

GREATER TAREE CITY COUNCIL



MANNING RIVER ESTUARY
MANAGEMENT PLAN



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Patterson Britton
& Partners Pty Ltd
consulting engineers



WorleyParsons
resources & energy



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ACKNOWLEDGEMENTS

This Manning River Estuary Management Plan was prepared by Patterson Britton & Partners Pty Ltd on behalf of the Estuary & Coastline Management Committee.

The Study stems from Council’s commitment to managing the estuarine reaches of the Manning River and its major tributaries including Lansdowne River, Cattai Creek, Dawson River, Scotts Creek and South Channel. It has been funded jointly by Council and the Department of Environment and Climate Change (DECC) on a 50:50 subsidy basis, under the New South Wales Government’s *Estuary Management Program*.

The Plan is the culmination of a range of investigations and studies that have been undertaken over the last 10 years. Reports detailing the outcomes of these investigations form the supporting documentation on which the recommendations outlined in this Plan are based. They include:

- *‘Manning River Estuary Data Compilation’ (March 1990)*
- *‘Manning River Estuary Processes Study’ (September 1997)*
- *‘Manning River Estuary Management Study’ (July 2009).*

These documents have been prepared by incorporating contributions from individuals from the broader community and a range of key stakeholders.

The Manning River Estuary Management Committee has also contributed to these studies. Its contributions have been essential to the formation of the Plan and are greatly appreciated.

Members of the Estuary Management Committee are listed opposite. Their contributions to the development of this Plan and the studies on which it is based are greatly appreciated.

ESTUARY AND COASTLINE MANAGEMENT COMMITTEE 2004-2008

Councillor Richard Wilson (Chair)	Greater Taree City Council
Councillor John Byrne	Greater Taree City Council
Councillor Helen Hannah	Greater Taree City Council
Ric Slatter	Department of Environment and Climate Change
Brian Semple	Department of Lands
Kevin Carter	Department of Environment and Climate Change
Bret Ryan	NSW Maritime Authority
Martin Angle	Department of Primary Industries Fisheries
Jim Love	Commercial / Interest - Waterways
Simon Skelton	Manning Coastcare
Beryl Neilsen (alternative George Townsend)	Manning River Channel Committee
John Sorby	Old Bar resident
Trevor Burns	Manning River Sustainable Recreational Fishing and Tourism Committee
Chris Watson (alternative Sherree Sheather)	Taree Fisherman’s Co-operative Society Limited
Mark Polson	Oyster Growers Association
Ian Crisp	Manning River Oyster Farmers Association
Peter Longworth	Manning Delta Landowners Protection Committee

1 BACKGROUND

1.1 OVERVIEW

This Manning River Estuary Management Plan incorporates both long term and short term strategies for managing the estuary. The Plan has been structured to provide a list of strategic measures that can be implemented to meet objectives determined through consultation with key stakeholders.

1.1.1 Long Term Strategies

These embrace broad regional issues, often related to reversing or curbing cumulative anthropogenic impacts. These issues typically require either further specific study to identify appropriate management solutions and/or time to build landowner support and commitment, such as for habitat regeneration on privately owned land.

In effect, these strategies are targeted at prevention of problems that, if no action was taken, could arise in the future.

1.1.2 Short Term Strategies

These relate to readily definable components of work or measures that can be implemented as soon as funds are available (*subject to the usual development approvals process*).

As such, these strategies are typically reactions to existing problems and include for example, works associated with bank stabilisation and reducing sediment load to the estuary.

1.2 PLAN LAYOUT AND DESCRIPTION

The Plan is set-out in detail on the figures and in the Implementation Schedule enclosed within Section 4. It includes 45 strategies which address identified objectives.

The Plan also incorporates a range of background information which led to the formulation of the 45 strategies. This includes a description of the key issues, significant and valuable attributes of the estuary, and the desired management objectives.

A description of how the Plan will be implemented is also provided. The detailed Implementation Schedule lists the estimated cost of each strategy, its priority and the projected timing for commencement.

1.3 THE ESTUARY MANAGEMENT PROCESS

In 1992, the NSW State Government introduced an *Estuary Management Policy* which was aimed at managing the growing pressures on estuarine ecosystems. The policy forms part of a suite of catchment management policies, which are consistent with the *Catchment Management Act, 1989*.

The general goal of the *Estuary Management Policy* is to achieve an integrated, balanced, responsible and ecologically sustainable use of the State's estuaries, which form a key component of coastal catchments.

The *Estuary Management Policy* provides for the assessment of all estuarine uses, the resolution of conflicts, and the production of a unified and sustainable management plan for each estuary (*NSW Government, 1992*). It is implemented on individual estuaries through a process which involves the establishment of an Estuary Management Committee.

1.4 APPLICATION OF THE ESTUARY MANAGEMENT PROCESS TO THE MANNING RIVER ESTUARY

The Manning River Estuary Management Committee was formed in 1999 to assist Great Taree City Council in achieving integrated, balanced, responsible and ecologically sustainable use of the Manning River Estuary.

The Committee was formed in recognition of the need to protect and preserve the natural state of the estuary while also planning for future development within the lower catchment of Manning River. The Committee consists of representatives from Greater Taree City Council, state government authorities, and the local community. The charter of the Committee is to identify the main issues affecting the river and its tributaries and then to proceed with preparation of a management plan to address identified problems or issues.

The primary aim of producing the **Estuary Data Compilation** document was to discover and appraise literature, data and anecdotal information related to the Manning River and its tributaries. Information was obtained from libraries, consultation with local estuary users, and review of background reports on related infrastructure and through site inspections.

The **Estuary Processes Study** provides essential information on the physical processes of importance to the estuary. It provides the Estuary Management Committee with technical information on which informed decision making can be based. The decisions that need to be made include:

- how to manage the estuary; and,
- how to respond to issues that may confront the future sustainability of the estuary as a conservation area, tourist destination and place for urban living.

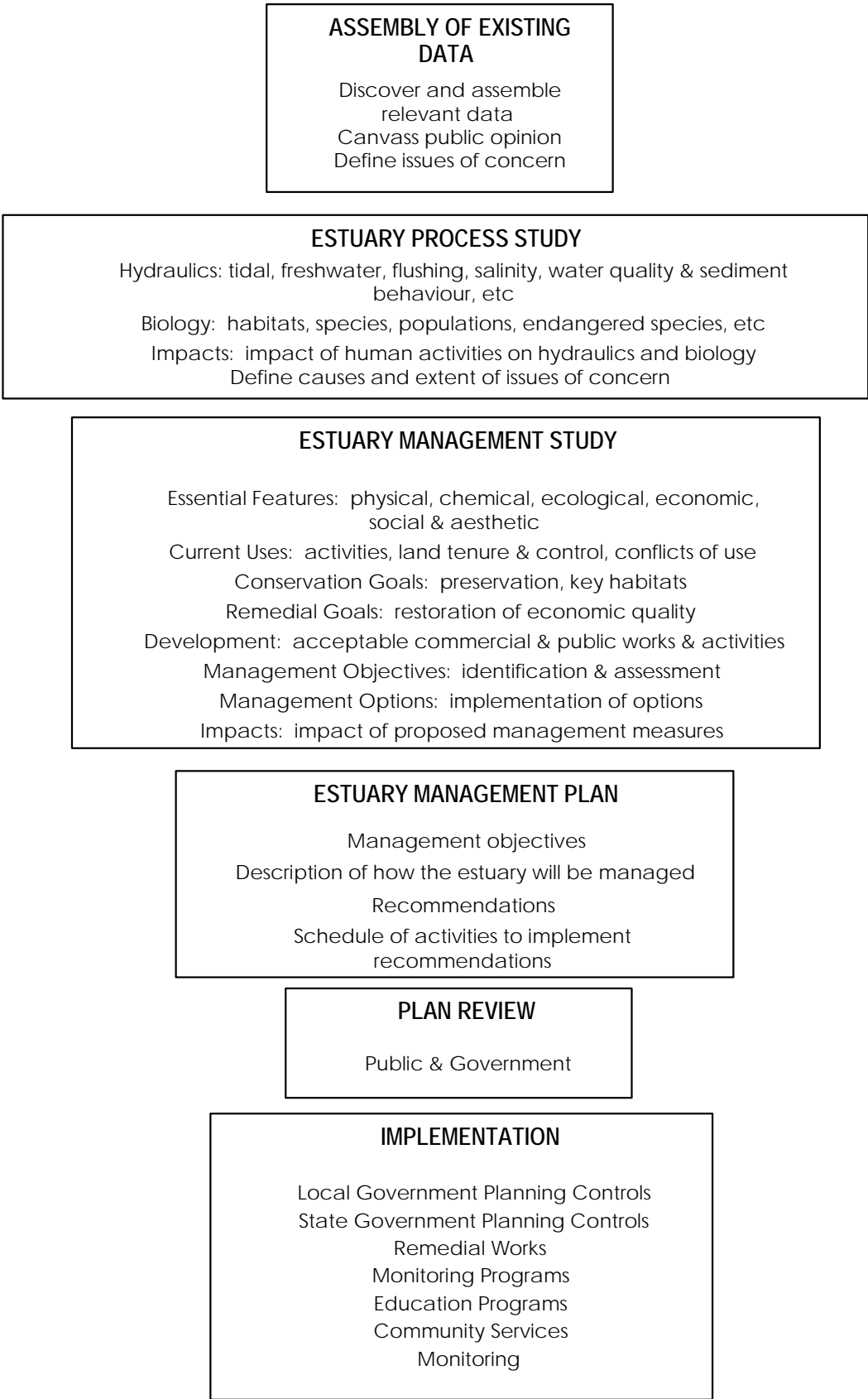
Following preparation of the **Estuary Processes Study**, Patterson Britton & Partners proceeded with the final stages in the estuary management process, comprising the preparation an **Estuary Management Study** and an **Estuary Management Plan**.

The Estuary Management Study describes a range of strategies that have been considered as measures for maintaining and improving the condition of the estuary. The aim of this phase of the estuary management process is to undertake appropriate consultation with the community and key stakeholders and to carry out investigations that will enable Council to adopt an Estuary Management Plan for the area.

This Plan is the culmination of the process.

Accordingly, the Plan identifies and prioritises those strategies required for the future management of the estuary. It provides a scheduled sequence of recommended activities identified through the study process. If further background information is required, refer to the Estuary Management Study.

ESTUARY MANAGEMENT COMMITTEE



This Estuary Management Plan is also a coastal zone management plan, as defined in the Coastal Protection Act 1979. Section 55C of the Act sets out the matters a coastal zone management plan must make provision for. These matters and how the Plan has met those requirements are described in the following:

- (a) *“Protecting and preserving beach environments and beach amenity”.*

The Act defines a beach as the area of unconsolidated material between the lowest limit of tidal or lake water level and the highest level reached by wave action. Within the context of this Plan a beach would include the estuarine foreshores and tidal river banks. This requirement is met through a number of Strategies allowing for the protection and preservation of the estuaries foreshores and river banks through the protection and rehabilitation of riparian vegetation and targeted river bank erosion control projects.

- (b) *“Emergency actions of the kind that may be carried out under the State Emergency and Rescue Management Act 1989, or otherwise, during periods of beach erosion, including the carrying out of related works, such as for the protection of property affected or likely to be affected by beach erosion, where beach erosion occurs through storm activity or an extreme or irregular event”.*

The studies undertaken in the development of the Plan identified many issues concerning the management of the estuary. The potential for properties to be affected by erosion occurring through storm or extreme events was not considered to be an issue for the estuary, and this Plan does not recommend the need for any specific emergency action.

- (c) *“Ensuring continuing and undiminished public access to beaches, headlands and waterways, particularly where public access is threatened or affected by accretion”.*

This is met through Strategies aimed to provide suitable access to the waterways and foreshores that benefit the community and the environment.

2 SIGNIFICANT ESTUARY FEATURES AND KEY ESTUARY MANAGEMENT ISSUES

2.1 SIGNIFICANT ESTUARY FEATURES

A healthy estuary results in a strong economy and a sustainable community lifestyle.

The Manning River catchment is shown in **Figure 1**. For the purpose of this plan, the estuary has been separated into 4 separate zones (*refer Figure 2*).

The “significant features” of an estuary are those which make the estuary important in a local, regional or national sense.

The significant features of the Manning River estuary have been determined through scientific assessments carried out as part of the ‘*Manning River Estuary Processes Study*’ (*September 1997*) and from consultation undertaken with Council officers and Committee members as part of the ‘*Manning River Estuary Management Study*’ (*December 2007, in draft*).

The significant estuary features are summarised in **Table 1**. They are also presented in **Figures 3 to 6** in terms of their location within the upper, middle and lower sections of the estuary.

As inferred by their title, the significant estuary features form critical components of the estuary (*from all perspectives*) and therefore deserve preservation and protection.

The preservation of these essential features is a major challenge facing the future management of the estuary.

Table 1 **SIGNIFICANT FEATURES OF THE ESTUARY**

Ecological Attributes

- Breeding ground for water birds
- Endangered water birds
- Fish and crustaceans
- Mangroves
- National Parks and reserves
- Seagrass beds
- Aquatic mammals
- Large areas of SEPP 14 wetlands
- Pockets of sub-tropical rainforest
- Saltmarsh / sedges / rushes
- Coastal swamps
- Terrestrial fauna
- Dry open forest
- Freshwater macrophytes
- Riparian vegetation / corridors
- Algae

Aesthetic Attributes

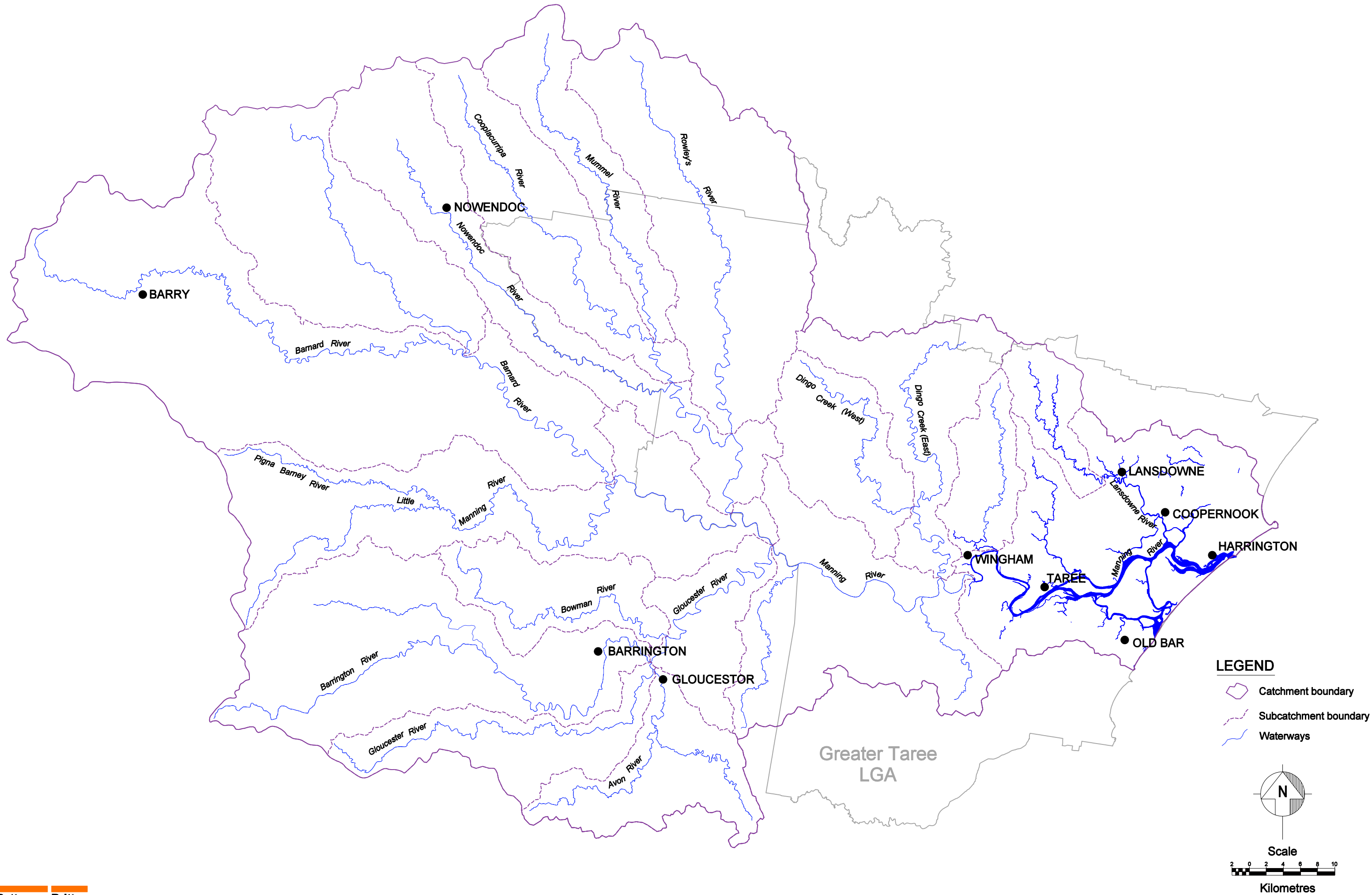
- Farquhar Inlet
- Two natural entrances
- Forests
- Mangrove stands
- Large areas of wetland
- Steep landforms
- Areas of wide open waterway
- Ridges and valleys
- Beaches
- Uplands and plateaus
- Sedges and rushes
- Intertidal shoals
- Coastal plains
- Dunes
- Saltmarshes
- Oyster industry infrastructure
- Training wall at Harrington Inlet

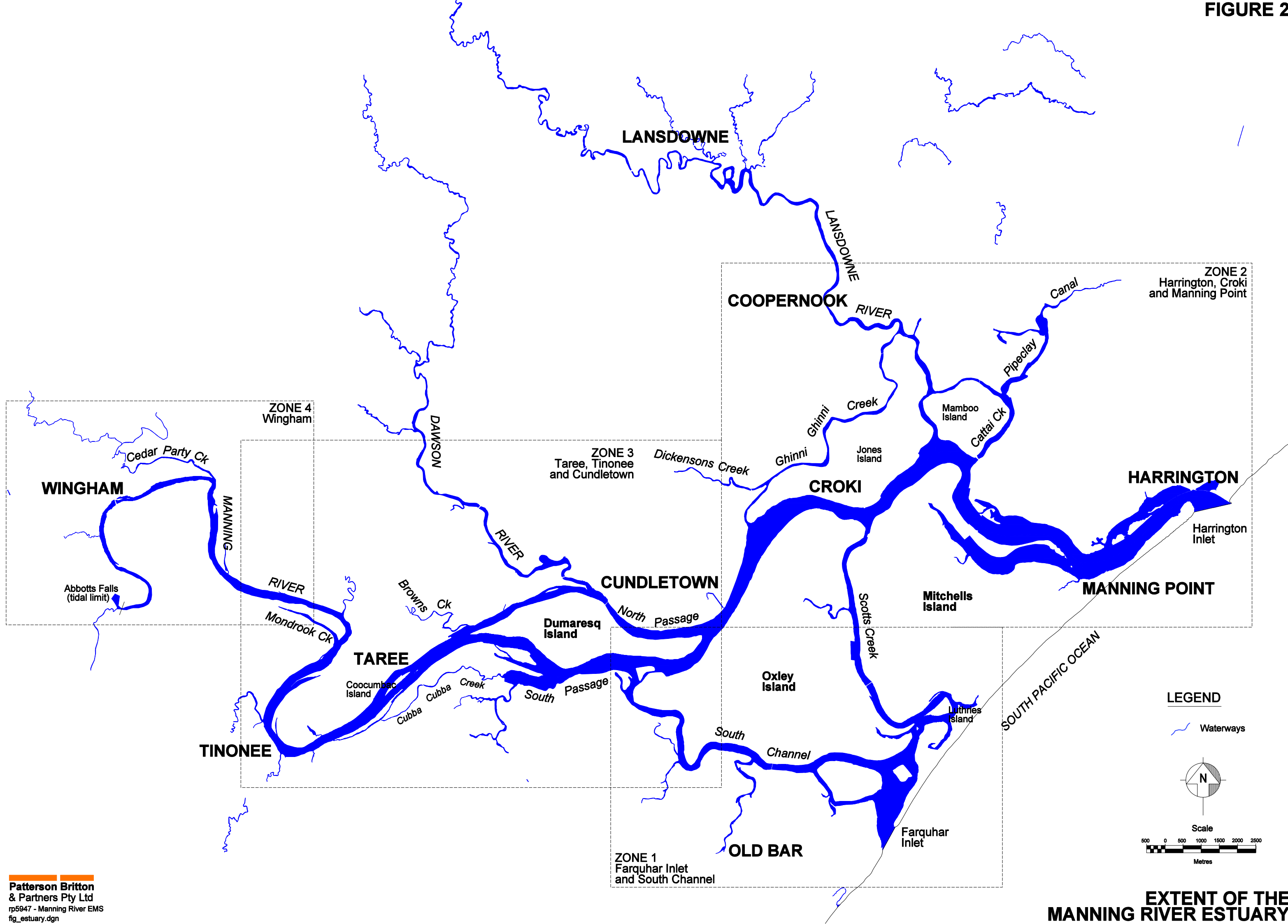
Social Attributes

- Recreational fishing
- Picnicking and foreshore access
- Swimming / snorkelling
- Camping and caravan parks
- Sailing and sailboarding
- Cultural heritage sites
- Rowing, kayaking and canoeing
- Boat launching ramps
- Recreational power-boating and water-skiing
- Wharves and jetties
- Houseboats
- Boat cruises
- Residential area

Economic Attributes

- Tourism
- Dairy industry
- Beef production
- Oyster / aquaculture industry
- Industry
- Commercial fishing
- Sand and gravel resources
- Commercial boating – cruises and hire boats





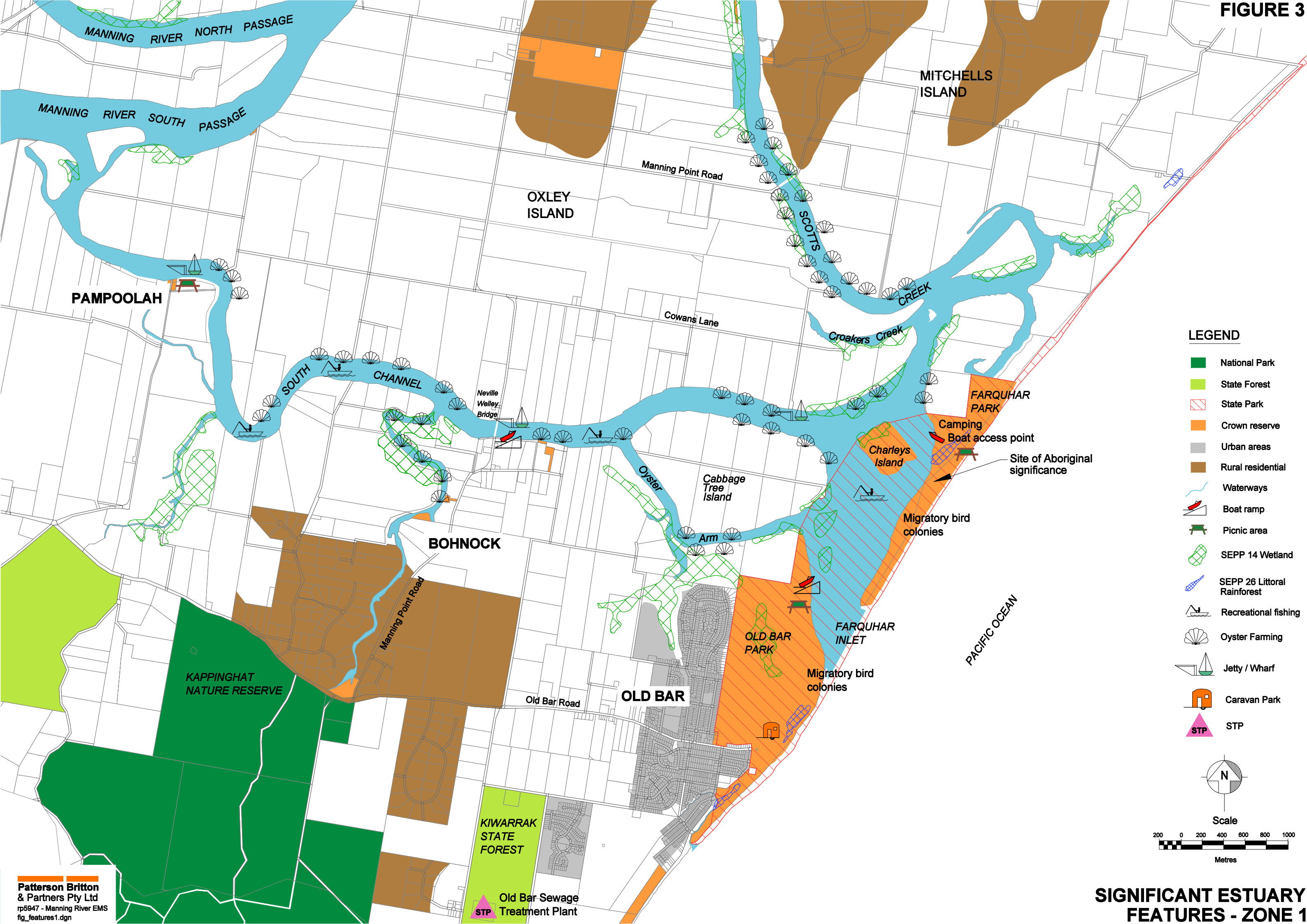
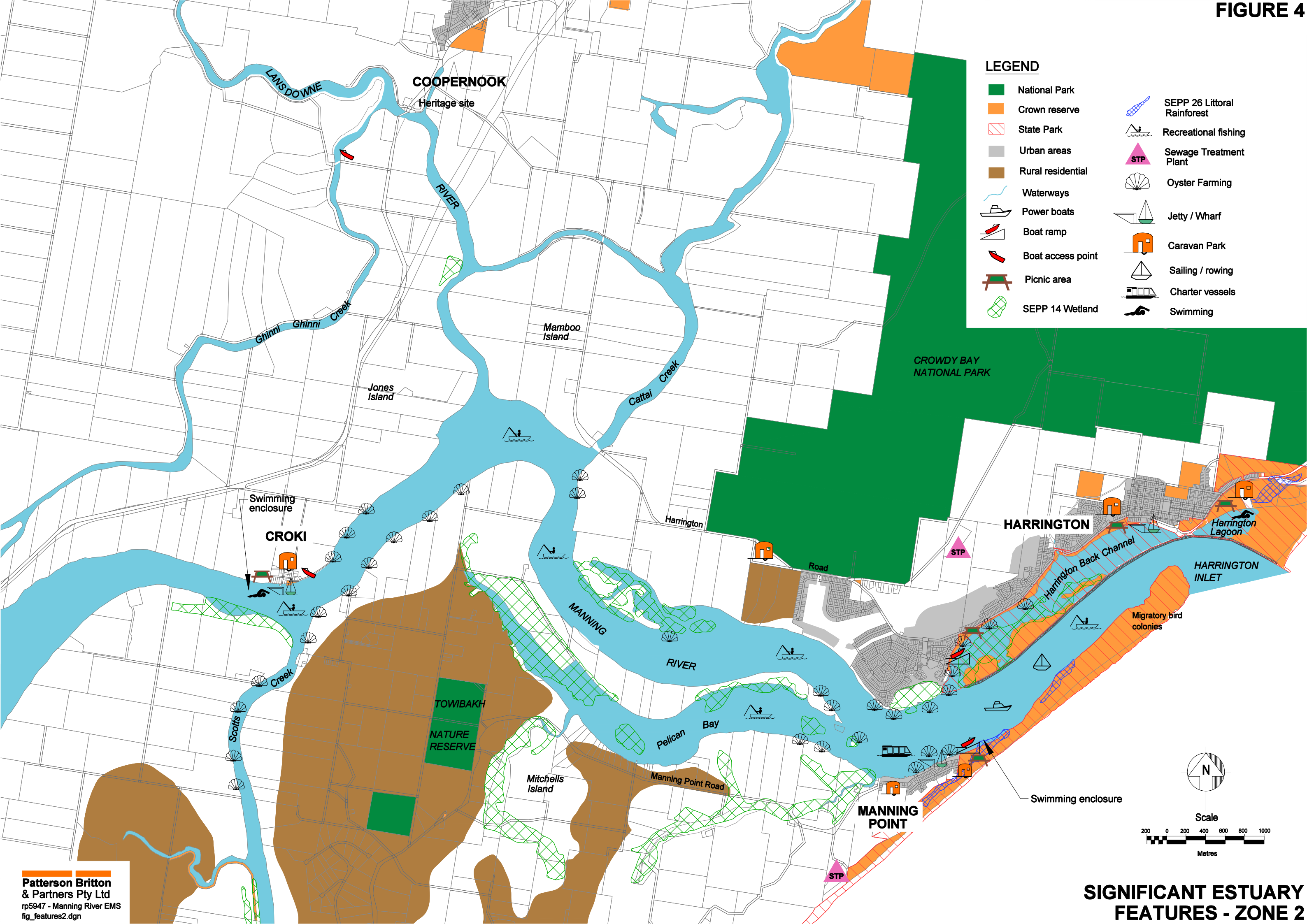
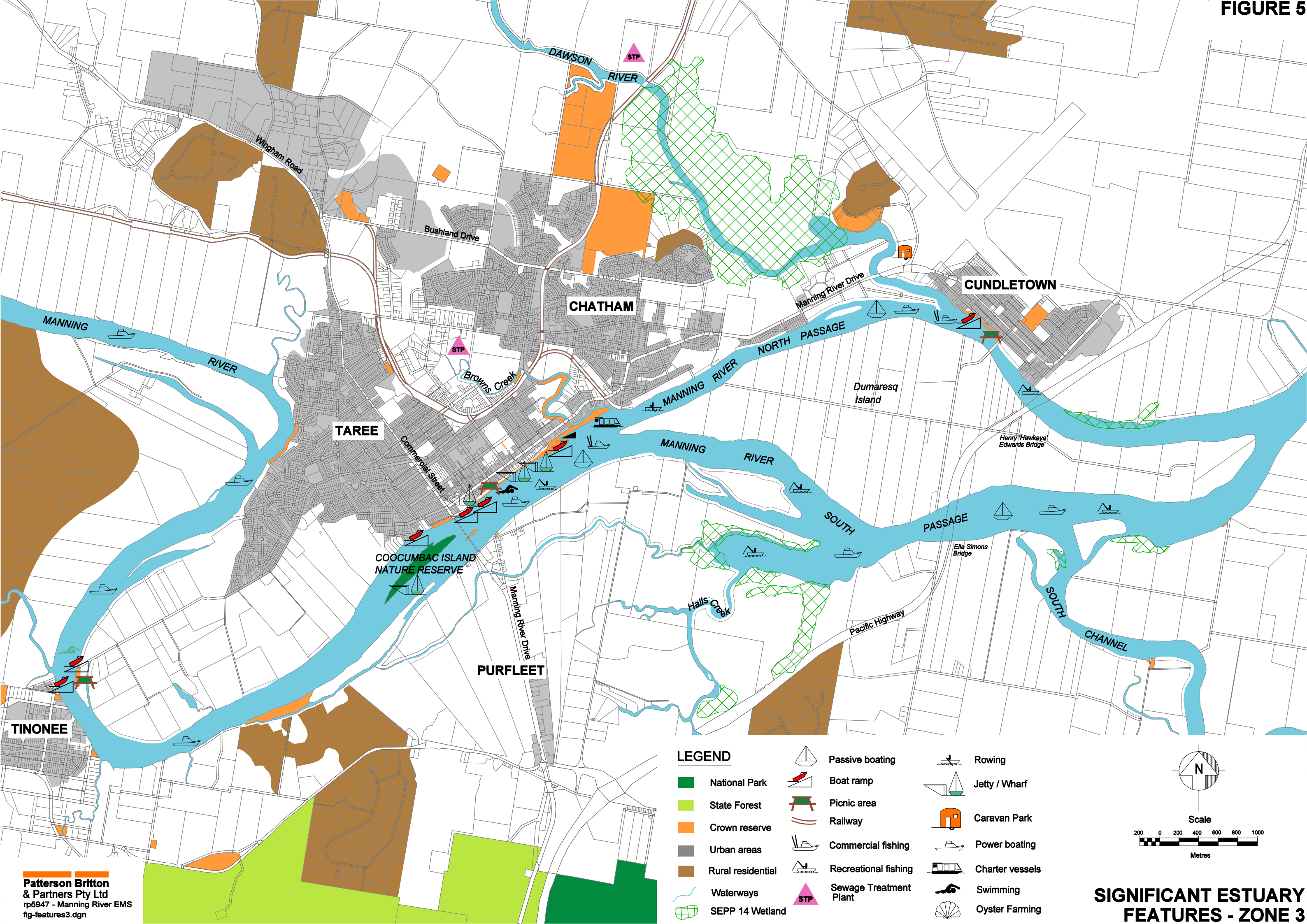
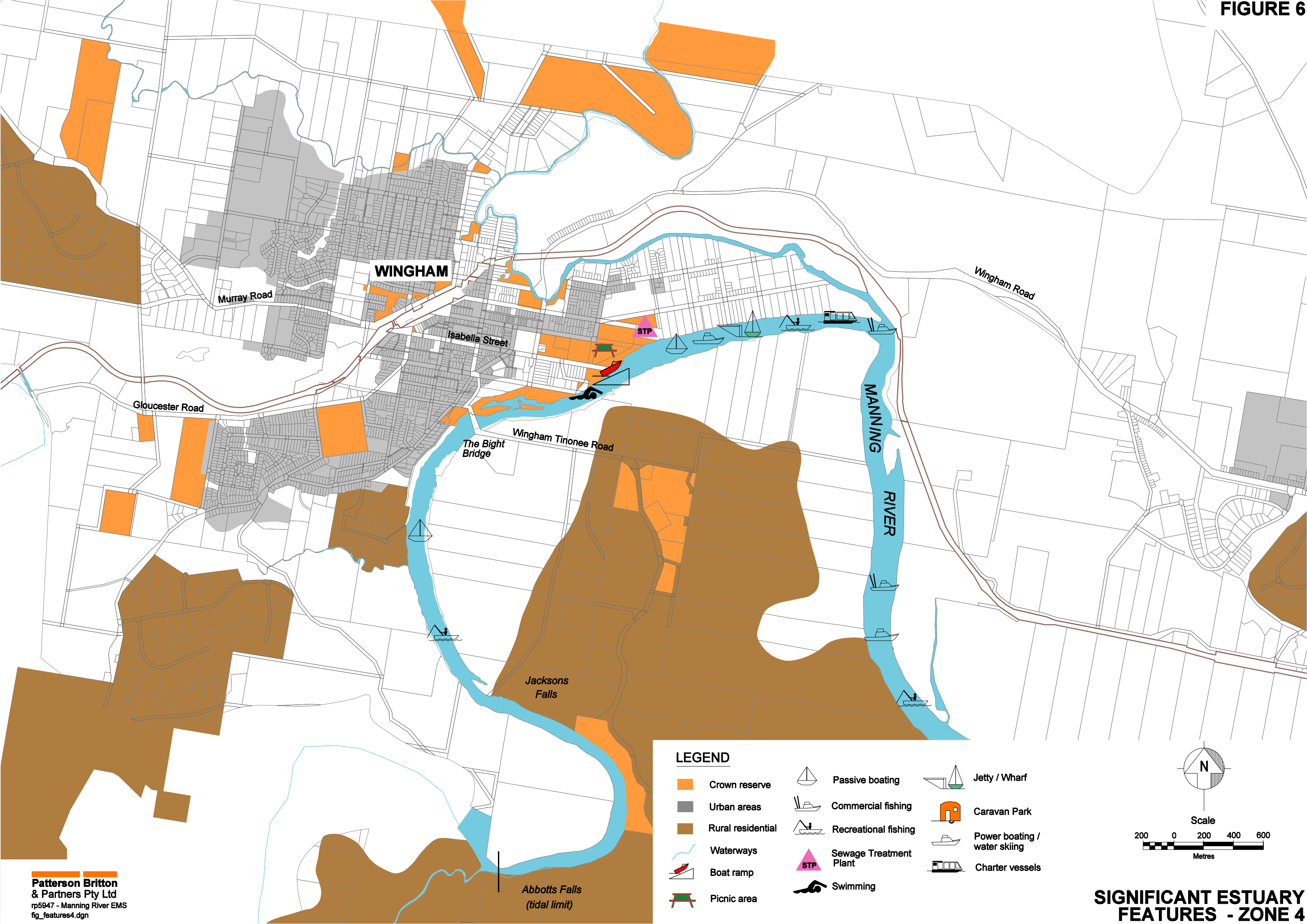


FIGURE 4







2.2 KEY ESTUARY MANAGEMENT ISSUES

A range of key issues have been identified that have the potential to confront the future management of the Manning River estuary. These are as follows:

1. Ocean Entrance Conditions:

- Shoaling due to the absence of major flooding in recent time
- Restricted navigability

2. Riverbank Erosion:

- Clearing of riparian vegetation
- Bank Collapse due to current scour

3. Nature Conservation:

- Preservation and expansion of significant natural habitat, including the riparian zone
- Preservation and expansion of foreshore mangrove, reed and seagrass strips

4. Development Controls:

- Coastal urbanisation
- Public open space
- Foreshore development

5. Waterway Usage:

- Conflicts between users

6. Access to the Waterway:

- Foreshore access
- Unrestricted boat launching
- Shoaling at existing boat ramps.

7. Sedimentation:

- Shallowing of rivers and creeks

- Natural build up of marine sand in lower estuary entrance areas
- Sediment mobilisation in the upper catchment
- Lack of recent flooding

8. The Fishery:

- Fish stocks
- Acid leachates in Lansdowne River and Cattai Creek
- Faecal contamination in Browns Creek and Dawson River
- Aquaculture

9. Water Quality:

- Sewage effluent inflows/STPs
- Nutrients from stock access and urban runoff
- Acid Sulphate Soils
- Poor flushing potential

10. Climate Change:

- Potential impacts of sea level rise and changes to catchment hydrology

This summary of the issues is supported by a range of specific concerns that are presented overleaf in **Figures 7 to 10** in terms of the areas within the estuary where they arise.

Further details of these specific concerns is provided in the following sections.

2.2.1 Ocean Entrance Conditions

Extensive shoaling at both entrances occurs. This results in reduced navigability of Harrington entrance.

Farquhar Inlet has a history of periodic closures. It has been suggested that the training wall at Harrington has increased flow through the northern entrance, possibly to the detriment of the southern entrance.

The rate of infilling and shoaling at the entrances and hence entrance closures are a significant management issue due to the number of factors that are dependent upon the opening or closing of the entrances.

2.2.2 Riverbank Erosion

Bank erosion is a significant feature along Manning River.

A number of factors are likely to aggravate erosion including; riverbank and catchment clearing for grazing and agriculture, water logging and tree collapse, cattle denuding, wave attack, and current scour.

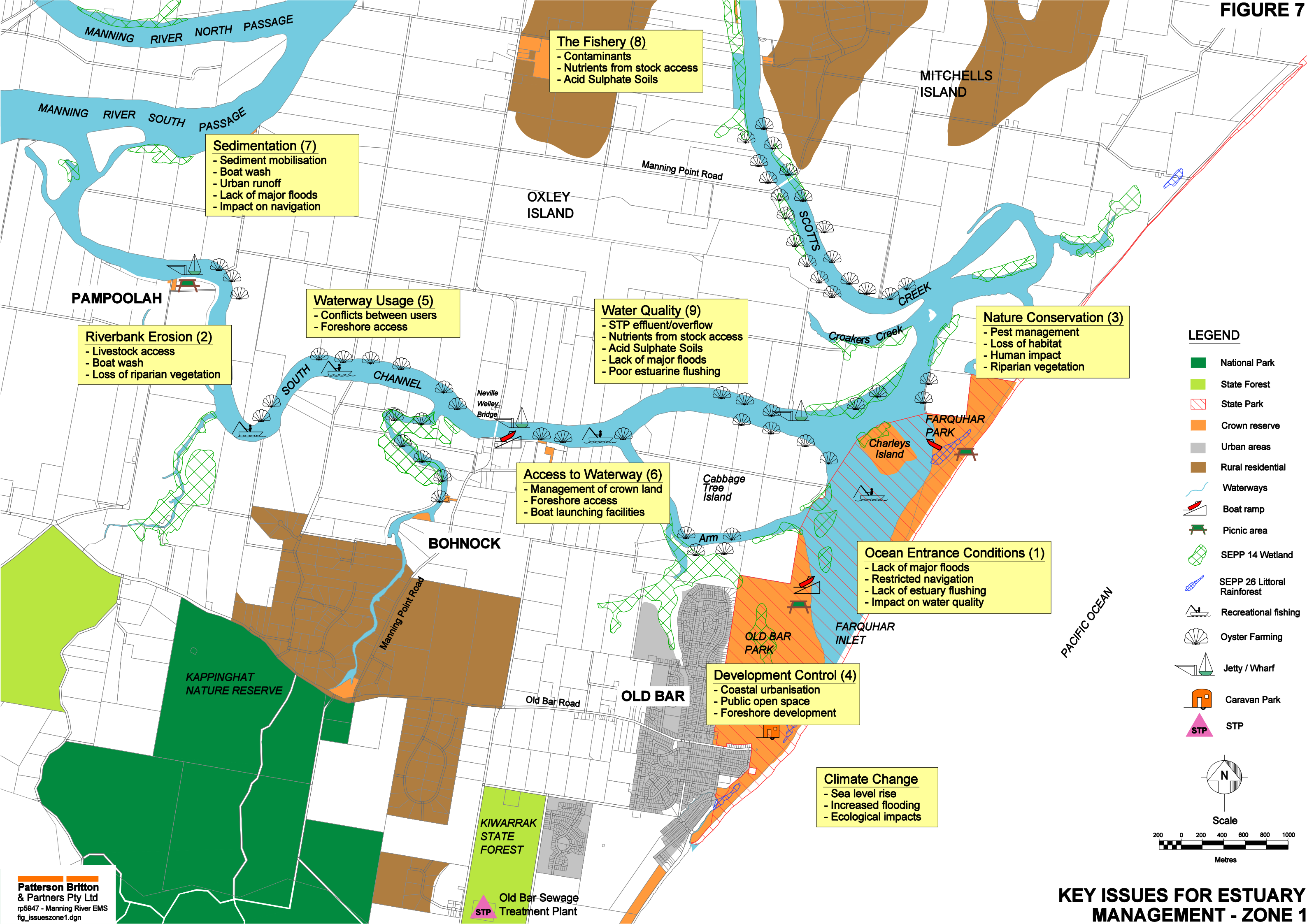
2.2.3 Nature Conservation

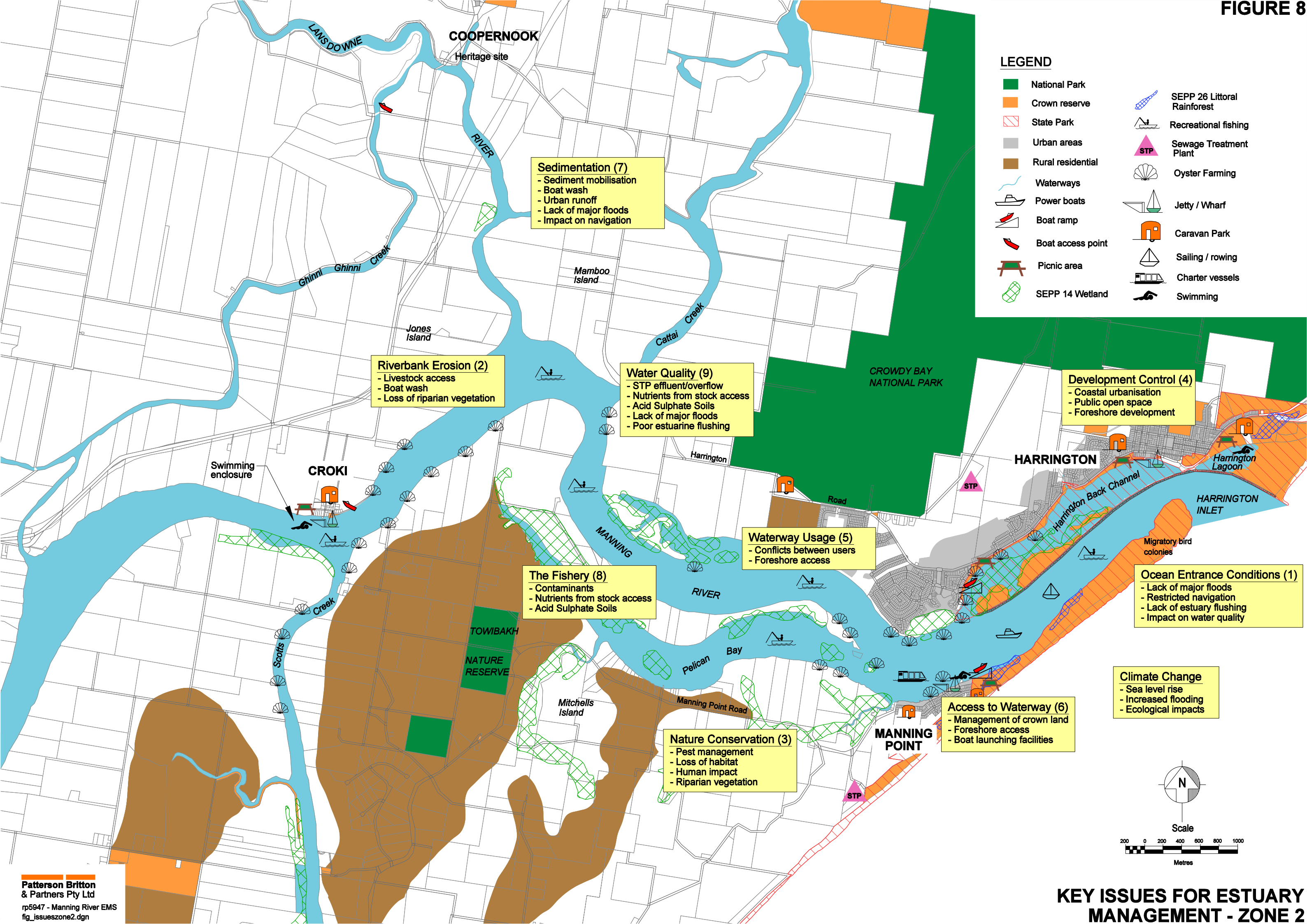
Flora and fauna of the Manning River Estuary is of great value to the community, but is under threat.

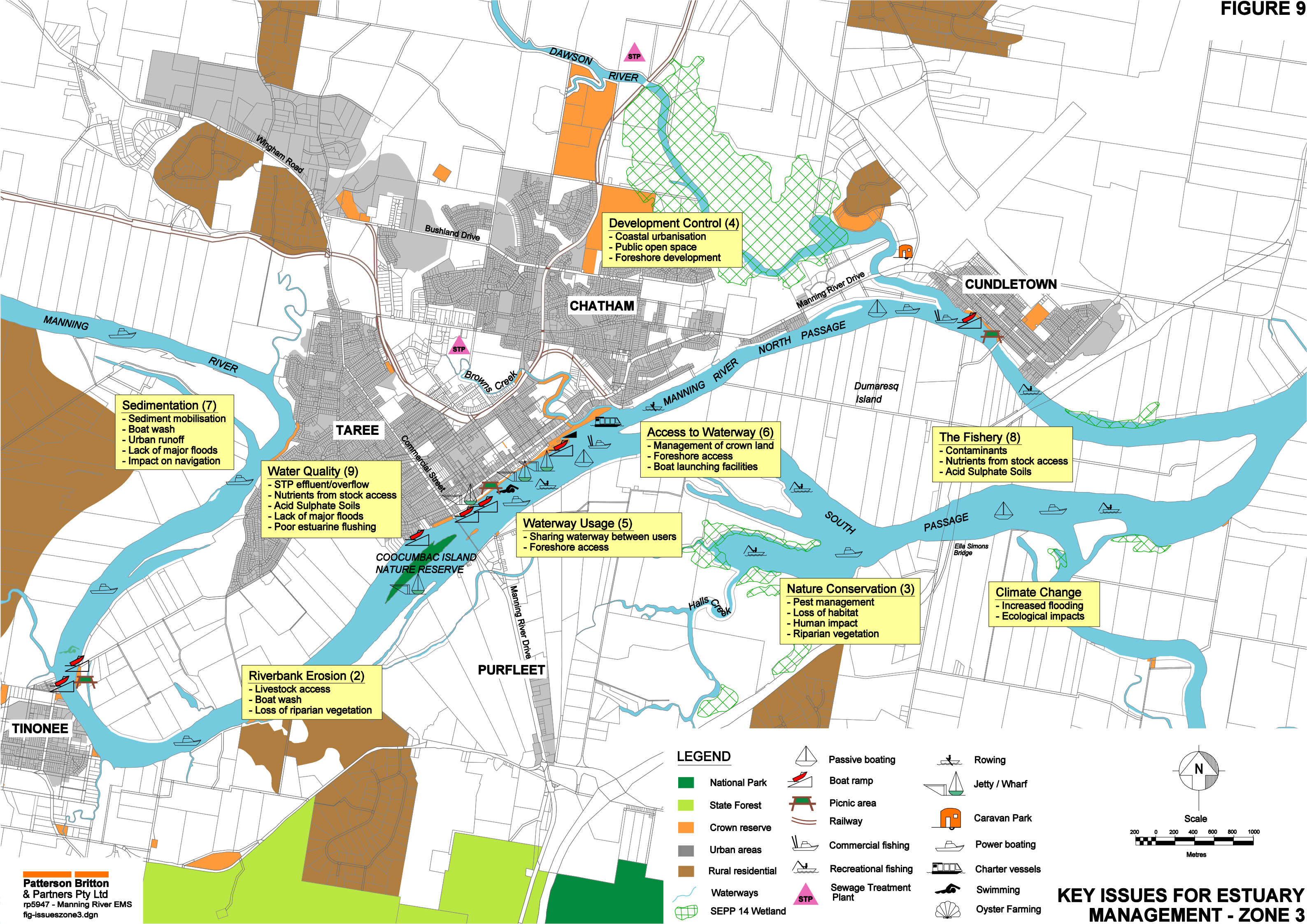
Land clearing and degradation are placing increasing pressure on the foreshore, inter-tidal and riparian habitats in the catchment.

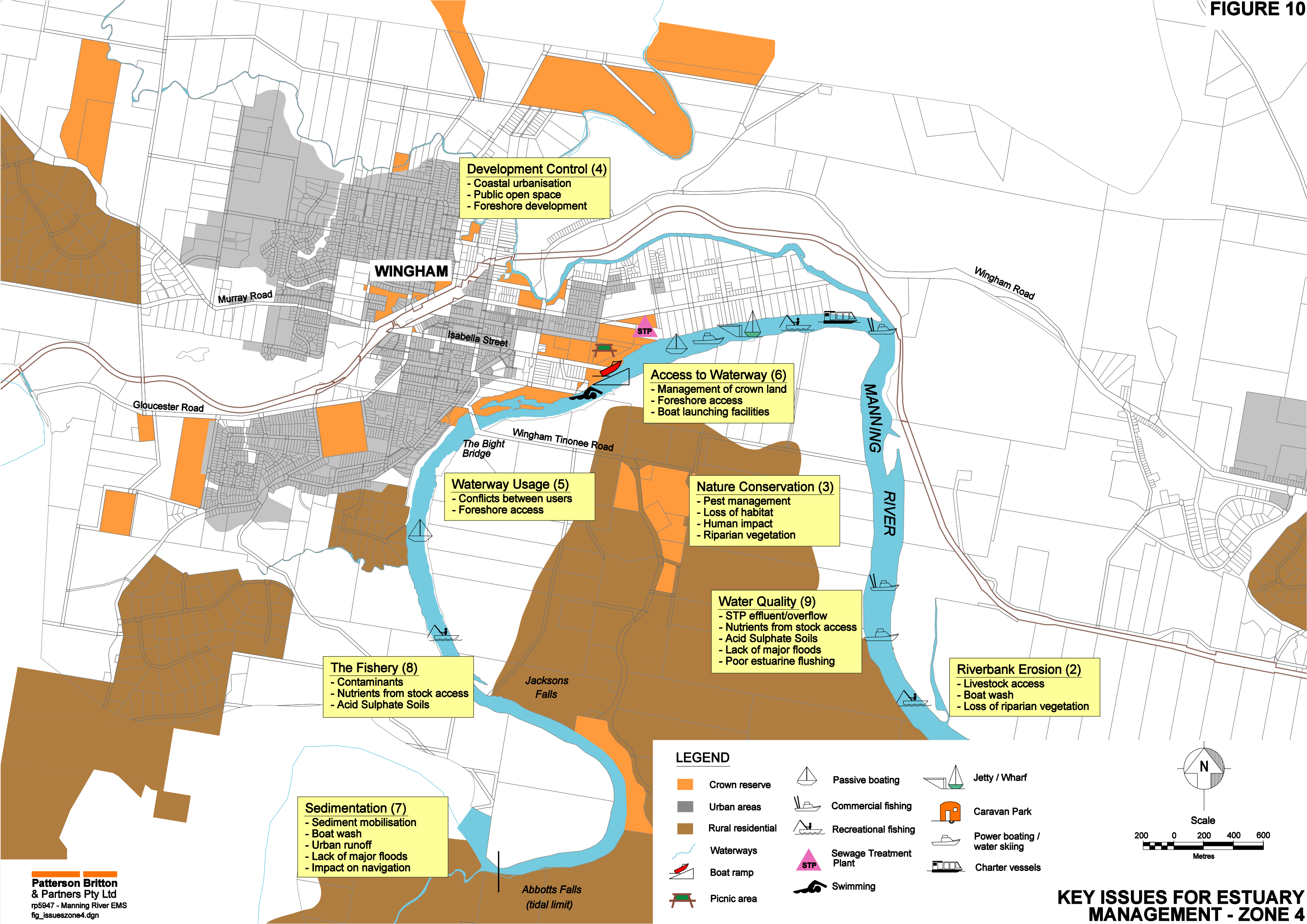
With such pressures there is a need to conserve and expand existing areas of significant natural habitat.

Foreshore mangrove, reed and seagrass strips are valuable to the estuarine









ecosystem, however are limited in extent in the Manning River Estuary.

2.2.4 Development Controls

Increased coastal urbanisation has the potential to impact on several estuary processes, particularly water quality processes and recreational amenity.

Urban development needs to be controlled so that stormwater runoff and treated effluents do not impact on the water quality of Manning River and its tributaries.

Development needs to be balanced with sufficient provision for public open space to allow sustainable use of the estuary by a wide range of users.

Foreshore development should consider its impact on riparian vegetation, estuary aesthetics and estuary foreshore access.

2.2.5 Waterway Usage

Refer to Section 2.3 for examples of conflicts that can arise on the Manning River between different estuary users.

2.2.6 Waterway Access

Access to the creeks, river and beaches of the estuary is limited. There is a prominent lack of major boat launching facilities on the river areas. There is also a lack of associated facilities such as beaches, safe swimming areas, picnic areas and amenities.

2.2.7 Sedimentation

Sedimentation is an issue due to both natural and man-made causes. The remobilisation and deposition of existing bed sediments influences the sediment in the water column. While Bank erosion, land clearing, natural build up of marine sands and marine deltas and the cessation of dredging all influence the total quantity of sediment in the estuary.

Sedimentation can impact on navigability of the estuary and impact on aquatic habitats such as seagrass beds.

2.2.8 The Fishery

The fishing industry contributes significantly to employment and income for the area. However, there is potential for the industry to be adversely impacts upon by a number of factors including floodgates and drainage culverts limiting fish passage, water quality issues, faecal contamination in some areas, acid leachate problems in the Lansdowne River and lower estuary and lower than expected levels of fish productivity.

2.2.9 Water Quality

The water quality of Manning River is in relatively good condition compared with many other developed estuaries along the NSW coast.

However, there is potential for water quality to be affected by a number of elements within the Manning River catchment, including urban stormwater runoff, contamination resulting from unrestricted stock access and point source discharges, such as the treated effluent from Sewage

Treatment Plants and partially treated effluent from septic tanks or caravan parks.

Runoff across areas of Acid Sulphate Soils (ASS) also poses a threat to water quality.

Water quality is also related to tidal flushing and therefore, the condition of the entrances at Harrington and Farquhar Inlet.

2.2.10 Climate Change

The potential impacts of climate change include sea level rise and changes to catchment hydrology and storm severity. Climate change is likely to affect most natural estuarine processes to some degree, and therefore is related to many of the other estuary management issues outline above.

Sea level rise will impact on foreshore vegetation and saltmarsh and seagrass communities. It may also impact on the location and severity of bank erosion and the formation of shoals, particularly in conjunction with increased storm severity and related sediment transport.

Changes to catchment rainfall and runoff patterns have the potential to alter the hydrology of the estuary, impacting on water quality, salinity, and biochemical processes, particularly in combination with sea level rise.

The combined impact of sea level rise and increased storminess is likely to alter the behaviour of, and potentially exacerbate, flooding within the estuary. This may impact on the use and operation of built

assets such as dwellings, roads and stormwater and sewerage infrastructure.

2.3 CONFLICTS OF WATERWAY USE

As discussed, a range of recreational and commercial activities are undertaken on or adjacent to the Manning River estuary.

Due to these activities, conflicts can occur between users where activities can be detrimental to other user's goals. Some of the conflicts of use are discussed in the following sections.

2.3.1 Oyster Farmers vs Boating

The disturbance caused by boats especially that of large power boats has the potential to reduce the productivity of oyster farms. Conversely the oyster farms limit boat movement. By restricting boating in areas where oyster farms are the conflict can be reduced.

2.3.2 Competition for Space

Around Taree there is a large number of users of the waterway. The Sailing and rowing club, the aquatic club and other users who access the river from this area are all in competition for a limited amount of space. Similar issues existing on the waterways around the township of Wingham.

2.3.3 Commercial vs Recreational Fishing

As discussed, Manning River Estuary is a popular spot for recreational fishers and commercial fisheries operate in the area.

A Recreational Fishing Haven was declared for the Manning River in 2003.

Commercial fishing operations are prohibited within the haven, which extends downstream from Ghinni Ghinni Creek on the North Passage and downstream from Berady Creek on the South Channel, including Scotts Creek.

Despite this arrangement, there is a need to better understand the importance of the estuary as a fish habitat. Fish stocks and recreational and commercial catches should be investigated and monitored in close collaboration with the local NSW Fisheries Conservation Manager, commercial fishers, and representatives of the recreational fishing groups.

3 ENTRANCE CONDITION ISSUES

3.1 HISTORY OF ENTRANCE CONDITIONS

The Manning River Estuary drains a catchment area of 8420 km². The estuary includes both the Lansdowne and Dawson Rivers, and comprises a complex system of inter-connecting channels that extend across a broad flat floodplain. The estuary is unique as it has two natural ocean entrances, one at Harrington and the other 12 km to the south near Old Bar (Farquhar Inlet).

The main entrance at Harrington is permanently open and has an artificial breakwater on the northern bank and extensive rock training walls on both banks extending up the river. Farquhar Inlet is untrained and has a history of periodic closure. At the time of writing, Farquhar Inlet had been blocked for some time by the back beach berm at Old Bar Beach.

Between the ocean and Taree there is a broad delta with numerous inter-connecting channels and large islands (*refer Figure 2*). The main channels are:

- the Manning River;
- the North Passage;
- the South Passage;
- the South Channel;
- Ghinni Ghinni Creek; and,
- Scotts Creek.

Beyond Taree the river is a single channel to the tidal limit. The approximate length of the main river is 150 km with the limit of tidal influence extending to "Abbotts Falls", which is a gravel bar located about 54 km from the entrance.

Ocean entrance conditions have been the topic of much discussion since European settlement of the area in the early 1800s. The basis for this discussion has varied at different times over this period and has also varied according to the locale of those that have raised concerns.

The concerns that have been raised include:

- concerns over navigability, particularly at Harrington;

- concerns about flooding and the potential for a second permanent entrance to reduce the perceived flood risk; and,
- concerns over long flushing times and associated impacts on water quality.

These concerns and the times when they have been raised, are typically a reflection of the condition of each of the entrances. For example, current concerns about flushing times and poor water quality appear to be more significant in the minds of the community due to the long period since the last major flood (*back in 1990*), and the subsequent reduction in frequency of opening of Farquhar Inlet since that time.

Accordingly, it is important to understand the history of the condition of each entrance over time, and the variability in that condition which is directly linked to the natural estuary processes that control it. A brief description of the change in estuary condition is presented in the following sections for both Harrington and Farquhar Inlet.

3.1.1 Harrington Entrance

- Northern Breakwater constructed circa **1904**
- **1904 – 1915** → Entrance channel adjacent to northern training wall
- **1919** → Sand build up against northern training wall. Channel relocated 1.2 km to south.
- **1927** → Shoaling against northern training wall substantially increased
- **1927** → Spur Walls constructed
- **1933** → Entrance channel moving toward northern training wall
- **1965 – 1970** → Entrance channel relocates southward similar to 1927 position. Large sand shoal against northern training wall.
- **1978** → Entrance channel closer to northern training wall; reduced shoaling.
- **1980 – 1990** → Entrance channel adjacent to northern training wall.
- **1990 – Present** → Intermittent shoaling of the entrance and progressive increase in shoal extent in response to reduced frequency of flooding.

3.1.1 Farquhar Inlet / Old Bar

- Never trained → No breakwater
- Earliest European records date to 1818 and indicate entrance at that time was open sufficiently to allow access for sailing craft
- **1818 – 1981** → Entrance open 26 times out of 38 records of entrance conditions; viz.:
 - 1886 to 1920 → Open
 - 1920 to 1924 → Closed
 - 1924 to 1926 (large seas) → Closed
 - 1926 to 1929 → Closed
 - 1929 to 1941 → Open
 - 1942 to 1946 → Closed
 - 1949 to 1981 → Intermittently Open
 - 1981 to 1983 → Open, but heavily constricted
 - 1985 → Closed
 - 1986 to 1991 → Open
 - 1992 to present → Periodically Closed
- Air photo evidence since 1940 indicates that entrance position (closed and open) has fluctuated along Old Bar Beach.

3.2 ENTRANCE OPENING INVESTIGATIONS

In recognition of community concerns about the entrance conditions, GTCC and its predecessor have undertaken a range of studies that have investigated options for improving channel entrance conditions. These investigations have included building new breakwaters and training walls, undertaking periodic channel dredging and constructing pilot channels to alleviate flood risks. These investigations extend back many years and can typically be linked to representations made by community groups and industry to a range of government departments.

For example, in 1987 Public Works published a study titled, *'Manning River Entrance Study - Background & Issues of Concern'*, which highlighted the following "issues of concern":

- heavy shoaling and treacherous entrance conditions at the permanent entrance at Harrington;
- the impact that the entrance at Old Bar has on flood levels and the time of inundation for various locations on the river;

- the effect, both positive and negative, that the entrance at Old Bar has on local oyster and other farming industries;
- the impact that the entrance at Old Bar has on the entrance at Harrington;
- general concerns about the detrimental effect to the local community and business that the continued shoaling and erosion problems have had along various reaches of the river and its entrances.

In more recent times, Council's Estuary Management Committee has overseen detailed investigations to address these issues. In that regard, the following studies have been prepared under the stewardship of the Committee:

- *'Manning River Estuary Processes Study' (1997)*
- *'Manning River Estuary Management Study- Numerical Modelling Investigation' (2001)*
- *Manning River Floodplain Management Study & Plan' (2001)*
- *'Manning River Estuary – Pilot Value Management Report' (2002)*
- *'Economic Scoping Study – Manning River Entrance Improvement Project' (2003)*
- *'Harrington Northern Breakwater Investigation' (2004)*
- *'Manning River Estuary Management Study (Part 2) and Plan' (in draft, 2008).*

These investigations have considered the technical aspects of various proposals to address each of the issues raised in the 1987 Report, as well as the economic and social benefits and impacts of proceeding with works to improve navigability and increase entrance opening frequency.

The fundamental outcome from these investigations is that major works would be required to improve estuary flushing times and entrance navigability. It also needs to be recognised that these works would require further justification on environmental grounds, and are likely to require a commitment for ongoing maintenance (*for example in the case of dredging of Harrington entrance*) in order for them to be viable.

Shoaling in the lower sections of the estuary at both Harrington and Farquhar Inlet is a consequence of natural coastal processes. Works to reduce the extent and frequency of shoaling that presents as a navigational impediment will require ongoing maintenance for the life of those works.

Through the investigations listed above, Council's Committee has identified the need for substantial additional funding should the community wish to proceed with the next steps involved in progressing the various proposals for improved entrance management at Harrington and Farquhar Inlet.

In this context, Council has sought financial support from the State Government, but it needs to be recognised that the funds required would be in the tens of millions of dollars should permanent entrance works be pursued.

Notwithstanding, it is recognised that many of the issues raised in the 1987 Report are still of concern to members of the Committee and the broader community. Furthermore, it is apparent that many in the community are not aware of the extent of the investigations that have been undertaken to-date or the cost implications of implementing permanent works to improve entrance conditions.

4 ESTUARY MANAGEMENT OBJECTIVES

4.1 OBJECTIVES

The objective of the Manning River Estuary Management Plan is to provide an integrated program of works, actions and strategies that will:

- minimise and rectify adverse impact of development and human activity within the estuary and catchment
- encourage low impact settlement patterns limiting urban sprawl
- protect riparian vegetation
- protect terrestrial flora and fauna
- protect aquatic habitats
- protect sites of cultural & Aboriginal significance
- maintain and improve water quality
- restore river/creek banks
- reduce impact of power boats
- improve navigation
- reduce channel sedimentation
- improve estuary user facilities
- encourage tourism
- maintain visual amenity
- manage the potential impacts of climate change

These broad objectives have been considered in conjunction with the key issues and essential features of the estuary, to develop a refined set of management objectives.

The inter-relationship between the issues and estuary attributes provided a basis for developing a set of management objectives for the estuary. The adopted management objectives are outlined below.

These management objectives have been used to develop strategies and actions for the sustainable management of the estuary and adjoining catchment, into the future.

Table 2 ADOPTED ESTUARY MANAGEMENT OBJECTIVES

ID Number	OBJECTIVE
1	Assess the viability of the entrances
2	Optimise the economic, environmental and social value of the estuary
3	Ensure sustainable development throughout the estuary and catchment
4	Protect and restore estuarine and foreshore habitats
5	Optimise waterway usage potential
6	Improve water quality and protect water quality values
7	Improve fish productivity
8	Improve waterway facilities
9	Improve estuary navigation
10	Improve education on estuary issues
11	Reduce fluvial sedimentation
12	Integrate land use and natural resource management plans
13	Protect Aboriginal and European heritage sites
14	Consider and manage the impacts of climate change and sea level rise

5 ESTUARY MANAGEMENT STRATEGIES

5.1 PRIORITISED STRATEGIES

A variety of actions have been determined to address the adopted management objectives for the estuary. These strategies encompass structural and non-structural measures aimed at protecting significant areas and improving aspects of the estuary to make it more suitable for existing and future waterway users. Where possible, the strategies aim to harness the natural attributes of the estuary and are sympathetic to the interests of existing land-users.

The prioritised strategies are the principal recommendations of the **Manning River Estuary Management Plan**. They have been prioritised based on scientific information provided in the **Estuary Processes Study**, an assessment and ranking of the key issues in consultation with the Estuary Management Committee, and also consider the outcomes of a Triple-Bottom-Line assessment that is documented in the **Estuary Management Study**.

Each strategy has been assigned a priority ranking. The priority rankings are defined as follows:

- **Priority 1** – Implementation should proceed immediately and is required to address major issues considered to require urgent attention. Physical implementation of works or changes to policy should be achieved within 3 years.
- **Priority 2** – Implementation should proceed at some time during the next five years and is required to address issues that have proved to be a consistent problem, but which can be “lived with” over the short term in the interests of achieving the right result rather than risking a quick “fix-it” solution that hasn’t been thought out.
- **Priority 3** – Implementation should proceed at some time over the next 5 to 10 years and is required for the long term benefit of the estuary. Priority 3 strategies are less urgent and can be built into other investigations or activities within the region.

Four figures have been developed to identify the location(s) of specific strategies or actions. These are presented as **Figures 11 to 14**.

5.2 ESTUARY MANAGEMENT STRATEGIES

The following strategies are documented in further detail in the Estuary Management Study.

Priority 1 Strategies

- Finalisation of a comprehensive land use plan (the Greater Taree Conservation and Development Strategy) to identify areas of future urban development and high conservation value
- Ensure Council planning staff are briefed on the contents of the Manning River Estuary Management Plan and aware of the impacts of planning decisions on estuary water quality and recent changes in legislation and policies for urban development along the Manning River Estuary
- Incorporate provisions to address Acid Sulphate Soils (ASS) management and rehabilitation into the new 'Local Plan 2008' (LEP), currently being prepared by Greater Taree City Council
- Request that a representative from the Manning River Commercial Fishers Association report to the Estuary Management Committee on the implementation of the Association's Environmental Management System for the Manning River Commercial Fishery
- Incorporate 40 metre wide un-developed 'Environmental Conservation' Zones adjacent to waterways within the revised Greater Taree City Council LEP (Local Plan 2008) and in accordance with the Greater Taree Draft Conservation and Development Strategy
- Take an adaptive approach towards planning and development design to cater for sea level rise within the revised Greater Taree City Council LEP (Local Plan 2008)
- Prepare and action a Plan of Management for the Manning Point foreshore
- Council to lobby State Government for funding assistance to undertake dredging of the Harrington Back Channel
- Undertake a field survey to ground truth the mapped extents where foreshore vegetation has been removed along the estuary and its tributaries
- Review the Manning River Bank Management Study (1997)
- Obtain catch / effort data from the Anglers Catch Research Program for Australian Bass recorded at the annual Manning River Basscatch event to determine changes in fish stocks over the last 5 years
- Council to lobby State Government for funding assistance to maintain navigability of the Harrington **Main** Channel through a Sub-Committee of the Estuary & Coastline Management Committee
- Map seagrass, saltmarsh and mangroves throughout the estuary

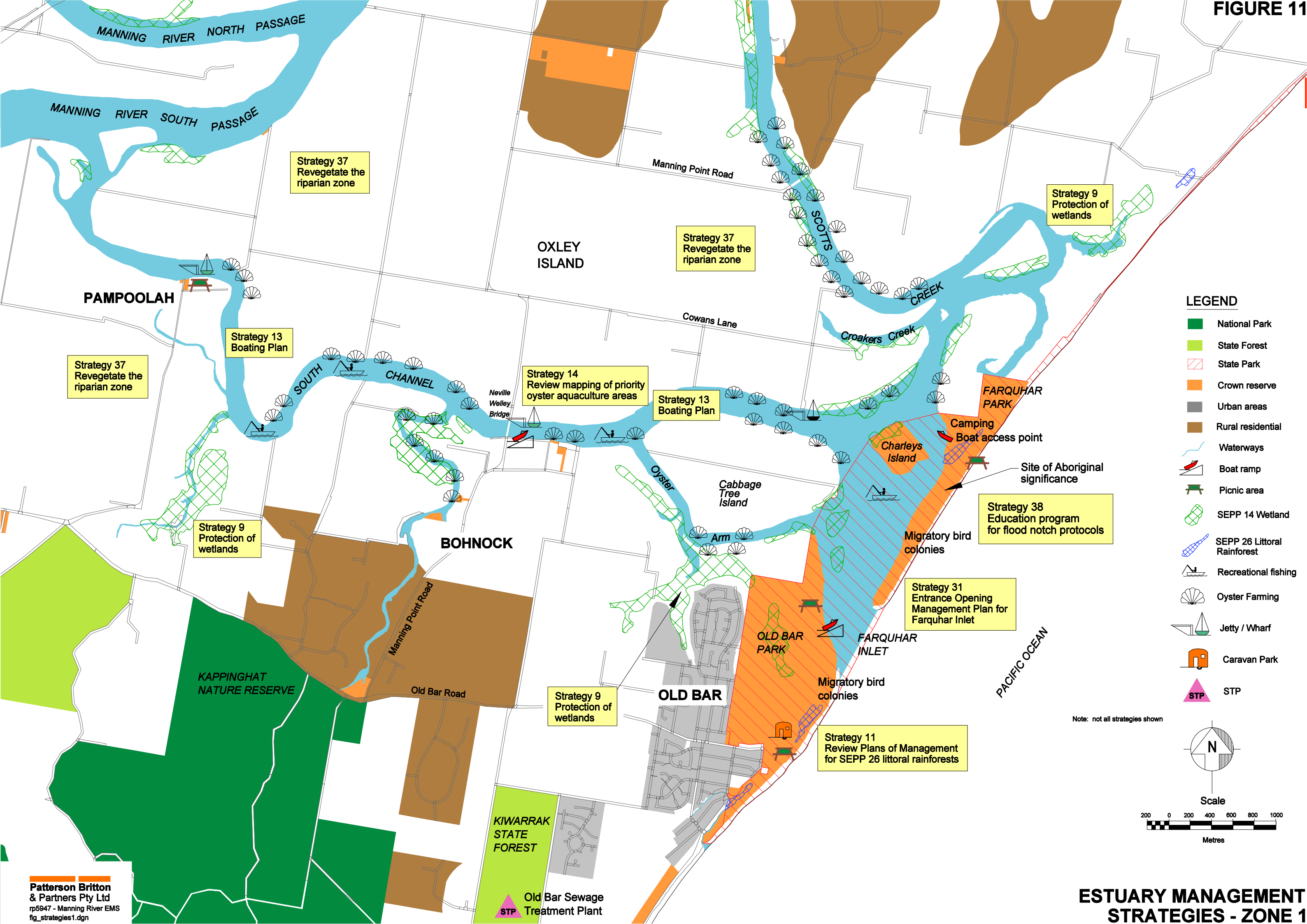
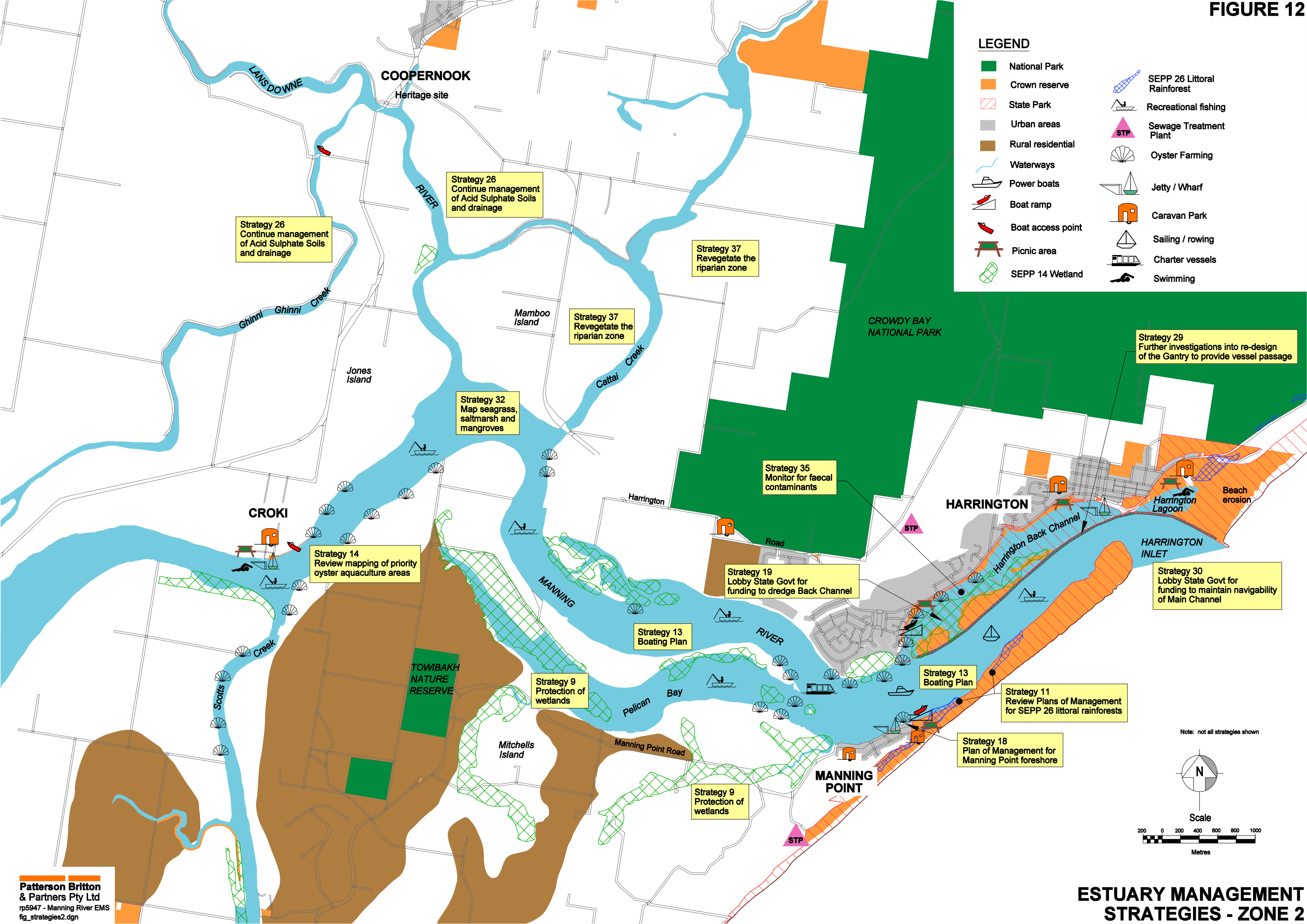
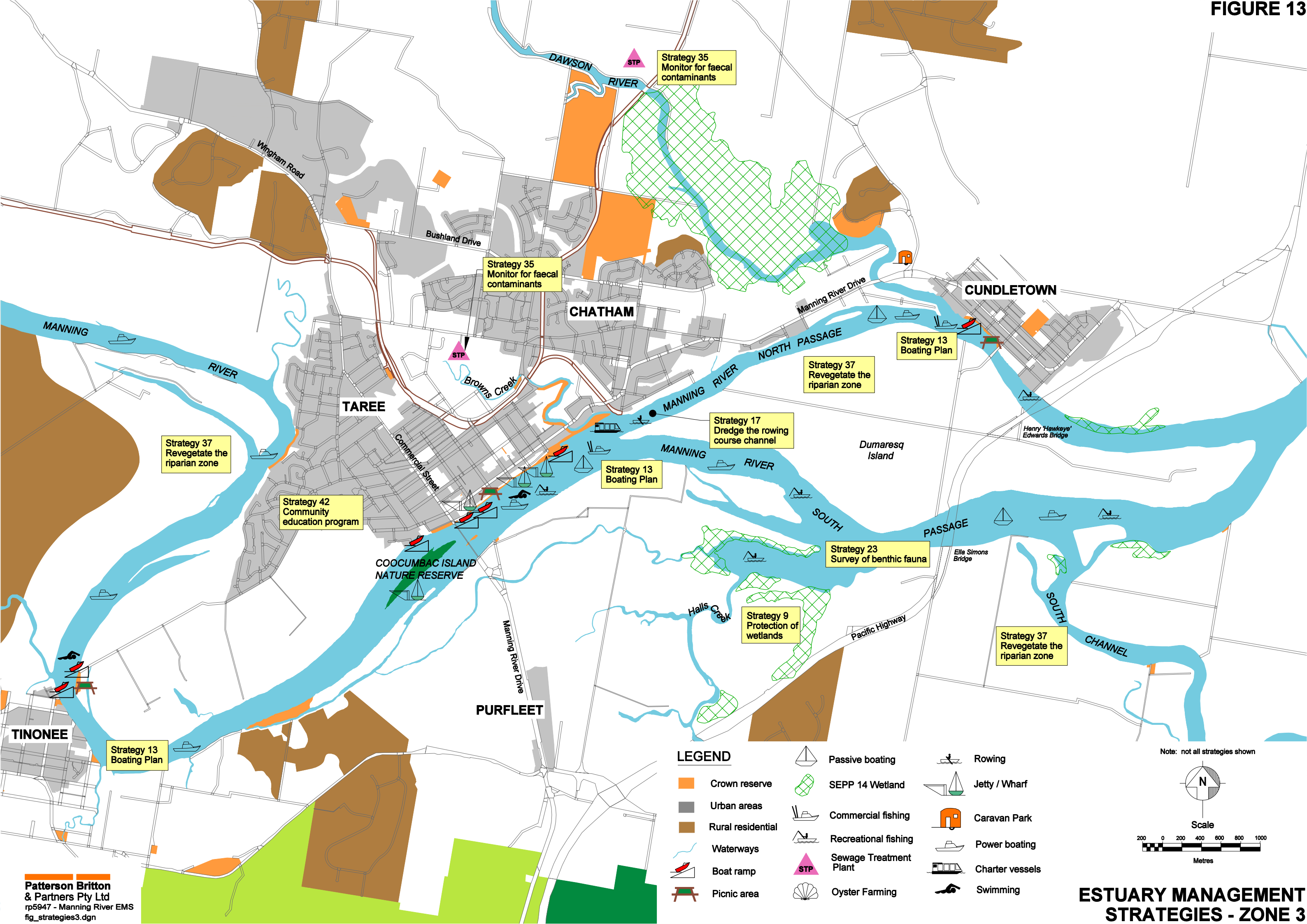
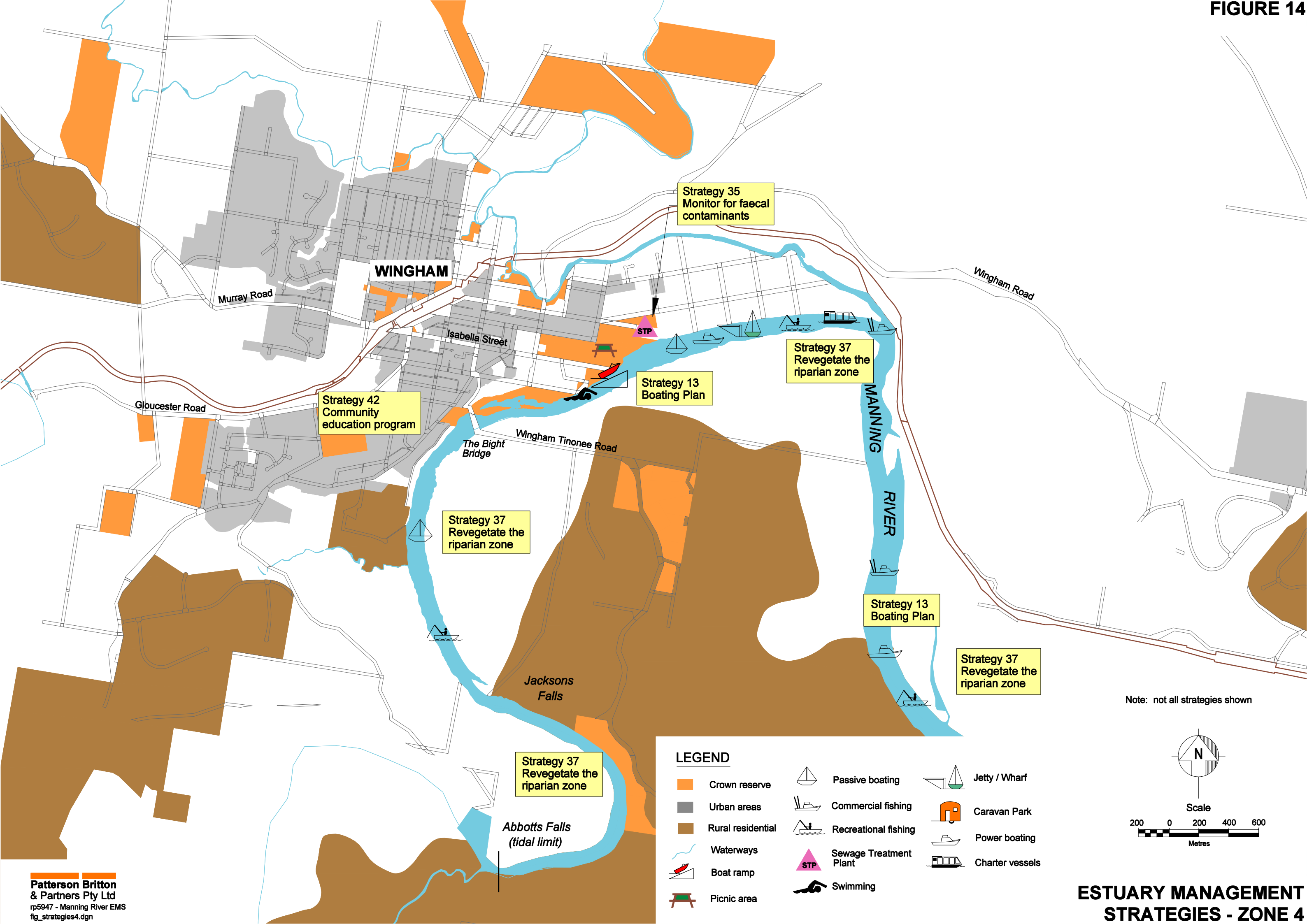


FIGURE 12







Priority 1 Strategies (cont')

- Council in partnership with State Government to prepare an Entrance Opening Management Plan for Farquhar Inlet
- Develop a water quality monitoring program for Manning River tributaries in the lower estuary to complement existing monitoring activities by Council, MidCoast Water and Waterwatch groups
- Representative from the Water Quality Partnership (*H-CR CMA, MidCoast Water, GTCC and Gloucester Council*) to report to Estuary Management Committee when current work to compile the water quality database has been completed
- Appoint a coordinator for the Manning River Estuary Management Plan
- Prepare an education program to inform community of current flood notch protocols
- Encourage landholders to enter into Property Vegetation Plans with the Hunter-Central Rivers Catchment Management Authority
- Conduct field days for riparian landholders at demonstration sites to raise awareness of the importance of riparian vegetation
- Develop a community education program that outlines the importance of estuary processes and the potentially adverse impacts of human activities
- Prepare and undertake a targeted community education program for rural property owners to make them aware of best management land-use practices, such as:
 - Minimisation of slope erosion;
 - Minimisation of gravel loss and bank erosion at river crossings;
 - Controlling cattle access to waterways
 - Minimisation of vegetation clearing
 - Replanting of native catchment and riparian vegetation;
 - Appropriate application (timing and locations) of fertilisers; and
 - Installation of sediment traps.

Priority 2 Strategies

- Prepare an Integrated Water Cycle Management Plan based on the recommendations of the Integrated Water Cycle Management Strategy
- Incorporate Water Sensitive Urban Design (WSUD) principles and requirements into the new Greater Taree City Local Environmental Plan ('Local Plan 2008') and Development Control Plan (DCP)
- Using the Manning River Water Quality Objectives establish a set of catchment health indicators by which the cumulative impact of development can be measured and managed (this can be done in conjunction with State of the Environment reporting and incorporated into an estuary health report card)

- In conjunction with the recommendations of the Department of Lands Crown Lands Assessment, identify and protect significant reserve sites throughout the estuary and linkages of vegetation through Crown Land management plans and Council planning legislation
- Review provisions for the protection of wetlands and vegetation communities on the Manning River floodplain
- Undertake a review of the existing Plans of Management for SEPP 26 littoral rainforests along the Manning River
- NSW Maritime to prepare or commission the preparation of a Boating Plan for the Manning river
- NSW Fisheries (*DP*) to review mapping of priority oyster aquaculture areas, as contained in the Sustainable Aquaculture Strategy (2006), to incorporate the location of recreational facilities in the lower estuary, such as boat launching ramps and jetties
- Construct fencing along creeks and rivers in the estuary where livestock access the river
- Create habitat to encourage mangrove growth at bank erosion sites throughout the estuary
- Identify, preserve and protect Indigenous and non-indigenous heritage sites throughout the estuary
- Undertake a detailed survey of fish populations and the recreational and commercial fishing industry throughout the Manning River Estuary
- Continue investigations into management of Acid Sulphate Soils (ASS) and drainage from areas of ASS
- Undertake an Industrial Assessment of all agricultural practices adjacent to waterways within the catchment to ensure best management practices are being adhered to, including Council's Cattle Feedlots Code 1998
- Model coastal inundation in relation to a range of predictions for sea level rise
- Undertake further environmental investigations into the proposed re-design of the Gantry at Harrington Back Channel
- Undertake monitoring for the biological indicator species, E.Coli and macroinvertebrate species throughout the estuary, to monitor for the presence of pathogenic organisms that may present a public health risk and to assess the health of the estuary
- Work with landholders to revegetate the riparian zone on private land along waterways within the Manning River Estuary
- Construct interpretative signs at key locations throughout the estuary to provide education on the potentially adverse impacts of human activities on the environmental health of the estuary, particularly stormwater pollutants and disturbance of the riparian zone
- Develop a 4 yearly "State of the Manning " environmental report card on all estuary monitoring activities and the health of the estuary (to tie in with SoE reporting)
- Dredge the navigation channel at identified rowing course near Shallow Island and locate and remove wrecks of old vessels and other navigational hazards

Priority 3 Strategies

- Undertake a survey of benthic fauna in the middle estuary
- Introduce a community recognition and local awards scheme for efforts towards biodiversity conservation

6 COSTS, TIMING AND RESPONSIBILITIES

6.1 IMPLEMENTATION SCHEDULE

A detailed listing of the prioritised strategies and their associated actions is provided in the Implementation Schedule included as the following 5 pages.

The schedule has been developed in a similar fashion to a “capital works program” and details projected costs, timing and responsibilities for undertaking the various strategies.

The Implementation Schedule has been prepared to assist in the process of acquiring funding to undertake the prioritised strategies and to provide a mechanism for implementing the strategies.

The implementation schedule includes:

- a description of the proposed strategy;
- the adopted priority ranking for each strategy or action, which effectively determines the expected date of commencement of works;
- a list of sub-tasks to be undertaken to effect each specific strategy;
- an estimate of the cost to complete the action or strategy the party or government agency responsible for undertaking or coordinating the investigation / work; and,
- the projected commencement date for each strategy.

6.2 ESTIMATED COST OF ACTIONS

As shown in the Implementation Schedule, there are 45 strategies in all. The total estimated cost for the implementation of future projects is approximately **\$990,000** capital cost plus \$290,000 per year ongoing costs (*including the construction of some components*).

The break-up of the cost of the proposed strategies is as follows:

- **Priority 1 Strategies** \$ 380,000 capital cost plus \$85,000 per year (*for projects to be initiated over the next 3 years*)
- **Priority 2 Strategies** \$ 590,000 capital cost plus \$205,000 per year (*for projects to be initiated over the next 5 years*)
- **Priority 3 Strategies** \$ 20,000 capital cost (*for projects to be initiated over the next 5 to 10 yrs*)

The above estimates do not include the costs associated with large-scale works that may be undertaken in the future, subject to the assessment of environmental impacts and sourcing of funding. These include potential dredging works, bank management activities and any additional boating facilities that may be included in the recommended Boating Plan. It is estimated that the future cost of such works could be up to **\$4.2 Million** (*refer Implementation Schedule – costs in brackets*).

The estimates also do not include any costs for works that are proposed within previously prepared Plans of Management for specific areas along the Manning River estuary. These include Harrington Foreshore, Coopernook, Wingham Foreshore, Andrews Reserve, Tall Ships Reserve, Taree CBD Foreshore, Kendall Reserve and Browns Creek. It is estimated that implementation of the associated on-ground works could cost in excess of \$250,000.

TABLE 3: MANNING RIVER ESTUARY MANAGEMENT PLAN - IMPLEMENTATION SCHEDULE (SUBJECT TO FUNDING)

RECOMMENDED STRATEGY		OBJECTIVES TARGETTED	PRIORITY RANKING	ACTIONS	ESTIMATED COST	SUGGESTED RESPONSIBILITY	PROJECTED DATE FOR COMMENCEMENT
	PLANNING CONTROLS AND POLICIES						
1	Finalisation of a comprehensive land use plan (the Greater Taree Conservation and Development Strategy) to identify areas of future urban development and high conservation value	2, 3, 4, 6, 10, 12, 13, 14	1	1. Council staff to report to Manning River Estuary Management Committee the progress of finalising the Strategy 2. Incorporate outcomes of the Strategy into land use mapping for the Local Plan 2008	na	GTCC	2009
2	Ensure Council planning staff are briefed on the contents of the Manning River Estuary Management Plan and aware of the impacts of planning decisions on estuary water quality and recent changes in legislation and policies for urban development along the Manning River Estuary	2, 3, 6, 12, 14	1	1. Strategy to target new staff arriving at Council 2. Undertake training activities every 6 months, including a one-day seminar/workshop and distribution of a brief training manual 3. Increase communication between departments	\$4,000 (annually)	GTCC	2009
3	Prepare an Integrated Water Cycle Management Plan based on the recommendations of the Integrated Water Cycle Management Strategy	2, 3, 6, 12, 14	2	1. Review and identify actions from IWCMs that have been previously undertaken to determine outstanding tasks for inclusion in the Plan 2. Incorporate Water Sensitive Urban Design (WSUD) principles into the Plan 3. Undertake public exhibition of draft Plan document 4. Finalise and adopt IWC Plan 5. Implement Integrated Water Cycle Management Plan	\$10,000	GTCC	2011
4	Incorporate Water Sensitive Urban Design (WSUD) principles and requirements into the new Greater Taree City Local Environmental Plan ('Local Plan 2008') and Development Control Plan (DCP)	2, 3, 6, 11, 12	2	1. Liaise with Council planners, building inspectors, local developers and the community to set criteria for new development 2. Undertake community consultation and public exhibition of draft LEP and DCP documents 3. Finalise and adopt new LEP and DCP	\$5,000	GTCC (with assistance from DECC)	2011
5	Using the Manning River Water Quality Objectives establish a set of catchment health indicators by which the cumulative impact of development can be measured and managed (this can be done in conjunction with State of the Environment reporting and incorporated into an estuary health report card – refer strategy 45)	2, 3, 6, 7	2	1. Establish set of catchment health indicators in conjunction with SoE reporting 2. Use indicators to monitor impact of development on a yearly basis in conjunction with monitoring activities associated with Strategy 33 3. Revise indicators every 3 years if required 4. Results of indicator monitoring to be consulted when determining future development and subdivision applications	\$5,000	GTCC	2010
6	Incorporate provisions to address Acid Sulphate Soils (ASS) management and rehabilitation into the new 'Local Plan 2008' (LEP), currently being prepared by Greater Taree City Council	4, 6, 7	1	1. Develop and include a policy of requiring development to avoid areas of Potential ASS wherever possible and that if development is proposed in an area of PASS, mitigative measures should be incorporated as a condition of development consent 2. Incorporate existing draft Acid Sulfate Soils provisions into the proposed LEP and new DCP Maintenance Guidelines	\$3,000	GTCC	2009
7	Request that a representative from the Manning River Commercial Fishers Association report to the Estuary Management Committee on the implementation of the Association's Environmental Management System for the Manning River Commercial Fishery	2, 4, 6, 7, 12	1	1. Regular reports on the implementation of the Environmental Management System every 12 months	na	MRCFA	2009
8	In conjunction with the recommendations of the Department of Lands Crown Lands Assessment, identify and protect significant reserve sites throughout the estuary and linkages of vegetation through Crown Land management plans and Council planning legislation	2, 3, 4, 5, 6, 8, 12	2	1. Liaise with the Department of Lands to identify and protect significant Crown Reserves within the Manning River estuary that do not have a current Plan of Management. 2. Prepare draft Plans of Management for appropriate sites. 3. Undertake community consultation to obtain community feedback on draft Plans of Management. 4. Finalise reports. 5. If appropriate, incorporate reserves into land use mapping as part of Local Plan 2008	\$50,000	Dept of Lands / GTCC	2012
9	Review provisions for the protection of wetlands and vegetation communities on the Manning River floodplain	3, 4, 6, 12, 14	2	1. Undertake site investigations to ground-truth the extent of SEPP 14 wetlands and potential Endangered Ecological Communities (EECs) and incorporate into GIS mapping 2. Incorporate revised mapping for wetlands and EECs into land use mapping for environmental protection within the Local Plan 2008 3. Incorporate standard statutory provisions in the Local Plan 2008 to protect mapped areas of wetlands and EECs	\$20,000	GTCC (with support from DECC and H-CR CMA)	2011
10	Incorporate 40 metre wide un-developed 'Environmental Conservation' Zones adjacent to waterways within the revised Greater Taree City Council LEP (Local Plan 2008) and in accordance with the <i>Greater Taree Draft Conservation and Development Strategy</i>	3, 4, 6, 12	1	1. Council planners to revise LEP such that 40 metre wide riparian buffers are provided adjacent to land already identified for potential rezoning and/or sub-division	na	GTCC	2009
11	Undertake a review of the existing Plans of Management for SEPP 26 littoral rainforests along the Manning River	2, 3, 4, 5, 10, 12	2	1. Review existing Plans of Management for SEPP 26 littoral rainforest areas along the Manning River Estuary to identify works successfully completed under the individual Plans 2. Identify and prioritise works and management activities from the individual PoMs that are yet to be implemented 3. Review availability and distribution of funding for management tasks 4. If required, seek additional funding 5. Implement outstanding management activities and tasks.	\$15,000	GTCC (with assistance from Dept of Lands)	2012
12	Take an adaptive approach towards planning and development design to cater for sea level rise within the revised Greater Taree City Council LEP (Local Plan 2008)	3, 4, 9, 12, 14	1	1. Floodplain Management Committee for Manning River to report to Estuary Management Committee regarding the adoption of increased flood planning levels for coastal inundation 2. Review appropriate scientific research to validate incorporation of additional floor level requirements for new development into Local Plan 2008 3. Investigate the rezoning or strategic purchase of land to account for sea level rise and its impacts on existing and future development and riparian vegetation and ecosystems (refer outcomes of Strategy 28) 4. Undertake future revisions of the Local Plan 2008 in accord with observed sea level rises and future predictions	\$15,000	GTCC	2009

TABLE 3: MANNING RIVER ESTUARY MANAGEMENT PLAN - IMPLEMENTATION SCHEDULE (SUBJECT TO FUNDING)

RECOMMENDED STRATEGY		OBJECTIVES TARGETTED	PRIORITY RANKING	ACTIONS	ESTIMATED COST	SUGGESTED RESPONSIBILITY	PROJECTED DATE FOR COMMENCEMENT
13	NSW Maritime to prepare or commission the preparation of a Boating Plan for the Manning river	2, 5, 6, 8, 9	2	1. Request that Manning River be included on the priority list for Boating Plans in the NSW Boating Plan of Management Strategy for 2008 and beyond 2. If Manning River is selected for a Boating Plan, review existing boating facilities and infrastructure (last completed in 1990) 3. Investigate waterway usage and potential user conflicts, including the impact of boat usage on river bank erosion 4. Incorporate additional boating facilities to encourage increased boating on the Manning River 5. Undertake community consultation during preparation of Boating Plan 6. Prepare generic Review of Environmental Factors for maintenance dredging to aid navigation	\$50,000 plus cost of boating infrastructure (~\$200,000)	NSW Maritime (with assistance from GTCC)	2011
14	NSW Fisheries (DPI) to review mapping of priority oyster aquaculture areas, as contained in the Sustainable Aquaculture Strategy (2006), to incorporate the location of recreational facilities in the lower estuary, such as boat launching ramps and jetties	2, 5, 8, 9, 12	2	1. Review of mapping to be undertaken in consultation with Council officers and the Estuary Management Committee 2. Review of mapping to focus on areas upstream from Old Bar and Manning Point and at Croki	\$8,000	NSW DPI Fisheries (with assistance from GTCC)	2011
	ON-GROUND WORKS						
15	Construct fencing along creeks and rivers in the estuary where livestock access the river	4, 5, 6, 8, 11	2	1. Undertake independent audit of existing stock fencing along waterways and stock watering points 2. Using the results of the audit and current/proposed land use mapping, identify and prioritise areas for fence installation within the immediate estuarine catchment 3. Source funding from H-CR CMA to fence priority riparian zones 4. Liaise with private landholders during planning and implementation of fencing works	\$60,000 (annually)	H-CR CMA	2011
16	Create habitat to encourage mangrove growth at bank erosion sites throughout the estuary	4, 6, 10, 11, 14	2	1. Identify and prioritise sites where mangrove stands have declined with reference to results from Strategy 21 2. Undertake planning and design for habitation sites, including any minor bank stabilisation or rock protection works 3. Undertake works to establish mangrove habitat sites 4. Monitor growth of mangrove stands at habitat sites	\$40,000 (annually)	H-CR CMA + landholders (with assistance from GTCC)	2011
17	Dredge the navigation channel at identified rowing course adjacent to Shallow Island and locate and remove wrecks of old vessels and other navigational hazards	2, 5, 8, 9	2	1. Develop a concept design for dredging works based on latest available bathymetric survey 2. Undertake appropriate assessment of environmental impacts of proposed dredging works 3. Undertake community consultation to gather community response to proposed works 4. Subject to environmental and community approval, prepare detail designs for dredging 5. Undertake dredging works, including all measures to minimise environmental impact 6. Locate and remove known wrecks/ballast and other navigational hazards	\$80,000 plus cost of dredging and ballast removal (~\$230,000)	GTCC and NSW Maritime	2013
18	Prepare and action a Plan of Management for the Manning Point foreshore	2, 5, 8, 9	1	1. Undertake feasibility study for upgrading boating facilities (refer to Boating Plan outcomes as part of Strategy 13) 2. Conduct community consultation to determine potential reaction to replacement of existing jetties 3. Identify if jetties are to be removed and determine suitable location for replacement structures 4. Develop designs for replacement structure and undertake assessment of environmental impacts 5. Subject to community response and environmental assessment, remove existing jetties and construct new wharf 6. Incorporate appropriate sewage pump-out facilities at new wharf structure	\$75,000	GTCC, DoP and NSW Maritime	2010
19	Council to lobby State Government for funding assistance to undertake dredging of the Harrington Back Channel: * Option A - Dredging of channel 50 metres wide * Option B - Dredging of pilot channel only (15m wide)	2, 5, 8, 9	1	1. Use existing EIS documentation and approvals to lodge application for funding 2. Consider Master Plan for Harrington CBD and the open water foreshore 3. Detail design investigations and dredging to proceed upon procurement of funding 4. Undertake dredging works	\$10,000 plus dredging costs (~\$1.25M)	GTCC	2009

TABLE 3: MANNING RIVER ESTUARY MANAGEMENT PLAN - IMPLEMENTATION SCHEDULE (SUBJECT TO FUNDING)

RECOMMENDED STRATEGY		OBJECTIVES TARGETTED	PRIORITY RANKING	ACTIONS	ESTIMATED COST	SUGGESTED RESPONSIBILITY	PROJECTED DATE FOR COMMENCEMENT
	INVESTIGATION AND RESEARCH						
20	Identify, preserve and protect Indigenous and non-indigenous heritage sites throughout the estuary	2, 3, 4, 5, 8, 10, 12, 13	2	1. Liaise with the Local Aboriginal Land Council(s) and DECC to identify indigenous sites along the estuary 2. Prepare and review mapping for sites of significance 3. Liaise with the GTCC Strategic Heritage Advisory Committee (SHAC) to ensure that all heritage sites on Manning River estuary are included in the Heritage Strategic Plan for the Greater Taree area 4. Development Plans of Management for significant heritage sites	\$60,000	SHAC, DECC and LALCs	2011
21	Undertake a field survey to ground truth the mapped extents where foreshore vegetation has been removed along the estuary and its tributaries	3, 4, 6, 12	1	1. Undertake inspection of creek foreshore vegetation in the upper catchment to ground truth the updated extant vegetation mapping produced by the Lower Hunter Central Coast Regional Environmental Management Strategy using aerial photographs from 2000 and 2001 2. Revise GIS layers if changes have occurred since previous airphotos were taken 3. Use ground-truthed GIS layers to identify and prioritise foreshore areas for revegetation works 4. Revegetation works to be undertaken in cooperation with H-CR CMA and Landcare groups	\$15,000	GTCC (with assistance from LHCCREMS and H-CR CMA)	2009
22	Review the <i>Manning River Bank Management Study (1997)</i>	4, 5, 6, 8, 10	1	1. Identify bank management works that have not been completed since preparation of 1997 Bank Management Study report 2. Consider recent bank management techniques to the design of outstanding works 3. Develop revised schedule of works and determine associated costs for outstanding works 4. Undertake bank management works	\$20,000 plus construction costs (~\$680,000)	H-CR CMA, landholders and GTCC	2009
23	Undertake a survey of benthic fauna in the middle estuary	2, 4, 6, 7	3	1. Advise interested Universities for post-graduate research projects to investigate benthic community 2. Work with university students to offer technical support and quality assurance 3. Review past research and available data from Midcoast Water, DPI Fisheries	\$15,000	MidCoast Water (with assistance from DPI Fisheries, GTCC and Universities)	2016
24	Obtain catch / effort data from the Anglers Catch Research Program for Australian Bass recorded at the annual Manning River Basscatch event to determine changes in fish stocks over the last 5 years	2, 5, 7	1	1. Compile data recorded at Manning River Basscatch events 2. Assess changes in bass numbers during the past 5 years 3. If required, provide recommendations to mitigate decline of fish numbers	\$10,000	NSW DPI Fisheries (with assistance from GTCC, ACRP and Native Fish Australia)	2009
25	Undertake a detailed survey of fish populations and the recreational and commercial fishing industry throughout the Manning River Estuary	2, 5, 7	2	1. Undertake roving creel survey of recreational fish species in the Manning River 2. Collate information and report on fish abundance 3. Use gathered data to determine primary productivity of the estuary 4. Undertake survey of fish abundance in 3 to 5 years to determine any changes in species or distribution 5. Undertake management actions as necessary to control fishing, including investigation of alternative commercial harvesting methods	\$80,000	NSW DPI Fisheries (with assistance from MPA)	2011
26	Continue investigations into management of Acid Sulphate Soils (ASS) and drainage from areas of ASS.	2, 4, 6, 7	2	1. Use findings from existing study into floodgate impacts and blockages by H-CR CMA in conjunction with inventory of floodgates compiled by DPI Fisheries 2. Determine likely impact of floodgates and drains on fish passage and water quality processes, including mobilisation of acidic runoff 3. Investigate potential to modify or remove existing drains, including voluntary purchase of land and methods to reinstate natural systems, such as wetlands 4. Prepare Acid Sulphate Soils (ASS) remediation action plans for the priority areas identified in DLWC report: 'Acid Sulphate Soil Management Priority Areas in the Lower Manning Floodplain' (Tulau, 1999) 5. Assess rehabilitation measures in terms of feasibility and environmental impact 6. Seek funding to implement measures	\$80,000 (annually)	GTCC and H-CR CMA (with assistance from DPI Fisheries and DECC)	2011
27	Undertake an Industrial Assessment of all agricultural practices adjacent to waterways within the catchment to ensure best management practices are being adhered to, including Council's <i>Cattle Feedlots Code 1998</i>	2, 3, 4, 6, 11, 12	2	1. Compile list of agricultural practices for assessment 2. Determine framework with which to assess each practice 3. Undertake assessment of selected farms 4. Analyse results of assessments to identify practices that require improvement 5. Target identified sites as part of education program in Strategy 43 6. If required, enforce legal requirements for practices	\$80,000	H-CR CMA and DPI	2011
28	Model coastal inundation in relation to a range of predictions for sea level rise	2, 3, 14	2	1. Use current sea level rise predictions to assess impact on estuary processes 2. Account for impacts of sea level rise when implementing estuary management strategies 3. Monitor work being undertaken by Intergovernmental Panel on Climate Change and CSIRO to predict sea level change 4. If predictions in sea level rise are confirmed and endorsed by Federal and State authorities, revise estuary management objectives and future strategies to account for predicted sea level change	\$30,000	GTCC (with assistance from DECC)	2011
29	Undertake further environmental investigations into the proposed re-design of the Gantry at Harrington Back Channel	2, 5, 8, 9	2	1. Undertake feasibility study of construction works, including works to raise the bridge to allow vessel access, to determine the cost and associated benefit 2. If option is feasible, prepare an Environmental Impact Statement for the works, considering flood impacts and ecological impacts 3. Subject to the outcomes of above actions, prepare concept and detail designs for the works	\$20,000 plus construction costs (~\$120,000)	GTCC	2012

TABLE 3: MANNING RIVER ESTUARY MANAGEMENT PLAN - IMPLEMENTATION SCHEDULE (SUBJECT TO FUNDING)

RECOMMENDED STRATEGY		OBJECTIVES TARGETTED	PRIORITY RANKING	ACTIONS	ESTIMATED COST	SUGGESTED RESPONSIBILITY	PROJECTED DATE FOR COMMENCEMENT
30	Council to lobby State Government for funding assistance to maintain navigability of the Harrington Main Channel through a Sub-Committee of the Estuary & Coastline Management Committee	1, 2, 5, 8, 9	1	1. Update economic scoping study and EIS documentation and associated approvals to lodge application for funding for proposed dredging works 2. Detail design investigations and dredging to proceed upon procurement of funding 3. Compile and review previous investigations and documentation regarding the potential southern training wall at Harrington 4. Undertake a detailed Environmental Impact Assessment for a southern training wall, considering flood impacts and ecological impacts (in conjunction with Manning River Floodplain Management Committee) 5. Prepare report containing investigation findings of southern training wall assessment 6. Incorporate program to educate the community regarding the outcomes of investigations	\$80,000 plus detail design and dredging costs (~\$1.7M)	GTCC (with assistance from Department of Lands)	2009
31	Council in partnership with State Government to prepare an Entrance Opening Management Plan for Farquhar Inlet	1, 2, 5, 6, 7, 8, 9, 10	1	1. Compile and review all previous documentation regarding the Farquhar Inlet and the existing sedimentary processes 2. If required, undertake additional data collection 3. Prepare and assess protocols for maintaining an open entrance at the inlet, including consideration of environmental impacts and estimated cost of maintenance works 4. Prepare management plan to document the findings of investigations and recommendations for protocols for maintaining an open entrance.	\$30,000	GTCC and DECC	2009
32	Map seagrass, saltmarsh and mangroves throughout the estuary	2, 4, 6, 7, 11, 14	1	1. Undertake survey to ground truth current seagrass extent (approach Universities for assistance for research projects) 2. Compare GIS layer of current seagrass extent with GIS data held by Council corresponding to extent of seagrass last surveyed in 1984, and previous aerial photographs taken between the 1940s and the present 3. Investigate impact of previous dredging works on seagrass extent in the lower Manning River 4. Investigate mitigative measures if seagrass extent found to be significantly decreased due to antropogenic influences	\$25,000	GTCC (with assistance from University research project)	2010
	MONITORING						
33	Develop a water quality monitoring program for Manning River tributaries in the lower estuary to complement existing monitoring activities by Council, MidCoast Water and Waterwatch groups	2, 3, 5, 6, 7	1	1. Monitoring program to determine the impact of catchment activities on nutrient levels in the lower Manning River estuary 2. Compile existing water quality data from Council monitoring activities for Gross Pollutant Traps and for the lagoons at Manning Point and Farquhar Park 3. Compile existing water quality data from 15 sites monitored by MidCoast Water (spanning 18 years) 4. Compile existing water quality data from the Waterwatch database, subject to reliability of the data 5. Extract relevant water quality data from database compiled by the Water Quality Partnership (refer Strategy 34) 6. Combine existing data into GIS mapping base that shows the location of all previous sampling sites 7. Use the available water quality data to develop a base level water quality data set 8. Additional water quality monitoring to be undertaken at the following 6 sites: - Lansdowne River near Lansdowne and at the confluence with Manning River - Dawson Creek at the confluence with Manning River and 8 km upstream from the confluence - at the tidal limit of Manning River and 10 km upstream from the tidal limit 9. Monitoring to focus on parameters that demonstrate the presence of nutrients and faecal contamination 10. Sampling to be undertaken monthly and following rainfall events 11. Incorporate newly collected water quality data into GIS mapping 12. Use total water quality data set to assess the impact of agricultural activities and urban runoff on nutrient levels in Manning River	\$20,000 plus \$55,000 annually	GTCC, MidCoast Water and H-CR CMA	2010
34	Representative from the Water Quality Partnership (H-CR CMA, MidCoast Water, GTCC and Gloucester Council) to report to Estuary Management Committee when current work to compile the water quality database has been completed	2, 3, 5, 6, 7, 11, 12	1	1. Interrogate compiled database to determine available background data for water quality and identify ongoing regular monitoring activities 2. Results from database analysis to be used in development of water quality monitoring program for the lower estuary (refer Strategy 33)	\$4,000	GTCC, MidCoast Water and H-CR CMA	2009
35	Undertake monitoring for the biological indicator species, <i>E.Coli</i> and macroinvertebrate species throughout the estuary, to monitor for the presence of pathogenic organisms that may present a public health risk and to assess the health of the estuary	2, 3, 6	2	1. Monitoring to include sites in the vicinity of outfalls from sewage treatment plants at: - Taree - Wingham - Manning Point - Harrington - Landsdowne - Coopernook - Gloucester - Dawson	\$25,000 (annually)	GTCC and MidCoast Water	2012
36	Appoint a coordinator for the Manning River Estuary Management Plan	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	1	1. Advertise coordinator position for part-time hours within Council and H-CR CMA 2. Coordinator to spend nominal time and resources to manage activities included in the Estuary Management Plan 3. Coordinator to report to Estuary & Coastline Management Committee and attend all Committee meetings	\$80,000 (annually)	GTCC and H-CR CMA	2009 (subject to funding)

TABLE 3: MANNING RIVER ESTUARY MANAGEMENT PLAN - IMPLEMENTATION SCHEDULE (SUBJECT TO FUNDING)

RECOMMENDED STRATEGY		OBJECTIVES TARGETTED	PRIORITY RANKING	ACTIONS	ESTIMATED COST	SUGGESTED RESPONSIBILITY	PROJECTED DATE FOR COMMENCEMENT
	EDUCATION AND COMMUNITY INVOLVEMENT						
37	Work with landholders to revegetate the riparian zone on private land along waterways within the Manning River Estuary	2, 3, 4, 6, 10, 11	2	1. Identify priority areas for revegetation within the immediate estuarine catchment (refer to outcomes of review of Manning River Bank Management Strategy - Strategy 22) 2. Supply tube sock to revegetate priority riparian areas 3. Liaise with landholders and local Landcare and Coastcare groups to assist in the revegetation of priority areas 4. Encourage landholders to conserve existing native remnant vegetation and to enter into Voluntary Conservation Agreements, Biodiversity Management Agreements or Property Vegetation Plans 5. Continue work as part of Council's Community Nursery program 6. Assist in the development of community networks	\$50,000	H-CR CMA and GTCC and Landcare	2011
38	Prepare an education program to inform community of current flood notch protocols	1, 2, 5, 10	1	1. Education program to target Old Bar community and oyster growers 2. Create education brochures explaining the procedures for maintenance of the flood notch and its purpose. Include details of environmental benefits 3. Review strategy following preparation of Entrance Opening Management Plan for Farquhar Inlet	\$5,000	GTCC	2009
39	Encourage landholders to enter into Property Vegetation Plans with the Hunter Central Rivers Catchment Management Authority	2, 3, 4, 6, 10, 11	1	1. H-CR CMA to establish trial of three sites for development of Property Vegetation Plans 2. H-CR CMA officer to undertake site inspections and advise landholders 3. Prepare draft Plans using "PVP Developer" 4. H-CR CMA to review and assess Plans 5. Approval of Property Vegetation Plans by H-CR CMA 6. Advertise and exhibit trial sites to encourage additional landholders to develop PVPs 7. H-CR CMA to report and update progress of PVP development to Estuary Management Committee 8. Assess suitability of H-CR CMA incentives program for works to maintain riparian buffer zones (up to 50 metres, including Core Riparian Zone and Vegetated Buffer)	\$15,000	H-CR CMA (with assistance from GTCC)	2009
40	Conduct field days for riparian landholders at demonstration sites to raise awareness of the importance of riparian vegetation	2, 3, 4, 6, 10, 11	1	1. Publish media article advising of completion of works at demonstration sites and advise of field days 2. Send invitations to all riparian property owners to field days at demonstration sites 3. Undertake field days, taking the opportunity to distribute educational brochures by hand	\$8,000	H-CR CMA (with assistance from GTCC)	2009
41	Introduce a community recognition and local awards scheme for efforts towards biodiversity conservation	2, 4, 6, 7, 10	3	1. Publish media article advising rural land owners, community groups and schools of awards scheme and request nominations 2. Identify suitable nominees for recognition by undertaking site inspections of nominated properties 3. Invite all participants to presentation via a media article and direct mail 4. Present awards 5. Encourage further nominations by fellow landholders and community groups	\$5,000	H-CR CMA	2013
42	Develop a community education program that outlines the importance of estuary processes and the potentially adverse impacts of human activities	2, 3, 4, 6, 7, 10, 11, 13, 14	1	1. Develop a community education program that outlines the importance of estuary processes and the potentially adverse impacts of human activities (ie: untreated and uncontrolled stormwater runoff, clearing of vegetation, 4WD access) 2. Develop and distribute a global brochure aimed at the whole community describing issues facing the estuary. 3. Develop and distribute targeted brochures to selected community groups and estuary users (e.g. residents, tourists, recreational fishers) outlining potentially adverse impacts. 4. Provide educational brochures on Council's Website in PDF format. Include print-friendly versions of all brochures. 5. Organise media coverage of on-the-ground works as they are carried out and achievements in the implementation of this Plan.	\$20,000	GTCC (with assistance from DECC and H-CR CMA)	2009
43	Prepare and undertake a targeted community education program for rural property owners to make them aware of best management land-use practices, such as: - Minimisation of slope erosion; - Minimisation of gravel loss and bank erosion at river crossings; - Controlling cattle access to waterways - Minimisation of vegetation clearing - Replanting of native catchment and riparian vegetation; - Appropriate application (timing and locations) of fertilisers; and - Installation of sediment traps.	2, 3, 4, 6, 10, 11	1	1. Post "expression of interest" brochures / letters to all rural property owners to identify interested parties, availability and topics for discussion 2. Make follow-up phone calls to potential participants 3. Publish a media article inviting all rural property owners to workshops 4. Undertake workshops for rural property owners at local community hall 5. Distribute industry-specific education brochures to all landholders 6. Encourage rural landowners to develop Property Vegetation Plans	\$25,000	H-CR CMA (with assistance from GTCC and DECC)	2009
44	Construct interpretative signs at key locations throughout the estuary to provide education on the potentially adverse impacts of human activities on the environmental health of the estuary, particularly stormwater pollutants and disturbance of the riparian zone	4, 6, 8, 10, 13	2	1. Design and erect signs at key locations of estuary usage and where the estuary may be impacted by human activities: - Foreshore reserves - Boat ramps - Wetland areas 2. Mark existing stormwater inlet pits with message, "This pit drains to Manning River" (or applicable equivalent) in 100 mm high bold yellow lettering using standard road line marking paint. 3. Involve community groups and local schools in the development of designs for signs.	\$18,000	GTCC	2011
45	Develop a 4 yearly " <i>State of the Manning</i> " environmental report card on all estuary monitoring activities and the health of the estuary (<i>to tie in with SoE reporting</i>)	2, 3, 10	2	1. Develop report card layout / structure 2. On a 4 yearly basis, compile all estuary water quality data from existing/future water quality monitoring programs and Marine Parks Authority monitoring 3. Assess water quality monitoring data against target values 4. Prepare report card detailing all water quality monitoring activities, including comparisons against target values 5. Prepare report card detailing all monitoring activities relating to ecological processes 6. Publish report card in local media and make available on Council's Website	\$12,000	GTCC (with assistance from DECC)	2011

* Cost estimates are based on WorleyParsons' experience and judgement as practising professional engineers familiar with the construction industry. Construction cost estimates can NOT be guaranteed as we have no control over Contractor's prices, market forces and competitive bids from tenderers. Construction cost estimates may exclude items which should be considered in a cost plan. Examples of such items are design fees, project management fees, authority approval fees, contractors risk and project contingencies (e.g. to account for construction and site conditions, weather conditions, ground conditions and unknown services). The construction cost estimates by WorleyParsons are not to be relied upon in any way. If a reliable cost estimate is required, then an appropriately qualified Quantity Surveyor should be engaged.

7 HOW THE PLAN WILL BE IMPLEMENTED

7.1 INTEGRATED APPROACH

The effective implementation of the Plan depends on:

- All levels of government and the community agreeing on the objectives, priorities and principal actions of the Plan;
- All levels of government and the community understanding and accepting their responsibilities under the Plan;
- Commitment from all involved to work together to implement the Plan, and to review progress, to ensure strong sustainable outcomes;
- Communication within Council and agencies, between Council and agencies, and with the broader community;
- Adequate information to make sound management decisions;
- Appropriate and ongoing funding.

7.2 FUNDING SOURCES

Funds for natural resource management projects are scarce, and must be spent effectively and accountably. A number of the actions under consideration require substantial capital and/or ongoing costs and an expanded commitment of staff resources. Relatively high capital costs are, for instance, associated with the construction of additional boating facilities or the construction of fencing along creeks and rivers in the estuary where livestock access the river.

Relatively high maintenance costs will be incurred in carrying out monitoring and reporting work. Ongoing co-ordination of multiple natural resource programs within the coastal zone, with effective partnerships, will require strong staff resources to manage new Council responsibilities.

The actions in the Estuary Management Plan will require funds from Great Taree City Council budget, from the recurrent funds in DECC, Hunter-Central Rivers Catchment Management Authority, NSW Maritime, NSW Fisheries and NSW Agriculture budgets, in addition to industry contributions and in-kind contributions from the community.

The local community is also encouraged to actively participate in the implementation of the Plan, either through better management of stormwater runoff and vegetation around their property or through volunteering their time to organised estuary management projects.

A range of incentives offered by the H-CR CMA, and subsidies, cross compliance programs, tradeable rights, market gains, etc, will assist in achieving changes in agricultural land practices. Cross compliance and rate reduction programs should be investigated first and would become part of formal agreements with landholders.

Section 94 contributions from new development along the estuary could also be used to assist with the funding of estuary management activities. The funds available from Section 94 will not necessarily be large,

but they may be sufficient to provide seeding money to obtain further funds from elsewhere.

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