

## **LAKE CONJOLA ENTRANCE ANNUAL REPORT JULY 2008–JUNE 2009**

### **Introduction**

This annual report on the operation of the Lake Conjola Entrance Management Plan has been prepared by the NSW Department of Commerce's Manly Hydraulics Laboratory on behalf of Shoalhaven City Council.

The aim of the management plan is to ensure a permanently open entrance with minimal interference with natural environmental processes. The management plan includes a commitment to an open entrance by Council and Government agencies, a decision support system to provide adequate warning of closure and procedures for pre-excavation activities so that entrance works can be commenced prior to closure.

An integral part of the plan is an agreement in principle by all parties and a clear description of the actions and funding required. This annual report has been prepared to provide a summary of the performance of the entrance throughout the 2008–2009 period.

The report includes figures showing the output from the decision support system (Figure 1), a summary of rainfall and wave events over the 2008–2009 period (Figure 2) and a brief commentary.

Further information regarding the entrance management plan is available from the Lake Conjola website <http://www.mhl.nsw.gov.au/www/lconj.html>

### **Decision Support System July 2008–June 2009**

The decision support system operated successfully throughout the 2008–2009 period, with no periods for which the M2 amplitude could not be calculated. The system is based on ongoing analysis of data from the tide gauge in the entrance to the lake. Under typical conditions the tidal range in the lake is reduced to approximately 20% of the ocean range by the restrictive effect of the shallow inlet plus storage attenuation of the main lake. The tidal range slowly declines as the entrance becomes more constricted.

The decision support system carries out a running harmonic analysis of the tidal data. The harmonic analysis yields the principal lunar semi-diurnal tidal constituent M2 (the effect of the Moon). M2 has been shown to provide a good indication of entrance constriction. The method overcomes the difficulty in identifying the slow decline in range due to shoaling within tides that vary in range from tide to tide and day to day.

The following trigger levels have been set, based on M2 values preceding the 1994 entrance closure as well as a more recent analysis of partial closure events:

- **Trigger Level A – Monitor Closely. M2 Values 0.10–0.05**
- **Trigger Level B – Activate Plan. M2 Values 0.05–0.04**
- **Trigger Level C – Possible Closure. M2 Values 0.04–0.02**
- **Trigger Level D – Imminent Closure. M2 Values 0.02–0.00**

Since early 2000 the amplitude of the M2 component has declined without the entrance becoming completely shoaled. Analysis of data over this period has allowed the new thresholds to be defined. In consultation with Shoalhaven City Council these new thresholds were implemented within the decision support system in April 2009.

Over the course of July 2008 to March 2009 the M2 amplitude progressively declined. It is likely that this stemmed from an extended period of low rainfall over the year. Then between March and the end of the period the M2 levelled and began to increase.

### **Rainfall**

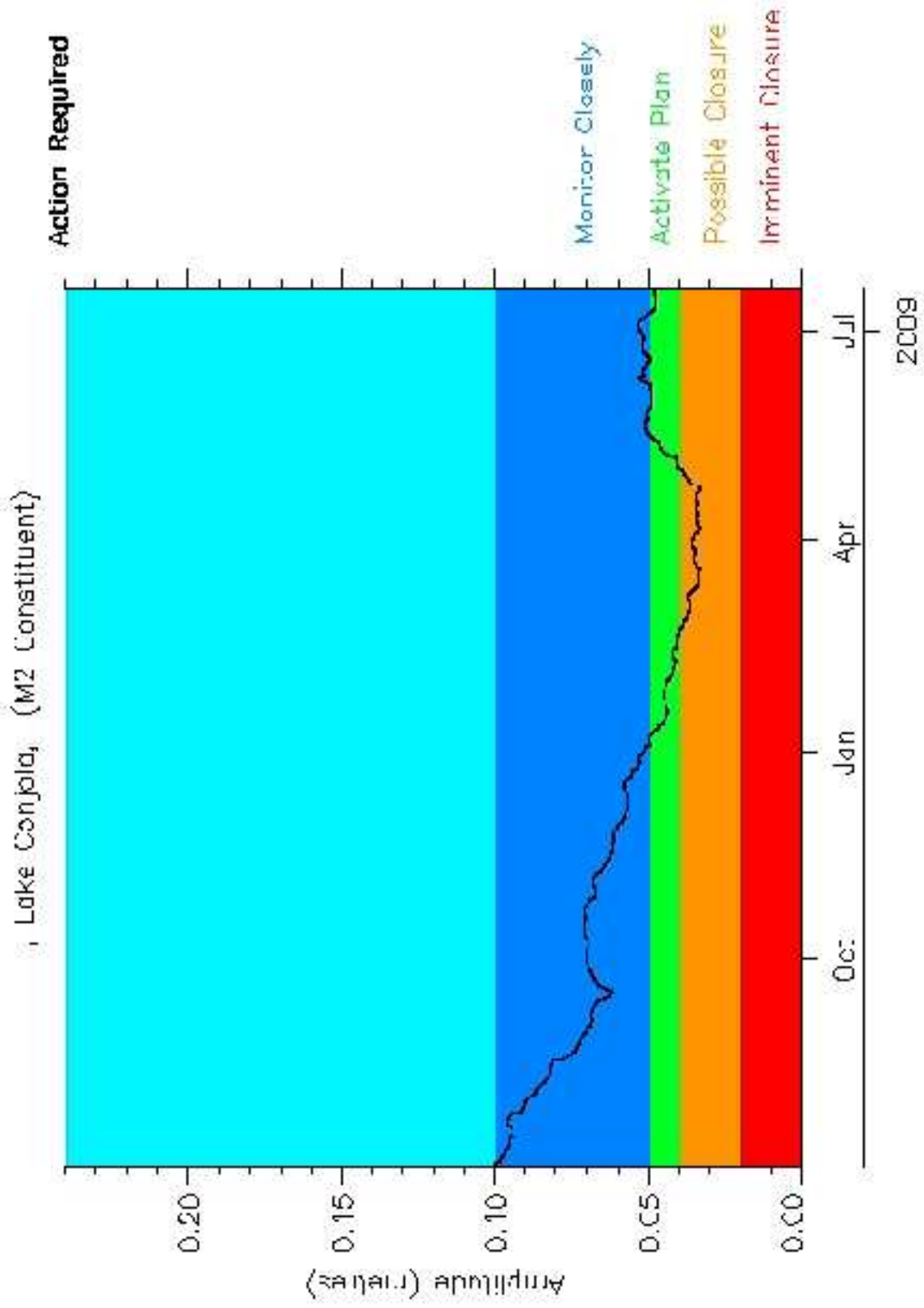
Rainfall was sparsely spread throughout the year, with a total of 789.5 mm recorded over the course of the year. Statistics at Ulladulla suggest that the average annual rainfall should be 1013.2 mm and the median rainfall is 1046.4 mm (BoM 2010). In addition maximum daily rainfall was 41.5 mm. These measurements, when considered together, suggest that low rainfall and a lack of significant rainfall events contributed to a progressive shoaling of the Lake Conjola entrance.

### **Waves**

The average significant wave height and period for the year were consistent with long-term averages established for the region. The average significant wave height over the year was 1.48 m, compared with 1.41 m for the long-term average. The average significant wave period for the year was 9.42 seconds, compared with 9.31 seconds for the long-term average. There were no exceptional wave events recorded over the course of the year.

### **In Summary**

It is likely that the extended period of low rain contributed to the progressive shoaling that continued over the course of the year. There were no heavy rain events recorded that may have contributed to scouring the entrance, nor were there any significant wave events that would have substantially contributed to entrance shoaling. It is likely that the progressive decline in the M2 amplitude throughout the period, along with the plateau and increase in amplitude, were part of the process of the entrance moving towards a dynamic equilibrium with respect to entrance geometry for the given climate conditions.



Manly Hydraulics Laboratory

LAKE CONJOLA ENTRANCE 2008-2009  
M2 CONSTITUENT

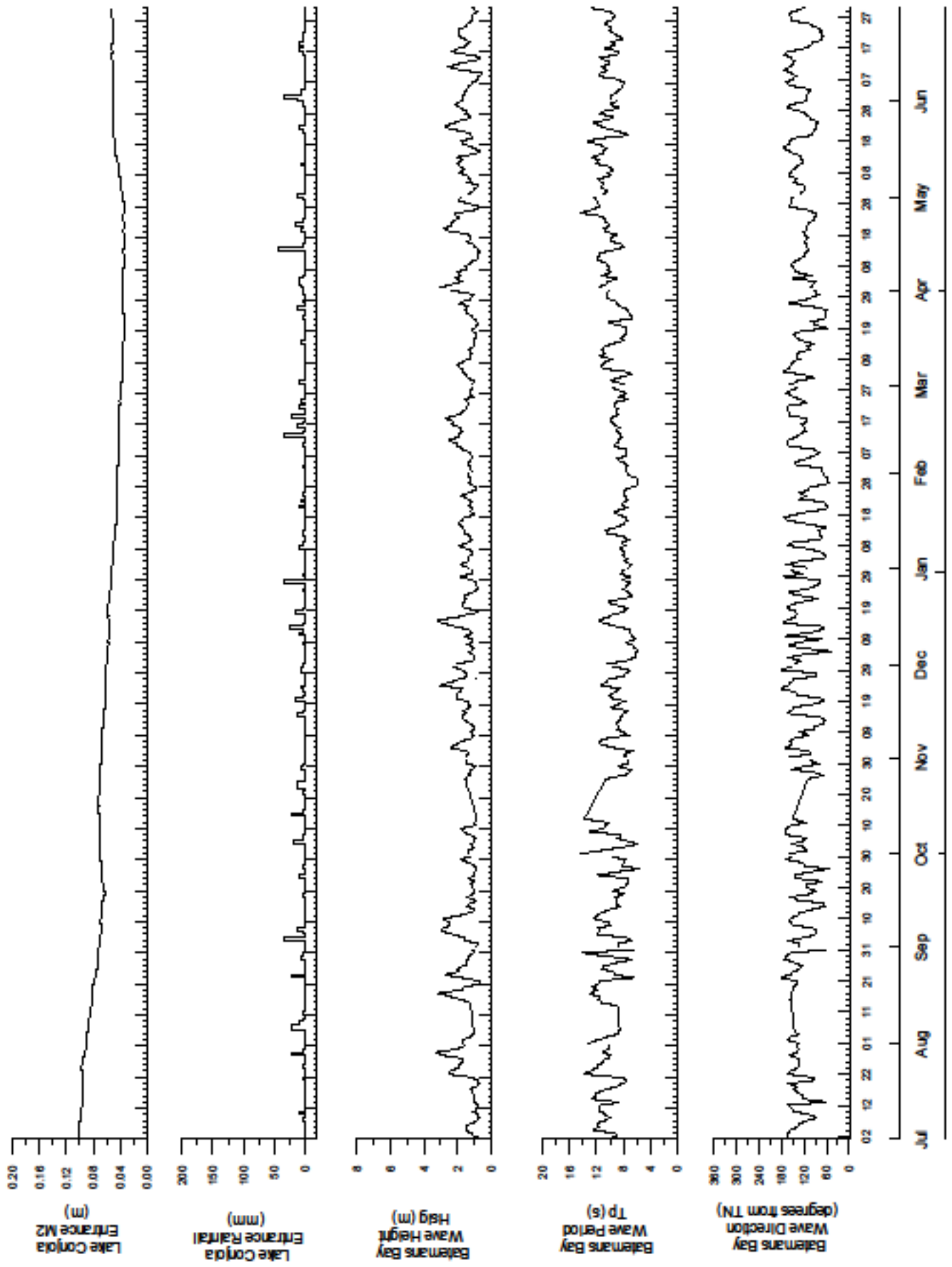
MHL  
2008-2009  
Figure  
1



Manly Hydraulics Laboratory

LAKE CONJOLA ENTRANCE, JUL 2008 - JUN 2009  
M2 CONSTITUENT, RAINFALL AND OCEAN WAVES

MHL  
BMcPMisc  
Figure  
2



2008

2009