

Kiama Municipal Council

WERRI LAGOON

INTERIM ENTRANCE MANAGEMENT POLICY



ADOPTED MARCH 2005

TABLE OF CONTENTS

1.	WERRI LAGOON INTERIM ENTRANCE MANAGEMENT POLICY PREAMBLE	1
2.	POLICY CONTEXT	1
3.	AIM AND OBJECTIVES	2
4.	BACKGROUND	3
5.	ISSUES	4
5.1	Flooding	4
5.2	Opening Duration and Flushing Times	6
5.3	Water Quality	7
5.4	Lagoon Ecology	9
6.	STATUTORY CONTEXT	12
6.1	Statutory Requirements	12
6.2	Penalties	14
7.	CONSULTATION	15
8.	LAGOON OPENING PROCEDURE	15
8.1	Prior Entrance Breaching Conditions	15
8.2	Responsibility for Opening	16
8.3	Procedures	16
9.	ENTRANCE MONITORING	16
10.	REVIEW AND UPDATE OF THIS INTERIM POLICY	17
	REFERENCES	19
	ENTRANCE MONITORING SHEET	20

1. WERRI LAGOON INTERIM ENTRANCE MANAGEMENT POLICY PREAMBLE

This Entrance Management Policy describes the procedures and responsibilities for artificial openings of Werri Lagoon entrance and the required response of authorities to natural opening events.

2. POLICY CONTEXT

There are a number of State Government Policies and Guidelines supporting the management of estuarine lakes and lagoons in a manner that promotes the maintenance of natural processes. Amongst these is the NSW State Rivers and Estuaries Policy, the objective of this policy is to manage the rivers and estuaries of NSW in ways which:

- slow, halt or reverse the overall rate of degradation in their systems;
- ensure the long-term sustainability of their essential biophysical functions; and
- maintain the beneficial use of these resources.

The NSW Estuary Management Policy (1992) is a component policy of the NSW State Rivers and Estuaries Policy (1992). It advocates the sustainable use and management of estuaries through the production and implementation of Estuary Management Plans. As yet an Estuary Management Plan has not been prepared for Werri Lagoon.

The Department of Primary Industries (DPI) through their publication, Aquatic Habitat Management and Fish Conservation Policy and Guidelines (1998), support minimum interference of estuarine lagoon barriers and natural processes being allowed to operate to the greatest extent possible. Further, they do not support the artificial opening of a lagoon where there is little threat to public health or safety from flooding or water quality deterioration.

The Water Quality and River Flow Interim Environmental Objectives (EPA, 1999) for the Illawarra Catchments, which includes Werri Lagoon, advocate a number of river flow objectives for estuaries within the area. These objectives include maintaining or mimicking natural flow variability, maintaining natural rates of change in water levels and maintaining wetland and floodplain inundation.

Recently, the Healthy Rivers Commission (HRC) conducted an independent inquiry into the management of coastal lakes in NSW. The State Government has subsequently prepared a statement of intent to implement many of the recommendations of the inquiry. The HRC recommended that Werri Lagoon be classified as being in the Healthy Modified Condition category. The HRC recommend that a Sustainability Assessment and Management Plan be prepared for the lagoon; indicative actions recommended include:

Adjust entrance intervention to protect critical ecosystem processes (such as bird breeding events). Require any new assets that are prone to water damage, significant inconvenience or which may exacerbate public health problems when lake water levels are high to be designed in ways that do not necessitate opening a lake entrance artificially, except where it is determined that reinstatement of natural processes in the longer term is not effective. In such cases any new assets must be designed in ways that are commensurate with those determined for existing assets, subject to satisfying any additional requirements that may arise as a result of a predicted rise in sea (and lake) water levels.

The NSW Government's Flood Prone Land Policy has as its primary objective to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property and to reduce private and public losses resulting from floods. At the same time, the policy recognises the benefits of floodplain occupation and the particular social, economic and ecological attributes of flood prone land.

In the absence of a Sustainability Assessment and Management Plan, a Floodplain Management Plan or an Estuary Management Plan for Werri Lagoon, an interim Entrance Management Policy has been produced. One of the major issues of concern to the community surrounding Werri Lagoon is the management of the entrance of the lagoon. The lagoon's entrance has been artificially breached 16 times in the last 4 years. The entrance has not breached naturally in the same period. The reason for artificially opening the lagoon is to alleviate flooding of low lying assets, particularly residential properties in Renfrew Road Gerringong. The effects upon the lagoon's ecology of continual artificial openings below the lagoon's natural breakout range have not been quantified and the repercussions of such actions are of concern to various stakeholders in the area.

This Entrance Management Policy and Review of Environmental Factors (REF) has been prepared prior to the completion of the Estuary Management Plan due to the conflicts arising in the community relating to the management of the entrance to Werri Lagoon. The policy also ensures that Kiama Municipal Council has a community endorsed basis for carrying out timely and environmentally responsible entrance management with all appropriate development approvals in place.

3. AIM AND OBJECTIVES

The aim of this policy is to provide Kiama Municipal Council, the State Government and the community with a detailed procedure for the short and long-term management of the Werri Lagoon entrance. This policy, and its accompanying Review of Environmental Factors, will form the basis for securing the necessary approvals for entrance opening to proceed.

This Entrance Management Policy and Review of Environmental Factors will be regularly reviewed and updated to incorporate new information and address the community and Government's changing needs. The specific objectives of the policy are to:

- implement a management regime which is consistent with the principles of ecologically sustainable development;
- ensure that entrance opening follows as natural a regime as possible within the constraints of property inundation and flooding;
- gain broad based community understanding and support for management of the lagoon entrance;
- deter unauthorised opening of the lagoon;
- streamline the decision-making and approval process in relation to artificial opening events;
- provide a mechanism for review and update of this policy when required;
- ensure the appropriate levels of environmental assessment and consultation are undertaken before the lagoon is artificially opened;
- clarify responsibilities and accountabilities in relation to artificially opening the lagoon;
- clarify when, where and how the lagoon is artificially opened; and
- detail the procedure for monitoring the lagoon entrance after it has opened.

Accompanying this Policy is a Review of Environmental Factors (REF), prepared in accordance with the requirements of the Environmental Planning and Assessment Act, 1979, for the artificial

opening of Werri Lagoon. The objective of the REF is to detail the environmental impacts of artificially opening the lagoon particularly on aquatic and fringing terrestrial habitats and associated fauna.

4 BACKGROUND

Werri Lagoon is typical of many intermittently opening South Coast lagoons:

- **It is an intermittently opening lagoon which is often closed to the sea by a sand bar.**
Lagoon openings tend to only last a few days to weeks as the entrance area is exposed to the open ocean whereby sand is deposited in the entrance area by wave and long shore drift action.
- **The entrance is opened more often artificially using mechanical equipment than by natural rainfall events.**
There have been 16 recorded opening events from January 2000 to October 2004, of these openings only one was natural (see Table 1).
- **The condition of the lagoon's entrance will play a part in the character of the estuarine ecosystem**
This includes the composition of plant and animal species, water quality, tidal and flooding characteristics.

Low lying areas around the lagoon are subject to flooding when the lagoon level is elevated. Over the years various methods, including the construction in 1975 of a concrete channel at the mouth of the lagoon, and the construction of a pipeline in the 1930's, have been tried in an attempt to maintain an open entrance. This has resulted in frequent openings at water levels down to approximately 0.80 and therefore well outside the likely natural opening regime for the lagoon. This pipeline and the concrete channel should be permanently blocked because of the failure of these systems and the adverse environmental impacts resulting from artificially opening the lagoon so frequently. Council has had an informal policy since 2000 of artificially opening the lagoon when the water level reached approximately RL 1.65m AHD (Australian Height Datum, 0.0m AHD is about mean sea level). The water level of 1.65m AHD is measured using a gauge plate installed in the lagoon at the rear of 35 Werri Street Gerringong.

Table 1: Opening Statistics for Werri Lagoon

Date of Opening	Water level # (m AHD)	Type of opening*	Duration of opening (weeks) #
9/03/00	NR	A	NR
3/07/00	NR	A	0.5
14/11/00	1.6	A	NR
15/03/01	NR	A	1
11/06/01	1.7	A	1
11/07/01	NR	A	NR
30/08/01	1.6	A	2
15/04/02	NR	A	NR
2/06/02	1.7	A	0.5
21/06/02	1.8	A	0.5
28/04/03	1.7	A	1
13/05/03	1.7	A	1
24/11/03	1.8	A	3.5
4/04/04	1.8	A	2
2/10/04	1.7	A	0.5
21/10/04	2.1	N	

*Artificial (A), Natural (N) # No record (NR)

5 ISSUES

The major issues that need to be considered if the entrance is to be artificially opened include flooding, water quality and lagoon ecology.

5.1 Flooding

A detailed Flood Study and subsequent Floodplain Management Plan have not been undertaken for Werri Lagoon and as such the following information is of a preliminary nature only.

Asset and Property Levels

Table 2 represents the lagoon level (in m AHD) at which inundation of low-lying assets at Werri Lagoon occurs. Land adjoining the south, west and north of the lagoon, which is zoned Environmental Protection Estuarine Wetlands 7 (b) and Rural "A" 1(a), and which is used presently for grazing, is partly inundated at approximately 1.3m AHD. The rear of residential properties along Werri Street to the east of the lagoon are inundated at 1.5m AHD. Inundation does not threaten housing until 2.28m AHD. Experience has shown that traffic is able to use Fern Street with water levels up to 1.65m AHD. The road is closed to traffic once water levels reach 1.85m AHD; at that time alternative access is via Belinda Street Gerringong.

Table 2: Relationship between Werri Lagoon water levels and inundation of surrounding low-lying assets.

Lagoon Level (m AHD)	Asset
1.3	Floodplain SEPP14 wetland No 371a
1.6	Fern Street lowest point
1.68	Floor level of shed in backyard of 37 Werri Street
1.74	Sewer manhole in public reserve at Werri Street
2.28	Floor level of residence at 35 Werri St
2.47	Sewer pumping station in public reserve at Werri Street

The estimated one in one hundred year flood level for properties adjoining the lagoon is RL 2.40 (GHD, 1999). Council has set a minimum floor level of 500mm above that level to ensure that no further assets will be placed so as to constrain the entrance opening level into the future.

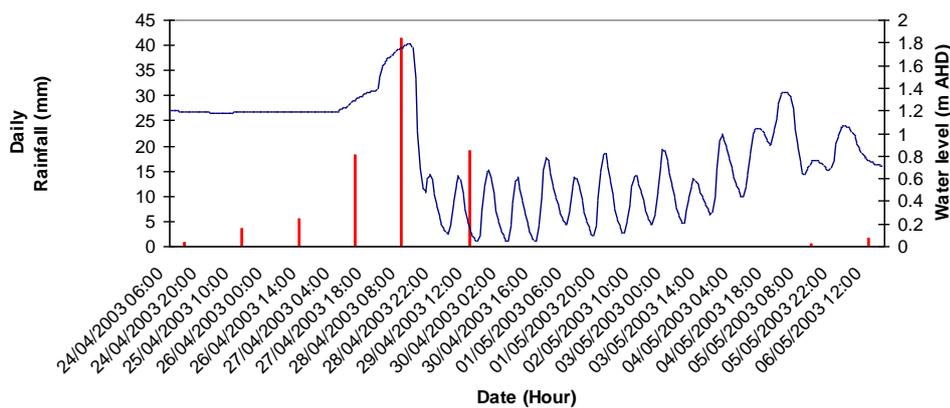
Small Rainfall Events

Water balance modelling has not been carried out for Werri Lagoon and as such predictions of water level rise in response to rainfall (under wet/dry catchment conditions) can not be made. Experience gained from previous openings has shown that once the lagoon is opened, water levels do not continue to rise.

Larger Rainfall Events

In a severe flood, with a probability of occurring once in 100 years (that is, a 1% annual exceedance probability (AEP), it is likely that water level rise would occur relatively quickly and the beach berm would be breached. Unfortunately, a water level recorder has only been operational in Werri Lagoon since August 2002; during this time there has not been a 'major' rainfall event. However, Figure 1 demonstrates the significant rise in water levels in response to a relatively minor rainfall event in April 2003 (less than 100mm over a number of days).

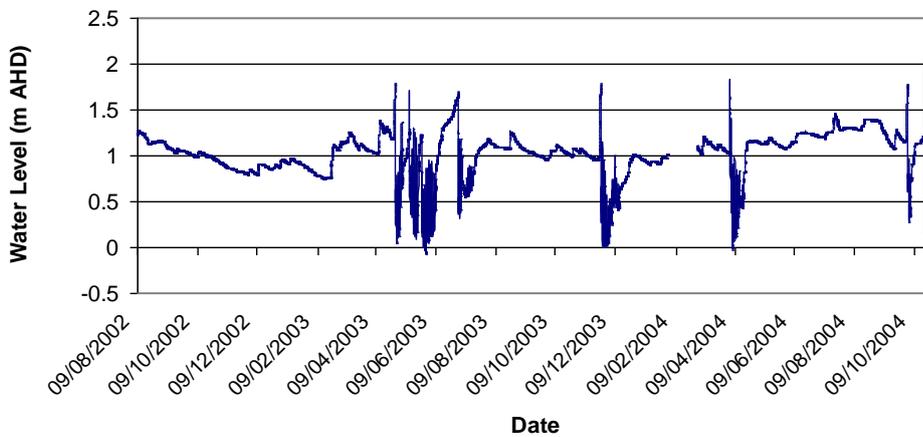
Figure 1: Werri Lagoon water levels in response to rainfall during April/May 2003



5.2 Opening Duration and Flushing Times

For Werri Lagoon, there is insufficient information to examine the relationship between water levels immediately prior to entrance opening and opening duration. Evidence from other NSW South Coast locations such as Coila Lake (Eurobodalla Shire Council, 2001) indicate that higher water levels preceding opening will generally result in a longer opening duration. The reason this occurs is a higher lagoon level will scour a deeper, more stable connecting channel to the ocean. Council records from January 2000 indicate that the mouth of Werri Lagoon remains open from between 2 to 3 days and 3.5 weeks following artificial opening. Most openings are less than 1 week. Water level records are only available from August 2002; these are shown in Figure 2.

Figure 2: Water level records for Werri Lagoon (August 2002 to October 2004)



Anecdotal evidence suggests that the main factor initiating the closure of Werri Lagoon is ocean swell conditions moving sand into the lagoon entrance. The location of the entrance at the northern end of Werri Beach results in an unprotected entrance from the dominant southerly longshore drift of sand.

There are a number of methods that can be employed to calculate flushing times for an estuary. Two methods have been used here to give an indication of what is likely to be the upper and lower limits of tidal flushing times.

It is likely, given the very short opening times that Werri Lagoon experiences, that only very limited tidal flushing occurs. For estuaries there is usually an incomplete mixing of ocean water with estuarine water and some of the water which does flush to the ocean during the ebb tide returns on the following flood tide (Dyer, 1997).

Studies on Wagonga Inlet and Lake Illawarra have given estimates of the efficiency of entrance exchange of 20% and 30% respectively, that is, between 20 and 30% of tidal inflow remains in the lakes while 70 to 80% is unmixed and flows back out to sea on the ebb tide. Therefore it is apparent that for effective flushing of the lagoon to take place a prolonged opening is required.

5.3 Water Quality

Although primarily governed by catchment inputs, entrance conditions will also affect water quality which in turn affects the functioning of the lagoon's ecology and also recreational opportunities such as swimming. When rainfall events do not breach the entrance, any pollutant sourced from the catchment will be retained in the lagoon. Repeated instances of low rainfall followed by evaporation can lead to a build up of pollutants. Therefore, identifying and controlling the source of any pollutants entering the lagoon and understanding their impact on the lagoon's ecology is important to the protection of the aquatic ecosystem in the lagoon.

Assimilative Capacity

In the absence of water balance modelling to determine the assimilative capacity of Werri Lagoon, the ratio of catchment area to waterway area gives a simple indication of the dilution capacity of the lagoon. Werri Lagoon has a catchment to waterway ratio of about 160 (catchment area = 24 km², waterway area 0.15 km²). This is a relatively large ratio indicating that the lagoon has a small dilution capacity that is, contaminants entering the lagoon from the catchment during rainfall events could be expected to impact upon water quality in the lagoon far more than systems with larger waterway areas, underlining the importance of adequate source control within the catchment.

Water Quality Monitoring

Water quality monitoring has been undertaken in Werri Lagoon catchment and estuary by a range of organisations since the early 1990's (QEM, 1992; AWT EnSight 1996; AWT EnSight 1998; Banasiak 2001, Kleyn 2002). These studies show that there are influences on water quality in Werri Lagoon from both rural and urban areas from sources such as fertiliser, effluent from on-site sewerage systems and stormwater runoff. The provision of the Gerringong-Gerroa Sewage Scheme in 2002 should significantly lower the amount of pollutants from urban areas. These studies are summarised below:

- Water quality monitoring by QEM (1992)

Two sites in Werri Lagoon and one rural tributary (Ooaree Creek) were monitored by QEM (1992) from December 1991 to April 1992. Data from Ooaree Creek records spikes in orthophosphate and total nitrogen and ammonia nitrogen concentrations that are probably related to fertiliser applications in the catchment. Orthophosphate runoff was highest in mid-late January and throughout March and April, whereas nitrogen runoff was highest in late February. High levels of faecal coliforms recorded in mid-late April were suggested to be the result of rural fertilising with fresh poultry shed manure (QEM, 1992).

The study by QEM (1992) did not directly sample stormwater runoff from Gerringong into Werri Lagoon. It is thus not possible to compare the quality of rural runoff against urban runoff. Their results, however, clearly demonstrate that fertiliser use in rural areas produces spikes in nutrient concentrations in rural runoff throughout summer and autumn. The similarity in nutrient concentrations and in-phase changes measured in Werri Lagoon and Ooaree Creek suggests that in 1991-92, rural runoff was probably the primary source of nutrients to Werri Lagoon.

- Water quality monitoring by AWT EnSight (1996)

The AWT EnSight (1996) study investigated concentrations of faecal coliforms only at four sites in Werri Lagoon and nine sites receiving stormwater runoff from Gerringong. Results from the monitoring indicated possible effluent contamination in a number of Gerringong stormwater drains. The maximum recorded and geometric mean concentrations of faecal coliforms were higher in stormwater drains than in rural tributaries. During wet weather conditions, water quality in Werri Lagoon was found to be generally unsuitable for primary contact recreation (AWT EnSight, 1996).

- Water quality monitoring by AWT EnSight (1998)

The AWT EnSight (1998) study sampled water quality at one site in the centre of Werri Lagoon, two sites draining urban areas and four sites draining rural areas. Sampling was undertaken from December 1997 to December 1998 and found that:

- High concentrations of orthophosphate occurred in a central portion of Werri Lagoon for an extended duration over the December-January and Easter holiday periods;
- High concentrations of orthophosphate and nitrogen were recorded at the sites in the narrow south west and south east arms of the lagoon draining the urban area of the Werri Lagoon catchment;
- Concentrations of faecal coliforms in Werri Lagoon generally exceed primary contact recreation guidelines during wet weather conditions.

The high orthophosphate readings over December-January coincided with peak holiday periods when coastal populations across NSW increase substantially. The high readings at sites draining the urban area during holiday periods, compared to rural sites, suggest that urban runoff, or seepage from on-site sewerage systems, contributed to the summertime orthophosphorous load in Werri Lagoon.

- Water Quality and Sediment Study (Banasiak, 2001)

A study of the sediments and water quality of Werri Lagoon was conducted by a University of Wollongong Environmental Science student in 2001. The study found that sediment-bound trace metal concentrations within Werri Lagoon may represent near-natural levels and do not appear to be influenced greatly by human activities. The water quality within Werri Lagoon was compared to previous water quality studies in 1992, 1996 and 1998 and showed that conditions within the lagoon have been relatively stable. Water quality generally complied with the Australian Water Quality Guidelines for Fresh and Marine Waters for aquatic ecosystem health in estuaries (Banasiak, 2001).

- Water Quality, Seagrass and Periphyton as Environmental Indicators for Estuaries in the Kiama Municipality, NSW (Kleyn, 2002)

A study of the three estuaries of the Kiama Local Government Area was conducted by an Environmental Science student in 2002. The study concentrated on obtaining baseline data on seagrass and water quality in Minnamurra River, Werri Lagoon and Crooked River. The study showed that the current distribution of the seagrass *Zostera* was extensive in Minnamurra River and Crooked River and appeared healthy, however declines in *Zostera* beds in Werri Lagoon was recorded and most likely due to impacts of changing entrance conditions. It was also shown that nutrient concentrations in Minnamurra River were good compared to other South Coast estuaries, however nutrient concentrations in Werri Lagoon and Crooked River were higher than national guidelines during wet weather (Kleyn, 2002).

- Beachwatch Monitoring of Werri Beach

The Beachwatch Program assesses the marine water quality at beaches and reports to the community the risks of sewage and stormwater pollution at beaches and estuarine swimming areas in Sydney and the Illawarra. Sydney Water Corporation conducts the sampling at Boyd Jones Beach, Bombo Beach, Surf Beach and Werri Beach.

Compliance of the beaches is based on the ANZECC *Guidelines for Fresh and Marine Water Quality* for primary contact recreation of the median over the bathing season of less than 150 faecal coliforms/100ml with 4 out of 5 samples less than 600 faecal coliforms/100ml, and the median over the bathing season of less than 35 enterococci/100ml (and maximum in any one sample: 100 enterococci /100ml).

Werri Beach was monitored weekly all year round between October 1996 and April 2001, and only in the bathing season from September to April after that time. Werri Beach did not comply with ANZECC *Guidelines for Fresh and Marine Water Quality* (2000) on only 4 days out of 365 (1.095%) days sampled. The dates of non-compliance were 1 April 1998 (a value of 270 enterococci organisms/100ml), 7 April 1998 (values of 430 enterococci organisms/100ml and 3200 faecal coliforms/100ml), 17 August 1998 (a value of 130 enterococci organisms/100ml) and 13 July 1999 (a value of 360 enterococci organisms/100ml). The beach has complied 100% of days for the last four years (EPA, 2003).

5.4 Lagoon Ecology

Flooding is an important component of the ecological processes operating in coastal lagoons. It is likely to be especially important in maintaining the character, extent and biodiversity of fringing wetland vegetation communities. Regular and repeated initiation of an early breakout prior to water levels peaking may degrade wetlands and riparian vegetation, reduce fisheries production over the long term and contribute to a decline in regional biodiversity.

Fauna

The distribution and abundance of fish and prawns in the lagoon is primarily determined by past entrance openings (that is, the season of occurrence, duration of opening and time since last opening) which allowed exchange with ocean waters. The entrance of Werri Lagoon is often closed and therefore the type and abundance of species found in the lagoon will reflect conditions within the lagoon, independent of the ocean and tidal cycles. The ability of larvae to enter the lagoon is dependent on the entrance opening coinciding with recruitment seasons. Sampling of fish populations in Werri Lagoon has been undertaken by West and Stephens (1998), sampling was undertaken seasonally for a year, the entrance to Werri Lagoon was closed for three of the four sampling occasions. Eleven estuaries throughout the Illawarra were sampled as part of this study; the highest species diversity was found in Fairy Creek, Werri Lagoon and Crooked River. Table 3 lists the fish species found in Werri Lagoon.

Table 3: Fish species recorded in Werri Lagoon (West and Stephens, 1998).

Common Name	Scientific Name	Common Name	Scientific Name
Blue-spotted goby	<i>Pseudogobius olorum</i>	Sand whiting	<i>Sillago ciliata</i>
Bridled goby	<i>Amoya bifrenatus</i>	Sandy sprat	<i>Hyperlophus vittatus</i>
Dusky flathead	<i>Platycephalus fuscus</i>	Sea mullet	<i>Mugil cephalus</i>
Eastern fortescue	<i>Centropogon australis</i>	Silver trevally	<i>Pseudocaranx dentex</i>
Flatheaded gudgeon	<i>Philynodon grandiceps</i>	Six-spined leatherjacket	<i>Meuschenia freycineti</i>
Glassy perchlet	<i>Ambassis jacksoniensis</i>	Small mouth hardyhead	<i>Atherinosoma microstoma</i>
Large mouth goby	<i>Redigobius macrostoma</i>	Smooth toadfish	<i>Tetractenos glaber</i>
Long snouted flounder	<i>Ammotretis rostratus</i>	Southern sand flathead	<i>Platycephalus bassensis</i>
Luderick	<i>Girella tricuspidata</i>	Tamar River goby	<i>Afurcagobius tamarensis</i>
Mosquito fish	<i>Gambusia holbrooki</i>	Tarwhine	<i>Rhabdosargus sarba</i>
River garfish	<i>Hyporhamphus ardelio</i>	Yellowfin bream	<i>Acanthopagrus australis</i>
Sand mullet	<i>Myxus elongatus</i>		

Interestingly, of the eleven estuaries sampled, Werri Lagoon was the only site where physical abnormalities in any fish were observed, a very small number of ulcerated fish were observed. Ulcerations are often associated with acid sulphate soils creating a pH problem for the fish. One fish with a deformed backbone was also noted.

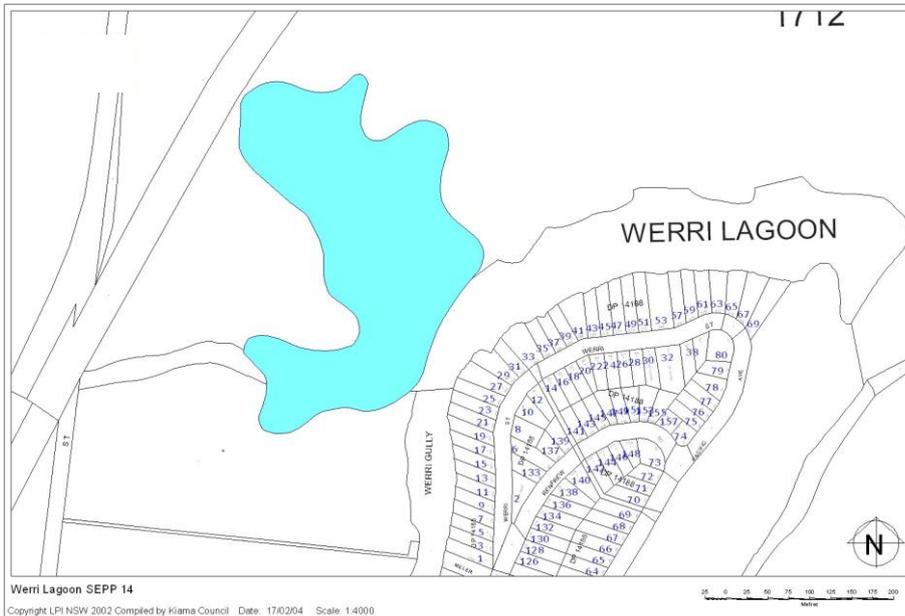
The Atlas of NSW Wildlife indicates that thirty animal species listed as threatened species in Schedule 1 and 2 of the NSW Threatened Species Conservation Act (1995) occur within Kiama Local Government Area. This includes 16 bird species, none of which have been recorded at the entrance of Werri Lagoon (Sydney Water, 1999). The Atlas also lists seven plant species within the Kiama Local Government Area. None of these plant species are recorded as being present at the entrance to Werri Lagoon.

There are no threatened species of fish listed under the NSW Fisheries Management Act (1994) which would be relevant to this activity. There is a low probability that the Australian Grayling which is listed under the Commonwealth Environment Protection and Biodiversity Conservation Act (1999) could occur at Werri Lagoon although the habitat is considered unsuitable (A. Lugg, DPI pers. comm.).

Wetlands

One wetland (No. 371a) classified under State Environmental Planning Policy No. 14 (Coastal Wetlands) is located on the western side of Werri Lagoon (Figure 3). Wetlands are an integral part of the estuarine ecosystem due to the role they play in nutrient cycling, contributing organic material to the estuary and in providing habitat to various types of fauna. Less frequent inundation of the wetland may be occurring as a result of manually opening the lagoon.

Figure 3: Location of SEPP14 wetland at Werri Lagoon



Saltmarsh has been declared an endangered ecological community under the Threatened Species Conservation Act (1995). Numerous saltmarsh species, such as *Sarcocornia quinqueflora*, occur on the floodplain adjacent to the lagoon. The floodplain is currently used for grazing purposes. Factors inherent in the conservation of saltmarsh are both the supply of freshwater to prevent sediments becoming hypersaline and tidal exchange to ensure flushing of the saltmarsh (Schlacher and Wooldridge, 1996). As such, in an intermittently open system such as Werri Lagoon, any interference in the natural inundation cycle must be carefully managed to ensure maintenance of the balance between fresh and saline water inundation. It is unknown whether the wetlands are contracting or the composition and distribution of flora and fauna species are changing as a result of past opening policies.

The SEPP14 wetland becomes inundated at a level of approximately 1.3m AHD. Ground levels within the wetlands only vary by about 0.5m; as such if water levels reach 1.7m AHD or above, the wetlands become completely inundated.

Ecological considerations have in the past, not influenced decisions about when the entrance was to be opened. However, greater opening frequency may be having effects on lagoon ecology which are at present unknown.

6 STATUTORY CONTEXT

6.1 Statutory Requirements

Kiama Local Environmental Plan (LEP)

The entrance area to Werri Lagoon is Community Land (Lot 281 DP14188) owned by Kiama Municipal Council and is part of the Werri Beach Reserve which is zoned Open Space Existing Recreation 6(a) (Figure 4). The artificial opening of the lagoon is considered to be flood mitigation works under the LEP and as such, may be treated as an activity under the provisions of Part 5 of the Environmental Planning and Assessment Act 1979.

Environmental Planning and Assessment Act 1979

Public authorities proposing to undertake either maintenance dredging or flood mitigation works have an obligation under Part 5 of the Environmental Planning and Assessment Act (EP&A Act) to consider the likely environmental impacts of the activity and to consider the appropriate level of environmental assessment which is required. For opening of an entrance this may be in the form of a Review of Environmental Factors but if the potential impacts are considered to be significant, an Environmental Impact Statement is required. Either assessment should consider the impacts associated with repeat openings over a long period of time and under a range of conditions, rather than a single opening, so that it does not have to be reproduced each time an opening is necessary. Although the assessment may be generic, it must take into consideration specific conditions at the time of any proposed opening.

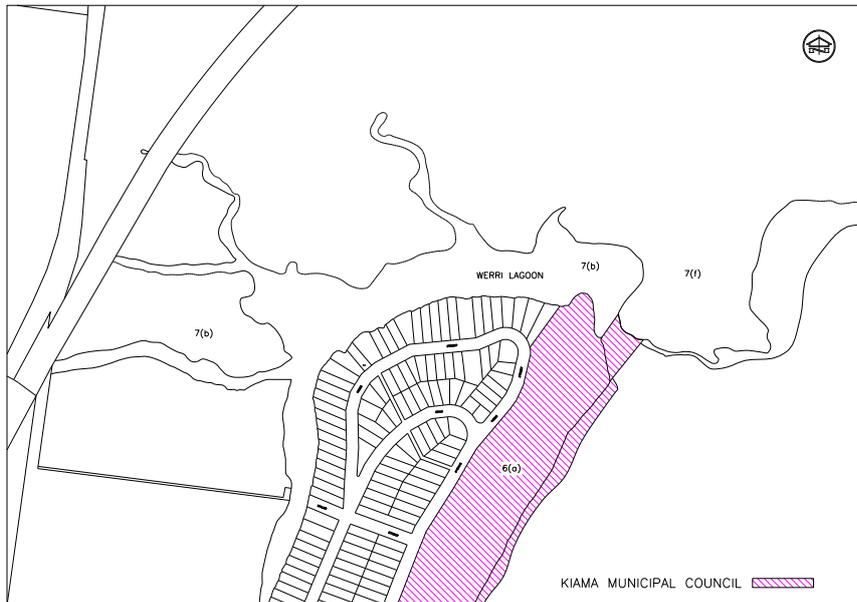


Figure 4: Zoning of land in the Werri Lagoon entrance area.

Crown Lands Act 1989

Local Councils proposing maintenance dredging on Crown land are required to obtain a licence from the Department of Lands under Part 4, Division 4 of the Crown Lands Act. A land assessment prepared in accordance with the Crown Lands Act, which identifies the proposal as a preferred use, will generally be required before approval is granted. A land assessment may be waived where it is in the public interest to do so and due regard has been given to the principles of Crown land management. Excavation for entrance opening will be confined to the area within Lot 281 DP14188 and as such a licence under the Crown Lands Act will not be required.

Threatened Species Conservation Act 1995

This Act requires an assessment of whether threatened species, populations or ecological communities are likely to be affected by the activity. This assessment is in the form of an eight part test of significance. If a significant effect on threatened species is likely, a species impact statement must be completed and concurrence of or consultation with the Director-General of the Department of Environment and Conservation (DEC) is required. The REF accompanying this policy outlines in greater detail the threatened species and ecological communities that may be present in the Werri Lagoon area.

Fisheries Management Act 1994

Sections 198 and 200 of the Fisheries Management Act require a local Council proposing to undertake dredging works to obtain a permit. These sections do not apply if the dredging is authorised under the Crown Lands Act 1989 or by another relevant authority (other than a Local Government). However, as the land where entrance opening will be located is Council owned (not Crown land) and the activity will not be carried out below mean high water mark, a dredging permit will be required from DPI.

Sections 204 and 205 (damage to marine vegetation) could also apply if dredging extends beyond the barrier sand dune into the submerged lands of the lagoon bed. If seagrasses were to be damaged, a permit would be required. The works proposed under this policy will be confined to the unvegetated entrance area and a permit under Section 204 and 205 will not be required.

National Parks and Wildlife Act 1974

It is an offence under this Act to knowingly destroy an Aboriginal site, relic or artefact. No Aboriginal site, relic or artefact has been recorded from the area where works will be carried out, and as entrance barriers are extremely dynamic environments, it is unlikely that any would be present in this environment (confirmed by R. Wellington, DEC, pers. comm.). In addition, considerable disturbance has occurred to the area as a result of the attempts to provide a man-made permanent opening to the lagoon over the past 70 years. Further, it is not expected that the opening of the lagoon will cause indirect impacts on possible Aboriginal relics through erosion of the banks of the lagoon, as these generally form low lying wetlands or gently sloping hind dune areas.

A licence is also required if the lagoon opening will impact on protected wildlife (other than threatened species). Potential impacts upon wildlife are addressed in the accompanying REF.

Aboriginal Land Rights Act 1983

This legislation would be relevant where an Aboriginal land claim has been made which affects submerged Crown Land or areas of Crown Land which may be proposed for processing, storage or use of dredged material. The Commonwealth Native Title Act (1993) and Native Title (New South Wales) Act (1994) may also be relevant in this regard.

State Environmental Planning Policy 14 – Coastal Wetlands

If SEPP14 wetlands are to be affected by a proposed opening, then the consent of Council and concurrence of the Director-General of the Department of Urban Affairs and Planning would be required. Under the policy, a number of matters must be taken into consideration when a development proposal is considered. These include but are not limited to:

- the environmental effects of the proposed development, including effects on plant and wildlife communities;
- safeguards and rehabilitation measures which have been, or will be made; and
- whether any feasible alternative exists or has been considered.

As previously stated, a SEPP14 wetlands exists on the western side of the lagoon and the impacts of the proposed works upon this system is outlined further in the accompanying REF.

6.2 Penalties

Local Government Act 1993

Under the Local Government Act 1993, Council has the authority to enforce penalties on anyone acting contrary to a notice erected on public land or in a bathing place under Section 632 (1). Signage prohibiting unauthorised openings must be adhered to.

Rivers and Foreshores Improvement Act 1948

The Department of Infrastructure Planning and Natural Resources (DIPNR) has the authority to prosecute anyone who opens lagoon entrances without proper authorisation under Section 22H (2) of the Rivers and Foreshores Improvement Act 1948.

Environmental Planning and Assessment Act 1979

To artificially open the entrance without assessing the environmental impacts, obtaining the relevant approvals required, or complying with the requirements of State Environmental Planning Policies (as outlined above) constitutes a breach of the EP&A Act. Possible penalties imposed may include rehabilitation or restoration orders and/or monetary penalties.

Fisheries Management Act 1994

DPI has the authority to prosecute anyone who opens lagoon entrances without relevant approval under Division 3 of part 7 of the Fisheries Management Act.

7 CONSULTATION

The unpredictable nature of rainfall often results in Council having to take urgent action within a matter of days or sometimes overnight to prevent flooding. The purpose of this policy is to document in advance the conditions under which the entrance is opened and gain the agreement of all affected parties (including permits required) to those pre-conditions for opening. Provided there is adequate time to contact affected parties, quick reference to affected parties can be made whilst still complying with the relevant legislation. If no reply is received within three hours of the reference, or if Council considers that immediate action is required to maintain public safety, Council will document the conditions and take appropriate action in accordance with the policy. It should be noted, however, if any determining authority considers that an activity is likely to significantly affect the environment then an EIS would be required.

8 LAGOON OPENING PROCEDURE

8.1 *Prior Entrance Breaching Conditions*

The logic behind this policy is the ultimate threat to flooding of roads and urban areas if the lagoon reaches 1.65m AHD and heavy rain occurs. At levels below 1.65m AHD, there is more opportunity to plan an opening. As such, once water levels reach 1.5m AHD and rainfall is predicted, monitoring of water levels will be undertaken so that an opening can be planned for in the event of water levels reaching 1.65m AHD.

The following summarises conditions under which the lagoon entrance can be breached.*

- a) If the level of the lagoon reaches 1.80m AHD it shall be opened as soon as conditions permit;
- b) If the level of the lagoon reaches 1.65m AHD it shall be opened on the top of the first available high tide without delay; or
- c) When the lagoon reaches a level of 1.50m AHD, works staff shall be placed on standby to open the lagoon without delay if heavy rain is predicted and water levels are likely to exceed 1.65m AHD overnight.

(* *There may be occasions when safety issues preclude an artificial opening proceeding, for example, during severe ocean storms.*)

The lagoon level prior to rainfall can be viewed from the Manly Hydraulics Laboratory website which will also record the lagoon response in real time. Note that a password and user number are necessary to access MHL data.

Kiama Council shall give notice in writing by email or facsimile marked urgent, specifying that opening of the lagoon may be required in the near future, and the reason for and proposed timing of opening, to the bodies listed below:

Department of Primary Industries
Senior Conservation Manager
Tel. (02) 4423 2200
Fax (02) 4423 2007

Department of Infrastructure Planning and Natural Resources
Team Leader, Coast and Estuaries
Sydney/South Coast Region
Tel. (02) 4224 9627
Fax (02) 4224 9651

Written notification will be followed by a telephone call to the bodies listed above so that any matters of concern relating to the opening that have been raised by the above within four hours of the giving of notice shall be satisfactorily addressed by Kiama Council prior to entrance opening works commencing. For emergency situations (as per the conditions outlined in (1), above) Council will document the conditions and take appropriate action in the interest of public safety, subject to the accompanying REF being a suitable level of environmental assessment.

8.2 Responsibility for Opening

- The Council officer responsible for carrying out specific on site assessment in accordance with the REF, consultation and any subsequent decision to open the lagoon (as per Sheet 1) is the **Director of Engineering and Works**.
- The Council officer responsible for plant management and on-site control is the **Manager of Works**. The procedures outlined in this document, including a copy of Figure 5 showing the entrance location and copies of the entrance monitoring sheet (attached as Sheet 1), will be made available to the **Manager of Works** to ensure the opening is made in the location and to the dimensions required.

8.3 Procedures

- The procedure is to be planned so that where possible the actual opening of the lagoon occurs shortly after the tide turns from high to low, for the lower tide of the day.
- The location of the opening is to be within approximately 75m of the northern rocky foreshore of Werri Beach as shown in Figure 5. This is the most frequently occurring entrance location determined from aerial photographs and from experience has proven the most stable.
- The opening should be sufficient for scour flow to develop. The preferred size is 2m wide with the bed graded to the ocean.
- Possible contamination of adjacent surf beaches should be considered.
- Appropriate action should be taken to protect public health and safety at the site.

9 ENTRANCE MONITORING

When artificial openings have been carried out, monitoring of the entrance should be undertaken, to determine the efficiency of the opening and for use in a possible future flood study.

For each opening attempt, the following data will be recorded:

- level of lagoon prior to opening
- location and length of excavation
- date and time of opening
- approximate width and depth of channel
- ocean wave conditions (wave height and direction)
- preceding rainfall conditions
- time to develop breakout conditions
- date of closure and cause.

If possible, photographs at later time intervals are to also be made, at least until the lagoon has emptied to tidal conditions.

If possible, an estimate of depth and peak flow velocity coincident with ocean low tide should be made; photographs of the water surface should also be made at each time interval. Comment should be made on apparent depth, velocity and width variations along the channel.

Monitoring will also include natural entrance breakouts, recording time and date of natural opening, the date of lagoon closure and any other relevant comments. Monitoring is to be carried out by Council.

The information is to be recorded on a standard monitoring sheet (attached as Sheet 2) which is to be completed for every entrance opening, whether artificial or natural.



Figure 5: Location of Werri Lagoon entrance channel (solid line indicates area for location of excavated channel).

10 REVIEW AND UPDATE OF THIS INTERIM POLICY

It is recommended that this policy and accompanying REF be incorporated in the Werri Lagoon Estuary Management Plan or Floodplain Management Plan when prepared. The Estuary Management Plan will be subject to update and review and as such this policy and accompanying REF will be reviewed as part of that process.

Alternatively, if the Werri Lagoon Estuary Management Plan or Floodplain Management Plan is not completed within the next two years, this policy will be reviewed in 2006/2007. Review of the policy will include analysis of all monitoring data collected to ensure that predictions outlined in the current REF are correct and a review of the intervention level in relation to infrastructure present at that time. As outlined in the REF, implementation also involves Kiama Municipal Council investigating and, where possible, implementing measures to progressively remove, relocate or otherwise treat items of low-lying infrastructure so that they no longer represent a constraint and the intervention level can be progressively raised. As such, if any of the assets listed in Table 2 are removed or modified, the intervention level will be amended accordingly.

In 1975, Council constructed an open concrete channel at the entrance to the lagoon connecting the lagoon to the open sea in an attempt to control flooding in the area. The floor of this channel is at RL 0.9. This replaced an older pipe built in the early 1900's located below the invert level of the concrete channel at RL 0.81. Following considerable discussions in the 1980's with the local community regarding the impact of the channel on the lagoon, Council made a number of adjustments to the outlet control on the channel. However, because of the very dynamic nature of this area, this pipeline filled with sand and was ineffective in providing an open entrance to the lagoon. Therefore over the past 4 years Council has, in consultation with DPI and DIPNR, adopted the current practice which is now being formalised, of opening the lagoon mouth by mechanical means. As such within the interim period of this policy, it is Council's intent to cease maintaining the pipeline and it will be blocked off.

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WERRI LAGOON ENTRANCE MONITORING

Opening Date	Natural (N) or Artificial (A)	Height of Dune	Location of Breach	Lagoon Water Level	Time	Channel		
						Length	Width	Depth
				Initial Breach				
				Ongoing Channel Development				
				Full Breakout				
				Final Dimensions				
Closing Date -								

Wave height/direction.....
 Wind strength/direction.....

Preceding rainfall.....