KEMPSEY SHIRE COUNCIL

CONSULTANT BRIEF

for the

MACLEAY RIVER ESTUARY

Process Study

February 2006.

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1.0 INTRODUCTION

1.1 General

This brief is to seek consultant services to prepare a Process Study describing in detail the hydrodynamics, sedimentation, ecology and key processes of the Macleay River Estuary and its coastal floodplain.

The studies shall be prepared in accordance with the general provisions set out in the States Estuary Management Manual (1992), the NSW Coastal Policy 1997, and directions as detailed by Healthy Rivers Commission North Coast Rivers report (2002)

This study is to provide the technical base upon which an estuary management plan can be formulated for the Macleay River Estuary and build on the Macleay River Estuary Data Compilation Study and associated reports prepared by GECO Environmental August 2005.

1.2 Location (see Fig 1)

The Macleay River estuary is located on the mid north coast of NSW approximately 450 kilometres north of Sydney and 50 kilometres north of Port Macquarie.

The estuary is a principal feature of the region from both a commercial and recreational aspect. Past flood mitigation works combined with increases in population, tourism, commercial and recreational activities are placing pressures on the natural processes, health and integrity of the estuary its coastal floodplain and foreshores.

In recognition of this, Kempsey Shire Council, through its Coast & Estuary Management Committee has resolved to prepare an Estuary Management Plan for the Macleay River estuary.

Tourism is a major industry within the Kempsey LGA with 415,000 visitors spending an estimated $90 million per year (Kempsey Tourist Information Centre 2000). The main tourist attractions are Trial Bay gaol, Hat Head National Park, waterways of the lower Macleay including the coastal beaches and the many recreation areas and bushwalks throughout the LGA

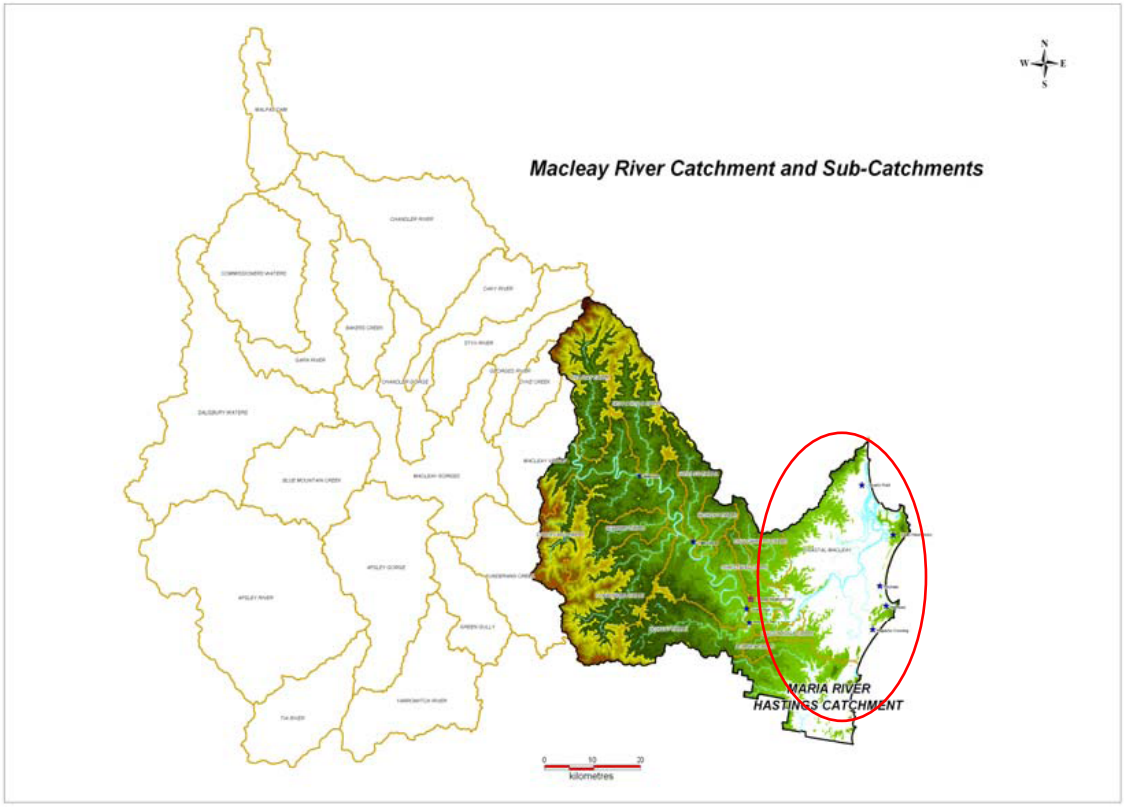

Figure 1 Map of Macleay River Estuary Study Area

1.3 Background

Council established a Coast & Estuary Management Committee in 1997 charged with the task of preparing management plans for all its estuaries and coastal lands. Funding was gained in September 1999 from the States Estuary Program to assist with the preparation of management plans for Killick and Saltwater Creeks, centred in the high growth coastal villages of Crescent Head. and South West Rocks respectively. These Plans are nearing completion.

The Committee is being guided by the NSW Coastal Policy 1997, Estuary Management Manual (draft 1992) and North Coast Rivers Healthy Rivers Commission Report (HRC 2003) which outlines a structured management process leading to the adoption and implementation of an integrated, balanced and community supported estuary management plan. Council gained additional funding in 2003 and 2005 to assist in the preparation of a management plan for the Macleay River estuary.

1.4. Recent studies

Recent studies commissioned by Council and DNR for the Macleay River Estuary as part of the Estuary Planning process includes;

- **Data compilation study (GECO 2005)** comprehensive collation and review of all available existing data sources, studies and reports on the Macleay River estuary into an electronic register www.macleay.kempsey.nsw.gov.au

This study also describes the historical context and makes recommendations on data gaps and investigations required

- High quality ortho rectified **base map** in GIS format for the Macleay river estuary and its floodplain using 2003 aerial photography.
- **The Geomorphology of Macleay River Estuary (Dr Tim Cohen Sept 2005)**
- **Flora and fauna assessment. (ID Landscape Management Sept 2005)**
- **Full Hydrographic Survey (Dept Commerce May 2003)**
- **Tidal Gauging Hydrosurvey (MHL Sept 2003**

2.0 Description of Macleay River Estuary

2.1 Catchment

The coastal Macleay sub catchment has an area of 739 sq km. and waterway area of 18.2 sq km The Macleay River has a catchment area of 11,435 sq km. Defined as a mature barrier estuary formed by the gradual infilling of the coastal basin by fluvial sediments from the landward end and by marine sediments from the seaward entrance it is bordered by Nambucca to the north and Hastings catchment to the south

The small coastal creeks and lagoons of Back, Killick, Korogoro, Creeks and Saltwater Lagoon are located to the east and south from the Macleay River entrance.

2.2 Geomorphology

The Macleay estuary is a mature barrier dominated system in a high energy ocean wave setting. It is a filled delta system dominated by fluvial processes. It can be broken into 3 broad process zones that reflect differing degrees of fluvial and tidal interactions. **Fluvial process zone** extends from tidal limit at Belgrave Falls to Kinchela (including Belmore, Kinchela and Upper Clybucca Creek). **Fluvial-Marine transitional zone** extends from Kinchela to Jerseyville Bridge and includes most of Clybucca Creek. **Marine flood tide zone** is dominated by marine derived sediment and extends from Jerseyville Bridge to the mouth of the Macleay River including the abandoned Macleay Arm. (Cohen Sept 2005)

The headwaters rise in the Great Dividing Range 1600m AHD and flow across the New England Tableland before falling some 400m into rugged gorge country, the Macleay River emerging from the gorges some 35km upstream of Kempsey

The Macleay River estuary extends some 54 kilometres upstream from the ocean at South West Rocks to the tidal limit at Belgrave Falls about 10km upstream of Kempsey.

The coastal floodplain has an area of 400sq km. and includes well defined levees up to 7m AHD along the rivers and creeks below Kempsey, grading to large semi permanent backswamps often < 1m above 0 AHD (M.Tulau & S. Naylor 1999). These swamps cover some 240 sq km representing 60% of the floodplain

The entire floodplain below Kempsey to South West Rocks is underlain by extensive estuarine deposits that include potential and actual Acid Sulfate Soil (ASS) It is estimated that some 31,000 ha of floodplain below Kemspey is underlain by high risk ASS that is either at or near the surface.

The outlying headlands of Grassy Head, Smoky Cape, Hat Head and` Crescent Head are linked by Pleistocene sand masses up to 70m above sea level. (M.Tulau & S. Naylor 1999)

Extensive flood mitigation works initiated after the 1949 and 1950 floods have significantly modified the coastal floodplain with some 210 floodgates in 47 separate structures servicing some 116km of excavated drains, 180km of levees. 80% of the main channel from Kempsey is lined with rock protection works. (M.Tulau & S. Naylor 1999)

While the Macleay River is the dominant watercourse on the floodplain, significant tributaries include Christmas, Borirgalla and Clybucca Creeks Macleay Arm, Andersons Inlet to the north and Belmore River and Kinchela Creek to the south.

The Macleay enters the ocean through a trained river entrance at South West Rocks which was first breached during the flood of 1893. Previously the river entrance was at Grassy Head. The old river channel between South West Rocks and Grassy Head now a backwater known as the Macleay Arm. (Webb 1997)

The mangrove area on the Macleay is about 5sq km representing 5% of States estuarine total, while Seagrass and Saltmarsh areas represent 1.097sq km and 3.652sq km respectively.

2.3 Early Images of the Macleay after Government Surveyor Clement Hodgkinson in his 1840's descriptions contained in (Australia from Port Macquarie to Moreton Bay, London Oct 1844)

"In ascending the Macleay River, from its entrance, the first objects which meet the eye on both banks are extensive mangrove flats, with thickets of myrtle, palm, and swamp oak, which are few miles further on, are superseded by dense alluvial brushes, rising like gigantic green walls on both sides of the river."

p3 He goes on to explain the term brush

……"brush trees in general possess a rich umbrageous foliage of bright shining green. The popular names of the most remarkable brush trees are as follows:- Red Cedar, White Cedar, Mahogany, Tulipwood, Rosewood, Ironwood, Lightwood, Sassafras, Corkwood the Australian Tamarind, Box numerous and elegant varieties of the Myrtle genus, the Australian Palms, and the Brush Fig……..But the peculiar appearance of the brush is principally caused by the countless species of creepers, wild vines and parasitical plants of singular conformation, which interlaced and intertwined in inextricable confusion, bind and weave together the trees almost to their summits, and hang in rich and elegant flowering festoons from the highest branches. ……..When this brush land is cleared, and cultivated, its fertility seems inexhaustable."p4

Now continuing with his description of the Macleay River……..

”It is navigable for vessels of fifty or sixty tons, to a distance of thirty four miles from its bar (Grassy Head), the water being of good depth, except at Shark and Pelican islands, where sand flats extend across the river, which can be passed by vessels only at high water. The reaches of the river are long and straight, averaging about a quarter of a mile in width, flanked on both sides by huge walls of the dense brush I have just described. These borders of alluvial brush land on the banks of the river, are generally half a mile, or a mile wide, and are then backed by extensive swamps of many thousand acres in extent, whose verdant sea, of high waving reeds and sedge, stretches away to the base of the distant forest ranges. There are several lagoons in these swamps, and the stagnant water is very generally diffused over their surface. (P9)

…….”The continuous brush renders the lower part of the Macleay very monotonous to the admirer of picturesque scenery; however an occasional glimpse of the azure tinted peaks of the distant mountain ranges, with green islands covered with palms, now and then varying the sameness of the reaches of the river, not to speak of the air of cheerfulness imparted to the scene by the large flocks of aquatic birds, of wonderful variety, all busily engaged, and fish leaping out of the water in every direction, renders an excursion on the waters of the Macleay pleasant enough. (P10)

2.4 Current description

Recent surveys indicate that 90% of entire estuary is stable with 27% of this being stabilised by rockwork. There are 25km of eroding riverbanks with minor erosion being the most common. Whilst there has been an increase in minor erosion in the last 70 years there has been a marked reduction in moderate and severe bank erosion since 1934. The most active areas are Kinchela bench and Fattorini Island just downstream of Smithtown (GECO 2005)

The Macleay River “riparian corridor” is highly degraded due to the extent of clearing and the paucity of remnant pockets along the riparian margin or in pockets across the floodplain. Weed infestation is extensive with some 80% of the mapped riparian zone containing *Category 1 Weeds* which are the most serious weeds on the North Coast, capable of displacing native communities. (ID Landscape Management 2005)

Extensive backswamps areas once prized for their forage value in dry times now have little productivity as many of the water tolerant species are now replaced by less tolerant pasture species. There is a history of fish kills that usually occur after heavy rains following prolonged dry periods. (S. Naylor 1996)

The Lower Macleay provides significant recreational boating opportunity with abundant diversity of waterways fronting the New Entrance area of South West Rocks.

There are significant commercial and recreational fishing activities and oyster farming in the lower Macleay. Commercial fishermen regularly work the Macleay

targeting mullet and mud crabs. Outside the estuary trawlers catch fish and prawns many of which are ecologically linked to the estuary.

Oysters are cultured principally around Shark Island, Macleay Arm , Andersons Inlet and` Clybucca Creek.

Recreational fishing is widespread with fish being sought in similar areas to commercial fishermen. The Macleay is also acknowledged as providing important habitat for Australian Bass, a significant recreational species. (Webb 1997)

3.0 ESTUARY PLANNING PROCESS

3.1 Coastal & Estuary Management Committee

Kempsey Shire Council has an active Coast & Estuary Management Committee with membership recently reviewed to ensure all key stakeholders are included.
The principle objective of the committee is to assist Council in the development and implementation of management polices and plans for all coastal and estuarine areas of the Kempsey Local Government Area, largely through funding derived from Council and the States' Estuary and Coastal Programs.

3.2 Planning Process

The States Estuary Management Manual (NSW Govt 1992) outlines the processes for preparing an estuary management plan.
The estuary management planning process is being reviewed as part of the Coastal Protection Package announced by the Premier during 2001. It is intended for both the coastal and estuary planning processes to be combined into a coastal zone management manual.
The planning process as outlined in the current revised Manual involves a 8-stage process as follows:

1. Form an Estuary Committee
2. Identify Issues and Set Goals
3. Data Compilation
4. Undertake an estuary processes study
5. Undertake an estuary management study
6. Prepare estuary management plan
7. Adopt and implement estuary management plan
8. Monitor and Review management process

Please note: This consultancy brief pertains to stage 4.

4.0. STUDY AREA

4.1. Estuary Management Plan Study Area

The study area includes the Macleay River estuary and its coastal floodplain. This includes the waterways and all tributaries up to the tidal limit, the entrance, foreshores, floodplain and adjacent land, and coastline. This sub catchment is

digitally mapped as the Coastal Macleay # 2060301 (DNR 1999 Stressed Rivers). Please note Back Creek near the New Entrance at South West Rocks must also be included in any assessment.

The tidal limit of the main river extends 55km upstream to Belgrave Falls about 10km upstream of Kempsey.

Obviously the wider catchment must be considered in so far as it may impact on the estuarine environment, especially the coastal floodplain wetlands (salt brackish and fresh) that interact with tidal and flood flows. Likewise heavy metal contamination of river and floodplain sediments emanating from mines in the tablelands warrants a catchment perspective.

5.0 AIMS & OBJECTIVES

5.1 Estuary Management Plan Objectives

In the broader context a Macleay River Estuary Management Plan must provide;

5.1.1 **Clear guidance**, direction and implications for management decisions relating to activities and planning decisions that may impact on the estuary and its floodplain.

5.1.2 Accurate, **comprehensive mapping** of physical attributes at resolution down to property scale (completed GECO Environmental 2005)

5.1.3 An **electronic register** of all projects and studies both completed and current for inclusion on Councils website (completed GECO Environmental 2005)

5.1.4 Clear description of the **key processes** driving the ecology of the Macleay River estuary

5.1.5 **Management framework** to maximise efficient use of available resources.

5.1.6 Specific recommendations as to adequacy of **landuse planning controls** and future growth strategies

5.1.7 Scheduled list of fully evaluated **costed actions** appropriate for key issues highlighted by Councils Coast & Estuary Committee.

Note This brief is specifically dealing with part 5.1.4. The balance of outcomes will be addressed in the final phase of estuary plan preparation.

6.0 PROCESS STUDY OVERVIEW

In broad terms the aim of this study is to;

6.1 Understand the overall physical, chemical and biological processes and interactions operating in the Macleay River estuary, its tributaries and floodplain during typical seasons (wet and dry) and its response to floods, droughts, catchment development, floodplain landuse, flood mitigation, waterway usage and entrance manipulation

6.2 Develop **conceptual models** from available research and reports and on-site investigations (where necessary) to describe comprehensively how these systems function. Conceptual models must identify all the processes relevant to the issues of concern for typical zones within the estuary.

6.3 Investigate and discuss the processes impacting on the **issues** under consideration and draw reference to any other issue identified during the process study development.

6.4 Assess and determine the **health** of Macleay River estuary highlighting those factors posing greatest threat

7.0 SCOPE OF WORKS

For the purpose of this brief the tasks will be grouped into two broad processes;

- Community consultation
- Estuary Processes study

7.1 COMMUNITY CONSULTATION

7.1.1 Communities

The study area comprises the communities of South West Rocks, Jerseyville, Kempsey, Frederickton, Kinchela, Belmore River, Smithtown, Gladstone, Clybucca, Stuarts Point, Grassy Head, and all relevant stakeholder groups that have a vested interest in the management of Macleay River Estuary and its floodplain. The community consultation process is fundamentally to inform the local communities of the process underway and any specific information pertaining to the development of the Process Study.

7.1.2 Inspection

Inspect the study area in the company of the Coastal & Estuary Management Committee to gain an appreciation of the scope of the estuary and the issues of relevance to the community, Council and State Government agencies.

7.1.3 Communication Strategy

Develop a **communication strategy** over the duration of project to increase the communities' awareness of

a) Historical and social context
b) An understanding of the geologic setting & key natural processes operating
c) Critical processes that affect the health and functioning of the Macleay River Estuary and its coastal floodplain
d) Opportunity for input and participation

8.0 PROCESS STUDY

8.1 General

On the basis of the priority issues derived from the data complication study,

community consultation and the Coast & Estuary Management Committee, undertake those studies and investigations necessary to understand the critical processes of the Macleay Estuary and tributaries that will enable the development of management options. The consultant is to;

Describe how this estuary works. With specific focus on the following 3 areas;

i Hydrology and hydrodynamics
ii Sedimentation
iii Ecological & Biogeochemical Processes

It is envisaged you will be conversant with the issues listed in Section 9 to ensure assessments and analysis undertaken is focussed and tailored to enable management actions to follow.

8.2 Hydrology and Hydrodynamics

8.2.1 Construct 2-D hydrological/hydrodynamic models for the current and historical (i.e. pre-European) Macleay River Estuary and floodplain based on existing tidal gauging, hydro-graphic survey, hydrological and historical data. This model should be used to:

a) Qualitatively describe the relationship between the Macleay River Estuary and its floodplain wetlands and how this relationship has changed since European settlement. In particular, describe the water balance for the estuary and interactions between the floodplain wetlands and freshwater inflows.
b) Describe alterations to the ecology and physical processes that the training wall structures have initiated.
c) Discuss how the marine processes interact with the entrance and lower estuary.
d) Describe the water balance for this estuary and interactions between the floodplain wetlands and freshwater inflows
e) Describe the salinity regime during wet and dry periods.
f) Identify and assess the mixing processes operating throughout the various zones within the estuary highlighting those areas of greatest sensitivity to poor water quality.
g) Describe the tidal influence on the estuary and its prominent floodplain wetlands

8.3 Sedimentation

8.3.1 Construct a **sediment budget** for the Macleay River Estuary including catchment inputs, bank erosion, marine inputs, sedimentation, and transfers within and between the different compartments of the estuary. It is suggested that a number of process-based investigations be undertaken as part of this study. These include:

a) Systematic collation of **planform changes** for the Lower Macleay River. This should focus on all styles of lateral adjustment (ie channel expansion, changes to meander length, sinuosity within each of the three process zones) and include geo-referencing of historical parish maps and or portion plans. This will provide the current context to channel processes

b) Systematic collation **of historical hydrographic surveys** demonstrating where bed elevations have changed

c) Examination of **changes to bank full discharge cross sectional** capacity at areas of accelerated change and representative sections of process zones by comparison of photogrammetry derived topographic data with permanent benchmarked cross sections

d) Systematic collation of the nature and timing of tidal dredging in the Lower Macleay River (ie how much, where and when?) This component should aim to determine what proportion was entirely removed from the system.

e) Detailed topographic analysis from current bathometric data (*i.e.* cross section every channel widths distance) on trunk stream with an equivalent analysis on tributaries (*i.e.* Clybucca Creek, Belmore River and Kinchela Creek). This will provide a more thorough assessment of current sediment storage patterns.

f) Use outputs from the hydrodynamic modelling, in conjunction with textural, compositional and geochemical data, to describe sediment transport processes and rates and deposition locations, and determine the role of this sediment in river processes and river ecology especially during floods (build on Macleay Extractive Industry study commissioned by DNR 2003).

g) Boat Wash. Determine the relative contribution of wind and boat waves for deep and shallow water profiles for a range of estuary settings and bank materials. A controlled experiment in targeted areas that measures wave height, wave direction, wind speed and wind direction, bank erosion, sediment production and turbidity from a range of vessel types representative of vessel traffic in this estuary. Identify the effects of vessel wash on shoreline stability and bank erosion. Develop a set of appropriate vessel operating criteria that may be applied to sections of the estuary.

h) Establish permanent bench-marked cross-sections from floodplain to floodplain in areas of accelerated change and in representative sections of each process zone. These should be located using differential GPS and marked adequately for long-term monitoring.

i) Describe processes causing shoaling of entrance to Back Creek, Macleay River, Macleay Arm and Clybucca Creek to improving understanding of natural processes and determine whether intervention is warranted.

8.4 Ecological & Biogeochemical Processes

a) Review existing water quality for the main arm of the Macleay Estuary. The proposed data sets to be reviewed will include Kempsey Councils, Sue Bottings assessment 2000, Safe Foods Monitoring, Brad Eyres 9 Sub Tropical Estuary Comparison Study 1996.

b) Measure sediment biogeochemical processes including benthic production and respiration, nutrient fluxes and denitrification in key benthic habitats.

c) Assess the bioavailability of arsenic and antimony in the estuarine sediments (check status of current UNE research into this topic)

d) Construct nutrient budgets for the estuary.

e) Establish an understanding of the key biogeochemical processes that control and maintain the ecological health of the Macleay Estuary. In particular the factors controlling algal blooms and the growth of aquatic weeds, and the impact of elevated concentrations of arsenic and antimony. Extensive beds of aquatic plants occur from Frederickton upstream to past Kempsey.

f) From the mapped fauna of the river and its floodplain wetlands identify any rare or endangered species or communities, and areas of conservation significance that may require special management attention.

i) Describe the role of flood events on the ecology of the river and its floodplain Identify critical times of year for different biota life cycle functions (nesting, breeding etc) Tabulate findings into seasonal groupings, activities and key habitat. Eg summer, terns hatch their young, sand spits.

8.5 Issue Assessment

8.5.1) Examine the issues detailed in section 9.0 identifying and describing the estuary processes that must be understood for effective management to occur.

8.6 Process Study Report

8.6.1 The Process Study Report will cover those elements in the brief including detailed assessments and descriptions of;
a) the ecological health of Macleay River Estuary and its floodplain
b) interactions between the processes and the extent to which human activities have modified or disrupted the processes
c) how this estuary, its coastal floodplain and marine processes function
d) the critical processes and scenarios to be considered for the issues raised

with specific focus on

- **Hydrology and Hydrodynamics**
- **Sedimentation**
- **Biogeochemistry and Ecology**

9.0 ISSUES TO BE ASSESSED

Issues raised by Kempsey Coast & Estuary Management Committee, Catchment Management Committee, stakeholders and Mid North Coast Catchment Management Board include;

1 Landuse Planning & Development Control
2 Riparian land management & bank erosion
3 Floodplain wetland management
4 Acid sulphate soil management
5 Floodgate & drain management
6 Boating use

7 Sedimentation
8 Tourism management
9 Habitat protection
10 Fish/shellfish management
11 Water quality
12 River health
13 Climate change and sea level rise
14 Information availability
15 Integration of projects

9.1 Land Use Planning & Development Control

Desired Outcome:

That landuse planning instruments and development controls a framework for sustainable use of the Macleay River Estuary and its Floodplain

Critical questions:

a) Do current landuse planning, development control and identified future urban release areas adequately protect the ongoing health of the Macleay River estuary and its floodplain?

b) What measures can be put in place to ensure the zonings, planning rules and guidelines are consistent and ensure due respect of the river and its processes?

c) What is the issue with Land Use Planning & Development Control?

Inappropriately sited and or poorly designed development, and land and water use can adversely impact on the ecology and or values of this system.

<u>What can the EMP do to help resolve this issue?</u>

Data Compilation / Mapping

- Map future landuse noting future urban growth strategies of Council
- Map & describe all environmental planning, development and management controls including, REP, SEPP, LEP, & DCPs. Urban development strategies, land assessments
- Define and map those areas vulnerable to sea level increases and climate change

Process Study

- Examine potential foreshore development for recreational type facilities eg training wall walkways, foreshore bike paths etc examine and describe the processes operating commenting on what considerations are necessary for establishment of facilities within this zone.
- Comment on current and proposed future uses and developments that may threaten or pose a risk to the estuary's structure , health, ecological processes, and existing uses

Management Study

- Highlight conflicts between existing uses; and
- Examine potential foreshore development especially recreational type facilities, formulate appropriate development controls
- Discuss management options available for current and proposed future uses and

developments that may threaten or pose a risk to the estuary's structure , health, ecological processes, and existing uses

9.2 Riparian land management & Bank Erosion

Desired Outcome

- hold the river in its current location
- reduced rate of bank erosion
- increased stability of all riparian lands fronting The Macleay River and its waterways
- ensure existing areas with intact native riparian vegetation remain healthy and robust and reinstate some of the Macleay River pre-disturbed of riparian vegetation character
- create vegetated corridors along and across the estuary and its coastal floodplain
- for public lands within villages and towns fronting the river to be appropriately managed and landscaped to set an example of how this type of land is best managed
- stream network corridors used to connect areas of significant vegetation

Critical question

a) What sections of the estuary have similar geomorphic characteristics and how can this be used to assist management approach?
b) What are the causes and preferred treatment options for a range of typical bank erosion scenarios?
c) To what extent does boating contribute to bank erosion and how can this be managed?
d) What sections of river have a high risk of instability posing a threat to infrastructure and productive land?
e) What contribution does bank erosion make to turbidity levels?

What are the issues with riparian land management?

- Lack of native riparian vegetation corridor along banks of Macleay river estuary and its tributaries for over 50km from Kempsey to entrance
- Extent of rock revetment as treatment option in isolation
- Urban residential lots and their general treatment of river banks
- Ongoing maintenance bank treatment
- Availability of support organisations
- Eroding riverbanks create problems with water quality, create sediments and result in the loss of valuable riverside land (both public & private).
- High cost of restoration and ongoing maintenance

<u>What can the EMP do to help resolve this issue?</u>

Data Compilation / Mapping

- Review 1934 report by Departmental Committee on Macleay River Erosion, Lands Dept analysing the changes over the past 70 years and the management implications
- Map streambank condition

Process Study

In order to more confidently determine the causes of current bank erosion it is suggested that a number of process-based investigations be undertaken. These include;

a) Detailed topographic analysis from current bathometric data (*i.e* cross section every channel widths distance) on trunk stream with an equivalent analysis on tributaries (*i.e* Clybucca Creek, Belmore River and Kinchela Creek). This will provide a more thorough assessment of current sediment storage patterns.

b) Construct a sediment budget for the Lower Macleay River from the bathometric data, floodplain topographic data and the ortho-photographs. This should aim to assess sediment storage in each of the identified process zones while also incorporating current research undertaken by Ashley and Graham from UNE.

c) Determine the relative contribution of wind and boat waves for deep and shallow water profiles. A controlled experiment (*sensu* Nanson et al., 1994) in targeted areas that measures wave height, wave direction, wind speed and wind direction, bank erosion, sediment production and turbidity will quantitatively determine the relative contribution of wind and boat waves for the Lower Macleay River.

d) Establish permanent bench-marked cross-sections from floodplain to floodplain in areas of accelerated change and in representative sections of each process zone. These should be located using differential GPS and marked adequately for long-term monitoring.

A process study that investigates both the historical and current bank erosion processes will ultimately provide Kempsey Shire Council and DNR a more valuable database in which to make and develop management policies relevant to bank erosion and sedimentation.

Management Study

- Identify mechanisms to overcome the social and financial barriers to helping landholders implement improved riparian land management
- Provide advice about the relative merits of rock and vegetation and combinations thereof
- Identify zones where bank protection is a priority.
- Identify areas of publicly owned river-bank that would benefit from revegetation.
- Examine what work has been done elsewhere that could be beneficial to the Macleay.
- Advise on-going financial requirements for effective maintenance.

Priority for EMP? High

9.3 Floodplain Wetlands Management

Desired Outcome

- Understanding of key functions of Macleay River Estuary floodplain wetlands
- rehabilitate degraded wetlands
- integration of floodplain and estuary management (HRC 2002)

Critical questions

a) To what degree do coastal floodplain wetlands influence the health and ecology of the Macleay River Estuary?

b) Given the plethora of activities and projects underway on the Macleay floodplain

through various initiatives. What things can be done to help expedite reinstatement of wetland values and functions?

c) What lessons have been learnt from the Yarrahapinni Wetland Rehabilitation Project?

What is the issue with floodplain wetland management?

- Wetlands form a significant component of the Macleay River Estuary occupying some 60% of its coastal floodplain.
- Wetlands provide important functions in terms of maintaining water quality, floodwater storage and habitat for birds, insects and aquatic fauna. Floodplain wetlands also have a very high biological productivity.
- Most of the wetlands on the coastal Macleay floodplain are degraded with highly modified vegetation and drainage systems. As a result, many of the important wetland functions have been similarly compromised.
- There has been a lot of recent activity and there are many projects trialing better ways of managing local floodplain wetlands.
- The goals of some programs appear in conflict with other programs underway. There is scope to better coordinate and integrate these activities.
- NPWS are difficult to engage in wetland management issues.
- All stakeholders do not necessarily agree on the best way to manage wetland areas.

What can the EMP do to help resolve this issue?

Data Compilation / Mapping

- Review current wetland mapping examining how it can best be presented and analysed to be of use in management scenario discussions
- Establish criteria to be used for baseline studies to demonstrate improvements. Citing studies exploring change in relation to the Yarrahapinni Rehabilitation Project

Process Study

a) Provide elevation mapping of floodplain surface to help predict the changed hydrology from restoration works and changed management of flood and drainage structures.

b) Identify priority wetland areas for protection and rehabilitation from the Macleay River health perspective.

c) Describe in detail the relationship between the Macleay River Estuary and its floodplain wetlands.

Management Study

- Integrate existing projects and activities, and in particular, ensure that the goals of the various programs are compatible.
- Determine the optimal management of wetland areas so that there is balance between agricultural productivity, flood mitigation and environmental protection.
- Identify ongoing funding requirements and funding sources.

Priority for EMP? High

9.4 Acid Sulphate Soil Management

Desired Outcome

The group decided that this issue is being reasonably dealt with through a range of existing projects, in particular the "Hotspots" program and through the work being done through the Macleay River Floodplain Project and the Macleay Acid Sulphate Soils Local Advisory Group (MASSLAG).

Critical questions

What can the EMP do to help resolve this issue?

Data Compilation / Mapping

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Process Study

a) To ensure the latest development in ASS techniques have been included within the data compilation. Recommended Contact Mr. Glenn Atkinson (DNR) 6562 0717

b)

c)

Management Study

- Identify cost effective means of getting detailed surface elevation mapping for the coastal floodplain and low lying coastal lands
- Coordinate and integrate all existing projects and activities on ASS issues throughout the lower Macleay.
- Ensure actions in EMP are consistent with and support ASS activities/projects

Priority for EMP? High

9.5 Floodgate and Drain Management

Desired Outcome

- water quality and water level data readily available
- coordination of projects to ensure consistency of direction
- actively managed floodgates to achieve best outcomes
- clear management regime in both flood events and non flood time

Critical questions

a) Is current management of the floodgates in both flood and non-flood period sensitive to ecological considerations.

b)

c)

What are the issues with floodgate and drainage management?

- The group acknowledged that the management of floodgates & drains is the main tool for dealing with the previous 2 issues (ASS management and floodplain wetlands) and therefore links strongly with these issues.
- Administrative issues with drains and floodgates have to be resolved before wide scale improvements can be made to the operation of floodgates and drains resulting in improvements to wetlands and ASS.

- the question of ownership, their maintenance and the process for getting approval to modify these structures must be resolved.
- availability of real time water quality and water level data to assist in floodgate management
- public access to WQ data
- lack of tidal process information on salinity and water levels to AHD for informed management of floodgates
- lack of surface elevation
- consistency of objectives of floodgate management with broad goals of maintaining the health of the river and its ecology

What can the EMP do to help resolve this issue?

Data Compilation / Mapping
- Provide detailed surface elevation mapping of floodplain surface

Process Study
a) Describe how the estuary processes interact with floodplain drainage systems

Management Study

- Investigate the ownership issue.
- Determine the feasibility of Council and/or the State taking ownership (and therefore management responsibility) for floodgates and drains.

Priority for EMP? High

9.6 Boating Use

Desired Outcome
- Planned provision of facilities commensurate with increased recreational and commercial boating use from population increase and tourism pressures.

Critical questions
a) Are additional planning controls warranted for increased waterway usage?

b) How is increased recreational and commercial boating usage best managed?

c) What boat ramps facilities exist, what should they have and where?

d) Which boat ramps and foreshore areas are in public ownership?

e) Are the amenities, building, carparks and river access points in the right spots?

What are the issues associated with boating use?

• Ever increasing numbers of boats places pressure on existing boating infrastructure such as moorings, boat ramps and fuelling facilities, particularly at the Maddy's Flat area at South West Rocks as well as impacting on river bank foreshore areas.

• Extensive aquatic plant growth in bed of Macleay from Frederickton to Green Hills upstream of Kempsey obstruct navigation channels at low tide and during the warmer months.

• Some conflicts between estuary users, suggested speed restrictions, possibly limiting access to certain areas of the estuary to protect sensitive habitat.

• The Back Creek area at South West Rocks has issues that include poor entrance conditions, concerns with the existing dredging program, recreational fishing issues, public access, derelict structures etc.

• Maritime NSW are proposing to prepare a "Boating Management Plan" for the entire Macleay River estuary and would like to involve the Estuary Management Committee in preparing the Plan.

What can the EMP do to help resolve this issue?

Data Compilation / Mapping

- Identify & map all public foreshore land and key access points to the river.
- Map all foreshore structures and identify those that are public facilities.

Process Study

a) Identify the effects of vessel wash on shoreline stability and bank erosion.
b) Investigate relationship of Back Creek and its catchment to the lower Macleay (ref Water Research Laboratory assessment 2003)
c) Identify areas suitable for boating facilities in relation to currents habitats etc
d) Describe the extent role and function of aquatic plants within the Macleay River bed.
e) Describe the critical processes and ecological considerations in vicinity of Maddys Flat boat ramp and boat ramps in general

Management Study

- Develop a set of appropriate vessel operating criteria that may be applied to sections of the estuary for different craft and/or activities.
- Develop a concept plan for Back Creek and Maddys Flat area.(check status of Councils POM for this Crown Reserve)
- Investigate options for upgrading boat facilities at Maddy's Flat, with a particular focus on providing for small boats (ie capable of handling the Macleay River entrance.)
- Opportunities to provide strategically located network of public waterfront structures
- Provide guidance to Waterways in relation to the development of a Boating Management Plan for Macleay estuary.
- Clearly define the role and relationship each area contributes to the overall boating and recreational needs of the Macleay
- Undertake community consultation in relation to Back Creek and Maddy's Flat.

Priority for EMP? High

9.7 Sedimentation

Desired Outcome

- Understand the role of sedimentation in river processes and its ecology
- Maintain navigable waterways between Kempsey and the river entrance
- Reduced rate of sedimentation
- Sustainable river based gravel extraction operations upstream of tidal limit
- Detailed hydrographic survey of the estuary
- Ensure no health risk is derived from presence of heavy metal contaminants

Critical questions

a) What role is sedimentation from upstream playing with estuarine processes? – where is it, what is happening to this material. and what is of consequence?

b) Does the heavy metal contamination in the river sediments and across the floodplain pose a health risk?

What is the issue with sedimentation?

- The Macleay River, Macleay Arm and Clybucca Creek appear to be getting shallower over time.
- The entrance to Back Creek is constantly shallow, regardless of the amount of dredging going on.
- Heavy metal contamination of estuary sediments and its coastal floodplain from mining operations up river and its health risk implications to primary production systems based on the floodplain

What can the EMP do to help resolve this issue?

Data Compilation / Mapping

- Map extent type sedimentation (refer Paterson Britton Report to DLWC 2003)
- Produce base map of shoals, highlighting areas problematic to boaters eg Kemspey Boat Ramp, Frederickton, Stuarts Point caravan park
- Review UNE research to assess the risk potential of heavy metal contamination to food cycle.
- Review conditions of Crown License for Back Creek Entrance Dredging

Process Study

a) Describe the type and distribution of sediments within the estuary
b) Describe processes causing shoaling of entrance to Back Creek , Macleay River, Macleay Arm and Clybucca Creek to improving understanding of natural processes and determine whether intervention is warranted.
c) Investigate the source of sediment, and determine role in river processes and river ecology especially its role during floods.
d) Estimate sediment transportation rates and deposition location/rates and their sources (build on Macleay Extractive Industry study commissioned by DNR 2003)

Management Study

- Re-examine the role of Back Creek, as a boat harbour, recreational area, swimming, fishing, walking, snorkelling, given the difficulty with keeping the channel open.

- Investigate measures to improve community understanding of safety issues associated with crossing entrance bars, in the context of prevailing coastal processes.

Priority for EMP? Medium

9.8 Tourism Management

Desired Outcome

- Range of well spaced, and located public access reserves with well designed facilities where required along the waterway foreshores

What are the issues with tourism management?

- Increased population and recreational pressures and demands/impacts on habitat
- Increased demand for facilities
- Lack of toilet facilities particularly Fisherman Reach and Back Creek
- Boat ramp facilities and public access along Macleay River estuary generally poor
- Lack of boat wash facilities
- Primitive camp site impacts on eg Renwick Island, Golden Hole and Fisherman Reach areas

What can the EMP do to help resolve this issue?

Data Compilation / Mapping

- Map location of all river access points and facilities

Process Study

a) Assess the quality of the toilet amenities and waste facilities in public reserves fronting the estuary, in terms of environmental impact risk.

Management Study

- Opportunity for provision of recreational walkways, cycle paths etc
- See points raised under issues Water Quality, Boating Use, Habitat Protection and Sedimentation.

Priority for EMP? High

9.9 Habitat Protection

Desired Outcome

- Critical habitat appropriately managed and protected within the planning framework
- Full knowledge of extent, type, condition and threats

Critical question

a) What are the key habitat areas of the Macleay River estuary?
b) Which areas require improved management or protection?

What are the issues with habitat protection?

- Level of protection over significant habitat value on the Macleay Arm and Clybucca Creek and small remnant tracts of high value coastal floodplain vegetation

- Poor documentation of extent type condition and threats to key habitat
- What is key habitat? and how does it relate to functioning of ecology of Macleay
- Role of coastal floodplain wetlands and backswamp country in Macleay river health
- No recognised database of fauna existing in macleay coastal floodplain wetlands
- Failure to value rivers and streams as economic, ecological and aesthetic community assetts (HRC 2002)
- Treatment of waterways as the residual in the landuse decision making process (HRC 2002)
- Increased use of the lower river has the potential to impact on critical estuarine habitat. Critical habitat areas provide sanctuary, a food source and shelter for fish and other aquatic species.
- Uncontrolled commercial and recreational fishing and boating has the potential to damage habitat.
- Existing landuse practices may degrade

What can the EMP do to help resolve this issue?

Data Compilation / Mapping

- Map all key habitat of the estuary and its coastal floodplain its extent, type, condition and any threats to its ongoing functioning. Key habitat are those types listed in **NSW Fish Habitat Plan No1 General**. and will include saltmarsh, intertidal flats and shallow water areas important for rare, endangered, vulnerable species including migratory shorebird species.
- Consultant to liase with Rob Williams NSW Fisheries Port Stephens, to discuss mapping already undertaken &/or underway as part of Bass Habitat project. It is envisaged that NSW Fisheries project outputs will form the basis upon which further work can be added. Any opportunity to value add must be explored.

Process Study

a) Describe the role of important habitat in the ongoing maintenance of estuary ecology, eg look at the abundance of river bed aquatic vegetation its role, function and relationships

Management Study

- Examine options for protecting these areas, including looking at the option of marine reserves and no take (fish sanctuary) zones.
- Investigate opportunities for aquatic reserves, including the concept of "no take" fish sanctuary zones.
- Identify activities that may threaten important habitat values
- Investigate ways to protect the sea grass meadows upstream of the foot bridge at Stuarts Point on the Macleay Arm.
- Examine the issue of habitat rehabilitation throughout the lower estuary. Set priorities for rehab.
- Develop a wetland management strategy for all key backswamp/wetland areas of the Macleay River estuary.
- Identify opportunities for improving the management of high conservation value areas on private lands and Public Lands
- Identify opportunities for re-establishing healthy corridor of native riparian vegetation.

- Investigate opportunities for land purchase (through NPWS) of areas with high conservation values
- Identify opportunities for Ramsar wetland declarations on the coastal floodplain.

Priority for EMP? High

9.10 Fish & Shellfish Management

Desired Outcome

- Sustainable use and management of fish resources
- Fish breeding grounds be protected
- Selected parts of estuary designated "no take areas" (HRC 2002) during important periods of lifecycle
- Maintenance of lease areas suitable for healthy oyster production be considered a fundamental estuary management objective

Critical question

a) What strategies need to be in place to ensure our fisheries continue to be productive?

b) Where does management effort have to focus to reduce the amount of river closures imposed on the Shellfish industry in this estuary?

What is the issue with fish and shellfish management?

- Exploitation of fish stock within estuary
- Habitat damage from commercial netting practices
- Too many commercial operators
- Recreational fishing pressures
- Most stocks are classified as fully fished or fully exploited (HRC 2002) though NSW Fisheries firmly deny that this is the case
- No estuarine areas reserved as fish havens protected from all fishing activities, traditional owners were known to protect "keep areas"(HRC 2002)
- Threat of acidic discharge and low DO black water from backswamps areas
- Human faecal contamination of oyster growing areas
- Continued decline in oyster production, the States most valuable agricultural enterprise per unit area.
- History of faecal bacterial contamination, with the source of contamination unknown. affecting the Shellfish industry
- Conflicts between recreational and professional fishers – often through the media.

What can the EMP do to help resolve this issue?

Data Compilation / Mapping

- Collate mapping of existing and abandoned oyster leases in consultation with NSW Fisheries Pt Stephens.
- Summarize existing information on the issue of closing the estuary to commercial fishers.

Process Study

a) Describe key factors that contribute to Macleay River closures.
b) Analyse existing Shellfish Quality Assurance Program water quality information to assess effectiveness of current water quality monitoring
c) Identify water quality hot spots that are contributing to oyster closures.
d) Identify those areas of estuary and its floodplain and time of year critical to breeding and development cycle of fishes

Management Study

- Assess option of "no take zones" to protect key habitat or nursery areas in certain times. See "habitat protection" issue above.
- Investigate the bacterial contamination issue, and make recommendations to resolve.
- identify a water quality monitoring strategy that provides industry and managers with clear understanding of problem areas that pose high risk to safe food production
- establish links with Safe Food authority to help generate an integrated approach to water quality analysis, reporting and review of estuarine water quality health
- describe the current status of habitat conservation areas in this area by Dept. Environment and Conservation and NSW Fisheries

Priority for EMP? High

9.11 Water quality

Desired Outcome

- Improve quality of waters discharging from the backswamps
- Access to regular analysis of real time water quality and water level data
- Integrated water quality monitoring network providing managers, commercial operators and community effective management tool

Critical questions

a) What strategies must be put in place to ensure compliance with desired guidelines?
b) What measures will help reduce the amount of river closures for sale of shellfish produce?
c) How water quality is best monitored?

What are the issues associated with water quality

- No overall water quality monitoring strategy that is integrated and routinely analysed to provide all users with access to current information
- Deterioration of flood structures and related wetland impacts
- Water quality problems (often at times of high or low flow):
- Discharge of acid water into estuary from ASS high risk areas
- 'Blackwater' discharge of low dissolved oxygen into estuary from backswamp drainage networks after / during storm events
- High level turbidity during flood events and its impact on estuary and marine habitat areas

- Faecal coliform inputs and associated public health risks to waterway and beach users from unsewered villages, caravan park and urban stormwater;
- Flood water management
- Heavy metal contamination of estuary sediments and its coastal floodplain from mining operations up river and its health risk implications to primary production systems based on the floodplain
- Salinity incursion into productive backswamp country
- Problems understanding and obtaining data plus public access to data
- Ongoing ability to fund and maintain water quality monitoring
- Tidal processes, levels and salinity level interactions with drain outlets inverts

What can the EMP do to help resolve this issue?

Data Compilation / Mapping

- Describe current water quality monitoring network and data management and use practices of key user groups.

Process Study

a) Assess water quality of Macleay River Estuary with respect to ANZECC guidelines and the interim water quality and river flow environmental objectives (NSW Gov 1999)

b) Estimate stormwater loadings to the Estuary from the diffuse and point source sources within the catchment during average & peak holiday time (eg rural residential septics, Sewerage Treatment Plants, urban area stormwater outlets, road runoff, rural landuse)

c) Describe how these loads impact on the river highlighting those areas posing greatest threat (eg The extensive growth of aquatic weeds in the vicinity of Kempsey and Frederickton is potentially indicative of elevated nutrient levels in the water column (see Point 3 in Section 4.2 Data Comp Study 2005).

d) Investigate the findings of current research by UNE into the heavy metal contamination of the Macleay floodplain with arsenic (As) and antimony (Sb).. Assess likelihood of uptake of heavy metal contaminants from bed and floodplain sediments into the food cycle, eg fish, shellfish or dairy products.

Management Study

- Examine the adequacy of stormwater management and runoff quality and quantity control within planning controls LEPs, DCPs and development guidelines.
- Document where improvements can be made.
- Review Councils current water quality monitoring regime with a view to developing a monitoring strategy that provides Council, key players, community and industry with a cost effective means of knowing how the estuary is performing, highlighting those areas that need some management action. (eg coastal crc work in SE Qld has some useful approaches)
- Examine how data collection for the Shellfish Water Quality Assurance Program under the Safe Foods system can be further enhanced / integrated with Councils and the States data collection programs.

9.12 River health

Desired Outcome

The Committee has endorsed a vision (adopted July 2004) that states;

"A clean healthy and productive estuary managed sustainably to the benefit of present and future generations".

Data Compilation / Mapping

- Review HRC North Coast Report for evaluation and comparison.
-

Process Study

a) Identify what needs to be researched, evaluate and monitored to ensure the health of the Macleay improves over time

Management Study

-
-
-

9.13 Climate change and sea level rise

Desired Outcome

- Implications of sea level rise and climate change fully acknowledged within the landuse planning framework
- Appropriate landuse of floodplain and backswamp country

Critical questions

a) What is the expected rate of seal level rise?
b) What are the implications of sea level rise on;
   - geomorphic processes of estuary evolution?
   - current landuse of coastal floodplain, saltmarsh and backswamp country?
   - impacts on infrastructure roads, stormwater, sewer, and drainage systems?
   - tidal flushing characteristics?

b) Do current planning controls adequately address this scenario?

What are the issues associated with climate change and sea level rise?

- International acceptance by the scientific community that sea level rise and climate change are realities to be planned for
- Implications of sea level rise on current landuse of floodplain and backswamp country
- Impacts on infrastructure, saltmarsh, mud flats
- Implications of changed hydrology on floodplain drainage and wetlands
- Increases in sea level and its effect on tidal flushing and tidal velocities in the estuary

> Whilst there is still some debate about the rate of change, it seems that there is little doubt that low lying coastal lands will be subject to greater risk of inundation from storm surge and extreme tides. Understanding the risk associated with sea level rise will have ramifications for land-use planning.

What can the EMP do to help resolve this issue (low-medium priority)?

Data Compilation / Mapping

- Map projected inundation levels for climate change scenarios and assess implications for current planning and development controls of Council.
- Map surface elevation of coastal floodplain lands

Process Study

a) Discuss the implications of sea level rise and climate change on;
   - current landuse of floodplain and backswamp country
   - impacts on infrastructure,
   - key habitats
   - implications of changed hydrology on floodplain drainage and wetlands
   - its effect on tidal flushing and tidal velocities in the estuary

Management Study

-
- Investigate if the Local Environmental Plan and Development Controls are adequate.

Priority for EMP? Medium.

9.14 Information availability

Desired Outcome

What is the issue with information availability?

- Whilst there has been a substantial amount of scientific work done in the Macleay River estuary, it is not generally easily accessed or known about. This is particularly true for the general community. This can result in "re-invention of the wheel" which is a waste of time and resources.

What can the EMP do to help resolve this issue?

Data Compilation / Mapping

- Establish a central registry of information that relates to the Macleay estuary and floodplain. This registry to include literature/reports, projects and contact details.

Process Study

a) To ensure that all relevant information/data developed is available on Councils data register web-site.
b) Review the outcomes of the data compilation and mapping study and formulate any recommendations within the Process Study.
c)

Management Study

- Package and make readily available relevant information pertaining to the management of the Macleay River Estuary and its coastal floodplain

Priority for EMP? High

9.15 Integration of projects

Desired Outcome

- Improved coordination and communication of projects active on the Macleay and its floodplain
- Integration of landuse planning and natural resource management outcomes

What is the issue with integration of projects?

- There are lots of natural resource management activities and projects underway on the Macleay coastal floodplain and estuary working to a mix of goals and objectives
- There is no clear mechanism to ensure consistency, integration and efficiency across a wide number of activities.

What can the EMP do to help resolve this issue?

Data Compilation / Mapping

- Create central register of projects and reports

Process Study

a) Implement a clear communication strategy for the Macleay River Estuary and its floodplain that provides regular newsletter updates for community.

Management Study

- The central register discussed in the "information availability" issue will assist with integration as well as improved communications.
- Examine opportunity for integration through Councils Coast & Estuary Management Committee estuary planning process.
- Investigate scope for integrating Councils EMC and Macleay River Floodplain Projects Committee.

Priority for EMP? High

10 REPORTING AND TIMETABLE

10.1 Project Management

10.1.1 Brief and concise progress reports to Council & DNR on the study findings and progress are required **monthly**.

10.1.2 Any aspects of the study that may not have been identified in the brief but could add value to the end product or improve on the process be clearly communicated to Council with details of specific tasks, outcomes envisaged with an estimate of time and costs

10.1.3 Written confirmation amending the scope of works to accommodate such tasks must be obtained from the Council contact officer before proceeding.

10.2 Draft Process Study Report

10.2.1 Considerable attention is to be given to presenting information in clear written, graphical, diagrammatic and tabular form that is readily understood by councils, Government agencies and the community.

10.2.2 Draft process study reports shall be produced and will be subject to review by Kempsey Council, Coast and Estuary Management Committee, relevant stakeholders and technical peer review.

10.2.3 Draft reports to include:

- 5 paper copies of each
- 10 CD roms with an electronic version in Microsoft Word format to allow editing
- 10 CD roms with document as pdf file format for public comment or listing on Councils web site
- all draft spatial and mapped data in JPEG format for use by Council and DNR GIS systems.

10.3 Public Exhibition

During the public exhibition period the Consultant will be required to give a presentation to Coast & Estuary Committee and hold a public meeting to describe the findings of the processes study and to provide answers to any enquiries.

For the public exhibition and meeting the **Council will**:

- distribute copies of the draft plan report;
- list the report and associated reports on Councils web site
- chair the public meeting;
- prepare advertisements and pay advertising costs;
- provide a suitable venue
- print handouts;
- be in attendance at the public meeting to provide assistance.

For the public exhibition and meeting the **Consultant will**:

- prior to the public exhibition, prepare a 1-2 page newspaper article that summarises key processes, character and findings of the Macleay River Process Study
- facilitate the public meeting;
- prepare a handout summarising the key findings
- provide a comprehensive presentation at the public meeting;
- answer any technical enquires;

10.4 Final Report

Following consideration of community comments and review by the Committee of proposed amendments, and written Council approval, the Consultant shall

- print fifty (50) copies (with colour exhibits) of the final Macleay River Processes Study to allow for distribution to Council, libraries, key stakeholder groups and State Agencies
- 10 CD Rom copies of the final reports in pdf format

In addition the Consultant shall supply to Council and DNR an unbound printing quality master copy (including artwork) of the Estuary Management Plan plus a copy in the following electronic form:

- textual data (report) - Word 6.0 for Windows or later version
- format suitable for web listing eg pdf file format
- graphical data - Mapinfo.TAB format or Autocad.DXF format, Mapinfo version 4.6 Autocad Version 14 Kempsey Council GIS check!!
- Tabular data - Excel 6.0 format or later version

The final report including figures must be published in format for distribution on CD ROM and by a web site.

The Consultant shall supply a realistic timeframe and program timetable for completion to draft study report and time required from receipt of community comments to final study report stage.

11 DATA AND REFERENCE DOCUMENTS

11.1 The Consultant will be responsible for collecting adequate information for review to fulfil the requirements of the brief. There will be no charge to the Consultant for access to reports held by DNR offices or Kempsey Shire Council.

11.2 All spatial data and relevant metadata must be forwarded to Kempsey Council and DNR Kempsey office upon completion of the project on CD-ROM.

Data must comply with the requirements as set out in "DNR North Coast Region Spatial Information Management Manual Nov 2003" All data obtained or developed through project funding are regarded as Department deliverables, including relevant license documents.

12 CONTACT OFFICER

The Council officer responsible for briefing and liaison
Mr Ron Kemsley
Ph 6566 3249
Fax 6566 3245
ron.kemsley@kempsey.nsw.gov.au

DNR Officer
John Schmidt
Ph 65620707
Fax 65629729
john.schmidt@DNR.nsw.gov.au

13 FEES

13.1 The fee shall be a lump sum as accepted by Council with the exception of hourly rates for attendance at Committee or other public meetings that are additional to the meetings and community consultation identified in the Brief.

13.2 The lump sum fee shall include final printing of the Study specified meeting attendance, field surveys and data collection, and all costs associated with the community consultation process.

13.3 A fee proposal shall be submitted on the Lump Sum Fee Schedule at **Schedule 1**.

13.4 An upper lump sum budget of $150,000.00 shall apply for tasks outlined in this brief. Should the Consultant consider the budget inadequate for the scope of work required, an alternative fee proposal can also be submitted. Any additional field data deemed necessary by the Consultant to fulfil the requirements of the brief should be detailed in the fee proposal.

13.5 Consultant may submit a fee proposal for all components of the Process Study (See Section 8.1) or for any individual component or key areas of investigation for the Process Study.

13.6 For work that may arise which is beyond the original engagement, the Consultant is required to provide hourly rates for professional and technical staff from which a time based fee for additional work can be negotiated.

13.7 Progress payments shall be made in accordance with an agreed payment schedule that reflects completion of tasks and/or achievement of milestones. The consultant shall submit as part of its proposal a proposed time based progress payment schedule.

14 QUALITY ASSURANCE

14.1 All work under this engagement, including work by sub-consultants, secondary consultants and service providers, shall be carried out under a quality system based on AS/NZ ISO 9001:1994 (or AS/NZS ISO 9002 : 1994 if applicable).

14.2 The proposal must be prepared as a Quality Assurance document.

15 COMPLETION OF PROPOSAL

The Consultant is to submit the following information in writing within the time allowed. Four (4) copies of the Consultant's proposal are required.

a) Consultant's capabilities with respect to methodology, understanding of the brief, experience, team to be used and community consultation program. The Consultant must demonstrate that the disciplines of hydrologic and hydrodynamic engineering, marine biology, estuarine & wetland ecology, natural resources/town planning, community consultation are adequately covered.

b) Consultant's fee proposal, itemised as per **Schedule 1**.

c) Name of the Project Manager for the commission, key staff employed on the work, and persons empowered to accept direction from Council.

d) Name of proposed sub-consultants

e) A detailed program showing:
- start and finish dates for each project task,
- milestones and critical dates for specialist input,
- proposed meetings with the Committee and/or council,
- key personnel working on each project task and allocated time in hours;
- progress payments schedule; and
- time allowances for reviews and exhibitions.

f) Confirmation of required professional indemnity and public liability insurance cover.

g) Details of the Consultants quality system.

h) Details of recent and relevant work performed by the Consultant.

i) Any pecuniary or possible conflict of interest associated with the Commission

16 SELECTION CRITERIA

16.1 Proposals shall be assessed by a sub-committee of the Macleay Coast & Estuary Management Committee. The sub-committee is likely to be comprised of representatives from Council, DNR and the community.

16.2 Proposals will be assessed on an objective basis in general accord with the following selection guidelines. Factors to be considered in the assessment process will be:

a) methodology;
b) demonstrated level of understanding of what is required to produce a quality outcome;
c) the quality of the Consultant's team in terms of demonstrated experience in the field. Proven tack record. Of particular importance is the presence of sufficient depth of experience to cover the broad range of skills needed to address the issues and formulate objectives and strategies;
d) community consultation proposal and skills;
e) overall fee;
f) project timetable; and
g) understanding of the Estuary Management Process.

17.0 ACCEPTANCE

Written acceptance and agreement from the Consultant that the work will be undertaken in accordance with the Brief is required before the Commission can begin.

18.0 COUNCILS CONSULTANCY AGREEMENT

18.1 General Conditions of Engagement

The tasks as identified in the brief are based on Council's assessment of the study. The consultant may suggest any amendments required to achieve the study objectives during the course of the study.

Any proposed departure from the agreed study tasks must first be ratified by Council before proceeding.

The conditions under which the consultant will be engaged shall be generally in accordance with the Association of Consulting Engineers Australia Guide to Consulting Engineering Services and this Brief.

18.2 Termination

The consultant's commission to carry out the study may be subject to termination due to non-performance or inability to meet set deadlines. The consultants will be informed by letter of such termination. This letter will be final and not subject to further correspondence.

18.3 Confidentiality

Investigations and reports will remain confidential unless, or until, released by the Council.

18.4 Sub-Consultants

The primary consultant may engage a sub-consultant for a specified part of the study subject to the written approval of Council. The primary consultant is responsible for the sub-consultant's work and compliance with the terms of the study. The sub-consultant has no claim on Council for fees or expenses.

18.5 Insurance

18.5.1 Professional Indemnity

The consultant shall maintain a current Professional Indemnity policy of insurance at a sum not less that $300,000 or not less than that sum specially nominated in the Letter of Engagement. The consultant shall maintain a policy of insurance for an amount that is sufficient to indemnify the consultant after completion of the commission.

18.5.2 On Site Public Liability

The consultant is responsible for taking out at least $5 million public liability insurance giving cover to himself/herself, his/her employees and any agent engaged by consultant for the duration of the work.

The consultant should also be aware of the obligations and liabilities under the "Occupational Health and Safety Act, 1983" and National Code of Practice pertaining to the Act.

18.5.3 Employees or Agents

Before commencing work under the commission, the consultant shall ensure that a suitable insurance policy is taken out giving cover to the consultant, the consultants employees and agents against any liability, loss, damage, costs and expenses arising at common law or under ant statute as a result of personal injury to or death of any person employed by the consultant or the consultants agents in or about the work.

18.5.4 Inspection of Insurance Policies and Receipts for Premiums

The consultant shall make available for inspection the policies of insurances effected, for the purpose of complying with this section and the receipt for payment for the current premiums or other such evidence of insurance as may be requested by Council.

18.6 Copyright

Results of the study and the models developed in the course of the study are the ownership of Council. All data files are to be provided to Council on completion of the study.

18.7 Conflict of Interest

The consultant shall inform Council immediately of any matter connected with this study which could give rise to an actual or potential conflict of interest. This information will be treated as confidential.

18.8 Certification

All final documents prepared by the Consultant must be signed by the Project Director nominated in the consulting proposal to certify that they have been prepared by competent professional staff, checked for accuracy and comply with relevant regulations and the requirements of the brief.

18.9 Corrections

Any error, ambiguity or deficiency, which becomes apparent during the course of the study, shall be referred to the consultant for correction or clarification. The consultant shall not be entitled to an additional fee where the correction or clarification arises from a fault of the consultant.

18.10 Acceptance of Commission

Written confirmation of acceptance of the commission for the study, in accordance with the conditions of engagement, is required before work commences.

18.11 Payment and Costs

Monthly progress payments will be made after project progress reports. Progress payments are not acknowledgment of the satisfactory performance of work and Council reserves the right to recover any overpayment.

Council will retain 10% of project costs on completion of the draft documentation. All monies will be paid on acceptance of the final documentation.

Clause SC2 - Goods and Services Tax
"Goods and Sales Tax (GST)" means any tax on goods and/or services, including any value added tax, broad based consumption tax introduced in Australia.

"GST Law" includes and Act, order or regulation which imposes or otherwise deals with the administration or imposition of a GST in Australia.

Notwithstanding any other provision of this Agreement:

(a) If a GST applies to any supply made by any party or in conjunction with this Agreement, the consideration provided or to be provided for that supply will be increased by an amount equal to the GST liability properly incurred by the party making the supply.

(b) If the imposition of a GST or any subsequent change in the GST law is accompanied by or undertaken in connection with the abolition of a reduction in any existing taxes, duties or statutory charges (in this clause *"taxes"*), the consideration payable by the recipient of the supply made under this Agreement will be reduced directly or indirectly as a consequence of the abolition of or reduction in taxes.

Each party warrants that at the time any supply is made under this agreement on which GST is imposed, that party is registered under the GST law. If the other party requests written evidence of registration, the party claiming to be registered will promptly produce evidence satisfactory to the party seeking such evidence.

Any invoice rendered by a party to this agreement which seek to recover an amount of GST payable by that party must conform to the requirements for a tax invoice (as that term as defined in the GST law). If requested to do so by the recipient of the supply, the supplier must provide a tax invoice within 14 days.

Council shall not be obliged to make any payment unless it is satisfied that the work satisfies the requirement of the brief.

The consultant shall be responsible for all his/her own costs for travel, accommodation and other expenses.

19.0 RESPONSIBILITY OF CONSULTANT

19.1 The responsibility for the preparation of the entrance management strategy and the supervision of sub consultants and their integrity, effectiveness and suitability for the purpose rests with the consultant. Council is relying upon the consultants knowledge, skill and judgement to produce a finished product which is fit for its intended purpose.

19.2 The consultant shall accept full responsibility for all work undertaken as a requirement of this brief.

19.3 The consultant is responsible for ensuring that adequate data and information to meet the requirements of this brief have been supplied are obtained from the appropriate sources.

19.4 Draft documents submitted for review by Council shall be signed by the consultants principal nominated in the proposal to certify that the documents represent adequate professional presentation for the particular of the work. All final documents prepared by the consultant must be signed by the consultants principal nominated in the proposal to certify that the documents have been prepared by competent professional staff and have been checked for accuracy, compliance with relevant regulations, the requirements of the brief and fully co-ordinated with all related documents.

19.5 Any errors, ambiguities or deficiency, which becomes apparent during the commission, shall be referred to the consultant for correction or clarification in suitable form. The consultant shall not be entitled to an additional fee where the correction or clarification arises from the fault of the consultant.

19.6 The consultant should ensure that the documents produced under the commission comply with relevant Acts, Codes, Ordinances and Regulations. The consultant shall immediately advise Council and obtain direction if the work requirements conflict with any such statutory requirement.

19.7 The consultant is to advise Council of any conflict of interest that may arise in the undertaking of this study from other work undertaken by the consultant in the study area.

SCHEDULE 1 LUMP SUM FEE SCHEDULE
MACLEAY RIVER ESTUARY PROCESSES STUDY

ITEM	AMOUNT $
Stage 1 Consultation	
Attend public meetings	
Develop Communication strategy	
Implement Communication strategy	
Undertake public exhibition of draft Study	
Undertake exhibition to Council of Final Study	
Sub total	
Stage 2 Process Study Undertake Study as per Section 9.	
Processes	
Hydrology & Hydrodynamic	
Sedimentation	
Ecological Processes	
Issue Analysis	
Sub total	
Stage 3 Prepare DRAFT Process Study report.	
Finalise and print Reports (5 copies).	
Cost per additional copy if required	
Sub total	
Stage 4 Prepare FINAL Process Study report.	
Finalise and print Reports (50 copies).	
Cost per additional copy if required	
Sub total	
OTHER	
Disbursements (all Stages).	
Additional data requirements – (detail if required).	
Work in the brief not covered by the above items.	
Sub Total	
TOTAL FEE	
Additional Meetings	
Attend any additional meetings as directed (per meeting).	

SCHEDULE 2

MACLEAY RIVER ESTUARY PROCESS STUDY
HOURLY RATES FOR VARIATIONS.

NAME	ROLE	HOURLY RATE