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Date: June 2011

Project Name: Strategic Regional Coastal Monitoring

Management Units: 4bMU8C - Sandwich Bay

Author: A. Dane

Checked By:

Approved By:

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<th>Revision</th>
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<td>Initial Report</td>
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# Beach Management Plan Site Report 2011
## Management Unit (MU) 8C: Sandwich 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.

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

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 Terrain and difference models**

The Digital Terrain 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 DTMs 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:

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

where \( \text{Grid}_1 \) = most recent baseline grid and \( \text{Grid}_2 \) = 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:**
November 2010

**LOGGED BY:** C. Milburn

**WORKS CODE:**

**NOTES:** e.g. Weather, post emergency works, date of storm, scheme maintenance etc.

- Beach Reprofiling

**FRONTAGE DESCRIPTION BEFORE MATERIAL PLACEMENT:** e.g. seawall exposed, berm width = 2m

**FRONTAGE DESCRIPTION AFTER MATERIAL PLACEMENT:** e.g. material profiled, crest height, berm width, profile gradient, back tipped etc.

### MATERIAL PLAced BETWEEN

<table>
<thead>
<tr>
<th>Profile/ Groyne Number*</th>
<th>and: Profile/ Groyne Number*</th>
<th>Distance (m, alongshore)</th>
<th>Lorry capacity (m³)</th>
<th>Number of lorry loads</th>
<th>e.g. Shingle/Sand/Mixed</th>
<th>Average cross-sectional area deposited (m²)</th>
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<tr>
<td>4b00282</td>
<td>4b00361</td>
<td>2900m</td>
<td></td>
<td></td>
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* Areas can be defined using ABMS Profile numbers (see map), groyne numbers, descriptions and/or drawn on map
Annex D

Deal Wave Recorder

July 2010 – June 2011
Deal Pier - September 2010 to August 2011

Location
OS: 638145E 152700N
WGS84: Latitude: 51° 13.428' N    Longitude: 01° 24.556' E

Water Depth
N/A

Instrument Type
Rosemount WaveRadar Rex

Data Quality

<table>
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<th>Recovery rate (%)</th>
<th>Sample interval</th>
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<tbody>
<tr>
<td>96</td>
<td>20 minutes</td>
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Storm Analysis

<table>
<thead>
<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>23-Dec-2010 23:20</td>
<td>2.20</td>
<td>9.4</td>
<td>5.3</td>
<td>-</td>
<td>2.12</td>
<td>HW -1</td>
<td>5.0</td>
<td>0.11</td>
<td>0.22</td>
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<tr>
<td>02-May-2011 21:40</td>
<td>1.82</td>
<td>8.0</td>
<td>4.9</td>
<td>-</td>
<td>1.88</td>
<td>HW -1</td>
<td>4.4</td>
<td>-0.06</td>
<td>-0.26</td>
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</table>

Table D1: Highest storms during the reporting period, September 2010 to August 2011

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.

The threshold used for Deal Pier is 1.7 m. This value has been determined using extremes analysis of 6 years of measured data (based on 3 hourly values). A 0.25 year return period is used to identify 4 storms in an average year. This is the first year that this higher threshold has been applied, replacing the 1.5 m threshold used in earlier reports.

* Tidal information is obtained from the nearest recording tide gauge (the gauge at Deal measures tides also). 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.
Summary

This reporting year contains two storms (Table D1 & Figure D2, top), with the storm occurring on 23 December 2010 being the highest recorded since the deployment of the WaveRadar in August 2005. Both storms display tidal modulation (as has been seen in previous recording periods).

Acknowledgements

Tidal predictions were produced using TASK2000 software, kindly provided by the Permanent Service for Mean Sea Level, Proudman Oceanographic Laboratory.
Monthly time series of $H_s$

Figure D3: Monthly time series of $H_s$ at Deal Pier. Storm threshold, shown in red, is 1.7 m
Highest storm

This storm recorded the highest waves since the deployment of the WaveRadar in August 2005. The meteorological station located at the end of Deal Pier recorded wind speeds of 14-18 m/s (28-34 knots; Force 7) for an 18-hour period (Figure D6) either side of the storm peak. The storm is characterised by a lengthy period of high, long period waves, which is unusual at this location due to its relatively sheltered location. The graph of $H_s$ (and to some extent $T_p$ and $T_z$) in Figure D4 displays tidal modulation. This effect is primarily due to shallow water effects, where wave height decreases with water depth; this is particularly evident during spring tides.

![Graphs of Hs, Tp, Hmax, Tz, and Measured and Predicted Tidal elevation (OD)](image)

Figure D4: Highest storm of the reporting period
Figure D5: Surface Pressure chart on 24 December 2010 at 00:00Z

Figure D6: Wind speed (m/s), recorded at Deal Pier
Second highest storm

Similar to the highest storm of the reporting year, the peaked nature of the wave height graph can be attributed to the depth-limited conditions at Low Water.

Figure D7: Second highest storm of the reporting period
Figure D8: Surface Pressure chart on 02 May 2011 at 00:00Z

Figure D9: Surface Pressure chart on 03 May 2011 at 00:00Z