BEACH MANAGEMENT PLAN REPORT

Winchelsea

2011

BMP 135 - Annex

September 2012
Document Title: **Beach Management Plan Site Report 2011**

Reference: **BMP 135 - Annex**

Status: **Final**

Date: **September 2012**

Project Name: **Strategic Regional Coastal Monitoring**

Management Units: **4cMU18 - Winchelsea**

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Checked By: **J. Clarke**

Approved By: **J. Clarke**

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<th>Revision</th>
<th>Description</th>
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<td>Final Report</td>
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Beach Management Plan Site Report 2011
Management Unit (MU) 18: Winchelsea

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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.

\[
\frac{\text{CSA}_1 - \text{CSA}_2}{\text{CSA}_2} \times 100
\]

Eqn (1)

where \(\text{CSA}_1\) = most recent springtime survey and \(\text{CSA}_2\) = 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:

\[ Grid_1 - Grid_2 \]  

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
DATE: 06/02/11 – 05/03/11

LOGGED BY: Sam Gawad

NOTES: e.g. Weather, post emergency works, date of storm, scheme maintenance etc.
Shingle replenishment using build up of shingle deposited at Rye harbour arm.
Total quantity excavated = 13 719.44 m³

FRONTAGE DESCRIPTION BEFORE MATERIAL EXTRACTION: e.g. seawall exposed, berm width = 2m
Large quantity of shingle/sand mixture deposited at and around Rye harbour arm.

FRONTAGE DESCRIPTION AFTER MATERIAL EXTRACTION: e.g. material profiled, crest height, berm width, profile gradient, back tipped etc.
Build up of excess shingle removed and site re-landscaped.

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<tr>
<th>MATERIAL EXTRACTED BETWEEN</th>
<th>QUANTITY OF MATERIAL</th>
<th>MATERIAL DESCRIPTION</th>
<th>Average cross-sectional area removed (m²)</th>
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<tr>
<td>Profile/ Groyne Number*</td>
<td>and: Profile/ Groyne Number*</td>
<td>Distance (m, alongshore)</td>
<td>Lorry capacity (m³)</td>
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<td>variable</td>
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* Areas can be defined using ABMS Profile numbers (see map), groyne numbers, descriptions and/or drawn on map
Form Code: RECYCLING LOG – Deposition Site

**DATE:** 06/02/11 – 05/03/11  
**LOGGED BY:** Sam Gawad  
**WORKS CODE:**

**NOTES:** e.g. Weather, post emergency works, date of storm, scheme maintenance etc.
Shingle replenishment at various locations along defined coastline using shingle deposited at Rye harbour arm.

**FRONTAGE DESCRIPTION BEFORE MATERIAL PLACEMENT:** e.g. seawall exposed, berm width = 2m
Shingle ridge along frontage down to 1m in places. At some places toe of sea wall exposed.
Total quantity deposited = 13 719.44 m³

**FRONTAGE DESCRIPTION AFTER MATERIAL PLACEMENT:** e.g. material profiled, crest height, berm width, profile gradient, back tipped etc.
Shingle ridge width increased up to approximately 7m width. Profile of shingle at east end = 1:7 gradient in places where possible.

**MATERIAL PLACED BETWEEN**  

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<th>and: Profile/ Groyne Number*</th>
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Ramp-3 Ramp-10

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<th>Number of lorry loads</th>
<th>e.g. Shingle/Sand/Mixed</th>
<th>Average cross-sectional area deposited (m²)</th>
<th>Based on lorry loads</th>
<th>Based on In/Out survey</th>
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Annex D

Rye Bay Wave Recorder

July 2010 – June 2011
Rye Bay Waverider Buoy - September 2010 to August 2011

Location
OS: 596521E 109474N
WGS84: Latitude: 50° 51.083' N  Longitude: 00° 47.433' E

Water Depth
~11 m CD

Instrument Type
Datawell Directional Waverider Mk III

Data Quality

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<tr>
<th>Recovery rate (%)</th>
<th>Sample interval</th>
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<td>99</td>
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Storm Analysis

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<tr>
<th>Date/Time</th>
<th>$H_s$ (m)</th>
<th>$T_p$ (s)</th>
<th>$T_z$ (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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<tr>
<td>12-Nov-2010 01:00</td>
<td>4.35</td>
<td>10</td>
<td>6.7</td>
<td>219</td>
<td>1.67</td>
<td>HW -2</td>
<td>4.3</td>
<td>0.09</td>
<td>0.51</td>
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<tr>
<td>11-Nov-2010 11:00</td>
<td>3.96</td>
<td>7.7</td>
<td>5.9</td>
<td>214</td>
<td>-0.90</td>
<td>HW -3</td>
<td>3.7</td>
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<td>23-Oct-2010 09:00</td>
<td>3.60</td>
<td>7.7</td>
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<td>7.7</td>
<td>5.9</td>
<td>212</td>
<td>2.52</td>
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<td>8.3</td>
<td>6.0</td>
<td>219</td>
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<td>181</td>
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<td>26-Oct-2010 19:00</td>
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<td>0.35</td>
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Table D1: Highest storms during the reporting period, September 2010 to August 2011

* Tidal information is obtained from the nearest recording tide gauge (the National Network gauge at Dover). The 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.
A storm is defined using the Peaks-over-Threshold method (Figure D1). 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 (second edition) since it covers the build-up and decay typical of mid-latitudes depression.

At present, the threshold for Rye Bay is derived empirically, since the measurements span 3 years only and, therefore, errs on the low side. Once the record length exceeds 5 years, a more realistic value of the Threshold can be derived, so as to identify 3 or 4 storms in an average year. The threshold used for Rye Bay is 3 m. It is envisaged that this threshold will increase in forthcoming years.
Summary

This reporting year contains nine storms (Table D1). The majority of the storms are concentrated in the winter months with the exception of one storm on 26th May 2011. Figure D2 displays the storms for this reporting period (top) and all of the storms recorded since the deployment of the buoy in August 2008 (bottom). Time series of the wave conditions for the six highest storms are described in the remainder of the report.

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.
Monthly time series of $H_s$

Figure D3: Monthly time series of $H_s$ at Rye Bay. Storm threshold, shown in red, is 3 m
The largest storm of the current reporting period began approximately 24 hours earlier than the recorded maximum significant wave height (see the second highest storm event of the reporting period). Combining the two storms together shows a lengthy period of waves exceeding the 3 m storm threshold for nearly 30 hours. The storm resulted from a continuation of a series of depressions crossing to the north of the UK during November 2010 (Figures D5 & D7). Due to the relatively exposed nature of this site, south-westerly swell can reach this location, as is indicated in the consistent direction of storm wave approach from the SW. Storm surge at Dover was negative prior to the peak of the storm in Rye Bay and positive afterwards.
Figure D5: Surface Pressure chart on 12 November 2010 at 00:00Z
Second highest storm

This storm is the precursor to the highest storm of the current reporting period. Wave height increased steadily over an 8 hour period during which the wave direction veered from easterly to south-westerly. The storm peak is followed by a negative storm surge. This is the same negative surge as that seen preceding the highest storm.

Figure D6: Second highest storm of the reporting period
Figure D7: Surface Pressure chart on 11 November 2010 at 00:00Z
Third highest storm

This storm, generated by a series of depressions passing to the north of the UK (Figure D9), represents a “typical” storm sequence with wave height gradually increasing over a 12 hour period to reach a maximum $H_s$ of 3.6 m. Throughout the storm the wave direction was from the SW. Although the storm peak occurred near High Water the storm surge was negligible.

Figure D8: Third highest storm of the reporting period
Figure D9: Surface Pressure chart on 23 October 2010 at 00:00Z
Fourth highest storm

The fourth largest storm of the current reporting period was generated by the passage of a deep depression (956 hPa) to the north-west of Scotland, with a well defined frontal system along the English Channel leading to sharply veering winds (Figures D11 & D12). This storm was preceded by easterly waves which became SW at the onset of the storm, veering between SSW and SSE through the storms duration. The storm peak occurred near High Water where a small storm surge was recorded.

Figure D10: Fourth highest storm of the reporting period
Figure D11: Surface Pressure chart on 08 November 2010 at 00:00Z

Figure D12: Surface Pressure chart on 09 November 2010 at 00:00Z
Fifth highest storm

Like previous storms in the current reporting period, this storm occurred around High Water with a negligible storm surge and a wave direction from the SSW to SW. Following the peak of the storm a second increase in wave height occurred some 10 hours later reaching a similar magnitude to the earlier peak.

![Graphs showing wave height (Hs), peak period (Tp), significant wave height (Hmax), peak frequency (Tz), direction, and tidal elevation (OD) for the fifth highest storm.](image)

**Figure D13:** Fifth highest storm of the reporting period
Figure D14: Surface Pressure chart on 04 December 2010 at 00:00Z
Sixth highest storm

The sixth highest storm of the current reporting period is noteworthy as it occurred on 26th May 2011. The storm itself is similar to the other storms seen in this reporting period, with wave direction being south-westerly, the storm peak occurring around High Water and a negligible storm surge.

Rye Bay - Storms during Sep 2010 to Aug 2011

![Graphs showing wave heights, periods, and tidal elevations for the sixth highest storm.]

Figure D15: Sixth highest storm of the reporting period
Figure D16: Surface Pressure chart on 26 May 2011 at 00:00Z

Figure D17: Surface Pressure chart on 27 May 2011 at 00:00Z