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Management Units: **4cMU29 - Eastbourne**

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Beach Management Plan Site Report 2010
Management Unit (MU) 29: Eastbourne

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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.

   \[
   \frac{CSA_1 - CSA_2}{CSA_2} \times 100
   \]

   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 modelling 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:

\[ \text{Grid}_1 - \text{Grid}_2 \]  
\text{Eqn (2)}

where \( \text{Grid}_1 \) = most recent baseline grid and \( \text{Grid}_2 \) = previous baseline grid. Therefore an annual change of \(-14\text{m}^2\) represents erosion during the last year of \(14\text{m}^2\), whilst positive values represent accretion over the period.
Annex C

Recycling Logs
No Recycling Logs for 2009-2010 Period
Annex D

*Pevensey Bay Wave Recorder*

*July 2009 – June 2010*
Pevensey Bay Waverider Buoy - July 2009 to June 2010

Location
OS: 570429E 100915N
WGS84: Latitude: 50° 46.966’ N  Longitude: 00° 24.974’ E

Water Depth
9.8m CD

Instrument Type
Datawell Directional Waverider Mk III

Data Quality

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<th>C1 (%)</th>
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Storm Analysis

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<th>Date/Time</th>
<th>Hs  (m)</th>
<th>Tp  (s)</th>
<th>Tz  (s)</th>
<th>Dir. (°)</th>
<th>Water level elevation* (OD)</th>
<th>Tidal stage (hours re. HW)</th>
<th>Tidal range (m)</th>
<th>Tidal surge* (m)</th>
<th>Max. surge* (m)</th>
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Table F1  Storm events during the reporting period, July 2009 to June 2010

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 mid-latitudes depression.

At present, the threshold for an individual site is derived empirically, since the measurements span only 6 years and, therefore, errs on the low side. The threshold used for Pevensey Bay is 3m, but is likely to be increased next year. The aim is to identify 3 or 4 storms in an average year.

Figure F2 shows the monthly time series of Hs, with the threshold shown in red. The occurrence of storm waves in the current reporting period is also compared with similar storm waves in previous years in Figure F3. Subsequent figures show a time series of the wave conditions for each of the storms listed in Table F1, together with the tidal

* Tidal information is obtained from the nearest recording tide gauge (the National Network gauge at Newhaven). The surge shown is the residual at the time of the highest Hs. The maximum tidal surge is the largest positive surge during the storm event.
conditions at the nearest tide gauge. Each graph is centred around the highest $H_s$ of the individual storm.

**Summary**

This reporting year was characterised by two main periods of storm activity in November 2009 and March 2010, although overall the waves at the peak of the storms were not as high as previous years. The lengthy period of moderate waves in November was evident at many other sites along the Channel coast including Rustington, Bracklesham, Milford and Boscombe.

**Acknowledgements**

Tidal data were supplied by the British Oceanographic Data Centre as part of the function of the National Tidal and Sea Level Facility, hosted by the Proudman Oceanographic Laboratory and funded by DEFRA and the Natural Environment Research Council.
Figure F2  Monthly time series of $H_s$ at Pevensey Bay. Storm threshold, shown in red, is 3m.
Figure F3 Incidence of storms during (a) reporting period and (b) since deployment.
This particular storm was marked by an extended period of waves over 2m, peaking at 3.61m $H_s$. Followed by a rapid decrease in wave height 4 hours after the peak of the storm. The storm was generated by a particularly deep, complex, slow-moving depression (969 hPa) centred in the North Atlantic (see Figure F5), producing strong, south westerly winds over much of southern Britain.

Unlike the remainder of the storms (which were all from the SW), there was a period of SSW waves during the first half of the storm, only becoming SW some 4 hours after the storm peak. The peak of the storm did not occur at High Water and was accompanied by a relatively small surge of 0.36m.
Figure F5  Surface Pressure chart on 14 November 2009 at 0001Z.
Figure F6  Second highest storm of the reporting period

This storm was more of a lengthy period of moderate to high waves for more than 16 hours prior to the peak of the storm, reaching a maximum $H_s$ of 3.49 m. Wave approach was from the SW.
Figure F7 Third highest storm of the reporting period

Unlike the two previous events, the storm peak coincided with High Water, although the storm surge was negligible at ~0.16m.
Figure F7 Fourth highest storm of the reporting period

This storm exceeded the threshold for only a short period peaking at 3.27 m Hs. Following the peak of the storm a second increase in wave height occurred some 12 hours after but did not reach the same magnitude.