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Walk-over Visual Inspections of Assets including Coastal Slopes

Scarborough Borough Council
Final Report

November 2014

Scarborough Borough Council

Coast Protection Assets
and Coastal Slope Condition Analysis

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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 0-1*). 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.

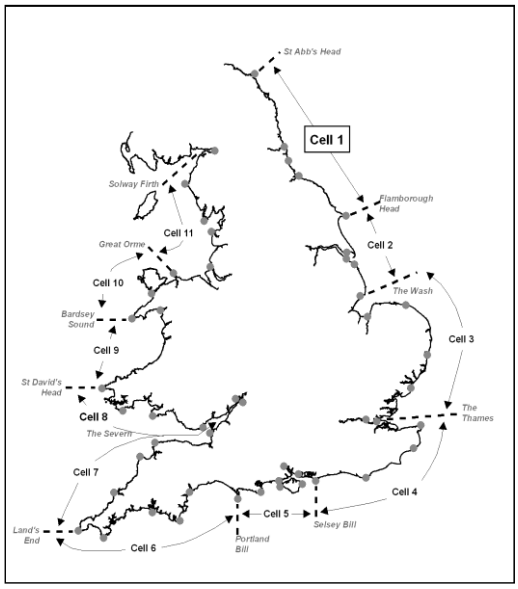


Figure 0-1: Sediment Cells in England and Wales

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:

Northumberland County Council
Northumberland Coast AONB
North Tyneside Council
South Tyneside Council
Sunderland City Council
Durham County Council
Redcar & Cleveland Borough Council
Hartlepool Borough Council
Whitby Scarborough Filey Borough of Scarborough
A great place to live, work & play
East Riding of Yorkshire Council
Environment Agency
Natural England
The National Trust

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 Scarborough Borough Council's frontage that were carried out in August and September 2014.

1 Introduction

1.1 Methodology

This section outlines the approach taken by the slope and asset inspectors, respectively, for the Scarborough Borough Council coastal frontage.

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.

On 5th December 2013 a significant storm surge, driven by strong northerly winds, coincided with one of the highest astronomical tides of the year. A comparison of the recorded water level data for the December 2013 storm surge at North Shields, Whitby and Scarborough has been provided in the second wave data analysis report covering the period 2013 to 2014. Recorded surge residuals from that report show a similar signature at the three sites, with the maximum surge height occurring before high water and the surge increasing in height as it progressed down the coast, from around 1.3m above predicted water level at North Shields to around 1.8m at Whitby and Scarborough. Based on the EA (2011) Coastal Flood Boundary Condition extreme water level data the surge had the follow chance of occurrence each year:

- North Shields: between 1 in 200 and 1 in 500
- Whitby: between 1 in 100 and 1 in 500
- Scarborough: between 1 in 150 and 1 in 500

In the week after the storm surge, a more limited site inspection was undertaken to document damage to coastal defences and movements of beach sediment (December 2013 supplementary report). The report also described the results of post-surge beach surveys that were completed one to two days after the surge. The present report provides the first comprehensive visual inspection of the whole coastline following the storm surge, which was undertaken between August and September 2014. The longer-term impact of the surge on beaches, dunes and cliffs in the Cell 1 area has been quantified in the 2014 partial measures survey reports.

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.

1.1.1 Assessment Methodology

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

Coastal Slope Condition Assessment
The 2014 Coastal Slope Condition Assessment was undertaken through systematic walk-over inspection of the whole coastline by a geomorphologist who is familiar with the site having undertaken previous inspections for SBC, including the post-2013 Storm Surge inspection. 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).

This report provides a summary of the cliff condition as assessed in August 2014, 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 in the 2014 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 Scarborough Borough 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, as at the coastal towns of Whitby, Scarborough and Filey, and in bays and at headlands where access could be gained safely with knowledge of the terrain and tides.

The Coastal Slope Condition Assessment walkover survey for the Scarborough Borough Council frontage was conducted on 6th, 7th 8th, 21st and 22nd August 2014, working in a south to north direction, although to maintain consistency with previous reports, the observations in this report are presented from north to south. The weather during this time was generally mild and dry.

Coast Protection Asset Assessment

The 2014 visual assessment of coast protection assets was carried out by a Chartered Engineer who is familiar with the defences, having undertaken the previous regional monitoring inspections in autumn 2012. The site visits were planned to coincide with suitable tidal states and weather conditions and taking advantage of the large Spring tides in September enabling maximum visibility of the structures, the inspections took place on 10th, 12th, 25th and 26th of September 2014. As in previous years, 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) and 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.

The commentary from the asset inspections in Section 3 provides 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. This report will also highlight 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 condition and locations of changes since the 2010 inspections are provided in Appendix B.

1.1.2 Study Area

This report documents the condition of the coastal cliffs and assets from Cowbar Nab, Staithes in the north, to the Southern part of Filey Bay 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 maps of the built assets are in Appendix B.

The cliff behaviour units (CBUs) previously mapped along this stretch of coast in 2008 were again used in this inspection, with adjustments made where units were found to deviate from the mapping.

The naming convention for CBUs in this region is as follows: For CBU E59/6 the prefix relates to Future Coast 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.

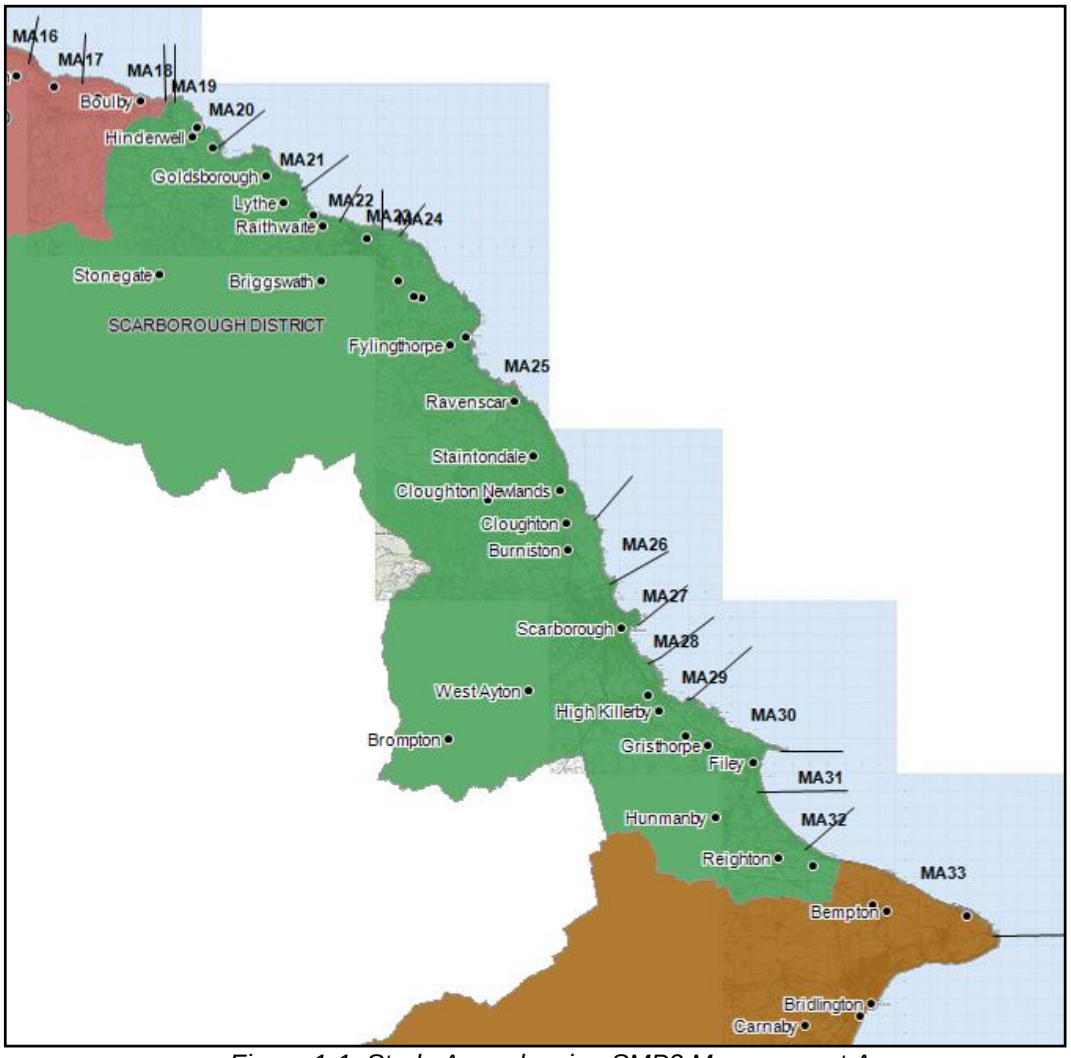


Figure 1-1: Study Area showing SMP2 Management Areas

2 Overview

2.1 Condition Assessment

Overview of Coastal Slope Condition Assessment

There is significant variation in the level of cliff activity within the SBC region, reflecting the diverse geology, history of landsliding and the range of cliff protection and stabilisation measures in place to tackle erosion and slope instability issues.

In total 265 cliff behaviour units (CBUs) have been assessed across the region during the 2014 walkover survey, of which Partly Active and Locally Active cliffs are the most common (Figure 1).

The SBC coastal frontage features numerous important assets, ranging from the busy coastal towns of Scarborough, Filey and Whitby to smaller settlements such as Staithes, Robin Hood's Bay and Runswick Bay. The Cleveland Way footpath follows the cliff top along the coastline and in other areas, such as Cayton Bay, strategic roads are routed close to the cliff top.

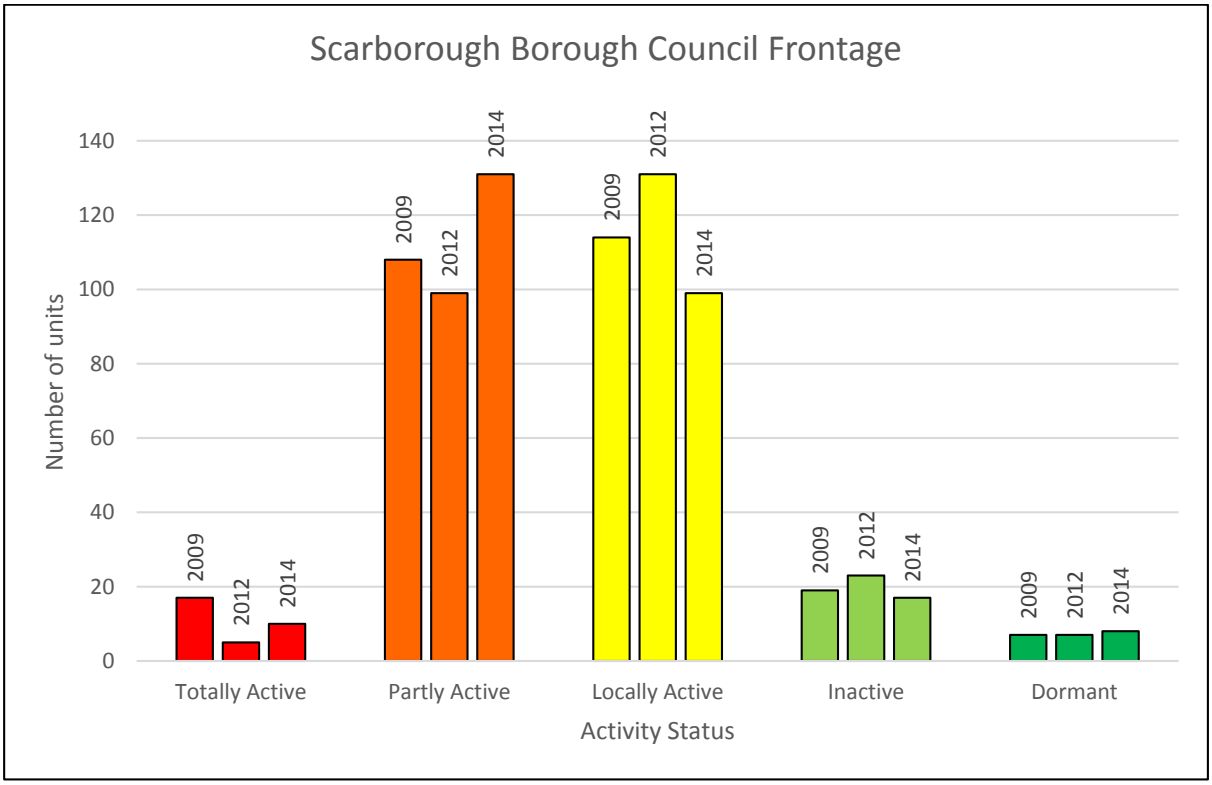


Figure 1. Frequency of cliff activity along the SBC frontage

Key observations made in 2008, 2009, 2012 and in the post-surge inspection of December 2013 are as follows:

Key findings of the 2008 cliff inspection were

- **Cayton Bay North**: In early 2008 there was a major reactivation of large scale, deep seated landslide activity at Cayton Cliff. This resulted in the loss of land and demolition of a number of properties. The Cleveland Way footpath also required rerouting. The activity of the landslide slowed during 2009 so the unit was reclassified from Totally to Partly Active. This situation remained the same in 2012 and continues to do so in 2014 as localised headscarp recession still occurs periodically, threatening the remaining properties.
- **Filey Town**: Localised cliff instability was evident in 2008 which had led to the closure of some footpaths in Filey. The instability was thought to be related to the significant rainstorm event which affected the town in 2007, which caused widespread damage. The impacts of

this event have been remediated, the cliff was categorised as inactive in 2012 and continues to be categorised as such in 2014.

Key findings of the 2009 cliff inspection were:

- **Filey Brigg**: There is ongoing and intensifying activity around Filey Brigg. While the on-going erosion will have little direct impact on coastal assets there is a risk to beach and cliff users. This remains an area of localised activity
- **Cornelian Bay**: This bay sits to the north of Knipe Point, Cayton Bay and has been subject to increased activity and headscarp recession during 2009, leading to closure of the cliff path and threatening some properties at Knipe Point. . The activity appeared to have reduced during 2012 and this trend has continued into 2014. However, careful observation of this area is important to minimize the risk to nearby land and property.
- **Robin Hood's Bay**: For the most part the units at Robin Hood's Bay are heavily defended at the toe and therefore classified as Dormant. In 2012 there was a large overhang in the coastal cliff to the north of the defended section and signs of increasing instability to the south, which are now beginning to undermine the paved section of the Cleveland Way near the town. Around the North Cheek headland from Robin Hoods Bay, an area of large tension cracking which crossed the Cleveland Way was identified in the 2014 survey at Far Jetticks. This was highlighted to SBC ahead of the production of the report, who passed the information to the North York Moors National Park Authority for action.

Key findings of the 2012 cliff inspection were:

- **Filey Bay**: The activity of the cliffs above Speeton Sands continues to be high but two of the frontages have been upgraded to Partly Active or Totally Active in the 2012 walkover survey. This area continues to be very active and several other units have been upgraded to Totally Active status in 2014.

Key findings of the 2013 post-surge cliff inspection were:

- **Runswick Bay** – Two units (**MU7/2 and MU7/3**) have been elevated in activity status due to increased erosion of the toe of the till cliffs following the storm surge.
- **Upgang Beach** – The unit occupying the majority of this area (MU10/2) has retained its 'Partly Active' status. However the western end of the cliff is totally active vegetation absent from large sections of the cliff and evidence of very recent mudsliding.
- **Whitby West** – This defended section (**MU11/1 and MU11/2**) has been elevated in activity status due to toe erosion (resulting in the removal of vegetation and exposure of sediments) and recent shallow mudsliding (likely a reactivation of an existing slide) in a section that is defended by a sea wall but not rock armour and the consequent exposure of drainage pipes. There is also evidence of smaller shallow failures further up in the cliff.
- **Robin Hoods Bay** – One unit (**MU16/2**) has been increased in activity status to reflect the undefended nature of the northern third of the unit which is significantly undermined at its toe and from which relatively recent rockfalls have occurred.
- **Scarborough North Bay (Scalby Ness)** - This unit had experienced toe erosion comprehensively throughout the unit and recent failures higher up in the cliff had occurred.
- **Filey Brigg –** Several units to the south of Filey Brigg have experienced widespread toe erosion. A recent mudslide initiating near the top of the cliff with its toe coming to rest on the beach was noted near Filey Sailing Club.
- **Filey Bay –** All units in this area now either remain, or have been elevated to 'Partly Active' Status. Whilst the upper cliff remains largely vegetated there is evidence of failure throughout the whole cliff in some units and the units immediately around Flat Cliffs (MU29/AR and MU29/AS) have experienced particularly severe toe erosion and failure of the lower cliff

Results of the 2014 cliff inspection are discussed in the next section and mapped in Appendix A.

Overview of Coast Protection Asset Condition Assessment

There are a large number of built coastal defence assets along this stretch of coastline, generally associated with the coastal towns and villages. Many of these assets are in good or fair condition but there are a large number that require minor repair works, a few where more

significant works are recommended and several locations where urgent attention to provide further more detailed assessments are recommended. The most common works required include blockwork repointing, resealing of joints, reinforcement of undercut zones, repairing cracks, replenishment of rock armour and resurfacing. Several notable areas require some more extensive works.

A brief overview for each of the key locations of coastal defences, highlighting areas of concern is given below.

Staithes: Since the 2012 inspections took place significant remedial maintenance works were undertaken costing around £140,000. The defects observed during the 2014 inspections were therefore somewhat different to observations documented in the 2012 report. The rock armour protecting the main breakwaters is mostly in good condition but there has been damage and displacement of the crest rock armour units on the North Breakwater. The steel sheet piling at the head of the North Breakwater is heavily corroded and the piles and breakwater may be voided below the low water line. Wave overtopping through the pedestrian access at the root of the north breakwater has also displaced armour at the north end of the revetment to the east end of Cowbar Nab. A significant number of repairs have been undertaken to the rear harbour wall since the 2012 inspection, but the walls are old and in need of regular attention and a number of defects such as undermining, loss of mortar from joints and spalling and damage to the facing were observed.

Runswick Bay: The rock armour defence remains in good overall condition, although some movement of armour units was evident to both sides of the southern slipway. The series of patchwork defences to the north of the old RNLI building exhibit a variety of defects which have continued to deteriorate despite repairs that have been undertaken after the December 2013 storm surge. There are several large cracks in the walls and erosion and abrasion of the rocky foreshore is undercutting the foundations in several locations.

Sandsend: As noted in previous years, the toe of the revetment at the car park at the north of the village is exposed and being undercut. The beach levels at the failed groyne system fronting the main length of seawall were higher than in previous years, affording some protection to the ad hoc toe armour apron which was noted to be in a failing condition in previous years. Works were underway to repair the cantilevered walkway which was destroyed by waves during the December 2013 storm surge. The large void under the toe apron at the south end of the blockwork defence beneath the walkway was not visible due to high beach levels and probably still needs repair. The sloping concrete revetment at the south side of Sandsend was severely damaged during the December 2013 storms and while temporary repairs were undertaken it remains susceptible to normal wave action and so requires frequent inspection and repairs to hold the shoreline until the capital improvement scheme that is planned can be undertaken in the future.

Whitby: The defences of most significant concern are below the Whitby Spa theatre, where the cliff toe protection is in very poor condition, having been undermined by low beach levels and there have been slips and failures of previously intact rock on the cliffs below the foundations of the building. As noted in 2012, low beach levels are leading to undercutting of the sections of wall to north west of the North beach café that does not have rock armour protection. Whitby main harbour arms show signs of block displacement on each arm, this has led to erosion and cracks to the blockwork as well as voids to parts of the wall. Without repair this may possibly lead to further cracking and potential failure of the harbour walls. The area of broken timber fenders at the fuel berth by the fish quay appears to have expanded. Urgent attention to repair the fenders is recommended as they prevent vessels colliding with the slender piles that support the suspended quay deck. The rock armour placed in 2001 in the outer harbour below the Haggerlythe has suffered further damaged and displacement from the toe of the slope and required needs re-profiling and topping up with larger armour. The harbour breakwater arms are in similar fair to poor condition to previous years and it is understood that a capital improvement scheme to renovate them is in development. Toe erosion and undermining at the west end of the Tate Hill (old RNLI) pier is threatening stability of the structure and needs urgent attention.

Robin Hood's Bay: The large vertical seawall protecting the main part of the lower village remains in poor to very poor condition in places and it is understood that a capital improvement scheme is being developed to repair the wall. Slumps in the cliffs south of the ramp to the Quarterdeck have damaged the rock armour and re-profiling should be considered in future.

Scarborough North Bay: Repairs were ongoing to the defences noted to be of most concern in 2012. These are the two sections of wall between the rock armour which stops at Clarence Gardens south and Peasholm Gap. Repairs have also been undertaken to defects and damage that occurred during the December 2013 storms.

Scarborough South Bay: It was noted that repairs had been undertaken to many of the more significant defects noted in the harbour area in the 2012 report such as the loose stone steps on the inner face of East Pier and the void under the sheet piles on the SE corner of the breakwater by the lighthouse. At the Spa seawall there had been a number of repairs to storm damage that occurred during the December 2013 surge event, including rebuilding sections of the parapet wall. However, there are still numerous defects including undercutting to the exposed and damaged toe apron, loose blocks in both main wall and crest wall, undermining of the toe, cracking and loss of front face. A capital scheme is understood to be in development to upgrade this section of defence. Despite a considerable number of repairs and improvements to sections of the defences south of the Spa further regular work is needed to hold these aging defences. The wall around the site of the former South Bay Pool is very exposed to waves and there were washed out joints with deep voids between the blockwork of the main wall.

Cayton Bay: The structure at the public access point just south of the former pumping station remains in a very poor / failed condition despite repairs having been undertaken to make it safer for public access. The length of defence immediately to the north has also failed and needs removal / making safe.

Filey: The private defences at the sailing club are in very poor condition with corroded piles and major voids beneath the promenade. A significant number of repairs have been undertaken since 2012, dealing with the more major defects noted in the previous report. The handrails along the crest of the defence are highly corroded and failing in places. The short section of rock armour and gabions at the south end has been rebuilt since 2012, but it appears that some of the armour has been displaced by storms since the work and further re-profiling is required.

Comparison with Previous Assessments and Recommendations

Few significant changes have been observed in the cliffs since the last inspection survey in 2008, although a number of minor changes in activity have occurred. There continues to be activity at Cayton Bay where a large landslide reactivated in early 2008 and properties remain at risk. Cliffs in the southern part of Filey Bay, at Reighton Gap have increased in activity, which may affect the holiday camp. Filey Brigg continues to experience intense erosion and cliffs between the Brigg and Cayton Bay, at the southern part of Robin Hood's Bay Village and in Runswick Bay, have all increased in activity. However, no built assets are at risk in these areas. In addition to these changes, landslide activity has been reported by residents in Staithes (eastern part of High Street) and Whitby (along Henrietta Street) where material has fallen from the cliff into back gardens and onto roofs of properties. Both these cliffs are known to be episodically active, particularly associated with intense and sustained rainfall.

In the case of Whitby, the cliff activity has threatened St Mary's church, which has lost a part of its graveyard (during January 2013). This event occurred at a similar time to a landslide in the centre of Whitby on Aelfleda Terrace (28 November 2012). These areas should be closely monitored, particularly in times of intense rainfall.

Many of the coastal defence assets were found to be in a similar condition to that reported in 2012 and comparative photos have been included in a number of locations in the main report text. A large number of defences have had repairs to damage that occurred during the December 2013 storm surge. In most locations beach levels were slightly higher than in previous inspections, so defects such as toe erosion were not fully visible at the time of the inspection. However, some assets showed a degree of degradation in condition since the previous survey. These include the armouring of the main breakwater at Staithes, defences at

the south of Sandsend, the defences below Whitby Theatre and the defences at the Scarborough Spa, particularly the southern section. Other minor deterioration including cracks, spalling and erosion were seen in coastal defences throughout the study area.

The whole coastline is expected be subjected to repeat inspections under the next phase of the Cell 1 Monitoring Programme in 2016, but key areas that should be closely monitored comprise: Staithes, Sandsend, Whitby, South and North Bays Scarborough, the southern part of Cornelian Bay, the northern part of Cayton Bay and Filey Bay.

3 Condition Assessment

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

Coastal Slope Condition Assessment
Brief descriptions and photographs are presented for each Management Unit. Photographs have been bordered with colours in order to show their activity status, as follows:

Coastal slope condition data, that also show areas of change, are provided in Maps 1-11 in Appendix A.

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

Coast protection asset data are also provided in Maps 1 to 7 in Appendix B. Full details of all of the of coast protection asset condition inspections has been entered into SANDS.

3.1 Management Unit 4 - Staithes

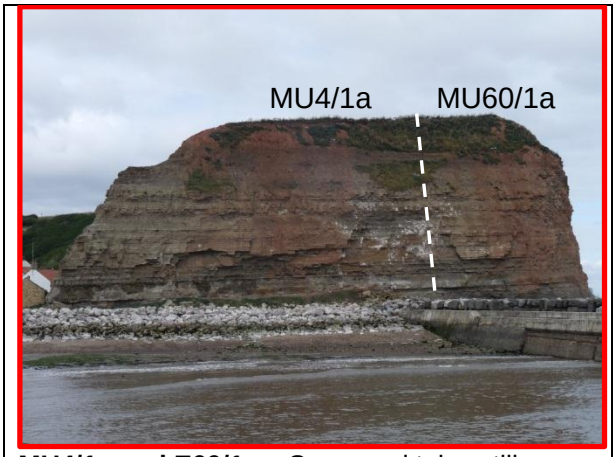
Coastal Slope Condition Assessment
This Management Unit comprises the high cliffs of Cowbar Nab and those behind and immediately to the east of Staithes (Appendix A Map 1).

The eastward facing end of Cowbar Nab (**MU4/1a and E60/1a**) features well-bedded and jointed rock and has very limited vegetation cover. During the post-surge inspection in December 2013, it was noted that these units had experienced recent rockfalls and that significant talus deposits were present. Displaced rock armour and a rockfall block was noted on the path beneath these units. In August 2014, the activity has not increased but recent scarring and talus deposits are still visible .Given this high level of activity, the 'Totally Active' status for these units has been retained.

Unit MU4/1b is the south facing side of Cowbar Nab which runs adjacent to Staithes Beck. This unit is sheltered from the wave action because it is upstream of the harbour walls. The cliff does fail occasionally as indicated by the exposed rock at the seaward (eastern/right in the photograph) end and has been retained its classification of Partly Active in 2014.

Unit MU4/2 sits behind Staithes Harbour and is classified as Partly Active. This cliff is generally well vegetated with small localised patches of erosion. The eastern end of the unit is more exposed than the rest of the unit because of its position in the bay and is more prone to erosion. Failed material is evident in at the toe of the cliff and activity has in the past been reported by residents of the eastern part of High St. The unit was re classified from Locally Active to Partly Active to reflect that activity. However, whilst there are shallow instability features throughout the cliff, the majority is vegetated with the exception of the eastern end which is more exposed. As such, this unit has been

Further east, beyond the extent of Staithes harbour is unit **MU4/3**. The face of this unit is almost entirely exposed and continues to show signs of active erosion. Unlike any of the other cliffs within this Management Unit, this section is not protected at the toe and is therefore subject to marine erosion. This unit was also classified as Partly Active in the 2012 walkover survey. Recent rockfalls were noted during December 2013 and August 2014. The Partly Active status has been retained for this unit.



MU4/1a and E60/1a – Scars and talus still visible on Eastern Facing End of Cowbar Nab (Totally Active). August 2014.

MU4/1b - The southwards facing side of Cowbar Nab which runs along Staithes Beck (Partly Active). August 2014.

MU4/2 – Locally active. Note there are scars from shallow failures, but the majority of the cliff is well vegetated. August 2014.

MU4/2 – Rockfalls, marine erosion of the cliff toe and failure of the superficial deposits (identified through 'streaking' down the cliff) continue to occur. Partly Active. August 2014.

Coast Protection Asset Condition Assessment

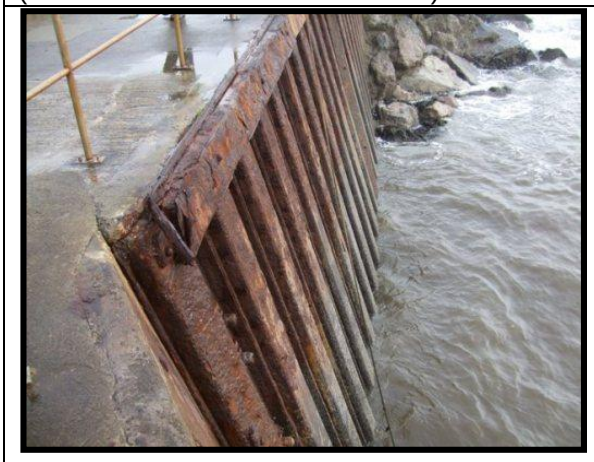
Asset inspection data are shown in Appendix B, Map 1. A number of the coastal defence assets within the village of Staithes have been renewed or repaired in recent years and it is understood that about £140k of maintenance money was spent in Staithes shortly after the 2012 inspection. As noted in previous inspections, the most significant of the recent works are the breakwater arms where 5-8 tonne rock armour was placed on the seaward side in 2002. This acts to provide a greater defended height and to dissipate waves from the breakwater

surface. New stainless steel handrails and a new concrete topping, cast over the original outer breakwater added further height to the defence in 2002.

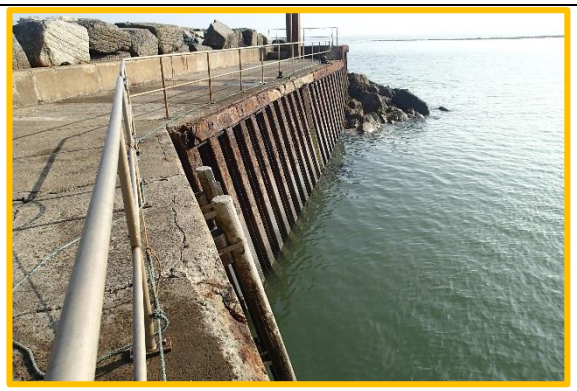
The North Breakwater is in fair condition overall, but certain elements are poor. The rock armour added in 2002 mostly remains tightly packed and in good condition, however, two of the stacked & pinned crest blocks adjacent to the walkway are missing and others have moved, presumably evidence of damage during wave overtopping in a major storm. The sheet piling on the inner face of the east end of the breakwater is heavily corroded and as noted in previous inspections the coping piece (horizontal) on the landward side of the breakwater has corroded and failed. Whilst at the head of the breakwater, waves could be heard entering the structure, indicating that there may be significant voids in the structure behind the piles. Undercutting is still apparent to the landward (south) side of the north breakwater wall, as well as corrosion to the sheet piling which has caused displacement of a pile. It is recommended that the sheet piling coping is repaired / replaced (Asset Ref. 1221D901D0402C01, element 4).

Missing crest armour unit on the north breakwater at approx. 1/3 way along crest (Asset Ref. 1221D901D0402C01/2)

Displaced crest armour near roundhead (Asset Ref. 1221D901D0402C01/2)



Corrosion of sheet piling on the landward side of the north breakwater (photo from 2009)



Corrosion of sheet piling on the landward side of the north breakwater (12/09/2014) (Asset Ref. 1221D901D0402C01/4)

Undercutting to landward facing of north breakwater (photo from 2009 inspection) (Asset Ref. 1221D901D0402C01)

No change since 2009 to undercutting at landward facing of north breakwater (12/09/2014) (Asset Ref. 1221D901D0402C01)

There is cracking in the promenade deck slab on the north breakwater, as previously reported, and loss of concrete at the top of the inner face, see below right. There is also extensive horizontal cracking and rust staining of the outer section of the crest wall. Vertical cracking in the crest wall adjacent to rock armour near the head of the breakwater, (photo below left) may be coincident with storm damage causing nearby displacement of crest rock armour (photo above, top right).

North breakwater crest wall showing cracking and damage from rock movement. (Asset Ref. 1221D901D0402C01)

North breakwater promenade showing damage to coping. (Asset Ref. 1221D901D0402C01)

The rock armour defence running south from the north breakwater to the end of Cowbar Lane (Asset Ref. 1221D901D0402C02) was constructed after the 2002 upgrade to the main breakwaters and was recorded as being in overall good condition in 2012, has been downgraded to fair. It appears to have suffered some storm damage with some armour stones having been displaced at the crest near the north end by wave overtopping through the pedestrian access way at the root of the north breakwater, see photo below left. At the north end, as previously reported there is cracking and spalling of the concrete walkway / promenade, possibly related to movement of the rock armour. At the south end the original promenade at the end of Cowbar Lane has surface erosion and exposed aggregate, and there is cracking and spalling to the blockwork wall, see below lower right.

Area of displaced armour stones near root of north breakwater
(Asset Ref. 1221D901D0402C02)

Rock armour which in fair condition adjacent to stepped wall at end of Cowbar Lane. (Asset Ref. 1221D901D0402C02)

Storm damage displaced armour stones near root of north breakwater
(Asset Ref. 1221D901D0402C02)

Surface erosion and exposed aggregate to southern end of promenade.
(Asset Ref. 1221D901D0402C02)

The seawall that extends into the northern side of Staithes Beck is split into two assets, 1221D901D0402C03 and 1221D901D0402C06, with the intersection at the west side of the RNLI slip. The eastern section, which is in fair overall conditions includes the slipway with gabion baskets beneath and a vertical concrete wall. The gabions are in a fair condition although as noted in the 2012 inspection, one section has settled, see photo below top left.

The repair and reinforcement to the cliff toe upstream of the footbridge that was underway at the time of the 2012 inspections appears to be holding well. The wall between the footbridge and the RNLI slipway (Asset ref 1221D901D0402C06) is in a poor condition with missing pointing, settlement of blockwork and exposure of the toe. The small size rock toe protection that was placed as part of the 2002 works has been scattered in the beck or removed and no longer provides any protection.

Gabion wall below slipway has settled
(Asset Ref. 1221D901D0402C03)

Cracks in wall adjacent to slipway
(Asset Ref. 1221D901D0402C03)

Reinforcement to cliff upstream of footbridge (Asset Ref. 1221D901D0402C06)

Missing pointing and voids in wall and displacement of toe armour. (Asset Ref. 1221D901D0402C06)

The main Staithes south breakwater (Asset Ref No.1221D901D0403C03), originally had a spur at the northern tip, but the section between main breakwater and the spur is filled with rock armour. The breakwater is in good overall condition. The rock armour is in very good condition. As noted in previous inspection reports there is minor cracking in concrete crest units in the middle of the breakwater length, but there were no obvious changes to these elements since last inspection. Exposure to aggregate and construction joints to the old, lower part of the wall (inner face, photo below lower right) was also similar to that in 2012.

South breakwater promenade and rock armour – photo from 2012 (Asset Ref. 1221D901D0403C03)

South breakwater promenade and rock armour (12/09/2014) (Asset Ref. 1221D901D0403C03)

South breakwater outer face rock armour in good condition. (Asset Ref. 1221D901D0403C03)

South breakwater inner face armour in condition. (Asset Ref. 1221D901D0403C03)

The concrete breakwater / pier (1221D901D0403C04) in the south east of the harbour, with rock armour at the southern end linking to the south breakwater is in good condition, photos below.

Crest of inner breakwater / pier in south of harbour (Asset Ref. 1221D901D0403C04)

Inner breakwater / pier in south of harbour (12/09/2014) (Asset Ref. 1221D901D0403C04)

Between the above breakwater and the slipway at the harbour office there is a section of undefended cliff, see photo of MU4/2 above.

The slipway (1221D901D0403C05) was largely obscured by sand and small dinghies at the time of the inspection, but appeared to be in good condition.

Slipway / boat park by harbour office (Asset Ref. 1221D901D0403C05)

Slipway / boat park by harbour office and undefended cliff MU4/2
(Asset Ref. 1221D901D0403C05)

The southern harbour wall around the Staithes frontage from the slipway at the Harbour office through to the footbridge in Staithes Beck, comprises 4 main assets 1221D901D0403C01, C02, C05, C22 and C04, plus a concrete groyne, C07. The rear wall of the harbour is generally in fair condition, with locally poor sections. A number of the defects reported in the 2009 and 2012 inspection reports have been repaired. The large crack to the east of the harbour near Leech Bank (Asset Ref. 1221D901D0403C01), photo below right, has been filled since the 2012 inspections.

Cracking and surface damage to wall west of harbour office. (Asset Ref. 1221D901D0403C01)

Recent repairs to vertical crack through rear harbour wall (Asset Ref. 1221D901D0403C01)

The concrete groyne (1221D901D0403C07) limiting sediment movement within the harbour is also in fair condition with only a minor cracking to the steps at the landward end in need of repair, photo below top left. Repairs had been undertaken to reinforce a damaged section of wall west of the Cod and Lobster, photo below top right. The masonry blockwork side walls to the slipway are in poor condition, with missing blocks and undermining (see photo below lower left).

Concrete groyne in fair condition (Asset Ref. 1221D901D0403C07)

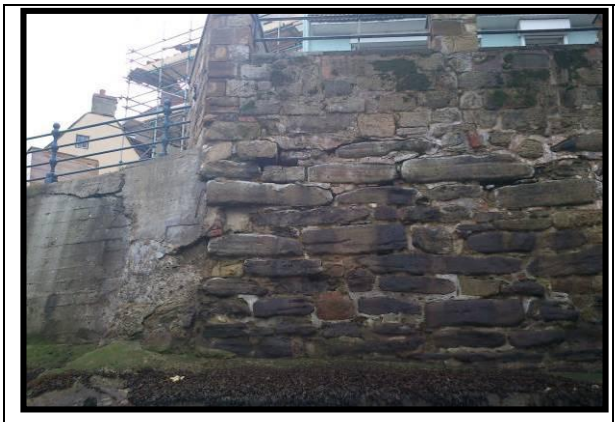
Additional section of toe berm placed since 2012 to stabilise wall (Asset Ref. 1221D901D0403C05)

Damaged and missing blockwork to slipway (Asset Ref. 1221D901D0403C05)

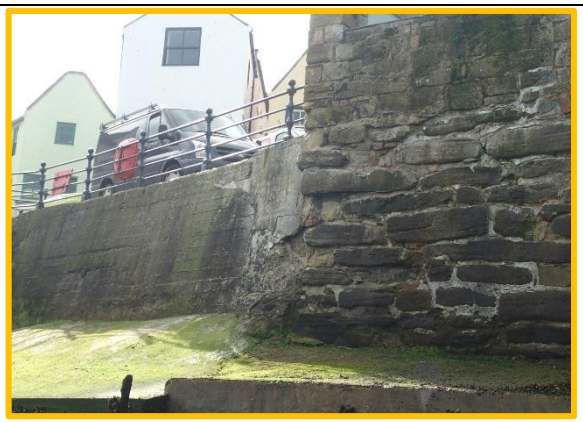
Void at toe of wall (Asset Ref. 1221D901D0403C05)

Older sections of the wall, towards the west side of the harbour and into Staithes beck, consist of masonry blockwork and are often exterior walls of private properties. As noted in previous inspections, these display visible loss of mortar and missing blocks, see below right. There is also undercutting of the toe in several locations, exposing timber piling. A number of defects

previously observed had been repaired, particularly in the lower parts of the wall, however, maintenance needs to be implemented at regular intervals (Asset Ref. 1221D901D0402C22). Should these minor repairs continue to fail, larger scale repairs or replacement of the assets should be considered.



Older sections of harbour wall in need of regular maintenance photo from 2012 (Asset Ref. 1221D901D0402C22)



Upper section of harbour wall in similar condition to 2012 (Asset Ref. 1221D901D0402C22)

Repairs evident to cracks and missing blocks replaced, but repairs continue to be required. (Asset Ref. 11221D901D0402C22)

Undercutting at the toe of some parts of the harbour wall (no change since 2009) (Asset Ref. 11221D901D0402C22)

Repair work to parts of the inner section of wall, downstream of the footbridge (Asset ref 1221D901D0402C04) were evident. Cracking remains in upper masonry sections but lower parts of the wall have been repaired. Vegetation was regrowing in parts of the wall and should be cleared.

A new wire gabion wall & berm has been constructed upstream from the foot bridge, see photo below right. The gabions appeared to be in good condition, but should be monitored closely in future as they may be susceptible to corrosion of the wire and loss of fill.

Repointing of lower masonry downstream of footbridge. (Asset ref 1221D901D0402C04)

New gabions and berm upstream of footbridge (Asset Ref. 1221D901D0403C01)

3.2 Management Unit 5 - Jet Wyke

Coastal Slope Condition Assessment
Jet Wyke forms the embayment between Penny Steel and Old Nab and consists of unit MU5/1, which is classified as Partly Active in 2014 The lower slopes of the cliff are very steep, unvegetated and subject to gradual marine erosion. The upper cliff is composed of softer material and supports some vegetation cover.

At the eastern extent of the unit is the western side of Old Nab, a headland composed of highly weathered shales. This unit has not changed activity status and remains as Partly Active in 2014.

MU5/1 – The including the highly weathered headland at Old Nab (Partly Active). August 2014.

Coast Protection Asset Condition Assessment

There are no coastal defence assets within this Management Unit.

3.3 Management Unit 6 - Old Nab to Runswick Bay

This Management Unit consists of 3 Sub-Management Units (Appendix A, Map 1), as follows:

Mu6A – Brackenberry Wyke
This sub-management unit consists of unit MU6/1 only. This section of cliff line is classified as Partly Active in 2014, unchanged since 2012. Marine erosion is cutting into the hard stratified rock at the base of the cliffs. Some vegetation is supported on the upper slopes with exposed shales lower down showing evidence of on-going erosion. A number of small failures were noted in the centre of the management unit as coastal erosion continues.

MU6/1 – Looking southeast across Brackenberry Wyke from Old Nab (Partly Active). August 2014.

MU6/1 – The eroding shales of the east facing side of Old Nab (Partly Active). The stabilised lobe of material in the background is MU6/2. August 2014.

Mu6B – Port Mulgrave
This sub-management unit consists of units MU6/2 to MU6/5.

Unit MU6/2 is located to the north of Port Mulgrave and is undefended and well-vegetated. There are some signs of recent activity in the form of rockfall from the outcrops of harder, jointed rock on the upper slopes and progressive erosion of the softer material which composes the lower slopes. This unit was downgraded to Locally Active in 2012. It remains Locally Active in 2014

Unit MU6/3 is located at Port Mulgrave harbour. The upper cliff has been extensively quarried and are generally well-vegetated. In these places there is erosion and slumping at the toe. It remains Locally Active in 2014.

Unit MU6/4 is Rosedale Cliffs, immediately south of Port Mulgrave. The majority of the unit is covered with vegetation and shows little activity. In some places the cliff face has been prone to collapse where the cliff has been eroded and the failure has propagated up the cliff face. The unit is classified as Locally Active.

Unit MU6/5 is the mostly southerly cliff within this sub-management unit. This unit is characterised by well-vegetated slopes with local areas of activity on the steeper, lower slopes. It remains Locally Active in 2014.

MU6/2, MU6/3 and MU6/4– Al these slopes show evidence of localised instability but also are substantively vegetated (Locally Active). August 2014.

MU6/5 – The unit is substantially vegetated but active marine erosion and localised failures in the cliff are evident (Locally Active). MU6/6 is discussed below. August 2014.

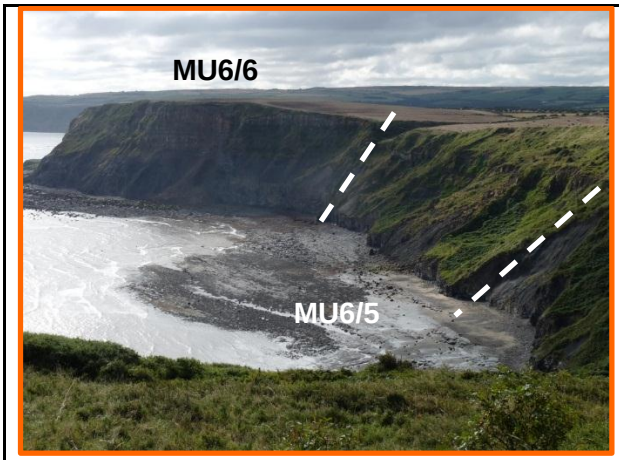
MU6C – Lingrow Cliffs
This sub-management unit consists of units MU6/6 to MU6/8.

Unit MU6/6 forms the northern part of the Lingrow Cliffs. The upper slopes support some vegetation cover while lower slopes are actively eroding. The unit continues to be classified as Partly Active in 2014.

Unit MU6/7 forms the central part of this sub-management unit and consists of a large relict debris run-out lobe. The cliff is well-vegetated with only localised activity at the toe. It is classified as Locally Active in 2014, unchanged since 2014.

Unit MU6/8 is located just north of Runswick Bay village. The cliff continues to experience weathering and erosion, although rockfalls observed in past inspections were not seen in 2014. The persistence of activity in the upper cliff means the unit is classified as Partly Active in 2014.

None of these units have changed activity class since the 2012 or December 2013 surveys



MU6/6 – The cliffs are vegetated on the upper slopes while the lower slopes are exposed and are subject to marine erosion. (Partly Active). August 2014.

MU6/7 – The cliffs continue to be densely vegetated on the upper slopes while the sea cliff is subject to wave attack (Locally Active). August 2014.

MU6/7 – view from cliff top at northern end of unit showing dense vegetation (Locally Active). August 2014.

MU6/8 – Much of the cliff continues to be unvegetated and is subject to rockfalls from the upper cliff and marine erosion at the toe (Partly Active). August 2014.

Coast Protection Asset Condition Assessment
There are no coastal assets within Sub-Management Units 6A and 6C.

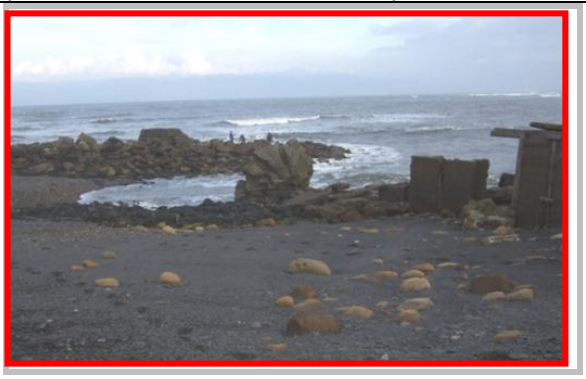
Mu6B (MA20) – Port Mulgrave
As noted during the 2008 and 2009 inspections, this is a former port and ironstone mine that has been derelict for 70 years and is considered to be redundant (Appendix B, Map 1). Virtually all coastal defences have been lost to the sea. What is left of the southern breakwater is undergoing large scale cracking, deformation, undercutting and outflanking. It is estimated that more than half of its original length has now been eroded (Asset Ref. 1221D901D0502C01). The breakwater appeared to have suffered further damage and lowering of the crest since the 2012 inspection. The photos below include post storm inspection from December 2013.

Looking at the end of the breakwater with evidence of erosion and failure in 2009 (Asset Ref. 1221D901D0502C01)

View of breakwater 30/10/2012 (Asset Ref. 1221D901D0502C01)

Seaward end of breakwater 25/09/2014
(Asset Ref. 1221D901D0502C01)

Erosion adjacent to fishermen's huts 25/09/2014
(Asset Ref. 1221D901D0502C01)



Overview of asset in 2009
(Asset Ref. 1221D901D0502C01)

Overview of asset in 2012
(Asset Ref. 1221D901D0502C01)

Overview of asset in July 2013
(Asset Ref. 1221D901D0502C01)

Overview of asset in Dec 2013 following storm surge of 5th Dec 2013. Significant loss of fill material adjacent to the breakwaters since July 2013 (left). (Asset Ref. 1221D901D0502C01)

Overview of asset in September 2014
(Asset Ref. 1221D901D0502C01)

3.4 Management Unit 7- Runswick Bay

Mu7A – Runswick Bay Village
This sub-management unit consists of **units MU7/1 and MU7/2** (Appendix A, Map 1).

Unit MU7/1 includes Runswick Bay village and the adjacent slopes. It is well vegetated and defended at the toe by a sea wall and rock armour that is being outflanked at the north. The unit is classified as Dormant in 2014, unchanged since 2012.

Unit MU7/2 is a narrow unit located to the south of Runswick Bay village representing a periodically active landslide complex. The slopes are relatively shallow and well vegetated. The only activity evident is at southern end of the unit toe, where the cliffs are subject to marine erosion where protection measures are more easily overtopped. This unit was upgraded from Inactive to Locally Active in December 2013 and this status has been retained in 2014.

MU7/1 – The slopes of Runswick Bay village (Dormant). August 2014.

MU7/2 (right of image with rock armour at toe - Inactive) **MU7/3** (left with eroding toe – Locally Active). August 2014.

Mu7B – Runswick Sands

This sub-management unit consists of units MU7/3 and MU7/4.

Units MU7/3 and MU7/4 are located on well-vegetated, undefended slopes behind Runswick Sands. The cliff toe is generally steep as a result or on-going marine erosion and shows evidence of recent, localised slumping. MU7/3 was raised to Partly Active status in the December 2013 survey due to reflect increased levels of toe erosion associated with the storm surge, but this level of erosion was not observed in 2014 and therefore both units are classified as Locally Active.

MU7/3 – Toe erosion at the base of the cliff (Locally Active). August 2014.

MU7/4 – Erosion at toe and instability in upper slope but still substantively vegetated. Locally Active. August 2014.

Coast Protection Asset Condition Assessment
This Management Unit is divided into 2 Sub-Management Units:
Mu7A – Runswick Bay Village (Map 1, Appendix B)

In recent years new coastal defences have been constructed in Runswick Bay, associated with the building of a new pumping station (adjacent to the lifeboat station) and associated with the remediation of the landslip that damaged the defence near the end of the road. The other defences fronting the properties at the north of the bay are of variable age and condition.

The rock armour defences (Asset ref: 1221D901D0602C01) remain generally in very good condition, with the rocks tightly packed with good coverage. However, there has been some movement resulting in loose blocks at both sides of the southern slipway and so the overall rating has been amended to good. The associated slipway towards the south from the end of the road and boat park is also in good condition. Beach levels appeared relatively high at the time of the inspection, so the toe was not visible. There is ongoing erosion of the undefended cliff at the southern end of the defence and some of the locally sourced smaller rock used at the tie in appears to have been reconfigured since the previous inspections, see lower photos below.

Runswick Bay village rock armour defences Photo from 2012 (Asset Ref. 1221D901D0602C01)

Runswick Bay village rock armour defences Photo 12/09/2014 (Asset Ref. 1221D901D0602C01)

View of armour at southern slipway.
(Asset Ref. 1221D901D0602C01)

Some movement of armour units has occurred adjacent to the southern slipway
(Asset Ref. 1221D901D0602C01)

Southern end of Runswick bay rock armour defences Photo from 2012
(Asset Ref. 1221D901D0602C01)

Southern end of Runswick bay rock armour defences Photo 12/09/2014.
(Asset Ref. 1221D901D0602C01)

The Sailing Club, located in the bay some 600m south of the village, where the beach is wider has been constructed on timber struts and features a mix of coastal defences (Asset Ref. 1221D901D0602C05), photos below. The informally placed relic tank trap blocks at the south end show extensive cracking. The timber defences across the front of the main building are showing signs of rot and will need replacement in future. The defences were in similar condition to the 2012 and 2013 inspections, although there has been undercutting of the Timber sleeper retaining wall, see below, top left.

Runswick Bay sailing club timber defences at south end, 12th September 2014.
(Asset Ref. 1221D901D0602C05)

Northern end of defences at Runswick Bay sailing club. Photo from 2012.
(Asset Ref. 1221D901D0602C05)

Northern end of defences at Runswick Bay sailing club, 17th December 2013. Note higher beach levels compared to 2012.
(Asset Ref. 1221D901D0602C05)

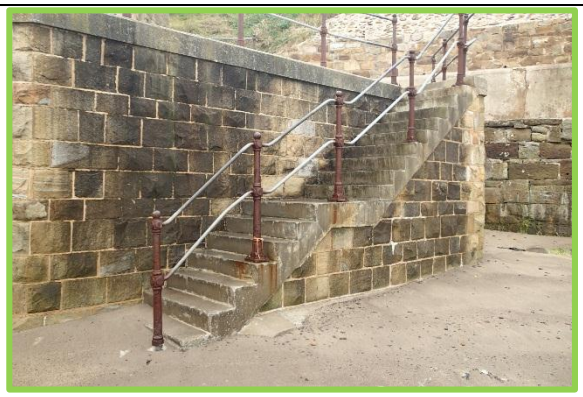
Northern end of defences at Runswick Bay sailing club, 12th September 2014. Beach levels similar to 2012. (Asset Ref. 1221D901D0602C05)

At the northern end of the rock armour, the slipway adjacent to the RNLI building remains in good overall condition, although the timber strips to support the small boats are rotting in many places and some are now missing. Joints between slabs in the slipway still need resealing. The timber slipway at the old RNLI building was damaged in the December 2013 storms, and many planks have been replaced, however the support timbers show signs of rot. The seawall around the pumping station to the north of the RNLI building is in very good condition, below lower right, although the standards for all of the handrails are showing corrosion and need cleaning and repainting, as noted in 2012.

Northern slipway adjacent to the RNLI. Some timbers missing. (Asset Ref. 1221D901D0601C04)

The timber slipway at the old RNLI building has been repaired. (Asset Ref. 1221D901D0601C04)

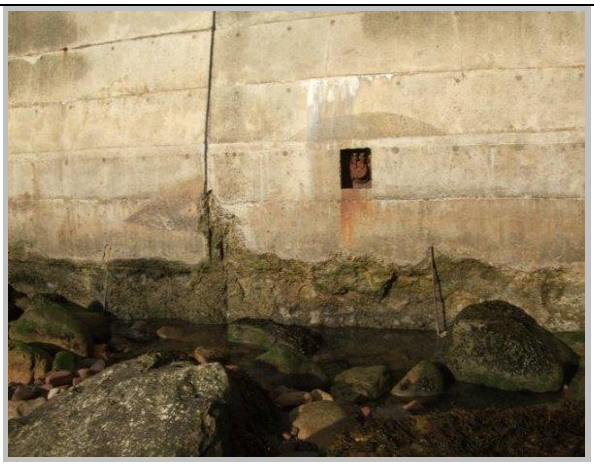
RNLI slipway storm damage viewed from the pumping station, 17th December 2013.
(Asset Ref. 1221D901D0601C04)



Seawall around the pumping station (Asset Ref. 1221D901D0601C07)

The sea wall defences to the north of the new pumping station show a variety of defects ranging from minor to more significant issues.

The most northern coastal sea wall (Asset Ref. 1221D901D0601C01) is suffering from surface cracking and erosion. Erosion of the underlying rocky foreshore continues to cause undercutting of the sea wall. Further investigation is required to determine the rate of undercutting. Further defects include washed out sealant joints, flap valves on weep holes which have seized shut, wash out of the joints under the capping beam, vertical cracks through the wall, missing joints and filler in the seawall face and promenade surface with vegetation growth, and outflanking at tie in to eroding cliff at northern end, see photos below. Although changes are limited since the 2009 inspection it is recommended that these issues are addressed. At the time of the 2014 inspection parts of the mudstone shore platform had been cleared of sediment and boulders, presumably by wave action, see central photos below.



Undercutting of the northern coastal sea wall (Photo taken from 2009 report

Foreshore scour at toe of seawall, photo from 30/10/2012 (Asset Ref. 1221D901D0601C01)

Foreshore scour at toe of seawall, photo from 12/09/2014 (Asset Ref. 1221D901D0601C01)

Foreshore scour at toe of seawall, photo from 12/09/2014 (Asset Ref. 1221D901D0601C01)

Promenade on top of northern seawall, showing movement of crest slabs and vegetation growth in damaged areas, 12/09/2014 (Asset Ref. 1221D901D0601C01)

Erosion of cliff adjacent to north end of seawall, 12/09/2014 (Asset Ref. 1221D901D0601C01)

Moving south, the protruding section of wall (1221D901D0601C06) protecting the thatched cottage is in fair condition. There are signs of repairs to the large vertical cracks in the wall and toe apron. However there are cracks in the top of the concrete bagwork part of the wall.

Toe of cottage wall, 17th December 2013. Note loss of timber fencing and undercutting of toe due to December 2013 storm event.
(Asset Ref. 1221D901D0601C06)

View of low foreshore levels and undermining of sewer pipe surrounds on foreshore at Runswick Beck, 12/09/2014

Repaired vertical cracks to toe of wall, and horizontal cracks holding
(Asset Ref. 1221D901D0601C06)

View of northern end of wall and Runswick Beck outfall with cracked concrete bagwork.
(Asset Ref. 1221D901D0601C06)

The main length of wall below the properties, Asset Ref. 1221D901D0601C03 is in variable condition. Although there are signs of repair work there are significant cracks in the wall and undercutting of the toe in several locations, see photos below. The beach level was lower than at the time of the 2012 inspection but similar to the December 2013 post storm inspection.

Exposed mudstone platform and undermining of wall toe 12/09/2014
(Asset Ref. 1221D901D0601C03)

Undermining of wall toe 12/09/2014
(Asset Ref. 1221D901D0601C03)

Overview of wall 12/09/2014
(Asset Ref. 1221D901D0601C03)

Damage to promenade cope 12/09/2014
(Asset Ref. 1221D901D0601C03)

Diagonal cracks in wall **Photo from 2012** (Asset Ref. 1221D901D0601C03)

Gaps at joints and missing blocks **Photo from 2012** (Asset Ref. 1221D901D0601C03)

The concrete breakwater or groyne (Asset Ref. 1221D901D0601C02) to the north of the pumping station and old RNLI slip was noted to be in need of repair during the 2009 survey, with large horizontal and vertical cracks on both sides propagating through the defence. The large deep horizontal cracks through breakwater have worsened since 2012 and the crest slab may have moved.

Large horizontal crack to breakwater photo from 2012. (Asset Ref. 1221D901D0601C02)

Large horizontal crack to breakwater photo from 12/09/2014 (Asset Ref. 1221D901D0601C02)

3.5 Management Unit 8 - Runswick Bay to Sandsend

Coastal Slope Condition Assessment
This Management Unit is divided into 2 Sub-Management Units (Appendix A, Map 1):

Mu8A – Runswick Sands to Kettle Ness
This sub-management unit consists of units MU8/1 to MU8/4.

Unit MU8/1 is located behind Runswick Sands. The toe is steep with little or no vegetation cover with evidence for recent falls and slides. The mid and upper slopes are more densely vegetated with localised patches of erosion. The unit is Partly Active in 2014.

Unit MU8/2 is a shallow-angle relict debris run out lobe situated adjacent to Runswick Sands. There is localised erosion at the toe with some protection afforded by rockfall deposits and the shore platform. Minor erosion is evident in places along the headscarp. This unit remains classified as Locally Active in 2014, unchanged since 2012.

MU8/3 is located behind Kettleness Sand. The cliff is steep with only the upper section being well-vegetated. Widespread toe erosion was observed in 2014 and the status has therefore been increased to Partly Active.

MU8/4 lies just west of Kettle Ness headland. On-going toe erosion means the unit remains classified as Partly Active in 2014, unchanged since 2012.

MU8/1 The cliffs behind Runswick Sands (Partly Active). August 2014.

MU8/2 Relict debris run out lobe adjacent to Runswick Sands (Locally Active). August 2014.

MU8/3 The vegetated upper cliffs and eroding sea cliffs above Kettleness Sands (Partly Active). August 2014.

MU8/4 - Very little vegetation on lower cliff (Partly Active). August 2014.

Mu8B – Kettle Ness to Sandsend
This sub-management unit consists of **units MU8/5 to MU8/15** (Appendix A, Maps 1 and 2).

Unit MU8/5 forms the headland promontory of Kettle Ness. This area was extensively quarried for alum in the past and as a result is now subject to ongoing erosion of exposed weak bedrock. It remains classified as Partly Active in 2014, unchanged since 2012.

Unit MU8/6 is located to the east of the Kettle Ness headland and is classified as Partly Active in 2014, unchanged since 2012. Along most of its length this unit is steep with little vegetation cover. There is evidence of recent rockfall activity from the headscarp and ongoing erosion at the toe.

Units MU8/7 and MU8/8 comprise the relict debris run out lobes of Seaveybog Hill and Ovalgate Cliff. They are generally well-vegetated, but localised activity at the toe and headscarp mean the units are classified as Locally Active in 2014, unchanged since 2012.

Unit MU8/9 is located at Loop Wyke and is classified as Partly Active in 2014, unchanged since 2012. The upper slopes support some vegetation cover, but the lower slopes are steeper, free of vegetation and subject to on-going toe erosion.

Unit MU8/10 forms a relict debris slide lobe. The unit is well-vegetated with localised erosion at the headscarp and the toe. This unit is classified as Locally Active in 2014, unchanged since 2012.

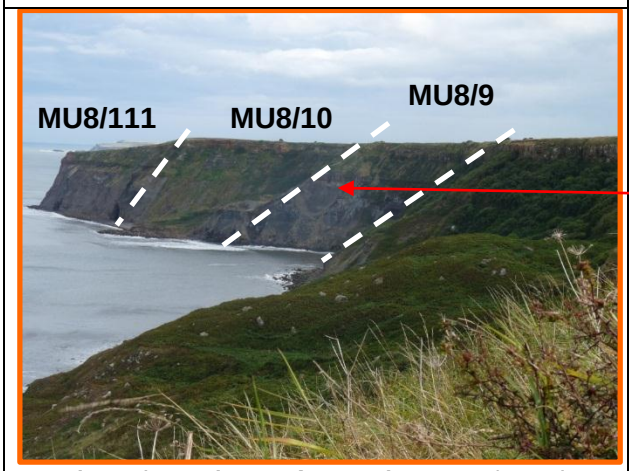
Unit MU8/11 is located at Keldhowe Steel and is classified as Partly Active in 2014, unchanged since 2012. The upper slopes are vegetated, with localised areas of activity at the headscarp. The lower slopes are experiencing on-going toe erosion.

Unit MU8/12 is south of Keldhowe Steel and is classified as Partly Active in 2014, unchanged since 2012. The upper slopes are vegetated, with localised areas of activity at the headscarp. The lower slopes are experiencing on-going toe erosion.

Units MU8/13, MU8/14 and MU8/15 from the headland of Sandsend Ness and the adjacent cliffs. All units remain classified as Partly Active in 2014, unchanged since 2012. The toes of these cliffs are subject to on-going erosion and there is evidence for localised erosion on the upper slopes. In 2012, the disintegration of abandoned sea defences in Unit MU8/15 were causing exposure and increased erosion of the lower cliff face and this was also observed in 2014.

MU8/5 The ongoing erosion of the Kettle Ness headland (Partly Active). August 2014.

MU8/6, MU8/7 and MU8/8. MU8/6 (furthest headland) is Partly Active and MU8/7 and MU8/8 are both Locally Active. August 2014.



MU8/9 and **MU8/10 and MU10/11.** MU8/9 and MU8/11 are Partly Active sea cliffs. MU8/10 is a debris slide deposit classified as Partly Active. The well-vegetated relict landslide deposit at Seaveybog Hill (MU8/7 and MU8/8) is in the foreground. August 2014.

MU8/9 (2012) - The scar of this failure is still visible in the 2014 survey photograph, indicating the cliff has not yet stabilised sufficiently to support vegetation at this point. August 2014.

MU8/12, MU8/13 and MU8/14. The cliff is showing signs of regular erosion in the lower one-to two-thirds of the face, particularly in MU8/14 (Partly Active). August 2014.

MU8/14 Active sea cliff – note recent failure just left of centre, indicated by arrow (Partly Active). August 2014.

MU8/15 - Active sea cliff and indicators of ongoing failure within unit – see below. (Partly Active). August 2014.

MU8/15 – Exposed shale slope in former railway cutting (now Cleveland Way) ongoing rilling and small scale slope erosion. August 2014.

Coast Protection Asset Condition Assessment

Two short lengths of retaining walls believed to have been originally intended to protect and support the disused railway line were identified along this section of coast in the 2009 inspection report. These are a brickwork wall at Deepgrove Wyke and a masonry wall south of The Scar that was noted to have failed. However, these two walls were not classed as coastal defences and were reported to be redundant in 2010, so as in 2012 they have not been included in this inspection report.

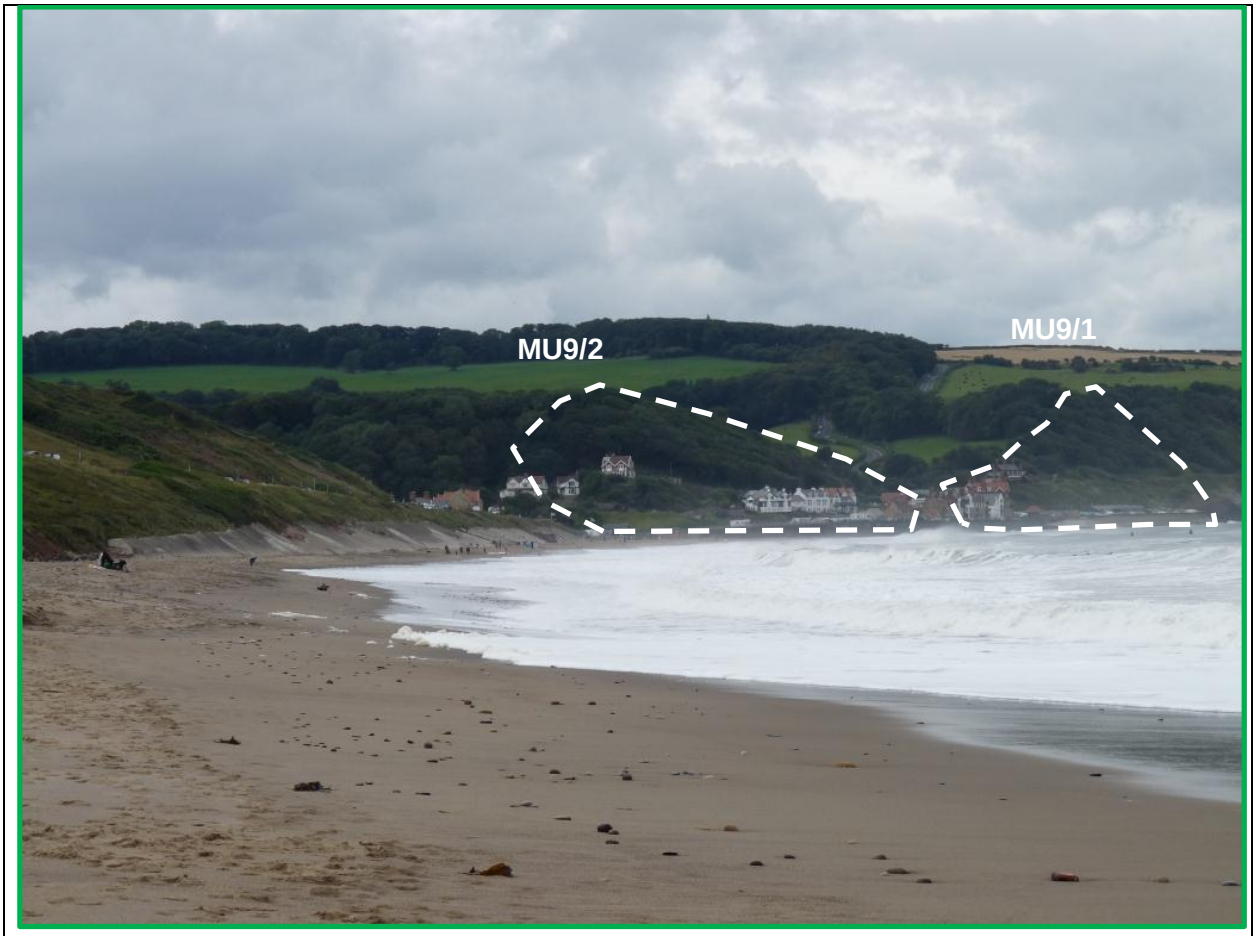
3.6 Management Unit 9 – Sandsend

Coastal Slope Condition Assessment

This Management Unit is divided into three Sub-Management Units, as follows (Appendix A, Map 2):

Mu9A and Mu9B – Sandsend Village

Management units MU9/1 and MU9/2 are Dormant cliffs behind Sandsend village. They are defended at the toe by a sea wall, groynes and rock armour. No evidence of activity was seen in 2014.



MU9/1 and MU9/2 are located close to Sandsend and show no signs of activity (Dormant). August 2014.

Mu9C – East Sandsend

This sub-management unit consists of unit MU9/3 only. This unit is located above the concrete sea defences immediately to the east of Sandsend. There has previously been some effort to stabilise the slopes within this unit, which reduced the level of activity. This unit is was classified as Locally Active in 2012 following completion of stabilisation works. The defences suffered damage during the December 2013 storm surge, and there was evidence of failure just above the sea defences. The defences have since been repaired, but evidence of shallow failures in the upper slope persists and the unit is classified as Locally Active.

MU9/3 Locally Active. August 2014.

Coast Protection Asset Condition Assessment
Mu9A and Mu9B – Sandsend Village (Map 2, Appendix B)

Coastal defences at Sandsend vary from fair to poor condition.

The most northerly defence at Sandsend car park area, is a sloping concrete revetment with recurve crest wall and rock armour toe protection (Asset Ref No.1221D901D0701C02). The concrete wall is in fair condition with minimal damage to the surface. There is some minor cracking and surface erosion which is typical of concrete defences such as this. The north end of the revetment has lost thickness of concrete at the base through abrasion, with exposure of reinforcement bars, although the worst area noted in the 2009 inspection was not visible as it was covered with cobbles and may have been repaired. Encasement of this reinforcement is advised from a structural perspective, as well as preventing any H&S accidents occurring due to sharp edges of the exposed bars. The toe of the revetment is exposed and undercut in many places, with abrasion of the soft rock on which the wall is founded ongoing, see below left. The toe armour is displaced and not fully protecting the toe; this could be ameliorated by re-profiling and topping up the rock armour protection. The large void under the south side of slipway adjacent to Sandsend Beck, reported in 2012 has been repaired.

Abrasion damage to revetment exposing reinforcement.
(Asset Ref No.1221D901D0701C02)

Corroded sheet piling and ongoing erosion at northern end of Sandsend revetment.
(Asset Ref No.1221D901D0701C02)

Displaced toe armour, undercutting to concrete revetment and abrasion damage to revetment. Photo from 2012 report.
(Asset Ref No.1221D901D0701C02)

Repairs have been undertaken at the slipway at the north of Sandsend
(Asset Ref No.1221D901D0701C02)

At the time of the September 2014 inspection the beach was higher than it had been during the 2009 and 2012 inspections, so the toe structures in front of the main concrete seawall in front of Sandsend village (Asset Ref. 1221D901D0702C01), were mostly covered, see photos below. The groyne field is derelict and the remains have no significant impact on sand movement. The toe of the seawall was showing evidence of significant damage and movement in 2009 and the defence appeared to have worsened over the three years to 2012, with the timber breastwork deteriorating and allowing the ad hoc toe protection units to move. There are cracks in the wall and significant abrasion at the steps.

Timber toe of sea wall in a poor state - **photo from 2009** (Asset Ref. 1221D901D0702C01)

Failed timber groynes and timber breastwork at toe of wall in front of Sandsend **photo from 2012**
(Asset Ref. 1221D901D0702C01)

Condition of wall, which was rated as poor in 2012 is similar or worse despite higher beach levels. (Asset Ref. 1221D901D0702C01)

Derelict groynes and timber toe breastwork partly covered due to high beach levels. Ref. 1221D901D0702C01)

The newer short section of masonry blockwork sea wall (Asset Ref. 1221D901D0702C04) that supports a cantilevered promenade just north of East Row Beck was noted in the 2008 inspection to suffer from undercutting of the toe of the structure with steel sheet piling in need of repair. Although the main wall is in fair condition the defence has an overall rating of poor. The steel toe piling was visible in several locations during the 2012 inspection and is corroded and abraded. There are holes through the piles and voids behind under the apron. The 2012 inspection noted a particularly large void under the southern end of the apron, see below left. The high beach levels at the time of the 2014 inspection meant it was not possible to tell if the damage had been repaired. The timber decking of the cantilever footway was destroyed during the December 2013 surge and repairs were nearing completion in September 2014.

Masonry blockwork sea wall with cantilevered footway, showing large void under toe apron and failed groynes. **Photo from 2012.** (Asset Ref. 1221D901D0702C04)

Exposure of toe piling below masonry wall. **Photo from 2012**. (Asset Ref. 1221D901D0702C04)

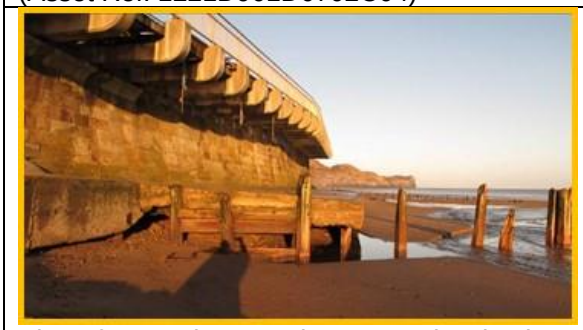


Photo from 17th December 2013, showing larger void under toe apron and failed groynes. (Asset Ref. 1221D901D0702C04)

Toe damage not visible due to high beach levels on 12/09/2014 (Asset Ref. 1221D901D0702C04)

The low masonry wall (Asset Ref. 1221D901D0702C03), below left and right, that returns into both sides of East Row Beck adjacent to the road bridge was previously recorded in overall good condition, although there was minor abrasion damage to some blocks and locally missing sections of mortar. It is notable that following the storm surge of 5th December 2013, extensive beach material accumulated in the East Row Beck inlet area between the retaining walls. There were noted to be some crest bocks missing and missing mortar in more locations in 2014 and the overall condition grading has been reduced to fair.

Low masonry wall at East Row Beck, south bank, **Photo from 17th December 2013**. Note accumulation of sand with the beck cutting through. (Asset Ref. 1221D901D0702C03)

Low masonry wall at east Row Beck, north bank. Damage including missing blocks and mortar adjacent to beach shop.
(Asset Ref. 1221D901D0702C03)

Mu9C – East Sandsend

Southeast of Sandsend, a large sloping concrete revetment covering light weight rock armour / rubble runs parallel to the coastal road (Asset Ref. 1221D901D0702C02). This 800m long defence features many significant defects throughout, despite multiple repairs. In 2012 there was a large void > 1.5m across where the revetment had failed and the underlying rubble was being actively eroded, see photo below top left below. There was severe damage to the revetment during the December 2013 storm surge. The photos below show a selection of photos of the damaged revetment in December 2013 when repairs were underway and the status at the time of the 2014 inspection. The whole asset is in poor condition and requires frequent inspection and repairs to hold the shoreline until the capital improvement scheme that is planned can be undertaken in the future.

Large void in revetment adjacent to recent patch repair (Asset Ref. 1221D901D0702C02)

New large void in revetment adjacent to previous and more recent patch repairs, **17th December 2013**. Compare to 2012 inspection (left).
(Asset Ref. 1221D901D0702C02)

Sandsend seawall revetment and eroded beach following the storm surge of 5th December 2013. **Photo taken on 8th December 2013**, NYCC inspection. (Asset Ref. 1221D901D0702C02)

Temporary repairs to revetment being carried out on **17th December 2013**.
(Asset Ref. 1221D901D0702C02)

Typical photo of repaired revetment adjacent to previous patch repairs, 12**th September 2014**.
(Asset Ref. 1221D901D0702C02)

Gabions protecting café at NW end of revetment, **Oct 2012.** (Asset Ref. 1221D901D0702C02)

Corner of gabions protecting café at NW end of revetment being repaired, **17th December 2013**.
(Asset Ref. 1221D901D0702C02)

New section of gabions gabions protecting café at NW end of revetment, 12/09/2014.
(Asset Ref. 1221D901D0702C02)

3.7 Management Unit 10 – Upgang Beach

Coastal Slope Condition Assessment
This Management Unit comprises units **MU9/4, MU10/1** and **MU10/2** (Appendix A, Map 2).

Unit MU9/4 is comprised of well vegetated slopes which are protected in part by the concrete toe defences. There is still some localised erosion at toe and the unit is classified as Locally Active in 2014, unchanged from the December 2013 survey.

MU10/1 was inactive in 2012, but this was revised to Locally Active following the Dec 2013 storm surge that caused toe erosion. This erosion is ongoing and the unit retains its Locally Active status in 2014.

MU10/2 comprises the till cliffs behind Upgang Beach that prone to episodic mudslides and block failures. Vegetation cover is limited along the cliff face and the unit is classified as Partly Active in 2014, unchanged since the December 2013 survey.

Coast Protection Asset Condition Assessment
There are no coast protection assets within this Management Unit.

MU9/4 (Locally Active). August 2014.

MU10/1 Well vegetated slopes (Locally Active). August 2014.

MU10/2 The collapsing till cliffs at Upgang Beach, eastern end. (Partly Active). August 2014.

MU10/2 An example of the failures seen along Upgang Beach (Partly Active). August 2014.

MU10/2 – Looking west from eastern end of unit (Partly Active). August 2014.

MU10/2 – Example of large cobble/small boulder sized particle posing a rockfall hazard for anyone in immediate proximity to the cliff. August 2014.

3.8 Management Unit 11 – Whitby West

Coastal Slope Condition Assessment
This Management Unit is divided into 2 Sub-Management Units (Appendix A, Map 2):

Mu11A – Whitby Sands West
This Sub-Management Unit consists of **units MU11/1 and MU11/2**.

These units are comprised of re-graded slopes protected by a sea wall and promenade. The slopes are well-vegetated, but there is evidence of localised instability, particularly in the lower slope of unit **MU11/2**. Slope stabilisation repairs undertaken before 2010 are still visible either side of one of the paths descending the cliff in unit **MU11/11**/ (indicated by an arrows in the unit photograph). Both these units were classified as Inactive in the 2012 survey, but were upgraded to Locally Active during the December 2013 post surge survey. They remain Locally Active in 2014.

MU11/1 Locally Active. Arrow indicates gap in rock armour and location of lower slope failures. August 2014.

MU11/1 - Locally Active. August 2014.

MU11/2 – Example of lower slope erosion and instability. August 2014.

MU11/2 – Example of lower slope erosion and instability. August 2014.

Mu11B – Whitby Sands East

This Management Sub-Unit consists of units **MU11/3** and **MU11/4** that are protected by a variety of coastal structures. The coastal slope of **MU11/3** has been classified as Inactive in the past. However, small rockfalls were noticed in December 2013 and further failures of the till and coastal defences in poor condition were noted in 2014. The unit is therefore classified as Locally Active in 2014.

Exposed rock faces are showing minor erosion in the absence of defences in places within **unit MU11/4,** which is classified as Locally Active in 2014, unchanged from December 2013.

MU11/3 Defended slopes with some evidence of recent activity in the rock slopes and till slope above the defences (Locally Active). August 2014.

MU11/3 – Failure of both till slope and exposed rocks above defences. August 2014.

MU11/4 Localised erosion above Whitby Sands (Locally Active). August 2014.

Coast Protection Asset Condition Assessment
Mu11A – Whitby Sands West and Mu11B – Whitby Sands East (Map 2 Appendix B)

This Management Unit encompasses the sea walls to the west of Whitby West pier. Most of the assets are in Fair condition. Although defects are localised, it is recommended that repairs and repointing is undertaken to prevent areas of weakness being exploited further. The defences of most significant concern are below the Whitby Spa theatre, where the cliff toe protection is in very poor condition, having been undermined by low beach levels and there have been slips and failures of previously intact rock on the cliffs below the foundations of the building. Sections of the sea wall east of the North Beach Café that are not protected by rock armour revetment are particularly susceptible to wave impact loading and abrasion causing increased levels of surface erosion, exploitation of joints between concrete sections and potential undermining (Asset Ref. 1221D901D0802C01, C03 and C13).

The most westerly defence at Whitby is a rock armour defence fronting the promenade (Asset Ref. 1221D901D0801C01). As in the 2009 and 2012 inspections the armour is in good condition with only minor movement visible. The asset is in overall good condition although the promenade is rated as fair as some slabs appear to be sinking with cracks and standing water, which may be a sign of loss of fill and voids beneath. Further investigation and monitoring is needed, although there was no obvious change between 2012 and 2014, see phots below.

Promenade looking south east showing cracks in slabs and standing water **Photo from 2012** (Asset Ref. 1221D901D0801C01)

Promenade looking south east showing cracks in slabs and standing water **Photo from 2014, (compare to 2012 photo left)** (Asset Ref. 1221D901D0801C01)

Corroded standards to handrails at steps
(Asset Ref. 1221D901D0801C01)

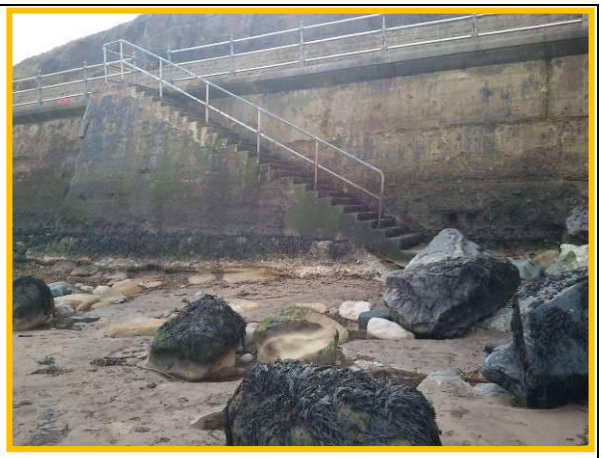
Rock armour in good condition
(Asset Ref. 1221D901D0801C01)

The sections of seawall along the frontage west of the North Beach Café with no protective rock armour, Asset Ref. 1221D901D0802C01, and 1221D901D0802C03 have in many places lost the concrete surface over whole lower half of wall due to abrasion. The toe is exposed and there was undercutting observed in 2012, see below left and right. Although the beach was higher in 2014 and the toe was not visible, there was significant abrasion damage to the lower part of the wall. There is also local damage to the wall capping beam and promenade slabs in a number of locations from wave overtopping damage where there is no rock revetment. The large concrete wall structure (Asset Ref. 1221D901D0802C03) is similar to the wall to the north west, but has no rock armour. The toe is exposed and eroded along its length, leading to significant undercutting, although the beach was higher at the time of inspection that during the previous, 2009 inspection. This defence is currently in a poor condition. Repairs to toe are required to prevent future instability of wall and it is recommended that consideration is given to extending the rock armour to this section. Adjacent sections of wall show similar defects although toe is often less visible.

Undermining of toe in section with no rock armour
Photo from 2012.
(Asset Ref. 1221D901D0802C01)

Undermining of toe in section with no rock armour
Photo from 2012.
(Asset Ref. 1221D901D0802C03)

Abrasion damage to lower part of wall (Asset Ref. 1221D901D0802C01)



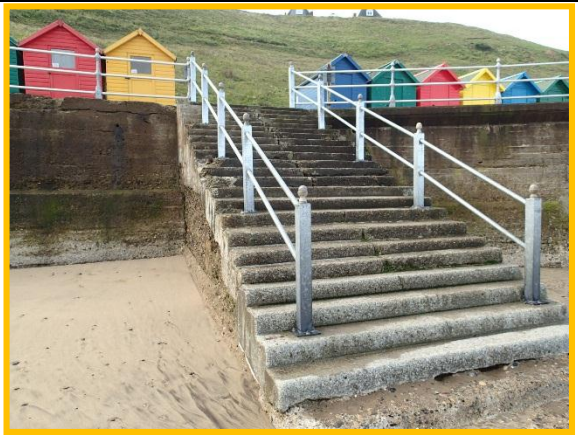
Undermining of wall adjacent to steps – **Photo from 2012** (Asset Ref. 1221D901D0802C03)

Undermining of wall adjacent to steps – **Photo 25/09/2014** (Asset Ref. 1221D901D0802C03)

Undermining of toe apron – **Photo 25/09/2014** (Asset Ref. 1221D901D0802C03

East of the north beach café the steps and ramps show signs of repairs, but are generally in poor overall condition with defects such as undercutting, erosion, cracking, exposure of aggregate and rounding of step edges. It was noted that the hand rails which were badly corroded had been replaced with new alloy standards and rails. Repair work, particularly to the toe is needed to some structures to prevent future failure. Undercutting and erosion is occurring to the side walls of the stairs along the West Cliff and are in need of repair (Asset Ref. 1221D901D0802C04).

Erosion and cracking to stair side wall - **Photo from 2012** (Asset Ref. 1221D901D0802C04)



No change from 2009 to stair sidewalls, but new handrails. (Asset Ref. 1221D901D0802C04)

General view of promenade showing new handrails, repaired slab, and open joints. (Asset ref. 1221D901D0802C14)

Abrasion damage to wall (Asset ref. 1221D901D0802C14)

The wall adjacent to Argyle Road (Asset ref. 1221D901D0802C14), above right, is in fair condition, and is intact with no toe exposed at the time of the site visit, as in 2012. However, the front face shows extensive abrasion and erosion and there are significant cracks both through the capping and directly beneath it. Although in some places patch repairs are visible, these defects should be monitored and repaired when possible to prevent further degradation in the future.

Horizontal cracks in wall (Asset Ref. 1221D901D0802C04)

Horizontal and vertical cracks and loss of facing (Asset Ref. 1221D901D0802C04)

East of Argyle Road Asset Ref. 1221D901D0802C04, see above, shows similar defects to previous inspections, with extensive abrasion damage and cracking. The new handrails have been set back slightly from the edge, presumably to avoid the defects and anchor to a sound section of wall. The upper level handrails have not been replaced and are corroding.

The masonry blockwork walls to the east, Assets Ref. 1221D901D0802C07 and 1221D901D0802C06 are in fair overall, but locally poor condition. There are cracks through blocks, washout along joints and the capping shows damage. The upper level concrete wall is in fair condition. Both assets' lengths have pipes exiting through front face, seepage from which has attracted vegetation growth.

Cracking, mortar loss and vegetation growth due to leaking pipe (Asset Ref. 1221D901D0802C06)

Cracking, mortar loss, damage to capping (Asset Ref. 1221D901D0802C07)

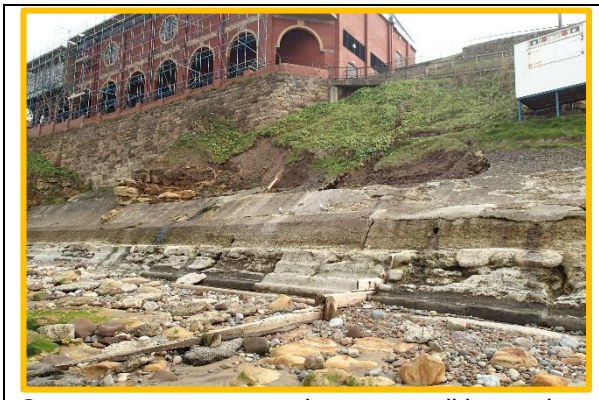
Joint washout abrasion damage and undermining at toe. (Asset Ref. 1221D901D0802C06)

Undermining of toe and damaged blocks(Asset Ref. 1221D901D0802C06)

The area below the theatre consists of a variety of defences, which are formed in several vertical stages or layers, with concrete/stone on the beach and with cliff toe protection walls formed of timber breastwork, rock armour and vertical walls. These make up Assets Ref. 1221D901D0802C15 and C05. The beach was low in September, exposing the toe of the defences which have multiple defects and have been downgraded from fair to poor condition.

It was noted in the 2009 inspection that there may be some movement in the vertical wall directly beneath the north corner of the theatre building/walkway, and a recommendation given that further investigations and monitoring are undertaken here, installation of tell tales and the setting up of a deformation survey may be appropriate.

During the August and September 2014 inspections surface slips and failure of the underlying rocks were noted in this area, see photos below and also MU11/3 above. Concerns over the poor condition of the defences, potential issues with cliff stability and the need for urgent further investigations were highlighted to Scarborough Borough Council immediately after the inspection.



Concrete revetment toe in poor condition and slumps and failures in cliff below building.
(Asset Ref. 1221D901D0802C15)

Damage to toe protection and weathering of natural rock below upper wall
(Asset Ref. 1221D901D0802C15)

Defence toe undermined with large voids (very poor condition)
(Asset Refs. 1221D901D0802C05)

Weathering and loss of cliff material above failed toe protection (Asset Ref. 1221D901D0802C05)

To the east of the theatre the natural cliff is intermittently defended with a series of blockwork and brickwork sections. These vary in construction and are generally in fair to good condition, but there are areas of undercutting and erosion at the interfaces between the blocks and the natural cliff that require repair and which lowers the condition to a 'fair' grading.

Example of undercutting at interface with cliff requires repair -poor condition.
(Asset Ref. 1221D901D0802C09)

Intermittent cliff protection - fair condition overall
(Asset Ref. 1221D901D0802C09)

The Battery Wall just west of West Pier is formed of large sandstone blocks (Asset Ref. 1221D901D0802C12), similarly to the pier itself. The previous reports have noted signs of movement, from numerous cracked blocks to large gaps at joints. There appears to have been little if any change since 2009; although repairs to some gaps are evident, further repairs are deemed necessary.

Photo from 2009 showing repairs visible, voids and gaps (Asset Ref. 1221D901D0802C12)

Evidence of repairs and repointing to upper blocks (Asset Ref. 1221D901D0802C12)

3.9 Management Unit 12 – Whitby

Coastal Slope Condition Assessment

This Management Unit consists of **unit MU12/1**, which is situated beneath Whitby Abbey and St Mary's Church on the town's East Cliff (Appendix A, Map 2). The slopes comprise a well-vegetated debris apron with toe protection afforded by the harbour walls. Localised activity occurs at the headscarp and in the debris apron. This unit is classified as Locally Active in 2014.

A significant but localised failure of the headscarp occurred on 29 November 2012, which lead to loss of part of the graveyard of St Mary's church and deposition of debris on properties along Henrietta Street. It is thought that the failure was associated with the very wet conditions of 2012 and was unrelated to coastal erosion.

MU12/1 Below Whitby Abbey the slopes are vegetated, but with localised signs of erosion (Locally Active). Cliffs behind Henrietta St (row of white cottages extending along cliff face below St Mary's church) are subject to periodic failure. Toe erosion is evident in the more seaward (towards left of photo) part of the cliff. August 2014.

Coast Protection Asset Condition Assessment

This Management Unit encompasses the sea walls and the East and West Piers (or 'harbour arms') of Whitby's harbour (Map 2 Appendix B). The coastal defences at Whitby are generally in fair condition, but several exhibit major defects.

The west and east harbour arms and outer breakwaters (Asset Refs. 1221D901D0803C01 / 02 / 03 / 04) were inspected during a low spring tide to maximise the visibility but even at low tide parts of the structures are below water and so not visible and there is no access onto the east outer breakwater (C04). However, these structures were previously inspected a few years ago under the strategy study, including a dive survey and a capital scheme is being planned for refurbishment works.

The main eastern and western harbour arms (Asset Refs. 1221D901D0803C02 / C03) have loose blocks and possible vertical movement in at least one location on each arm. It is recommended that the fixity of the loose blocks is investigated urgently, and that any voids are filled with grout. It is possible that loose blocks could displace during a storm and that there

may be a significant quantity of wash-out material behind it, leading to the consequent weakening and collapse of the structure. It is understood that a major capital scheme to improve the piers is under consideration. Longer term detailed monitoring recommendations should be developed as part of the scheme maintenance plan.

Undermining of apron between main and outer West Breakwater (Asset Ref. 1221D901D0803C02 / 01)

General view of West breakwater (Asset Ref. 1221D901D0803C02)

Displacement of block work on west side of West Breakwater - left image from 2009, right from 12/09/14 (Asset Ref. 1221D901D0803C02)

Toe of east side of West Breakwater (Asset Ref. 1221D901D0803C02)

Missing blocks and voids in east face (Asset Ref. 1221D901D0803C02)

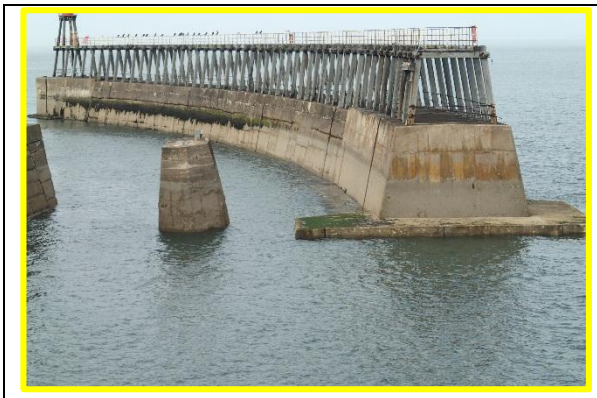
There is a new access bridge, opened in July 2012, between the main and outer western breakwaters. The timber deck of the western outer breakwater (C01) was in a fair condition, with evidence of rot to some ends of some planks (below left). It is slippery when wet so may

pose a safety concerns. The supporting timber structure was not inspected due to limited access.

Damage to ends of timber desk on West Pier extension and replacement plank (Asset Ref. 1221D901D0803C01)

General view of west outer breakwater (Asset Ref. 1221D901D0803C01)

An urgent works scheme was undertaken in 2011/12 to repair the southern end of the outer east breakwater where a large void had formed in the structure behind the sheet pile toe which had failed following corrosion and abrasion. Despite the repair the asset remains in overall poor condition due to corroded toe piling and rotting timber deck structure. This asset was only inspected from the main east breakwater as there is no access on foot even at low water.

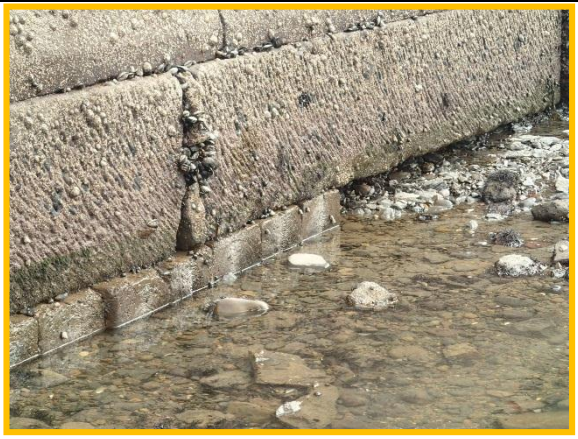


General view of outer east breakwater extension arm, on 12/09/2014 showing south end of outer east breakwater extension arm, where failed toe piling was replaced with precast concrete panels in 2012. (Asset Ref. 1221D901D0803C04)

North end of outer east breakwater extension arm on 25/09/2014, showing corroded toe piles. (Asset Ref. 1221D901D0803C04)

The main east breakwater 1221D901D0803C03 remains in poor overall condition. There are large cracks to the promenade and settlement of poured concrete slabs and erosion to capping beams. Furthermore there is displacement to the sandstone block work, with large cracks at several locations and voids in the blockwork near the NE bend. There are also loose blocks at south end by the rock armour. As was found in 2012, the low beach levels on the harbour side of the breakwater is exposing a section of timber foundation below the stone blockwork, see photos below left and right which may accelerate decay of the timber and destabilise the blockwork.

Exposed timber foundation under inner face of east breakwater **photo from 2012**.
(Asset Ref. 1221D901D0803C03)



Exposed timber foundation under inner face of east breakwater **photo from 25/09/2014**.
(Asset Ref. 1221D901D0803C03)

Area of displaced blocks and voids on inner (W) face of East Pier
(Asset Ref. 1221D901D0803C03)

Example area of displaced blocks on outer (W) face of East Pier
(Asset Ref. 1221D901D0803C03)

The west harbour pier at the fish quay consists of a concrete slab suspended over the original quay wall with concrete filled vertical and raking steel pile supports, see photos below. There is corrosion to the steel piles, which look rather slender and susceptible to damage. It was not possible to inspect the underside properly as this would require a boat even at low tide. A more detailed structural inspection of the piles is recommended. The original wall where viewed from the ends looks to be in fair condition. The broken vertical timber fender piles at the fuel berth that were noted in 2012 are still in need of urgent repair as they provide protection to the main pier support piles. There are also broken fender piles near mid-length of the quay.

View under west pier from south end
(Asset Ref. 1221D901D0803C06)

Corrosion to deck support columns
(Asset Ref. 1221D901D0803C06)

Broken and missing timber fender piles at fuel berth need replacing urgently to protect the deck support piles. Asset Ref. 1221D901D0803C06)

View under west quay, with original wall on right, showing corroded deck support piles
Asset Ref. 1221D901D0803C06

The inner section of the west harbour quay wall (Asset Ref. 1221D901D0803C07), near the swing bridge was largely obscured by seaweed on the lower wall and vegetation growth to the upper wall, see below left, but appears to be in good overall condition. The promenade is in good condition. As noted in 2012 there is wash out of joints at the set of stairs at middle of wall length that requires attention, particularly as these steps are heavily used by trip boat passengers. It was also noted that there was significant corrosion to floating pontoon supports at the steps.

Inner west quay wall near swing bridge, (Asset Ref. 1221D901D0803C07)

Cracked and loose steps with washed out joints require attention.
(Asset Ref. 1221D901D0803C07)

The inner wall on the east side, between the swing bridge and the RNLI berth consists of a variety of riparian property walls, which are protected by concrete apron and a sheet pile toe, below top right (Asset Ref. 1221D901D0803C10). Access is difficult so inspection was from the RNLI berth and swing bridge.

Area of washed out joints seaward of swing bridge (Asset Ref. 1221D901D0803C10)

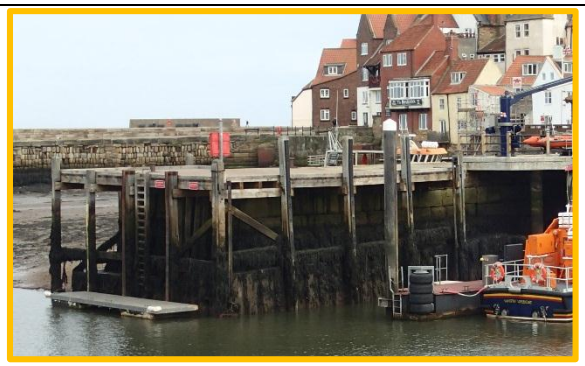
Sheet piling and toe apron protecting property walls (Asset Ref. 1221D901D0803C10)

Asset 1221D901D0803C08 includes the pier immediately north of the RNLI pontoon and the larger Tate Hill (or Old RNLI) Pier that projects into the harbour together with the harbour rear wall between them. This asset is in poor overall condition. The south pier is masonry with a timber surround, see below lower right. The deck of the timber surround has been replaced since 2012. There was evidence of repairs to the south pier, including replacement capping blocks. The masonry rear harbour wall between the two piers, consisting of riparian property walls, has missing mortar and blocks in places, see below upper right, and is in poor condition. The longer masonry pier opposite the fish quay, known as Tate Hill Pier has very weathered blocks on south side see below lower left. There also appears to be toe undermining and a void under the NE toe of Tate Hill (old RNLI) pier and displacement of facing/crack to deck slab at the end (below upper left).

Toe undermining and erosion damage at seaward end of Tate Hill (old RNLI) pier. (Asset Ref. 1221D901D0803C08)

Wall at east side of harbour south of Tate Hill pier (Asset Ref. 1221D901D0803C08)

Heavily weather blocks on south side of Tate Hill pier (Asset Ref. 1221D901D0803C08)



View of southern pier with timber surround and RNLI berth. (Asset Ref. 1221D901D0803C08)

North of Tate Hill pier, the harbour wall is fronted by a sand beach, with a variety of riparian walls at the back, Asset ref. 1221D901D0803C09, below left. Between here and the main harbour East Pier there is a rock revetment protecting the toe of the slope at the Haggerlythe, 1221D901D0803C05. This was constructed in 2001, but was noted in 2012 to be in poor condition and is now very poor. The same asset reference continues outside the East Pier below the abbey for about 200m, and here larger rock was used in the 2001 scheme. Within the harbour the revetment is showing signs of significant damage, with displacement of the armour and exposure of the geotextile netting stabilising the slope above, see photo below right. This armour needs re-profiling and topping up with additional larger armour.

Riparian walls backing sandy beach in east side of harbour, (Asset Ref. 1221D901D0803C09)

Displaced rock armour and damaged revetment at the Haggerlythe inside harbour adjacent to East pier (Asset Ref. 1221D901D0803C05)

The rock revetment Asset Ref No.1221D901D0803C05 continues east outside the harbour, to protect the toe of Abbey Cliff. This section, again built in 2001 it is constructed of larger rock and is in fair condition (see images in next section).

3.10 Management Unit 13 – Whitby East

Coastal Slope Condition Assessment
This Management Unit is divided into 2 Sub-Management Units:

Mu13A – Cliffs east of Whitby Harbour
Unit **MU12/2** comprises high cliffs protected by rock armour (Appendix A, Map 2). There is evidence of a large recent rockfall from the upper part of the cliff (centre-left of photo) and ongoing erosion at the headscarp. Almost the entire cliff face is exposed with very little vegetation cover. The cliffs are Partly Active.

MU12/2 The cliff face does not support vegetation and there is evidence of recent rockfalls at a number of points along the unit (Partly Active). August 2014.

Mu13B – Whitby East to Widdy Head
This Sub-Management Unit consists of **units MU13/1 to MU13/6** and part of unit MU14/1 (which will be discussed under Management Unit 14) (Appendix A, Maps 2 and 3)

Unit MU13/1 is located immediately east of Whitby and is classified as Partly Active. The lower slopes are almost entirely exposed and are subject to marine erosion. The upper slopes are actively retreating through periodic rockfalls.

Unit MU13/2 comprises the eroded headland of Saltwick Nab. This unit is continuing to actively erode and supports little vegetation cover. Rilling and gullying is evident on the exposed faces. As a result this unit is classified as Partly Active in 2014.

The cliffs within **unit MU13/3** are located within Saltwick Bay. The cliffs of this embayment are protected to some extent from marine action by the high stable beach. As a result, the unit is less active and well vegetated. It has been classified as Locally Active in 2014.

Unit MU13/4 is located just east of Saltwick Bay and it fronted by a narrower beach than adjacent unit MU13/3. Consequently it is subject to more regular wave attack at the toe and much of the slopes are active and exposed. There is evidence of small slumps of debris and rockfall activity and there is ongoing localised and minor recession of the headscarp. This unit was Locally Active in 2012 has the same classification in 2014.

Unit MU13/5 is formed by the shallow, relict debris flow lobe at Black Nab. The slopes of this unit are well vegetated, with localised activity evident at the toe and headscarp. Activity noted at the headscarp and toe meant it was classified as Partly Active in 2012, this appears to have reduced and therefore the unit has been classified as Locally Active in 2014.

Unit MU13/6 is a long, steep-faced unit near the Whitby Fog Signal and the former lighthouse. The slopes are largely exposed with evidence of rockfalls from the upper cliff. In places the fence on the seaward side of the Cleveland Way was being undermined by this cliff top recession (see photo below). There are also signs of ongoing weathering and marine erosion of the lower layers. This unit is classified as Partly Active in 2014.

MU13/1 Cliffs east of Whitby (Partly Active). August 2014.

MU13/2 West side of the highly weathered headland of Saltwick Nab (Partly Active). August 2014.

MU13/3 Saltwick Bay cliffs and beach (Locally Active). August 2014.

MU13/4 Exposed, eroding cliff subject to marine erosion (Partly Active). August 2014.

MU13/5 The cliff is primarily vegetated with erosion of the toe which has left a stack (just to the left of the photograph) Locally Active. Downgraded to Locally Active as mostly vegetated. August 2014.

MU13/6 Steep faces close to the Whitby Fog Signal, looking north-west (Partly Active). August 2014.

MU13/6 – South-eastern end of unit – unvegetated eroding cliffs (Partly Active). August 2014.

MU13/6 - Cliff top failure starting to undermine fence – grid reference 492483 510474. August 2014.

Coast Protection Asset Condition Assessment
(Appendix B – Map 2)

Mu13A – Cliffs east of Whitby Harbour

There is a section of rock armour giving limited protection to the eastern side of the harbour and toe of Abbey cliff directly to the east of Whitby harbour East Pier. The rock armour varies in size from 1-4 tonnes to 5-8 tonnes. (Asset Ref No.1221D901D0803C05) and is in fair condition, below left and right, although there are areas that would benefit from topping up with additional armour stone.

Rock armour protection to toe of Abbey Cliff (Asset Ref. 1221D901D0803C05)

Rock armour at interface between east pier and Abbey cliff (Asset Ref. 1221D901D0803C05)

Mu13B – Whitby East to Widdy Head
There are no coastal assets within this Sub-Management Unit.

3.11 Management Unit 14 – Widdy Head to Pursglove Stye Batts

Coastal Slope Condition Assessment
The only unit within this Management Unit is **MU14/1** (Appendix A, Map 3). The cliffs within this unit are classified as Locally Active in 2014. The slopes are partly vegetated, with small areas of erosion evident. Parts of the lower cliff are mantled by vegetated debris and the cliff toe is characterised by extensive boulder lobes. This unit has not changed activity status since 2009.

MU14/1 stable cliffs with largely-vegetated debris aprons and boulder lobes. Upper photo looking north from south end of unit, lower photo looking south from north end of unit (Locally Active). August 2014.

Coast Protection Asset Condition Assessment
There are no coastal assets within this Management Unit.

3.12 Management Unit 15 – Pursglove Stye Batts to Robin Hood's Bay

Coastal Slope Condition Assessment
This Management Unit consists of **units MU15/1 to MU15/4** (Appendix A, Maps 3 and 4).

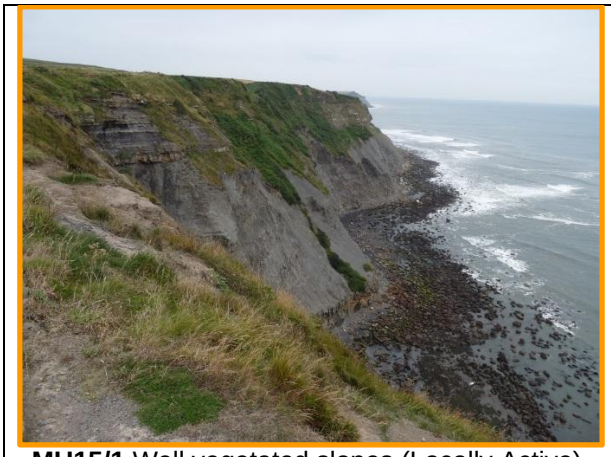
Unit MU15/1 is a long unit, generally well vegetated at the cliff top and classified as Locally Active in 2014. There are localised areas of more intense erosion in places and a substantively unvegetated cliff toe.

Unit MU15/2 is located at Far Jetticks. This cliff has widespread activity, with ongoing marine erosion evident at the toe and localised activity on the cliff face. The cliff was classified as Partly Active in 2012 due to the appearance of vegetation on the cliff face. Little vegetation exists on the cliff face in 2014, but is present among much of the cliff top and therefore Partly Active status has been retained in 2014.

A series of arcuate tension cracks were observed on the cliff top at gird reference 495076 507274, indicating an incipient failure that poses a hazard to walkers on the Cleveland Way. The site has been brought to the attention of Scarborough Borough Council who have informed the North York Moors National Park Authority.

Unit MU15/3 is largely comprised of the headland of Bay Ness, north of Robin Hood's Bay. The cliffs are subject to ongoing toe erosion and occasional small scale rockfalls and cliff top recession. This recession was evident at grid reference 495709 505886 where the cliff top had receded to such a point that the fence on the seaward side of the Cleveland Way had been undermined (see below). This unit is classified as Partly Active in 2014.

Just north of Robin Hood's Bay Village is **unit MU15/4**. The cliffs are eroding throughout much of their height. There is evidence of slumping on the cliff face, with active recession of the headscarp. This unit is classified as Partly Active in 2014, unchanged from 2012.



MU15/1 Well vegetated slopes (Locally Active). August 2014.

MU51/2 An area of intense erosion (Partly Active). August 2014.

MU15/2 – Large tension cracks delineating failing section of headscarp (Partly Active). August 2014.

MU15/3 Upper photo - southern side, photo taken from Ravenscar golf course and northern side. Lower photo – northern part of unit (Partly Active). August 2014.

MU15/3 – Fence on seaward side of Cleveland Way being undermined by recession of the cliff top. August 2014.

MU15/4 Exposed cliffs with boulders at the toe (Partly Active). August 2014.

Coast Protection Asset Condition Assessment
There are no coastal assets within this Management Unit.

3.13 Management Unit 16 – Robin Hood's Bay

Coastal Slope Condition Assessment
This Management Unit is divided into 3 Sub-Management Units:

Mu16A – Robin Hood's Bay Village
This sub-management unit is composed of **units MU16/1, MU16/2 and MU16/3** (Appendix A, Map 4)

Unit MU16/1 is the cliff fronting the upper part of Robin Hood's Bay Village and is classified as Partly Active in 2014, the same as during the December 2013 post-surge survey. The upper slopes show evidence of slumping and localised recession of the headscarp. The lower slopes are near vertical. The lower cliff has been undercut by marine erosion.

Units MU16/2 and MU16/3 are stabilised landslides that form the lower parts of Robin Hood's Bay Village. MU16/2 is classified as locally active at its northern end, beyond the extent of the defences. These units have not changed status since the post-surge survey in December 2013

MU16/1 Cliffs below the upper part of Robin Hood's Bay Village (Partly Active). August 2014.

MU16/2 Locally Active in August 2014. Evidence of recent rockfalls in the lower cliff and failure of the upper cliff. Recent rockfall scars and failure of the upper cliff are evident in that part of the unit beyond the extent of the sea defences.

MU16/2 (Locally Active)**, MU16/3** (Dormant), **MU17/1** (Dormant) **and MU17/2** (Partly Active). August 2014.

MU16/3 – Robin Hoods Bay Village (Dormant). August 2014.

Mu16B – South of Robin Hood's Bay Village

This Sub-Management Unit consists of **unit MU17/1**, which is defended at the toe by a sea wall and rock armour. The slopes show little evidence of recent activity. As a result this unit is classified as Dormant in 2014, a decrease in activity status since earlier surveys.

MU17/1 The defended toe and heavily vegetated slopes show that the unit has been stable (Dormant). August 2014.

Mu16C – Cowling Scar

This Sub-Management Unit consists of **unit MU17/2** and part of **unit MU17/3**.

Unit MU17/2 is partly protected in part by rock armour at the toe. The slopes are generally well vegetated with some exposed areas at the head and mid-slope where evidence of sliding and gullies are present. This unit was classified as Partly Active in 2012, due to the evidence of instability throughout the unit. This instability appears to have continued and the rear scarp (i.e. the cliff top) of the mudslide is undermining the paved Cleveland Way.

Further south, within **unit MU17/3**, defences are absent and the cliffs are more active. There is significant slumping and sliding activity at beach level as well as at the cliff head and mid-slopes. This unit is classified as Partly Active in 2014, no change from earlier surveys.

MU17/2 - The paved Cleveland Way has almost been undermined by recession of the cliff top. (Partly Active). August 2014.

MU17/3 Poorly-vegetated slope with widespread evidence of ongoing slope failure. (Partly Active). August 2014.

Coast Protection Asset Condition Assessment

Robin Hood's Bay Village is defended by an extensive system of coast protection defences which was upgraded and extended in 2001 (Appendix B, Map 3). Most of the defences at Robin

Hoods Bay are in a fair to good condition, but the older original structures dating from the 1970s are showing evidence of damage and defects. The recent strategy study has proposed a capital scheme for the large vertical seawall (Asset Ref. 1221D901D1003C02) that protects the main part of the lower village. Maintenance recommendations elsewhere include re-pointing and repairing cracks and keeping localised areas of vegetation growth under control to avoid damage.

The most northern defence at Robin Hoods Bay is a section of rock armour that gives some limited protection to the cliff toe to the north of the northern slipway / beach access ramp, Asset Ref. 1221D901D1002C02. This rock armour constructed as part of the 2001 scheme is in good condition, see photo below, top left.

The large sea wall (Asset Ref. 1221D901D1003C01) that was built in 2001 is fronted by rock armour and incorporates a slipway / ramp to its northern end. The wall is in very good condition. Joints and sealant show no signs of damage or minor defects. The rock armour at the toe is also very good, apart from one area near the centre where there are several gaps indicating displaced armour units. The northern slipway has some abrasion damage near the toe and missing joint filler, but is overall in good condition. There has been some erosion / weathering of the cliff at the southern end of the wall that need minor repairs (see photo below lower left).

Rock armour at north end of defence system in good condition.
(Asset Ref. 1221D901D1003C02)

Section of rock armour with gaps / displaced units in front of 2001 seawall. (Asset Ref. 1221D901D1003C01)

Sea wall with rock armour toe constructed in 2001 (Asset Ref. 1221D901D1003C01)

Rock armour extension at the interface between defended and undefended section.
(Asset Ref. 1221D901D1003C01)

Between the 2001 seawall and the large vertical defence wall built in 1975 further south there is a short 25m length of undefended shale cliff, Asset Ref. 1221D901D1003C03, which is slowly eroding, see photo below right and threatens to undermine the north end of the vertical wall.

Erosion at the north end of the Large vertical wall at Robin Hood's Bay
(Asset Ref. 1221D901D1003C02/C03)

Short section of undefended cliff
(Asset Ref. 1221D901D1003C03)

The large vertical concrete wall that was constructed in 1975 (Asset Ref. 1221D901D1003C02) is in poor condition, showing evidence of surface cracking, rust marks indicating corrosion of the reinforcement steel, mineral encrustation, seepage, and extensive cracking and repair work to the crest of the wall. Previous inspections have also noted some evidence of undercutting at the toe, but this was not visible at the time of inspection due to the beach levels. The recently developed strategy has proposed a capital scheme to repair and refurbish this wall and it is understood that a Project Appraisal Report to seek funding is in preparation.

Large vertical wall at Robin Hood's Bay in poor condition (Asset Ref. 1221D901D1003C02)

Crest wall locally very poor condition, with evidence of recent cosmetic repairs.
(Asset Ref. 1221D901D1003C02)

Example of typical damage to precast panels
(Asset Ref. 1221D901D1003C02)

Example of typical damage to precast panels
(Asset Ref. 1221D901D1003C02)

The short section of defence between the central slipway and the vertical wall (Asset Ref. 1221D901D1003C04) had evidence of repairs since 2012, but more are needed. The beach was higher than in 2012 so the toe was not exposed. At the northern end there are washed out joints, voids in the masonry wall and loose blocks, see below right. Above the wall there has been further loss of the render to the upper property wall.

The adjacent central slipway (Asset Ref. 1221D901D1003C05) is in an overall good condition, with signs of wear, minimal cracking and several missing cobbles near to toe and stream outfall. Some cracks/ washed out joints, see photos below, lower left and right. This structure needs regular inspections and minor repairs to keep it in good order.

Loose render on property wall to north side of slipway (Asset Ref. 1221D901D1003C04)

Open joints and voids visible in several places (Asset Ref. 1221D901D1003C04)

Central Slipway in overall good condition (Asset Ref. 1221D901D1003C05).

Some loss of mortar in slipway joints, with evidence of multiple previous repairs. (Asset Ref. 1221D901D1003C05)

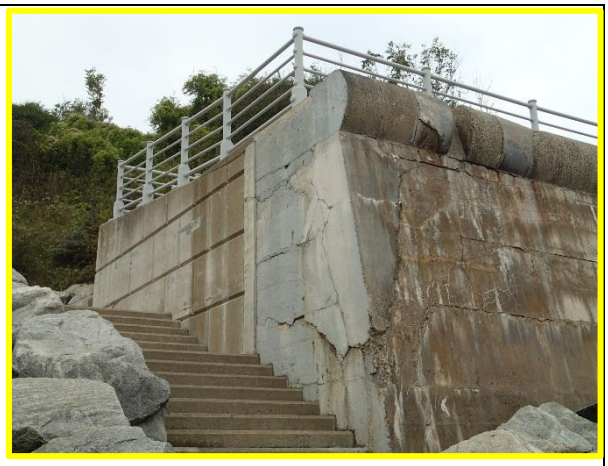
The mixed construction defence (Asset Ref. 1221D901D1003C06) on the south side of the slipway has mass concrete toe at the base with a variety of stone and blockwork above. The defence has a patchwork of previous repairs and repointing throughout and looked better than in 2012, but regular work is needed. There is a large crack visible in south end of the concrete toe and some undermining of the toe was apparent. There were some missing stone blocks in return end at south.

Washed out joints in masonry wall (Asset Ref. 1221D901D1003C06)

Wide cracks to toe of wall and undermining (Asset Ref. 1221D901D1003C06)

At the south of the village is the concrete sea wall at the Quarter Deck (Asset Ref. 1221D901D1003C10). This was given rock armour toe protection as part of the 2001 scheme. The rock armour is still tightly packed and is providing good protection to the toe of the sea wall behind. The upper sections of the sea wall itself show some evidence of seepage through the blockwork joints, and cracking and erosion to the capping beam and spalling. In 2012 there was evidence of repairs since the 2009 inspection, and the condition in 2014 was the same or slightly worse. The promenade above the sea wall is in a good condition, with only minor defects present. The timber access stairs down onto the Quarter Deck are worn and show signs of previous repairs and will need replacing soon. Several of the timber bench seats on the Quarterdeck had collapsed and need repair or removal.

Quarter Deck sea wall with cracked capping beam with previous repairs (Asset Ref. 1221D901D1003C10)



Failing previous repairs at south end of Quarter Deck
(Asset Ref. 1221D901D1003C10)

At the south of the Quarter Deck there is a length of rock armour defence with a slipway / ramp, both of which were constructed in 2001, see photo below left. The rock armour is in very good condition, is generally tightly packed and performing well, although there are a few armour units that have moved near the centre and at the edge of the ramp (Asset Ref. 1221D901D1003C09). The barrier gate on the ramp is rusted and needs treating and repainting.

To the south of the southern ramp is a short section of rock armour built in 2001 to stabilise the cliff and prevent outflanking of the Quarter Deck wall, Asset Ref 1221D901D1003C07. At the south end the eroding adjacent cliff is starting to cause some unravelling and it is suggested that in future after further erosion the rock armour should be reprofiled to form a double sided defence, in a similar way to the transition at the south end of the northern section of rock armour (Asset 1221D901D1003C03). The cliff has slumped just south of the ramp, with debris flowing over the armour and displacing some of the rock, see photos below top right and lower left. This should be monitored and the rock reprofiled once the slip has stabilised.

Rock armour and ramp south of Quarter Deck
Photo from 2012
(Asset Ref. 1221D901D1003C09)

Rock armour and ramp south of Quarter Deck
Photo 25/09/2014
(Asset Ref. 1221D901D1003C09)

Tightly packed rock armour in good condition in 2012– **photo from 2012**
(Asset Ref. 1221D901D1003C07)

Cliff slump has partially covered and damaged the revetment. (Asset Ref. 1221D901D1003C07)

Cliff slump has partially covered and damaged the revetment. (Asset Ref. 1221D901D1003C07)

Southern extent of rock armour - photo from 2009 inspection (Asset Ref. 1221D901D1003C07)

 Erosion adjacent to south end of rock armour. November 2012 (Asset Ref. 1221D901D1003C07)	 Southern extent of rock armour - **25/09/2014** inspection (Asset Ref. 1221D901D1003C07)

3.14 Management Unit 17 – Cowling Scar to Peak Steel

Coastal Slope Condition Assessment
This Management Unit is divided into 2 Sub-Management Units (Appendix A, Map 1):

Mu17A – Boggle Hole
This Sub-Management Unit consists of part of **unit MU17/3** only. This unit is described under Management Unit 16.

Mu17B – Boggle Hole to Peak Steel

This Sub-Management Unit consists of **units MU17/4 to MU17/9.**

Units MU17/4 is located between Boggle Hole and Stoupe Beck and has a near-vertical lower cliff formed in bedrock (and is actively eroding although the upper part of the cliff formed in till is more stable. This unit retains a status of Partly Active in 2014

MU17/5 is located south of Stoupe Beck and is also classified as Partly Active. The cliff toe is near vertical and subject to marine erosion and rockfalls. The body of the cliff is a shallower gradient and composed of soft glacial sediments with localised stream incision. A former WWII pillbox is situated at the cliff top which provides a benchmark for cliff top erosion.

Further south, units **MU17/6 and MU17/7** were previously classified as Locally Active following the 2012 However, their lower slopes have active sea cliffs and there is evidence of recent recession of the cliff top, therefore both have been upgraded to Partly Active in 2014.

Units MU17/8 and MU17/9 are located immediately west of Peak Steel. **Unit MU17/8** has a steep lower slope which is actively eroding and a shallower upper slope which supports some vegetation cover. Headscarp recession is evident in places. **Unit MU17/9** is steep with little vegetation. These units are classified as Partly Active in 2014, no change since 2012.

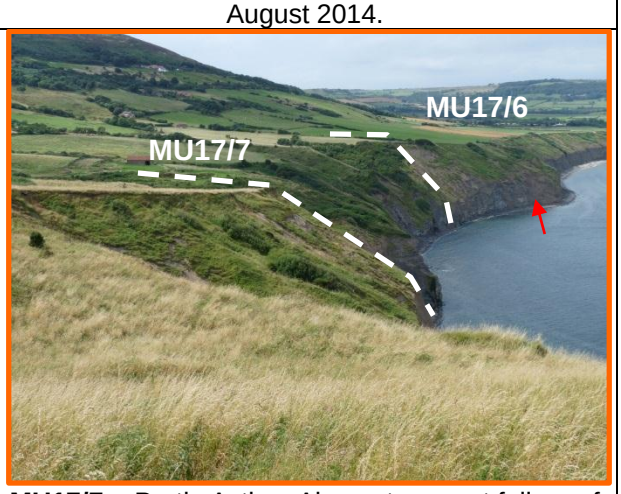
MU17/4 has been subject to marine erosion at the toe of the cliff (Partly Active). August 2014.

MU17/4 - Active cliff top erosion at in MU17/4. Partly Active. August 2014.

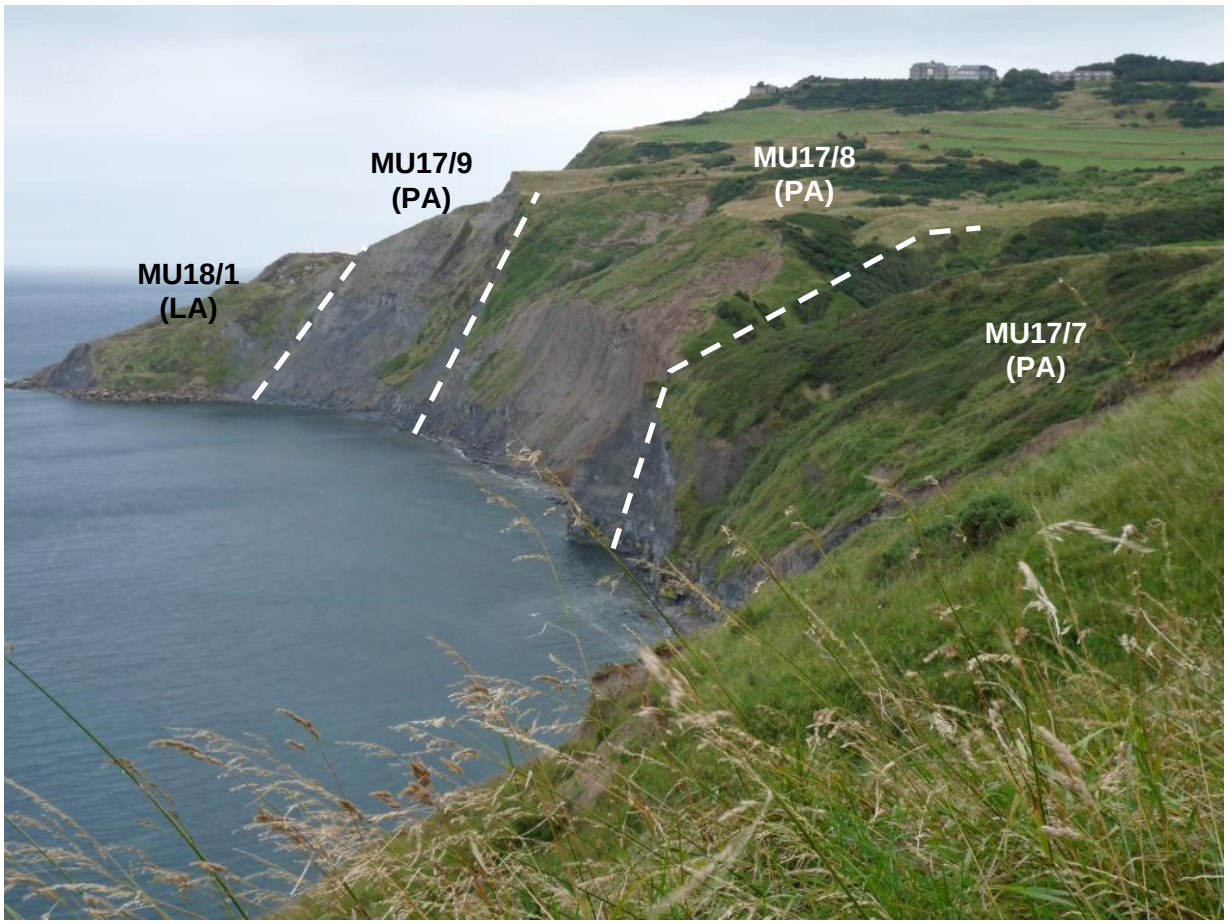
MU17/5 Looking south from Stoupe Beck (Partly Active). August 2014.

MU17/5 Former WWII defence provides an indicator of cliff top position (Partly Active). August 2014.

MU17/6 – Example of cliff top mudslide causing cliff top recession. Possible underlying cause is discharge from land drain identified by arrow. August 2014.



MU17/7 - Partly Active. Also note recent failure of lower cliff in 17/6, indicated by the arrow. August 2014.



MU 17/8 and **17/9** have both been subject to wave attack and are Partly Active. August 2014.

Coast Protection Asset Condition Assessment
Mu17A and Mu17B– Boggle Hole to Peak Steel
There are no coastal defences present here, but fluvial assets include a stone slipway integrated with a concrete revetment, a fuel bund and the outfall of Mill Beck. Boggle Hole Youth Hostel and footbridge is located 50m upstream of the mouth of the beck. Not inspected in 2012. Access is provided to the beach via a concrete slipway.

A short section of rock armour revetment and concrete and timber piling are providing protection to the mouth of the Stoupe Beck just to the south of Boggle Hole. However these are fluvial rather than coastal sea defences and not included in the coastal defence asset inspection.

3.15 Management Unit 18 – Peak Steel to southern end of Beast Cliff

Coastal Slope Condition Assessment
This Management Unit is divided into 2 Sub-Management Units, as follows (Appendix A, Maps 4 and 5):

Mu18A – Peak Steel to Blea Wyke Steel

This Sub-Management Unit consists of **units MU18/1 and MU18/2.**

Unit MU18/1 is located at Peak Steel, below Ravenscar. The cliffs in this region have a distinct two-tiered form. Much of the upper headscarp is densely vegetated with little evidence of recent activity. The lower headscarp, exposed to the sea, is more active and subject to episodic slides and falls evident. This unit is classified as Locally Active in 2014, no change from 2012.

Unit MU18/2 is a well vegetated, relict system with no signs of activity. As a result it is classified as Inactive.

MU18/1 Peak Steel (Locally Active). August 2014.

MU18/2 Distinct two-tiered cliffs (Inactive). August 2014.

Mu18B – Common Cliff and Beast Cliff

This Sub-Management Unit consists of **units MU18/3 and MU18/4**, both of which are classified as Locally Active. The cliffs have a distinct 'undercliff', likely to be formed by seepage erosion and landsliding processes. The slopes show only localised patches of activity. These units have not changed activity status since 2012.

MU18/3 Densely vegetated relict cliffs (Locally Active). August 2014.

MU18/4 Vegetated overall but with very localised erosion of the headscarp (Locally Active). August 2014.

Coast Protection Asset Condition Assessment
There are no coastal assets within this Management Unit.

3.16 Management Unit 19 – Beast Cliff to Scalby Ness

Coastal Slope Condition Assessment
This Management Unit is divided into 5 Sub-Management Units (Appendix A, Maps 5 and 6):

Mu19A – Beast Cliff to Herbert Hole
This Sub-Management Unit consists of **unit MU19/1** only. Failures are localised although a large failure in the upper cliff ca. 5-10yrs old was noted during this inspection. This unit is classified as Locally Active, and has not changed since the 2012 survey.

MU19/1 the well vegetated cliff face (Locally Active). August 2014.

MU19/1 – Large ca. 5-10yr old failure of upper cliff (Locally Active). August 2014.

Mu19B – Herbert Hole to Tindall Point
This Sub-Management Unit consists of **unit MU19/2** and **part of units MU19/1** (described previously) **and MU19/3.**

Unit MU19/2 is located on the north side of Hayburn Wyke and is classified as Locally Active in 2014, unchanged since 2012. There is minor activity at the headscarp and some evidence of past rockfalls at the toe. The slopes around the footpath on the northern side of Hayburn Wyke have been susceptible to instability in the past, and the 2012 survey reported that recent stabilisation works had been effective. However, it was noted during the 2014 survey that there was deformation of the steps here, indicating possible renewed movement.

Unit MU19/3 is located around and to the south of Hayburn Wyke. These cliffs are well vegetated, with localised erosion at the toe and headscarp. This unit is classified as Locally Active, unchanged since 2012.

MU19/2 Looking north across Hayburn Wyke at the vegetated cliffs (Locally Active). August 2014.

MU19/2 Limited deformation of the steps on the north side of Hayburn Wyke (Locally Active). August 2014.

MU19/3 – Well vegetated undercliff on south side of Hayburn Wyke (Locally Active). August 2014. August 2014.

MU19/3 – Southern part of unit – well vergated undercliff with localised erosion of headscarp (Locally Active)

Mu19C – Tindall Point to North of Cloughton Wyke
This Sub-Management Unit comprises parts of **units MU19/3** (described above) and **MU19/4.**

Unit MU19/4 is located immediately to the north of Cloughton Wyke. The unit is characterised by high, steep cliffs which are more active than those cliffs further north and south. There is some recession of the headscarp. This unit continues to be classified as Partly Active in 2014, unchanged since 2012.

Mu19/4 and MU19/5 - The upper slopes are vegetated but the lower slopes are (Partly Active). August 2014.

Mu19D – Cloughton Wyke
This Sub-Management Unit consists of **units MU19/5 and MU19/6**.

Unit MU19/5 (see photo above) is located on the northern side of Cloughton Wyke and is classified as Locally Active, unchanged since 2012. The near vertical cliffs are composed of hard rock which have failed through a series of small rockfalls. The cliffs support some vegetation, primarily in the northern end of the unit cover and are subject to ongoing marine erosion at the toe.

Unit MU19/6 forms the southern part of Cloughton Wyke and extends southwards to Long Nab. The lower cliff is near vertical and actively eroding. There is evidence of rockfall (large, angular boulders) from this part of the cliff onto the shoreline below. The upper part of the cliff is shallower angled and much less active. This unit is classified as Locally Active in 2014, unchanged since 2012.

MU19/6 Southern side of Cloughton Wyke (Locally Active). August 2014.

MU19/6 South of headland on southern side of Cloughton Wyke – photo taken from former coastguard station. (Locally Active). August 2014.

Mu19E – Hundale Point to Scalby Ness
This Sub-Management Unit consists of **unit MU19/6** (described previously) and **units MU19/7 to MU19/11.**

Units MU19/7 and MU19/8 extend from Long Nab in the north to Cromer Point in the south. They are both classified as Locally Active in 2014, unchanged from 2012. Minor activity is evident at the toe as a result of marine action and there is localised recession of the headscarp.

Units MU19/9 and MU19/10 are located between Cromer Point and Scalby Ness. The toe of these units is subject to marine action and the headscarp is steep, exposed and actively retreating at several places throughout the units. Landsliding does occur in the midslope but the cliffs are substantially vegetated and therefore retain a status of Locally Active. However the south side of Cromer Point shows evidence of greater activity than the rest of unit MU19/9 and includes a substantial landslide embayment with a steep, high rear scarp.

The Scalby Ness headland comprises **unit MU19/11**. This area is well vegetated on its more landward extents, but was noted during the December 2013 inspections to be eroding severely in the lower half of the cliff with some failure in the upper part and was therefore upgraded to Partly Active; this status has been retained following the 2014 inspection.

MU19/7 Looking north towards Long Nab (Locally Active). August 2014.

MU19/8 Looking south towards Cromer Point (Locally Active). August 2014.

MU19/9 There is evidence of headscarp erosion and erosion of the toe (Locally Active). August 2014.

MU19/9 Landslide embayment with large exposed rear headscarp on south side of Cromer Point. (Locally Active). August 2014.

MU19/10 Principally vegetated till cliff but with eroding headscarp (Locally Active). August 2014.

MU19/11 – Scalby Ness is eroding at the toe and there is evidence of failure in the upper slope. (Partly Active). August 2014.

Coast Protection Asset Condition Assessment

Mu19 – Beast Cliff to Scalby Ness

There are no formal sea defences within MU 19. However there is an outfall pipe which has been laid across the mouth of Scalby Beck and continues north across the foreshore in front of Scalby Ness. This acts as a weir controlling the flow of the beck at low tide and was discussed in the 2009 report, but as it is not a SBC coastal defence asset it has not been included in the 2012 or 2014 inspections.

3.17 Management Unit 20 – Scarborough North Bay

Coastal Slope Condition Assessment

This Management Unit is divided into 2 Sub-Management Units (Appendix A, Map 6):

Mu20A – Northern North Bay

This Sub-Management Unit consists of **units MU20/1 and MU20/2**.

Both of these units are defended at the toe by the sea wall which runs the entire length of North Bay. The slopes are well vegetated, show no evidence of recent activity and are both classified as Dormant, as they were in the 2012 and 2013 surveys.

MU20/1 Dormant. August 2014.

MU20/2 Behind the sea wall (Dormant). August 2014.

Mu20B – Southern North Bay
This Sub-Management Unit comprises **units MU20/3, MU20/4a and MU20/4b.**

Unit MU20/3 is well vegetated and shows no obvious evidence of recent instabilities. It is classified as Dormant, unchanged since the 2012 and December 2013 post-surge surveys.

Unit MU20/4a is located to the rear of North Sands and is classified as Inactive. The relict slopes are well vegetated with only minor and localised evidence of erosion at the headscarp, it remains classified as Inactive, unchanged since the 2012 and 2013 surveys.

Unit MU20/4b covers the area of Clarence Gardens and has previously been slightly more active than the adjacent unit MU20/4a. However, remediation works have repaired cracks and the slopes are now well vegetated with exposed rock at the headscarp. This unit was downgraded to Inactive in 2012 and retains this status in 2014.

MU20/3 Well vegetated slopes (Dormant). August 2014.

MU20/4a Relict slopes with localised activity (Inactive). August 2014.

MU20/4b Exposed rock headscarp (Inactive). August 2014.

Coast Protection Asset Condition Assessment

The coast defence system protecting the Town of Scarborough stretches for approximately 6.5km and includes a wide variety of defence types which are in varying condition (Appendix B, Map 4). The inspections were undertaken on 10th and 26th September 2014. For ease of reference the defence inspection has been subdivided in accordance with the Scarborough Coastal Defence Strategy units.

Scarborough North Bay

There are formal defences throughout the whole length of the North Bay, many of which are currently stable but most of the concrete and blockwork structures show some evidence of damage such as; cracking, loss of mortar, loss of expanding sealant and surface erosion and abrasion damage to front face. There are also a number of structural cracks in the back wall behind the promenade where this acts as a retaining wall to the road. A number of major repairs and capital works improvement to refurbish the North Bay defences have been undertaken recently and works were underway at the time of the inspections and are noted below.

Mu20A – Northern North Bay
Sealife Centre 20A/1

The most northerly defence in the Scarborough Town system, Asset Ref. 1221D901D1201C01, starts adjacent to the footbridge at Scalby Mills and is in fair condition, see below left. There are small cracks throughout and some holes and damage near the bridge where it ties into the river bank.

Moving south the wall, Asset Ref. 1221D901D1201C02, around the promontory on which the Sea Life centre is built is in less good, but still overall fair condition, see below top right and bottom left. There is evidence of toe scour and abrasion damage to the face of the wall. At the southern end of this defence there is a beach access ramp / slipway that is unusable due to the low beach levels leaving a large drop and boulders at the bottom. The Promenade in this area is in good condition, below lower right, although in places there is evidence of wave overtopping damage to the vegetation in the Sea Life Centre gardens behind.

Wall on south side of Scalby Beck in fair condition (Asset Ref. 1221D901D1201C01)

Damage to face of blocks on wall at Sea Life Centre (Asset Ref. 1221D901D1201C02)

Exposed toe at Sea Life Centre. Note missing infill apron behind end of sheet pile toe. **Photo from 2012** (Asset Ref. 1221D901D1201C02)

Exposed toe at Sea Life Centre. Very little change since 2012. **Photo 26/09/2014** (Asset Ref. 1221D901D1201C02)

Low foreshore levels make ramp to south end unusable. (Asset Ref. 1221D901D1201C02)

Promenade at Sea Life Centre in good condition. Some cracking to wave wall (Asset Ref. 1221D901D1201C02)

North Bay Cliffs – 20A/2 to 20A/7

Sea walls (Asset Refs. 1221D901D1201C03, C24, C25, and C04, lie between the Sea Life Centre and the small promontory at the south of the mini golf course. These are formed of blockwork with a concrete crest wall with a promenade beyond, backed by a grouted stone revetment, see below lower right. There is considerable abrasion damage to the front face, and spalling of the capping beam along this length, see below top left. The beach was lowest at the north, as on previous surveys, but was higher than in 2012 and the sheet pile toe was only exposed at the step at the north (Asset Ref. 1221D901D1201C03). However, previous surveys

have noted the concrete toe (Asset Ref. 1221D901D1201C24) has been exposed and undermined / eroded. The promenade shows signs of heavy wave overtopping damage with loss of filler from joints. The steps mid-way along are abraded with rounded steps near the toe. The wall around the promontory, Asset ref 1221D901D1201C04, which is more exposed has had relatively recent repairs to both the front face and the low crest wall. The beach levels here were higher than in 2012 covering lower parts of the wall, but there are further areas of damage to the front face and crest wall that should be considered for refacing in future.

Erosion and spalling of front face of wall. Asset Ref. 1221D901D1201C03

Grouted revetment behind prom has been repaired in many locations Asset Refs. 1221D901D1201C25 & C04

Recent repairs to areas of front face of wall. Asset Ref. 1221D901D1201C04

Damage to crest wall at ramp adjacent to promontory. Asset Ref. 1221D901D1201C04

Between the promontory at Asset Ref. 1221D901D1201C04 and Peasholm Gap, the beach levels are high in front of the beach huts. This section has been split into asset lengths between each set of access steps and consists of defences Asset Ref. 1221D901D1201C10, C26, C11, C12, C13, C14, C15, C16, C05, C17, C18 and C06, running from north to south. The beach was relatively high along all this length, so only the upper wall and steps were visible, see sample photos below. Previous inspections had noted voids and missing stones in a number of locations in the rear grouted stone revetment below the beach huts, but recent repairs were evident along the whole length. At a number of locations the wall capping beams have been repaired, but further work is required in several further locations. Abrasion damage was evident to the beach steps along this section. At the south of this section a new rear wall was being constructed, see photo below, lower right. Just to the north of this, in front of the beach huts there had been damage to several of the capping beach on the low wall at the back of the promenade, and in one case a 1m length was missing.

The wall to the north of the ramp at Peasholm Gap has several vertical cracks, see below bottom right. The beach is higher at this location, but there is occasional wave action and this has caused loss of expansion joint filler in the new rear wall protecting the new development behind the wall.

High beach levels in front of beach huts. Minor damage to capping. (Asset Ref. 1221D901D1201C12)

Recent repairs to grouted revetment at rear of promenade. (Asset Ref. 1221D901D1201C05)

High beach in front of beach management centre, (Asset Ref. 1221D901D1201C15)

Abrasion damage rounding steps and washout of joints. Asset Ref. 1221D901D1201C17

Newly constructed section of wall north of Peasholm Gap (Asset Ref. 1221D901D1201C06)

Voids in rear grouted revetment north of Peasholm Gap (Asset Ref. 1221D901D1201C17)

Southern North Bay
Peasholm Gap and Clarence Gardens - 20B/1 to 20B/3

The wall at Peasholm Gap, Asset ref. 1221D901D1201C19 has had significant repairs since 2012, with sections rebuilt or overlaid, presumably after the December 2013 storms. However, there are still some damaged areas of blocks and spalling to the splash beam in areas not yet repaired, see below upper left photo. The promenade and slipway / ramps appeared in fair to good condition, although the mastic sealant had been washed out of the slipway joints, see below lower right.

Damage to lower blocks on southern section of wall at Peasholm Gap.
(Asset Ref. 1221D901D1201C19)

Sloping wall at slipway in fair condition.
(Asset ref. 1221D901D1201C20)

Repaired section of upper wall and splash beam at Peasholm Gap.
(Asset Ref. 1221D901D1201C19)

Washed out joints in slipway at Peasholm Gap
(Asset ref. 1221D901D1201C20)

South of Peasholm Gap the beach levels drop and Royal Albert Drive is protected by an increasingly high curve profiled blockwork wall Asset 1221D901D1201C07 and C21 that runs south to the slight promontory at the ramp opposite the recently redeveloped Oasis Café. The promenade along this section was being re-laid at the time of the previous inspection (7th Nov 2012). Beach levels were lower than in 2012, and undermining of the toe was evident north of the central steps, see top photos below.

Low beach levels exposing toe to erosion north of central steps
(Asset Ref. 1221D901D1201C07)

Erosion and undermining at central steps at south end of Asset Ref. 1221D901D1201C07

Undermining of toe apron to north of steps (Asset Ref. 1221D901D1201C07)

Promenade relaid in 2012 remains in good condition. (Asset Ref. 1221D901D1201C07)

South of the central steps the beach was very low as in 2012 and works were underway to repair the toe apron where it had been undercut and damaged, Asset 1221D901D1201C21. Repairs had been undertaken to a number of vertical cracks and the capping beam where badly damaged, see photo below right. The promenade was partly re-laid in 2012, but the central section remains to be replaced. The joint between the promenade and the wall capping beam needs resealing along some of the length.

Low beach levels exposing toe apron (Asset Ref. 1221D901D1201C07)

Repair to vertical crack and capping beam north of the ramp. (Asset Ref. 1221D901D1201C21)

To the southern end of the North Bay, opposite Clarence Gardens to the north of the rock armour there is a large stepped concrete blockwork sea wall structure (Asset Ref. 1221D901D1201C08 – just north of Albert Road) constructed with eight large buttresses/bastions which protrude from the wall out onto the beach. The buttresses/bastions vary in height and length. The 2009 and 2012 inspections noted that the toe of the wall was severely eroded and there was severe cracking to out-built sections particularly at north end. There have been extensive repairs to this asset with some of the steps and toe replaced or overlaid with sections significantly improved. However, the overall condition rating of fair has been kept because there are still sections of original blocks with horizontal cracking. The concrete berm above the buttresses is in good condition. Above this are the sea wall and promenade, and a second wall at the back of the promenade as the road, Albert Drive, is at higher level here. Both the promenade and the second wall show cracking, with open joints and loss of surface to areas of the promenade.

Horizontal cracking in original blocks
(Asset Ref. 1221D901D1201C08)

Repairs to lower blockwork on outbuilt section, upper section still to be repaired.
(Asset Ref. 1221D901D1201C08)

Rebuilt section of steps.
(Asset Ref. 1221D901D1201C08)

Berm, upper steps and promenade.
(Asset Ref. 1221D901D1201C08)

Overview photo looking north showing damage to lower blocks and defence toe. **Photo from 07/1/2012**.
(Asset Ref. 1221D901D1201C08)

Overview photo looking north showing repairs to lower blocks and standing water in scour hole at defence toe. 26/09/2014.
(Asset Ref. 1221D901D1201C08)

There is a short section of stepped blockwork wall (Asset Ref. 1221D901D1202C23) between the above stepped wall and the rock armour section. This short wall two large vertical cracks with one crack extending through the capping beam. There is another crack extending half way up the wall. There is missing blockwork in localised areas and the lower part of wall is eroded with exposed aggregate. The secondary wall beyond the promenade and the promenade itself are also cracked. These issues were identified in the 2009 inspections but had changed very little when inspected in 2012 or again in 2014, see photos below.

Example of cracking Photo from 2009
(Asset Ref. 1221D901D1202C23)

Little change is same crack- Photo from 26/09/14
(Asset Ref. 1221D901D1202C23)

The southern-most section of defence in this unit is the first section of the rock armour at Clarence gardens (south) that was constructed in 2004/5. This is in good condition, protecting the original wall behind, Asset ref 1221D901D1202C01.

Toe of rock armour, looking north from steps
(Asset Ref. 1221D901D1202C01)

Crest of rock armour – **photo from 2012**
(Asset Ref. 1221D901D1202C01)

Scour hole at toe of steps prevents use at low tide. Note abraded / corroded steps.
(Asset ref. 1221D901D1202C01)

Crest of rock armour. Adjacent promenade showing surface damage.
(Asset ref. 1221D901D1202C01)

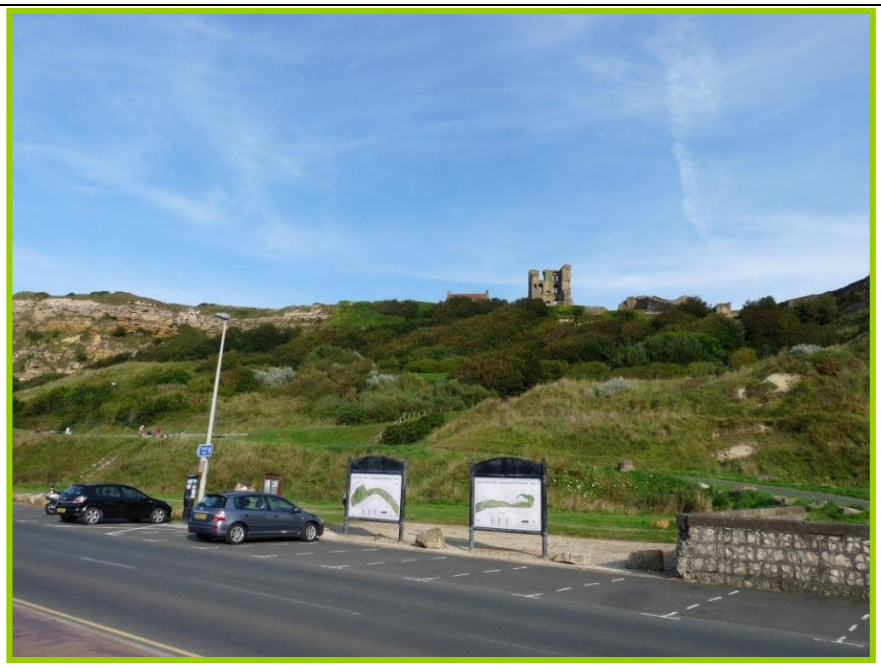
3.18 Management Unit 21 – Castle Cliff, Scarborough

Coastal Slope Condition Assessment
This Management Unit is divided into 2 Sub-Management Units (Appendix A, Map 7):

Mu21A – Castle Cliff
This Sub-Management Unit consists of **units MU21/1 and MU21/2.**

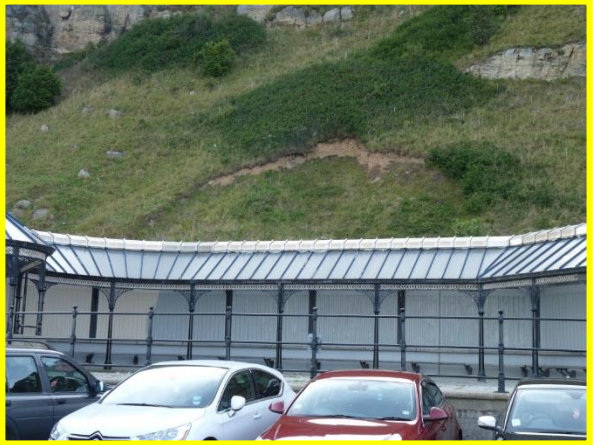
Unit MU21/1 is located at The Holms and continues to be classified as Inactive in 2014, unchanged from 2012 and December 2013. The unit comprises a series of relict rotational landslides (High-Point Rendel, 1999) and is prone to rockfalls, however, there was no evidence during the 2014 inspection of recent rockfall activity.

Unit MU21/2 forms the Castle Cliff promontory and continues to be classified as Locally Active, unchanged from 2012 and December 2013. The cliffs are steep with extensive toe protection measures. Locally, bedrock is exposed where it is subject to ongoing weathering and erosion from rainfall. The December 2013 survey report noted, large rock fall debris at the toe of the slope and undermining of competent rock in the upper cliff, causing some of the rockfalls. These observations held true during the 2014 survey. A failure of the talus in the lower slope behind the covered seating area towards the south of the unit. Inspection of photographs from December 2013 confirmed this failure had taken place prior to that inspection.



MU21/1 Well jointed hard rock has a thick cover of vegetation (Inactive). August 2014.

MU21/2 Well jointed hard rock subject to localised failure – note relatively fresh scar and large boulder size angular debris (Locally Active). August 2014.



MU21/2 Talus failure in lower slope (Locally Active). August 2014.

Mu21B – The Harbour
There are no natural cliff units within this Sub-Management Unit.

Coast Protection Asset Condition Assessment

Mu21A/1 – The Holms and Castle Headland 21A/2
Asset condition data are shown in Appendix B Maps 4 and 5. The rock armour and Accropodes "East Pier to the Holms" coast protection scheme constructed between 2003 and 2005 protects the area at the south end of North Bay with a rock armour revetment, Asset ref 1221D901D1202C03. This continues through the Holms as rock armour with concrete toe piles to reduce the footprint of the defence limiting encroachment into the SSSI, Asset Ref. 1221D901D1202C04. The section continuing around the Castle Headland to the harbour is an Accropode revetment with concrete toe piles and rock crest, Asset ref.1221D901D1202C02. There is a continuous wave return wall along the crest of these defences.

On the whole, these defences remain in good condition. There is some evidence of cracking and erosion along the Accropode arm edges and several of the units are broken, although there were known to be a number of broken units shortly after construction was completed. The inspection was limited to views from the crest wall and it was not possible to inspect the toe as along most of the length it is below water in all tide conditions. There are a number of cracks in the crest wall and while these are currently of no concern, monitoring may be useful to detect further deterioration. There has been some deterioration through wear and tear and localised damage to parts of the promenade and some expansion joints in both promenade slabs and wave wall need resealing, but the promenade remains in overall good condition.

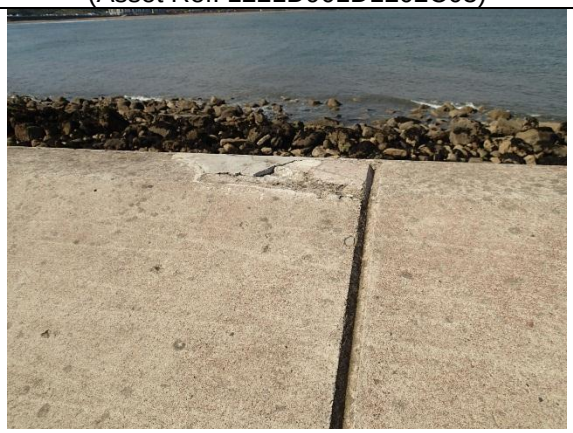
The two sets of steps through the rock armour in the south part of North Bay both show abrasion damage to the steps and locally scoured areas of the beach which leave a standing pool of water at low tide, making access to and from the beach difficult (see photo of Asset ref. 1221D901D1202C01 above and photo below top right and left).

Abrasion damage to steps at south of North Bay
(Asset Refs. 1221D901D1202C03)

Standing water in scour hole at toe of steps
(Asset Ref. 1221D901D1202C03)

Example of crack through centre of wave wall – **photo from 2012**
(Asset Ref. 1221D901D1202C03)

View of rock armour with looking north
(Asset Ref. 1221D901D1202C03)



Previous minor repair to crest wall damage in need of further repair
(Asset Ref. 1221D901D1202C02)

View of crest wall and rock armour with toe piles just visible.
(Asset Ref. 1221D901D1202C04)

View of crest wall and rock crest and Accropodes with toe piles just visible.
(Asset Ref. 1221D901D1202C02)

View of Accropode revetment and toe piles at south end near YW pumping station.
(Asset Ref. 1221D901D1202C02)

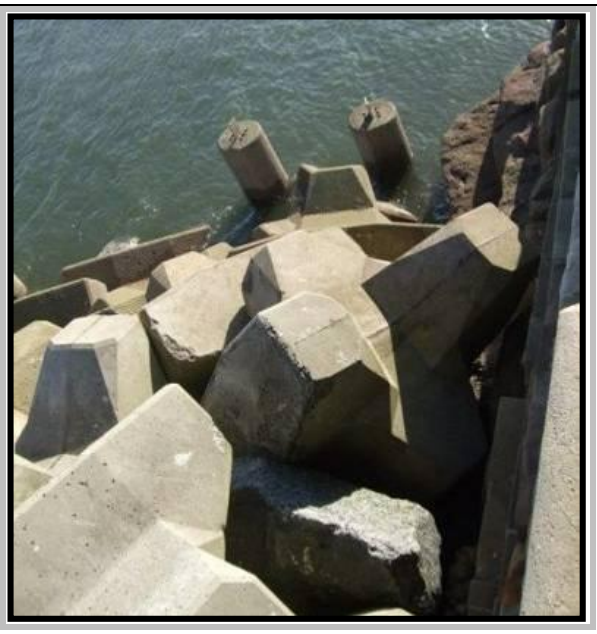
Mu21B/1 and 21B/2 – The Harbour

Scarborough Harbour is located at the southern side of the Castle Headland at the old part of the town. There are continuous formal defences throughout the whole extent. These range from the 2005 rock armour and Accropode sections to very old stone quay walls. Around the commercial side of the harbour many of the defences are aged, and are constructed using sheet metal piles back-filled with mass concrete. The inspection of this area took place on a very low tide on 10th September 2014.

The East Pier outer wall armour (Asset Ref. 1221D901D1301C01) is in good overall condition, with only minor cracking to the crest wall and individual Accropodes. The raised section of stone blocks that was rebuilt along almost the entire length remains in good condition with minor erosion and cracks present. At the seaward (south) end of the harbour arm the armour is less tightly packed than it is along the rest of the pier, but there has been little if any change since the 2009 inspection. It was noted that there is a possible areas of settlement of the armour crest adjacent to the area with the wide rock blanket toe, photo below top left.

East Pier rock armour and Accropodes showing area of possible settlement of crest armour
(Asset Ref. 1221D901D1301C01)

Tightly packed rock armour, Accropodes rock toe blanket and concrete toe piles seaward of East Pier harbour wall
(Asset Ref. 1221D901D1301C01)



South end of harbour arm showing potential lack of armour fill **photo from 2009** (Asset Ref. 1221D901D1301C01)

South end of harbour arm showing potential lack of armour fill **Photo taken 16/10/2012** (Asset Ref. 1221D901D1301C01)

Rock armour, Accropodes and rock toe blanket adjacent to lower part of crest wall (Asset Ref. 1221D901D1301C01)

South end of harbour arm showing potential lack of armour fill **Photo taken 10/09/2014 No change**. (Asset Ref. 1221D901D1301C01)

The faces of many blocks are missing or cracked at the seaward end of the original East Pier wall. The inner face of East Pier, Asset ref 1221D901D1301C16 was refurbished as part of the 2005 scheme, with missing blocks replaced and joints filled. Minor missing joints and cracks appear throughout the harbour masonry walls. The inner wall was inspected on a very low tide and it was noted that there are open joints and voids at the toe, see photos below left and right.

The stone stairs set into this defence noted to have loose treads and washed out joints in the 2012 inspection had been repaired, see lower photos below, although further repairs below the high water line are required. The washout of the joints at this set of steps was noted in the 2009 report and this has deteriorated, threatening collapse of the stone treads.

Erosion at toe, near mid length of inner face of East Pier. (Asset Ref. 1221D901D1301C16)

Open joints and voids between blocks in inner face of east Pier below repaired section.
(Asset Ref. 1221D901D1301C16)

Washout behind steps – **photo from 2012**
(Asset Ref. 1221D901D1301C16)

Steps have been repaired, but mortar is starting to wash out again.
(Asset Ref. 1221D901D1301C16)

A number of defences in the harbour area show corrosion to the steel piling of varying degrees (Asset Ref. 1221D901D1301C13 and 1221D901D1301C17), as would be expected in an environment such as this. Locals report the piles to be up to 50 years old. Significant corrosion is evident in the photo below located on the harbour arm near the lighthouse. The large void in the SE corner that was noted in 2012 has been repaired (Asset Ref. 1221D901D1301C17).

Void under SE corner of breakwater by lighthouse
Photo from 2012
(Asset Ref. 1221D901D1301C17)

Repair to void under SE corner of breakwater by lighthouse **photo 10/09/2014**
(Asset Ref. 1221D901D1301C17)

Corroded sheet piles, but overall fair condition **Photo from 2102** (Asset Ref. 1221D901D1301C17)

Corroded sheet piles, but overall fair condition **Photo from 10/09/14** (Asset Ref. 1221D901D1301C17)

The original quay wall on Sandside (Asset Ref. 1221D901D1301C06) shows signs of deformation; missing joints and movement of blockwork. The newer concrete jetty which has been constructed above also shows signs of movement. The previous inspections noted that there are cracks forming on the columns and beams to the underside of the extended jetty with exposed reinforcement bar in places. The section of steel sheet piling adjacent to the east is heavily corroded. At the east end of Sandside the promenade is supported by several arches built in front of the original quay. These appear in fair condition and the adjacent access ladder appears to have been renewed but there is damage to the concrete capping, see below right.

The original quay wall beneath the newer concrete jetty (Asset Ref. 1221D901D1301C06)

Spalling concrete capping to arched suspended quay at east end of Sandside (Asset Ref. 1221D901D1301C05)

Corroded sheet piles at back of harbour (Asset Ref. 1221D901D1301C12)

Washout of mortar in masonry blocks on harbour access ramp (Asset Ref. 1221D901D1301C11)

The West Pier appears to be mostly in fair condition, the steel sheet piling on the inner side of the harbour wall and at the seaward end is corroded, although intact (Asset Ref. 1221D901D1301C13 and C18). The outer side (Asset Refs. 1221D901D1301C07 and Asset Ref. 1221D901D1301C19) shows several significant defects including large full height cracks and exposure of aggregates and has been recorded as poor condition since 2009. During the 2012 inspection at low tide the timber toe piling was exposed and seen to be in poor condition with potential undercutting in a number of places with low beach levels. At the time of this years' inspection on 10 September 2014 the beach was higher and the toe piles were not visible. Erosion to the wall and minor cracks to the promenade were also noted during the inspection (Asset Ref. 1221D901D1301C19). These cracks require repair and monitoring to ensure that the structural integrity of the defence is maintained.

Corroded sheet piling of West Pier
(Asset Ref. 1221D901D1301C13)

Corroded sheet piling and damaged timber fenders at end of West Pier
(Asset Ref. 1221D901D1301C18)

Undermining of toe of concrete encased section at bend where West Pier narrows
(Asset Ref. 1221D901D1301C07)

Cracks to concrete facing and exposed toe to steps on West Pier
(Asset Ref. 1221D901D1301C18)

The beach level at the west side of west pier (Asset Ref. 1221D901D1301C19 and C07, see photos below) was lower than during the 2009 inspections, see photos below, exposing the timber toe piles. If the lower levels persist the toe piles may become further undercut so additional toe protection should be considered.

Cracks and repairs in concrete encasement section at narrowing of West Pier
(Asset Ref. 1221D901D1301C07)

Large vertical crack extending through the wall **photo from 2009**
(Asset Ref. 1221D901D1301C19)

No change to vertical crack extending through the wall **photo from 16/10/12**, with low beach exposing timber toe piles.
(Asset Ref. 1221D901D1301C19)

No change to large vertical crack extending through the wall, but beach levels higher than in 20012 or 2009. **Photo 10/09/2014**
(Asset Ref. 1221D901D1301C19)

3.19 Management Unit 22 – Scarborough South Bay

Coastal Slope Condition Assessment
This Management Unit is divided into two smaller Sub-Management Units (Appendix A, Map 7):

Mu22A – St Nicholas Cliff
There are no natural cliff units within this Sub-Management Unit.

Mu22B – South Cliff and Holbeck Gardens
This Sub-Management Unit consists of **units MU22/1 to MU22/8**, all of which are protected at the toe by the sea wall, promenade and in places, rock armour.

Unit MU22/1 is the most northerly unit located in Scarborough's South Bay and is classified as Inactive in 2014, unchanged since 2012 and December 2013.

Unit MU22/2 comprises the area around and to the north of the Spa complex. The unit was downgraded from Locally Active in 2012 to Inactive and remains Inactive in 2014.

Unit MU22/3 is located just south of the Spa Complex in the vicinity of the cliff lift. The steep slopes of this unit are well vegetated with little evidence of instability. Therefore, this unit is classified as Inactive in 2014, unchanged since 2012 and December 2013.

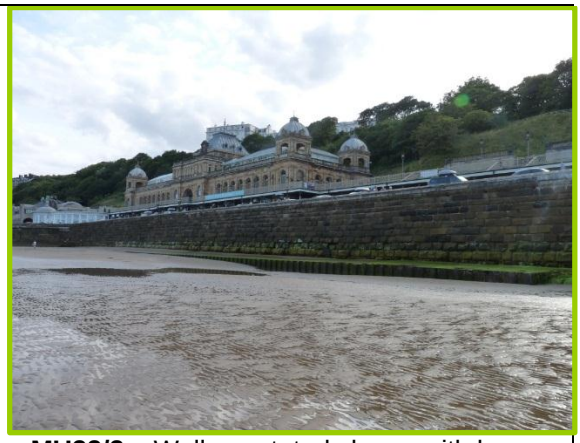
Units MU22/4 and MU22/5 comprise the northern part of the South Cliff Gardens and are both classified as Inactive in 2014, unchanged since December 2013. These units appear to be largely stable. However, a significant unvegetated area was noted in the mid-upper slope at the southern end of unit MU22/5, indicating a shallow failure at this location. This scar was also present during the December 2013 survey so occurred prior to that.

Unit MU22/6 is located behind the former bathing pool and is classified as Inactive in 2014, unchanged since 2012 and December 2013.

Unit MU22/7 is located at Holbeck Gardens and is classified as Inactive in 2014, unchanged since 2012. A number of footpaths in have previously been closed due to cracking and ongoing instability. Otherwise, the slopes are well vegetated except for an area of exposed bedrock subject to small rockfalls at the cliff toe. The promenade at the base of the cliff is protected by a rockfall catch fence.

Unit MU22/8 comprises the stabilised Holbeck Hall landslide run-out lobe and is protected at the toe by boulder armour. Localised sections near the headscarp are exposed. This unit is classified as Locally Active in 2014, unchanged from 2012.

MU22/1 - Well vegetated slopes with large coastal defences at the toe (Inactive). August 2014.



MU22/2 – Well vegetated slopes with large coastal defences (Inactive). August 2014.

MU22/3 Well-vegetated slopes (Inactive). August 2014.

MU22/4 The cliff face shows stability overall (Inactive). August 2014.

MU22/5 – Vegetated slope (Inactive). August 2014.

MU22/5 – Note small unvegetated area indicating a shallow slip in the upper cliff (Inactive). August 2014.

MU22/6 – Vegetated slope behind former South Bay Pool (Inactive). August 2014.

MU22/7 – Mostly vegetated slope defended at base but with some exposed bedrock just above sea defence (Inactive). August 2014.

MU22/8 - Upper part of Holbeck Hall landslide. Note small localised areas of exposed rear scarp (Locally Active). August 2014.

MU22/8 Defended Holbeck Hall landslide run-out lobe (Locally Active). August 2014.

Coast Protection Asset Condition Assessment
Scarborough South Bay

A wide range of coastal defence assets are located in South Bay. Throughout the defences there are vertical cracks, defects and areas of heavily eroded blockwork. Although there are numerous defects to the sea walls, they are generally structurally sound but repair work is needed to improve the condition of the assets and capital schemes have been recommended in the strategy at several locations. Common defects visible throughout include mortar loss and surface cracking.

Foreshore Road and St Nicholas Cliff MU 22A1/ and 22A/2

The South Bay defences start at the RNLI station, adjacent to West Pier. As in the 2009 and 2012 inspections the sea wall protecting the Lifeboat Station is in fair to good condition with minor mortar loss of joints and erosion (Asset Ref No.1221D901D1301C08).

View of blockwork wall beneath life boat station **Photo from 2009** (Asset Ref. 1221D901D1301C08)

Minimal change to wall since 2009 (Asset Ref. 1221D901D1301C08)

The low defence wall along the east side of Foreshore Road, is split into different NFCDD assets at each of the sets of access steps. These are running from north to south Asset Refs. 1221D901D1301C15, C21, C22, C23, C24 and C25. Due to high beach levels only the top one or two courses of stone blocks were visible along most of this length. However, where visible, the sea wall is in fair to good condition with occasional washed out joints and erosion evident and occasional defects to the hand railing needing repair.

High level beach with only top course of masonry visible, missing mortar. (Asset Ref. 1221D901D1301C22)

East end of Foreshore Road sea wall where beach was lower, showing washed out joints. (Asset Ref. 1221D901D1301C15)

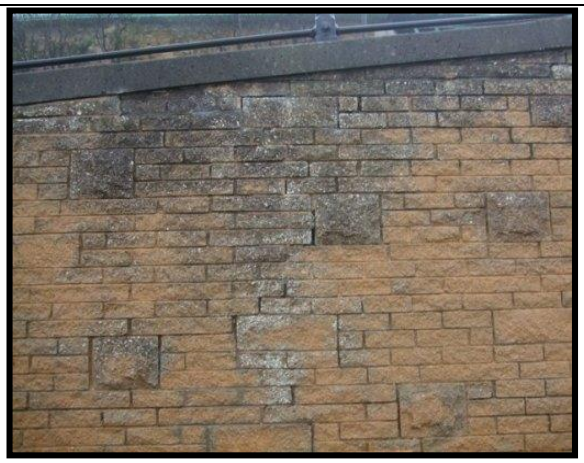
Damaged handrailing needing repair. (Asset Ref. 1221D901D1301C22)

Damage at edge of road and open joints in some of the beach access ramp blockwork. (Asset Ref. 1221D901D1301C23)

Damaged blocks and washed out joints needing repair. (Asset Ref. 1221D901D1301C24)

Occasional washed out joints in wall at south end of Foreshore Road. (Asset Ref. 1221D901D1301C25)

The two stage wall at the end of Valley Road / Aquarium Top has a number of cracks in the retaining wall at the back of the promenade (Asset Ref. 1221D901D1301C25/C09/C10). A vertical crack was observed in 2009 and while that crack does not appear to have deteriorated significantly there are other vertical and horizontal cracks evident. Repair work to the wall is advised to prevent further damage.



Vertical crack to second wall protecting road. **Photo from 2009** (Asset Ref. 1221D901D1301C09)

Second stage wall, with vertical crack, 10/09/14 (Asset Ref. 1221D901D1301C09)

Second stage wall, with horizontal cracks below coping, 10/09/14 (Asset Ref. 1221D901D1301C10)

Toe apron has been replaced or overlaid (Asset Ref. 1221D901D1301C09)

Spa Chalet 22/A3

The recurved sea wall between Valley Road and the promontory at the Spa (Asset Ref. 1221D901D1301C26) shows occasional defects throughout, such as washout of joints and erosion to the blockwork surface and some cracked blocks although they appear stable. It is recommended that repointing is undertaken to prevent future washout and further damage. The crest wall, photo below right, shows weathering / abrasion damage to some stone blocks in the parapet wall that requires attention and repairs to missing mortar or cracks in joints.

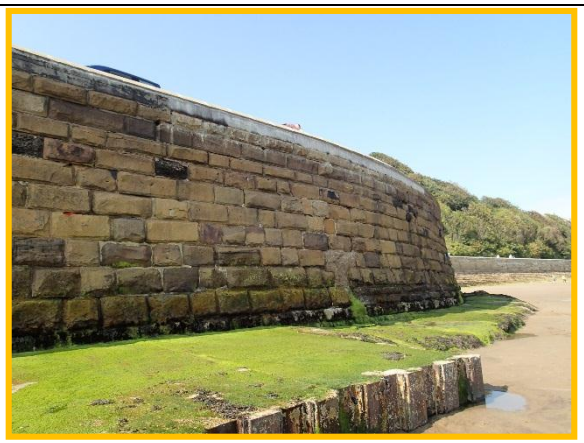
General view of defence at Spa Chalet (Asset Ref. 1221D901D1301C26)

Erosion and weathering to limestone blocks in crest wall (Asset Ref. 1221D901D1301C26)

The Spa – 22A/4 to 22B/2

The beach was relatively high for the inspection of the stone blockwork sea wall at “The Spa”, possibly due to beach management operations moving sand to this area from the Foreshore Road beach earlier in the year. However, the toe apron, which is in locally poor condition was still exposed. A capital improvement works scheme is under development for this frontage, although further deterioration should be closely monitored and action taken if necessary until the scheme can be implemented.

Loose blocks set back in void at toe of wall and open joints (Asset Ref. 1221D901D1301C27)

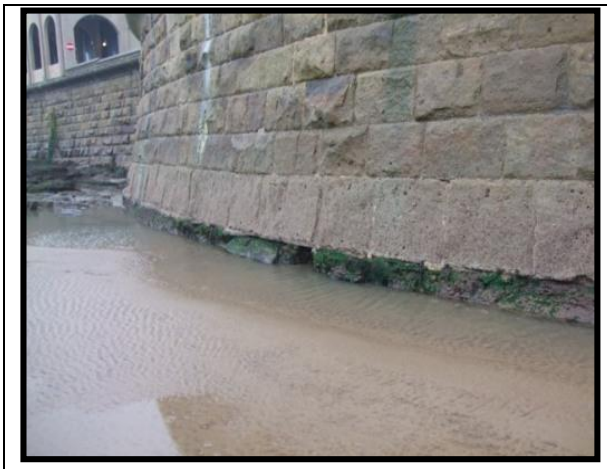


Exposed and abraded toe apron at the Spa (Asset Ref. 1221D901D1301C27)

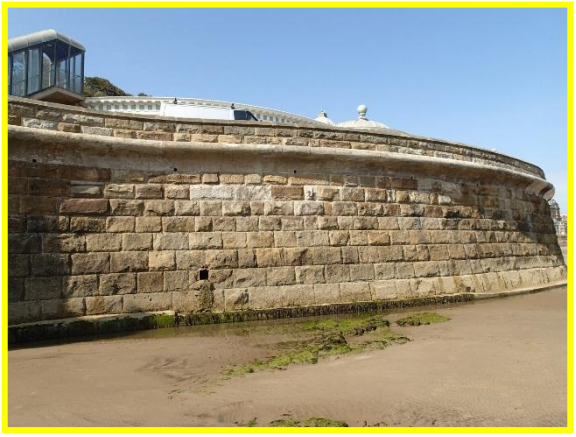
Parapet wall has been rebuilt following December 2013 storm, but crest wall needs constant attention to repairs. (Asset Ref. 1221D901D1301C27)

Abraded and slippery steps with rounded edges makes beach access hazardous. (Asset Ref. 1221D901D1301C27)

The curved plan section of wall, (Asset Ref. 1221D901D1301C28 is in a similar state to the main blockwork wall to the north. There are open joints and cracked blocks throughout especially in south. The repairs to the cracked splash beam undertaken prior to the 2012 inspection appear to be holding well so far.



Undercutting to the sea wall – photo from 2009 (Asset Ref. 1221D901D1301C28)

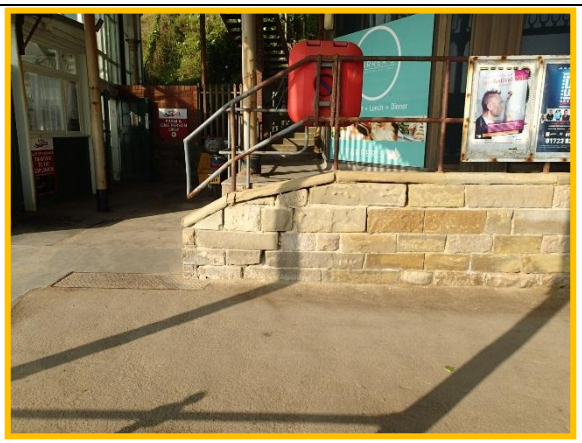


Repaired splash beam, but cracks in blockwork below (Asset Ref. 1221D901D1301C28)

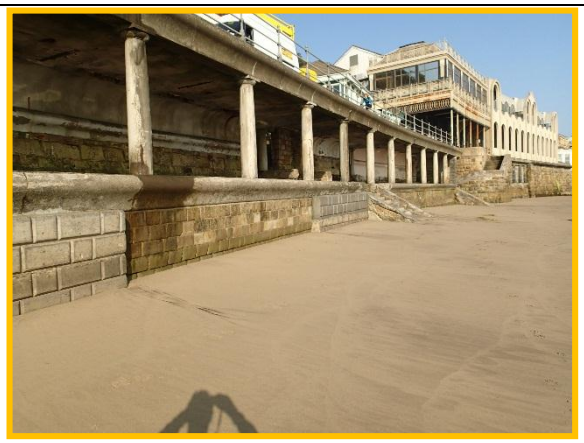
The wall at Spa Colonnade, Asset ref 1221D901D1301C29, while in fair overall condition has major spalling and loss of concrete to lower splash beam bellow in filled openings, see below left. There is also a small void at the toe near to South end.

The low wall with low level promenade shelter, Asset Ref. 1221D901D1302C01 adjacent to the cliff railway is in poor condition and in need of capital improvement works. There are open joints in lower wall and two large areas of missing facing blocks. The concrete rendering to the columns and beams supporting the upper level promenade is cracked with corrosion staining from the reinforcement or steel beams, particularly near the stairs to the upper level. The rear splash wall at the back of the upper level has lost mortar jointing between the stone blocks (see below right).

Abraded and spalling concrete capping to original wall below in filled openings (Asset Ref. 1221D901D1301C29)



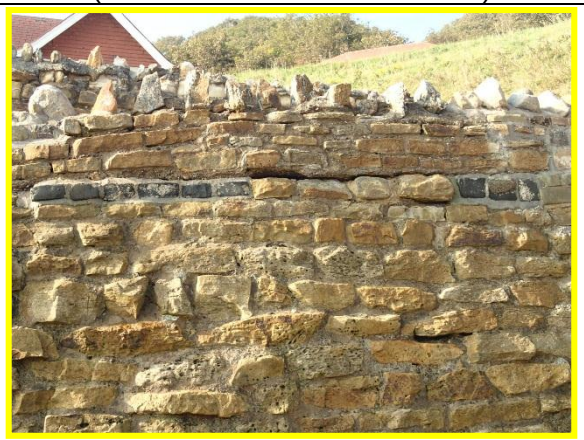
Weathering and loss of joints in stone wall at back of high level prom by cliff railway (Asset Ref. 1221D901D1302C01)



Repairs have been undertaken to lower level wall, but defence remains in poor overall condition (Asset Ref. 1221D901D1302C01)

Cracking and corrosion to beams and upper level deck slab
(Asset Ref. 1221D901D1302C01)

Following major damage in the December 2013 storm a section of wall to south of the Spa has been rebuilt (Asset Ref. 1221D901D1302C03)



However, there are still areas of joint wash out that require attention.
(Asset Ref. 1221D901D1302C03)

The low wall at South Cliff Gardens, Asset Ref. 1221D901D1302C02, has had a considerable number of repairs over the last few years, with rebuild of sections of the capping beam and front face apparent, significantly improving condition locally. However this wall is very exposed to storm action, due to its low level, with the crest overtopped on many tides each year, so regular ongoing repairs and continuing to rebuild further failing sections is recommended. The wave overtopping has dislodged the joint sealant between some of the promenade slabs, some of which appear to have settled. There is evidence of undercutting due to the erosion of the relatively soft rock on which the wall is founded in a number of places.

Missing joint sealant in gaps promenade slabs (Asset Ref. 1221D901D1303C02)

Area of washed out joints, abrasion and undercutting. (Asset Ref. 1221D901D1302C02)

South Bay Pool MU 22B/5

The lower section of the concrete block wall which has offset, slightly stepped blocks and the capping beam is showing evidence of significant surface erosion exposing aggregate throughout the defence. The 2012 inspection noted that there were deep voids/ missing joints in the blockwork that need attention. While repairs do appear to have been undertaken there is more to do. The lower promenade, which is subject to regular heavy wave overtopping, is missing filler between slabs in places. There were washed out joints with deep voids behind in the main wall (see photos below left and right). There was also loss of facing to set back second wall and cracks/spalling to splash beam, although it is noted that a section of the middle level wall had been rebuilt recently. Ongoing repairs and maintenance will be necessary in future due to the age and overall condition of this asset.

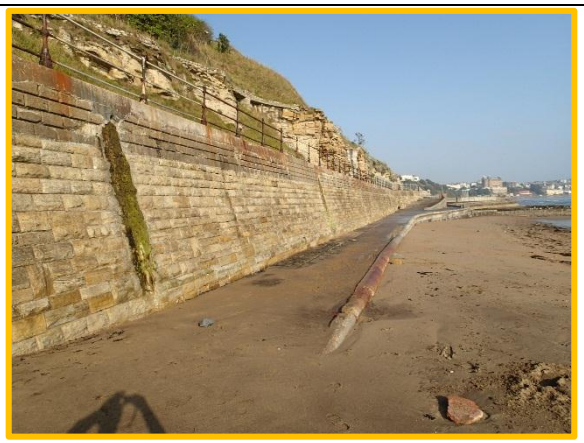
Undermining of wall, with voids at South Bay Pool (Asset Ref. 1221D901D1303C02)

Repaired upper section of upper wall adjacent to re-constructed concrete ramp. (Asset Ref. 1221D901D1303C02)

Holbeck Gardens MU 22B/6

The beach at the Holbeck Gardens defence, was high covering the lower promenade in the centre. This is probably due to its relatively enclosed location between South Bay Pool and the Holbeck cliff landslide lobe. The bastion groyne at the north has cracks throughout the concrete, although there were repairs evident at head of bastion. There are missing / damaged parts of the capping beam to the lower wall. The handrail to the upper promenade is badly corroded with missing sections, but the upper promenade has been barriered off from public access.

Public access to the upper level prom has been barriered. (Asset Ref. 1221D901D1304C02)



High beach covering lower wall at Holbeck Gardens (Asset Ref. 1221D901D1304C02)

Holbeck Cliff MU 22B/7
The relatively new rock armour revetment (Asset Ref. 1221D901D1304C01) defending the relict debris flow lobe at the site of the Holbeck Hall landslide remains in good condition, with the armour tightly packed and good coverage. The rock toe was inspected on a very low tide and appears in good condition, with the toe rocks concreted into the soft rock platform. At the southern end of the defence there has been erosion leaving the beach access ramp with a vertical drop to rocks at the end and a crack in the bottom slab.

Vertical drop off ramp at south end of Holbeck revetment (Asset Ref. 1221D901D1304C01)

Rock armour revetment at Holbeck landslide (Asset Ref. 1221D901D1304C01)

3.20 Management Unit 23 – Holbeck to Knipe Point

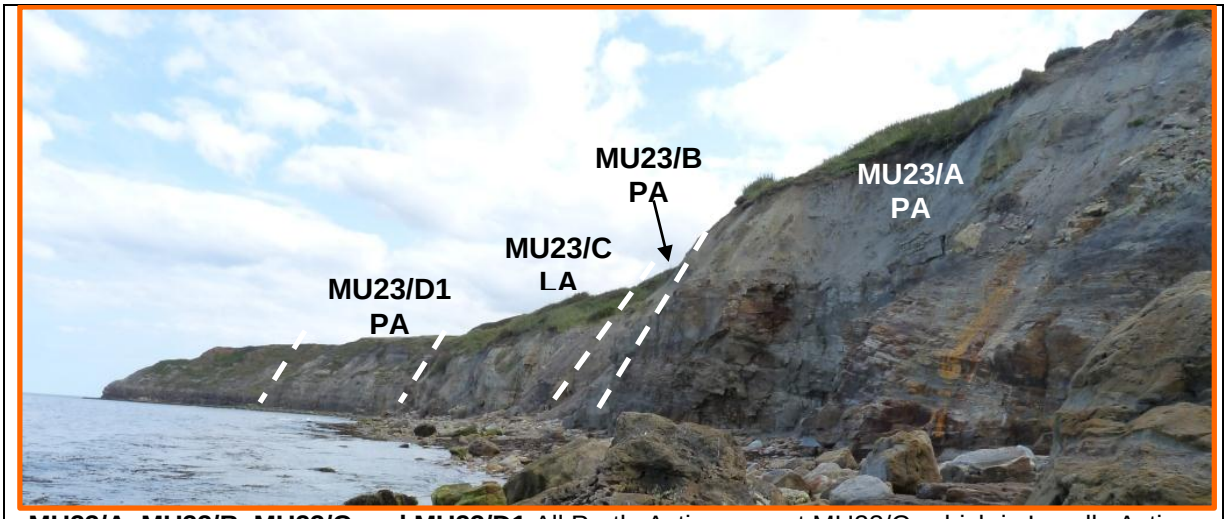
Coastal Slope Condition Assessment
This Management Unit consists of a large number of units, from MU23/A in the north to MU24/A7 at Knipe Point in the south (Appendix A, Map 7).

Unit MU23/A is located immediately south of the Holbeck Hall landslide run-out lobe and is classified as Partly Active, unchanged since 2012 and December 2013. This unit has well-vegetated upper slopes, but the cliff experiences on-going marine action and rockfalls.

Units MU23/B continues to be also classified as Partly Active in 2014, unchanged since 2012.

Unit MU23/C remains classified as Locally Active in 2014, unchanged since 2012. The unit is well-vegetated in the upper cliff but with a steep and eroding cliff toe.

Units MU23/D1, MU23/D2 and MU23/D3 are located at Wheatcroft Cliff above Black Rocks. These units are active down much of their length, with on-going recession of the headscarp, slumping in the mid-slope and erosion of the toe. **MU23/D2 and MU23/D3** were classified as Locally Active in 2012 as activity was more localised than previously seen, but have been returned to partly active due to evidence of recent failures in the upper cliff, the debris from which has not yet been removed from the shore platform.



MU23/A, MU23/B, MU23/C and MU23/D1 All Partly Active except MU23/C, which is Locally Active.

MU23/D2 The failed material is evident on the shore, as indicated by red arrows (Partly Active). August 2014.

MU23/D3 Joint bound blocks in the cliff face – recently failed block evident nearest to camera, although the source location is not clear (Partly Active). August 2014.

Unit MU23/E is located at White Nab and remains classified as Locally Active in 2014, unchanged from 2012. The slopes of this unit support some vegetation cover with intermittent areas of more intense erosion mid-slope and at the unit toe.

Unit MU23/F is a narrow, thin unit which follows a small valley occupied by an outflow channel for a pipeline and pumping station. The slopes inland are well vegetated and show very little evidence of recent activity. As a result, this unit is classified as Inactive in 2014. However, during the 2014 inspection it was noted that there were ongoing works to repair the infrastructure at this site (which we believe to be controlled by Yorkshire Water), although the stage that the works were at meant it was not possible to tell whether the work had been required because of coastal erosion.

MU23/E Vegetation and localised erosion (Locally Active). August 2014.

MU23/F Works encountered during the 2014 survey (Inactive). August 2014.

Units MU23/G1 and MU23/G2 form the northern part of Frank Cliff and are both classified as Partly Active in 2014, unchanged since 2012. The upper slopes of these units support some vegetative cover. The unit toes are highly active with evidence of rockfalls, slumping and sliding onto the beach below.

Unit MU23/H forms the headscarp and upper zone of a large mudslide embayment at Frank Cliff. Little erosion is evident and it is classified as Locally Active in 2014. **Unit MU23/H2** forms the main body of the mudslide. It has previously assessed as having a greater level of activity, and classified as Partly Active, but was not accessible during this inspection, so the same status has been retained. The mudslide toe comprises a series of smaller mudslides forming **units MU23/H1, MU23/H2a, MU23/H2b and MU23/H3**. In 2014, Partly Active status has been retained for **MU23/H1** and **MU23/2a** and **MU23/2b** have been elevated in status from Locally Active to Partly Active due to evident toe erosion and a large unvegetated scar further up in the cliff.

MU23/G1 Partly Active due to widespread toe erosion. August 2014.

MU23/G2 Partly Active due to widespread toe erosion. August 2014.

MU23/H – Well vegetated headscarp of unit. August 2014.

MU23/H1 Mostly vegetated upper sea cliffs with an eroding toe (Partly Active). August 2014.

MU23/H2a Well vegetated lower coastal slope but with an eroding toe (Partly Active). August 2014.

MU23/H2b – Eroding toe with some vegetation in lower cliff but exposed scar towards horizon at top of sea cliff (Partly Active). August 2014.

Unit MU23/I comprises the main body of the Cornelian Bay mudslide and was classified as Partly Active in 2012. The majority of this unit is densely vegetated, and previously noted activity at the headscarp, has decreased and therefore this unit has been classified as Locally Active in 2014. **Units MU23/I1, MU23/I2 and MU23/I3** form smaller mudslides at the toe of unit 23/I. All these units have been classified as Locally Active, including MU23/I1 which was classified as Partly Active in 2012 and has therefore been downgraded.

Unit MU23/I4 situated on the north side of the Knipe Point headland and is composed of soft glacial material. The unit was downgraded from Totally Active to Locally Active in 2012. However, activity in this unit appears to have increased throughout much of the cliff. Over-steepening at the toe of this unit is likely to lead to further failure of the upper slopes, which over time may lead to a reactivation of movements in MU23/I.

MU23/I1, MU23/I2 and MU23/I3 Activity limited to toe (All Locally Active). August 2014.

MU23/I4 Note lack of vegetation and deposits on the beach originating from failure of the upper (Partly Active). August 2014.

MU23/I Continued revegetation of mudslide source area evident (Locally Active). August 2014.

MU23/I – Continued revegetation of mudslide source area evident (Locally Active). August 2014.

Unit MU23/J is also located on the north side of Knipe Point. This unit is composed of hard, well jointed rock and has been upgraded from Locally Active to Partly Active in 2014 due to the actively receding toe and exposed bedrock in the mid-cliff which is a source of rockfall.

Units MU24/A8 and MU24/A7 are situated on the east and south facing sides of Knipe Point respectively and are both classed as Partly Active in 2014, no change from 2012. The unit frontages are almost entirely exposed and experiencing intense erosion. There is some evidence of past rockfall activity.

MU23/J Rock face of the north side of Knipe Point (Partly Active). August 2014.

MU24/A7 and A8 Exposed slopes – MU24/A7 outlined by white dashed line (Partly Active). August 2014.

MU24/A8 - Close up of activley eroding sea cliff on east facing aspect of Knipe Point. August 2014.

MU24/A8 - Actively eroding sea cliff on east facing aspect of Knipe Point. August 2014.

Coast Protection Asset Condition Assessment

There are no coastal defence assets within this Management Unit.

3.21 Management Unit 24 – Cayton Bay

Coastal Slope Condition Assessment
This Management Unit is divided into 2 Sub-Management Units (Appendix A, Map 1):

Mu24A – Cayton Bay North

This Sub-Management Unit consists of **units MU24/A and A2, MU24/B and MU24/B1 to B10.**

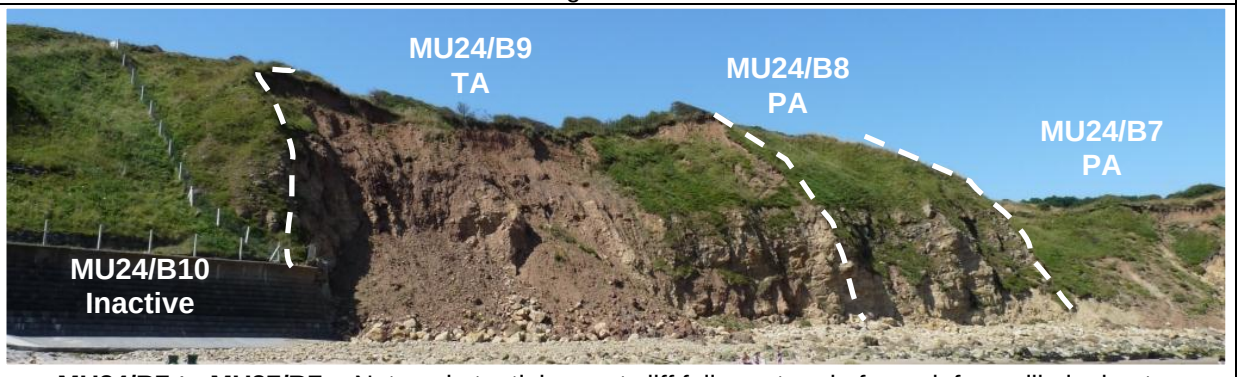
Unit MU24/A comprises the main body of the Cayton Cliff landslide complex that reactivated during 2008-2009. Significant recession of the headscarp was occurred in this event, resulting in the loss of land and properties at Knipe Point Drive. Only localised activity noted at the toe and headscarp in 2012, and no evidence for movement noted in the body of the landslide. Following the December 2013 storm surge, continuous erosion at the toe and penetration of waves into the most low-lying parts of the landslide complex were noted, however these were only local impacts and no further movement was noted in the rest of the unit. The unit is therefore considered to still be Locally Active in 2014.

Unit MU24/B forms the main part of the Tenants' Cliff landslide and is classified as Inactive in 2014, no change from 2012. The toe of Tenants' Cliff is comprised of a number of smaller

landslide units **MU24/B1 to MU24/B10**. These were all previously classified as Locally Active in 2012. However, during the 2014 survey it was noted that there was a distinct difference in the levels of activity, with the more northerly units (**MU24/1** and **MU24/B2**) being Locally Active, **MU24/B3 to MU24/B8** Partly Active and **MU24/B9** in which there was almost total failure of the upper sea cliff, being classified as Totally Active. **MU24/B10** is protected by the sea wall which extends northwards from the pumping station and has been subject to failure in the past, but during the 2014 survey was noted to be completely vegetated and has been classified as Inactive.

MU24/A The toe of Cayton Cliff is actively eroded but there is only localised activity in the rest of the unit (Locally Active). August 2014.

MU24/B and B1 to 10 Tenants' Cliff upper slopes are inactive. Units at the toe are Locally Active. August 2014.



MU24/B7 to MU27/B7 - Note substantial recent cliff failure at end of sea defence likely due to outflanking of this defence by marine erosion. August 2014.

MU24/B – Cliff behind pumping station showing no indications of significant activity (Inactive). August 2014.

MU24/B – Upper part of unit showing no signs of active instability except minor exposure of superficial materials at the headscarp (Inactive). August 2014.

Mu24B – Cayton Bay South

This Sub-Management Unit consists of **units MU24/C to MU24/T.**

Units MU24/C, MU24/D and MU24/E are located just southeast of the Pumping Station in Cayton Bay and are cut into the soft till cliffs. All units show active recession of the headscarp and slumping and cracking mid-slope. At the unit toes there is evidence of slumping and erosion. The classification of these units has been changed from Locally Active to Partly Active in 2014 due to there being substantial toe erosion and relatively widespread instability features higher in the cliff. However, they should be considered to be closer to the Locally Active classification rather than the Totally Active classification.

The small embayments of **units MU24/F and MU24/G** are fairly well vegetated but show widespread signs of erosion and recent in the lower part of the slope. They are both classified as Partly Active in 2014, an increase in status from Locally Active in 2012.

Unit MU24/H comprises the access route to the beach at Cayton Bay. The slopes of this unit are engineered and well vegetated, with no obvious signs of recent activity. Therefore this unit is classified as Inactive in 2014, no change since 2012.

Unit MU24/I is formed in soft glacial sediments and shows substantial toe erosion and evidence of headscarp erosion, leading to an increase in activity status from Locally Active in 2012, to Partly Active in 2014.

Unit MU24/J, also formed in soft glacial sediments, and whilst there is activity throughout much of the headscarp, it is less than in adjoining units. As such this unit retains a classification of Locally Active in 2014, the same as in 2012.

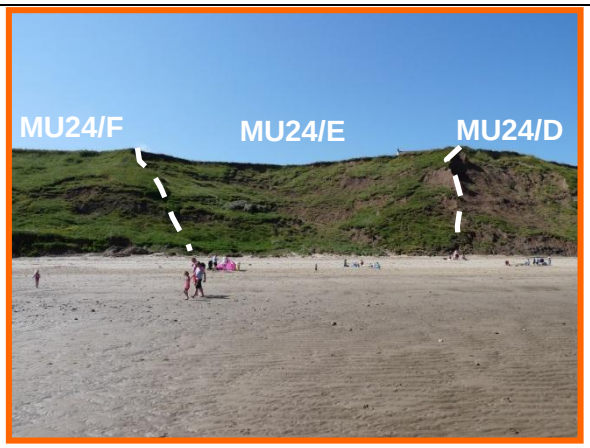
MU24/K, to MU24/O are all formed predominantly in soft glacial sediments but in the more southerly units, failed glacial material is likely masking bedrock in the lower cliff. All these units are classified as Partly Active in 2014 and show substantial evidence of recent instability, although some vegetation is present. This is an increase in activity status for **MU24/K** and **MU24/L** since 2012, but no change for units **MU24/M1** to **MU24/O**.

Units MU24/P and Q comprise soft glacial sediments in the upper cliff and exposed bedrock at the toe. These units are also characterised by a retreating cliffline, slumping and sliding down most of the unit lengths and an eroding toe. They have been classified as Partly Active in 2014, no change from 2014.

At **unit MU24/R**, the cliff becomes much higher, steeper and is composed of a more resistant bedrock geology with only a thin covering of superficial sediments. The mechanism of erosion

changes accordingly, so that within units **MU24/R and S and T** the dominant processes are now rockfall and weathering. These units are all classified as Partly Active in 2014, no change since 2012.

MU24/C and D Substantial toe erosion and slumping in the upper cliff (Partly Active). August 2014.



MU24/D and E Evidence of movement throughout height of cliff(Partly Active). August 2014.

MU24/F and G Evidence of toe erosion and significant movement in lower part of slope (Partly Active). August 2014.

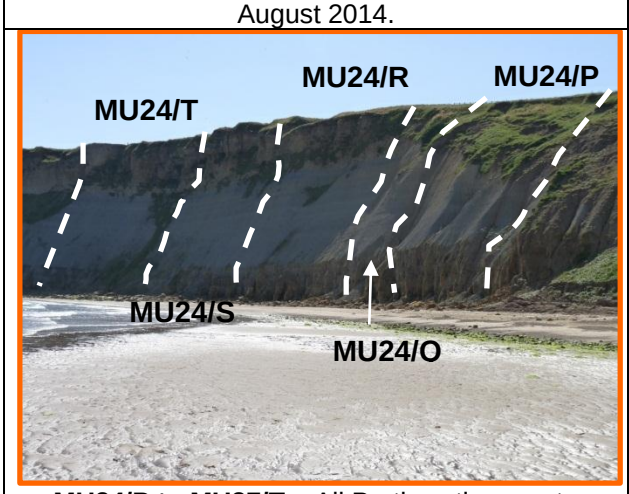
MU24/H Access route to Cayton Sands (Inactive). August 2014.

MU24/I Substantial toe erosion and localised headscarp recession (Locally Active). August 2014.

MU24/J The slope is well vegetated with limited toe erosion and headscarp erosion (Locally Active). August 2014.

MU24/M1 Substantial slumping of the cliff exposing large areas of headscarp (Partly Active). August 2014.

MU24/M2, MU24/N and MU24/O – Partly Active. August 2014.



MU24/P to MU27/T – All Partly active – note absence of vegetation on lower cliff

Coast Protection Asset Condition Assessment

Mu24A – Cayton Bay North

There are no coastal defence assets within this Sub-Management Unit.

Mu24B – Cayton Bay South

Cayton Bay is predominantly a natural bay mostly free from coastal defences. However, there are a series of defences at Cayton pumping station, which extend to the beach access ramp to the south (Appendix B, Map 6).

To the north of the pumping station (which is now converted to a private residence) is a private blockwork defence with concrete toe slab, Asset Ref. 1221D901D1402C02, which ties into the eroding cliffs to the north with a mixture of brick, stone blocks and concrete, see below left. This wall is in fair condition and appears newer than the wall to the south, although the toe apron is undermined with voids beneath that need attention. There has been significant erosion of the undefended cliff immediately to the north since 2012, see MU24/B9 above.

There are a complex series of private blockwork and concrete sea walls (Asset Ref. 1221D901D1402C05) protecting the main pumping station building. As in 2012 the condition of the defences varies from good to very poor and partly relates to the height from the high water mark. The higher, red brick walls appear sound. The lower, concrete and sandstone blockwork is in fair condition with evidence of quite recent repairs to joints. A patchwork of repair work is visible to the blockwork (see photo below lower left). The apron at the toe appears to have had further cosmetic repairs with poured concrete that appears to have been tipped from above. The beach was higher than at the time of the 2012 inspection, so the undermining of the toe noted in 2012 was not visible. There appear to have been repairs since the last inspection but

due to the age, exposure and patchwork nature of the defence there will be a need for ongoing maintenance repairs to prevent defects expanding and destabilising the overall wall.

Tie in of Pumping station defences at north end. **Photo from 2012.**
(Asset Ref. 1221D901D1402C02)

Tie in of Pumping station defences at north end note erosion of cliff compared to photo on left. **Photo from 26.09.2014.**
(Asset Ref. 1221D901D1402C02)

Walls protecting former pumping station
(Asset Ref. 1221D901D1402C05)

Walls protecting former pumping station
(Asset Ref. 1221D901D1402C05)

Between the southern end of the pumping station defences and the beach access point there is a derelict length of defence, Asset Ref. 1221D901D1402C04, which exhibits major undercutting, blockwork washout, parts of upper wall missing and significant damage. The condition is slightly worse than reported in 2012. It is advised that the failed southern part of this defence should be made safe or removed in accordance with the SMP policy.

Large voids to makeshift defences to the south of the pumping station **Photo from 2012.**
(Asset Ref. 1221D901D1402C04)

South end defence of the pumping station. **Photo from 26.09.2014.**
(Asset Ref. 1221D901D1402C04)

The last defence to the south is the concrete structure at the public beach access point. This is in a failed condition with large cracks and voids throughout (Asset Ref. 1221D901D1402C06). Repair work consisting of poured concrete skim over the voids on the deck has been undertaken since 2012 to make the structure safer for pedestrians and with the higher beach levels the structure appears slightly better than in 2012. However, slumps in the cliff behind are threatening the access onto the structure and as in the 2012 report it is still recommended that this structure is demolished and removed and replaced with a simple safer public access ramp set further back.

Difficult public access at failing beach defence.
Photo from 2012.
(Asset Ref. 1221D901D1402C06)

Repairs have been undertaken to patch up the defence at beach access south of the pumping station. (Asset Ref. 1221D901D1402C06)

Slumping cliffs threatening path to beach access structure.

Around 300m south there is a beach access point for the path from the public car park at the surf shop. There are a set of beach access steps that were previously protected by gabion baskets, which have distorted and split under wave action and / or cliff movement, see below left and right. This is not a formal coastal defence, so has no asset number.

(Failed gabion baskets at south beach access.
Photo from 2012)

(Failed gabion baskets at south beach access)
Photo 26.09.2014

3.22 Management Unit 25 – Lebberston Cliff and Gristhorpe Cliff

Coastal Slope Condition Assessment
This Management Unit consists of **units MU25/U** at Lebberston Cliff **to MU25/AE** at the eastern end of Gristhorpe Cliff (Appendix A, Maps 7 and 8).

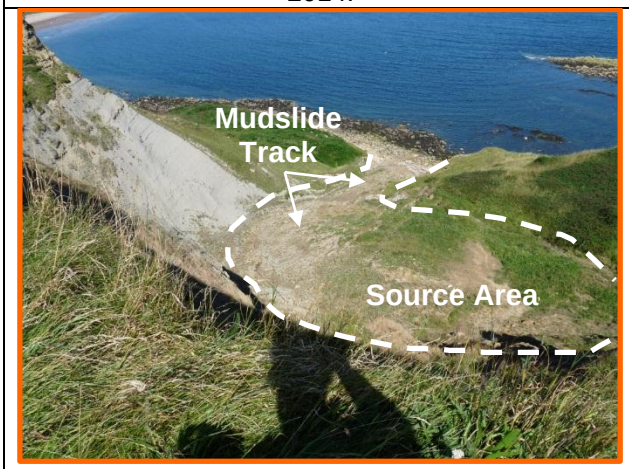
Unit MU25/U is located above Red Cliff Hole and is classified as Locally Active in 2014, unchanged from 2012. The steep cliffs are characterised by localised areas of erosion, but are otherwise fairly well vegetated. .

Unit MU25/V is located at Lebberston Cliff and comprises a large, periodically active mudslide system. The unit appears to be prone to regular change and recession. This unit was downgraded from Totally Active to Partly Active following the 2012 walkover. The morphology in the upper part of the feature (clear tension cracks) indicates that it is still active. Given the exposed bedrock at the headscarp and evidence of recent small failures of the headscarp a status of Partly Active has been retained for 2014.

Unit MU25/W is situated at Red Cliff Point was classified as Locally Active in 2012. The slopes of this unit are relatively well vegetated but recent headscarp activity has caused this unit to be upgraded to Partly Active in 2014.

MU24/U – Shallow angle part of cliff formed in Oxford Clay much more vegetated and failure much more localised (Locally Active). August 2014.

MU24/V - is situated on a geological fault (Red Cliff Fault) indicated by thin white line. Mudslide source area outlined by thick white dashed line. August 2014.



MU24/V - view from directly above the mudlside (Partly Active). August 2014.

MU24/W – Upgraded to Partly Active due to recent failures of the headscarp. August 2014.

Unit MU25/X is classified as Partly Active in 2014, unchanged since 2012. Despite being well vegetated, the slopes of this unit appear to be subject to ongoing instability, with evidence of mudsliding and recession at the headscarp.

Units MU25/Y and MU25/Z are located at the northwest end of Gristhorpe Cliff and are classified as Partly Active. These units are characterised by numerous areas of activity, with headscarp recession, slumps in the mid-slope and on-going erosion of the toe.

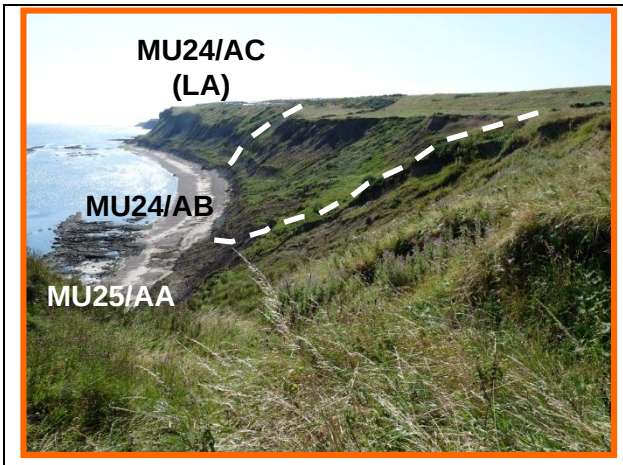
Unit MU25/AA In 2012, previously identified mudslide activity was less marked than in earlier surveys and the unit was downgraded from Totally Active to Partly Active. The soft till cliff continues to erode at the headscarp with slumping and sliding mid-slope. Marine erosion is apparent at the cliff toe and therefore a Partly Active status has been retained in 2014.

MU25/X - Relatively well vegetated instability in the upper cliff (Partly Active). August 2014.

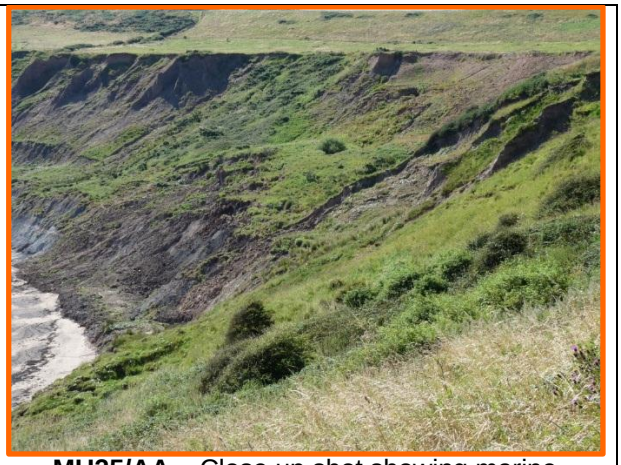
MU25/Y Headscarp recession and mid-slope activity (Partly Active). August 2014.

MU25/Y – Large Mudslide Scarp. (Partly Active). August 2014.

MU24/Z This feature was also present in 2012. Partly Active. August 2014.



MU25/AA, MU25/AB (Partly Active) **and MU25/C** Locally Active **–** Wide view of units. Note that lower cliff in MU25C has well vegetated lower cliff with limited marine erosion. August 2014.



MU25/AA – Close up shot showing marine erosion and mudsliding (Partly Active). August 2014.

Units MU25/AB and MU25/AC form the main part of Gristhorpe Cliff and are adjacent to a caravan park. The upper cliff slopes are composed of soft glacial sediments and experience localised slumping, with headscarp recession. The face of the cliff is steeper with active erosion and formation of debris aprons. Unit **MU25/AB** is Partly Active, while **MU25/AC** is Locally Active. Neither unit has changed status since 2012.

Units MU25/AD and MU25/AE are similar in form to adjacent units MU25/AB and AC. There is some erosion of the headscarp and localised areas of more intense erosion on the lower slopes. These units are classified as Locally Active in 2014, unchanged since 2012.

MU25/AD Erosion affecting the top of the cliff (Locally Active). August 2014.

Coast Protection Asset Condition Assessment
There are no coastal assets within this Management Unit.

3.23 Management Unit 26 – Newbiggin Cliff and North Cliff

Coastal Slope Condition Assessment
This Management Unit comprises **unit MU26/AF** in the northwest **to unit MU26/AX** just to the west of Filey Brigg (Appendix A, Map 8).

Units MU26/AF, MU26/AG and MU26/AH are located at The Wyke, to the west of Newbiggin Cliff and are all classified as Locally Active in 2014, unchanged since 2012. These units are characterised by a soft till overlying resistant rock cliff that is fronted by a debris apron. There is minor, localised activity within the till capping including recession of the headscarp in places.

The rock cliff is largely stable, but the debris apron shows evidence for recent rock falls and is subjected to marine erosion.

Units MU26/AI and MU26/AJ, form the western part of Newbiggin Cliff and are both classified as Partly Active in 2014, unchanged since 2012. These units are of a similar form to the adjacent Locally Active units, described above. However, they are characterised by a greater level of activity within both the upper and lower cliff layers and less continuous vegetation cover.

MU26/AK and MU26/AL were downgraded from Partly Active to Locally Active in 2012. Both units are heavily vegetated and stable, although not as well protected by a debris apron at the cliff toe as MU26/AM to the east and retain a Locally Active status in 2014.

MU26/AG Very well vegetated at the cliff top (Locally Active). August 2014.

MU26/AH The soft upper layer of this unit (Locally Active). August 2014.

MU26/AI, AJ (Partly Active), AK, AL and AM (Locally Active) – nearer units show evidence of recent mudsliding in the softer overlying glacial sediments and furthest unit has debris apron protecting the base of the cliff from marine erosion which is not present in MU26/K and MU26/L. August 2014.

Units MU26/AM, MU26/AN and MU26/AO form the main part of Newbiggin Cliff and are classified as Locally Active in 2014, unchanged since 2012. These cliffs are again characterised by a soft upper layer, a hard rock middle layer and series of debris cones at the unit base. There is localised activity within these units, especially within the soft upper layer.

Unit MU26/AP was classified Partly Active in 2012. However, there was no distinct difference noted between this unit and those also classified as Locally Active during the 2014 survey and has therefore been downgraded to Locally Active in 2014.

Unit MU26/AQ was downgraded to Locally Active in the 2012 walkover survey. However, failures in much of the upper cliff were noted during the 2014 survey and has therefore returned to Partly Active during the 2014 survey. There is vegetation on the upper and the talus slopes but the cliff face is exposed and eroding.

Unit MU26/AR shows few signs of instability in the upper cliff and has been assigned locally active status in the 2014 survey, unchanged since 2012.

Units MU26/AS and MU26/AT have been assigned a status of Partly Active in 2014 due to recent failures in the soft glacial sediment which forms the upper cliff**.** This is not a change in status for MU26/AS but is an upgrade for MU26/AT which was classified as Locally Active in 2012. **MU26/AU to MU26/AY** form the main part of North Cliff and all units have been assigned the Locally Active status during the 2014 walkover, which is no change in status from the 2012 survey. The upper part of the cliffs, comprised of soft glacial sediment is exhibiting localised erosion in the form of headscarp recession and mud sliding. There is localised marine erosion of the toe.

MU26/AN Locally Active. August 2014.

MU26/AQ Locally Active, with vegetated upper slopes. August 2014.

MU26/AS and AT Partly Active, with vegetated upper slopes. August 2014.

MU26/AW, AX and AY Little activity in the upper cliff (Locally Active). August 2014.

Coast Protection Asset Condition Assessment
There are no coastal assets within this Management Unit.

3.24 Management Unit 27 – Filey Brigg

Coastal Slope Condition Assessment
This Management Unit comprises **units MU27/AY to MU27/O** on the northern and southern sides Filey Brigg (Appendix A, Map 8).

Unit MU27/AY has a similar form to those units described in Management Unit 26, with till overlying rock cliffs and is classified as Locally Active in 2014. The upper slopes show intermittent zones of activity in the form of headscarp recession and rilling of exposed sediment. The classification is the same as in 2012 walkover surveys.

Unit MU27/AZ is very similar to unit MU27/AY. In 2012 it was classified as Partly Active. This is because the upper slopes showed more widespread activity and less continuous vegetation cover, but revegetation has occurred and the unit is classified as Locally Active in 2014.

Unit MU27/BA was classified Partly Active in the 2012 survey. Comparison of 2014 photographs to those from 2012 indicate the level of activity remains similar and a status of Partly Active has still been retained. Shallow groundwater was noted to be seeping from the cliff after heavy convectional rainfall the previous day during the 2014 survey.

Units MU27/BB to MU27/BD are located on the northern side of Filey Brigg and are all Partly Active in 2014, no change from 2012. The upper slopes of these units support some discontinuous vegetation cover. Headscarp recession, localised mudslides and rilling are common in the upper till unit.

Unit MU27/BE and 27/BF are located on the northern side of Filey Brigg have previously been less active than adjacent units. However, much of the upper slopes were unvegetated and therefore both have been classified in 2014 as Partly Active and increase in status since 2012.

Units MU27/A and MU27/B are located at the tip of Filey Brigg, both are all classified as Partly Active in 2014. These units are composed entirely of the soft glacial material which is particularly susceptible to erosion. There is frequent mud sliding within these units. The classification of these units is unchanged from the 2012 survey.

Units MU27/C to MU27/G are located on the south side of Filey Brigg towards its tip. The south side of the Brigg has a thicker cover of till than the north side, due to the southerly dip of the bedrock. These units support much more continuous vegetation cover than those units on the north side of the Brigg. All units are classified as Locally Active in 2014, unchanged since 2012. There is localised activity mid-slope and erosion of the unit toes resulting result from marine action.

MU27H to MU27/J are located in the central part of the south side of Filey Brigg and bear some vegetation but are predominantly unvegetated, increasingly so towards the western (landward) end of the Brigg. These units are all classified as Partly Active in 2014 – this is an increase in status from 2012 for MU27/H to MU27/I, which were previously classified as Locally Active.

Units MU27/K and MU27/O are also located on the south side of the Brigg at its western (landward) end. These units are undergoing intense erosion down much of their length and are therefore classified as Totally Active. In previous surveys some of units MU27/K and MU27/O were classified as Partly Active.

MU27/AZ Well vegetated upper slopes (Locally Active and Partly Active). August 2014.

MU27/BA A failure which was beginning to stabilise in 2012 (Partly Active). August 2014.

MU27/BA – Very similar in 2014 with little more revegetation and evidence of seepage from the cliff face (Partly Active). August 2014.

MU27/BB Mass failure of upper layer in 2012 (Party Active)

MU27/BB – Similar levels of activity in 2014 (Partly Active)

MU27/BC Slumping, sliding and rilling (Partly Active). August 2014.

MU27/BC - Slightly increased levels of activity in 2014 (Partly Active). August 2014.

MU27/BD Substantial activity in the soft glacial sediments which form the greater proportion of the cliff
(Partly Active)

MU27/BE The vegetated slopes increased signs of failure relative to 2012 (Partly Active). August 2014.

MU27/BF (near) **and A** (distance) - Relatively well vegetated but evidence of failure (Locally Active). August 2014.

MU27/B Ongoing erosion (Partly Active). August 2014.

MU27/C to J Varying levels of vegetated upper slopes on the south side of Filey Brigg (Locally Active and Partly Active). August 2014.

MU27/K to MU27/O Continuing denudation of Filey Brigg, with gullies and mudslides evident in the thick glacial sediments (Totally Active). August 2014.

Coast Protection Asset Condition Assessment
There are no formal coast protection structures in this unit. However, at the East end of Filey Brigg a cabin structure and wall exists tucked away against the cliffs. The structure comprises of a blockwork wall, poured concrete apron and blockwork cabin build onto the cliff strata. The previous inspection noted that undercutting is occurring to the apron as well as washout of the joints to the wall, the cabin is in structurally sound condition. Access is restricted due to the eroded path leading to the asset and as it is not a formal coast protection asset and as in 2012 inspections it was not inspected in the 2014 asset inspections.

3.25 Management Unit 28 – Filey Bay North

Coastal Slope Condition Assessment
This Management Unit is divided into 2 Sub-Management Units (Appendix A, Map 8):

Mu28A – North of Filey Town
This Sub-Management Unit consists of **units MU27/O to MU27/X**, located to the north of Filey town.

Unit MU27/O has been described above as Totally Active.

Units MU27/P to MU27/S are situated below the North Cliff Country Park. These cliffs are composed of glacial sediment and are undergoing erosion down much of their length and were classified as Partly Active in 2012, with the exception of **MU27/R**. However, during the 2014 survey MU27/R has also been upgraded to Partly Active as all units in this section show evidence of similar activity. Erosion is particularly intense at the steep unit toe where the cliffs are subject to marine action. Upslope, there is greater vegetation cover but still with areas of sliding, cracking and recession at the unit heads.

Units MU27/T and MU27/U are located in the vicinity of Filey sailing club and were classified in 2012 as Locally Active. These units are better vegetated than those Partly Active units to the north, yet feature localised common areas of erosion, particularly at the toe. Both were

upgraded to Partly Active status during the December 2013 survey. MU27/T has retained this status as toe erosion is consistent throughout the section and there is evidence of instability in the upper slopes, but MU27/U has been downgraded to Locally Active as there activity is not widespread.

Unit MU27/V, is located just south of the sailing club. The unit was classified as Partly Active again in 2014 because a mudslide incorporating the whole height of the cliff that was first identified during the December 2013 survey was present.

Units MU27/W and MU27/X lie immediately north of Filey town. Vegetation cover of these units is variable, with localised areas of activity throughout. There is ongoing recession at the headscarp and erosion of the toe by marine activity. MU27/W was upgraded to Partly Active status during the December 2013 survey due to there being widespread toe erosion and signs of instability further up the slope. MU27/X retains a Locally Active status in 2014 due to there being erosion and signs of instability at the undefended northerly end of the unit.

MU27/O to MU27/S Intense erosion (Partly Active)**.** August 2014.

MU27/T Filey sailing club (Partly Active). August 2014.

MU27/U Slopes around Filey sailing club (Partly Active). August 2014.

MU27/V Mudslide encompassing the whole height of the cliff with debris lobe on the beach (Partly Active). August 2014.

MU27/V and Toe erosion throughout section and numerous instability features in the mid and upper slopes (Partly Active)**.** August 2014.

MU26/X - Slopes in this unit show some evidence of instability at their northern end beyond the extent of the Coble Landing sea defences. August 2014.

Mu28B – Filey Town Frontage
This Sub-Management Unit consists of **units MU28/Y and MU28/Z** at Filey town.

Much of the town frontage lies within **unit MU28/Y**. This unit has retained its Inactive status in 2014 as it is well defended at the toe and it is very much a relict cliff, although in December 2013 indications of minor slope movements were identified in the landscaped gardens in this unit.

Unit MU28/Z is located at the southern end of Filey Town and is also classified as Inactive in 2014. Inactive status has been retained as only limited signs of instability (such as off-horizontal steps) were noted in December 2013.

MU28/Y - The northern part of Filey town's frontage does not show any signs of slope failure (Inactive). August 2014.

MU28/Z – The southern part of Filey town's frontage does not show any signs of failure (Inactive). August 2014.

Coast Protection Asset Condition Assessment

Mu28A – North of Filey Town *(Appendix B Map 7)*

To the north of the town, Filey Sailing Club is located at the back of the beach and is partly protected by some coastal defences. The section of cliff below the boat park (which is located on a terrace part way up the cliff) north of the club building is undefended. In 2012 the eroding face was littered with geotextile debris from previous slope stabilisation works that have failed, see below left.

Immediately north of the Sailing Club piled defences there was formerly a defence structure (Asset Ref. 1221D901D1601C02) that consisted of timber breastwork retaining rock armour. This defence failed prior to 2012 and as reported in 2012 it is now totally ineffective with debris scattered on the beach, see photo below top right.

Eroding cliff at sailing club boat park.
Photo August 2014.
(Asset Ref. 1221D901D1601C01)

Debris from failed defence and former slope stabilisation at Sailing Club
Photo 26/09/14 (Asset Ref. 1221D901D1601C02)

View of sheet piling below Sailing Club house from north.
(Asset Ref. 1221D901D1601C03)

Centre section of sheet piling below Sailing Club house in failed condition.
(Asset Ref. 1221D901D1601C03)

Newer section of sheet piling at Sailing Club ramp in centre of photo.
(Asset Ref. 1221D901D1601C03)

Slipway to south side of sailing club
(Asset Ref. 1221D901D1601C03)

The piles at the northern end of the Sailing Club (Asset Ref. 1221D901D1601C03) show surface corrosion but, as reported in 2012 they are generally in a sound condition. The central section of piles were noted to be are badly corroded with large holes and in need of repair in 2012 and they have further deteriorated, see photo above centre right. The southern section of piles at the side of the concrete slipway giving access to the beach to the south were replaced between 2009 and 2012 and as reported in 2012 these piles show surface corrosion but are generally sound. The natural accumulation of pebbles in front of the structures inevitably leads to abrasion damage so this must be an ongoing problem. Minor repair work is needed to the slipway where there are cracks between construction slabs.

Mu28B – Filey Town Frontage *(Appendix B Map 7)*
The Filey Town frontage is protected by a sea wall just over 1km in length between Cobble Landing in the north and Martin's Gill at the south and is split into 9 asset lengths. The sea wall is generally in fair condition although it shows evidence of minor, localised defects including cracks and chipping within the capping beam, surface erosion and mortar loss. There have been a significant number of repairs and maintenance works to the defences since 2012 that have dealt with many of the more significant defects that were identified previously. The description of the inspection runs from north to south.

The most northerly asset in the defence system consists of the rear wall and slipway at Cobble landing (Asset Ref. 1221D901D1602C01). The slipway blockwork appeared in good condition with the washed out joints and missing mortar noted in 2012 having been repaired. As noted in 2012 the rear wall below the chalets has a long horizontal crack in the wall and a void in centre of wall near the ramp at the north end of chalets.

Rear wall set back behind slipway at Cobble Landing (Asset Ref. 1221D901D1602C01)

Missing grout in sections of cobbles in slipway (Asset Ref. 1221D901D1602C01)

Between the northern slipway at Cobble Landing and the slipway at the end of Ravine Road the seawall is split into two assets. The northern asset, 1221D901D1602C09, is essentially a breakwater or wing wall protecting the slipway. In 2009 and 2012 this section of wall was in poor condition and in need of repair with a major crack and section of loose blocks, see photo below left. This section of wall has been repaired and the overall asset condition has been improved to fair, see below right. The beach levels were higher than in 2012 and the toe apron which was noted to be undercut in 2012 was not visible at the time of the 2014 inspection.

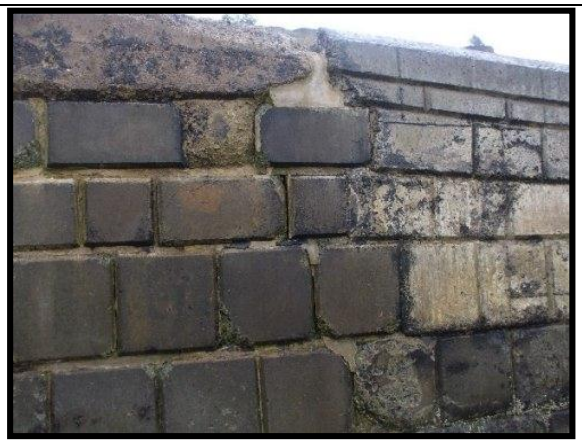


Photo from 2009 inspection of crack at Cobble Landing – (Asset Ref. 1221D901D1602C09)

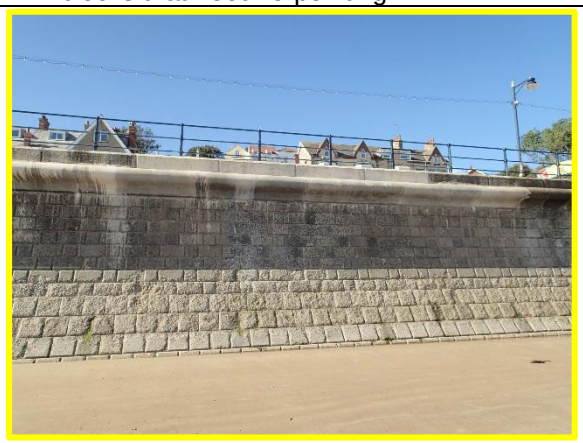
Repaired section of wall adjacent to slipway 26/09/2014.
(Asset Ref. 1221D901D1602C01)

The main part of the wall to the south, Asset ref. 1221D901D1602C06 is in fair overall condition, although there are areas of damage that have been previously repaired, see photos below. There cracks, washed out joints / missing mortar between the masonry blocks in several locations in the slipway / beach access ramp next to the car park.

Cracks in coping and damaged blocks at ramp with evidence of previous repairs. (Asset ref. 1221D901D1602C06)

Repaired section of blockwork facing. (Asset ref. 1221D901D1602C06)

The section of wall between Ravine Road and the access point east of Cargate Hill Road is Asset ref. 1221D901D1602C08. This section is in fair overall condition, although some blocks have abrasion damage to the front face, particularly just above beach level. Many of the bullnose splash coping blocks have been replaced, but others are cracked. The high beach level was covering some of the wall drainage flap valves that were noted to be partly covered with sand in the 2012 report. At both slipway access points there are open joints in the slipway blocks that need re-pointing.



View of wall showing repaired coping and wave return blocks and abrasion damage to blocks near beach level. (Asset Ref. 1221D901D1602C08)

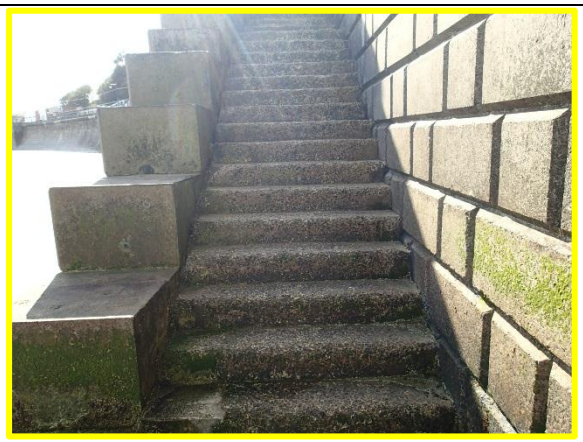
Pedestrian bridge at access slipway from Cargate Hill has been replaced. Open joints in slipway blocks need attention.
(Asset Ref. 1221D901D1602C08)

From the promenade pedestrian bridge at Cargate Hill to the next access point at Crescent Hill the wall (Asset Ref. 1221D901D1602C03) is in fair condition. There are several new or repaired coping splash beam blocks, but more are cracked. There are chipped / abraded areas of blocks with loss of face to many blocks throughout, particularly at lower levels at the south end. The south slipway has missing pointing in some joints and vegetation growing through that needs clearing. The hand rails are corroding at many of the joints and one section was broken and had been marked as a hazard with red and white tape. The upper coping near the handrail up-stands is chipped and damaged in many locations.

View of wall looking north from near Crescent Hill access, showing abraded lower facing blocks. (Asset Ref. 1221D901D1602C03)

Badly corroded handrails at repaired section of coping. (Asset Ref. 1221D901D1602C03)

The next defence asset to the south is the wall around the promontory, Royal Parade, Asset ref. 1221D901D1602C04. This section of wall is again in fair overall condition, although it is slightly more exposed to wave action than the wall to the north. There was noted to be evidence of repair to cracks/joints with mastic. Some of the faces of blocks in the main wall are damaged. The bottom access steps which, in 2012 were noted to be abraded, had been replaced, but the rest of the steps are also abrading and will require attention in future.



Exposed aggregate on access steps (Asset Ref. 1221D901D1602C04)

Lower steps have been replaced. (Asset Ref. 1221D901D1602C04)

The section of the wall between the two small promontories, Asset ref. 1221D901D1602C07 is again in fair condition. There is cracking to splash beam in several areas and numerous chipped / damaged blocks. There is cracking between the blocks and loose blocks in the buttress to the southern set of steps that needs attention.

Cracking and open joints between blocks at southern set of steps. (Asset Ref. 1221D901D1602C07)

General view of wall showing area of damaged blocks and previous repairs to coping / splash beam. (Asset ref. 1221D901D1602C07)

The southernmost section of the main wall including the southern promontory and the return section to Martin's Gill is Asset ref. 1221D901D1602C05 is again overall fair. However, there is chipping and cracking to the coping in small areas throughout length. Numerous lower blocks from beach level to 2m up are damaged on front face. The beach was slightly higher than in 2012. There is a horizontal crack on seaward section (photo below right) extending along 8 blocks (no change since 2012). The retaining wall to the slipway / beach access ramp, below left has cracking below the surface slab and the lower section of handrails is missing.

Ramp at south end of wall showing cracking in side wall and lower section of handrails missing. (Asset Ref. 1221D901D1602C05)

Horizontal crack in upper wall on southern promontory. (Asset Ref. 1221D901D1602C05)

A short section of rock revetment with gabion baskets beneath is located at the southern end of the seawall near Martin's Gill, (Asset Ref. 1221D901D1602C02). This defence extends into Sub-Management Unit Mu29A and is to manage the interface between the hard defences to the north and eroding natural cliff to the south. The gabions have been replaced and the rock armour was re-profiled after the 2012 inspections. However, the rock armouring has been damaged again with some units displaced, see photo below top right. The rock needs maintenance topping up with additional heavier rock units placed to a more stable profile.

General view of rock armour at interface with natural cliff. **Photo from 2012.**
(Asset Ref. 1221D901D1602C02)

General view of rock armour at interface with natural cliff showing repaired or replaced gabions and re-profiled rock armour, which is again showing signs of displacement.
Photo 26/09/2014
(Asset Ref. 1221D901D1602C02)

Gabion and rock defence with slumping cliff behind. (Asset Ref. 1221D901D1602C02)

3.26 Management Unit 29 – Filey Bay

Coastal Slope Condition Assessment
This Management Unit is divided into three smaller Sub-Management Units, as follows (appendix A, Maps 8 and 9):

Mu29A – Muston Sands
This Sub-Management Unit comprises **units MU29/AA to MU29/AI** along Muston Sands..

Units MU29/AA and MU29/AB are located immediately south of Filey town and are classified as Partly Active in 2014, an upgrade since the 2012 survey but the same as during the post-surge survey in December 2013. Despite the presence of some rock armour protecting the toe of **unit MU29/AA**, there are very common areas of intense erosion and active recession of the

headscarp. **Unit MU29/AB** is not defended at the toe and is steep and undergoing active erosion as a result.

Units MU29/AC was upgraded to Partly Active following the December 2013 storm surge due to intense toe erosion, but has been downgraded back to Locally Active in the 2014 survey as this toe erosion does not appear to have caused any failure in the upper cliff which is still heavily vegetated.

MU29/AD, AE, AF, AG and AH were upgraded from Locally Active to Partly Active following the December 2013 storm surge and have retained this status as there is evidence that the toe erosion sustained during the storm surge is still causing failures to propagate further up the cliff.

MU29/AI is immediately north of Mile Haven and is classified as Locally Active in 2014, as it shows less activity than in the units to the north, but the differences between them are marginal.

MU29/AA Very common intense erosion and headscarp recession (Partly Active). August 2014.

MU29/AB Eroding toe and sliding mid-slope (Partly Active). August 2014.

MU29/AC Well vegetated with some toe erosion (Locally Active). August 2014.

MU29/AD Note propagation of failure to the midslope following winter toe erosion in left of photo (Locally Active). August 2014.

MU29/AE/AF Continuous toe and headscarp erosion (Partly Active). August 2014.

MU29/AF (middle distance), **AG** and **AH** (near) Consistent toe erosion and signs of failure higher up in the cliff (Partly Active). August 2014.

MU29/AI Locally steep and bare, but primarily vegetated (Locally Active). August 2014.

Mu29B – Hunmanby Sands

This Sub-Management Unit consists of **units MU29/AJ** at Mile Haven **to MU29/BE2** at Hunmanby Gap.

Unit MU29/AJ is a very small unit located immediately south of the inlet at Mile Haven. It is composed of similar material to those units in Sub-Management Unit Mu29A and has been downgraded in the 2014 survey from Partly Active to Locally Active. It is characterised by a receding cliff line, slumping and sliding mid-slope and erosion at the toe.

Units MU29/AK to MU29/AT comprise the area in and around the hamlet of Flat Cliffs, extending southwards to Butcher Haven. All units were classified as Locally Active in 2012, but, were upgraded to Partly Active following the December 2013 survey which identified comprehensive toe erosion arising from the storm surge event on 05 December 2013. **Units MU29/AK to MU29/AQ** have since been downgraded to a status of Locally Activity. The low lying cliffs are generally well vegetated with localised areas of erosion. **MU229/AR and MU29/AS** which comprise respectively the northern and southern parts of the Flat Cliffs settlement retain their Partly Active status. **MU29/AT**, like its counterparts to the north of Flat Cliffs has been downgraded to Locally Active in 2014.

MU29/BA is a small unit immediately to the south of Butcher Haven which has retained the Locally Active status it had been given both during the 2012 and December 2013 surveys.

Units MU29/BB to MU29/BE are located between Butcher Haven and Hunmanby Gap and are all classified as Partly Active, unchanged from 2012. These cliffs are generally steeper than those units further north and are characterised by headscarp recession and very common areas of intense erosion. The toes of these units are particularly active with slumping and sliding of materials onto the beach. None of these units have changed classification.

Unit MU29/BE2 is at Hunmanby Gap. The cliffs here are relatively shallow and well vegetated. There is localised erosion at the unit toe and some sliding and cracking mid-slope resulting in a classification of Locally Active, unchanged from 2012.

MU29/AJ Some erosion is evident but it is generally well vegetated (Locally Active). August 2014.

MU29/AK-AO Well-vegetated low lying cliffs, showing some, but not intense toe erosion (Locally Active). August 2014.

MU29/AP Continuing mudslide activity and toe erosion at Flat Cliffs (Locally Active). August 2014.

MU29/AR and AS Intense toe erosion at Flat Cliffs (Partly Active). August 2014.

MU29/AS Protruding pipe illustrating ongoing erosion in this unit (Partly Active). August 2014.

MU29/BA The small unit at Butcher Haven supports substantial vegetation on its upper slopes but is undergoing erosion at its toe. (Locally Active). August 2014.

MU29/BB and BE Steeper cliffs with very common areas of intense erosion (Partly Active). August 2014.

MU29/E2 and EF – Units immediately north of Hunmanby Gap. Erosion is taking place at the toe but is much less evident in the upper cliff than in the units immediately to the north. August 2014.

Mu29C – Reighton Sands

This Sub-Management Unit consists of **units MU29/BF** near Hunmanby Gap **to MU29/BQ** below Reighton Moor.

Units MU29/BF includes Hunmanby Gap itself. This unit is partly shielded from marine erosion by unit MU29/BG and is classified as Locally Active in 2014, unchanged from 2012.

MU29/BG to MU29/BJ are located south of Hunmanby Gap. These cliffs are steep and affected by intense erosion throughout most of their height. The headscarp is retreating and there is some slumping of materials onto the beach. MU/29BG to MU29/BH have been classified as Totally Active in 2014; this is an upgrade for all of these units except MU29/BG which was also classified as Totally Active in 2012.

Further south**, units MU29/BK to MU29/BQ** are located above Reighton Sands. All of the units are classified as Partly Active in 2014 and their status is unchanged from 2012, apart from **MU29/BN**, which was previously classified Locally Active. These units are characterised by steep slopes which support some vegetation cover. There is recession of the headscarp, common areas of intense erosion mid-slopes and a steep, eroding toe section.

MU29/BH Steep, intensely eroding cliffs (Totally Active). August 2014.

MU29/BJ (left of photo). Steep, intensely eroding cliffs (Totally Active). August 2014.

MU29/BK- BN Steep slopes with patchy vegetation cover (Partly Active). August 2014.

MU29/BO - BQ (Foreground) Intense erosion of the unit toes (Partly Active). August 2014.

Coast Protection Asset Condition Assessment
There are no formal coastal defence assets within Management Unit 29, although the rock revetment and baskets extend into this Sub-Management Unit from Mu28B. See the Coast Protection Asset Assessment section for Mu28B for details. There are no other coastal defence assets within this Sub-Management Unit.

3.27 Management Unit 30 – Filey Bay South

Coastal Slope Condition Assessment
This Management Unit is divided into two smaller Sub-Management Units: MU30A Reighton Gap and MU30B at Speeton Sands (Appendix A, Map 9).

Sub-Management Unit 30A is located beneath the Reighton Sands Holiday Village and consists of **units MU29/BR to MU29/CCa**.

Units MU29/BR, MU29/BS and MU29/CA form the majority of this Sub-Management Unit and were Partly Active during the 2014 walkover survey, unchanged from 2012. These units have a limited vegetation cover, and have active mudslides and toe erosion leading to headscarp recession and debris lobes on the beach.

Unit MU29/CB is at the eastern end of the holiday village. The entire unit shows evidence of mudsliding and an eroding headscarp. The unit was classified as Partly Active in 2012 and retains that status in 2014.

Unit MU29/CCa forms a shallow mudslide embayment. There is evidence of limited marine erosion at the toe but the majority of the slope sustains nascent vegetation indicating a degree of recent stability. The unit was upgraded from Locally Active to Totally Active in 2012, but in 2014 has been downgraded back to Partly Active.

MU29/BR (north) Active toe erosion (Partly Active). August 2014.

MU29/BR (south) Intense toe erosion (Partly Active). August 2014.

MU29/BS Active toe erosion (Partly Active). August 2014.

MU29/CA Active toe erosion (Partly Active). August 2014.

MU29/CB. Partly Active. August 2014.

MU29/CCa The mudslide system retains a similar for to previous inspections but is revegetating (Partly Active). August 2014.

Sub-Management Unit 30B comprises units MU29/CC to MU29/CJ above Speeton Sands.

Unit MU29/CC forms a large, shallow, well vegetated embayment known as Middle Cliff. There is localised activity at the unit head and mid-slope. The unit was classified as Partly Active in 2012 and has retained this status in 2014.

Unit MU29/CD forms another large shallow embayment which is also well vegetated in its upper part. Despite this though, activity at the toe is intense in the exposed grey clay deposits in the

lower cliff, from which large, recent block failures were observed during the 2014 survey. As a result this unit is classified as Partly Active, as it was in 2012.

Unit MU29/CE is similar in form to unit MU29/CC but is classified as Locally Active in 2012, unchanged from 2014. The slopes are well vegetated with dense trees and shrubs in places. Erosion at the toe is extends relatively high above the beach in places, but the upper slopes are well vegetated.

Units MU29/CF to MU29/CI are located at Speeton Cliffs and are all classified as Locally Active in 2014, unchanged from 2012. These units are characterised by outcrops of chalk near the unit toes which are actively eroding onto the beach below. In places the headscarp is near vertical and exposed.

The high chalk cliffs within unit **MU29/CJ** are much steeper than those to the north, with large mantles of slumped material at the unit toe. There is some evidence of rockfall and marine erosion at the cliff base but otherwise the cliffs appear fairly stable. Therefore, this unit has been classified as Locally Active in 2014, unchanged from 2012.

MU29/CC Northern part of unit showing erosion and mudsliding at Middle Cliff (Partly Active). August 2014.

MU29/CD Large, recent block failure of the Kimmeridge Clay cliff (Partly Active). August 2014.

MU29/CE Actively eroding cliff toe (Locally Active). August 2014.

MU29/CF Actively eroding cliff toe (Locally Active). August 2014.

	
MU29/CG Actively eroding cliff toe (Locally Active). August 2014.	**MU29/CH,I and J** Actively eroding cliff toe (Locally Active). August 2014.

Coast Protection Asset Condition Assessment
There are no coastal defence assets within this Management Unit

4 Comparison with Previous Assessments

4.1 Coastal Slope Condition Assessment

The change in condition of the cliffs is shown in Maps 1 to 11 in Appendix A. Areas of increased or sustained high levels of activity are summarised below:

Increased Activity
The majority (199 units) of the 265 units surveyed in the 2014 walkover retained the same activity status as they had in 2012. Five units had their classification changed from Partly Active to Totally Active between 2012 and 2014. These were all at Filey Brigg and Speeton Sands. Only one unit, MU24/B9 in Cayton Bay was increased from Locally Active in 2012 to Totally Active in 2014. This unit is at the toe of Tenants' Cliff, immediately north-west of the defended pumping station.

The most common change observed between 2012 and 2014 was reclassification from Locally Active to Partly Active; 43 units in total. 24 units were upgraded during the December 2013 inspection when widespread toe erosion due to the December 2013 storm surge was observed. However, 14 units which were observed to be totally active during the December 2013 survey were downgraded Locally Active during the 2014 inspection as activity had reduced. Areas where the activity classification has increased since the last survey (whether that was summer 2012 or December 2013), other than those described above, are:

- **MU 8/3** at Kettleness (Locally Active to Partly Active)
- **MU11/3** at Whitby West Cliff (Inactive to Locally Active)
- **MU17/6 and MU17/7** at the southern end of Robin Hoods Bay (Locally Active to Partly Active)
- **MU29/D2** – north of White Nab at the southern end of Scarborough South Bay (Locally Active to Partly Active)
- **MU23/I4 and MU23/J** – on the northern side of Knipe Point (Locally Active to Partly Active)
- **MU 24/B3 to MU24/B9** at the toe of Tenants Cliff in Cayton Bay (Locally Active to Partly Active).
- **MU24/C to MU24/G, MU24I, MU24K and MU24/L** all in the southern part of Cayton Bay (Locally Active to Partly Active)
- **MU25/W** at Lebberston Cliff/Red Point (Locally Active to Partly Active)
- **MU26/AQ, MU26/AS and MU26/AT** at North Cliff, Filey Field (Locally Active to Partly Active)
- **MU27/BE and MU27/BF** on the north side of Filey Brigg (Locally Active to Partly Active)
- **MU27/H and MU27/I** on the south side of Filey Brigg (Locally Active to Partly Active)
- **MU27/R** at North Cliff Country Park, Filey (Locally Active to Partly Active)
- **MU29/BH to MU29/BJ** (Partly Active to Totally Active) and **MU29/BN** (Locally Active to Partly Active) at Reighton Sands, just south of Hunmanby Gap

Notable areas of increased activity during the 2014 walkover survey, as in the 2012 survey are at Filey Bay and Cayton Bay.

Sustained High Activity
Sustained levels of high activity were observed at the following locations. These units were classified as Totally Active in 2009 and 2012 and 2014.

- Staithes (**MU4/1a and E60/1a**).The steep face of Cowbar Nab continues to be subject to large rockfall activity.
- Filey Brigg (**MU27/ L, M and N**) Three of the units show ongoing intense erosion and failure of the glacial sediments. There appears to be some slight expansion in both directions.
- Hunmanby Gap (**MU29/BG**): These steep cliffs are almost entirely affected by intense erosion and mudslides. This area of intense activity appears to expanded southwards into adjoining units in the most recent survey.

Additional areas of sustained high activity was noted at Upgang Beach, where active mudsliding is taking place in the till cliffs and rockfalls to the beach occur. Also, attention should be given

to Unit **MU15/2** at Far Jetticks (north of Robin Hood's Bay) where on-going landsliding threatens the Cleveland Way coast path.

4.2 Coast Protection Asset Condition Assessment

Generally, the condition of the defences has not changed dramatically since the 2009 inspection, with many just suffering from minor erosion. The maps in Appendix B show symbols on the assets that have a change in the overall condition grading. However, in many cases the changes that were noted are to localised sections or elements and have not changed the overall grading. Recent repair work was evident in a number of places and therefore some conditions of the defences improved, with upgraded residual life classification of 11-20 or >20 years. However, some defences where repair work has not taken place have deteriorated and are now in further need of repair. It is these assets which are highlighted below.

Mu4 – Staithes

There is little change since 2009 in the condition grading of the defences within Staithes harbour, with the overall classification ranging from fair to poor, with certain asset elements good or very poor. The rock armour to the breakwaters remains mostly in good condition but there has been damage and displacement of the crest rock armour units on the North Breakwater. Wave overtopping through the pedestrian access at the root of the north breakwater has also displaced armour at the north end of the revetment to the east end of Cowbar Nab. The sheet piling to the seaward end of the north breakwater remains significantly corroded and the breakwater may be voided below the low water line.

The rear harbour sea wall made from a mixture of concrete, blockwork and masonry materials backing on to residential properties (Asset Ref No. 1221D901D0402C22) has had a number of repairs since the last inspection, and its condition has been improved from poor to fair. Cracks, missing joints and voids to the centre parts of wall have all contributed to the down grading of the defence and the need of urgent repair. Undercutting to the toe of the wall is still evident in places.

Mu7 - Runswick Bay

Many of the defences along the sea front at Runswick Bay mostly remain in a similar or slightly worse condition to that reported by the previous inspections. The series of patchwork defences to the north of the old RNLI building exhibit a variety of defects which have continued to deteriorate despite repairs that have been undertaken after the December 2013 storm surge. The gravel and cobble beach was low and undermining and damage to the toe of the defences north of the old RNLI building were particularly evident. There are several large cracks in the walls and erosion and abrasion of the rocky foreshore is undercutting the foundations in several locations. It is understood that a coastal defence improvement scheme is under development for the northern defences, which will put rock armour protection in front of the wall, but the original seawall still needs to be repaired and undermining and voids dealt with before the rock armour is placed.

Mu9 – Sandsend Village

The defences at the south of Sandsend Village were badly damaged by the December 2013 storm surge event and temporary repairs have been undertaken to patch up the defences until a planned capital improvement scheme can be put in place. The temporary repairs are susceptible to normal wave action and so frequent inspection and repairs to hold the shoreline are required until the capital improvement scheme that is planned can be undertaken in the future. Some repair works have been undertaken to the defences to the north, including the large void at the slipway by the car park. However, the toe of the revetment around the car park at the north is exposed and undercut and the rock toe protection needs repositioning and topping up. The void under the toe apron of the section of wall with cantilevered footway was not visible, but is assumed to still require repair.

Mu11-13 - Whitby

The defences below Whitby Theatre have been downgraded to poor / very poor as the low beach levels have caused toe damage and undermining. This area is of particular concern as there have also been slips and falls to the near vertical cliff above the defences and below the foundations of the building above. Further west, the defences of West Cliff appear to be in a

generally good condition, but sections of the promenade in the west that do not have protective rock armour are suffering from toe scour.

As in 2012, the two breakwaters in Whitby (1221D901D0803C02 and 1221D901D0803C03) continue to show some signs of deformation as well as evidence of block displacement. Urgent repair works were undertaken to the south end of the eastern outer breakwater, in 2011/12 but further sections of sheet piling are known to be in poor condition.

There were broken / missing timber fenders on the quay 1221D901D0803C06 near the fuel berth. The damage has expanded since 2012 and it is recommended that the fenders should be replaced urgently to give protection to the piles supporting the quay.

The defences to the east of the harbour show more evidence of erosion and most assets show cracking and erosion or loss of joint material. The rock armour protecting the toe of the slope at the Haggerlythe, just south of the root of the East Pier has been further damaged and needs reprofiling and topping up with larger armour.

Mu16 – Robin Hood's Bay
Defences around the settlement of Robin Hood's Bay are in a similar state to that observed during previous surveys. The large vertical defence wall (Asset Ref. 1221D901D1003C02) continues to show deterioration with seepage and cracking. Erosion continues adjacent to the rock armour at the southern end of the Robin Hood's Bay Village and it is suggested that in future after further erosion the armour should be re-profiled to form a double sided structure similar to that at the north end of the large vertical seawall. Slumping debris from the cliffs has damaged the rock armour immediately south of the access ramp from the beach to the Quarterdeck and this will need re-profiling in future.

Mu20-21 – Scarborough North Bay
Defences here are generally in a similar state to when visited in 2012, although some major repairs have been undertaken and / or are underway to the large walls between Clarence Gardens South and Peasholm Gap, assets 1221D901D1201C08 and 1221D901D1201C21. Also, the rear grouted rubble revetment behind the promenade between Peasholm Gap and the Sealife Centre had been repaired. Continuing repair work to cracks, joint loss and toe damage is still needed in several areas.

The beach was low in front of the high sea walls at the south end of North Bay, and also at the Sealife Centre exposing the toe apron to wave damage and increasing deterioration of the walls which have a number of significant defects.

The rock armour and Accropode revetment with a raised concrete sea wall behind between the South end of Clarence gardens and the East Pier remains in good to fair condition. The small vertical cracks in the wave wall first noted in 2009 did not seem to have significantly changed.

Mu21-22 – Scarborough Harbour
A number of defects noted in the harbour in the 2012 inspection have had repairs. The loose stone steps on the inner face of East Pier had been repaired, although some of the joints were starting to wash out again. The toe of the inner face of East Pier has a number of washed out joints and voids that appear worse than in 2012 (Asset 1221D901D1301C16). The void observed in 2012 under the corroded steel sheet piles on the SE corner of the breakwater by the lighthouse has been repaired. The West Pier appears to be in the same condition as previously reported, with continuing corrosion to steel work, cracks and erosion in prominence (Asset Refs. 1221D901D1301C07 and 1221D901D1301C19).

Mu22-23 – Scarborough South Bay
There has been a continuing degradation of assets within this area since the previous inspection. Loss of joint material and full height cracks (Asset Ref. 1221D901D1301C09) are visible as well as severe erosion to the walls. At the Spa seawall there had been a number of repairs to storm damage that occurred during the December 2013 surge event, including rebuilding sections of the parapet wall. However, there are still numerous defects including undercutting to the toe apron, loose blocks in both main wall and crest wall, undermining of the toe, cracking and loss of front face. Despite a considerable number of repairs and

improvements to sections of the defences south of the Spa further regular work is needed to hold these aging defences. The wall around the site of the former South Bay Pool (Asset 1221D901D1303C02) is very exposed to waves and there were washed out joints with deep voids between the blockwork of the main wall that need urgent attention to prevent the damage spreading.

Mu24-25 – Cayton Bay
It appears that maintenance and repair to the private defences at the former pumping station have continued since the previous surveys. The defence structure at the public access point south of the former pumping station is in very poor / failed condition despite repairs having been undertaken to make it safer for public access. The length of defence immediately to the north has also failed and needs removal / making safe.

Mu28a-29a – Filey
The central section of the private defences at the sailing club are in very poor condition with large holes through the corroded and abraded piles and major voids beneath the promenade (Asset Ref. 1221D901D1601C03). The main defences through the town show evidence of significant maintenance and repair works over the last two years, dealing with many of the more significant defects reported in the last inspection including rebuilding of sections of wall, repointing and the replacement of coping stones. However ongoing repair work is required as there are a significant number of areas of minor damaged facing blocks.

The short section of rock armour and gabions at the south end 1221D901D1602C02 has been rebuilt, but subsequent storm damage has displaced some of the rocks and so further re-profiling and topping up of the rock armour is required.

5 Problems Encountered and Uncertainty in Analysis

Coastal Slope Condition Assessment
As in 2009, no significant problems were encountered in the 2012 Coastal Slope Condition Assessment. A limited view of the cliff was afforded at a small number of CBUs, but in all cases, sufficient lengths of the cliff could be seen to assess its condition.

Coast Protection Asset Assessment
Very few problems were encountered onsite during the Coast Protection Asset Assessment. Access issues presented the largest potential problem although most assets were located in public spaces and were easily accessible and access to private property was not an issue. Local tides predictions provided key information for the appropriate planning of each day's inspections. The toe of defence assets around Castle Cliff and Scarborough Harbour are constantly submerged and therefore an inspection of only the visible elements from land has been undertaken. This also applies to the breakwaters at Whitby and Staithes. High beach levels particularly in parts of Scarborough's North and South Bay Promenades prevented full inspections of the defences, therefore only visual inspections where possible. This problem was also encountered in the previous Halcrow 2012, 2009 and 2008 inspections.

Assets that proved difficult to inspect leading to uncertainty in analysis were those situated in a marginal or submarine environment throughout all tide conditions;

- Staithes outer parts of north and south breakwaters (1221D901D0403C01 and 1221D901D0403C03)
- Whitby offshore breakwaters (West/East) (1221D901D0803C01/C04)
- Whitby inner breakwater walls (West/East) (1221D901D0803C02/C03)
- Whitby Harbour LB – Fishing boat fuelling, docking area (1221D901D0803C06)
- All assets around Scarborough's Castle Cliff and Harbour

A future solution to this problem would be to undertake additional inspections using a boat. Although, obviously these areas are used by commercial boats and therefore access could be problematic. Furthermore, boat handlers may not want to work at close proximity to hard structures in a period of tide change and slack water may not give enough time to inspect assets properly. An alternative could be remote photography from a suspended or remote controlled camera. It would be necessary to consult the harbour master before any such work was undertaken.

6 Conclusions and Recommended Actions

Recommended Actions 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.

Areas of particular concern are as follows.

- **Staithes:** The cliffs at the end of Cowbar Nab continue to be Totally Active despite the defence of the toe. The continuation of activity at Staithes poses a risk to beach users and should be closely monitored.
- **Robin Hoods Bay:** There is a large overhang in MU16/1 to the north of the defended section of Robin Hoods Bay which is likely to collapse if marine erosion is allowed to continue. A large area of open tension cracks has been identified at Far Jetticks, to the north of Robin Hood's Bay and full failure of the cliff top here poses a danger to users of the Cleveland Way.
- **Cornelian Bay:** Activity at Cornelian Bay seems to be limited in comparison to previous surveys and there has been substantial revegetation of the mudslide headscarp. However, units at the toe on the north side of Knipe Point, Particularly MU23/I4, shows much activity and with further recession here upslope movements could recommence.
- **Tenant's Cliff (Cayton Bay):** The toe of Tenants Cliff has experienced substantial recent activity, particularly immediately to the north of the pumping station. Should this continue, there may be upslope movements at Tenants Cliff.
- **Filey Brigg:** Many units around the Brigg have shown sustained high levels of activity. Instability here poses a risk to walkers along the Brigg and beach users.
- **Flat Cliffs**: The toe of the Flat Cliffs landslide complex has experienced significant erosion which may lead to further upslope movements as support from the toe of the landslide is removed. Incipient movements and their relationship to rainfall and groundwater conditions should be monitored.
- **Hunmanby Gap:** Several units immediately to the south of Hunmanby Gap have been upgraded to Totally Active. A ravine separates these cliff units from housing, so there are unlikely to be short-term consequences of this activity, but the ongoing recession of these units should be given specific attention in future surveys.

Recommended Actions 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 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 SANDS database NFCDD asset inspection records for each area.

The next set of strategic inspections of the whole coast will be during the next phase of the regional monitoring programme and are provisionally expected to take place in 2016.

Appendix A

Coastal Slope Condition and Change

UNIT	2002	2005	2008	2009	2012	2013 post-surge	2014
MU4/1b	Dormant	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active
MU4/2	Dormant	Locally Active	Locally active	Locally Active	Partly Active	Partly Active	Locally Active
MU4/3	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active
MU5/1	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU6/1	Partly Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU6/2	Totally Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active
MU6/3	Dormant	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU6/4	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU6/5	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU6/6	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU6/7	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU6/8	Partly Active	Locally Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active
MU7/1	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Dormant
MU7/2	Inactive	Locally Active	Inactive	Inactive	Inactive	Locally Active	Locally Active
MU7/3	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Locally Active
MU7/4	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU8/1	Totally Active	Locally Active	Locally active	Locally Active	Partly Active	Not Inspected	Partly Active
MU8/2	Inactive	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU8/3	Totally Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Partly Active
MU8/4	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU8/5	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU8/6	Partly Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU8/7	Inactive	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU8/8	Inactive	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU8/9	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active

UNIT	2002	2005	2008	2009	2012	2013 post-surge	2014
MU8/10	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU8/11	Partly Active	Locally Active	Locally active	Partly Active	Partly Active	Not Inspected	Partly Active
MU8/12	Partly Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU8/13	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU8/14	Totally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU8/15	Totally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU9/1	Dormant	Dormant	Dormant	Dormant	Dormant	Dormant	Dormant
MU9/2	Dormant	Dormant	Dormant	Dormant	Dormant	Dormant	Dormant
MU9/3	Inactive	Partly Active	Partly Active	Partly Active	Locally Active	Locally Active	Locally Active
MU9/4	Inactive	Partly Active	Locally active	Locally Active	Locally Active	Locally Active	Locally Active
MU10/1	Partly Active	Locally Active	Inactive	Inactive	Inactive	Locally Active	Locally Active
MU10/2	Totally Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active
MU11/1	Dormant	Locally Active	Inactive	Inactive	Inactive	Locally Active	Locally Active
MU11/2	Inactive	Locally Active	Locally active	Locally Active	Inactive	Locally Active	Locally Active
MU11/3	Dormant	Locally Active	Inactive	Inactive	Inactive	Inactive	Locally Active
MU11/4	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Locally Active	Locally Active
MU12/1	Dormant	Locally Active	Locally active	Locally Active	Locally Active	Locally Active	Locally Active
MU12/2	Inactive	Locally Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active
MU13/1	Totally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU13/2	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU13/3	Totally Active	Partly Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU13/4	Partly Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active
MU13/5	Partly Active	Locally Active	Locally active	Locally Active	Partly Active	Not Inspected	Locally Active
MU13/6	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU14/1	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU15/1	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU15/2	Partly Active	Totally Active	Totally Active	Totally Active	Partly Active	Not Inspected	Partly Active

UNIT	2002	2005	2008	2009	2012	2013 post-surge	2014
MU15/3	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU15/4	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU16/1	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active
MU16/2	Dormant	Dormant	Dormant	Dormant	Dormant	Locally Active	Locally Active
MU16/3	Dormant	Dormant	Dormant	Dormant	Dormant	Dormant	Dormant
MU17/1	Dormant	Partly Active	Inactive	Inactive	Inactive	Inactive	Dormant
MU17/2	Partly Active	Partly Active	Locally active	Locally Active	Partly Active	Partly Active	Partly Active
MU17/3	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU17/4	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU17/5	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU17/6	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU17/7	Partly Active	Partly Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU17/8	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU17/9	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU18/1	Inactive	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU18/2	Inactive	Locally Active	Inactive	Inactive	Inactive	Not Inspected	Inactive
MU18/3	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU18/4	Inactive	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU19/1	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU19/2	Partly Active	Partly Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU19/3	Inactive	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU19/4	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU19/5	Partly Active	Partly Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU19/6	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU19/7	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU19/8	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU19/9	Totally Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active

UNIT	2002	2005	2008	2009	2012	2013 post-surge	2014
MU19/10	Totally Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active
MU19/11	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Partly Active
MU20/1	Dormant	Dormant	Dormant	Dormant	Dormant	Dormant	Dormant
MU20/2	Dormant	Dormant	Dormant	Dormant	Dormant	Dormant	Dormant
MU20/3	Inactive	Dormant	Dormant	Dormant	Dormant	Dormant	Dormant
MU20/4a	Inactive	Locally Active	Inactive	Inactive	Inactive	Inactive	Inactive
MU20/4b	Inactive	Locally Active	Locally active	Locally Active	Inactive	Inactive	Inactive
MU21/1	Inactive	Locally Active	Locally active	Inactive	Inactive	Inactive	Inactive
MU21/2	Dormant	Locally Active	Locally active	Locally Active	Locally Active	Locally Active	Locally Active
MU22/1	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
MU22/2	Dormant	Locally Active	Locally active	Locally Active	Inactive	Inactive	Inactive
MU22/3	Inactive	Locally Active	Inactive	Inactive	Inactive	Inactive	Inactive
MU22/4	Inactive	Locally Active	Inactive	Inactive	Inactive	Inactive	Inactive
MU22/5	Inactive	Locally Active	Inactive	Inactive	Inactive	Inactive	Inactive
MU22/6	Inactive	Locally Active	Locally active	Locally Active	Inactive	Inactive	Inactive
MU22/7	Inactive	Locally Active	Inactive	Inactive	Inactive	Inactive	Inactive
MU22/8	Dormant	Locally Active	Locally active	Locally Active	Locally Active	Locally Active	Locally Active
MU23/A	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active
MU23/B	Partly Active	Partly Active	Locally active	Locally Active	Partly Active	Not Inspected	Partly Active
MU23/C	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Locally Active	Locally Active
MU23/D1	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU23/D2	Partly Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Partly Active
MU23/D3	Totally Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Partly Active
MU23/E	Locally Active	Partly Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU23/F	Locally Active	Partly Active	Inactive	Inactive	Inactive	Not Inspected	Inactive
MU23/G1	Partly Active	Totally Active	Locally active	Partly Active	Partly Active	Not Inspected	Partly Active
MU23/G2	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active

UNIT	2002	2005	2008	2009	2012	2013 post-surge	2014
MU23/H	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU23/H1	Locally Active	Totally Active	Totally Active	Totally Active	Partly Active	Not Inspected	Partly Active
MU23/H2a	Partly Active	Totally Active	Totally Active	Totally Active	Partly Active	Not Inspected	Partly Active
MU23/H2b	Partly Active	Totally Active	Totally Active	Totally Active	Locally Active	Not Inspected	Partly Active
MU23/H2	Locally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU23/I	Locally Active	Locally Active	Locally active	Partly Active	Partly Active	Not Inspected	Locally Active
MU23/I1	Locally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Locally Active
MU23/I2	Locally Active	Partly Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU23/I3	Partly Active	Partly Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU23/I4	Partly Active	Partly Active	Totally Active	Totally Active	Locally Active	Not Inspected	Partly Active
MU23/J	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU24/A	Locally Active	Locally Active	Totally Active	Partly Active	Locally Active	Locally Active	Locally Active
MU24/A7	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU24/A8	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU24/B	Inactive	Inactive	Inactive	Inactive	Inactive	Not Inspected	Inactive
MU24/B1	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU24/B10	Inactive	Locally Active	Locally active	Inactive	Locally Active	Not Inspected	Inactive
MU24/B2	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU24/B3	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU24/B4	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU24/B5	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU24/B6	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU24/B7	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU24/B8	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU24/B9	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Totally Active
MU24/C	Locally Active	Locally Active	Locally active	Partly Active	Locally Active	Not Inspected	Partly Active
MU24/D	Locally Active	Locally Active	Locally active	Partly Active	Locally Active	Not Inspected	Partly Active

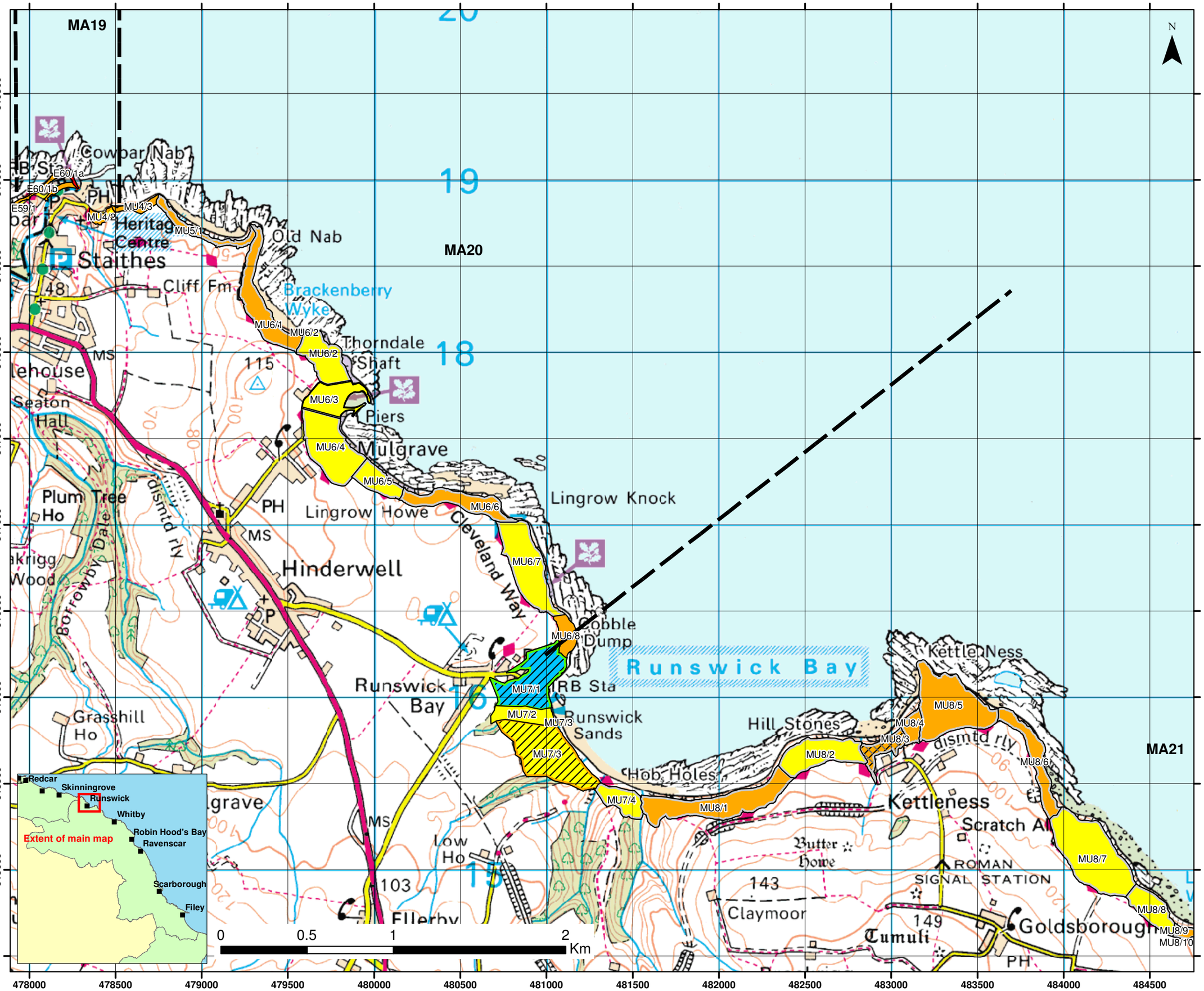
UNIT	2002	2005	2008	2009	2012	2013 post-surge	2014
MU24/E	Locally Active	Locally Active	Partly Active	Partly Active	Locally Active	Not Inspected	Partly Active
MU24/F	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU24/G	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU24/H	Locally Active	Locally Active	Inactive	Inactive	Inactive	Not Inspected	Inactive
MU24/I	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU24/J	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU24/K	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU24/L	Locally Active	Partly Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU24/M1	Locally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU24/M2	Dormant	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU24/N	Locally Active	Partly Active	Totally Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU24/O	Locally Active	Partly Active	Partly Active	Totally Active	Partly Active	Not Inspected	Partly Active
MU24/P	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU24/Q	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU24/R	Locally Active	Locally Active	Locally active	Partly Active	Partly Active	Not Inspected	Partly Active
MU24/S	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU25/AA	Locally Active	Partly Active	Partly Active	Totally Active	Partly Active	Not Inspected	Partly Active
MU25/AB	Locally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU25/AC	Locally Active	Locally Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active
MU25/AD	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU25/AE	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU25/T	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU25/U	Locally Active	Locally Active	Partly Active	Locally Active	Locally Active	Not Inspected	Locally Active
MU25/V	Locally Active	Partly Active	Locally active	Totally Active	Partly Active	Not Inspected	Partly Active
MU25/W	Locally Active	Locally Active	Totally Active	Locally Active	Locally Active	Not Inspected	Partly Active
MU25/X	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU25/Y	Locally Active	Locally Active	Locally active	Locally Active	Partly Active	Not Inspected	Partly Active

UNIT	2002	2005	2008	2009	2012	2013 post-surge	2014
MU25/Z	Locally Active	Locally Active	Locally active	Locally Active	Partly Active	Not Inspected	Partly Active
MU26/AF	Locally Active	Locally Active	Locally active	Locally Active	Locally active	Not Inspected	Locally Active
MU26/AG	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU26/AH	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU26/AI	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU26/AJ	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU26/AK	Locally Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active
MU26/AL	Locally Active	Locally Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active
MU26/AM	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU26/AN	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU26/AO	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU26/AP	Locally Active	Locally Active	Locally active	Partly Active	Partly Active	Not Inspected	Locally Active
MU26/AQ	Partly Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Partly Active
MU26/AR	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU26/AS	Locally Active	Locally Active	Locally active	Locally Active	Partly Active	Not Inspected	Partly Active
MU26/AT	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU26/AU	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU26/AV	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU26/AW	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU26/AX	Locally Active	Locally Active	Partly Active	Locally Active	Locally Active	Not Inspected	Locally Active
MU27/A	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU27/AY	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU27/AZ	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Locally Active
MU27/B	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU27/BA	Locally Active	Totally Active	Totally Active	Totally Active	Partly Active	Not Inspected	Partly Active
MU27/BB	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU27/BC	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active

UNIT	2002	2005	2008	2009	2012	2013 post-surge	2014
MU27/BD	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU27/BE	Locally Active	Locally Active	Partly Active	Partly Active	Locally Active	Not Inspected	Partly Active
MU27/BF	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU27/C	Partly Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active
MU27/D	Totally Active	Totally Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active
MU27/E	Partly Active	Partly Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU27/F	Partly Active	Partly Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU27/G	Totally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU27/H	Partly Active	Partly Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU27/I	Partly Active	Partly Active	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active
MU27/J	Totally Active	Partly Active	Locally active	Partly Active	Partly Active	Not Inspected	Partly Active
MU27/K	Totally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Totally Active
MU27/L	Totally Active	Totally Active	Totally Active	Totally Active	Totally Active	Not Inspected	Totally Active
MU27/M	Totally Active	Totally Active	Totally Active	Totally Active	Totally Active	Not Inspected	Totally Active
MU27/N	Partly Active	Totally Active	Totally Active	Totally Active	Totally Active	Not Inspected	Totally Active
MU27/O	Totally Active	Partly Active	Totally Active	Totally Active	Partly Active	Not Inspected	Totally Active
MU27/P	Totally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU27/Q	Totally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU27/R	Locally Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Partly Active
MU27/S	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU27/T	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Partly Active
MU27/U	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Locally Active
MU27/V	Totally Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active
MU27/W	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Partly Active
MU27/X	Dormant	Locally Active	Locally active	Locally Active	Locally Active	Locally Active	Locally Active
MU28/Y	Dormant	Dormant	Inactive	Inactive	Inactive	Inactive	Inactive
MU28/Z	Dormant	Dormant	Locally active	Locally Active	Inactive	Inactive	Inactive

UNIT	2002	2005	2008	2009	2012	2013 post-surge	2014
MU29/AA	Partly Active	Locally Active	Partly Active	Partly Active	Locally Active	Partly Active	Partly Active
MU29/AB	Locally Active	Locally Active	Partly Active	Partly Active	Locally Active	Partly Active	Partly Active
MU29/AC	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Locally Active
MU29/AD	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Partly Active
MU29/AE	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Partly Active
MU29/AF	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Partly Active
MU29/AG	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Partly Active
MU29/AH	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Partly Active
MU29/AI	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Locally Active
MU29/AJ	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Locally Active
MU29/AK	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Locally Active
MU29/AL	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Locally Active
MU29/AM	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Locally Active
MU29/AN	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Locally Active
MU29/AO	Locally Active	Locally Active	Locally active	Partly Active	Locally Active	Partly Active	Locally Active
MU29/AP	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Locally Active
MU29/AQ	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Locally Active
MU29/AR	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Partly Active
MU29/AS	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Partly Active
MU29/AT	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Partly Active	Locally Active
MU29/BA	Partly Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU29/BB	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/BC	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/BD	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/BE	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/BE2	New Unit in 2009	New Unit in 2009	New Unit in 2009	Locally Active	Locally Active	Not Inspected	Locally Active

UNIT	2002	2005	2008	2009	2012	2013 post-surge	2014
MU29/BF	Partly Active	Totally Active	Totally Active	Totally Active	Locally Active	Not Inspected	Locally Active
MU29/BG	Partly Active	Totally Active	Totally Active	Totally Active	Totally Active	Not Inspected	Totally Active
MU29/BH	Partly Active	Totally Active	Totally Active	Totally Active	Partly Active	Not Inspected	Totally Active
MU29/BI	Partly Active	Partly Active	Totally Active	Partly Active	Partly Active	Not Inspected	Totally Active
MU29/BJ	Locally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Totally Active
MU29/BK	Locally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/BL	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/BM	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/BN	Locally Active	Locally Active	Partly Active	Partly Active	Locally Active	Not Inspected	Partly Active
MU29/BO	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/BP	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/BQ	Locally Active	Locally Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/BR	Locally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/BS	Locally Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/CA	Partly Active	Partly Active	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/CB	Partly Active	Partly Active	Totally Active	Totally Active	Partly Active	Not Inspected	Partly Active
MU29/CC	Locally Active	Totally Active	Locally active	Locally Active	Partly Active	Not Inspected	Partly Active
MU29/CCa	Locally Active	Partly Active	Locally active	Locally Active	Totally Active	Not Inspected	Partly Active
MU29/CD	Locally Active	Locally Active	Locally active	Partly Active	Partly Active	Not Inspected	Partly Active
MU29/CE	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active
MU29/CF	Locally Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active
MU29/CG	Locally Active	Partly Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active
MU29/CH	Locally Active	Locally Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active
MU29/CI	Locally Active	Locally Active	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active
MU29/CJ	Locally Active	Locally Active	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active



KEY

2014 Classification

- Totally active
- Partly active
- Locally active
- Inactive
- Dormant
- Not inspected 2014

2013 Classification

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active
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Change to 2014

- Increase in status
- Decrease in status
- No change

Notes:

Centre colour = 2014 classification
Border colour = 2013 classification
Hashing = change from previous inspection (December 2013 or Autumn 2012)

Management unit

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 1
Cliff Activity

Scarborough Borough Council

2014 Coastal Inspection

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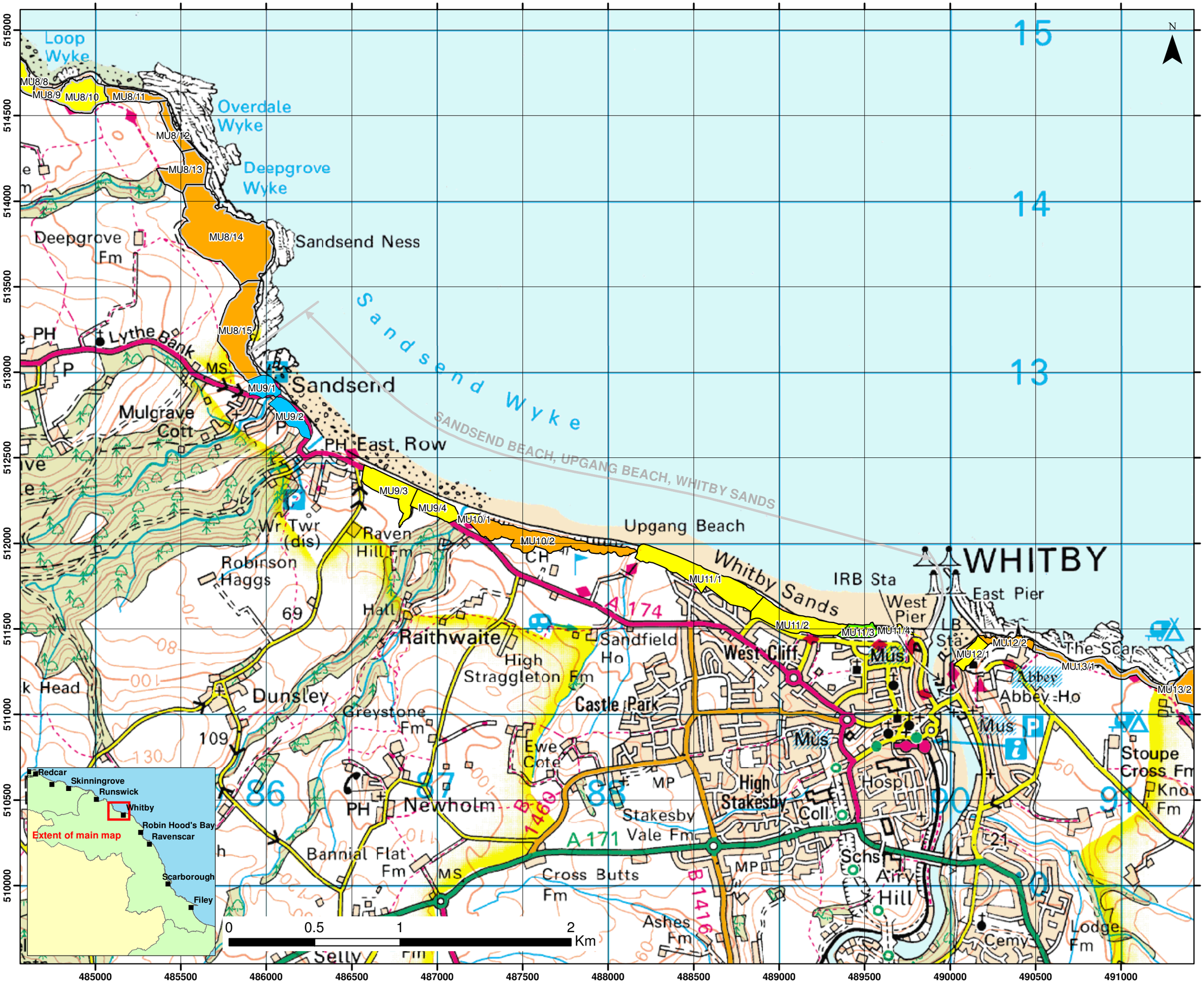

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- Inactive
- Dormant
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2013 Classification

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Management unit

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 2
Cliff Activity

Scarborough Borough Council

2014 Coastal Inspection

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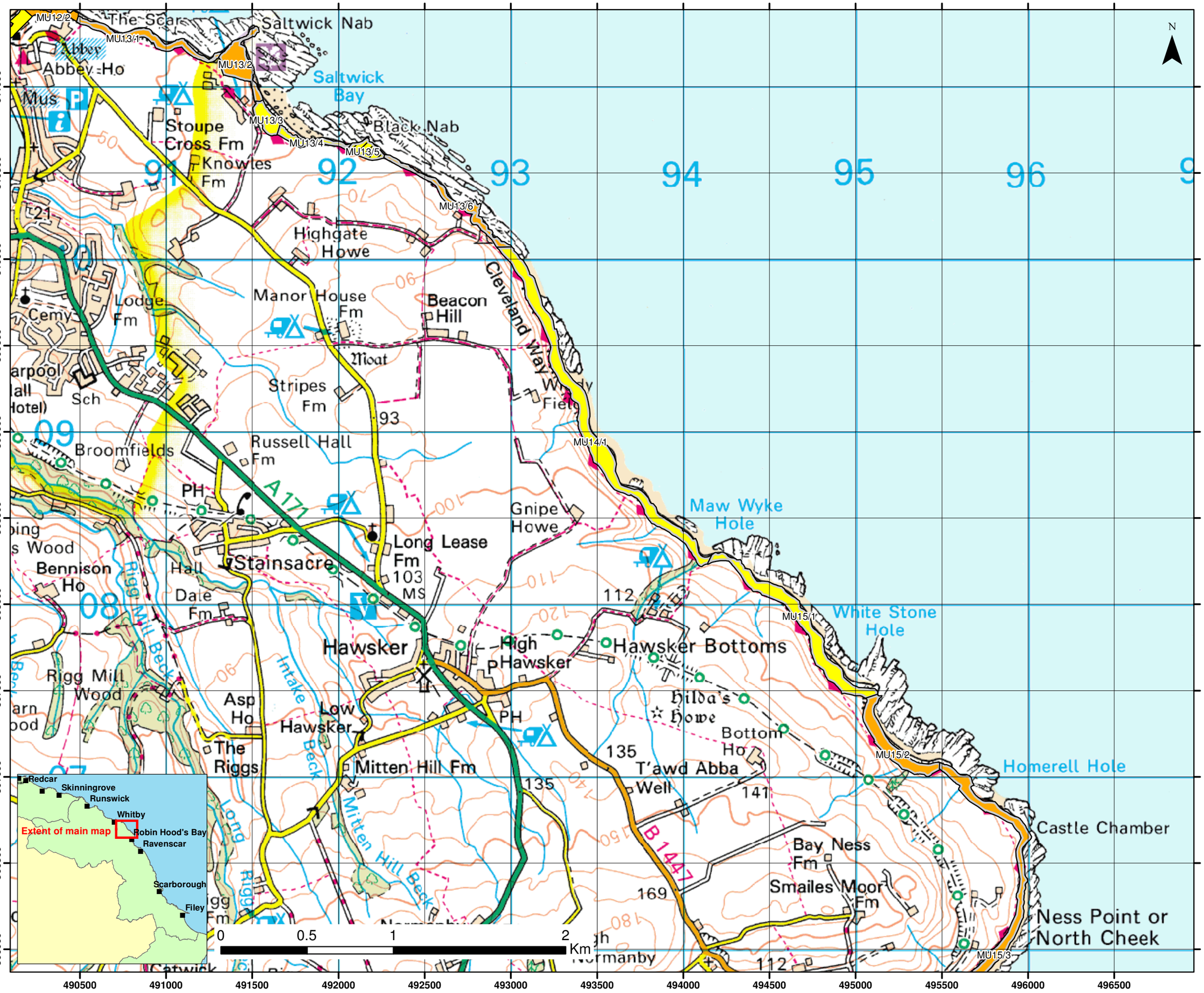

KEY

2014 Classification

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- Partly active
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2013 Classification

- Dormant
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Change to 2014

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Management unit

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 3
Cliff Activity

Scarborough Borough Council

2014 Coastal Inspection

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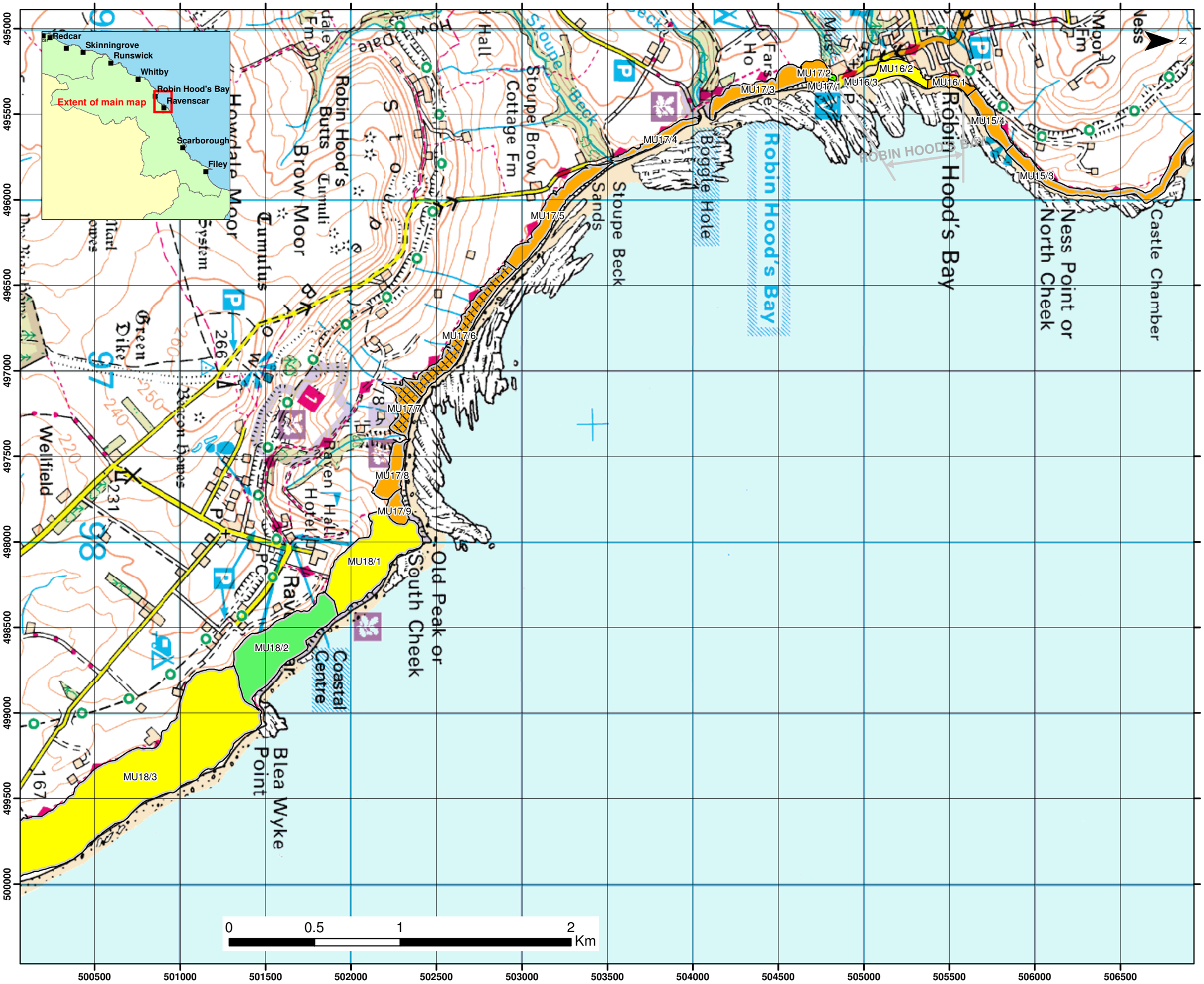

KEY

2014 Classification

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- Partly active
- Locally active
- Inactive
- Dormant
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2013 Classification

- Dormant
- Inactive
- Locally active
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- Totally active
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Change to 2014

- Increase in status
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- No change

Notes:

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Management unit

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 4
Cliff Activity

Scarborough Borough Council

2012 Coastal Inspection

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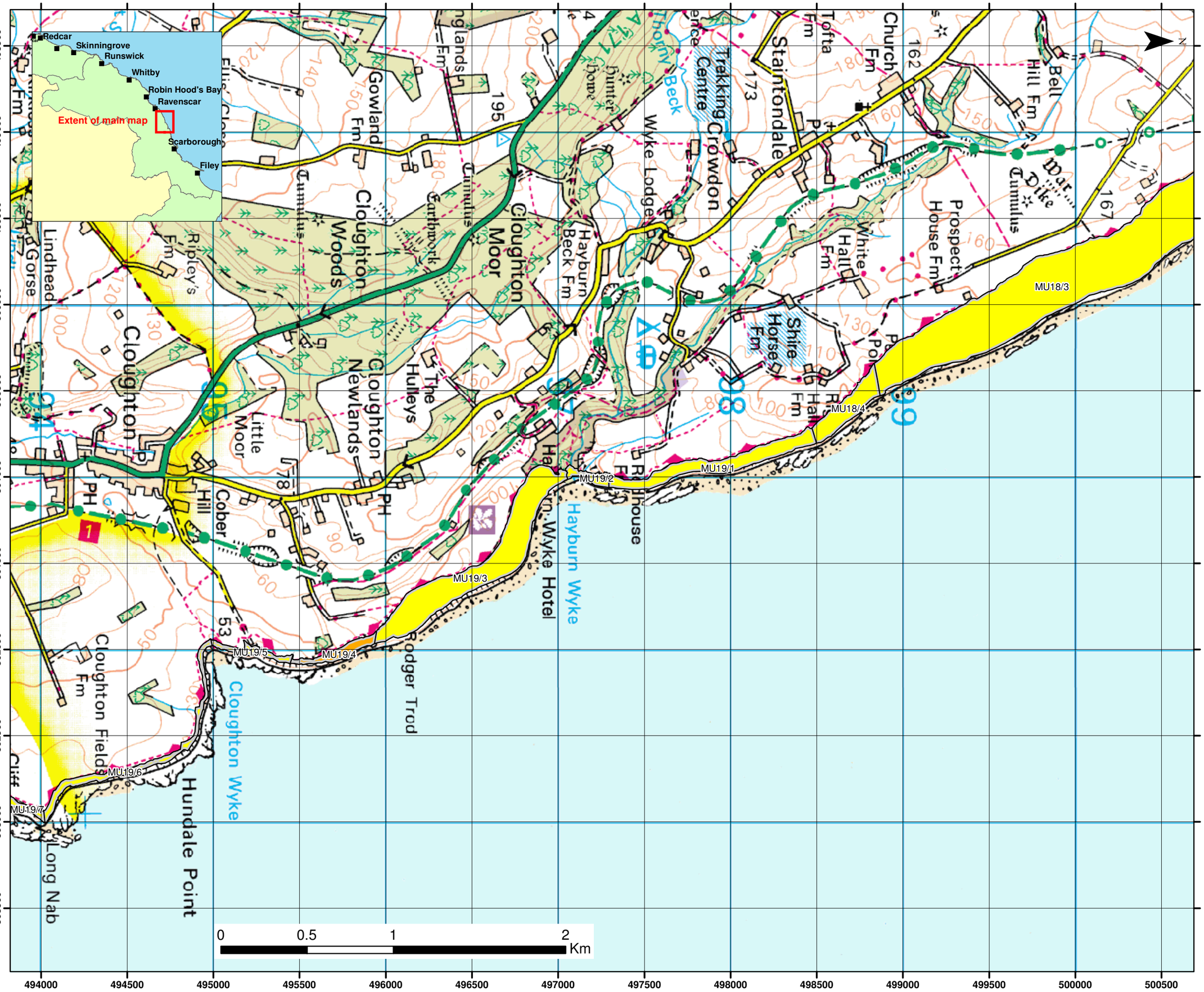

KEY

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- Inactive
- Dormant
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2013 Classification

- Dormant
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Change to 2014

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Management unit

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 5
Cliff Activity

Scarborough Borough Council

2014 Coastal Inspection

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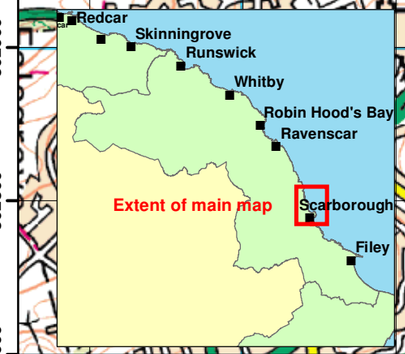

KEY

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- Inactive
- Dormant
- Not inspected 2014

2013 Classification

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Change to 2014

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- Decrease in status
- No change

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Management unit

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 6
Cliff Activity

Scarborough Borough Council

2014 Coastal Inspection

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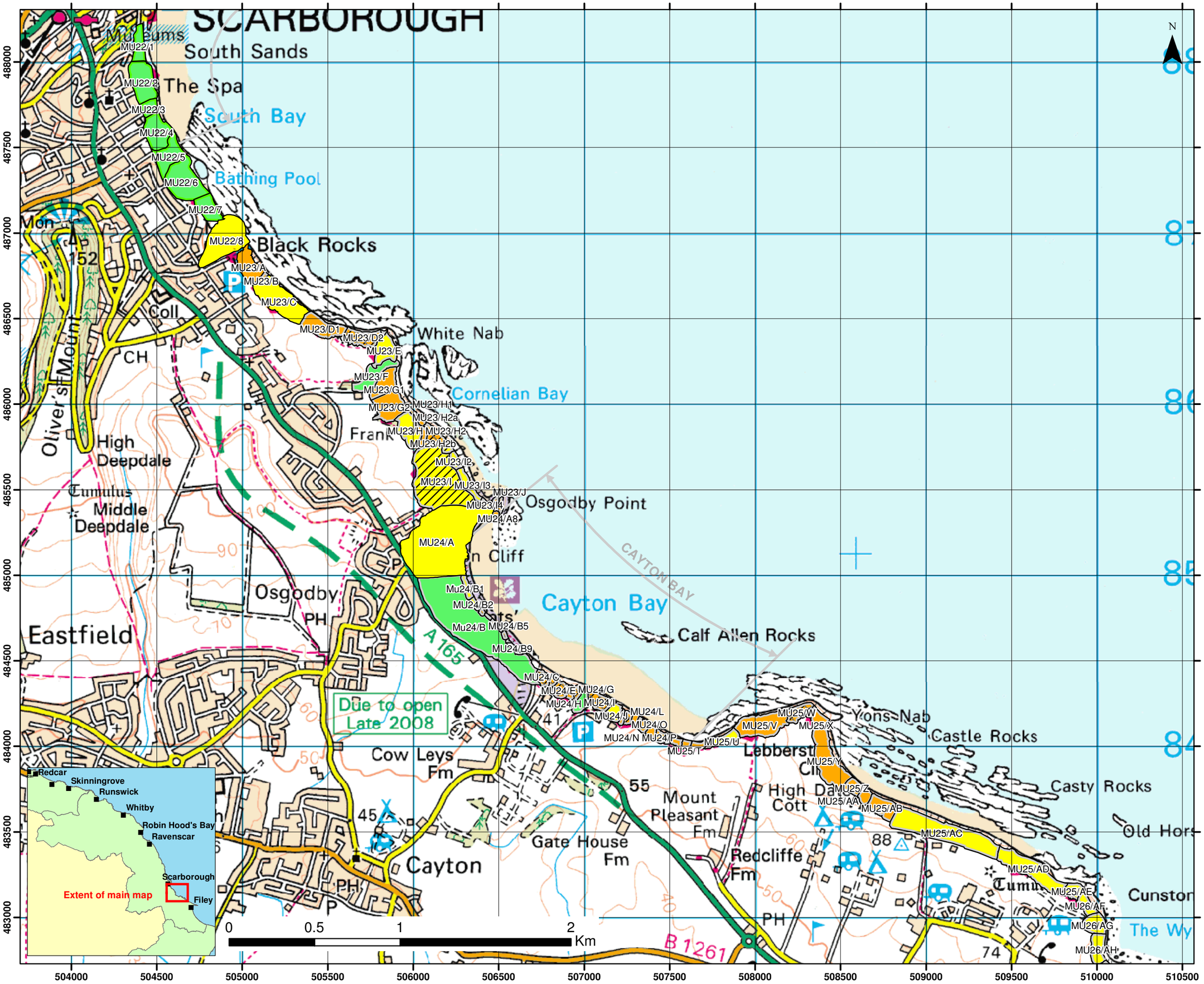

KEY

2014 Classification

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- Inactive
- Dormant
- Not inspected 2014

2013 Classification

- Dormant
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Change to 2014

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Management unit

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 7
Cliff Activity

Scarborough Borough Council

2012 Coastal Inspection

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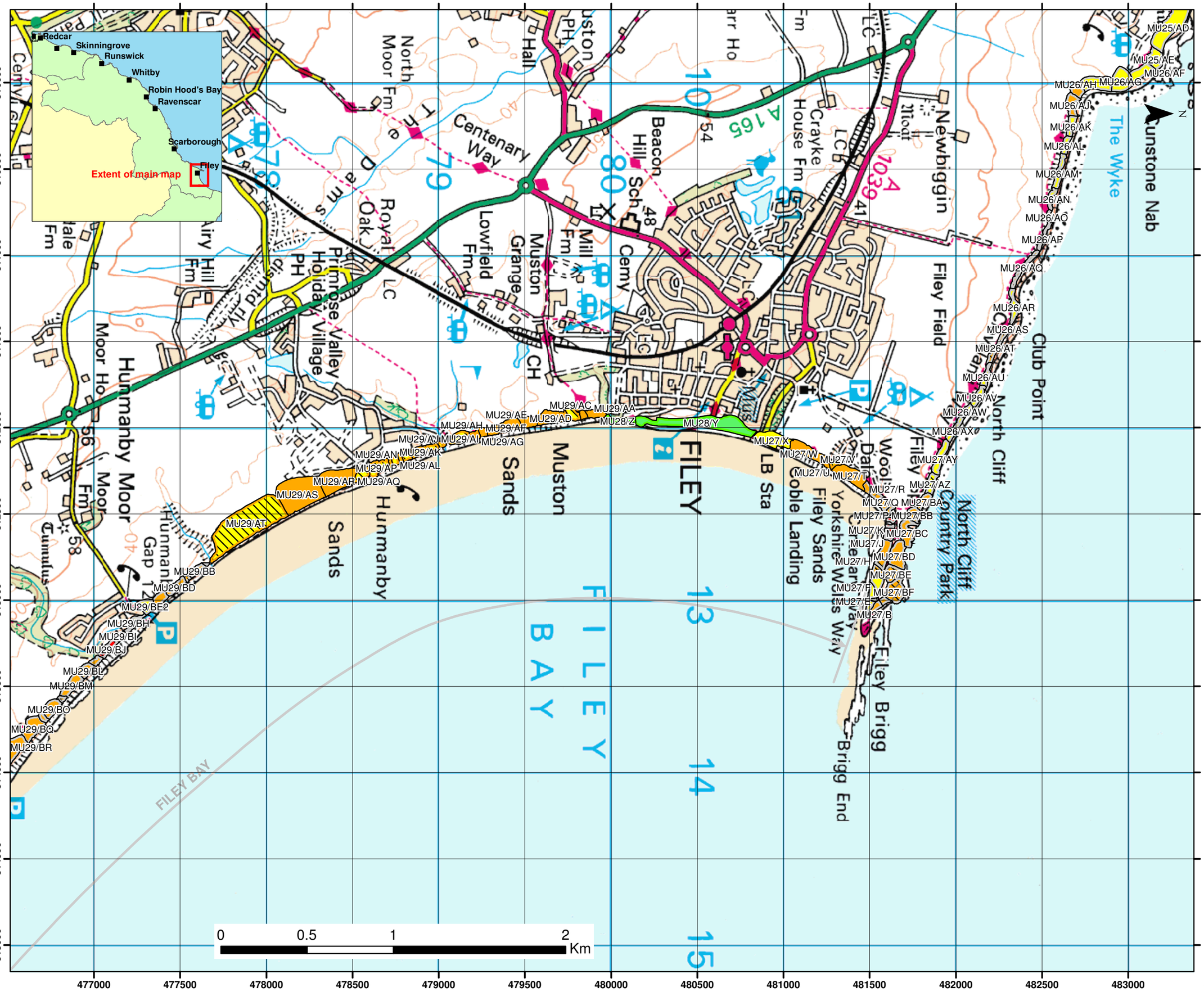

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2013 Classification

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Change to 2014

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Management unit

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 8
Cliff Activity

Scarborough Borough Council

2014 Coastal Inspection

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Change to 2014

- Increase in status
- Decrease in status
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Notes:

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Management unit

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 9
Cliff Activity

Scarborough Borough Council

2014 Coastal Inspection

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Appendix B

Coast Protection Asset Condition and Change

Asset Number	Asset Type Description	Asset Location description	Asset Length (m)	Inspection Date	Inspection Comments	Overall Condition	Worst Condition	Residual Life	Recommendations	Urgency
Staithes										
1221D901D0402C01	Breakwater	NZ78271901, NZ78441906. North breakwater.	370.8	12/09/2014	Rock mostly tightly packed, but two of the stacked & pinned crest blocks missing, others have moved. Heavily corroded sheet piling, possible voids behind piling at head.Cracking to promenade and crest wall.	3	4	>20	Repack rock armour at crest; replace sheet piles; grout voids in structure.	routine
1221D901D0402C02	Sea wall with rock armour	NZ78301893, NZ78271901. South of Northern breakwater.	91.4	12/09/2014	Rock armour in gen good cond, but some units displaced near crest at N end by gap in B/W. Path has areas of damage from movement of rock armour. South end promenade eroded and exposed aggregate, cracking spalling blockwork.	3	3	>20	Repair cracked wall, reprofile rock crest at N end. Repair path.	routine
1221D901D0402C03	Sea wall	NZ78251893, NZ78301893. RNLI slipway.	55.3	12/09/2014	Exposed agg at the face of the wall, also horizontal cracks to wall. Slipway surface in good condition, but timber piles cracked and weathered. Gabions gen in fair condition, but one section settled. corroded rails to sw. Build up of sand gravel at slip	3	3	11 - 20	Monitoring and repair cracks to wall.	routine
1221D901D0402C04	Sea wall.	NZ78261889, NZ78301886. South bank from bridge.	117.1	12/09/2014	Repair work to parts of wall evident. Cracking in upper masonry sections but lower sections repaired. Vegetation regrowing in parts of the wall. Minor cracks evident thought wall. New wire gabion wall & berm upstream from bridge.	3	4	11 - 20	Monitor, repair cracks fill voids and undercutting to toe.	routine
1221D901D0402C05	Wall	NZ78301886, NZ78361882. Between East groyne and slipway.	70.5	12/09/2014	Multiple cracks and spalling,but signs of multiple repair works. Void at root of slipway W side. Some loose blocks to slip walls. Cracks along promenade. Slipway v slippery. Additional toe berm placed along short length since 2012. Cope patches holding.	3	4	11 - 20	Continue to monitor and repair cracks and joints.	routine
1221D901D0402C06	Channel side.	Staithes, LB of River D/S of footbridge.	100.3	12/09/2014	Promenade in fair condition. Wall has missing blocks and open joints. Toe armour, where present near ends not well packed. Vegetation at top of wall.	3	4	6 - 10	Replace missing blocks and grout open joints.	routine
1221D901D0402C22	Wall	Between slipway and groyne on South wall.	47.7	12/09/2014	Repairs evident to cracks and missing blocks replaced. Undercutting of the toe in places. Groyne in good condition. Missing joints to slipway wall.	3	4	11 - 20	repairs to wall joints, cracks and toe.	routine
1221D901D0403C01	Wall.	NZ78361882, NZ78421880 South wall next to last slipway.	73.1	12/09/2014	Vertical full height crack through the wall between stairs and groyne has been filled. Exposure of aggregate throughout wall. Vegitation regrowing at top of wall. Cracking to promenade. Steps in fair conditon.	3	3	11 - 20	Continue to monitor and repair crack to wall and promenade cracking.	routine
1221D901D0403C03	Breakwater	NZ78491884, South Breakwater.	327.5	12/09/2014	Concrete crest units cracked in the middle of the length, repairs evident to chips and cracks. Rock armour mostly tightly packed but small limestone blocks scatterd on top. Opening of const joints to the old part of the wall (inner face).	2	3	>20	Continue to monitor	routine
1221D901D0403C04	Breakwater with rock armour	NZ78431886, NZ78461884 Behind South breakwater.	39	12/09/2014	Good condition concrete breakwater, some scracking in top surface. Vegetation growth to walls Beach has built on W side.	2	2	>20	Continue to monitor.	routine

Asset Number	Asset Type Description	Asset Location description	Asset Length (m)	Inspection Date	Inspection Comments	Overall Condition	Worst Condition	Residual Life	Recommendations	Urgency
1221D901D0403C05	Revetment/slipway.	NZ78421881, NZ78441881 Next to cliff.	26.8	12/09/2014	Good condition no sig.defects visible, but partly covered with boats parked up along all over slipway, wall at top of slipway not inspected closely, but appears in fair condition.	2	3	>20	Continue to monitor.	routine
1221D901D0403C06	Undefended cliff.	NZ78441881, NZ78461884	39.8	12/09/2014	Partly active. Recent minor cliff debris falls. Warning signs present, but public still present - class of students on site, all wearing hard hats!					
1221D901D0403C07	Groynes.	NZ78361882, NZ78381885. In-between South slipways.	32	12/09/2014	Horiz cracking to second step, rest of groyne in good condition, minor vegetation growth at seaward end.	3	3	>20	Continue to monitor	routine
Port Mulgrave										
1221D901D0502C01	Pier.	NZ79871763, NZ79941769. Port	161.4	25/09/2014	Very poor condition and considered redundant. Significant further damage since inspection in 2012. Still gives some	5	5	1 - 5	Assume as redundant, needs confirming.- same as previous inspection	routine
Runswick Bay										
1221D901D0601C01	Wall	NZ81081614, NZ81111619. Next to Upgarth Hill	72.4	12/09/2014	Erosion and abrasion & undercutting to the wall toe in the mudstone. Cracks, erosion and spalling to capping beam. Wash out of the joints under the capping beam. Missing joints and filler joints in places on wall and prom. Prom slabs have dropped /moved	3	3	11 - 20	Repair joints, cracks and undercutting as well as fill the voids to wall.	routine
1221D901D0601C02	Breakwater	NZ81011606, NZ81031605.	26.1	12/09/2014	Breakwater / groyne. Large deep horizontal cracks through breakwater have worsened since 2012. Crest slab may have moved. Multiple patches and cracks. Smaller vertical cracks to breakwater at sea end.	4	4	6 - 10	Consider removal or incorporation in new revetment scheme.	routine
1221D901D0601C03	Sea wall.	NZ81001604, NZ81081614. North of breakwater.	91.3	12/09/2014	Washout of the joints to masonry block wall. Repairs to coping masonry and crest evident. Cracks to toe berm. Some cracks to prom. Repairs to steps and toe being undercut. Beach low W of outfall exposing mudstone platform.	3	4	6 - 10	Repair cracks, voids and undercutting. Consider rock scour protection.	routine
1221D901D0601C04	Revetment	NZ81011601. Lifeboat slipway.	43.8	12/09/2014	Rotting timber supports to dissused timber slipway - some planks recently replaced in deck. Cracks to side walls of smaller slipway. Southern slipway / ramp in good condition.	2	3	11 - 20	Repair cracks to slipway, replace rotten / missing timbers.	routine
1221D901D0601C06	Sea wall.	North side of Runswick Bay	25.3	12/09/2014	Cracks to top of bagwork Some horizontal cracks at base of toe. Repair work evident to large cracks. Cracks to wall, as well as repair work evident to previous cracks. Some missing masonry blocks.	3	3	6 - 10	Continue to monitor and repair cracks, replace blocks.	routine
1221D901D0601C07	Pumping station.	Runswick Bay. Pumping station.	33.3	12/09/2014	Pumping station and associated sea wall and berm. Wall and berm in good condition. Some cracks around mortar starting to show. Corrosion to handrail standards, especially on steps. Minor surface damage to steps.	2	1	>20	Continue to monitor.	routine

Asset Number	Asset Type Description	Asset Location description	Asset Length (m)	Inspection Date	Inspection Comments	Overall Condition	Worst Condition	Residual Life	Recommendations	Urgency
1221D901D0602C01	Rock armour.	NZ81051591, NZ81011601	318	12/09/2014	Rock armour mostly in v good condition, and well and tightly packed, but some movement / loose blocks at both S ends by southern slipway. Slipway in good condition. Cliff slumping and eroding to south.	2	2	>20	Continue to monitor	routine
1221D901D0602C05	Wall	South end of bay.	56.2	12/09/2014	Wall concrete toe not visible due to high beach level. Timber sleeper retaining wall has been undercut. Cracks throughout concrete tank blocks at South end of wall.	3	3	11 - 20	Continue to monitor and repair/replace timber.	routine
Sandsend										
1221D901D0701C02	Recurved Wall.	NZ86061286, NZ85981297. Wall protecting car park.	174.5	12/09/2014	Toe of wall exposed and undercut in many places. Toe armor displaced. Exposure of rebar to bottom of wall at N end. Bottom part of wall abraded exposing rebar. Missing filler in joints to slipway. Void to S side repaired, but open jts missing blocks	3	3	11 - 20	Repair toe armour / undercutting to toe and cover exposed re bar.	routine
1221D901D0702C01	Wall	NZ86061286, NZ86241268	259.1	12/09/2014	Groynes derelict. Beach higher than 2012, apron part burried, assume still v poor. Timber planks & stakes next to apron missing and rotten. Missing joints filler under capping beam. Missing sealant in most v joints in wall, with abrasion around joints.	4	5	>20	Re-seal joints between poured sections of sea wall, and replace apron.	routine
1221D901D0702C02	Revetment.	NZ86281257, NZ86981226. North of Raven Hill.	774.5	12/09/2014	Cracks throughout revetment and missing sections of concrete overlay exposing rubble and stone underlayer and voids. Evidence of mulitple repairs. Undercutting to bottom of revetment. Improvement scheme planned.	4	4	1 - 5	Keep patching up until scheme in place.	urgent
1221D901D0702C03	Wall.	NZ86211252, NZ86251264. Wall extending from East Row Bridge	232.4	12/09/2014	Masonry blockwork wall to channel sides in fair to good condition. Minor abbrasion to a few blocks, missing mortar in joints near cafe.	3	3	>20	Condition to monitor.	routine
1221D901D0702C04	Wall.	NZ86251264, NZ86241268. NE of East Row Bridge.	42.1	12/09/2014	Beach higher than 2012 covering voids under apron? See 2012 insp. Toe piles exposed look v corroded. Groynes derelict. Vertical crack to masonry wall near pipe at centre of wall. Some mortar missing in some jts in masonry wall. Timber walkwy being replcd	4	5	11 - 20	Repair voids under toe apron? Replace toe piles?	routine
Whitby										
1221D901D0801C01	Wall.	NZ88161194, NZ88541185	439.3	25/09/2014	Rock armour gen good, well packed but movement in sev local areas.Some smaller armour loosely packed on crest. Prom as in 2012, some slabs have settled. Small wall back prom in gd con, but waves overtop.	2	3	>20	Continue to monitor surface cracking in promenade.	routine

Asset Number	Asset Type Description	Asset Location description	Asset Length (m)	Inspection Date	Inspection Comments	Overall Condition	Worst Condition	Residual Life	Recommendations	Urgency
1221D901D0802C01	Wall	NZ88541185, NZ88671180	136.6	25/09/2014	Concrete wall has extensive minor cracking. Heavy abrasion over whole lower part of wall. Toe not visible, but beach low. Local damage to capping. Promenade no major defects.Handrails have been repaired.	3	3	6 - 10	Consider extending rock revetment.	routine
1221D901D0802C02	Wall.	NZ88671180, NZ88861170	216.1	25/09/2014	Rock armour in good condition, closely packed, and good coverage. Some smaller rocks on crest lost interlock. Promenade surface as 2012, showing some signs of cracking and sealant loss between concrete sections.	2	3	>20	Continue to monitor joints between promenade sections.	routine
1221D901D0802C03	Wall.	NZ88861170, NZ89231154	166.8	25/09/2014	Lower half of wall abraded/eroded. Toe exposed along whole length due to low sand level - heavily undercut/eroded & missing in part. Apron missing locally and poor. Prom fair, signs of wave overtopping causing damage. Handrails anchor bolts corroding.	3	4	11 - 20	Consider extending rock armour along this section.	routine
1221D901D0802C04	Sea wall.	NZ89231154, NZ89291153	65.4	25/09/2014	horizontal (at northern end) and one vertical crack in southern third of wall. Erosion/abrasion to lower half of wall. North west half has been repaired. Lower handrails have been replaced (set back from edge). Minor cracking to promenade.	3	3	11 - 20	Repaint upper level hand rails, repair eroded front face.	routine
1221D901D0802C05	Wall	NZ89401152, NZ89511152	43.1	12/09/2014	Concrete toe seaward of timber breastwork is undercut with large voids beneath and breaking up. Blockwork walls above appear sound but slips / falls in cliff below and some loss of mortar.	4	5	1 - 5	Urgent repairs to toe, more detailed survey of cliff and walls.	urgent
1221D901D0802C06	Wall.	NZ89361152, NZ89401152	37.5	12/09/2014	Blockwork wall with many open joints. Abrasion and loss of blocks and motar in lower section at under ramp Water seeping through wall and leaking pipe as in 2012. Beach lower exposing toe structure which is abraded.	3	3	11 - 20	Repair or encase toe. Repair cracking in masonry wall. Repair pipe.	routine
1221D901D0802C07	Sea wall.	NZ89291153, NZ89361152	71.9	25/09/2014	Blockwork wall - cracking/loss of mortar and blocks in places locally poor. Generally stable although these points of weakness could cause failure. Higher concrete wall in a fair condition. Minor cracking in promenade. Corrosion to upper hand rails.	3	4	11 - 20	Repair / replace damaged blocks and grout joints.	routine
1221D901D0802C09	Sea wall.	NZ89541152, NZ89651151	115.8	12/09/2014	High sections of blockwork sea wall facing in between in-situ rock outcrops. Sections of masonry appear sound condition, somemortar loss, but worse than noted in 2012, in several locations tie in of edges to cliff geeting outflanked / abraded. .	3	3	>20	Repair edges of panels where tie in to cliff	routine
1221D901D0802C10	Wall.	NZ89771147, NZ89781150. West side of West Pier.	26.8	12/09/2014	Loose blocks with open joints, but no obvious change since previous survey, although beach lower than in 2012 by 1 course of blocks..	3	3	11 - 20	Continue to monitor. Grout joints as part of capital scheme.	routine

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1221D901D0802C12	Wall	NZ89781150, NZ89861150 Start of west pier at slipway.	87.7	25/09/2014	Battery wall. Deep voids between blockwork, few blocks vertically cracked. Voids between corners of blocks. Slipway wall capping beam and wall to W eroded, with displaced block.Slipway and prom in fair condition.	3	3	11 - 20	Continue to monitor and repair deep voids cracks and monitor abrasion.	routine
1221D901D0802C13	Wall.	NZ88861170, NZ89231154	158.4	25/09/2014	Horiz cracks to wall visible near slipway E of beach cafe. Beach level higher than 2012, toe not exposed. Cracks in joint along prom 0.5m from edge. Handrail has been replaced. SOme anchor bolts showing signs of corrosion.	3	3	>20	Repair cracks to wall near slipway. Fill/seal joint prom gaps. Repair toe in W.	routine
1221D901D0802C14	Sea wall.	NZ88861170, NZ89231154	86.2	25/09/2014	Erosion/abrasion to lower half of wall. Minor damage throughout. Loss of section of render at W ramp . Apron not visible. Minor cracking to prom throughout. Areas of chipping/cracking along top edge. Handrails have been replaced.	3	3	11 - 20	Repair chipped areas approx 0.5m from edge throughout.	routine
1221D901D0802C15	Sea wall.	Beneath red brick building.	71.8	25/09/2014	Concrete toe showing signs of cracking, abrasion and loss of concrete and undercutting. Blockwork walls appear sound but some loss of mortar. Slips in cliff between upper wall and toe structure. Additional photos taken on 25th Sept.	4	4	11 - 20	Stabilise and repair cliff. Repair toe.	urgent
1221D901D0803C01	Breakwater arm	NZ89921172, NZ89921187 West breakwater arm.	315.5	25/09/2014	Limited inspection as toe covered in water at low tide. Rust to handrailings, Some timber planks in prom have ends rotting. Abrasion to edges of concrete structure and exposure of aggregate. Timber supporting structure weathered.	3	3	>20	Continue to monitor and replace planks in prom as necessary. Detailed inspection	routine
1221D901D0803C02	Breakwater	NZ89861145, NZ89931173 North pier.	639.7	25/09/2014	Inspection from crest & E side on 25/09. Similar to condition in 2012, gen fair. Some local movement and cracking of blocks. Prom has cracking btwn slabs. Handrails showing rust stains but intact. Where visible inner toe OK.	3	4	>20	Investigate and repair displaced / missing blocks	urgent
1221D901D0803C03	Breakwater.	NZ90161146, NZ90001174. East Pier.	637	25/09/2014	Signs of many repairs to deck, but some open joints seen. Erosion to capping beams. Voids & settled blockwork at NE bend, inside face. Large cracks at several locns. Loose blocks at S end by rock armour. Toe piles corroded. Settled blocks on E face.	4	4	6 - 10	Continue to monitor and patch up pending capital repair scheme.	urgent
1221D901D0803C04	Breakwater.	NZ90041172, NZ89971186. East breakwater.	330.9	25/09/2014	Limitd insp due to no access and WL. Eroded joints and gaps in wall. Timber structure in poor cond? Corroded toe piles. Repair completed in 2012, more needed. Phots taken from W exxtension at LW on 29th.	4	4	11 - 20	Repair further sections of toe pile.	routine
1221D901D0803C05	Rock Armour	NZ90171146, NZ90421143. East side of pier.	420.7	12/09/2014	Cliff toe protection in fair condition outside harbour. Some areas need reprofiling - displaced armour. Inside harbour v. poor - evidence of wave damage to slope above revetment & failed / displaced /missing rock - cliff eroding above rock.	4	5	6 - 10	Add rock armour & reprofile at Haggerlyth.	urgent

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1221D901D0803C06	Harbour Wall	LB Whitby Harbour	215.4	25/09/2014	Timber edge beam rotten and parts missing. Orig wall viewed from ends, looks fair. Some voids to blockwork. Deck support piles corroding. Broken vertical fenders at fuel berth & several others. Piles lack any bracing, boat collision could cause failure.	3	4	6 - 10	Repair fenders at fuel berth. Detailed inspection of supporting piles to deck	urgent
1221D901D0803C07	Harbour Wall	LB Whitby Harbour	157.4	25/09/2014	Timber fenders along length, vegetation to upper part of wall . Promenade in good condition. Lower wall obscured by seaweed. Steps cracked and open joints at mid length.Corrosion to floating pontoon supports at steps.	2	3	>20	Repair and repoint joints at steps..	routine
1221D901D0803C08	Harbour wall.	RB Whitby Harbour RNLI Station and Pier.	391.3	12/09/2014	Very weathered blocks with gaps on S side of north Old RNLI pier and displacement of facing/crack to deck slab at end. Void under SW corner. Walls btwn piers fair to poor. Missing mortar betwn blocks and cracked blocks in both piers.Timber quay renewed.	4	4	11 - 20	Repair toe at seaward end of Old RNLI pier, fill voids, cracks and open joints.	urgent
1221D901D0803C09	Harbour Wall	South of Collier Hope and Mussel Beds	154.9	12/09/2014	Riparian walls in various states, some quite poor. Protected by sand and cobble beach. Spalling/to the render and expsure of the aggregate.	3	4	11 - 20	Continue to monitor, repoint where needed. Replace missing blocks.	routine
1221D901D0803C10	Harbour Wall	RB D/S of Whitby Bridge	135.2	12/09/2014	Looks fair - some joint washout to riparian walls. Area of damage to blocks 20m d/s of bridge. Limited access, visual inspection from RNLI and bridge.	3	3	>20	Continue to monitor - repair washed out joints to wall.	routine
Robin Hoods Bay										
1221D901D1002C02	Rock armour.	Robin Hood's Bay.	59.4	25/09/2014	As 2012 Inspection: Rock armour remains tightly packed and in good condition. Installed in 2001.	2	2	>20	Continue to monitor.	routine
1221D901D1003C01	Rock armour revetment	NZ95340504, NZ95270520	183.4	25/09/2014	Wall was built in 2001 Rock armour in good cond with good coverage. SOme movement of rocks near centre apparent.. Slipway ramp in good cond, some abrasion to slab and joints near toe. Wall v good, although starting to become exposed at	2	2	>20	Continue monitor. Repair S end tie in to undefended cliff.	routine
1221D901D1003C02	Wall.	NZ95330488, NZ95310502	150.5	25/09/2014	Toe not visible high beach levels. Conc wall poor - displaying surface cracking, loss of surface, rust staining and mineral encrustation. Wall crest showing more cracking and repairwork. Signs of recent repairs and repainting on crest wall. Prom fair.	4	5	6 - 10	Continue to monitor. Undertake capital repairs.	urgent
1221D901D1003C03	Undefended frontage	NZ95310503, NZ95340504	56	25/09/2014	Short undefended section. Active but slow erosion. Cutting back adjacent to walls to south & north.	4				routine

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1221D901D1003C04	Wall	NZ95320486, NZ95330488	29.3	25/09/2014	Wall displaying surface erosion and joint washout. Repairs evident since 2012. Voids and open joints in masonry near tie in to concrete wall. Loose render on upper wall. Toe not visible as beach higher than in 2012.	3	4	11 - 20	Grout voids, repair render. repoint joints,reinspect toe when beach lower.	routine
1221D901D1003C05	Apron	NZ95310485, NZ95320486	15.6	25/09/2014	Slipway in gen good condition. Some cracking but appears stable at present. Several missing cobbles near to toe and stream outfall. Some cracks/ missing joints.	2	2	11 - 20	Continue to monitor, investigate and fill voids, repoint as necessary.	routine
1221D901D1003C06	Wall	NZ95310481, NZ95310485	51.9	25/09/2014	Patchwork of repairs/repointing throughout, looks better than in 2012. Void / undercutting to S end of conc toe. Some open	3	4	11 - 20	Continue to monitor and repoint / repair.	routine
1221D901D1003C07	Wall.	NZ95320468, NZ95310481	54.3	25/09/2014	Rock armour mostly well packed, but cliffs slumping from rear over top of revetment has damaged and displaced rock, partic just south of slipway / ramp.	3	3	>20	Reprofile armour near end of slipway.	routine
1221D901D1003C09	Wall.	NZ95320468, NZ95310481	62	25/09/2014	Rock armour is gen tightly packed and good cover. Some smaller rocks show signs of movement. Promenade and slipway in good cond. Gate to ramp corroded. Overall good.	2		>20	Repaint gate. Monitor aromour for need to reprofile in future.	routine
1221D901D1003C10	Wall.	NZ95320468, NZ95310481	29.2	25/09/2014	Cracks and spalling to capping beam. Damge to prevous repairs to S end of wall. Rock armour at toe in good condition. Timber steps at N end of prom worn with evidence of repairs.	3	3	>20	Continue to monitor. Repair spalling and joints where necessary.	routine
Scarborough North Bay										
1221D901D1201C01	WallSBC 38-20A-01	TA03569082, TA03569085. North of the Sea Life Centre.	37.4	10/09/2014	As 2012: Some joints missing mortar. Small cracks throughout wall, as well as small holes near bridge. Promenade in good condition.	3	3	11 - 20	Continue to monitor and repair	routine
1221D901D1201C02	Wall.SBC 39-20A-02	TA03549057, TA03569082. Wall and promenade next to Sea Life Centre.	327.2	10/09/2014	Slipway at S not usable due to toe erosion. Wall toe getting undercut to N & S. Sheet piling visible in places holes in piles where visible. Exposed aggregate in places to wall. Cracks to splash wall but looks sound. Prom good cond.	3	3	11 - 20	Continue to monitor, refill filler to joints and repair cracks.	routine
1221D901D1201C03	Wall.SBC40-20A-02	TA03589031, South of Sea Life Centre.	120.6	10/09/2014	Toe piling only exposed at steps at N end. Erosion of external blockwork throughout sea wall. Vertical crack to sea wall at south end of stretch. Corroded handrails. Cracking and spalling to prom slabs and some missing sealant between slabs.	3	3	>20	Continue to monitor and repair cracks to wall and handrail.	routine

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1221D901D1201C04	Sea wall.SBC 41-20A-02	TA03599020, TA03589031 At North end of beach huts.	99.1	10/09/2014	Repairs appear to be holding. Beach high covering lower wall. Spalling coping next to southern ramp to N of recent coping repair. Promenade in good condition.	3	3	11 - 20	Continue to monitor repair cracks and coping.	routine
1221D901D1201C05	Sea wall.SBC 42-20A-16	TA03758981, TA03599020	55.6	10/09/2014	High beach, capping & top roe only visible. Exposed aggregate in localised locations. Some chipped capping along length. New	3	3	11 - 20	Monitor and repair coping	routine
1221D901D1201C06	Sea wall.SBC 43-20B-01	TA03818971, TA03758981	34.2	10/09/2014	Wall has been reparied since 2012. South section rebuilt / overlayed. Cracking still evident at N end.	3	3	11 - 20	monitor	routine
1221D901D1201C07	Sea wall.SBC 44-20B-02	TA03818971, TA04078946 East of Alexandra Gardens.	158.9	26/09/2014	Damaged coping in several locations. Previous repair work to cracks holding Corrosion to hand rails. Prom relaid in concrete in 2012 in good cond. Erosion / undercutting at steps S end. Steps abraded. missing blocks near toe in centre.	3	3	11 - 20	Cracks need repointing throughout sea wall Repair damage to coping and toe.	routine
1221D901D1201C08	Sea wall with buttresses.SBC 45-20B-02	TA04078945, TA04288930	206.9	26/09/2014	Cracks & open joints to prom slabs and loss of surface. Some prom slabs have been replaced / repaired recently. Recent 2012/13 repair / replacement work on some of the steps / toe, but some horiz cracks in orig blocks remain. Lower wall not visible.	3	3	11 - 20	Continue to monitor and repair cracks and resurface rest of prom.	routine
1221D901D1201C10	Sea wall.SBC 41-20A-04	TA03599020, TA03589031	13	10/09/2014	Beach high obscuring lower wall. Few cracks appear on capping beam, adjacent to N ramp to prom. High beach level, toe not visible. Promenade in good condition.	2	3	11 - 20	Repoint missing mortar to sea wall.	routine
1221D901D1201C11	Sea wall.SBC 42-20A-04	TA03758981, TA03599020	58.7	10/09/2014	Beach high. Evidence of repairs to capping. Abrasion to wall blocks and steps rounded. Cracks in poured concrete capping to wall, promenade in good condition. Rear revet looks fair. Some sections of capping repaired since last inspection.	3	3	11 - 20	Monitor	routine
1221D901D1201C12	Sea wall.SBC 42-20A-06	TA03758981, TA03599020	58.4	10/09/2014	As in 21012, sea wall mostly buried by sand. Section of coping to wall have been repaird, promenade in good condition. but some spalling adjacent to coping. Rear revet in fair cond.	3	3	11 - 20	Continue to monitor.	routine
1221D901D1201C13	Sea wall.SBC 42-20A-08	TA03758981, TA03599020	58.2	10/09/2014	Beach high, only top row of blocks and capping visible. Some spalling to joints between sections of capping, erosion to capping exposing aggregate. Missing joints in grouted revetment to rear.	3	3	11 - 20	Repair cracks to capping and inspect when blockwork visible.	routine
1221D901D1201C14	Sea wall.SBC 42-20A-10.	TA03758981, TA03599020	58.4	10/09/2014	Cracks to capping with some erosion exposing aggregate in places, Some capping slabs repaired, but remaining showing signs of damage. High beach at time of inspection.Rear revet fair with recent repairs.	3	3	11 - 20	Monitor and repair spalling to wall capping.	routine

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1221D901D1201C15	Sea wall.SBC 42-20A-12	TA03758981, TA03599020	31.9	10/09/2014	Only concrete capping of wall visible due to high beach, wall capping and promenade in good condition, no visible defects. Rear wall - ramp below beach man centre appears near new cond, some rust staining at fixings. Both sets of steps showing	3	3	11 - 20	Continue to monitor.	routine
1221D901D1201C16	Sea wall.SBC 42-20A-14	TA03758981, TA03599020. In front of Beach Management Centre.	32	10/09/2014	Only capping visible due to high beach. Some missing mortar to first (North) slab, cracking to capping at joints as well as the edges. Promenade in good condition. Rear revetment has been repaired.	3	3	11 - 20	Repair cracks to capping and inspect at low beach height.	routine
1221D901D1201C17	Sea wall.SBC 42-20A-18	In front on new apartments.	22.8	10/09/2014	Only capping and top row visible. Localised gapping at joint, in centre of defence. New wall to rear has replaced most of rock revetment. Some voids evident in rear revetment. Some chips	3	3	>20	Repair defects to coping / prom edge and rear revetment.	routine
1221D901D1201C18	Sea wall.SBC 42-20A-20	In front of new apartments.	43	10/09/2014	Cracking and spalling to wall capping. Beach high covering most of wall. Promenade in good condition. Rear wall remains as new.	3	3	11 - 20	Repair/replace damaged capping / coping beams.	routine
1221D901D1201C19	Sea wall.SBC 43-20B-03	TA03818971, TA03758981. In front of new development.	93.2	10/09/2014	Upper wall has been rebuilt at N end. Facing of some blocks missing. Joints between slabs in slipway at south open / missing mastic.	3	3	11 - 20	Repair missing joints and chipped parts of capping and splash beams.	routine
1221D901D1201C20	Sea wall (raised).SBC 44-20B-01	South of new development.	40.8	10/09/2014	Section of coping recently reparired. Slipway missing sealant in joints. Cracking in prom.	3	3	11 - 20	Seal joints in slipway and crack in prom. Continue to monitor inspect	routine
1221D901D1201C21	Seawall.SBC 44-20B-05	TA03818971, TA04078946 East of Alexandra Gardens.	211.1	26/09/2014	Erosion to capping at edge of prom. Cracks and holes between capping and prom. Prom surface replaced in 2012 at N and S ends, but centre still to do. Works underway to replace some	3	3	11 - 20	Complete repairs. Fill / seal joints in prom at rear of coping.	routine
1221D901D1201C24	Wall.SBC 40-20A-04	TA03589031, TA03549057	65	10/09/2014	As prev survey: Exposed aggregate and erosion / spalling to capping beam and facing blockwork. Cracks throughout promenade. Repairs evident in rear revetment.	3	3	11 - 20	Continue to monitor. Repair damaged capping beam and cracks in promenade..	routine
1221D901D1201C25	Wall.SBC 40-20A-06	TA0357690349 North of slipway and beach huts.	73.8	10/09/2014	Beach high covering most of wall. Cracking to parts of promenade. Revetment to rear of prom appears in good cond,	3	3	11 - 20	Continue to monitor and repair cracks.	routine
1221D901D1201C26	Sea wall.SBC 42-20A-02	TA03758981, TA03599020	13.7	10/09/2014	As 2012: Sea wall mostly buried by sand. Spalling in poured concrete capping to wall, promenade in fair condition.	3	3	11 - 20	continue to monitor and maintain	routine
The Holms and Castle Headland										
1221D901D1202C01	Wall.SBC 46-20B-01	TA04288929, TA0493895. East of Albert Road.	124.8	26/09/2014	Original wall hidden by rock armour, splash wall seems to be in good condition. Tightly packed rock armour with good coverage. Some smaller rock loose on crest. Scour pool at toe of steps prevents use at low tide.	2	2	>20	Continue to monitor.	routine
1221D901D1202C02	Wall.	TA05178883, TA04988952. East of Scarborough Castle.	886.7	26/09/2014	As 2012: Vertical cracks on some of the splash wall modules, some chipping at joints, Accropodes slightly eroded and chipped throughout. No concern at present. Promenade slab	3	3	>20	Continue to monitor. Repair cracks and joints to splash wall.	routine
1221D901D1202C03	Wall.SBC 46-20B-04		429.2	10/09/2014	As 2012: Constructed 2003ish. The Holms. Prom & Splash wall in good cond. Some of prom suracing damaged locally. Armour well packed and good cover. Original wall not visible.	2	2	>20	Continue to monitor.	routine
1221D901D1202C04	Wall.SBC 46-20B-07		219.9	10/09/2014	As prev survey in 2012 Original wall hidden by armour, splash wall seems to be in good condition. Tightly packed rock armour	2	2	>20	Continue to monitor.	routine

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1221D901D1202C23	Sea wall.SBC 45-20B-03	North of Albert Road.	31.5	26/09/2014	2 large vertical cracks extending throughwall Damaged blockwork and lower part of wall eroded and exposed aggregate. Cracks to promenade. Handrails corroding.	3	3	11 - 20	Continue to monitor, seal cracks, repair damage	routine
Scarborough Harbour and South Bay										
1221D901D1301C01	Breakwater.	TA04958849, TA05178883 North Harbour Breakwater.	444.9	10/09/2014	Crest wall good. Rock armour & accropodes in generally good condition, well packed. Less tightly packed or missing armour units at south end of wall. Several cracked pieces of armour. Possible settlement of crest adjacent to area with rock toe apron.	2	4	>20	Continue to monitor.	routine
1221D901D1301C02	Wall.	TA05108874, TA05148874. Next to fair ground.	77.9	10/09/2014	As 2012: Wall unable to be inspected due to timber decking and high sand level under decking. Missing joints to the wall at slipway edge. Missing grout between stone blocks in slipway surface	3	3	>20	Repoint missing joints to slipway wall and repair slipway surfacing.	routine
1221D901D1301C03	Breakwater	TA04958853, TA04938860. Lighthouse island.	83.5	10/09/2014	As 2012: Inner wall at entrance breakwater. Numerous cracks to blocks and missing mortar in joints. Vegetation and fenders obscuring most of walls. Only inspected from distance.	3	3	11 - 20	Continue to monitor and repoint cracks and joints.	routine
1221D901D1301C04	Breakwater.	TA04948860, TA05088877. Inner wall promenade breakwater.	463.1	10/09/2014	Appears fair. Missing fill between blocks throughout wall, fenders, vegetation and boats obscuring the lower parts of wall. Promenade in good condition.	3	3	11 - 20	Continue to monitor and repoint cracks and missing joints.	routine
1221D901D1301C05	Wall.	TA05048878, TA05088877. South of roundabout opposite	43.2	10/09/2014	Cracking and missing joints to top of capping, arches look structurally sound, access ladder has been renewed. Promenade in good condition. Mortar joints missing in slip at	3	3	>20	Repair cracks and damage to coping..Grout slipway blocks.	routine
1221D901D1301C06	Wall.	TA04768876, TA04958876. Opposite Information centre.	195.8	10/09/2014	No change since 2012. Back wall appears to be fair to good, where visible although cracks and missing joints in places. Suspended quay appears to be fair condition, some cracks in protective coating. Prom good. Timber edging rail decaying.	3	3	11 - 20	Monitor cracks to wall.	routine
1221D901D1301C07	Breakwater.SBC 49-21B-04	TA04738870, TA04908862. Beach end of West Pier, between	58.7	10/09/2014	Scour apron not visible due to beach level. Horizontal and vertical cracking at bend of wall, repair work failing. Exposed aggregate throughout wall. Numerous cracks throughout wall.	3	4	11 - 20	Continue to monitor and repair cracks, voids and damaged apron.	routine
1221D901D1301C08	Sea wall.SBC 49-21B-01	TA04708872, TA04738870	69.2	10/09/2014	No change from last inspections: Some mortar loss to joints of wall, some minor erosion to capping beam next to the West Pier, as well as minor mortar loss of joints to toe.	3	3	>20	Continue monitoring, repair joints.	routine
1221D901D1301C09	Wall.SBC 52-22A-02	TA04428822, TA04438827. Wall at underground tunnel entrance.	41.5	10/09/2014	Toe apron has been repaired / overlayed. Localised missing mortar in joints to wall and signs of abrasion. Several full height vertical cracks to upper road wall. Promenade in good condition.	3	3	11 - 20	Continue to monitor and repair joints and cracks.	routine
1221D901D1301C10	Wall.SBC 52-22A-04	TA04508772, TA04428822. South of slipway.	100.7	10/09/2014	Missing mortar joints to wall, occ and cracked blockwork to lower part of wall, vegetation near slipway. Cracking in upper retainging wall between prom and slipway. Repairs to slipway toe holding, but more open jints require filling.	3	3	11 - 20	Continue to monitor, repair cracks and joints.	routine

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1221D901D1301C11	Wall.	TA04958876, TA04998877, Opposite Subway restaurant.	47	10/09/2014	As 2012: Few minor cracks to wall, spalling to capping. Promenade in good condition. Upper wall good. Slipway blocks missing mortar joints in places.Concrete piles at lower wall appear to have rotated in past but appear stable.	3	3	>20	Continue monitoring, repair cracks / joints.	routine
1221D901D1301C12	Wall	TA04998877, TA05048878. Next to masonry arches.	51.7	10/09/2014	Corrosion evident sheet piles, especially lower part, but appear fair. Promenade in good condition. Missing mortar in joints in slipway surfacing at western end. Only viewd form distance due to mud.	3	3	>20	Continue to monitor.	routine
1221D901D1301C13	Piling.	TA04758875, TA04908862. West pier wall.	140.2	10/09/2014	Sheet piles appear fair to good where visible, but only inspected from distance at LW. Promenade in good condition. Missing mortar betwen blocks in slipway.	3	3	11 - 20	Consider future inspection of quay from boat. Grout slipway joints.	routine
1221D901D1301C14	Revetment	TA04758875, TA04768876. West of Information centre.	19.5	10/09/2014	Missing mortar in wall at top. Gaps in between blocks in slipway missing mortar.	3	3	>20	Continue active monitoring repoint missing joints.	routine
1221D901D1301C15	Wall.SBC 51-22A-02	TA04538856, TA04698873	40.3	10/09/2014	Missing mortar joints throughout wall, especially to coping. Beach quite high. Prom good. Handrail rusting in places.	3	3	11 - 20	Repair joints between blocks.	routine
1221D901D1301C16	Breakwater.	Scarborough Harbour. North inner breakwater wall.	362.1	10/09/2014	Vegetation at bottom half of wall. Wall was repaired 2004/5. Gen repairs holding, but some voids at toe. Some cracks to promenade. Timber edge beams have been replaced. Steps have been repaired since 2012.	3	3	>20	Continue to monitor. Repair toe voids.	routine
1221D901D1301C17	Breakwater.	TA04958853, TA04938860. Wall at south side of Lighthouse island	97	10/09/2014	Outer face. Sheet piles heavily corroded, although obscured by vegetation growing on the bottom of the piling. Void seen under southern corner in 2012, has been repaired.	3	3	11 - 20	Repair cracks	routine
1221D901D1301C18	Breakwater.	West Pier, Scarborough South Bay.	115.6	10/09/2014	Fair overall. Heavily corroded piles throughout, Cracking and missing render at steps. Steps on W side have been refurbished, but beginning to loose mortar.	3	4	11 - 20	Continue to monitor,	routine
1221D901D1301C19	Breakwater.SBC 49-21B-02	TA04738870, TA04908862. Shore end of West Pier.	110.4	10/09/2014	Beach higher than in 2012, toe piles not visible.Vertical crack from top to bottom of wall at middle section of length, appears same as last inspection. Horizontal and vertical cracks and exposed aggregate throughout wall. Few minor cracks to promenade.	4	4	11 - 20	Continue to monitor and repair cracks.	routine

Asset Number	Asset Type Description	Asset Location description	Asset Length (m)	Inspection Date	Inspection Comments	Overall Condition	Worst Condition	Residual Life	Recommendations	Urgency
1221D901D1301C20	Slipway with wall. SBC 51-22A-01	Next to Life boat house.	28.5	10/09/2014	Missing joints filler in large parts of cobble slipway, overall fair conditon.	3	3	11 - 20	Repair missing joints and cracks	routine
1221D901D1301C21	Wall. SBC 51-22A-04	TA04538856, TA04698873	57.8	10/09/2014	Wall in fair cond, missing mortar between blocks, esp below coping. Prom good. Beach quite high, only top of wall visible. Rusting coming through on several areas of handrails.	2		6 - 10	Repoint when necessary.	routine
1221D901D1301C22	Wall. SBC 51-22A-06	TA04538856, TA04698873	114.9	10/09/2014	Beach high so only upper wall visible. Broken section of lower handrail at mid length. Some missing mortar between top row of blocks. Prom good.	2		6 - 10	Repair handrails. Repoint blocks.	routine
1221D901D1301C23	Wall. SBC 51-22A-08	TA04538856, TA04698873	101.8	10/09/2014	Beach high so only upper wall inspected. Wall appears in fair to good condition. Some loss of material at road / slipway junction in south.	3		6 - 10	Repair edge of road at slipway.	routine
1221D901D1301C24	Wall. SBC 51-22A-10	TA04538856, TA04698873	109.7	10/09/2014	S slipway has missing mortar in gaps between blocks. Southern section face of masonry abraded.SOme missing mortar between blocks. Prom good.	3			monitor and repoint when necessary.	routine
1221D901D1301C25	Wall.SBC 51-22A-12	TA04538856, TA04698873. In front of Hotel.	99.1	10/09/2014	Missing mortar in joints in places and signs of abrasion, but no cause for concern. Promenade in good condition.	3	3	11 - 20	Continue to monitor and repair joints, inspect at low beach level.	routine
1221D901D1301C26	Wall. SBC 53-22B-02	TA04508772, TA04428822. South of slipway.	162.1	10/09/2014	Wall in fair to good condition. Some cracked blocks but seem stable. Missing mortar / open joints here and there. Crest wall repairs evident with some sections of coping replaired after	3	3	11 - 20	Grout joints.	routine
1221D901D1301C27	Wall.SBC 53-22B-05	TA04508772, TA04428822. North of The Spa.	158.1	10/09/2014	Beach high at time of survey. Toe piling corroding. Multiple repairs, some not holding well. Section of crest wall has been rebuillt after Dec 13 storm, but still poor elsewhere. Many cracks, open jonts and diispl blocks in main wall.	3	4	6 - 10	Develop improvement scheme. Repair cracks and joints to hold wall until scheme.	urgent
1221D901D1301C28	Wall.SBC 53-22B-06	TA04508772, TA04428822 Opposite The Spa	76.4	10/09/2014	As 2012 inspct: Open joints and cracked blocks throughout, cracking to splash beam esp in south. Erosion / scour at toe along Northern section of wall.	3	4	6 - 10	Monitor and patch up until improvement scheme implemented.	urgent
1221D901D1301C29	Wall.SBC 53-22B-07	TA04508772, TA04428822. South of The Spa.	57.4	10/09/2014	Beach high at time of inspection. Open joints in main wall. Major spalling and loss of concrete to lower splash beam bellow infiled openings. Promenade in good condition.	3	4	6 - 10	Continue repair joints and monitor erosion until scheme implemented.	urgent

Asset Number	Asset Type Description	Asset Location description	Asset Length (m)	Inspection Date	Inspection Comments	Overall Condition	Worst Condition	Residual Life	Recommendations	Urgency
1221D901D1302C01	Wall.SBC 54-22B-01	TA04538765, TA04508772. Next to cliff railway.	77.5	10/09/2014	Lower wall has repairs to 2 large areas. Cracking and corrosion /rust staining to beams supporting upper prom near stairs. Cracking & rust staining to cols. Major weathering loss of stone blocks in rear splash wall.	4	4	1 - 5	Patch up until scheme can be implemented.	urgent
1221D901D1302C02	Wall.SBC 55-22B-01	TA04628752, TA04538765. In front of Beach Chalets.	231.8	10/09/2014	Repairs evident since 2012. Several sections rebuilt facing and wave wall. Repairs to wall and prom evident, and prom slabs have been replaced. However, large areas of missing joints in prom slabs, particularly at north end.	3	5	6 - 10	Replace missing filler in joints in promenade.	urgent
1221D901D1302C03	Wall.SBC 54-22B-03	TA04628752, TA04538765. South of cliff railway.	19.2	10/09/2014	Major repairs evident since last inspection, with blocks replaced and joints filled. However, in other areas still joint mortar loss evident in places. Cracks, and open joints in stairs. Repair work to prom visible and crack across full width.	3	3	1 - 5	Regular repair to joints, partic on steps	urgent
1221D901D1303C02	Sea wall.SBC 56-22B-05	TA04828723, TA04668746.Wall at Dickinsons Point.	308.2	10/09/2014	Deep voids/ missing joints in blockwork in lower wall need further attention. Beach higher than in 2012 covering toe. Many open joints between concrete slabs in lower prom. Loss of facing to second wall, cracks/spalling to splash beam.	4	4	6 - 10	Urgently repair voids in joints in lower wall, and open joints in lower prom.	urgent
1221D901D1304C01	Rock armour.SBC 56-22B-08	TA05038695, TA04868713. Land slip.	294.7	10/09/2014	As in 2012, southern ramp has vertical drop to rocks and crack in bottom slab. Rock armour tightly packed, good cover and looks in good condition. Toe in good condition, rock socketed into wave cut platform of soft rock.	2	2	>20	Continue to monitor, monitor stability of cliffs, repair cracked ramp	routine
1221D901D1304C02	Bastion and sea walls.SBC 56-22B-07	TA04868713, TA04828723. East of Holbeck Gardens.	112.5	10/09/2014	Cracks to bastion throughout. Missing pointing / open joints and damaged parts of upper and lower capping beam. Unable to inspect lower wall due to high beach level. Corroded handrail with missing sections. Upper prom has been fenced off.	3	4	11 - 20	Continue to repair facing and copings	routine
Cayton Bay										
1221D901D1402C02	Wall.SBC 58-24B-01	TA06618455, TA06648454	34	26/09/2014	North of old PS. Poured concrete and concrete blockwork toe below a stepped seawall with curved coping stone. More recent construction than adjacent wallls. Cliff cutting back adjacent to N. Wall gen fair, but toe undercut at S.	3	3	>20	Repair toe voids. monitor for outflanking..	routine
1221D901D1402C04	Wall.SBC-60-24B-01	TA06698449, TA06758445	32.6	26/09/2014	Southern section of apron is missing, lower sea wall has been undercut and failed. Blockwork missing and displaced. Some repairs to deck with concrete. Upper wall missing southern section. Toe undermined. crest breaking up	4	5	6 - 10	Repair or removal / making safe.	urgent
1221D901D1402C05	Sea wall.SBC-59-24B-01	TA06698449, TA06658454	67.3	26/09/2014	Private wall to old PS. Lower apron has multiple patch repairs with poured concrete, but has cracks. Recent pointing to main wall joints. Berm not able to inspect. Higher wall slightly	3	4	6 - 10	Private maintenance.	routine
1221D901D1402C06	Wall/apron.SBC-60-24B-01	Nr Pumping Station in Cayton Bay.	19.9	26/09/2014	Mass concrete wall has failed and is breaking up. More patch repair work has been done to make safer for pedestrians. Large voids beneath. Needs removing and replacing with safer beach pedsestrian access.	5	3	1 - 5	Demolish and remove and construct safer beach access ramp.	routine
Filey										

Asset Number	Asset Type Description	Asset Location description	Asset Length (m)	Inspection Date	Inspection Comments	Overall Condition	Worst Condition	Residual Life	Recommendations	Urgency
1221D901D1601C01	Simple Cliff / Scarp	TA12278130, TA12338139	108.9	26/09/2014	As 2012: Undefended section. Former slope stabilisation below boat park has failed. Fully active. Geotextile debris washing onto beach. Erosion at S next to Sailing Club piling should be monitored.	5	4	<1	Monitor erosion risk to boat park and relocate?	
1221D901D1601C02	Breastwork	TA12248126, TA12278130	18.3	26/09/2014	Rock armour scattered and totally ineffective. Timber breastwork no longer evident. Coastal slope appears to be actively eroding.	5	5	11 - 20	onider reprofiling to slow erosion at boat club.	no repairs
1221D901D1601C03	Piling.SBC-64-28A-02	TA12228121, TA12248126	55.8	26/09/2014	Sheet piling heavily corroded with v large holes within sheet piles & large voids under prom in front of club and P/S. Piles adjacent to slip and at N end appear new, but are corroding.	5	4	6 - 10	Replace central section of sheet piling	routine
1221D901D1602C01	Wall	TA12118095, TA12128100	49.6	26/09/2014	Slipway blockwork looks in good condition. Horiz crack in wall at rear. Abrasion and surface erosion to rest of wall visible.	3	3	11 - 20	Repair damaged wall.	routine
1221D901D1602C02	Wall.SBC-67-28B-13	TA12068082, TA12118095	18.5	26/09/2014	Gabions covered in small rock armour. Has been improved since 2012, but needs more rock. Slumping cliffs behind may be pushing rock over. Needs addtional rock and reprofile to stable slope.	4	4	1 - 5	Reprofile and top up rock armour	urgent
1221D901D1602C03	Wall.SBC-67-28B-05	TA11978020, TA12068082	318.8	26/09/2014	Chipped / abraded areas of blocks. Loss of face to many blocks throughout, partic lower levels at S end. Several new / repaired coping blocks. South slip has missing pointing in some joints and veg growing. Hand rails corroding at many jts, one broken.	3	3	11 - 20	Monitor abrasion and reface in future. Repair / replace handrails.	routine
1221D901D1602C04	Splash WallSBC-67-28B-07	TA11968012, TA11978020	91.8	26/09/2014	Evidence of repair to cracks/joints with mastic. Abrasion / chipping to steps, but lower steps recently replaced. Faces of some blocks missing, but overall fair. Missing joints between a few blocks. Prom fair.	3	3	>20	Seal cracks	routine
1221D901D1602C05	Wall.SBC-67-28B-11	TA11957997, TA11968012	103.9	26/09/2014	Some damage to seaward edge of prom. Repairs to splash beam by outfall holding. Numerous lower blocks from beach level to 2m damaged on front face.Beach higher than in 2012. Horizontal crack on seaward section as2012. Cracks in retaining	3	3	>20	Monitor damage to blocks and repair when necessary. Patch repair prom surfacing.	routine
1221D901D1602C06	Sea wall.SBC-67-28B-01	North of promenade, Filey.	109.8	26/09/2014	Missing pointing between blocks on wall and in S slipway. Damage to front face of several blocks. Repairs have been undertaken to one area. Slipway masonry blocks abraded but in fair conditon. Cracks to wing wall.	3	3	11 - 20	Repointing. Seal cracks below coping.	routine

Asset Number	Asset Type Description	Asset Location description	Asset Length (m)	Inspection Date	Inspection Comments	Overall Condition	Worst Condition	Residual Life	Recommendations	Urgency
1221D901D1602C07	Wall.SBC-67-28B-09		98	26/09/2014	Cracking to splash beam in a few placed, other area have been repaired. Numerous chipped / damaged blocks, but overall fair. Cracks and open joints in blockwork of S steps buttress. Prom fair to good.	3	3	>20	Repair cracks and loose blocks at v wall by S stairs	routine
1221D901D1602C08	Wall.SBC-67-28B-03	TA11978020, TA12068082	301.6	26/09/2014	Abrasion to front face, partic' just above beach level. Many bullnose splash blocks have been repaired, but others are cracked and will need attention. Missing joints in slipway ramp at S. Bridge over access ramp has been replaced. Handrails corroded.	3	3	>20	Replace/repair cracked coping and repair damaged blocks. Replace handrails.	routine
1221D901D1602C09	Sea wall.	N of promenade, Filey.	38.8	26/09/2014	Crest section repaired since 2012, looks to be holding well. Some horiz cracks and open joints. Degradation of front faces of blocks and capping.	3	4	11 - 20	Monitor and repair damage as necessary.	routine

Overall condition worsened since 2012
Overall condition improved since 2012

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Extent of main map
Skinningrove
Runswick
Whitby
Robin Hood's Bay
Ravenscar
Scarborough
Filey

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KEY

Management Unit

Asset condition (2014)

Very good
Good
Fair
Poor
Very poor

Asset condition change

○○○ Improvement since 2012
△△△△ Worsened since 2012

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 1
Coast Protection Asset Condition 2014

Scarborough Borough Council

2014 Coastal Inspection

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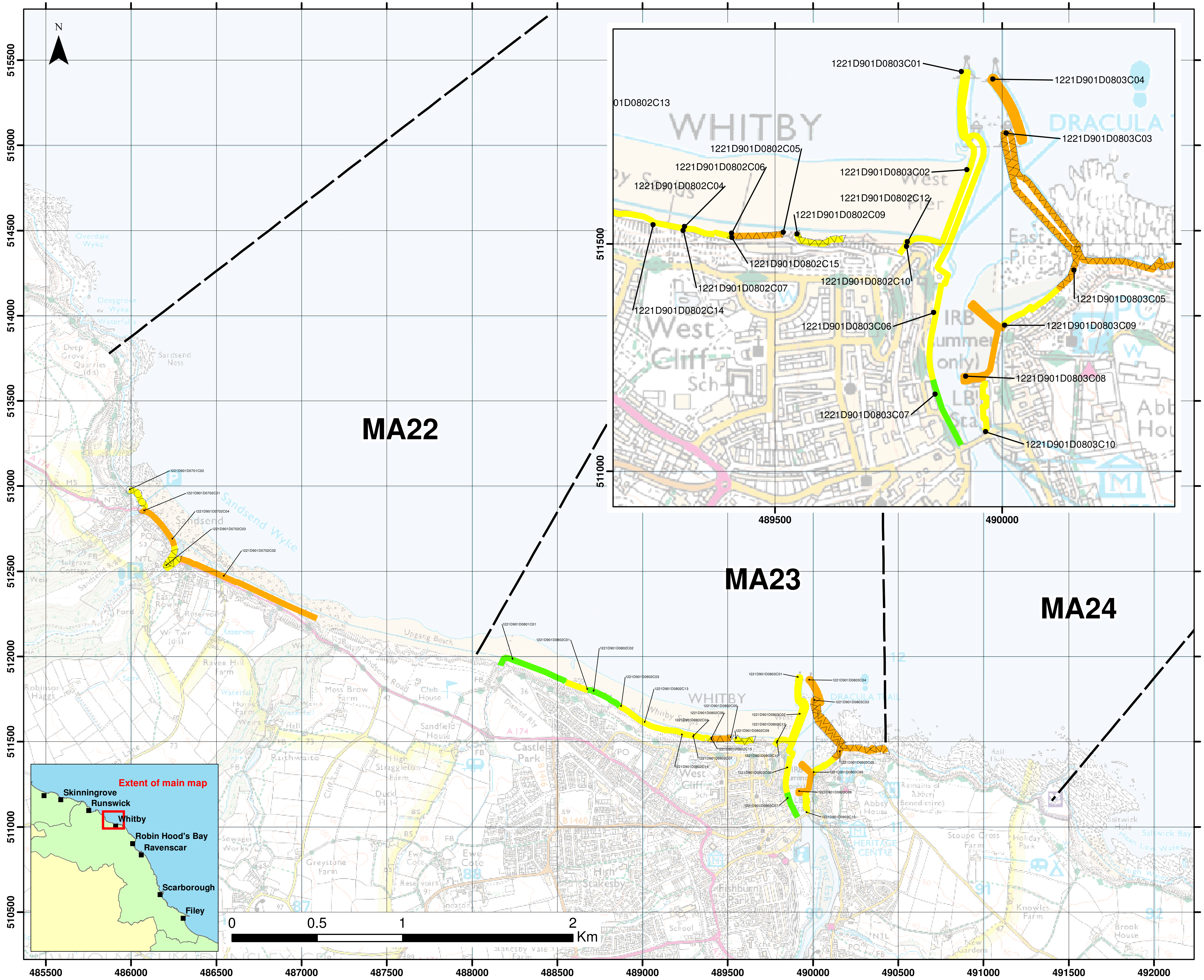

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Extent of main map
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Whitby
Robin Hood's Bay
Ravenscar
Scarborough
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KEY

- Management Unit

Asset condition (2014)

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- Very poor

Asset condition change

- ○○○ Improvement since 2012
- △△△△ Worsened since 2012

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Map 2
Coast Protection Asset Condition 2014

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Extent of main map

Skinningrove
Runswick
Whitby
Robin Hood's Bay
Ravenscar
Scarborough
Filey

0 0.5 1 2 Km

KEY

Management Unit

Asset condition (2014)

- Very good
- Good
- Fair
- Poor
- Very poor

Asset condition change

- ○○○ Improvement since 2012
- △△△△ Worsened since 2012

Client: North East Coastal Group

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Map 3
Coast Protection Asset Condition 2014

Scarborough Borough Council

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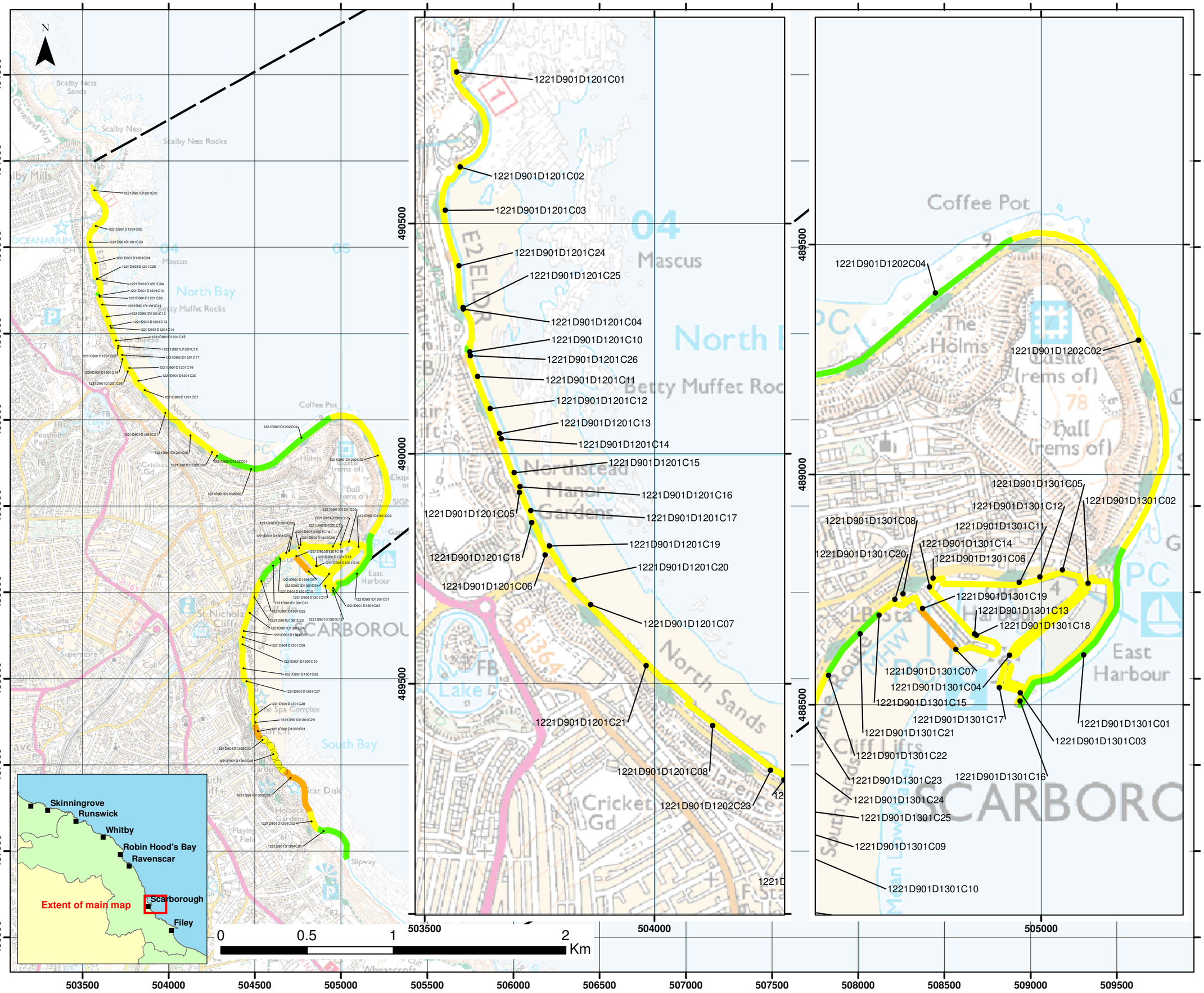

KEY

- Management Unit

Asset condition (2014)

- Very good
- Good
- Fair
- Poor
- Very poor

Asset condition change

- ○○○ Improvement since 2012
- △△△△ Worsened since 2012

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 4
Coast Protection Asset Condition 2014

Scarborough Borough Council

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MA27

MA28

N

KEY

- Management Unit

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Asset condition change

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Extent of main map

Skinningrove
Runswick
Whitby
Robin Hood's Bay
Ravenscar
Scarborough
Filey

0 0.5 1 2 Km

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 5
Coast Protection Asset Condition 2014

Scarborough Borough Council

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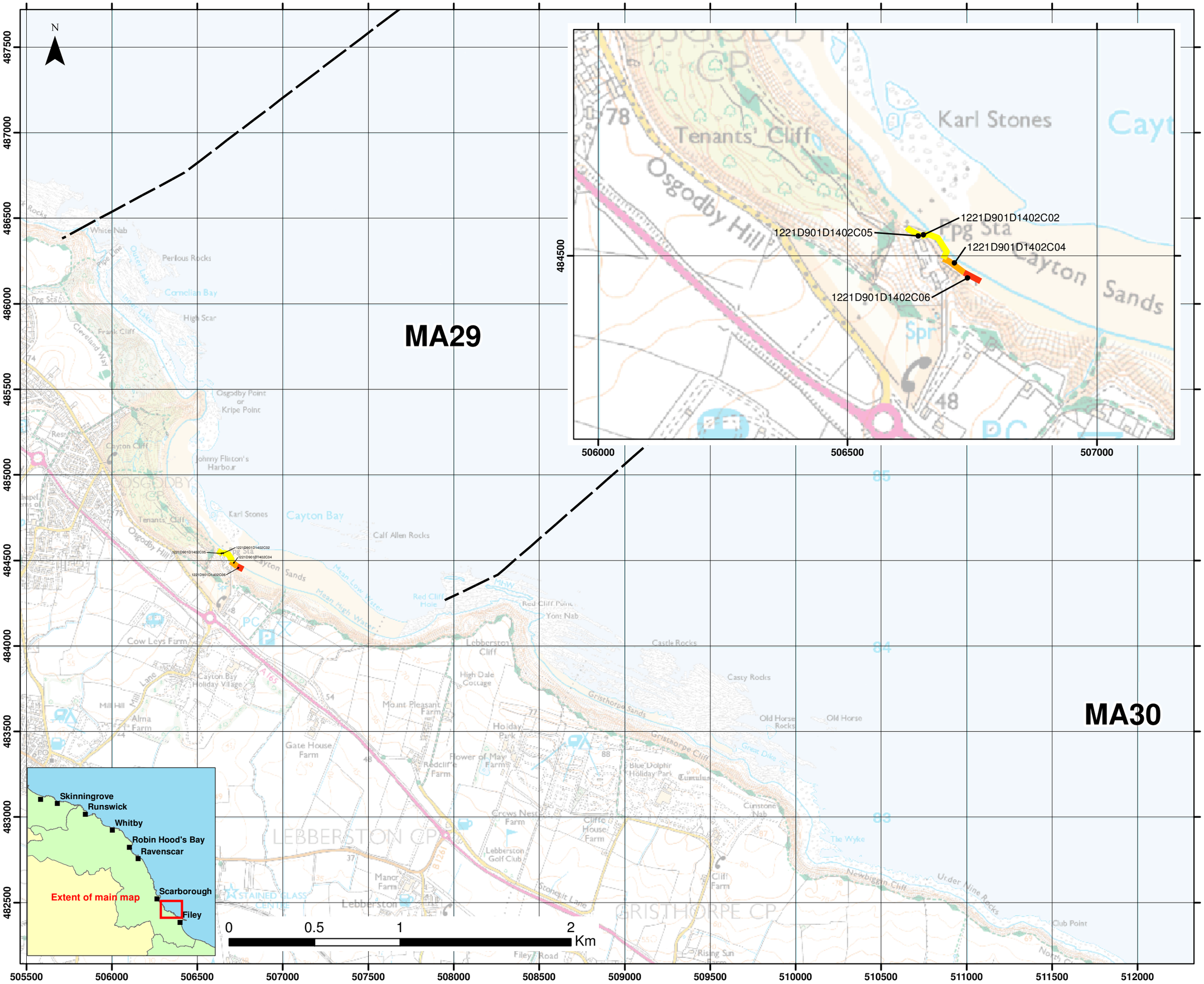

KEY

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Asset condition (2014)

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- Good
- Fair
- Poor
- Very poor

Asset condition change

- ○○○ Improvement since 2012
- △△△△ Worsened since 2012

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 6
Coast Protection Asset Condition 2014

Scarborough Borough Council

2014 Coastal Inspection

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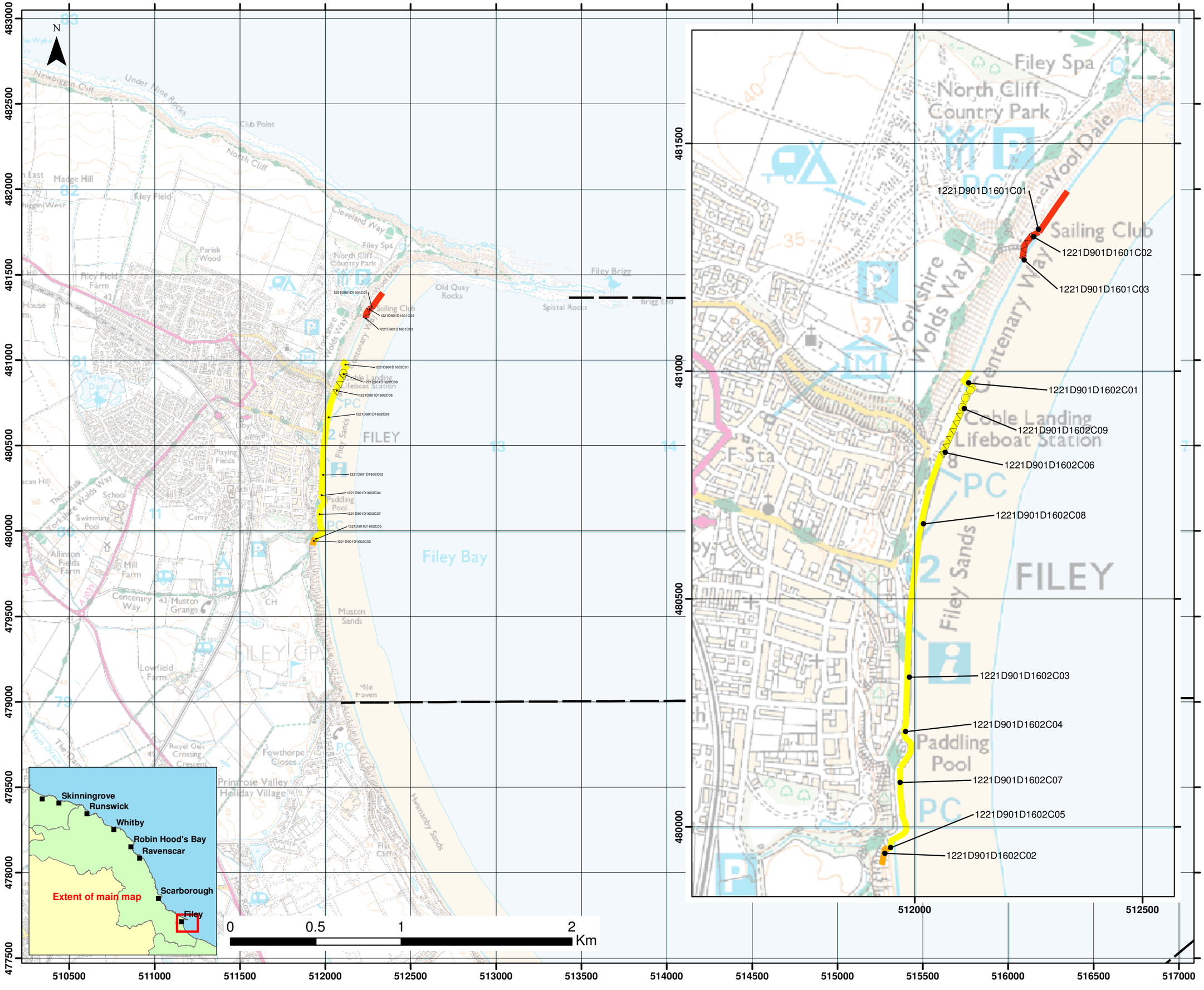

KEY

- Management Unit

Asset condition (2014)

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Asset condition change

- ○○○ Improvement since 2012
- △△△△ Worsened since 2012

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme 2011 to 2016

Map 7
Coast Protection Asset Condition 2014

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2014 Coastal Inspection

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