South West Regional Coastal Monitoring Programme

Annual Survey Report
Dawlish Warren to Start Point
2016

AR56
September 2016
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<tr>
<td>Date</td>
<td>September 2016</td>
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<td>Project Name</td>
<td>South West Regional Coastal Monitoring Programme</td>
</tr>
<tr>
<td>Author</td>
<td>J W Webborn</td>
</tr>
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* Presented on the CD accompanying printed copies of this report distributed by the Plymouth Coastal Observatory.
Summary

This report contains changes to the beaches and wave conditions that have been measured and recorded by the South West Regional Coastal Monitoring Programme from Dawlish Warren to Start Point. The data set analysed is from the previous year and 2007 when the Programme began.

Over the last year, the majority of the survey units have experienced erosion. Between Dawlish Warren and Teignmouth the overall trend has been for erosion for all of the survey units. Erosion is most noticeable for both the Dawlish Warren (6bSU16-3) and Dawlish (6bSU17) survey units. Between Oddicombe Beach (6bSU20-1) and Broadsands (6bSU21-8) there has been a mixture of erosion and accretion throughout each of the survey units. Start Bay has mainly experienced erosion with the exception on the eastern ends of Slapton Sands and Beesands and the whole of Blackpool Sands which have experienced accretion.

Since 2007, similarly to the year on year analysis, a trend for erosion is apparent across the sub cell. Between Dawlish Warren (6bSU16-3) and Teignmouth (6bSU18-1) the majority of the survey units have experienced erosion, with the exception of the Teign Estuary (6bSU18-2) which has seen an overall trend for accretion. Both Dawlish Warren (6bSU16-3) and Dawlish (6bSU17) have experienced high levels of erosion with the majority of profiles loosing material, with the exception of a couple of profiles at the eastern ends of the survey units which have accreted. Towards the centre of the sub cell between Oddicombe Beach (6bSU20-1) and Broadsands (6bSU21-8) there has been a mixture of erosion and accretion throughout each of the survey units, with the majority experiencing erosion. Similar to the year on year analysis, Start Bay has experienced erosion with the exception of the eastern ends of Slapton Sands (6bSU26-1) and Beesands (6bSU26-2) and the whole of Blackpool Sands (6bSU25-2) which have experienced accretion. Hallsands (6bSU26-3) has experienced high levels of erosion with each profile losing >50m$^2$ of material.

Repeat Baseline site 6bSU16-3 (Dawlish Warren) has lost 10% of its beach volume in the last year, and 35% since 2007. Repeat Baseline site 6bSU26-1 (Slapton Sands) has lost 3% of its beach volume in the last year and 22% since 2007. Repeat Baseline site 6bSU26-2 (Beesands) has lost 7% of its beach volume in the last year, and 17% since 2007. Repeat Baseline site 6bSU26-2 (Hallsands) has lost 18% of its beach volume in the last year, and 31% since 2007.

Over the past year the Dawlish Directional Waverider Buoy recorded five storms that exceeded the 2.6m threshold between April 2015 and March 2016. The waves were recorded approaching primarily from the south or southeast. The Tor Bay Directional Waverider Buoy recorded five storms that exceeded the 2.1m threshold between April 2015 and March 2016. The waves were recorded approaching primarily from the east or southeast. Finally, the Start Bay Directional Waverider Buoy recorded five storms that exceeded the 3m threshold between April 2015 and March 2016. The waves were recorded approaching primarily from the south or southeast.
South West Regional Coastal Monitoring Programme

Annual Survey Report 2016 – Dawlish Warren to Start Point

Introduction

Analysis presented in this report provides an overview of beach changes and wave and tidal measurements since the commencement of the South West Regional Coastal Monitoring Programme. The first beach surveys took place during the spring of 2007 and changes are reported until spring 2016.

Data are presented at the following levels:

• Process Cell
  o Process cell summary of percentage and actual profile change from Spring 2015 to Spring 2016.
  o Process cell summary of percentage and actual profile change from Baseline 2007 to Spring 2016.

• Survey Unit
  o Detailed beach profile change from Spring 2015 to Spring 2016.
  o Detailed beach profile change from Baseline 2007 to Spring 2016.
  o Topographic difference model change from Repeat Baseline 2015 to Repeat Baseline 2016 (where available).
  o Topographic difference model change from Baseline 2007 to Repeat Baseline 2016 (where available).
  o Change in position of Mean High Water contour (where available).
  o Beach sediment distribution (where available).
  o Time series of beach profile graphs*.
  o Trend analysis of beach cross-sectional area*.

*Note that beach profile graphs and cross-sectional area charts are presented on the CD accompanying hard copies of this report distributed by the Plymouth Coastal Observatory.

The process cell summary maps provide an at-a-glance summary of the changes during the past year and over the longer term. It is recommended that the user should use the maps to identify areas of interest and then examine the individual profile plots and trends. Colour-coded lines highlight areas of maximum change and identify profiles which might need closer examination.

Lines are colour-coded based on actual change; percentage change is displayed in brackets following the profile name on each line. Please note that lines on the map have been extended for clarity and therefore may not represent the actual distance surveyed.

Difference models have been produced where there are at least two baseline surveys to compare. Where available, the most recent LiDAR data has been used to extract the level of Mean High Water (MHW) for each survey unit, and where possible, sediment distribution maps are produced from the latest topographic baseline survey information.
It must be appreciated that the accuracies of each measurement system must be taken into account when drawing conclusions, particularly from the difference models. In the case of topographic difference models from RTK GPS surveys, the accuracy of each data point is ±0.03m and therefore differences of ±0.06m can generally be considered as "real", whilst smaller changes may be an artefact of the measuring system, and are considered to be "No Change". Difference plots show changes >±0.25m, which should be indicative of areas of genuinely measurable change. Smaller changes may also be present but these are filtered from the analysis to provide clarity. This report displays difference models only where detailed analysis suggests that the changes are real but, nevertheless, the user should approach the results as indicative, unless reinforced overtime or with other information.

Where LiDAR has provided the source data sets, the modelling is less precise. Each LiDAR cell value has a plan position representative of a 1m² grid. It is not reasonable to expect to observe changes with positional accuracy of better than 1-2m therefore. Profiles of steep slopes may suggest that the changes "bounce" back and forth. This is an artefact of the accuracy of the source data. LiDAR is particularly ineffective at identifying sharp edges or steep slopes e.g. cliffs, seawalls. Despite these limitations in accuracy the changes shown indicate an overview of profile change, but to a lower precision than the RTK data. The location of the regularly surveyed profiles superimposed on the difference plots indicates how representative these profiles might be of overall changes.

It must be emphasised that this is only the eighth report of a series and that changes identified are indicative only of relatively short-term trends.
Dawlish Directional Waverider Buoy

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**Instrument type**

Datawell
Directional Waverider Mk III

**Water depth**

~11 m CD

Buoy in situ off Dawlish beach. Photo courtesy of Fugro EMU Limited

**Location of buoy (Google mapping)**

**Summary**

During this reporting period from April 2015 to March 2016, there was a high frequency of storms of typical magnitude for the site with six events exceeding the 2.75m storm threshold. The largest event on 01 January 2016 reached 3.99m Hs, close to High Water. December had the highest average wave height and percentage occurrence of bimodal seas ever measured for that month.

**Data Quality**

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<th>Sample interval</th>
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**Monthly Averages – 2015/16**

*All times are GMT*

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Storm Analysis

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Distribution plots

The distribution of wave parameters are shown in the accompanying graphs of:
- Monthly time series of H_s (red line is 2.75 m storm threshold)
- Incidence of storms during the reporting period and for all previous years. Storm events are defined using the Peaks-over-Threshold method. The highest H_s of each storm event is shown
- Percentage of occurrence of H_s, T_p, T_z and Direction from April 2015 to March 2016
- Wave rose (percentage of occurrence of Direction vs. H_s) for all measured data

General

The wave buoy at Dawlish was deployed on 07 December 2010, at which time the magnetic declination at the site was 2.7° west, changing by 0.15° east per year.

Acknowledgements

Tidal predictions were produced using the TASK windows edition software, kindly provided by the Marine Data Products team at the UK National Oceanography Centre (Liverpool).

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* Tidal information is obtained from the nearest recording tide gauge (the WaveRadar REX in Exmouth Marina). 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.
Annual Survey Report
Dawlish Warren to Start Point 2016

Offshore Wave Hs (m)
Dawlish WB: 07/12/2010 - 31/03/2016

- >= 0.00 < 0.50 (m)
- >= 0.50 < 1.00 (m)
- >= 1.00 < 1.50 (m)
- >= 1.50 < 2.00 (m)
- >= 2.00 < 2.50 (m)
- >= 2.50 < 3.00 (m)
- >= 3.00 < 3.50 (m)
- >= 3.50 < 4.00 (m)
- >= 4.00 < 4.50 (m)
- >= 4.50 < 5.00 (m)
- >= 5.00 < 5.50 (m)
- >= 5.50 < 6.00 (m)
- >= 6.00 < 998.00 (m)
Tor Bay Directional Waverider Buoy

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Instrument type

Datawell Directional Waverider Mk III

Water depth

~11m CD

Buoy in situ in Tor Bay. Photo courtesy of Fugro EMU Limited

Location of buoy (Google mapping)

Summary

During this reporting period from April 2015 to March 2016, five storms of typical magnitude for the site exceeded the 2.1m storm threshold. The largest storm on 01 January 2016 reached 2.94m $H_s$ close to High Water.

Data Quality

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Monthly Averages – 2015/16

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All times are GMT
Storm Analysis

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<th>Date/Time</th>
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<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>
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Distribution plots

The distribution of wave parameters are shown in the accompanying graphs of:

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- Wave rose (percentage of occurrence of Direction vs. $H_s$) for all measured data

General

The buoy was first deployed on 4 July 2008, at which time the magnetic declination at the site was 3.0° west, changing by 0.15° east per year.

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Annual Survey Report

Dawlish Warren to Start Point 2016

Hs at Tor Bay Apr 2015 to Mar 2016

Day in month

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Jan

Feb

Mar
Start Bay Directional Waverider Buoy

<table>
<thead>
<tr>
<th>Location</th>
<th>OS</th>
<th>WGS84</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>285001 E 44852 N</td>
<td>Latitude: 50° 17.542' N  Longitude: 03° 36.948' W</td>
</tr>
</tbody>
</table>

**Instrument type**
- Datawell
- Directional Waverider Mk III

**Water depth**
~-10m CD

Buoy in situ in Start Bay. Photo courtesy of Fugro EMU Limited

Location of buoy (Google mapping)

### Summary

During this reporting period from April 2015 to March 2016, five storms of typical magnitude for the site exceeded the 3.0m storm threshold. The three largest storms all occurred around High Water, with the second highest on 30 December 2015 occurring on spring tides. This storm also contained some long period waves of around 12 seconds leading to bimodal spectra in the first half of the storm. December also had the highest average wave height and percentage occurrence of bimodal seas ever measured for that month.

### Data Quality

<table>
<thead>
<tr>
<th>Recovery rate (%)</th>
<th>Sample interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>99</td>
<td>30 minutes</td>
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</tbody>
</table>

### Monthly Averages - 2015/16

*All times are GMT*

<table>
<thead>
<tr>
<th>Month</th>
<th>Hs (m)</th>
<th>Tp (s)</th>
<th>Ts (s)</th>
<th>Dir. (°)</th>
<th>SST (°C)</th>
<th>No. of days</th>
<th>Bimodal seas (%)</th>
</tr>
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<tbody>
<tr>
<td>April</td>
<td>0.59</td>
<td>8.3</td>
<td>4.1</td>
<td>152</td>
<td>10.2</td>
<td>30</td>
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<tr>
<td>May</td>
<td>0.58</td>
<td>7.7</td>
<td>4.2</td>
<td>165</td>
<td>11.7</td>
<td>31</td>
<td>3</td>
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<tr>
<td>June</td>
<td>0.50</td>
<td>7.7</td>
<td>4.0</td>
<td>156</td>
<td>13.7</td>
<td>30</td>
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<tr>
<td>July</td>
<td>0.50</td>
<td>7.4</td>
<td>4.0</td>
<td>166</td>
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<td>August</td>
<td>0.47</td>
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<td>September</td>
<td>0.68</td>
<td>6.6</td>
<td>4.0</td>
<td>138</td>
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<tr>
<td>October</td>
<td>0.85</td>
<td>7.1</td>
<td>4.3</td>
<td>135</td>
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<td>November</td>
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<td>8.8</td>
<td>4.5</td>
<td>172</td>
<td>14.0</td>
<td>30</td>
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<tr>
<td>December</td>
<td>1.43</td>
<td>9.6</td>
<td>5.0</td>
<td>179</td>
<td>12.4</td>
<td>31</td>
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<td>January</td>
<td>1.21</td>
<td>9.5</td>
<td>5.3</td>
<td>171</td>
<td>10.9</td>
<td>28</td>
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<tr>
<td>February</td>
<td>1.06</td>
<td>9.9</td>
<td>5.0</td>
<td>163</td>
<td>9.9</td>
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<td>March</td>
<td>0.82</td>
<td>9.0</td>
<td>4.6</td>
<td>156</td>
<td>9.2</td>
<td>31</td>
<td>4</td>
</tr>
</tbody>
</table>
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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<tbody>
<tr>
<td>01-Jan-2016 23:30</td>
<td>3.89</td>
<td>8.3</td>
<td>6.5</td>
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<td>1.75</td>
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<td>30-Dec-2015 09:30</td>
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<td>188</td>
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<td>06-Feb-2016 17:00</td>
<td>3.23</td>
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<td>-0.04</td>
<td>HW-5</td>
<td>2.1</td>
<td>-</td>
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</tbody>
</table>

Distribution plots

The distribution of wave parameters are shown in the accompanying graphs of:

- Monthly time series of $H_s$ (red line is 3.0 m storm threshold)
- Incidence of storms during the reporting period and for all previous years. Storm events are defined using the Peaks-over-Threshold method. The highest $H_s$ of each storm event is shown
- Percentage of occurrence of $H_s$, $T_p$, $T_z$ and Direction from April 2015 to March 2016
- Wave rose (percentage of occurrence of Direction vs. $H_s$) for all measured data

General

The buoy was first deployed on 5 April 2007, at which time the magnetic declination at the site was 3.2° west, changing by 0.15° east per year.

Acknowledgements

Tidal predictions were produced using the TASK windows edition software, kindly provided by the Marine Data Products team at the UK National Oceanography Centre (Liverpool).

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* Tidal information is obtained from the nearest recording tide gauge (the WaveRadar REX in Exmouth Marina). 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.
Annual Survey Report

Storms at Start Bay from Apr 2015 to Mar 2016

Storms at Start Bay - all years

Start Bay Apr 2015 to Mar 2016

% of occurrence

Hs (metres)

Tp (seconds)

Direction (degrees)

Tz (seconds)
Offshore Wave Hs (m)
Start Bay WB: 05/04/2007 - 31/03/2016

- >= 0.00 < 0.50 (m)
- >= 0.50 < 1.00 (m)
- >= 1.00 < 1.50 (m)
- >= 1.50 < 2.00 (m)
- >= 2.00 < 2.50 (m)
- >= 2.50 < 3.00 (m)
- >= 3.00 < 3.50 (m)
- >= 3.50 < 4.00 (m)
- >= 4.00 < 4.50 (m)
- >= 4.50 < 5.00 (m)
- >= 5.00 < 5.50 (m)
- >= 5.50 < 6.00 (m)
- >= 6.00 < 998.00 (m)
The table below gives the target and completion dates for topographic surveys between spring 2015 and the repeat baseline surveys of 2016.

<table>
<thead>
<tr>
<th>Topographic Survey Type</th>
<th>Spring interim Profile 2015 Target</th>
<th>Spring interim Profile 2015 Completion</th>
<th>Autumn interim Profile 2015 Target</th>
<th>Autumn interim Profile 2015 Completion</th>
<th>Post-Storm Repeat Baseline 2015 Target</th>
<th>Post-Storm Repeat Baseline 2015 Completion</th>
<th>Spring interim Profile 2016 Target</th>
<th>Spring interim Profile 2016 Completion</th>
<th>Post-Storm Repeat Baseline 2016 Target</th>
<th>Post-Storm Repeat Baseline 2016 Completion</th>
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<tr>
<td>6bSU16-3</td>
<td>31/03/2015</td>
<td>25/03/2015</td>
<td>23/04/2015</td>
<td>31/08/2015</td>
<td>20/08/2015</td>
<td>31/12/2015</td>
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<td></td>
</tr>
<tr>
<td>6bSU26-2</td>
<td>31/03/2015</td>
<td>07/03/2015</td>
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</tr>
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<td></td>
</tr>
</tbody>
</table>

For the most recent survey schedules for each survey unit please see http://southwest.coastalmonitoring.org/latest-updates/survey-schedule/
Topographic Survey Report

Profile Data

Analysis has been conducted for those sites where a minimum of three surveys have been recorded. In general, changes are measured relative to the Mean Low Water Springs (MLWS) level. In cases where none of these levels can be reached the master profile is placed at the most appropriate level for the survey unit in question.

A full time series of plotted beach profiles is shown superimposed on and relative to a Master Profile for each profile location. The Master Profile provides the basis for calculation of beach cross-section area changes. Where possible, identical depth boundaries have been used for all profiles within a survey unit. However, even where this has not been possible, direct comparisons can be made for the beach cross sectional area at one profile over time, since the master profile is constant for each profile (Figure 1). In some instances, raising the lower depth of the Master Profile may reduce the overall cross sectional area of the profile. This may cause small changes in the beach profile to have a large impact on the percentage change. This effect has been taken into account in the analysis of change to beach profiles. The trend in cross-sectional area (CSA) is presented as a graph for each profile (Figure 2).

Figure 1: Example Master Profile with CSA Calculated from the Surveyed GPS Profile
**Figure 2: Example of Beach Cross-Sectional Area Trend Analysis**

**Baseline Data**

As part of the Monitoring Programme specification, each survey unit receives a full topographic baseline survey once every five years. In addition, highly managed sites, or those with a beach management plan, receive an annual baseline survey. Baseline surveys include a full profile survey at 50m intervals and continuous spot height data collected at approximately 1m intervals across the whole beach to the level of MLWS. This continuous data also includes a feature code for each spot height data point recorded, indicating the surface sediment type.

Where there are at least two baseline surveys for a survey unit, a topographic difference model is produced based on the spot height elevations. The raw spot height data is processed into a grid model and successive models are subtracted from one another to produce a difference model for the survey unit. The spot height data from each survey can be used to derive Mean High Water (MHW) and Mean Low Water (MLW) contours along each survey unit. In some cases, where there is no topographic baseline data collected, the information described above may be derived from LiDAR data.

**Process Cell**

The Beach Change Summary maps contain an at-a-glance condition of the whole area between Dawlish Warren and Start Point, with the lines representing the average accretion, no change or erosion for each survey unit where there is topographic data.
**Survey Unit**

Topographic changes within each survey unit are summarised on six maps where applicable:

- Beach change map (Spring to Spring).
- Beach change map (Baseline to Spring).
- Topographic difference model map (2007 Baseline to 2016 Repeat Baseline).
- Topographic difference model map (2015 Repeat Baseline to 2016 Repeat Baseline).
- Mean High Water line.
- Sediment distribution maps.

Beach change maps show the location of each beach profile, superimposed on an aerial photograph (note that the line may be extended for clarity). Where possible, the annual change in cross-sectional area has been calculated from Spring 2015 to Spring 2016 and from Baseline 2007 to Spring 2016.

**Survey Schedules**

Spring interim surveys are conducted between January and March each year. Baseline and repeat baseline surveys are carried out between April and August. A minimum of 8 weeks must elapse between successive surveys. The dates of individual surveys are given in the topographic survey record and with the analysis for each survey unit.
EXPLANATORY NOTES

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.

\[
\frac{CSA_1 - CSA_2}{CSA_2} \times 100 \quad \text{eqn(1)}
\]

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.

Net Sediment Volume Calculation

This is the volume change in m\(^3\) across each individual survey unit over time. The initial volumes are derived from the Digital Terrain Models (DTM) made for consecutive baseline topographic surveys. Both models are clipped to cover the same area, and a volume above the MLWS plane is calculated for each DTM. The net sediment change is calculated as

\[
Vol_1 - Vol_2 \quad \text{eqn(2)}
\]

Where Vol\(_1\) = most recent DTM model volume and Vol\(_2\) = earlier DTM model volume. Therefore a net change of -19,730m\(^3\) represents erosion since the earlier survey.
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

- Survey Unit Boundary

Legend:
- Accretion
- No Change
- Erosion

Map indicates changes in cross-sectional area with symbols representing different change levels.
South West Regional Coastal Monitoring Programme

Beach Change Summary - Baseline 2007 to Spring 2016

Annual Survey Report 2016

South Devon

Actual Change in Cross-sectional Area
(Baseline 2007 to Spring 2016)

Survey Unit Boundary

Accretion
No Change
Erosion

±

km

0
4
8
### Survey Unit

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Dates Surveyed</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring-Spring</td>
<td>25/03/2015 - 22/03/2016</td>
<td>Over the past year, the dominant trend for this survey unit has been for erosion. Profiles 6b00007, 6b00009, 6b00011, 6b00017 and 6b00019, at the western end of the beach, have experienced high levels of erosion. Profile 6b00009 has seen the greatest change, losing 147m³ of material. This has resulted in a large recession of the beach face and a shallower beach slope which has also occurred on profiles 6b00011 and 6b00014. Towards the middle of the beach, profiles 6b00024 to 6b00030 have experienced low level accretion, increasing their cross-sectional areas by up to 7%. Towards the eastern extent of the beach, profiles 6b00031 to 6b00046A have experienced erosion with profile 6b00032 seeing the greatest change, losing 38% of its cross-sectional area. Some low level accretion has occurred on profiles 6b00051 and 6b00056.</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>18/04/2007 - 22/03/2016</td>
<td>Since 2007, high level erosion has dominated the survey unit with the majority of profiles losing significant amounts of material, up to 587m³ on profile 6b00017. Consequently, profiles 600009 to 600021 have seen a large recession of the beach face of up to 140m on some profiles. Accretion has occurred on profile 6b00007 at the distal end of the spit, increasing its cross-sectional area by 14%.</td>
</tr>
<tr>
<td>Spring-Spring</td>
<td>20/08/2015 - 04/07/2016</td>
<td>A large area of erosion can be seen towards the eastern end of the Warren. Some low level erosion has also occurred towards the western end of the Warren at the top of the beach. Low level accretion has occurred at the beach front towards the middle of the Warren and also at the eastern and western ends. Towards the middle of the spit, accretion has occurred mainly at the top section of the beach in between the groyne field.</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>18/04/2007 - 04/07/2016</td>
<td>Since 2007, there has been high level erosion towards the distal south eastern end of the spit with a 5m drop in elevation in places. This has resulted in a large recession of the beach up to 140m at the southern end of the spit. Towards the north eastern of the spit there has been a large area of beach that has accreted, seeing a &gt;3m increase in elevation. Towards the proximal end of the Warren, erosion has dominated a large area at the top of the beach, with small areas of accretion and little change present. An area of high level erosion is apparent towards the western end of the survey unit, resulting in a lowering of the beach of up to &gt;3m in front of the sea wall. Smaller areas of no change are present throughout the survey unit.</td>
</tr>
</tbody>
</table>

### Comments

Note the large gap in the spring to spring topographic difference model towards the eastern end of the spit is as a result of very dense vegetation.
<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>CSA Diff (m³)</td>
<td>% Change</td>
<td>CSA Diff (m³)</td>
</tr>
<tr>
<td>6b00002</td>
<td>-3.25</td>
<td>0</td>
<td>-8.64</td>
</tr>
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<td>6b00005</td>
<td>-4.13</td>
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<td>6b00007</td>
<td>-52.88</td>
<td>-9</td>
<td>65.23</td>
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<tr>
<td>6b00009</td>
<td>-146.88</td>
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<td>-262.14</td>
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<td>6b00011</td>
<td>-57.38</td>
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<td>-81.21</td>
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<td>-58.68</td>
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<td>-7.59</td>
</tr>
</tbody>
</table>
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

Survey Unit Boundary
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

Survey Unit Boundary

Accretion
Erosion
No Change

Aerial Photography from 2012

SDADCAG - South Devon
Actual Change in Cross-sectional Area
(Baseline 2007 to Spring 2016)

- Survey Unit Boundary

- 6b00038 (44%)
- 6b00006 (26%)
- 6b00051 (9%)
- 6b00046A (42%)
- 6b00056 (29%)

- Accretion
- No Change
- Erosion

- > 30 m²
- 15 - 30 m²
- 5 - 15 m²
- < 5 m²

- 15 - 30 m
- 5 - 15 m
- < 5 m

Aerial Photography from 2012

SDADCAG - South Devon
Change in Elevation (m) Between August 2015 and July 2016

Model Extent

- EROSION
- NO CHANGE
- ACCRETION

Change in Elevation (m)
Change in Elevation (m) Between April 2007 and July 2016

Model Extent

Change in Elevation (m)

ACCRETION
EROSION
NO CHANGE

< -3
-3 ≤ -2.5
-2.5 ≤ -2
-2 ≤ -1.5
-1.5 ≤ -1
-1 ≤ -0.5
-0.5 ≤ 0
0 ≤ 0.5
0.5 ≤ 1
1 ≤ 1.5
1.5 ≤ 2
2 ≤ 2.5
2.5 ≤ 3
3 ≤ 3.5

Aerial Photography from 2012
Change in Elevation (m) Between April 2007 and July 2016

Model Extent

Change in Elevation (m)

Erosion
No Change
Accretion

<= -3
-3.25 - -0.25
-0.25 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 3.25

Aerial Photography from 2012

South West Regional Coastal Monitoring Programme
Annual Survey Report 2016

SDADCAG - South Devon
Contours

- MHW 2016-03
- MHW 2007 - 10
- MHW 2014 - 06
- MHW 2007 - 04
- MHW 2010 - 01
- MLW 2016-03

MHW Elevation: 1.56OD
MLW Elevation: -1.34OD
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<tr>
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<td>Grass</td>
<td>Green</td>
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<td>Gravel &amp; Mud</td>
<td>Teal</td>
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<td>Mud</td>
<td>Gray</td>
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<tr>
<td>Mud &amp; Sand</td>
<td>Medium Gray</td>
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<td>Shell</td>
<td>Pink</td>
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<td>Water Body</td>
<td>Blue</td>
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<tr>
<td>Saltmarsh</td>
<td>Green</td>
</tr>
<tr>
<td>Sea Defence</td>
<td>Red</td>
</tr>
<tr>
<td>Obstruction</td>
<td>Black</td>
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<tr>
<td>Mixture</td>
<td>Teal</td>
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Sediment Type
- Gravel
- Gravel & Sand
- Sand
- Boulder
- Dune
- Dune Vegetated
- Grass
- Gravel & Mud
- Mud
- Mud & Sand
- Rock
- Saltmarsh
- Sea Defence
- Shell
- Water Body
- Mixture
- Obstruction

Aerial Photography from 2012

0 150 300 m

SDADCAG - South Devon
### Survey Unit
6bSU17

### Local Name
Dawlish

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Dates Surveyed</th>
<th>Observations</th>
</tr>
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<tbody>
<tr>
<td>Spring-Spring</td>
<td>Beach Change</td>
<td>20/03/2015 - 21/03/2016</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>Beach change</td>
<td>19/04/2007 - 21/03/2016</td>
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### Comments

### Profile Cross-Sectional Area

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
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<tr>
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<td>-17.99</td>
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<td>6b00119</td>
<td>9.80</td>
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<td>-8.04</td>
</tr>
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</table>
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

Survey Unit Boundary

Erosion
No Change
Accretion

> 30 m²
15 - 30 m²
5 - 15 m²
5 - 15 m²
15 - 30 m²
> 30 m²
< 5 m²

± 43
Annual Survey Report 2016

South West Regional Coastal Monitoring Programme

SU17 Dawlish - Beach Change (2 of 2)

SDADCAG - South Devon

Aerial Photography from 2012

Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

Survey Unit Boundary

No Change

Accretion

Erosion

< 5 m²

5 - 15 m²

15 - 30 m²

> 30 m²

6b00102 (-13%)

6b00107 (-12%)

6b00111 (9%)

6b00119 (10%)

6b00116 (-11%)

6b00098 (-19%)

6b00107 (12%)

6b00094 (5%)

6b00111 (-9%)

6b00113 (2%)

South West Regional Coastal Monitoring Programme
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

Survey Unit Boundary

- Accretion
- Erosion
- No Change

Aerial Photography from 2012
Contours

- MHW 2016 - 03
- MHW 2011 - 01
- MHW 2014 - 06
- MHW 2008 - 12
- MHW 2012 - 07
- MHW 2007 - 10
- MHW 2011 - 11
- MLW 2016 - 03

MHW Elevation: 1.56OD
MLW Elevation: -1.34OD

Aerial Photography from 2012
Contours

- MHW 2016 - 03
- MHW 2014 - 06
- MHW 2012 - 07
- MHW 2011 - 11
- MHW 2011 - 01
- MHW 2008 - 12
- MHW 2007 - 10
- MLW 2016 - 03

MHW Elevation: 1.45OD
MLW Elevation: -1.30OD

Aerial Photography from 2012
### Survey Unit
- **Local Name**: Teignmouth

### Survey Type: Spring-Spring
#### Beach Change
- **Dates Surveyed**: 22/01/2015 - 11/03/2016
- **Observations**: Over the past year, there has been a mixture of erosion and accretion throughout the survey unit. Profile 6b00179 has gained the most material increasing its cross-sectional area by 41%. The accretion has occurred along the entire length of the profile increasing the steepness of the beach slope. Towards the western end of the survey unit, profiles 6b00216 and 6b00219 have experienced high level erosion losing >60m². However, it is important to note that this area of the beach is highly dynamic due the presence of the estuary.

### Survey Type: Baseline-Spring
#### Beach Change
- **Dates Surveyed**: 16/05/2007 - 11/03/2016
- **Observations**: At the western end of the survey unit the dominant trend has been of erosion, whereas towards the central and eastern areas of the survey unit there has been a general trend of accretion. Profiles 6b00153 and 6b00179 have experienced the most change increasing their cross-sectional areas by 93% and 112% respectively. This accretion of material has occurred along the entire length of both profiles, increasing the steepness of the beach slope. A large amount of sediment has accreted at the top of the beach in front of the sea wall on profile 6b00179. At the western end of the survey unit, profiles 6b00191 to 6b00219 (with the exception of profile 6b00216) have experienced erosion. Both profiles have experienced a decrease in their cross-sectional areas by >20%, resulting in a large recession of the beach face. Profile 6b00219 has experienced the most change loosing 130m² of material.

### Profile Cross-Sectional Area

<table>
<thead>
<tr>
<th>Profile</th>
<th>CSA Diff (m³)</th>
<th>% Change</th>
<th>CSA Diff (m³)</th>
<th>% Change</th>
<th>Master Profile Level (m)</th>
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</thead>
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<td>36.60</td>
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<td>4</td>
<td>-1.95</td>
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<td>-64.01</td>
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<td>-129.50</td>
<td>-25</td>
<td>-1.95</td>
</tr>
</tbody>
</table>
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

Survey Unit Boundary

- > 30 m²
- 15 - 30 m²
- 5 - 15 m²
- < 5 m²
- 15 - 30 m²
- > 30 m²

Accretion  No Change  Erosion

Aerial Photography from 2012

0  125  250 m
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

Survey Unit Boundary

Accretion | No Change | Erosion
--- | --- | ---
> 30 m² | 15 - 30 m² | < 5 m²
5 - 15 m² | 5 - 15 m² | 15 - 30 m²
5 - 15 m² | > 30 m² | > 30 m²

Aerial Photography from 2012

0 125 250 m
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

Survey Unit Boundary

- > 30 m²: Erosion
- 15 - 30 m²: Erosion
- 5 - 15 m²: Erosion
- < 5 m²: Erosion

No Change
Accretion

Survey Unit Boundary

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Aerial Photography from 2012

6bSU18-1 Teignmouth - Beach Change (1 of 3)
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

Survey Unit Boundary

Accretion
No Change
Erosion

> 30 m²
15 - 30 m²
5 - 15 m²
< 5 m²
5 - 15 m²
15 - 30 m²
> 30 m²
< 5 m²
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

Survey Unit Boundary

Accretion
Erosion
No Change

0 125 250 m

Aerial Photography from 2012
Contours

- MHW 2016 - 03
- MHW 2008 - 12
- MHW 2014 - 04
- MHW 2007 - 10
- MHW 2011-11
- MLW 2016 - 03
- MHW 2011 - 01

MHW Elevation: 1.45OD
MLW Elevation: -1.30OD

Aerial Photography from 2012
Contours

- MHW 2016 - 03
- MHW 2008 - 12
- MHW 2014 - 04
- MHW 2007 - 10
- MHW 2011 - 11
- MLW 2016 - 03
- MHW 2011 - 01

MHW Elevation: 1.45OD
MLW Elevation: -1.30OD

Aerial Photography from 2012
Contours

- MHW 2016 - 03
- MHW 2008 - 12
- MHW 2014 - 04
- MHW 2007 - 10
- MHW 2011 - 11
- MLW 2016 - 03
- MHW 2011 - 01

MHW Elevation: 1.45OD
MLW Elevation: -1.30OD
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<thead>
<tr>
<th>Survey Type</th>
<th>Dates Surveyed</th>
<th>Observations</th>
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</thead>
<tbody>
<tr>
<td>Spring-Spring</td>
<td>23/01/2015 - 11/03/2016</td>
<td>Over the past year, there has been a trend for erosion throughout the survey unit, however the changes in cross-sectional area are very low indicating the stability of the survey unit. Profiles 6b00221 and 6b00263 have experienced the most change with profile 6b00221 decreasing its cross-sectional area by 8% and profile 6b00263 increasing its cross-sectional area by 14%.</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>26/10/2007 - 11/03/2016</td>
<td>Unlike the year on year analysis, the long term trend is for accretion since 2007. Profiles 6b00221 and 6b00263 have seen the greatest change, gaining between 14m² and 25m² of material, which equates to a cross-sectional area change of 20% and 23% respectively. The material gained has been mainly towards the top of the beach. The remaining profiles show low level erosion and accretion showing change of 8% or less in their cross-sectional areas.</td>
</tr>
</tbody>
</table>

**Profile Cross-Sectional Area**

<table>
<thead>
<tr>
<th>Profile</th>
<th>CSA Diff (m²)</th>
<th>% Change</th>
<th>CSA Diff (m²)</th>
<th>% Change</th>
<th>Master Profile Level (m)</th>
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<td>14.15</td>
<td>20</td>
<td>-1.67</td>
</tr>
</tbody>
</table>
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

- Survey Unit Boundary

Accretion

- > 30 m²
- 15 - 30 m²
- 5 - 15 m²
- < 5 m²

Erosion

- > 30 m²
- 15 - 30 m²
- 5 - 15 m²
- < 5 m²

No Change

Aerial Photography from 2012

SDADCAG - South Devon
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

Survey Unit Boundary

Accretion
No Change
Erosion

Aerial Photography from 2012

SDADCAG - South Devon
## Profile Cross-Sectional Area

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
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<tbody>
<tr>
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<td>CSA Diff (m²)</td>
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<td>-17.12</td>
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<td>6b00399</td>
<td>-15.10</td>
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<td>-30.73</td>
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<tr>
<td>6b00409</td>
<td>-2.92</td>
<td>-3</td>
<td>1.71</td>
</tr>
</tbody>
</table>

Since 2015, all profiles have experienced low level erosion. Profiles 6b00396, 6b00397 and 6b00399 have all experienced a decrease in their cross-sectional areas of >8%. As a result, the beach elevation has dropped, by up to 1 meter in places. Profile 6b00409 has remained stable showing only very low level erosion.

Similar to the year on year analysis, profiles 6b00397 and 6b00399 have experienced erosion, with profile 6b00399 seeing the greatest change, losing 31m² of material across the entire length of the profile. Profiles 6b00396 and 6b00409 have shown low level accretion increasing their cross-sectional area by 2% or less, indicating the stability of these profiles.
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

- 6b00409 (3%)
- 6b00396 (-3%)
- 6b00397 (-17%)
- 6b00399 (-22%)

Survey Unit Boundary

Aerial Photography from 2012

SDADCAG - South Devon
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

- Survey Unit Boundary
- 6b00396 (+1%)
- 6b00397 (-19%)
- 6b00399 (-37%)

Aerial Photography from 2012

Accretion
No Change
Erosion

- > 30 m$^2$
- 15 - 30 m$^2$
- 5 - 15 m$^2$
- < 5 m$^2$
- 15 - 30 m$^2$
- > 30 m$^2$
Over the past year, there has been a mixture of erosion and accretion throughout the survey unit. Profiles 6b00520A and 6b00527 have shown low level accretion increasing the steepness of the beach slope. Profiles 6b00524 and 6b00529 have both experienced low level erosion decreasing their cross-sectional areas by 14% and 33% respectively.

Since 2007, all profiles except 6b00520A have experienced erosion. Profile 6b00529 has experienced the largest change, decreasing its cross-sectional area by 43%, equating to a loss of 34m² of material. The beach level has dropped along the entirety of the profile and is at its lowest level since it was first surveyed in 2007.

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Dates Surveyed</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring-Spring</td>
<td>09/01/2015 - 26/02/2016</td>
<td>Over the past year, there has been a mixture of erosion and accretion throughout the survey unit. Profiles 6b00520A and 6b00527 have shown low level accretion increasing the steepness of the beach slope. Profiles 6b00524 and 6b00529 have both experienced low level erosion decreasing their cross-sectional areas by 14% and 33% respectively.</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>17/05/2007 - 26/02/2016</td>
<td>Since 2007, all profiles except 6b00520A have experienced erosion. Profile 6b00529 has experienced the largest change, decreasing its cross-sectional area by 43%, equating to a loss of 34m² of material. The beach level has dropped along the entirety of the profile and is at its lowest level since it was first surveyed in 2007.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>6b00520A</td>
<td>11.21</td>
<td>13</td>
<td>26.53</td>
</tr>
<tr>
<td>6b00524</td>
<td>-11.57</td>
<td>-14</td>
<td>-17.37</td>
</tr>
<tr>
<td>6b00527</td>
<td>6.44</td>
<td>15</td>
<td>-2.46</td>
</tr>
<tr>
<td>6b00529</td>
<td>-21.52</td>
<td>-33</td>
<td>-33.95</td>
</tr>
</tbody>
</table>
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

- **Accretion**
  - > 30 m²
  - 15 - 30 m²
  - 5 - 15 m²

- **No Change**
  - 5 - 15 m²
  - 15 - 30 m²
  - > 30 m²

- **Erosion**
  - < 5 m²

Survey Unit Boundary

Aerial Photography from 2012
Contours

- MHW 2016 - 03
- MHW 2009 - 04
- MHW 2014 - 04
- MHW 2008 - 04
- MHW 2012 - 04
- MLW 2016 - 03
- MHW 2011 - 03

MHW Elevation: 1.50OD
MLW Elevation: -1.45OD

Aerial Photography from 2012

SDADCAG - South Devon
The dominant trend for this survey unit over the past year has been of erosion, with the exception of profile 6b00578 that has shown some low level accretion. The greatest change is experienced by profile 6b00592 which has seen a 30% decrease in its cross-sectional area. Profiles 6b00570, 6b00574, 6b00585 and 6b00595 have experienced low level erosion, showing a change of 5% or less.

Since 2007, the trend is very similar to that of the year on year analysis with the majority of profiles experiencing low level erosion, except for profile 6b00578 which has shown some low level accretion.

The high percentage change in cross-sectional area observed along 6b00578 is due to the short length of the profile and does not equate to a large amount of actual material change.
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

Survey Unit Boundary

- > 30 m²: Erosion
- 15 - 30 m²: No Change
- 5 - 15 m²: No Change
- < 5 m²: No Change
- > 30 m²: Erosion

Survey Unit Boundary
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

Survey Unit Boundary

- Accretion
- No Change
- Erosion

Aerial Photography from 2012
### Survey Unit

<table>
<thead>
<tr>
<th>Survey Unit</th>
<th>6bSU21-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Name</td>
<td>Paignton</td>
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### Dates Surveyed and Observations

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Dates Surveyed</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring-Spring</td>
<td>19/01/2015 - 09/03/2016</td>
<td>Over the past year, a mixture of low level erosion and accretion is apparent within this survey unit. Actual changes in cross-sectional area are very low, showing change of 6% or less. This indicates that the survey unit is relatively stable.</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>18/05/2007 - 09/03/2016</td>
<td>Since 2007, accretion has occurred at the eastern end of the survey unit and a mixture of erosion and accretion is prevalent throughout the rest of the survey unit. The majority of the cross-sectional area changes are small in the western and central sections of the survey unit, with the exception of profiles 6b00614 and 6b00624 at the eastern end, where the change is greater. Profile 6b00624 has experienced the greatest change, increasing its cross-sectional area by 24%.</td>
</tr>
</tbody>
</table>

### Profile Cross-Sectional Area

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CSA Diff (m³)</td>
<td>% Change</td>
<td>CSA Diff (m³)</td>
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<tr>
<td>6b00614</td>
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<td>20.42</td>
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<td>6b00624</td>
<td>8.57</td>
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<td>27.86</td>
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<td>6b00628</td>
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<td>8.94</td>
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<td>-8.96</td>
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<td>6b00652</td>
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<td>0.42</td>
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Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

Survey Unit Boundary

Accretion
No Change
Erosion

Aerial Photography from 2012

0 250 500 m
Contours

- MHW 2016 - 03
- MHW 2009 - 04
- MHW 2014 - 04
- MHW 2008 - 04
- MHW 2011 - 11
- MLW 2016 - 03
- MHW 2011 - 03

MHW Elevation: 1.50OD
MLW Elevation: -1.45OD
Survey Unit | Survey Unit 6bSU21-6
Local Name | Goodrington Sands

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Dates Surveyed</th>
<th>Observations</th>
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<tbody>
<tr>
<td>Spring-Spring</td>
<td>Beach Change</td>
<td>10/01/2015 - 09/03/2016</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>Beach change</td>
<td>19/05/2007 - 09/03/2016</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CSA Diff (m³)</td>
<td>% Change</td>
<td>CSA Diff (m³)</td>
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<tr>
<td>6b00673</td>
<td>4.02</td>
<td>3</td>
<td>26.90</td>
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<td>6b00676</td>
<td>-4.45</td>
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<td>19.33</td>
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<tr>
<td>6b00679</td>
<td>-4.24</td>
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<td>-3.03</td>
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<td>6b00683</td>
<td>-12.69</td>
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<td>6b00687</td>
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</table>
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

<table>
<thead>
<tr>
<th>Survey Unit Boundary</th>
<th>Accretion</th>
<th>Erosion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 30 m²</td>
<td>&lt; 5 m²</td>
</tr>
<tr>
<td></td>
<td>15 - 30 m²</td>
<td>5 - 15 m²</td>
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<td>5 - 15 m²</td>
<td>15 - 30 m²</td>
</tr>
<tr>
<td></td>
<td>&gt; 30 m²</td>
<td>&gt; 30 m²</td>
</tr>
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</table>

Aerial Photography from 2012
## Actual Change in Cross-sectional Area
(Baseline 2007 to Spring 2016)

<table>
<thead>
<tr>
<th>Survey Unit Boundary</th>
<th>Accretion</th>
<th>Erosion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>&gt; 30 m²</td>
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<tr>
<td></td>
<td>15 - 30 m²</td>
<td>15 - 30 m²</td>
</tr>
<tr>
<td></td>
<td>5 - 15 m²</td>
<td>5 - 15 m²</td>
</tr>
<tr>
<td>No Change</td>
<td>&lt; 5 m²</td>
<td>&lt; 5 m²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 - 30 m²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 30 m²</td>
</tr>
</tbody>
</table>

Aerial Photography from 2012

Survey Unit Boundary
MHW Elevation: 1.50OD
MLW Elevation: -1.45OD

Contours

MHW 2016 - 03  MHW 2009-04
MHW 2014 - 04  MHW 2008-04
MHW 2011-04  MLW 2016 - 03
MHW 2011-03

Aerial Photography from 2012

0 125 250 m
**Survey Unit** | 6bSU21-8  
---|---  
**Local Name** | Broadsands

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Dates Surveyed</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring-Spring Beach</td>
<td>07/01/2015 - 09/03/2016</td>
<td>There has been little change over the past year in the survey unit, with very low level accretion occurring on all profiles. This is shown by the small changes in cross-sectional area, with a change of 1% or less. This indicates the stability of this survey unit.</td>
</tr>
<tr>
<td>Baseline-Spring Beach</td>
<td>02/08/2007 - 09/03/2016</td>
<td>Since 2007, a very similar trend is apparent to that of the year on year analysis. All profiles show low level accretion, with profile 6b00717 experiencing the greatest change increasing its cross-sectional area by 5%.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Profile</th>
<th>CSA Diff (m²)</th>
<th>% Change</th>
<th>CSA Diff (m³)</th>
<th>% Change</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6b00717</td>
<td>2.31</td>
<td>1</td>
<td>11.13</td>
<td>5</td>
<td>-2.1</td>
</tr>
<tr>
<td>6b00721</td>
<td>1.39</td>
<td>1</td>
<td>1.71</td>
<td>1</td>
<td>-2.1</td>
</tr>
<tr>
<td>6b00725</td>
<td>0.89</td>
<td>0</td>
<td>6.84</td>
<td>3</td>
<td>-2.1</td>
</tr>
</tbody>
</table>
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

- Accretion
  - > 30 m²
  - 15 - 30 m²
  - 5 - 15 m²
- Erosion
  - < 5 m²
  - 5 - 15 m²
  - 15 - 30 m²
  - > 30 m²
- No Change

Survey Unit Boundary

Aerial Photography from 2012
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

- **Accretion**:
  - > 30 m$^2$ (2)
  - 15 - 30 m$^2$ (2)
  - 5 - 15 m$^2$ (2)
  - < 5 m$^2$ (2)

- **Erosion**:
  - > 30 m$^2$ (2)
  - 15 - 30 m$^2$ (2)
  - 5 - 15 m$^2$ (2)
  - < 5 m$^2$ (2)

No Change:
- 5 - 15 m$^2$ (2)

**Survey Unit Boundary**
MHW Elevation: 1.50OD
MLW Elevation: -1.45OD

Contours

- MHW 2016 - 03
- MHW 2009 - 04
- MHW 2014 - 04
- MHW 2008 - 04
- MHW 2011 - 04
- MLW 2016 - 03
- MLW 2011 - 03

Aerial Photography from 2012
### Survey Unit

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Dates Surveyed</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring-Spring</td>
<td>05/02/2015 - 22/02/2016</td>
<td>Over the past year, all profiles have experienced high levels of accretion with each gaining &gt;50m$^2$ of material. Profile 6b01182 has seen the greatest change, increasing its cross-sectional area by 19%.</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>17/05/2007 - 22/02/2016</td>
<td>Similar to the year on year analysis, all profiles have shown high levels of accretion across all profiles in the survey unit. Each of the profiles have gained &gt;150m$^2$ of material. The greatest change has occurred on profile 6b01182 increasing its cross sectional area by 90%.</td>
</tr>
</tbody>
</table>

### Comments

#### Profile Cross-Sectional Area

<table>
<thead>
<tr>
<th>Profile</th>
<th>CSA Diff (m$^2$)</th>
<th>% Change</th>
<th>CSA Diff (m$^2$)</th>
<th>% Change</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6b01175</td>
<td>75.47</td>
<td>13</td>
<td>185.84</td>
<td>40</td>
<td>-2.02</td>
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<tr>
<td>6b01179</td>
<td>51.92</td>
<td>8</td>
<td>226.19</td>
<td>51</td>
<td>-2.02</td>
</tr>
<tr>
<td>6b01182</td>
<td>106.59</td>
<td>19</td>
<td>320.03</td>
<td>90</td>
<td>-2.02</td>
</tr>
<tr>
<td>6b01186</td>
<td>64.05</td>
<td>18</td>
<td>155.47</td>
<td>57</td>
<td>-2.02</td>
</tr>
</tbody>
</table>
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

- **Accretion**
  - > 30 m$^2$
  - 15 - 30 m$^2$
  - 5 - 15 m$^2$
- **Erosion**
  - < 5 m$^2$
  - 5 - 15 m$^2$
  - 15 - 30 m$^2$
  - > 30 m$^2$
- **No Change**

Survey Unit Boundary

Aerial Photography from 2012

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South West Regional Coastal Monitoring Programme

Annual Survey Report 2016

SDADCAG - South Devon
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

- **Accretion**
  - > 30 m$^2$
  - 15 - 30 m$^2$
  - 5 - 15 m$^2$
- **Erosion**
  - < 5 m$^2$
  - 5 - 15 m$^2$
  - 15 - 30 m$^2$
  - > 30 m$^2$
- **No Change**

Survey Unit Boundary

Aerial Photography from 2012

0 75 150 m
MHW Elevation: 1.50OD
MLW Elevation: -1.45OD

Contours
- MHW 2016 - 03
- MHW 2014 - 04
- MHW 2011 - 04
- MHW 2009 - 03
- MHW 2008 - 03
- MLW 2016 - 03

Aerial Photography from 2012

0 140,000 280,000 m
<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Dates Surveyed</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring-Spring</td>
<td>Beach Change</td>
<td>19/03/2015 - 23/03/2016</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>Beach Change</td>
<td>30/09/2007 - 23/03/2016</td>
</tr>
<tr>
<td>Spring-Spring</td>
<td>Topographic Difference</td>
<td>18/06/2015 - 22/07/2016</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>Topographic Difference</td>
<td>30/09/2007 - 22/07/2016</td>
</tr>
<tr>
<td>Profile</td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------</td>
<td>----------</td>
</tr>
<tr>
<td>6b01220</td>
<td>31.15</td>
<td>5</td>
</tr>
<tr>
<td>6b01227</td>
<td>30.43</td>
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<tr>
<td>6b01233</td>
<td>12.59</td>
<td>1</td>
</tr>
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<td>6b01237</td>
<td>14.48</td>
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</tr>
<tr>
<td>6b01243</td>
<td>-43.37</td>
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</tr>
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<td>6b01247</td>
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<td>6b01253</td>
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</tr>
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<td>6b01319</td>
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<td>-18</td>
</tr>
<tr>
<td>6b01323</td>
<td>4.24</td>
<td>3</td>
</tr>
</tbody>
</table>
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

Accretion
- > 30 m²
- 15 - 30 m²
- 5 - 15 m²

No Change
- < 5 m²

Erosion
- 5 - 15 m²
- 15 - 30 m²
- > 30 m²

Survey Unit Boundary

Aerial Photography from 2012
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

<table>
<thead>
<tr>
<th>Survey Unit Boundary</th>
<th>Accretion</th>
<th>Erosion</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 30 m²</td>
<td>6b01220</td>
<td>6b01227</td>
</tr>
<tr>
<td>15 - 30 m²</td>
<td>6b01233</td>
<td>6b01237</td>
</tr>
<tr>
<td>5 - 15 m²</td>
<td>6b01243</td>
<td>6b01247</td>
</tr>
<tr>
<td>&lt; 5 m²</td>
<td>6b01253</td>
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Survey Unit Boundary

Aerial Photography from 2012

South West Regional Coastal Monitoring Programme
Annual Survey Report 2016

SDADCAG - South Devon
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

<table>
<thead>
<tr>
<th>Change Type</th>
<th>Increase/Decrease</th>
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<td>Erosion</td>
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<tr>
<td></td>
<td>15 - 30 m²</td>
</tr>
<tr>
<td></td>
<td>&gt; 30 m²</td>
</tr>
</tbody>
</table>

Survey Unit Boundary

Aerial Photography from 2012

South West Regional Coastal Monitoring Programme
Annual Survey Report 2016

6bSU26-1 Slapton Sands - Beach Change (2 of 3)
SDADCAG - South Devon
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

Aerial Photography from 2012

Survey Unit Boundary

Accretion

- > 30 m²
- 15 - 30 m²
- 5 - 15 m²

No Change

- < 5 m²
- 5 - 15 m²

Erosion

- 15 - 30 m²
- > 30 m²
Change in Elevation (m) Between June 2015 and July 2016

<table>
<thead>
<tr>
<th>Change in Elevation (m)</th>
<th>Model Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;= 32.5</td>
<td></td>
</tr>
<tr>
<td>32 - 2.5</td>
<td></td>
</tr>
<tr>
<td>2.5 - 1.5</td>
<td></td>
</tr>
<tr>
<td>1.5 - 0.5</td>
<td></td>
</tr>
<tr>
<td>0.5 - 10</td>
<td></td>
</tr>
<tr>
<td>-0.25 - -0.25</td>
<td></td>
</tr>
<tr>
<td>-0.5 - -1</td>
<td></td>
</tr>
<tr>
<td>-1 - -1.5</td>
<td></td>
</tr>
<tr>
<td>-1.5 - -2</td>
<td></td>
</tr>
<tr>
<td>-2 - -2.5</td>
<td></td>
</tr>
<tr>
<td>-2.5 - -3</td>
<td></td>
</tr>
<tr>
<td>-3 - -3</td>
<td></td>
</tr>
</tbody>
</table>

Aerial Photography from 2012
Change in Elevation (m) Between June 2015 and July 2016

-0.25  -  0.25
-0.5  -  -0.25
-1  -  -0.5
-1.5  -  -1
-2  -  -1.5
-2.5  -  -2
-3  -  -2.5

ACCRETION  EROSION  NO CHANGE
<= -3
-3  -  -2.5
-2  -  -2
-1  -  -1.5
-0.5  -  -0.25
0.5  -  1
1  -  1.5
2  -  2.5
3  -  3.5
4  -  4.5
5  -  5.5

±E

Model Extent

Aerial Photography from 2012
Change in Elevation (m) Between September 2007 and July 2016

Aerial Photography from 2012

Change in Elevation (m)

- EROSION
- NO CHANGE
- ACCRETION

Model Extent
Change in Elevation (m) Between September 2007 and July 2016

Aerial Photography from 2012

- EROSION
- NO CHANGE
- ACCRETION

Model Extent

Change in Elevation (m)
MHW Elevation: 1.73OD
MLW Elevation: -1.32OD

Contours
- MHW 2016 - 03
- MHW 2014 - 04
- MHW 2012 - 04
- MHW 2011 - 01
- MLW 2016 - 03
- MHW 2009 - 09
- MHW 2009 - 04
- MHW 2008 - 03
- MHW 2009 - 04
- MHW 2008 - 03

Aerial Photography from 2012

0 200 400 m
MHW Elevation: 1.73OD
MLW Elevation: -1.32OD

Contours
- MHW 2016 - 03
- MHW 2009 - 09
- MHW 2014 - 04
- MHW 2009 - 04
- MHW 2012 - 04
- MHW 2008 - 03
- MHW 2011 - 01
- MLW 2016 - 03

Aerial Photography from 2012
MHW Elevation: 1.73OD
MLW Elevation: -1.32OD

Contours
- MHW 2016 - 03
- MHW 2014 - 04
- MHW 2012 - 04
- MHW 2011 - 01
- MHW 2009 - 09
- MHW 2009 - 04
- MHW 2008 - 03
- MLW 2016 - 03
- MLW 2012 - 04
- MLW 2009 - 03
- MLW 2008 - 03

Aerial Photography from 2012
Aerial Photography from 2012

Sediment Type
- Gravel
- Gravel & Sand
- Sand
- Boulder
- Dune
- Dune Vegetated
- Grass
- Gravel & Mud
- Mud
- Mud & Sand
- Rock
- Saltmarsh
- Sea Defence
- Shell
- Water Body
- Mixture
- Obstruction

0 200 400 m
<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Dates Surveyed</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring-Spring</td>
<td>07/03/2015 - 14/01/2016</td>
<td>Over the last year, there has been a mixture of erosion and accretion throughout the survey unit. The central profiles have experienced varying levels of erosion and towards the eastern and western ends of the unit there has been accretion, with the exception of profile 6b01354 which has experienced some low level erosion. Profile 6b01346 has experienced high level erosion, losing 39m² of material, equating to a cross-sectional area change of 65%. As a result, the elevation of the beach has dropped by 1 metre in front of the road and rock armour. Profiles 6b01338 and 6b01342 have experienced low level erosion, losing 9m² and 11m² of material respectively. However, changes in cross-sectional area are relatively low. Profile 6b01330 has gained the most material, increasing its cross-sectional area by 15%. There has been a redistribution of material that has accreted towards the central and lower sections of the profile.</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>30/09/2007 - 14/01/2016</td>
<td>Since 2007, the dominant trend at this survey unit has been for erosion. The western and central profiles have experienced high levels of erosion, whereas the profiles towards the eastern end of the unit have experienced accretion. Profiles 6b01342 to 6b01354 have experienced high level erosion losing &gt;26m². Profile 6b01346 has seen the greatest change losing 116m² of material which equates to a cross-sectional area change of 87%. This loss of material has led to a significant drop in beach elevation, up to 4.5 meters on the lower section of the profile. Towards the eastern end of the beach, moderate accretion has occurred, with profile 6b01330 experiencing the greatest change increasing its cross-sectional area by 33%.</td>
</tr>
<tr>
<td>Spring-Spring</td>
<td>07/05/2015 - 21/07/2016</td>
<td>Two bands of accretion are visible at the top and lower sections of the beach at the eastern end. Erosion is dominant throughout the central and western sections of the beach with high level erosion visible at MHW level. Towards the central section of the survey unit high level erosion is also apparent at the top section of the beach. Net sediment balance above MLWS: -16,687 m³ Net sediment change: -7%</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>30/09/2007 - 21/07/2016</td>
<td>Accretion can be seen at the most eastern extent of the beach below and above MHW level. A small band of erosion can be seen stretching from the eastern section of survey unit towards the central section. This continues along the MHW level down towards the western section of the survey unit. There are areas towards the eastern end of the survey unit where little change has taken place at the top and lower sections of the beach. A significant amount of erosion is seen towards the central area of the survey unit in front of the rock armour. Net sediment balance above MLWS: -36,795 m³ Net sediment change: -17%</td>
</tr>
</tbody>
</table>

Comments

Remedial work has been carried out to the sea defence in front of the main village, with additional boulders placed in front of the first section of road that services the houses at the eastern end of the beach.
## Profile Cross-Sectional Area

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td></td>
<td>Mar 2015 to Jan 2016</td>
<td>Sep 2007 to Jan 2016</td>
<td></td>
</tr>
<tr>
<td>6b01330</td>
<td>29.00</td>
<td>15</td>
<td>54.34</td>
</tr>
<tr>
<td>6b01334</td>
<td>1.61</td>
<td>1</td>
<td>16.99</td>
</tr>
<tr>
<td>6b01338</td>
<td>-9.41</td>
<td>-3</td>
<td>-26.48</td>
</tr>
<tr>
<td>6b01342</td>
<td>-10.50</td>
<td>-5</td>
<td>-71.10</td>
</tr>
<tr>
<td>6b01346</td>
<td>-32.84</td>
<td>-65</td>
<td>-115.81</td>
</tr>
<tr>
<td>6b01350</td>
<td>3.98</td>
<td>9</td>
<td>-76.40</td>
</tr>
<tr>
<td>6b01354</td>
<td>-1.57</td>
<td>-3</td>
<td>-56.13</td>
</tr>
</tbody>
</table>
Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

<table>
<thead>
<tr>
<th>Survey Unit Boundary</th>
<th>Accretion</th>
<th>Erosion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 30 m²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 - 30 m²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 - 15 m²</td>
<td></td>
</tr>
<tr>
<td>No Change</td>
<td>&lt; 5 m²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 - 15 m²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 - 30 m²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 30 m²</td>
<td></td>
</tr>
</tbody>
</table>

Aerial Photography from 2012
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

<table>
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<tr>
<td></td>
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<td>15 - 30 m²</td>
<td>5 - 15 m²</td>
</tr>
<tr>
<td></td>
<td>5 - 15 m²</td>
<td>15 - 30 m²</td>
</tr>
<tr>
<td></td>
<td>&lt; 5 m²</td>
<td>&gt; 30 m²</td>
</tr>
</tbody>
</table>

Survey Unit Boundary

Aerial Photography from 2012

South West Regional Coastal Monitoring Programme
Annual Survey Report 2016

6bSU26-2 Beesands - Beach Change

SDADCAG - South Devon
Change in Elevation (m) Between May 2015 and July 2016

- EROSION
- NO CHANGE
- ACCRETION

Model Extent

Aerial Photography from 2012
Aerial Photography from 2012

Change in Elevation (m) Between September 2007 and July 2016

- EROSION
- NO CHANGE
- ACCRETION

Change in Elevation (m)
MHW Elevation: 1.73OD
MLW Elevation: -1.32OD

Contours

- MHW 2016 - 03
- MHW 2009 - 09
- MHW 2014 - 04
- MHW 2009 - 04
- MHW 2012 - 04
- MHW 2008 - 03
- MHW 2011 - 01
- MLW 2016 - 03

Aerial Photography from 2012

0 200 400 m
### Survey Unit
- **6bSU26-3**

### Local Name
- **Hallsands**

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Dates Surveyed</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring-Spring</td>
<td>07/03/2015 - 14/01/2016</td>
<td>Over the past year, erosion has dominated the survey unit, with the exception of profile 6b01382 which has experienced low level accretion, increasing its cross-sectional area by 6%. Profiles 6b01383, 6b01384 and 6b01385 have all experienced high level erosion all losing &gt;37m³ of material.</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>28/09/2007 - 14/01/2016</td>
<td>Since 2007, all profiles have experienced high level erosion, losing a significant amount of material. All profiles have lost &gt;53m³ of material. As a result the beach elevation has dropped significantly and there has been a large recession of the beach face. Profiles 6b01383, 6b01384 and 6b01385 are at their lowest levels since the first survey in 2007.</td>
</tr>
<tr>
<td>Spring-Spring</td>
<td>08/07/2015 - 22/07/2016</td>
<td>Erosion can be seen occurring throughout the majority of the survey unit, with small areas of no change. A thin strip of higher level erosion is apparent towards the middle section of the beach. Net sediment balance above MLWS: -17,937 m³, Net sediment change: -18%</td>
</tr>
<tr>
<td>Baseline-Spring</td>
<td>28/09/2007 - 22/07/2016</td>
<td>Similar to the year on year analysis, erosion dominates the entire survey unit. A band of higher level erosion can be seen towards the middle section of the beach. Net sediment balance above MLWS: -36,407 m³, Net sediment change: -31%</td>
</tr>
</tbody>
</table>

### Comments
- Some remedial work has been carried out at the western extent of the survey unit after the winter storms in 2013/14. With extra boulder defence added to protect the access road. Furthermore, the low level accretion shown on profile 6b01382 for the spring to spring analysis, does not appear on the topographic difference model. This is most likely due to the fact that there were three storms after January 2016 where the material was eroded.

<table>
<thead>
<tr>
<th>Profile</th>
<th>CSA Diff (m³)</th>
<th>% Change</th>
<th>CSA Diff (m³)</th>
<th>% Change</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6b01382</td>
<td>9.95</td>
<td>6</td>
<td>-53.43</td>
<td>-23</td>
<td>-2.02</td>
</tr>
<tr>
<td>6b01383</td>
<td>-44.76</td>
<td>-22</td>
<td>-115.98</td>
<td>-42</td>
<td>-2.02</td>
</tr>
<tr>
<td>6b01384</td>
<td>-43.25</td>
<td>-48</td>
<td>-98.40</td>
<td>-68</td>
<td>-2.02</td>
</tr>
<tr>
<td>6b01385</td>
<td>-37.22</td>
<td>-44</td>
<td>-89.33</td>
<td>-65</td>
<td>-2.02</td>
</tr>
</tbody>
</table>
### Actual Change in Cross-sectional Area (Spring 2015 to Spring 2016)

<table>
<thead>
<tr>
<th>Survey Unit Boundary</th>
<th>Accretion</th>
<th>Erosion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 30 m²</td>
<td>&lt; 5 m²</td>
</tr>
<tr>
<td></td>
<td>15 - 30 m²</td>
<td>5 - 15 m²</td>
</tr>
<tr>
<td></td>
<td>5 - 15 m²</td>
<td>15 - 30 m²</td>
</tr>
<tr>
<td></td>
<td>&lt; 5 m²</td>
<td>&gt; 30 m²</td>
</tr>
</tbody>
</table>

- **Accretion**: Blue
- **Erosion**: Red
- **No Change**: Grey
- **Survey Unit Boundary**: Yellow

Aerial Photography from 2012

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*South West Regional Coastal Monitoring Programme Annual Survey Report 2016*

*SDADCAG - South Devon*
Actual Change in Cross-sectional Area (Baseline 2007 to Spring 2016)

- Accretion
  - > 30 m²
  - 15 - 30 m²
  - 5 - 15 m²
- No Change
  - < 5 m²
  - 5 - 15 m²
  - 15 - 30 m²
- Erosion
  - > 30 m²

Survey Unit Boundary

Erosion > 30 m²
Erosion 15 - 30 m²
Erosion 5 - 15 m²
Erosion < 5 m²
Accretion > 30 m²
Accretion 15 - 30 m²
Accretion 5 - 15 m²
Accretion < 5 m²
No Change > 30 m²
No Change 15 - 30 m²
No Change 5 - 15 m²
No Change < 5 m²

Aerial Photography from 2012

Plymouth Coastal Observatory

South West Regional Coastal Monitoring Programme

Annual Survey Report 2016

SDADCAG - South Devon
Change in Elevation (m) Between July 2015 and July 2016

<table>
<thead>
<tr>
<th>Change in Elevation (m)</th>
<th>Model Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>EROSION</td>
<td></td>
</tr>
<tr>
<td>NO CHANGE</td>
<td></td>
</tr>
<tr>
<td>ACCRETION</td>
<td></td>
</tr>
</tbody>
</table>

Aerial Photography from 2012
MHW Elevation: 1.73OD
MLW Elevation: -1.32OD

Contours
- MHW 2016 - 03
- MHW 2009 - 09
- MHW 2014 - 04
- MHW 2009 - 04
- MHW 2012 - 04
- MHW 2008 - 03
- MHW 2011 - 01
- MLW 2016 - 03

Aerial Photography from 2012

0 50 100 m
Cross Sectional Area above MP Trend for Location: 6b00007 and Reference Profile Set

Area Above MP Trend: Accreting at 10.609 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00000 and Reference Profile Set

Area Above MP Trend: Eroding at -25.513 m²/Year

Survey Unit for 6bSU16-3
Cross-Sectional Area Charts
Cross Sectional Area above MP Trend for Location: 6b00014 and Reference Profile Set

Area Above MP Trend: Eroding at -28.865 m2/Year
Cross Sectional Area above MP Trend for Location: 6b00017 and Reference Profile Set

Area Above MP Trend: Eroding at -65.844 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00019 and Reference Profile Set

Area Above MP Trend: Eroding at -49.634 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00027 and Reference Profile Set

Area Above MP Trend: Eroding at -3.084 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00029 and Reference Profile Set

Area Above MP Trend: Eroding at -9.034 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00030 and Reference Profile Set

Area Above MP Trend: Eroding at -11.966 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00031 and Reference Profile Set

Area Above MP Trend: Eroding at -9.136 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00032 and Reference Profile Set

Area Above MP Trend: Eroding at -10.230 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00038 and Reference Profile Set

Area Above MP Trend: Eroding at -14.996 m²/Year

Survey Date

04/12/2005 03/12/2006 03/12/2008 03/12/2009 03/12/2010 03/12/2011 02/12/2012 02/12/2013 02/12/2014 02/12/2015
Area (m²)
480 500 520 540 560 580 600 620 640 660 680 700 720 740 760 780 800 820

Recycling Event Area Above MP Area Trend
Cross Sectional Area above MP Trend for Location: 6b00042 and Reference Profile Set

Area Above MP Trend: Eroding at -8.105 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00058 and Reference Profile Set

Area Above MP Trend: Eroding at -1.528 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00074 and Reference Profile Set

Area Above MP Trend: Eroding at -0.772 m²/Year
Cross-sectional Area above MP Trend for Location: 6b00086 and Reference Profile Set

Area Above MP Trend: Eroding at -0.327 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00094 and Reference Profile Set

Area Above MP Trend: Eroding at -1.414 m²/Year

Survey Date

04/12/2007 03/12/2008 03/12/2009 03/12/2010 03/12/2011 02/12/2012 02/12/2013 02/12/2014 02/12/2015

Area (m²)

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220
Cross Sectional Area above MP Trend for Location: 6b00107 and Reference Profile Set

Area Above MP Trend: Eroding at -1.502 m²/Year

Survey Date:
- 04/12/2007
- 03/12/2008
- 03/12/2009
- 03/12/2010
- 03/12/2011
- 02/12/2012
- 02/12/2013
- 02/12/2014
- 02/12/2015

Recycling Event, Area Above MP, Area Trend

SANDS
Cross Sectional Area above MP Trend for Location: 6b00157 and Reference Profile Set

Area Above MP Trend: Accreting at 2.840 m²/Year

Survey Date

04/12/2007 03/12/2008 03/12/2009 03/12/2010 03/12/2011 02/12/2012 02/12/2013 02/12/2014 02/12/2015

Area (m²)
Survey Unit for 6bSU18-1
Cross-Sectional Area Charts

Cross Sectional Area above MP Trend for Location: 6b00181 and Reference Profile Set

Area Above MP Trend: Eroding at -2.815 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00169 and Reference Profile Set

Area Above MP Trend: Eroding at -0.192 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00172 and Reference Profile Set

Area Above MP Trend: Accreting at 2.224 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00179 and Reference Profile Set

Area Above MP Trend: Accreting at 4.120 m²/Year

Survey Date

04/12/2007 03/12/2008 03/12/2009 03/12/2010 03/12/2011 02/12/2012 02/12/2013 02/12/2014 02/12/2015

Area (m²)
Cross Sectional Area above MP Trend for Location: 6b00183 and Reference Profile Set

Area Above MP Trend: Accreting at 0.277 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00108 and Reference Profile Set

Area Above MP Trend: Eroding at -2.436 m²/Year

Survey Date

04/12/2007 03/12/2008 03/12/2009 03/12/2010 03/12/2011 02/12/2012 02/12/2013 02/12/2014 02/12/2015

Area (m²)
Survey Unit for 6bSU18-1
Cross-Sectional Area Charts

Cross Sectional Area above MP Trend for Location: 6b00204 and Reference Profile Set

Area Above MP Trend: Eroding at -4.242 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00200 and Reference Profile Set

Area Above MP Trend: Eroding at -9.722 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00212 and Reference Profile Set

Area Above MP Trend: Eroding at -4.290 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00216 and Reference Profile Set

Area Above MP Trend: Eroding at -3.773 m²/Year

Survey Date

04/12/2007 03/12/2008 03/12/2009 03/12/2010 03/12/2011 02/12/2012 02/12/2013 02/12/2014 02/12/2015

0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520 540

Area (m²)
Cross Sectional Area above MP Trend for Location: 6b00219 and Reference Profile Set

Area Above MP Trend: Eroding at -10.418 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00247 and Reference Profile Set

Area Above MP Trend: Eroding at -1.214 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00249 and Reference Profile Set

Area Above MP Trend: Eroding at -1.876 m²/Year
Cross Sectional Area above MP Trend for Location: b00254 and Reference Profile Set

Area Above MP Trend: Eroding at -0.322 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00263 and Reference Profile Set

Area Above MP Trend: Accreting at 1.578 m²/Year

Survey Date

04/12/2007  03/12/2008  03/12/2009  03/12/2010  03/12/2011  02/12/2012  02/12/2013  02/12/2014  02/12/2015

Area (m²)
Cross Sectional Area above MP Trend for Location: 6b00399 and Reference Profile Set

Area Above MP Trend: Eroding at -4.624 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00524 and Reference Profile Set

Area Above MP Trend: Eroding at -0.798 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00527 and Reference Profile Set

Area Above MP Trend: Eroding at -0.911 m²/Year

Survey Date

04/12/2007 03/12/2008 03/12/2009 03/12/2010 03/12/2011 02/12/2012 02/12/2013 02/12/2014 02/12/2015

Area (m²)
Cross Sectional Area above MP Trend for Location: 6b00529 and Reference Profile Set

Area Above MP Trend: Eroding at -3.525 m²/Year
Survey Unit for 6aSU21-4
Cross-Sectional Area Charts

Cross Sectional Area above MP Trend for Location: 6b00578 and Reference Profile Set

Area Above MP Trend: Accreting at 0.501 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00595 and Reference Profile Set

Area Above MP Trend: Accreting at 0.278 m²/Year

Survey Date

04/12/2007 03/12/2008 03/12/2009 03/12/2010 03/12/2011 02/12/2012 02/12/2013 02/12/2014 02/12/2015

Area (m²)
Cross Sectional Area above MP Trend for Location: 6b00024 and Reference Profile Set

Area Above MP Trend: Ending at -5.387 m2/Year

Survey Date
03/12/2007
04/12/2007
03/12/2008
03/12/2009
03/12/2010
03/12/2011
03/12/2012
02/12/2013
02/12/2014
02/12/2015

Survey Unit for 6bSU21-5
Cross-Sectional Area Charts
Survey Unit for 6bSU21-5
Cross-Sectional Area Charts

Cross Sectional Area above MP Trend for Location: 6b00528 and Reference Profile Set

Area Above MP Trend: Eroding at -9.904 m²/Year
Cross Sectional Area above MP Trend for Location: 6b00552 and Reference Profile Set

Area Above MP Trend: Eroding at -14.005 m²/Year

Survey Date:
- 04/12/2007
- 03/12/2008
- 03/12/2009
- 03/12/2010
- 03/12/2011
- 02/12/2012
- 02/12/2013
- 02/12/2014
- 02/12/2015

Area (m²):
- 240
- 230
- 220
- 210
- 200
- 190
- 180
- 170
- 160
- 150
- 140
- 130
- 120
- 110
- 100
- 90
- 80
- 70
- 60
- 50
- 40
- 30
- 20
- 10
- 0

Recycling Event: Area Above MP Area Trend

SANDS
Cross Sectional Area above MP Trend for Location: 6b00725 and Reference Profile Set

Area Above MP Trend: Eroding at -15.640 m²/Year
Cross Sectional Area above MP Trend for Location: 6b01175 and Reference Profile Set

Area Above MP Trend: Eroding at -4.054 m²/Year
Cross Sectional Area above MP Trend for Location: 6b01179 and Reference Profile Set

Area Above MP Trend: Eroding at -0.287 m²/Year

Survey Date

Area (m²)

04/12/2007 03/12/2008 03/12/2009 03/12/2010 03/12/2011 02/12/2012 02/12/2013 02/12/2014 02/12/2015

Survey Unit for 6bSU25-2
Cross-Sectional Area Charts
Cross Sectional Area above MP Trend for Location: 6b01182 and Reference Profile Set

Area Above MP Trend: Accreting at 4.365 m²/Year

Survey Date

04/12/2007 03/12/2008 03/12/2009 03/12/2010 03/12/2011 02/12/2012 02/12/2013 02/12/2014 02/12/2015

Area (m²)
Cross Sectional Area above MP Trend for Location: 6b01188 and Reference Profile Set

Area Above MP Trend: Eroding at -0.040 m²/Year
Profile Charts for Survey Unit SU26-1

Profile: UN2025

Depth (m)
Survey Unit for 6bSU26-1
Cross-Sectional Area Charts

Cross Sectional Area above MP Trend for Location: 6b01220 and Reference Profile Set

Area Above MP Trend: Eroding at -14.897 m²/Year

Survey Date

04/12/2007  03/12/2008  03/12/2009  03/12/2010  03/12/2011  02/12/2012  02/12/2013  02/12/2014  02/12/2015

Area (m²)

50  100  150  200  250  300  350  400  450  500  550  600  650  700  750  800  850  900  950  1,000  1,050  1,100

Recycling Event • Area Above MP — Area Trend
Cross Sectional Area above MP Trend for Location: 6b01247 and Reference Profile Set

Area Above MP Trend: Eroding at -45.781 m²/Year
Cross Sectional Area above MP Trend for Location: 6b01259A and Reference Profile Set

Area Above MP Trend: Eroding at -32.752 m²/Year
Cross Sectional Area above MP Trend for Location: 6b01263 and Reference Profile Set

Area Above MP Trend: Eroding at -34.112 m²/Year

Survey Date:

Survey Unit for 6bSU26-1
Cross-Sectional Area Charts
Cross Sectional Area above MP Trend for Location: 6b01267 and Reference Profile Set

Area Above MP Trend: Eroding at -31.971 m²/Year
Cross Sectional Area above MP Trend for Location: 6b01268A and Reference Profile Set

Area Above MP Trend: Eroding at -40.195 m²/Year

Survey Unit for 6bSU26-1
Cross-Sectional Area Charts
Cross Sectional Area above MP Trend for Location: 6b01272A and Reference Profile Set

Area Above MP Trend: Eroding at -37.142 m²/Year

Survey Date

- Recycling Event
- Area Above MP
- Area Trend

SANDS
Survey Unit for 6bSU26-1

Cross-Sectional Area Charts

Cross Sectional Area above MP Trend for Location: 6b01277 and Reference Profile Set

Area Above MP Trend: Eroding at -46.792 m²/Year

Survey Date

04/12/2007 03/12/2008 03/12/2009 03/12/2010 03/12/2011 02/12/2012 02/12/2013 02/12/2014 02/12/2015

Area (m²)

500 450 400 350 300 250 200 150 100 50 0

Recycling Event, Area Above MP, Area Trend
Cross Sectional Area above MP Trend for Location: 6b01283 and Reference Profile Set

Area Above MP Trend: Eroding at -35.360 m²/Year

Survey Date

Area (m²)

[Graph showing area versus survey date, indicating erosion trend]

[Legend: Recycling Event, Area Above MP, Area Trend]
Cross Sectional Area above MP Trend for Location: 6b01287 and Reference Profile Set

Area Above MP Trend: Eroding at -37.821 m²/Year
Cross Sectional Area above MP Trend for Location: 6b01294 and Reference Profile Set

Area Above MP Trend: Eroding at -31.936 m²/Year
Survey Unit for 6bSU26-1
Cross-Sectional Area Charts

Cross Sectional Area above MP Trend for Location: 6b01298 and Reference Profile Set

Area Above MP Trend: Eroding at -32.735 m²/Year

Survey Date:
- 04/12/2007
- 03/12/2008
- 03/12/2009
- 03/12/2010
- 03/12/2011
- 02/12/2012
- 02/12/2013
- 02/12/2014
- 02/12/2015

Area (m²):
- 1,100
- 1,050
- 1,000
- 950
- 900
- 850
- 800
- 750
- 700
- 650
- 600
- 550
- 500
- 450
- 400
- 350
- 300
- 250
- 200
- 150
- 100
- 50
- 0

Legend:
- Recycling Event
- Area Above MP
- Area Trend

SANDS
Cross Sectional Area above MP Trend for Location: 6b01302 and Reference Profile Set

Area Above MP Trend: Eroding at -28.339 m²/Year
Cross Sectional Area above MP Trend for Location: 6b01310 and Reference Profile Set

Area Above MP Trend: Eroding at -27.699 m²/Year
Cross Sectional Area above MP Trend for Location: 6b01315 and Reference Profile Set

Area Above MP Trend: Eroding at -24.207 m²/Year
Cross Sectional Area above MP Trend for Location: 6b01319 and Reference Profile Set

Area Above MP Trend: Eroding at -19.433 m²/Yr
Cross Sectional Area above MP Trend for Location: 6b01342 and Reference Profile Set

Area Above MP Trend: Eroding at -18.708 m²/Year
Cross-Sectional Area above MP Trend for Location: 6b01354 and Reference Profile Set

Area Above MP Trend: Eroding at -12.522 m²/Year

Survey Date

04/12/2007 03/12/2008 03/12/2009 03/12/2010 03/12/2011 02/12/2012 02/12/2013 02/12/2014 02/12/2015

Area (m²)
Cross-sectional Area above MP Trend for Location: 6b01382 and Reference Profile Set

Area Above MP Trend: Eroding at -7.09 m²/Year
Cross Sectional Area above MP Trend for Location: 6b01383 and Reference Profile Set

Area Above MP Trend: Eroding at -10.964 m²/Year

Survey Date

04/12/2007  03/12/2008  03/12/2009  03/12/2010  03/12/2011  02/12/2012  02/12/2013  02/12/2014  02/12/2015

Area (m²)
Cross Sectional Area above MP Trend for Location: 6b01384 and Reference Profile Set
Area Above MP Trend: Eroding at -9.234 m²/Year
Cross Sectional Area above MP Trend for Location: 6b01385 and Reference Profile Set

Area Above MP Trend: Eroding at -7.858 m²/Year