Wagonga Inlet

Estuary Management Study and Plan

Final

November 2001

Summary

The Estuary Management Study and Plan for Wagonga Inlet was prepared under the direction of the Wagonga Inlet Estuary Management Committee (EMC) and was jointly funded by Eurobodalla Shire Council (ESC) and the Department of Land and Water Conservation (DLWC) under the State Government's Estuary Management Program.

It was developed from existing background information; investigations carried out as part of the preceding Estuary Processes Study (MHL et al 2001a); investigations into entrance bar improvements (MHL et al 2000); and through community and stakeholder consultation.

This document was prepared by Nelson Consulting with input from the NSW Department of Public Works and Service's Manly Hydraulics Laboratory (MHL), Environmental Science and Engineering (ESE), The Ecology Lab (TEL) and Coastal and Marine Geosciences (CMS).

The goals of the Estuary Management Plan are to:

- protect water quality within the inlet for human health and to maintain a healthy ecosystem;
- ensure future development does not detract from the values of the inlet and is appropriately designed;
- conserve the natural ecological communities and their component flora and fauna;
- protect and increase recognition of Aboriginal and European heritage;
- improve boat navigation and safety; and
- in keeping with conservation values, ensure equitable use of the inlet's waterway and recreational resources.

Recommended actions to be taken to implement the Management Plan include:

- Developing a water quality monitoring program for Forsters Bay to assess ecosystem health and compliance with guidelines for recreational use.
- Reviewing Council plans and policies to increase protection of the environmental values of Wagonga Inlet.
- Managing reserves of ecological significance for low impact activities, environmental education activities etc and encouraging community involvement in weed control and bush regeneration.

- Establishing major interpretive signage at Rotary Park covering both Aboriginal and European cultural heritage and installing interpretive signs at other points of interest/walks around the inlet.
- Exploring opportunities to develop a 'Bar Watch' System to improve the dissemination of information on the bar conditions and hence improve boating safety.
- Ongoing monitoring of navigation channel depths and sand intrusion into Forsters Bay to assess impacts on boating and the need for dredging.
- Preparing a mooring plan for the inlet and reviewing boating controls and impacts of vessel operation with reference to areas of ecological significance.
- Preparing a Town Wharf Extension Design Report, including boat pumpout facility, and upgrading/providing additional public foreshore facilities, such as boardwalks, jetties and fish cleaning tables.

See **Figures A** and **B** for more information.

Table of Contents

Figures

Appendices

1 Introduction

1.1 Study Area

Wagonga Inlet is located on the NSW South Coast, within the Eurobodalla Local Government Area (LGA), which extends from Durras Lake (north of Batemans Bay) in the north to Wallaga Lake in the south. The Princes Highway crosses the inlet at Narooma, which is approximately 355 km south of Sydney, 222 km from Canberra and 700 km from Melbourne. See **Figure 1.1** which shows the study area and location.

Wagonga Inlet is permanently open to the ocean and the entrance channel has been modified by the construction of training walls and breakwaters. The inlet consists of an entrance channel which extends upstream of the Princes Highway Bridge and two major basins, Forsters Bay (located immediately south-west of the bridge) and Wagonga Inlet proper. The major tributaries are Billa Bilba and Burrimbidgee Creeks to the north-west and Punkally Creek to the south.

Established, urban development is located along the Princes Highway to the north and south of Wagonga Inlet (in the eastern section of the catchment), with new development occurring at Ringlands Estate (to the west of Forsters Bay). Foreshore recreation and boating facilities are primarily located along the entrance channel and the eastern foreshore of Forsters Bay. The majority of the catchment to the west is within Bodalla State Forest.

1.2 Regional Context

The main centres along the Eurobodalla Coast are Batemans Bay, Moruya and Narooma (see **Figure 1.1**). Batemans Bay is the largest town in the shire and is a growing commercial and tourist centre. Moruya is the most central town and has historically been the service centre of the Eurobodalla LGA. Narooma is mainly a tourist and retirement area (ESC 1998).

The population of Narooma is approximately 3,400 (Tourism NSW 2000). Australian Bureau of Statistics (ABS) census data from 1981 onwards shows a strong growth in the 50-54 years age group and increases in the 65 year plus age group, illustrating the areas popularity with retirees (ESC 1998).

During the summer holiday period the population of Narooma and surrounding areas is estimated to increase to 10,000 (Masterplan Consultants 1989). Compared to other regions a high number of visitors to Eurobodalla, and the South Coast region in general, stay in their own holiday homes or at caravan parks (Advance Tourism 1997).

The distinguishing tourist attraction for Narooma is Montague Island (managed by NSW National Parks and Wildlife Service (NPWS) for its wildlife and heritage values) and associated cruises which cater for whale watching, fishing and diving.

1.3 Planning Framework

Land use in and around Wagonga Inlet and in the catchment is controlled by the *Eurobodalla Urban Local Environmental Plan 1999* and the *Eurobodalla Rural Local Environmental Plan 1987* (LEPs). Bodalla State Forest is managed under the *Ecologically Sustainable Forest Management Plan for the South Coast Forestry Region* (2001) which replaced the *Narooma Management Plan* (1986).

Ringlands Estate is subject to a specific Development Control Plan (DCP). Natural areas and undeveloped Crown and Council reserves are subject to a generic plan of management (ESC 1997), prepared under the Local Government Act, and a

foreshore and townscape masterplan has been prepared for Narooma and surrounds by Conybeare Morrison & Partners et al (1998). Under a directive from the Environment Protection Authority (EPA), a stormwater management plan (which includes Narooma) was completed and adopted by Council in May 2001.

The Estuary Management Study and Plan was prepared in accordance with the State Government's *Estuary Management Policy*. It is consistent with the principles, aims and objectives of this policy and other policies and plans relevant to Wagonga Inlet and estuary management in general (see **Appendix A**).

1.4 Management Arrangements

Eurobodalla Shire Council (ESC) is responsible for the day to day management of most public land and facilities around Wagonga Inlet, with the Department of Land and Water Conservation (DLWC) being responsible for the management of Town Wharf and unreserved Crown land, including the bed of the inlet. Other authorities with a management role for Wagonga Inlet and its foreshores include NSW Fisheries (oyster farming and recreational fishing in the inlet), the Waterways Authority (recreational boating and management of moorings) and State Forests (management of some foreshore land and a picnic area on the inlet). Refer to **Appendix A** which provides more information on authority roles and legislation relevant to estuary management.

1.5 Plan Preparation and Format

This Estuary Management Study and Plan was prepared under the direction of the Wagonga Inlet Estuary Management Committee (EMC) which includes community, State Government and ESC representatives. It was based on the results of community consultation and with reference to existing reports including:

- *Wagonga Inlet Estuary Processes Study* (2001a), MHL et al;
- *Investigations of Narooma Bar Improvements* (2000), MHL et al;
- *Wagonga Inlet Estuary Management Study Questionnaire Results* (2000), Nelson Consulting (see **Appendix B**);
- *Draft Wagonga Inlet Flooding Investigation* (1999), Gary Blumberg and Associates; and
- Narooma Foreshore and Townscape Masterplan (1998), Conybeare Morrison and Partners et al.

The Appendices to the Estuary Management Study and Plan contain background information and have been printed under a separate cover.

2 Background

2.1 Waterway Characteristics

Wagonga Inlet has a waterway area of 6.9 km^2, catchment area of 110 km^2 and extends approximately 9 km upstream of the ocean entrance. The entrance channel, which is about 3.5 km long, is crossed by the Princes Highway Bridge. Downstream of the bridge, rock training walls and breakwaters contain tidal flows to maintain a relatively deep (about 3 to 5 m below mean sea level (MSL)) navigable channel, with lesser depths on the bar which is located up to 150 m seawards of the tip of the walls.

Upstream of the bridge, broad, shallow (water depths <1 m below MSL) sandy flats associated with the flood tidal delta extend into deeper more protected waters. Shell Point separates the estuary into two distinct basins, Wagonga Inlet to the west (where water depths are up to 16 m below MSL) and the smaller Forsters Bay to the south. Refer to **Figures 2.1a** and **2.1b** which show waterway and foreshore features (note that the location of oyster leases on these figures is indicative only, refer to **Figure 2.2** for current locations). The major tributaries (Billa Bilba, Burrimbidgee and Punkally Creeks) drain into the western portion of the estuary. The tidal limit extends approximately 500 m into each of these creeks.

The bed of the estuary consists of (from east to west) relatively clean quartzose sands (tidal delta), organic-rich sandy muds (basins) and poorly sorted, gravelly, muddy sands (fluvial deltas) infilling a deep bedrock valley.

2.2 Waterway Uses and Facilities

Wagonga Inlet supports a small oyster farming industry. Although there are 80 current leases (covering approximately 104.75 ha) operated by 15 permits holders, only three or four permit holders are considered to be full time commercial farmers. The majority of oyster leases are located along the foreshore (see **Figure 2.2**) and cultivation methods include trays, baskets and sticks. Only two leases are used as catching leases, both located in the channel north of the Forsters Bay sand flat. Facilities to process oysters as part of the growing process, or for sale, are located in Barlows and Forsters Bays (NSW Fisheries 1999).

Recreational fishing occurs over most of Wagonga Inlet but is concentrated at the eastern end. Fishing spots and species of fish (many of which can be caught throughout the year) are summarised in **Figure 2.3**. Wagonga Inlet has generally been closed to netting and trapping since the early 1900s. This closure applies to both commercial and recreational anglers. Spearfishing is also prohibited east of the Princes Highway Bridge (MHL et al 2001a). The only fishing activities that occur legally in Wagonga Inlet are line fishing, dip/scoop netting for prawns and trapping of poddy mullet for bait (NSW Fisheries 1999). Cockles may be collected by recreational fishers (subject to bag limits) and one commercial fisher who holds a collection permit (pers. comm. Mathew Richardson, NSW Fisheries). NSW Fisheries is actively assessing the feasibility of cockle collection within the estuary (NSW Fisheries 2001).

The average size of vessel used by recreational anglers is a 5 to 6 m aluminium or fibreglass vessel that holds three to four persons and can be used for line fishing, free diving or scuba diving (NSW Fisheries 1999). Boats can be hired from two businesses (10 hire boats in total, which cater for an average of four people (6 maximum)). There are also two self-drive house boats available for hire.

In peak holiday periods there may be up to 100 boats on the Inlet (pers. comm. Ray McDonnell, Quarterdeck Marina). During the summer months, and during the period May to June, the number of vessels travelling to sea can reach about 150 per day, depending on weather conditions and target species. At other times of the year, the number of vessels can be as low as one per day (NSW Fisheries 1999).

Apart from fishing, there is limited use of Wagonga Inlet for water skiing and canoeing (canoes can be hired). A growing area is sailing. Amongst them, the Narooma Sailing Club members own about 16 catamarans, which are launched from the sand ramp near the NSW Fisheries building in Forsters Bay. See **Figures 2.1a** and **2.1b** which show boat launching and berthing facilities around the inlet. Apex Park, Rotary Park and the open area between Riverside Drive and Forsters Bay are the most popular areas for passive recreation.

The only regular commercial tour on the inlet is by the Wagonga Princess, which is the oldest operating ferry in Australia (built in 1905). It usually carries a maximum of 30 passengers. During the peak Christmas season trips run every day, over Easter four to five days/week and three days a week for the remainder of the year, depending on minimum numbers (ie six persons). The tours include information on historic sites around the inlet and Aboriginal middens, and a rainforest walk at Freshwater Bay. Batemans Bay is the only other town on the Eurobodalla Coast that offers estuary/river cruises (Advance Tourism 1997).

The Wagonga Inlet commercial off-shore fishing and charter boat fleet can range from five up to about 15 vessels depending on weather conditions, target species and tourist demand. The commercial fishing fleet usually comprises 13 boats, six of which are trailered and launched each day (there is also potential for this number to increase in the future, NSW Fisheries 2001). As well as sport and game fishing, charter services include scuba diving and whale watching trips, tours of Montague Island and general sightseeing. Charter vessels range in length from 11.5 m to 17.2 m and are licensed to carry between 10 and 53 passengers. It has been estimated that the combined vessels carry in excess of 10,000 people per annum (Willson, charter boat operator 1999).

Berthing facilities are available at Town Wharf (where there are eight licensed berths), three licensed moorings are held by commercial operators on the northern side of the inlet, east of the bridge, and moorings are available at the Marina in Forsters Bay. The National Parks and Wildlife Service (NPWS) manages Montague Island and its 12 m long supply vessel is berthed at a floating pontoon near Mill Bay. **Appendix C** provides more boating and mooring information.

Other commercial fishing/boating related businesses at Narooma include seafood outlets, bait and tackle suppliers and a slipway at Forsters Bay.

2.3 Catchment Uses

The catchment of Wagonga Inlet is relatively small and steep. Slopes greater than 10° occur throughout much of the catchment with gentle slopes (<5°) only encountered in the vicinity of Wagonga Inlet and major drainage lines (see **Figure 2.4**). The highest elevations (about 800 m) occur in the vicinity of Mount Dromedary (known as Gulaga by the traditional owners) in the south-west of the catchment.

Due to constraints, including steep slopes, rural land around Wagonga Inlet is generally classified as non-arable, ie suited only to grazing. Small areas of land suited to agriculture, or suited to pasture improvement and occasional crops are located along Punkally Creek (Crichton et al 1986). **Figure 2.5** shows general land uses and conservation areas in and around the catchment of Wagonga Inlet (note that some areas of State Forest have now become National Park).

As shown in **Figure 2.6** much of the catchment of Wagonga Inlet falls within Bodalla State Forest. Forest zones within the catchment are:

- Zone 1 Special Protection – a harvesting exclusion area where management is to maximise protection of very high natural and cultural conservation values.
- Zone 2 Special Management – a harvesting exclusion area with specific management and protection of natural and cultural conservation values.
- Zone 3A Harvesting Exclusions – areas where harvesting is excluded but other management and production activities are permitted.
- Zone 4 General Management – management of native forests for timber production (it should be noted that further areas within this zone are subject to harvesting exclusions).

Much of the foreshore of Wagonga Inlet is in public ownership and zoned open space (6(a) under the Rural LEP or 6a1 under the Urban LEP). The exceptions to this are the 2ec ('Residential – Environmental Constraints') land adjoining Forsters Bay to the south and a roadway fronting open space on the south-western side of Forsters Bay (see **Figures 2.1a**, **2.1b** and **2.7**).

The objectives of the 6a1 zone include to:

- allow development on foreshores where that development is water-related and enhances the recreational use or natural environment of the foreshore; and
- ensure that development in areas of environmental significance does not reduce that significance.

The objectives of the 6(a) zone include to:

- ensure that a range of recreational opportunities is provided that is compatible with the natural environment.

Areas of Bodalla State Forest front the inlet between Brices Bay and Burrimbidgee Creek. Two areas of land zoned 'Further Investigation', on the southern side of the inlet, extend to the water. On the northern side there are three areas of Rural 1(a) land ('Environmental Constraints and Agriculture') with frontages to the inlet. See **Figure 2.8**, for an overview of land use zoning around the western section of the inlet.

3 Values of Wagonga Inlet

The key values of Wagonga Inlet were identified from:

- Existing information, in particular *The Eurobodalla Coast its Natural and Cultural Values* – the authors, Kevin Mills & Associates (1994) identified Wagonga Inlet as one of 13 areas of natural and cultural significance along the Eurobodalla Coast.
- The views of members of the Estuary Management Committee (EMC).
- Feedback from the community through consultation with stakeholders and a community questionnaire (see **Appendix B**).
- Site inspections.

As values range from social (ie what the community values) to scientific, the basis for the assessment of the significance (or uniqueness) of these values differs.

3.1 Good Water Quality

As the catchment area of Wagonga Inlet is small compared to the waterway area, freshwater inflows are relatively low. In addition, as the entrance is permanently open and the connection to the ocean is relatively large, freshwater inflows are able to drain to the ocean relatively quickly. This results in good tidal exchange and overall salinity levels not much reduced from seawater. The saline nature of Wagonga Inlet is a distinguishing feature and is thought to contribute to the relatively high diversity and abundance of aquatic fauna, when compared to other NSW estuaries.

Although there is insufficient data to assess the water quality of Wagonga Inlet with regard to Australian and New Zealand Environment and Conservation Council (ANZECC) guidelines, the limited data and anecdotal evidence suggests that water quality is generally good. Questionnaire responses indicated that good water quality was the most valued attribute of Wagonga Inlet (see **Appendix B**). In addition to the diversity and abundance of aquatic fauna, many of the other values of Wagonga Inlet are dependent on good water quality.

3.2 Ecological Values

Areas of ecological significance for Wagonga Inlet are shown in **Figures 3.1a** and **3.1b** based on surveys of seagrasses and fringing vegetation by TEL (1999), as part of the Processes Study, and information from other sources as outlined below.

Vegetation and Habitat

The Department of Urban Affairs and Planning (DUAP 1997) identified a vegetated habitat corridor extending west of Kianga and Dalmeny through to Bodalla State Forest as regionally significant (see **Figure 2.5**), as it provides a link between existing nature reserves and national parks.

A preliminary list of plant species of potential regional botanic significance has been prepared for Eurobodalla. Many of these species are at their southern limit of distribution at Narooma. Some of the gullies adjacent to Wagonga Inlet support stands of rainforest, which is restricted in distribution and size in Eurobodalla. The rainforest at Flying Fox Bay is considered of regional importance and supports some significant native fauna (Kevin Mills & Associates 1994).

Wetland areas around the main tributary creeks to Wagonga Inlet are protected under State Environmental Planning Policy (SEPP) No. 14, see **Figure 2.5**. The tidal flats between Shell Point and the entrance, and the sand flats alongside Riverside

Drive are also considered important as they provide habitat for wading and sea birds (Kevin Mills & Associates 1994). The sand spit behind the training wall on the eastern side of the bridge is a significant habitat for pelicans, gulls, terns and migratory waders/shorebirds. This area is also a possible breeding site for Pied Oystercatchers (NPWS 2001).

Wagonga Inlet is one of only two estuaries on the Eurobodalla Coast that supports *Posidonia australis* (strapweed). Although strapweed is distributed widely throughout coastal NSW from Wallis Lakes in the north to Twofold Bay in the south, it is sensitive to habitat changes and recovery from disturbance is very slow. Damage caused by the removal or covering of plants through dredging and reclamation works is usually permanent (Fisheries Scientific Committee 2000).

Wagonga Inlet is an important fish nursery, with habitats including mangrove colonies and some of the most extensive seagrass beds on the NSW South Coast (NSW Fisheries 1999).

Birds

A total of 197 species of birds have been recorded for the Wagonga Inlet area, with ten of these being protected under international agreements on migratory birds. Six seaeagle pairs have been observed nesting around the inlet and have produced juveniles over the last four years (pers. comm. Charlie Bettini, Wagonga Princess).

Wagonga Inlet is one of nine important sites for waders on the Eurobodalla Coast. Large numbers of several species are regularly recorded, such as the Pied Oystercatcher (up to 30 birds), Red Knot (70) and the Bar-tailed Godwit (300). Of the 14 wader species recorded, four are listed as endangered in the *Threatened Species Conservation (TSC) Act*.

Aquatic Fauna

Wagonga Inlet is considered of regional significance for aquatic fauna, as outlined below.

Zooplankton and Benthos

Wagonga Inlet supports the most diverse and one of the most abundant assemblages of zooplankton and benthos within estuaries on the Eurobodalla Coast. Rissik (1999) recorded 25 species of zooplankton which constitutes a fairly diverse community for an estuary the size of Wagonga Inlet.

Fish

Ferrell et al (1992) recorded more species of fish in Wagonga Inlet than either Jervis Bay or Port Hacking (MHL et al 2001a). Briggs (1980) recorded 50 species, making Wagonga Inlet the most diverse compared to other estuaries on the Eurobodalla Coast. Six of these species were only found in Wagonga Inlet and this difference was attributed to both the saline nature of the inlet and its extensive strapweed beds (note that these results should be treated with caution as sampling methods differed between estuaries).

Wagonga Inlet is also home to the Estuary Cod, a listed protected species under the *Fisheries Management Act*. It is also possible the Weedy Sea Dragon occurs in the inlet, as it is known to inhabit strapweed beds along the coast.

3.3 Scenic/Aesthetic Values

R L & M J McDonnell (1998) noted that people are attracted to Narooma because it provides *a quiet, natural, village atmosphere set in beautiful surroundings where there is room for people to move freely, even in peak times….It attracts those who*

are looking for somewhere safe to bring their family, nature lovers and water sportspeople.

Narooma is arguably the most picturesque town on the South Coast mainly due to its location, being surrounded by Wagonga Inlet (Advance Tourism 1998). The extent of open water and vistas over Wagonga Inlet are a major part of these scenic values. After good water quality, most responses on the values of Wagonga Inlet related to scenic views (see **Appendix B** for questionnaire responses).

The undeveloped foreshore and catchment areas of Wagonga Inlet were identified by DUAP (1997) as regionally significant. The 'pristine' environment and undeveloped nature of the area were also mentioned by many respondents to the questionnaire (see **Appendix B**).

Research has shown that one of the most positive perceptions of the Eurobodalla Coast is its relatively unspoilt and undeveloped nature (Advance Tourism 1998). The proprietors of the Quarterdeck Marina confirm this statement for Narooma. *It has been made clear to us that....the town provides what has been, for a growing number of people, taken away (by overdevelopment/overconstruction) from places such as Batemans Bay and Merimbula* (R L & MJ McDonnell 1998).

3.4 Recreation and Tourism Values

From the questionnaire (see **Appendix B**) the most popular activities at Wagonga Inlet, in order, were identified as walking, relaxing, picnics/barbecues, swimming, fishing from the shore, fishing from a boat and sightseeing. As well as being attracted by the scenic values of the inlet, the diversity of the area and accessibility for all sorts of people, including families, were noted as reasons why respondents like Wagonga Inlet.

Many businesses on the Eurobodalla Coast rely on customers who have been attracted by fishing opportunities (Advance Tourism 1997). As an example, the Narooma Sport and Gamefishing Club's annual convention (held in May) attracts over 200 people.

Wagonga Inlet is renowned for consistent catches of large fish such as flathead (to 10 kg) and mulloway (to 13 kg) and seasonal catches of kingfish, salmon and even tuna. Juvenile snapper, bream, tailor, mullet and whiting can be caught at any time of the year. Large quantities of baitfish inhabit Wagonga Inlet at varying times of the year and the inlet is popular for aquarium collectors during the warmer months (NSW Fisheries 1999).

Advance Tourism (1997) listed the five most appealing features of the Eurobodalla Coast as the beaches, national parks, Montague Island cruises, restaurants, food and wine and historic sites. Willson (1999) noted that the *number of tourists visiting Narooma to take tours to Montague Island, whale watching, scuba diving and fishing charters is increasing markedly each season* and the tourist season now extends over about 8 months of the year (pers. comm. Daryl Stewart, charter boat operator). The number of commercial fishing and charter boats that use Narooma as their main port is the forth highest on the NSW South Coast behind Bermagui, Merimbula and the Shoalhaven/Crookhaven Rivers which have 16, 14 and 11 vessels respectively using these waterways as their main port (CFBIRG 1998).

NPWS (1998) estimated tourism associated with Montague Island was worth $1.4 M per annum. As noted in **Section 1.2**, Narooma is mainly a tourist and retirement area (see **Appendix C** for more information on tourism) so the commercial fishing and charter boat industry is valuable to the local community.

Although oyster farming is not a full time concern for most growers at Wagonga Inlet, the availability of locally grown and processed oysters is an asset. The *Eurobodalla*

Nature Coast Tourism Development Strategy (Advance Tourism 1997) identified oyster bars and oyster tasting cruises as potential new tourism products which should be encouraged and supported.

3.5 Cultural Heritage

Wagonga Inlet and the surrounding forests are of local and regional cultural significance as they contain evidence of a rich and diverse Aboriginal and European past (Kevin Mills & Associates 1994).

3.5.1 Aboriginal Cultural Values

The areas of highest potential Aboriginal cultural significance within Eurobodalla are the coastal lakes and forested hinterland. The coastal landscape generally is highly significant to Aboriginal people, as testimony to traditional spiritual beliefs and socio-economic lifestyle (Kevin Mills & Associates 1994). For Wagonga Inlet, the area east of the bridge on the north side of the inlet is particularly significant (pers. comm. Ron Mason, chairperson, Wagonga Local Aboriginal Land Council (LALC)).

Over twenty middens have been recorded on rock promontories around Wagonga Inlet. Although over half the recorded sites on the Eurobodalla Coast are middens, many of the middens around Wagonga inlet are mounded, which is a relatively rare site type on the South Coast (Kevin Mills & Associates 1994). There have also been reports of burial sites, artefact scatters and scarred trees (Navin Officer 1997). Vivian Mason (ESC 1996) reported that a burial site at Rotary Park was uncovered about 20 years ago and an extensive campsite with stone tools was found exposed in the intertidal area at Ringlands Bay. Areas of high archaeological sensitivity around Narooma were identified by Navin Officer (1997) and are shown in **Figure 3.2**.

Midden sites (east of Lavender Point) identified by Navin Officer (1997) were assessed as having low to high levels of scientific or archaeological significance, depending on the level of surface disturbance. Midden sites located at Ringlands Estate were assessed as having low archaeological significance because of the extent of disturbance (Navin Officer 1997).

3.5.2 European Cultural Values

Wagonga Inlet and surrounding lands played an important role in the European history of the South Coast through first settlement in 1839, followed by:

- development of a port to service the goldfields of Nerrigundah and Mount Dromedary;
- sawmilling and timber getting (the distinctive spotted gum found in forests near Narooma was much sought after in ship building for its strength and durability); and
- association with the Bodalla bacon and cheese company and the first commercial fish cannery in Australia (Pacey 1990, Kevin Mills & Associates 1994, State Forests undated).

There is considerable evidence of the various themes of Wagonga's history around the inlet, including archaeological remains, structures and landscapes, as well as a rich oral and archival record. Items or sites of historic interest have been mapped by Pacey (1990), see **Figure 3.3**. Examples of cultural landscapes are the plantings of exotic trees along the shoreline of Wagonga Inlet (Kevin Mills & Associates 1994).

The Uniting Church group and associated parsonage and picket fence at 134 Wagonga Street are listed as heritage items in the Eurobodalla LEP. The

significance of identified heritage sites/items around Wagonga Inlet were assessed by EJE (1997) as follows:

- pilots wharf and boatshed (local significance)
- former McMillans Mill remains (regional significance)
- Wagonga Wharf site at Brices Bay (regional significance)
- Wagonga cemetery at Brices Bay (local significance)
- rock training walls at Wagonga Inlet (local significance)
- Narooma Bridge (regional significance)
- log ramps (skids) around Wagonga Inlet (local significance)
- wharf pylon at Bluewater Drive (local significance)
- old ferry approaches at the Princes Highway (local significance)
- former cheese factory at Forsters Bay (local significance).

See **Appendix D** for Statements of Significance for these sites. Note that the mill remains and Narooma Bridge are under consideration for re-classification as items of State significance (pers. comm. Allen Grimwood, ESC).

4 Issues and Options

The following issues and options for management were identified:

- from the study brief;
- by the consultants through site inspections and investigations carried out as part of this study, the Estuary Processes Study (MHL et al 2001a) and Narooma Bar Improvements (MHL et al 2000); and
- through consultation with the Estuary Management Committee, other stakeholder groups and a community questionnaire (see **Appendix B**).

4.1 Entrance Bar

The entrance bar is subject to natural changes in the littoral (along shore) drift regime associated with annual variability in the prevailing weather conditions. While it appears that the annual net littoral drift is very small, individual events can cause substantial transport of marine sediments.

Although entrance works resulted in the deepening of the entrance channel between the breakwaters and movement of the bar offshore, water depths over the bar are still relatively shallow. Under certain weather conditions navigation becomes hazardous, particularly when the south-east channel is shoaled.

Examination of accident records show common factors, which include:

- that most accidents occurred on an ebb (outgoing) tide and with an estimated swell wave height of 1.8 m or higher; and
- the vast majority of boats involved were recreational, not commercial vessels (MHL et al 2000).

The Narooma bar has an unwarranted nationwide reputation as being very dangerous to navigate. Sure, accidents can happen but the majority of mishaps crossing the bar are the result of the lack of local knowledge, inexperience in boat handling or just downright stupidity. This has caused a significant reduction in the number of tourists with trailer boats over the past decade. They are preferring to stay in Bermagui and spend over twice as much of their holiday money on fuel to reach Montague Island, rather than cross the Narooma bar (observations of charter boat operator - Willson 1999).

Suggested options to improve navigation included modification of the entrance channel breakwaters and training walls (eg extending the northern breakwater, removing the southern breakwater), dredging and improved hazard warning and management.

A preliminary review of these options as part of the *Investigation of Narooma Bar Improvements* (MHL et al 2000) found that, while very expensive, modifications to the entrance structures may achieve navigation improvements only in the short-term (depending on sediment transport). However, the bar would return to a similar configuration as exists now in a relatively short space of time (MHL et al 2001a). Refer to **Appendix E** which provides a summary of all the options considered for the Narooma Bar.

Although insufficient data is available to quantify sediment movement patterns and rates, dredging may improve bar conditions when major shoaling of the south-east channel occurs over an extended period.

Options to educate boaters and improve dissemination of information include compilation of data and analysis of tides, swell and weather conditions to predict when the bar will become hazardous.

This could involve the development of a computerised system and dissemination of information by:

- broadcasts on boat radio frequencies and local radio; and
- digital display boards (similar to those used on freeways) at the boat launching ramp at Apex Park and in the entrance channel closer to the bar itself.

An alternative to a computerised system has been put forward by the EMC, ie:

- development of protocols for a hazard ranking system for the Narooma Bar, based on information available to the Royal Volunteer Coastal Patrol (RVCP), ie based on their observations and weather forecasting by the Bureau of Meteorology;
- as above, digital display boards or a simpler system using lights (ESC 2000), eg static display with various descriptions of bar condition (possibly similar to fire hazard signs) with a light indicating current entrance conditions; and
- installation of a video camera to cover the inlet channel throat, with the aim of covering the RVCP's blind spot and improving its response time to incidents on the bar.

In addition, to further improve response times and provide a more visible presence, the RVCP is currently investigating use of the Old Pilots Wharf near the entrance to Wagonga Inlet.

4.2 Shoaling

The main area of concern is the channel upstream of the Princes Highway Bridge, where shoaling restricts boat access into Forsters Bay and hence reduces utilisation of boating facilities available in the bay, eg marina, moorings and slipway.

Comparison of shoal locations, using digitised aerial photographs (1964 to 1997) and survey transects (1959 and 1997), indicated the following.

- The location of the shoals near Mill Bay hardly changed between 1964 and 1997, however, since 1971 there is some evidence of shoaling and a decrease in water depth on the northern side of the entrance channel.
- Although the sewer crossing between Mill Bay and the bridge has had some local effects, impacts on overall sediment movement within the entrance channel are negligible.
- Upstream of the bridge (between 1959 and 1997) there has been some shoaling of the channel, some of which may be related to the redistribution of sediment into previously dredged areas.
- Although narrowing of the entrance to Forsters Bay at Shell Point has been raised by the community, the flood tide delta (see **Figure 4.1**) at the point appears to have been virtually unchanged over the past 40 years. However, some accumulation of sand near the eastern shoreline of Forsters Bay is apparent.
- The sand flat near the NSW Fisheries building at Forsters Bay has expanded over the past 30 years, with some suggestion that the rate of expansion has increased in recent years.

Some of these changes can be confirmed, eg encroachment of the sand flat at the NSW Fisheries building such that the slipway is no longer serviceable. Removal of rocks and infrastructure from old oyster leases on the sand flats may have resulted in

the release of some sediment that is continually being re-worked by the prevailing winds and currents.

A preliminary analysis of dredging the shallow points (see **Figure 4.2**) in the channel off Peters Point and closer to the bridge off Lavender Point was undertaken. This indicated that if 50,000 m^3 of material was removed, assuming an average transport rate of 30 m^3 per tide, it would take roughly two to five years for the channel to infill through the re-working of sand by tidal action. Dredging could also potentially affect oyster leases adjacent to the western end of the channel (MHL et al 2001a).

An alternative to the above was suggested, based on an account of historical navigation channels in Wagonga Inlet. *The present channel to Peters Point was formerly too shallow for larger boats. It gradually deepened after the former Ringlands Bay channel silted up* (when) *sand from what is now the netted beach moved upstream and filled it during construction of the sea walls. This former southern channel was dredged circa 1919 to allow small ships access to the sawmills upstream and was still navigable by trawlers (going to the slipway) up to the time that the* (breakwaters were built in 1977/78)*. The cheapest place to dredge would be this old north-south channel. Disposal would be easier, building an island on the bare sand to the east, and the distance would be far shorter* (to Forsters Bay), (Cr Gough, comments on Estuary Processes Study (undated) and Management Study (15/9/2000)). Note that dredging locations and disposal sites would need to take into consideration issues such as impacts on seagrass beds, refer to **Section 6.2**.

Dredging a new access channel in a similar alignment to this old north-south channel would not improve navigation as much as dredging the shallow points discussed above. However, it would only require removal of about 8,000 m^3 of material and would alleviate (for an undetermined period of time) what is reportedly the most significant hazard associated with navigating between the entrance channel and the deeper waters of Wagonga Inlet. That is, crossing the shoal at the flood tide delta off Peters Point (MHL et al 2001a). Recent advice from Waterways and NSW Fisheries (at the August 2001 meeting of the EMC) indicates that the old north-south channel is deepening fairly continuously by natural means from the bridge to the drop off.

It has also been suggested that the southern training wall be raised to stop erosion of the sand area it encloses and hence drift of sand into the entrance channel. The flow of water over the wall represents only a small fraction of the tidal prism (ie volume of water moving into and out of Wagonga Inlet) and hence a small potential source of suspended sediment. However, from investigations, it appears that sand is redistributed within the area enclosed by the training wall, rather than being eroded, washed over the wall and deposited in the entrance channel. Accordingly, no benefits would be gained through raising the wall (MHL et al 2001a).

Options to address shoaling on the northern shore of the inlet, east of the bridge, are the extension of wharves and jetties and selective dredging, as required, to maintain access to moorings.

4.3 Erosion and Sedimentation

Some erosion is apparent in the downstream reaches of Billa Bilba, Burrimbidgee and Punkally creeks, however, the cause of this is unclear.

In general, sedimentation of Wagonga Inlet is proceeding at a very low rate because of the relatively large area of the estuary and relatively small inflows. The major sediment sources are:

- from the catchment (fluvial sediments) which result in an increase in the deltas at the mouths of the creeks; and

- marine sediments which are deposited on the flood tide delta, resulting in a slow increase in the area of the delta over a geological time scale (ie over thousands of years).

The rates of infilling of the whole estuary are particularly small and estimated to be less than 1 mm/year. This rate is typical of NSW estuaries.

Analysis of aerial photography (1957, 1967 and 1994) indicated that rates of sediment delivery to the Punkally Creek delta are not exceptional when compared with similar data for relatively undisturbed South Coast estuaries. However, localised sedimentation in the upper reaches around Wagonga and Punkally Creek has been identified. Infrastructure associated with oyster leases near the major creeks may have resulted in increased accumulations and channel realignment in these areas.

Appropriate development controls and catchment management practices such as the use of erosion control structures, planting programs to stabilise creek banks and sealing sections of roads at creek crossings can prevent accelerated siltation of waterways. The Environment Protection Authority (EPA 2000a) has identified the need for improved design and maintenance of gravel surfaced roads within the Eurobodalla LGA.

4.4 Water Quality

Interim Water Quality and River Flow Objectives (EPA 2000b) have been developed for the Tuross River catchment, which includes Wagonga Inlet. For estuaries in the Tuross River catchment, water quality objectives are for the protection of:

- aquatic ecosystems
- visual amenity
- secondary contact recreation (eg boating)
- primary contact recreation (eg swimming)
- aquatic foods (cooked) and commercial shellfish production.

River flow objectives include to:

- maintain or rehabilitate estuarine processes and habitats.

As discussed in **Section 3.1**, based on the limited data available, water quality within Wagonga Inlet is generally good. However, there are some indications of localised nutrient enrichment in the form of epiphytic growth on seagrasses (ie increase in density of algae attached to seagrasses) and an indication that high chlorophyll-a concentrations may occur (chlorophyll-a is a measure of the abundance of phytoplankton, which are minute aquatic plants). It is not clear if this is typical of the natural system or if it has been accelerated in recent times. In addition, a bloom of marine algae was recorded in Wagonga Inlet in October 1999, although it is not known whether this formed in the inlet in response to elevated nutrient levels, or was transported into the inlet from north of Montague Island where a bloom occurred (MHL et al 2001a).

Protection of the health of shellfish consumers and recreational swimmers is an important management issue for Wagonga Inlet. The limited available data on bacteria (consisting of thermotolerant coliform counts) is inadequate for assessing whether human pathogens are present in significant densities within the estuary. However, faecal coliform counts were generally low with higher counts recorded in upstream locations associated with rainfall events (MHL et al 2001a). With regard to oysters, the NSW Shellfish Quality Assurance Program (NSW SQAP) requires that

oysters are purged for 36 hours prior to delivery to market and that weekly water and meat sampling is undertaken to ensure compliance with food safety standards.

Limited sediment sampling indicates that Wagonga Inlet is not subject to heavy metal or organochloride contamination (MHL et al 2001a). Mackay et al (1975), found concentrations of copper, cadmium, lead and zinc in oysters from Wagonga Inlet to be well below National Health and Medical Research Council (NH&MRC) guidelines. However, arsenic concentrations were elevated and it was suggested that a source could be oyster sticks treated with arsenate preservation compounds (TEL 1999).

Over the years oysters have been grown in estuaries on single treated (Copper, Chrome/Arsenic (CCA)) timbers, double treated (CCA + Pigment Emulsified Creosote (PEC)) timbers and on tarred sticks. Treated sticks are now rarely used, thought due to their comparatively high cost (pers. com. Alan Maling, Kardon Marketing Services). The use of tarred sticks has now been banned by the EPA and oyster farmers are trialling plastic sleeves and other methods of cultivation to address problems with timber decay and marine borer attack (pers. com. Mathew Richardson, NSW Fisheries).

Koppers double treated hardwood marine piles have been used for many applications in marine/estuarine environments throughout Australia over the past 23 years. It should be noted that the PEC preservative used in Australia was jointly developed by Koppers Timber Preservation P/L and the CSIRO and is different to the product used in the United States (Kardon Marketing Services, letter dated 19/3/2001). Preservative retention and penetration are subject to Australian Standard AS 1604 (Koppers Timber Preservation P/L 1999) and the success of the product is dependant on the preservative not leaching from the wood. After initial installation an oil slick may be visible on the water surface adjacent to the pile (personal observation, viewing platform Curl Curl Lagoon, Sydney), however, this is a temporary occurrence and the slick quickly dissipates through tidal action (pers. com Alan Maling, Kardon Marketing Services and Greg Britton, Patterson Britton & Partners).

Oysters from within Wagonga Inlet have been tested for heavy metal contamination as part of the NSW SQAP, however, the test results were not available at the time of writing.

Potential sources of pollutants to Wagonga Inlet include urban stormwater, sewer overflows, septic tank seepage and on-site sewage treatment, rural run-off and waste from boats and boat maintenance.

Community feedback indicated that Forsters Bay was the most affected by stormwater pollution. Localised stormwater inputs to Forsters Bay may contribute to excess nutrients. To identify and quantify nutrient inputs (together with other pollutant loads) it would be necessary to undertake monitoring near onshore facilities and in the deeper water of the bay.

Options to reduce stormwater pollution include:

- installation of small wetlands/vegetated buffers to strip nutrients;
- installation of litter traps on stormwater drains; and
- education regarding the responsible use of fertilisers, erosion control etc.

Council's Stormwater Management Plan (2001) identifies suitable locations and costs for stormwater quality improvement devices (SQIDs).

Blockages from tree roots, or electrical failures, have been the main causes of sewage overflows at Narooma. These overflows occur predominantly at manholes, but may also occur at sewer pumping stations (see **Figure 4.2**). Several strategies

have been employed to minimise sewer overflows at Narooma, including pressure cleaning mains of tree roots, audits of pumping stations including pump drawdown tests, standby diesel pumps, and a radio telemetry warning system. These strategies have reduced discharge from sewer overflows to amounts that should not adversely affect the water quality of Wagonga Inlet in the long-term. The EPA is also working with ESC to investigate actions to reduce sewer discharges as part of a Pollution Reduction Program attached to the Narooma Sewage Treatment Plant (EPA 2000a).

The town sewer currently extends just beyond the intersection of the Princes Highway and the Old Highway, approximately 1.5 km from the eastern edge of Ringlands Estate. The Estate was designed with larger lot sizes to facilitate the on-site treatment and disposal of effluent. Regular inspections of on-site disposal systems and monitoring will be necessary to ensure systems are working effectively.

In the existing, serviced urban area all land near Wagonga Inlet has been developed. The Field Street area represents the only major serviced area in Narooma with immediate development potential. Any expansion of the urban area, in the designated urban expansion zone to the south, would be dependent on the provision of services, including reticulated sewerage.

Disposal of galley waste and sewage from boats is catered for at Wagonga Inlet through provision of a privately owned boat pumpout at the Quarterdeck Marina, which is used by the houseboats operating on the inlet. To increase awareness and use of this facility it could be included on boating and tourist maps. However, currently commercial vessels are not required to have holding tanks and facilities at Forsters Bay are unsuitable for larger vessels.

4.5 Flooding

Flooding was identified as an issue for the ‘flat area’ of Narooma (ie area adjoining the eastern foreshore of Forsters Bay). Based on an assessment of historical flooding, the area of most concern is the main drainage catchment from the oval and surrounding ridge line to the concrete-lined stormwater channel draining to Forsters Bay (adjacent to McMillan Road and Brice Street).

Flooding of the flat area is due to a combination of oceanic influences (eg tide levels, elevated ocean water levels due to coastal storms) and freshwater influences (ie intensity of rainfall in the catchment), rather than factors associated with the capacity or maintenance of the stormwater drainage system.

Options to reduce the impact of flooding in the flat area will be based on the flood levels determined by the Flood Study (GBA 1999). These will focus on building and development controls and include a review of design floor levels for new developments and redevelopments.

4.6 Waterway Facilities

4.6.1 Boat mooring facilities

Tourism is important to Narooma, with the Eurobodalla Nature Coast Tourism Development Strategy (Advance Tourism 1997) listing Montague Island cruises as one of the five most appealing features of the Eurobodalla Coast. There are eight charter boats based at Narooma plus the Wagonga Princess which undertakes tours within the inlet.

As there is insufficient room at the Town Wharf, some operators moor at Forsters Bay, or on the northern side of the inlet east of the bridge, which puts them at a disadvantage due to a lower customer profile and time and costs associated with travel between moorings and the Town Wharf. Extension of this wharf has been

recommended in a number of reports. The following suggestion was put forward by the charter boat operators.

The wharf extension should be to the north-west and straddle the training wall. It should be of sufficient length to moor all of the large vessels currently on moorings, including the NPWS and RVCP vessels (based on hydrographic survey information, existing water depths would be adequate).

Contrary to this view, some community members suggested that Town Wharf be available for public use, with charter vessels mooring elsewhere and using this facility as a pick-up and drop-off point (at present there is one dedicated berth for pick-up and drop-off).

In addition to charter boat accommodation, there are few mooring facilities east of the highway bridge for local and visiting vessels. The issuing of pole moorings to address this has been associated with displacement of sand along the foreshore due to propeller wash, and encroachment into navigation channels.

Suggested locations for development of a marina east of the bridge include the area in front of the public swimming pool (see **Figure 4.1**), Mill Bay and the old salmon trap, downstream of Mill Bay.

The Narooma Foreshore and Townscape Masterplan (Conybeare Morrison & Partners et al) investigated Mill Bay as a possible marina site, however, this was not considered suitable for a large facility due to size constraints, lack of water depth and potential impacts on sewer mains and seagrass beds. Similar issues were identified for the salmon trap area.

4.6.2 Access and facilities for water-based recreation

The Waterways Working Group of the EMC investigated potential jetty sites around Wagonga Inlet and noted that private ownership of foreshore land, and in some cases proximity of oyster leases to the shore, precluded large areas of the shoreline from consideration. *In particular, access to the northern inlet shore is very constrained. Similarly, access to the upper reach (Punkally and Billa Bilba Creeks) is so limited as to be beyond useful consideration for the present.* The Working Group identified other factors to be considered in jetty siting including provision of vehicle access and land-based facilities (eg fish cleaning facilities, picnic tables, toilets).

From a review of 12 sites, five potential public jetty sites were identified and are shown on **Figure 4.1**. They are described below.

Ringlands Bay:

- site 1 - site of previous jetty with vehicle access restricted to the existing carpark at the picnic area; and
- site 2 - reconstruction of the existing jetty which is in a poor state of repair.

Ringlands Point to Hobbs Bay:

- site 3 - this site is useable but there are some minor land-based access difficulties;
- site 4 - Picnic Point is a good site but some negotiation with the oyster lessee(s) would be necessary; and
- site 5 – adjacent to land owned by the Wagonga Local Aboriginal Land Council (LALC).

Sites 1, 2 and 5 were identified as priorities for further investigation (EMC 1998). However, construction of a jetty at site 5 (as well as sites 3 and 4) would adversely impact on *Posidonia australis* (strapweed) beds. In addition site 5, as well as site 4, would affect oyster leases.

The Narooma Foreshore and Townscape Masterplan contained a number of recommendations for improved foreshore facilities in and around Narooma. Those still to be implemented include completion of foreshore paths and the following.

Forsters Bay:

- low-key mangrove boardwalk and interpretive signage off Riverside Drive near the backpacker's accommodation; and
- south-west boat ramp – new jetty, fish cleaning table and formalising and sealing the carpark area.

Bar Rock area:

- widening and upgrading the existing wharf to allow for fishing and viewing, with a fish cleaning table to be installed to the south (as noted in **Section 4.1** the RVCP is investigating use of this wharf).

Further suggestions put forward by the community included:

- widening of the sail boat launching ramp near the NSW Fisheries building;
- improvements to the Town Wharf fish cleaning table and other fish cleaning facilities, including lighting and provision for disposal of fish offal;
- construction of a jetty at State Forest's picnic area between Brices Bay and Burrimbidgee Creek;
- signage informing tourists of recreational facilities etc at Forsters Bay; and
- provision of more barbecue and picnic facilities.

4.7 Mangroves and Seagrasses

Aerial photography (1957, 1967 and 1994) was used to compare the deltas at Billa Bilba and Punkally creeks (MHL et al 2001a). Limited mangrove development was noted in 1957, no mangroves were apparent in 1967 and there was extensive growth of mangroves in 1994. The absence of mangroves in 1967 is probably due to clearing or grazing, rather than changes in bed levels influencing the distribution of mangroves.

The distribution of seagrass beds recorded as part of the Estuary Processes Study (TEL 1999) was similar to previous studies (ie, Briggs et al 1980 and West et al 1985), except:

- there appeared to be much less eelgrass (*Zostera capricorni*) on the sand flat to the west of Riverside Drive, thought due to shoaling which has raised the level of the sand flat, reducing the amount of suitable substratum for seagrass growth; and
- the seagrass beds on the sand flat behind the southern training wall appear to be smaller than in 1985 and 1980.

Clearing of mangroves and seagrass beds, and conversely the need for their protection were raised by the community. Mangroves contribute significantly to estuarine productivity as well as stabilising shorelines (and hence minimising erosion and turbidity), while seagrasses are recognised for their importance as fish nurseries. Suggestions to protect foreshore vegetation and seagrass beds included:

- public education, so that their values would be appreciated; and
- providing for, and limiting foreshore activities to designated areas (via boardwalks and viewing platforms – appropriate locations were identified in the Narooma Foreshore and Townscape Masterplan).

4.8 Other Issues

Other identified issues related to:

- The recognition, protection and management of cultural heritage sites (lack of interpretive material, sites in private ownership).
- Deterioration of some middens around the foreshore due to human impacts and exposure in the intertidal zone:
  - Sullivan (1981) re-examined sites originally recorded by Anderson (1890) and found that Wagonga Inlet middens had been substantially diminished in volume through both natural erosion and deliberate removal for fill and lime burning in the early 1900s (Kevin Mills & Associates 1994).
- Adverse impacts of clearing of trees and other foreshore vegetation for views, and weed invasion of bushland.
- Illegal fishing activities and management of recreational fishing:
  - Gibbs (1997) states that there are insufficient data to assess the recreational finfish fishery in South Coast estuaries. However, increased population size, increased tourism and improved fishing gear will have contributed to increases in recreational fishing effort. Studies in other parts of NSW show that the recreational catch of some estuarine species (Williams et al 1993 and Steffe et al 1996a) and coastal species in nearshore areas of the South Coast (Steffe et al 1996b) can be substantial (TEL 1999).
- Management/control of oyster leases and the eradication of the Pacific Oyster (note that oyster leases in Wagonga Inlet are already managed for the control of the Pacific Oyster to protect the existing aquaculture industry).
- Management/control of power boating.
- Control of dogs and disposal of dog droppings.
- Pit toilets and litter at picnic areas on the western foreshore of the inlet (this is more of a maintenance issue – flushing toilets would not be appropriate in these areas because of their proximity to the inlet and risk of seepage from septic tanks).

Actions to address the above issues are included in **Section 5**.

The bridge approach and access to Mill Bay were identified as needing improvement. The need to raise the bridge to allow larger vessels to access areas upstream was also indicated as an issue. These road and traffic matters are outside the scope of the Estuary Management Study and Plan. With regard to pedestrian and cycleway access, Council has commenced construction of a boardwalk between Mill Bay and Apex Park.

5 Action Plan

Goals and objectives for the management of Wagonga Inlet are set out on the following pages. The associated strategies and actions have been formulated to protect the identified values of Wagonga Inlet (see **Section 3**) and to address issues and problems (see **Section 4**).

The authority or organisation primarily responsible for implementing individual actions is also listed. Where more than one authority is listed, the authority(s) with primary responsibility is indicated in bold. The following abbreviations have been used.

CoC	Narooma Chamber of Commerce
DLWC	Department of Land and Water Conservation
EMC	Wagonga Inlet Estuary Management Committee
ENC	Eurobodalla Nature Coast (tourism association)
EPA	Environment Protection Authority
ESC	Eurobodalla Shire Council
Fisheries	NSW Fisheries
HS	Narooma Historical Society Inc.
LALC	Wagonga Local Aboriginal Land Council
NPWS	National Parks and Wildlife Service
RLPB	Rural Lands Protection Board
SC	Narooma Sailing Club
SF	State Forests
SGFC	Narooma Sport and Game Fishing Club
RVCP	Royal Volunteer Coastal Patrol (Narooma)
Waterways	NSW Waterways

Priorities for actions have been listed as:

- high implementation within two to five years
- medium implementation within six to 10 years
- low implementation within 11 to 20 years

Further information and indicative costs for proposed major actions are provided in **Section 6.1**. Possible future actions are discussed in **Section 6.2**. These actions are dependent on the outcomes of the proposed actions and associated investigations. Measures to monitor the effectiveness of actions, which require evaluation, are outlined in **Section 7**.

5.1 Goal: to protect water quality within the inlet for human health and to maintain a healthy ecosystem

Objective: To gain a better understanding of water quality and compliance with guidelines

Strategy		Action	Priority	Responsibility
Assess changes to water quality within Forsters Bay	1.1	Develop and implement water quality monitoring program (see **Section 6.1** for more details) including testing for chlorophyll-a (to assess ecosystem health) and bacteria (to assess compliance with ANZECC & NH&MRC guidelines for primary contact recreation – a sampling and analysis program currently exists for oysters as part of the NSW Shellfish Quality Assurance Program (SQAP).	high	**ESC**, DLWC, Wagonga SQAP

Objective: To minimise discharge of effluent from commercial and recreational vessels

Strategy		Action	Priority	Responsibility
Increase awareness of appropriate means of disposal of effluent from boats	1.2	Support initiatives to make holding tanks mandatory for commercial vessels.	high	EMC
	1.3	Include information on boat pumpout facility in Forsters Bay when Waterways Map is revised.	medium	Waterways

Objective: To improve the quality of run-off from urban and rural areas

Strategy		Action	Priority	Responsibility
Ensure the inlet is not affected by seepage from septic tanks	1.4	Continue to carry out environmental audits of septic tanks within the catchment of the inlet to identify poor performance and any illegal discharges. Notify owners of required actions, eg desludging, pumpout.	high	ESC
	1.5	As part of the water quality monitoring program for Forsters Bay (see **Section 6.1**) include sampling sites to identify any changes to run-off/water quality due to the development of Ringlands Estate.	high	ESC
Identify and address possible pollutant sources	1.6	Carry out an environmental audit of businesses around the inlet to identify practices which adversely impact on water quality – prepare educational package on appropriate site management practices (see **Section 6.1**).	medium	ESC
	1.7	Continue actions to minimise sewer overflows at Narooma, eg pressure cleaning mains of tree roots, pump draw down tests.	ongoing	ESC

Strategy		Action	Priority	Responsibility
Manage land use/development to prevent accelerated input of sediments from the catchment	1.8	Encourage the formation of a Landcare group to assist in developing vegetated buffer zones around tributary creeks, as well as promoting erosion control, planting programs, exclusion of stock, protection of SEPP No. 14 wetlands, noxious weed control and feral animal control.	medium	**DLWC**, ESC, RLPB, EMC
	1.9	Investigate improvements to maintenance/design of Tourist Drive 4 and Riverview Road including sealing sections of these roads where they cross major creeks to reduce sediment wash-off during storm events (already included in Council's roadworks program).	medium	ESC
	1.10	Report any incidences of sediment laden run-off (and other water pollution) to ESC or EPA.	as they arise	members of EMC
Improve fish cleaning facilities	1.11	Upgrade existing tables and, depending on availability of services, provide lighting, wash down hose and rubbish bins for the disposal of fish offal and litter at Town Wharf and Apex Park.	high	ESC
Include additional guidelines relating to water quality in DCPs	1.12	When DCPs and Residential Design and Development Guidelines are updated include reference to erosion and sediment controls in 'Checklist' section for the lodgment of development applications.	medium	ESC
	1.13	Prepare DCP which includes guidelines relating to development impacts on water quality.	medium	ESC

5.2 Goal: to ensure future development does not detract from the values of the inlet and is appropriately designed

Objective: To maintain the scenic views and vistas to and from Wagonga Inlet

Strategy		Action	Priority	Responsibility
Provide visually unobtrusive viewing points around the inlet	2.1	As per *Narooma Foreshore and Townscape Masterplan* provide additional boardwalks/platforms to increase opportunities to view the inlet while minimising impacts on foreshore vegetation (see actions under **6.9** and **6.10**). Consult with LALC on route selection and siting of structures.	medium	ESC
Encourage attractive building design compatible with the visual qualities of the inlet	2.2	Continue to promote existing residential design and development guidelines. Consideration could also be given to introducing annual Shire wide design awards.	ongoing	ESC
	2.3	Develop DCP for Coastal Villages which includes attractive building design guidelines for foreshore areas.	high	ESC

Objective: To ensure development is compatible with natural hazards

Strategy		Action	Priority	Responsibility
Increase awareness of flood hazard in the Narooma 'flat area'	2.4	Review design floor levels and development controls in view of the results of the *Wagonga Inlet Flooding Investigation* (GBA 1999).	high	ESC
	2.5	When DCPs and Residential Design and Development Guidelines are updated include reference to flood protection.	medium	ESC

5.3 Goal: to conserve the natural ecological communities and their component flora and fauna

Objective: To increase awareness of the values of natural communities in general and, in particular, the habitat values of wetlands

Strategy		Action	Priority	Responsibility
Provide information on natural communities and component species	3.1	Develop community education program that includes information on the protection of shorebirds, migratory species and wetlands and management of vegetation communities.	medium	**NPWS**, **ESC**
Publicise the link between mangroves and seagrasses and fish numbers	3.2	Include information on the fish nursery and habitat values of mangroves and seagrasses in interpretive signage for proposed boardwalk off Riverside Drive at Forsters Bay (see **6.9**).	high	**ESC**, Fisheries
	3.3	Where mangrove clearing is evident, letter-box drop foreshore residents with information from NSW Fisheries habitat management and fish conservation guidelines and details of penalties for illegal clearing.	as required	Fisheries
Monitor changes in mangroves and seagrasses	3.4	Install survey markers to identify changes in the extent of mangroves (possible student project).	medium	**EMC**, ESC, Fisheries
	3.5	Repeat seagrass surveys (Forsters Bay beds a priority) to monitor health (as an indicator of nutrient levels) and changes in distribution. See **Section 6.1** for more details.	medium	**EMC**, ESC, Fisheries

Objective: To appropriately manage aquatic resources

Strategy		Action	Priority	Responsibility
Control infestations of the Pacific Oyster	3.6	Continue to regularly inspect leases and rocky foreshores and remove Pacific Oysters to protect the existing aquaculture industry from the problems experienced in other NSW estuaries. Liaise with Navy divers to provide assistance.	medium	**Fisheries**, Wagonga Oyster Farmers

Strategy		Action	Priority	Responsibility
Collect base-line data on recreational fishing	3.7	Undertake recreational fishing survey to gain an understanding of the magnitude of the recreational finfish catch and harvesting of intertidal animals. Liaise with universities as possible student project.	low	**Fisheries**, EMC, SGFC
Encourage clean-up of areas around oyster leases	3.8	Include particular problem areas (eg walking track from Ringlands Point) in 'Clean up Australia' day program and liaise with oyster farmers to gain their participation.	high	**ESC**, Fisheries, Wagonga Oyster Farmers
Ensure cockle collection does not adversely impact on aquatic habitats	3.9	Continue to employ gathering practices which do not impact adversely on strapweed beds. Continue to assess the feasibility and sustainability of cockle collection within the estuary.	high	**Fisheries**, commercial fisher

Objective: To provide a vegetated buffer zone around the entire inlet

Strategy		Action	Priority	Responsibility
Preserve bushland around Wagonga Inlet	3.10	Investigate mechanisms to impose harsher penalties for breaches of development consent and Council's Tree Preservation Order relating to clearing of bushland on Ringlands Estate.	high	ESC
Control damage to vegetation resulting from vehicle access	3.11	Close track on Crown Reserve adjoining Ringlands Estate to private vehicles. Maintain as emergency bushfire access, access for weed control and walking track.	high	ESC
Actively manage remnant bushland of conservation significance	3.12	Develop bushland management plan and weed control program for the rainforest at Flying Fox Bay and remnant vegetation at the northern end of Mill Bay.	medium	ESC
Increase the extent of foreshore buffer zones	3.13	As per Council's Policy, continue to pursue opportunities to transfer foreshore land into public ownership through conditions of development/subdivision consent, for: - land zoned 2ec around Forsters Bay - land zoned Rural 1(a) around Barlows and Clarks Bays, Freshwater Bay/Paradise Point, and between Honeymoon Point and Hobbs Point - land zoned "Further Investigation for Rural C" between Brices Bay and Punkally Creek.	ongoing	ESC
	3.14	Change zoning of unused road reserves around inlet to 6(a) eg: - road reserve on south-western side of Forsters Bay.	low	ESC
	3.15	Rezone SEPP 14 wetland No. 126 (between Punkally and Burrimbidgee Creeks) to 7(a) Environmental Protection - Wetland	high	ESC

Strategy		Action	Priority	Responsibility
Increase the extent of foreshore buffer zones (continued)	3.16	Map riparian buffer zones in Rural 1(c) small holdings zones for better protection.	high	ESC
	3.17	In conjunction with current/future review of LEPs consider introduction of an environmental protection zone for riparian buffers, shorebird nesting and feeding areas, regionally uncommon vegetation and wildlife corridors.	as arises	ESC

Objective: To encourage community participation in the management of foreshore reserves

Strategy		Action	Priority	Responsibility
Establish volunteer bush regeneration group(s)	3.18	Develop a program for weed control along the Princess Highway/Centenary Drive (as per *Masterplan*) and advertise/approach existing community groups for volunteers to become involved. Resources may also be available through the Green Corps and Natural Heritage Trust. Extend program to other areas as interest develops.	medium	ESC

5.4 Goal: to protect and increase recognition of Aboriginal and European heritage

Objective: To increase awareness of Aboriginal and European sites and local history

Strategy		Action	Priority	Responsibility
Continue to develop and seek sponsorship for walking track brochures	4.1	Prepare Narooma Town/Bar Rock brochure (funding has been received).	high	**HS**, ESC
Develop design guidelines and program for the installation of interpretive signs	4.2	Install interpretive signs at: - points of interest along *Mitchell's Mill Walk and Ringland's Rotary Walk* - log ramp (skids) at Wagonga Picnic Area - at points of interest along proposed Narooma Town/Bar Rock walk – develop major interpretive signage for Rotary Park covering both Aboriginal and European heritage (including *Lady Darling* wreck).	medium	**ESC**, HS Forests HS, LALC, **ESC**, NPWS

Objective: To prevent deterioration of Aboriginal middens and other archaeological sites

Strategy		Action	Priority	Responsibility
Maintain involvement of LALC in foreshore/catch-ment works	4.3	Refer to recommendations contained in Navin Officer (1997) and continue to involve Aboriginal sites officer in the planning for, and construction of, foreshore paths and other recreational facilities (eg proposed access from Mill Bay to Apex Park), as well as logging operations/management of Bodalla State Forest.	ongoing	**ESC**, NPWS, **Forests**
Protect middens and other sites	4.4	Investigate means to address erosion of the midden at the Wagonga Picnic Area and other sites as necessary.	as needed	**LALC**, **Forests**

Objective: To conserve the remains of early European settlement and industry

Strategy		Action	Priority	Responsibility
Ensure access is available to heritage relics for conservation, and where appropriate, interpretation	4.5	Liaise with property owner to gain access to Wagonga Cemetery to repair fence and headstones as and when required.	high	**ESC**, HS

5.5 Goal: to improve boat navigation and safety

Objective: To maintain navigation channels

Strategy		Action	Priority	Responsibility
Assess adequacy of navigation channel depths and impacts of shoaling	5.1	Monitor channel depths (by depth sounder) upstream and downstream of the bridge and provide regular reports to the EMC.	high	Waterways
	5.2	Provide detailed channel surveys (including channel at Shell Point) and depth comparisons at appropriate intervals.	high	DLWC
	5.3	Monitor continuing sand intrusion into Forsters Bay and its impacts on Taylors Boatramp and adjacent private jetties. This is to include details on the frequency and volume of sand removed from the boatramp by Council.	high	DLWC, ESC
Maintain adequate depths for commercial and recreational vessels to enter Forsters Bay	5.4	Remove rocks at danger buoy, downstream of the highway bridge.	high	**Waterways**, **DLWC**, ESC
	5.5	Review need for dredging navigation channels. If required, prepare environmental impact assessment report. See **Section 6.2** for more details.	high (ongoing)	**ESC**, DLWC

Objective: To improve boat safety awareness

Strategy		Action	Priority	Responsibility
Improve dissemination of information on bar conditions and boat safety	5.6	Continue to include articles on correct procedures for putting to sea and crossing the bar in the *Narooma News*, *This Month on the Sapphire & Eurobodalla Coast* and other tourist/fishing publications.	ongoing	**RVCP**, ENC, Fisheries, **Waterways**, CoC
	5.7	Prepare and distribute information on boating safety tips (such as those prepared by the RVCP in the past) so that they are available at caravan parks, motels and other tourist accommodation.	high	**RVCP**, CoC, **Waterways**
	5.8	Explore opportunities for the implementation of a trial 'bar watch' system including dissemination of information via digital display boards and hazard ranking lights. See **Section 6.1** for more details. Funding assistance for this system may be available under Waterway's Asset Development and Management Program (WADAMP).	high	ESC, RVCP, **Waterways**
	5.9	Explore opportunities for repair of Old Pilots Wharf for use by RVCP, subject to funding availability (works to be sympathetic to heritage significance of structure and could include interpretive signage).	high	**RVCP**, Waterways

5.6 Goal: in keeping with conservation values, ensure equitable use of the inlet's waterway and recreational resources

Objective: To balance the commercial and recreational uses of the inlet

Strategy		Action	Priority	Responsibility
Maintain open water areas within the inlet for recreational boating and visual amenity	6.1	Continue current closure on new leases. Assessment of applications to the Minister for relocation of silted leases to take account of areas of ecological significance (see **Figures 3.1a** and **3.1b**), navigation channels and access to/from boat launching and foreshore picnic areas.	as arises	Fisheries
	6.2	Prepare mooring plan for Wagonga Inlet (with input from EMC and with reference to areas of ecological significance, see **Figures 3.1a** and **3.1b**) identifying existing/future mooring areas (public/private) and the maximum number of moorings per area.	high	Waterways

Objective: To promote foreshore facilities that cater for commercial, tourism and public use

Strategy		Action	Priority	Responsibility
Extend Town Wharf	6.3	Prepare design report for the extension of Town Wharf towards the swimming pool. Include boat pumpout facilities, see **Section 6.1** for more details. A preliminary concept showing public/commercial space is shown in **Figure 5.1**. Funding may be available through the Federal Government's Regional Assistance Program. DLWC and Waterways funding is available for public wharves.	high	ESC, DLWC, commercial operators, Waterways

Objective: To address potential conflicts between recreational users and between recreational use and ecological values/commercial use of the inlet

Strategy		Action	Priority	Responsibility
Manage boating to avoid conflicts	6.4	Review existing boating controls and impacts of vessel operation with reference to **Figures 3.1a** and **3.1b**, areas of ecological significance.	in hand	**Waterways**, EMC, ESC
	6.5	Implement appropriate boating controls (and associated advisory/educational signage at boat launching areas) based on the following principles: - reduced boat speeds upstream of Honeymoon Point to minimise boat wash, effects on oyster leases, SEPP No.14 wetlands and other sensitive foreshore lands - no anchoring in seagrass beds - reduced boat speeds over large beds of strapweed *Posidonia australis* (see **Figure 3.1a** and **3.1b**) - reduced boat speeds (ie noise levels) adjacent to areas of ecological significance consistent with use as passive recreational areas.	medium	Waterways
Manage foreshore reserves in accordance with their ecological values	6.6	Development of reserves identified as being of ecological significance to be restricted to low impact recreational and educational activities, eg bushwalking, nature study and only basic facilities to be provided, ie unsealed walking tracks, 'bushland' picnic areas.	medium	ESC
	6.7	Consider exclusion of dogs from areas of high native animal habitat value (eg shorebird breeding and feeding areas) and exercise of dogs on-leash only, in other areas of ecological significance.	high	ESC
Encourage responsible dog exercising	6.8	Monitor impacts of off-leash dog exercise on passive use of reserves. Consider installation of 'dog litter bins'.	ongoing	ESC

Objective: To improve public facilities and foreshore access to the inlet

Strategy		Action	Priority	Responsibility
Provide viewing/fishing platforms and boardwalks	6.9	As per the *Narooma Foreshore & Townscape Masterplan* install mangrove boardwalk off Riverside Drive.	medium	ESC
	6.10	As per *Masterplan* construct walkway under bridge and extend *Masterplan* to north-western side of bridge (old ferry approach) to address bank erosion, formalise area for fishing/viewing and provide interpretive sign. See **Section 6.1** for indicative costs per metre for boardwalks.	low	ESC
Provide more public jetties	6.11	Reconstruct existing jetty at Ringlands Point (note that open mesh decking would be required to minimise impacts on strapweed beds (Posidonia australis)	high	ESC
	6.12	Construct jetty, provide fish cleaning table, wash down hose, lighting and bins and formalise and seal carpark to southern boat ramp at Forsters Bay Funding is available through DLWC and Waterways programs for public wharves and jetties. Indicative costs per metre are provided in **Section 6.1**.	low	ESC
Improve access for launching sailboats etc	6.13	Widen sand ramp near NSW Fisheries building so more than one boat can be launched at a time.	high	**ESC**, SC

6 Major Actions

Indicative costs for major actions are indicated where sufficient detail is available or where other project costs can be used as a guide. Many of the actions included in **Section 5** relate to staff time, which has not been costed. Potential funding sources have also been indicated in **Section 5**. Proposed major actions are described and costed in **Section 6.1**. Further works/investigations which may be required are outlined in **Section 6.2**.

6.1 Proposed Major Actions

Wharf Extension Design Report

It is estimated that the proposed extension would need to accommodate about 10 vessels, with the total area set aside for commercial vessels catering for the eight existing licensees, catamaran on pole mooring, four boats on the waiting list and the NPWS Montague Island supply vessel. Part of the wharf would have to be trafficable for a crane truck to load and off-load containers for Montague Island (this may not be necessary if NPWS and Rose construct a joint facility at Mill Bay). It is proposed that the timber section of the wharf be for temporary use by the public and visiting yachts/other vessels.

The estimated cost for this report is $26,000, based on the following tasks:

- Appraisal of current and future demand for permanent and temporary berths.
- Survey of other Councils to gain information on wharf maintenance costs and income from mooring fees.
- Appraisal of existing geotechnical information from the original construction and extension of the wharf.
- Engineering assessment of the training wall, including determination of whether or how this would be tied into the new wharf.
- Land survey to prepare cross-sections for use in developing designs.
- Identification of potential environmental issues.
- Preparation of report including plans of design options (eg full wharf, or piled moorings with catwalk access and dedicated wharf area for loading/unloading – boat pumpout to be included in designs); indicative construction costs, and maintenance costs and likely income; and recommendation on preferred option.
- Identification of funding options and ongoing maintenance and management arrangements through discussions with commercial charter boat operators, DLWC, Waterways and ESC.

The Wharf Extension Design Report would be followed by an environmental impact assessment report covering issues such as potential impacts on aquatic habitat, heritage items (ie last remaining pylon from ISCSN Co Wharf, see **Appendix D**), parking and traffic, servicing and maintenance and Native Title considerations. It would also include geotechnical investigations, eg probes/test pits/bore holes.

This would be followed by the preparation of a specification and tender documents. It is not possible to cost the latter two reports/documents as this would be dependent on the outcomes of the Design Report.

The typical cost for full wharf structures is about $\$1,000/m^2$. If catwalk access was proposed, mooring poles would be about $3,500 each (based on use of Koppers double treated hardwood piles) with catwalks about $5,000 each. These are

indicative costs only and would vary depending on site conditions and the size of the proposed wharf extension (pers. comm. Greg Britton, Patterson Britton & Partners).

Trial Bar Watch System

This includes the development of protocols for a hazard ranking system based on existing data and the installation of a video camera in the entrance to cover the RVCP blind spot. The estimated cost of the bar watch system is $65,000 (annual maintenance costs about $2,000) based on the following indicative costs provided by MHL (2001b):

- develop protocols (incl. workshop with experts) $10,000
- video camera (analogue system, real time image) $5,000-$10,000

  (costs dependent on housing with maintenance estimated at $1,000/year, as wiper device would need to be installed and maintained to remove spray)

Indicative costs for a computerised Bar Watch System are provided in **Section 6.2**. Both systems would be accompanied by a digital display board on the waterway near the entrance and hazard ranking lights at the Apex Park boatramp.

Indicative costs are provided below.

- digital sign board (as used by RTA) $30,000-$40,000
  (maintenance approx. $500/year)
- static display board with lights $5,000-$10,000
  (maintenance approx. $500/year)

Water Quality Monitoring Program

Water quality monitoring should focus on Forsters Bay due to:

- the proximity of Ringlands Estate (where town sewerage is not available);
- the concentration of businesses along the eastern foreshore; and
- as community feedback indicated that the bay was the area most affected by stormwater pollution.

It is suggested ongoing monitoring of the following parameters be undertaken for both foreshore sites (surface water quality monitoring) and sites in the deeper areas of the bay (monitoring through the water column to identify stratification of bay waters):

- dissolved oxygen
- temperature
- salinity
- chlorophyll-a.

Foreshore monitoring sites would be located adjacent to stormwater outlets, potential sewage overflow points and drainage lines. In addition to the above, these sites would be monitored for oil, gross pollutants and faecal coliform indicators. Other parameters (such as nitrogen and phosphorus) could be monitored if a specific contaminant is suspected. It is not proposed to monitor nutrients on a regular basis as the EPA (2001) has advised that chlorophyll-a levels and seagrass depth and distribution (see action below on seagrasses) *provide a better, more cost effective, integrated* (measure of the) *biological response to various forms of nutrient input.*

The monitoring program should be developed in accordance with ANZECC guidelines, EPA environmental objectives (as outlined in **Section 4.4**) and the

findings of the Stormwater Management Study (ESC 2001). The ANZECC (2001) guidelines recognise that optimum water quality characteristics differ between regions and so site specific information is required to account for the natural variability of aquatic environments across Australia. Accordingly, it is recommended that water quality guidelines be determined through the use of high quality reference sites. As water quality within Wagonga Inlet is generally considered good, reference sites (remote from potential pollutant inputs) within the main body of the inlet could be used as a baseline for setting guidelines for Forsters Bay.

It is assumed that the water quality sampling and analysis could be done in-house by Council, however, there may be a need for some parameters to be analysed at an external laboratory. Costs associated with external laboratory analysis would need to be confirmed once the sampling frequency and number of sites was determined. As noted in **Section 4.4** a monitoring program relating to oyster production is already in place.

Seagrass Monitoring

Wagonga Inlet contains three species of seagrass, *Posidonia australis* (strapweed), *Zostera* sp. (eelgrass), and *Halophila* sp. (paddleweed). McNeil *et al.* (1997) measured several variables (including density, maximum depth and epiphyte/seagrass weight ratios) through time to assess the health of *P. australis* beds and water quality in Wagonga Inlet. The University of Wollongong is currently undertaking a study of seagrasses in Wagonga Inlet. This data could be repeated to analyse temporal changes.

The total cost for a single sampling exercise including fieldwork, laboratory work, analysis and reporting is estimated to be between $20,000 and $30,000 (based on commercial rates). Note that this does not include detailed mapping of the distribution of seagrasses within the inlet. NSW Fisheries advise that it would be necessary to sample more than twice to provide an assessment of changes over time. Some cost saving would be possible for sampling over time, eg costs for three sampling exercises would be less than three times the estimated fee for one sampling exercise.

Forsters Bay Mangrove Boardwalk, Jetties and Interpretive Signs

Improvements to pedestrian access to foreshores etc were costed as part of the *Narooma Foreshore and Townscape Masterplan* in 1998. Current costs for boardwalks, based on projects in Sydney's northern beaches area, are about $500 per metre (1.5 m wide boardwalk without handrails) up to about $1,000 per metre with handrails and integral interpretive signs (pers. comm. Paul Hardy, Pittwater Council). Materials and design of interpretive signage around the inlet should be in keeping with the area's heritage and scenic values.

The cost for jetty structures would be similar to a wharf structure, ie about $1,000/$m^2$ as noted above.

Commercial Area Education Package

It is recommended that an education package be prepared by Council and distributed to Narooma businesses within the catchment of Wagonga Inlet. This should cover:

- Sign posting internal stormwater drains to indicate that they should carry clean water only, as they ultimately discharge to the inlet.
- Promoting dry sweeping methods to prevent polluted waters from washing down activities entering the stormwater system.

- Confining wash down activities to bunded areas where waste water can be treated, recycled or discharged to the sewer as approved by Council.
- Storing bulk liquids away from stormwater drains in a bunded area or on trays so accidental spills or leaks do not enter the stormwater system (this also makes spills or leaks easier to clean up).
- Providing information on waste management/recycling services, eg oil separating equipment, waste oil recycling services.
- Publicising procedures in case of a pollutant spill and contact numbers for organisations that can provide advice/assist in containment/clean-up (eg provision of absorbent booms).

6.2 Possible Future Actions

Computerised Bar Watch System

This would involve integrating existing data (eg tides, offshore wave heights and weather conditions) to determine the prevailing conditions at the bar at any one time. Information on the condition of the bar could be obtained through a digital camera link. *These data could be displayed together on a purpose built 'Narooma Bar' home page or management system for direct interpretation*, *or could first be used as input to a predictive model to assess the relative hazard of crossing the bar now, or at some time (say two to six hours) in the future* (MHL 2000)*.*

To assist in developing the system wave modelling and current monitoring would be required. This would consist of refraction/diffraction modelling of nearshore wave conditions and the installation of current meters in the inlet, to record current velocity and direction at strategic locations, during different seasons.

The estimated cost of modelling/monitoring work is $25,000 but could be higher depending on the length of time current metres were installed. The indicative cost to develop a trial computerised system is $50,000 - $80,000, with maintenance estimated at $5,000-$10,000/year (MHL 2000).

Dredging of Navigation Channels – General Comments

NSW Fisheries (2001) advised that *as discussed with the* (Estuary Management Committee) *during the August 2001 meeting, the ability to dredge the inlet is restricted due to the presence of Posidonia australis. In line with NSW Fisheries Policies and Guidelines for Aquatic Habitat Management and Fish Conservation, any potential direct or indirect impacts on this species of seagrass are viewed very seriously. NSW Fisheries, whilst understanding the economic situation faced by businesses within Forsters Bay, is unlikely to support any dredging options within areas adjacent to Posidonia australis.*

In addition NSW Fisheries (2001) advised that *location of dredging plant on the sand flat area* (on the eastern side of Forsters Bay) *would not be acceptable due to possible damage to the surrounding aquatic environ….*and that *it would not be acceptable to locate the spoil from any dredging operation within the confines of the Wagonga Inlet. The spoil would have to be removed and disposed of.*

Maintenance Dredging of North-South Navigation Channel

If dredging of the north-south channel was proposed, as noted above, the environmental impact assessment would need to consider, amongst other matters, potential impacts on *Posidonia australis* beds. Other issues which may need to be considered are indicated below in the discussion on Major Dredging of Navigation Channels.

While dredging an access channel on a similar alignment to the old north-south channel (if approved by NSW Fisheries) would not improve navigation to the extent of a major dredging program (see below), it would provide the following benefits:

- A channel 50 m wide by 200 m long dredged to a depth of 2.5 m below Australian Height Datum (AHD) would require removal of about 8,000 m^3 of material compared with 50,000 m^3 for major dredging.
- It would alleviate, for an undetermined period of time, what is reportedly the most significant hazard associated with navigating between the entrance channel and the deeper waters of the inlet. That is, crossing the shoal at the flood tide delta off Peters Point.
- The dredged channel could be monitored over time to assess the contemporary infill rate. Further dredging activities could then be considered in light of this information and the need, or otherwise, for further improvements to channel navigation.

Typical costs for dredging are $5-$7 per cubic metre. Accordingly, dredging costs would be in the order of $40,000 to $56,000 excluding dredge mobilisation costs (dependent on the type of plant used and transport costs) and any costs associated with disposal of the dredged material (ie costs associated with transport to a land-based site and processing costs).

Major Dredging of Navigation Channels

If a more extensive dredging program was proposed, in addition to environmental issues, matters to be considered in deciding whether or not to proceed would include:

- the level of impact on recreational/commercial boating, eg what size vessels are currently experiencing difficulties accessing Forsters Bay, how many boats are affected?
- the level of access difficulty for affected boats, eg is access only possible on high tides?
- why boats need access to Forsters Bay, eg for recreational fishing, processing of oysters, hire boats based at the marina, maintenance at slipway?
- are there other facilities elsewhere that cater for boats with access difficulties?
- initial and ongoing costs of dredging – how is this to be funded (eg would the work be eligible for funding under the Estuary Management Program) and who benefits, eg private individuals, businesses?
- what are the consequences of 'doing nothing'.

A major dredging program would require the preparation of a dredge design report as described below. The estimated cost for this report is $30,000, based on the following tasks:

- Vibrocoring to proposed dredge depth to determine physical properties of sediments which influences handling/disposal/reuse options (no allowance for testing of heavy metals or organochlorides is included as material is assumed to be clean sand).
- Dredge design (eg dredge depths, batters).
- Identification of dredge options (eg type(s) of dredge employed, method of transporting dredge material to disposal/reuse site).
- Identification of preferred option for disposal/reuse of dredged material.

- Identification and preliminary assessment of environmental issues: eg traffic impacts associated with transport of dredged material; potential impacts on oyster leases, seagrasses, threatened or protected species, aquatic/foreshore habitats (including shorebird breeding and feeding areas); and impacts on/rehabilitation of disposal/reuse area(s).
- Costs for initial dredging and indicative costs for maintenance dredging.
- Costs for transport/disposal/reuse of dredged sediment.

The design report would be followed by the preparation of an environmental impact assessment report. Note that various licences, permits and approvals are required for dredging works including a permit under the *Fisheries Management Act* and, for works involving more than 30,000 m^3/year, an Environment Protection Licence (EPL) under the *Environment Operations Act*.

If approvals were obtained, a technical specification and tender documents would then be prepared.

7 Assessment of Actions

The following techniques are suggested as means of monitoring the effectiveness of actions set out in **Section 5** which require evaluation.

- Sampling and analysis of water quality data in Forsters Bay (as discussed in **Section 6.1**) to identify trends, as well as compliance with water quality guidelines, relating to public health and ecosystem health.
- As per **Actions 5.1** – **5.3** comparisons of channel depth surveys and extent of sand intrusion into Forsters Bay to determine changes in shoaling patterns and impacts on boating within the inlet.
- Seagrass surveys to assess seagrass health and as a measure of ecosystem health, as described in **Section 6.1**.
- As per **Action 3.6** comparison of numbers of Pacific Oysters removed during regular inspections to assess effectiveness of control measures (note that the local aquaculture industry's actions have already resulted in a reduced level of Pacific Oyster infestation in recent years, NSW Fisheries 2001).
- As per **Action 3.7** comparison of results of recreational fishing surveys to identify changes in finfish catch/catch effort and harvesting of intertidal animals.
- Annual survey at Apex Park boat ramp to determine if, how and when recreational boaters received information on boating safety and bar conditions.
- Use and analysis of data bases on reports/incidents relating to water pollution, illegal tree clearing and entrance bar accidents/incidents.
- Records of numbers of participant hours/participants in Landcare and bush regeneration group activities to gauge the success of environmental education programs and initiatives to increase community involvement in foreshore reserves management.
- Vegetation surveys to map increases in vegetated areas/success of planting programs and weed control programs.
- Follow-up commercial area surveys to gauge implementation of appropriate environmental management practices.

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Appendix A

Main State Government Authorities with a role in Estuary Management

Authority	Relevant Legislation	Responsibility
Department of Land & Water Conservation (DLWC)	Native Vegetation Conservation Act 1997 Native Title Act 1993 (Commonwealth legislation administered by the State) Catchment Management Act 1989 Crown Lands Act 1989 Coastal Protection Act 1979 Rivers & Foreshores Improvement Act 1948 Soil Conservation Act 1938 Water Act 1912 (the Water Management Act 2000 repeals the Water Act and Rivers & Foreshores Improvement (R&FI) Act, however, permit arrangements under the R&FI Act will remain until 2002)	DLWC is responsible for developing, controlling and managing the State's water resources (both surface and ground water) for human use / recreation and ecological needs. It is responsible for Crown lands assessments and the leasing and licensing of Crown land; the conservation of soil and preventing erosion; and carries out soil surveys (including acid sulphate soil mapping) and land capability studies. DLWC is also involved in: catchment, vegetation, coastal zone and floodplain management; the provision of waterway infrastructure such as wharves, boat ramps and fishing ports; and provides technical and policy advice on country water and sewerage programs.
Environment Protection Authority (EPA)	Protection of the Environment Operations Act 1997	The EPA is responsible for controlling, reducing and preventing pollution from premises required to hold an Environmental Pollution Licence or for which the EPA is the appropriate regulatory authority. It is also involved in waste management and minimisation, sewage management, stormwater and contaminated sites.
Department of Urban Affairs & Planning (DUAP)	Environmental Planning & Assessment Act 1979 Heritage Act 1977	DUAP coordinates planning in NSW and oversees the operation of the environmental impact assessment legislation. It is responsible for planning at regional and State level and produces publications relating to planning, changes in planning laws, environmental issues, policies and heritage protection.
NSW Fisheries	Fisheries Management Amendment Act 1997 Fisheries Management Act 1994	NSW Fisheries legislative objectives are to conserve fish stocks and key fish habitats; conserve threatened species, populations and ecological communities of fish and marine vegetation; and promote ecologically sustainable development, including the conservation of biological diversity and where consistent with these objectives: promote viable commercial fishing and aquaculture industries; promote quality recreational fishing opportunities; and appropriately share fisheries resources between the users of those resources.
Waterways Authority	Maritime Services Act 1935 Navigation Act 1901	Waterways is responsible for: developing and managing waterways for recreation; controlling non-port traffic; and maintaining non-port waterways / navigation channels.
National Parks & Wildlife Service (NPWS)	Threatened Species Conservation Act 1995 National Parks & Wildlife Act 1974	NPWS has statutory responsibilities for the care, control and management of national parks, nature reserves and state recreational areas as well as for the protection and care of Aboriginal sites and relics, and native flora and fauna throughout New South Wales.
State Forests	Forestry and National Park Estate Act 1998 Forestry Act 1916	State Forests is responsible for ecologically sustainable management of State Forests. This includes conserving biodiversity and cultural heritage, producing timber and forest products and providing for recreation.

Local and Regional Plans

Lower South Coast REP No.1 – High Rise Buildings

This applies to coastal land within Bega Valley and Eurobodalla LGAs. The plan aims to conserve scenic and environmental character and to protect the coast's visual quality by setting height limits of 14 m on most buildings.

Lower South Coast REP No.2

This REP provides a framework to guide decisions on local planning and development, and government and private investment in Bega Valley and Eurobodalla Shires. It provides regionally relevant guidelines for the preparation of local plans and lists matters to be considered when assessing development applications. This includes the policies and guidelines of the NSW Coastal Policy.

Lower South Coast Regional Settlement Strategy

This strategy identifies a hierarchy of settlement based on the varying roles and functions of existing town and villages and their capacity and suitability for further growth. Eden has been identified as a District Centre, which has the potential to develop a greater tourism role in conjunction with its servicing role. Bega Valley Shire Council plans to develop a staged strategy for supply of new release areas in Eden.

Eurobodalla Shire Rural Local Environmental Plan (LEP)

The LEP includes two specific environment protection zones – the Wetlands Zone and Coastal Lands Protection Zone. It also includes the Coastal Lands Acquisition Zone and the Rural (Environmental Constraints and Agriculture) Zone with objectives of environmental protection. The objectives of the Wetlands Zone are directly related to ensuring protection of breeding and feeding areas for birdlife, fish and shellfish, and to promote rehabilitation (ESC 1998).

Eurobodalla Development Control Plans and Residential Design and Development Guidelines

These DCPs/Guidelines contain objectives and guidelines relating to sunlight and solar access, privacy, views, floor space ratio, building heights, set-backs and building lines (including minimum 12 m set-backs from foreshore reserves), private open space, landscaping, parking and access and bushfire protection. The 'Introduction and Design Considerations' document also includes guidelines for site analysis, energy efficiency and mitigation of flood impacts.

Erosion and sediment controls are imposed on developments as conditions of consent. In addition, depending on the magnitude of the development, a soil and water management may be required to be submitted and approved prior to release of a construction certificate.

Development Control Plan No. 156 Rural Subdivision

This DCP aims to promote subdivisions which:

- *maximise retention of native vegetation;*
- *minimise potential for erosion, sedimentation and contamination of water courses;*
- *avoid intrusion of development on visually significant ridges, hill slopes, drainage lines and other environmentally sensitive areas;*
- *provide opportunity for the location of dwelling houses in sympathy with the capability of the land;*
- *provide a mix of lot sizes;*
- *provide safe, practical and environmentally compatible vehicular access; and*
- *ensure compatibility with existing and future surrounding development.*

Ringlands Estate Development Control Plan

This DCP aims to:

- *identify environmental factors relevant to Rural Small Holdings development, including:*
  - *provision of public utilities;*
  - *land capability as determined by land form, vegetation, climatic and soil factors;*
  - *scenic values to residents and visitors of Eurobodalla Shire;*
  - *landscape conservation;*
  - *the protection of water quality of Wagonga Inlet;*
  - *the provision of public access to the waterfront and other significant areas;*
  - *hazard factors, including bushfire hazard.*
- *Establish development standards relating to subdivisions, the erection of buildings and provision of services.*
- *Emphasise controls already established concerned with land clearing and conservation of Aboriginal artefacts.*

Eurobodalla Shire Plan of Management – Natural Areas and Undeveloped Reserves

The general objectives of the plan are:
- *To restore, preserve and protect the valuable characteristics of each 'Natural Area' of Community Land.*
- *To manage passive recreation opportunities that meet the needs of the community in Natural Areas consistent with the conservation of natural values of the land concerned.*
- *To manage a portfolio of smaller undeveloped areas for passive recreation in urban areas.*
- *To promote visitor safety, awareness and appreciation of the natural environment.*

Management issues addressed include landscape character; soils, drainage and waterways; pesticides, herbicides and fertilisers; noxious weeds and feral animals; fuel, oil and hazardous materials; and vegetation clearing including fire hazard reduction.

Regional Forest Agreements and Ecologically Sustainable Forest Management Plan

Regional Forest Agreements (RFAs) and Integrated Forestry Operations Approvals (IFOAs) govern activities within State Forests. IFOAs specify the terms of licences under the *Protection of the Environment Operations Act 1997*, *Threatened Species Conservation Act 1995*, *Fisheries Management Act 1994*, together with heritage guidelines. The licence conditions under the *Protection of the Environment Operations Act* cover soil and water management and monitoring. Ecologically Sustainable Forest Management Plans are also part of the RFA and IFOA planning process.

The Ecologically Sustainable Forest Management Plan for the South Coast Forestry Region is due for completion in 2001 and will guide the management of State Forests and other forested public lands. It will replace State Forests' Narooma Management Plan (1986). The goals of the Plan will be the:
- *conservation of biodiversity*
- *protection of soil and water quality*
- *protection of cultural heritage*
- *provision of social and economic benefits.*

Principles and Policy Objectives relevant to Estuary Management

(largely based on DLWC Sydney/South Coast Region's requirements for EISs)

In addition to the following strategies and policies an Urban Streams Policy is being developed by DLWC, a Riparian Zone Policy by DUAP and policies and guidelines will flow from the Water Reforms Act. The following strategies and policies have been produced by DLWC. There are many other guidelines and policies produced by other authorities which are also relevant to estuary management, such as NSW Fisheries habitat management guidelines and the *Aquatic Habitat Management and Fish Conservation Policy and Guidelines*.

The policies are listed in order from the broad to the more issue specific. The goals and objectives developed for the Wagonga Inlet Management Plan constitute the application of these broad policies for a specific geographic area.

NSW Biodiversity Strategy

The aim of the strategy is to protect the native biodiversity of NSW and to maintain ecological processes and systems. The following principles apply:
- Proposals/activities should not decrease native biodiversity of either individual species or communities of a site or area.
- Proposals/activities should not be part of any threatening process to the native biodiversity of a site or area.
- The precautionary principle is to be taken into account by careful evaluation of the consequences of management/development options to avoid, wherever possible, serious or irreversible damage to native biodiversity.

NSW Coastal Policy

For the purposes of this policy, the coastal zone includes coastal lakes, lagoons and the estuarine sections of coastal rivers, as well as the open coast. The goals of the Coastal Policy are to:
- Protect, rehabilitate and improve the natural environment.
- Recognise and accommodate natural processes.
- Protect and enhance aesthetic qualities.
- Protect and conserve cultural heritage.
- Provide for ecologically sustainable development and use of resources.
- Provide for ecologically sustainable human settlement.
- Provide for appropriate public access and use.
- Provide information to effectively manage the coastal zone.
- Provide for integrated planning and management of the coastal zone.

NSW State Rivers and Estuaries Policy

The aim of the policy is to encourage sustainable development of the natural resources of the State's rivers, estuaries, wetlands and adjacent riverine plains. This is to reduce and where possible halt:

- declining water quality;
- loss of riparian vegetation;
- damage to river banks and channels;
- loss of biodiversity; and
- declining natural flood mitigation.

It is also to encourage projects and activities which will restore the quality of the river and estuarine systems such as:

- rehabilitating remnant habitats;
- re-establishing vegetation buffer zones adjacent to streams and wetlands;
- restoring wetland areas;
- rehabilitating of estuarine foreshores; and
- ensuring adequate streamflows to maintain aquatic and wetland habitats.

NSW Wetlands Policy

The aim of this policy is to encourage projects and activities, which will restore the quality of the State's wetlands. The following principles apply.

- Water regimes needed to maintain or restore the physical, chemical and biological processes of wetlands will have formal recognition in water allocation and management plans.
- Land use and management practices that maintain or rehabilitate wetland habitats and processes will be encouraged.
- New developments are to allow for suitable water distribution to and from wetlands.
- Water entering natural wetlands is to be of sufficient quality so as not to degrade the wetlands.
- The construction of purpose-built wetlands on the site of viable natural wetlands is discouraged.
- Natural wetlands should not be destroyed, but when this is required as a result of social or economic imperatives, compensatory wetlands are to be constructed or existing wetlands rehabilitated.
- Degraded wetlands and their habitats and processes are to be actively rehabilitated as far as is practical.
- Wetlands of regional or national significance are to be conserved.
- The adoption of a stewardship ethos and co-operative action between land and water owners and managers, government authorities, non-government agencies and the general community is necessary for effective wetland management.

NSW Estuary Management Policy

The NSW Government recognises the ecological, social and economic importance of the State's estuaries and is concerned about the long-term consequences of their accelerating degradation. The general goal of this policy is to achieve an integrated, balanced, responsible and ecologically sustainable use of the State's estuaries.

As such, the State's estuaries should be managed to ensure:

- No adverse impacts on the physical processes operating within the estuary, for example:
  - a reduction in the existing tidal prism as a result of reclamation may affect an estuary's flushing and water quality characteristics, and
  - any associated retaining wall construction may result in erosion of adjacent properties and destruction of foreshore flora and fauna.
- Intertidal and aquatic flora and fauna are adequately protected.
- Potential impacts on water quality of proposals during construction and operational phases are appropriately mitigated.
- Conflict between estuary users and uses are minimised.
- The visual impact of potential development is assessed, for example, the length of jetties, the extent of foreshore walls, the form and colour of structures, the degree of land clearing, etc.
- The cumulative impacts of activities/proposals are considered in terms of their contribution to overall habitat loss and disturbance, water quality degradation, alienation of intertidal areas, increase in boat traffic etc.

NSW Flood Policy

The primary objective of the State Government's Flood Policy is to reduce the impact of flooding and flood liability on individual owners and occupiers, and to reduce the potential private and public losses resulting from all levels of flooding.

With regard to new development, the Policy is merits based, in which the impacts of flooding are balanced against planning, social, environmental and economic issues.

In assessing development proposals, consideration needs to be given, where appropriate, to:

- the potential impacts of flooding on the proposed development;
- the impact of the proposed development on flood behaviour both upstream and downstream of the site; and
- the possible impacts of flooding on residents and other users of the floodplain.

Particular attention should also be given to the availability of safe access and egress from flood affected property in times of flood. In this regard, the full range of potential flood events, up to the probable maximum flood (PMF) should be considered, together with the likely cumulative effects of future development.

Other DLWC Policies

- Coastal Crown Lands Policy – objectives relate to the rehabilitation, conservation and appropriate use of coastal Crown lands and the acquisition of significant coastal lands for future public use.
- Crown Land Foreshore Tenures Policy (Non-Commercial Operations).

Appendix B

Consultation

Consultation included:

- Individual meetings/telephone discussions with EMC representatives, local officers of State Government authorities and other local stakeholders.
- An 'open day' at Narooma Plaza on 10 December 1999 and distribution of a community questionnaire (see following report on questionnaire results for more information). The questionnaire included an invitation to register on a mailing list (over 100 people registered to receive further information).
- Distribution of an Issues and Options Paper (**Section 4** of the main report is based on this Paper), with submissions page to people registered on the mailing list (three submissions were received).
- Review of the preliminary drafts of the Estuary Management Study and Plan by government authorities and interest groups.

Acknowledgements

The following people provided input to the study and their contribution in developing the Estuary Management Plan is acknowledged.

- Members of the EMC and in particular Charlie Bettini (Wagonga Inlet Cruises), Laurelle Pacey (Narooma Historical Society) and Jim Croucher (oyster farmers representative)
- Peter Spurway (Project Manager) and other Eurobodalla Council staff
- Margaret Wyborn (NSW Waterways, Narooma)
- Mathew Richardson (NSW Fisheries, Narooma)
- Kerryn Stephens (DLWC, Wollongong)
- Ian Barnes (State Forests, Batemans Bay)
- Ray McDonnell (Quarterdeck Marina)
- Darryl Stewart (Narooma Commercial Fishing and Charter Boats)
- Tom Michelsen and other members of the Narooma Sailing Club
- Ron Mason (Wagonga Local Aboriginal Land Council)

The contribution of the Narooma community and visitors is also acknowledged through their completion of a questionnaire on Wagonga Inlet and continued interest through registration on the mailing list.

Narooma Plaza Management and Narooma Golf Club's assistance is also acknowledged in helping distribute the questionnaire. Charlie Bettini also assisted with the questionnaire survey by distributing questionnaires on the Wagonga Princess tours.

Appendix C

Appendix D

South Coast Tourism Information

Compiled from the following:

- Advance Tourism (1997), *Eurobodalla Nature Coast Tourism Development Strategy*, for Eurobodalla Shire Council.
- Bureau of Tourism Research (BTR) (2000), *Tourism Trends in NSW South Coast Regional Biannual Profile Year end June 1999*, prepared for Tourism New South Wales.
- NSW Tourism Commission (1990a), *Illawarra Region NSW Tourism Development Strategy.*
- NSW Tourism Commission (1990b), *South Coast Region NSW Tourism Development Strategy.*
- Tourism New South Wales (1999), *Attractions Development Strategy for Regional New South Wales.*

Eurobodalla is part of the South Coast Tourism Region, which also includes the Shoalhaven and Bega Valley Local Government Areas (LGAs). For the financial year 1995/96 Shoalhaven received 44% of visitors, Eurobodalla 29% and Bega Valley 27% (Tourism NSW 1999).

During 1998/99, there were approximately 2,637,000 domestic overnight visitors (representing 10% of domestic visitors in NSW) and 2,138,000 domestic day visitors to the South Coast. The average length of stay for overnight visitors was 3.9 nights, which is amongst the highest in NSW (BTR 2000). Of the international visitors to NSW, 3% or 72,100 visited the South Coast in 1998/99. These tourists were mostly from the United Kingdom or other European countries (BTR 2000). From previous surveys it appears that visitation to the South Coast has decreased but that the length of stay has increased (survey methodology changed in 1998 so previous data is not readily comparable).

Table D.1 shows the origin of visitors to the region.

Table D.1 - Origin of Overnight and Day Visitors to the South Coast

Origin of Visitors	Overnight Visitors %	Day Visitors %
Sydney	46	36
Other New South Wales	24	56
ACT	15	7
Victoria	13	

Source: BTR 2000 (NVS year ended 1999)

Obviously different areas within the South Coast Region attract visitors from different origins. Eurobodalla is popular with ACT residents, while the Sapphire Coast (particularly Merimbula) is popular with Melbourne and rural Victorian residents (NSW Tourism Commission 1990b). There are no recent breakdowns for visitor origin, however, **Table D.2** provides an indication of the origin of visitors to the Illawarra Region (which in 1988/89 included Shoalhaven) and the then South Coast Region.

Table D.2 - Origin of Domestic Visitors to the Illawarra and South Coast 1988/89

Origin	Illawarra % (including Shoalhaven)	South Coast % (Eurobodalla and Bega Valley)
Sydney	64.0	29.0
NSW country	22.7	25.3
Melbourne	2.3	14.8
Victoria Country	0.9	8.2
ACT	7.1	20.8
Queensland	2.1	
other interstate	1.0	2.0

Source: (NSW Tourism Commission 1990a and 1990b)

For the year ended June 1999, most overnight visitors visited the South Coast in January (18%) followed by April (10%) and February and May (9% each). The percentage of visitors for these peak summer and school holiday periods was 1 to 2% higher than the NSW State average, apart from the month of January when visitation was 6% higher than the State average. This illustrates the seasonality of visitation to the South Coast and predominance of summer visitation.

The popularity of the South Coast with families and retires is illustrated in **Table D.3**. This shows that more families with school age or younger children and more older non-working married people visit the South Coast Region compared to the State average. The popularity of the South Coast with families is also illustrated by the seasonal variations (highest visitation in school holidays) and the high average length of stay.

Table D.3 - South Coast Overnight Visitors – Lifecycle Group

Lifecycle Group	South Coast Region %	NSW %
young single living at home	11	13
young single living alone or in shared accommodation	2	3
midlife single	8	10
young/midlife couple, no kids	12	12
parent with youngest child aged 5 or less	**13**	12
parent with youngest child aged 6-14	**15**	13
parent with youngest child aged 15+ and still at home	**10**	8
older working single	2	3
older non-working single	3	5
older working married person	9	10
older non-working married person	**14**	12

Source: BTR 2000 (NVS year ended 1999)

(note: does not add up to 100% due to rounding)

The data and distinct image of the South Coast as a family destination is seen as a deterrent to other market segments. However, the proximity of the Eurobodalla Coast to Sydney and Canberra, and location on the tourist route between Sydney and Melbourne provides much potential for growth in visitor numbers all year round (Advance Tourism 1997).

Boating Information

NSW Charter Boat Industry

(excepts from *Discussion Paper – Management of the NSW Charter Fishing Boat Industry – Future Options,* Charter Fishing Boat Industry Review Group, 1998)

Steffe et al (1998) *found that fishing for inshore and coastal reef species is generally the most important type of charter fishing activity, with high levels of participation throughout NSW. Fishing for gamefish species is the second most important in terms of statewide participation, but it is the most important type of charter fishing for the Far South Coast region of NSW, accounting for the 40% of direct effort in that region. Ecotourism is the third most important charter activity for the NSW charter fleet and is generally more important in coastal regions to the north of Sydney than game fishing. Besides ecotourism other non-fishing charter activities of importance to many operators are dive charters and other activities, eg parasailing, corporate/social functions and transport services.*

The NSW recreational fishing charter boat fleet consists of many different sized vessels, which target and catch a great variety of fish species, and can move from port to port in response to seasonal and tourist demand. However, while the industry is diverse, three main classes of charter boat operation, which contain some 84% of the charter fishing boat fleet, can be identified:

- *6.1-9.0 m vessels, with 62 boats representing 25.4% of the NSW fleet;*
- *9.1-12.0 m vessels, with 88 boats representing 36.1% of the NSW fleet;*
- *12.1-15.0 m vessels, with 54 boats representing 22.1% of the NSW fleet.*

Overall, the bulk of the fleet consists of vessels that have maximum carrying capacities in the 6-10 person (96 boats representing 40.5% of the NSW fleet) and the 11-15 person (62 boats representing 26.2% of the NSW fleet) classes.

In all some 211 operators have been identified, which manage 249 charter boats. The majority of these operators (86%) manage a single vessel. It should also be noted that many charter fishing operations operate on a seasonal or part-time basis.

An estimated 11,103 charter fishing boat trips were made throughout NSW for the year September 1993 to August 1994 and a further 10,934 trips occurred during the second survey year September 1994 to August 1995 (Steffe et al 1996).

In addition to the above background information the Paper considered amendments to the *Fisheries Management Act* to:

- recognise the charter fishing boat industry as a legitimate third sector of the fishing industry; and
- to control access to fish stocks through a licensing system.

Narooma Charter Boats

(from *Report on Moorings and Dredging – Wagonga Inlet* by Doug Willson representing the Commercial Fishing and Charter Boats, 30 March 1999*)*

Name of Vessel	Length (m)	Owner	Mooring	Licensed to carry (persons)	No. persons carried past 12 months
Dallas	10.2	Bert Elswyk	Town Wharf	12	not available
Sea Eagle	13.4	Darryl Stewart	Pole Mill Bay	30	2,500
Dreamtime	13.0	Darryl Stewart	Town Wharf	40	4,500
Nitro	11.7	Charlie Martin	None	18	not available
Karlissa-T	10.7	John Miller	permissive occupancy	12	300
Silver Dollar	9.6	Paul Mood	Town Wharf	10	not available
Stage II	11.5	Adrian Dun	Forsters Bay	15	1,500
Kato IV	17.2	Peter Tinson	Town Wharf	53	not available

Town Wharf Berths

Town Wharf is located on unreserved Crown Land and is managed by DLWC. Construction and extension of the wharf was jointly funded by Council and DLWC. It is usual for Councils to take over management of public wharves, however, some years ago a licence for this was not renewed.

There are eight licensed berths and one spot for pick-up and drop off at the wharf. Licence fees are $1040 per annum. The waiting list for berths at Town Wharf has fluctuated slightly over the years. Currently four boats are listed and no new requests have been received over the last 6 months.

(pers. comm. Chris Fowler, DLWC, Nowra)

Wagonga Inlet Moorings

Presently there are 30 moorings on Wagonga Inlet licensed with Waterways. Six new mooring licences were established in 2000, with a total of six new moorings established over the preceding five years. The annual licence fee starts at $149 per annum for a vessel up to 7 m long, then rises by $30/m for longer vessels. Mooring locations and the number of moorings in each area are listed below.

- East side of bridge – 3 commercial and 4 private moorings
- Forsters Bay between Marina and boatramp – 2 commercial and 9 private moorings
- Forsters Bay south of boatramp – 8 private moorings
- Ringlands Bay – 1 private mooring (with potential for 10 more moorings)
- Upper inlet near Punkally Creek – 2 commercial moorings
- Clarke Bay – 1 mooring.

The owner of Taylors Boatshed in Forsters Bay permits small boats to moor on a casual basis.

(pers. comm. Margaret Wyborn, Waterways)

Appendix E