

BEACH MANAGEMENT PLAN REPORT

Herne Bay

2009

BMP 102 - Annex

July 2010

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Beach Management Plan Site Report 2009 Management Unit (MU) 5C: Herne Bay

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Annex A

Explanatory Notes

1. Summary of method of conducting topographic and hydrographic surveys (based on the Environment Agency's National Specification Sections XII and XIII)

Topographic cross-shore (profile) measurements are made at the intercept of the beach and a hard structure, at all changes of beach slope, at changes in surface sediment and at maximum defined intervals (every 5 metres). Each measurement is feature-coded with the type of surface material. Profiles are 100-500m apart, depending on management status. The seaward limit to be achieved is Mean Low Water Springs or 50 metres from the beach toe.

Topographic spot height (baseline) surveys are carried out annually at Beach Management Plan sites. Profiles are measured at 50m intervals, with the addition of spot heights at the toe of hard structures, the beach surface surrounding structures, all beach ridge crests, all other changes in slope and sediment changes, plus contour lines at a maximum spacing of 5m. All measurements are feature-coded with sediment type. Sufficient data points must be measured to generate a reliable Digital Terrain Model.

Hydrographic surveys are conducted with a single beam echo-sounder, with the position fixing requirement relaxed to DGPS. Soundings are taken along cross-shore profile lines 50m apart and extend 1km offshore. A minimum of 4 shore parallel tie lines are required (including one near the landward and seaward boundaries). The landward limit varies slightly across the region, due to the variation in tidal range, but in general is landward of Mean Sea Level, thus providing overlap with the topographic surveys. Tidal control may be by RTK GPS or by correction from tide gauges which are tied to the survey control network

2. Change in Cross-sectional Area (CSA)

The annual change in cross-sectional area is calculated as the difference in CSA between two surveys, expressed as a percentage change compared to the earlier CSA.

$$\frac{CSA_1 - CSA_2}{CSA_2} * 100 \quad \text{Eqn (1)}$$

where CSA_1 = most recent springtime survey and CSA_2 = spring survey previous year. Therefore an annual change of -14% represents erosion during the last year of 14% of the area of last year's survey.

3. Method of derivation of Digital Ground and difference models

The Digital Ground Model is created by interpolating the points of a topographic baseline survey collected by using RTK GPS system. The interpolation method used to create the SECG DGMs is specified as Triangulation with smoothing and is applied in MapInfo Vertical Mapper to create a 1 metre resolution grid.

Triangulation is a process of grid generation that is usually applied to data that requires no regional averaging, such as elevation readings. The surface created by triangulation passes through all of the original data points while generating some degree of "overshoot" above local high values and "undershoot" below local low values. Elevation is an example of point values that are best "surfaced" with a technique that predicts some degree of over- and under- estimation. In modeling a topographic surface from

scattered elevation readings, it is not reasonable to assume that data points were collected at the absolute top or bottom of each local rise or depression in the land surface.

Triangulation involves a process whereby all the original data points are connected in space by a network of triangular faces, drawn as equilaterally as possible. This network of triangular faces is referred to as a Triangular Irregular Network (TIN). Points are connected based on the nearest neighbour relationship (the Delaunay criterion) which states that a circumcircle drawn around any triangle will not enclose the vertices of any other triangle.

To visualise the resulting grid, the same colour scheme is applied, thus enabling comparison between grids of different geographic origin. The colour bands cover a elevation range between -4 to +12 metres OD with elevations lying between -2 and + 5 metres OD are shown in 0.5 metres intervals, the remaining elevation bands shown in 1 metre intervals.

All difference models are created by using a grid calculator within the GIS system. For example the difference model of two baseline surveys is created by subtracting the earlier baseline grid from the most recent baseline grid:

$$Grid_1 - Grid_2 \quad \text{Eqn (2)}$$

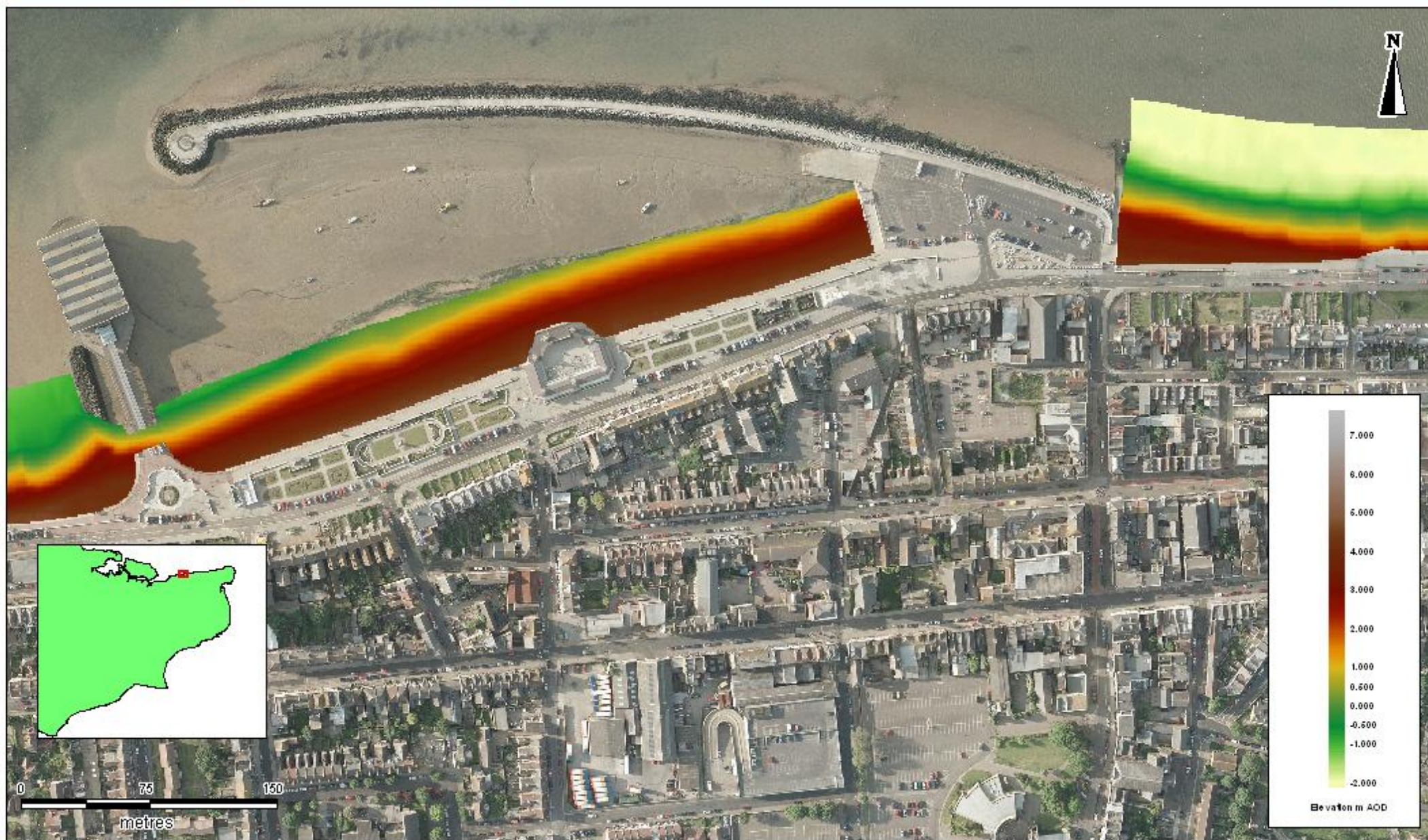
where $Grid_1$ = most recent baseline grid and $Grid_2$ = previous baseline grid. Therefore an annual change of $-14m^2$ represents erosion during the last year of $14m^2$, whilst positive values represent accretion over the period.

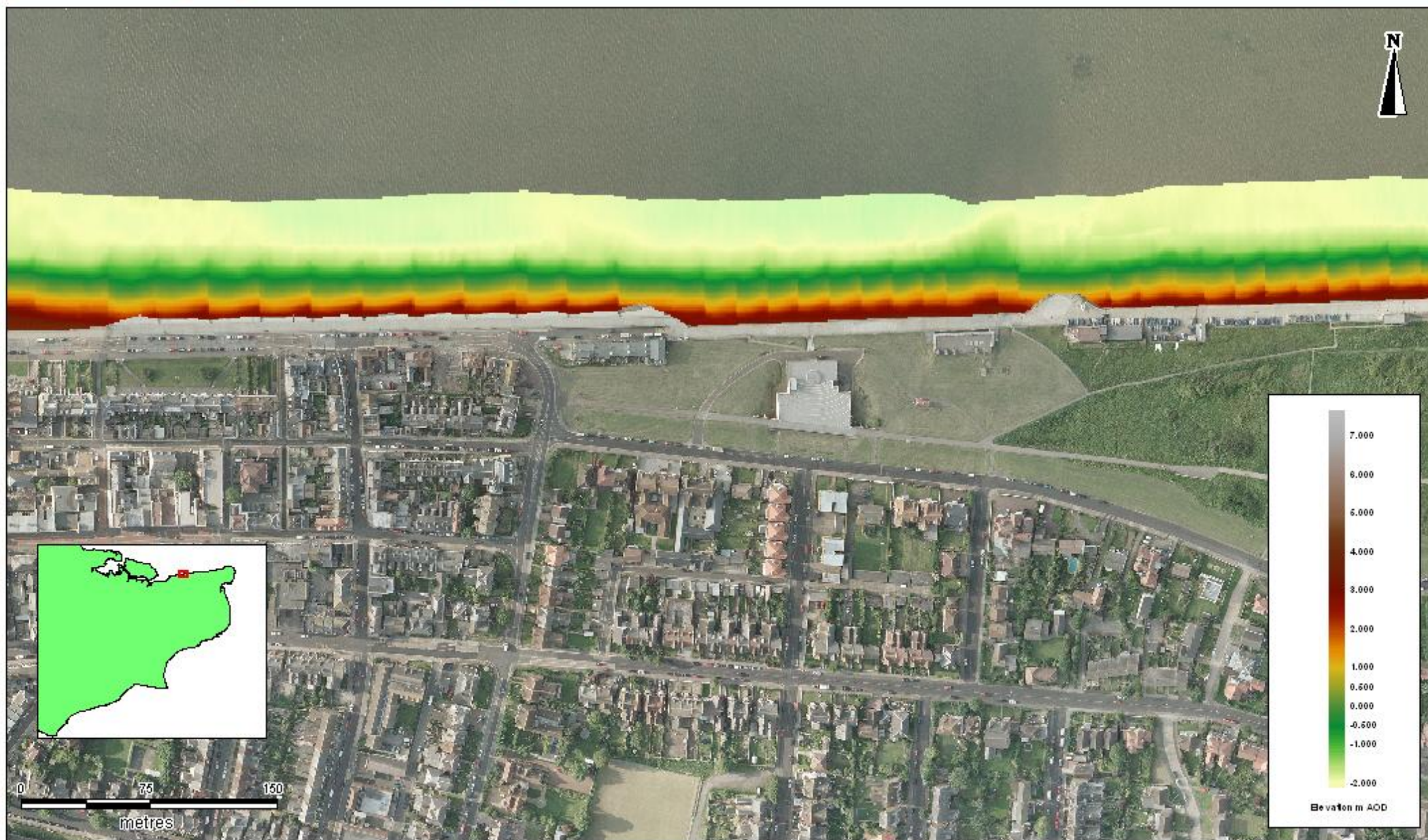
Annex B

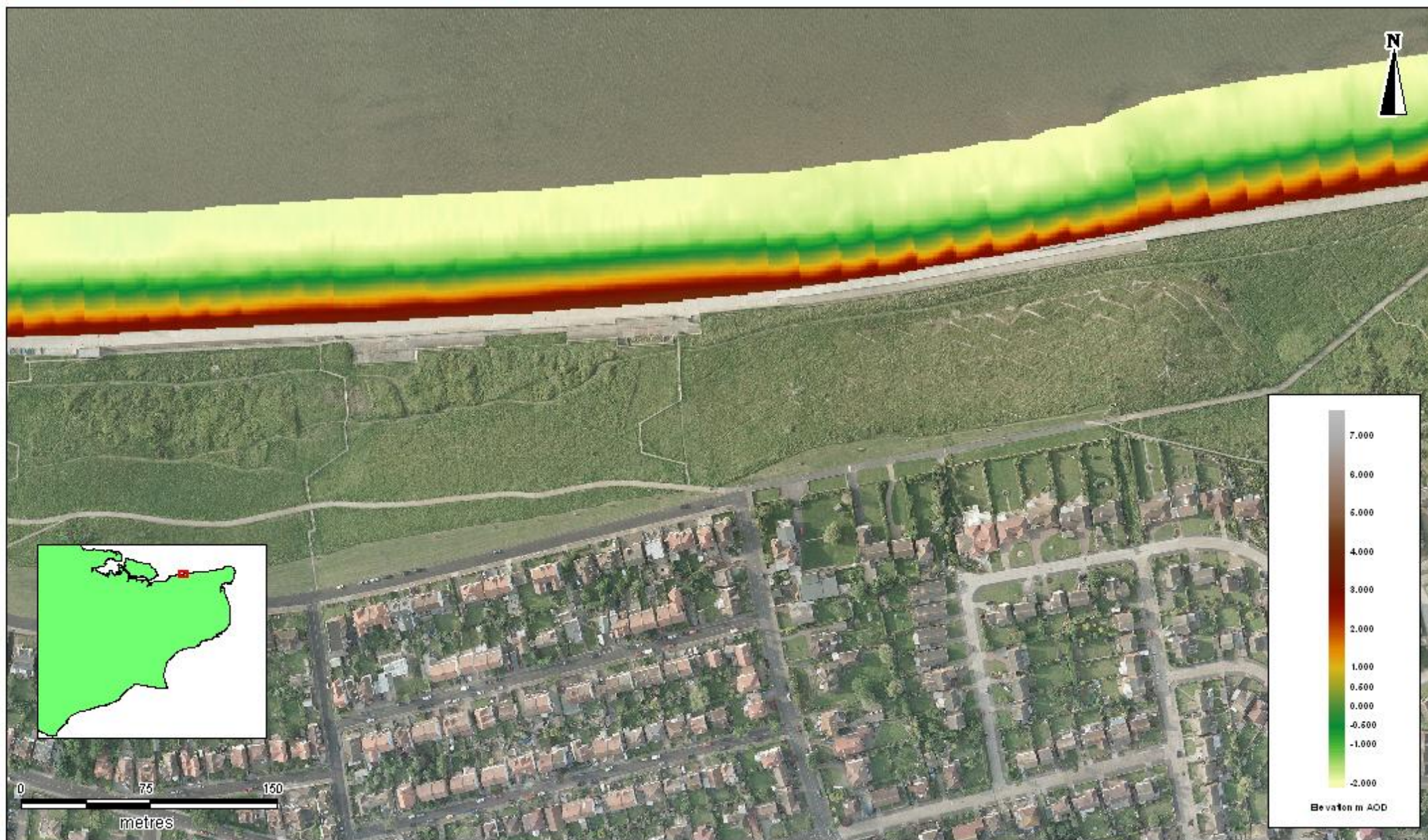
Digital Ground Models

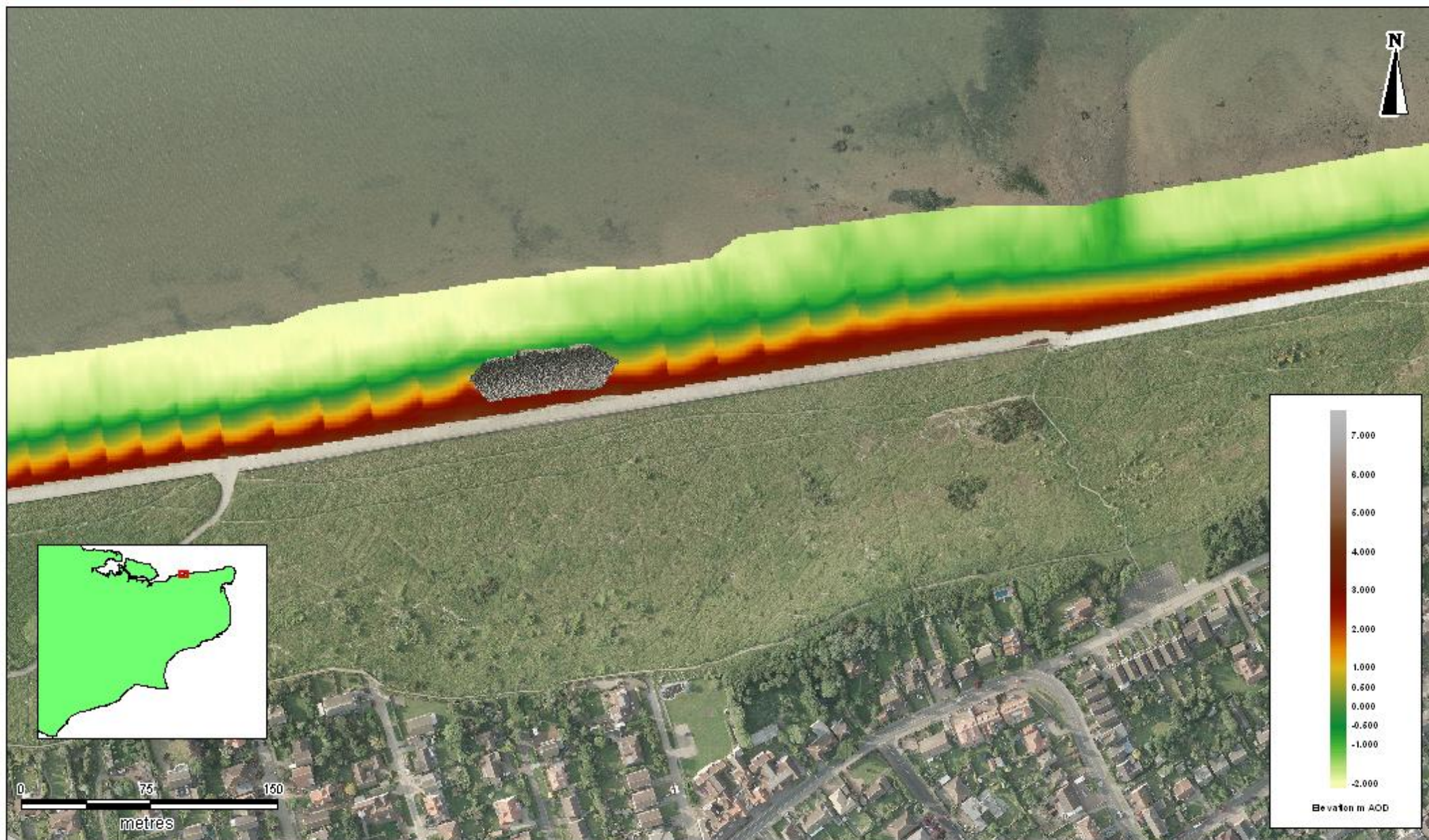


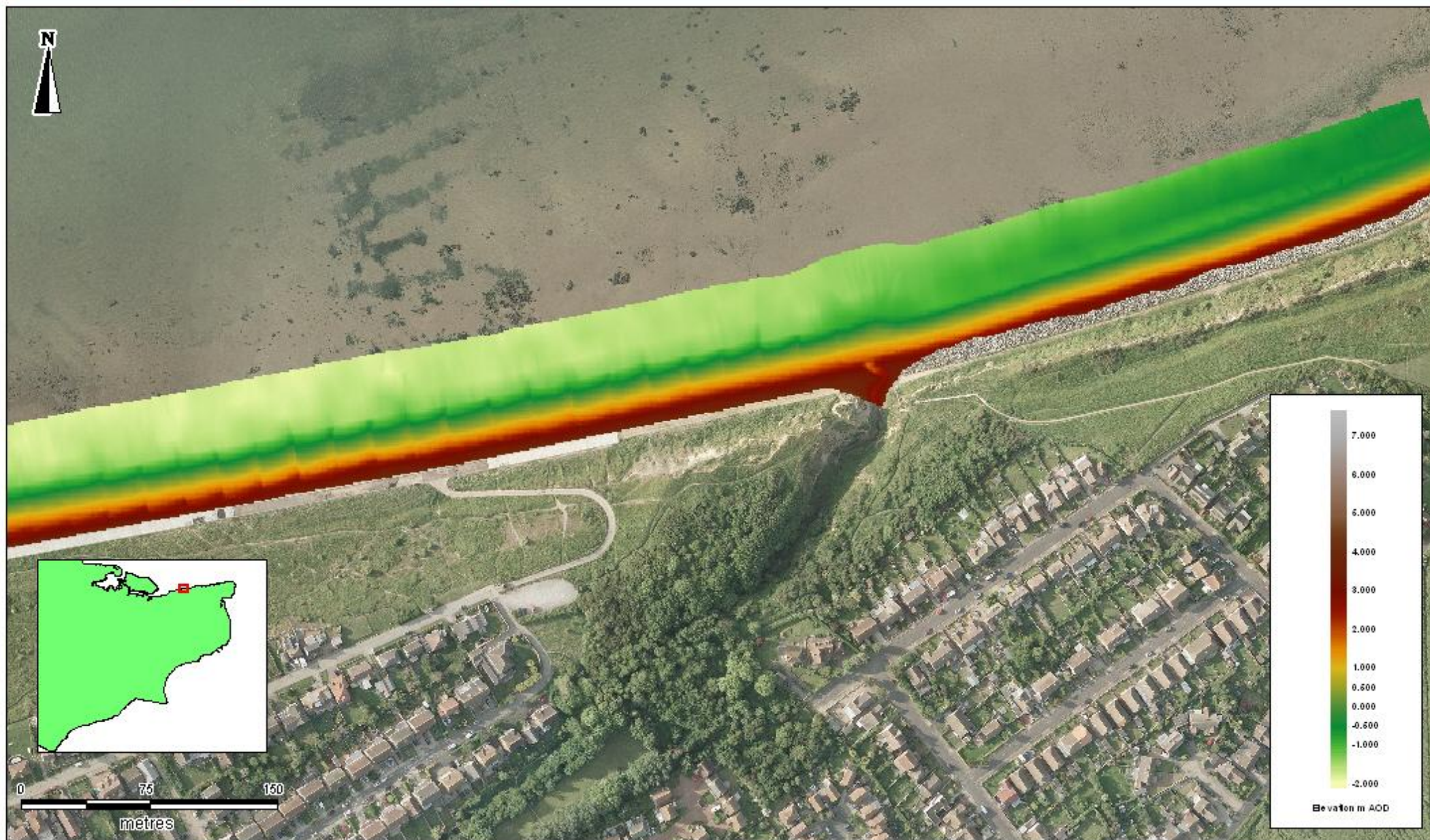












Annex C

Recycling Logs

No Recycling Logs for 2008-2009 Period

Annex D

Herne Bay Wave Recorder

July 2008 – June 2009

Herne Bay Step Gauge - July 2008 to June 2009

Location

OS: 616870E 169390N
WGS84: Latitude: 51° 22' 55.5"N Longitude: 01° 06' 54.66"E

Water Depth

~0.5m CD

Instrument Type

Etrometa Step Gauge

Data Quality

C1(%)	Sample interval
93	20 minutes

Storm analysis

All times GMT

Storm events in 2008/9									
Date/Time	H _s	T _p	T _z	Dir	Water level elevation ¹ (OD)	Tidal stage (hours re. HW)	Tidal range (m)	Tidal surge* (m)	Max. surge* (m)
23-Jan-2009 11:40	1.88	4.4	5.3	-	1.86	HW +2	3.23	0.70	0.92
22-Nov-2008 10:00	1.74	3.9	5.4	-	1.41	HW +2	3.34	1.03	1.17
05-Jan-2009 16:20	1.73	5.1	5.2	-	0.90	HW -2	3.06	-0.12	0.55
10-Feb-2009 05:20	1.61	4.4	5.6	-	-1.24	HW +5	4.55	0.62	0.66

Table F1 Storms during the reporting period, July 2008 to June 2009

A storm is defined using the Peaks-over-Threshold method (Figure F1). Each storm is then examined in detail, and covers the period 16 hours either side of the storm peak, so as to include both the build-up and decay of the storm. This is the procedure recommended by the CIRIA Beach Management Manual since it covers the build-up and decay typical of a mid-latitudes depression.

The choice of the threshold value aims to identify 3 or 4 storms in an average year. The threshold used for Herne Bay is 1.6m.

Figure F2 shows the monthly time series of H_s, with the threshold shown in red. In such shallow water, there is a tidal signature in H_s and, therefore, the wave heights are expected to decrease as the water depth decreases; this effect is magnified during spring tides and is clearly visible in Figure F2. The occurrence of storm waves in the current reporting period is also

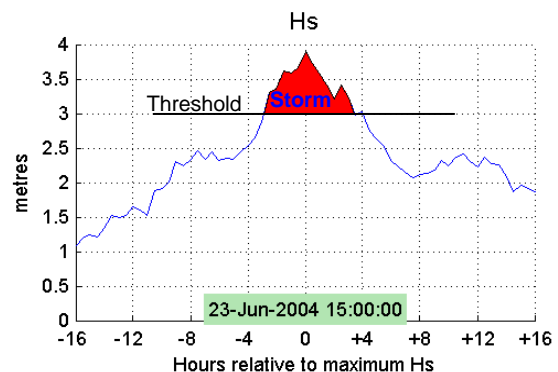


Figure F1 Storm definition

¹ Tidal information is obtained from the nearest recording tide gauge (the Step Gauge also measures tidal elevation). The tidal surge shown is the residual at the time of the highest H_s. The maximum tidal surge is the largest positive surge during the storm event.

compared with similar storm waves in previous years in Figure F3.

Summary

This reporting year was characterised by a higher number of storms than the previous year, although it was still a fairly quiet year, with only 5 storms over the 1.6m threshold. During periods of prolonged onshore winds, a significant storm surge can develop as occurred on 22 November 2008.

Acknowledgements

Tidal predictions were produced using TASK2000 software, kindly provided by the Permanent Service for Mean Sea Level, Proudman Oceanographic Laboratory.

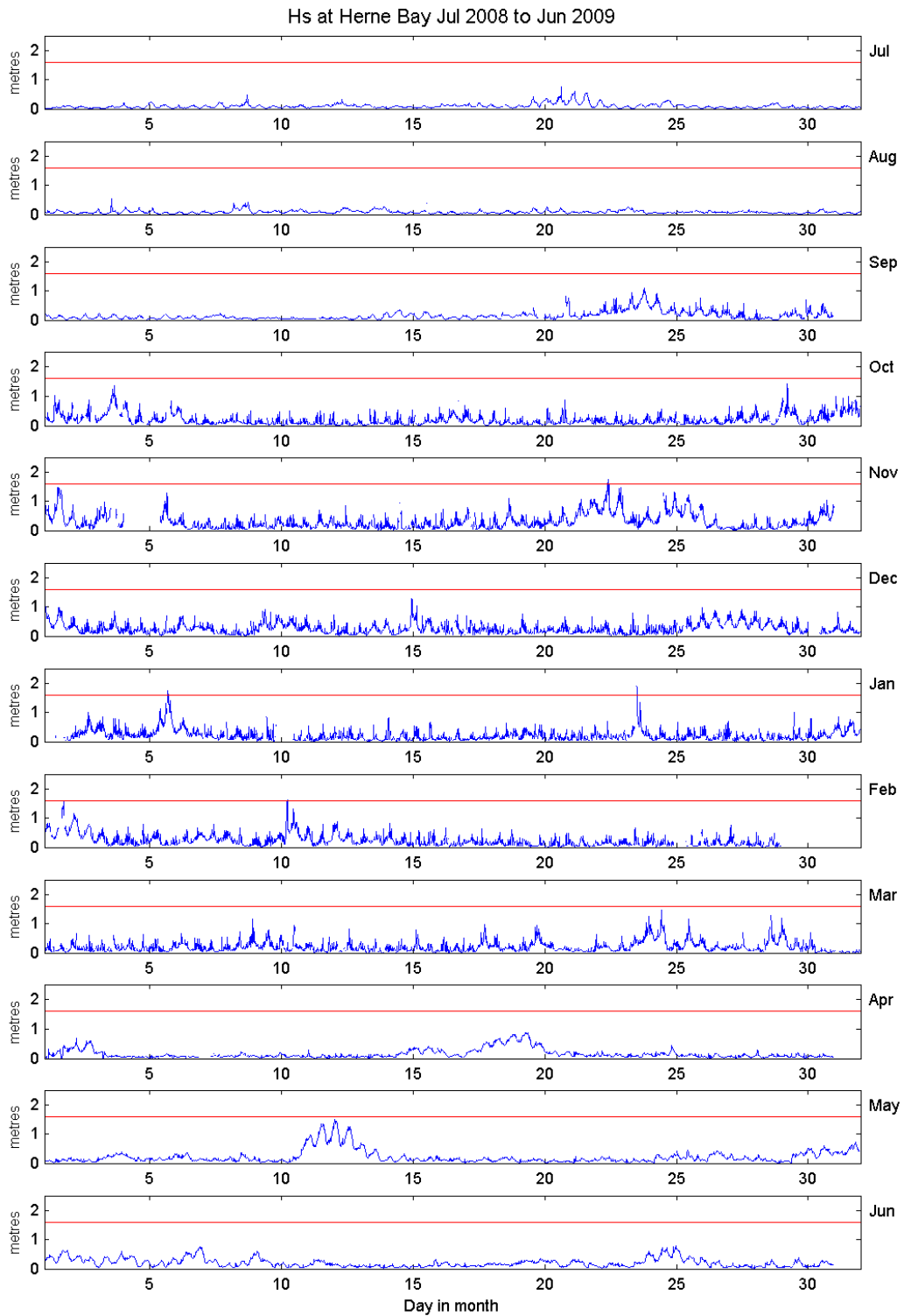


Figure F2 Monthly time series of H_s at Herne Bay. Storm threshold, shown in red, is 1.6m

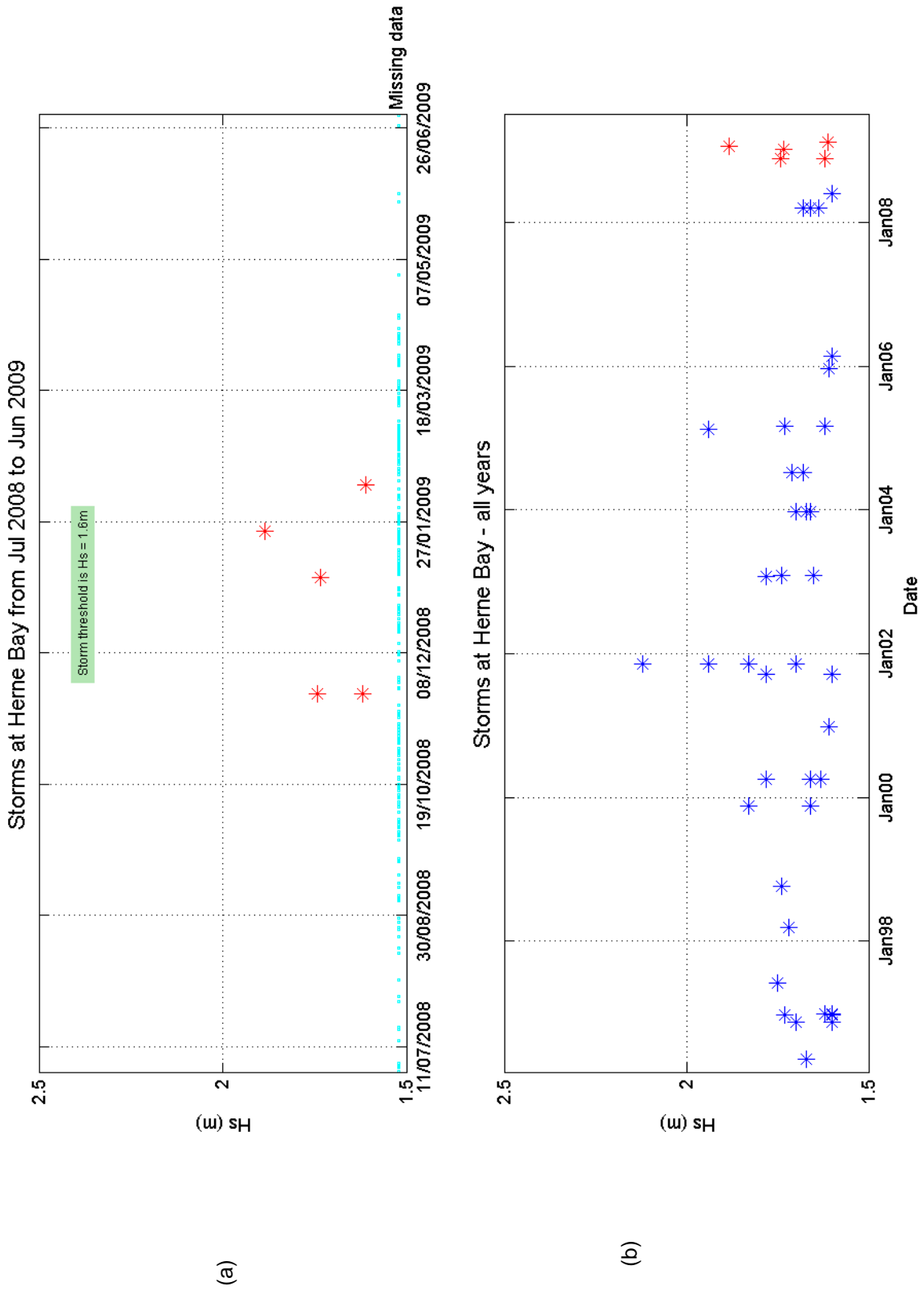


Figure F3 Incidence of storms during: (a) reporting period and (b) since deployment

Herne Bay - Storms during Jul 2008 to Jun 2009

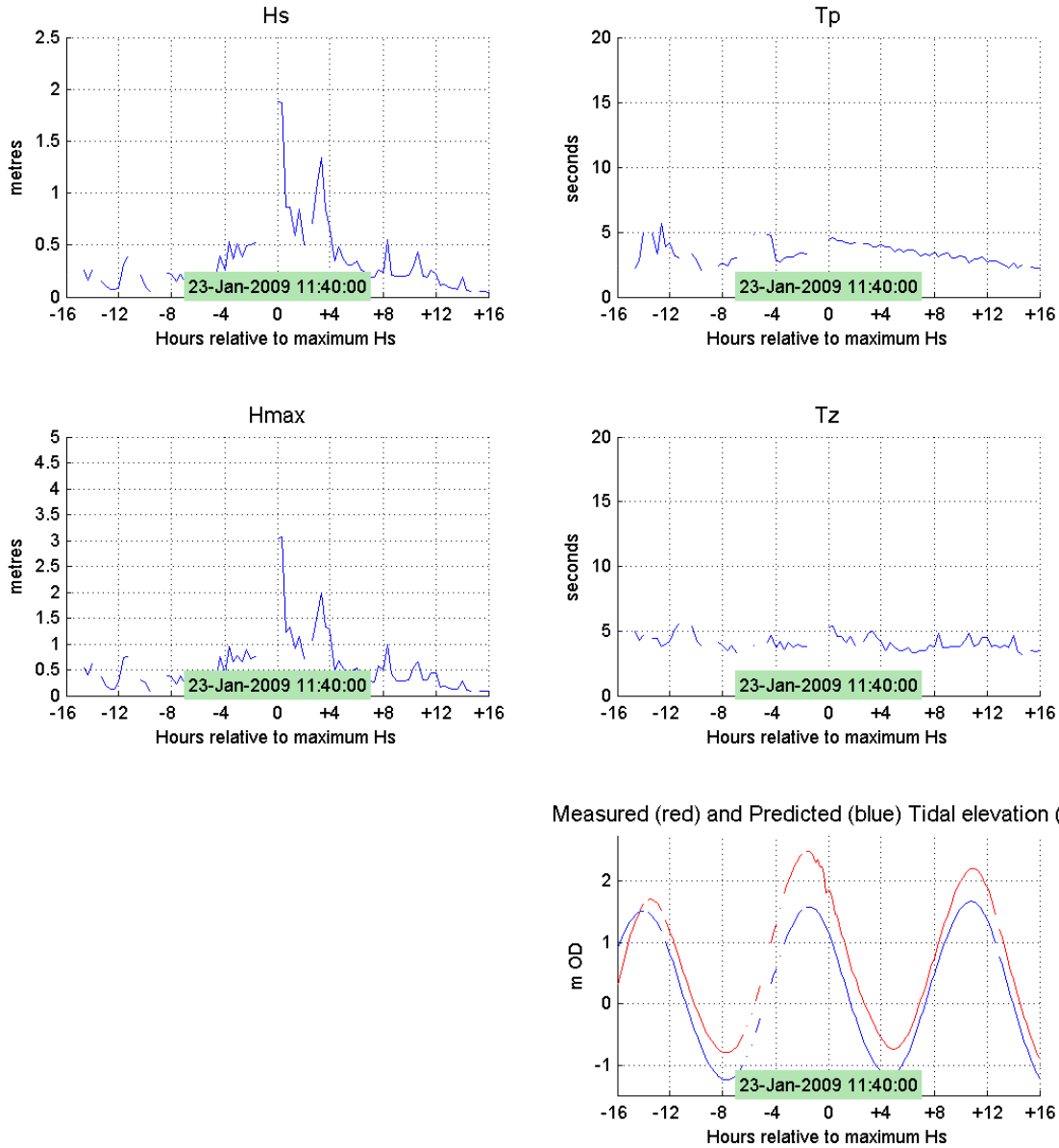


Figure F4 Highest storm of reporting period

Although there was an extremely deep low pressure system situated to the NW of the UK (central pressure 938 hPa), the brief period of high waves at Herne Bay were generated by a secondary low pressure centred just off Cornwall (Figure F5). The storm was accompanied by surge of ~1m.

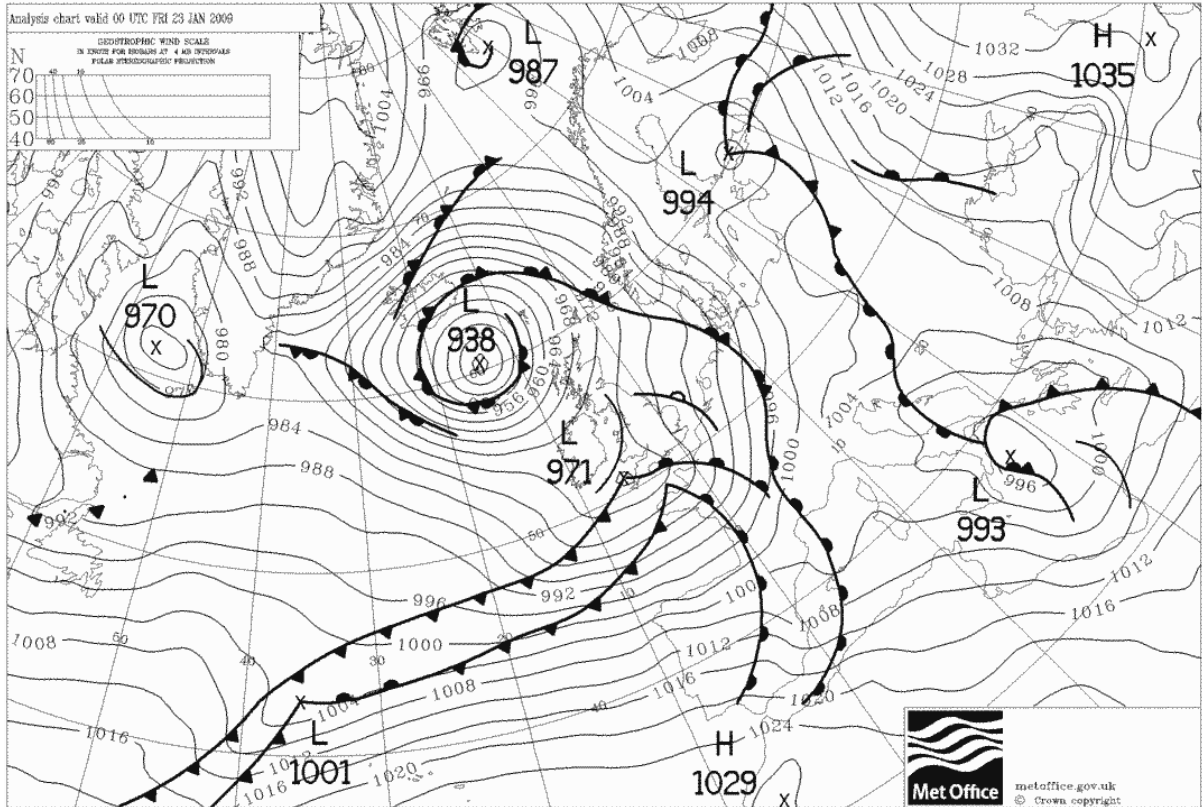


Figure F5 Surface pressure chart on 23 January 2009 at 00:00Z

Herne Bay - Storms during Jul 2008 to Jun 2009

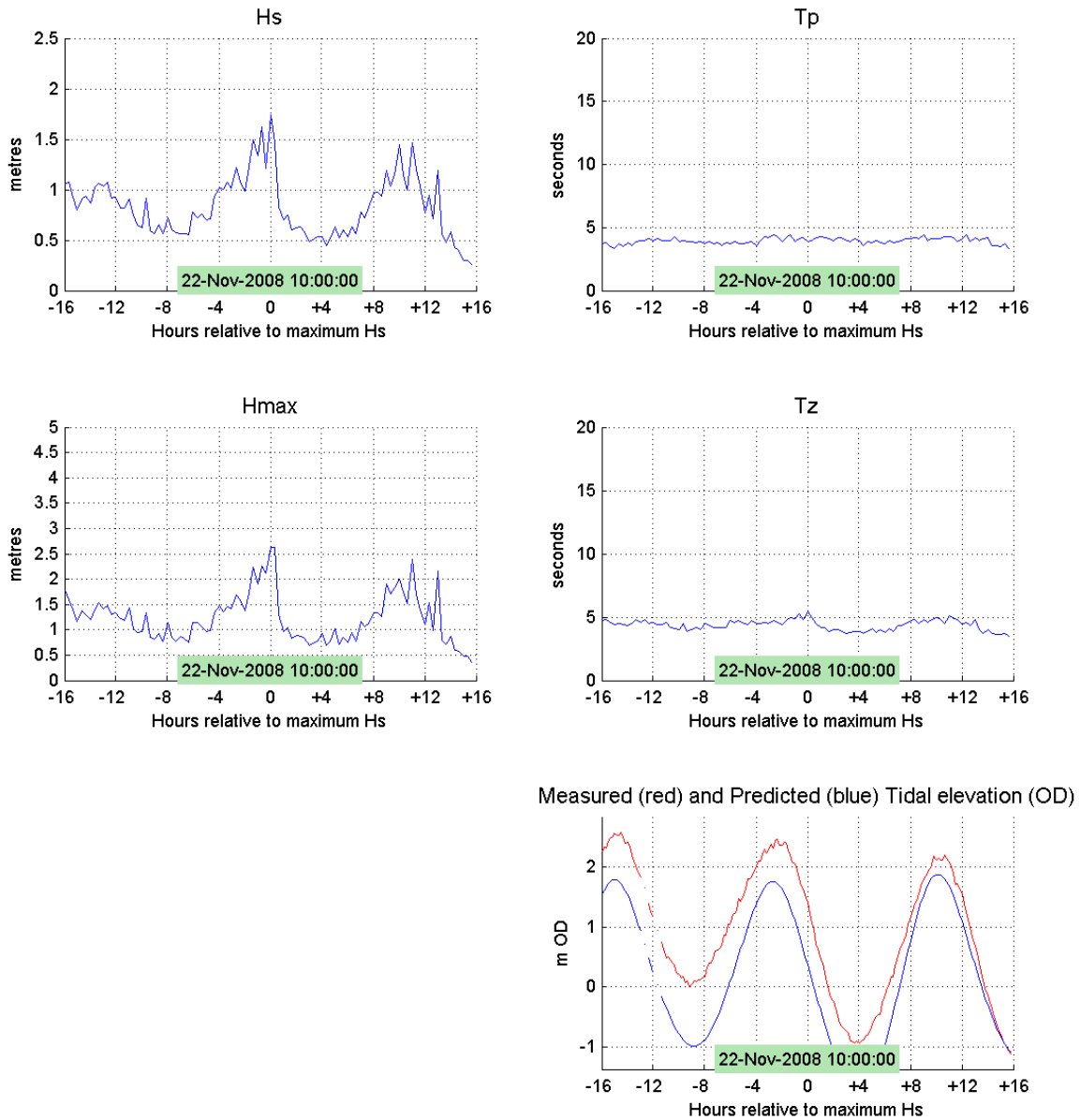


Figure F6 Second highest storm of reporting period

The effect of the shallow water on wave height is clear during this storm, which shows an apparent twin-peak in wave height. The waves resulted from a considerable period of north-westerly winds extending the length of the North Sea and, although the storm itself was not severe, it was accompanied by an extended storm surge, which reached a maximum of 1.17m.

Herne Bay - Storms during Jul 2008 to Jun 2009

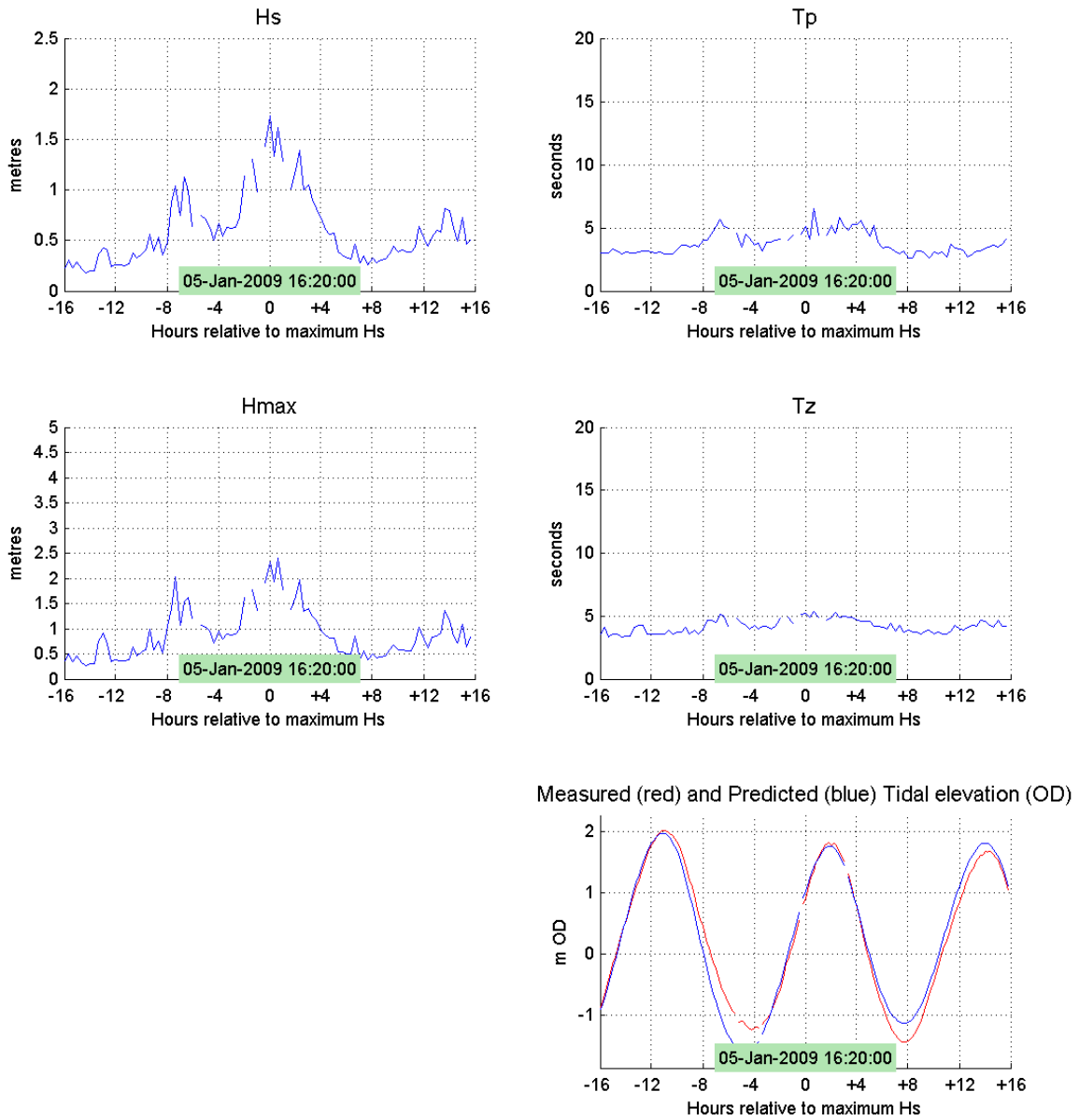


Figure F6 Third highest storm of reporting period

This storm event was associated with a prolonged episode of moderate easterly winds, reaching 25 knots at the peak of the storm. The storm surge was negligible.

Herne Bay - Storms during Jul 2008 to Jun 2009

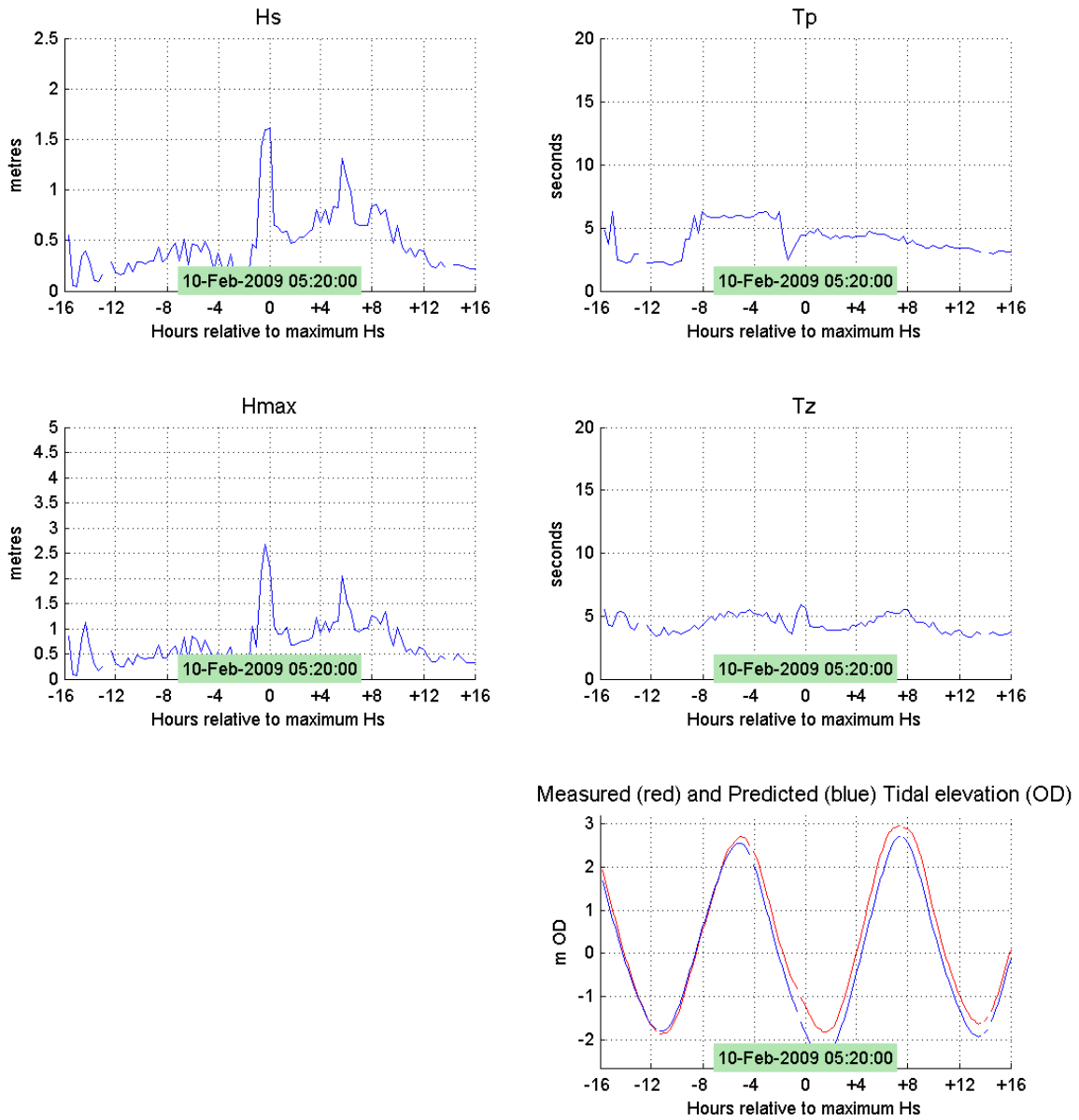


Figure F7 Fourth highest storm of reporting period

This storm was very short lived in terms of peaks over threshold, again due to the shallow water effect. Although the storm occurred during spring tides, the storm surge was relatively insignificant and the peak of the storm was close to Low Water. The waves were generated by a rapidly-deepening low pressure system (central pressure 975 hPa) which transited quickly up the Channel.