensland Government, 2009); and
- Increase in storm tide inundation (Queensland Government, 2009).

The key manifestations of these climate change impacts in the coastal zone will be permanent tidal inundation due to SLR and associated rises in coastal groundwater levels, which will have significant implications for drainage patterns and increase flood risk.

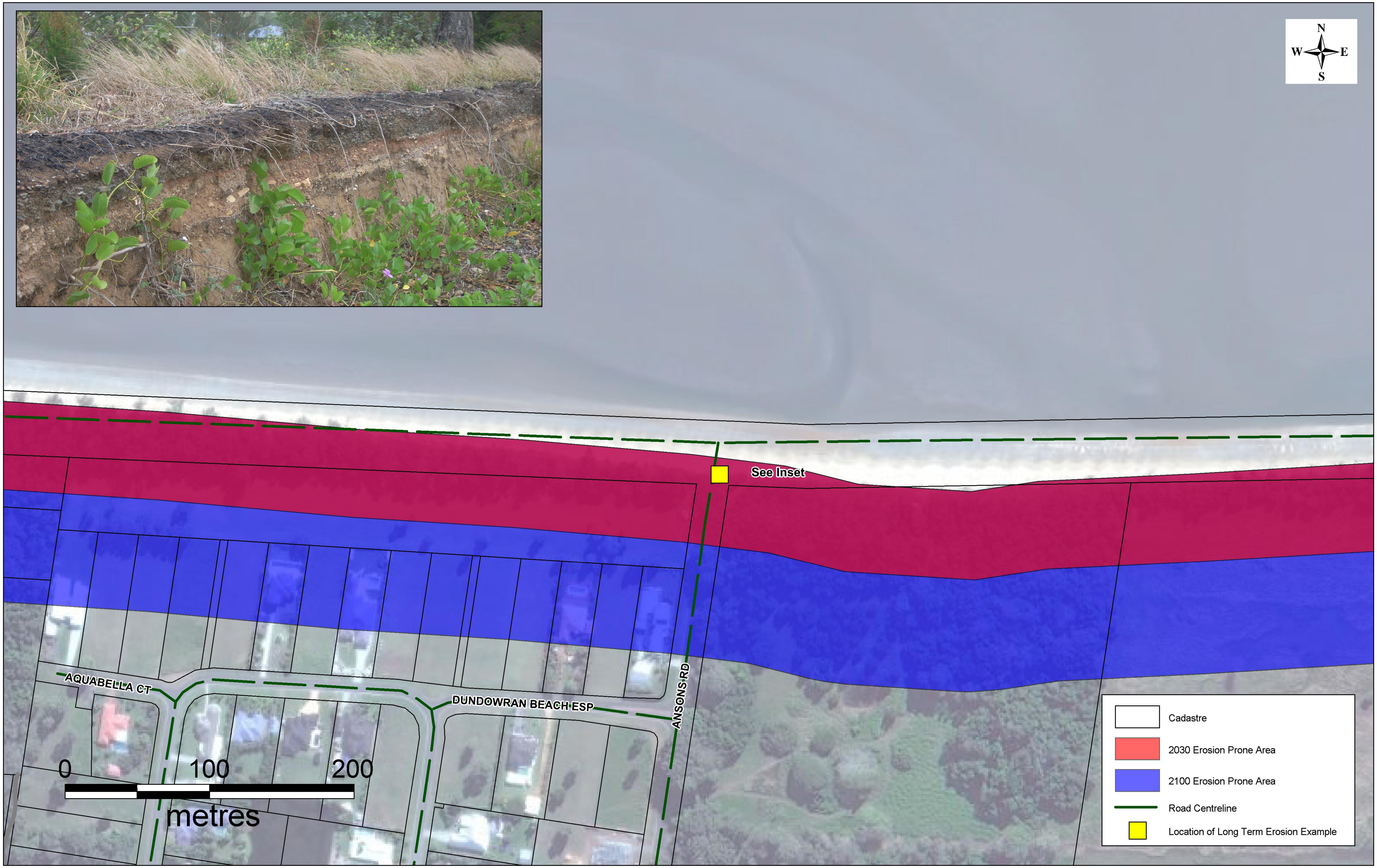

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FIGURE 3.4 LONG TERM EROSION EXAMPLE

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3.2 Existing Coastal Protection Works

There are a number of existing coastal protection works located in the study area. The location of these works has been mapped in Figures 1.1 and 1.2 based on:

- Two GIS layers provided by FCRC, which cover the former Hervey Bay LGA only (CoastalGroyne.tab and Coastalwall.TAB); and
- Field observations and aerial photography interpretation for those locations not covered by the GIS layers provided by FCRC.

The status of existing coastal protection works is described based on the previous study by Coastal Engineering Solutions (1999). No technical studies have been conducted subsequently and the information therein has been updated by observations made during the 2010 site inspection.

3.2.1 Hervey Bay Area

There are a number of coastal protection works in the Hervey Bay area, most of which are clustered around the urban centre from Torquay to Urangan. Much of the information on existing protection works in this part of the study area is based on information found in BPA (1989) and the technical assessment of foreshore seawalls conducted by Coastal Engineering Solutions (1999). It is noted that almost all the seawall structures audited in the latter study were considered likely to be subject to failure during a storm event due to overtopping.

This section presents a brief inventory of the existing coastal protection works and their condition. Further information on local coastal processes and the condition of the structures can be found in these reports.

At the time of preparation of this report no additional information was available as to current status of the existing coastal protection works, and it has been assumed that no maintenance works or upgrades have been undertaken since the Coastal Engineering Solutions report was prepared in 1999.

Burrum Heads

Parts of Burrum Heads are vulnerable to shoreline erosion due to its location near the mouth of Burrum River, where complex sediment transport processes occur due to the interaction between coastal and catchment processes (Coastal Engineering Solutions, 1999). Along the section of shoreline fronting Hervey Bay, the main structures controlling the shoreline morphology are:

- A rock seawall in three sections, running from the western end of the Lions Memorial Park to Dudley Street (Figure 3.5, left);
- Two boat ramps, one located at the end of Ross Street and one at the end of Burrum Heads Road. The boat ramps are located in between seawall sections and act as groynes (Figure 3.5, right); and
- What is referred to as a "drainage groyne", located at the end of Dudley Street at the terminal end of the rock seawall.

The 320 m long seawall section west of the Ross Street boat ramp is described as being in generally reasonable condition, although the local rock material used to construct the wall is deteriorating and there is some evidence of collapse (Coastal Engineering Solutions, 1999). The portion of the rock seawall west of the Burrum Heads Road boat ramp was described as being subject to failure due to inadequate toe protection (Coastal Engineering Solutions, 1999). The seawall section east of the Burrum Heads Road boat ramp is in better condition.

Figure 3.5: Existing Coastal Protection Works - Burrum Heads

There is also a 320 m long seawall west of the Ross Street boat ramp that protects the Lions Memorial Park. It is comprised of flexible concrete matting that is in relatively good condition, however, the local rock used in construction tends to fracture and this can affect the integrity of the seawall (Coastal Engineering Solutions, 1999). On the day of the site inspection (10/02/2010) sections of the seawall were being undermined.

Toogoom

Toogoom is located on the southern bank of Beelbi Creek where it meets Hervey Bay. It is located on the seaward side of a spit which has formed in the Beelbi Creek entrance and the shoreline is subject to ongoing erosion at this location, (Coastal Engineering Solutions, 1999). At the time of the condition assessment conducted by Coastal Engineering Solutions (1999), it was found that the stretch of rock seawall running parallel with Moreton Street was in good condition.

The rock seawalls east of Moreton Street are thought to have been constructed from a variety of rock sources, the most commonly used rock being locally quarried, although building rubble is also evident (Coastal Engineering Solutions, 1999). These seawall sections are in poor condition.

Scarness

There is a rock seawall in Scarness that runs along the shoreline parallel to The Esplanade. West of the Scarness Jetty, the seawall is in poor condition, with most of wall having failed through a combination of undermining at the toe and dislodgement of rocks off the armoured slope (Coastal Engineering Solutions, 1999).

At the time of the condition assessment in 1999, it was noted that ad hoc repairs appeared to have been undertaken with no evidence of an engineered rehabilitation of the seawall. That section of the rock seawall east of the Scarness Jetty was said to be in good condition in 1999 (Coastal Engineering Solutions, 1999), although based on the site inspection undertaken (10/02/2011) it appears that some sections are subject to failure (Figure 3.6).

Figure 3.6 Existing Coastal Protection Works - Scarness

Urangan

In Urangan the foreshore is protected by rock seawalls running from Robert Street to the Urangan Pier, and two rock groynes located at the end of Margaret and Churchill Streets. Opposite Elizabeth Street there is a section of seawall in the form of a stepped revetment, however, there is no information available on the condition of this structure and this discussion focuses on the rock seawalls. At the time of the 1999 condition assessment by Coastal Engineering Solutions, the rock seawall sections between the Pier and Churchill Street were in very poor condition in places due to degradation of the rock material. The Esplanade area and the beach south of Urangan Pier have also experienced some significant erosion, and this has been a cause of concern to the community. Some deterioration of the seawall sections along Shelley Beach was evident on the day of the site inspection (10/02/2011; Figure 3.7).

Figure 3.7: Existing Coastal Protection Works – Urangan

3.2.2 Great Sandy Strait Area

The main concentration of coastal protection works within the Great Sandy Strait area is associated with the Urangan Boat Harbour. The following formal coastal protection works are also in place:

- Rock seawalls and sloping revetments for a small number of freehold properties at various locations along the coastline;
- A seawall at the ferry terminal at River Heads;
- A failing seawall comprised of rock and concrete at Boonooroo; and
- Poor condition rock seawalls in Poona.

A number of less formal coastal protection works have also been implemented, particularly at Poona. They appear ad hoc in nature and it is not known if they were undertaken by FCRC or residents. These informal works consist of retaining walls of timber construction, low rock seawalls, and groynes constructed from sand filled geotextile bags or pieces of timber. It is anticipated that most of these types of works would likely have limited success in arresting shoreline erosion, and it is reasonable to assume that they would not provide much protection (particularly from overtopping) during a storm event or cyclone.

Some examples of the existing coastal protections works are shown in Figure 3.8.

Figure 3.8: Existing Coastal Protection Works – Great Sandy Strait

3.3 Erosion Prone Areas

The EPAs for the study area were calculated as outlined in Section 2.4.2 (and Appendix B) and mapped for each of the five management zones (see Section 2.5).

The five Management Zone are:

- *Management Zone 1: Burrum Heads to Eli Waters*
  - Encompassing EPA 77-87,
  - Swell wave/tide dominated,
  - Generally low lying sandy shoreline,
  - Incorporates Beelbi and O'Regans Creeks,
  - Low density residential development,
  - Low intensity tourism development (i.e. caravan park) , moderate levels of visitation;
- *Management Zone 2: Point Vernon to Pialba*
  - Encompassing EPAs 88-92,
  - Swell wave/tide dominated,
  - Moderately elevated topography,
  - Rocky headland with significant rock outcropping in the nearshore zone,
  - Low to medium density residential development;
- *Management Zone 3: Pialba to Urangan*
  - Encompassing EPAs 93-101,

  - Swell wave/tide dominated,
  - Low lying sandy shoreline,
  - Medium to high density residential and commercial development,
  - High level of utilisation for tourism purposes;
- *Management Zone 4: Urangan Harbour to River Heads*
  - Encompassing EPAs 102-104,
  - Largely tide dominated,
  - Steep topography near River Heads,
  - Some sandy shoreline and some intertidal mudflat areas,
  - Medium to low density residential development,
  - Some tourism and commercial/industrial development, primarily in the north (i.e. caravan park, Urangan Harbour); and
- *Management Zone 5: Boonooroo to Tinnanbar*
  - Encompassing EPAs 105-109,
  - Tide dominated with some locations affected by wind waves,
  - Very low lying coastal lands,
  - Some sandy shorelines and some intertidal mudflat areas,
  - Low density residential development in scattered townships,
  - Some low level tourism development in Boonooroo and Poona (i.e. caravan park).

Figures 3.9-3.13 show the 2030 and 2100 EPAs. For all Management Zones there is generally an increase in the width of the EPAs from 2030 to 2100, except for those 'transitional' areas mapped by DEHP corresponding to the location of creeks or rivers for which a nominal EPA width of 400 m has been adopted. The increase in EPA width from 2030 to 2100 is due to the both the naturally occurring trend of shoreline recession, which accelerates over time due to the impacts of SLR inundation and the associated shoreline adjustment. As a consequence, the number of developed areas falling within the EPAs increases over time. Changes in shoreline position and beach volume result from a combination of both short term and long term erosion processes, and therefore the SEMP will need to consider both existing levels of risk from erosion and future levels of risk. The level of risk associated with the threat of shoreline erosion is discussed in Section 6.

This increase in the width of the EPAs over time is also visible in Figures E.1-E.5 (see Appendix E), which show the EPAs for all four planning horizons: 2030, 2050, 2070 and 2100.

Community Consultation on Erosion Issues

The findings of the community survey (see Section 2.2.2) reveal that there is a high level of concern in the community about the issue of shoreline erosion and a need for certainty in the way this issue will be dealt with in the future. Recurrent themes emerging from the community consultation include:

- A sense of urgency around the need to address the existing erosion issues;
- Concern about how erosion impacts on the use and enjoyment of the shoreline by the community (i.e. lifestyle impacts);
- Concern about the restrictive nature of the regulatory environment as it relates to implementing erosion management initiatives, and the complex institutional framework around coastal management;
- Need to establish an overarching framework and program of works, and to clearly define roles and responsibilities for implementation of shoreline management works;
- Concern about the apparent lack of coastal defences and/or the poor condition of the existing protection works and the need for ongoing maintenance;
- The loss of vegetation and other environmental features to erosion;
- Development patterns within areas subject to coastal hazards such as shoreline erosion;
- A need for guidance in relation to emergency management and temporary shoreline protection works ahead of an imminent storm event; and
- The need for an equitable and sustainable long term approach to shoreline management.

FIGURE 3.9 EROSION PRONE AREAS - ZONE 1

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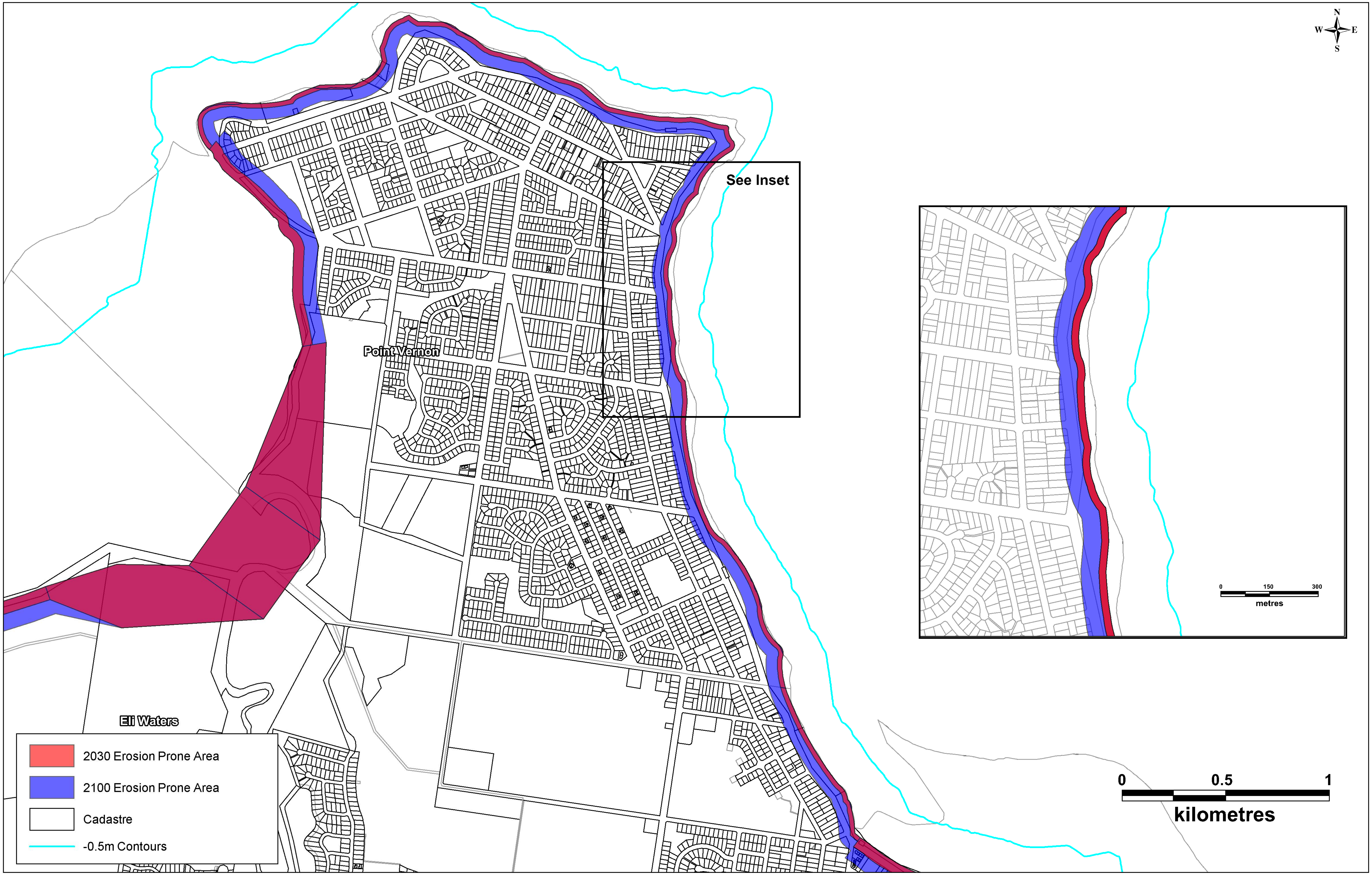

FIGURE 3.10 EROSION PRONE AREAS - ZONE 2

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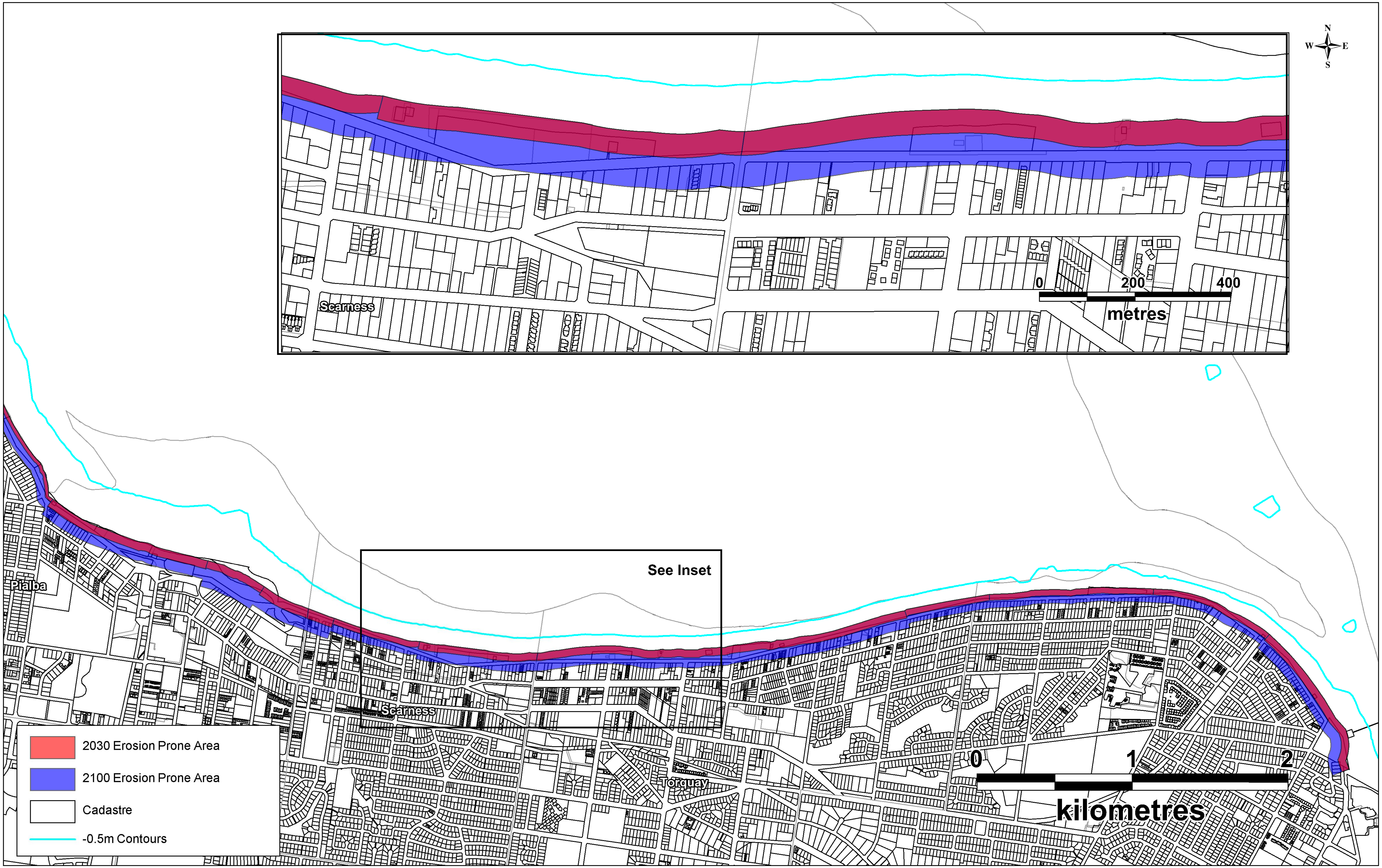

FIGURE 3.11 EROSION PRONE AREAS - ZONE 3

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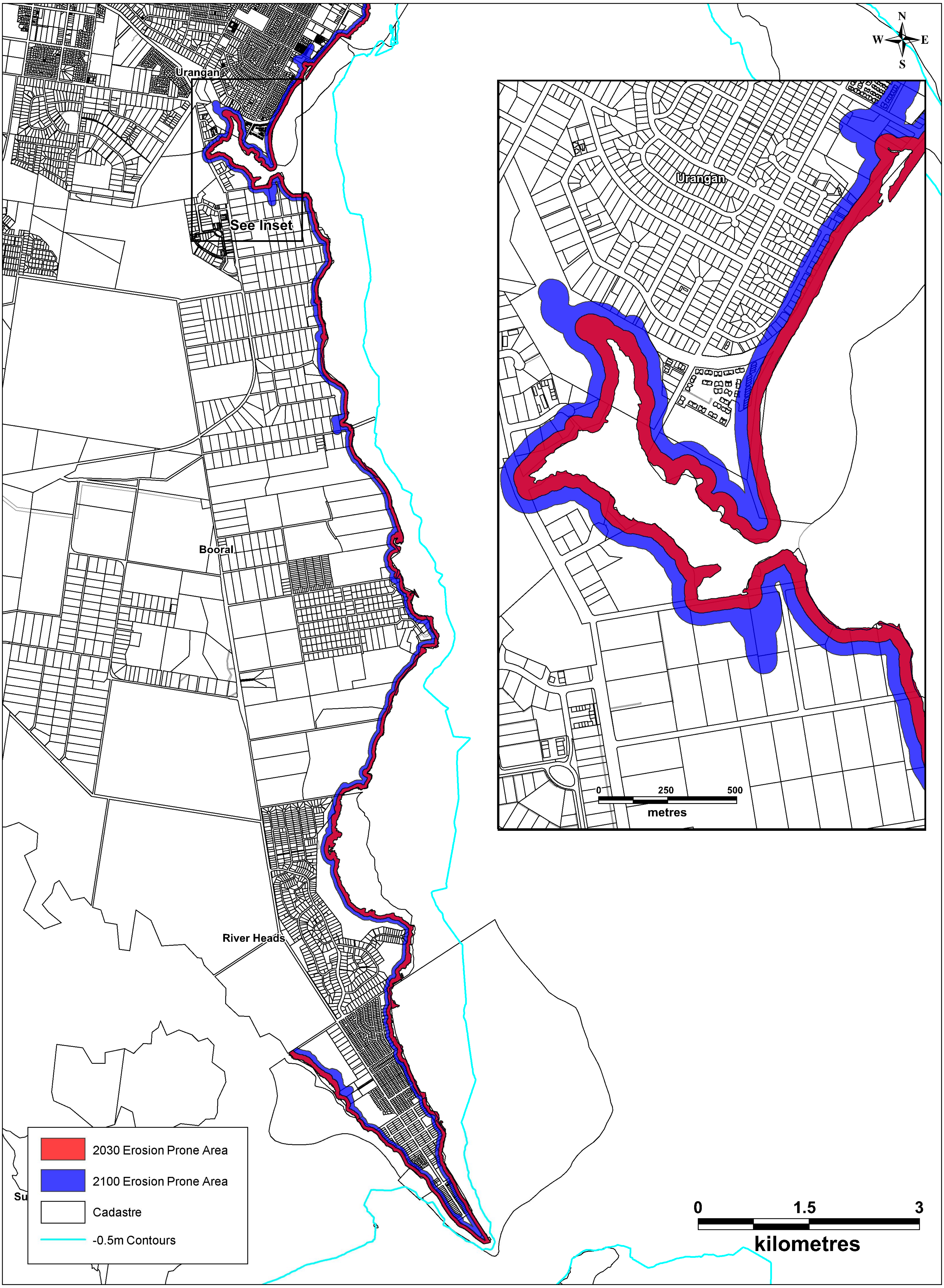

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FIGURE 3.12 EROSION PRONE AREAS - ZONE 4

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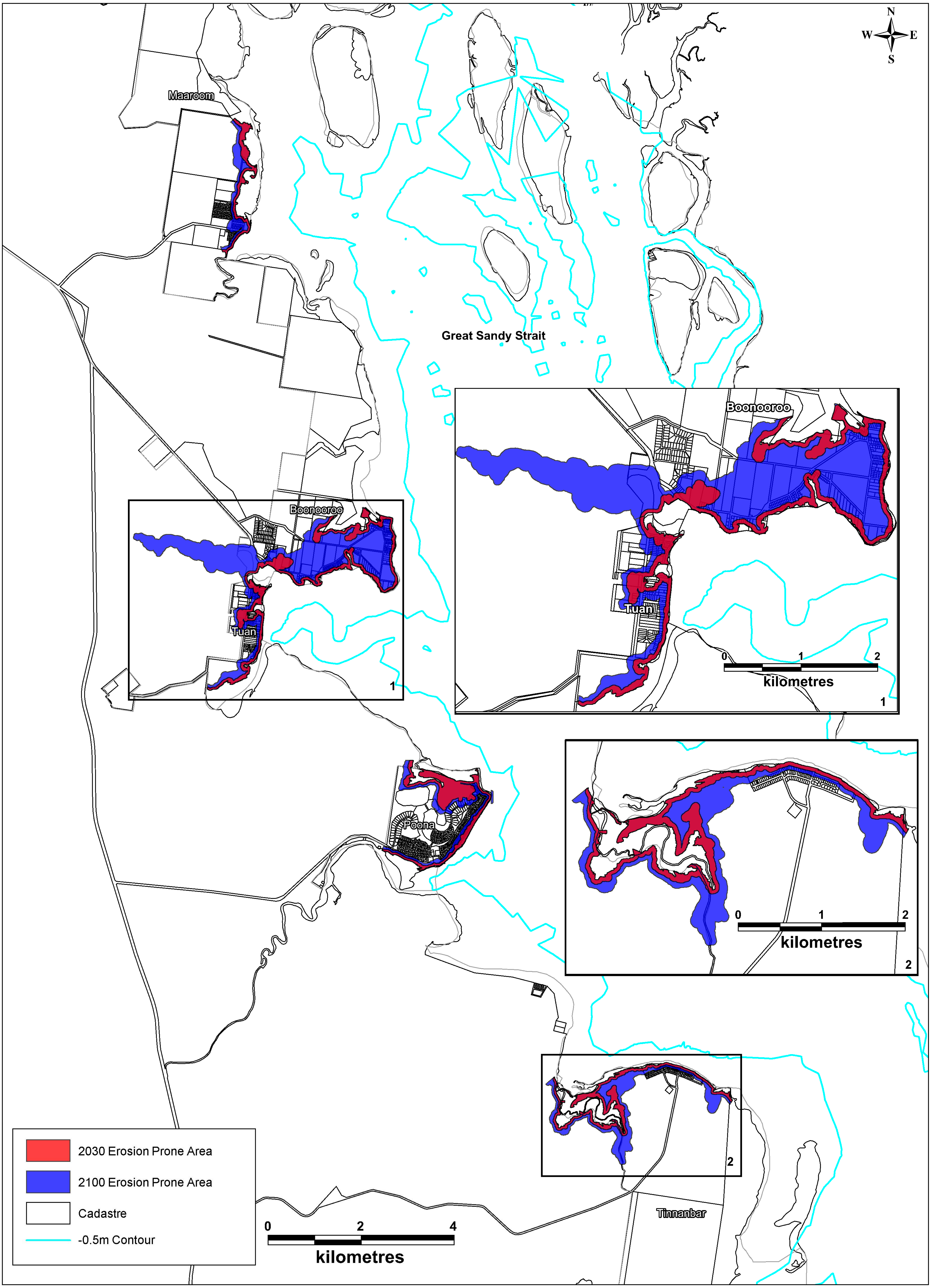

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FIGURE 3.13 EROSION PRONE AREAS - ZONE 5

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3.4 Generic Erosion Management Policies and Options

Table 3.1 outlines the different types of approaches available for the management of shoreline erosion, including discussion on the advantages and disadvantages associated with each approach. Whilst there are a number of management policies and options available to mitigate the risk of shoreline erosion, there are a number of constraints and opportunities that will influence the decision as to which erosion management option is appropriate, reasonable and feasible for a particular location (see Sections 4 and 5). The generic management policies and options have been presented early in this report in order to assist the reader in understanding and interpreting later discussion on constraints and opportunities.

Table 3.1: Generic Erosion Management Policies and Options

Policy/Option	Advantages	Disadvantages	Comments
Management Policy:			
No Active Intervention – allow natural erosion processes to occur while accepting losses of assets. Also referred to as "do nothing".	▪ Beach continues to behave naturally. ▪ No direct expenditure on protective measures – removal of debris may be required.	▪ Development is lost due to ongoing erosion, which may have both direct and indirect impacts. ▪ Additional unintended impacts may occur in relation to the damaged infrastructure.	This approach is only practical where the assets at risk are of limited value and their loss can be accepted.
Management Policy:			
Managed Retreat – allow natural erosion processes to occur, but progressively relocate infrastructure and other assets located in the hazard area to a safer location.	▪ Beach continues to behave naturally. ▪ With careful planning, this approach can provide an effective solution to the erosion problem.	▪ There can be strong public reaction against managed retreat. ▪ Land acquisition/compensation payments can be prohibitive.	In spite of its short term disadvantages and up-front costs, this policy may be cheaper and provide a more equitable outcome for the community in the long term. If adopted as the preferred policy for a location, significant planning would be required to develop an action plan to guide implementation.
Management Policy:			
Planning Controls – Implement land use planning and development controls that seek to reduce the risk from erosion by either preventing or limiting development of the EPA, or by specifying the type of development that can proceed (e.g. structures that may be more easily relocated if required).	▪ Beach continues to behave naturally. ▪ Reduces the future risk to development from shoreline erosion. ▪ Often there is minimal direct expenditure involved.	▪ Does not address the risk to existing development. ▪ May trigger compensation claims under the *Sustainable Planning Act 2009* due to any change in land use zoning that materially affects the value of the affected land.	This policy is an excellent way of reducing future risk from shoreline erosion and is one of the most commonly implemented management policies (or options), noting however, that it does not address the risk to existing development from shoreline erosion.
Management Policy:			
Hold the Line – This policy provides for maintenance of the present day average shoreline location by arresting the erosion process. There are a number of different management options available for implementation under this policy, each of which have their advantages and disadvantages.			
Seawalls – provide a hard physical barrier to stop further encroachment. There are a range of different types of seawalls, from low amenity seawalls (e.g. rock walls) to high amenity seawalls (e.g. stepped, vegetated revetments).	▪ Well suited to emergency erosion control. ▪ Provides direct property protection.	▪ Only effective at preventing erosion if properly designed, constructed and maintained. ▪ Adversely affects the beach in front and at the ends of the seawall, resulting in wider social and environmental impacts. ▪ Cost of construction and maintenance can be high.	Should only be used in emergency situations; protects property but at the expense of the beach. Often used in conjunction with artificial beach nourishment to minimise the impact on the beach.
Groynes – trap sand in eroding areas on beaches where erosion is caused mainly by currents.	▪ May be effective at building beach on the updrift side of the structure. ▪ Also effective as channel training structures.	▪ Does not prevent erosion, merely transfers the issue to another location.	Only useful in conjunction with beach nourishment or if erosion on the downdrift side is considered acceptable.
Offshore breakwaters – reduce the wave energy arriving locally at the beach and trap sand in eroding areas.	▪ May be effective at building beach on the updrift side of the structure. ▪ Shelters beach from storm wave attack.	▪ Cost is usually very high/prohibitive. ▪ Results in erosion on the downdrift side.	Cost can be prohibitively expensive and special design requirements apply.
Artificial beach nourishment – sand is taken from another location and placed on the eroding beach.	▪ Increases buffer zone width and hence provides further protection for assets. ▪ Provides for ongoing usage and amenity of the beach. ▪ Can be a relatively cost-effective option.	▪ A source of suitable sand may not be close by, which can add to the cost of implementation. ▪ Requires a higher rate of maintenance than for a seawall structure.	This appears to be the best and most equitable approach to managing beach erosion, but may be expensive to implement if there is no local source of sand.
Sand pushes – involves re-shaping of the beach profile in a particular location by mechanically moving sand from the lower beach face to the upper beach face.	▪ Has potential to accelerate beach re-building and increase buffer widths over the very short term. ▪ May be suitable as an emergency response option. ▪ Key benefit is that it provides for improved usage and amenity of the beach.	▪ Under certain conditions, may result in increased erosion during a storm event. ▪ Does not prevent long term erosion. Any net loss of sand from the system will continue. ▪ High ongoing maintenance requirements.	See literature review in Carley et al. (2010) for information on pros and cons. Because a sand push does not actually add any sand to the beach, the benefits are accrued primarily over the short term (weeks to months) in relation to seasonal changes in beach profile. This approach is not feasible for mitigating long term erosion.

Channel realignment – the alignment of a channel within a creek/river can run close to the bank, thereby causing shoreline erosion. This options provides for relocation of the main channel to mitigate this issue.	▪ Sidecast material can be placed so as to mitigate existing shoreline erosion. ▪ May be effective at training the channel (main flow path). ▪ Can have added benefit in providing for improved navigation.	▪ Only effective at preventing erosion if properly designed and implemented. ▪ Requires ongoing maintenance.	This option only applies where shoreline erosion is occurring along the shoreline of a river or creek.
Sand bagging – Involves the placement of sand filled geotextile bags on the shoreline to form a structure similar to a seawall.	▪ Well suited to emergency erosion control. ▪ Provides direct property protection.	▪ A source of suitable sand may not be close by, which can add to the cost of implementation. ▪ Only effective at preventing erosion if properly designed and constructed; requires ongoing maintenance. ▪ Adversely affects the beach in front and at the edges of the sandbags, resulting in wider social and environmental impacts.	This approach is typically used in emergency situations and is not a desirable medium-long term solution; protects property at the expense of the beach.
Dune management works – Dunes are re-vegetated or subject to other works that trap sand and build the dune volume.	▪ Increases buffer zone width and therefore provides further protection for assets. ▪ Provides for ongoing usage and amenity of the beach, and can improve the ecological value of the beach.	▪ Success requires a high level of ongoing maintenance.	This can be a suitable approach in areas where the level of risk from erosion is lower; success may be limited, particularly in some locations. Unlikely to be technically feasible in many parts of the study area.
Management Policy:			
Managed Realignment – This policy provides for relocation of the shoreline from its average location in the present day, to a new location further landward, at which point the shoreline may be more readily defended for the considered epoch. Effectively this involves adoption of the No Active Intervention policy in the short term, until such time as the risk to development from erosion becomes too great, and a Hold the Line policy is implemented. Any of those options listed under the Hold the Line policy could be adopted under this policy.			