FINAL REPORT

Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Prepared For:

Parks Victoria

March 2015

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Ethos NRM Pty Ltd

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1 INTRODUCTION

The Mitchell River Silt Jetties Shoreline Protection and Enhancement Project is an initiative of Parks Victoria. It aims to provide clear direction and priorities for future use of this important site, with a focus on erosion mitigation and enhancement of natural and recreational values.

This project is funded by the Gippsland Lakes Environment Fund and addresses objectives outlined in the Gippsland Lakes Environment Strategy (2013). These objectives include the assessment and prioritisation of areas of shoreline erosion as well as identifying areas where human activities may be detrimental to environmental values, with subsequent implementation of management programs. One of the greatest potential impacts on the Lakes' ecological character and environmental value is through damage to significant landforms and vegetation caused by shoreline erosion.

Parks Victoria has engaged Ethos NRM, Alluvium Consulting, and Dodo Environmental to undertake an assessment of the key values and threats to the site, and assess and describe potential management actions.

The project will allow evaluation of current approaches to management of shoreline erosion along the silt jetties and provides guidance on further erosion mitigation works, including the feasibility and appropriateness of current public access and facilities.

A stakeholder engagement process has been undertaken to capture the aspirations and views of stakeholder groups and partnership agencies to help shape the future use of the silt jetties. This stakeholder engagement process has also helped to guide proposed management approaches to rock beaching, road access and visitor access nodes.

Outcomes of this work will allow the prioritisation of potential management actions and guide implementation of targeted on ground actions, and provide a strategic view to support future management of the threats to the silt jetties.

1.1 Objectives

The project has the primary aim of providing clear direction and priorities for future use of the Mitchell River Silt Jetties. These priorities will focus on erosion mitigation and enhancement of natural and recreational values at this site of geomorphological significance.

Specific objectives of this project are to:

- To assess and review existing threats from erosion and other threats to natural and recreational values across the target area.
- To recommend priorities and targets for on ground actions to address threats and protect these values for the future.
- To engage and liaise with key stakeholders to gain a deeper understanding of the aspirations for future use of the Mitchell River Silt Jetties and provide clear evaluation of these responses in balance with appropriate use for the long term health of the silt jetties.
- To provide a clear and useable document for implementation of on ground erosion mitigation actions, recreational facility improvement and revegetation actions (including monitoring for revegetation and erosion mitigation).

2 STUDY AREA

The Mitchell River Silt Jetties are a site of international geomorphological significance (Rosengren, 1984) located within the Gippsland Lakes system, a Ramsar listed wetland of international importance recognised for habitat and biodiversity values. A Natural Features and Scenic Reserve covering the Mitchell River Silt Jetties is managed by Parks Victoria and protects a unique river delta at the mouth of the Mitchell River.

The study area for this project extends from Two Belles (locality on the Silt Jetties) to Point Dawson at the end of the southern silt jetty and takes in the public land managed by Parks Victoria in this area. The project considers the condition and management of the northern jetty from The Cut to the mouth of the Mitchell River (see Figure 1).

2.1 Gippsland Lakes Ramsar Site

Located in coastal Victoria, the Gippsland Lakes are a group of coastal lagoons and marsh environments that are separated from the sea by a barrier system of sand dunes and fringed on the seaward side by the Ninety Mile Beach. The Gippsland Lakes was listed as a Wetland of International Importance under the Ramsar Convention in 1982 in recognition of its outstanding coastal wetland values and features (BMT WBM, 2011).

Eleven Ramsar wetland habitat types have been identified as occurring within the boundaries of the site. These include, most notably, coastal lagoons, sub tidal seagrass and algal beds, and a range of saline, brackish and freshwater marsh environments (BMT WBM, 2011).

A broad range of ecosystem services/benefits exist within the Gippsland Lakes including nationally and internationally threatened wetland species, waterbird breeding and fish spawning sites. Cultural and socio-economic values are equally diverse, noting the particular importance of the site in a regional context in terms of recreational activities such as boating, recreational fishing and holiday tourism (BMT WBM, 2011).

2.2 Geomorphological Context

Formed at the mouth of the Mitchell River, the Mitchell River Silt Jetties represent a significant feature that divides the main body of Lake King from Jones Bay in the Gippsland Lakes. The jetties extend almost eight kilometres into the lakes as low, narrow tongues of sediment formerly bordered by a wide zone of reed swamp dominated by *Phragmites australis*. A flood in 1917 breached the northern silt jetty and since then, the majority of flow and associated sediment load has been diverted through this opening directly into Jones Bay. (Rosengren, 1984).

It is likely that the Mitchell River Silt Jetties are a true deltaic feature, with major factors in their growth considered to be the virtual absence of tidal current in Lake King and the presence of shoreline reed swamp fringe able to trap a large proportion of river sediments and provide protection from wave energy (Rosengren, 1984). The resulting classic elongate digitate delta ranks as one of the finest examples in the world and is recognised as a site of national and international significance (Rosengren, 1984).

2.3 Loss of fringing vegetation around the Gippsland Lakes

The creation of the permanent entrance at Lakes Entrance initiated an ecosystem-wide cascade of environmental consequences, starting with the Gippsland Lakes developing into a permanently estuarine environment.

That there would be marked ecological consequences caused by making (and maintaining) a permanent opening to Bass Strait was first explicitly acknowledged in a book chapter by Bird in 1966, who predicted that the existing fringes of Common Reed (*Phragmites australis*) would be

Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

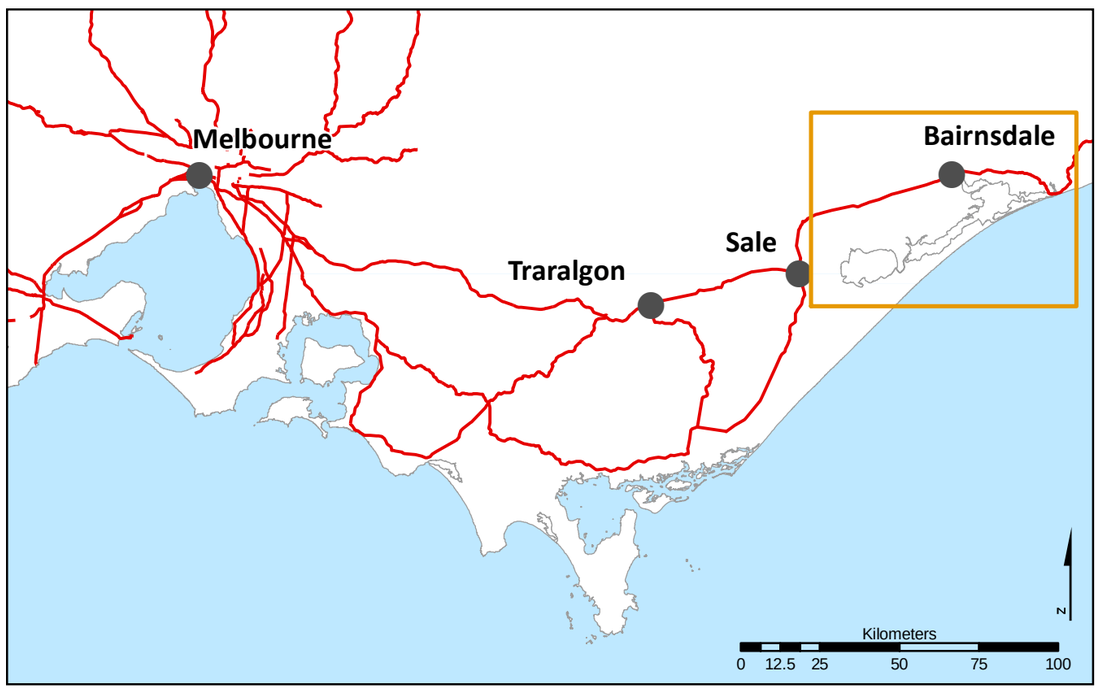
Figure 1: Site Locality

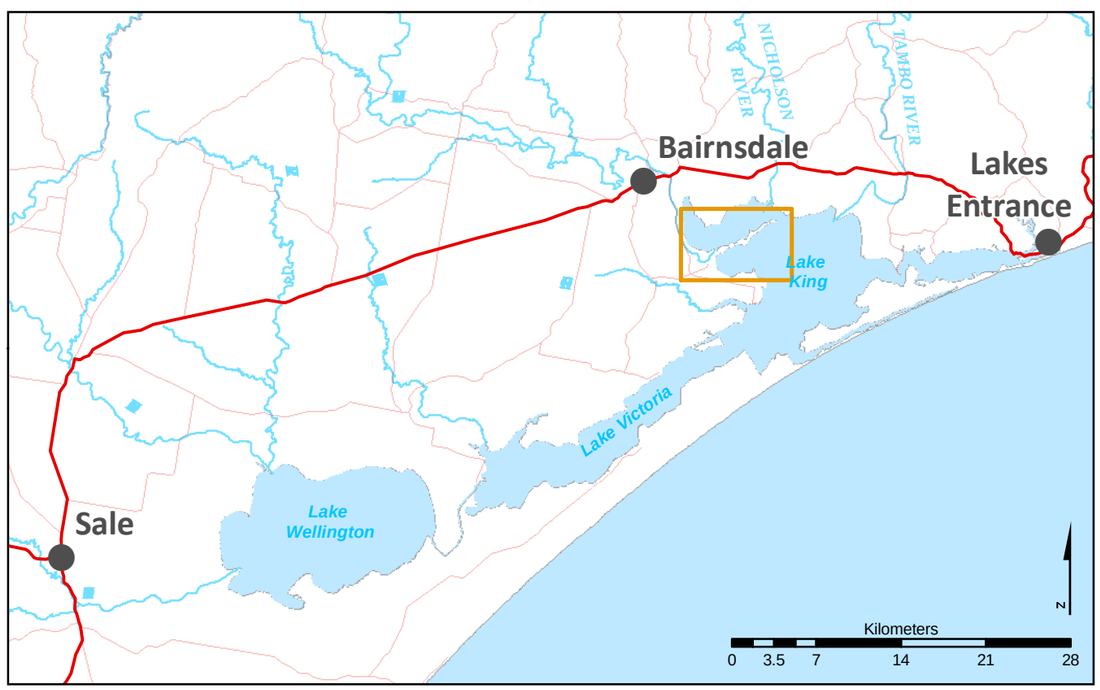
Study Area

Localities

Waterways

Roads





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replaced by the putatively more salt-tolerant Swamp Paperbark (*Melaleuca ericifolia*) and, ultimately, even the latter would be replaced by coastal saltmarsh in many parts of the Lakes.

Bird's (1966) predictions as to changes in fringing vegetation along the shorelines of the Gippsland Lakes have been largely confirmed by empirical studies. Possibly the first written record of salinity impacts was by Hart (1921), who noted the salinity-induced cut-back and erosion of shorelines previously densely vegetated by Swamp Paperbarks. This observation supports the notion that salinity-mediated impacts of chronic seawater inputs on salt-intolerant fringing vegetation were probably evident within the first few decades after the entrance was artificially opened, an argument advanced by Bird (1966) and Bird and Rosengren (1974). Many of Bird's predictions were confirmed also in the survey of changes in the vegetation communities of Dowd Morass since the early 1960s undertaken by Boon *et al*. (2008); this study also showed a progressive loss of Common Reed and their replacement by Swamp Paperbark.

There is evidence too for an increase in the area of saltmarsh around the Gippsland Lakes, although the spatial and temporal patterns are complex (Sinclair and Boon 2012). The last line of evidence to support Bird's (1966) model is that the submerged angiosperm *Vallisneria australis*, which was formerly common in the lakes and fringing wetlands (Aston 1977; Ducker *et al*. 1977; Bird 1978), is now precluded by high salinities and unstable sediments from these areas (Salter *et al.* 2010a).

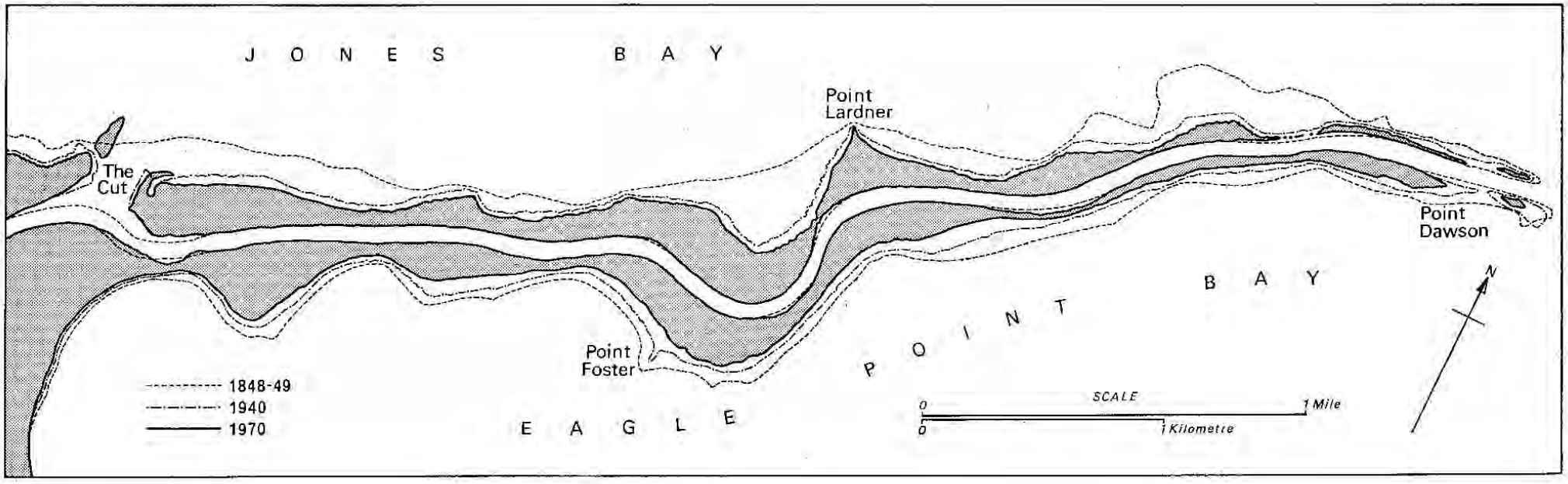
2.4 Shoreline Erosion

The large scale loss of fringing vegetation from the shorelines of the Gippsland Lakes, including the Mitchell River Silt Jetties, has contributed to increased levels of shoreline erosion. The loss of energy absorbing emergent vegetation has been critical in reducing the resistance of shoreline areas to wind waves and other erosive processes.

It was noted in the mid 1840's, by Wilkinson and Smyth who originally surveyed the site, the Mitchell delta was broader in outline than it is currently, and much of the shoreline was fringed with reedswamp dominated by *Phragmites australis*. Bird and Rosengren (1971), through aerial photograph comparison, confirmed that the delta area has been reduced from 268 hectares in area in the 1840's to 148 hectares in 1970, little over half its original extent.

Figure 2 below reproduced from Rosengren (1984), shows the changes in shoreline around the Mitchell River Silt Jetties between 1848-49 and 1970. Despite significant management intervention in the following 44 years to the present, many areas have exhibited further shoreline retreat in this time.

Figure 2: Changes in the Mitchell River Silt Jetties shoreline 1848 – 1970 (Rosengren, 1984)



2.5 Past and Current Land use

Historic land use of the Mitchell River Silt Jetties has varied significantly over time. Aboriginal Traditional Owners of the area have a particularly strong connection to the Gippsland Lakes and its natural environment. Through their cultural traditions, the Gunaikurnai identify the Gippsland Lakes as their Traditional Country. It is likely that the Gunaikurnai people would have used the silt jetties for access to Lake King, areas of Jones Bay, the Mitchell River and the resources that these areas held. The entire study area is designated to be an Area of Aboriginal Cultural Sensitivity.

Large areas of the silt jetties have been subject to the clearing of native vegetation and grazing of livestock in the past. The majority of the northern silt jetty was cleared, with grazing stock present until the early 1980's. Access to the northern silt jetty was also provided by a bridge across the Cut until this time.

The Mitchell River Silt Jetties was designated as a reserve managed by Parks Victoria in 1984. Significant efforts to revegetate both the northern and southern silt jetties have been completed in the recent past, comprising works completed by organisations including the Department of Conservation Forests and Lands, the local Eagle Point Landcare Group, and the Friends of the Gippsland Lakes.

A range of land uses are currently supported on the Mitchell River Silt Jetties including areas of Crown land designated for conservation and game hunting, private residential land, and areas of public land managed by East Gippsland Shire Council for recreational access to the site and the Gippsland Lakes.

Entirely Crown land, the northern silt jetty is accessible only by boat from either Jones Bay or the Mitchell River. This land experiences a relatively low level of use by the community with the majority of users engaging in specific recreational activities including bird watching, nature appreciation, recreational fishing, hunting (in season),and some commercial fishing activity within Jones Bay.

The southern silt jetty contains a mix of both Crown land and private property, with approximately 20 private titles in existence. Private land use includes both permanent and temporary residents, with a number of holiday rental properties also existing.

Road access along the southern silt jetty provides access to the Mitchell River for fishing (boat ramp, jetties, fishing platforms), and is a popular destination for recreational fishers. The current road access extending to Point Dawson (the end of the southern silt jetty) is often used by visitors to view both the Gippsland Lakes and the lower Mitchell River.

Specific infrastructure provides only limited opportunity for other recreation types at the site including kite surfing and sail boarding, kayaking, cycling, walking and nature appreciation.

2.6 Management and Planning Context

The entire study site is contained within the Mitchell River Silt Jetties Gippsland Lakes Reserve, and is managed by Parks Victoria. A management plan was prepared for the Shire of Bairnsdale, the Mitchell River Management Board, Port of Melbourne Authority, and the Department of Conservation and Natural Resources in 1994 (Landsmith, 1994), however this plan is not currently in use.

The Macleod Morass and Jones Bay Wildlife Reserves Management Plan (Parks Victoria, 2005) guides the management of areas adjoining the Mitchell River Silt Jetties and specifically states the aims of providing protection for landforms and geological features of scientific or cultural significance; and to minimise disturbances to geomorphological processes or features.

The Mitchell River Silt Jetties directly adjoin the Gippsland Lakes Ramsar site. Management of this Ramsar site is currently guided by the Gippsland Lakes Ramsar Site Strategic Management Plan (DSE, 2003). A review and revision process is currently underway to update the current Ramsar Plan for the Gippsland Lakes. This updated plan will help guide the future management of the silt jetties and the broader Gippsland Lakes environment.

The silt jetties are listed on the Australian Register of the National Estate, which does not in itself create a requirement to protect the place under Commonwealth law; however information in the register may continue to be current and may be relevant to statutory decisions about protection. (Department of Environment, 2014)

The East Gippsland Regional Catchment Strategy (EGCMA, 2013a) identifies the Mitchell River Silt Jetties as a Feature of Significance within the Gippsland Lakes Hinterland Program Area. Whilst the East Gippsland Regional Waterway Strategy (EGCMA, 2013b) lists long term (>20 years) condition targets including that; the condition of the in-stream habitat is improved in the Lower Mitchell, providing habitat for native fish and invertebrates; and the bank condition of the Lower Mitchell estuary is improved, providing resistance and resilience, reducing the risk of instability. These targets support the maintenance of the stability of the Mitchell River silt jetties, particularly within the river channel.

Areas of private land occur along the Mitchell River Silt Jetties, with around 20 properties in private ownership. The management of this private land is guided by the East Gippsland Shire Planning Scheme and the zones and overlays which are prescribed within it. An example 'Planning Property Report' which details relevant planning controls for the site is contained within Appendix 1.

All private properties within the study area are covered by the *Rural Conservation Zone (RCZ)*. This zone has the purpose of:

- conserving specified values within the zone;
- protecting and enhancing the natural environment and natural processes for their historic, archaeological and scientific interest, landscape, faunal habitat and cultural values;
- protecting and enhancing natural resources and the biodiversity of the area;
- encouraging development and use of land which is consistent with sustainable land management and land capability practices, and which takes into account the conservation values and environmental sensitivity of the locality;
- providing for agricultural use consistent with the conservation of environmental and landscape values of the area; and
- conserving and enhancing the cultural significance and character of open rural and scenic non-urban landscapes.

Areas of public land within the study site are covered by the *Public Conservation and Resource Zone (PCRZ)* with the purpose of:

- protecting and conserving the natural environment and natural processes for their historic, scientific, landscape, habitat or cultural values;
- providing facilities which assist in public education and interpretation of the natural environment with minimal degradation of the natural environment or natural processes; and
- providing for appropriate resource based uses

Furthermore a number of planning overlays exist across the site:

- *Land Subject to Inundation Overlay (LSIO)* – in place to identify land in flood storage or flood fringe area affected by the 1 in 100 year flood, or any other area determined to be appropriate. This overlay is also in place to ensure that development maintains or improves river and wetland health, waterway protection and floodplain health;
- *Significant Landscape Overlay (SLO)* – in place to identify significant landscape and to conserve and enhance the character of these landscapes, in this case the Gippsland Lakes;
- *Vegetation Protection Overlay (VPO)* – in place to protect areas of significant vegetation, ensure development minimises the loss of vegetation; recognise areas of special significance, natural beauty, interest and importance, and to maintain and enhance habitat corridors for indigenous fauna.

2.7 Past Works

The majority of past management actions across the Mitchell River Silt Jetties have focussed on protection from shoreline erosion. Bird and Rosengren (1971) identified the potential fragmentation of the silt jetties, and the likely outcome of the site becoming a series of disconnected islands by 2000. The need for large scale intervention in the form of rock armouring was again identified in Rosengren (1984) to protect the soft and easily erodible muddy sediments of the delta shoreline.

Multiple management agencies including the Mitchell River Management Board, the Melbourne Port Authority, and various Victorian State Government Departments have implemented works to limit the impacts of shoreline erosion around the silt jetties. Extensive areas of rock beaching have historically been established along both the lake and river shorelines of the silt jetties, this included major programs in the 1970's and 1980's to armour the outer face of the northern jetty and tenuous island sections near Point Dawson (Landsmith, 1994) . Works to reconnect islands that had formed in the lower sections of the delta using fill armoured with rock beaching were also completed over this period.

Figure 3 shows 'Hazard Areas' as mapped by Landsmith (1994), including areas of shoreline erosion. Figure 4 shows the current distribution and condition of rock beaching mapped as part of this project that surrounds the Mitchell River Silt Jetties.

Initial revegetation of the northern silt jetty was completed between 1986 and 1988 by the Department of Conservation Forests and Lands (see Figure 4). The connecting bridge at the Cut was also removed at this time due to teredo worm attack in the bridge piles (Landsmith, 1994).

2.8 Recent and Current Works

Ongoing, but limited management actions are currently focussed on the Mitchell River Silt Jetties. Parks Victoria and their regional partners deliver basic pest plant and animal programs across the northern and southern jetties, and some revegetation work has been completed over the last decade predominantly as a response to community interest and aspiration.

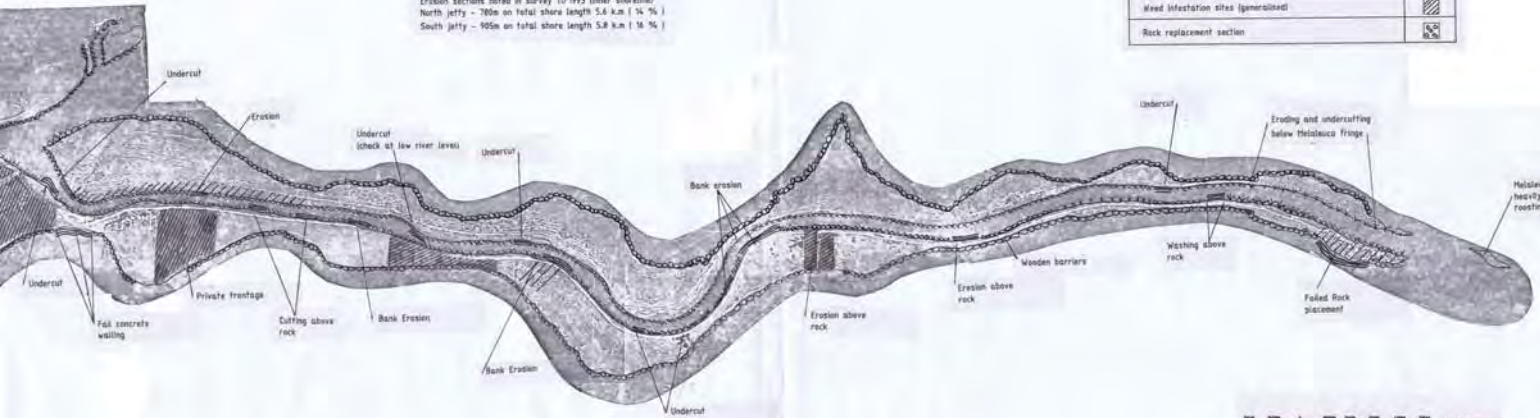
Rock beaching and other various erosion control measures, along with the re-introduction of large wood for fish habitat, have been implemented by partner agencies such as the East Gippsland Catchment Management Authority (see Figure 5) and Department of Environment and Primary Industries over the last fifteen years in areas of significant and visible erosion. Work completed by the Department of Environment and Primary Industries has included rock armouring along the southern shore of the southern jetty, and the installation of large geotextile bag groynes as part of a Gippsland Lakes wide trial of alternate erosion control methods (DEPI, 2012).

Enhancement of the existing fishing and recreational facilities was undertaken in 2004 to improve the visitor experience at the reserve. This included construction of a number of fishing platforms,

bench-style seating at these platforms, as well as rocking and fencing to protect revegetation at these locations (see Figure 5). New signage and a formalised car park at Point Dawson were also completed through this project. Much of this refurbishment work is in need of further repair and evaluation to assess whether it still meets the needs and expectations of visitors and community.

AREAS	LEGEND
Freehold Land.	
Swamp , paperbark fringe (Melaleuca)	
Reed fringe	
Erosion hazard section	
Weed infestation sites (generalised)	
Rock replacement section	

Note:-
Erosion sections noted in survey 11/1993 (inner shoreline)
North jetty - 780m on total shore length 5.6 k.m (14 %)
South jetty - 905m on total shore length 5.8 k.m (16 %)



4. HAZARDS AREAS

SHOWING EROSION SITES, VERMIN AND WEED CONCENTRATION AND ROCK PLACEMENT SECTIONS

Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 4: Rock Beaching Presence and Historic Revegetation Works

Rock Beaching Extent

Historic Revegetation Works

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0 112.5 225 450 675 900

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Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 5: Location of Recent On Ground Works

In-stream Works

- Large Wood Installation
- Bank Stabilisation

Recreational Assets

- Fishing platform and access improvements (including parking)
- Formal Road Maintenance

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3 DATA SOURCES

A range of hard copy and electronic data has been collated as part of this project to help inform both technical assessments and the development of management recommendations for the site. These data sets include:

- Specific literature provided by Parks Victoria and obtained from other relevant sources;
- Completed on ground works provided by the EGCMA as GIS layers;
- Aerial photography (2010) provided by Parks Victoria and the West Gippsland Catchment Management Authority used to complete shoreline mapping and identify vegetation types and extent;
- High resolution surface elevation data (LiDAR) provided by the West Gippsland Catchment Management Authority to assist with the development of a 2D hydraulic model for the lower Mitchell River; and
- Wind rose data sourced from the Bureau of Meteorology (East Sale weather station) to assist with wind wave calculations and modelling for the site.

Biodiversity and land management related data for the descriptions of values and threats associated with the site including; occurrence and description of Ecological Vegetation Classes; records of Rare or Threatened flora and fauna; distribution of Threatened Ecological Communities; current land management arrangements; and planning zones and overlays was also utilised from a number of sources:

- Planning Maps online (DTPLI, 2014);
- EPBC Protected Matters Search Tool (DE, 2014);
- Victorian Biodiversity Atlas database (DPEI, 2014a);
- DEPI Biodiversity Interactive Maps (DEPI 2014b); and
- DEPI Ecological Vegetation Class Benchmark Descriptions (DEPI 2014e).

4 STAKEHOLDER CONSULTATION

4.1 Purpose

A central component of the project has been the engagement with stakeholders, to help understand aspirations for future use of the Mitchell River Silt Jetties, and to understand views on the potential options for management of priority threats. Table 1 provides an overview of the planned engagement activities.

Table 1: Overview of planned project engagement activities

ENGAGEMENT ACTIVITY	PURPOSE	TARGET OUTCOME	TIMING	METHOD/S	LEVEL ON IAP2 SPECTRUM
Inviting participation	Identifying and inviting stakeholders to participate in the two workshops	Interest in participating from a representative range of interested and affected parties	September 2014	Email	Inform
Workshop 1	Explore what stakeholder's value about the site, their vision for its future and – broadly – what is required to achieve that vision.	Input gathered from stakeholders regarding the values and vision regarding the site A high level program logic Positive relations established with stakeholders regarding the project	October 2014	Workshop	Consult
Workshop 2	Explore options for managing threats to the site and the values it supports.	Stakeholder understanding of the technical assessments regarding key threats and options for on ground action to protect values. Input gathered from stakeholders on preferences regarding priorities and targets for on ground actions	November 2014	Workshop	Consult
Final presentation	Presentation of resulting management plan	Stakeholders understand how their input influenced the final outcome and can appreciate why decisions were made about the final suite of management actions and priorities	February 2015	Presentation	Inform

To date, this engagement focussed on two workshops held in October and November 2014, that involved a broad range of representatives from formal organisations across management agencies, special interest groups and local community.

Workshop 1 focussed on values and vision for the site, and Workshop 2 on priorities and actions. This sequencing of the workshops came from the recognition that stakeholders would likely come to the process with established and diverse ideas on what are the key issues for the silt jetties and what corresponding action they want to see. It was our view that in order to achieve constructive dialogue and decision making, it was necessary for stakeholders to have the chance to build some common ground through Workshop 1 – i.e. to develop an appreciation of the collective values attached to the site and a shared vision for the future – before exploring the priorities and actions during Workshop 2. To help achieve this, we requested that one representative attend per organisation and that representatives commit to participating in both workshops.

The International Association for Public Participation (www.iap2.org.au) emphasises the importance of being clear with stakeholders about where on the 'public participation spectrum' any planned engagement lies and to articulate the engagement 'goal' and 'promise.' At each of our two workshops we confirmed the following with participants:

- We view the workshops as positioned at Consult on the public participation spectrum;
- Our participation goal is to understand what is important to stakeholders and their organisations and stakeholder preferences for the future;

- Our public participation promise is to listen to stakeholders and understand what is important to them, and to incorporate what we can of stakeholder input into the final decision on the project.

To fulfil this public participation promise, it will be important to report back to stakeholders on how their input influenced the final outcome and provide an explanation for why decisions were made about the final suite of management actions and priorities.

4.2 Workshop 1

The purpose of this workshop was to explore what stakeholders value about the site, their vision for its future and, broadly, what is required to achieve that vision. The intention was to set a positive tone for the project and build some goodwill between participants, laying a good foundation for a productive approach to Workshop 2; and develop a broad program logic to give the project team the mandate to finalise objectives for the site, investigate the threatening processes and come back to the next session with our findings and some possible solutions.

Some key aims for the first workshop included:

- Produce an annotated map that paints a picture of the diversity of values attached to the site;
- Capture the values associated to the Mitchell River Silt Jetties through shared personal stories, drawings, cultural knowledge, ecological insights and photographs provided by all participants to help us determine '"What makes this place special?";
- Present a draft 30 year vision statement to the group for discussion and explore how well this vision statement encompasses the values people have identified; and
- Based on this vision statement, map out a high-level program logic, i.e. what might be the long-term (up to 30 years) and medium-term (10 year) outcomes we would need to reach this vision?

4.2.1 Summary and Outcomes

This workshop brought together a diverse range of stakeholders – including management agencies, special interest groups and local community – to explore what people value about the Mitchell River Silt Jetties. The group also discussed key threats to these values, explored a high level vision for the site's future and shared views on what are the outcomes or milestone they would like to see along the way.

The day began with a guided walk and talk on site to discuss how the silt jetties were formed, the dominant physical processes and environments, key natural and social values, and various management interventions that have been introduced to reduce erosion and improve fish habitat.

During the afternoon session, participants were invited to annotate a large format aerial image of the Mitchell River Silt Jetties to help map the range of natural and social values attached to the site, with photos and key words and phrases that describe what makes this place special. This session confirmed that the site is highly valued and for a broad diversity of reasons: natural, social, recreational, cultural and intrinsic.

Participants generally agreed that the physical form of the site is a key part of what makes it special. As an iconic geographic feature within the Gippsland Lakes, the silt jetties were said to contribute to a sense of place, identity and pride for locals and provide a unique scenic experience for visitors. The fact that the silt jetties are recognised as a site of international significance was discussed; both in terms of their unusual geomorphology and as a haven for migratory waterbirds as part of the international Ramsar Convention.

The group identified a range of recreational activities the site is used for, including fishing, water sports including kite surfing and kayaking, bird watching, nature appreciation, outdoor education

such as scouting, geocaching and photography. There was general agreement that all social values attached to the site are underpinned by the natural environment.

The next segment of the workshop involved exploring what vision stakeholders might have for the future of the Mitchell River Silt Jetties and, broadly, what might be required to achieve that vision. The timeframe for this vision was set at 30 years. The starting point for this discussion was consideration of a draft vision prepared by Parks Victoria for this project: *"To preserve, protect and enhance the Mitchell River Silt Jetties and provide appropriate opportunity for park visitors and community for the future."*

Participants were split into three groups to discuss this draft vision statement and to explore their own ideas. Each group presented back and a whole group discussion followed. The following areas of commonality were identified in terms of potential elements of a collective vision:

- Maintain physical form
- Keep the natural aesthetic
- Balance between social values and environmental values
- Environmental values underpin social values

In the final workshop segment, participants spent time considering, as individuals, what might be the long-term (up to 30 years) and medium-term (10 year) outcomes (or milestones) we would need to see to achieve the type of long-term vision explored in the previous session. Amongst the top themes were:

- Develop a management plan and increase funding
- Increase the profile and understanding of the silt jetties
- Address erosion issues
- Protect and enhance vegetation and habitat
- Better management of public access
- Enhance experience for variety of recreational users

A more detailed summary of Workshop 1 including detailed minutes can be found in Appendix 2 to this report.

4.3 Workshop 2

The purpose of this workshop was to explore options for managing threats to the site and the values it supports; for stakeholders to gain an understanding of the technical assessments undertaken as part of the project and the available options for on ground action to protect values; and to gather input from stakeholders on priorities and targets for potential future on ground actions.

Some key aims for the second workshop included:

- Providing a revision of Workshop 1, the resulting program logic, and agreed outcomes put forward by stakeholders;
- Provide information to stakeholders related to the technical assessments undertaken in relation to managing key threats and options for on ground action to protect values;
- Provide information and collect feedback on potential conceptual options for erosion control at the site; and
- Facilitate discussion on priorities and targets for on ground actions, including the assessment of broad management options for the site.

4.3.1 Summary and Outcomes

This session brought stakeholders back together to build on the outcomes of the first workshop. Once again, a broad diversity of interests and perspectives were represented, including some additional input from local residents and Landcare members as well as Gippsland Ports.

The purpose of this session was both for stakeholders to gain an understanding of the technical assessments undertaken and the available options for on ground action to protect values; and to gather input from stakeholders on priorities and targets for on ground actions.

The day began with a recap of outcomes from Workshop 1, in particular a summary of the environmental and social values attached to the site; the key threats to these values; and the central elements of a future vision and target outcomes for the site. It was noted that the threat to values posed by litter, vandalism and anti-social behaviour of some users was perhaps not captured adequately during the first workshop.

From here, the majority of the day focussed on presentation of the technical and risk assessments undertaken at the site, and well as discussion and assessment of potential management zones and options to help achieve a set of agreed objectives for the site.

We had broad agreement and acceptance from the stakeholder group on:

- The outcomes of the technical assessments (wind wave modelling, flood modelling, shoreline erosion resistance survey, and site disturbance assessment);
- The development of 'risk mapping' to determine areas of high risk to shoreline erosion;
- The conceptual erosion control options and measures presented to address shoreline erosion at the site;
- The development of management zones or areas across the site; and
- Six proposed management objectives developed from the outcomes of Workshop 1 (considering environment and physical factors, social components, and financial constraints).

The final exercise of the day presented a risk matrix used to assess the potential for proposed broad management options to achieve the agreed objectives for the site. The three broad management options assessed using the matrix were:

1. Retain existing access arrangements and improve facilities to match the level of use.
2. Retain road access to the extent of private property on the site; implement walking / bike path to the end of the southern jetty from this point.
3. Retain road access to the end of the majority of private property (approx. 4km from Point Dawson); implement walking / bike path to the end of the southern jetty.

The session concluded by offering participants to submit any further feedback on the risk matrix the broad management options back to the project team by the end of the following week, and by letting stakeholders know that they should expect to hear how their input influenced the final recommendations when the project report is finalised in the first quarter of 2015.

A more detailed summary of Workshop 2 including detailed minutes can be found in Appendix 2 to this report.

5 SITE VALUES

The Mitchell River Silt Jetties are a unique geographic feature within the Gippsland Lakes. Set within Lake King and bounding Jones Bay, the silt jetties support high-level natural and recreational values. These often competing values fall generally into two broad categories; environmental or ecological values; and social or recreational values. The descriptions provided below represent a summary of data collated from independent sources as well as information gathered through the stakeholder consultation process.

5.1 Environmental Values

Environmental and ecological values of the Mitchell River Silt Jetties are underpinned by the intact and continuous physical nature of the site. The longitudinal continuity of the jetties themselves and the unique geomorphological process that created them result in a site of local, regional, national, and international significance.

Figure 6 shows the distribution of environmental values across the study site.

5.1.1 Ramsar Site

The Mitchell River Silt Jetties directly adjoin the Gippsland Lakes Ramsar Site which is listed as a Wetland of International Importance under the Ramsar Convention. The Gippsland Lakes was listed as a site of importance under the Convention in 1982 in recognition of its outstanding coastal wetland values and features (BMT WBM, 2011).

5.1.2 Significant Species

Habitat to a number of Victorian Rare and Threatened species is provided by the Mitchell River Silt Jetties and surrounding areas, including a wide range of migratory species. A total of 30 significant species have been recorded across the project site, with 9 listed as Endangered, 12 listed as Vulnerable, and 9 listed as Near Threatened in Victoria. Additionally, 21 listed migratory species have also been recorded on or surrounding the site. Table 2 provides a detailed list of recorded Victorian Rare or Threatened species, including listed Migratory species, as recorded in the Victorian Biodiversity Atlas (2014).

Terrestrial and adjoining intertidal and aquatic habitats provide opportunities and resources for a wide range of bird species. Birdlife East Gippsland has recorded over 100 species of terrestrial and waterbirds at the Mitchell River Silt Jetties in the period 1998 -2008.

5.1.3 Native Vegetation

Vegetation Class (EVC) modelling identifies that much of the remnant vegetation on the Mitchell River Silt Jetties is Swamp Scrub (EVC 53). Swamp Scrub is listed as Endangered within the Gippsland Plains Bioregion in which the study site is located. Whilst there are limitations to the modelled EVC data, the remnant vegetation on site (particularly at the downstream extent of both the northern and southern jetties) contains areas of EVC 53 - Swamp Scrub. This vegetation type provides important habitat to a range of species, and is important in reducing the rate of shoreline erosion in many areas.

5.1.4 Native Fish Habitat

The Mitchell River is a major tributary of the Gippsland Lakes and provides an important area of habitat for many native fish species including Black Bream (*Acanthopagrus butcheri*), Estuary Perch (*Macquaria colonorum*) and Australian Bass (*Macquaria novemaculeata*). Large fallen and sunken trees provide important areas of habitat for fish to aggregate, find shelter, and feed. The lower reaches of the Mitchell River Silt Jetties contain significant amounts of large wood (both naturally derived and introduced by management agencies) that provide habitat for key native species.

Table 2: Significant species recorded within or surrounding the study site

SCIENTIFIC NAME	COMMON NAME	FFG	ADVISORY LIST	EPBC	LISTED MIGRATORY SPECIES
Acrocephalus stentoreus	Clamorous Reed Warbler				Yes
Actitis hypoleucos	Common Sandpiper		vu		Yes
Alcedo azurea	Azure Kingfisher		nt		
Anas rhynchotis	Australasian Shoveler		vu		
Anseranas semipalmata	Magpie Goose	L	nt		
Ardea ibis	Cattle Egret				Yes
Ardea intermedia	Intermediate Egret	L	en		
Ardea modesta	Eastern Great Egret	L	vu		Yes
Aythya australis	Hardhead		vu		
Biziura lobata	Musk Duck		vu		
Calidris acuminata	Sharp-tailed Sandpiper				Yes
Calidris ferruginea	Curlew Sandpiper		en		Yes
Calidris ruficollis	Red-necked Stint				Yes
Dasyurus maculatus maculatus	Spot-tailed Quoll	L	en	EN	
Egretta garzetta nigripes	Little Egret	L	en		
Gallinago hardwickii	Latham's Snipe		nt		Yes
Haliaeetus leucogaster	White-bellied Sea-Eagle	L	vu		Yes
Hydroprogne caspia	Caspian Tern	L	nt		Yes
Larus pacificus pacificus	Pacific Gull		nt		
Lewinia pectoralis pectoralis	Lewin's Rail	L	vu		
Limosa lapponica	Bar-tailed Godwit				Yes
Limosa limosa	Black-tailed Godwit		vu		Yes
Litoria raniformis	Growling Grass Frog	L	en	VU	
Merops ornatus	Rainbow Bee-eater				Yes
Numenius madagascariensis	Eastern Curlew		vu		Yes
Nycticorax caledonicus hillii	Nankeen Night Heron		nt		
Oxyura australis	Blue-billed Duck	L	en		
Phalacrocorax varius	Pied Cormorant		nt		
Platalea regia	Royal Spoonbill		nt		
Plegadis falcinellus	Glossy Ibis		nt		Yes
Pluvialis fulva	Pacific Golden Plover		vu		Yes
Pluvialis squatarola	Grey Plover		en		Yes
Rhipidura rufifrons	Rufous Fantail				Yes
Sterna hirundo	Common Tern				Yes
Sternula albifrons sinensis	Little Tern	L	vu		Yes
Sternula nereis nereis	Fairy Tern	L	en	VU	

L – Listed under the FFG Act 1988; **en/EN** –Endangered; **vu/VU** – Vulnerable; **nt** – Near Threatened

Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 6: Distribution of Environmental Values

- Victorian Rare or Threatend Species
- Migratory Species
- Instream Habitat
- EVC 53 - Swamp Scrub
- Gippsland Lakes Ramsar Site

Parks Victoria

alluvium

DODO ENVIRONMENTAL

ETHOSNRM

Date: 28/11/14

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5.2 Social Values

A wide range of social or recreational values are contained within the Mitchell River Silt Jetties site. The site is a popular destination for recreational fishers, visitors to the area, and local residents seeking to experience the natural beauty and isolation of the Gippsland Lakes and the lower Mitchell River.

Figure 7 shows the distribution of social values across the study site.

5.2.1 Private Land

Significant areas of private property exist within the site, particularly at the upstream end of the southern jetty; two 'included' private properties also exist approximately midway along the southern jetty. A total of 20 private properties exist within the study site. The assets, infrastructure, and services associated with these properties represent a significant community value to the area.

5.2.2 Road Access

A partly sealed access road exists along the entire length of the southern silt jetty. This road provides access to private properties, as well as vehicle access to the majority of the southern jetty. No road access exists to the northern silt jetty. Management of the road is shared between Parks Victoria and the East Gippsland Shire Council and is maintained to provide legal access for residents to their properties and access for visitors to the Mitchell River Silt Jetties Gippsland Lakes Reserve.

5.2.3 Community Assets

The East Gippsland Shire manages a number of assets (other than Rivermouth Road) within the site including the boat ramp, car park and public toilets located at The Cut on the southern side of the Mitchell River. Gippsland Ports is responsible for a large jetty located at Point Dawson at the end of the southern jetty. These facilities provide access for visitors to the site to launch, retrieve, and moor vessels, and are an integral part of the recreational use of the site.

5.2.4 Recreational Fishing and Hunting

Recreational fishing opportunities represent a significant social value of the site. The opportunity to access both the lower reaches of the Mitchell River and areas of Lake King are highly valued by local stakeholders. Opportunities to fish from the southern bank of the river exist across the majority of the site; the northern bank is only accessible by boat. Various formal and informal fishing locations exist on the southern jetty, with other formal fishing platforms, seating and parking areas also in place.

Other fishing and hunting activities are also valued by local stakeholders, and a number of commercial and bait fishermen also operate in the waters surrounding the silt jetties. The northern jetty is used as a base for hunting (in season) in the Jones Bay Wildlife Reserve which adjoins the Mitchell River Silt jetties to the north west.

5.2.5 Other Recreational Activities

Numerous other recreational opportunities exist across the sites and are highly valued by local stakeholders. Kayaking, kite surfing, sail boarding, swimming, bird watching, cycling, walking, nature appreciation are all undertaken across the site with a broad cross section of the local community and visitors to the area engaging in these activities. However, appropriate infrastructure to support these activities is lacking in many cases.

Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 5: Distribution of Social Values

Numerous other recreational opportunities exist across the sites and are highly values by local stakeholders. Swimming, cycling, walking, nature appreciation are all undertaken across the site with a broad cross section of the local community and visitors to the area engaging in these activities.

Access Road

Private Land

Fishing / Access Points

Informal

Formal

Recreational Values / Activities

Bird watching

Boat launch and retrieval

Kite surfing and Sail boarding

Hunting

Kayaking and Boating

N

Meters

0 125 250 500 750 1,000

Parks Victoria

alluvium

DODO ENVIRONMENTAL

ETHOSNRM

Date: 28/11/14
Map Produced by: Ethos NRM
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5.3 Cultural Values

Values within the site have a rich cultural overlay with Gunaikurnai People, not only are environmental and social values of the Mitchell River Silt Jetties threatened by current levels of shoreline erosion and some land use practices, significant cultural values representing the very fabric of Gunaikurnai connection, and cultural practices are also held within the site.

Through consultation with the Gippsland Land and Waters Aboriginal Corporation (GLaWAC), the information outlined above has been provided. With reference to future management of the site, GLAWaC have indicated that it is clear that erosion is an issue, and every effort to balance the silt jetties for their cultural, social, environmental, and scientific values should be made.

GLaWAC have indicated the Mitchell River Silt Jetties are an extremely important and sensitive site, and they record atrocities committed in this area. The silt jetties have not only collected the blood of hundreds of Gunaikurnai Men, Women, and Children, but also hold their Remains and cultural materials.

5.4 Objective for the Site

Through consultation with project stakeholders, and an assessment of the values, threats and uses of the Mitchell River Silt Jetties, a suite of objectives for the site have been developed. These objectives consider the outcomes from stakeholder consultation and represent the agreed direction for management of the site.

The objectives outlined below address the physical or environmental, the social, and the financial considerations required for future management of the silt jetties. These objectives aim to guide management action in the short to medium term (5 years), and help achieve medium term (10 year) outcomes that will support the long-term (up to 30 year) vision for the site developed in consultation with stakeholders.

The objectives for management developed for the Mitchell River Silt Jetties are to:

- Retain the physical integrity of the Mitchell River Silt Jetties in their elongate digitate delta form;
- Protect and enhance the environmental character of the Mitchell River Silt Jetties;
- Provide access for residents of the silt jetties to and from their property;
- Provide access for visitors to the site for a variety of recreational activities;
- Limit the cost of any new or proposed works undertaken to achieve the project objectives; and
- Reduce the maintenance cost of existing and any new works at the site through appropriate design and management solutions.

6 THREATS TO SITE VALUES

A number of key threatening processes to this significant site have been identified, including shoreline erosion, inappropriate visitor use, and current recreational access. The sections below provide a description of the general scope of these threats across the site.

6.1 Shoreline Erosion

There has been considerable erosion and recession of the delta since the creation and maintenance of a permanent ocean entrance to the Gippsland Lakes in 1889. This can be attributed to a number of factors; increased salinity, the subsequent dieback of fringing vegetation, and wave erosion.

The morphology and physical integrity of the Mitchell River Silt Jetties (a primary reason for its regional, national and international significance) is currently under threat from extensive areas of shoreline retreat. Significant areas of the shoreline are now armoured with rock beaching, however much of the rock in place is providing very limited protection from current erosion processes.

The majority of the lakeside shorelines along the silt jetties are unstable and provide limited opportunity for the establishment, or re-establishment, of native vegetation which may provide some resistance to erosive processes. Very few areas of emergent vegetation, which previously provided a level of protection against wave energy, now exist along the lakeside shorelines of the site.

The continual retreat of shoreline areas and loss of fringing vegetation (both terrestrial and emergent) has the potential to threaten the physical integrity of the site, and both the environmental and social values which depend on a stable physical environment to persist at the site.

Plate 1: An eroding shoreline on the Lake King side of the southern silt jetty. Note the vertical shoreline and easily erodible silty material. The breaking waves to the right of the image mark the position of rock beaching previously placed to prevent erosion.

6.1.1 Wind Waves

The dominant process leading to lakeshore erosion is associated with wind waves. The scale and extent of wind wave erosion is a function of the balance between the competing forces of the applied energy and the resisting forces provided by the bank material.

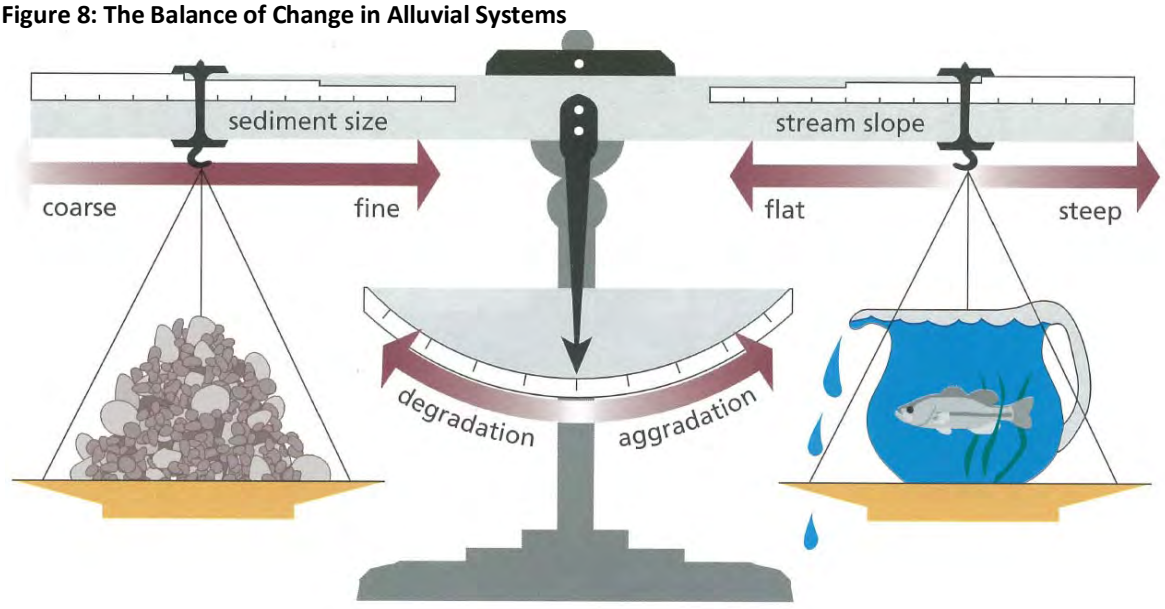
Applied wave energy: The wind wave energy applied to lake shores is principally a function of the wind speed, wind duration, wind direction (angle of the wave to the shoreline), and the wave fetch. The wind speed, duration and direction dictate wave energy and can be identified from weather stations in the region. The fetch, refers to the distance across a water body over which waves can be generated. The longer the distance or 'fetch' over a water body, the larger the wave that can be generated. The largest and most erosive wind waves occur where wind speed is high, duration is long, direction is at right angle to the bank alignment and where the fetch is high. None of these elements have changed significantly in the Gippsland Lakes since European settlement and in this respect the energy applied to the shore has not changed since settlement

Resistance to wave energy: Resistance to wave energy can be applied by the material (soil, sediment, placed material) that makes up the lake shore bed and banks, the angle of incline (slope) of the bank, and the vegetation in the lake bed and along the shoreline. Larger gravels and cobbles will be more resistant to erosion that finer sands and silts. It is likely that there has not been any significant change in the lakeshore sediment size since European settlement. As described in Section 6.2 in this report, vegetation serves to protect the bed and bank material from erosion. Vegetation both buffers against wave action and provides tensile strength to sediment. As set out in this report, there has been a significant decline in vegetation associated with the increasing salinity of the Gippsland Lakes. This decline in vegetation condition has contributed to, and will continue to contribute to, ongoing bank retreat. In the absence of management intervention, the ongoing wave action will lead to the continuing loss of sediment, and decline of the silt jetties.

6.1.2 River Bank Retreat

The Mitchell River through the silt jetties can be described as an unconfined alluvial stream system. Such systems can be expected to undergo episodic periods of channel change. The dominant process of change will be meander migration, and depending on conditions, either the enlargement or narrowing of the channel. The processes of change can be a function of the balance between the forces of change and the resistance of the system to such forces. This balance is illustrated conceptually below in Figure 8.

Figure 8: The Balance of Change in Alluvial Systems

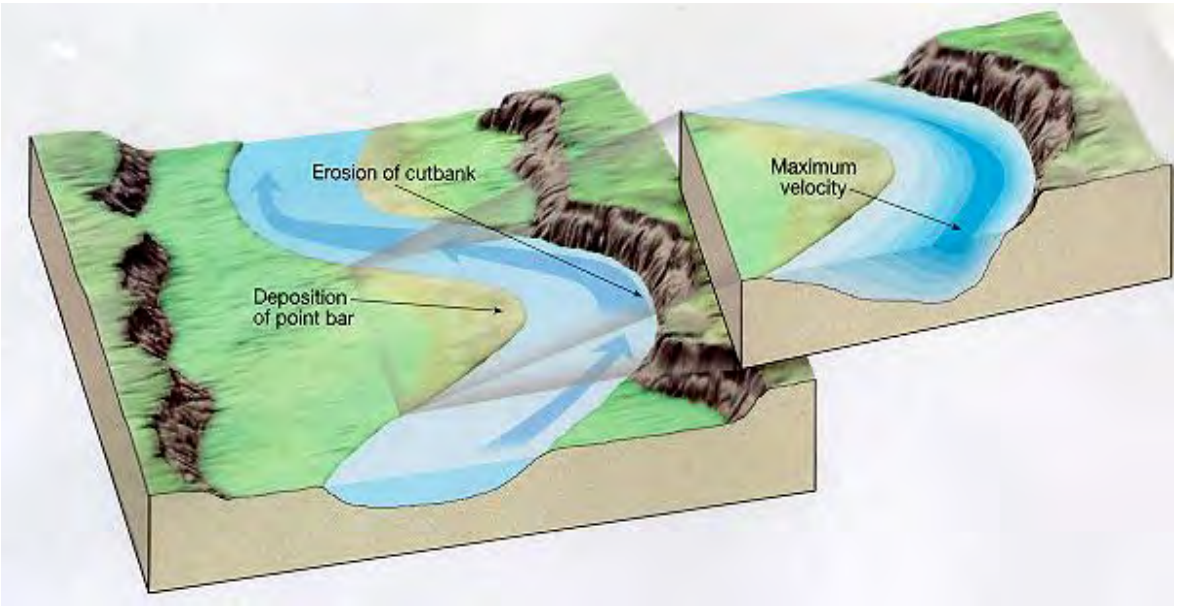


Since settlement the silt jetties have been subject to significant change that has potential to impact on this balance between the competing forces.

- Applied energy to the stream banks
  - The volume of water passing through the silt jetty system has reduced as a result of the 'the Cut'. The reduction in water now passing through the system reduces the potential for scour of the river banks through the silt jetties.
  - However while there has been a reduction in energy associated with the loss of flow from the system, there is an increase in wave energy associated with boat traffic. Boat wash is likely to be causing some bank erosion on the river bank components.
- Resistance to the applied energy
  - Accompanying the loss of stream flow has been a reduction in sediment supply to the silt jetties. The transport of suspended sediment requires energy and reductions in sediment supply can result in increased energy available to mobilise and transport sediment. It is likely that the reduction in stream flow has been offset by the reduction in sediment transport through the system.
  - Bank material/ sediment size/vegetation. While the sediment size range making up the banks of the Mitchell River has not changed, stock access and increased salinity (associated with the permanent opening of the Gippsland Lakes) have resulted in a decline in riparian vegetation condition. Riparian vegetation serves to increase the resistance of stream banks to scour forces. The loss of vegetation has resulted in a reduction in erosion resistance.

The most active stream banks on the Mitchell River silt jetties will be vertical banks with poor or limited riparian vegetation. It is expected that vertical banks are to be found on the downstream extent of meander bends as illustrated in the following Figure 9.

Figure 9: Conceptual diagram of meander bend



6.2 The Role of Fringing Vegetation

Three recent studies of the global literature ('meta-analyses') have shown convincingly that fringing vegetation, especially if dense and wide, makes coastal shorelines less susceptible to erosion and to damage by storm surges, and potentially even to small tsunamis (Prasetya 2006; Gedan *et al*. 2008; Shepard *et al*. 2011). The effectiveness of vegetation in protecting against shoreline erosion is controlled by a number of factors:

- the width of the fringing vegetation (wider bands are almost always more effective than narrow bands);
- plant density (more dense distributions are usually more effective than sparse distributions, until a maximum effect is reached); and
- plant architecture (especially the robustness of individuals and the way their roots, branches and leaves are orientated to (and resistant to) wave action).

Bird (1983) and Sjerp *et al*. (2002) showed that the loss of fringing vegetation has had a major impact on shoreline dynamics around the Lakes. They noted that vulnerable shorelines occurred along the Mitchell and Tambo River deltas, as well as along the Latrobe and Avon River deltas and parts of McLennan Strait, amongst other locations. The progressive loss of the Mitchell River Silt Jetties was examined in detail by Bird (1962a, 1970) and Bird and Rosengren (1971).

6.2.1 Common Reed (Phragmites australis)

Common Reed is still found in many areas of the Gippsland Lakes, particularly around the edges of inflowing rivers and in the fresh and brackish-water wetlands. Because it is a globally distributed, robust, emergent, perennial, clonal species with a wide hydrological niche, Common Reed has been the subject of a number of investigations into the role played by fringing vegetation in protecting shorelines against erosion.

In the Netherlands, Coops *et al*. (1996) showed that *Phragmites australis* not only proved relatively immune to uprooting by waves but also 'influenced the erosive impact of waves by both sediment reinforcement and wave attenuation. A smaller amount of net erosion was measured in the wave-exposed sections covered by vegetation than in the unplanted sections'. Similar results have been reported in other parts of Europe (e.g. Phillips 1987 in the USA; Caffrey and Beglin 1994 in Ireland; Horppila *et al*. 2012 in Finland) and, in some locations (e.g. the Atlantic coast of France), the loss of fringing reed beds and their associated protection of the shoreline is viewed with alarm (Guillou 2010).

Du *et al*. (2011) reported that beds of *Phragmites australis* provided the best protection (of a number of alternative plant communities) against shoreline erosion around Chongming Island, China. In southern Africa, Kotschy and Rogers (2008) reported that the clonal characteristics of *Phragmites mauritianus* helped it survive disturbance in a semi-arid river, and in the Widden Brook, a tributary of the Hunter River in New South Wales, Erskine *et al*. (2012, page 102) reported that the 'establishment of stonoliferous and rhizomatous clonal grasses (*Phragmites australis, Cynodon dactylon, Paspalum distichum, Pennisetum. clandestinum*) is important in inducing sedimentation

Bird (1961b) analysed the factors that may have been responsible for the loss of fringing beds of Common Reed from around the Gippsland Lakes. He concluded that reed regrowth was limited by high salinities, but could not unequivocally dismiss changing land-use practices, especially uncontrolled grazing, as a contributing factor. Interestingly, Roberts (2000) concluded that agriculture was primarily responsible for retractions in the area covered by Common Reed in inland south-eastern Australia.

In a more detailed study, Clucacs and Ladiges (1980) investigated the loss of Common Reed from around the Gippsland Lakes and its putative link with increased salinity, which is the most comprehensive study to date. The investigation included a field component, where plant performance at a number of sites around the Lakes was compared, and a greenhouse component, in which plants of various providences from different parts of Gippsland were grown under different salinity regimes. A conclusion reached by this study was that 'At the sites studied, stand performance is generally correlated with site salinity'… 'Stands growing in areas of high salinity are generally short and sparse; flowering and seed-forming ability are reduced'.

The most recent study into the effect of salinity on reed dynamics is the two-part work by Hurry *et al*. (2013) and James *et al*. (2013). These investigations focussed on gene flow in *Phragmites* beds in the Gippsland region. The first demonstrated there was no genetic evidence of salt-tolerant variants in the various populations examined, which included sites around the lower Latrobe River, the Avon and Mitchell Rivers, Dowd and Macleod Morasses, Metung and Lake Bunga. There were, however, substantial differences in stem length and diameter and in leaf width (smaller in saline sites, larger in freshwater sites). The second paper showed there was appreciable genetic connectivity across the various sites, probably via wind-blown seed.

6.3 Other Threats

The Mitchell River Silt Jetties represent a high use area for a range of recreational activities. This high level of use, and the formal and informal infrastructure associated with this use, has the potential to threaten both the environmental and social values of the site.

6.3.1 Rivermouth Road

The management of drainage from the unsealed sections of the formal road, particularly at the downstream end of the southern jetty, has previously resulted in instability and erosion on adjoining shorelines.

Ethos NRM (2010) identified erosion posed a direct threat to Rivermouth Road at sixteen sites, with eight sites considered as high priority. Of these sites, eight were identified where stormwater discharging off Rivermouth Road was either the principle cause of bank erosion, or is exacerbating it.

Options for management of bank erosion were identified and the recommended option involved the construction of rock wall armouring at all identified erosion sites, with immediate action required for the 8 high priority sites. In addition, eight sites required improved stormwater management to direct water from Rivermouth Road towards the river, down fluming or small rock chutes.

Works were completed in 2010 to address some of these issues, however continued informal use of areas adjoining the road continue to increase the risk of further impacts.

A network of informal tracks also exists across the site. These tracks provide access through revegetated areas and have the potential to threaten rehabilitation works, and in some cases increase the risk of erosion through damage to native vegetation.

6.3.2 Loss of Vegetation

Informal access to the edge of the river, and the lake shoreline, provides potential for increasing the likelihood of erosion across the site. Clearing of native vegetation for access tracks and informal fishing areas, reduces the resistance of the area impacted (through the removal of stabilising vegetation) and increases the potential for erosion to occur.

Compaction and damage to the soil profile and vegetation surrounding informal access points through trampling, foot traffic, and fires, may further increase the likelihood of erosion, particularly in sensitive areas.

6.3.3 Pest Plants and Animals

A range of pest plants and animals have been recorded across the Mitchell River Silt Jetties. These species impact on the natural values of the site, and place further pressure on ecological processes within this modified environment.

Pest plant species often out-compete native species within disturbed environments, locations like road edges and areas of disturbance within intact vegetation, provide habitat for weed species to become established within a site. This is particularly relevant across the southern jetty where Rivermouth Road extends for its entire length, and the network of informal tracks and access points provide opportunities for weeds to spread and establish.

Pest animals, particularly predators, have the potential to significantly impact on the indigenous fauna across the site. The number and diversity of birds found on the Mitchell River Silt Jetties has the potential to be impacted by pest animal species through predation.

Table 3 shows the species recorded (within the Victorian Biodiversity Atlas and by Parks Victoria) within the study site.

Table 3: Pest plant and animal species recorded within the study site

Pest Plants		Pest Animals	
Scientific Name	Common Name	Scientific Name	Common Name
Aptenia cordifolia	Heart-leaf Ice-plant	*Acridotheres tristis*	Common Myna
Asparagus asparagoides	Bridal Creeper	*Alauda arvensis*	European Skylark
Asparagus officinalis	Asparagus	*Anas platyrhynchos*	Northern Mallard
Atriplex prostrata	Hastate Orache	*Cyprinus carpio*	Carp
Callitriche stagnalis	Common Water-starwort	*Oryctolagus cuniculus*	European Rabbit
Cirsium vulgare	Spear Thistle	*Passer domesticus*	House Sparrow
Fumaria bastardii	Bastard's Fumitory	*Rattus rattus*	Black Rat
Hedera helix	English Ivy	*Streptopelia chinensis*	Spotted Turtle-Dove
Juncus acutus subsp. acutus	Spiny Rush	*Sturnus vulgaris*	Common Starling
Lepidium africanum	Common Peppercress	*Turdus merula*	Common Blackbird
Lycium ferocissimum	African Box-thorn	*Vulpes vulpes*	Red Fox
Phormium tenax	New Zealand Flax		
Plantago coronopus	Buck's-horn Plantain		
Plantago major	Greater Plantain		
Rubus fruticosus spp. agg.	Blackberry		
Rubus laciniatus	Cut-leaf Bramble		
Sonchus oleraceus	Common Sow-thistle		

6.3.4 Vandalism and Undesirable Behaviour

Issues of vandalism, littering and other undesirable behaviour was considered to be of significant importance by many within the project stakeholder group. Undesirable practices including off track driving, vandalism of signs and infrastructure, littering, dumping of household waste, unauthorised camping, fires, and removal of native vegetation, have an impact on the natural values of the site as well as the amenity and useability of the area.

7 TECHNICAL INVESTIGATIONS

Erosion risk assessments were undertaken for the silt jetties. Different forms of assessment were undertaken to identify the likely scale of both river and lakeshore erosion.

7.1 Lakeshore erosion - Wind wave analysis

A lakeshore erosion assessment was undertaken for the silt jetties. The assessment was based on an assumption that the lakeshore erosion process is dominated by wind waves. The lakeshore wind wave assessment comprised:

- Dividing the silt jetty lakeshore into 20 metre segments.
- For each segment identifying the dominant or primary bank alignment (i.e. north, north east, east, south east, south, south west, west and north west)
- For each segment identifying the distance across the water (fetch) to the nearest shoreline for each of eight separate directions (i.e. north, north east, east, south east, south, south west, west and north west).
- Identifying the 'angle of attack' for each wave direction acting on the dominant bank alignment. Waves that hit a bank at an angle less than 90 degrees were adjusted down to reflect reduced energy expenditure on the subject bank. A reduction on wave energy was used for waves / wind direction at angles less than 90 degrees to the bank alignment.
- Application of the Bureau of Meteorology wind rose for East Sale to identify the duration and strength of winds in each of the 8 wind directions assessed.
- Application of both the 9.00am and 3.00pm wind rose results and weighting the results on a 75:25 (9.00am : 3.00pm) basis to reflect the expected duration and strength of winds over a 24hour period
- Multiplication of the adjusted fetch in each direction by the weighted wind speed and duration for that direction for each 20 metre segment of bank. This identifies the wave energy expended on each 20 metre bank segment from each wave direction.
- Summing the results for the 8 wind directions at each 20 metre bank segment to identify an overall wind wave energy expended on each 20 metre bank segment.
- Mapping the total wave energy expended on each 20 metre segment of bank.

The results of the lakeshore wind wave assessment are shown in Figure 10

7.2 Flood modelling

We undertook two- dimensional hydraulic modelling of the lower Mitchell River to identify the shear stress in the system in flood events and hence the potential for erosion arising from fluvial erosion processes. The hydraulic modelling was undertaken in the 2-dimensional TUFLOW hydraulic modelling package.

The boundaries of the hydraulic model extended from upstream of the cut to the downstream extent of the silt jetties. Topographic data for the model was sourced from available LiDAR data for the area and from available bathymetric data sourced from Gippsland Ports. Limited LiDAR data was available for the northern silt jetty and some assumptions on the land surface elevation in this area were made based on the land surface elevation of the southern jetty. Hydrologic data for the modelling was sourced from gauge data for the Mitchell River.

The modelling revealed large volumes of water in flood events to be discharged through the cut, with limited volumes and hence velocity and shear stress in the reach of the Mitchell River discharging through the silt jetties.

The shear stress results derived from the flood modelling are provided in Figure 10. Based on the hydraulic modelling we found the subject reach of the Mitchell River to have very low shear stress and erosion potential.

7.3 Resistance Survey

Through the data collation and background investigations completed as part of the project, a lack of reliable data related to the current distribution of erosion control works (rock beaching) and variety of shoreline condition across the study site was identified.

A key component of the project includes an assessment to identify the level of erosion likelihood and risk across the silt jetties, incorporating both the banks of the Mitchell River and the shorelines of the silt jetties in Jones Bay and Lake King.

In order to provide current on ground context to the technical investigations, there was a need to better understand the current level of resistance to erosion within the system. The most efficient way to gain an understanding of current condition was through a targeted survey of the shorelines of the silt jetties, including the occurrence and condition of rock beaching currently in situ, and the structural components of the adjoining native vegetation that are present.

A shoreline survey of the 26km of silt jetty shorelines was completed on the 8th and 10th October 2014.

The shoreline survey involved the following tasks:

- Development of classification criteria for rock beaching condition and vegetation presence (see Table 4).
- 2 days of water based survey (using a kayak) to map the current condition of the silt jetty shorelines. Spatial information was recorded using a TDS Nomad GPS unit and ESRI ArcPad software. Data fields recorded included:
    - Presence or absence of rock beaching;
    - Condition and functionality of the rock beaching;
    - Current modes of failure;
    - Assessment of bank angle;
    - Presence of native vegetation communities; and
    - Structural components of vegetation communities present.

The data collected from the shoreline survey was used to inform the assessment of the level of resistance of lengths of shoreline across the silt jetties. The outcomes of this assessment are outlined in Section 7.4. Figure 11 below illustrates the type and resolution of the data collected as part of the shoreline survey.

Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 10: Wind Wave Assessment and Flood Modelling Results

Flood Energy (N/m2)

- 0.0- 1.0
- 1.1 - 2.0
- 2.1 - 5.0
- 5.1 - 10.0
- 10.1 - 15.0
- 15.1 - 25.0
- 25.1 - 40.0
- 40.1 - 60.0
- 60.1 - 120.0
- 120.1 - 217.0

Wind Wave Energy

- 98775.1 - 816000.0
- 816000.1 - 1390000.0
- 1390000.1 - 1964000.0
- 1964000.1 - 2538000.0
- 2538000.1- 3112000.0
- 3112000.1 - 3686000.0
- 3686000.1- 4260000.0
- 4260000.1 - 4834000.0
- 4834000.1 - 5408000.0
- 5408000.1- 5982000.0

N

Meters
0 120 240 480 720 960

Parks VICTORIA

alluvium

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Figure 11: Shoreline Survey - Sample Data

Rock Beaching Condition

- Failing
- Intact

Presence of Emergent Vegetation

- Present
- Not present

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Table 4: Shoreline resistance survey classification criteria

CRITERIA	ATTRIBUTE	DESCRIPTION
ROCK BEACHING		
Presence	Yes	Rock beaching present on shoreline
	No	Rock beaching not present on shoreline
Rock Condition	Intact	Rock beaching currently providing protection from erosion
	Failing	Evidence of erosion visible
Rack / Bank Angle	Low	Angle < 15^{o}
	Moderate	Angle 15^{o} – 60^{o}
	Steep	Angle > 60^{o}
	Vertical	Angle 90^{o} or undercut
VEGETATION		
Emergent Vegetation		
Presence	Yes	Emergent vegetation present immediately adjacent to shoreline
	No	Emergent vegetation not present immediately adjacent to shoreline
Origin	Native	Indigenous species
	Introduced	Non-indigenous species
Dominant Species	Name	Name of dominant species in survey sector
Ground Layer		
Presence	Yes	Grasses or grass like plants present in near shore environment
	No	Grasses or grass like plants not present in near shore environment
Origin	Native	Indigenous species
	Introduced	Non-indigenous species
Dominant Species	Name	Name of dominant species in survey sector
Shrub layer		
Presence	Yes	Shrubs (>1m) present in near shore environment
	No	Shrubs (>1m) not present in near shore environment
Origin	Native	Indigenous species
	Introduced	Non-indigenous species
Dominant Species	Name	Name of dominant species in survey sector
Emergent Tree Layer		
Presence	Yes	Emergent trees (e.g. *Eucalyptus, Acacia*) present
	No	Emergent trees (e.g. *Eucalyptus, Acacia*) not
Origin	Native	Indigenous species
	Introduced	Non-indigenous species
Dominant Species	Name	Name of dominant species in survey sector

7.4 Site Disturbance Assessment

A field assessment was undertaken to determine the location and level of disturbance from recreational and visitor activities across the southern silt jetty. The northern jetty is only accessible by boat, and through discussions with Parks Victoria, project stakeholders, and observations throughout other assessments completed as part of the project, it was determined that the relative level of disturbance in this area is minimal.

Site visits were undertaken along the length of the southern silt jetty, with areas of disturbance noted and mapped. Spatial information was recorded using a GPS unit and ESRI ArcPad software.

Assessments were made of road and track location, road drainage, and formal and informal access points to the river and lake edge. Excluding roads and tracks which were mapped as linear features, a total of fifty seven (57) areas of disturbance were recorded. Of these mapped areas of disturbance, 80% (46) were determined to be of an informal nature.

The extent of native vegetation that has been impacted or removed at informal access points was also calculated from on-site mapping. A total of over 4000m^2 was determined to have be cleared or impacted in the creation and maintenance of informal access point, paths, and parking areas.

Figure 12 shows the location of both formal and informal roads, tracks, and access points across the southern jetty, including examples of typical impacts at these sites.

Other Issues related to drainage at informal access points, drainage from the road, and the inability for vegetation to establish due to spatial constraints on narrow sections of the southern jetty were also identified.

Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 12: Distribution of Roads, Tracks, and Access Points

A - An example of the data collected in the site disturbance assessment, mapping areas of vegetation loss and compaction.

B, C and D - Examples of areas where informal access points have resulted in loss of vegetation, compaction of the soil, and poor drainage

Meters
0 110 220 440 660 880

N

Roads and Tracks

- Informal
- Formal

Access Points

- Informal
- Formal

Disturbance footprint

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8 EROSION LIKELIHOOD AND RISK

Areas of greatest erosion likelihood and risk have been identified across the Mitchell River Silt Jetties using a combination of the information collected from the technical investigations.

The two components used to identify areas of greatest erosion ***likelihood*** are:

- Erosion potential, or energy acting upon a given area of shoreline; and
- Shoreline resistance.

8.1 Erosion Potential (Energy)

The technical investigations completed as part of this project identified erosion potential that exists across the shorelines of the Mitchell River Silt Jetties. The results and methods associated with these technical investigations are detailed in Sections 7.1 and 7.2 of this report.

Outputs of flood and wind wave modelling exercises identified the amount of energy potentially acting upon shorelines of the silt jetties. The outputs of these models allowed the classification of shorelines based upon the relative level of energy that may be exerted upon them. For each segment of shoreline, the average energy acting upon that shoreline (with the potential to cause erosion) was classified as either Very Low; Low; Moderate; High; or Very High.

Table 5 shows the classifications and the energy ranges that have been included within them.

Table 5: Energy range classifications for riverine and wind wave erosion potential

VERY LOW	LOW	MODERATE	HIGH	VERY HIGH
RIVERINE EROSION (UNITS = N/M2)				
0.12 – 0.78	0.79 – 1.88	1.89 – 3.49	3.49 -7.64	7.65 – 53.07
WIND WAVE EROSION (UNITS – FETCH (M) X WIND SPEED (KM/HR))				
163250 - 52881	752882 - 1304485	1304486 - 1930887	1930888 - 2717568	2717569 - 4133942

8.2 Shoreline Resistance

The shoreline survey detailed in Section 7.3 provided data to assess the level of resistance that is present across the shorelines of the Mitchell River Silt Jetties. Two components of resistance to erosion were assessed:

- Physical or structural resistance (provided by rock beaching); and
- Vegetation resistance (provided by the adjoin vegetation community

8.2.1 Physical Resistance

The physical or structural resistance of a given sector of shoreline was determined based on the presence and condition of rock beaching, and the angle of the bank. The matrix below was used to provide a rating for each shoreline sector.

PHYSICAL RESISTANCE		ROCK BEACHING PRESENCE		
		NOT PRESENT	PRESENT (FAILING)	PRESENT (INTACT)
Bank Angle	VERTICAL	Very Low	Low	Moderate
	INTERMEDIATE	Low	Moderate	High
	LOW	Moderate	N/A	Very High

8.2.2 Vegetation Resistance

The resistance of a given sector of shoreline provided by vegetation communities was determined based on the presence and condition of emergent vegetation, and the presence and structural diversity of other vegetation present. The matrix below was used to provide a rating for each shoreline sector.

VEGETATION RESISTANCE		TERRESTRIAL VEGETATION		
		POOR	MODERATE	GOOD
Emergent Vegetation	POOR	Very Low	Low	Moderate
	MODERATE	Low	Moderate	High
	GOOD	Moderate	High	Very High

The definitions used for determining the ratings for each vegetation class are contained in Table 6 below.

Table 6: Shoreline resistance survey classification criteria

VEGETATION CLASS	RATING	DEFINITION
Emergent Vegetation	Poor	None Present
	Moderate	Present with dominant species of *Juncus kraussii* or *Cladium procerum.* If *Phragmites australis* is present I may only be present in a thin or disjunct band.
	Good	Present with dominant species of *Phragmites australis*. *Phragmites australis* must be present in a wide intact band.
Terrestrial Vegetation	Poor	Only a single structural category[1] present
	Moderate	2 structural categories present
	Good	3 structural categories present

[1] A structural category is defined as a group of species with similar lifeform characteristics. i.e. Ground layer species; Shrub species; and Emergent tree species. The assumption made in developing the ratings above is that a more diverse native vegetation community will create a more diverse sub soil root structure, and therefore provide greater resistance to erosion.

8.2.3 Resistance to Shoreline Erosion

The overall level of resistance along a given sector of shoreline was determined by considering both the level of physical resistance, and the level of resistance provided by vegetation communities in that area. Levels of physical and vegetation resistance for each sector of shoreline were determined using the matrices outlined in the sections above.

The matrix below was used to provide an overall resistance rating for each shoreline sector by combining the levels of resistance provided by both physical means (rock beaching) and riparian and lake shore vegetation communities. Figure 13 shows the level of current resistance to shoreline erosion across the Mitchell River Silt Jetties.

COMBINED RESISTANCE		PHYSICAL / STRUCTURAL RESISTANCE				
		VERY LOW (1)	LOW (2)	MOD (3)	HIGH (4)	VERY HIGH (5)
VEGETATION RESISTANCE	VERY LOW (1)	1	2	3	4	5
	LOW (2)	2	4	6	8	10
	MODERATE (3)	3	6	9	12	15
	HIGH (4)	4	8	12	16	20
	VERY HIGH (5)	5	10	15	20	25

Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 13: Shoreline Resistance Rating

Resistance Rating

- Very Low
- Low
- Moderate
- High
- Very High

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8.3 Areas of High Erosion Likelihood

When determining the areas of greatest erosion likelihood across the Mitchell River Silt Jetties, an assessment has been made that combines the two factors that determine the susceptibility of a given area to erosion:

- Erosion potential, or energy acting upon a given area of shoreline; and
- Shoreline resistance.

In essence;

Erosion Risk = fn (excess energy, level of resistance)

The matrix below was used to provide an overall erosion likelihood rating for each shoreline sector by combining the levels of resistance with the level of potential energy available to generate erosive processes within each shoreline sector.

		ENERGY				
		VERY LOW (1)	**LOW (2)**	**MOD (3)**	**HIGH (4)**	**VERY HIGH (5)**
RESISTANCE	**VERY HIGH (1)**	1	2	3	4	5
	HIGH (2)	2	4	6	8	10
	MEDIUM (3)	3	6	9	12	15
	LOW (4)	4	8	12	16	20
	VERY LOW (5)	5	10	15	20	25

Figure 14 illustrates the likelihood of erosion that has been determined for shoreline sectors across the Mitchell River Silt Jetties. The detailed results of the risk assessment process for each area of shoreline, including the spatial extent of each sector, are contained within Appendix 3.

8.4 Areas of High Erosion Risk

The combination of likelihood and consequence is used to determine ***risk***. In the specific instance of the Mitchell River Silt Jetties, the key negative consequence related to shoreline and stream bank erosion processes is the loss of physical integrity or intactness of the site. Erosion has the potential to degrade the form of the silt jetties resulting in a series of discontinuous islands.

Areas of the highest likelihood of erosion across the Mitchell River Silt Jetties are identified in Figure 14 below.

In terms of consequence, the highest consequence of erosion occurs in areas where the silt jetties are narrow, such that fragmentation of the jetties would result from the erosion. The lowest consequence occurs where the silt jetties are widest.

When combining the likelihood and consequence of erosion, the highest Erosion Risk occurs where there is both a high likelihood and high consequence of erosion. For the Mitchell River Silt Jetties the highest risk occurs where areas of high likelihood of erosion align with the narrowest parts of the jetties (see Figure 14).

Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 14: Shoreline Erosion Likelihood Rating and Areas of High Erosion Risk

Likelihood of Erosion

- Low
- Moderate
- High
- Very High

Areas of High Erosion Risk

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9 MANAGEMENT APPROACH

9.1 Proposed Objectives for Management

A suite of objectives to guide management action in the short to medium term (5 years), and help achieve medium term (10 year) outcomes that will support the long-term (up to 30 year) vision for the site was developed in consultation with stakeholders.

The agreed objectives for future management of the Mitchell River Silt Jetties are to:

- Retain the physical integrity of the Mitchell River Silt Jetties in their elongate digitate delta form;
- Protect and enhance the environmental character of the Mitchell River Silt Jetties;
- Provide access for residents of the silt jetties to and from their property;
- Provide access for visitors to the site for a variety of recreational activities;
- Limit the implementation cost of any new or proposed works implemented to achieve other project objectives; and
- Reduce the maintenance cost of existing and any new works at the site through effective design and management solutions.

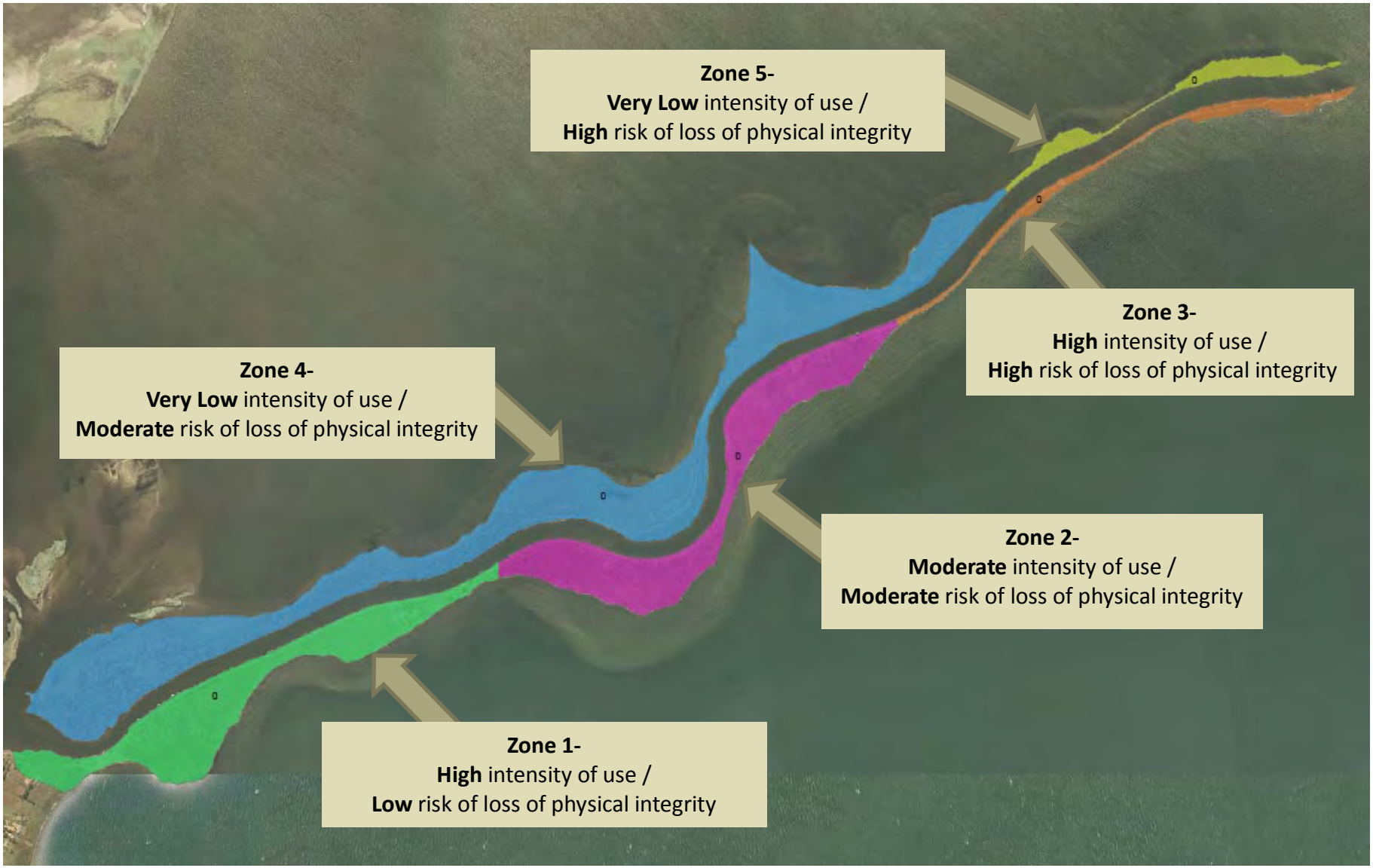
9.2 Land Use and Proposed Management Zones

During consultation with project stakeholders a series of principles for land management were examined. Outcomes of this discussion concluded that:

- Land use, and intensity of that land use, should match the capability and suitability of land for that specific use; and
- The standard of facilities in an area should reflect the intensity of use and the standard of access. e.g. low level facilities are appropriate where low intensity land use is suitable and is proposed.

Using the principles outlined above, and in incorporating outcomes from discussions with project stakeholders in Workshop 2, a series of management zones have been mapped that reflect current land use and capability. Figure 15 outlines the extent of these zones, the current level of use, and the current risk of the loss of physical integrity of the site within that zone.

Figure 15: Proposed management zones



9.3 Land Management Options Analysis

A major feature of the southern silt jetty is Rivermouth Road, which currently extends from the boat ramp at The Cut to Point Dawson at the end of the southern jetty. The ongoing status and management of this road was the focus of many discussions with project stakeholders regarding the future management of the site.

In order to assess the benefits and limitations that would result from changes to current land management practices across the Mitchell River Silt Jetties, a semi-quantitative process to assess potential broad management options against the agreed site objectives was undertaken.

A suite of broad land management options, focussed on managing access and the extent of Rivermouth Road were documented. These options reflect the possible range of access levels that may be applied to the site, and include:

1. Retain existing access arrangements and improve facilities to match the level of use.
2. Retain road access to the extent of private property on the site; implement walking / bike path to the end of the southern jetty from this point.
3. Retain road access to the end of the majority of private property (approx. 4km from Point Dawson); implement walking / bike path to the end of the southern jetty.

The matrix outline below in Table 7 shows the results of the assessment of each potential broad management option against the agreed objectives for the site. Each option was assessed against each objective for each of the management zones described in Figure 15.

The level to which each option satisfied each objective in that particular zone was scored using a High (5), Moderate (3), Low (1) scale. Objectives that were not relevant to particular zones were assigned a zero (0) value.

The total and mean values for each option were then used to better understand the compatibility of each option with the agreed site objectives, and to guide the recommendations for future management contained in Section 10.3.

Table 7: Options vs. Objectives matrix used to assess potential broad management options

	Objective	*Option 1*	*Option 2*	*Option 3*
Zone 1	**P1**	5	5	5
	P2	1	1	1
	S1	5	5	5
	S2	5	5	5
	F1	3	3	3
	F2	3	3	3
Zone 2	**P1**	3	3	5
	P2	3	3	5
	S1	5	5	1
	S2	5	5	1
	F1	3	3	1
	F2	3	3	5
Zone 3	**P1**	1	5	5
	P2	1	5	5
	S1	0	0	0
	S2	5	3	1
	F1	1	5	5
	F2	1	5	5
Zone 4	**P1**	5	5	5
	P2	5	5	5
	S1	0	0	0
	S2	1	1	1
	F1	5	5	5
	F2	5	5	5
Zone 5	**P1**	5	5	5
	P2	5	5	5
	S1	0	0	0
	S2	1	1	1
	F1	5	5	5
	F2	5	5	5
	TOTAL	**95**	**109**	**103**
	MEAN	**3.17**	**3.63**	**3.43**

Option 1	Retain existing access arrangements (road to end of Zone 3) and improve facilities to match level of use
Option 2	Retain road access to end of Zone 2; implement walking / bike path to end of Zone 3
Option 3	Close road at the end of Zone 1; implement walking / bike path through Zone 2 to end of Zone 3
Objective P1	Retain physical integrity of site
Objective P2	Protect and enhance environmental character
Objective S1	Provide access and egress for resident of the site
Objective S2	Provide access for visitors to the site for recreation
Objective F1	Limit the implementation costs of new works
Objective F2	Limit maintenance costs of existing and new works

Level to which Option meets Objective

High	5
Moderate	3
Low	1
N/A	0

10 PRIORITY ACTIONS

10.1 Erosion Control

A set of standardised, or template, erosion control design options has been developed for the Mitchell River silt jetties. It is proposed that the areas of highest erosion risk be afforded the greatest level of erosion control, and conversely those areas of least erosion risk are afforded the lowest level of erosion control.

Importantly all options set out below are reliant on complementary vegetation establishment, and vegetation establishment should be included within all erosion control options as a fundamental element of the design. In this respect, the structural arrangements should be considered as providing increased stability between erosive events, providing an environment within which vegetation can be established.

The proposed erosion control arrangements are set out below

Option 1 **Reflective beach**

Application: Sites that are subject to aggressive erosion

Principle: Infill coastline with material on low gradient slope (approximately 1:10). Rock is used in the outer part of the slope where wave break will be induced as the water shallows. The energy of the wave break will be taken out on the rock portion of the beach. The water continues to run up the beach with its residual (low) energy. Expectation is that fine material can be deposited on the beach as the flow reverses, nourishing the vegetation established on the beach line.

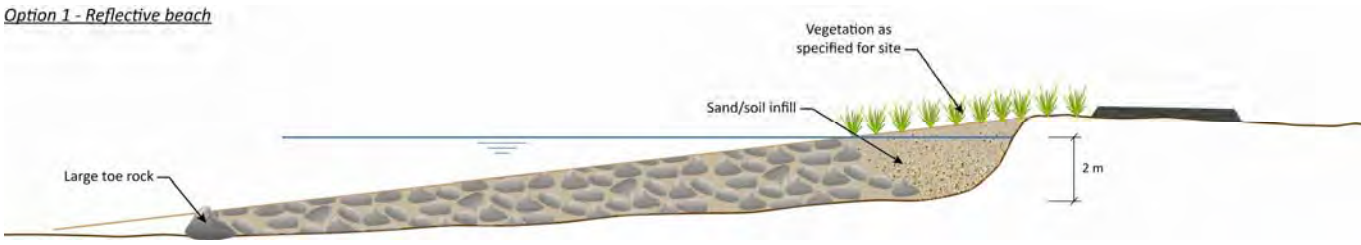
The location of the transition from rock to sand/soil beach needs to be calculated based on predicted wave break points which is affected by water depth, swell size, tide, and weather effects.

Vegetation needs to be suitable for the saline water conditions that are typical of the Lake environment.

Issues: Provides ready public access into the water (for fishing, etc)

A large amount of material will be required to be placed. This may be an expensive option.

Costs: Expect work to exceed $3000 / metre of bank length (revegetation costs not included)



Option 2 **Submerged breakwater**

Application: Sites that are subject to aggressive erosion

Principle: Install a breakwater below the water level and off the coastline to induce wave break before the wave reaches the shoreline. The wave breaks at the breakwater dissipating its energy. The water spills into the pool between the breakwater and the shoreline. Due to its lower energy suspended material drops out and is deposited as sediment.

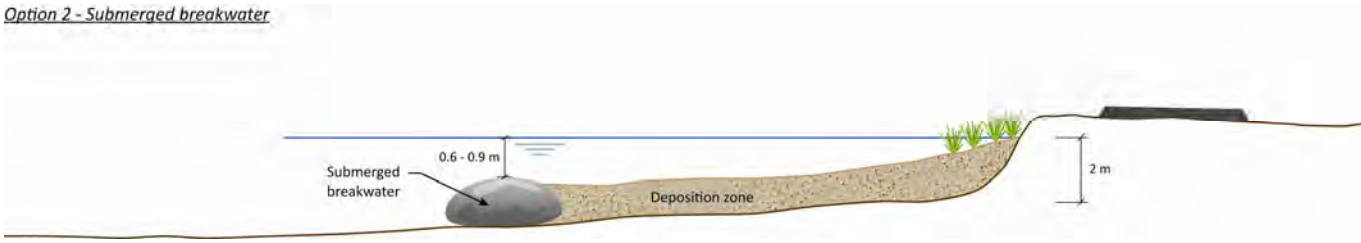
In this way natural processes work to extend the coastline. The process can be accelerated by placing selected material in the pool area next to the shoreline and establishing suitable colonising vegetation. The vegetation will extend into the new sediments and help to lock in those sediments as they are deposited, preventing subsequent erosion.

The breakwater can be large boulders, concrete blocks, or Elcorock geotextile sand containers (see photo). Other options may also be feasible. The location and height of the breakwater needs to be calculated based on predicted wave break criteria which is affected by water depth, swell size, tide, and weather effects.

Issues: Submerged breakwater may interfere with fishing and boating activities near the shoreline.

The breakwater will need to be well designed. It works best when it is perpendicular to the propagation path of the wave. If waves are able to freely enter behind the breakwater and run parallel with it they will induce high rates of erosion.

Costs: Expect costs of approximately $2000 / metre of bank length, plus barge costs for offshore placement (costs exclude vegetation placement)



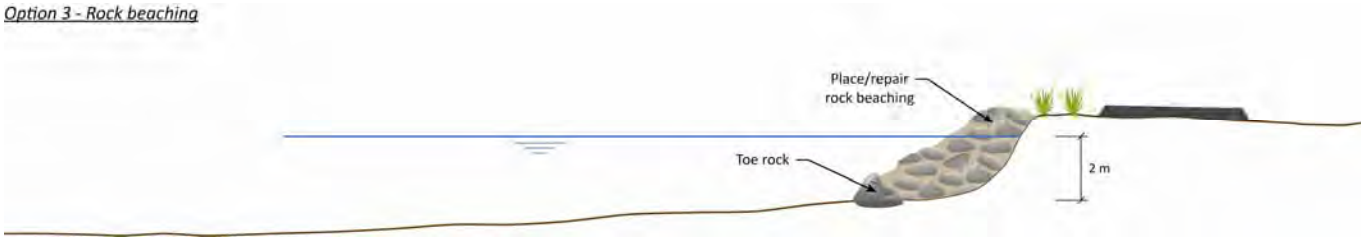
Option 3 **Rock beaching**

Application: For areas of moderate erosion, and repairing areas of damaged rock beaching.

Principle: Rock beaching is placed on areas susceptible to erosion, generally at grade of 1V:2H. Rock size will be determined based on calculated wave energy. The rock beaching will stabilise the bank to allow vegetation establishment.

Issues: Rock beaching limits the rate of establishment of vegetation on the coastline. This approach stabilises the bank but provides little prospect of beach line nourishment and growth.

Costs: Expect costs of approx. $1000 / metre of bank length (revegetation costs not included)



Option 4 **Battering of bank and revegetate**

Application: For areas of low likelihood of erosion

Principle: Lay back the bank and extend the slope into the shallow water zone. The bank will be unprotected sand so will need to be on a low gradient, and is only applicable where erosion likelihood (wave energy) is identified as low. Revegetation with suitable species (see Section 10.2) will help to consolidate the slope and provide stability, with some potential for growing the shoreline.

Issues: Main risks are erosion from a severe storm event during the establishment phase. This treatment may also susceptible to damage from human or animal incursions.

Costs: Expect costs of approx. $250 / metre of bank length (revegetation costs not included)

Options for management have been linked with the likelihood of erosion across the site to identify the most appropriate forms of erosion control through the silt jetties. The erosion control options are set out in Table 8 below.

Table 8: Erosion Control Options and Applicable Erosion Risk Zones

LIKELIHOOD RATING	OPTIONS	COMMENT
Very High	Option 1	Applicable in high erosion risk areas where there is scope for battering of banks and establishment of a reflective beach. This is the preferred method of erosion control
	Option 2	Applicable for high erosion risk areas where wave energy is high and limited vegetation establishment is achievable. The option can be implemented in concert with Option 3.
High	Option 1	Applicable in high erosion risk areas where there is scope for battering of banks and establishment of a reflective beach. This is the preferred method of erosion control
	Option 2	Applicable for high erosion risk areas where wave energy is high and limited vegetation establishment is achievable. The option can be implemented in concert with Option 3.
Moderate	Option 1	The preferred approach to erosion control
	Option 3	Applicable for sites with limited space for bank battering
Low	Option 4	Battering and revegetation are appropriate for sites of low erosion risk and bank angle.

Recommendations

EC1 – Implement appropriate erosion control options in specific locations according to the calculated erosion likelihood and risk rating for that location (see Table 8 and Figures 16 and 17);

EC2 – Prioritise the implementation of erosion control works in areas of High Erosion Risk (see Figure 14);

EC3 – Prioritise the implementation of erosion control works in either areas of Very High or High Likelihood (see Figure 14);

EC4 – Investigate opportunities to align erosion control works in Very High or High Erosion Risk with the location of high environmental, cultural, or social values; and

EC5 – Investigate opportunities to align erosion control works in Very High or High Erosion Risk with the implementation of new or upgraded recreational facilities to limit ongoing impacts from shoreline retreat.

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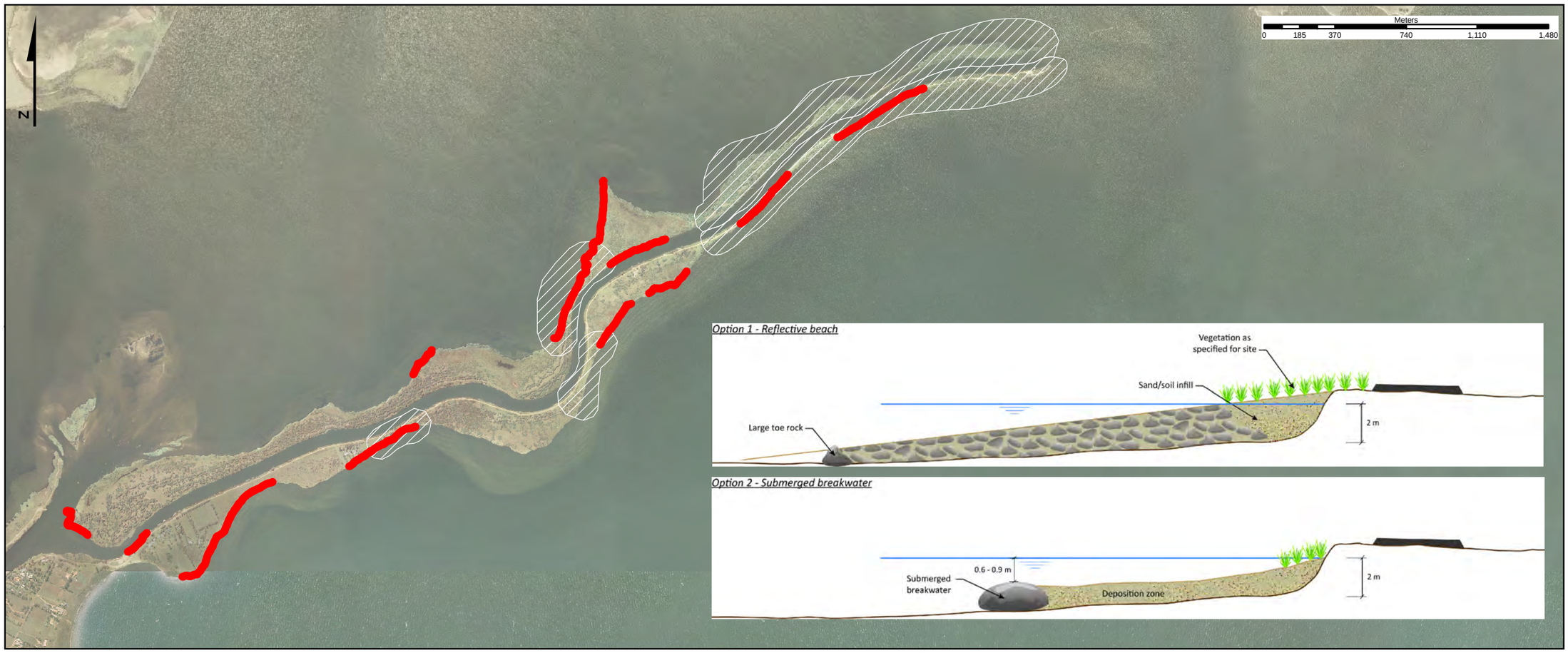
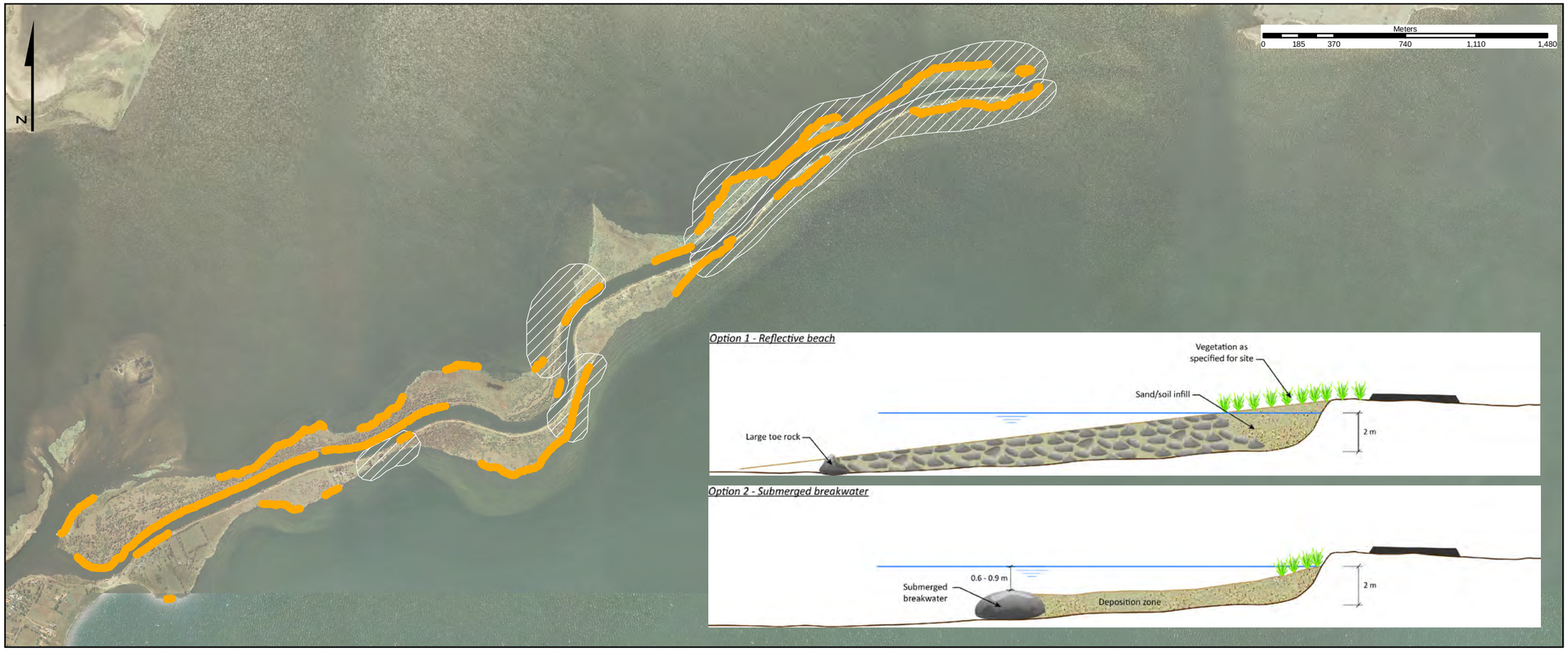
Figure 16: Priority Erosion Risk and Management Options (Very High and High Likelihood)





Likelihood of Erosion

- High
- Very High

Areas of High Erosion Risk

Parks Victoria

alluvium

DODO ENVIRONMENTAL

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Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 17: Priority Erosion Risk and Management Options Moderate and Low Likelihood)

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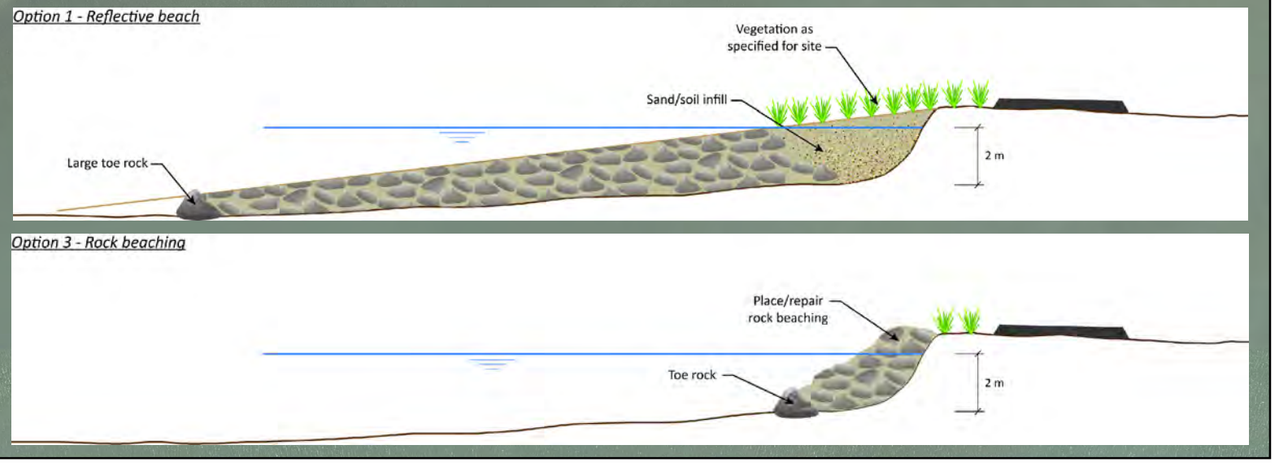

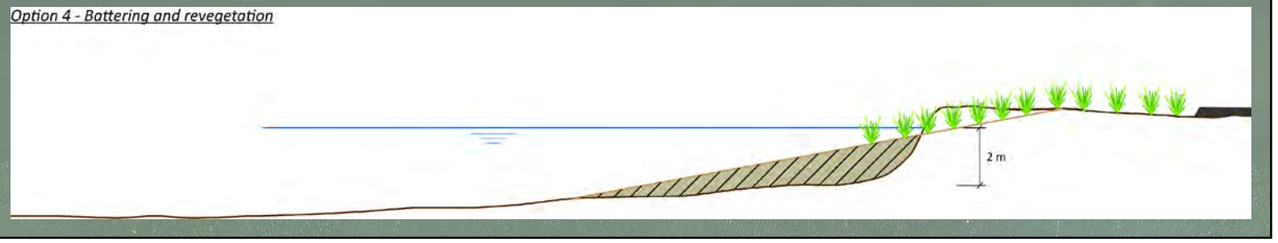

Likelihood of Erosion

- Low
- Moderate

Areas of High Erosion Risk

Parks VICTORIA

alluvium

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10.2 Vegetation Management

An options paper for controlling shoreline erosion in the Gippsland Lakes prepared by Storer (2006) did not include revegetation as a remediation mechanism (despite, in section 4, their finding that 'vegetation at all trial sites is in decline due to salinity or erosion'), opting instead for a suite of engineering options. In contrast, the assessment of Sjerp *et al*. (2002) recommended revegetation of both terrestrial and of water-dependent fringing vegetation around the Gippsland Lakes.

Terrestrial vegetation, involving the establishment of native species on eroding beaches and foreshores, was recommended as a tool to slow the rate of erosion rather than as a mechanism for halting it completely. Sjerp *et al*. (2002) recognized that, without revegetation of the fringing reed beds, terrestrial revegetation alone would be only marginally successful. The re-establishment of dense, wide and healthy beds of aquatic macrophytes was recognised as being critical to controlling shoreline erosion and the success of terrestrial revegetation in the near-shore hinterland.

The inside and the outside edges of the Mitchell silt jetties should be considered separately, as they experience distinctly different physical and chemical regimes. The outside edges that fringe Jones Bay to the north and Lake King to the south are more saline than the inner edges receiving freshwater influence from the Mitchell River. The outside edges are also more subject to wave and wind forces than the inner shores, and are exposed to far longer fetches over which higher energy waves can develop.

10.2.1 Inside (river-side) Edges

Four indigenous plant taxa are, at least in principle, suitable for (re)establishment along the inner edges of the silt jetties:

- Common Reed (*Phragmites australis*)
- Sea Rush (*Juncus kraussii*)
- Leafy Twig-rush (*Cladium procerum*)
- Swamp Paperbark (*Melaleuca ericifolia*).

Of the four taxa, Sea Rush is likely to be the most salt-tolerant (Zedler *et al*. 1990; Greenwood and MacFarlane 2006; Naidoo and Kift 2006). It, however, rarely grows in the dense, wide bands that typify healthy beds of Common Reed (Plate 2a). It is also unclear whether it can grow well in areas subject to disturbance by waves and by wind, as it is almost always found growing in quiescent areas, often subject to freshwater inflows from the hinterland. Because of these two factors, it is unlikely that Sea Rush would offer the shoreline protection offered by Common Reed.

Leafy Twig-rush is a large rhizomatous perennial, forming clumps that are usually rooted in damp sediments and with shoots and leaves that extend out along the water surface (Plate 2b). As it is often found in coastal swamps and along margins of lakes, Leafy Twig-rush probably has moderate salt tolerance, however there are no empirical studies known to the author that have measured salt responses in this species.

Given these factors, it is likely that Common Reed would remain the species of choice for (re)vegetation along the inner margins of the Mitchell silt jetties. The salinities that exist within the lower Mitchell River are most likely in the range of 1–5 g/L, and these are readily coped with by Common Reed (Clucacs and Ladiges 1980; Bart and Hartman 2003; Morris *et al*. 2008).

Swamp Paperbark is present in many parts of the Gippsland Lakes, either in waterlogged areas of fresh and brackish-water wetlands, or growing behind and among reed beds, sometimes in more terrestrial settings. The water logging and salinity tolerances of Swamp Paperbark are well known

(Bird 1962b; Ladiges *et al*. 1981; Robinson *et al*. 2006, 2008, 2012; Salter *et al*. 2007, 2008, 2010b, c; Morris *et al*. 2008). The resultant woodland community it forms provides useful animal habitat and may help bind the soil, but Swamp Paperbark alone is unlikely to be the most effective species in protecting shorelines against erosion.

Plate 2: left (a) shows Sea Rush growing along the lower Nicholson River; right (b) shows Leafy Twig-rush growing along the lower Avon River. (Paul Boon, September 2014).

10.2.2 Outside (lake-side) edges

The outer margins of the silt jetties differ in two critical ways from the inner margins:

- They are more saline, likely having salinities of between 5−15 g/L.
- They are far less protected than the inner shores.

There are few options for the selection of plant taxa for (re)vegetating the outer edges of the silt jetties. Sjerp *et al*. (2002) examined some options for shoreline protection of the Gippsland Lakes more generally, and excluded possibilities such as:

- Cordgrass (*Spartina*) due to its ability to rapidly colonise sediments and possibly to protect them against erosion. However, it should be noted that it is an introduced species and an environmental weed in many parts of southern Victoria.
- Exotic salt-tolerant species of Phragmites, such as *Phragmites karka* from Asia and the Middle East. These too should be discounted on the basis of not being indigenous and because of their potential to spread and become weeds.

One option that should be considered over the longer term is the mangrove *Avicennia marina*. Only one taxon of mangrove, *Avicennia marina* subsp. *australasica*, occurs in Victoria (Duke 2006). It is usually considered to have a discontinuous distribution, from the Barwon River in the west to McLoughlins Beach in the east of the State.

Since the late 1980s or early 1990s, however, a small stand of mangroves has established in the distal end of Cunninghame Arm and, more recently, isolated specimens have been observed near Bullock Island at Lakes Entrance (Plate 4). It is very likely that mangroves have appeared in the saltier parts of the Gippsland Lakes in response to the increasing salinization of the water bodies (Boon *et al*. in press). The area around Jones Bay to the north and Lake King are likely to be too fresh to support a stand of mangroves and it is unclear whether they could establish successfully in such an erosive environment. Nevertheless, with the ongoing salinization of the Lakes, there may be, in the future, isolated, small sheltered areas along the outer margins of the silt jetties that could prove suitable for mangrove establishment. It is, however, unclear to what extent the establishment of mangroves in these areas would meet with public or agency approval.

Plate 4: Small stand of mangroves at the distal end of Cunninghame Arm. (Paul Boon, September 2014).

The best option for (re)vegetation of the outer Mitchell River silt jetties remains Common Reed, although in this environment it will be necessary to identify and use salt-tolerant strains. It is likely that salt-tolerant strains of Common Reed do occur elsewhere in the Gippsland Lakes, and a study (due for completion in late 2015) is currently underway to address this question.

Should salt-tolerant strains of Common Reed not occur in the Gippsland Lakes, it may be possible that they do occur outside the Lakes, in other parts of Gippsland. Clucacs and Ladiges (1980) identified and studied Common Reed growing in saline conditions in the South Gippsland region, around Port Albert.

If future studies show that Common Reed specimens from these or similarly salty areas elsewhere in the Gippsland region are sufficiently salt-tolerant, they might be able to be used as stock to revegetate the lower Mitchell River silt jetties and other estuarine areas in the Gippsland Lakes that have suffered a reed loss. Issues with obtaining plant material from outside the catchment of the Gippsland Lakes might have to be addressed before this action was implemented.

It is worth noting that even if salt-tolerant strains of Common Reed could be found, obstacles to their provenance resolved, and specimens transplanted to the shorelines of concern, there still remains the problem of establishing plants (by seed, by seedling, or by transplanted rhizomes) on a receding shoreline. It is possible that physical erosion − and not only salinity − is the factor that currently limits the establishment and growth of Common Reed in many parts of the Gippsland Lakes.

A model that deserves further consideration is that it was increased salinity that was responsible for the initial loss of reed beds, but once shoreline erosion set-in, conditions for the establishment of new reed beds were precluded. If this interpretation is correct, there is little hope for revegetating areas from which the original reed beds have been lost until more stable conditions have been established under which reed seedlings can re-establish. Once they have established, the reed beds might then expand and proffer some protection against ongoing shoreline erosion.

Recommendations

VM1 –Integrate the findings of ongoing investigations into salt tolerant varieties of *Phragmites australis* into any shoreline revegetation works planned for the site;

VM2 – Ensure that appropriate erosion mitigation works have been undertaken at any proposed revegetation sites to ensure this limiting factor to emergent vegetation establishment is reduced; and

VM3 –Use *Phragmites australis* as the species of choice when attempting to re-establish emergent vegetation types, both in lake shore, and riverine environments.

10.3 Changes in Land Management

Through consideration of the results of the technical investigations, the erosion risk assessment, and the management options and site objectives analysis it had been identified that changes in land management arrangements are required along the Mitchell River Silt Jetties to achieve the outcomes sought by project stakeholders and Parks Victoria.

The sections below outline the recommended broad changes to current land use and management; as well as targeted actions required to achieve those changes and ensure objectives for the site are met. Figure 18 provides an outline of the recommended land use zones and recreational activity focus for the site, and Figures 19 - 22 provide detail of the type, and location of the recommended actions.

10.3.1 Land Use and Recreational Access

Historical trajectories for the site, technical investigations completed as part of this project, and erosion risk mapping for the site identify that there is a significant risk to of the physical integrity of the Mitchell River Silt Jetties. The area where this risk is most apparent is located at the downstream ends of both the northern and southern jetties, with the greatest threat posed by erosion on the shores of Lakes King and Jones Bay.

Current access and land management arrangements on the **northern silt jetty** mean the site experiences little pressure from visitors, and therefore other issues that may exacerbate shoreline erosion are not particularly common. Change to the current land management arrangements are not required to mitigate the erosion risk in this area. The targeted methods to mitigate shoreline erosion in priority zones (as described in Section 10.1) represent the best approach for addressing this issue where required.

The **southern silt jetty** experiences much higher use than the northern jetty, through greater levels of access and infrastructure. The identified level of erosion risk at the downstream end of the southern jetty is also higher than that of the northern jetty, particularly in the highly narrowed sections in the last 2km. With higher use, the prevalence of issues exacerbating shoreline erosion or increasing the risk of erosion by limiting vegetation establishment is also higher.

Based on the management options and site objectives analysis carried out as part of this project in conjunction with stakeholders, it has been identified that changes to the current access arrangements along the narrowed section of the southern jetty would assist in achieving the agreed objectives for the site. By restricting vehicle access to this part of the southern jetty, more management techniques would be available to Parks Victoria to address issues exacerbating shoreline erosion, with greater potential to establish vegetation on the highly narrowed sections would increase significantly.

Recommendations

LM1 -Implement a program of management to close the road to vehicle access from the final 2km of the southern silt jetty;

LM2 -Develop alternate arrangements for recreational users and visitors to access Point Dawson through establishment of a pedestrian and cycle path;

LM3 – Respect and incorporate the cultural values and history of the site in the planning and design of future access arrangements, infrastructure, and interpretation;

LM4 –Maximise recreational fishing opportunities in areas to be accessible by vehicle, including the provision or upgrade of facilities;

LM5 -Maintain the current land management arrangement for the northern silt jetty.

NORTHERN SILT JETTY

Maintain, and enhance where possible, existing environmental values and processes;

Protect and improve existing vegetation communities in this area;

Maintain the current level of access; and

Retain the physical integrity of the site with a particular focus on the north eastern end of the zone.

NORTHERN AND SOUTHERN SILT JETTIES

Respect and incorporate the cultural values and history of the site in the planning and design of future access arrangements, infrastructure, and interpretation.

SOUTHERN SILT JETTY (EASTERN ZONE)

Provide shared access and opportunities for a wide range of visitors and recreational users;

Retain the physical integrity of the site with a particular focus on the north eastern end of the zone; and

Improve the condition and extent of native vegetation communities to improve environmental value and provide resistance to shoreline erosion.

SOUTHERN SILT JETTY (CENTRAL ZONE)

Maximise recreational fishing opportunities in this area including the provision or upgrade of facilities;

Provide and maintain road access for visitors and recreational users;

Provide and maintain access to private properties; and

Provide facilities and information to help visitors and recreational users understand the opportunities and importance of the site.

SOUTHERN SILT JETTY (WESTERN ZONE)

Maintain and improve existing public infrastructure in this area;

Provide and maintain access to private properties; and

Improve information available to visitors and recreational users at key locations.

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Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 18: Proposed Management Zones and Specific Objectives

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10.3.2 Targeted Actions

To achieve the broader land management changes outlined in Section 10.3.1, a series of recommended targeted actions are required to be implemented. These actions will support the continued recreational use of the site by a variety of users and will facilitate environmental protection works to address priority threats across the Mitchell River Silt Jetties.

With a reduction in the length of the jetties accessible to vehicles, a comprehensive design and implementation program to create a vehicle 'turn around' area and limited size car park is required. This process will create a focus for visitors to enjoy the site, park easily, understand the context of the site and the further opportunities available to them from this point, and to adequately prevent unauthorised vehicle access past the selected location.

The development of alternate access options for a variety of users including walkers, cyclists, and kayakers/canoeists is an important component of protecting the site while facilitating access for a wide variety of recreational activities.

The management of recreational fishing locations along the southern jetty is important. Existing informal locations adjoining a new shared pathway may require rehabilitation, and existing facilities in this area will need maintenance. Similarly in other locations popular with recreational anglers still accessible by vehicles, access and facilities will also require formalisation and or upgrading.

An integrated approach to interpretive information at the site should be implemented. Interpretive signage and information should be available to visitors at a variety of locations and should provide guidance on the available facilities, access arrangements, opportunities for recreation, and information about the environmental, cultural, and social values of the site.

Recommendations

LM6 – Develop and implement a plan for the closure of Rivermouth Rd at a point approximately 2km from Point Dawson. This plan should include comprehensive site improvements including formal parking, picnic, river access, and recreational facilities.

LM7 – Constructed a multi-use shared pathway from the selected 'turn around' location suitable for a variety of users including walkers and cyclists.

LM8 – Undertake rehabilitation works including the management of drainage from the old road surface, revegetation of areas of disturbance (including areas of old road surface adjoining the new pathway), and identified priority areas disturbed by previous informal access to the river or lake edge.

LM9 – Improve and formalise recreational fishing access across the site. Improve the current level of facilities in areas to be accessible by vehicles, and consolidate and maintain other formal access points adjoining the new shared pathway.

LM10 – Create and implement an integrated interpretive information plan for the site to provide visitors and recreational users with a variety of information including recreational options, access arrangements, locations of facilities including roads, shared pathways, and recreational fishing facilities.

LM11 – Create a destination at Point Dawson for those accessing the site by boat or along the shared pathway. Improve the current facilities for visitors, and provide opportunities for access to the lake and river.

LM12 – Implement programs to maintain and improve the quality, diversity and extent of native vegetation across the northern silt jetty, including the management of key pest plant and animal threats.

RIVERMOUTH ROAD (WEST)

Maintain access for private landholders owners to and from their property.

EXISTING CAR PAPRK AND BOAT RAMP PRECINCT

Implement the relevant parts of an integrated interpretive information plan for the site. Provide visitors and recreational users with information including recreational options, access arrangements, locations of facilities including roads, shared pathways, and recreational fishing facilities.

MITCHELL RIVER (RIGHT BANK)

Maximise recreational fishing opportunities in this area including the provision or upgrade of facilities (low key).

OLD SCHOOL SITE - LAKE ACCESS

Formalise access to the 'Old School Site', to minimise disturbance outside a defined access easement.
Ensure any shoreline erosion control works facilitate safe access to and from the water for

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0 45 90 180 270 360

Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 19: Recommended Management Actions (Southern Silt Jetty - west)

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RIVERMOUTH ROAD (CENTRAL)

Maintain access for private landholders owners to and from their property.

MITCHELL RIVER (RIGHT BANK)

Maximise recreational fishing opportunities in this area including the provision or upgrade of facilities.

Develop formal areas of access to the river with adequate areas for vehicle parking.

Prioritise the location of facilities in areas of current high use, and areas where disturbance to vegetation will be minimised.

ROAD CLOSURE - TURN AROUND LOCATION

Implement the closure of Rivermouth Rd at this approximate location.

Construct a robust mechanism to close the road and prevent unauthorised access further along the southern silt jetty.

Complete comprehensive site improvements at this location including formal parking, picnic facilities, river access (particulalry for unpowered watercraft), and other recreational facilities.

Implement the relevant parts of an integrated interpretive information plan for the site. Provide visitors and recreational users with information including recreational options, access arrangements, locations of facilities including roads, shared pathways, and recreational fishing facilities.

THE PINES- LAKE ACCESS

Formalise access to the 'The Pines', to minimise disturbance outside a defined access easement. Ensure any shoreline erosion control works facilitate safe access to and from the water for recreational users.

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Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 20: Recommended Management Actions (Southern Silt Jetty - central)

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RIVERMOUTH ROAD (EAST)

Implement the relevant parts of an integrated interpretive information plan for the site.

Provide visitors and recreational users with information at regular interavle along the shared pathway.

Highlight the important environmental, cultural and social values of the site and provide users with information including recreational options, access arrangements, and recreational fishing facilities.

MITCHELL RIVER (RIGHT BANK)

Maximise recreational fishing opportunities in this area including the upgrade of existing facilities.

RIVERMOUTH ROAD (EAST)

Construct a multi-use shared pathway from the selected 'turn around' location to Point Dawson.

The pathway should be suitable for a variety of users including walkers and cyclists.

POINT DAWSON

Create a destination at Point Dawson for those accessing the site by boat or along the shared pathway.

Complete comprehensive site improvements at this location including picnic facilities, river access (particulalry for unpowered watercraft), and other recreational facilities.

Provide opportunities for access to the lake and river.

Implement the relevant parts of an integrated interpretive information plan for the site.

Provide visitors and recreational users with information including recreational options, access arrangements, and recreational fishing facilities.

RIVERMOUTH ROAD (EAST)

Undertake rehabilitation works alongside the newly constructured shared pathway.

Improve drainge from the old roadway and revegetate of areas of disturbance along the old road footprint (including areas of old road surface).

Identify priority areas of disturbance caused by previous informal access to the river or lake edge. and implement revegation works in these

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Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure 21: Recommended Management Actions (Southern Silt Jetty - east

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APPENDIX 1 – Planning Property Report

Planning Property Report

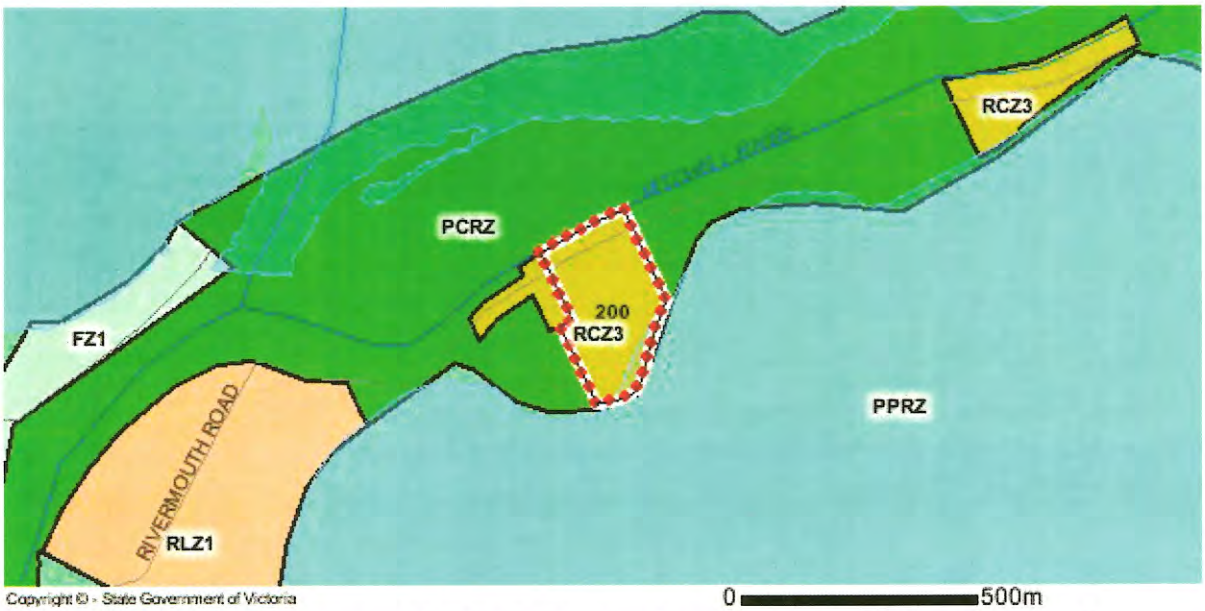
from www.dtpli.vic.gov.au/planning on 10 December 2014 09:53 AM

Address: 200 RIVERMOUTH ROAD EAGLE POINT 3878
Crown Description: Allot. 13 Sec. B PARISH OF BAIRNSDALE
This property has a total of 4 parcels.
For full parcel details get the free Basic Property report at Property Reports
Local Government (Council): EAST GIPPSLAND **Council Property Number:** 552
Directory Reference: VicRoads 84 D8

See next page for planning information

Planning Zones

PUBLIC CONSERVATION AND RESOURCE ZONE (PCRZ)
SCHEDULE TO THE PUBLIC CONSERVATION AND RESOURCE ZONE
RURAL CONSERVATION ZONE - SCHEDULE 3 (RCZ3)
SCHEDULE TO THE RURAL CONSERVATION ZONE - SCHEDULE 3



Note: labels for zones may appear outside the actual zone - please compare the labels with the legend.

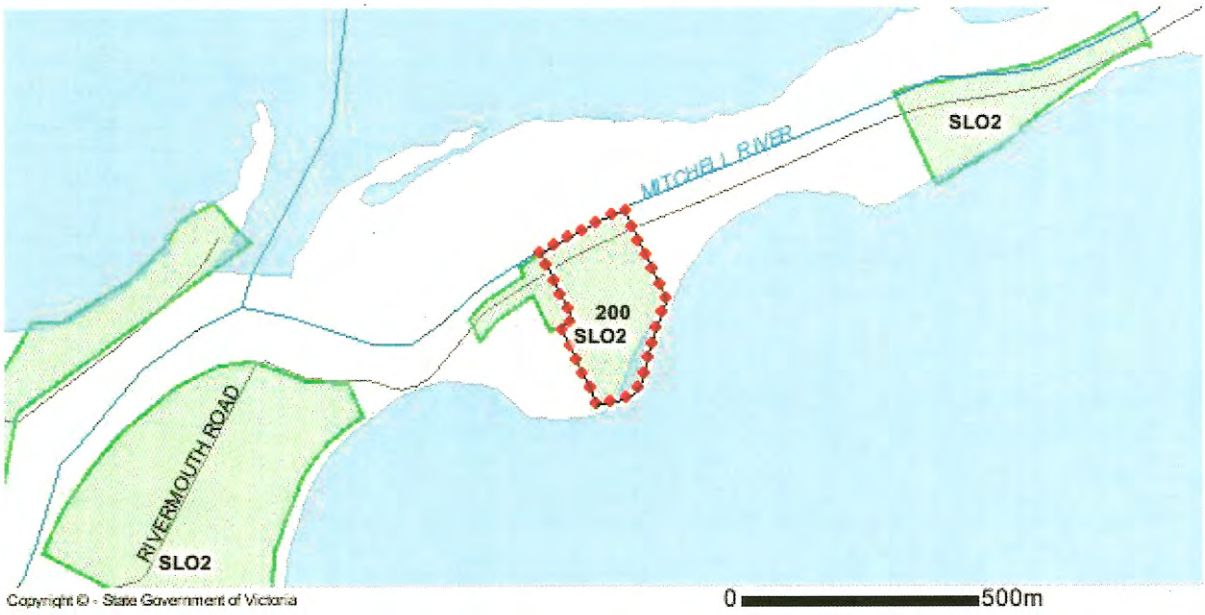
Zones Legend

- ACZ - Activity Centre
- B1Z - Commercial 1
- B2Z - Commercial 1
- B3Z - Commercial 2
- B4Z - Commercial 2
- B5Z - Commercial 1
- C1Z - Commercial 1
- C2Z - Commercial 2
- CA - Commonwealth Land
- CCZ - Capital City
- CDZ - Comprehensive Development
- DZ - Dockland
- ERZ - Environmental Rural
- FZ - Farming
- GRZ - General Residential
- GWAZ - Green Wedge A
- GWZ - Green Wedge
- IN1Z - Industrial 1
- IN2Z - Industrial 2
- IN3Z - Industrial 3
- LDRZ - Low Density Residential
- MUZ - Mixed Use
- NRZ - Neighbourhood Residential
- PCRZ - Public Conservation & Resource
- PDZ - Priority Development
- PPRZ - Public Park & Recreation
- PUZ1 - Public Use - Service & Utility
- PUZ2 - Public Use - Education
- PUZ3 - Public Use - Health Community
- PUZ4 - Public Use - Transport
- PUZ5 - Public Use - Cemetery/Crematorium
- PUZ6 - Public Use - Local Government
- PUZ7 - Public Use - Other Public Use
- PZ - Port
- R1Z - General Residential
- R2Z - General Residential
- R3Z - General Residential
- RAZ - Rural Activity
- RCZ - Rural Conservation
- RDZ1 - Road - Category 1
- RDZ2 - Road - Category 2
- RGZ - Residential Growth
- RLZ - Rural Living
- RUZ - Rural
- SUZ - Special Use
- TZ - Township
- UFZ - Urban Floodway
- UGZ - Urban Growth
- Urban Growth Boundary

Planning Overlays

LAND SUBJECT TO INUNDATION OVERLAY (LSIO)
LAND SUBJECT TO INUNDATION OVERLAY SCHEDULE (LSIO)

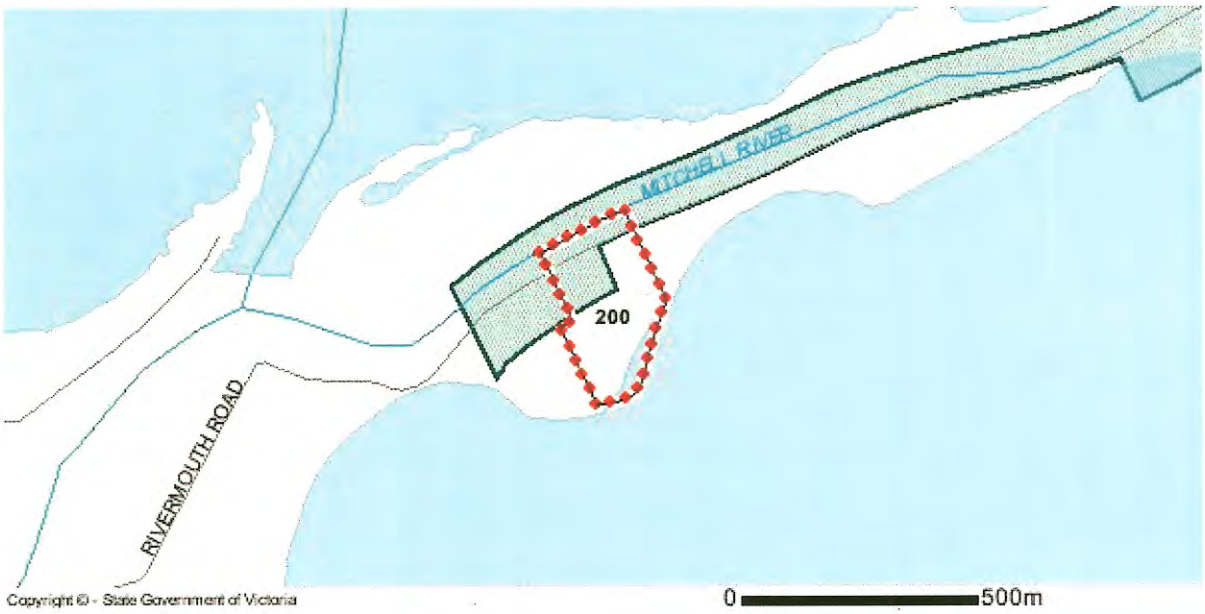
SIGNIFICANT LANDSCAPE OVERLAY (SLO)
SIGNIFICANT LANDSCAPE OVERLAY - SCHEDULE 2 (SLO2)



Planning Overlays

VEGETATION PROTECTION OVERLAY (VPO)

VEGETATION PROTECTION OVERLAY - SCHEDULE 1 (VPO1)



Overlays Legend

- AEO - Airport Environs
- BMO - Bushfire Management (also WMO)
- CLPO - City Link Project
- DCPO - Development Contributions Plan
- DDO - Design & Development
- DDOPT - Design & Development Part
- DPO - Development Plan
- EAO - Environmental Audit
- EMO - Erosion Management
- ESO - Environmental Significance
- FO - Floodway
- HO - Heritage
- IPO - Incorporated Plan
- LSIO - Land Subject to Inundation
- MAEO1 - Melbourne Airport Environs 1
- MAEO2 - Melbourne Airport Environs 2
- NCO - Neighbourhood Character
- PO - Parking
- PAO - Public Acquisition
- RO - Restructure
- RCO - Road Closure
- SBO - Special Building
- SLO - Significant Landscape
- SMO - Salinity Management
- SRO - State Resource
- VPO - Vegetation Protection

Note: due to overlaps some colours on the maps may not match those in the legend.

Areas of Aboriginal Cultural Heritage Sensitivity

This property is within, or is affected by, one or more areas of cultural heritage sensitivity as described in the Aboriginal Heritage Regulations 2007.

The data provides indicative information about the location and extent of areas of Aboriginal cultural heritage sensitivity and is provided to assist with the decisions about the potential need to prepare a Cultural Heritage Management Plan in relation to proposed activities on this property.

For further information about whether a Cultural Heritage Management Plan is required go to Aboriginal Heritage Planning Tool

To find out if your property has any recorded Aboriginal cultural heritage places, such as scarred trees, occupation sites or places of burial, you can request information from the Victorian Aboriginal Heritage Register.

Find out more about the Victorian Aboriginal Heritage Register

Aboriginal Cultural Heritage Sensitivity Aboriginal Cultural Heritage Sensitivity Selected Land

Further Planning Information

Planning scheme data last updated on 4 December 2014.

A **planning scheme** sets out policies and requirements for the use, development and protection of land. This report provides information about the zone and overlay provisions that apply to the selected land. Information about the State, local, particular and general provisions of the local planning scheme that may affect the use of this land can be obtained by contacting the local council or by visiting Planning Schemes Online

This report is NOT a **Planning Certificate** issued pursuant to Section 199 of the Planning & Environment Act 1987. It does not include information about exhibited planning scheme amendments, or zonings that may abut the land. To obtain a Planning Certificate go to Titles and Property Certificates

For details of surrounding properties, use this service to get the Reports for properties of interest

To view planning zones, overlay and heritage information in an interactive format visit Planning Maps Online

For other information about planning in Victoria visit www.dpcd.vic.gov.au/planning

APPENDIX 2 – Stakeholder Workshop Minutes

Workshop 1 – Outcomes

Project	Mitchell River Silt Jetties Protection and Enhancement Project
Meeting	Workshop 1 – Values and Vision
Date	Tuesday 14 October 2014
Time	10:00 – 3:00 pm
Venue	Met at boat ramp at the Cut (car park on Rivermouth Rd) – to begin session Eagle Point Community Hall, 15 Eagle Point Rd – workshop will continue here
Participants	Bill Storer (Crown Land Management, Department of Environment and Primary Industries); Martin Richardson (Gippsland Lakes Ministerial; Melissa Birleson and Ken Judd (East Gippsland Catchment Management Authority); Carmel Henderson (Gippsland Coastal Board); Ian Bate (East Gippsland Shire Council); Andrew Brown (Friends of the Gippsland Lakes); Pat McPherson (Bairnsdale Field Naturalists Club / East Gippsland Birdlife); David Young (Bairnsdale Field and Game); Hilary Rigg (Eagle Point Landcare Group); Rob Caune (VR Fish); Yasmin Aly, Tracy Neilson and James Tomlinson (Parks Victoria); Sean Philipson (Ethos NRM); Leonie Duncan (Alluvium).
Apologies	Damien Snell (Gippsland Ports); Ricky Mullett (Gippsland Land and Waters Aboriginal Corporation)
Purpose	Explore what stakeholders value about the site, their vision for its future and, broadly, what is required to achieve that vision.

Summary of workshop and outcomes

This workshop brought together a diverse range of stakeholders – including management agencies, special interest groups and local community – to explore what people value about the Mitchell River Silt Jetties. The group also discussed key threats to these values, explored a high level vision for the site's future and shared views on what is outcomes or milestone they would like to see along the way.

The day began with a guided walk on talk on site to discuss how the silt jetties were formed, the dominant physical processes and environments, key natural and social values, and various management interventions that have been introduced to reduce erosion and improve fish habitat.

Ethos NRM's Sean Phillipson on 'river side' of the silt jetties leading the walk and talk session. (Photo: Alluvium)

After re-grouping at the nearby Eagle Point Community Hall, participants were invited to annotate a large format aerial image of the Mitchell River Silt Jetties to help map the range of natural and social values attached to the site, with photos and key words and phrases that describe what makes this place special. This session confirmed that the site is highly valued and for a broad diversity of reasons: natural, social, recreational, cultural and intrinsic.

Workshop participants were invited to annotate an aerial image of the Mitchell River Silt Jetties to help map the range of natural and social values attached to the site. (Photo: Alluvium)

Participants generally agreed that the physical form of the site is a key part of what makes it special. As an iconic geographic feature within the Gippsland Lakes, the silt jetties were said to contribute to a sense of place, identity and pride for locals and provide a unique scenic experience for visitors, particularly when viewed from above at the bluff. The fact that the silt jetties are recognised as a site of international significance was discussed; both in terms of their unusual geomorphology as a 'finger delta' and as a haven for migratory waterbirds as part of the international Ramsar Convention. The East Gippsland Birdlife representative reported that 55 bird species were identified during their most recent bi-annual count (in October 2014), half waterbirds and half terrestrial. Participants also noted that the site has both road and boat access along with permanent residences and holiday rental accommodation. The group identified a range of recreational activities the site is used for, including fishing, water sports including kite surfing and kayaking, bird watching, nature appreciation, outdoor education such as scouting, geocaching and photography. There was general agreement that all social values attached to the site are underpinned by the natural environment.

Participants were then invited to explore some of the key threats to these values and identified the following:

- Infrastructure does not meet need or status
- Overuse – over loved
- Under resourcing – people – money
- Invasive species
- Climate change – sea level rise
- Behaviour threat – trampling – fishing
- Lack of signage
- Off track driving
- Impacts of clearing at fishing spots
- Loss of place, use, access
- Ability to preserve the geomorphological features

The next segment of the workshop involved exploring what vision stakeholders might have for the future of the Mitchell River Silt Jetties and, broadly, what might be required to achieve that vision. The timeframe for

this vision was set at 30 years. The starting point for this discussion was consideration of a draft vision prepared by Parks Victoria for this project: *"To preserve, protect and enhance the Mitchell River Silt Jetties and provide appropriate opportunity for park visitors and community for the future."*

Participants were split into three groups to discuss this draft vision statement and to explore their own ideas. Each group presented back and a whole group discussion followed. The following areas of commonality were identified in terms of potential elements of a collective vision:

- Maintain physical form
- Keep the natural aesthetic
- Balance between social values and environmental values
- Environmental values underpin social values

Mitchell River Silt Jetties from above. Workshop participants generally agreed that the site is an iconic geographic feature within the Gippsland Lakes and that its unusual physical form is a key part of what makes it special. (Credit: GLMAC)

In the final workshop segment, participants spent time considering, as individuals, what might be the long-term (up to 30 years) and medium-term (10 year) outcomes (or milestones) we would need to see to achieve the type of long-term vision explored in the previous session. Amongst the top themes were:

- Develop a management plan and increase funding
- Increase the profile and understanding of the silt jetties
- Address erosion issues
- Protect and enhance vegetation and habitat
- Better management of public access
- Enhance experience for variety of recreational users

The workshop concluded with confirmation of the next workshop date, November 11, where the focus will be on options and priorities for management action.

For detailed minutes of the workshop, see Appendix 1.

Appendix 1 – Detailed minutes

Minutes

Project	Mitchell River Silt Jetties Protection and Enhancement Project
Meeting	Workshop 1 – Values and Vision
Date	Tuesday 14 October 2014
Time	10:00 – 3:00 pm
Venue	Met at boat ramp at the Cut (car park on Rivermouth Rd) – to begin session Eagle Point Community Hall, 15 Eagle Point Rd – workshop will continue here
Participants	Bill Storer (Crown Land Management, Department of Environment and Primary Industries); Martin Richardson (Gippsland Lakes Ministerial; Melissa Birleson and Ken Judd (East Gippsland Catchment Management Authority); Carmel Henderson (Gippsland Coastal Board); Ian Bate (East Gippsland Shire Council); Andrew Brown (Friends of the Gippsland Lakes); Pat McPherson (Bairnsdale Field Naturalists Club / East Gippsland Birdlife); David Young (Bairnsdale Field and Game); Hilary Rigg (Eagle Point Landcare Group); Rob Caune (VR Fish); Yasmin Aly, Tracy Neilson and James Tomlinson (Parks Victoria); Sean Philipson (Ethos NRM); Leonie Duncan (Alluvium).
Apologies	Damien Snell (Gippsland Ports); Ricky Mullett (Gippsland Land and Waters Aboriginal Corporation)
Purpose	Explore what stakeholders value about the site, their vision for its future and, broadly, what is required to achieve that vision.

Item		Detail
1.	Arrival	• Group met by boat ramp at the Cut (car park on Rivermouth Rd)
2.	Welcome	• Welcome to country • Introductions
3.	Walk and talk	• Guided walk and talk on the southern silt jetty, led by Sean Phillipson and with contributions by various participants, including discussion of: • Brief overview of the project • How the silt jetties have been formed and the important processes associated with this, impact of The Cut, sea level rise. • Dominant processes and environments on both 'lake side' and 'river side' of the jetties • Summary of natural values – threatened species, important vegetation types, recorded / present at the site • Shoreline erosion on the Gippsland Lakes (effect of permanent entrance opening, increased salinity, loss of fringing vegetation) • Various management interventions that have been introduced to reduce erosion and improve fish habitat.
4.	Lunch	• Regrouped at community hall for lunch and to continue session • Reiteration of project purpose and approach, i.e. • It is an initiative of Parks Victoria, with funding from Gippsland Lakes Environment Fund • Aim is to provide clear direction and priorities for future use and management of MRSJ, with a focus on erosion mitigation, and enhancement of natural and recreational values. • The project involves: a review of existing literature, gathering input from stakeholders and undertaking some technical assessments. • Alluvium and Ethos NRM have been engaged to undertake an independent assessment of the key values, threats and potential management actions related to the site. Central to this assessment is engagement with stakeholders. Project runs from September 2014 – February 2015. • Final report is intended to directly inform works to assist conservation and recovery of natural values, with a strong focus on enhancement of existing recreational sites. • Overview of the purpose of the two workshops, i.e.:

- To understand stakeholder aspirations for future use of the Mitchell River Silt Jetties and views on the potential management of priority threats. This first one is focused on understanding values and vision. Second one on priorities and action.
- Our goal is to listen to stakeholder views, incorporate what we can into the options that are developed and provide feedback on how this input influenced final recommendations. For those familiar with the IAP2 spectrum of engagement, we are positioned at Consult / Involve.
- Over lunch Gippsland Lakes Ministerial Advisory Committee representative, Martin Richardson, showed an advance version of a new promotional video as part of the 'Love our lakes' community education campaign.

5. Values

- Participants were invited to annotate a large format aerial image of the Mitchell River Silt Jetties to help map the range of natural and social values attached to the site, i.e. by attaching photos and post-it notes with key words and phrases that describe what makes this place special. This was followed by a group discussion of what had been posted up.
- Discussion included (in no particular order):
- Access is important
- Important that infrastructure is there (roads, toilets, fishing platforms)
- Flood photos provide opportunity to see change / cyclical
- Ramsar classification provides requirement for management planning / action to ensure management / avoid loss of values
- Tourist drive
- Iconic geomorphology
- 55 species at recent count (half / half waterbirds / terrestrial birds)
- Scenic / recreational value (photography)
- Local identity – sense of place – intrinsic
- Holiday rental
- Soldier settlement / history of settlement
- Residents meet – sense of community – diversity of view – lucky to be around the place
- Jetties as infrastructure – water access
- The bluff – scenic values – indigenous values – views
- Water sports – powered – unpowered
- Outdoor education – scouts schools
- Next, the group discussed threats to these values. The following points were raised:
- Infrastructure does not meet need or status
- Overuse – over loved
- Under resourcing – people – money
- Invasive species
- Climate change – sea level rise
- Behaviour threat – trampling – fishing
- Lack of signage
- Off track driving
- Impacts of clearing at fishing spots
- Loss of place, use, access
- Ability to preserve the geomorphological features

6. Vision

- This segment involved exploring what vision stakeholders might have for the future of the Mitchell River Silt Jetties and, broadly, what might be required to achieve that vision. The timeframe for this vision was set at 30 years.
- The starting point for this discussion was consideration of a draft vision prepared by Parks Victoria for this project: "To preserve, protect and enhance the Mitchell River Silt Jetties and provide appropriate opportunity for park visitors and community for the future."
- Participants were split into three groups to discuss this draft vision statement: how well does it encompass the values that have been identified? What would need to change? Can we describe the vision in different terms i.e. what it might look to walk the site in 2044? What might an alternate vision statement look like? What would the key elements be at least?
- Results of the small group discussions were as follows:

Group 1:

- Fishing experience enhanced regardless of their level of experience or interest – getting

the mix right – management of vegetation to facilitate the fishing experience (type amount)
- More natural looking fishing access point – more aesthetically acceptable formal fishing location – no eyesore – 'no treated pine structures'
- Maintain what we have now – form the same – intact and accessible
- Interpretation to help understand context of formation and change
- Should look loved
- Less pest plants and animal
- Opportunities for other experience that don't rely on vehicles

Group 2

- Physically intact and vegetated
- Restore and protect
- Artificialness
- Most values discussed as social not natural values – natural benefits can be achieved
- Maintain what we currently have
- Plan for minimal harm and disturbance
- Accessed managed to some extent
- Political social support to invest in management action – need for more active management
- Northern jetty managed separately to southern jetty – treated as separate sites and management
- Site as a relict or artefact – preservation of a feature – due to past management intervention – slow of decline
- Control of people / access
- Sympathetic works to protect

Group 3

- Preserve the physical form and natural attributes
- Balancing and natural values and attributes
- Protection of high value areas – development of infrastructure in 'low value' areas
- Don't say 'appropriate', use specific words like 'low impact' or 'minimal'
- Proper management and resourcing required – vision to articulate that increased management or resourcing is required

- From here, the whole group discussed the areas of commonality across the three groups, i.e.:

- Maintain physical form
- Keeping the natural aesthetic
- Social value related to natural values
- Balance between social values and environmental values
- Environmental values underpin social values

- The final part of this session participants spent time, as individuals, considering what might be the long-term (up to 30 years) and medium-term (10 year) outcomes / milestones we would need to see to achieve such a vision.
- Responses covered:

- Improve the area of fish habitat within the jetties (exclusion from areas using natural structures)
- Increased profile for silt jetties
- Decreased / stop of erosion
- Management plan (x 8)
- Buy back private land
- No vehicle access to last 2km
- Source funding (x2) – economic assessment for 'asset'
- Engineering solution – intermediate soft engineering solution to facilitate vegetation to grow
- Vegetation – protect what is there and enhance where possible
- Education for user groups to protect what exists
- Investigation to passive recreation options / type
- Staged implementation of stabilisation / revegetation
- Secure the site in terms of erosion

		• Appropriately resourced and funded • Promotional profile developed • Secure from erosion soft and hard engineering • Manage for day access, hard engineering to manage people access • Adapt and retreat for climate change impacts • Continuing revegetation / control destruction of revegetation • Maintain habitat for woodland / terrestrial birds • Increase management, funding, awareness • Improvements in vegetation – restriction of access and weed control • Improve state of access – resourcing required • Maintain assets now available • Access to northern jetty – transfer water flow to river • Maintain erosion control • Maintain public access • Rock placement – natural approach and aesthetic 'soften' visual • Enhanced habitat within the river channel to enhance fishing experience • Keeping geomorphological status of site – raising profile may lead to increased resources • Interpretation to help raise awareness of the site • Halt or slow erosion • Commitments to resourcing, including monitoring • Review of condition in 20 years • Enjoying continued variety of uses at the site • Maintenance of natural processes where possible • Manage what we can manage • Geomorphological feature – let nature take its course • Walking / cycling track on the southern side of the jetty • Maintain the site for the birds – healthy bird life and breeding – increased opportunity to see the birds • Giant egret sculpture / giant sea bass sculpture!
7.	Wrap up	• Confirm next steps: Workshop 2, November 11
8.	Close	

Workshop 2 - Outcomes

Project	Mitchell River Silt Jetties Protection and Enhancement Project
Meeting	Workshop 2 – Threats, Objectives, and Management Priorities
Date	Tuesday 11 November 2014
Time	9:30 – 2:30 pm (including a lunch)
Venue	St Mary's Parish Hall, 23 Pyke St, Bairnsdale
Attendees	Bill Storer (Crown Land Management, Department of Environment and Primary Industries); Melissa Birleson (East Gippsland Catchment Management Authority); Ian Bate (East Gippsland Shire Council); Andrew Brown (Friends of the Gippsland Lakes); Pat McPherson (Bairnsdale Field Naturalists Club / East Gippsland Birdlife); David Young (Bairnsdale Field and Game); Hilary Rigg (Eagle Point Landcare Group); Rob Caune (VR Fish); Trevor Caldwell and Nancy McMurray (Friends of the Gippsland Lakes / Eagle Point Landcare Group); Jeremy Tscharke, James Tomlinson, Yasmin Aly, Jen Lightfoot, Will McCutcheon and Tracy Neilson (Parks Victoria); Sean Philipson (Ethos NRM); Leonie Duncan (Alluvium).
Apologies	Martin Richardson (Gippsland Lakes Ministerial Advisory Committee); Ricky Mullett (Gippsland Land and Waters Aboriginal Corporation); Carmel Henderson (Gippsland Coastal Board); Ken Judd (East Gippsland Catchment Management Authority)
Purpose	• For stakeholders to gain an understanding of the technical assessments undertaken and the available options for on ground action to protect values. • Gather input from stakeholders on priorities and targets for on ground actions

Summary of workshop and outcomes

This session brought stakeholders back together to build on the outcomes of the first workshop on October 14, 2014. Once again, a broad diversity of interests and perspectives were represented, including some additional input from local residents and Landcare members as well as Gippsland Ports.

The purpose of this session was two-fold: 1. for stakeholders to gain an understanding of the technical assessments undertaken and the available options for on ground action to protect values, and 2. to gather input from stakeholders on priorities and targets for on ground actions.

The day began with a recap of outcomes from Workshop 1, in particular a summary of the environmental and social values attached to the site; the key threats to these values; and the central elements of a future vision and target outcomes for the site. It was noted that the threat to values posed by litter, vandalism and anti-social behaviour of some users was perhaps not captured adequately by the terms 'over-use' and 'over-loved'.

From here, the majority of the day focussed on presentation of the technical and risk assessments undertaken at the site, and well as discussion and assessment of potential management zones and options to help achieve a set of agreed objectives for the site.

Continued over page…

We had broad agreement and acceptance from the stakeholder group on:

- The outcomes of the technical assessments (wind wave modelling, flood modelling, shoreline erosion resistance survey, and site disturbance assessment – *see Figure 1 for an example*);
- The development of 'risk mapping' to determine areas of high risk to shoreline erosion - *see Figure 2*;
- The conceptual erosion control options / measures presented to address shoreline erosion at the site *see Figure 3 for an example*;
- The development of management zones or areas across the site – *see Figure 4*
- The six proposed management objectives developed from the outcomes of Workshop 1 (considering environment/physical factors, social components, and financial constraints), which are as follows:

  <u>Physical Integrity / Environmental</u>

  - Retain the physical integrity of the site
  - Protect and enhance the environmental character of the site

  <u>Usage / Social</u>

  - Provide access and egress for residents of the site to their property
  - Provide access for visitors to the site for recreation

  <u>Economic</u>

  - Limit the implementation cost of new or proposed works
  - Reduce the maintenance cost of existing and new works at the site

and,

- The risk matrix used to assess the potential for proposed broad management options to achieve the agreed objectives for the site – *see*
-
-

- Figure 5. The three broad management options assessed using the matrix were:
    - **OPTION 1:** Retain existing access arrangements (road to end of Zone 3) and improve facilities to match level of use
    - **OPTION 2:** Retain road access to end of Zone 2; implement walking / bike path to end of Zone 3
    - **OPTION 3:** Close road at the end of Zone 1; implement walking / bike path through Zone 2 to end of Zone 3

The session concluded by offering participants to submit any further feedback on the risk matrix the broad management options back to the project team by the end of the following week, and by letting stakeholders know that they should expect to hear how their input influenced the final recommendations when the project report is finalised in the first quarter of 2015.

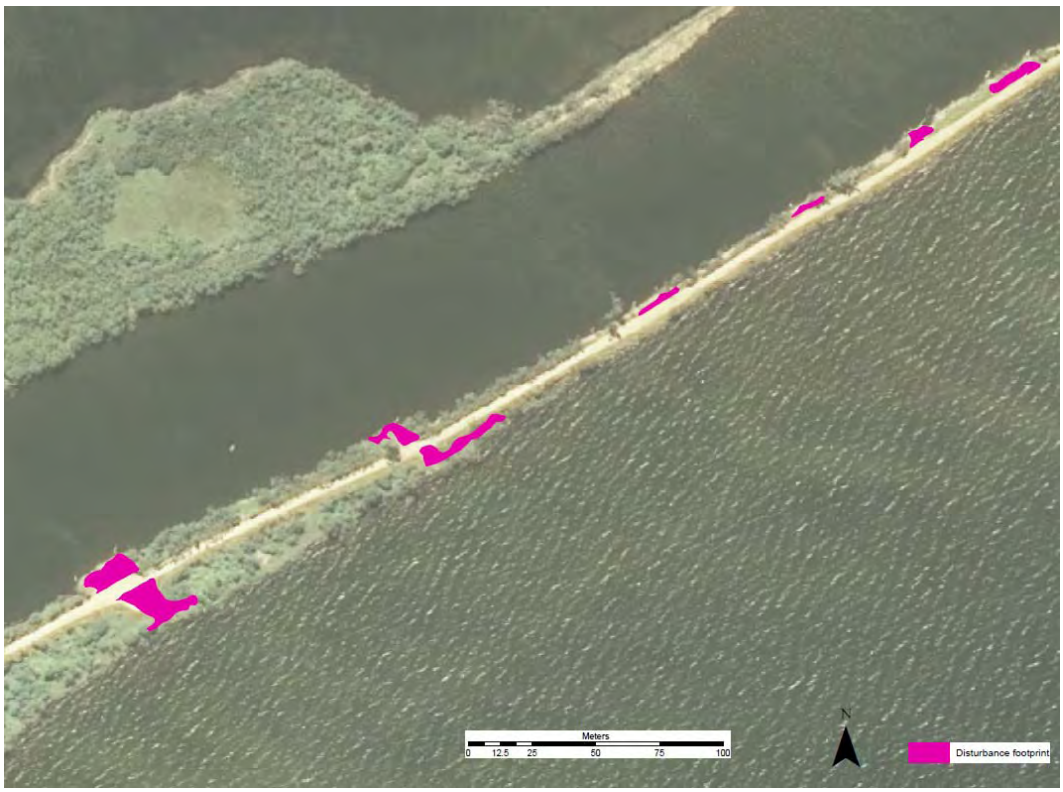


Figure 1. ***Site Disturbance Assessment:*** *site visits were undertaken along the length of the silt jetties to note and map areas of disturbance. Assessments were made of road and track location, road drainage, river and lake access points. This assessment noted 57 areas of disturbance (46 informal, 11 formal), with over 4000m^2 of vegetation impacted or removed at informal access points. Issues relating to this disturbance include drainage at informal access points, drainage from the road, and inability for vegetation to establish dues to spatial constraints.*

Figure 2. ***Erosion risk:*** *This map shows areas identified as being at the greatest erosion risk across the site, using a combination of the information collected from the technical investigations. In essence, Erosion Risk = Excess energy x Level of resistance*

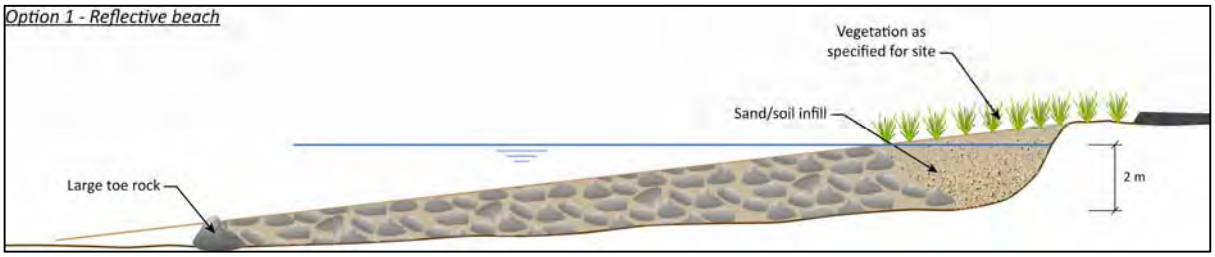


Figure 3. ***Erosion control interventions:*** *Erosion control interventions are required in priority areas to maintain the physical form of the site and protect important values. Four conceptual options have been developed for the site. These conceptual options (or variations) will be subject to detail design as part of the final project report. Option 1 (pictured) would be for application in areas subject to aggressive erosion. The principle behind this option is that the 'armoured' low gradient surface creates a surface that dissipates excess wave energy over an extended area. A key issue with this option is that a large amounts of material may be required, making it costly.*

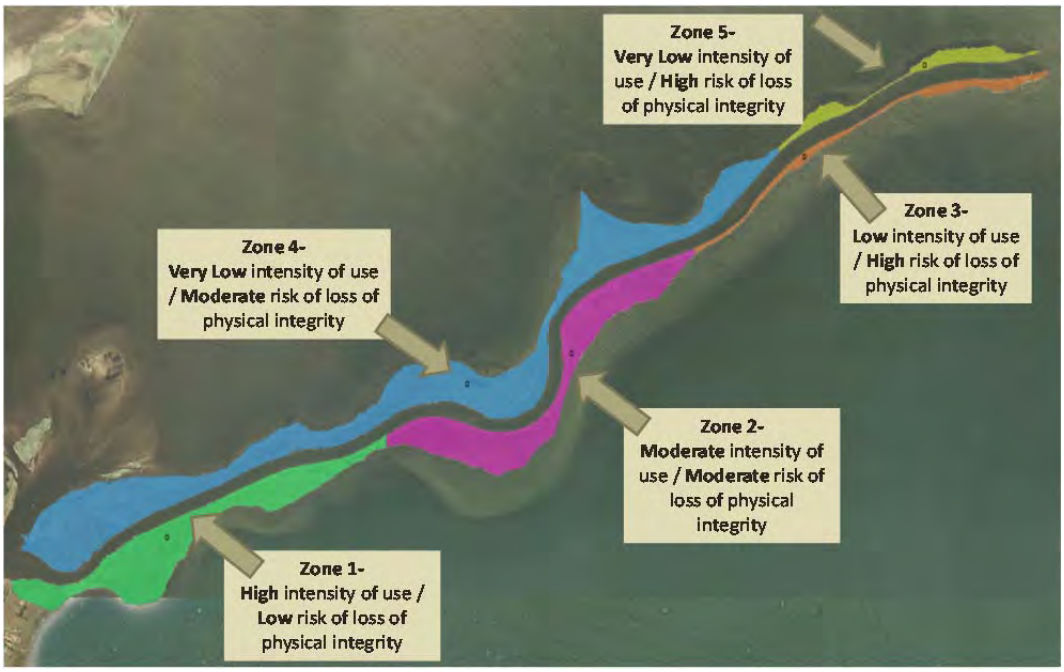


Figure 4. ***Land management zones:*** *Six zones for land management were identified, based on the principle that land use and intensity of that land use should match capability and suitability of land for that use; and the principle that the standard of facilities should reflect the standard of access. e.g. low level facilities where low intensity land use is suitable and is proposed*

		Option		
	Objective	1	2	3
Zone 1	P1	5	5	5
	P2	1	1	1
	S1	5	5	5
	S2	5	5	5
	F1	3	3	3
	F2	3	3	3
Zone 2	P1	3	3	5
	P2	3	3	5
	S1	5	5	1
	S2	5	5	3
	F1	3	3	1
	F2	3	3	5
Zone 3	P1	1	5	5
	P2	1	5	5
	S1	0	0	0
	S2	5	3	1
	F1	1	5	5
	F2	1	5	5
Zone 4	P1	5	5	5
	P2	5	5	5
	S1	0	0	0
	S2	1	1	1
	F1	5	5	5
	F2	5	5	5
Zone 5	P1	5	5	5
	P2	5	5	5
	S1	0	0	0
	S2	1	1	1
	F1	5	5	5
	F2	5	5	5

Option 1	Retain existing access arrangements (road to end of Zone 3) and improve facilities to match level of use
Option 2	Retain road access to end of Zone 2; implement walking / bike path to end of Zone 3
Option 3	Close road at the end of Zone 1; implement walking / bike path through Zone 2 to end of Zone 3
Objective P1	Retain physical integrity of site
Objective P2	Protect and enhance environmental character
Objective S1	Provide access and egress for resident of the site
Objective S2	Provide access for visitors to the site for recreation
Objective F1	Limit the implementation costs of new works
Objective F2	Limit maintenance costs of existing and new works

Level to which Option meets Objective	
High	5
Moderate	3
Low	1
N/A	0

Figure 5. ***Risk assessment of management options:*** *In groups, stakeholder workshop participants were invited to review the options vs objectives matrix (pictured) to assess how each option might meet each objective within the 5 management zones and to propose revised ratings were there was disagreement as well as providing a rationale to support any change.*

Appendix 1 – Detailed minutes

Minutes

Item		Detail / notes
1.	Arrival	• Morning tea
2.	Welcome	• Introductions
3.	Overview and Introduction	• Overview of project: o Initiative of Parks Victoria, with funding from Gippsland Lakes Environment Fund o Purpose is to provide clear direction and priorities for future use and management of MRSJ, with a focus on erosion mitigation, and enhancement of natural and recreational values at this significant geomorphological site. o The project involves: a review of existing literature, gathering input from stakeholders and undertaking some technical assessments. o Alluvium and Ethos NRM have been engaged to undertake an independent assessment of the key values, threats and potential management actions related to the site. Central to this assessment is engagement with stakeholders. o Final report is intended to directly inform works to assist conservation and recovery of natural values, with a strong focus on enhancement of existing recreational sites on the silt jetties. • Summary of progress to date including Workshop 1 outcomes (see previous minutes). Discussion included: o General agreement from group on outcomes summary o Particular resonance for some on the concept of jetties being a 'relic' o Additional points made: the threat to values posed by litter, vandalism and anti-social behaviour of some users was perhaps not captured adequately by the terms 'over-use' and 'over-loved'. (This point was also emphasised in a subsequent written submission from Nancy McMurray and Trevor Caldwell.) • Overview of the purpose of Workshop 2 • Reminder of our engagement 'goal' (To understand what is important to stakeholders and their organisations and stakeholder preferences for the future), and 'promise' (To listen to stakeholders and understand what is important to them, and to incorporate what we can of stakeholder input into the final decision on the project).
4.	Initial priorities for action	• Next, stakeholders split into three groups for a quick workshop activity aimed at canvasing thoughts on priority areas on the jetties requiring protection from erosion / disturbance. • Discussion points included: o Erosion particularly an issue in the narrow strip of land towards the end of the jetties (where there is rocking either side of road but slumping behind), and a couple of other main spots. o The very tip of the southern jetty is particularly vulnerable – high erosion on end point and vegetation reduced. o Towards the tip of the northern jetty rocking has reduced erosion but is a temporary solution o Erosion will reduce access and enjoyment: reduce vegetation, habitat, landholders, private property access o Feature supports a number of important values: recreational and natural o Physical feature as a whole o Rock wall has a shelf life = maintenance

		o Threat to "status" of the jetties as 2nd longest in the world o Threat from recreational access
5.	Results of technical investigations	• Presentation of the results of the technical investigations completed to date as part of the project: o Wind and wave modelling o Flood modelling o Shoreline resistance survey o Site disturbance assessment
6.	Erosion Risk / Conceptual options for erosion control	• Presentation of mapped areas of highest erosion risk (based on technical investigations). • Questions / comments included: o Any interventions are only ever temporary, will require review and replacement down the track o Professor Paul Boon (on project team) will advise on vegetation types with highest ability to mitigate erosion. o Impact of boat wake on erosion, relies in part on speed limits being adhered to o Better to talk about 'ecological' or 'biological' values rather than 'natural' values, given how modified the jetties are already o Impact of climatic conditions on vegetation condition • Presentation and discussion of conceptual options for erosion control methods across the site. • Questions / comments included: o Options at conceptual level only, some of the complexities yet to be worked through o Rock beaching an attractive option because already a bit in place. Some now failing but not feasible to pull out, could build upon what's there o Impact on sea grass beds
7.	Lunch	
8.	Objectives and option for management	• Small group activity to assess and discuss current areas with similar management needs. Results were as follows: o Group 1: a large area of revegetation zone on northern jetty; mix of revegetation and residential zones for much of southern jetty, but with greater management control of access and erosion from just beyond the residential areas to the tip. o Group 2: northern jetty largely a conservation zone; active management zone for the last third of southern jetty towards the tip; private management zone across much of the rest of the southern jetty o Group 3: six zones identified: ▪ Zone 1: northern jetty, first third of area after cut – revegetated ▪ Zone 2: northern jetty, last two-thirds towards tip – less treatment (reveg etc.) has areas of veg in good condition ▪ Zone 3: southern jetty, from where it narrows about (about two-thirds of the way along) to tip – high impact, manage for reduced recreational ability to improve degraded area ▪ Zone 4: southern jetty, from entrance to about halfway along – freehold private land ▪ Zone 5: southern jetty, around entrance – very high ▪ Zone 6: southern jetty, between Zone 4 and Zone 3 – mid impact, ability to improve biodiversity (recreation?) • Additional points made included: ▪ northern jetties managed separately – ecological 'natural' values priority; ▪ non-road access (walking) from car park; ▪ define fishing access points - limit footprint; ▪ manage recreation all along; ▪ consider acquiring private property when available; ▪ manage use and facilities (illegal camping, impacts on veg and

revegetation);
    - invasive species (fox).
- Objectives for the management of the site (based on outcomes of Workshop # 1) presented, with broad agreement and acceptance from the stakeholder group on. These were as follows:

  Physical Integrity / Environmental

  - Retain the physical integrity of the site
  - Protect and enhance the environmental character of the site

  Usage / Social

  - Provide access and egress for residents of the site to their property
  - Provide access for visitors to the site for recreation

  Economic

  - Limit the implementation cost of new or proposed works
  - Reduce the maintenance cost of existing and new works at the site

- Presentation and review of a risk matrix that assesses the level to which potential management options achieve the agreed management objectives for the site. The three management options assessed were:

  - **OPTION 1:** Retain existing access arrangements (road to end of Zone 3) and improve facilities to match level of use
  - **OPTION 2**: Retain road access to end of Zone 2; implement walking / bike path to end of Zone 3
  - **OPTION 3:** Close road at the end of Zone 1; implement walking / bike path through Zone 2 to end of Zone 3

- In groups, stakeholder workshop participants were invited to review the options vs objectives matrix to assess how each option might meet each objective within the 5 management zones and to propose revised ratings were there was disagreement as well as providing a rationale to support any change. The result was broad agreement and acceptance from the stakeholder group. Questions / comments included:

  - Whether the result for Option 3, Zone 3, S2 should be higher
  - Pros and cons of closing the road from a fisher perspective

9.	Afternoon Tea	
10.	Revised priorities for action	• Revisit the priorities for erosion control identified earlier in the session based on the outcomes of Items 5, 6 and 7.
11.	Wrap up	• The session concluded by offering participants to submit any further feedback on the risk matrix the broad management options back to the project team by the end of the following week, and by letting stakeholders know that they should expect to hear how their input influenced the final recommendations when the project report is finalised in the first quarter of 2015.
12.	Close	

APPENDIX 3 – Shoreline Sectors and Detailed Erosion Risk Table

Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure A3-1: Shoreline Sectors (South West)

Shoreline Sector

99

99

Meters
0 70 140 280 420 560

N

Parks Victoria

alluvium

DODO ENVIRONMENTAL

ETHOSNRM

Date: 28/11/14
Map Produced by: Ethos NRM
162 Macleod Street, Bairnsdale, VIC. 3875
ph. (03) 51530037 info@ethosnrm.com.au

Mitchell River Silt Jetties Shoreline Protection and Enhancement Project

Figure AXX: Shoreline Sectors (North East)

Shoreline Sector

99

99

N

Meters

0 70 140 280 420 560

Parks VICTORIA

alluvium

DODO ENVIRONMENTAL

ETHOSNRM

Date: 28/11/14
Map Produced by: Ethos NRM
162 Macleod Street, Bairnsdale, VIC. 3875
ph. (03) 51530037 info@ethosnrm.com.au

Sector	*Resistance Level*	*Resistance Rating*	*Wave Energy*	*Wave Energy Rating*	*Flood Energy*	*Flood Energy Rating*	*Erosion Risk*	*Likelihood of Erosion*
29	1	Very High			1	Very Low	1	Low
31	1	Very High			1	Very Low	1	Low
53	1	Very High			1	Very Low	1	Low
33	2	High			1	Very Low	2	Low
42	2	High			1	Very Low	2	Low
57	2	High			1	Very Low	2	Low
1	2	High	1	Very Low			2	Low
34	3	Moderate			1	Very Low	3	Low
39	3	Moderate			1	Very Low	3	Low
40	3	Moderate			1	Very Low	3	Low
108	3	Moderate			1	Very Low	3	Low
123	3	Moderate			1	Very Low	3	Low
79	3	Moderate	1	Very Low			3	Low
80	3	Moderate	1	Very Low			3	Low
81	3	Moderate	1	Very Low			3	Low
89	3	Moderate	1	Very Low			3	Low
50	2	High			2	Low	4	Moderate
30	4	Low			1	Very Low	4	Moderate
37	4	Low			1	Very Low	4	Moderate
43	4	Low			1	Very Low	4	Moderate
48	4	Low			1	Very Low	4	Moderate
110	4	Low			1	Very Low	4	Moderate
121	4	Low			1	Very Low	4	Moderate
11	2	High	2	Low			4	Moderate
64	2	High	2	Low			4	Moderate
71	4	Low	1	Very Low			4	Moderate
32	5	Very Low			1	Very Low	5	Moderate
35	5	Very Low			1	Very Low	5	Moderate
36	5	Very Low			1	Very Low	5	Moderate
41	5	Very Low			1	Very Low	5	Moderate
44	5	Very Low			1	Very Low	5	Moderate
45	5	Very Low			1	Very Low	5	Moderate
49	5	Very Low			1	Very Low	5	Moderate
54	5	Very Low			1	Very Low	5	Moderate

Sector	*Resistance Level*	*Resistance Rating*	*Wave Energy*	*Wave Energy Rating*	*Flood Energy*	*Flood Energy Rating*	*Erosion Risk*	*Likelihood of Erosion*
102	5	Very Low			1	Very Low	5	Moderate
103	5	Very Low			1	Very Low	5	Moderate
111	5	Very Low			1	Very Low	5	Moderate
112	5	Very Low			1	Very Low	5	Moderate
119	5	Very Low			1	Very Low	5	Moderate
120	5	Very Low			1	Very Low	5	Moderate
124	5	Very Low			1	Very Low	5	Moderate
128	5	Very Low			1	Very Low	5	Moderate
101	5	Very Low	1	Very Low			5	Moderate
46	3	Moderate			2	Low	6	Moderate
47	3	Moderate			2	Low	6	Moderate
52	3	Moderate			2	Low	6	Moderate
0	3	Moderate	2	Low			6	Moderate
12	3	Moderate	2	Low			6	Moderate
13	3	Moderate	2	Low			6	Moderate
28	3	Moderate	2	Low			6	Moderate
63	3	Moderate	2	Low			6	Moderate
65	3	Moderate	2	Low			6	Moderate
88	3	Moderate	2	Low			6	Moderate
93	3	Moderate	2	Low			6	Moderate
98	3	Moderate	2	Low			6	Moderate
8	2	High	3	Moderate			6	Moderate
19	2	High	3	Moderate			6	Moderate
76	2	High	3	Moderate			6	Moderate
104	4	Low			2	Low	8	High
125	4	Low			2	Low	8	High
127	4	Low			2	Low	8	High
7	4	Low	2	Low			8	High
78	4	Low	2	Low			8	High
2	3	Moderate	3	Moderate			9	High
14	3	Moderate	3	Moderate			9	High
26	3	Moderate	3	Moderate			9	High
62	3	Moderate	3	Moderate			9	High
66	3	Moderate	3	Moderate			9	High
68	3	Moderate	3	Moderate			9	High

Sector	*Resistance Level*	*Resistance Rating*	*Wave Energy*	*Wave Energy Rating*	*Flood Energy*	*Flood Energy Rating*	*Erosion Risk*	*Likelihood of Erosion*
69	3	Moderate	3	Moderate			9	High
70	3	Moderate	3	Moderate			9	High
72	3	Moderate	3	Moderate			9	High
77	3	Moderate	3	Moderate			9	High
92	3	Moderate	3	Moderate			9	High
97	3	Moderate	3	Moderate			9	High
99	3	Moderate	3	Moderate			9	High
38	5	Very Low			2	Low	10	High
51	5	Very Low			2	Low	10	High
55	5	Very Low			2	Low	10	High
105	5	Very Low			2	Low	10	High
106	5	Very Low			2	Low	10	High
107	5	Very Low			2	Low	10	High
109	5	Very Low			2	Low	10	High
113	5	Very Low			2	Low	10	High
118	5	Very Low			2	Low	10	High
122	5	Very Low			2	Low	10	High
126	5	Very Low			2	Low	10	High
61	4	Low			3	Moderate	12	High
117	4	Low			3	Moderate	12	High
129	4	Low			3	Moderate	12	High
9	3	Moderate	4	High			12	High
15	3	Moderate	4	High			12	High
16	3	Moderate	4	High			12	High
21	3	Moderate	4	High			12	High
24	3	Moderate	4	High			12	High
27	3	Moderate	4	High			12	High
74	3	Moderate	4	High			12	High
82	3	Moderate	4	High			12	High
90	3	Moderate	4	High			12	High
91	3	Moderate	4	High			12	High
95	3	Moderate	4	High			12	High
67	4	Low	3	Moderate			12	High
73	4	Low	3	Moderate			12	High

Sector	*Resistance Level*	*Resistance Rating*	*Wave Energy*	*Wave Energy Rating*	*Flood Energy*	*Flood Energy Rating*	*Erosion Risk*	*Likelihood of Erosion*
83	4	Low	3	Moderate			12	High
94	4	Low	3	Moderate			12	High
96	4	Low	3	Moderate			12	High
100	4	Low	3	Moderate			12	High
56	5	Very Low			3	Moderate	15	Very High
114	5	Very Low			3	Moderate	15	Very High
115	5	Very Low			3	Moderate	15	Very High
116	5	Very Low			3	Moderate	15	Very High
10	5	Very Low	3	Moderate			15	Very High
20	5	Very Low	3	Moderate			15	Very High
4	3	Moderate	5	Very High			15	Very High
84	3	Moderate	5	Very High			15	Very High
3	4	Low	4	High			16	Very High
5	4	Low	4	High			16	Very High
6	4	Low	4	High			16	Very High
18	4	Low	4	High			16	Very High
25	4	Low	4	High			16	Very High
75	4	Low	4	High			16	Very High
58	5	Very Low			4	High	20	Very High
59	4	Low			5	Very High	20	Very High
17	5	Very Low	4	High			20	Very High
22	5	Very Low	4	High			20	Very High
23	5	Very Low	4	High			20	Very High
86	4	Low	5	Very High			20	Very High
87	4	Low	5	Very High			20	Very High
60	5	Very Low			5	Very High	25	Very High
85	5	Very Low	5	Very High			25	Very High