Shoreline Erosion Management Plans
An effective tool for developing proactive shoreline erosion management strategies

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Shoreline erosion and tidal inundation are continuing threats to development along many parts of the Queensland coast and with predicted increases in cyclone frequency and sea level rise associated with global warming, the long-term threat of shoreline erosion is likely to intensify. In order to appropriately address these emerging problems, and ensure impacts on the social, environmental and economical values of coastal areas are minimised, technically sound proactive shoreline planning is required.

The Environmental Protection Agency is promoting the development of shoreline erosion management plans (SEMP's) as a means to understand emerging erosion threats and develop optimal long-term strategies to address such threats. This process allows for the timely development and implementation of management strategies and works before erosion and inundation problems pose a serious threat to development.

A SEMP is a non-statutory planning document prepared by local government that sets out an agreed management strategy to manage and respond to existing erosion or potential future erosion threats. SEMP's provide a framework for all relevant stakeholders to be involved in the development of the plan which details the underlying causes of existing erosion problems and any predicted future impacts. Sustainable solutions to the problem can then be developed considering the environmental, social and economic values of the land and the physical coastal processes acting on the foreshore. SEMP's also detail the appropriate uses of erosion prone land, and long term management goals. Having all relevant stakeholders involved in this process ensures future management strategies are supported and agreed upon prior to their implementation.

The development of a SEMP is seen as a means of achieving a range of policy objectives of the State Coastal Management Plan prior to submitting a formal development application under the *Integrated Planning Act 1997.* By facilitating a cooperative approach, SEMP's provide the framework for pre-assessment agreement between State and local governments and the community as to the most appropriate management strategy to the problem. Such an agreement can be used to speed up any future development assessment procedures.

INTRODUCTION

Worldwide, coastal erosion and inundation is a significant issue requiring specialised management consideration. It is estimated that 70 percent of the world's sandy shorelines are eroding (Bird, 1985), and in many low-lying coastal areas, human impacts, such as the construction of erosion protection works, the removal of large quantities of native sediments and the destruction of dune stabilising vegetation has accelerated or increased the risk of erosion and tidal inundation (Tomlinson, 2001). At

the same time, coastal populations are burgeoning, with more than 85 percent of the Queensland population living on the coast (Queensland Government, Environmental Protection Agency, 2001). This raises the fundamental question — what is the best management response to the problem of shoreline recession?

Individual land owners or manager, and local government are usually responsible for addressing erosion threats to development . However local government often do not have the technical capacity or the resources to develop and implement planning and management strategies for coastal erosion problems. The Environmental Protection Agency is the lead agency for coastal management in Queensland, and has the policy framework and technical capacity to guide decision making by local government. However, the bulk of technical capacity for investigating and developing solutions for shoreline erosion problems lies with consulting engineers in the private sector and expertise within Universities. The cooperation of these three groups is necessary for the development of effective erosion and inundation solutions.

The preparation of a SEMP involves gaining a thorough understanding of the physical processes responsible for shaping a shoreline before management strategies are considered. This approach involves a technical investigation of regional coastal behaviours and regional geomorphological processes and the identification of how these interact and respond over different spatial and temporal scales. It is essentially a qualitative approach based upon conceptual understanding of the fundamental elements that make up the coastline and how these evolve. The SEMP then provides a priority listing of the most effective erosion management strategies for a particular area based on the processes identified in the technical investigation. Such a priority listing also identifies the relevant approvals and indicative costs associated with each of the suggested management strategies.

BACKGROUND

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 episodic or persistent shoreline erosion problems. But what is an erosion problem?

The causes of erosion have been well documented and can be classified as follows:

- Short term natural variability – beach fluctuations, storms
- Medium term natural variability – periodic changes in coastal climate
- Medium term erosion – disruption to local sediment budget due to man's activities
- Long term natural variability – sea level rise, geological realignment, reduction in sediment supply. (Tomlinson, 2001)

With respect to mans activities Bird (1985) puts the blame on five major activities – these being:

- the stabilisation of river and tidal inlets;
- dredging activities (stemming from the above)
- the construction of buildings and facilities on sand dune systems;
- sand mining; and
- any forms of human recreational activity which directly result in beach and dune degradation and or erosion.

The threat of sea erosion to development is therefore a condition where:

1. development has been placed within an area of natural variability of the coast (the active beach system), and acts as an artificial boundary to natural fluctuations; and
2. shoreline recession extends beyond the natural boundaries of shoreline movements due to artificial disruptions of sediment supply.

The "sea erosion problem" can be further constrained by the sense that erosion is only considered as a problem where permanent development is under threat of loss, or a natural system is experiencing erosion as a result of man-made works or activities. The dynamic movement of sediment within a natural system should not be construed as an erosion problem nor considered as needing management.

Over the last 25 years, State government policies have successfully eliminated sea erosion as a problem for new "greenfield developments[1]" through land surrender conditions on reconfigurations within erosion prone areas and management of activities that may disrupt natural sediment transport processes. Specifically the land surrender provision, under the now repealed *Beach Protection Act 1968* and section 110 of the *Coastal Protection and Management Act 1995*, has proven as a successful tool in ensuring development does not occur on undeveloped freehold land in areas vulnerable to sea erosion. Therefore, erosion threats to development are confined to areas where previous land use decisions have allowed development to occur within areas of natural shoreline movements..

The complexity of sediment transport along the coast and behaviour of landforms such as river deltas, and the varying influence of climate means that no two erosion problems will ever be exactly the same, nor respond similarly to the same treatments. Coastal management efforts can be further complicated at each site by the varying land tenure, high recreational and ecological values, competing interests in the land and local 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 natural coastal processes to continue, proactive planning and effective management strategies are required.

PURPOSE OF A SEMP

A Shoreline Erosion Management Plan (SEMP) is a non-statutory planning document[2] that sets out an agreed framework and management strategy to manage and respond to current erosion or potential future erosion problems. SEMP's 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 recognise each erosion problem as a unique and complex situation and through rigorous scientific assessment, identify the specific causes for each location and suggest unique management strategies based on the local conditions. 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:

1. Enable local government to proactively plan for erosion management in priority areas consistent with the policies of the State Coastal Management

[1] A greenfield development is a new development on previously undeveloped or rural land involving reconfiguration of land and building works.

[2] There are no statutory or policy requirements to develop SEMP's nor are there any specified requirements or restriction on how they are prepared.

Plan 2001 and relevant Regional Coastal Management Plans (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.

CONTENTS OF A SEMP

The contents of a SEMP are at the discretion of the local government developing the SEMP and are based on the requirements detailed in the Terms of Reference. A SEMP may include (but not limited by):

1. An assessment, analysis and documentation of the severity of shoreline erosion and the subsequent risks posed for the community and development in the area;
2. A description of the local and regional coastal processes impacting the area (specifically an investigation and clear description of how estuarine influences, hydrodynamics, nearshore and offshore sediment dynamics, geomorphology and geology (both onshore and offshore) interact to affect the coastal evolution over various timescales and the role of plants in erosion control and land building);
3. 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;
4. 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;
5. Identification of any knowledge gaps that may limit management of shoreline erosion;
6. Provision of technical descriptions of shoreline erosion or buffer zone management options;
7. A ranking of management options with regard to environmental, social and economic cost/benefits, sequentially prioritising options having regard to: (and compliant with State/Regional Coastal Management Policies)
    - 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, biodiversity, environmental values and water quality objectives, and any relevant marine park zoning plan or declared Fish Habitat Area. 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.
8. A recommendation of the preferred management strategy based on the ranking;
9. An outline of the estimated costs associated with the preferred management strategy and possible funding sources;
10. 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;

11. A program or strategy to implement preferred erosion/buffer zone management works;
12. 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
13. 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).

METHODS OF DEVELOPING A SEMP

Generally the methodology for developing a SEMP will be similar for each project however, the details of who is involved and the framework for consultation will be at the discretion of each local government in their role as the project manager. Generally, a consultant is employed based on a successful expression of interest application responding to a terms of reference set by the project manager. The Environmental Protection Agency can be involved in the early stages to assist in the formation of the terms of reference and to provide guidance in developing broad project management frameworks and project localities. For more information refer to the EPA guideline "*Preparation of a Shoreline Erosion Management Plan".*

CONSULTATION

There are potentially many stakeholders who could be involved in the development of a SEMP. These include local government officers, Councillors, Government departments who may have an interest in the area or the outcomes of the study or who may be responsible for issuing approvals for any works associated with the chosen management strategy (e.g. Environmental Protection Agency; Department of Natural Resources and Water; Department of Primary Industries and Fisheries; Office of Urban Management; Queensland Transport; Maritime Safety Queensland; Department of Local Government Planning, Sport and Recreation), community groups, local residents, non-government environmental management organisations, private industry representatives (e.g. fishing groups, building industry) and the consultant employed to develop the SEMP.

Depending on how the project manager develops and implements the project framework, stakeholders can be involved either as a member on a steering committee or reference group or via one-on-one consultations. Regardless of the consultation framework, it is imperative that community representatives are involved at the earliest stage possible, particularly with regards to providing comments and suggestions for the formation of the terms of reference, as these sets out desired outcomes of the SEMP. Similarly it is imperative that representatives from the relevant Government departments responsible for assessing development associated with the suggested management strategies are consulted and involved in the selection of the most appropriate management strategy.

The Environmental Protection Agency is available to provide both overarching project management guidance in addition to assisting the project manager to interpret technical components of the study. Regional development assessment officers need to be involved in the management strategy prioritisation and selection process to ensure the chosen management strategy complies with the relevant coastal policies.

TAKE HOME MESSAGE

The physical coastal processes that work to shape our coastlines are a natural phenomena and their maintenance requires pro-active planning and management

strategies to ensure these natural processes do not threaten life and property in developed coastal communities. Such strategies can only be developed based on a thorough understanding of the natural coastal processes occurring within an area and modelling of potential future movements of the shoreline. Through the development of a SEMP, key stakeholders can then make informed decisions with regards to pro-active shoreline erosion management strategies which appreciate the need to maintain natural coastal processes.

REFERENCES

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