Appendix D: SWAN Wave Modelling

D.1 Preamble

The Eurobodalla Shire Council area is subject to extreme waves originating from offshore storms. When swell waves approach the coast, they are modified by the processes of refraction, diffraction, wave-wave interaction and dissipation processes. The model SWAN (Simulating WAves Nearshore) was used to quantify the change in wave conditions from an offshore boundary to nearshore locations of interest. Details of SWAN can be found in Booij et al. (1999) and Ris et al. (1999) and is described in brief below.

D.2 SWAN Wave Model

SWAN (version 41.10) is a third-generation wave model that computes random, short-crested, wind-generated waves in coastal regions and inland waters. The SWAN model is based on the wave action balance equation with sources and sinks, and accommodates the processes of wind generation, white capping, bottom friction, quadruplet wave-wave interactions, triad wave-wave interactions and depth induced breaking (Ris et al., 1995). It was developed at Delft University of Technology (2016).

The formulation of the SWAN wave model imposes a number of restrictions which should be acknowledged. While the model may be used on domains of any scale, its use in oceanic scale domains is not recommended for reasons of computation efficiency compared to models such as WAM and WaveWatchIII. Additionally, the spectral formulation of the model limits its ability to accurately model wave diffraction and some surf zone processes such as wave setup (in a two-dimensional simulation).

Despite these limitations, the SWAN model is considered an industry-standard spectral wave generation and propagation model and, with appropriate acknowledgment and allowance for such limitations, provides accurate and robust values.

D.3 Computational Domain

Correct representation of natural bathymetry within the model computational domain is critical to simulating representative wave propagation and transformation processes.

D.3.1 Data Sources

Sources of bathymetric data of the Eurobodalla Shire region used within this study are presented in Table D-1. Topographic data was sourced from the most recent available LIDAR (2005 within Batemans Bay and 2011 elsewhere). Bathymetry is shown for each model domain in Figure D-2 to Figure D-5.

Table D-1: Available Bathymetric Survey Data for the Study Region

Location	Source	Survey Date	Grid Reference System	Datum[1,2,3]
Maloneys Beach	OEH Hydrosurvey	24/7/2014	GDA94/MGA Zone 56	AHD
Long Beach	OEH Hydrosurvey	29/7/2014	GDA94/MGA Zone 56	AHD
Surfside Beach (east and west)	OEH Hydrosurvey	30/7/2014	GDA94/MGA Zone 56	AHD
Malua Bay	OEH Hydrosurvey	30/7/2014	GDA94/MGA Zone 56	AHD
Guerilla Bay	OEH Hydrosurvey	29/7/2014	GDA94/MGA Zone 56	AHD
Barlings Beach	OEH Hydrosurvey	1/4/2015	GDA94/MGA Zone 56	AHD
Tomakin Cove	OEH Hydrosurvey	1/4/2015	GDA94/MGA Zone 56	AHD
Broulee Beach	OEH Hydrosurvey	1/4/2015	GDA94/MGA Zone 56	AHD
Bengello Beach	OEH Hydrosurvey	1/4/2015	GDA94/MGA Zone 56	AHD
Batemans Bay Bar	RMS Hydrosurvey	8/7/2015	GDA94/MGA Zone 56	BBHD
Batemans Bay Marine Parks	NSW Marine Park Authority Survey	2007 - 2012	GDA94/MGA Zone 56	AHD
Batemans Bay	OEH Hydrosurvey	1986-87	AGD66/ISG Zone56/1	BBHD
Batemans Bay	OEH Hydrosurvey	5-8/12/1995	AGD66/ISG Zone56/1	BBHD
Deepwater Bed Elevation	Australian Hydrographic Service (AHS)	varied	GDA94/MGA Zone 56	LAT

Notes:

(1)   BBHD   = Batemans Bay Hydro Datum   =   -0.889 m AHD.

(2)   LAT   = Lowest Astronomical Tide   =   -0.850 m AHD.

(3)   AHD   = Australian Height Datum   ≈   Mean Sea Level (MSL).

D.3.2   Model Domains

Four (4) model domains were constructed to represent different scales and regions of the ESC region, shown in Figure D-1. These domains include:

1. Coarse Eurobodalla Domain (Figure D-2) – extends 56 km from Brush Island (Bawley Point) in the north to Toragy Point (Moruya Heads) in the south and at least 15 km offshore to ensure that model boundary effects did not influence the wave characteristics reaching the beaches in the study area. This coarse model domain has a spatial resolution of 100 m and was primarily used as a transformation model to simulate wave propagation from an offshore location to the nearshore.
2. Durras Model Domain (Figure D-3) – this is a nested grid with a spatial resolution of 25 m. This model domain is centred around Durras Beach and Cookies Beach, and is used to simulate wave propagation at these locations.
3. Batemans Bay Domain (Figure D-4) – this is a nested grid with a spatial resolution of 25 m, centred around Batemans Bay. It is used to simulate wave propagation for beaches between (and including) Maloneys Beach and Sunshine Bay.
4. Moruya Domain (Figure D-5) - this is a nested grid with a spatial resolution of 25 m, covering the southern extent of the study area. It is used to simulate wave propagation for beaches between (and including) Malua Bay and Bengello Beach.

The parameters used to define the position of each model domain are provided in Table D-2.
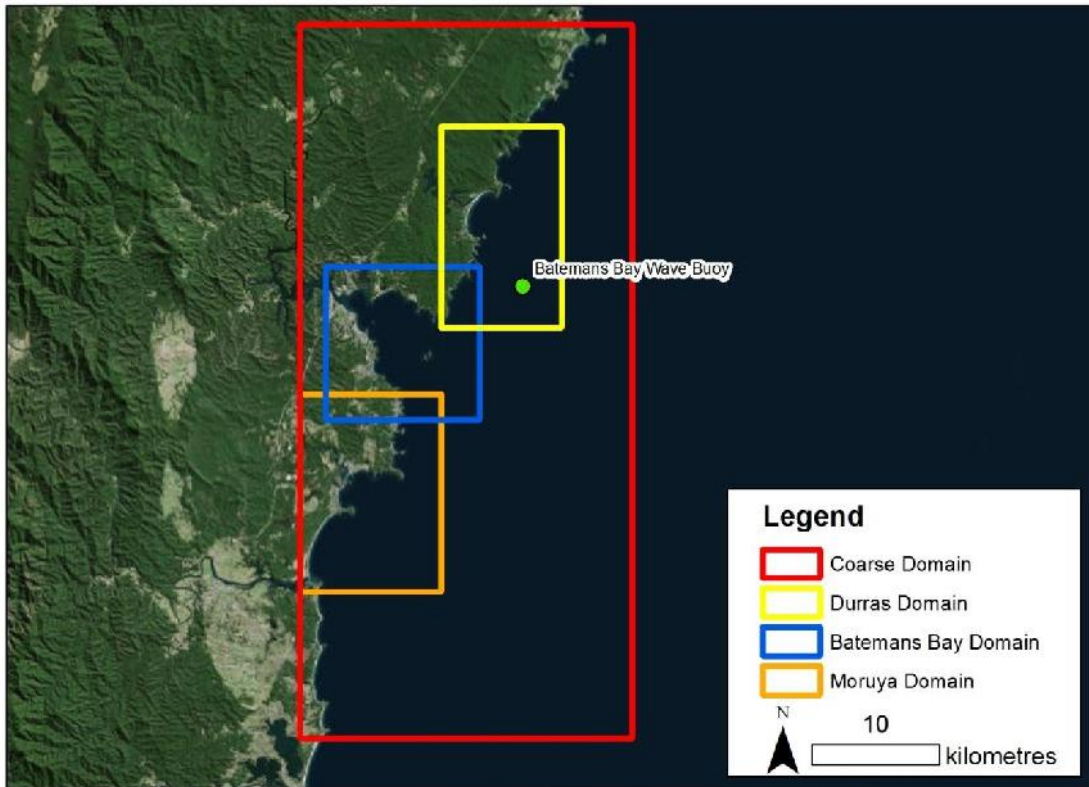
Figure D-1: SWAN model domains

Table D-2: Summary of Model Domain characteristics

| Domain	Parameter	East	North
Coarse	Coordinate - Lower Left Corner	242,250	6,010,250
	Size (km)	56	26
	Resolution	100	100
	# Cells	260	560
Durras	Coordinate - Lower Left Corner	253,250	6,042,500
	Size (km)	9.5	15.75
	Resolution	25	25
	# Cells	380	630
Batemans Bay	Coordinate - Lower Left Corner	244,250	6,035,250
	Size (km)	12	12
	Resolution	25	15
	# Cells	480	480
Moruya	Coordinate - Lower Left Corner	242,250	6,021,750
	Size (km)	11	15.5
	Resolution	25	25
	# Cells	440	620
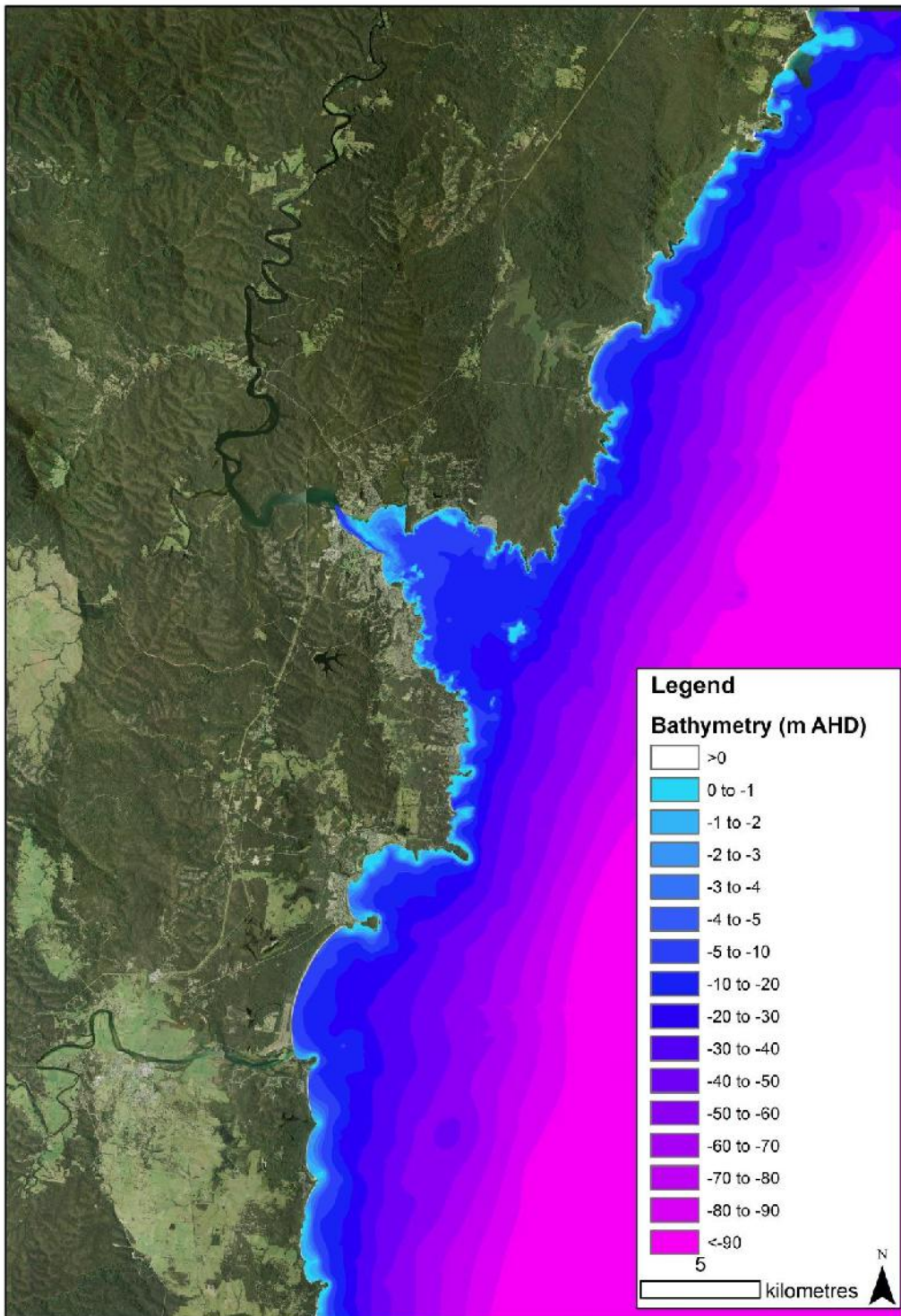
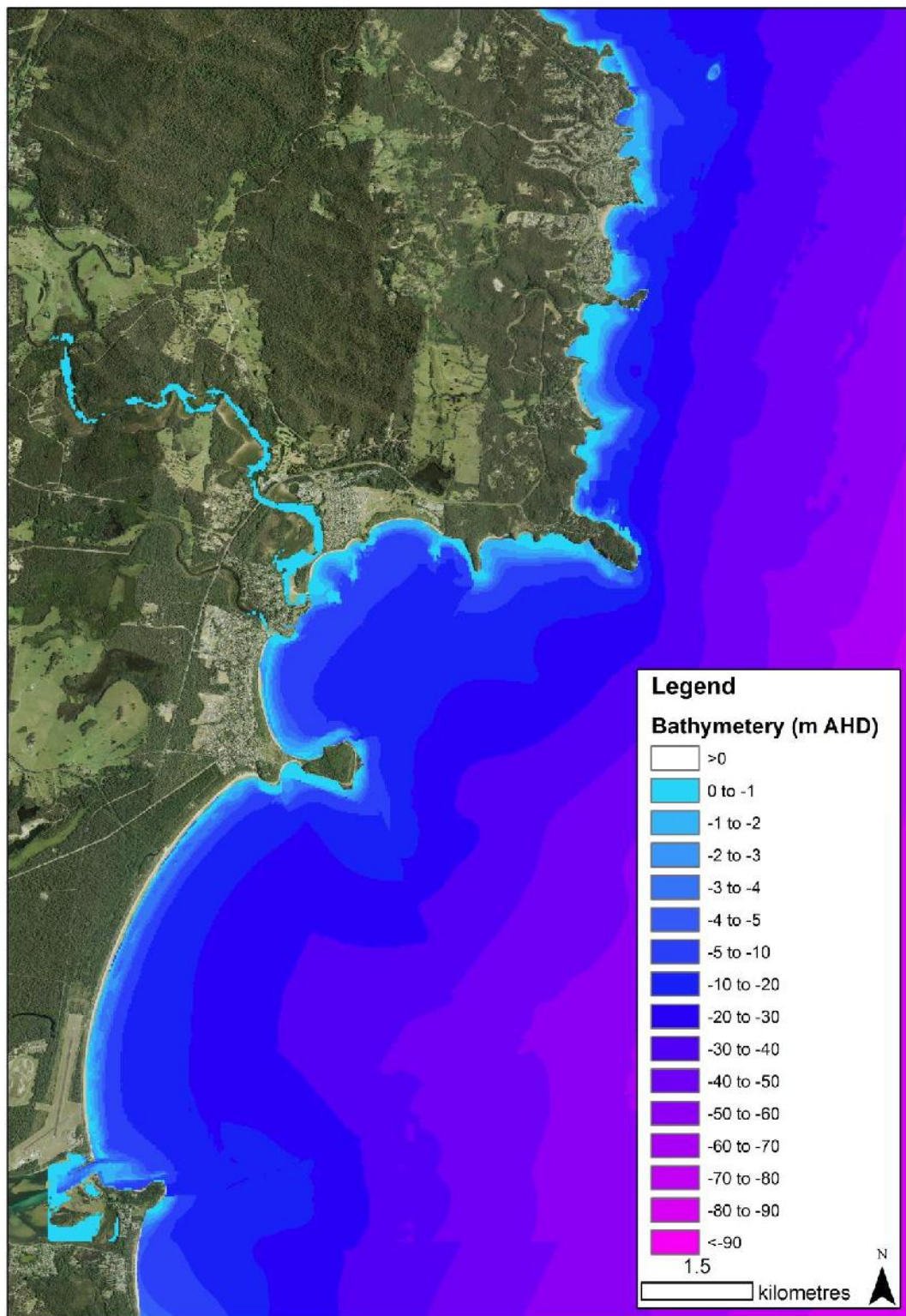**Figure D-2: Eurobodalla Coarse model domain bathymetry**
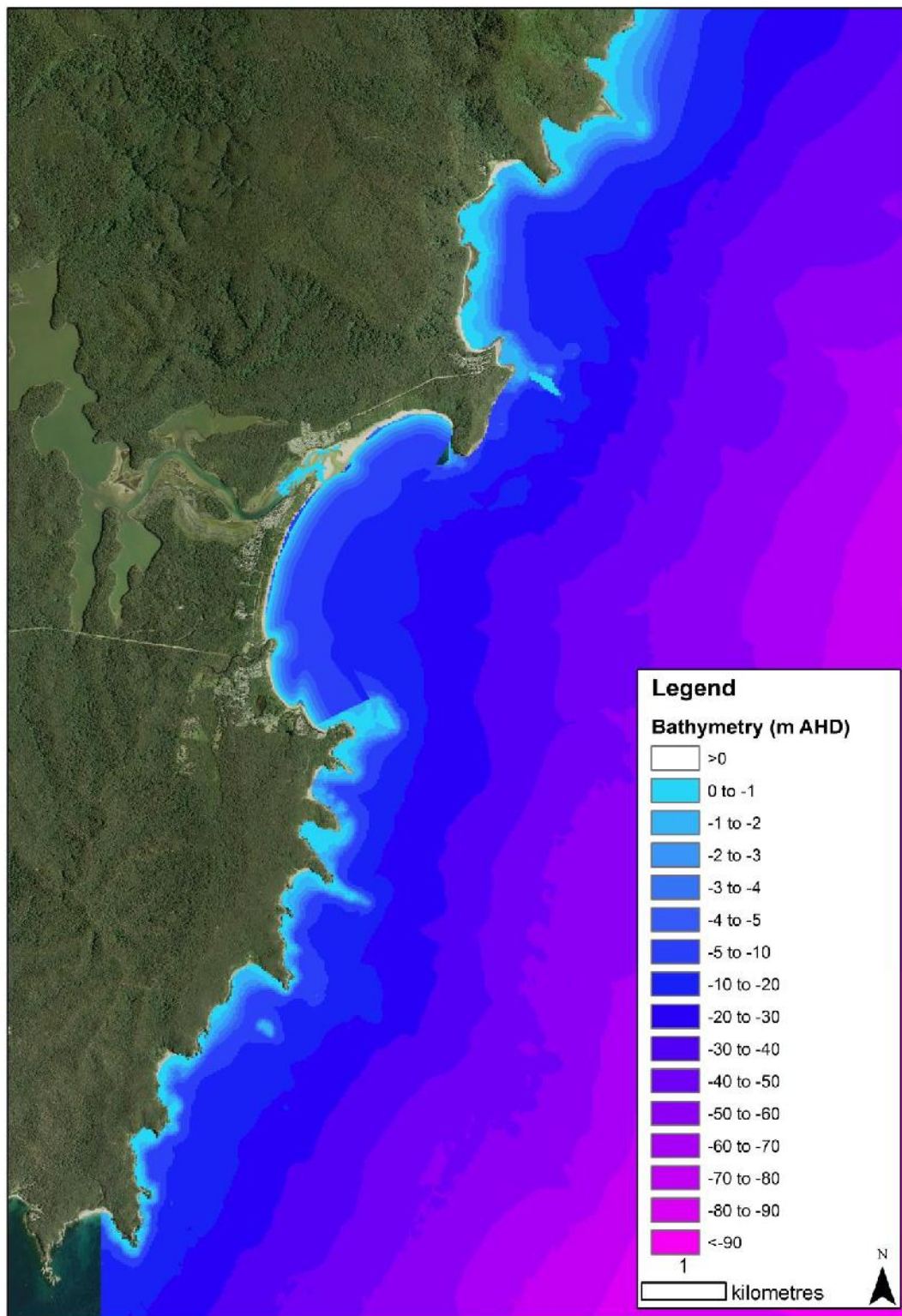
Figure D-3: Durras model domain bathymetry
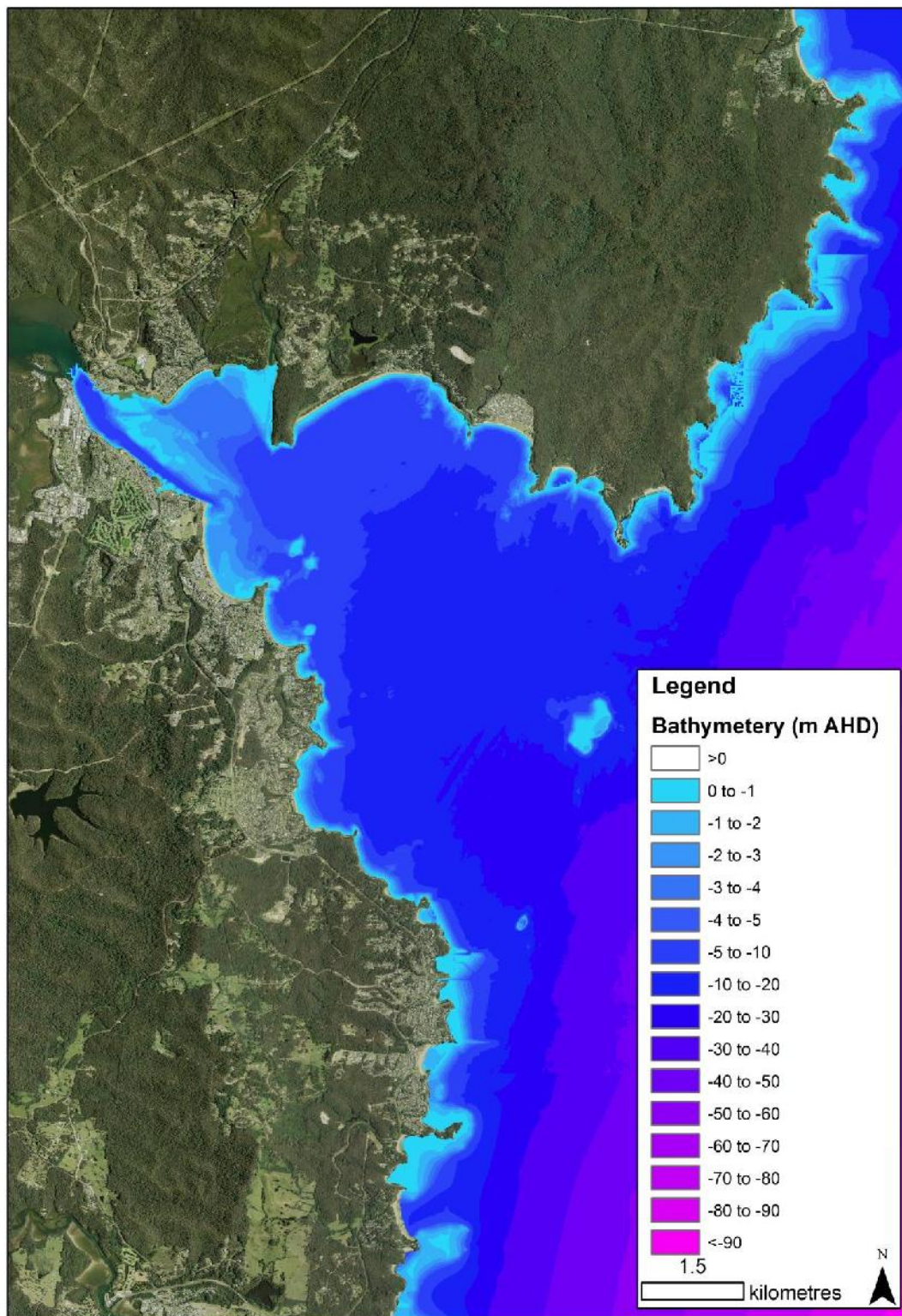
Figure D-4: Batemans Bay model domain bathymetry

Figure D-5: Moruya model domain bathymetry

D.3.3 Output Locations

For each model simulation, spatial maps of wave height, period and direction have been generated for the four (4) model domains. More detailed information including significant wave height, mean and peak period and direction and depth have also been provided for 33 locations within the study area. These locations are shown in Figure D-6, Figure D-7 and Figure D-8.

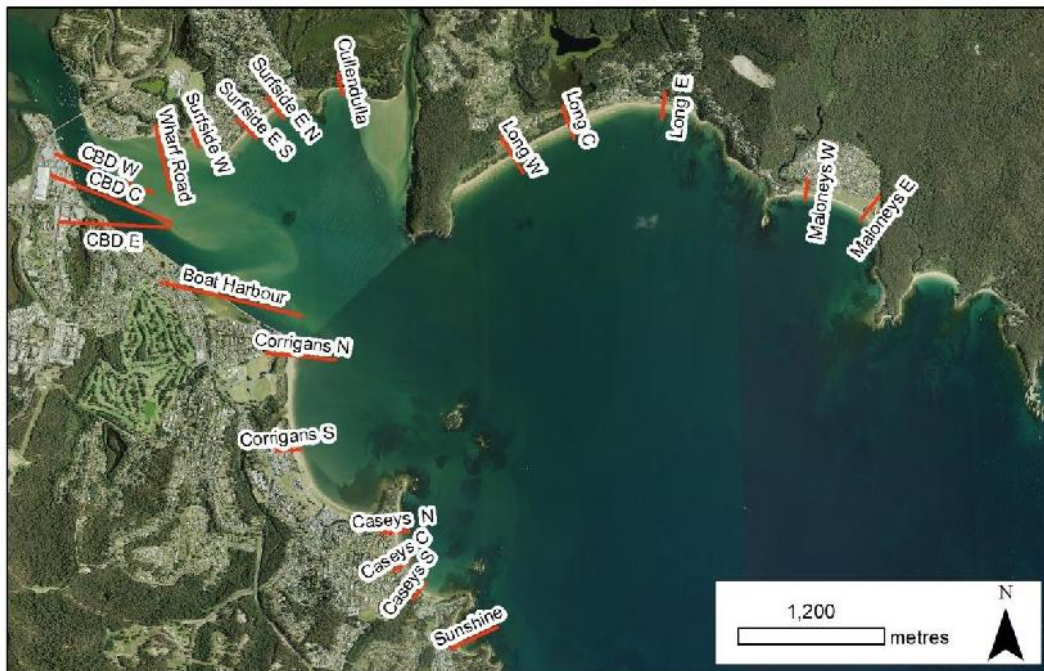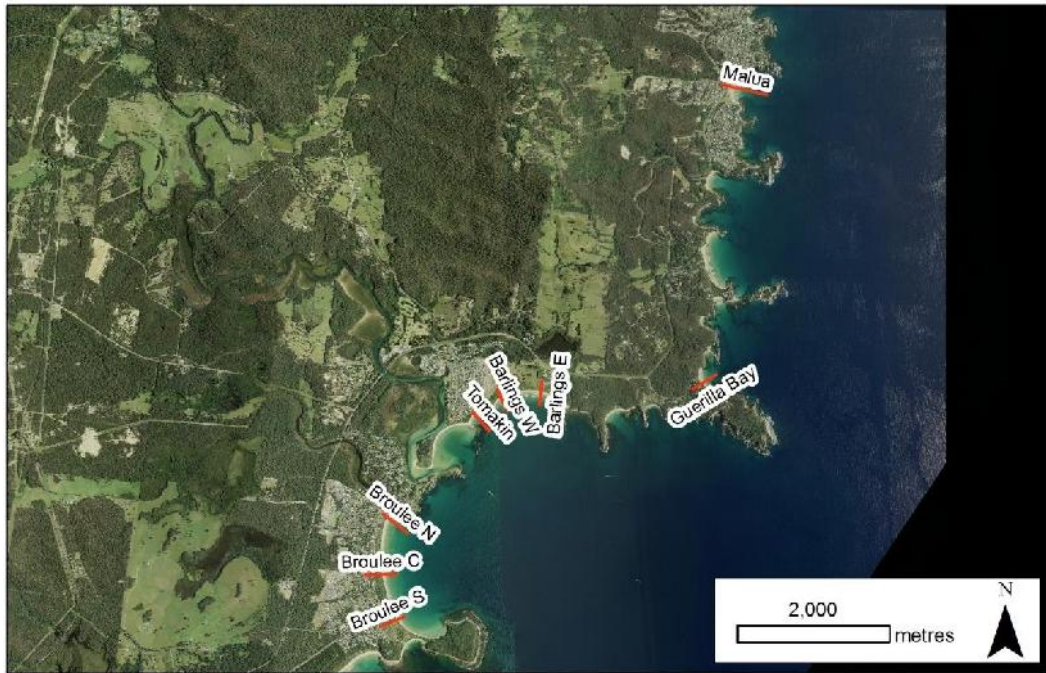**Figure D-6: Output locations for the Durras region**

Figure D-7: Output locations for the Batemans Bay region

Figure D-8: Output locations for the Moruya region

Rather than specify a single point offshore of a coastal location, information was extracted along transect lines from pre-breaking to the shoreline. This is due to the significant amount of wave transformation which occurs immediately prior to breaking. When an arbitrary output point is specified, the location may be well offshore of the surf zone and will not include final, nearshore transformation or may be inside the surf zone where some loss of spectral wave height through offshore breaking of larger waves has already occurred. By extracting information along a transect, wave conditions at the outer edge of the surf zone may be extracted using the wave breaking fraction. The outer edge of the surf zone is assumed to occur when the wave breaking fraction reaches 1% and wave conditions were extracted and output for that location.

D.4 SWAN Wave Simulations

D.4.1   Wave Parameters

SWAN modelling was undertaken using the model parameters and coefficients shown in Table D-3. Sensitivity tests were undertaken on some coefficients, however some were determined based on WRL's past wave modelling experience.

Table D-3: SWAN Modelling Setup and Parameters

Model Physics	
Physics mode (generation)	3rd
Wave growth formulation	Komen et al. (1984)
Triad wave-wave interaction	On
Nonlinear quadruplet wave interaction	On
Whitecapping	On
Wave breaking model	Battjes and Janssen (1978)
A	1
H_{max}/d (γ)	0.73
Bottom friction (JONSWAP)	0.067 (default)
Model Numerics	
Model Run Mode	Stationary, Two dimensional
Iterations	15
Spectral Parameters	
Spectral Shape at Boundary	JONSWAP
Peak Enhancement Factor	3.3 (default)
Period	Peak
Standard Deviation of Directional Spreading	30 º
Diffraction	Off (recommended)
Directional Space Parameters	
Directional Range	360 º
Directional Resolution	10 º
Frequency Space Parameters	
No. Frequency Bins	32
Min. Frequency	0.05
Max. Frequency	1

D.4.2   Scenarios

Main model scenarios corresponding to 1, 20 and 100 year ARI events (1 hour duration) from directions between north-east and south have been simulated. Event directions have been undertaken at 22.5° increments. The wave height and direction at the model boundaries of the coarse grid were manually adjusted to ensure that the target wave conditions were reproduced at the Batemans Bay wave buoy location. A summary of main scenarios is presented within Table D-4. Table D-4 also shows the median wave conditions at each beach (based on the following wave conditions at the Batemans Bay wave buoy: H_S = 1.30 m, T_P = 9.5 s, SE direction – see Shand et al. 2010 and Coghlan, 2010), which are provided for comparison.

Table D-4: SWAN Main Model Scenarios and Environmental Forcing Factors (1 hour duration)

Scenario	ARI	Water Level (m AHD)	Conditions at Batemans Bay Offshore Wave Buoy			Domain Wind Conditions	
			Hs (m)	Tp (s)	Dp (°)	V (m/s)	Dir (°)
NE	1	0.51	3	11.6	45	16.3	45
	20	1.37	5	12.8		20.1	
	100	1.43	6.2	13.4		22.2	
ENE	1	0.51	3	11.6	67.5	16.3	67.5
	20	1.37	5	12.8		20.1	
	100	1.43	6.2	13.4		22.2	
E	1	0.51	3.7	11.6	90	16.3	90
	20	1.37	6.1	12.8		20.1	
	100	1.43	7.3	13.4		22.2	
ESE	1	0.51	4.9	11.6	112.5	19.3	112.5
	20	1.37	6.8	12.8		23.8	
	100	1.43	7.7	13.4		26.4	
SE	1	0.51	4.9	11.6	135	19.3	135
	20	1.37	6.8	12.8		23.8	
	100	1.43	7.7	13.4		26.4	
SSE	1	0.51	4.9	11.6	157.5	19.3	157.5
	20	1.37	6.8	12.8		23.8	
	100	1.43	7.7	13.4		26.4	
S	1	0.51	3.7	11.6	180	18.3	180
	20	1.37	6.1	12.8		22.6	
	100	1.43	7.3	13.4		25.0	
SE	median	0.00	1.3	9.5	135	-	-

Additional wave model scenarios were run, but the environmental conditions and resulting wave heights are not presented in this report for brevity. Scenarios include:

- The 100 year ARI wave conditions with a duration of 3 hours, 6 hours, 12 hours, 24 hours, 48 hours, 96 hours and 144 hours (for SBEACH erosion modelling and Durras Lake tailwater conditions);
- The 20 year ARI wave conditions with a duration of 3 hours, 6 hours, 12 hours, 24 hours, 48 hours, 96 hours and 144 hours (for Durras Lake tailwater conditions);
- The 1 year ARI wave conditions with a duration of 3 hours, 6 hours, 12 hours, 24 hour and 48 hours (for Durras Lake tailwater conditions);
- The wave height exceeded for 12 hours per year (0.137% exceedance) for Hallermeier (1983) outer depth of closure calculations; and
- The 10% exceedance wave height (for SBEACH erosion modelling and Durras Lake tailwater conditions).

While the 20 and 100 year ARI events wave conditions have been combined with the 20 and 100 year ARI events for water level conditions (tide plus anomaly), respectively, 1 year ARI wave conditions have been combined with the Mean High Water (MHW) level (0.51 m AHD) as previously agreed with OEH. This wave and water level combination is considered more

representative of that which would result in 1 year ARI coastal inundation rather than assuming complete dependence of the variables (i.e. 1 year ARI waves and 1 year ARI water level).

D.4.3   Diffraction at Cullendulla

The dominant dissipative processes behind Square Head at Cullendulla are diffraction and refraction. Therefore, at this location, desktop methods were preferred to using the SWAN wave model whose diffraction approximation does not properly handle diffraction into bays around large headlands (Delft University of Technology, 2016).

To estimate the diffracted wave height at Cullendulla, the irregular wave diffraction diagram for waves passing through a structure gap with B/L = 2.0 (ratio of entrance width to local wavelength) and S_{MAX} = 75 (directional spreading function; value appropriate for swell waves) published by Goda (2000) was overlain on the study area as shown in Figure D-9. A diffraction factor of 0.35 was used for design.


Figure D-9: Irregular Wave Diffraction Coefficients at Cullendulla

D.5 Results

Examples of SWAN output for each model grid for the 100 year ARI event from the east-south-east (ESE) are shown in Figure D-10, Figure D-11, Figure D-12 and Figure D-13.

For each output location (coordinates in MGA Zone 56), wave conditions for each direction scenario were evaluated and maximum conditions (at outer breakpoint) are summarised in Table D-5.   The median wave statistics originating from a south easterly (SE) direction are also included for comparison. Output locations are shown in Figure D-14 to Figure D-23.

Note that the bed elevations referred to in Table D-5 are for present day (2017) conditions only. No changes were made to the bathymetry grids to represent possible future changes to the seabed due to projected sea level rise.
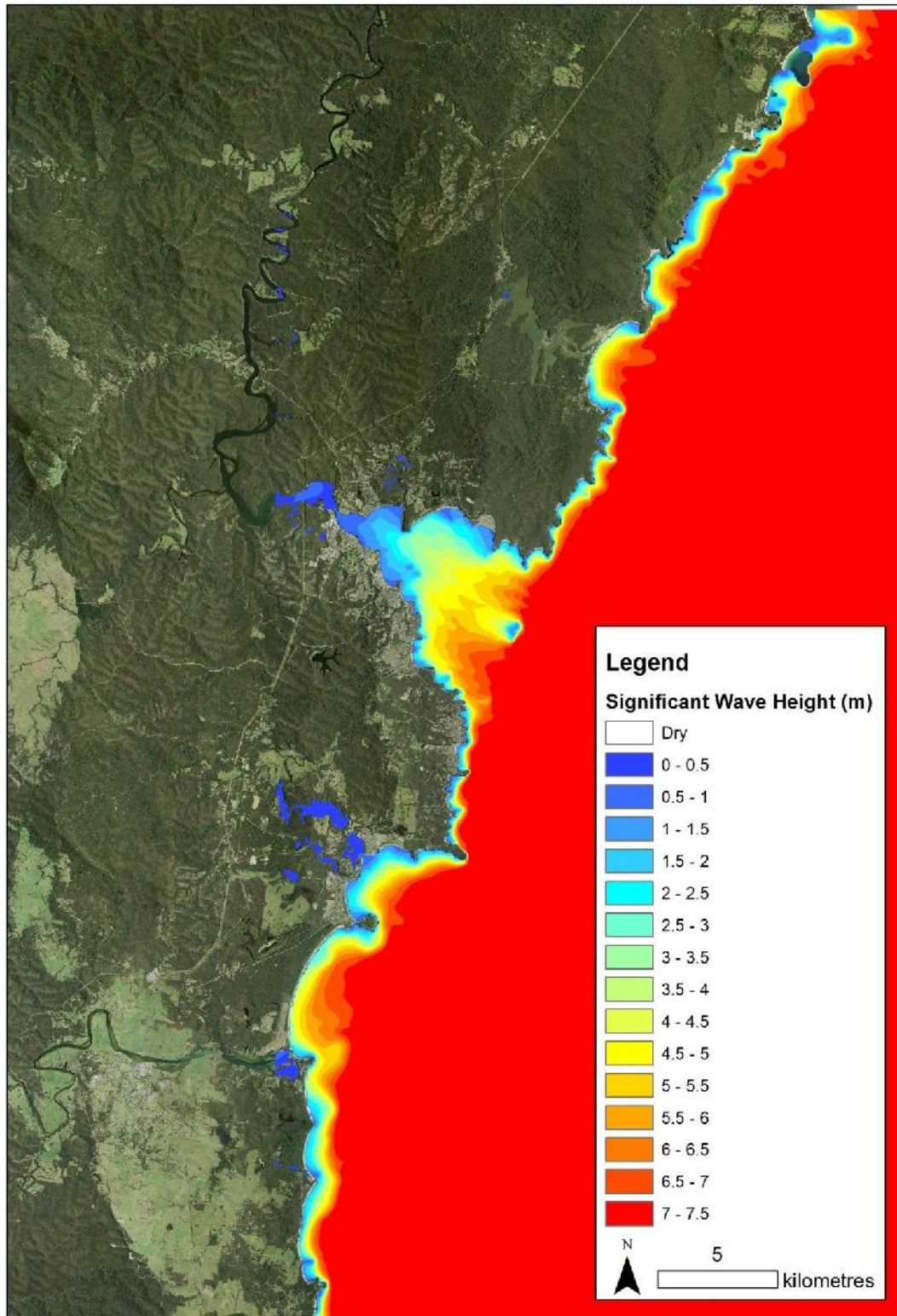
Figure D-10: Example of 100 year ARI east south-east event for the Eurobodalla Coarse model domain
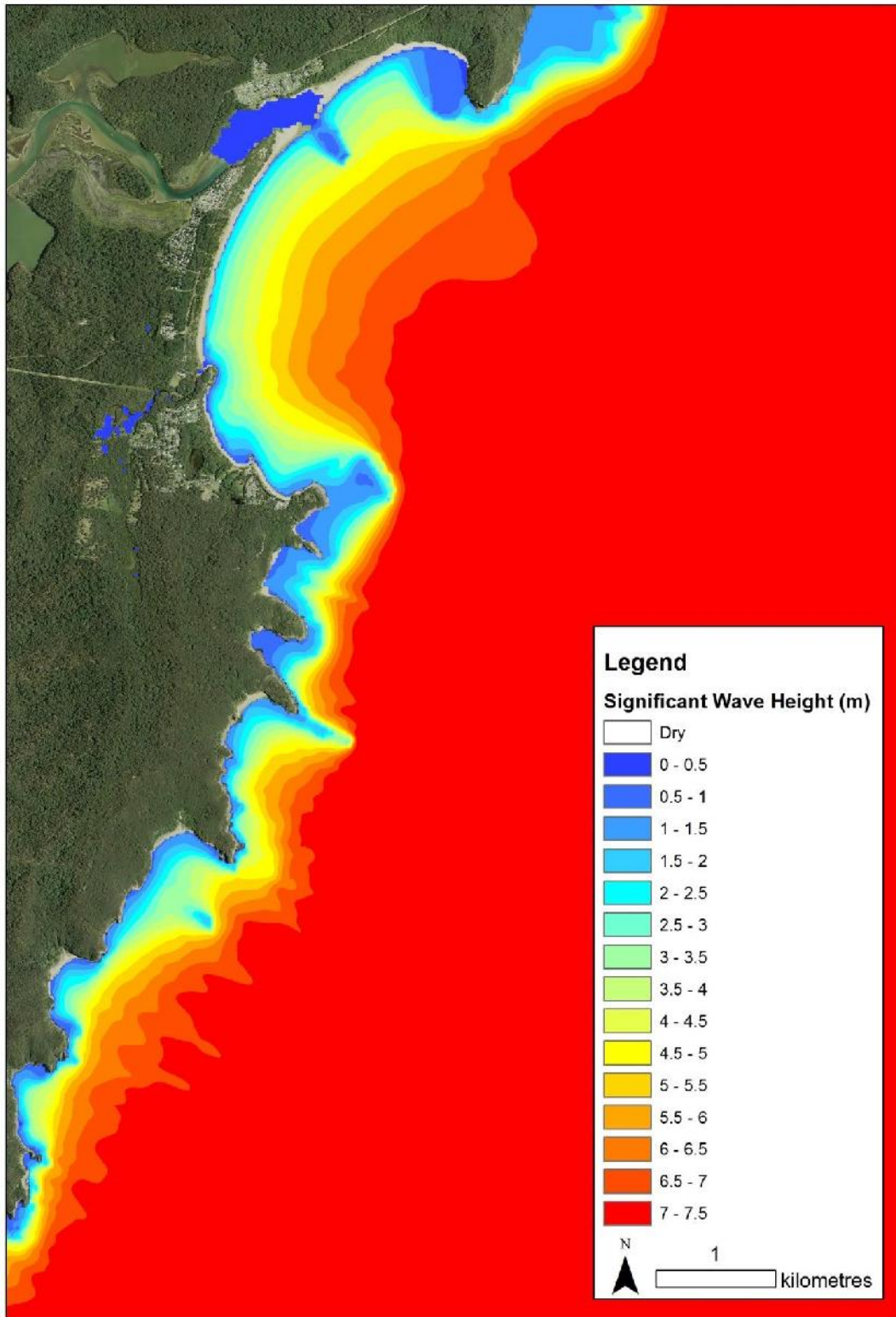
Figure D-11: Example of 100 year ARI east south-east event for the Durras model domain
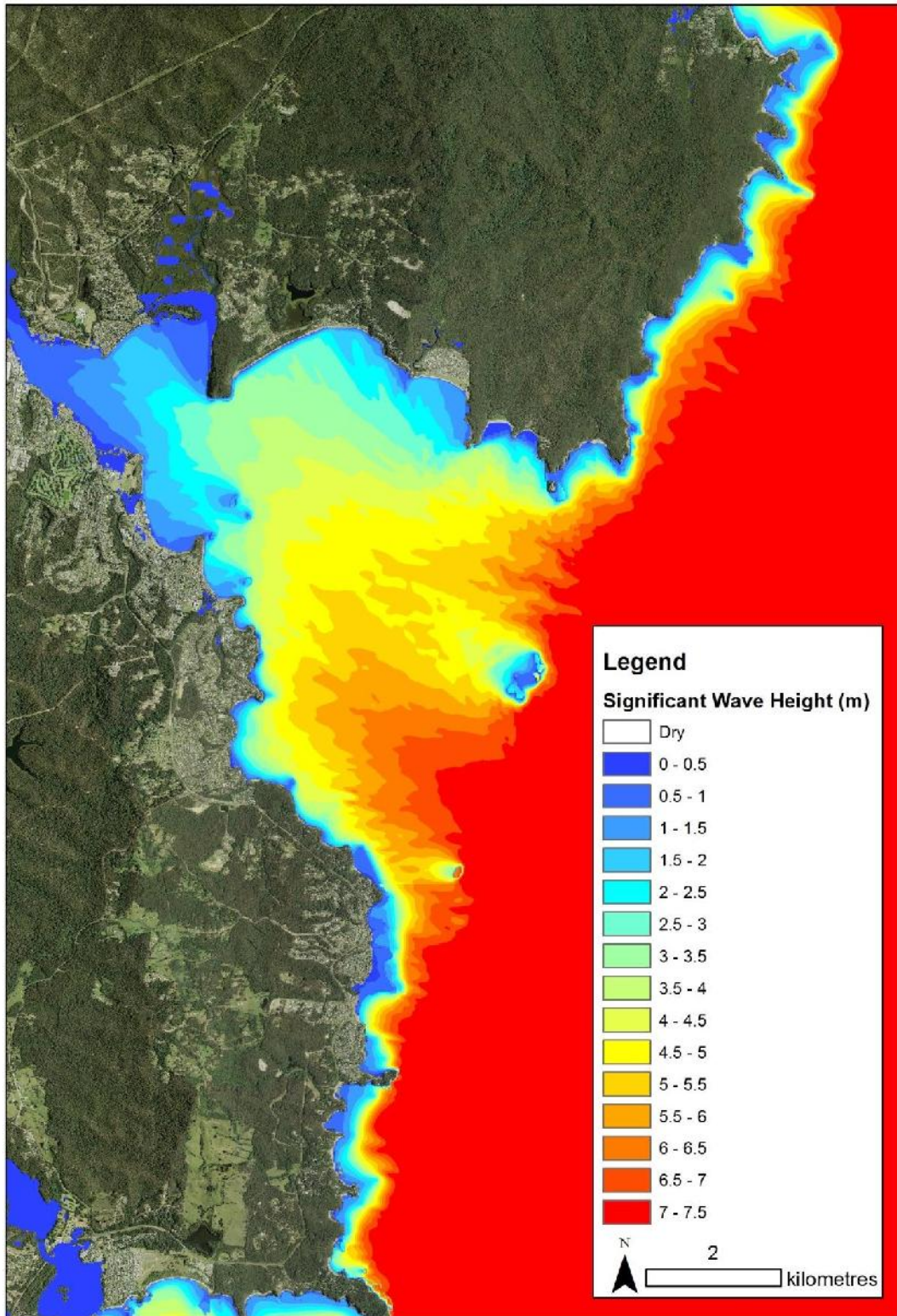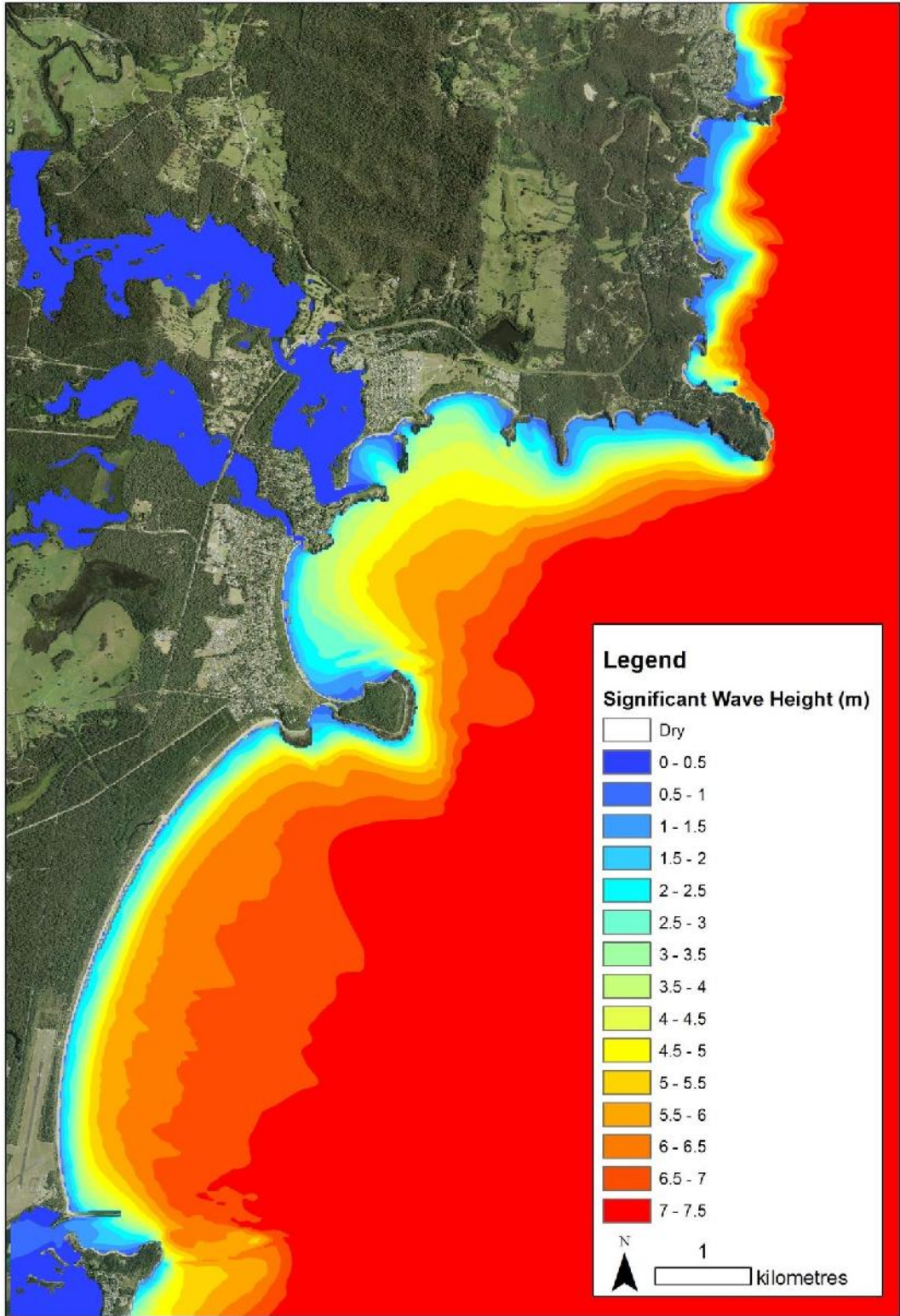
Figure D-12: Example of 100 year ARI east south-east event for the Batemans Bay model domain

Figure D-13: Example of 100 year ARI east south-east event for the Moruya model domain

Table D-5: Maximum Wave Conditions at the Outer Breakpoint of the Surf Zone

Beach	Profile	ARI (year)	Easting (m)	Northing (m)	Bed Elevation (m AHD)	Offshore Wave Direction (°)	Hs (m)	Tp (s)	Peak Direction (°)
Durras	North	Median	255806	6052180	-3.3	SE	1.1	9.2	125
		1	255962	6052102	-6.0	SE	3.4	11.2	125
		20	256051	6052057	-7.4	SE	4.2	12.3	125
		100	256095	6052034	-8.0	SSE	4.5	13.6	135
	Central	Median	255447	6051552	-3.1	SE	1.0	9.2	115
		1	255617	6051510	-5.8	ESE	3.4	11.2	115
		20	255762	6051474	-7.7	ESE	4.4	12.3	115
		100	255811	6051461	-8.4	ESE	4.7	13.6	115
	South	Median	255260	6050876	-2.3	SE	0.8	9.2	95
		1	255410	6050874	-5.2	ESE	3.0	11.2	95
		20	255708	6050872	-8.3	ESE	4.6	12.3	95
		100	255758	6050871	-8.9	ESE	5.0	13.6	95
Cookies	-	Median	255364	6050132	-2.8	SE	0.7	9.2	75
		1	255723	6050238	-5.9	ESE	3.4	11.2	85
		20	255818	6050266	-7.8	ESE	4.4	12.3	95
		100	255866	6050280	-8.6	E	4.8	13.6	95
Maloneys	East	Median	251181	6044556	-2.9	SE	0.4	9.2	215
		1	251196	6044576	-1.4	SSE	1.1	12.3	215
		20	251196	6044576	-1.4	S	1.3	13.6	215
		100	251181	6044556	-2.9	S	1.5	13.6	205
	West	Median	250736	6044748	-1.6	SE	0.5	9.2	185
		1	250733	6044724	-2.8	SSE	1.5	11.2	175
		20	250733	6044724	-2.8	SSE	1.8	12.3	185
		100	250733	6044724	-2.8	S	1.9	13.6	185

Table D-5: Maximum Wave Conditions at the Outer Breakpoint of the Surf Zone (cont...)

Beach	Profile	ARI (year)	Easting (m)	Northing (m)	Bed Elevation (m AHD)	Offshore Wave Direction (°)	Hs (m)	Tp (s)	Peak Direction (°)
Long	East	Median	249569	6045434	-1.8	SE	0.4	9.2	175
		1	249566	6045410	-2.5	SSE	1.6	11.2	175
		20	249563	6045386	-3.2	SSE	1.9	12.3	175
		100	249563	6045386	-3.2	SSE	2.0	13.6	175
	Central	Median	249315	6045432	-3.1	SE	0.4	9.2	165
		1	249315	6045432	-3.1	SSE	1.8	11.2	165
		20	249318	6045408	-4.4	SSE	2.3	12.3	165
		100	249318	6045408	-4.4	SSE	2.4	13.6	165
	West	Median	248403	6045008	-2.9	SE	0.7	9.2	145
		1	248429	6044966	-5.0	SSE	2.6	11.2	155
		20	248442	6044944	-6.0	SSE	3.0	12.3	155
		100	248442	6044944	-6.0	SSE	3.1	13.6	155
Cullendulla	-	Median	246963*	6045588*	-1.0	SE	0.2	9.2	185
		1	246963*	6045588*	-1.0	SSE	0.8	11.2	175
		20	246963*	6045588*	-1.0	SSE	0.9	12.3	175
		100	246963*	6045588*	-1.0	SSE	0.9	13.6	175
Surfside E	North	Median	246480	6045396	-2.3	SE	0.3	9.2	145
		1	246465	6045416	-1.5	SSE	1.2	11.2	145
		20	246465	6045416	-1.5	SSE	1.4	12.3	145
		100	246480	6045396	-2.3	SSE	1.5	13.6	145
	South	Median	246246	6045242	-1.7	SE	0.4	9.2	135
		1	246246	6045242	-1.7	SE	1.4	11.2	135
		20	246263	6045224	-2.3	SSE	1.6	12.3	135
		100	246263	6045224	-2.3	SE	1.6	13.6	135
Surfside W	-	Median	245793	6045159	-1.1	SE	0.2	9.2	145
		1	245793	6045159	0.1	SE	0.6	11.2	155
		20	245793	6045159	0.1	SSE	0.7	12.3	155
		100	245793	6045159	0.1	SSE	0.7	13.6	155

*Approximate location only, determined using a diffraction factor of 0.35

Table D-5: Maximum Wave Conditions at the Outer Breakpoint of the Surf Zone (cont...)

| Beach	Profile	ARI (year)	Easting (m)	Northing (m)	Bed Elevation (m AHD)	Offshore Wave Direction (°)	Hs (m)	Tp (s)	Peak Direction (°)
Wharf Rd	-	Median	245555	6044795	-0.8	SE	0.2	2.4	105
		1	245555	6044795	-0.6	ESE	0.9	11.2	105
		20	245555	6044795	-0.6	ESE	1.0	12.3	105
		100	245555	6044795	-0.6	ESE	1.1	13.6	105
CBD	West	Median	245419	6044788	-0.3	SE	0.1	1.2	105
		1	245419	6044788	-0.3	SE	0.8	11.2	105
		20	245419	6044788	-0.3	ESE	0.9	12.3	105
		100	245419	6044788	-0.3	ESE	0.9	13.6	105
	Central	Median	245567	6044546	-0.5	SE	0.4	9.2	85
		1	245567	6044546	-0.5	ESE	0.9	11.2	85
		20	245567	6044546	-0.5	ESE	1.0	12.3	85
		100	245567	6044546	-0.5	ESE	1.0	13.6	85
	East	Median	245567	6044546	-0.5	SE	0.4	9.2	85
		1	245567	6044546	-0.5	ESE	0.9	11.2	85
		20	245567	6044546	-0.5	ESE	1.0	12.3	85
		100	245567	6044546	-0.5	ESE	1.0	13.6	85
Boat Harbour	-	Median	246636	6043788	-2.0	SE	0.6	9.2	95
		1	246636	6043788	-2.0	ESE	1.5	11.2	105
		20	246636	6043788	-2.0	ESE	1.7	12.3	105
		100	246636	6043788	-2.0	ESE	1.7	13.6	105
Corrigans	North	Median	246598	6043462	-2.3	SE	0.5	9.2	85
		1	246598	6043462	-2.3	ESE	1.4	11.2	85
		20	246918	6043432	-2.8	ESE	2.0	12.3	95
		100	246918	6043432	-2.8	ESE	2.0	13.6	95
	South	Median	246629	6042705	-1.9	SE	0.4	4.7	75
		1	246629	6042705	-1.9	ESE	1.1	11.2	85
		20	246629	6042705	-1.9	ESE	1.2	12.3	85
		100	246629	6042705	-1.9	ESE	1.3	13.6	85

Table D-5: Maximum Wave Conditions at the Outer Breakpoint of the Surf Zone (cont…)

Beach	Profile	ARI (year)	Easting (m)	Northing (m)	Bed Elevation (m AHD)	Offshore Wave Direction (°)	Hs (m)	Tp (s)	Peak Direction (°)
Caseys	North	Median	247457	6042028	-1.8	SE	0.5	9.2	95
		1	247481	6042030	-2.9	ESE	1.8	12.3	95
		20	247481	6042030	-2.9	ESE	2.0	12.3	95
		100	247506	6042032	-3.6	ENE	2.2	13.6	95
	Central	Median	247507	6041785	-1.9	SE	0.4	9.2	75
		1	247507	6041785	-1.9	ESE	1.4	12.3	75
		20	247527	6041798	-2.7	E	1.7	13.6	75
		100	247527	6041798	-2.7	ENE	1.8	13.6	75
	South	Median	247642	6041622	-1.8	SE	0.4	9.2	35
		1	247627	6041602	-1.3	ESE	1.2	11.2	55
		20	247642	6041622	-1.8	E	1.4	12.3	55
		100	247642	6041622	-1.8	NE	1.5	13.6	45
Sunshine	-	Median	247963	6041129	-1.4	SE	0.4	4.7	55
		1	248167	6041224	-5.9	ESE	3.1	11.2	115
		20	248234	6041254	-7.0	ESE	3.9	12.3	115
		100	248234	6041254	-7.0	ESE	4.0	13.6	115
Malua	-	Median	249857	6035412	-2.9	SE	1.1	9.2	115
		1	249977	6035384	-6.9	ESE	3.7	11.2	115
		20	250122	6035351	-10.7	ESE	5.5	12.3	115
		100	250194	6035334	-12.0	ESE	6.4	13.6	115
Guerilla	-	Median	249374	6031600	-2.6	SE	0.5	9.2	65
		1	249415	6031626	-4.2	ESE	2.5	11.2	75
		20	249498	6031678	-7.5	ESE	4.0	12.3	85
		100	249498	6031678	-7.5	E	4.3	13.6	75

Table D-5: Maximum Wave Conditions at the Outer Breakpoint of the Surf Zone (cont...)

Beach	Profile	ARI (year)	Easting (m)	Northing (m)	Bed Elevation (m AHD)	Offshore Wave Direction (°)	Hs (m)	Tp (s)	Peak Direction (°)
Barlings	East	Median	247172	6031325	-2.2	SE	0.6	9.2	185
		1	247170	6031300	-3.1	SSE	2.0	11.2	175
		20	247168	6031275	-3.9	S	2.5	12.3	165
		100	247165	6031250	-4.4	S	2.8	13.6	165
	West	Median	246731	6031218	-3.8	SE	1.0	9.2	145
		1	246754	6031174	-5.4	SSE	3.2	11.2	145
		20	246765	6031152	-6	SSE	3.4	12.3	155
		100	246765	6031152	-6	S	3.5	13.6	155
Tomakin	-	Median	246403	6031042	-2.0	SE	0.6	9.2	135
		1	246502	6030930	-6.3	SE	3.2	11.2	145
		20	246519	6030912	-6.8	ESE	3.6	12.3	145
		100	246519	6030912	-6.8	ESE	3.7	13.6	145
Broulee	North	Median	245306	6029683	-2.5	SE	0.9	9.2	115
		1	245404	6029606	-5.0	ESE	2.9	11.2	115
		20	245443	6029576	-5.7	ESE	3.4	12.3	115
		100	245443	6029576	-5.7	ESE	3.5	13.6	115
	Central	Median	245224	6029049	-1.9	SE	0.5	9.2	85
		1	245273	6029050	-3.2	ESE	1.9	11.2	95
		20	245298	6029050	-3.6	ESE	2.4	12.3	95
		100	245322	6029051	-3.9	E	2.6	13.6	95
	South	Median	245359	6028478	-1.6	SE	0.4	9.2	55
		1	245406	6028496	-2.4	ESE	1.4	11.2	65
		20	245406	6028496	-2.4	ESE	1.7	12.3	65
		100	245406	6028496	-2.4	E	1.8	13.6	65
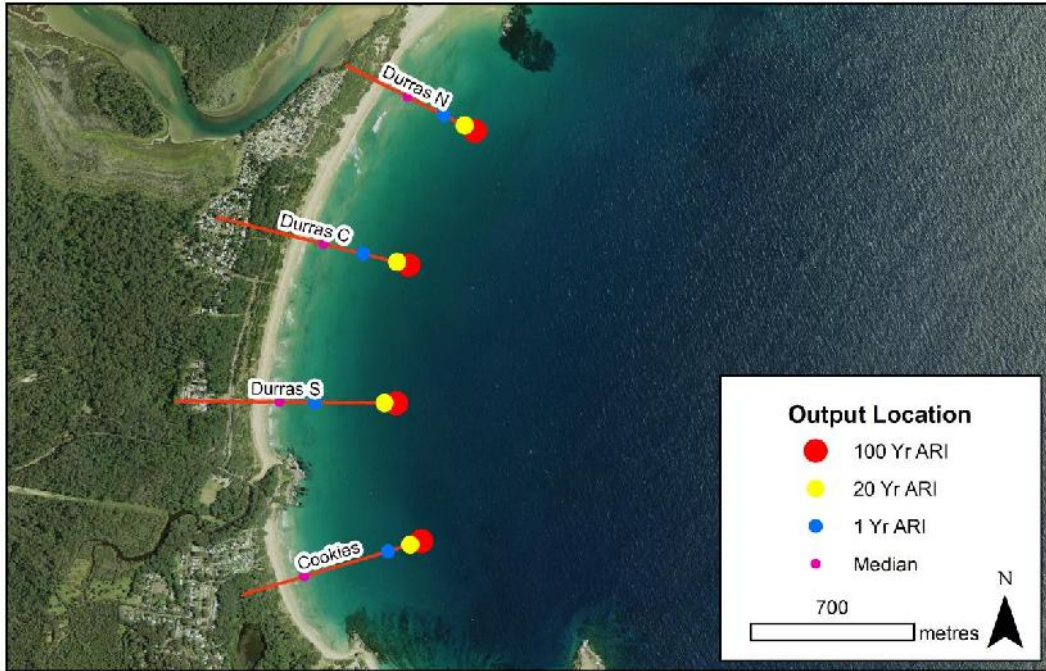
Figure D-14: SWAN Output Locations: Durras Beach and Cookies Beach
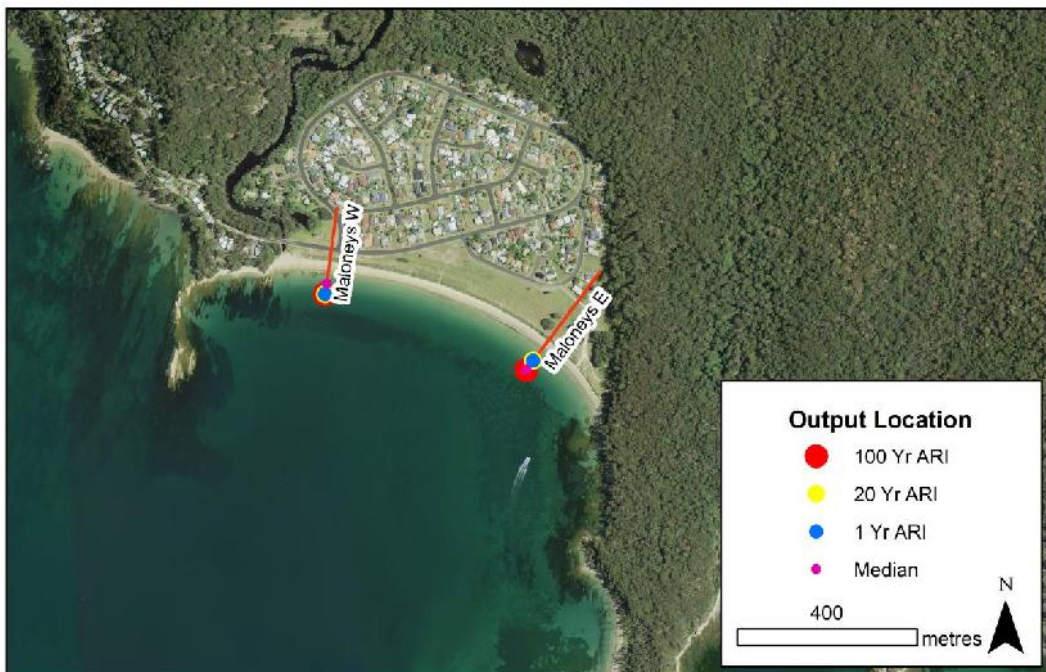
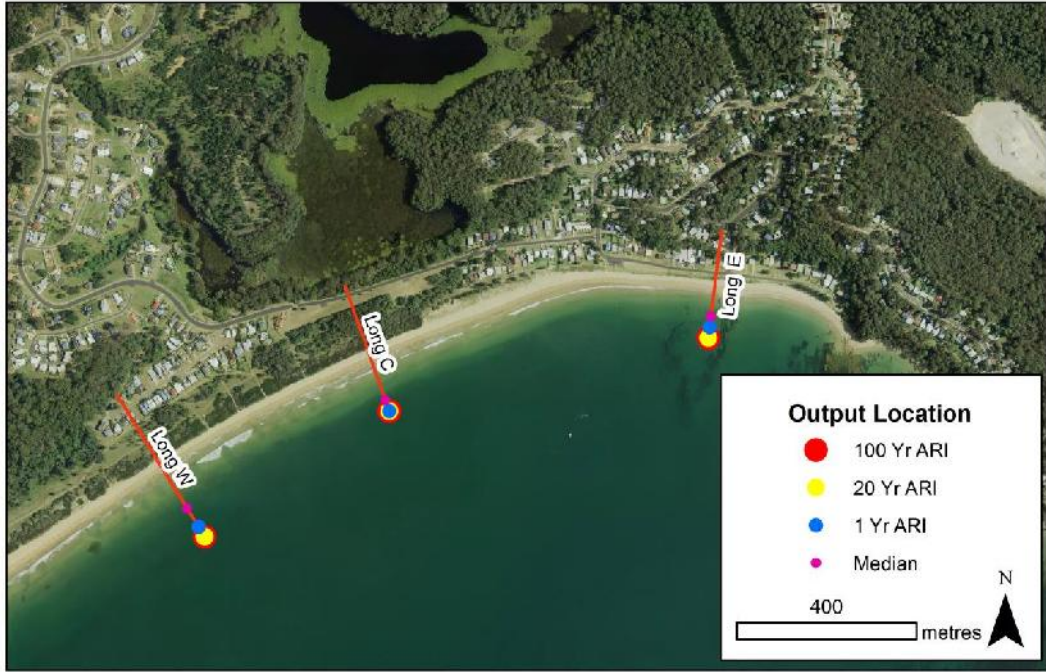**Figure D-15: SWAN Output Locations: Maloneys Beach**

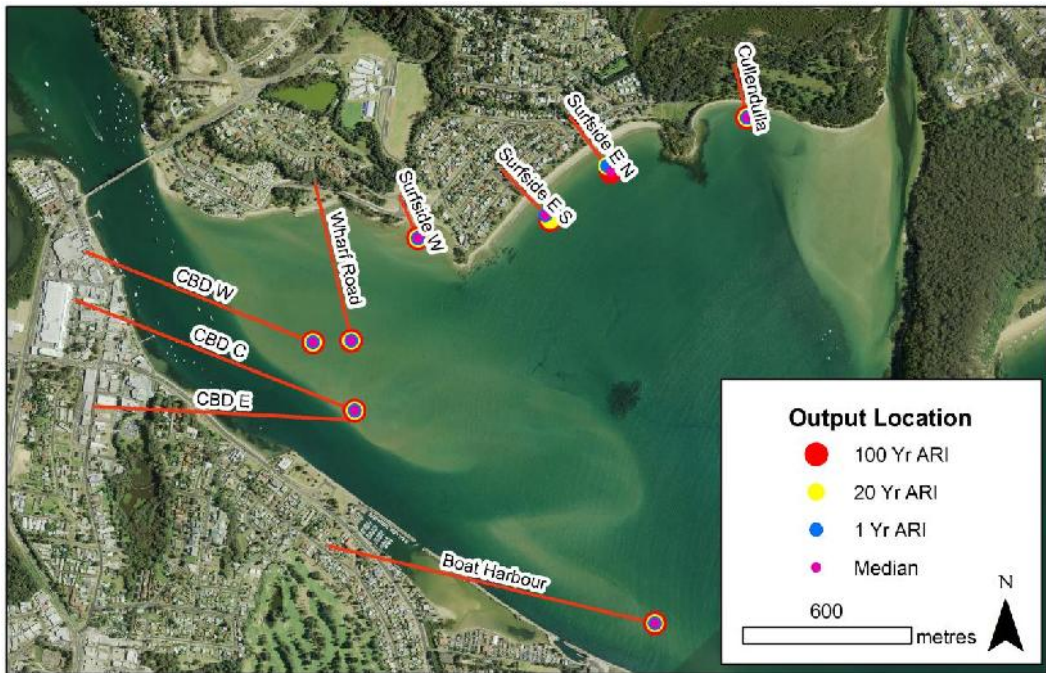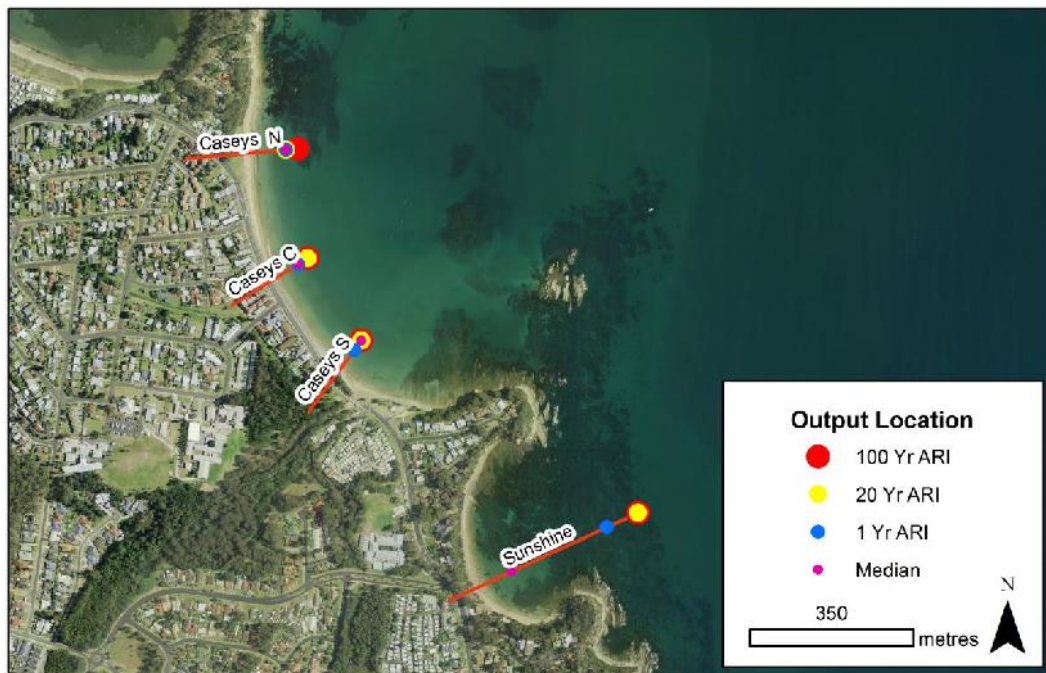**Figure D-16: SWAN Output Locations: Long Beach**

Figure D-17: SWAN Output Locations: Inner Batemans Bay Beaches

Figure D-18: SWAN Output Locations: Corrigans Beach

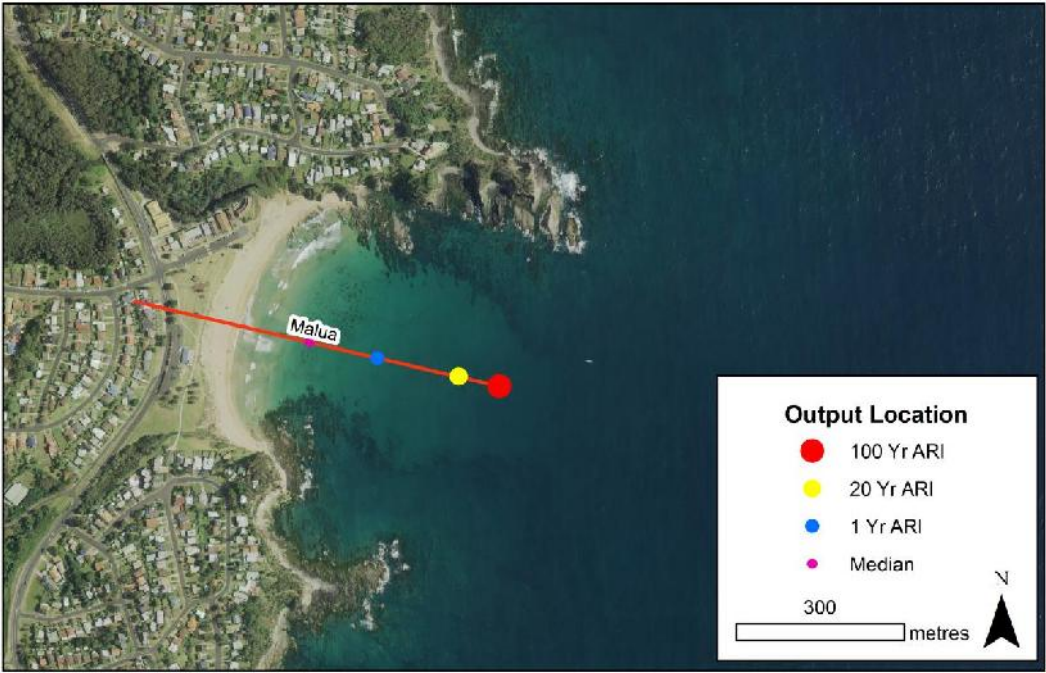**Figure D-19: SWAN Output Locations: Caseys Beach and Sunshine Bay**

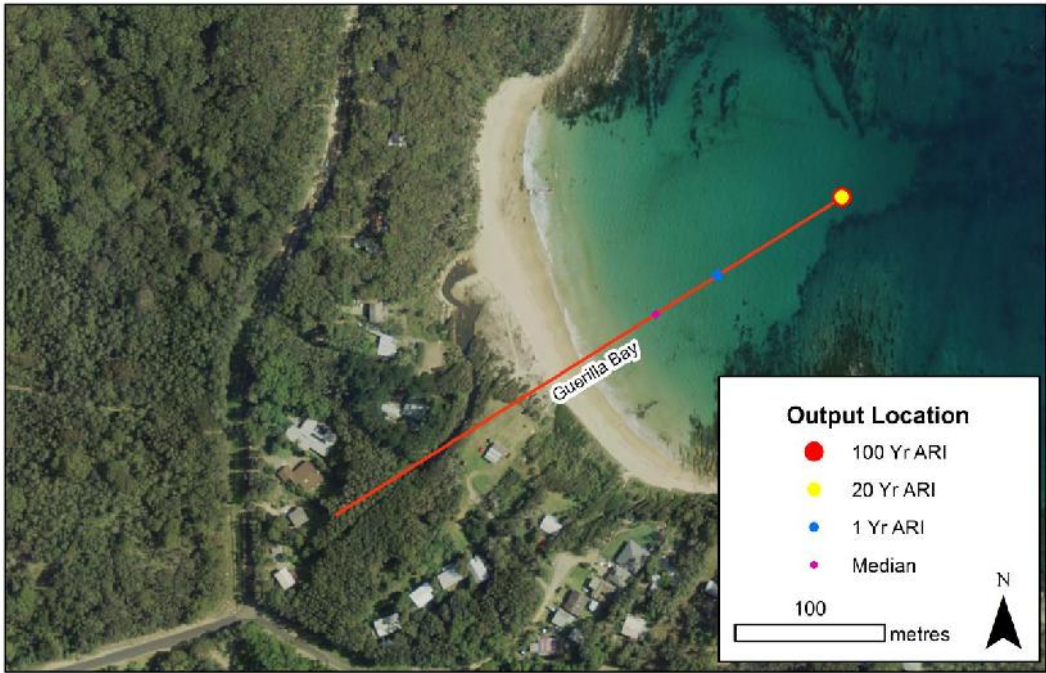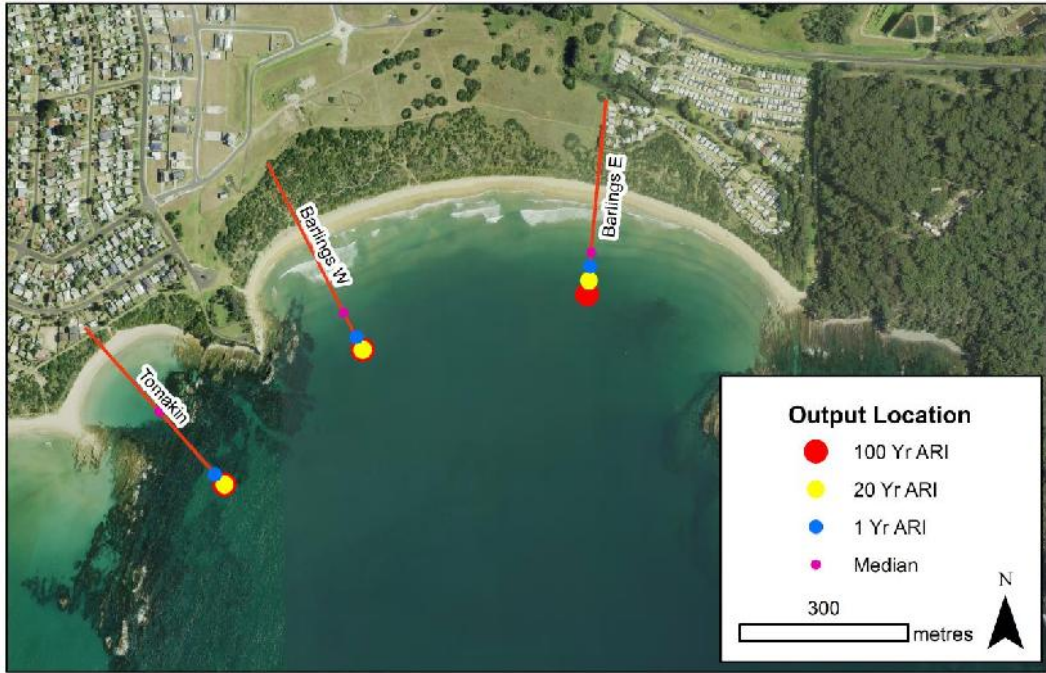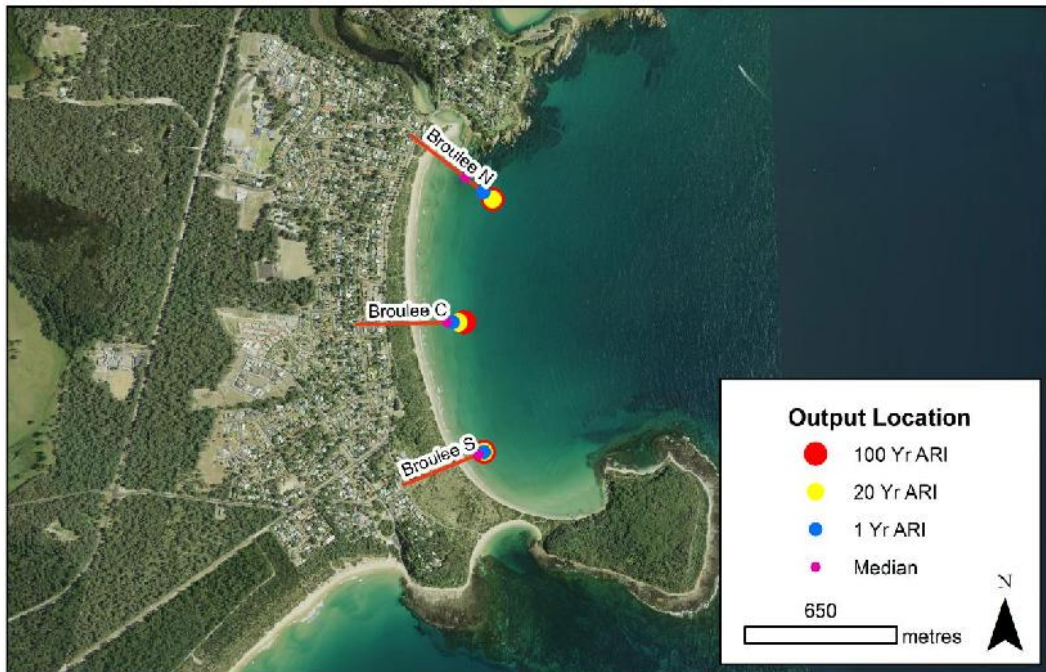**Figure D-20: SWAN Output Locations: Malua Bay**

Figure D-21: SWAN Output Locations: Guerilla Bay

Figure D-22: SWAN Output Locations: Tomakin Cove and Barlings Beach

Figure D-23: SWAN Output Locations: Broulee Beach

D.6 Historical Nearshore Wave Photos

On 4-6 June 2012, a severe storm with offshore significant wave heights of 6 m (typical T_P = 13 s, south-easterly wave direction, maximum water level 1.3 m AHD) had a large impact upon beaches within Batemans Bay. During this event, Mr Lindsay Usher of ESC photographed the nearshore wave conditions on 6 June 2012 at Long Beach (central section, Figure D-24) and Surfside Beach (east) (northern end, Figure D-25). Based on interpolation of existing SWAN results, WRL estimates that the significant wave heights at outer edge of the surf zone of these beaches at the peak of the storm to be 2.0 m and 1.3 m, respectively. These local wave heights are considered to have an approximate average recurrence interval of 5 years.

Figure D-24: Nearshore Waves at Long Beach, 6 June 2012 (Mr Lindsay Usher)

Figure D-25: Nearshore Waves at Surfside Beach (East), 6 June 2012 (Mr Lindsay Usher)