



**Cell 1 Regional Coastal Monitoring Programme
Analytical Report 1: 'Full Measures' Survey 2008**



**Durham County Council
Final Report**

May 2009

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Abbreviations and Acronyms

Acronym / Abbreviation	Definition
AONB	Area of Outstanding Natural Beauty
DGM	Digital Ground Model
HAT	Highest Astronomical Tide
LAT	Lowest Astronomical Tide
MHWN	Mean High Water Neap
MHWS	Mean High Water Spring
MLWN	Mean Low Water Neap
MLWS	Mean Low Water Spring
m	metres
ODN	Ordnance Datum Newlyn

Glossary of Terms

Term	Definition
Beach nourishment	Artificial process of replenishing a beach with material from another source.
Berm crest	Ridge of sand or gravel deposited by wave action on the shore just above the normal high water mark.
Breaker zone	Area in the sea where the waves break.
Coastal squeeze	The reduction in habitat area which can arise if the natural landward migration of a habitat under sea level rise is prevented by the fixing of the high water mark, e.g. a sea wall.
Downdrift	Direction of alongshore movement of beach materials.
Ebb-tide	The falling tide, part of the tidal cycle between high water and the next low water.
Fetch	Length of water over which a given wind has blown that determines the size of the waves produced.
Flood-tide	Rising tide, part of the tidal cycle between low water and the next high water.
Foreshore	Zone between the high water and low water marks, also known as the intertidal zone.
Geomorphology	The branch of physical geography/geology which deals with the form of the Earth, the general configuration of its surface, the distribution of the land, water, etc.
Groyne	Shore protection structure built perpendicular to the shore; designed to trap sediment.
Mean High Water (MHW)	The average of all high waters observed over a sufficiently long period.
Mean Low Water (MLW)	The average of all low waters observed over a sufficiently long period.
Mean Sea Level (MSL)	Average height of the sea surface over a 19-year period.
Offshore zone	Extends from the low water mark to a water depth of about 15 m and is permanently covered with water.
Storm surge	A rise in the sea surface on an open coast, resulting from a storm.
Swell	Waves that have travelled out of the area in which they were generated.
Tidal prism	The volume of water within the estuary between the level of high and low tide, typically taken for mean spring tides.
Tide	Periodic rising and falling of large bodies of water resulting from the gravitational attraction of the moon and sun acting on the rotating earth.
Topography	Configuration of a surface including its relief and the position of its natural and man-made features.
Transgression	The landward movement of the shoreline in response to a rise in relative sea level.
Updrift	Direction opposite to the predominant movement of longshore transport.
Wave direction	Direction from which a wave approaches.
Wave refraction	Process by which the direction of approach of a wave changes as it moves into shallow water.

Preamble

The Cell 1 Regional Coastal Monitoring Programme covers approximately 300km of the north east coastline, from the Scottish Border (just south of St. Abb's Head) to Flamborough Head in East Yorkshire. This coastline is often referred to as 'Coastal Sediment Cell 1' in England and Wales (Figure 1). Within this frontage the coastal landforms vary considerably, comprising low-lying tidal flats with fringing salt marshes, hard rock cliffs that are mantled with glacial till to varying thicknesses, softer rock cliffs, and extensive landslide complexes.

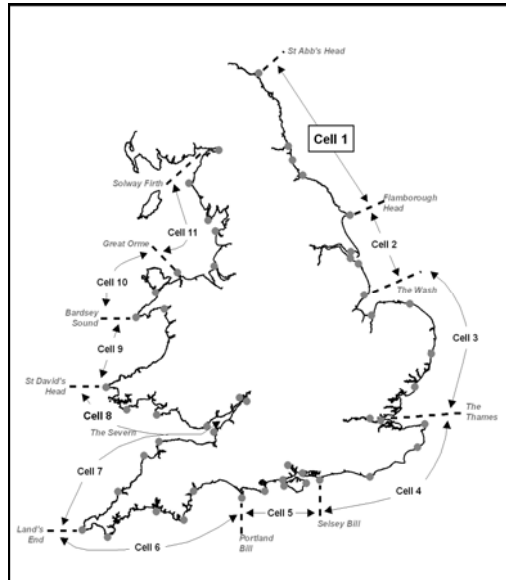


Figure 1 Sediment Cells in England and Wales

The programme commenced in its present guise in September 2008 and is managed by Scarborough Borough Council on behalf of the North East Coastal Group. It is funded by the Environment Agency, working in partnership with the following organisations.



The data collection, analysis and reporting is being undertaken as a partnership between the following organisations:



The main elements of the Cell 1 Regional Coastal Monitoring Programme involve:

- beach profile surveys
- topographic surveys
- cliff top recession surveys
- real-time wave data collection
- bathymetric and sea bed characterisation surveys
- aerial photography
- walk-over surveys

The beach profile surveys, topographic surveys and cliff top recession surveys are undertaken as a 'Full Measures' survey in autumn/early winter every year. Some of these surveys are then repeated the following spring as part of a 'Partial Measures' survey.

Each year, an Analytical Report is produced for each individual authority, providing a detailed analysis and interpretation of the 'Full Measures' surveys.

This is followed by a brief Update Report for each individual authority, providing ongoing findings from the 'Partial Measures' surveys.

Annually, a Cell 1 Overview Report is also produced. This provides a region-wide summary of the main findings relating to trends and interactions along the entire Cell 1 frontage.

To date the following reports have been produced:

Table 1 Analytical, Update and Overview Reports Produced to Date

Year		Full Measures		Partial Measures		Cell 1 Overview Report
		Survey	Analytical Report	Survey	Update Report	
1	2008/09	Sep-Dec 08	May 09 ^(*)	Mar-May 09		-

^(*) The present report is **Analytical Report 1** and provides an analysis of the 2008 'baseline' Full Measures survey for Durham County Council's frontage.

In addition, separate reports are produced for other elements of the programme as and when specific components are undertaken, such as wave data collection, bathymetric and sea bed sediment data collection, aerial photography, and walk-over visual inspections.

For purposes of analysis, the Cell 1 frontage has been split into the sub-sections listed in the Table 2.

Table 2 Sub-divisions of the Cell 1 Coastline

Authority	Zone
Northumberland County Council	Spittal A
	Spittal B
	Goswick Sands
	Holy Island
	Bamburgh
	Beadnell Village
	Beadnell Bay
	Embelton Bay
	Boulmer
	Alnmouth Bay
	High Hauxley and Druridge Bay
	Lynemouth Bay
	Newbiggin Bay
	Cambois Bay
Blyth South Beach	
North Tyneside Council	Whitley Sands
	Cullercoats Bay
	Tynemouth Long Sands
	King Edward's Bay
South Tyneside Council	Littehaven Beach
	Herd Sands
	Trow Quarry (incl. Frenchman's Bay)
	Marsden Bay
Sunderland Council	Whitburn Bay
	Harbour and Docks
	Hendon to Ryhope (incl. Halliwell Banks)
Durham County Council	Featherbed Rocks
	Seaham (Dawdon)
	Blast Beach
	Hawthorn Hive
	Blackhall Colliery
Hartlepool Borough Council	North Sands
	Headland
	Middleton
	Hartlepool Bay
Redcar & Cleveland Borough Council	Coatham Sands
	Redcar Sands
	Marske Sands
	Saltburn Sands
	Cattersty Sands (Skinningrove)
Scarborough Borough Council	Staithes
	Runswick Bay
	Sandsend Beach, Uppgang Beach and Whitby Sands
	Robin Hood's Bay
	Scarborough North Bay
	Scarborough South Bay
	Cayton Bay
	Filey Bay

1. Introduction

1.1 Study Area

Durham County Council's frontage extends from Ryhope Dene to Crimdon Beck. For the purposes of this report, it has been sub-divided into five areas, namely:

- Featherbed Rocks
- Seaham (Dawdon)
- Blast Beach
- Hawthorn Hive
- Blackhall Colliery

1.2 Methodology

Along Durham County Council's frontage, the following surveying is undertaken:

- Full Measures survey annually each autumn/early winter comprising:
 - Beach profile surveys along 7 no. transect lines
- Partial Measures survey annually each spring comprising:
 - Beach profile surveys along 4 no. transect lines
- Cliff top survey bi-annually at:
 - Seaham (Dawdon)

Note: The Hartlepool North Sands topographic survey extends into Durham County Council's jurisdiction once every five years, capturing data between Crimdon Park and Crimdon Beck. Analysis of data in this area is incorporated within the Hartlepool North Sands analysis, reported in the Hartlepool Borough Council report.

The location of these surveys is shown in Figure 2. Also enclosed on the accompanying CD-ROM is a file which can be opened in Google Earth showing the locations of the surveys.

The baseline Full Measures survey was undertaken along this frontage in November 2008, when weather conditions were cold but bright. The sea state was medium rough.

All data have been captured in a manner commensurate with the principles of the Environment Agency's *National Standard Contract and Specification for Surveying Services* and stored in a file format compatible with the software systems being used for the data analysis, namely SANDS and Arc-GIS. This data collection approach and file format is comparable to that being used on other regional coastal monitoring programmes, such as in the South East and South West of England.

Upon receipt of the data from the survey team, they are quality assured and then uploaded onto the programme's website for storage and availability to others and also input to SANDS and GIS for subsequent analysis.

The Analytical Report is then produced following a standard structure for each authority. This involves:

- description of the changes observed since the previous survey and an interpretation of the drivers of these changes (Section 2);
- documentation of any problems encountered during surveying or uncertainties inherent in the analysis (Section 3);
- recommendations for 'fine-tuning' the programme to enhance its outputs (Section 4); and
- providing key conclusions and highlighting any areas of concern (Section 5).

Data from the present survey are presented in a processed form in the Appendices.

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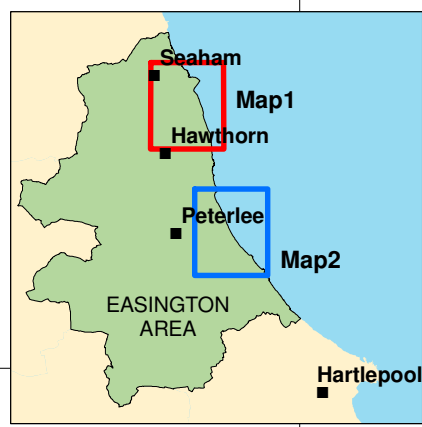
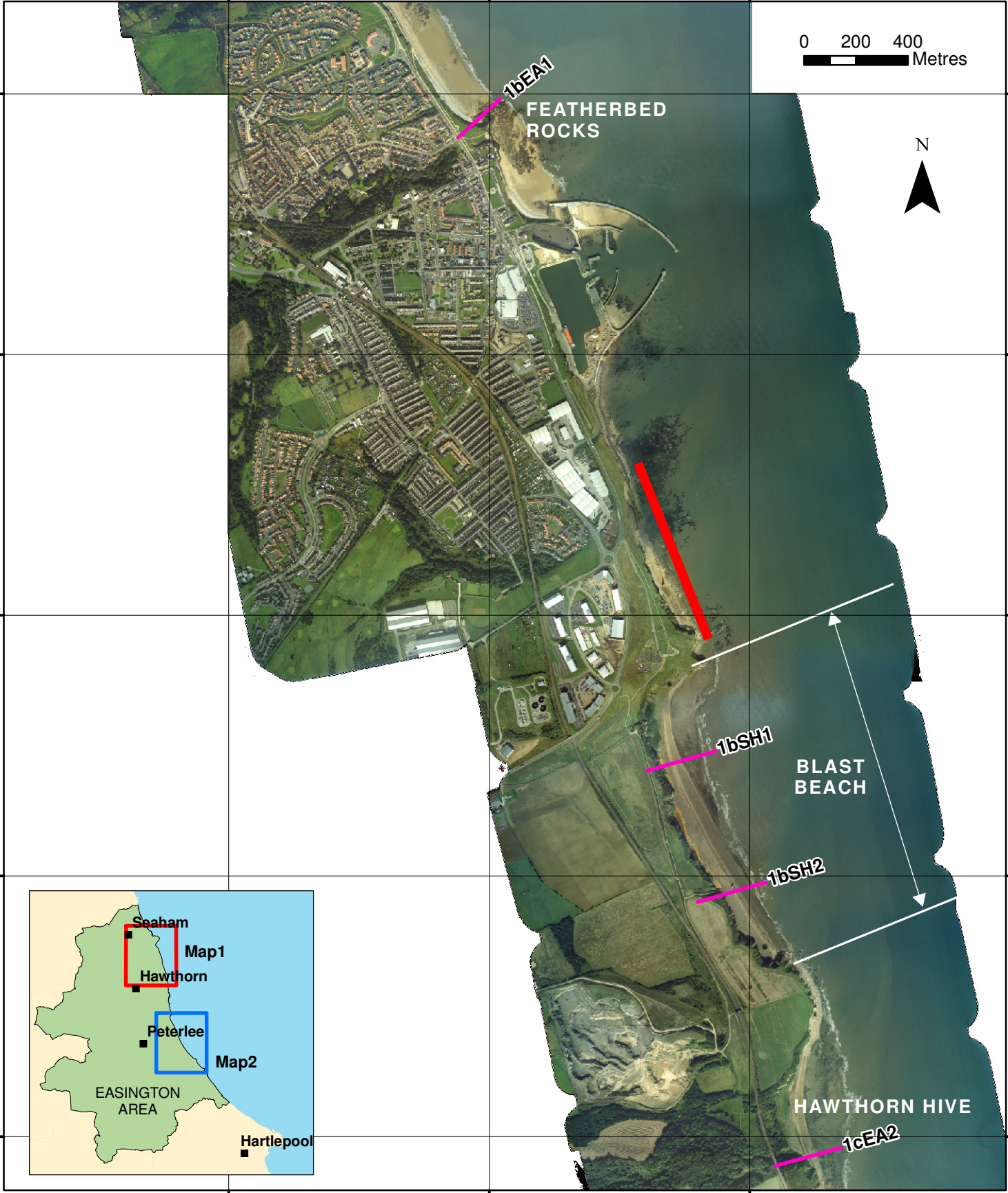
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TOPOGRAPHIC SURVEY LOCATIONS

- Annual Profile
- Bi-Annual Profile
- 6 monthly Survey
- Yearly Survey
- 5 yearly Survey
- Cliff Top Survey @ 50 centres
- Cliff Top Survey @ 100 centres
- Cliff Top Survey @ 300 centres

(Indicative Survey Extents shown)

Client: North East Coastal Group
 Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 1
 Durham County Council Frontage**

Analytical Report 1
 'Full Measures' Survey 2008

Drawing Scale 1:20,000 at A4



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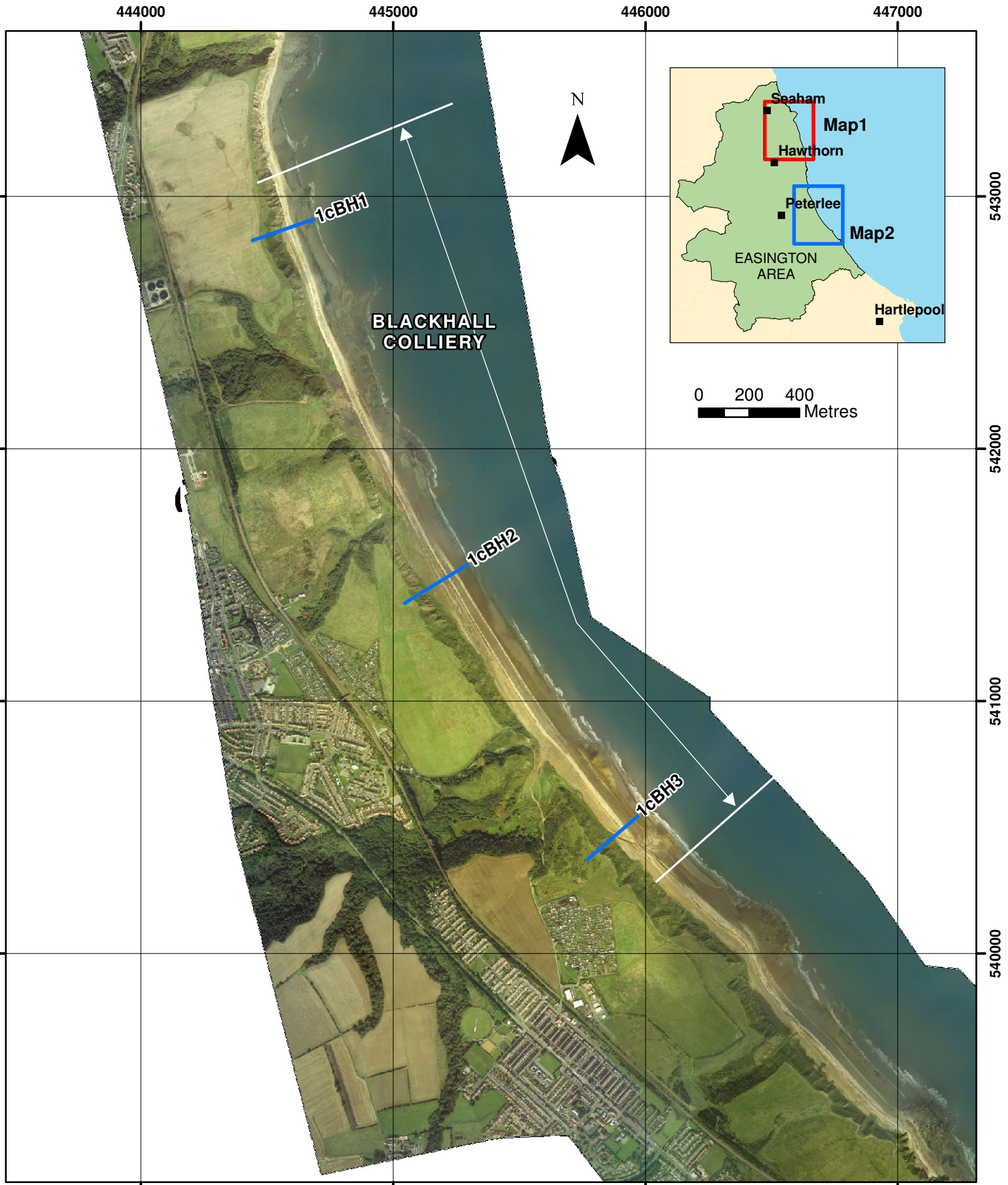
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TOPOGRAPHIC SURVEY LOCATIONS

- Annual Profile
- Bi-Annual Profile
- 6 monthly Survey
- Yearly Survey
- 5 yearly Survey
- Cliff Top Survey @ 50 centres
- Cliff Top Survey @ 100 centres
- Cliff Top Survey @ 300 centres

(Indicative Survey Extents shown)

Client: North East Coastal Group
 Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 2
 Durham County
 Council Frontage**

Analytical Report 1
 'Full Measures' Survey 2008

Drawing Scale 1:20,000 at A4



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2. Analysis of Survey Data

2.1 Featherbed Rocks

Survey Date	Description of Changes Since Last Survey	Interpretation
11-2008 (Baseline)	<p>Beach Profiles:</p> <p>One beach profile line (EA1) is located at Featherbed Rocks (Appendix A). This starts on the cliff top immediately adjacent (seaward side) to the B1287 North Road at an elevation of around 20.5mODN and drops to the grassland level, of just over 19mODN, after a chainage of 10m. For the next 68m chainage, the profile extends across the cliff top, dipping slightly at the cliff edge to around 18mODN. The profile then drops some 14.5m down the cliff face to the toe of the cliff and extends seaward across the foreshore until it meets the rock armour revetment placed around the headland. This is clearly distinctive from the profile, indicating a crest level of around 4.7mODN. This is over 1m higher than a 1 in 200 year extreme sea level. Further offshore from the rock armour is a rock scar outcropping from the sea bed.</p>	<p>Being protected by the rock armour revetment, it is likely that this profile will not exhibit significant signs of change. Slightly further north of here, however, it is known that erosion of the cliff face is occurring due to the 'ramping' action of the beach on wave run-up. Here significant volumes of shingle have accumulated against the sea wall, almost burying its crest in places. Due to this, it is recommended to move this profile line slightly to the north to better capture these ongoing changes. Section 3 contains further details.</p>

2.2 Seaham (Dawdon)

Survey Date	Description of Changes Since Last Survey	Interpretation
11-2008 (Baseline)	<p>Cliff Top Survey:</p> <p>Three ground control points have been established along the cliff top at Dawdon (Figure B1). The separation between any two points is nominally 300m. These cliff top surveys are intended to inform on erosion rates of the undefended sea cliffs extending south of the rock armour revetment to the south of Seaham Harbour. The cliff top surveys at Dawdon are undertaken bi-annually. Measurements are taken from a fixed ground control point along a fixed bearing to the edge of the cliff top.</p>	<p>Appendix B provides information about the ground control points and results from the 2008 (baseline) cliff top survey showing the position from the ground control point to the edge of the cliff top along the defined bearing. Future reports will show results from subsequent surveys and provide a means of assessing erosion since the baseline survey.</p>

2.3 Blast Beach

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>11-2008 (Baseline)</p>	<p>Beach Profiles:</p> <p>Blast Beach is covered by two beach profile lines (Appendix A).</p> <p>SH1 is located in the northern half of the beach and shows a cliff top elevation of around 37.5mODN. At the toe of the cliff lies a 37m width of beach composed of colliery spoil. This has a distinct cliff edge of around 0.5m in height, dropping down to the beach 'proper' which grades away towards low water level. Levels at the toe of the cliff (3.7mODN) are lower than at the highest point within the fronting colliery spoil (5.1mODN). Whilst levels at the cliff toe remain above HAT level (3.18mODN) they are very close to the extreme water levels associated with a 1 in 200 year storm (3.7mODN) and, in the absence of the protection provided by the fronting spoil beach, such an event would directly attack the cliff toe.</p> <p>SH2 shows a similar profile shape to SH1, but with two subtle differences. First, the cliff face exhibits a gentler gradient, mainly due to the presence of talus material at the cliff toe. Second, there is a less distinct 'cliff' at the interface between the spoil beach and the natural beach and effectively the two merge with a gentler-sloping berm distinguishable. There remains around 34m width of spoil protecting the backing cliffs. Similar to SH1, the levels at the toe of the cliff (4.0mODN) are lower than the highest point within the spoil beach (5.1mODN), again showing the beneficial effect of the spoil in terms of cliff protection.</p>	<p>The cliffs along Blast Beach are protected against marine erosion by the width of colliery spoil forming an artificial beach on the foreshore. As this spoil erodes, so the risk increases that the cliffs will become re-activated once again and may start to erode back. It will be important to continue monitoring here to better understand rates of erosion of the colliery spoil.</p> <p>The area north of SH1 currently has a greater width of beach and a higher cliff edge at the seaward limit of the colliery spoil. It is recommended that an additional profile line be added here to further understand changes along Blast Beach following cessation of spoil tipping.</p>

2.4 Hawthorne Hive

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>11-2008 (Baseline)</p>	<p>Beach Profiles:</p> <p>One beach profile line (EA2) is located at Hawthorne Hive (Appendix A). This starts on the cliffs south of Hawthorne Burn at an elevation of around 24.3mODN and runs down the slope, crossing several subsequent cliff and plateau features, including the most seaward cliff 'ridge' seen on the front cover of this report. Almost immediately at the toe of this feature the profile cross the outlet channel of Hawthorne Burn and then continues along the beach down to low water.</p>	<p>Subsequent surveys will indicate the degree of change that occurs along this frontage in beach levels and in position and size of the outlet channel of Hawthorne Burn.</p>

2.5 Blackhall Colliery

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>11-2008 (Baseline)</p>	<p>Beach Profiles:</p> <p>Blackhall Colliery is covered by three beach profile lines (Appendix A).</p> <p>BH1 is located near Horden Point. It starts on the cliff top at an elevation of around 51.8mODN and extends some 50m to the cliff edge. It then drops to the foreshore where the elevation at the cliff toe is around 5.6mODN. Here the cliff toe is protected by a colliery spoil beach where the level is retained above the limit of marine action for around 33m before gently shelving down to low water level.</p> <p>BH2 exhibits a similar profile, with cliff top elevation being around 46.5mODN and the cliff face gently sloping down to the spoil beach at the toe. This spoil beach retains a level of between 4.5mODN and 5.5mODN, i.e. well above the limit of marine action, for over 65m before forming a very distinct cliff of around 1.5m in height at its interface with the natural beach, which then shelves down to low water level.</p> <p>BH3 also shows a similar profile, with the cliff top being around 40mODN in elevation. The cliff face gently slopes down to the spoil beach, which is at a level of between 5.0mODN and 5.5m ODN at the cliff toe. Here, however, the spoil beach is only around 20m in width before it is intersected by the outlet channel of Castle Eden Burn. Although some spoil material remains on the seaward side of this channel, the beach levels soon shelf down to low water.</p>	<p>The cliffs along the Blackhall Colliery frontage are protected against marine erosion by the width of colliery spoil forming an artificial beach on the foreshore. As this spoil erodes, so the risk increases that the cliffs will become re-activated once again and may start to erode back. It will be important to continue monitoring here to better understand rates of erosion of the colliery spoil.</p>

3. Problems Encountered and Uncertainty in Analysis

There were no problems encountered during the surveys or with the analysis.

4. Recommendations for 'Fine-tuning' the Monitoring Programme

A recommendation has been made to move the Featherbed Rocks beach profile (EA1) slightly further north to better capture the changes that are occurring at the southern end of the beach, where shingle is accumulating in significant quantities. The revised profile location is shown in Figure 3. This change can be made with no additional cost to the monitoring programme as it is 'fine-tuning' of existing arrangements.

It is also recommended that an additional profile line be added north of SH1 in Blast Beach. In this location, there is a greater width of spoil beach and a more distinct cliff at its seaward end than is observed along SH1 and additional monitoring here would provide further useful insight into erosional processes in areas where colliery spoil was formerly deposited. This change would incur additional costs to the monitoring programme since it is an addition to existing arrangements, although the additional cost is expected to be relatively minor.

No other changes are recommended at the present time.

5. Conclusions and Areas of Concern

- The profile line that is being relocated to the north of Featherbed Rocks will be important for monitoring changes in beach level at the southern end of Seaham promenade. These changes have impacts on 'ramping' waves over the crest of the promenade, causing localised erosion of the backing cliffs.
- The cliffs along several areas within County Durham Council's jurisdiction are protected against marine erosion by the width of colliery spoil forming an artificial beach on the foreshore. As this spoil erodes, so the risk increases that the cliffs will become re-activated once again and may start to erode back. It will be important to continue monitoring here to better understand rates of erosion of the colliery spoil.
- It will be interesting to note any variability in the position of the channel of Hawthorne Burn as it crosses the foreshore and whether this has any influence on recession or stability of the backing cliffs.

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Re-located Profiles

1bEA1

FEATHERBED ROCKS

SEAHAM

1bSH1

BLAST BEACH

1bSH2

HAWTHORN HIVE

1cEA2



REVISED TOPOGRAPHIC SURVEY LOCATIONS

- Annual Profile
- Bi-Annual Profile
- Cliff Top Survey @ 50 centres
- Cliff Top Survey @ 100 centres
- Cliff Top Survey @ 300 centres

(Indicative Survey Extents shown)

Client: North East Coastal Group
 Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 3 - Map 1
 Durham County Council Frontage**

Analytical Report 1
 'Full Measures' Survey 2008

Drawing Scale 1:20,000 at A4

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Appendices

Appendix A
Beach Profiles

Beach Profile

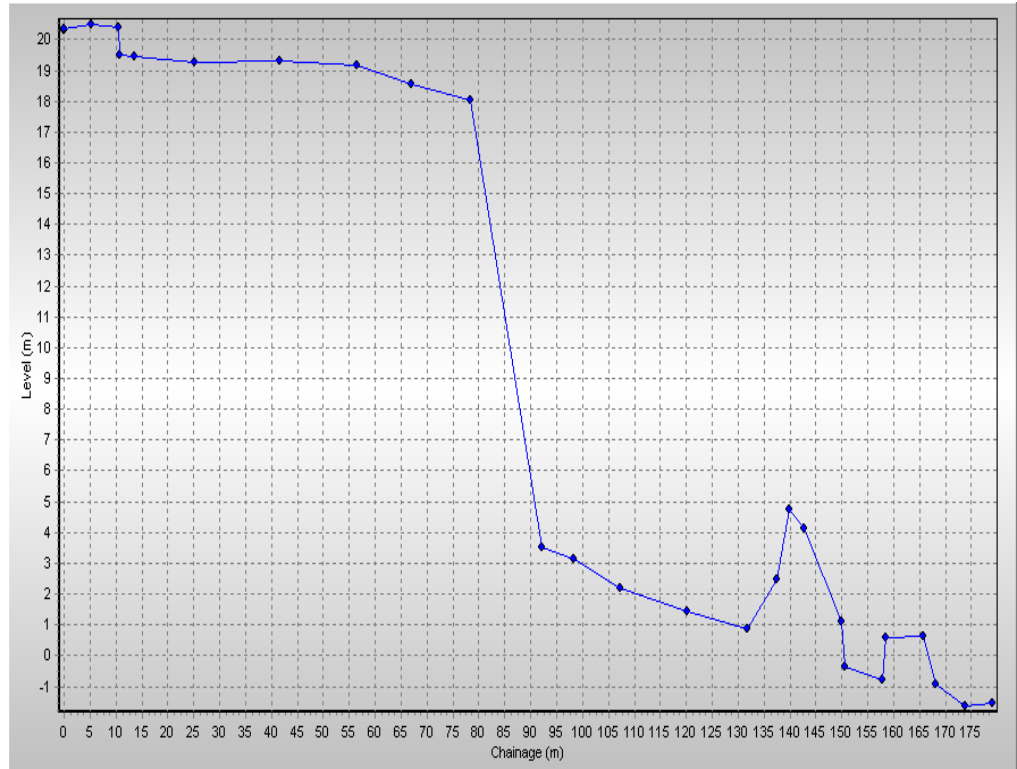
1bEA1

Date 02/11/2008 **Inspector** RH
Wind Light **Sea State**
Summary

Low Tide (m) **Low Tide Time**
Visibility Good **Rain** No

Easting 442882.690 **Northing** 549833.020 **Bearing** 47

Chainage	Level
0.000	20.284
0.065	20.350
5.248	20.491
10.599	20.383
10.717	19.517
13.556	19.467
25.257	19.241
41.676	19.310
56.457	19.158
67.045	18.543
78.358	18.009
92.141	3.516
98.236	3.121
107.363	2.175
120.250	1.420
131.842	0.851
137.425	2.478
139.812	4.741
142.669	4.116
149.930	1.090
150.629	-0.353
157.774	-0.784
158.525	0.590
165.615	0.641
168.173	-0.930
173.724	-1.638
179.051	-1.554



Beach Profile

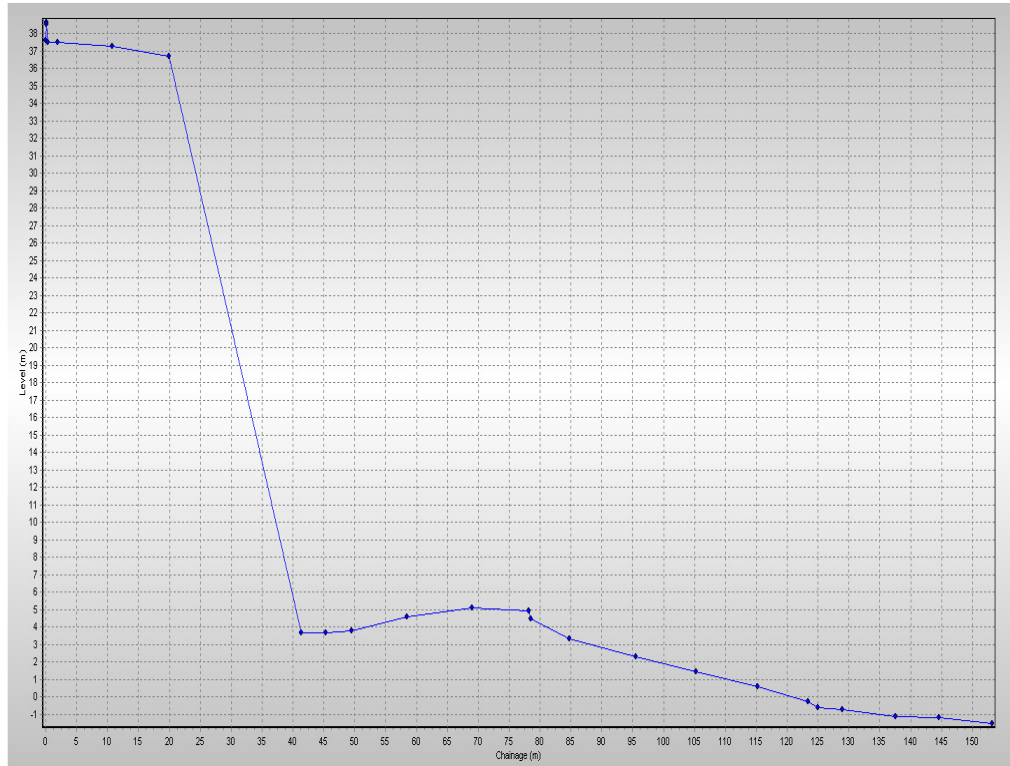
1bSH1

Date 25/11/2008 **Inspector** RH
Wind Light **Sea State**
Summary

Low Tide (m)
Visibility Good **Low Tide Time**
Rain No

Easting 443613.740 **Northing** 547404.590 **Bearing** 74

Chainage	Level
0.000	37.629
0.066	38.631
0.088	38.511
0.326	37.498
1.896	37.472
10.723	37.279
19.929	36.715
41.398	3.691
45.324	3.659
49.525	3.801
58.494	4.560
69.015	5.115
78.214	4.948
78.539	4.497
84.746	3.354
95.516	2.279
105.298	1.441
115.205	0.581
123.449	-0.277
125.017	-0.629
128.979	-0.746
137.568	-1.144
144.592	-1.210
153.198	-1.526



Beach Profile

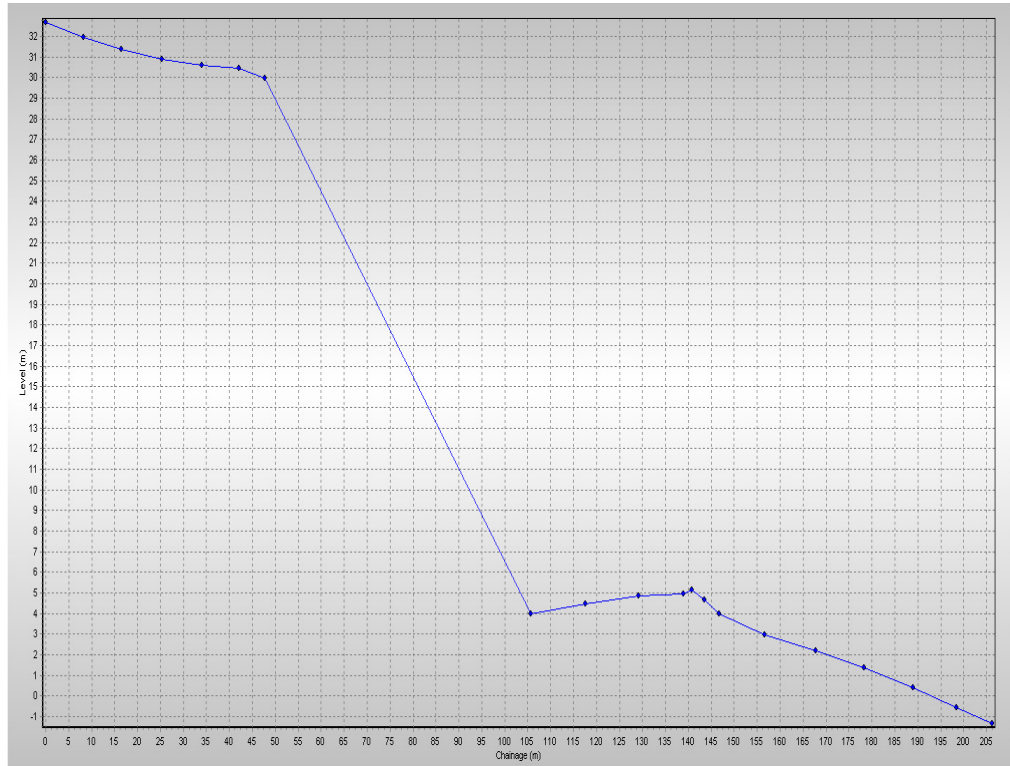
1bSH2

Date 25/11/2008 **Inspector** RH
Wind Light **Sea State**
Summary

Low Tide (m)
Visibility Good **Low Tide Time**
Rain No

Easting 443806.530 **Northing** 546899.550 **Bearing** 74

Chainage	Level
0.000	32.685
8.243	31.977
16.441	31.371
25.250	30.898
34.003	30.601
42.160	30.438
47.718	29.971
105.671	3.983
117.567	4.458
129.226	4.871
138.947	4.959
140.709	5.129
143.561	4.688
146.689	3.973
156.706	2.965
167.761	2.200
178.226	1.391
189.025	0.400
198.410	-0.577
206.203	-1.332



Beach Profile

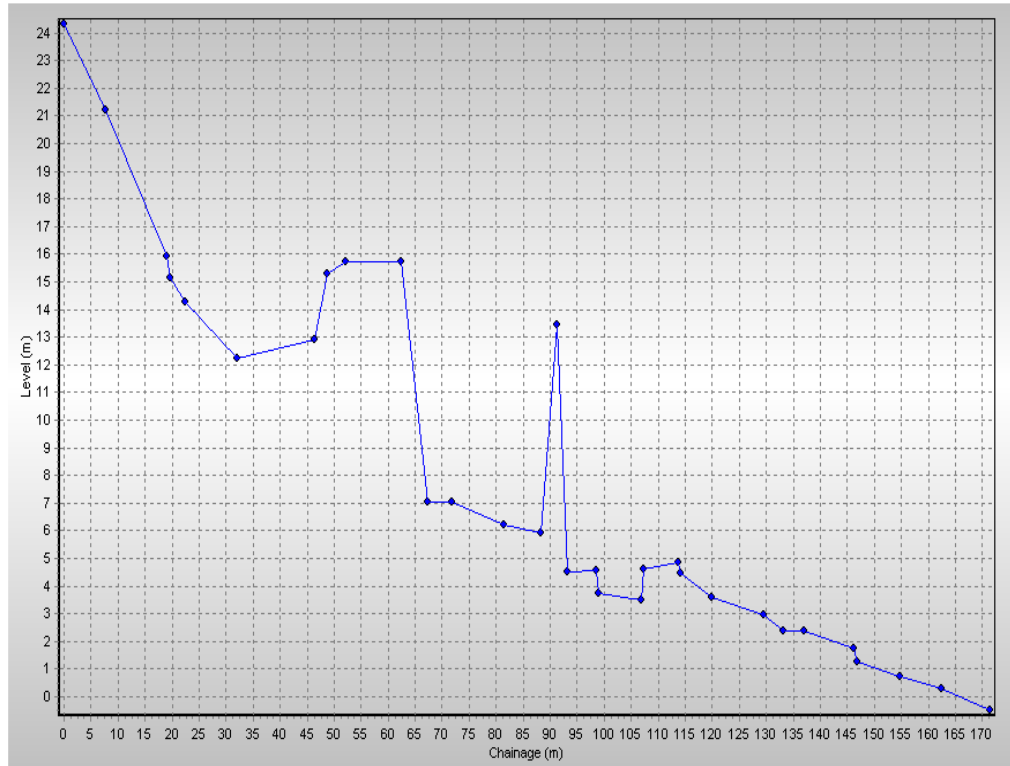
1cEA2

Date 03/12/2008 Inspector RH
Wind Light Sea State
Summary

Low Tide (m) Low Tide Time
Visibility Good Rain No

Easting 444101.530 Northing 545888.480 Bearing 75

Chainage	Level
0.000	24.319
7.729	21.218
19.058	15.928
19.595	15.146
22.468	14.285
32.065	12.212
46.430	12.918
48.818	15.267
52.251	15.729
62.477	15.724
67.320	7.063
71.891	7.036
81.510	6.206
88.317	5.941
91.345	13.469
93.171	4.535
98.436	4.544
99.049	3.729
106.804	3.501
107.261	4.589
113.687	4.841
114.184	4.451
119.853	3.585
129.473	2.938
133.126	2.391
137.100	2.380
146.242	1.758
146.892	1.253
154.715	0.743
162.427	0.271
171.425	-0.484



Beach Profile

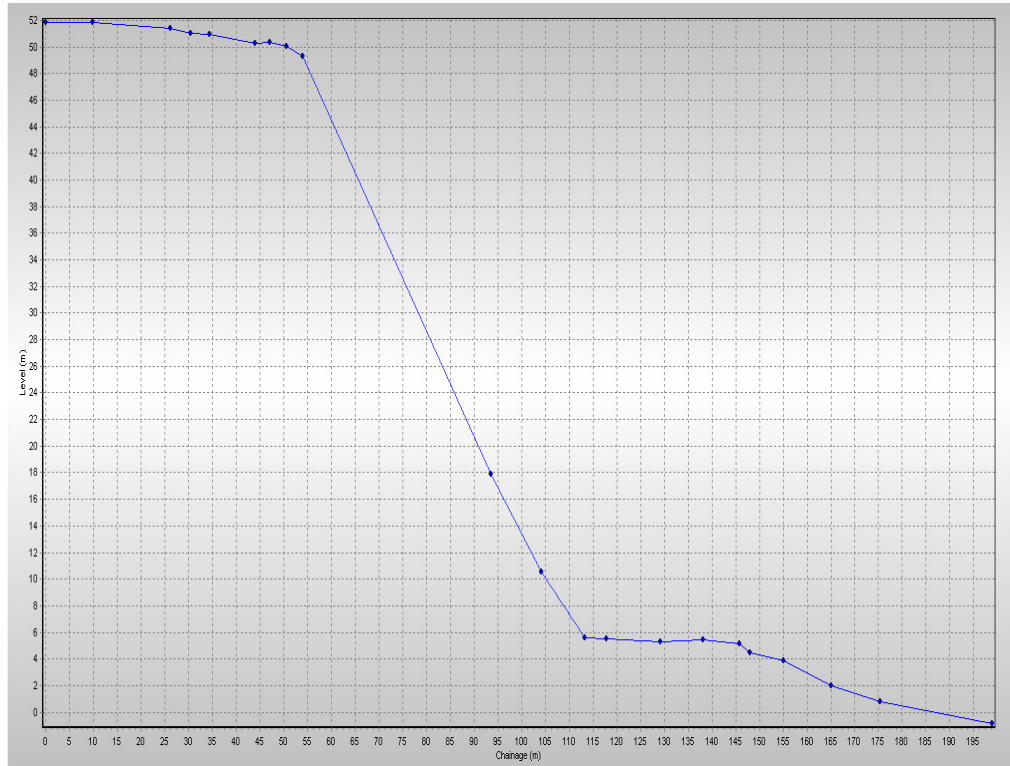
1bBH1

Date 06/11/2008 **Inspector** RH
Wind Light **Sea State**
Summary

Low Tide (m)
Visibility Good **Low Tide Time**
Rain No

Easting 444443.310 **Northing** 542826.090 **Bearing** 71

Chainage	Level
0.000	51.837
9.840	51.848
26.190	51.363
30.490	51.009
34.420	50.931
43.990	50.286
47.090	50.348
50.640	50.063
54.020	49.290
93.580	17.924
104.220	10.546
113.250	5.614
117.840	5.490
129.240	5.324
138.210	5.464
145.760	5.122
147.960	4.444
155.050	3.879
165.140	1.971
175.300	0.766
198.910	-0.856



Beach Profile

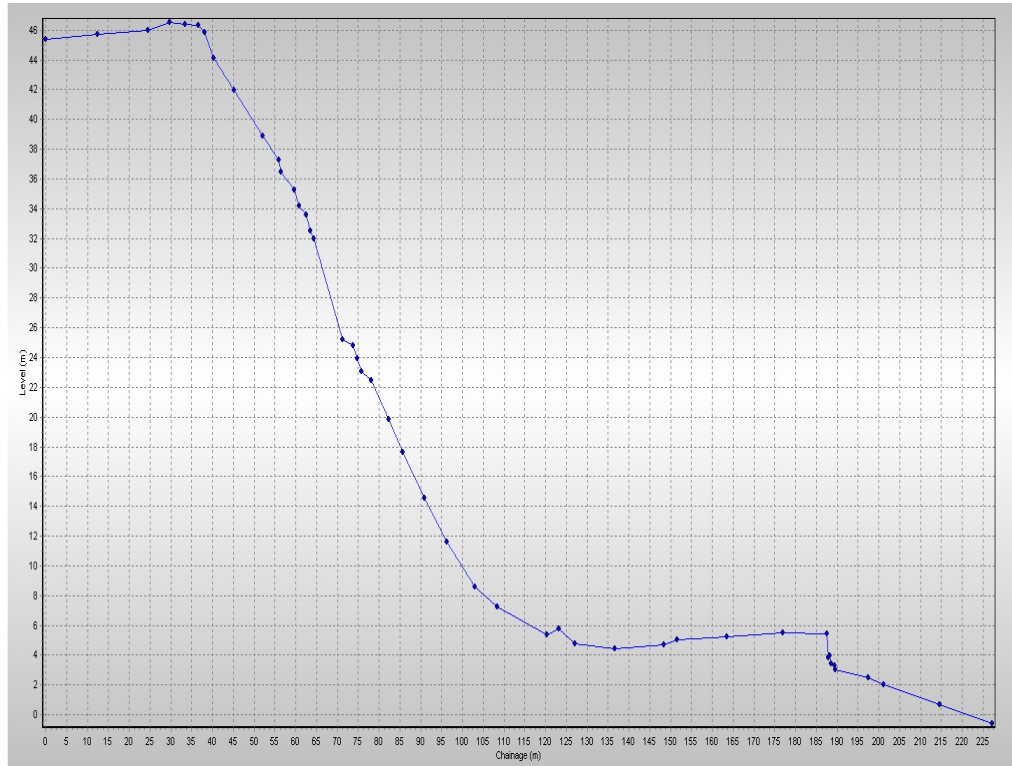
1bBH2

Date 06/11/2008 **Inspector** RH
Wind Light **Sea State**
Summary

Low Tide (m)
Visibility Good **Low Tide Time**
Rain No

Easting 445046.840 **Northing** 541386.810 **Bearing** 58

Chainage	Level
0.000	45.385
12.420	45.734
24.600	46.011
29.760	46.519
33.370	46.412
36.600	46.309
38.200	45.842
40.310	44.124
45.180	41.981
52.070	38.903
55.930	37.255
56.540	36.438
59.650	35.261
60.910	34.217
62.520	33.564
63.600	32.537
64.440	32.008
71.210	25.227
73.750	24.805
74.820	23.926
75.850	23.037
78.140	22.436
82.320	19.844
85.690	17.647
90.910	14.526
96.230	11.618
103.090	8.602
108.330	7.227
120.310	5.340
123.180	5.784
127.100	4.781
136.690	4.452
148.320	4.707
151.560	4.999
163.510	5.230
176.910	5.534
187.590	5.458
187.930	3.847
188.210	3.933
188.530	3.419
189.340	3.315
189.500	3.027
197.430	2.469
201.090	2.013
214.600	0.693
227.190	-0.598



Beach Profile

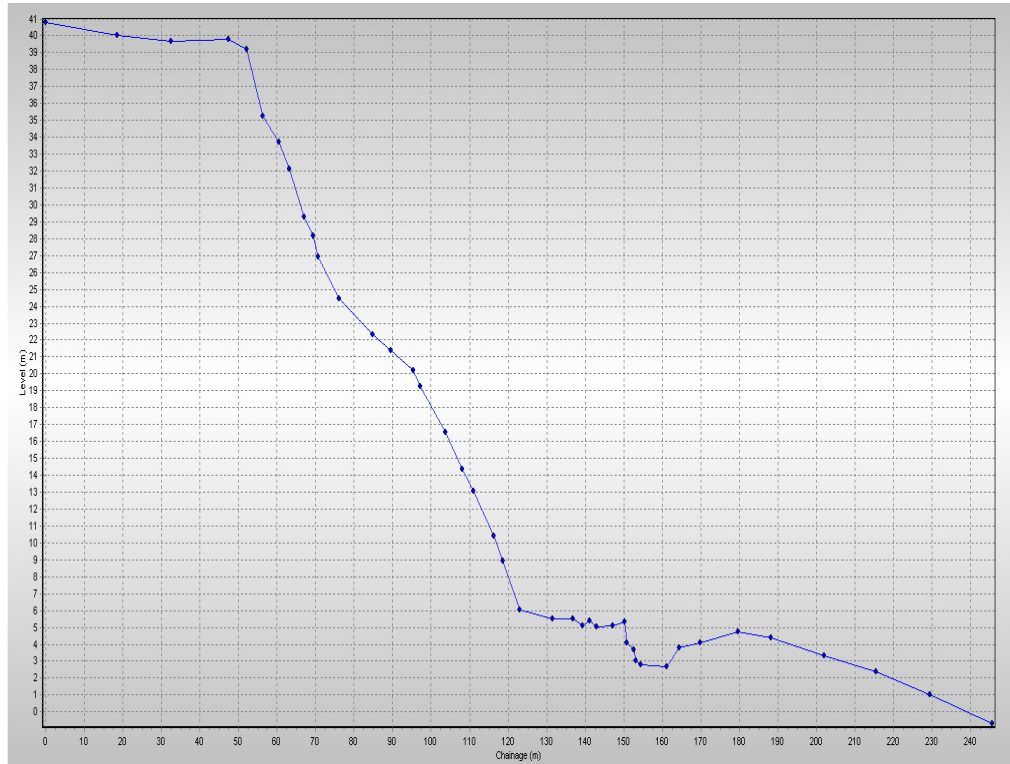
1bBH3

Date 06/11/2008 **Inspector** RH
Wind Light **Sea State**
Summary

Low Tide (m) **Low Tide Time**
Visibility Good **Rain** No

Easting 445771.320 **Northing** 540371.470 **Bearing** 49

Chainage	Level
0.000	40.794
18.590	40.035
32.580	39.662
47.500	39.815
52.150	39.221
56.350	35.264
60.520	33.741
63.200	32.121
67.080	29.280
69.470	28.169
70.720	26.933
76.200	24.419
84.750	22.310
89.520	21.382
95.430	20.223
97.220	19.252
103.640	16.515
108.090	14.379
111.030	13.078
116.180	10.375
118.640	8.900
123.010	6.040
131.500	5.491
136.780	5.526
139.300	5.122
141.140	5.412
142.980	5.009
147.120	5.070
150.320	5.341
150.870	4.086
152.530	3.649
153.190	3.019
154.350	2.782
161.120	2.702
164.470	3.818
169.870	4.071
179.680	4.719
188.150	4.394
201.940	3.339
215.510	2.355
229.450	0.998
245.610	-0.690



Appendix B
Cliff Top Survey

Cliff Top Survey

Seaham (Dawdon)

Three ground control points have been established along the cliff top at Dawdon (Figure B1). The separation between any two points is nominally 300m. These cliff top surveys are intended to inform on erosion rates of the undefended sea cliffs extending south of the rock armour revetment to the south of Seaham Harbour.

The cliff top surveys at Dawdon are undertaken bi-annually. Measurements are taken from a fixed ground control point along a fixed bearing to the edge of the cliff top.

Table B1 provides information about these ground control points and results from the 2008 (baseline) cliff top survey showing the position from the ground control point to the edge of the cliff top along the defined bearing. Future reports will show results from subsequent surveys and provide a means of assessing erosion since the baseline survey.

Table B1 – Cliff Top Surveys at Dawdon

Ground Control Point Details					Distance to Cliff Top (m)			Total Erosion (m)		Erosion Rate (m/year)
Ref	Easting	Northing	Level (mODN)	Bearing (°)	Baseline Survey (Full 2008)	Previous Survey (N/A)	Present Survey (N/A)	Baseline (Full 2008) to Present (N/A)	Previous (N/A) to Present (N/A)	Baseline (Full 2008) to Present (N/A)
1	443515	548422	25.1	70	16.10	-	-	-	-	-
2	443608	548136	28.0	90	13.30	-	-	-	-	-
3	443756	547859	27.6	95	14.80	-	-	-	-	-

443000

444000



549000

548000



Cliff Top Monitoring Points

Client: North East Coastal Group
 Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 1
 Durham County
 Council Frontage**

Analytical Report 1
 'Full Measures' Survey 2008

Drawing Scale 1:10,000 at A4



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 Checked by: MD Date: 13/05/2009
 Approved by: NC Date: 13/05/2009

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