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Management Units: 4aMU5C - Herne Bay

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Checked By: J. Clarke

Approved By: J. Clarke

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<th>Revision</th>
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Beach Management Plan Site Report 2010
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.

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

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 an 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 \(-14 \text{m}^2\) represents erosion during the last year of \(14 \text{m}^2\), whilst positive values represent accretion over the period.
Annex B

*Digital Ground Models*
Annex C

Recycling Logs
LOGGED BY: N. Jordan
WORKS CODE: PR6000

NOTES: Coastal maintenance works

FRONTAGE DESCRIPTION BEFORE MATERIAL EXTRACTION: Large accumulation of shingle in front of bandstand

FRONTAGE DESCRIPTION AFTER MATERIAL EXTRACTION: Material in front of bandstand moved west to eroded area at side of pier

<table>
<thead>
<tr>
<th>MATERIAL EXTRACTED BETWEEN</th>
<th>QUANTITY OF MATERIAL</th>
<th>MATERIAL DESCRIPTION</th>
<th>Average cross-sectional area removed (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profile/ Groyne Number*</td>
<td>Distance (m, alongshore)</td>
<td>Lorry capacity (m³)</td>
<td>Number of lorry loads</td>
</tr>
<tr>
<td>Neptune Ramp</td>
<td>4.5</td>
<td>24</td>
<td>Shingle</td>
</tr>
<tr>
<td>Breakwater</td>
<td>10.9</td>
<td>225</td>
<td>Shingle</td>
</tr>
</tbody>
</table>

A = B / C (B^2C)/A

* Areas can be defined using ABMS Profile numbers (see map), groyne numbers, descriptions and/or drawn on map.
**DATE:** 21st-25th March 2011  
**LOGGED BY:** N.Jordan  
**WORKS CODE:** PR6000

**NOTES:** Coastal Maintenance

**FRONTAGE DESCRIPTION BEFORE MATERIAL PLACEMENT:** Erosion of beach on eastern side of pier

**FRONTAGE DESCRIPTION AFTER MATERIAL PLACEMENT:** Eroded section beside pier filled and graded

<table>
<thead>
<tr>
<th>MATERIAL PLACED BETWEEN</th>
<th>QUANTITY OF MATERIAL</th>
<th>MATERIAL DESCRIPTION</th>
<th>Average cross-sectional area deposited (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Based on lorry loads</td>
</tr>
</tbody>
</table>
| Neptune Ramp            |                      |                      | 4.5  
| Breakwater              |                      |                      | 10.9  

<table>
<thead>
<tr>
<th>Number* 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>2,560m³</th>
<th>(B*C)/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neptune Ramp</td>
<td>4.5</td>
<td>24</td>
<td>Shingle</td>
<td></td>
<td>2,560m³</td>
<td>(B*C)/A</td>
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<tr>
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<td>10.9</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Areas can be defined using ABMS Profile numbers (see map), groyne numbers, descriptions and/or drawn on map.
Clearance of Neptune ramp/Recycling of beach

23/02/11 - Shingle removed from Neptune ramp by Serco (arranged by PB). Large quantity of beach material collected behind ramp wall. Level at wall reduced by 1m and material spread throughout two adjacent bays with D6 bulldozer (Chunnel Plant, arranged by NJ).

06/03/11 – Reports from fisherman that shingle is overtopping onto Neptune ramp again. Inspected site and found all previously recycled beach (23/02/11) had moved back to the wall. This was primarily due to an unusually persistent westerly wind causing the ramp wall to act as a terminal groyne. PB arranged for another clearance of ramp by Serco on 08/03/11. NJ arranged for 13t excavator (Chunnel Plant) to be delivered to recycle excess beach material to eroded corner by Herne Bay Pier.

08/03/11 to 09/03/11 - Neptune Ramp cleared by Serco. Material against wall removed to a depth of 1m and recycled using 10t Hydrema truck borrowed from Lane End recycling work. All material deposited by eastern side of Herne Bay Pier.
Annex D

*Herne Bay Wave Recorder*

*September 2010 – August 2011*
Herne Bay - September 2010 to August 2011

Location
OS: 616895E  169377N
WGS84: Latitude: 51° 22.919' N  Longitude: 01° 06.934' E

Water Depth
N/A

Instrument Type
Etrometa Step Gauge

Data Quality

<table>
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<tr>
<th>Recovery rate (%)</th>
<th>Sample interval</th>
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<tr>
<td>83</td>
<td>20 minutes</td>
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Storm Analysis

All times are GMT

<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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</thead>
<tbody>
<tr>
<td>23-Dec-2010 13:00</td>
<td>2.40</td>
<td>5.1</td>
<td>4.9</td>
<td>-</td>
<td>2.77</td>
<td>HW -1</td>
<td>4.8</td>
<td>0.40</td>
<td>0.51</td>
</tr>
<tr>
<td>02-Mar-2011 23:40</td>
<td>1.90</td>
<td>3.5</td>
<td>3.6</td>
<td>-</td>
<td>1.99</td>
<td>HW</td>
<td>4.0</td>
<td>0.03</td>
<td>-0.23</td>
</tr>
<tr>
<td>04-Mar-2011 00:20</td>
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<td>2.9</td>
<td>3.9</td>
<td>-</td>
<td>2.09</td>
<td>HW</td>
<td>3.9</td>
<td>-0.05</td>
<td>-0.36</td>
</tr>
</tbody>
</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 Herne Bay is 1.6 m. This value has been determined using extremes analysis of 15 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.

* Tidal information is obtained from the nearest recording tide gauge (the gauge at Herne Bay 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 three storm events (Table D1 & Figure D2, top), with the storm occurring on 23 December 2010 being the highest recorded since the deployment of the step gauge in March 1996.

![Storms at Herne Bay from Sep 2010 to Aug 2011](image1)

![Storms at Herne Bay - all years](image2)

**Figure D2:** Incidence of storms during reporting period (top) and since deployment (bottom)

Acknowledgements

Tidal predictions were produced using TASK2000 software, kindly provided by the Permanent Service for Mean Sea Level, Proudman Oceanographic Laboratory.
Figure D3: Monthly time series of $H_s$ at Herne Bay. Storm threshold, shown in red, is 1.6 m
**Highest storm**

This storm recorded the highest waves since the deployment of the step gauge in March 1996. The meteorological station located at Herne Bay recorded wind speeds of 14-18 m/s (28-34 knots; Force 7) for an 18-hour period (Figures D5 to D7) either side of the storm peak. These winds were predominantly from the north (Figure D8). The graph of $H_s$ 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 (as is the case in this storm). The storm was accompanied by a surge of around 0.5 m.

![Graphs showing wave height and period](image)

*Figure D4: Highest storm of the reporting period*
Figure D5: Surface Pressure chart on 23 December 2010 at 00:00Z

Figure D6: Surface Pressure chart on 24 December 2010 at 00:00Z
Figure D7: Wind speed (m/s), recorded at Herne Bay

Figure D8: Herne Bay Wind Rose – 23 & 24 December 2010
Second highest storm

This storm is similar to the highest storm of the reporting year. The meteorological station located at Herne Bay recorded north to north-easterly winds with speeds of 9-14 m/s (17-27 knots; Force 5-6) for over 36-hours leading up to the storm peak. The storm peak occurred at High Water.

Figure D9: Second highest storm of the reporting period
Figure D10: Surface Pressure chart on 02 March 2011 at 00:00Z

Figure D11: Surface Pressure chart on 03 March 2011 at 00:00Z
Third highest storm

This storm follows on from the second highest storm of the current reporting period and is similar in its characteristics. The storm peak occurred at High Water.

Figure D12: Second highest storm of the reporting period