1 INTRODUCTION

1.1 Overview

The Fraser Coast region has a history of shoreline recession and erosion which has been observed by the local community and is also well documented in reports such as the *Hervey Bay Beaches Report* (BPA, 1989) and the *Burnett Mary Coast - Coastline Features and Vulnerability* report (Helman, 2010). The former Hervey Bay City Council previously prepared a *Coastal Protection Strategy* (WBM, 2004) for the Hervey Bay area, which outlined a number of shoreline erosion management activities designed to protect the coast from subsequent erosion.

Since 2008, the Fraser Coast Regional Council (FCRC) was created by amalgamating four Local Government Areas (LGAs), including the City of Hervey Bay, City of Maryborough, Divisions 1 and 2 of the Shire of Tiaro, and the Shire of Woocoo. The continuing erosion issues within the new Fraser Coast LGA have resulted in a need to develop a consistent policies and options for managing erosion across the entire LGA. The development of a Shoreline Erosion Management Plan (SEMP) is particularly important to guide strategic land use planning and in allocating resources for erosion management initiatives across the LGA in a strategic and appropriate fashion.

During the past two decades, there has been increasing recognition of the potential impacts of climate change with the release of the Intergovernmental Panel on Climate Change *Fourth Assessment Report* in 2007 (IPCC AR4), which updated the previous (AR3) SLR projections and generally suggest sea level will rise by 0.8 m over the next 90 years. These projected climate change impacts and particularly SLR will exacerbate the current trend of shoreline erosion.

Cardno was engaged by FCRC to prepare a SEMP for the Fraser Coast LGA in accordance with the guidelines produced by the UK Department of Environment, Food and Rural Affairs (DEFRA, 2006). In the project brief, FCRC identified the purpose of the SEMP is to promote and demonstrate a strategic planning approach to managing the risk from coastal erosion across the entire Fraser Coast region in a sustainable and transparent manner. The SEMP is intended to feed into other strategic planning initiatives undertaken by FCRC.

The recent Queensland Government *State Planning Policy for Coastal Protection Guideline* (DERM, 2011c) provides further guidance on the role of SEMPs and how they should be prepared. The SEMP is described as a non-statutory planning document that identifies an agreed framework and management strategy to manage and respond to both existing erosion risk, and potential future erosion risk, in a manner that is consistent with the *Queensland Coastal Plan* (hereafter referred to as the QCP) (DERM, 2011a). The stated purpose of the SEMP is to (after DERM, 2011c):

- Enable local Government to proactively plan for erosion management in priority areas consistent with the policies of the QCP;
- Investigate and assess the underlying causes of shoreline erosion and likely future progression; and

- 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.

The local authority may request that the SEMP be endorsed by the Minister to facilitate its application in the assessment of development applications lodged for land contained in the coastal zone. In addition, a SEMP that has been endorsed by the Minister 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 (DERM, 2011c).

Further discussion on the policy framework is provided in Section 4.2.

Coastal erosion has been recognised as a threat to coastal developments for some years and the Beach Protection Authority estimated erosion prone area (EPA) widths in the 1980's. These estimates of potential future erosion risk have been updated in light of the recently adopted value of 0.8 m to 2100 for projected sea level rise (SLR). As part of the update of the QCP, DEHP has also updated the EPA mapping originally prepared by the Beach Protection Authority. The new DEHP maps show the extent of EPAs for 2100 (i.e. incorporating 0.8 m SLR).

This report has been prepared by Cardno in order to define the level of risk from coastal erosion within the Fraser Coast LGA, and to propose a management strategy for consideration by the stakeholders and the community that considers the range of environmental, social and economic values associated with the Fraser Coast coastline.

1.2 Study Area

The Fraser Coast LGA encompasses 112 km of shoreline, from Burrum Heads in the north, to Tinnanbar in the south. Within this extent there are a number of detailed areas of investigation that form the study area (Figures 1.1 and 1.2).

1.3 Evolution of the Fraser Coast Shoreline

The geology of the Fraser Coast region is comprised of a large sedimentary delta system with basalt intrusions that form rocky headlands. The coastal strip was formed as a result of a net sediment deposition during the last 1.8 million years (BPA, 1989). The major features controlling beach alignment in the northern portion of the study area occur as rocky outcrops from the Burrum Coal Measures at Point Vernon and Dayman Point (BPA, 1989). These features prevent the northward transport of sand resulting in an inshore sediment deficit west of Point Vernon (Helman, 2010).

A more comprehensive review of coastal features and processes contributing to shoreline erosion can be found in Helman (2010).

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Fraser Coast Shoreline Erosion Management
Options Assessment

FIGURE 1.1 STUDY AREA - HERVEY BAY

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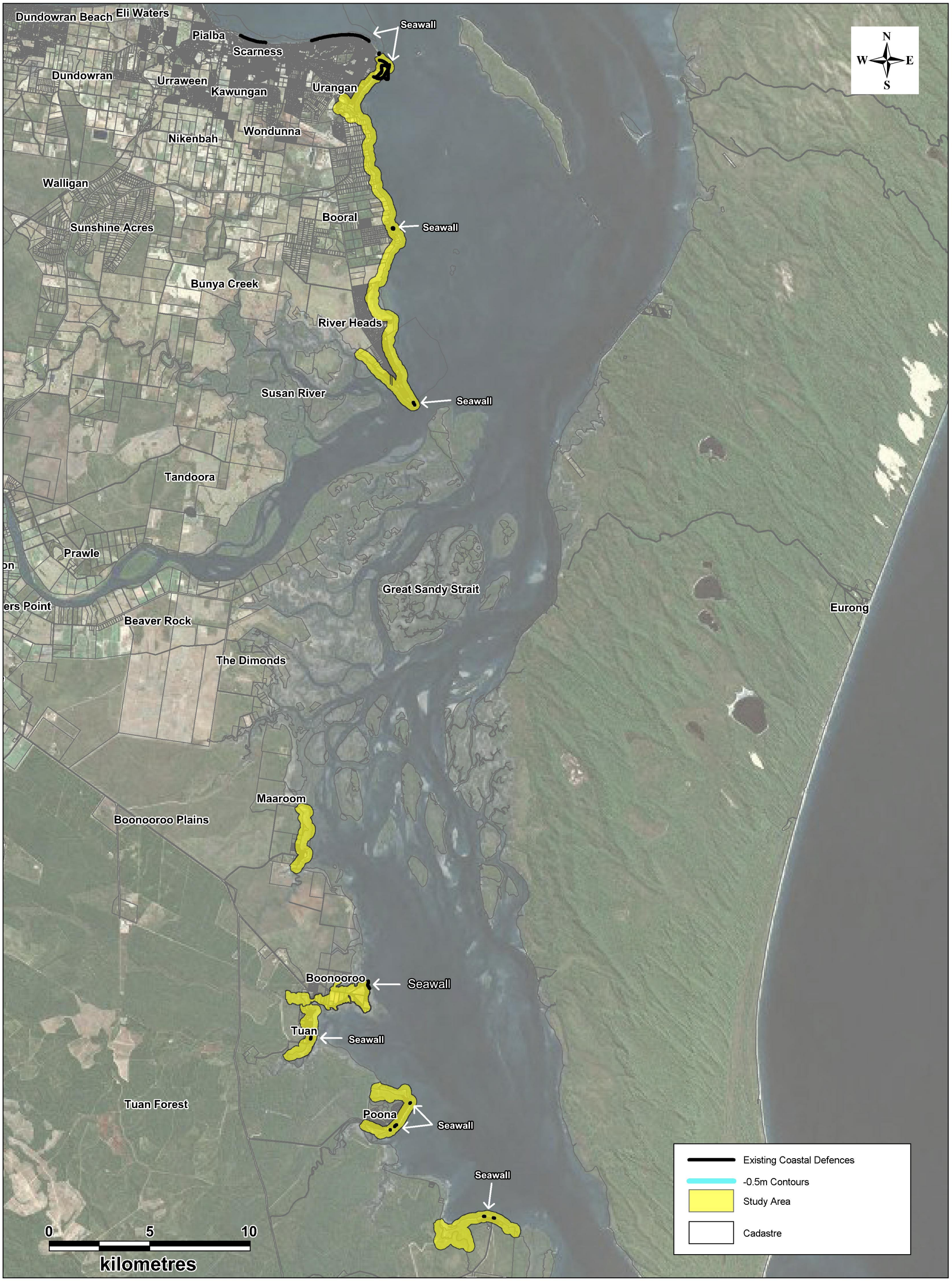

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FIGURE 1.2 STUDY AREA - GREAT SANDY STRAIT

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The morphology of the coastal zone is shaped by the atmospheric and oceanographic forces that drive sediment transport within this zone. The combination of the sandy sediments of the broader region, regular tidal forcing and sporadic events such as cyclones makes for a dynamic coastal zone within which the shoreline position is changing. The processes driving coastal erosion operate at different temporal and spatial scales, such that dramatic removal or erosion of sediment from the beach during storms or cyclones, along with the long term rising water levels due to sea level rise, both contribute to the shoreline erosion phenomenon.

At the last end of the last ice age some 18,000 years before present (b.p.) the ocean water level was some 120 m lower than the present level and the shoreline located about 100 km offshore its present position in Hervey Bay. Between 18,000 and 6,000 years b.p. sea level rose some 120 m (Figure 1.3) and the shoreline migrated landward to roughly its current location. The present day sandy coastline of the study area has formed due to accretion since this time (BPA, 1989).

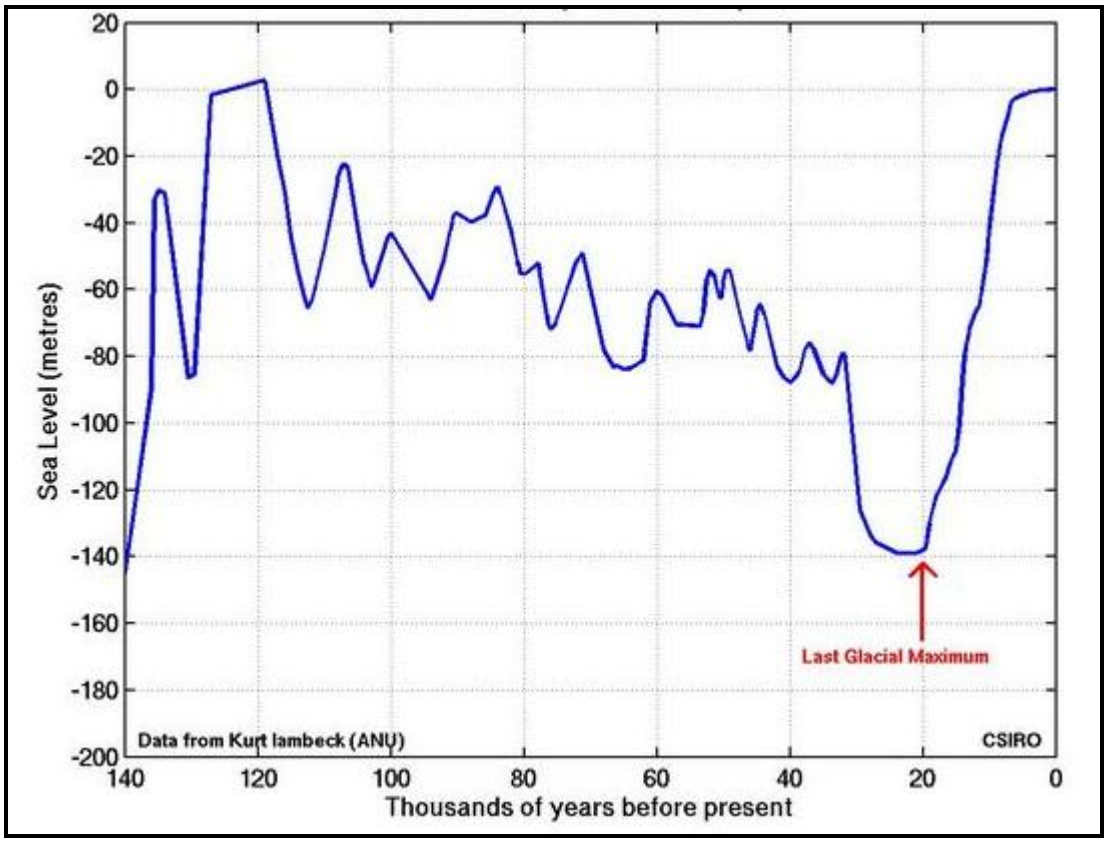

Figure 1.3: Historic Sea Level Trends over the Last 140,000 Years (source: CSIRO, 2011a)

Over the past 6,000 years sea level has remained reasonably steady (Helman, 2010) until more recent times. However, from 1961 to 2003 globally average sea levels rose 1.8 mm/yr, although the rate of rise appears to be increasing, with globally averaged sea levels rising 3.1 mm/yr between 1993 and 2003 (DCC, 2009). In Australia, sea levels increased by an average of about 1.2 mm/yr between 1842 and 2002.

The projected range of global averaged SLR from the Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report (Church *et al*., 2001) for the period 1990 to 2100 is shown by the lines and shading in Figure 1.4. The central dark shading is an average of models for the range of greenhouse gas emission

scenarios. The light shading is the range for all models and all emissions scenarios, and the outer bold lines include an allowance for land-ice uncertainty.

The updated Fourth Assessment Report (AR4) IPCC projections of 2007 for the emissions scenarios (Meehl *et al.,* 2007) are shown by the bars plotted at 2095 in Figure 1.4. The pink bar represents the range of model projections (90% confidence limits). Ocean thermal expansion and melting of glaciers and ice caps are the largest contribution to this range. The red bar is a potential, but poorly quantified, additional contribution from a dynamic response of the Greenland and Antarctic ice sheets to global warming. Note that the IPCC AR4 states that "*larger values cannot be excluded, but understanding of these effects is too limited to assess their likelihood or provide a best estimate or an upper bound for sea level rise*." This translates to an average global SLR of up to 0.79 m by 2100, noting that the contribution from melting of ice sheets to SLR could be higher, and SLR estimates in excess of 1.0 m and up to 1.5 m may be possible (DCC, 2009) (Figure 1.4). This would translate to a significant landward translation of the shoreline due to SLR inundation and shoreline erosion, although there is evidently a high level of uncertainty around the SLR projections and it will be important to provide for ongoing monitoring and re-assessment of the projections over time.

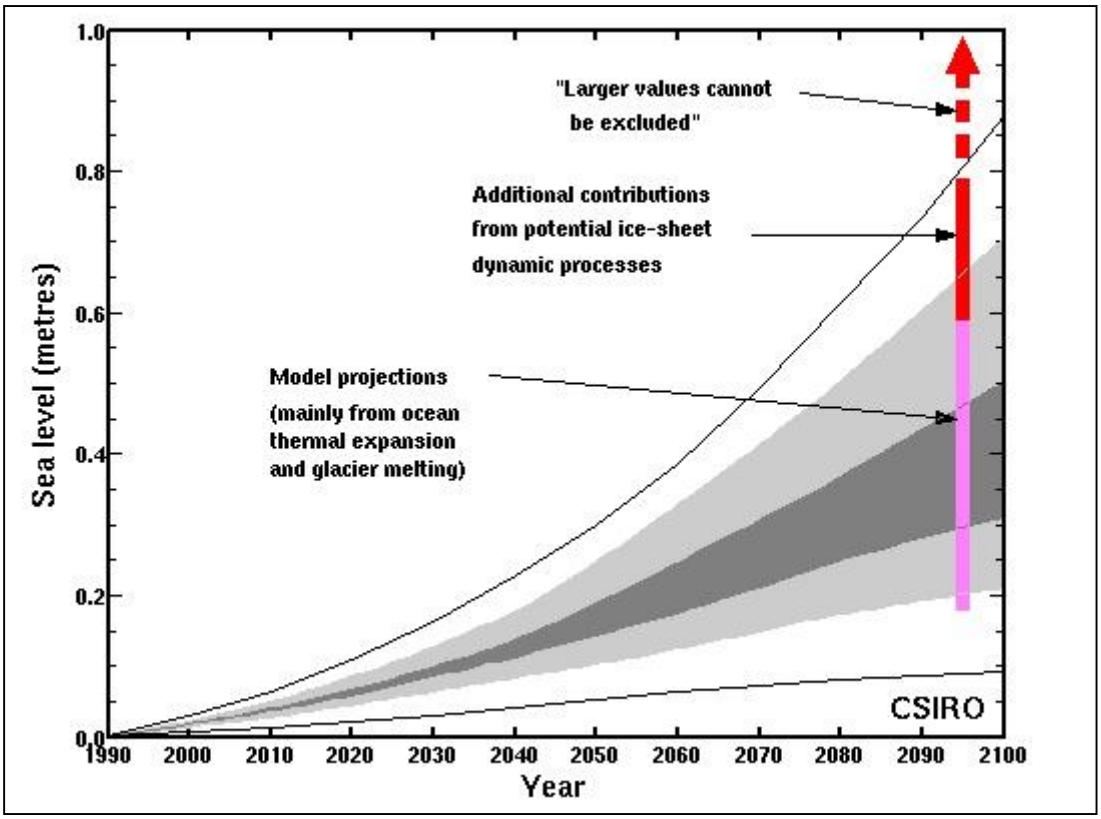

Figure 1.4: Projected Sea Level Rise for the 21st Century (source: CSIRO, 2011b)

The historical placement of fixed cadastral boundaries in that portion of the coastal zone now known to be susceptible to shoreline erosion has led to a situation in which substantial portions of the developed coastline are under threat from shoreline erosion.

1.4 Study Objectives

The purpose of this study is to inform the development of the SEMP and to provide information to assist in consultation with the community and key stakeholders.

Based on consideration of both FCRC's and the State Government's requirements, the overarching aim of this study has been to:

- Review coastal processes for the Fraser Coast LGA and present updated EPAs (Section 3);
- Identify the key constraints and opportunities relating to shoreline erosion management (Sections 4 and 5);
- Assess the level of risk from erosion (Section 6); and
- Develop a series of feasible erosion management options and subject them to a cost:benefit assessment (Section 7 and Appendix G);
- Present the findings of the cost:benefit assessment to FCRC to enable them to select a subset of options for inclusion in the SEMP (Appendix H); and
- Make recommendations regarding any further studies and monitoring activities that would assist FCRC in implementation of the SEMP and management of the Fraser Coast coastline (Section 8).

It is intended that this document will provide the information that will subsequently be used to develop the Fraser Coast SEMP.