



**Walk-over Visual Inspections of Assets  
including Coastal Slopes**



**Redcar and Cleveland  
Borough Council  
Final Report**

**October - November 2012**

# Redcar and Cleveland Borough Council

## Cell One Coast Protection Assets and Coastal Slope Condition Analysis

### Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Signed
1	0	Draft	10/5/13	AP
2	0	Final	07/06/13	AP

# Contents

<b>Contents</b>	<b>ii</b>
<b>Disclaimer</b>	<b>iii</b>
<b>Preamble</b>	<b>iv</b>
<b>1. Introduction</b>	<b>1</b>
1.1. <i>Methodology</i>	1
1.2. <i>Assessment Methodology</i>	1
1.3. <i>Study Area</i>	2
<b>2. Overview</b>	<b>4</b>
2.1 <i>Coastal Slope Condition Assessment</i>	4
2.2 <i>Coast Protection Asset Condition Assessment</i>	4
<b>3. Condition Assessment</b>	<b>6</b>
3.1 <i>Coatham Sands</i>	6
3.2 <i>Redcar</i>	11
3.3 <i>East Redcar to Saltburn-by-the-Sea</i>	11
3.4 <i>Saltburn-by-the-Sea</i>	15
3.5 <i>Cliffs northeast of Saltburn</i>	21
3.6 <i>Hunt Cliff and Warsett Hill, west of Skinningrove</i>	22
3.7 <i>Cattersty Cliff and Skinningrove</i>	23
3.8 <i>Skinningrove to Boulby</i>	29
3.9 <i>Boulby to Cowbar Nab</i>	32
<b>4. Comparison with Previous Assessments</b>	<b>35</b>
<b>5. Problems Encountered and Uncertainty in Analysis</b>	<b>36</b>
<b>6. Conclusions and Recommended Actions</b>	<b>37</b>

## Appendices

Appendix A Coastal Slope Condition maps

Appendix B Coast Protection Asset Condition maps and data summary table

## Disclaimer

Halcrow Group Limited ('Halcrow') is a CH2M HILL company. Halcrow has prepared this report in accordance with the instructions of our client Scarborough Borough Council (SBC) for the client's sole and specific use. Any other persons who use any information contained herein do so at their own risk. Halcrow has used reasonable skill, care and diligence in the interpretation of data provided to them and accepts no responsibility for the content, quality or accuracy of any Third party reports, monitoring data or further information provided either to them by SBC or, via SBC from a Third party source, for analysis under this term contract.

Raw data analysed in this report is available to download via the project's webpage: [www.northeastcoastalobservatory.org.uk](http://www.northeastcoastalobservatory.org.uk). The North East Coastal Observatory does not "license" the use of images or data or sign license agreements. The North East Coastal Observatory generally has no objection to the reproduction and use of these materials (aerial photography, wave data, beach surveys, bathymetric surveys), subject to the following conditions:

1. North East Coastal Observatory material may not be used to state or imply the endorsement by North East Coastal Observatory or by any North East Coastal Observatory employee of a commercial product, service, or activity, or used in any manner that might mislead.
2. North East Coastal Observatory should be acknowledged as the source of the material in any use of images and data accessed through this website, please state "Image/Data courtesy of North East Coastal Observatory". We recommend that the caption for any image and data published includes our website, so that others can locate or obtain copies when needed. We always appreciate notification of beneficial uses of images and data within your applications. This will help us continue to maintain these freely available services. Send e-mail to [Robin.Siddle@scarborough.gov.uk](mailto:Robin.Siddle@scarborough.gov.uk)
3. It is unlawful to falsely claim copyright or other rights in North East Coastal Observatory material.
4. North East Coastal Observatory shall in no way be liable for any costs, expenses, claims, or demands arising out of the use of North East Coastal Observatory material by a recipient or a recipient's distributees.
5. North East Coastal Observatory does not indemnify nor hold harmless users of North East Coastal Observatory material, nor release such users from copyright infringement, nor grant exclusive use rights with respect to North East Coastal Observatory material.

North East Coastal Observatory material is not protected by copyright unless noted (in associated metadata). If copyrighted, permission should be obtained from the copyright owner prior to use. If not copyrighted, North East Coastal Observatory material may be reproduced and distributed without further permission from North East Coastal Observatory.

# 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 1-1). 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 sediment to varying thicknesses, softer rock cliffs and extensive landslide complexes.

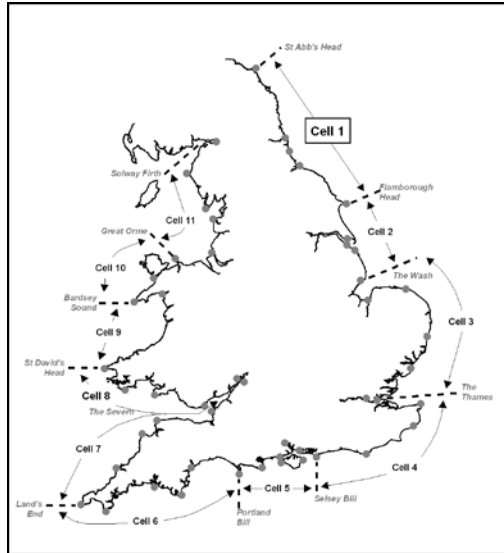


Figure 1-1: Sediment Cells in England and Wales

The work commenced with a three-year monitoring programme in September 2008 that was managed by Scarborough Borough Council on behalf of the North East Coastal Group. This initial phase has been followed by a five-year programme of work, which started in October 2011. The work is funded by the Environment Agency, working in partnership with the following organisations:



The original three year programme of work was undertaken as a partnership between Royal Haskoning, Halcrow and Academy Geomatics. For the current five year programme of work the data collection associated with beach profiles, topographic surveys and cliff top surveys is being

undertaken by Academy Geomatics. The analysis and reporting for the programme is being undertaken by Halcrow.



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

In addition, separate reports are produced for other elements of the programme as and when specific components are undertaken, such as beach profile, topographic and cliff top surveys, wave data collection, bathymetric and sea bed sediment data collection, and aerial photography.

The present report provides a summary of the main findings of the Coastal Walk-over visual Inspections of assets of Redcar and Cleveland Borough Council's frontage that were carried out in September to November 2012.

# 1. Introduction

## 1.1. Methodology

This section outlines the approach taken by the slope and asset inspectors, respectively, for the Redcar and Cleveland Borough Council coastal frontage, extending from the South Gare Breakwater in the north, to Cowbar Nab, Staithes in the south.

Coastal Walkover Inspections have previously been undertaken every 2 years since 2002 between Scottish Border to River Tyne, and every 2 years since 2008 between River Tyne and Flamborough Head. The most recent inspection of the Redcar and Cleveland frontage was 2010. The Scarborough Borough Council frontage was last inspected in 2009. The approach to the inspections is consistent with the previous work. The asset and slope inspectors have included Chartered Engineers (focusing mainly on the built coastal protection structures) and Engineering Geomorphologists (focusing mainly on the natural cliffs and coastal slopes) ensuring suitable skills are applied to each length of frontage.

## 1.2. Assessment Methodology

This section presents the approach taken by the slope and asset inspectors respectively for the Redcar and Cleveland Borough Council coastal frontage.

### *Coastal Slope Condition Assessment (Saltburn to Cowbar)*

The 2012 Coastal Slope Condition Assessment was undertaken by systematic walk-over inspection of the whole coastline by a team of geomorphologists who are familiar with the site having undertaken previous inspections in this area. The inspection involved visual assessment of cliff activity and noting specific areas of activity (e.g. landslides and tension cracks). All observations were documented with photographs and field notes. Each unit was identified, photographed and classified according to the five point activity scale as defined in Table 1.1. This classification scheme is the same as that used in previous cliff activity assessments undertaken by Halcrow for Scarborough Borough Council in Cell 1 (Halcrow 2002, Halcrow 2005, Halcrow 2010).

This report provides a summary of the cliff condition as assessed in September-October 2012, and how this differs to assessments from previous years. A fuller discussion of geology and specific mechanisms of cliff failure can be found in previous reports (Halcrow 2002, Halcrow 2005, High Point Rendel 2002). For ease of reference the photos presented in this report have also been bordered with the colours from the key indicated below. Maps showing current activity and change in activity since the last survey are provided in Appendix A.

Rank	Activity Class	Description
1	Dormant	Protected cliffline or landslide complex with no visible evidence of landslide activity.
2	Inactive	Relict cliffs or landslides with vegetated slopes and localised erosion of the toe or failure of the headscarp.
3	Locally Active	Retreating cliffline with localised small landslides or areas of erosion.
4	Partly Active	Retreating cliffline with very common smaller-scale landslides or areas of intense erosion.
5	Totally Active	Retreating cliff line almost entirely affected by large-scale landsliding or intense erosion.

Table 1.1. Cliff activity classes used 2012 assessment

The inspection was primarily conducted from the cliff top, due to access restrictions and health and safety concerns associated with the cliff toe and beaches along this stretch of coast. In the Redcar and Cleveland Council region, the coastline is followed for the most part by the Cleveland Way cliff top footpath. Where the footpath moved inland the inspection kept

to the cliff edge to ensure the whole coastline was observed and activity recorded. The beach and foreshore were only inspected where access could be safely achieved from the cliff top.

The Coastal Slope Condition Assessment walkover survey for the Redcar and Cleveland Borough Council frontage between Saltburn Sands (eastern side of Hazel Grove) in the north, to Cowbar Nab, Staithes in the south was conducted between 26<sup>th</sup> and 27<sup>th</sup> September 2012. The remainder of the natural coast assets between South Gare breakwater and Saltburn were inspected on 15<sup>th</sup> October 2012. The weather during this time was generally mild and dry.

#### *Coast Protection Asset Assessment*

The visual assessment of coast protection assets was carried out by Chartered Engineers in October and November 2012. The inspections were planned to coincide with suitable tidal states and weather conditions. Assets were visually inspected, photographed, graded based on their condition as defined in Table 1.2 and an estimate was made of their residual life and urgency of repair work. The grading assessment followed standard Environment Agency guidelines as presented in the Condition Assessment Manual (EA, 2011).

This classification scheme is the same as that used during previous inspections. Inspections were made from both the seaward and landward side of defence where possible. All assets were photographed and all data were stored 'live' using NFCDD inspection forms within SANDS, which was loaded on a ruggedised laptop.

The asset descriptions provided give an overview of findings, summarising each locality and identifying individual assets of poor condition, failing structures and assets that have the potential to fail. It is anticipated that this will help identify areas for investment, including repair work, replacement or the installation of a different asset type. The report also highlights assets with a certain level of importance or interest.

Grade	Rating	Description
1	Very Good	Cosmetic defects that will have no effect on performance.
2	Good	Minor defects that will not reduce the overall performance of the asset
3	Fair	Defects that could reduce performance of the asset.
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation needed.
5	Very Poor	Severe defects resulting in complete performance failure

*Table 1.2 Condition assessment grading used in the 2012 inspections*

For ease of reference the photos presented in this report have also been bordered with the colours from the key indicated above. Maps showing current asset condition grade are provided in Appendix B.

### **1.3. Study Area**

This report documents the condition of the coastal cliffs and built and natural assets along Redcar and Cleveland Borough Council's frontage, which extends from the South Gare Breakwater in the north, to Cowbar Nab, Staithes in the south. An overview of the study area is provided in Figure 1-1 below, which also shows the SMP2 Management Areas. Detailed maps of the cliff units are in Appendix A and the built assets in Appendix B.

The majority of the frontage between the River Tees and Saltburn is characterised by natural undefended coastal slopes of varying profile and level, with extensive concrete and masonry sea defences at Redcar and local defences at Marske-by-the-Sea and Saltburn. South of Saltburn the frontage is characterised by slope-over-wall cliffs comprising Lower Jurassic Lias clays and limestones overlain by glacial sediments. Between Skinningrove and Boulby the natural cliffs are largely replaced by extensive abandoned quarries cut back into the coastline. In places, the quarries are steep and extend down to sea level. East of Boulby the cliffs are



lower, with the clear stratigraphy of the Lower Jurassic Lias rock and glacial sediment evident again.

The naming convention for CBUs in this region is as follows: For CBU E59/6 the prefix relates to FutureCoast unit E59 and the suffix 6 relates to the specific area as defined in this case by the headland at Redhouse Nab (between Boulby and Cowbar).

The built coastal defence assets are named using the system established within the National Flood and Coastal Defence Database (NFCDD), as used on the previous surveys of this frontage.

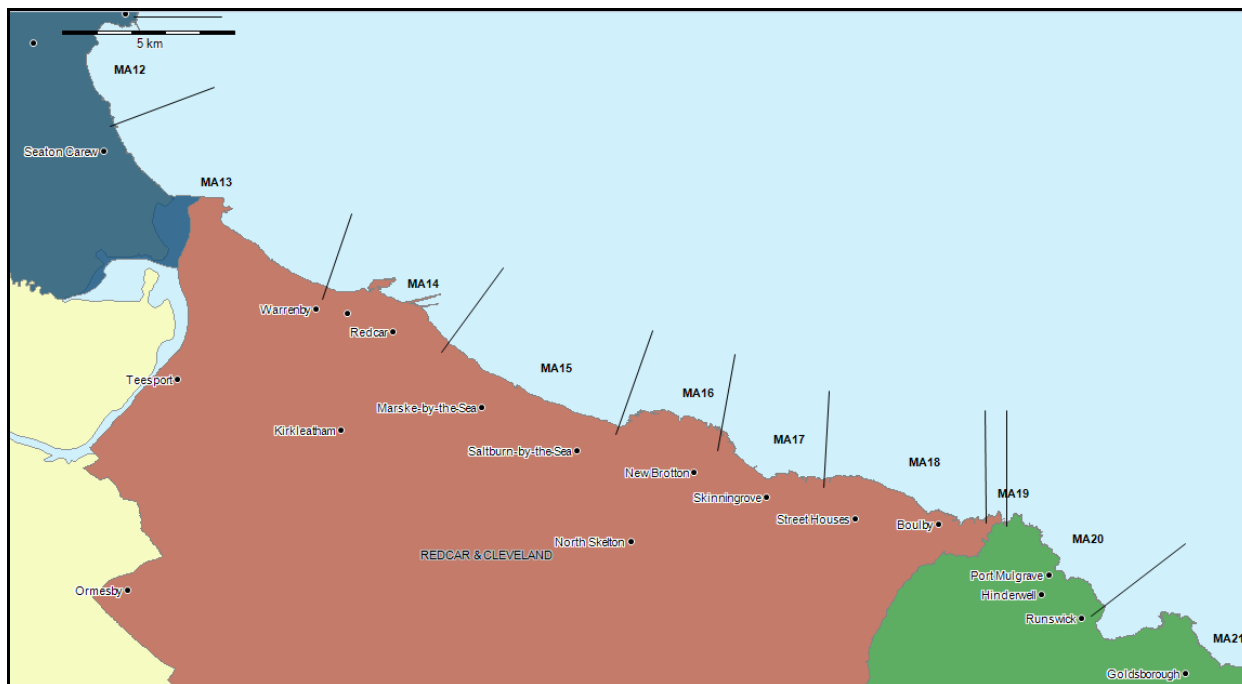


Figure 1-1: Study Area showing SMP2 Management Areas

## 2. Overview

### 2.1 Coastal Slope Condition Assessment

Variation in activity levels observed within this area reflects the diverse geology, past landslide activity and history of land-use.

In total 60 CBUs were observed during the 2012 walkover, of which, two were classed as Totally Active, 25 as Partly Active, 26 as Locally Active, six were Inactive and one unit was Dormant (Figure 2-1). The principal assets at risk along the natural stretch of coastline is the Warsett Hill railway line, which provides the rail link to the Boulby Potash mine. In addition, there are occasional properties and the Cleveland Way cliff top footpath.

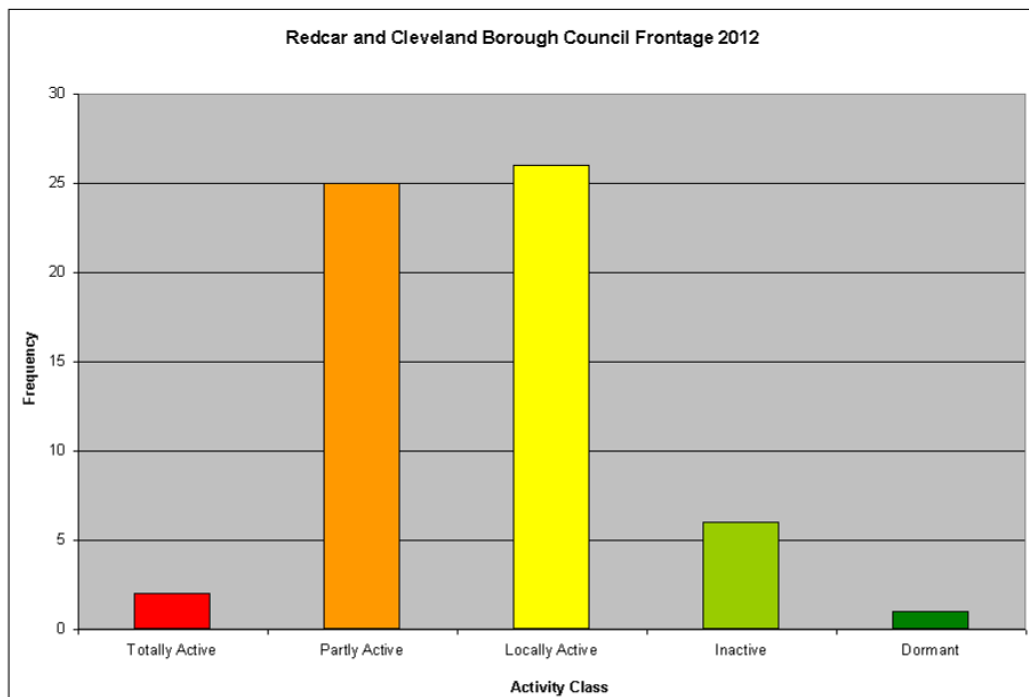


Figure 2-1. Frequency of cliff activity along the Redcar & Cleveland frontage in 2012

As in 2010, of particular concern is the activity observed at the following locations:

- Hunt Cliff and Warsett Hill where the railway line runs close to the cliff edge.
- Between Boulby and Cowbar where intense erosion was observed and parts of Cowbar Lane continue to be lost. Setback of the road has been necessary. This poses a significant risk to local traffic as it is the only access road to Cowbar.
- Boulby Grange, where the cliff top has shown recession and may begin to threaten the Cleveland Way footpath.

Regular monitoring of these sites is recommended.

### 2.2 Coast Protection Asset Condition Assessment

As identified in the 2008 and 2010 inspections, the South Gare Breakwater at the northern end of Coatham Sands (Asset Ref No 1221C901C0506C01) remains in poor condition and despite further recent patchwork repairs is still deteriorating. A detailed survey of the structure was recommended in the 2010 report, and if not yet undertaken is still required. This needs to identify if continuing local, isolated repairs are sufficient or whether a broader strategy/scheme which considers the condition and performance of the whole structure is more appropriate.

The assets protecting the Redcar frontage were not inspected in the 2008 inspection as extensive Environment Agency funded capital works to upgrade the 2.7km of assets from Coatham to the eastern extent of The Stray were to commence imminently. These works were nearing completion at the time of the inspections (October / November 2012) but as works were underway the new and partly completed sections of defence were not inspected.

The timber groynes along Redcar Sands to the east of Redcar (Asset Ref No 1221C901C0603C01) were in poor condition identified in 2008 and 2010 inspections but are being renovated / replaced as part of the improvement works.

As during the previous inspections in 2008 and 2010, the masonry seawall protecting much of the frontage at Saltburn (Asset Ref No's 1221C901C0703C02 to 1221C901C0704C06) requires repointing in places and repairs to minor defects. East of Skelton Beck the ad-hoc repairs to the eastern section of defences noted in 2010 were holding, but there are still major defects.

At Skinningrove, the jetty continues to show deteriorate (Asset Ref No. 1221D901D0201C02). Although It is disused as a jetty, access is still possible and so consideration should be given to public health and safety. It is strongly recommended that the jetty is once again secured to prevent public access. The low beach levels at Skininnngrove at the time of the inspection was exposing the toe of some of the rock armour defences between the jetty and the village, (Asset Ref No. 1221D901D0202C01). Although there was no notable movement in the armour, it had been undermined in places and so vulnerable to storm damage. At the eastern side of Kilton Beck the wall (Asset Ref No. 1221D901D0202C03) protecting the road where it turns inland is in poor condition, with the low beach levels exposing the toe which is significantly undermined.





### 3. Condition Assessment

This section provides an account of observations made on the condition of cliffs and coastal assets within Redcar and Cleveland Borough Council's coastline, running from north to south.

#### *Coastal Slope Condition Assessment*

Brief descriptions and photographs are provided, with reference made to groups of CBUs of similar activity. Location and activity status of all CBUs in the study area are shown on maps 1 to 4 in Appendix A. These maps also show change in activity. A full assessment of cliff condition has been entered into NFCDD.

Photographs have been bordered with colours in order to show their activity status, as follows:

	Totally Active
	Partly Active
	Locally Active
	Inactive
	Dormant

#### *Coast Protection Asset Condition Assessment*

Brief descriptions and photographs are presented for key assets and those where there are significant defects or where the condition has changed significantly since the previous inspection. Photographs have been bordered with colours in order to show their condition as follows:

	5 – Very poor
	4 – Poor
	3 – Fair
	2 – Good
	1 – Very good

Coast protection asset condition data is also provided on Maps 1 to 4 in Appendix B, and these also highlight any changes in overall asset condition since 2010. A full assessment of coast protection asset condition has been entered into NFCDD inspection forms held in the SANDS database.

### 3.1 Coatham Sands

#### *Coastal Slope Condition Assessment*

As reported in 2008 and 2010, the sand dunes (E52/11) were generally stable with a good coverage of established vegetation. Minor erosion, loss of vegetation and lowering of dune crests was evident locally where members of the public access the beach most frequently (the northern and southern extents of the dunes). A healthy beach level was maintained throughout Coatham Sands.



E52/11 View towards Redcar from South Gare.  
(Inactive)



Localised pedestrian damage to dunes near  
caravan park



E52/11 view from south - Photo from 2010



E52/11 Accretion of dunes at caravan park and  
next to site compound at Coatham (Inactive)  
Photo 15/10/2012

*Coast Protection Asset Condition Assessment*

The northern extent of the Redcar & Cleveland frontage is marked by the South Gare Breakwater, see Map 1 in Appendix B.

In the 2010 inspections the structure was noted as being generally in a poor condition throughout with significant cracking, spalling, loss of mortar and sealant and exposure of reinforcing steel to many of the concrete and masonry elements and undercutting and local slumping of the slag embankments. The 2012 inspection found that although there was evidence of recent repairs, the overall condition remains poor.

The western side of the breakwater was reported to be in worse condition than the eastern side in 2010 due to the defects observed in the slag embankment section of the structure. Some of these defects have been repaired, but the structure is a patchwork of repairs and requires continuous regular attention to limit further damage.



Patchwork of repairs on west side of South Gare Breakwater, recent repairs to concrete grouted revetment in foreground (Asset Ref No 12221C901C0506C01)

Several pre-cast concrete seawall units were missing towards the seaward extent of the structure exposing cracked and rust stained concrete walls beneath with extensive spalling of concrete.

The local in situ concrete pours noted in 2010 to replace the deck slabs on the eastern side of the structure appear to be holding, see below, lower right and left.



Voids present in deck - 2008  
(Asset Ref No 12221C901C0506C01)



Slab repairs to deck on east side of structure –  
2010 (Asset Ref No 12221C901C0506C01)



View of east side of South Gare breakwater, showing debris from failed deck slabs on beach. (Asset Ref No 12221C901C0506C01)



Repaired deck slabs over voids appear to be holding but facing to outer structure missing (Asset Ref No 12221C901C0506C01)

A detailed survey of the structure was beyond the scope of the present inspection and a full structural survey of the breakwater is recommended in order to establish the full extent of the damage and identify appropriate remedial works.

To the west of Redcar, a grouted stone revetment with a concrete wall along the crest tie into the dunes to the north of the Coatham Sands car park, see photo below. While there appears to have been accretion of the dunes and roll-back to cover sections of the fence at the contractor's compound there is extensive damage to the vegetation due to pedestrian trampling, which will be exacerbating wind blown sand problems.



Overview of defences at west of Redcar from sand dunes adjacent to contractor's compound

The concrete wall with grouted stone revetment, 1221C901C0601C01, remains in fair overall condition where exposed the revetment which appeared in fair condition with minor grout loss and vegetation growth, but much of the revetment was covered by the high beach levels. There is still a missing section of crest wall towards its western extent, as noted in the 2010 inspection, see below left and right. This appears to concentrate overtopping and drainage flows, resulting in a loss of beach material and exposure of the revetment. Further east the

promenade was flooded, presumably due to wind blown sand and high beach levels blocking the drainage, lower left. At the eastern end of this asset the construction of the new Redcar seawall was progressing well and the interface with the new wall is shown below lower right.



Gap in concrete wall and exposed revetment  
Photo from 2010



Gap in concrete wall with adjacent beach erosion from drainage, October 2012 (Asset Ref No 12221C901C0601C01)



Flooded promenade due to blocked drainage  
(Asset Ref No 12221C901C0601C01)



Interface with new seawall at the eastern end of  
Asset Ref No 12221C901C0601C01

During the inspection a missing inspection chamber cover was noted adjacent to the defence, see photo below. This was brought to the attention of the local authority by email on 22/10/2012 as although not a sea defence asset it posed a safety risk to the public using the beach in this area.



Open inspection chamber cover to west of outfall structure at Coatham beach leading to safety risk of falls into deep void / confined space.  
(Adjacent to asset Ref No 12221C901C0601C01)



### 3.2 Redcar

#### *Coastal Slope Condition Assessment*

There are no coastal slopes along the defended length of frontage at Redcar.

#### *Coast Protection Asset Condition Assessment*

The existing sea defences at Redcar were not fully covered as part of the current asset inspections as major Environment Agency funded capital works to upgrade 2.7km of assets from Coatham to the eastern extent of The Stray were underway at the time of the inspection. As the works will be complete in 2013 the Condition grade shown on Map 1 in Appendix B is set to very good.



Works underway at west end of Redcar seawall, Asset ref. 1221C901C0602C06



New stepped concrete seawall wall adjacent to Esplanade, Asset ref No. 1221C901C0602C02



New stepped concrete seawall wall adjacent to Esplanade, Asset ref No. 1221C901C0602C02



New crest wall adjacent to Esplanade, Asset ref No. 1221C901C0602C02

### 3.3 East Redcar to Saltburn-by-the-Sea

#### *Coastal Slope Condition Assessment*

The CBUs between Redcar and Saltburn show evidence of recent instability. The units E52/10 to E52/8 between Redcar east and Marske are classified as Locally Active. Most of the movement of the slopes appears to be localised simple cliff failures. Signs are present along The Stray south of Mill Howle warning members of the public of landslips. Further south in this section, at E52/9 and E52/8 the cliffs are afforded some protection by the increasingly wide cobble beach at the toe, see below right. Immediately to the north of Marske, E52/7 is classified as Dormant as it is defended at its toe by low level sand dunes and a series of masonry and concrete walls and shows no evidence of landslide activity. At the headland at Marske, E52/6 there are low accreting dunes protecting the cliff toe.

From Marske to Saltburn the crest level of the coastal slopes increases and the slopes become vegetated with localised erosion at the toe. CBU's E52/6 and E52/5 are classified as Inactive, whilst E52/4 is partly active.



E52/10 Interface between new seawall and cliff at Mill Howle (Locally Active)



E52/9 Cobble beach gives some protection to Locally active cliff



E52/7 Sand dunes and walls to toe of vegetated slope (Dormant) Photo from 2010



E52/7 Sand dunes and walls to toe of vegetated slope (Dormant) Photo October 2012



E52/6: Coastal slopes viewed looking north (Inactive)



E52/5: Coastal slopes viewed looking south (Inactive)



E52/4: Coastal slopes viewed looking east to Saltburn (partly active)



E52/4: Coastal slopes viewed looking north west from Saltburn (partly active)

*Coast Protection Asset Condition Assessment*

Refer to Map 2 in Appendix B.

As noted above the coastal defence assets at Redcar were being upgraded with a major scheme nearing completion at the time of the inspection. This includes the defences to the east of Redcar including along The Stray to Mill Howle and as works were underway the defences were not included in the walk over.

The coastal defences at Marske are protected by a wide beach and so only exposed to marine action during storm events. The low masonry wall and revetment (Asset Ref No 12221C901C0702C03) around the headland to the north west of the beach access at Marske was largely covered by high beach levels, but where exposed was in fair condition, although there were missing coping blocks and there was evidence of lateral movement / settlement of the wall. The concrete wall (Asset Ref No 12221C901C0702C03) at the toe of the vegetated slope was reported as cracked through its full height in the 2008 and 2010 inspections and the defect appeared to be of the same width and extent when inspected on 15/10/2012. The slope above (CBU E52/7) showed no evidence of recent movement or any placement of excessive loading on the structure.



Missing coping blocks on wall below path.  
(Asset Ref No 12221C901C0702C03)



High beach levels covering wall and parts of path.  
(Asset Ref No 12221C901C0702C03)



Crack in concrete wall below coastal slope (Asset Ref No 12221C901C0702C03)  
Photo from 2010 report.



Crack in wall – photo from 15/10/2012.  
(Asset Ref No 12221C901C0702C03)

The masonry revetment (Asset Ref No 12221C901C0702C02) on the north west side of the beach access at Marske was reported in poor condition with extensive loss of blocks and erosion of the material below in the 2010 inspections. Vegetation growth obscured a large proportion of the structure in 2012, particularly to the seaward section. Where visible the wall appeared in fair condition but as there were no obvious repairs the overall condition assessment remains poor. The masonry wall below the revetment shows evidence of local settlement although this appears of the same magnitude as observed in 2008 and 2010 which suggests the structure is stable.



Local settlement of masonry structure  
(Asset Ref No 12221C901C0702C02)  
**Photo from 2010 Report**



Extensive vegetation growth on revetment;  
local settlement of masonry structure similar to  
2010. (Asset Ref No 12221C901C0702C02)



Revetment and toe wall covered in sand and vegetation. (Asset Ref No 12221C901C0702C02)



Wall enclosing fishing boat park (Asset Ref No 12221C901C0702C02)

The masonry wall to the southeast of the beach access at Marske (Asset Ref No 12221C901C0702C01) has settlement cracks and missing bricks to the seaward end. However it is in similar condition to that reported in 2008 and 2010.



Photo from 2010 Report



Missing masonry at seaward end of wall to southeast of beach access. (Asset Ref No 12221C901C0702C01)

### 3.4 Saltburn-by-the-Sea

#### *Coastal Slope Condition Assessment*

The CBUs in and around Saltburn-by-the-Sea do not show much evidence of recent instability.

Units **E52/3b**, **E52/3a**, **E52/2** above Saltburn Sands are again classified as Inactive. These units are defended at the toe by a sea wall and are well vegetated. Small cracks are seen in some of the footpath surfaces, but this is related to normal wear and not erosion or ground movement.

CBU **E52/1** shows more activity, with loose materials and localised erosion at the head of the large mound situated just east of Saltburn Gill and remains classified as Locally Active.

To the east, CBU **E53/5** was classified as Dormant in 2010. There has been recent shallow slumping on the cliff face and the unit has been reclassified as Locally Active. The slumping has occurred despite the presence of toe protection and probably occurred in response to the wet weather experienced in the latter half of 2012.



**E52/3b** from the stable and well vegetated cliffs above Saltburn Sands (Inactive)



**E52/3a** the stabilised slopes close to the Cliff Lift (Inactive)



**E52/2** the stable cliffs above Saltburn Sands (Inactive)



**E52/1** looking up at well vegetated cliffs from Saltburn Sands (Locally Active)



**E53/5** has slumped, leaving open cracks in the cliff face and resulting in instability classified as Locally Active.

*Coast Protection Asset Condition Assessment*

A 600m long masonry seawall protects much of the frontage at Saltburn. This comprises several NFCDD assets, running from 1221C901C0703C02 at Hazel Grove Foot in the west, through 1221C901C0704C04, which is the Lower Promenade, until it reaches the pier, and finishes with 1221C901C0704C01 and then 1221C901C0704C06 at Skelton Beck, see Map 2 in Appendix B. The beach in front of the seawall consists of a mixture of sand and gravel with shingle / gravel deposits located at the toe of the wall throughout most of its length.

The outfall that exits at Hazel Grove Foot is protected by a trash screen, which was partially blocked at the time of the inspection. It was also noted as being partly blocked in the 2010 inspection and needs regular clearing. There were several missing blocks that should be replaced to avoid damage expanding.

	
<p>Partially blocked outfall exiting through sea wall at Hazel Grove Foot (Asset Ref No 1221C901C0703C02)</p>	<p>Cracked wing wall in slipway attached to sea wall at Hazel Grove Foot (Asset Ref No 1221C901C0703C02)</p>
	
<p>Missing coping stones at edge of slipway at Hazel Grove Foot (Asset Ref No 1221C901C0703C02)</p>	<p>Eroding cliff adjacent to ramp at the north of Hazel Grove Foot, (Asset Ref No 1221C901C0703C02).</p>

The main section of wall, (Asset Ref No 1221C901C0704C04) is in good overall condition, but has abrasion damage near the toe in places and requires repair to a number of minor defects. There is occasional missing mortar in blockwork joints throughout and this is particularly notable in the at the beach ramps which require repair before more major damage occurs. A damaged section of hand railing was noted in the north.



Example of area where repointing is needed to blockwork (Asset Ref No 1221C901C0704C04)



Damaged section of coping at handrail upstand (Asset Ref No 1221C901C0704C04)



General view of wall looking south, showing abrasion near toe (Asset Ref No 1221C901C0704C04)



Example of area where re pointing is required (Asset Ref No 1221C901C0704C04)



Photo from 2010 inspections



Open joints in pier abutment masonry requires repair. (Asset Ref No 1221C901C0704C04)

To the south of the pier, asset Ref. No. 1221C901C0704C01 is a section of masonry blockwork revetment adjacent to the car park area. This is in overall good condition with no missing blocks. One large section has been repaired using smaller blocks. Most mortar joints were in good condition but there was some missing mortar on slipway joints. The steps to the beach area were in poor condition and require repair to missing / damaged blocks/ treads.





Damaged steps to beach  
(Asset Ref No 1221C901C0704C01)



View of sloping masonry revetment at car park area. (Asset Ref No 1221C901C0704C01)

Asset 1221C901C0704C06 is the concrete blockwork seawall and associated elements immediately adjacent to Skelton Beck. This was in fair overall condition with joint washout and cracking visible and a short section of coping stone missing. At the time of the inspection the wall was protected by the high beach level in this area.



Missing coping stones to edge of path  
(Asset Ref No 1221C901C0704C06)



Armouring at edge of outfall from Skelton Beck  
(Asset Ref No 1221C901C0704C06)

Asset ref. 1221C901C0704C02 is the frontage to the east of Skelton Beck at the boat park. This is classed as undefended in NFCDD, with protection relying on the shingle bank that forms the boat park.



Evidence of previous storm damage to shingle bank at boat park (Asset Ref No 1221C901C0704C02)



Armouring at edge of outfall from Skelton Beck adjacent to Asset Ref No 1221C901C0704C02

To the south of the boat park the defence asset 1221C901C0704C03 is a set back wall protected by a cobble beach. This was in an overall good condition, but the slipway at the east end is being undercut by erosion and has cracks to the surface, both of which require repair, see below right.



Set back rendered wall protected by shingle beach (Asset Ref No 1221C901C0704C03)



Damage to slipway at east end of Asset Ref No 1221C901C0704C03

The most southerly section of coastal defences at Saltburn is Asset Ref. 1221C901C0704C05. This is a patchwork of informal defences protecting the public house and land to the east side of the slipway. Here, in 2008, the coastal protection consisted of heavily eroded sections of concrete defences, displaying large amounts of excavation, undercutting, major cracking and in some parts, total collapse (Asset Ref No. 1221C901C0704C05). In 2010 it was observed that large scale emergency repairs had been completed, but that these works did not appear to have been carried out by professional contractors and the condition rated as poor. The 2012 inspection found that the previous repairs were in a similar condition, with overall asset condition poor, see photos below.



Undercutting and excavation of concrete defences (Asset Ref No. 1221C901C0704C05)  
**Photo from 2010**



Damage to poured concrete over rubble defence. (Asset Ref No. 1221C901C0704C05)



Repairs visible, but defence still shows evidence of cracking and erosion (Asset Ref No. 1221C901C0704C05)  
**Photo from 2010**



2012: Some accretion of cobbles, defence in similar condition to 2010 (Asset Ref No. 1221C901C0704C05)

### 3.5 Cliffs northeast of Saltburn

#### *Coastal Slope Condition Assessment*

Northeast of Saltburn the cliffs have a slope-over-wall form, with a weak till overlying a steep hard rock cliff. The till is subject to periodic mudslides, which result in material falling over and staining the cliffs and deposition of a debris apron along the cliff toe. The debris apron is partly-vegetated, indicating periodic activity in the form of wave erosion and debris falls.

Unit **53/4** has been subject to recent localised mudsliding in the till. The unit therefore remains classified as Locally Active.

Unit **53/3 and 53/2** also have a slope-over-wall form. The units are classified as Locally Active (53/3) and Partly Active (53/2) reflecting the degree of mudslide activity in the till and wave erosion of the resulting debris cone. The Partly Active unit (E53/2) is characterised by widespread mudslide activity in the till.

Unit **53/1** is showing signs of developing mudslides in the upper till section.



**E53/4** Slumping in the till layer of the cliff northeast of Saltburn (Locally Active).



**E53/3 and E53/2** The rock part of the cliff is steep and exposed. The till part is much shallower and vegetated (Locally Active).



**E53/1** Instability in the upper till section of this unit (Locally Active).

*Coast Protection Asset Condition Assessment*

There are no coastal assets within this area.

### **3.6 Hunt Cliff and Warsett Hill, west of Skinningrove**

*Coastal Slope Condition Assessment*

The cliffs are characterised a slope-over-wall form, comprising vertical rock cliffs capped by weaker till. There is evidence of localised and recent rock fall activity in the cliff and mudsliding in the till.

These high, steep cliffs are all classified as Partly Active during the 2012 walkover survey. Units E54/4, E54/3b and E54/2b have been downgraded from Totally Active in 2010. Units E54/3a and E542/a have remained classified as Partly Active since the 2010 walkover survey.

Unit **E54/4** has some vegetation on the debris apron and an exposed rock cliff face above.

Unit **E54/3b**, has some areas of vegetation and stability but overall the cliff face is composed of exposed rock.

Unit **E54/3a**, the railway line runs very close to the cliff edge as it curves around Warsett Hill within this unit. The photograph shows that the footpath and fencing is getting close to the edge of the cliff.

Unit **E54/2b** and **E54/2a** have a bare rock cliff face and is showing signs of continued erosion.



*Coast Protection Asset Condition Assessment*  
 There are no coastal assets within this area.

### 3.7 Cattersty Cliff and Skinningrove

(Map 1 – Saltburn to Cattersty Cliffs, Coastal Slope Condition 2012 and Map 2 – Cattersty Cliffs to Loftus Alum Quarries, Coastal Slope Condition 2012)

*Coastal Slope Condition Assessment*

The cliffs in this area reduce in height towards Skinningrove and are generally less active than those around Warsett Hill. They have a characteristic slope-over-wall form, comprising a thin layer of till overlying the hard rock cliff.

The CBUs in the north of this area, such as **E54/1**, **E55/3** are characterised by a vegetated layer of till, which sits above the Lower Jurassic rocks. Lower down the cliff, cliff face is largely obscured by periodically active debris lobes that are undergoing marine erosion at the toe. These units are Locally Active.

Units **E55/2** and **E55/1** have a small, steep debris apron that is sparsely vegetated. Most of the debris apron show evidence of recent activity and is subject to on-going toe erosion. The till is subject to localised mudslide development and headscarp recession. These units are Partly Active.

Unit **E56/2a** and **56/2b** are above Cattersty Sands (immediately west of the jetty). Both units are Locally Active. 56/2a was formerly reclassified as Inactive, but mudslide activity in the till was observed. The cliffs here have a shallower gradient with extensive vegetation cover.

They are also provided protection at their base by a set of embryo dunes. The development of these dunes and lack of erosional activity within this unit is due to the protection afforded by the adjacent jetty.

Unit **E56/1** is located to the east of the jetty and adjacent to the mouth of the beck. The slopes within this unit are well-vegetated. There is some evidence of recent sliding activity at the cliff toe, despite the rock armour defences, and this unit is classified as Locally Active.

Only unit 56/2a has changed its activity classification between the 2010 and 2012 walkover survey.



#### *Coast Protection Asset Condition Assessment*

In this area there are coastal defences are present around Skinningrove village, located to the east of the original mining breakwater (or 'jetty') which is some 400m northwest of the village, see Map 3 in Appendix B. Although this jetty is still present, it is redundant, and is in a failing state. There are gates to restrict public access to the unsafe structure but at the time of the inspection (30/10/2012) they were open. It is recommended that they are secured once again in order to prevent access by the public. The jetty is constructed of concrete and sheet piles and shows evidence of significant cracking, deformation and corrosion (Asset Ref No. 1221D901D0201C02). Although redundant for its original purpose as a jetty the structure provide some coastal stabilisation to the adjacent bay and may provide protection to Skinningrove Village to the south.



Jetty – view from south showing open gates  
(Asset Ref No. 1221D901D0201C02)



Seaward side of jetty showing failed sections and displaced slabs  
(Asset Ref No. 1221D901D0201C02)

The rock armour defence between Catersty Jetty and the village, (Asset Ref No 1221D901D0202C01) has deteriorated since the 2010 inspections and is in fair condition. Although the rock armour still appeared tightly packed, the beach was low at time of inspection exposing the toe at the south end to scour and undermining. Additionally, the crest rubble, placed to fill voids in the main armour and reduce risks to the public has been displaced and deformed by wave overtopping.



General view of rock armour revetment, from jetty to village (Asset Ref No. 1221D901D0202C01)



Low beach levels have exposed toe of rock armour to scour damage (Asset Ref No. 1221D901D0202C01)



View of crest infill rubble adjacent to path has been scattered by wave overtopping (Asset Ref No. 1221D901D0202C01)



View of rock armour looking towards jetty (Asset Ref No. 1221D901D0202C01)

There were improvement works to the rock armour defences in the beck including construction of a spur section to reduce the wave scouring in the beck and widen the channel to the bridge in around 2004. As found in the 2010 inspections, in general the rock armour to the north side of the beck (1221D901D0202C02), including in front of Marine terrace, still appears to be tightly packed and does not appear to have suffered from significant deformation or rock displacement. However, the low beach levels at the seaward end of this length defence have exposed the wrap around geotextile toe at the spur section to damage and potential undermining, see below left.



Exposed geotextile matting at rock armour toe. (Asset Ref No. 1221D901D0202C02)



Rock armour along Kilton Beck with small wall behind in Skinninggrove village (Asset Ref No. 1221D901D0202C02)

The defence asset no 1221D901D0202C05 includes both the fishtail groyne and the rock armour revetment running through to the bridge on the east side of Kilton Beck was rated as fair overall condition. The fishtail breakwater itself is in good overall condition although there is localised displaced armour on seaward side and the top of the navigation marker was missing at the time of the inspection (30/10/2012) and needs repair. This asset also includes the slipway running from the boatpark to the west side of the fishtail groyne. There was a missing section of concrete near the top of the slipway, although this did not appear to be related to storm damage and may possibly have been omitted from the original construction for some reason.





Seaward end of fishtail breakwater showing damaged navigation marker (Asset Ref No. 1221D901D0202C05)



Area of displaced armour on seaward side of fishtail (Asset Ref No. 1221D901D0202C05)



West side of fishtail groyne and revetment to boat park. (Asset Ref No. 1221D901D0202C05)



Slipway from boatpark on root of fishtail groyne showing missing section near crest filled with rubble. (Asset Ref No. 1221D901D0202C05)

East of the breakwater there are two further assets, a shingle ridge with boulders at the back along the edge of the boat park (Asset Ref No. 1221D901D0202C04), and a concrete wall (Asset Ref No. 1221D901D0202C03).

The shingle ridge, which is artificially stabilised by the fishtail groynes, was in good condition with high crest and gentle seaward slope. The adjacent wall, Asset Ref No. 1221D901D0202C03, is in poor condition. The toe was exposed by low beach levels and has been significantly undercut, particularly towards the east. In 2010 the promenade on the crest of the wall was noted to be significantly cracked in places and have a void, approximately 700mm deep; the condition in 2012 was very similar, although repairs had been undertaken and the void was not visible. It is noted that beach levels were generally low in the area compared to the 2010 inspections as the wall toe was not visible then. The low retaining wall behind the promenade has a full height crack which was not mentioned in the 2010 inspection and so may indicate movement in the slope behind in the last 2 years.



Shingle ridge with boulders to rear protecting boatpark. (Asset Ref. No 1221D901D0202C04)



Shingle ridge looking landwards. (Asset Ref. No 1221D901D0202C04)



Undermining of wall toe exposing deep voids. (Asset Ref No. 1221D901D0202C03)



General view of wall from west end with road behind, showing eroding cliff to east in background. (Asset Ref. No 1221D901D0202C03)



Crack in low rear retaining wall. (Asset Ref No. 1221D901D0202C03)



Patchwork repairs to promenade slabs. (Asset Ref No. 1221D901D0202C03)

### 3.8 Skinninggrove to Boulby

#### *Coastal Slope Condition Assessment*

Many of the cliffs in this area have been subject to alum quarrying of their uppermost sections, resulting in a characteristic excavated upper part and a natural lower part. In some parts, the whole cliff face has been subject to quarrying and the coastline is formed in quarry waste.

To the west of The Warren, the cliffs are characterised by an upper till layer with some vegetation cover and localised mudsliding and consequent recession at the headscarp. The lower rocky cliff is free of vegetation and has evidence for on-going erosion.

Unit **57/7** has widespread erosion with limited vegetation cover and is classified as Partly Active. Unit **57/6** is a high rock cliff with a thin cap of till above. Both parts show localised activity (Locally Active). Units **57/5 to 57/1** form a small bay near Hummersea Scar. The units are Locally Active due to widespread evidence for toe erosion. Unit **58/6** cover a section of cliff known as 'The Warren' and represents a change in behaviour between the naturally formed cliffs to the west and the cliffs formed, at least in part, by quarrying and tipping of waste. This unit is classified as Locally Active.

All of these units have retained their classification since the 2010 walkover survey.

To the east of The Warren, the cliffs rise to become some of the highest in Britain. Here the cliff form owes its character to the large abandoned alum quarries which were operational in this area during the 19<sup>th</sup> Century.

Units **58/5 to 58/2** each have an upper and lower unit. The upper parts of the quarry units are backed by steep sandstone cliffs and feature heavily vegetated, undulating terrain, possibly the product of past rockfalls as a result it is classified as Locally Active. The lower part of the cliff is exposed to marine attack are steep and comprise exposed shales which are heavily weathered and prone to ongoing and intense erosion and as a result is classified as Partly Active.

None of these units have changed activity status since 2010.

Below Rockhole Hill there is a single unit classified as Partly Active, which was downgraded from Totally Active (**E58/1c**). Large block detachments are still visible although the tension cracks at the head seen in the past were not observed.



E57/7 looking southeast across the bay at Skinninggrove (Partly Active)



E57/6 looking west across the well vegetated upper slopes (Locally Active) (Note this unit has moved down a class since 2008)



Units 57/5 to 57/1 are all locally active and characterised by till overlying steep rock cliffs which are undergoing wave attack.



Unit 58/6, The Warren has vegetated upper slopes and lower slopes formed of quarry waste over intact cliffs.



E58/5 Lower, is not vegetated and is prone to wave attack at the toe.



E58/5 Upper, these slopes are much more vegetated than the lower slopes and are more stable



E58/3 Upper and Lower, Failed blocks litter the mid slope, which is vegetated. The lower slopes are more exposed. The Upper slopes are Locally Active and the lower slopes are Partly Active.



E58/2 upper the gentler sloping much more vegetated upper slopes are not as active as the slopes below (Locally Active)



E58/2 lower the lower slopes are much more exposed and prone to erosion (Partly Active)



E58/1c the majority of the unit is vegetated and stable with the exception of the bare rock face on the upper slope and the zone of coastal erosion. (Partly Active)

*Coast Protection Asset Condition Assessment*

There are no coastal protection assets within this area.

### **3.9 Boulby to Cowbar Nab**

*Coastal Slope Condition Assessment*

In the coastal section between Boulby and Cowbar Nab the cliffs are much lower than those adjacent to the west. The majority of CBUs within this area are classified as Partly Active. They are characterised by a soft upper till unit which supports a variable vegetation cover and is subject to landsliding and consequent headscarp recession. Lower down the cliff the harder rock unit is largely bare except where covered by debris cones, reflecting localised rockfall activity.

Within unit **E58/1a** there has been recent failure at the headscarp and associated cliff top recession. In time, this may lead to the loss of the Cleveland Way footpath immediately west of the buildings at Boulby Grange and at some point could threaten the properties.

An area of particular concern along this stretch is adjacent to Cowbar Lane. Here units **E59/3 and E59/4** are both classified as Partly Active, having been downgraded from Totally Active. They are characterised by an upper till unit which is undergoing severe erosion and there is evidence of recent rockfall from the lower part of the cliff. This is resulting in the loss of the now abandoned parts of Cowbar Lane. Rock armour is also locally present along the toe of unit **E60/1b**, which is acting to protect the base of the cliffs, but is not able to prevent failures in the till materials above.

Unless stated the units on this frontage have remained the same classification in the 2010 and 2012 walkover surveys.



E59/8 looking towards Staithe from Boulby (Partly Active). Cowbar Nab in middle distance.



E59/8 recent headscarp activity and risk to footpath at Boulby Grange (Partly Active)



E59/7 the cliff face is largely exposed with the exception of the gently sloping till material (Partly Active)



E59/5 failure and active headscarp recession within the upper till part of the cliff (Partly Active)



E59/4 fresh failures within the till and rockfall from lower cliff face (Partly Active)



E59/3 ongoing loss of abandoned road at Cowbar (Partly Active)



E59/1 the lower cliff continues to erode due to marine action at the toe (Partly Active)



E60/1b continuing erosion on the seaward face of Cowbar (Partly Active)

*Coast Protection Asset Condition Assessment*

Although the NFCDD records show no specific coastal defence assets within this area there are two sections of rock armour providing that give some protection to the cliff toe adjacent to the pinch points next to the cottages on Cowbar lane, constructed as part of the 2002 scheme at Staithes harbour. The rock armour was in fair condition and appears to comprise a mixture of imported granite and smaller locally sourced rock. The crest level is relatively low and the length of cliff protected short, so appears to be designed as an adaptive measure to slow the rate of erosion locally.



Eastern section of rock armour at cliff toe next to Cowbar lane  
(Asset Ref No. 1221D901D0401C01)



Western section of rock armour at cliff toe next to Cowbar lane  
(Asset Ref No. 1221D901D0401C01)



## 4. Comparison with Previous Assessments

### *Coastal Slope Condition Assessment*

The previous cliff condition assessment undertaken in summer 2010 is available for comparison with this inspection. The majority of CBUs along this stretch of coastline have not changed significantly since 2010 and their activity status is unchanged. However, there have been some areas of notable change.

Unit E59/4 along Cowbar Lane has been upgraded from Partly to Totally Active. This reflects the presence of numerous fresh failures and gulying within the upper till and recent rockfall activity from the lower cliff. The abandoned part of Cowbar Lane is also under threat here. This area is subject to detailed monitoring by Durham University using laser scanning to precisely monitor the location and rate of cliff erosion.

Units E53/5 at Saltburn and E56/2a at Cattersty Sands have also increased in activity. The upper part of unit E57/5 was formerly classified as Dormant, but the recent development of a shallow slump has left cracks in the cliff face that may subsequently lead to headscarp recession. The unit has been upgraded to Locally Active to reflect this activity and the associated risk to cliff top assets. Unit E56/2a is above Cattersty Sands. The cliff was been classified as Inactive in 2010 but localised activity on the cliff face mean it has been upgraded to Locally Active in 2012.

Unit E57/5 at Hummersea Cliff has been downgraded from Partly to Locally Active. The upper part of this unit is well vegetated at the present time and activity noted in 2010 has ceased.

### *Coast Protection Asset Condition Assessment*

Previous asset condition data was available in the form of data stored within NFCDD that has been imported into the SANDS database for the Cell 1 monitoring programme. This data was collected for this area by Halcrow during 2008 and 2010 enabling comparisons with the latest results. For a number of the assets changes have been noted in the relevant parts of Section 3 of the report and photographs from 2010 included where appropriate for comparison.

The maps showing the coastal defence asset overall condition in Appendix B have symbols overlaid to indicate assets that have improved or deteriorated in overall condition. Although there was evidence of localised repairs in many locations, in general the changes were not significant enough for the overall condition grading to alter in most cases. Significant changes are noted below

The South Gare breakwater (Asset Ref No 1221C901C0506C01) remains in poor condition and despite further recent patchwork repairs is still deteriorating.

At Redcar the coastal defence improvement scheme was nearing completion. The works were still underway but when complete in early 2013 this section of 5 NFCDD assets covering about 2.7km will be improved to very good condition, see Map 1 in Appendix B.

Most assets at Saltburn-by-the-Sea show little change in condition since 2008 when they were first inspected under the programme. No asset had changed significantly enough for the condition grade to be improved or lowered, see Map 2 in Appendix B.

At Skinningrove the old jetty which has been assessed as being in Condition Grade 4 (Poor), since 2008 is continuing to deteriorate. Although the overall condition has not altered significantly it is highlighted here for reference.

The low beach levels in front of Skinningrove village were exposing the toe of the rock armour defence north of the village (Asset Ref. No. 1221D901D0202C01) to scour and the crest protection rubble had been deformed, resulting in downgrading this asset from good to fair. The fishtail groyne (Asset Ref. No. 1221D901D0202C05) has suffered some storm damage with localised displacement of armour and so has also been downgraded to fair from good.

The low beach levels also allowed inspection of the toe of the seawall to the east of Skinningrove (Asset Ref. No. 1221D901D0202C03), which is badly undercut and has been downgraded from Condition Grade 3 to 4 (Poor).

In addition as noted in 2010, the rock armour and wall sea defences along the watercourse seaward of the bridge at Skinningrove although in good condition appear low and may be easily overtopped by a high tide.

## **5. Problems Encountered and Uncertainty in Analysis**

### *Coastal Slope Condition Assessment*

Views of the lower part of the cliffs between units E58/5lower to E58/1c were sometimes limited. This is a result of the steep, complex terrain of the former quarries. At these locations, judgements about cliff behaviour activity status were made based on the visible cliff sections. Additional data will be derived from aerial survey data collected as part of Cell 1 monitoring work during 2012/13.

### *Coast Protection Asset Condition Assessment*

Very few problems were encountered on site during the asset condition assessment. Access issues posed the largest potential problems although most assets were located in public spaces and were easily accessible. The main frontage of defences at Redcar was not accessible due to the major improvement works scheme underway. Local tide tables provided key information for the appropriate planning of each day's inspections. These issues are not considered to have affected the quality of the assessment.

## 6. Conclusions and Recommended Actions

### *Findings for Coastal Slopes*

It is recommended that monitoring of the entire frontage should be continued regularly by interpretation of data collected by aerial survey under the Cell One programme and the next planned walkover inspection in 2014.

Activity levels remain high for most of this stretch of coastline. As a result it is recommended that the entire frontage be regularly inspected. Areas of particular concern are located at units E54/3a and in the vicinity of E59/3. The former is where the railway line runs extremely close to the cliff edge around Warsett Hill. The latter is classified as Partly Active and is where parts of the abandoned Cowbar Lane are being lost to erosion and failure. Close monitoring of the cliff top position near to the buildings at Boulby Grange (E58/1a) would also be beneficial given the proximity of the headscarp to the footpath here.

### *Findings for Coast Protection Assets*

The grading of all defences and structures have been assigned using the Environment Agency asset condition assessment guidelines.

The table in Appendix B includes a summary listing of the defence inspection results for each asset including all of the recommendations that have been made. Note that the "Urgency" and "Residual Life" are NFCDD asset descriptors. Urgency categories within NFCDD are: Routine, Urgent and No Repairs. Residual life categories are: <1, 1-5, 6-10, 11-20 and >20 years and are based on visual inspection only.

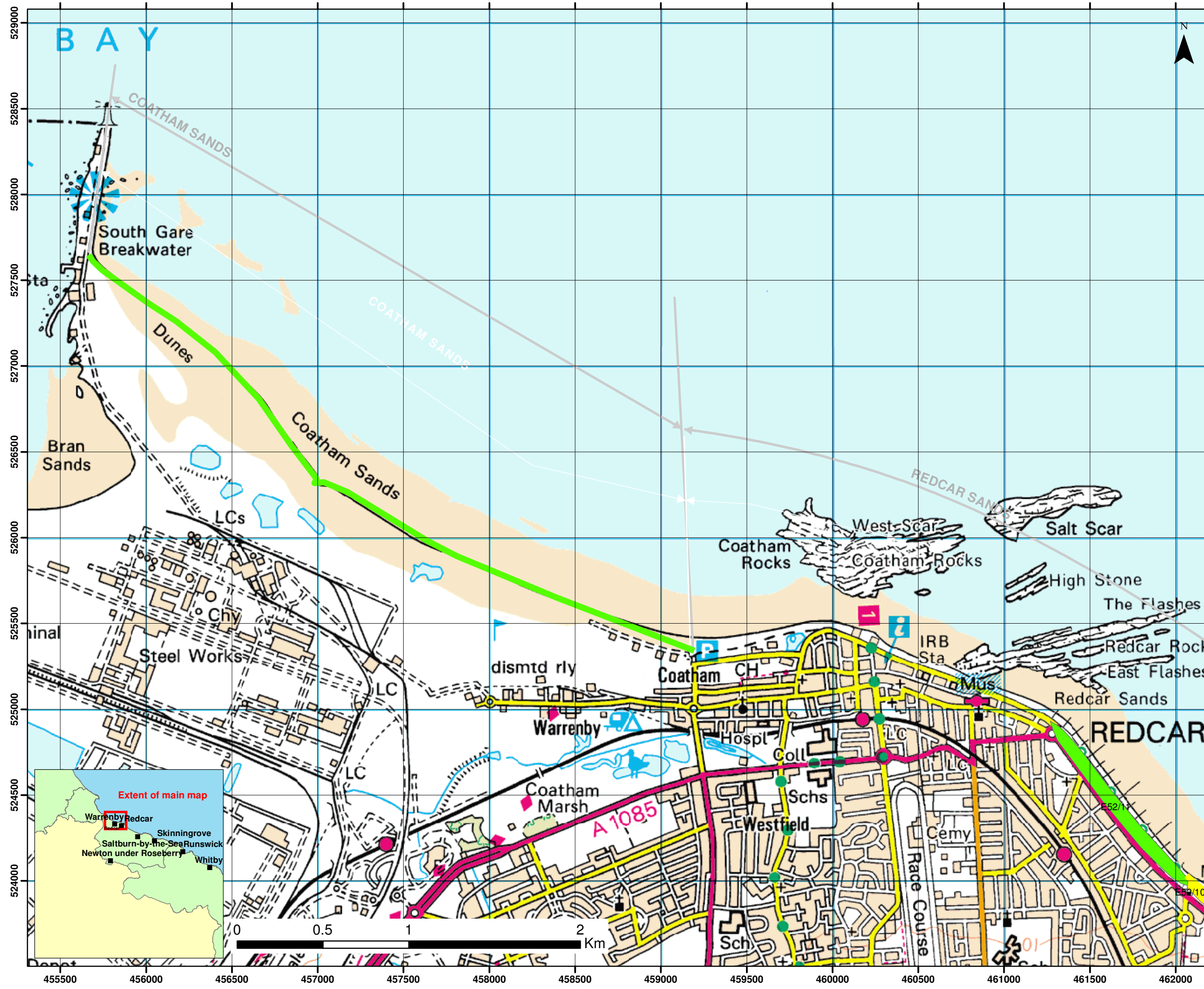
For detailed comments on asset construction and condition, as well as many more photos of the defences and locations refer to the accompanying SANDS database viewer NFCDD asset inspection records for each area.

Two-yearly walk-over inspections are recommended to continue into the future to assess ongoing deterioration and coastal erosion, as well as the performance of general repairs and the new capital scheme at Redcar.

## **Appendix A**

### **Coastal Slope Condition**

#### **Maps 1 – 4**



**KEY**

**Cliff activity 2012**

- Totally active
- Partly active
- Locally active
- Inactive
- Dormant
- Not surveyed in 2012

**Change since 2009**

- Increase in activity
- Reduction in activity
- No change in activity

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

**Map 1  
 Cliff and Natural Asset  
 Activity**

**Redcar & Cleveland  
 Borough Council**

2012 Coastal Inspection

**Halcrow**  
 A CH2M HILL COMPANY  
 Halcrow Group Ltd, Lyndon House, 62 Hagley Road, Edgbaston, Birmingham, B16 8PE  
 Tel: +44 (0)121 456 2345  
 Fax: +44(0)121 456 1569  
 www.halcrow.com

Reproduced from Ordnance Survey mapping with the permission of the Controller of Her Majesty's Stationery Office © Crown Copyright. Scarborough Borough Council Licence No. LA 079251



**KEY**

**Cliff activity 2012**

- Totally active
- Partly active
- Locally active
- Inactive
- Dormant
- Not surveyed in 2012

**Change since 2009**

- Increase in activity
- Reduction in activity
- No change in activity

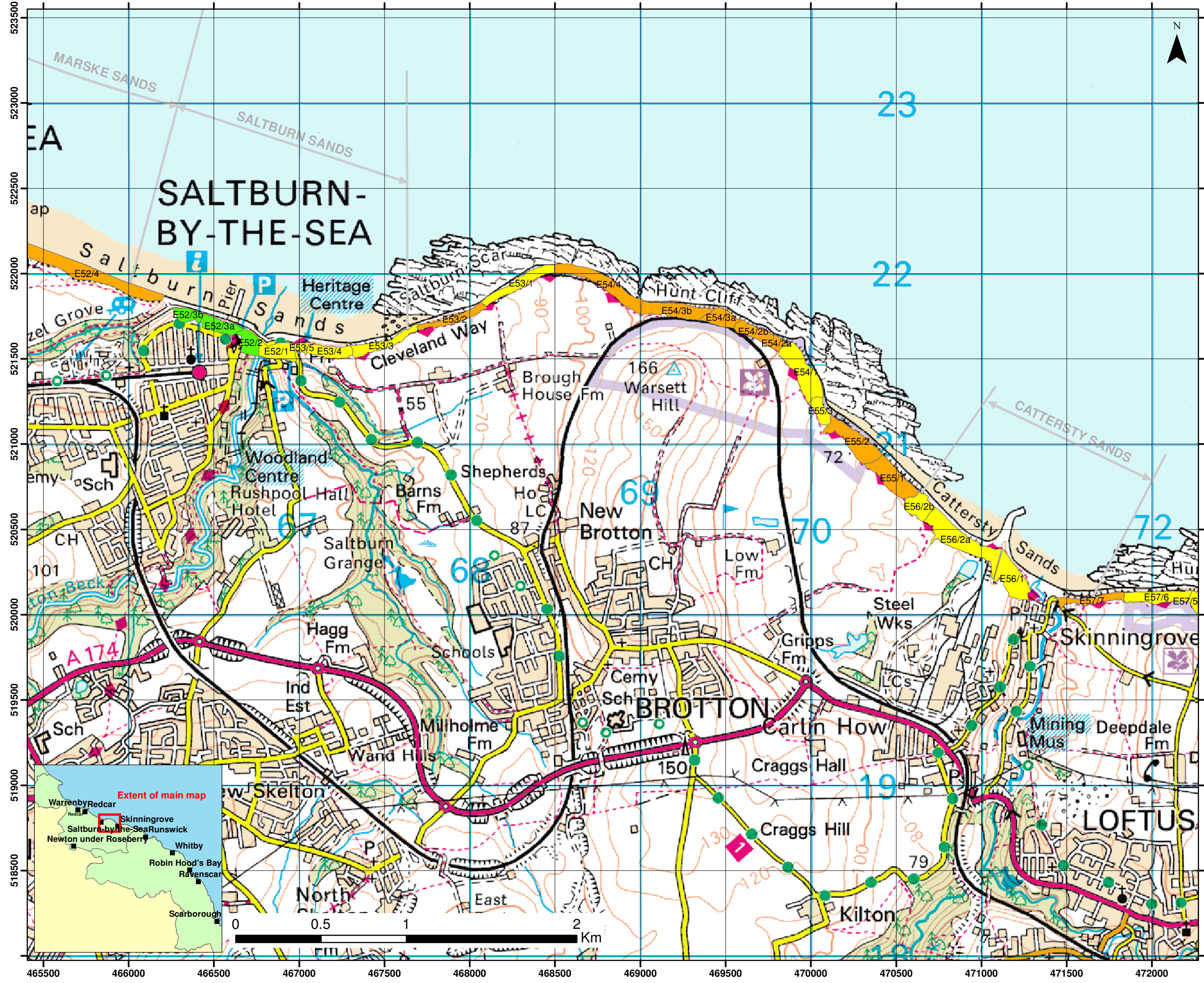
Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

**Map 2**  
**Cliff and Natural Asset Activity**  
**Redcar & Cleveland Borough Council**

2012 Coastal Inspection

**Halcrow**  
 A CH2M HILL COMPANY  
 Halcrow Group Ltd, Lyndon House, 62 Hagley Road, Edgbaston, Birmingham, B16 8PE  
 Tel: +44 (0)121 456 2345  
 Fax: +44(0)121 456 1569  
 www.halcrow.com

Reproduced from Ordnance Survey mapping with the permission of the Controller of Her Majesty's Stationery Office © Crown Copyright. Scarborough Borough Council Licence No. LA 079251



**KEY**

**Cliff activity 2012**

- Totally active
- Partly active
- Locally active
- Inactive
- Dormant
- Not surveyed in 2012

**Change since 2009**

- Increase in activity
- Reduction in activity
- No change in activity

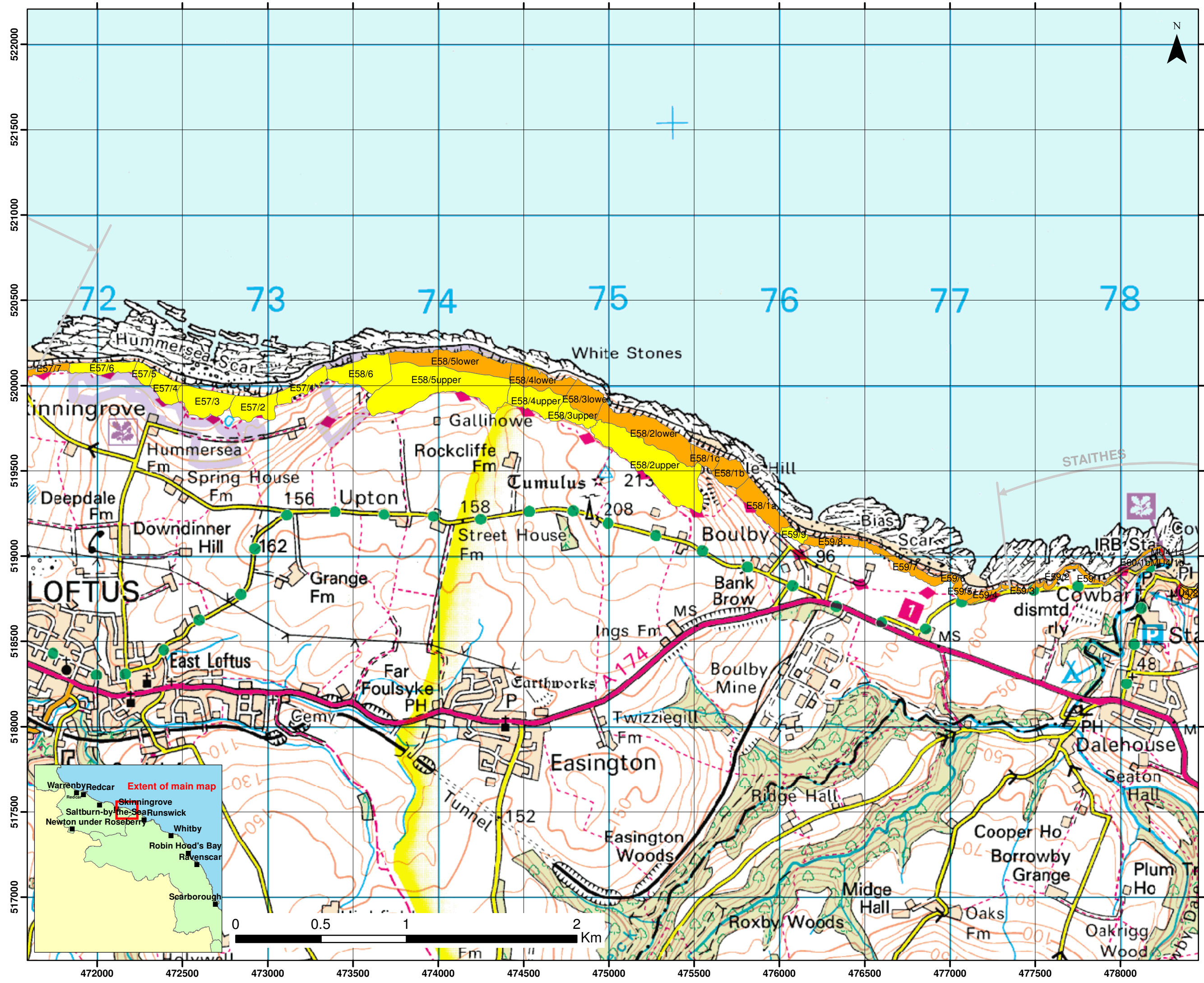
Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

**Map 3**  
**Cliff and Natural Asset Activity**  
 Redcar & Cleveland Borough Council

2012 Coastal Inspection

**Halcrow**  
 A CH2M HILL COMPANY  
 Halcrow Group Ltd, Lyndon House, 62 Hagley Road, Edgbaston, Birmingham, B16 8PE  
 Tel: +44 (0)121 456 2345  
 Fax: +44(0)121 456 1569  
 www.halcrow.com

Reproduced from Ordnance Survey mapping with the permission of the Controller of Her Majesty's Stationery Office © Crown Copyright. Scarborough Borough Council Licence No. LA 079251



**KEY**

**Cliff activity 2012**

- Totally active
- Partly active
- Locally active
- Inactive
- Dormant
- Not surveyed in 2012

**Change since 2009**

- Increase in activity
- Reduction in activity
- No change in activity

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

**Map 3**  
**Cliff and Natural Asset Activity**  
 Redcar & Cleveland Borough Council

2012 Coastal Inspection

**Halcrow**  
 A CH2M HILL COMPANY  
 Halcrow Group Ltd, Lyndon House, 62 Hagley Road, Edgbaston, Birmingham, B16 8PE  
 Tel: +44 (0)121 456 2345  
 Fax: +44(0)121 456 1569  
 www.halcrow.com

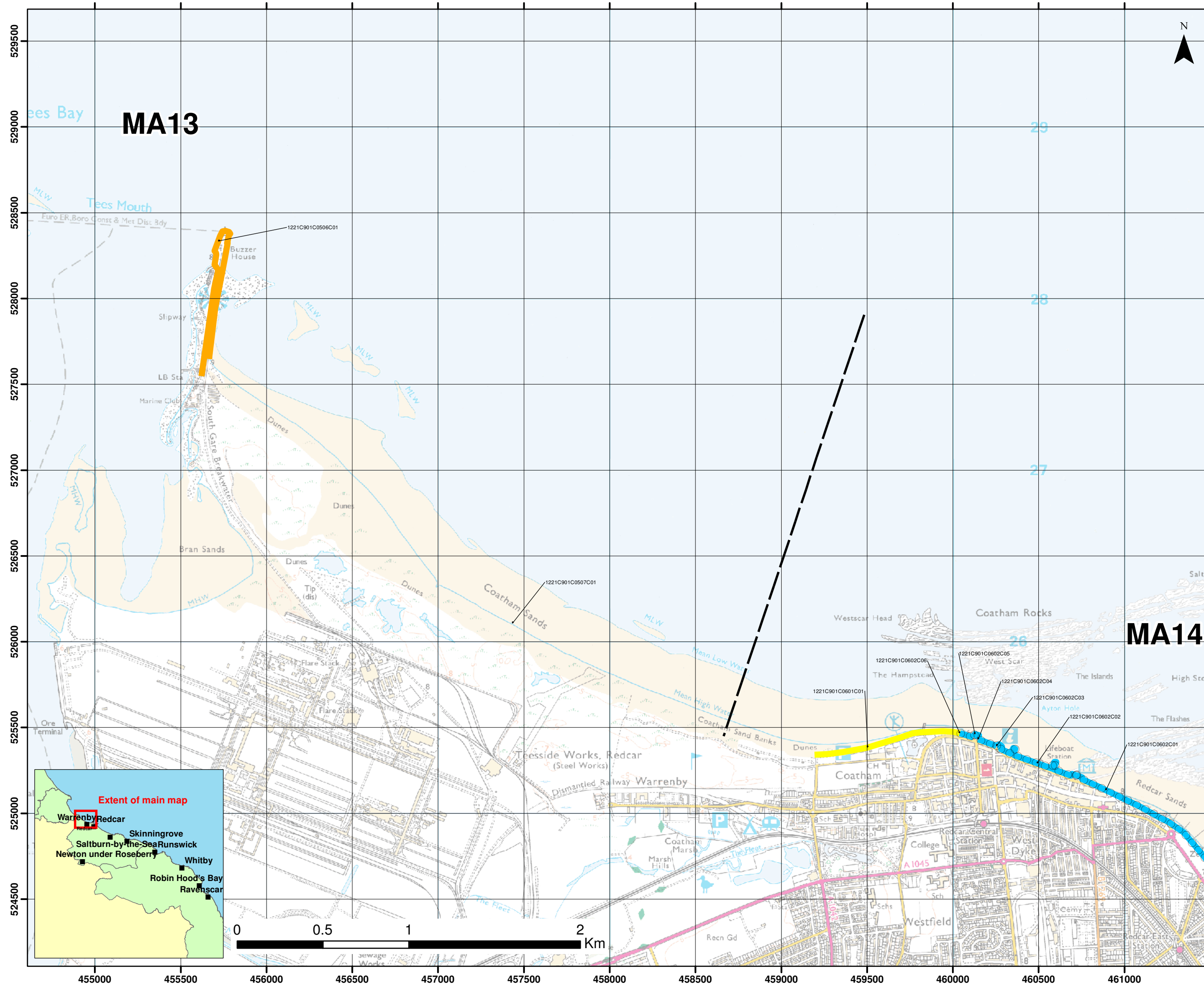
Reproduced from Ordnance Survey mapping with the permission of the Controller of Her Majesty's Stationery Office © Crown Copyright.  
 Scarborough Borough Council Licence No. LA 079251



## **Appendix B**

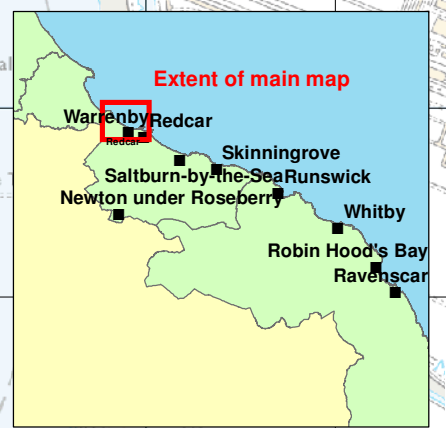
### **Coast Protection Asset Condition**

#### **Maps 1 to 4**



**KEY**

- Management Unit
- Asset condition (2012)**
  - Very good
  - Good
  - Fair
  - Poor
  - Very poor
  - Not inspected
- Asset condition change**
  - Worsened since 2009/10
  - Improved since 2009/10



Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

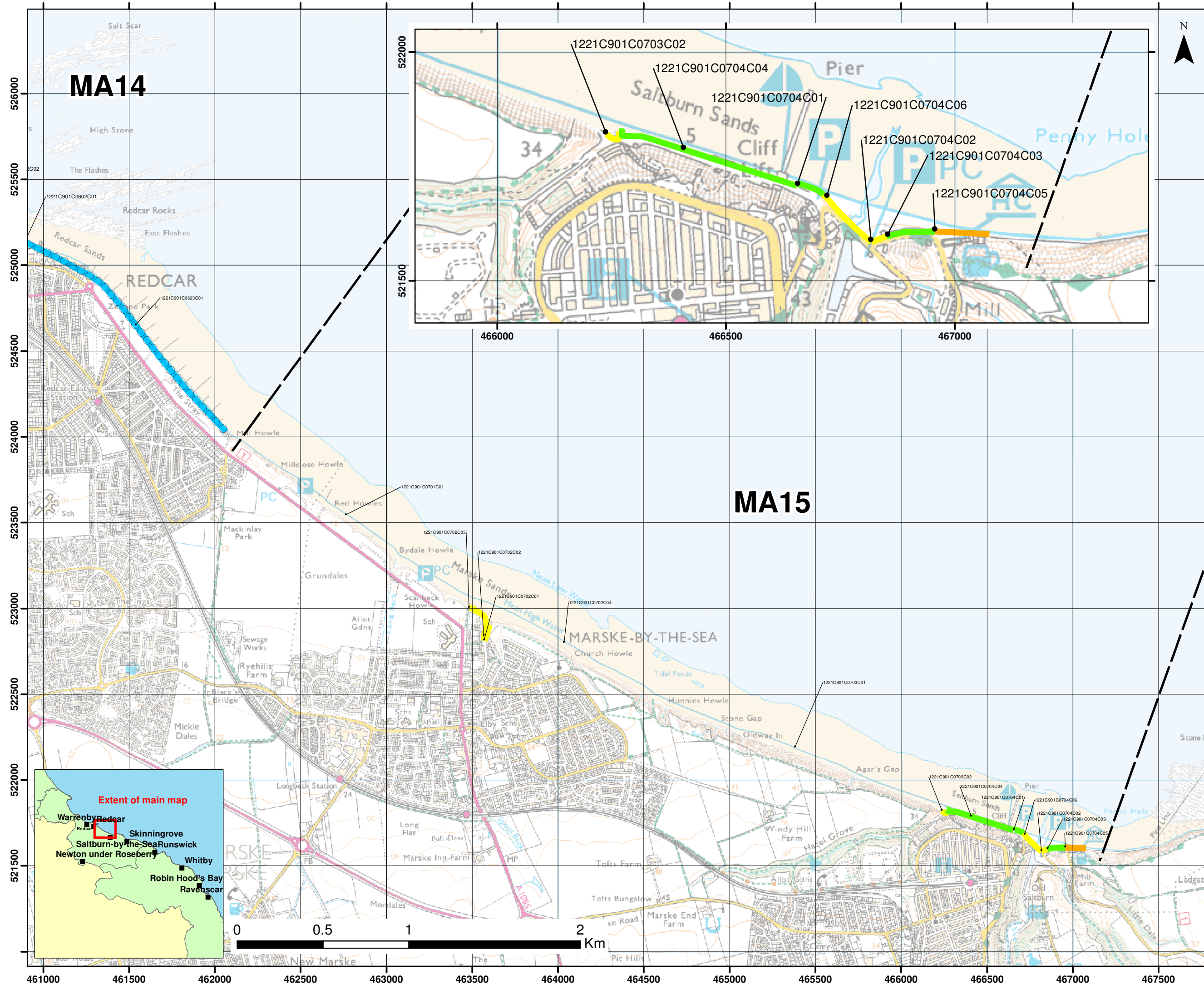
**Map 1**  
**Coast Protection Asset Condition 2012**

**Redcar & Cleveland Borough Council**

2012 Coastal Inspection

**Halcrow**  
A CH2M HILL COMPANY  
Halcrow Group Ltd, Lyndon House, 62 Hagley Road, Edgbaston, Birmingham, B16 8PE  
Tel: +44 (0)121 456 2345  
Fax: +44(0)121 456 1569  
www.halcrow.com

Reproduced from Ordnance Survey mapping with the permission of the Controller of Her Majesty's Stationery Office © Crown Copyright.  
Scarborough Borough Council Licence No. LA 079251



**KEY**

- Management Unit
- Asset condition (2012)**
  - Very good
  - Good
  - Fair
  - Poor
  - Very poor
  - Not inspected
- Asset condition change**
  - Worsened since 2009/10
  - Improved since 2009/10

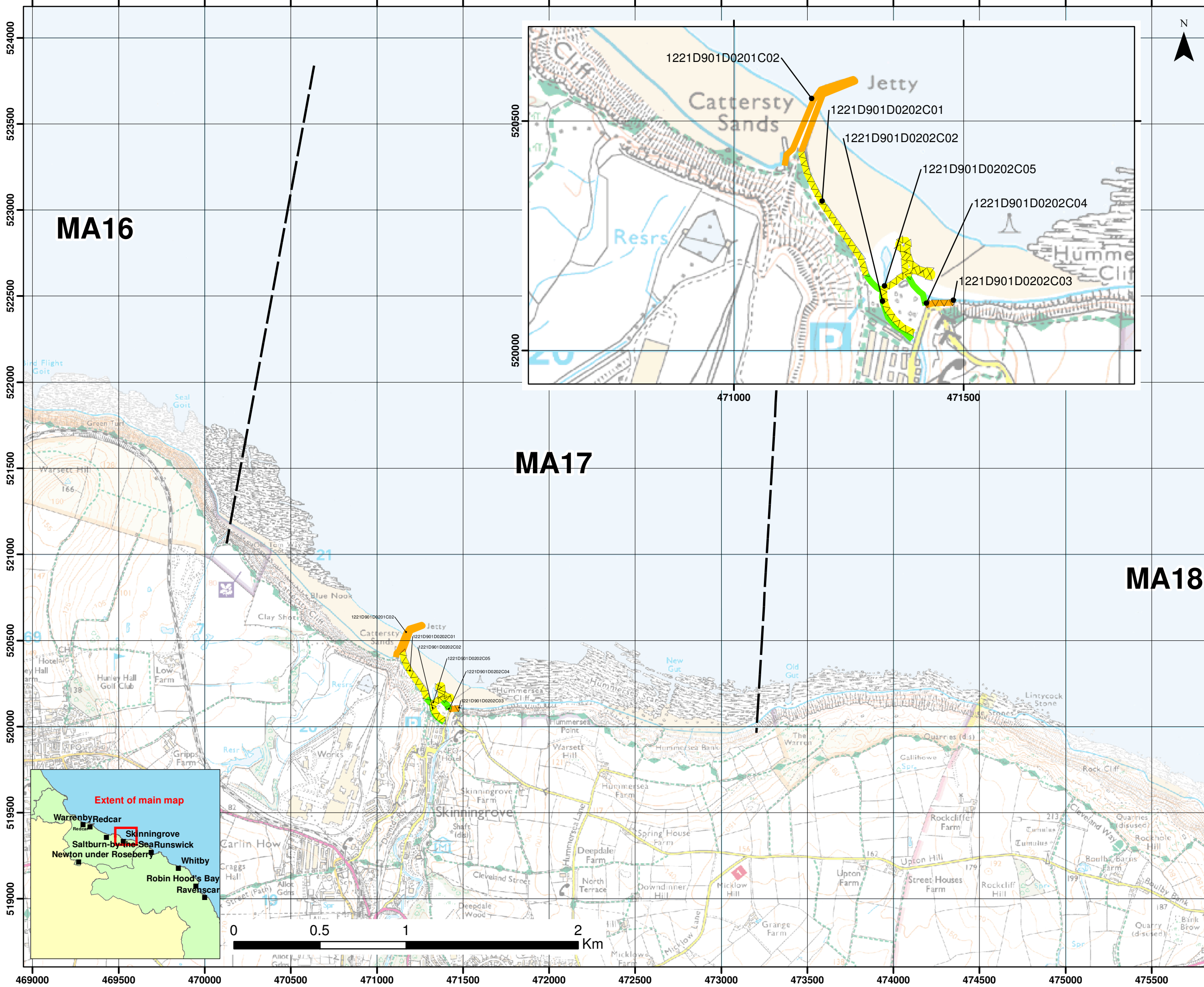
Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

**Map 2**  
**Coast Protection Asset**  
**Condition 2012**  
**Redcar & Cleveland**  
**Borough Council**

2012 Coastal Inspection

**Halcrow**  
 A CH2M HILL COMPANY  
 Halcrow Group Ltd, Lyndon House, 62 Hagley Road, Edgbaston, Birmingham, B16 8PE  
 Tel: +44 (0)121 456 2345  
 Fax: +44(0)121 456 1569  
 www.halcrow.com

Reproduced from Ordnance Survey mapping with the permission of the Controller of Her Majesty's Stationery Office © Crown Copyright. Scarborough Borough Council Licence No. LA 079251



**KEY**

- Management Unit
- Asset condition (2012)**
- Very good
- Good
- Fair
- Poor
- Very poor
- Not inspected
- Asset condition change**
- △△△△ Worsened since 2009/10
- Improved since 2009/10

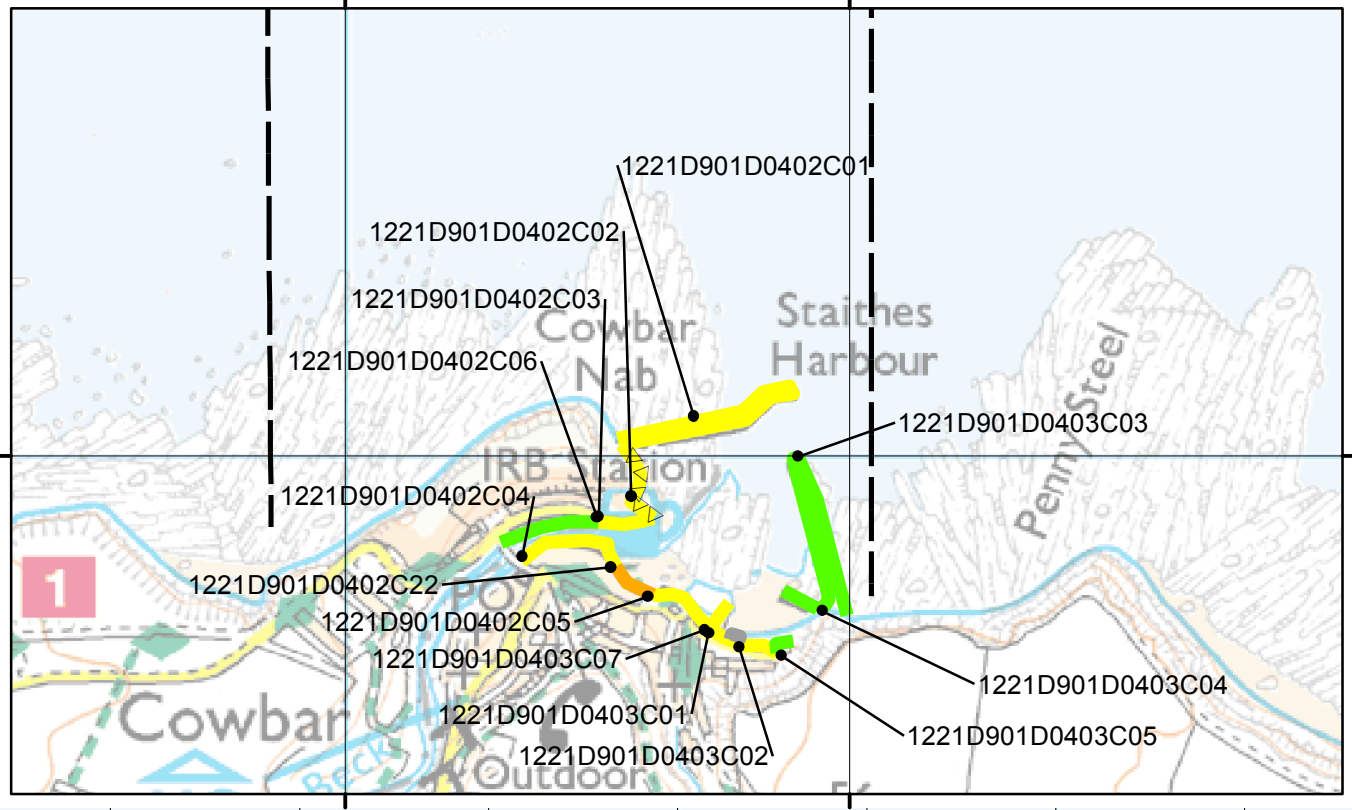
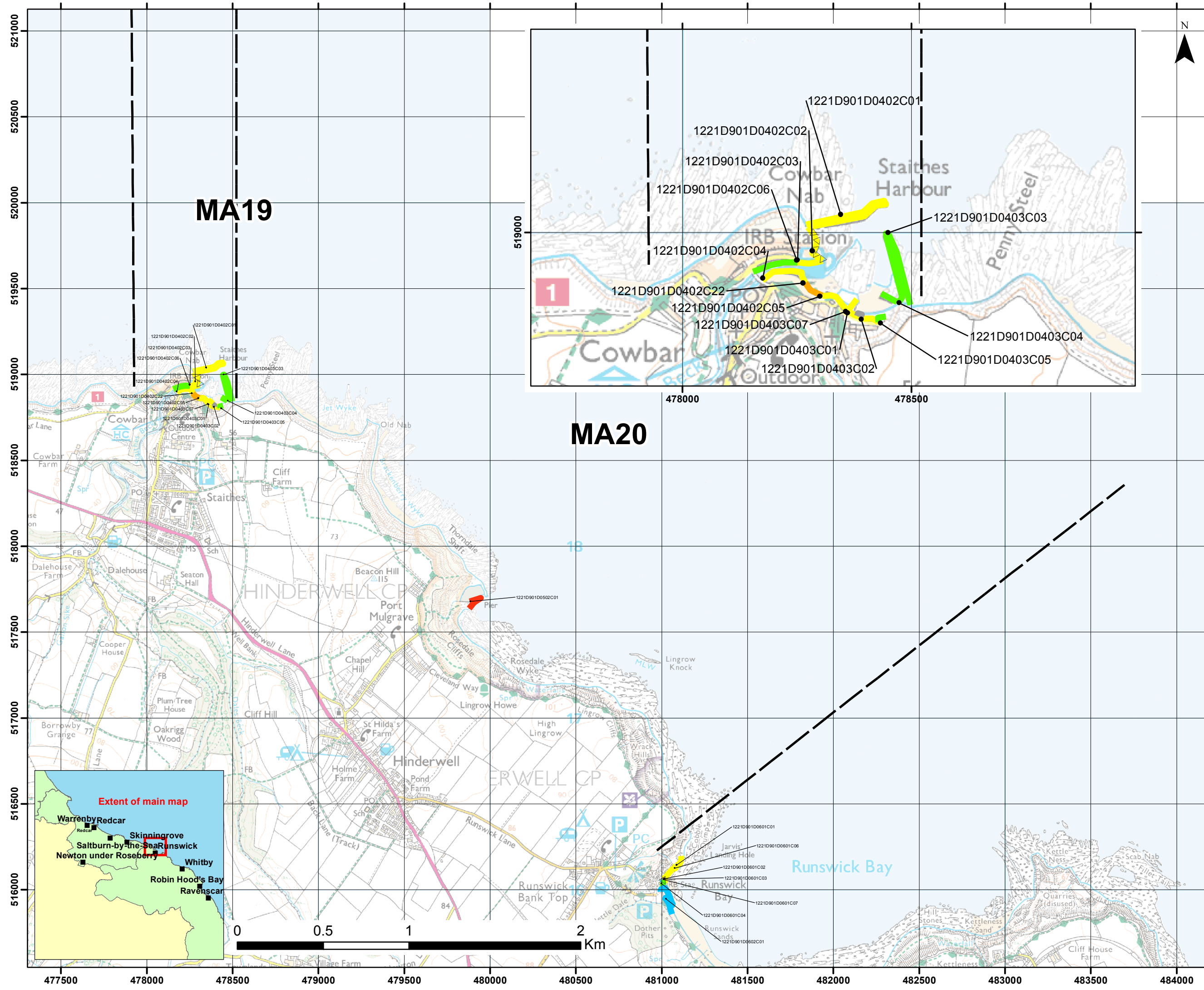
Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

**Map 3**  
**Coast Protection Asset Condition**  
**Redcar & Cleveland Borough Council**

2012 Coastal Inspection

**Halcrow**  
 A CH2M HILL COMPANY  
 Halcrow Group Ltd, Lyndon House, 62 Hagley Road, Edgbaston, Birmingham, B16 8PE  
 Tel: +44 (0)121 456 2345  
 Fax: +44(0)121 456 1569  
 www.halcrow.com

Reproduced from Ordnance Survey mapping with the permission of the Controller of Her Majesty's Stationery Office © Crown Copyright. Scarborough Borough Council Licence No. LA 079251



- KEY**
- Management Unit
  - Asset condition (2012)**
  - Very good
  - Good
  - Fair
  - Poor
  - Very poor
  - Not inspected
  - Asset condition change**
  - △△△ Worsened since 2009/10
  - Improved since 2009/10

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

**Map 4**  
**Coast Protection Asset**  
**Condition 2012**  
**Redcar & Cleveland**  
**Borough Council**

2012 Coastal Inspection

**Halcrow**  
 A CH2M HILL COMPANY  
 Halcrow Group Ltd, Lyndon House, 62 Hagley Road, Edgbaston, Birmingham, B16 8PE  
 Tel: +44 (0)121 456 2345  
 Fax: +44(0)121 456 1569  
 www.halcrow.com

Reproduced from Ordnance Survey mapping with the permission of the Controller of Her Majesty's Stationery Office © Crown Copyright.  
 Scarborough Borough Council Licence No. LA 079251

Asset NFCDD Reference Number	Alternative Asset Reference	Description of Asset (As recorded in NFCDD)	Asset Type (As recorded in NFCDD)	Asset Location description (As recorded in NFCDD)	Asset Length (m)	Inspection Date	Inspection Comments for 2012	Overall Condition	Worst Condition	Residual Life	Recommendations	Urgency
1221C901C0506C01	CPSE-220/6601/03	South Gare Breakwater. Protects Coatham Sands to south and Tees entrance to north.	Apron	NZ55622754, NZ55762839	1672.5	15/10/2012	Overall strategy should consider condition & performance of whole structure (massive structure, controls bay to south. Evidence of quite recent repairs to grouted revetment on north and concrete deck (south side).	4	4	11 - 20	Continue with patch repairs.	routine
1221C901C0507C01		Undefended	Undefended	NZ55662764, NZ59192534	4330.2	15/10/2012	Good coverage of established vegetation. Evidence of recent wave run up to vegetation, but healthy beach levels. Local erosion due to trampling, especially at S end where there is a high but v narrow dune ridge at N end of car park (site compound).	2	3	>20	Monitor with LIDAR and aerials.	routine
1221C901C0601C01	CPSE-220/6602/02	Concrete crest wall above part length of grouted stone revetment.	Wall	NZ59192534, NZ60042546	861.5	15/10/2012	In front of car park crest of wall is concrete and generally fair condition, with grouted stone revetment. 2m section of crest wall missing towards northern end. sand has accreted on landward side of wall, blocking drainage.	3	3	11 - 20	Replace missing render. Replace missing concrete wall at northern end.	routine
1221C901C0602C01	CPSE-220/6607/02	Concrete toe to revetment.	Apron	NZ60712522, NZ61092503	559.2	15/10/2012	Major new defence scheme under construction - nearing completion, so frontage not inspected.	1	2	>20	Monitor new defences	routine
1221C901C0602C02	CPSE-220/6606/02	Concrete revetment below concrete seawall.	Revetment	NZ60352534, NZ60712522	480.7	15/10/2012	New defences under construction and nearing completion for whole Redcar frontage. Frontage not inspected due to works underway.	1	2	11 - 20	Monitor performance of new defences	routine
1221C901C0602C03	CPSE-220/6605/01	Stepped seawall to main sea frontage.	Wall	NZ60252539, NZ60362537	206.4			2	2	>20		no repairs
1221C901C0602C04	CPSE-220/6604/01	Former concrete promenade shelter, now has voids infilled with brick work (internal structure unknown).	Wall	NZ60142543, NZ60252539	113.9			2	2	>20	Monitor southern extent of seawall for movement. Infill cracks.	routine
1221C901C0602C05	CPSE-220/6626/01	Massive concrete wall to rear of cinema. Crest level reduces towards shore.	Wall	NZ60112544, NZ60152545	68.7		Scheme to improve Redcar sea defences underway. Frontage not inspected due to works.	3	3	11 - 20	Infill cracks	no repairs
1221C901C0602C06	CPSE-220/6603/01	Rough concrete revetment over old 1890's slag revetment.	Revetment	NZ60042546, NZ60112544	82.1			3	3	11 - 20		routine
1221C901C0603C01	CPSE-220/6609/03	Grouted masonry revetment in front of promenade & The Stray. Concrete splash wall landward of promenade. Accretion of sand & dunes behind.	Splash Wall	NZ62062403, NZ61212497	1273	15/10/2012		2	3	11 - 20	Complete seawall improvement scheme	routine
1221C901C0701C01		Undefended Frontage	Undefended Frontage	NZ62062403, NZ63482300	1765.3	15/10/2012	Condition varies - active erosion in north, but further south wider cobble beach affords some protection and the cliff is largely vegetated.	3	4	11 - 20	Continue monitor with aerials and LIDAR	routine
1221C901C0702C01	CPSE-220/6612/01	Brick wall enclosure of boat park and access. Short length of concrete wall with lower crest level.	Wall	NZ63562281, NZ63602290	97.2	15/10/2012	As last inspect, wall in fair cond. Seaward end untidy, missing bricks/mortar, will reduce integrity of structure. Settlement crack from crest to base. Landward concrete wall fair condition. Several vertical cracks from crest to base. Local scour to rear.	3	3	11 - 20	Repoint masonry. Fill cracks. Tidy seaward end of wall. Replace missing bricks.	routine
1221C901C0702C02	CPSE-220/6611/01	Masonry revetment to path and coastal slope above masonry wall. Coastal slope with access to properties above.	Revetment	NZ63562281, NZ63572293	122.2	15/10/2012	Extensive vegetation growth on revetment slope. Toe wall appears fair where exposed. Seaward section largely covered by sand and vegetation so unable to identify if repairs recommended in 2010 undertaken.	4	4	6 - 10	Repoint wall, clear vegetation. Replace missing blocks/infill locally.	routine
1221C901C0702C03	CPSE-220/6610/01	Lower masonry wall to path. Upper wall varies (concrete/masonry), coastal slope to rear.	Wall	NZ63482300, NZ63572293	125.9	15/10/2012	High beach levels covering much of lower wall. Missing mortar near steps and where exposed. Missing coping blocks at N. Evidence of minor lateral movement (seaward). Embankment above appears stable. Beach and dunes seem to be accreting in front of wall.	3	3	11 - 20	Repair cracks, replace missing blocked and monitor lateral movement of structure.	routine
1221C901C0702C04		Undefended Frontage	Undefended Frontage	NZ63602290, NZ64502254	1011.6	15/10/2012	Low accreting dunes in front of vegetated cliff.	2	3	>20	Inspect in 2014	routine
1221C901C0703C01		Undefended Frontage	Undefended Frontage	NZ64502254, NZ66232182	1883.2	15/10/2012	Partly active, HWM at cliff toe in south. Highly vegetated, but many minor local failures.	4	4	>20	Monitor with LIDAR and aerials.	routine
1221C901C0703C02	CPSE-220/6613/01	Concrete wall including outfall and two concrete slipways to coastal slope.	Wall	NZ66232182, NZ66262182	46.8	15/10/2012	Overall in a fair condition, some minor cracking and spalling visible although stable. Some vegetation growth present. Rust staining to top of wall from hand rails. Some cracking to side walls of ramp to S, missing coping at top of ramp.	3	3	>20	Replace missing blocks. Clear trash screen. Repair cracks if they worsen.	routine
1221C901C0704C01	CPSE-220/6615/01	661501 Large masonry block revetment protecting carpark, road and coastal slope. Masonry slipway is also present.	Revetment	NZ66652170, NZ66812158	65.8	15/10/2012	Generally sound. No missing blocks. One large section has been repaired using smaller blocks. Most mortar joints in good condition, very few have been washed out. Missing mortar on slipway joints, but looks stable. Steps poor with missing blocks/ treads	2	3	>20	Repoint masonry blockwork, repair steps.	routine
1221C901C0704C02	CPSE-220/6616/01		Carpark.	NZ66812158, NZ66852159	35.7	15/10/2012	Undefended section at fishing boat park. Evidence of cliffing in shingle.	3	3		Continue monitoring and reprofile shingle if necessary.	

Asset NFCDD Reference Number	Alternative Asset Reference	Description of Asset (As recorded in NFCDD)	Asset Type (As recorded in NFCDD)	Asset Location description (As recorded in NFCDD)	Asset Length (m)	Inspection Date	Inspection Comments for 2012	Overall Condition	Worst Condition	Residual Life	Recommendations	Urgency
1221C901C0704C03	CPSE-220/6617/01	661701 White rendered sea wall set back from the beach, cobbles have collected on the seaward side protecting the toe. Boat handling area, carpark and PH located behind. Slipway is also present giving access to the beach.	Wall	NZ66852159, NZ66952160	106.8	15/10/2012	Rendered wall in a sound condition, no visible defects. Protected by high cobble beach. Slipway at E is being undercut and significant cracks have occurred on slipway surface.	2	3	11 - 20	Repair slipway toe and cracking in slipway surface.	routine
1221C901C0704C04	CPSE-220/6614/01	Masonry wall in good condition, generally high sand with shingle to east end. Concrete splash wall to rear of promenade below coastal slope.	Sea Wall	NZ66262182, NZ66652170	415	15/10/2012	Abrasion at toe in places. Joint washout/ missing mortar. Promenade is still sound. Slipways missing all mortar joints although remaining stable. Shingle beach level higher north of pier. Cliff inactive.	2	3	>20	Repoint masonry blockwork. Repair coping and handrailing.	routine
1221C901C0704C05	CPSE-220/6618/01	661801 Various concrete and masonry walls to private property with various degrees of concrete apron with typical level of 4.7 mODN.	Wall	NZ66952160, NZ67072160	118.6	15/10/2012	All sections of wall suffering sig. cracking, undercutting, surface erosion and joint failure. Some voids have been grouted at South end.	4	4	1 - 5	Infill holes/gaps/voids, repair cracking.	urgent
1221C901C0704C06	CPSE-220/6615/01	Concrete blockwork seawall protecting pavement, handrail and tarmac road. This section also includes bridging point over river, continuation of sea wall on the southern side.	Sea Wall	NZ66652170, NZ66812158	147.1	15/10/2012	Concrete blockwork wall, joint washout and cracking visible, short section of coping stone missing. Vegetation growth present. Pavement and road in a good condition. High beach profile protecting toe of wall.	3	3	>20	Repair cracking, repoint.	routine
1221D901D0101C01		High cliffs are locally active above beach east of Saltburn. Cliffs much more active (partly/totally active) along Hunt Cliff above shore platform, specifically where railway nears cliff edge. Further east, cliffs are less high and locally active.	undefended high cliffs.	NZ67072160, NZ70142118	3551.2							
1221D901D0201C01		Cliffs to NW partly active, slumping of soft upper slopes, erosion of harder lower cliff, some veg. Cliffs to SE support more veg, small dune system at toe, less active (locally active/inactive).	undefended high cliffs.	NZ70142118, NZ71112040	1262.3							
1221D901D0201C02	CPSE-220/6619/01	661901 Old concrete jetty. A short section of steel sheet piling is also incorporated into construction. Was last in use when local mining was active.	Breakwater	NZ71112040, NZ71262059	477	30/10/2012	As previous survey: Old concrete jetty. Significantly cracked with deformation throughout. Slab nr landward end is lifted as a result of wave action. Piling is corroded through, fixings are failing. Whole defence is in disrepair. Still stabilises bay.	4	4	1 - 5	Re-secure gates to prevent public access.	routine
1221D901D0202C01	CPSE-220/6620/01	662001 Rock armour slope with 150 ballast behind. To path and coastal slope. Control to erosion of village.	Armour	NZ71282016, NZ71142043	305.1	30/10/2012	Rock armour in a fair condition, rocks are well placed and packed tightly. However, beach low at time of survey exposing toe at south end - toe rocks look stable. Crest rubble has been displaced by overtopping. Vegetation growth at back of armour.	3	3	>20	Continue to monitor.	routine
1221D901D0202C02	CPSE-220/6621/03	662103 Masonry wall behind rock revetment, severely overtopped prior to breakwater and beck control works.	Wall	NZ71382002, NZ71282016	182.3	30/10/2012	Rock armour well packed and appears stable. Blockwork wall also in good condition, stable and vertical. Geotextile exposed on toe of spur groyne at seaward end due to low beach. Tarmac road in reasonable condition, some surface cracking.	2	3	>20	Continue active monitoring.	routine
1221D901D0202C03	CPSE-220/6623/01	662301 Concrete wall in moderate condition to end of protection offered by breakwater. Protects road.	Wall	NZ71412009, NZ71472010	60.5	30/10/2012	Beach levels low and toe seriously undermined. Promenade is significantly cracked in places evidence of repair of previous void. Retaining wall has large cracks.	4	5	1 - 5	Repair toe, & cracking in concrete surface	urgent
1221D901D0202C04		Beach frontage with cobbles and boulders located at beach giving protection to soil embankment and fishing area.	Beach frontage.	NZ71412009, NZ71372016	77.1	30/10/2012	Rock armour behind cobble beach protecting boat park. No visible defects. Cobble beach level is currently high and slopes down gently to sea.	2	2	>20	Continue to monitor.	routine
1221D901D0202C05	CPSE-220/6622/01	662201 Offshore fishtail breakwater protecting frontage and stabilizing beach levels. Concrete slipway also included in defence providing access for fishermen. High ground is natural main land.	Breakwater	NZ71392004, NZ71372024	450.4	30/10/2012	Fishtail breakwater in generally good condition, good coverage of rock armour tightly packed. Localised displaced armour on seaward side. Missing top of navigation marker. Concrete slipway has missing section at crest.	3	3	>20	Repair nav mark and slipway crest, monitor armour.	routine