

Hayle Interim Report

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Southwest Strategic Regional Coastal Monitoring Programme

Interim report 2011 – Hayle

1. Introduction

Hayle is a sandy beach situated in St Ives Bay, north Cornwall, stretching for approximately 1.6 kilometres and backed by extensive dune systems. The Hayle estuary discharges through the central part of the beach.

St Ives bay is one of two sediment sinks located in North Cornwall. Sediment output from the bay is thought to be negligible, making St Ives bay a closed sediment system. Sediment input from the Hayle estuary into the bay is thought to be limited due to predominately slow currents (Halcrow, 2006). The estuary acts as a sink for material and has historically needed to be dredged to maintain a channel for shipping. The use of the harbour as a shipping port in the estuary is now defunct although there are plans to redevelop the area and build a new commercial fishing harbour.

The current dredging license for the estuary stipulates that sand extracted from the estuary not be in excess of 53,000 tonnes per year. The majority of sand dredged from the estuary is sold on for use in the agricultural industries. The dredging license requires that 20% of the material dredged is placed back into the St Ives sand cell. At present, sand is dredged from three different sections throughout the centre of the beach where the estuary channel flows; the dredged sand is placed on the Harvey's Towans sand dune system (Figure 1). Records of dredged material weights have been kindly supplied by Hayle Harbour Management Ltd. The deposition site of dredged material has been estimated from photographs supplied to Cornwall Council by Hayle Harbour Management Ltd.

Figure 1. Dredging areas, see Table 1 for dredged weights.



This report is a summary of the results from the Strategic Regional Coastal Monitoring Programme from 2006 – 2011, and earlier data provided by the Environment Agency (2003 LiDAR data and 2001 photography). It should be read in conjunction with the Lands End to Hartland Point Annual Survey Report 2010, where the methods of data analysis and constraints can be found.

2. Hydrodynamics

The nearest Directional Waverider Buoy is at Perranporth and a summary of wave conditions during 2009/2010 is given at Annex A on the accompanying CD.

3. Survey analysis

Cross-sectional areas of beach profiles have been calculated above a constant Master Profile. Profiles from spring 2011 are compared with those of spring 2010 and 2007. Graphs of individual profiles superimposed upon the master profile and plots of cross-sectional area over time are included on the accompanying CD.

Analysis of LiDAR data is based on difference models. The LiDAR data has also been used to derive the position of Mean High Water (MHW) and Mean Low Water (MLW) in 2003, 2008 and 2009. Ortho-rectified aerial photography was captured in 2001 (Environment Agency), 2007 and 2009, from which the position of the main channel has been derived.

Changes in cross-sectional area of profiles are shown in Figures 2 and 3. Note that the coloured profile line in the Figures represents the actual extent of the survey. From spring 2010 to spring 2011 there is a clear pattern of accretion across the majority of the management unit with the exception of some erosion along two profiles either side of the channel. Over the 4 year period (2007-2011), the overall trend is for accretion to the west and a mixture of erosion and accretion to the east of the estuary mouth.

The LiDAR difference model from 2003 – 2009 also indicates overall accretion near the estuary mouth, and that the pattern of erosion along the open beach is concentrated generally in the mid-beach area (Figure 4). However, the earlier LiDAR data was at a lower resolution (2m) than the later (1m) which could account for some of the noise in the LiDAR difference models. The less variable nature of the lower beach, in comparison with the dunes, means that more confidence can be placed on the differences on the mid and lower part of the beach. Nonetheless, caution should be applied before drawing conclusions from the difference model for operational beach management.

Cut volume March 2003 to March 2009: 332,781 m³

Fill volume March 2003 to March 2009: 372,962 m³

Net Sediment Balance from March 2003 to March 2009: + 40,181 m³

LiDAR difference models for 2003 to 2009, 2003 to 2008 and 2008 to 2009 are shown in Figures 4, 5 and 6 respectively.

The outline of the channel through the beach has been digitised from aerial photography and superimposed on the 2009 photography in Figure 7. The MHW contour, derived from LiDAR data from 2003, 2008 and 2009 is shown in Figure 8, and demonstrates the accretion of material around Harvey's Towans.

Table 1. Table of dredging activity from August 2008 to October 2009. Weight dredged in kg.

Section	01/08/2008	01/09/2008	01/10/2008	01/12/2008	Total 2008
A	144,900	2,721,000	1,485,000	1,760,000	6,110,900
B	149,500	149,500	0	640,000	939,000
C	0	0	0	520,000	520,000

Section	01/01/2009	01/02/2009	01/03/2009	01/04/2009	01/05/2009	01/06/2009	01/07/2009	01/08/2009	01/10/2009	Total 2009
A	3,120,000	660	3,260	3,000	1,200	200	200	0	1,200	3,129,720
B	1,680,000	460	100	0	100	1,000	1,200	1,400	1,000	1,685,260
C	0	460	100	0	100	200	600	0	1,000	2,460

Quantities provided by Hayle Harbour Management Ltd.

Most Dredging Records provided show weights in kg although March 2009 was shown in tons.













