Title	Coastal Floodplain Prioritisation Study - Estuarine Tidal Hydrodynamic Models

Abstract

The Coastal Floodplain Prioritisation Study is a product of the NSW Marine Estate Management Strategy (MEMS) developed by the University of NSW Water Research Laboratory (WRL).

As part of that Study, a finite element numerical hydrodynamic model (RMA-2) (King, 2015) was developed to simulate present day and future sea level rise hydrodynamics in each of the Tweed, Richmond, Clarence, Hastings, Macleay, Manning and Shoalhaven River estuaries.

Hydrodynamics is the study of water movement. In an estuary, three main elements control the movement of water (tidal hydrodynamics). This includes, estuary geometry, upstream catchment inflows and downstream ocean tides. The geometry of an estuary is defined by its width, length, depth or the shape and storage of sidearms. Upstream catchment inflows are based on rainfall and runoff and downstream tidal inflows are based on the water levels in the ocean.

The completed hydrodynamic tidal models adequately represent day-to-day variations to estuarine water levels using detailed bathymetry in the intertidal range, and calibrated over a long time period to capture different tidal conditions. The hydrodynamic models were calibrated to both water levels and flow (where possible). Calibration and verification periods varied between the seven (7) estuaries based on data availability. Information on the period of calibration and data used for calibration can be found in the appendix of each individual floodplain report.

The RMA-2 hydrodynamic model solves the shallow water wave equations and is suitable for the simulation of flow in vertically, well-mixed water bodies such as, estuaries. RMA-2 uses the principles of conservation of mass and momentum, and represents typical processes of bed and bank friction, turbulence and wind stress.

The hydrodynamic model for each estuary comprised of three (3) main inputs:

1. Channel bathymetry;
2. Downstream tidal water levels; and
3. Upstream river flow.

The channel bathymetry was defined from existing hydro-survey datasets which had been collected for each estuary. 1-D elements were used to represent well defined channels in which the water levels remain ‘in bank’ and two dimensional 2-D elements were used to represent areas in which flow can occur in both the X and Y planes.

Ocean tidal water levels were based on MHL observations at the entrance of each estuary. Major upstream river flows were applied as inflow boundaries and were based on real-time streamflow observations maintained by WaterNSW. Lower catchment floodplains inflows were not included in the modelling and were likely to have a proportionally minor influence on water level statistics near the areas of interest near the lower parts of the estuary.

Further information on the tidal hydrodynamic models are outlined in the Coastal Floodplain Prioritisation Study – Background and Methodology (Rayner et al., 2023) (i.e. the ‘Methods report’). Details of the specific inputs used for each estuaries’ model is included Appendix I of the relevant Study Appendices document (see references below).

The Estuarine Tidal Hydrodynamic Models for the following regions can be accessed as resources below:

- Tweed River
- Richmond River
- Clarence River
- Hastings River
- Macleay River
- Manning River
- Shoalhaven River

Legal Constraints

governing permissions and limitations under the License.

The User acknowledges that the Data may contain omissions and errors, assumptions and limitations. The User must rely on their own examination, skill and expertise in determining whether the Data is accurate, suitable or safe for a particular application.

Although every care has been taken in the preparation of these numerical models, DPI Fisheries and the authors accept no responsibility for any errors, omissions, or inaccuracies in the numerical models or damages resulting from the use of this information. The User releases the authors from all liability, negligence, injury, death, economic loss, loss of reputation or damages incidental or consequential whatsoever arising out of the Users use of the Data.

The subject model is based on or contains data from a range of sources (see individual report appendices) who give no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data.

Resource locator

WRL Hydrodynamic Models README.txt	Name: WRL Hydrodynamic Models README.txt Protocol: WWW:DOWNLOAD-1.0-http--download Function: download
Apache License	Name: Apache License Protocol: WWW:DOWNLOAD-1.0-http--download Function: download
Clarence WRL Hydrodynamic Tidal Model	Name: Clarence WRL Hydrodynamic Tidal Model Protocol: WWW:DOWNLOAD-1.0-http--download Function: download
Hastings WRL Hydrodynamic Tidal Model	Name: Hastings WRL Hydrodynamic Tidal Model Protocol: WWW:DOWNLOAD-1.0-http--download Function: download
Macleay WRL Hydrodynamic Tidal Model	Name: Macleay WRL Hydrodynamic Tidal Model Protocol: WWW:DOWNLOAD-1.0-http--download Function: download
Manning WRL Hydrodynamic Tidal Model	Name: Manning WRL Hydrodynamic Tidal Model Protocol: WWW:DOWNLOAD-1.0-http--download Function: download
Richmond WRL Hydrodynamic Tidal Model	Name: Richmond WRL Hydrodynamic Tidal Model Protocol: WWW:DOWNLOAD-1.0-http--download Function: download
Shoalhaven WRL Hydrodynamic Tidal Model	Name: Shoalhaven WRL Hydrodynamic Tidal Model Protocol: WWW:DOWNLOAD-1.0-http--download Function: download
Tweed WRL Hydrodynamic Tidal Model	Name: Tweed WRL Hydrodynamic Tidal Model Protocol: WWW:DOWNLOAD-1.0-http--download Function: download
Coastal Floodplain Prioritisation	Name: Coastal Floodplain Prioritisation Study - Estuarine Tidal Hydrodynamic Models Data Quality Statement Protocol: WWW:DOWNLOAD-1.0-http--download

Study - Estuarine Tidal Hydrodynamic Models Data Quality Statement	Description: Data Quality Statement for Coastal Floodplain Prioritisation Study - Estuarine Tidal Hydrodynamic Models Function: download

Unique resource identifier

Code	b53170a9-b20e-4cf3-b46a-0d22483cfc32

Presentation form

Dataset language

English

Metadata standard

Name	ISO 19115
Edition	2016

Dataset URI

https://datasets.seed.nsw.gov.au/dataset/b53170a9-b20e-4cf3-b46a-0d22483cfc32

Purpose

These models were developed specifically for determining regular daily water levels throughout the tidal limit of each subject estuary. Any other use of the models would require informed variations to the model input files and or source code, and create a different model and purpose (refer to licensing details below). The objective of the Coastal Floodplain Prioritisation Study was to develop an evidence base for the strategic management of NSW coastal floodplains. Sea level rise scenarios were run in the Coastal Floodplain Prioritisation Reports using the models to indicate expected water level changes, with the results used to estimate or rank the vulnerability of fixed infrastructure (such as floodgates) and adjoining floodplains to reduced functionality or drainage constraint. The sea level rise vulnerability information can be used in land use and infrastructure management decision making related to both water quality and drainage vulnerability risks.

Status

Completed

Spatial representation

Type	vector

Spatial reference system

Code identifying the spatial reference system	4283

Topic category

Keyword set

keyword value	ECOLOGY-Landscape
	INDUSTRY-Primary
	WATER
	WATER-Hydrology
	WATER-Rivers
	WATER-Surface

	MARINE-Estuaries
	MARINE-Geology-and-Geophysics
	MARINE-Human-Impacts
	BIOPHYSICAL
	CLIMATE-AND-WEATHER
	CLIMATE-AND-WEATHER-Climate-change
	HAZARDS
	HAZARDS-Flood
	GEOSCIENCES
	GEOSCIENCES-Geomorphology
	GEOSCIENCES-Hydrogeology
	OCEANOGRAPHY-Physical
	LAND-Topography
	HUMAN-ENVIRONMENT-Planning
	HUMAN-ENVIRONMENT-Structures-and-Facilities
Originating controlled vocabulary	
Title	ANZLIC Search Words
Reference date	2008-05-16

Geographic location

West bounding longitude	150.61492
East bounding longitude	153.59633
North bounding latitude	-34.94724
South bounding latitude	-28.16887

Vertical extent information

Minimum value	-100
Maximum value	2228
Coordinate reference system	
Authority code	urn:ogc:def:cs:EPSG::
Code identifying the coordinate reference system	5711

Temporal extent

Begin position	
End position	N/A

Dataset reference date

Resource maintenance

Maintenance and update frequency	Not planned
Contact info	

Contact position	Data Broker
Organisation name	Department of Primary Industries and Regional Development (DPIRD)
Responsible party role	pointOfContact

Lineage

Tucker, T. A., Rayner, D. S., Harrison, A. J., Lumiatti, G., Rahman, P. F., Gilbert, D. & Glamore, W. 2023. Tweed River Floodplain Prioritisation Study WRL TR2020/04. Water Research Laboratory, University of New South Wales. Harrison, A. J., Rayner, D. S., Tucker, T. A., Lumiatti, G., Rahman, P. F., Gilbert, D. & Glamore, W. 2023. Richmond River Floodplain Prioritisation Study WRL TR2020/05. Water Research Laboratory, University of New South Wales. Harrison, A. J., Rayner, D. S., Tucker, T. A., Lumiatti, G., Rahman, P. F., Gilbert, D. & Glamore, W. 2023. Clarence River Floodplain Prioritisation Study WRL TR2020/06. Water Research Laboratory, University of New South Wales. Tucker, T. A., Rayner, D. S., Harrison, A. J., Lumiatti, G., Rahman, P. F., Gilbert, D. & Glamore, W. 2023. Macleay River Floodplain Prioritisation Study WRL TR2020/07. Water Research Laboratory, University of New South Wales. Harrison, A. J., Rayner, D. S., Tucker, T. A., Lumiatti, G., Rahman, P. F., Gilbert, D. & Glamore, W. 2023. Hastings River Floodplain Prioritisation Study WRL TR2020/08. Water Research Laboratory, University of New South Wales. Rayner, D. S., Ruprecht, J. E., Harrison, A. J., Tucker, T. A., Lumiatti, G., Rahman, P. F., Gilbert, D. & Glamore, W. 2023. Manning River Floodplain Prioritisation Study WRL TR2020/09. Water Research Laboratory, University of New South Wales. Rayner, D. S., Harrison, A. J., Tucker, T. A., Lumiatti, G., Rahman, P. F. & Glamore, W. 2023. Shoalhaven River Floodplain Prioritisation Study WRL TR2020/10. Water Research Laboratory, University of New South Wales. Rayner, D. S., Harrison, A. J., Tucker, T. A., Lumiatti, G., Rahman, P. F., Waddington, K., Juma, D. & Glamore, W. 2023. Coastal Floodplain Prioritisation Study – Background and Methodology WRL TR2020/32. Water Research Laboratory, University of New South Wales.

Limitations on public access

Responsible party

Contact position	Data Broker
Organisation name	Department of Primary Industries and Regional Development (DPIRD)
Responsible party role	pointOfContact

Metadata point of contact

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Organisation name	Department of Primary Industries and Regional Development (DPIRD)
Responsible party role	pointOfContact

Metadata date

2023-10-11T19:52:08.911670

Metadata language