# Executive Summary

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Executive Summary

Shingle beaches provide a vital element of the flood and coastal erosion defences along the Bexhill frontage. The monitoring and management of this asset is therefore crucial to the successful and sustainable delivery of flood and coastal erosion protection.

The condition and performance of different beach sections are currently monitored through the Strategic Regional Coastal Monitoring Programme. This report evaluates changes along the coastline in the previous year (2004-2005) and compares these to baseline surveys conducted at the outset of the project in 2003. The key findings are listed below;

- A net gain of 24,000m$^3$ was observed along the entire Bexhill frontage over a two year period (2003-2005)
- An annual gain of 12,000m$^3$ is in direct contrast to the Cooden-Cliff End Strategy Plan Report (2002), which estimates an average loss of -5,000m$^3$/year
- Sediment transport rates may have also been under estimated in past studies, beach plan survey data indicates they could be as high as 20,000m$^3$/year eastwards along part of the frontage, this is in contrast to values of five to ten thousand presented in previous reports.
- The largest areas of accretion were at the opposing ends of the Bexhill frontage. At the western end (Cooden – Veness Gap) the beach has accumulated over 27,000m$^3$ of material since 2003, probably due to sediment input from management activities along the Pevensey Bay Scheme. The eastern end (Sutton Place – Bulverhythe) has benefited from 15,000m$^3$ of material as a consequence of losses elsewhere in the unit.
- De Le Ware has proved the most erosive area since the project outset, especially the section around the out-cropping headland, losing over 20,000m$^3$ since the monitoring project commenced in 2003. This area should be carefully monitored in the future.
- Beach crest levels are on the whole reasonably healthy well clear of ‘action’ trigger levels defined in the Cooden – Cliff End Strategy Plan (2002). The one exception to this is the beach in front of Veness Gap where levels are a metre below proposed strategy levels and only half a metre above the ‘action’ level. Given this area has also shown an erosive trend over the last two years, it should be closely monitored for any drop in beach crest height.
- Hydrodynamic conditions have been relatively mild over the last storm year (2004/05) with only five storms exceeding the storm threshold of a 2.75m significant wave height ($H_s$) at the Pevensey wave buoy. The largest event occurred in January 2005 where the significant wave height peaked at 3.53m.
- The sediment budget is intrinsically linked to the actively managed sites of Pevensey Bay and Bulverhythe, which have both recently conducted replenishment operations.

It is important to recognise the inconsistency in short-term trends. As with many coastal areas a lot of annual variability is expected, thus drawing conclusions with increased confidence will become possible as more data is collected, with regards annual losses, net sediment drift and erosion/accretion trends in section sub-units.
1.0 Introduction

Boundaries for the extent of this report are consistent with the Beachy Head to South Foreland Shoreline Management Plan (1996), comprising Management units five and six. These largely cover the Bexhill frontage managed by Rother District Council, with the exception of the far eastern section of MU 6, which falls under the management of the Environment Agency as part of the Bulverhythe scheme. Hold the line policy options are utilised in both units in order to protect the rail/road infrastructure and settlements.

Historically beach levels have only been monitored with an annual aerial beach management survey (ABMS), this data suffered from numerous accuracy problems as a consequence of poor control, processing and the limitations of the technique itself. Consequently this data is not reviewed in this report.

As part of the strategic regional coastal monitoring project the beach has been surveyed three times a year since the summer of 2003 with land based GPS techniques. These comprise biannual profile surveys and a complete beach plan survey every year, full details of which can be found in the explanatory notes. In addition to this a bathymetric survey of the adjacent seabed was conducted in 2004, and a network of tide and wave gauges have been set up in the southeast region. The location of the frontage is shown in Figure 1.1 and also includes the nearest wave buoy and tide gauge.

1.1 MU5 – Bexhill west

Bexhill-on-Sea is protected by a variety of defence structures. The whole frontage consists of a shingle beach maintained by a series of timber groynes. At the western end (Cooden) the shingle ridge is wide and backed by a grassy embankment. Moving eastwards, towards Veness Gap, the shingle ridge reduces in width and is backed by a promenade with a splash wall. Directly behind the promenade and grass embankment, large detached properties are located seaward of the railway line. Further eastwards the topography of the coastal fringe rises and then starts to decent into an area known as ‘West Parade’. In this region, the shingle is retained by a series of timber groynes and is backed by a vertical concrete wall and promenade, which protects Western Bexhill. A large number of residential properties exist at the back of this promenade.
West Parade has a history of flooding due to wave overtopping of the existing coastal defences, consequently the area is more sensitive to changes in beach levels, with regards the short-term standard of defence, than other sections in the unit.

Beyond this point towards De La Ware, the coastline is relatively straight and protects the old town of Bexhill. The existing defences consist of a near vertical blockwork wall with promenade fronted by a shingle beach and timber groynes.

1.2 MU 6 – Bexhill East

At De La Ware, the western section of the Management Unit, the frontage forms a slight headland with most properties set back a considerable distance inland, these are unlikely to be affected by overtopping or flooding.

From this point east the coastline becomes more jagged and is defended by a series of timber groynes and a shingle beach backed by a vertical wall and promenade.

At Sutton Place the coastline begins to rise to form the sedimentary rock slopes at Galley Hill. A shingle beach in combination with a series of timber groynes defends this frontage. To the rear of the beach the slopes are protected by a concrete wall. East of Galley Hill the main railway line runs adjacent to the beach. Again the frontage is protected by a concrete wall, shingle beach and timber groynes. The eastern half of the unit is a largely low-lying developed frontage. This stretch of coastline has been the subject of a major capital scheme during 2005 consisting of the construction of 10 rock groynes and 700m of rock revetment together with the importation of approximately 22,000m³ of beach material.

Figure 1.2-1: Lookout Point at the centre of Management Unit 6
2.0 Design conditions

Tidal statistics for Bexhill are presented in table 2-1. The mean high water spring value is the highest for the Southeast of England (Isle of Grain – Beachy Head). Waves propagating from the Southeast to Southwest sector directly affect the frontage, with the largest storm waves occurring from the Southwest with an inshore significant wave height in the region of 3.5m. The largest recorded significant wave height occurred in November 2003 at the Pevensey wave buoy and exceeded 4m.

<table>
<thead>
<tr>
<th>Tide Level</th>
<th>Tide Height (mODN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHWS</td>
<td>3.80</td>
</tr>
<tr>
<td>MHW</td>
<td>2.90</td>
</tr>
<tr>
<td>MHWN</td>
<td>2.00</td>
</tr>
<tr>
<td>MSL</td>
<td>0.05</td>
</tr>
<tr>
<td>MLWN</td>
<td>-1.60</td>
</tr>
<tr>
<td>MLW</td>
<td>-2.25</td>
</tr>
<tr>
<td>MLWS</td>
<td>-2.90</td>
</tr>
</tbody>
</table>

An assessment of the joint probabilities of extreme wave heights and high water level was carried out for the Cooden to Cliff End Strategy Plan (Jan 2002). The assessment was carried out for a nearshore point in close proximity to Hastings. This was used to establish combined occurrences of wave and water levels for the evaluation of defence standards and potential flooding return periods, the results of which are set out in Table 2-2 below. It should be noted that much larger wave heights can occur than those defined in this strategy plan.

<table>
<thead>
<tr>
<th>Return Period (years)</th>
<th>Water Level 2000 (m AOD)</th>
<th>Water Level 2050 (m AOD)</th>
<th>Inshore Wave Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Height Hs (m)</td>
</tr>
<tr>
<td>5</td>
<td>4.85</td>
<td>5.15</td>
<td>2.10</td>
</tr>
<tr>
<td>10</td>
<td>4.93</td>
<td>5.23</td>
<td>2.12</td>
</tr>
<tr>
<td>50</td>
<td>5.04</td>
<td>5.34</td>
<td>2.15</td>
</tr>
<tr>
<td>100</td>
<td>5.07</td>
<td>5.37</td>
<td>2.23</td>
</tr>
<tr>
<td>200</td>
<td>5.09</td>
<td>5.39</td>
<td>2.27</td>
</tr>
</tbody>
</table>

Given the predominance of Westerly forces, there is a net drift of shingle in an easterly direction. This is estimated as approximately 4,500m³/year in the Shoreline Management plan (1996).
3.0 Surveys

All topographic and bathymetric surveys are referenced to a Global Positioning System (GPS) control grid, established for this programme, and conducted according to the current Environment Agency’s National Specification, summarised in the Explanatory Notes. The schedule of completed surveys since the start of the Regional Monitoring Programme is given in Table 3-1.

Table 3-1: Completed Survey Schedule

<table>
<thead>
<tr>
<th>Management Units 5 &amp; 6</th>
<th>Profile</th>
<th>Beach Plan</th>
<th>Post-storm</th>
<th>Bathymetric</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25/10/2003</td>
<td></td>
<td></td>
<td>14/09/2003</td>
</tr>
<tr>
<td></td>
<td>25/03/2004</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20/04/2005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20/06/2005</td>
<td>20/06/2005</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.1 Topographic

The topographic survey for 2005 is not complete at the western end of Management Unit 7 due to the Bulverhythe capital works scheme. At the conclusion of the capital works, a detailed topographic survey will be conducted and included in future analysis.

Digital Terrain Models of the 2003 Baseline topographic survey are shown at Figures 3.1 superimposed upon the ortho-rectified aerial photograph of 2001. Figures 3.2 and 3.3 illustrate the 2004 and 2005 Beach Management Plan survey, all of which are located in Annex B. The method used for deriving Digital Terrain Models is given in the Explanatory Notes (Annex A).

3.2 Bathymetric

A Hydrographic baseline survey conducted in 2003/04 is represented at contour intervals of 0.5m in Figures 3.4 (Annex C). The survey extends a kilometre offshore and is scheduled to be repeated in 2006.

In general both units exhibit a steady gradient down to depths in the region of -9m ODN at a kilometre offshore. The presence of rock platform accounts for several of the anomalies observed elsewhere in the data.
4.0 Difference Models

Now that a sufficient data set has been compiled, it has been possible to overlay the results of the baseline survey with the successive year’s data. This then enables comparative volumetric analysis to be undertaken to determine change over a given period. Through the use of three dimensional ground models and the ortho-rectified aerial photographs it has been possible to create a visual interpretation of the volumetric change that has occurred during each analysis period. This is shown in Figures 4.1 to 4.3 (Annex D), which indicate areas of net erosion or accretion (note that 0.25m difference in elevation is considered as “no change”) and the location of any extraction/deposition sites.

Figure 4.1 is the difference model of the 2004 survey minus the baseline survey (2003) with negative values representing erosion that has occurred during that past period and positive values accretion. Figure 4.2 is the difference model of the most recent survey minus the previous years survey and Figure 4.3 is the difference model of the most recent survey minus the baseline survey. This final figure represents the overall erosion or accretion that has taken place since the start of the programme.

Whilst these figures show an overall change in beach volume within each discrete ‘area change boundary’ it should be recognised that the data is based on the beach management survey, which is undertaken once each year. It is therefore only a snapshot in time and the particular dynamics of each frontage need to be considered. This will ensure that the information shown in the difference models represents the net change rather than capturing a particular extreme variation caused by a large event.

The following section of the report contains a narrative summarising the changes that have taken place over the last three years, and as part of this exercise a hypothesis of the processes driving these changes has been made. This has been carried out for a number of locations along the frontage, with the extent and nature of the change generally depicting the boundaries of each location. Also, to ensure that the results from the difference models are representative of net change rather than a particular event that may have been captured by the survey, the beach profiles have been cross referenced with the other profile surveys carried out on an annual basis. This then gives an indication of the beach variability over three time steps in each individual year.

4.1 Management Unit 5

To aid purposeful analysis the unit has been split into four sections as depicted in figure 4.1-1. These reflect changes in beach configuration and/or the presence of terminal structures.

4.1.1 Section 5.1

This section covers the 1.5km from Cooden to Veness Gap, the area has a number of timber groynes at 40-60m intervals. Several of these groynes are covered by shingle and at present provide little help in arresting sediment transport. Those that are above the current beach levels have an accumulation of shingle at the eastern end of each bay to the top of the existing groyne planks, thus it is apparent that shingle regularly moves over these structures in an easterly direction.

Over the last two years the section has gained over 27,000m³ of beach material, 13,000m³ from the summer of 2003 to 2004, and 14,000m³ in the last year up to July 2005. Given the net littoral drift is from west to east, this material is most likely to originated from Norman’s Bay, part of the Pevensey Bay PPP scheme.
Figure 4.1-1: MU 05 Beach Analysis sections
4.1.2 Section 5.2

Comprising 750m of groyned beach extending from Veness Gap to West Parade, this area lost 8,000m$^3$ in the year 2003/04 but this has been partly compensated for by a gain of 1,300m$^3$ in the last year, 2004/05. The majority of this loss occurred between the 2003 autumn survey and the subsequent spring 2004 survey, since then beach levels have remained relatively stable.

4.1.3 Section 5.3

The beach in front of West Parade exhibited a gain in beach volume of 10,000m$^3$ between 2003 and 2004, this would suggest that this area of the coast was the main beneficiary of the losses observed in the previous section. Despite this nearly 5,000m$^3$ of material was lost in the last year 2004/05, mainly from the western end of this section.

4.1.4 Section 5.4

The eastern end of the unit in the area of De La Ware displays an erosive trend between the 2003 and 2004. This trend extends throughout the section frontage with the highest volumetric losses being in front of the sailing club. In total this area lost over 11,000m$^3$ of material over this period.

In contrast the unit has gained 9,000m$^3$ of material during 2004/05, this is mainly observed at the western end of the section with the area in front of the sailing club continuing to erode.

Overall the management unit made a gain of some 4,500m$^3$ in the year 2003/04 and a much more significant increase of nearly 20,000m$^3$ during 2004/05, thus representing accretion in the region of 25,000m$^3$ since the project commenced in September 2003. The results and error estimates are summarised in table 4-1.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>13,230 m$^3$</td>
<td>14,198 m$^3$</td>
<td>+/− 2,990 m$^3$</td>
<td>27,428 m$^3$</td>
</tr>
<tr>
<td>5.2</td>
<td>-8,032 m$^3$</td>
<td>1,304 m$^3$</td>
<td>+/− 1,379 m$^3$</td>
<td>-6,728 m$^3$</td>
</tr>
<tr>
<td>5.3</td>
<td>10,321 m$^3$</td>
<td>-4,836 m$^3$</td>
<td>+/− 1,539 m$^3$</td>
<td>5,485 m$^3$</td>
</tr>
<tr>
<td>5.4</td>
<td>-11,056 m$^3$</td>
<td>9,258 m$^3$</td>
<td>+/− 1,663 m$^3$</td>
<td>-1,799 m$^3$</td>
</tr>
<tr>
<td>Total</td>
<td>4,462 m$^3$</td>
<td>19,924 m$^3$</td>
<td>-</td>
<td>24,386 m$^3$</td>
</tr>
</tbody>
</table>

* Error estimates are calculated as the survey area multiplied by a +/− 30mm error margin, although unlikely the error of combined surveys can be up to double this figure.
4.2 Management Unit 6

To aid purposeful analysis the unit has been split into three sections as depicted in figure 4.2-1. These reflect changes in beach configuration and/or the presence of terminal structures.

4.2.1 Section 6.1

Extending from De Le Ware to Sutton Place this area shows a highly erosive trend especially around the headland. Beach plan surveys demonstrate year on year losses totalling nearly 15,000m$^3$ over the course of the project.

4.2.2 Section 6.2

The area from Sutton Place through to the Bulverhythe scheme demonstrated accretionary trends along the whole length during 2003/04, with a net gain of over 16,000m$^3$. During 2004/05 this reversed with a net loss of 2,000m$^3$, which was mainly observed along the western end of the section.

4.2.3 Section 6.3

The last section comprises part of the Environment Agency Bulverhythe coastal defence scheme, constituting a combination of rock groynes and shingle replenishment. This has been ongoing for some time and due to the nature of the disturbance, and artificial introduction of beach material, a report will be issued later in the year on completion of the scheme. As a guide surveying that has been possible indicates a gain of 14,000m$^3$ over the last two years for the section.

Overall the management unit made a gain of some 14,000m$^3$ over the two years, however discounting the Bulverhythe area the rest of the unit has maintained the same overall volume of material. Losses in the east reflected with proportional gains in the middle of the unit. The results and error estimates are summarised in table 4-2.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>-9,249 m$^3$</td>
<td>-5,517 m$^3$</td>
<td>+/-1,364 m$^3$</td>
<td>-14,766 m$^3$</td>
</tr>
<tr>
<td>6.2</td>
<td>16,565 m$^3$</td>
<td>-1,903 m$^3$</td>
<td>+/-1,775 m$^3$</td>
<td>14,662 m$^3$</td>
</tr>
<tr>
<td>6.3</td>
<td>1,102 m$^3$</td>
<td>13,045 m$^3$</td>
<td>+/-2,135 m$^3$</td>
<td>14,147 m$^3$</td>
</tr>
<tr>
<td>Total</td>
<td>8,418 m$^3$</td>
<td>5,625 m$^3$</td>
<td>-</td>
<td>14,043 m$^3$</td>
</tr>
</tbody>
</table>

* Error estimates are calculated as the survey area multiplied by a +/- 30mm error margin, although unlikely the error of combined surveys can be up to double this figure

To provide a visual summary the data for the entire Bexhill frontage is illustrated as a graph in figure 4.2-2. This plots volume changes for each analysis polygon against the relevant easting value along the frontage. This clearly highlights the two largest zones of accretion, at the western end between Cooden and Veness Gap, and the Bulverhythe scheme. It also demonstrates the most erosive area around De La ware.
Figure 4.2-1: MU 06 Beach Analysis Sections
Figure 4.2-2: Summary of Bexhill Beach Analysis Polygons
5.0 Profile Evolution

While beach plan surveys provide a more accurate view of morphological change and beach volume levels, profiles still provide a visually more discernable impression of the beach cross section. Also, to ensure that the results from the difference models are representative of net change rather than a particular event that may have been captured by the survey, the beach profiles have been cross referenced with the other profile surveys carried out each year. This then gives an indication of the beach variability over three time steps in each individual year.

A Cross-sectional area (CSA) has been calculated for all beach profiles. This is calculated as the area of profile above a Master Profile. In general, the lower boundary of the Master Profile is the transition between the beach material and the foreshore. The landward boundary is either the seawall or, where a hard structure is not present, the landward extent of the stable part of the beach. The Master Profile is held constant for a given profile line and therefore the changes in CSA through time can be derived. Figure 5.1 (Annex E) shows the location of the profile lines, which are colour-coded to represent the change since the previous year and are labelled with the actual and percentage change in CSA.

5.1 Management Unit 5

This unit contains 85 profiles that are surveyed in conjunction with the annual beach plan survey, 19 of these are designated profiles, which are re-surveyed twice a year in Spring and Autumn and in the aftermath of major storm events. Annex F contains profile summary sheets for each designated line containing the latest survey (July 2005), profile envelope, photograph and trend analysis since the first survey in 2003.

5.1.1 Section 5.1 (4c01678 – 4c01639)

Profile data is consistent with the results of the beach plan surveys, in that the large levels of accretion observed in the latter are also evident in the profile surveys. Almost without exception profiles demonstrated an increase in cross sectional area (CSA) over the course of the project, with trends up to and over +20m²/year in places. Although slight increases in beach crest width, and accretion on the beach slope are evident in some areas, a large proportion of this material has been deposited on the lower beach. This is especially apparent along the eastern end of the section and has resulted in a seaward migration of the beach toe by over 10m in places, and a corresponding increase in the immediate foreshore level by 0.5m+ (Figure 5.1-1).

Figure 5.1-1: Example of accretion along lower beach
5.1.2 Section 5.2 (4c01638 – 4c01617)

Profiles in this area have predominately negative trends over the life of the project supporting the losses indicated in the beach plan surveys. The western end of the section faired worst with losses exceeding \(-30\text{m}^2/\text{year}\) in places, and reductions in beach crest width of up to 10m. In contrast the eastern end exhibited signs of accretion in places and has been relatively more stable.

![Figure 5.1-2: Example of increase in crest width](image)

5.1.3 Section 5.3 (4c01616 – 4c01594)

On the whole the profiles at the eastern end of this section exhibit accretionary trends, but the profiles on the western end are far more volatile. There is evidence to support the net gain over 2003/2004 and subsequent loss in 2004/05, but trends demonstrate a lot more variance in this half of the unit.

5.1.4 Section 5.4 (4c01592 – 4c01571)

There is a clear divide in performance of this unit, all profiles along the western stretch (4c01592-4c01584) have net positive trends, whereas all profiles east of this point (4c01582-4c01571) demonstrate erosional trends over the last two years.

In general the bulk of the losses observed at the eastern end occurred over the 2003/04 storm season, in contrast the gains at the western end were observed over 2004/05. This accretion is probably a result of the corresponding losses in section 5.3 over the same period.

The area in front of the sailing club is particularly erosive demonstrating a 10m reduction in beach crest width in the first year of monitoring alone.
5.2 Management Unit 6

This unit contains 59 profiles that are surveyed in conjunction with the annual beach plan survey, 14 of these are designated profiles, which are re-surveyed twice a year in Spring and Autumn and in the aftermath of major storm events. Those falling within the Bulverhythe frontage (Section 6.3) are not analysed in this report due to the on-going works. Annex F contains profile summary sheets for each designated line containing the latest survey (July 2005), profile envelope, photograph and trend analysis since the first survey in 2003.

5.2.1 Section 6.1 (4c01571 – 4c01551)

Profiles 4c01571-4c01562: This covers the area around the headland and all profiles show highly erosive trends year on year. This has been met with large reductions in beach crest widths and a corresponding change in beach gradient from 1:5 to 1:9 in places (Figure 5.2-1).

Profiles 4c01563-4c01551: On the whole these are more stable but show a much greater degree of variance, with respect to changes in CSA.

5.2.2 Section 6.2 (4c01550 – 4c01524)

Without exception all profiles in this section have accretionary trends over the course of the project, up to around +15m²/year. There is evidence to suggest that large proportions of this material arrived between the March and August 2004 surveys. This corresponds to the third largest storm of the year eight days before the August survey.

The slight loss of material over 2004/05, highlighted in the beach plan surveys, is also evident in the profile data.

5.2.3 Section 6.3 (4c01523 – 4c01495)

The last section comprises part of the Environment Agency Bulverhythe coastal defence scheme, constituting a combination of rock groynes and shingle replenishment. This has been ongoing for some time and due to the nature of the disturbance, and artificial introduction of beach material, a report will be issued later in the year on completion of the scheme.
6.0 Wave Climate

Wave records are recorded by a datawell directional wave rider buoy sited in Pevensey Bay. There were 4 storm events during this reporting period, where the $H_s$ at the peak of the storm exceeded 2.75m, namely on 19th August, 14th October, and 28th December during 2004, and on 8th January 2005. The late October storms were those that resulted in extensive coastal flooding in the West Country and were produced by Storm Force 10 winds, however the largest recorded significant wave height ($H_s$) was 3.53m and occurred during the January 2005 storm, wave statistics for which are presented below.

![Wave Statistics Graphs](image)

Figure 6.1-1: Example of wave statistics for January 2005 storm

A detailed analysis of the wave climate for July 2004 to June 2005 is given in Annex G.

7.0 Storm Events

There were a number of storm events, during the reporting period, that exceeded the storm threshold, but no additional post storm profiles have being taken. Systems have now been put in place to allow early notification of storm threshold ascendance thus allowing early mobilisation of survey contractors to collect post storm profile data.

Whilst the wave buoy at Pevensey Bay can alert the existence of a storm it is difficult to assess which areas of the coastline will have been affected. Local frontage managers can assist in this process by notifying the lead authority of any possible ‘damage’ to beaches so that survey contractors can be mobilised and the most beneficial data collected.
8.0 Performance Overview

8.1 Critical Beach conditions

There are two areas along the Bexhill frontage that give cause for concern. The first is the cliffed area east of Veness gap (Figure 8.1-1), beach levels here have eroded over the last two years with reductions in crest width and level in places. Second is the headland and adjacent beach near De La Ware.

![Figure 8.1-1: Erosive area east of Veness Gap](image)

The Cooden to Cliff End Strategy Plan (2002) sets out proposed beach crest levels for both units, for illustrative purposes these are presented in figure 8.1-2. Current beach crest levels at the seawall are also shown, these were derived from the June 2005 profiles, for means of comparison. Trigger levels have also been extracted from the strategy plan comprising an ‘action’ (yellow) and ‘emergency’ (red) level for each section.

Given these values the majority of the unit is in very good shape with beach crest levels around or exceeding the proposed levels. The one area where this does not hold true is the region around Veness Gap, here beach crest levels are up to a metre below the recommended value of 6.1m, which is the current seawall height. Furthermore the levels are in places only half a metre above the alarm value set in the strategy, and the beach has demonstrated an erosional trend over the last two years, consequently remedial action may be required in the future. That said it should be noted that the seawall is backed by cliffs so there is no immediate risk of flooding, although increased overtopping may lead to greater erosion rates of the cliff that supports a number of residential properties.

Despite comparable beach crest levels to those proposed in the strategy plan, along much of the coast, it should be kept in mind that these also recommend a minimum crest width that is often not present at eroding areas in this unit.

The area in front of De La Ware Parade represents the most erosive section of coastline along the whole Bexhill frontage having lost somewhere around 20,000m³ of material over the last two years. This is especially prominent around the out cropping headland, where crest widths have been markedly reduced. Given the amount of material lost this area should be carefully monitored to ensure this trend does not continue at its current rate and beach levels begin to stabilise. Intuitively, now that beach levels have dropped well below current groyne levels, it should be expected that the rate of sediment transport should be reduced in future years.
Figure 8.1-2: Comparison of current and proposed beach crest levels
8.2 Sediment Budget

It is difficult to reach any conclusions with a high degree of confidence given the relatively short-term trends produced over a three year monitoring period. The data collected to date does however provide an insight into the accuracy of conclusions drawn in previous studies.

Net sediment transport rates are quoted as 4,500 m$^3$/year easterly in the Shoreline Management Plan (2000), whereas the Cooden to Cliff End Strategy Plan (2002) estimates them at 5,000 m$^3$/year with a variability of ±5,000m$^3$. In reality transport rates vary throughout the frontage dependant on type/condition of controlling structures, amount of beach material, orientation of coastline and exposure to hydrodynamic conditions.

Loss rates for shingle along the Bexhill frontage are quoted as -5,000 m$^3$/year in the strategy plan. In contrast monitoring data collected thus far indicates a net gain of +12,000 m$^3$/year, and this figure does not include the replenishment at Bulverhythe. This is a bit deceptive in that management unit 6 has maintained the same net beach volume over the last two years (excluding Bulverhythe), whereas management unit 5 has gained over 24,000 m$^3$/year of material over the same period, 20,000 m$^3$ of which accreted over 2004/05. This influx of material undoubtedly came from the West and is most probably a product of replenishment schemes associated with the Pevensey Bay area. These figures contradict previous reports and show a reversal in what has traditionally been called an eroding coastline, however it should be remembered that these only reflect a very small time frame and may be somewhat of an anomaly.

De La Ware in contrast is the most erosive area and has lost over 20,000 m$^3$ of material during the last two years (Figure 8.2-2). Although this was counteracted by gains elsewhere in the unit, it would seem to suggest that net sediment transport rates have exceeded those in previous reports of around 5,000 m$^3$ (E) by up to four times. Despite the large losses in this area, now that beach levels have dropped well below the current groyne levels, the rate of erosion and degree of sediment transport should be markedly reduced in future years.

Any accretion in future years is highly dependant on activities down drift at the Pevensey Bay Scheme, which can have a profound effect on the sediment input at the western end of Bexhill. In addition many of the groynes that are in place only perform a limited holding role with current beach levels regularly overtopping them (Figure 8.2-1). The Cooden to Cliff End Strategy Plan (2002) highlights the limited residual life of some groynes due to their dilapidated condition. This has serious implications to the sediment budget, as these become less effective sediment transport rates are going to increase resulting in higher rates of erosion.

Figure 8.2-1: Example of dilapidated groyne
Now that beach levels have dropped significantly below the current groyne heights they should become more effective as controlling structures. Future net sediment transport can be expected to decrease reducing the highly erosive trend observed over the last two years.
9.0 Special Site Conditions

9.1 Environmental

Bexhill has several environmental designations areas, one of the most significant being Cooden Cliffs SNCI, which is of great geological and biological importance. This is an area of low, steep cliffs with patches of fine grassland and some maritime species. In addition rocky intertidal areas have their characteristic fauna and flora and are particularly interesting because of their isolated position on a predominately shingle and soft sediment coast.

9.2 Archaeological

Marine archaeology is extremely important along this frontage, and the potential for future discoveries has lead to the whole coastline as far as Fairlight Cove being designated as an archaeological site. Two features of particular note are the wreck of the ‘Amsterdam’ the only known well preserved example of a Dutch East Indiaman, lost in 1749 offshore from Bulverhythe, and an ancient wrecked boat located off the beach near Cooden. Both these sites have received designation under the protection of wrecks act.

10.0 Coastal Works

10.1 Recycling

No records of recycling activities have been received, and it is presumed none have taken place. Bexhill does not lend it self to regular beach recycling operations due to the lack of a suitable borrow area, there are no large terminal structures, or areas that demonstrate consistent long-term accretion.

10.2 Replenishment

Although there have been no replenishment schemes along the Bexhill frontage the area is influenced by the Bulverhythe coastal defence scheme to the west, and the heavily managed section to the east, namely Pevensey Bay. Given the predominant sediment drift is from west to east, the Bexhill area is unlikely to benefit from the replenishment along the Bulverhythe frontage. Despite this the management activities throughout the Pevensey Scheme have a profound influence on the sediment budget in Bexhill, dictating to a large extent the amount of sediment that is available to naturally enter the frontage from the east.
11.0 Conclusions

Bexhill coastline has produced somewhat surprising results over the course of the monitoring project. Previous studies all point to an eroding coastline losing in the region of 5,000m$^3$/year along the frontage. In stark contrast the monitoring data for 2003-2005 demonstrates a gain of 12,000m$^3$/year. Given the predominant west-east drift direction this has mainly originated from the neighbouring management units, namely the Pevensey Bay coastal defence scheme. This is supported by the largest net gain being observed in management unit five. This unexpected increase in sediment supply is most likely due to management activities along the adjacent coast, which has had a number of replenishments in the last few years.

Sediment transport rates may also have been underestimated in previous reports. Beach plan data indicates they could be as high as 20,000m$^3$/year eastwards along the most erosive parts of the frontage; this is opposed to a net easterly drift of around 5,000m$^3$ presented in the SMP (2000) and up to 10,000m$^3$ in the Strategy Plan (2002). De La Ware has proved the most erosive area over the last two years, losing over 20,000m$^3$ of material in the vicinity of the outcropping headland. The two largest areas of accretion are the western end of management unit five (Cooden – Veness Gap) and the western end of management unit six just prior to the Bulverhythe scheme (Sutton Place – Bulverhythe).

Beach crest levels are on the whole consistent with the proposed strategy plan levels. The one exception to this is the area around Veness Gap where crest levels are up to a metre below proposed heights and only half a metre above the designated ‘action’ level. In addition this area exhibits an erosional trend and as such should be monitored carefully in future years.

Hydrodynamic conditions have been relatively mild over the last storm year (2004/05) with only five storms exceeding the storm threshold of a 2.75m significant wave height ($H_s$) at the Pevensey wave buoy. The largest event occurred in January 2005 where the significant wave height peaked at 3.53m. During 2003/04 there were far more storms, nineteen, generally of a greater magnitude.

It is important to recognise the inconsistency in short-term trends. As with many coastal areas a lot of annual variability is expected, thus drawing conclusions with increased confidence will become possible as more data is collected, with regards annual losses, net sediment drift and erosion/accretion trends in section sub-units.

Scheduled future monitoring includes profile surveys in Autumn 2005 and Spring 2006, in addition storm surveys may be carried out if any event is deemed to have significantly affected the frontage. An interim report will be issued on completion of the spring profile survey, with the next BMP report scheduled to be issued after completion of the Summer 2006 beach plan survey. All historic monitoring data is available on the website (www.channelcoast.org), future surveys will be obtainable after satisfying the projects quality assurance procedures.