Examples Using the Floodplain Risk Management Guide

Modelling the Interaction of Catchment Flooding and Oceanic Inundation in Coastal Waterways

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Abbreviations

AEP	Annual exceedance probability
AHD	Australian Height Datum
ARI	Average recurrence interval
DECC	Department of Environment, Climate Change NSW
DECCW	Department of Environment, Climate Change and Water NSW
HHWS(SS)	High High Water Springs (Solstice Spring)
ICOLL	intermittently closed and open lakes and lagoon
ISLW	Indian Springs Low Water
OEH	Office of Environment and Heritage
SLR	Sea Level Rise

Glossary

The majority of terms in the document are defined in the NSW Government's *Floodplain Development Manual*, 2005. Additional relevant terms are defined as indicated below.

Design flood	A flood being used as the basis of design for flood mitigation works.
Oceanic inundation	A natural process resulting from severe storms whereby elevated ocean water levels combined with a varying combination of wave setup and wave runup along the coast can result in elevated ocean water levels in estuaries and ocean seawater overtopping frontal dune systems and coastal barriers during storms. Overtopping of frontal dunes and coastal barriers is generally rare and episodic, occurring principally around the peak of a high tide, creating a hazard mainly where frontal dunes or coastal barriers along the NSW coastline are crested below about 5 m AHD.
Ocean water level boundary conditions	The ocean water level(s) used as the downstream boundary level for hydraulic modelling for a flood study in a coastal waterway.
Planning flood	A flood being used as the basis for deriving flood planning levels to manage development.
Tidal waterways	The lower portions of coastal rivers, creeks, lakes, harbours, and ICOLLs affected by tidal fluctuations.

Case studies

These case studies demonstrate the use of the Floodplain Risk Management Guide: Modelling the Interaction of Catchment Flooding and Oceanic Inundation in Coastal Waterways and documentation of selected methodologies and assumptions.

The case studies outline the general and simplistic approaches in Waterway Entrance Types A and C drawing upon Table 1(a, b and c) and the advice in Sections 1 to 10 of this guide.

Each example illustrates the decision making involved and the type of information that should be provided as a minimum to outline why assumptions and decisions were made and certain methodologies used. The case studies assume that all relevant background information (Section 1) has been collected, reviewed and informs decision making. The examples provided assume that background information is inadequate and that further assessment is required.

Small tributary discharging to a larger estuary

Describe the outcomes you are trying to achieve

This case study provides an example of using the guide to assess catchment flooding and oceanic inundation depending on whether the analysis is for:

- A small project (e.g.) building a house on a site where no flood study is available (in this example Location A in Figure E.1). A site specific assessment, whilst conservative, may be undertaken to estimate the flood impacts on the development. If this approach results in too conservative a result, the general approach could be used to refine flood estimates for the site, though this would involve additional investigation, modelling and reporting costs.
- A strategic flood study of a tributary that discharges to a larger estuary at Location A in (Figure E.1). The area of interest within the tributary should be sufficiently upstream of Location A to avoid significant boundary effects. Strategic studies should use as a minimum the general approach. Use of the detailed approach could also be considered.

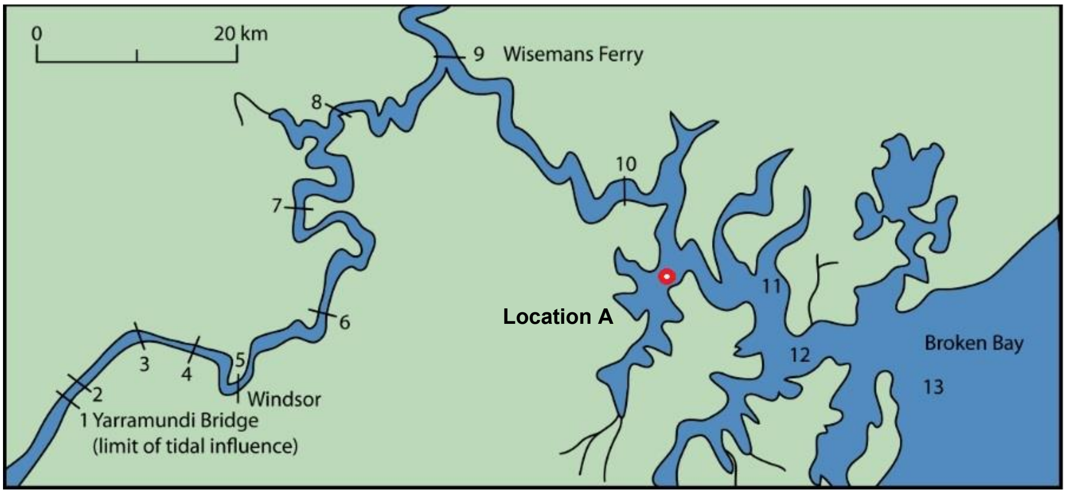

Figure E.1: Example assessment for small tributary of a large estuary

Step 1 – Gather and review available information

Outline the studies available and the information they provide that is relevant to the assessment

Step 2 – Waterway entrance type

Group 2 Tide dominated estuary – Waterway Entrance Type A – Table 1a

Step 3 – Selected modelling approach

Simplistic approach	General approach
Use existing study if available. Otherwise Site specific assessment at Location A shown on Figure E.1.	Derive downstream boundary condition for strategic study

Step 4 – Entrance condition & management – N/A Waterway Entrance Type A

Simplistic approach	General approach
N/A - Waterway Entrance Type A	N/A Waterway Entrance Type A

Step 5 – Modelling ocean (downstream) boundary conditions for 1%, 5%, ISLW, HHWS for design events

Simplistic approach	General approach
Refer Figure 5.2– South of Crowdy Head (no adjustment) Refer Table 5.–Waterway entrance type A - Design still water level at Fort Denison with no wave set up allowance (Type A) – 1% Ocean Water level - 1.45m AHD 5% Ocean Water Level - 1.40m AHD	Refer Figure 5.2– South of Crowdy Head (no adjustment) Refer Fig A1 (1%AEP) & Fig A4 (5% AEP) - peaks of the dynamic boundary equate to those shown in Table 5.2 for Design still water levels at Fort Denison with no wave set up • Dynamic 1% Ocean Water level - 1.45m AHD peak • Dynamic 5% Ocean Water Level - 1.40m AHD peak Indicative Dynamic Spring and Neap Tide – boundary based on Appendix C - Fig C1 (south of Crowdy Head) – For highest velocity in inlet coincide peak flood with ISLW, for highest level coincide peak of flood with HHWS(SS) Initial water level conditions in the estuary determined in consideration of tidal penetration into the waterway

Step 6 – Translating ocean boundary

In this case there are gauges inside the larger estuary to assist with translation. Tidal plane information for HHWS can be used from the most recent Manly Hydraulics Laboratory Tidal Planes Analysis

Find the ocean tide gauge closest to area of interest (refer report Figure A1) and find river gauge location closest to the point of interest (Location A). Compare HHWS at these two gauges and determine indicative difference e.g. 0.1m. => HHWS at river gauge level 0.1m higher than ocean gauge.

Simplistic approach	General approach
Adjust steady state boundary by 0.1m (determined from relative peaks of HHWS in tidal planes report)	Adjust dynamic boundary by 0.1m (determined from relative peaks of HHWS in tidal planes report)

Step 7 – Relative timing of catchment flooding and oceanic inundation– adjust flood peak to coincide with ocean boundary

Simplistic approach	General approach
Peak Catchment flow and peak static boundary from Step 5	Adjust timing of catchment flow to coincide with peak of ocean boundary condition determined from Step 5

Step 8 – Determining design flood levels – Table 8.1 and project brief

Simplistic approach	General approach
Generally use envelope approach considering catchment flooding and oceanic inundation typically for the 1% and PMF or suitable extreme event.	Generally use envelope approach considering dynamic catchment flooding and oceanic inundation for 1%, PMF and typically several more frequent events based on Table 8.1

Step 9 – Sensitivity testing for coincidence of catchment flooding and oceanic inundation

Simplistic approach	General approach
As per table 1a, generally no sensitivity testing for ocean boundary or catchment timing required	Time of concentration is less than 24hrs for this study area, therefore test offset of ocean boundary to peak of flood by +/- 3hrs and report on sensitivity

Step 10 – Where council's Sea Level Rise Projections (SLRs) need to be considered

Simplistic approach	General approach
Add council's SLR projection to event of interest to derive projected design flood levels.	Add council's SLR projection to the downstream boundary condition and to initial water levels for the tidal waterway in the model. Run model to derive projected design flood levels.

Example 1 - Summary of decision making using the general approach

Name of waterway	Tributary to coastal bay	
Location	Outlets at Location A as shown on Figure E.1	
Purpose of assessment	Develop downstream boundary for flood study	
Local council		
1. Available information to inform this assessment	Outline studies etc	
	Adopted methodology/figures	**Reasoning/Reference/Source of Information**
2. Waterway entrance type	A	Group 2 tide dominated estuaries
3. Selected modelling approach	General	Derive downstream boundary condition for strategic study near red dot Figure E.1
4. Entrance condition and management	N/A	Open entrance which has negligible impact on ocean inundation and flood levels. Waterway Entrance Type A
5. Modelling the ocean water level boundary		
North or south of Crowdy Head	South Figure 5.2	Broken Bay – location south of Crowdy Head
Peak design ocean boundary water level	1%-1.45m AHD 5%- 1.4m AHD Ref Table 5.2	Broken Bay – location south of Crowdy Head for Type A Waterway Decide upon initial water level conditions in the estuary in consideration of tidal penetration into the waterway
Static or dynamic analysis	Dynamic Ref A1 and A4	Strategic study
Initial water level conditions in the estuary	Based upon mean water levels aligned to start dynamic downstream boundary	MHL Tidal Planes Report - MHL2053
6. Translating the ocean boundary to study boundary		
Adjustment	+ 0.1m	Difference in ocean and river gauge for HHWS
Method used/source	Relevant ocean gauge (Patonga) and river gauge closest to downstream boundary (Spencer)	MHL Tidal Planes Report – MHL2053
7. Relative timing of catchment flooding and oceanic inundation		
Peak catchment with static/dynamic ocean	Dynamic catchment flooding and oceanic inundation – peaks aligned	Strategic study Aligned at downstream boundary of study area
8. Determining design flood levels		
Design AEP	1% 2% 5% 10% PMF	Combinations as per Table 8.1 and project brief
Design flood envelope	1%	Envelope derived from combinations as per Table 8.1 – including peak levels and velocities
9. Sensitivity testing		
Ocean boundary level	N/A	Waterway Entrance Type A
Peak timing	+-3hrs	Time of concentration 6–24hrs
Efficiency of entrance	N/A	
10. Incorporating sea level rise		
Council's adopted projections	Available	Council's adopted SLR projections
Adjustment made to: Boundary conditions Initial water levels Starting entrance conditions	Add council's SLR projection to these factors. Run model to derive projected design flood levels.	Project brief

2. Coastal lake

Describe the outcomes you are trying to achieve

This case study provides an example of using the guide to assess catchment flooding and oceanic inundation in a coastal lake, depending on whether the analysis is for:

- A small project (e.g.) building a house on a site where no flood study is available (in this example Location B in Figure E.2). A site specific assessment, whilst conservative, may be undertaken to estimate the flood impacts on the development. If this approach results in too conservative a result, the general approach could be used to refine flood estimates for the site, though this would involve additional investigation, modelling and reporting costs.
- A strategic study of flooding in the whole lake system (Figure E.2). Strategic studies should use as a minimum the general approach. Use of the detailed approach could also be considered.

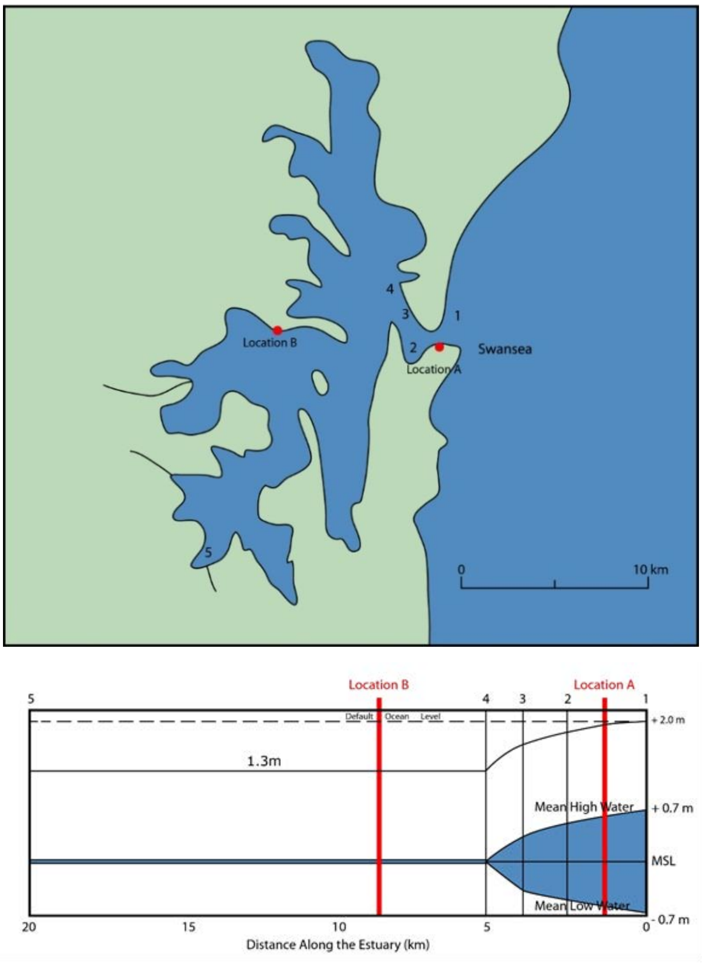

Figure E.2: Example assessment of a coastal lake

Step 1 – Gather and review available information

Outline the studies available and the information they provide that is relevant to the assessment

Step 2 – Waterway entrance type

Group 3 - trained entrance – Waterway Entrance Type B – Table 1b

Step 3 – Selected modelling approach

Simplistic approach	General approach
Use existing study if available. Otherwise site specific assessment at Location B shown on Figure E.2.	Derive downstream boundary condition for strategic study of whole lake

Step 4 – Entrance condition & Management – Waterway Entrance Type B

Simplistic approach	General approach
Identify current and peak shoaled entrance condition from studies or historical analysis Identify whether an entrance management policy exists and its operating parameters. Identify any waterway structures that may control upstream flood behaviour (i.e.) bridges and culverts which constrict waterways	Identify current and peak shoaled entrance condition from studies or historical analysis Identify whether an entrance management policy exists and its operating parameters. Identify any waterway structures that may control upstream flood behaviour (i.e.) bridges and culverts which constrict waterways Consider dynamic morphology of entrance as appropriate.

Step 5 – Modelling ocean (downstream) boundary conditions for 1%, 5%, ISLW, HHWS for design events

Simplistic approach	General approach
Refer Fig 5.2 South of Crowdy Head (no adjustment) Refer Table 5.2 –Waterway Entrance Type B - Design still water level at Fort Denison with some wave set up allowance (Type B) 1% Ocean Water level – 2.0m AHD 5% Ocean Water Level – 1.9m AHD	Refer Fig 5.2 – South of Crowdy Head (no adjustment) Refer Fig A2 (1%AEP) & Fig A5 (5% AEP) - peaks of the dynamic boundary equate to those shown in Table 5.2. for Design still water levels at Fort Denison with some wave set up allowance (Type B). • Dynamic 1% Ocean Water level – 2.0m AHD peak • Dynamic 5% Ocean Water Level – 1.9m AHD peak Indicative Dynamic Spring and Neap Tide – boundary based on Appendix C - Fig C1 (south of Crowdy Head) – For highest velocity in inlet coincide peak flood with ISLW, for highest level coincide peak of flood with HHWS(SS) Decide upon initial water level conditions in the estuary in consideration of tidal penetration into the waterway

Step 6 – Translating ocean boundary

In this case there are gauges inside the larger estuary to assist with translation. Tidal plane information for HHWS can be used from the most recent Manly Hydraulics Laboratory Tidal Planes Analysis

Find the ocean tide gauge closest to the waterway of interest (MHL report Figure A1) and find river gauge location (where available) from report closest to the point of interest (for site specific assessment, Location B, for strategic study downstream boundary, i.e. Location A).

Simplistic approach	General approach
Lake system is reducing tidal influence. HHWS => approx. 0.7 to 0.2 => reduce levels from Step 5 by 0.5m 1% Lake Water level – 1.5m AHD 5% Lake Water Level – 1.4m AHD	Strategic study of lake starting with downstream boundary at entrance to allow for entrance dynamics including ocean penetration through entrance channel and for influence of oceanic inundation on available lake volume.

Step 7 – Relative timing of catchment flooding and oceanic inundation – adjust flood peaks to coincide with ocean boundary

Simplistic approach	General approach
Peak catchment flow and peak (static) ocean boundary from Step 5	Adjust timing of catchment flow to coincide with peak of ocean boundary condition determined from Step 5

Step 8 – Determining design flood levels – Table 8.1 and project brief

Simplistic approach	General approach

Generally use the envelope approach considering catchment and ocean flooding typically for the 1% and PMF or suitable extreme event	Generally use the envelope approach considering dynamic catchment flooding and oceanic inundation for 1%, PMF and typically several more frequent events based on Table 8.1

Step 9 – Sensitivity testing for coincidence of catchment flooding and oceanic inundation

Simplistic approach	**General approach**
Test sensitivity to downstream ocean boundary condition by increasing this by 0.3m	Test downstream ocean boundary condition by increasing dynamic boundary by 0.3m. Time of concentration < 24hrs for study area, therefore test offset of peak ocean boundary to flood peak by +/-3hrs. Due to low tidal exchange test sensitivity to entrance efficiency – increase waterway area by 10% in tidal range.

Step 10 – Where council's Sea Level Rise Projections (SLRs) need to be considered

Simplistic Approach	**General Approach**
Add council's SLR projection to event of interest to derive projected design flood levels.	Add council's SLR projection to the downstream boundary condition and to initial water levels for the tidal waterway in the model. Run model to derive projected design flood levels.

Example 2 - Summary of decision making from the general approach

Name of waterway	Coastal lake	
Location	Whole of lake strategic study	
Purpose of assessment	Develop downstream boundary for flood study	
Local Council		
1. Available information informing this assessment	Outline studies etc.	
	Adopted methodology/Figures	**Reasoning/Reference/Source of Information**
2. Waterway entrance ype	B	Group 3 wave dominated estuaries - (entrances that are constricted by wave-deposited beach sand and flood-tidal deltas, but are permanently open
3. Selected approach	General	Develop downstream boundary for catchment wide flood study
4. Entrance condition and management	N/A	Open entrance which has negligible impact on ocean inundation and flood levels. Waterway Entrance Type B
5. Modelling the ocean water level boundary		
North or south of Crowdy Head	South Fig 5.2	Lake Macquarie – location south of Crowdy Head
Peak design ocean boundary water level	1%-2.0m AHD 5%- 1.9m AHD Ref Table 5.2	Lake Macquarie – location south of Crowdy Head for Type B waterway
Static or dynamic analysis	Dynamic Ref A2 and A5	Strategic study
Adjustment	Nil	Lake study needs to start at entrance due to significant entrance and lake volume affects
Method used/source	N/A	N/A
Initial water level conditions in the estuary	Based upon mean water levels aligned to start dynamic downstream boundary	MHL Tidal Planes Report - MHL2053
6. Translating ocean boundary	Not Required	Ocean boundary at entrance, Location A
7. Relative timing of catchment flooding and oceanic inundation		
Peak catchment with static/dynamic ocean	Dynamic catchment flooding and oceanic inundation – peaks aligned	Strategic study Aligned at downstream boundary of study area
8. Determining design flood levels		
Design AEP	1% 2% 5%	Combinations as per Table 8.1 and project brief

	10% PMF	
Design Flood Envelope	1%	Envelope derived from combinations as per Table 8.1 – including peak levels and velocities
9. Sensitivity testing		
Ocean boundary level	To downstream ocean boundary condition by increasing these by 0.3m.	Waterway entrance Type B
Peak timing	Time of concentration < 24hrs for study area, therefore test offset of peak ocean boundary to flood peak by +/-3hrs.	Time of concentration 6–24hrs
Efficiency of entrance	Due to low tidal exchange test sensitivity to entrance efficiency – increase waterway area by 10% in tidal range.	Section 9 of Guide
10. Incorporating sea level rise		
Council adopted projections	Available	Council adopted SLR projections
Adjustment made to: Boundary conditions Initial water levels Starting entrance conditions	Add council's SLR projection to these factors. Run model to derive projected design flood levels.	Project brief

3. ICOLL

Describe the outcomes you are trying to achieve

This case study provides an example of using the guide to assess catchment flooding and oceanic inundation in an ICOLL, depending on whether the analysis is for:

- A small project (e.g.) building a house on a site where no flood study is available (in this example at the Site Location in Figure E.3). A site specific assessment, whilst conservative, may be undertaken to estimate the flood impacts on the development. If this approach results in too conservative a result, the general approach could be used to refine flood estimates for the site, though this would involve additional investigation, modelling and reporting costs.
- A strategic study of flooding in the whole lake system (Figure E.3). Strategic studies should use as a minimum the general approach. Use of the detailed approach could also be considered.

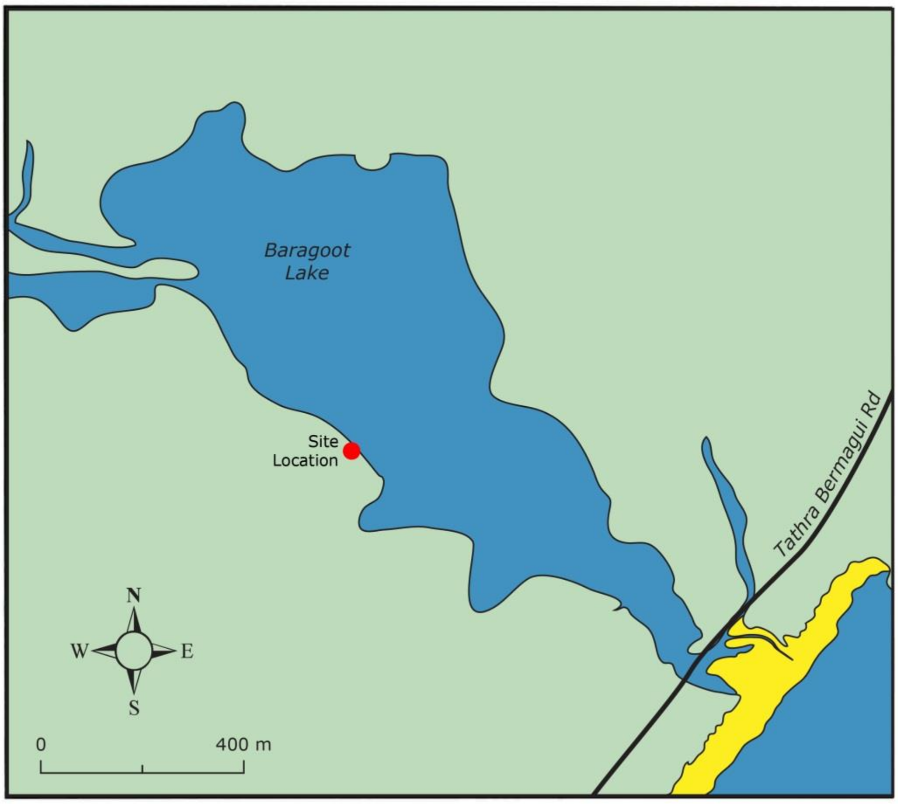

Figure E.3: Example Assessment of an ICOLL

There are three key ways in which flooding can occur in ICOLLs:

- catchment flooding, as a result of intense rainfall within the local catchment and the influence of the entrance berm and ocean boundary conditions;
- oceanic inundation, as a result of high ocean tides, storm surge, wave penetration, and
- low-level persistent flooding, occurring through a gradual and prolonged rise in lake levels during periods of entrance closure.

It is important to consider each of these processes in flood investigations in ICOLL catchments.

Examples of Using Floodplain Risk Management Guide: Modelling the Interaction of Catchment Flooding and Oceanic Inundation in Coastal Waterways

Step 1 – Gather and review available information

Outline the studies available and the information they provide that is relevant to the assessment

Step 2 - Waterway entrance type

Group 4 ICOLL – Waterway Entrance Type C – Table 1c

Step 3 – Selected modelling approach

Simplistic approach	General approach
Site specific assessment at location shown on Figure E.3	Derive downstream boundary condition for strategic study for lake foreshore and tidal waterway

Step 4 – Entrance condition & management

Simplistic approach	General approach
Identify current and peak shoaled entrance condition from studies or historical analysis Identify whether an entrance management policy exists and its operating parameters. Identify any waterway structures that may control upstream flood behaviour (i.e.) bridges and culverts which constrict waterways	Identify current and peak shoaled entrance condition from studies or historical analysis Identify whether an entrance management policy exists and its operating parameters. Identify any waterway structures that may control upstream flood behaviour (i.e.) bridges and culverts which constrict waterways Consider dynamic morphology of entrance as appropriate.

Step 5 – Modelling ocean (downstream) boundary conditions for 1%, 5%, ISLW & HHWS for design events

Simplistic approach	General approach
Refer Fig 5.2 South of Crowdy Head (no adjustment) Refer Table 5.2 –Waterway Entrance Type C – Design still water level at Fort Denison with full wave set up allowance (Type C) 1% Ocean Water level – 2.55m AHD 5% Ocean Water Level – 2.35m AHD Outlet berm configuration/management: • peak shoaled condition/historical variations • Management measures	Refer Fig 5.2 – South of Crowdy Head (no adjustment) Refer Fig A3 1% & Refer Fig A6 5% - peaks of the dynamic boundary equate to those shown in Table 5.2 for design still water levels at Fort Denison with full wave set up allowance (Type C). • Dynamic 1% Ocean Water level – 2.55m AHD peak • Dynamic 5% Ocean Water Level – 2.35m AHD peak Indicative dynamic Spring and neap tide – boundary based on Appendix C - Fig C1 (south of Crowdy Head) – For highest velocity in inlet coincide peak flood with ISLW, for highest level coincide peak of flood with HHWS(SS) Outlet berm configuration/management: • peak shoaled condition/historical variations/scoured • management measures Decide upon initial water level conditions in the estuary in consideration of historic water and berm levels and entranced management strategies

Step 6 – Translating ocean boundary

Simplistic approach	General approach
N/A to Waterway Entrance Type C (i.e. ICOLL) due to the influence of the entrance berm on upstream flood levels	N/A to Waterway Entrance Type C (i.e. ICOLL) due to the influence of the entrance berm on upstream flood levels

Step 7 – Relative timing of catchment flooding and oceanic inundation – adjust flood peaks to coincide with ocean boundary

Simplistic approach	General approach
Peak catchment flow and peak static boundary from Step 5.	Adjust timing of catchment flow to coincide with peak of ocean boundary condition determined from Step 5

Step 8 – Determining design flood levels – Table 8.1 and requirements of individual project brief

Simplistic approach	General approach
Generally utilise envelope approach considering catchment and ocean flooding typically for the 1% and PMF with appropriate entrance conditions and considering impacts of waterway structures	Generally utilise envelope approach considering dynamic catchment flooding and oceanic inundation for 1%, PMF and typically several more frequent events based on Table 8.1 with appropriate entrance conditions and considering impacts of waterway structures

Step 9 – Sensitivity testing – For coincidence of catchment flooding and oceanic inundation as outlined in Section 8 and Table 1

Simplistic approach	General approach
Generally test sensitivity to peak shoaled condition of the entrance berm and downstream ocean boundary condition by increasing these by 0.3m	Generally test sensitivity to peak shoaled condition of the entrance berm, downstream ocean boundary condition and initial water level in estuary by increasing these by 0.3m. Time of concentration is less than 24hrs for this study area, therefore test offset of ocean boundary to peak of flood by +and - 3hrs and report on sensitivity

Step 10 – Where council's Sea Level Rise Projections (SLRs) need to be considered

Simplistic approach	General approach
Add council SLR projection to event of interest to derive projected design flood levels	Add council SLR projection to the downstream boundary condition and to initial water levels for the tidal waterway in the model. Run model to derive projected design flood levels.

Example 3 - Summary of decision making from the general approach

Name of waterway	ICOLL	
Location	Whole of lake strategic study	
Purpose of assessment	Develop downstream boundary for flood study	
Local Council		
1. Available Information informing this assessment	Outline studies etc	
	Adopted methodology/figures	**Reasoning/reference/source of information**
2. Waterway Entrance Type	C	Group 4 ICOLL
3. Selected approach	General	Develop downstream boundary for flood study
4. Entrance condition and management	Identify current and peak shoaled entrance condition and whether an entrance management policy exists and its operating parameters. Consider dynamic morphology of entrance as appropriate. Identify any waterway structures that may control upstream flood behaviour	Studies, aerial photos, survey records, historic records Council entrance management policy
5. Modelling the ocean water level boundary		
North or south of Crowdy Head	South Fig 5.2	Location south of Crowdy Head
Peak design ocean water level	1% Ocean Water level – 2.55m AHD 5% Ocean Water Level – 2.35m AHD Ref Table 5.2	Refer Fig A3 1% & Refer Fig A6 5% - peaks of the dynamic boundary equate to those shown in Table 5.2. Indicative dynamic Spring and neap Tide – boundary based on Appendix C – Fig C1 (south of Crowdy Head) for highest level coincide peak of flood with HHWS(SS)
Static or dynamic analysis	Dynamic Ref A3 and A6	Strategic study
Outlet berm configuration/management:	• peak shoaled condition/historical variations • management measures	Entrance management plan. Estuary management studies Aerial photos, council records
Initial water level conditions in the estuary		Decide upon initial water level conditions in the estuary in consideration of historic water and berm levels and entranced management strategies
6. Translating the ocean boundary to the study boundary		
Adjustment	Nil	N/A to Waterway Entrance Type C's (i.e.) ICOLL due to the influence of the entrance berm on upstream flood levels
Method used/source	N/A	N/A

7. Relative timing of catchment flooding and oceanic inundation		
Peak catchment with static/Dynamic Ocean	Dynamic catchment flooding and oceanic inundation – peaks aligned	Strategic study. aligned at downstream boundary of study area
8. Determining design flood levels		
Design AEP	1%, 2%, 5%, 10% and PMF	Combinations as per Table 8.1 and project brief
Design Flood Envelope	1%	Envelope derived from combinations as per Table 8.1 – including peak levels and velocities
9. Sensitivity testing		
Berm condition and downstream ocean boundary condition	Generally test sensitivity to peak shoaled condition of the entrance berm and downstream ocean boundary condition by increasing these both by 0.3m.	Waterway Entrance Type C
Peak timing	Time of concentration < 24hrs for study area, therefore test offset of peak ocean boundary to flood peak by +/-3hrs.	Time of concentration 6-24hrs
Efficiency of entrance	N/A	N/A
10. Incorporating sea level rise		
Council adopted projections	Available	Council adopted SLR projections
Adjustment made to: Boundary conditions Initial water levels Starting entrance conditions	Add council SLR projection to these factors. Run model to derive projected design flood levels.	Project brief