ROYAL HASKONING

Halcrow

Coast Protection Assets and Coastal Slope Condition Analysis

Scarborough Borough Council Final Report

March 2010

Scarborough Borough Council

Coast Protection Assets
and Coastal Slope Condition Analysis

Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Signed
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Contents

List of tables and figures

Preamble

The following organisations each have certain responsibilities for managing the coastline between the River Tyne and Flamborough Head:

- South Tyneside Council;
- Sunderland City Council;
- Easington District Council;
- Hartlepool Borough Council;
- Redcar and Cleveland Borough Council;
- Scarborough Borough Council;
- East Riding of Yorkshire Council;
- Environment Agency;
- North York Moors National Park;
- Natural England;
- The National Trust.

Collectively, as the former North East Coastal Authorities Group (NECAG), the councils produced a 'second generation' Shoreline Management Plan (or 'SMP2') for its coastal frontage in 2007. In this SMP2, recommendations were made for condition assessments of the coastal protection assets and coastal cliffs and slopes along this frontage, as part of a broader coastal monitoring programme.

To this end, Scarborough Borough Council, acting as the 'lead authority' for the councils, commissioned a team from Royal Haskoning and Halcrow to undertake the '*NECAG Coastal Protection Assets and Coastal Slope Condition Analysis*' in August 2008 and then again in the autumn of 2009 under the Cell One Coastal Monitoring Programme, 2008-2011.

The joint team approach between Royal Haskoning and Halcrow was taken in 2008 and again in the 2008-2011 programme, and has enabled skilled staff with previous expertise of the specific stretches of frontage to work together and offer best value to the councils. 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.

To ensure a consistency of approach in reporting with the work of 2008, the same standard template has been used for this assessment of the Scarborough Borough Council frontage in 2009. In addition, the findings from the latest inspections have been entered into the Environment Agency's National Flood and Coastal Defence Database (NFCDD) for each identified length of 'defence', be it an engineered structure or a natural cliff/slope. This ensures that the Local Authority is complying with its High Level Target to ensure that the NFCDD is regularly updated.

It is intended that future inspections will be undertaken within this Cell One Coastal Monitoring Programme, by the same teams and that the 2009 inspections will become part of an ongoing record against which future changes, such as deterioration of defences or erosion of cliffs, can be compared.

1 Introduction

1.1 Methodology

1.1.1 Assessment Methodologies

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 2009 Coastal Slope Condition Assessment was undertaken by systematic walk-over inspection of the whole coastline by a team of geomorphologists who are familiar with the site having undertaken previous inspections for SBC. The inspection involved visual assessment of cliff activity and noting specific areas of activity (e.g. landslides and tension cracks). All observations were documented with photographs and field notes. Each unit was identified, photographed and classified according to the five point activity scale as defined in Table 1.1. This classification scheme is the same as that used in previous cliff activity assessments undertaken by Halcrow for Scarborough Borough Council in Cell 1 (Halcrow 2002, Halcrow 2005, Halcrow 2009). The brief cliff condition descriptions currently in the National Flood and Coastal Defence Database (NFCDD) were updated and photographs added where necessary.

This report provides a summary of the cliff condition as assessed in September-October 2009, 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).

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

Table 1.1. Cliff activity classes used 2009 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.

The Coastal Slope Condition Assessment walkover survey for the Scarborough Borough Council frontage was conducted between 28th September and 9th

October 2009, working in a north to south direction. The weather during this time was generally mild and dry.

Coast Protection Asset Assessment
The visual assessment of built assets was carried out by a team of asset inspectors and structural engineers in October and November 2009. Assets were graded based on their condition as defined in table 1.2, residual life and urgency of repair work, following standard Environment Agency guidelines and the Condition Assessment Manual (CAM). This classification scheme is the same as that used during inspections in 2008 and that planned for future inspections. Inspections were made from both the seaward and landward side of defence where possible. Observations were photographed and all data were stored 'live' in the offline NFCDD Poweruser software using ruggedised laptops.

Asset descriptions provide 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 2009 assessment

During the pre-survey meeting between SBC and Halcrow it was mentioned that defences may need to be delineated to a greater extent than during previous surveys, i.e. defences should be broken down into smaller sections, and structures such as stairs and slipways should be digitised, as per SBC units, rather than as per Environment Agency guidelines as previously followed. Defences and structures were digitised in this way for all of Filey, Scarborough and for Robin Hood's Bay. Following further discussions regarding the additional time and costs associated with carrying out inspections for all of these digitised, and for all the not yet digitised structures in other locations, it was decided to revert to the previous specification. However, inspections of structures in Filey, the northern part of Scarborough North Bay, and Robin Hood's Bay had already been completed, so inspections exist within NFCDD for these assets.

The Coast Protection Asset Assessment for the Scarborough Borough Council frontage was conducted between 5th October and 6th of November 2009, working in a south to north direction. The weather experienced during this period was of a mild nature, with occasional wet days.

1.1.2 Study Area

The study area covered by this report runs from Staithes in the north to Speeton in the south. The cliff units previously used by Halcrow (2002, 2005 and 2008) were used for this area. During the walkover assessment the boundaries of these

units were reviewed and any significant changes in cliff form, due to landsliding or marine erosion, were noted. These units are coded as follows:

- Management Units (Mu)
- Sub-Management Units (SMU)
- Coastal Behaviour Units (CBU)

For example, unit Mu4A/1 refers to Management Unit 4, Sub-Management Unit 4A and Coastal Behaviour Unit 1.

Maps showing the location of all of the above units are provided in Appendix A

Assets will be referenced according to unique NFCDD Asset References, maps showing the location of assets are provided in Appendix B

2 Overview

2.1 Condition Assessment

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 269 cliff behaviour units (CBUs) have been assessed across the region during the 2009 walkover survey, of which Locally Active and Partly 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.

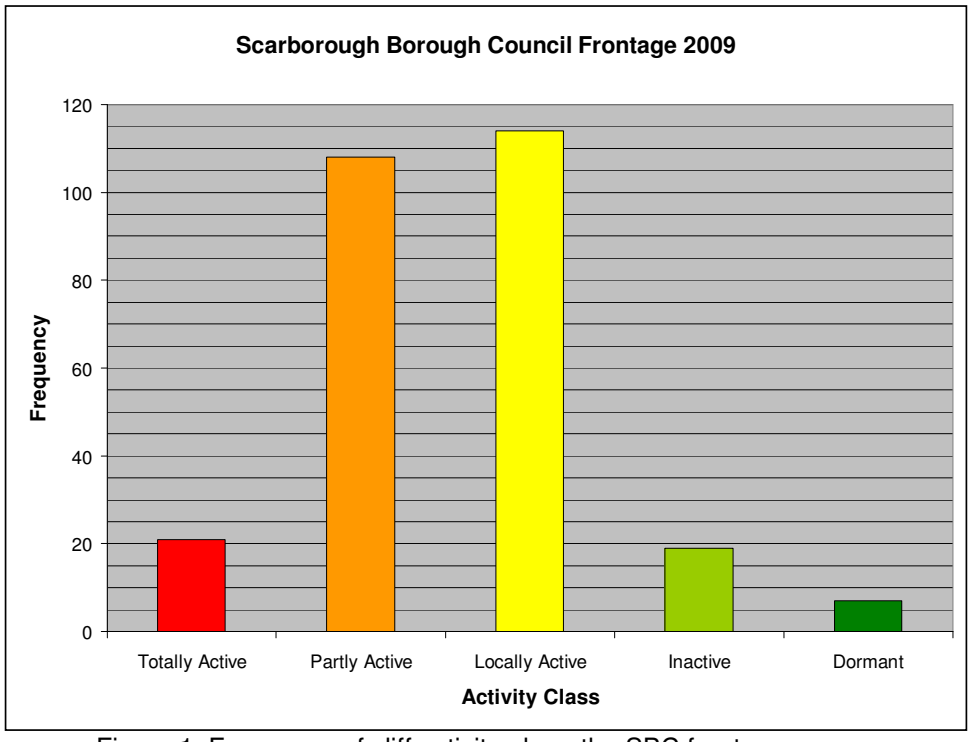


Figure 1. Frequency of cliff activity along the SBC frontage

During the 2008 walkover survey, the following areas were highlighted as having significant cliff activity in the vicinity of key assets. In 2009, these areas remain vulnerable;

- **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 property and the rerouting of the Cleveland Way footpath. Whilst such behaviour has slowed during 2009 (and hence the unit has been reclassified from Totally to Partly Active), there is ongoing recession at the headscarp and there remains the potential for significant future activity.

- **Filey Town:** Localised cliff instability was evident in 2008 which had led to the closure of certain footpaths in Filey. It is likely that this instability was related to the significant rainstorm event which affected the town in 2007, and caused widespread damage. The impacts of this event have been remediated, but the coastal cliffs fronting the town should be regularly inspected to minimize the threat to people and property.

In addition, the 2009 walkover survey identified these areas;

- **Filey Brigg:** There is ongoing and intensifying activity around Filey Brigg. Whilst this does not present a threat to any major infrastructure, it is likely that the erosion of this peninsula will be exacerbated in the future, posing a risk to beach and cliff users.
- **Cornelian Bay:** This bay sits adjacent to the landslide at Cayton Cliff, and has been subjected to increased activity and headscarp recession during 2009, particularly at its' southern end. 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 Hoods' Bay are heavily defended at the toe and therefore stable and classified as Dormant accordingly. There is however, a section of cliff which is not currently protected and is subject to intense marine erosion. Action should be taken to address this as soon as possible in order to prevent the development of instability in this area.

Coast Protection Asset Condition Assessment

A large number of coastal defence assets are situated along this stretch of coastline. Many of these assets are in good or fair condition but a large number require minor repair works. 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;

- **Staithes:** a number of large full height cracks in, and undercutting to, the sea wall. Investigation of the problem and subsequent remedial works are required.
- **Runswick Bay:** there is a large crack in sea wall here, and large horizontal cracks to the breakwater.
- **Whitby:** a number of large full height cracks in sea wall. Investigation of the problem and subsequent remedial works are required. Whitby 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. This may possibly lead to further cracking and potential failure of the harbour walls. Investigation and repair work is needed to both harbour arms. Studies are currently underway with regards repairing a large void under the landward end of the East Pier Extension.
- **Robin Hood's Bay:** beginning to see large cracks and voids to old sea walls and undercutting to newer formal sea defences.
- **Scarborough North and South Bays:** a number of large full height cracks in sea walls in both bays. Investigation of the problem and subsequent remedial works are required.
- **Cayton Bay:** There is a significant 'blow-out' of the lower blockwork of the Cayton pumping station. Although repair work is evident there are still signs of mortar loss, leading to the loosening and washout of blocks. Investigation of the problem and urgent repair is required.

Comparison with Previous Assessments and Recommendations

Few significant changes have been observed in the cliffs since the 2008 inspection survey, although a number of minor changes in activity have occurred. There is some activity ongoing at Cayton Bay where a large landslide reactivation

occurred in early 2008, at Filey Town where localised landslide activity is still apparent following the significant rainstorm event in 200,7 and at Filey Brigg where intense erosion continues. Recent activity has also been observed within Cornelian Bay which may be related to the recent landslide activity within the neighbouring Cayton Bay.

Many of the coastal defence assets were found to be in a similar condition to that reported in 2008. However, some assets showed a degree of degradation in condition since the previous survey. These include movement and deformation to both the breakwater harbour arms at Whitby, severe erosion and cracks to the sea wall and capping beams south of The Scar in Scarborough, evidence of voids, cracks and undercutting in Robin Hood's Bay, and large voids, undercutting and displacement to parts of the sea wall defences in Cayton Bay. Other minor deterioration including cracks, spalling and erosion where seen in coastal defences throughout the study area.

The whole coastline will be subjected to repeat inspections under the Cell 1 Monitoring Programme, but key areas that should be closely monitored comprise Staithes, Whitby, South and North Scarborough, the southern end of Cornelian Bay, the northern end of Cayton Bay and Filey.

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:

- Totally Active
- Partly Active
- Locally Active
- Inactive
- Dormant

Coastal slope condition data are provided in Maps 1-12. Data concerning change in coastal slope condition are provided in Maps 13-24. A full assessment of cliff condition has been entered into NFCDD.

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:

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

Coast protection asset data are also provided in Maps 25 to 38. A full assessment of coast protection asset condition has been entered into NFCDD.

3.1 Management Unit 4 – Staithes

Coastal Slope Condition Assessment
(Map 1 – Staithes to Runswick Bay)

This Management Unit comprises the high cliffs of Cowbar Nab and those behind and immediately to the east of Staithes. The eastward facing end of Cowbar Nab (**MU4/1a**) features exposed, bedded and jointed rock and has very limited vegetation cover. There is ongoing erosion of softer material at the headscarp and evidence of recent rockfall activity from the blocky lower face is present along the walkway beneath the cliff face. As a result this unit is classified as Totally Active.

Unit MU4/1b is the southwards facing side of Cowbar Nab which runs adjacent to Staithes Beck. This unit is similar in form, material and process to MU4/1a but at present features a slightly lower level of activity (Partly Active).

Unit MU4/2 sits behind Staithes harbour and is classified as Locally 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 and is subject to weathering, rilling and gullying. Slumped material is evident in places.

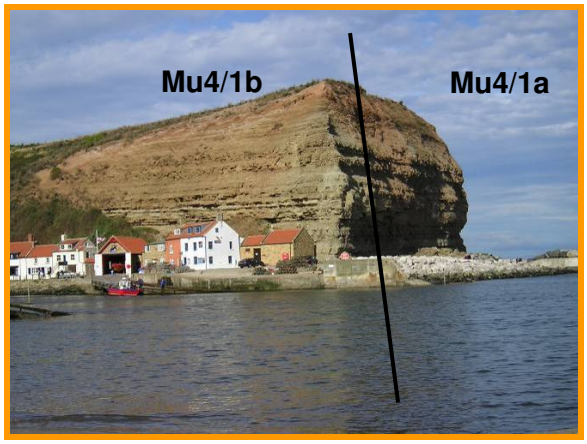
Further east, beyond the extent of Staithes harbour is **unit MU4/3**. The face of this unit is almost entirely exposed and showing signs of active erosion. Unlike any of the other cliffs within this Management Unit, this section is not protected at the toe and is therefore subject to marine erosion. This unit is classified as Partly Active.

None of these units have changed activity class between the 2008 and 2009 walkover surveys.

MU4/1a - Exposed and active eastward facing end of Cowbar Nab, Staithes (Totally Active)

MU4/1a – Close up of evidence of rockfall activity at the base of the unit (Totally Active)

MU4/1a – Rockfall onto the walkway at the eastwards facing end of Cowbar Nab (Totally Active)



MU4/1a and MU4/1b – The end and side of Cowbar Nab (Totally and Partly Active respectively) (approx. extents shown)

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

MU4/2 – Generally well vegetated cliff with localised erosion, behind Staithes harbour (Locally Active)

MU4/2 – More active eastern end of cliff unit behind Staithes harbour (Locally Active)

MU4/3 – Exposed cliff, subject to marine erosion, eastwards of Staithes harbour (Partly Active)

Coast Protection Asset Condition Assessment
(Map 25 – Staithes to Runswick Bay and Map 25A Staithes)

A number of the assets within the village of Staithes have been renewed or repaired in recent years. As noted in previous inspections, the most significant of these are the breakwater arms where 5-8 tonne rock armour has been placed on the seaward side. This acts to provide a greater defended height and to dissipate waves from the breakwater surface. New stainless steel handrails were added and a new concrete topping, cast over the original breakwater added further height to the defence. The sheet piling coping piece (horizontal) on the landward side of the breakwater still shows corrosion at fixing points and has failed. Undercutting continues to occur to the landward west 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 replaced to prevent seawater intruding behind the pile and the undercutting repaired to prevent further damage to the wall. (Asset Ref. 1221D901D0402C01)

Corrosion of sheet piling on the landward side of the breakwater
(Asset Ref. 1221D901D0402C01)

Rock armour lines the seaward side of the breakwater
(Asset Ref. 1221D901D0402C01)

Cracking to beam next to rock armour
(Asset Ref. 1221D901D0402C01)

Undercutting occurring to inland part of wall
(Asset Ref. 1221D901D0402C01)

The eastern breakwater has a spur at the tip; the void of which is filled with rock armour (Asset Ref No.1221D901D0403C03). The breakwater is in good condition with the only visible defect a crack to the edge of the walkway.

East breakwater promenade and rock armour (Asset Ref. 1221D901D0403C03)

Crack to corner of concrete promenade (Asset Ref. 1221D901D0403C03)

The harbour wall extends around much of the Staithes sea frontage. The rear wall of the harbour is in fair to good condition. Minor cracking and surface erosion is present although currently it appears sustainable. One large crack is visible to the east of the harbour near Leech Bank (Asset Ref. 1221D901D0403C01) extending vertically through the whole wall and is in need of repair and maintenance. A concrete groyne (breakwater) preventing sediment movement within the harbour is also in fair condition with only a minor vertical crack to the second stage step (Asset Ref. 1221D901D0403C07).

Older sections of the wall, towards the west side of the harbour, consist of masonry blockwork and are often exterior walls of private properties, these display visible loss of mortar and blocks. Although there is evidence of repair work, maintenance needs to be implemented at regular intervals (Asset Ref. 1221D901D0402C22). Should these repairs continue to fail, replacement of the assets should be considered.

Some sections of the harbour wall also show evidence of undercutting at the toe. It is anticipated that this is due to the dynamic movement of sand, however further investigation would be necessary to establish this for certain (Asset Ref. 1221D901D0402C22).

Cracks throughout wall and toe
(Asset Ref. 1221D901D0402C22)

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

Undercutting at the toe of some parts of the harbour wall
(Asset Ref. 11221D901D0402C22)

Vertical crack through wall
(Asset Ref. 1221D901D0403C01)

3.2 Management Unit 5 – Jet Wyke

Coastal Slope Condition Assessment
(Map 1 – Staithes to Runswick Bay)

Jet Wyke forms the embayment between Penny Steel and Old Nab and consists of **unit MU5/1** only. This unit is classified as Partly Active. 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 Partly Active headland composed of highly weathered shales. This unit has not changed activity class between the 2008 and 2009 walkover surveys.

MU5/1 – Exposed lower slopes and partly vegetated upper slopes of Jet Wyke (Partly Active)

MU5/1 – The highly weather headland at Old Nab (Partly Active)

Coast Protection Asset Condition Assessment
(Map 25 – Staithes to Runswick Bay)

There are no coastal assets within this Management Unit.

3.3 Management Unit 6 – Old Nab to Runswick Bay

Coastal Slope Condition Assessment
(Map 1 – Staithes to Runswick Bay)

This Management Unit consists of 3 Sub-Management Units, 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. 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. This erosion is especially intense around the east facing side of Old Nab. This unit has not changed activity class between the 2008 and 2009 walkover surveys.

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

MU6/1 – The eroding shales of the east facing side of Old Nab (Partly Active)

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. The cliff supports some vegetation but also shows signs of recent activity in the form of rockfall from the outcrops of harder, jointed rock on the upper slopes, and rilling and erosion of the softer material which composes the lower slopes. The base of the unit is lobe shaped and represents the tendency of this unit to slumping and small scale landsliding. This unit is classified as Partly Active.

Unit MU6/3 is located at Port Mulgrave itself and is classified as Locally Active. The cliffs are generally well vegetated but are exposed in localised patches. In these places there is intense erosion and weathering with some slumping at the unit toe. Some protection is afforded by the remains of the Port Mulgrave harbour.

Unit MU6/4 consists of the Rosedale Cliffs, immediately south of Port Mulgrave, which extend landward by about 250m. The majority of the unit is well covered with grasses and other dense vegetation. However localised activity is observed, particularly at the toe of the unit where there are large exposed faces subject to erosion, rilling, gullying and marine action. As a result, this unit is classified as Locally Active.

Unit MU6/5 is the mostly southerly cliff within this sub-management unit. This unit does not extend as far landward at unit MU6/4 but is otherwise similar. It is characterised by generally

well vegetated slopes with local areas of activity on the steeper, lower slopes. Thus, this unit is also classified at Locally Active.
None of these units have changed activity class between the 2008 and 2009 walkover surveys.

MU6/2 – Rockfall from upper slopes, weathering of lower slopes and lobe shaped unit toe, north of Port Mulgrave (Partly Active)

MU6/3 – Localised activity of the cliffs behind Port Mulgrave (Locally Active)

MU6/4 – Rosedale Cliffs, south of Port Mulgrave (Locally Active)

MU6/5 – Local activity on the lower slopes, looking southwards (Locally Active)

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. These cliffs are much steeper than those within sub-management unit 6B and do not extend as far inland. This unit is also more active than the units immediately to the northwest and is classified as Partly Active. The upper slopes are composed of well jointed, hard rock and support some vegetation cover. There is minor erosion of the headscarp. Lower down, the slopes consist of softer, grey material which is almost entirely exposed. As a result, the lower slopes are undergoing intense weathering and are subject to marine erosion.

Unit MU6/7 forms the central part of this sub-management unit and consists of a large relict debris run-out lobe. The cliffs are shallower than those in MU6/6 and are less active. The stepped terrain is well vegetated for the most part and shows only small patches of activity at the toe. Thus the unit is classified as Locally Active.

Unit MU6/8 is located just north of Runswick Bay village. The cliff here is formed of two steps, both of which have exposed faces and limited vegetation cover. The exposed slopes are undergoing weathering and rilling. There is also evidence of rockfall activity from the upper slope. This unit is classified as Partly Active.

None of these units have changed activity class between the 2008 and 2009 walkover surveys.

MU6/6 – The steep northern part of the Lingrow Cliffs (Partly Active)

MU6/7 – Well vegetated, large relict run out lobe (Locally Active)

MU6/8 – Stepped terrain north of Runswick Bay village (Partly Active)

Coast Protection Asset Condition Assessment
(Map 25 – Staithes to Runswick Bay and Map 25B Runswick Bay)

There are no coastal assets within Sub-Management Units 6A and 6C.

Mu6B – Port Mulgrave
Sub-Management Unit 6B features relict assets at Port Mulgrave. As noted during the 2008 inspection, this is a former port and ironstone mine which has been derelict for 70 years. Virtually all coastal defences have been lost to the sea. What is left of the breakwater is undergoing large scale cracking, deformation, undercutting and outflanking. It is estimated that half of its original length has now been eroded (Asset Ref. 1221D901D0502C01). As a result, the launching and retrieval of boats would be difficult here. If regular access by sea was required, a regeneration project to remove the breakwater ruins and build a new access point would be of benefit. There has been no significant change since 2008.

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

Outflanking and erosion occurring behind the breakwater
(Asset Ref. 1221D901D0502C01)

Overview of asset
(Asset Ref. 1221D901D0502C01)

Visible failure
(Asset Ref. 1221D901D0502C01)

3.4 Management Unit 7 – Runswick Bay

Coastal Slope Condition Assessment
(Map 1 – Staithes to Runswick Bay and Map 2 – Runswick Bay to Sandsend)

This Management Unit is divided into 2 Sub-Management Units:

Mu7A – Runswick Bay Village
This sub-management unit consists of **units MU7/1 and MU7/2.**

Unit MU7/1 includes Runswick Bay village itself and the adjacent slopes. It is well vegetated and is defended at the toe by a sea wall and rock armour. The outflanking of these defences to the north (within Mu6C) indicates the nature of the erosion which may be occurring here if it were not for the protective influence of these structures. There is some minor evidence of very localised, small scale erosion on the engineered slopes to the south of the village, but this does not appear to be significant. Therefore it is classified as Inactive.

Unit MU7/2 is a narrow unit located to the south of Runswick Bay village. The slopes are relatively shallow and well vegetated. The only activity evident is at the unit toe, where the cliffs are subject to marine erosion in the absence of protection measures. This unit is also classified at Inactive.

These units have not changed activity class since the 2008 walkover survey.

MU7/1 – The slopes of Runswick Bay village (Inactive)

MU7/2 – The well vegetated slopes and eroding toe adjacent to Runswick Bay village (Inactive)

Mu7B – Runswick Sands
This sub-management unit consists of **units MU7/3 and MU7/4.**

Units MU7/3 and MU7/4 are located behind Runswick Sands. The cliffs here are similar to those within unit MU7/2 in that they are well vegetated and of a shallow gradient. The units do not have any protection at the toe and therefore are subject to continual marine activity. The toe is generally steep as a result, does not support any vegetation cover, and shows evidence of recent slumping and sliding. As a result, both units are classified as Locally Active.

These units have not changed activity class since 2008.

MU7/3 – Toe erosion at the base of the cliffs (Locally Active)

MU7/4 – Well vegetated, shallow gradient slopes (Locally Active)

Coast Protection Asset Condition Assessment
(Map 25 - Runswick Bay and Map 25C – Runswick Bay)

This Management Unit is divided into 2 Sub-Management Units:
Mu7A – Runswick Bay Village
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). Rock armour defences are tightly packed, with good coverage and no evidence of deformation. Near Runswick Sailing Club there is a new concrete slipway and revetment. These are also both in very good condition displaying no significant defects (Asset Ref. 1221D901D0602C01). The Sailing Club itself, located just south of the village, has been constructed on timber struts and features a mix of coastal defences (Asset Ref. 1221D901D0602C05).

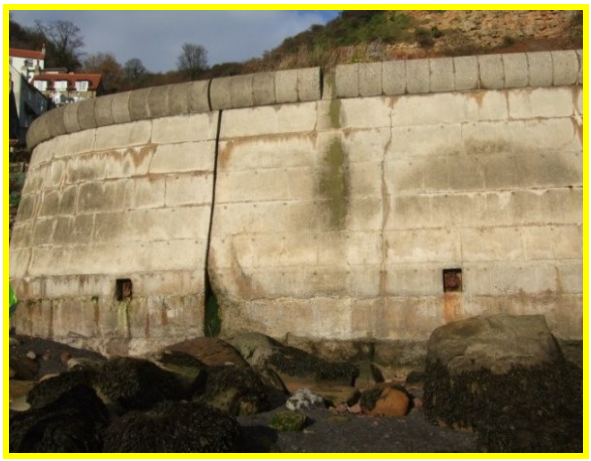
Runswick Sailing Club built on timber struts (Asset Ref. 1221D901D0602C05)

Looking Northeast towards Runswick Bay village across the new rock armour defences (Asset Ref. 1221D901D0602C01)

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 northern coastal sea wall, which gives direct protection to a private property, is suffering from surface cracking and erosion. Erosion of the underlying bedrock is causing 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 and wide voids emerging. It is recommended that these issues are addressed (Asset Ref. 1221D901D0601C01 and 1221D901D0601C03).

Undercutting of the northern coastal sea wall (Asset Ref. 1221D901D0601C01)



Wide void at joint and large vertical crack through wall (Asset Ref. 1221D901D0601C01)

Overview of wall showing gaps and erosion at joints (Asset Ref. 1221D901D0601C03)

Top of wall showing gaps at joints (Asset Ref. 1221D901D0601C03)

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 northern coastal sea wall, which gives direct protection to a private property, is suffering from surface cracking and erosion. Erosion of the underlying bedrock is causing undercutting of the sea wall. Further investigation is required to determine the rate of undercutting. Further defects include washed out sealant joints, flap valves which have seized shut, wash out of the joints under the capping beam, vertical cracks through the wall and wide voids emerging. It is recommended that these issues are addressed (Asset Ref. 1221D901D0601C01 and 1221D901D0601C03).

Beneath the northern properties, repair work to significant cracks at the toe of the wall is evident, although there are still unrepaired cracks to the second tiered wall behind. Although some vertical cracks to the toe have been recently repaired, horizontal cracks are appearing at the toe of the wall. This indicates that deformation is active. Installation of a tell tale would give precise levels of movement. Further studies are required (Asset Ref. 1221D901D0601C06).

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

Repaired vertical crack to toe of wall and vertical cracks to second tiered wall
(Asset Ref. 1221D901D0601C06)

The breakwater north of the slipway is in need of repair with large horizontal and vertical cracks propagating through the defence. It is advised that urgent repair work is carried out to the asset (Asset Ref. 1221D901D0601C02).

Overview of breakwater
(Asset Ref. 1221D901D0601C02)

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

Mu7B – Runswick Sands
The rock revetments described for Mu7A extent into this area (see above) but otherwise there are no other coastal assets here.

3.5 Management Unit 8 – Runswick Bay to Sandsend

Coastal Slope Condition Assessment
(Map 2 – Runswick Bay to Sandsend)

This Management Unit is divided into 2 Sub-Management Units:

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 and is classified as Locally Active. The toe is steep with little or no vegetation cover and evidence of recent falls and slides. The mid and upper slopes are more densely vegetated with localised patches of erosion.

Unit MU8/2 is a relict debris run out lobe situated adjacent to Runswick Sands. The slopes are generally shallower than those of neighbouring units and are mostly well vegetated. 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 is classified as Locally Active.

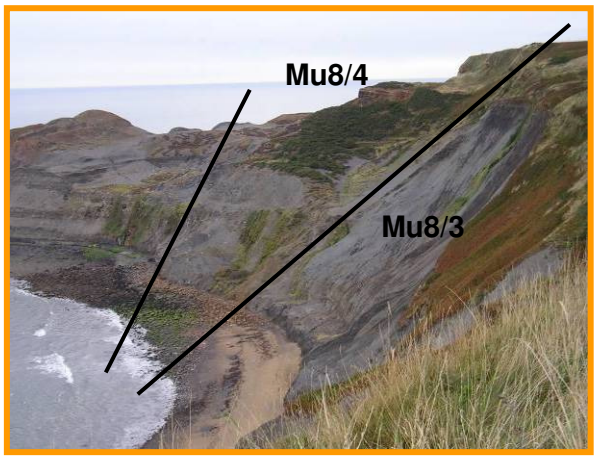
MU8/3 is located behind Kettleness Sand and is classified as Partly Active. The slopes are steep and free from vegetation down much of their length. There is intense weathering occurring along much of the unit, especially at the toe which is subject to marine action.

MU8/4 is small unit, just west of Kettle Ness itself. The mechanisms of erosion occurring here are alike those in unit MU8/3, although the morphology is more stepped. The intense weathering, marine erosion and lack of vegetation cover mean this unit is classified as Partly Active.

None of these units has changed activity class between the 2008 and 2009 walkover surveys.

MU8/1 The cliffs behind Runswick Sands (Locally Active)

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



MU8/3 (foreground) and **MU8/4** (mid-distance) Intense weathering of the slopes above Kettleness Sand (both Partly Active) (approx. extents shown)

Mu8B – Kettle Ness to Sandsend
This sub-management unit consists of **units MU8/5 to MU8/15**.

Unit MU8/5 forms the headland of Kettle Ness. The flatter top part of the unit supports some vegetation cover. This area was extensively quarried for alum in the past and as a result is now subject to ongoing and intense weathering. It is classified as Partly Active.

Unit MU8/6 is located to the east of the Kettle Ness headland and is classified as Partly Active. 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 weathering of the lower grey materials.

Units MU8/7 and MU8/8 comprise the relict debris run out lobes of Seaveybog Hill and Ovalgate Cliff. They are generally well covered by vegetation which is dense in places. There is some evidence of localised activity at the toe and headscarp. These units are classified as Locally Active.

Unit MU8/9 is located at Loop Wyke and is classified as Partly Active. The upper slopes of this unit support some vegetation cover. Lower down the slopes are very steep, support no vegetation cover and are undergoing intense weathering. The base of the unit is subject to marine erosion.

Unit MU8/10 forms a relict debris slide lobe with a steep back face and shallow toe. The unit is quite well vegetated with some localised erosion evident at the headscarp and at the toe. Some protection of the toe is afforded by past rockfall deposits. This unit is classified as Locally Active.

Unit MU8/11 is located at Keldhowe Steel and is classified as Partly Active. There has been a minor increase in activity within this unit since the 2008 walkover survey. This is indicated by increased weathering of the lower slopes and a reduced vegetation cover. The upper slopes still support some vegetation, with localised patches of erosion at the headscarp.

Just south of Keldhowe Steel is **unit MU8/12**. The lower slopes of this unit are steep, exposed and subject to marine erosion. Further upslope the unit supports some vegetation with minor, localised erosion of the headscarp. This unit is classified as Partly Active.

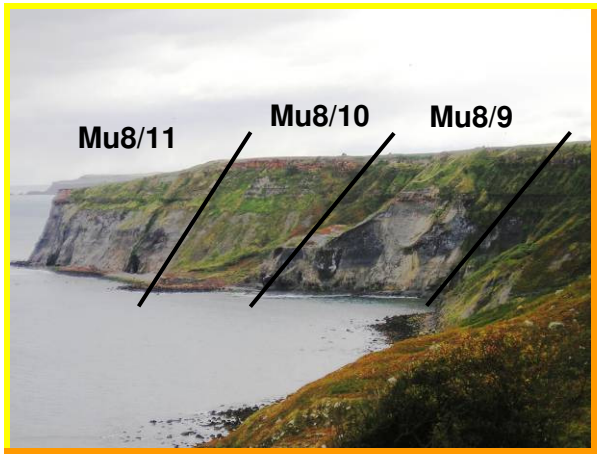
Units MU8/13, MU8/14 and MU8/15 form the headland of Sandsend Ness and the adjacent cliffs. All units are classified as Partly Active. The toes of these units are subject to continual marine action and are eroding accordingly. Some vegetation is supported on the upper slopes. The disintegration of relict sea defences within Unit MU8/15 are resulting in exposure and erosion of the lower cliff face.

With the exception of unit MU8/11, none of these units have exhibited a change in activity sufficient to warrant a change in activity status in 2009.

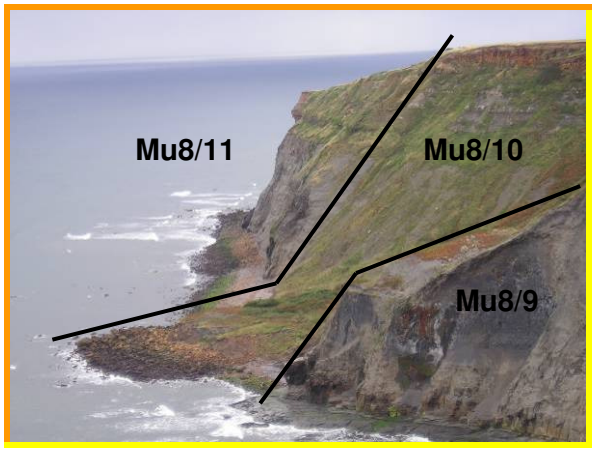
MU8/5 The ongoing erosion of the Kettle Ness headland (Partly Active)

MU8/6 (mid-distance) Steep, exposed slopes (Partly Active) (approx. extent shown)

MU8/7 and **MU8/8** The well vegetated relict debris flow lobe at Seaveybog Hill (Locally Active)



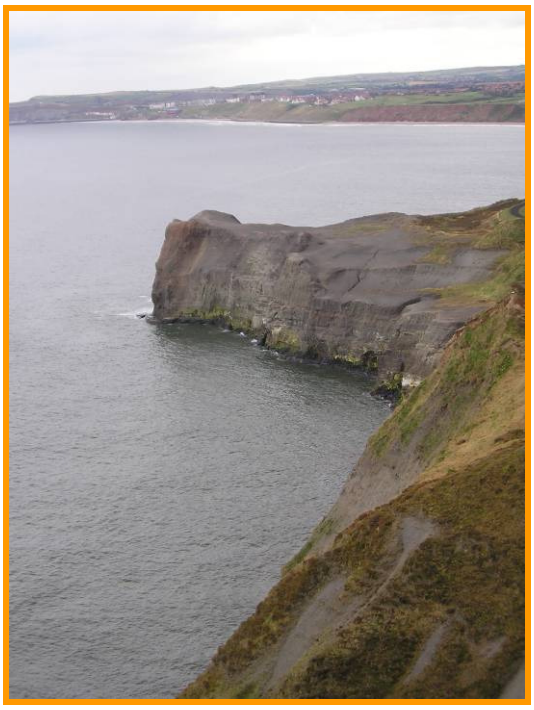
MU8/9 Partly Active, **MU8/10** Locally Active, **MU8/11** Partly Active (approx. extents shown)



MU8/9 Partly Active, **MU8/10** Locally Active, **MU8/11** Partly Active (approx. extents shown)

MU8/12 Steep, unvegetated lower slopes and shallower, partly vegetated upper section (Partly Active)

MU8/13 and **MU8/14** Erosion at the toe of the units (Partly Active) (approx. extents shown)



MU8/14 Sandsend Ness (Partly Active)

MU8/15 Erosion just north of Sandsend (Partly Active)

MU8/15 Marine erosion of lower part of this unit, just north of Sandsend (Partly Active)

Coast Protection Asset Condition Assessment
(Map 26 – Runswick Bay to Kettleness and Map 26A Runswick Bay)

Two retaining walls believed to be used to protect and maintain stability of the disused railway line can be seen along the coast. The brickwork wall at Deepgrove Wyke appears to be in good condition, although was difficult to inspect, and appears to be preserving the stability of the embankment. The second wall South of The Scar has failed; most of the wall has now collapsed onto rocks below. This defence is now thought to be redundant, and as the wall is so short in extent, it has not been included in the asset inspection report.

Brickwork wall at Deepgrove Wyke
(Asset Ref. 1221D901D0603C01)

Failed masonry wall South of The Scar
(Asset Ref. 1221D901D0701C01)

3.6 Management Unit 9 – Sandsend

Coastal Slope Condition Assessment
(Map 3 – Sandsend to Whitby East)

This Management Unit is divided into three Sub-Management Units, as follows:

Mu9A and Mu9B – Sandsend Village
These management units comprise **units MU9/1 and MU9/2**. Both units are defended at the toe by the Sandsend sea wall, groynes and some rock armour. As a result there is no evidence of recent activity and the units are both classified as Dormant, as they were in 2008.

MU9/1 and **MU9/2** located at Sandsend (both Dormant)

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 been some effort to stabilise the slopes within this unit; however the presence of tension cracks, rilling and gullying in exposed materials provides evidence of ongoing instability. Therefore this unit is classified as Partly Active. This does not represent a change in activity since 2008.

MU9/3 Ongoing instability above the concrete defences (Partly Active)

MU9/3 Looking up from Sandsend Beach (Partly Active)

Coast Protection Asset Condition Assessment
(Map 27 – Kettleness to Whitby and Map 27A Sandsend)

Mu9A and Mu9B – Sandsend Village
Coastal defences at Sandsend are in fair to poor condition. A concrete revetment, the most northerly defence (car park area), 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, with some reinforcement bars being exposed. 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 in places resulting in undercutting. This could be ameliorated by increasing the basal rock armour protection (Asset Ref No.1221D901D0701C02).

The remnants of timber groynes are visible in front of Sandsend village. These are in such a poor state that it is unlikely that they have a significant impact on sand movement. The toe of the seawall is also showing evidence of significant damage and movement although not yet affecting the structural stability of the sea wall (Asset Ref. 1221D901D0702C01).

A fairly new short section of blockwork sea wall supports a cantilevered promenade along part of the Sandsend frontage. In the previous inspection undercutting of the toe of this structure revealed steel sheet piling in need of repair. Due to the beach height this was not visible on the current inspection therefore the only defects to the defence is a large vertical crack and minor erosion to the sea wall (Asset Ref. 1221D901D0702C04).

Exposed reinforcement bar and undercutting to concrete revetment
(Asset Ref No.1221D901D0701C02)

Concrete revetment located in the north of Sandsend
(Asset Ref No.1221D901D0701C02)

Timber toe of sea wall in a poor state
(Asset Ref. 1221D901D0702C01)

Timber groynes in front of Sandsend (Asset Ref. 1221D901D0702C01)

Relatively new blockwork sea wall with undercutting at the toe
(Asset Ref. 1221D901D0702C04)

Undercutting and erosion of the concrete revetment backing Sandsend Beach
(Asset Ref. 1221D901D0702C04)

Mu9C – East Sandsend

Southeast of Sandsend, a large concrete revetment covering light weight rock armour runs parallel to the coastal road. The 800m long defence features many significant defects throughout. The most common of these being surface cracking and localised spalling, the most significant defect being major undercutting, erosion of the toe and a large crack and collapsed section at the east end of the revetment. During the inspection repair work was taking place to the base of the revetment at the west end. It is advised that this repair work is extended to the other parts of the wall where rock armour is exposed (Asset Ref. 1221D901D0702C02).

Exposed rock armour at base of concrete revetment (Asset Ref. 1221D901D0702C02)

Large crack and collapse at East end of the concrete revetment (Asset Ref. 1221D901D0702C02)

Undercutting of concrete revetment (Asset Ref. 1221D901D0702C02)

Cracks and exposed rock armour (Asset Ref. 1221D901D0702C02)

3.7 Management Unit 10 – Upgang Beach

Coastal Slope Condition Assessment
(Map 3 – Sandsend to Whitby East)

This Management Unit comprises units **MU9/4, MU10/1** and **MU10/2.**

Unit MU9/4 is comprised of well vegetated slopes which are protected in part by the concrete toe defences. There is still some minor localised erosion at the unit toe so that this unit is classified as Locally Active.

Further east, **unit MU10/1** is a small unit classified as Inactive. The relict cliffs are vegetated down most of their length, with some small patches of erosion evident at the unit toe.

Unit MU10/2 comprises the glacial till cliffs behind Upgang Beach. These cliffs are prone to episodic failure in the form of localising mudsliding and block failure onto the beach. Vegetation cover is sporadic and is most likely related to the landslide cycles. This unit is classified as Partly Active.

None of these units have changed activity class between the 2008 and 2009 walkover surveys.

Coast Protection Asset Condition Assessment
(Map 3 – Sandsend to Whitby East)

There are no coastal assets within this Management Unit.

MU9/4 (Locally Active)

MU10/1 Well vegetated slopes with few signs of activity (Inactive)

MU10/2 The collapsing till cliffs at Upgang Beach (Partly Active)

MU10/2 Activity onto Upgang Beach (Partly Active)

3.8 Management Unit 11 – Whitby West

Coastal Slope Condition Assessment
(Map 3 – Sandsend to Whitby East)

This Management Unit is divided into 2 Sub-Management Units:

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

These units are comprised of regraded slopes which are largely protected by the sea wall and promenade. As a result there is very little evidence of activity. **Unit MU11/1** is classified Inactive.

Within **unit MU11/2**, there is evidence of slope wash and footpath erosion has caused localised disintegration of the underlying slope stabilisation fabrics. As a result, this unit is classified as Locally Active.

These units have not changed activity status since the 2008 walkover survey.

MU11/1 Regraded, stabilised slopes (Inactive)

MU11/1 Minor patch of erosion above the promenade (Inactive)

MU11/2 Localised slope erosion (Locally Active)

MU11/2 Close up of slope erosion (Locally Active)

Mu11B – Whitby Sands East
This Management Sub-Unit consists of units **MU11/13** and **MU11/14**.

These units are generally protected by a variety of coastal structures. The coastal slope at **unit MU11/13** shows very few signs of activity and therefore is classified as Inactive. Exposed rock faces are showing minor erosion in the absence of defences in places within **unit MU11/14**. As a result, this unit is classified as Locally Active.

These units have not changed activity status between the 2008 and 2009 walkover surveys.

MU11/3 Well vegetated slopes with little evidence of recent activity (Inactive)

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

Coast Protection Asset Condition Assessment
(Map 27 – Kettleness to Whitby and Map 27A Sandsend)

Mu11A – Whitby Sands West and Mu11B – Whitby Sands East
Rock armour defences along the promenade to the west of Whitby are in good condition with only minor movement visible in the armour. The promenade and low concrete retaining wall are in good condition with repaired and sealed lateral cracks along the promenade. Some planks along the promenade appear to be sinking with standing water, further investigation and monitoring is needed (Asset Ref. 1221D901D0801C01).

Rock armour along the promenade, west of Whitby (Asset Ref. 1221D901D0801C01)

Promenade looking North West (Asset Ref. 1221D901D0801C01)

The slipway and stair structures were digitised for defences to the west of Whitby, these structures were all in poor condition. Defects such as undercutting, erosion, cracking, exposure of aggregate and rounding of step edges have occurred to most of these structures. Repair work 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. 1221D901D0802C04001).

Erosion evident to slipway next to wall (Asset Ref. 1221D901D0802C13002)

Erosion and cracking to stair side wall (Asset Ref. 1221D901D0802C04001)

3.9 Management Unit 12 – Whitby

Coastal Slope Condition Assessment
(Map 3 – Sandsend to Whitby East)

This Management Unit consists of **unit MU12/1** only and is situated below Whitby Abbey. The slopes are generally well vegetated with localised activity at the toe and headscarp. For example, there is some rock exposure just below the headscarp which is supported by wire netting. This unit is classified as Locally Active – this does not represent a change in activity class since the 2008 walkover survey.

MU12/1 Below Whitby Abbey (Locally Active)

MU12/1 Localised erosion at the toe and headscarp (Locally Active)

Coast Protection Asset Condition Assessment
(Map 28 Whitby to Saltwick Bay and Map 28A Whitby)

This Management Unit encompasses the sea walls and the East and West Piers (or 'harbour arms') of Whitby's harbour. Coastal defences at Whitby are generally in fair condition, but several exhibit major defects. Cracking, loss of mortar, expansion sealant and surface erosion are common to virtually all concrete and blockwork structures, including the west and east harbour arms (where visible) and the adjacent sea wall. Although defects are localised, it is recommended that repointing is undertaken to prevent areas of weakness being exploited further. Sections of the sea wall not protected by rock armour revetment are particularly susceptible to increased levels of surface erosion and exploitation of joints between concrete sections (Asset Ref. 1221D901D0802C03 to 1221D901D0802C12).

There is cracking to numerous concrete planks along the northern promenade. Spalling and cracking to the coping at top of sea wall is also visible along the length. This is the case in those sections protected with rock armour and those with no protection.

Cracking and settlement of promenade
(Asset Ref. 1221D901D0801C01)

Damage and repair to coping
(Asset Ref. 1221D901D0802C01)

Further east, adjacent to North Promenade, a large concrete walls structure (Asset Ref. 1221D901D0802C03) is currently intact, but the toe is exposed and eroded along its length, leading to significant undercutting. This defence is currently in a poor condition. It is recommended that further studies are undertaken to investigate cause of degradation. Repairs to toe are required to prevent future instability of wall. Adjacent sections of wall show similar defects although toe is often less visible here

Overview of asset looking south, showing exposure of toe.
(Asset Ref. 1221D901D0802C03)

Erosion of toe near northern extent
(Asset Ref. 1221D901D0802C03)

Erosion of toe and stair foundation
(Asset Ref. 1221D901D0802C03)

Significant undercutting to defence
(Asset Ref. 1221D901D0802C03)

Cracking, repair work and exposed toe
(Asset Ref. 1221D901D0802C03)

Exposure of rebar and cracking to underside of capping
(Asset Ref. 1221D901D0802C03)

The wall adjacent to Argyle Road is in fair condition, and is intact with no toe exposed at the time of the site visit. 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.

Overview of asset, looking south. Patchwork repairs to capping visible.
(Asset Ref. 1221D901D0802C04)

Significant damage to and cracking beneath capping
(Asset Ref. 1221D901D0802C04)

View near tunnel showing damage resulting from erosion and abrasion
(Asset Ref. 1221D901D0802C04)

Close up view of eroded front face and significant vertical crack (to left of image)
(Asset Ref. 1221D901D0802C04)

Between Argyle Road and the Royal Crescent, two sections of blockwork separated by a slipway show further defects. There are cracks through blocks, washout along joints and the capping shows significant damage which requires repair. Defence with Asset Ref. 1221D901D0802C07 is currently in poor condition and 1221D901D0802C06 is in fair condition. Both assets have pipes exiting through front face, seepage from which has attracted vegetation growth.

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

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

Visible joint washout and seepage
(Asset Ref. 1221D901D0802C06)

View of capping and promenade
(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 protection walls formed of timber breastwork, rock armour and vertical walls. Most require non-urgent repair works and are in fair condition. Typical defects here include cracking and washout at joints. It appears that there may be some movement in the vertical wall directly beneath the north corner of the theatre building/walkway. It is recommended that further investigations and monitoring are undertaken here, installation of tell tales and the setting up of a deformation survey may be appropriate.

Overview of assets
(Asset Refs. 1221D901D0802C05 and C15)

Mortar loss and surface erosion to wall
(Asset Ref. 1221D901D0802C15)

The natural cliff to the east of the theatre is additionally defended with a series of blockwork and brickwork sections. These vary in construction and are generally in good condition. However, one section shows some significant undercutting, which lowers the condition to a 'fair' grading. Although only localised, this area does require repair.

Natural cliff protected with block/brickwork
(Asset Refs. 1221D901D0802C09)

Undercutting to blockwork section, requires repair
(Asset Refs. 1221D901D0802C09)

The area around First Nab just west of West Pier is formed of large stone blocks (Asset Ref. 1221D901D0802C12) and shows signs of movement, from numerous cracked blocks to large gaps at joints. Investigation is required as to the reason for this movement, and repairs are required to prevent further washout of fines which subsequently may lead to more significant damage. Repairs to some gaps are evident, but further repairs are deemed necessary.

Repairs visible, also voids and gaps
(Asset Refs. 1221D901D0802C12)

Cracking, gaps and joints and lateral movement
(Asset Refs. 1221D901D0802C12)

The west and east harbour arms and breakwaters (Asset Refs. 1221D901D0803C01 / 02 / 03 / 04) were not inspected thoroughly due to limited access even at low tide. It is recommended that inspection from a boat is undertaken here. Both cases would need permission from the harbour master due to commercial boat activity in the vicinity. The eastern and western harbour arms (Asset Refs. 1221D901D0803C02 / C03) have loose blocks and possible vertical movement in one location on each arm. It is recommended that the fixity of the loose blocks is investigated urgently, and that any voids are filled. It is possible that loose blocks could displace and that there may be a significant quantity of wash-out material behind it, leading to the consequent weakening and collapse of the structure. In the longer term, the monitoring of movement of this structure is recommended, along with establishing the reason for movement if there is any. In addition to the vertical movement there are some cracks in the promenade (Asset Ref. 1221D901D0803C03) as well as erosion to the wall and capping beams (Asset Refs. 1221D901D0803C02 / C03). It is advised that the repair work for this asset is included in capital investment due to the amount of repair work required.

Close inspection of the breakwaters was not possible due to high tides. However, there were signs of recent concrete repair and replacement work. Erosion and cracks were visible at the top and edges of the concrete structure. The timber deck of the western breakwater was is a good condition, although slippery when wet and may present a possible H&S issue. Emergency works are currently being developed to repair voids and movement at the landward end of the eastern breakwater, with construction anticipated in summer 2010. The eastern breakwater has no access due to a bridge no longer being in service connecting the pier to the breakwater. This has given a limited visual inspection from the east harbour arm and will also need a full inspection by boat.

Displacement of blockwork to west side of the west harbour Pier
(Asset Ref. 1221D901D0803C02)

Crack and voids to east harbour pier (inspection below the water line is necessary before replacement of blocks)
(Asset Ref. 1221D901D0803C03)

Erosion to edges of west concrete breakwater
(Asset Ref. 1221D901D0803C01)

East breakwater
(Asset Ref. 1221D901D0803C04)

Timber pontoon on RNLI pier platform
(Asset Ref. 1221D901D0803C08)

Cracking and erosion to east harbour wall next to breakwater
(Asset Ref. 1221D901D0803C08)

	
Concrete extension of promenade supports (Asset Ref. 1221D901D0803C06)	Wall at East side of harbour (Asset Ref. 1221D901D0803C09)

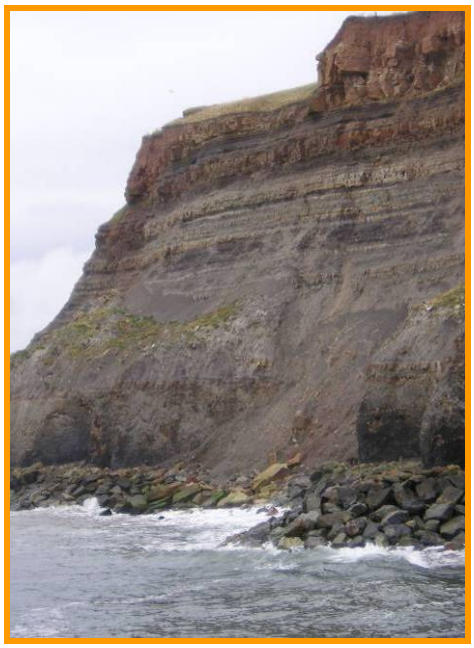
The east inner harbour walls are in poor condition although structurally sound at present. Missing and displaced blockwork, large horizontal cracking as well as erosion and voids are present throughout the wall (Asset Ref. 1221D901D0803C08 and 1221D901D0803C09). Previous repair work is visible throughout the wall, although more repair work is needed. A pontoon structure attached to end of the RNLI pier has missing and corroded bolts causing movement in the structure. A local resident describes visible movement while several pedestrians were standing on the platform. Due to the height of the tide at low tide there is limited access to the structure, therefore an inspection from a boat and further investigation into the structure is needed (Asset Ref. 1221D901D0803C08). An inspection via boat is also needed for a promenade extension on the West side of the harbour. Limited access is available under the extension giving limited visibility to the wall and supports and hindering a full inspection (Asset Ref. 1221D901D0803C06).

3.10 Management Unit 13 – Whitby East

Coastal Slope Condition Assessment
(Map 3 – Sandsend to Whitby East and Map 4 – Whitby East to Pursglove Stye)

This Management Unit is divided into 2 Sub-Management Units:

Mu13A – Cliffs east of Whitby Harbour
This Sub-Management Unit consists of **unit MU12/2** only. The high cliffs which comprise this unit are classified as Partly Active. There is evidence of a large recent rock fall from the upper part of the cliff and ongoing erosion at the headscarp. Almost the entire cliff face is exposed with very little vegetation cover. There is no change in activity level since 2008.



MU12/2 Recent rockfall evidence (Partly Active)

MU12/2 Looking east from Whitby's East Pier showing recent failure from the cliff top (Partly Active)

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)

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 consist of a hard blocky layer and a softer top layer. There is evidence of past rockfall from the blocky layer, and recession of the headscarp is occurring in the softer layer.

Unit MU13/2 comprises the intensely weathered 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.

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 beach. As a result, the unit features less activity and is generally well vegetated. It is classified as Locally Active.

Unit MU13/4 is located just east of Saltwick Bay yet does not have the beach protection as in unit MU13/3. Consequently it is subject to marine erosion at the toe and much of the slopes

are active and exposed. There is evidence of sliding and rock fall and there is ongoing minor recession of the headscarp. This unit is therefore classified as Partly Active.

Unit MU13/5 is formed by the shallow, relict debris flow lobe at Black Nab. The slopes of this unit are well vegetated, with minor activity evident only in places at the toe and headscarp. This unit is classified as Locally Active.

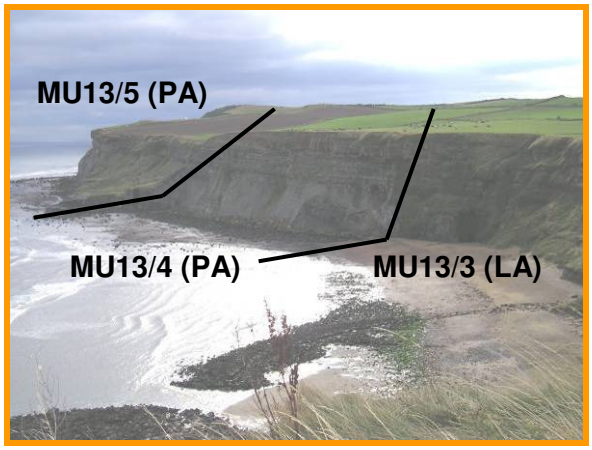
Unit MU13/6 is a long, steep-faced unit which sits below the Whitby Fog Signal and the former lighthouse. There is some intermittent vegetation cover however; the slopes are largely exposed with evidence of rockfall from the upper strata and ongoing weathering and marine erosion of the lower layers. This unit is classified as Partly Active.

None of these units have experienced a change in activity status between the 2008 and 2009 walkover surveys.

MU13/1 Cliffs east of Whitby (Partly Active)

MU13/2 The highly weathered headland of Saltwick Nab (Partly Active)

MU13/3 Saltwick Bay cliffs and beach (Locally Active)
(approx. unit extents shown)



MU13/4 Exposed, eroding cliff subject to marine erosion (Partly Active)
(approx. extents of adjacent units shown)

MU13/5 Well vegetated debris flow lobe at Black Nab (Locally Active)

MU13/6 Steep faces below the Whitby Fog Signal (Partly Active)

MU13/6 Steep exposed lower slope (Partly Active)

Coast Protection Asset Condition Assessment
(Map 28 Whitby to Saltwick Bay and Map 29 Saltwick Bay to Raw Pasture Bank)

Mu13A – Cliffs east of Whitby Harbour
There is a section of rock armour protecting the eastern side of the harbour and toe of natural cliff directly to the east of Whitby. The rock armour varies in size from 1-4 tonnes to 5-8 tonnes. Rockfall as identified in previous inspection is still visible, either replenishment with larger rock armour or a larger scale repair is recommended if this can be justified (Asset Ref No.1221D901D0803C05).

Close up of the base of a rockfall over rock armour defences
(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
(Map 4 – Whitby East to Pursglove Stye)

The only unit within this Management Unit is **MU14/1**. The cliffs within this unit are classified as Locally Active. The slopes are generally well vegetated, with small local patches 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 2008.

MU14/1 An area of localised erosion (Locally Active)

MU14/1 Vegetated debris aprons and boulder lobes (Locally Active)

Coast Protection Asset Condition Assessment
(Map 29 Saltwick Bay to Raw Pasture Bank)

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
(Map 5 – Pursglove Stye to Tinkler's Stone)

This Management Unit consists of **units MU15/1 to MU15/4.**

Unit MU15/1 is a long, generally well vegetated unit classified as Locally Active. There are localised areas of more intense erosion in places.

Unit MU15/2 is located at Far Jetticks. This cliff is active down its entire length, with ongoing weathering, rilling and gullying evident and marine erosion at the toe. Consequently this unit is classified as Totally Active.

Unit MU15/3 is largely comprised of the headland of Bay Ness, north of Robin Hood's Bay. The upper slopes support some continuous vegetation cover however the lower slopes are largely exposed. As a result they are subject to ongoing erosion and occasion small scale rock falls. This unit is classified as Partly Active.

Just north of Robin Hood's Bay Village is **unit MU15/4**. The cliffs have a general absence of vegetation cover and are eroding down much of their length. There is evidence of sliding, rilling and weathering with active recession of the headscarp. The toe is mantled by a narrow boulder strip which is insufficient to protect against marine action. This unit is classified as Partly Active.

None of these units have changed activity class since the 2008 walkover survey.

MU15/1 Well vegetated slopes (Locally Active)

MU51/1 An area of intense erosion (Locally Active)

MU15/2 Far Jetticks (Totally Active)

MU15/3 Ongoing erosion and evidence of small scale rockfall (Partly Active)

MU15/3 (Partly Active)

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

Coast Protection Asset Condition Assessment
(Map 29 Saltwick Bay to Raw Pasture Bank)

There are no coastal assets within this Management Unit.

3.13 Management Unit 16 – Robin Hood's Bay

Coastal Slope Condition Assessment
(Map 5 – Pursglove Stye to Tinkler's Stone)

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.**

Unit MU16/1 sits below the upper part of Robin Hood's Bay Village and is classified as Partly Active. The upper slopes are composed of soft material and support some vegetation cover with evidence of slumping, sliding and recession of the headscarp in places. The lower slopes are near vertical with no vegetation cover and are stained by the material eroded from the upper slopes. Sliding and marine undercutting is also occurring.

Units MU16/2 and Mu16/3 are located further south at Robin Hood's Bay Village and are both classified as Dormant. The units are largely protected by sea defences and show no evidence of recent activity. There is however, a section of cliff which is not currently protected and is therefore subject to intense marine erosion. This should be addressed as soon as possible in order to prevent the development of instability in this area.

None of these units has changed activity status since 2008.

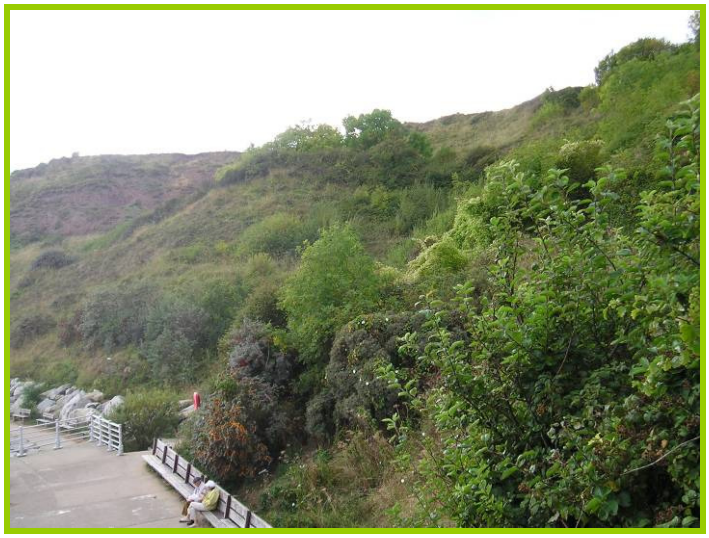
MU16/1 Cliffs below the upper part of Robin Hood's Bay Village (Partly Active)

MU16/2 and **MU16/3** Slopes and sea defence at Robin Hood's Bay (Dormant)

MU16/2 Undefended section subject to marine action and potential instability if not addressed (Dormant)

Mu16B – South of Robin Hood's Bay Village

This Sub-Management Unit consists of **unit MU17/1** only. This unit is defended at the toe by a sea wall and rock armour. The slopes are densely vegetated with trees and shrubs and show little evidence of recent activity. As a result this unit is classified as Inactive, as it was in 2008.



MU17/1 Looking south from Robin Hood's Bay Village (Inactive)

Mu16C – Cowling Scar

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

Unit MU17/2 is 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 sliding and some rilling is occurring. This unit is classified as Locally Active.

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.
These units have not changed activity status between the 2008 and 2009 walkover surveys.

MU17/2 Localised activity mid-slope (Locally Active)

MU17/3 Partly Active

MU17/3 Looking southwest across Robin Hood's Bay (Partly Active) (approx. unit extents shown)

Coast Protection Asset Condition Assessment
(Map 30 Robin Hoods Bay and Map 30A Robin Hoods Bay)

Robin Hood's Bay village is defended by an extensive coast protection scheme which was completed in 2001. All defences within Mu16 are in a fair to good condition, with the older original structures showing evidence of damage and minor defects. Recommendations include repointing and repairing of minor cracks where identified. Localised areas of vegetation growth could also be sprayed or removed to prevent increasing amounts of growth during successive summers.

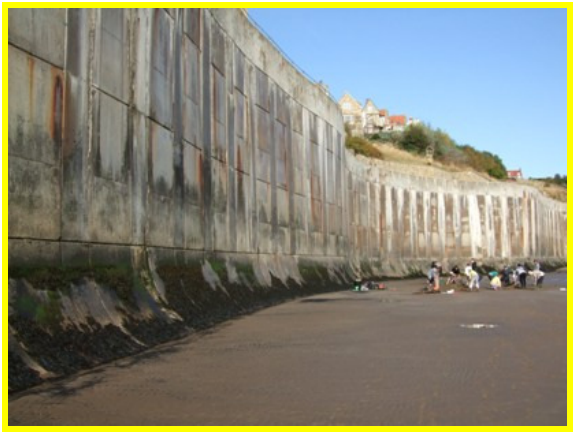
Mu16A – Robin Hood's Bay Village
At the northern end of this Sub-Management Unit there is a newly built sea wall in very good condition. Joints and sealant show no signs of damage or minor defects. There is packing visible in some joints, possibly for resistance of movement. Rock armour protecting the toe of the wall is tightly packed with good coverage throughout. The northern slipway is supporting some vegetation growth but is overall in good condition (Asset Ref. 1221D901D1003C01).

Sea wall at the northern end of Mu16A
(Asset Ref. 1221D901D1003C01)

Joint between defended and undefended section. Packing of joints between blocks also visible
(Asset Ref. 1221D901D1003C01)

Further south there is a large vertical defence wall, directly protecting houses located behind at high level. The concrete is in a fair to poor condition, showing evidence of surface cracking, rust marks, mineral encrustation, seepage, cracking and repair work to the crest of the wall. There is some evidence of undercutting at the toe (Asset Ref. 1221D901D1003C02).

In between the two hard defences there is a short section of exposed cliff, which is exhibiting signs of erosion and threatens to undermine the western end of the vertical wall.

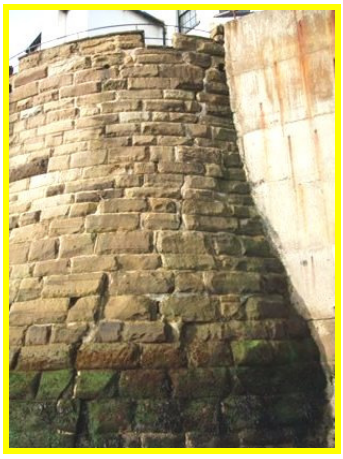


Large vertical wall at Robin Hood's Bay
(Asset Ref. 1221D901D1003C02)

Joint between defended and undefended section
(Asset Ref. 1221D901D1003C02)

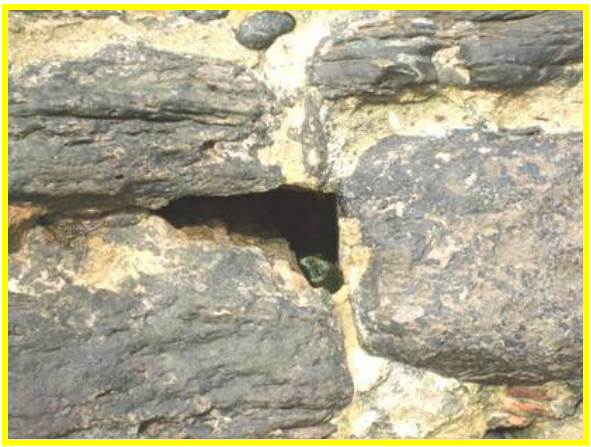
Mu16B – South of Robin Hood's Bay Village
This small Sub-Management unit features a short section of sea defence and some rock armour revetment extending to the south.

The short section of defence (Asset Ref. 1221D901D1003C04) has an exposed toe with evidence of large cracks at its southern end. The wall surface is showing some evidence of surface erosion and repair work and repointing to the joints. The structure exhibits no further signs of deformation although further repointing and repair work is needed. The adjacent slipway (Asset Ref. 1221D901D1003C06) is in a good condition, with some signs of wear but otherwise minimal cracking and loss of cobble stones.



Wall on north side of slipway with cracks visible - properties above
(Asset Ref. 1221D901D1003C04)

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



Close up of void
(Asset Ref. 1221D901D1003C04)

Slipway with missing cobbles and cladding
(Asset Ref. 1221D901D1003C05)

The mixed construction defence (Asset Ref. 1221D901D1003C06) on the opposite side of the slipway is formed of mass concrete at the base with stone and blockwork above. The most notable defects here are wide cracks in the concrete base, although these are currently no cause for concern.

Looking northwards at the short section of defence in the south of Robin Hood's Bay village (Asset Ref. 1221D901D1003C06)

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

The southern-most defences in the village (Asset Refs. 1221D901D1003C09/C10) are formed of rock armour, together with a section of concrete sea wall. These defences are considered to be in a good condition. Rock armour is 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, rather than visible cracking, as well as erosion to the capping beam and spalling. The promenade above the sea wall is in a good condition, with only minor defects present

The rock armour, sea wall and promenade above (Asset Ref. 1221D901D1003C10)

Sea wall with damaged capping beam (Asset Ref. 1221D901D1003C10)

Mu16C – Cowling Scar

The rock armour described for Mu16B extends southwards into this Sub-Management Unit. There is also a section of newly installed rock armour which is in very good condition, is tightly packed and performing well (Asset Ref. 1221D901D1003C07). Vegetation is present on the defences in localised spots, however it is anticipated that this will die away in the winter months. As described in the Coastal Slope Condition Assessment, there is noticeably greater erosion of the natural cliffs where the rock revetment finishes to the south, which is a typical 'end effect' of linear coastal defences. The condition of these assets remains unchanged since previous inspection.

Individual slipway and stair structures were included in the inspection for the Robins Hood Bay stretch of defences. These structures were all in good condition with the residual life of

the assets ranging from 11-20 to over 20 years. None of the structures show any signs of defects and do not require any maintenance work, although continued monitoring of the structures is advised.

Looking northwards at the rock armour
(Asset Ref. 1221D901D1003C07)

Slipway next to rock armour at south end of bay
(Asset Ref. 1221D901D1003C07001)

Extent of rock armour, showing 'end effect'
(Asset Ref. 1221D901D1003C07)

3.14 Management Unit 17 – Cowling Scar to Peak Steel

Coastal Slope Condition Assessment
(Map 5 – Pursglove Stye to Tinkler's Stone and Map 6 – Tinkler's Stone to Common Cliff)

This Management Unit is divided into 2 Sub-Management Units:

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

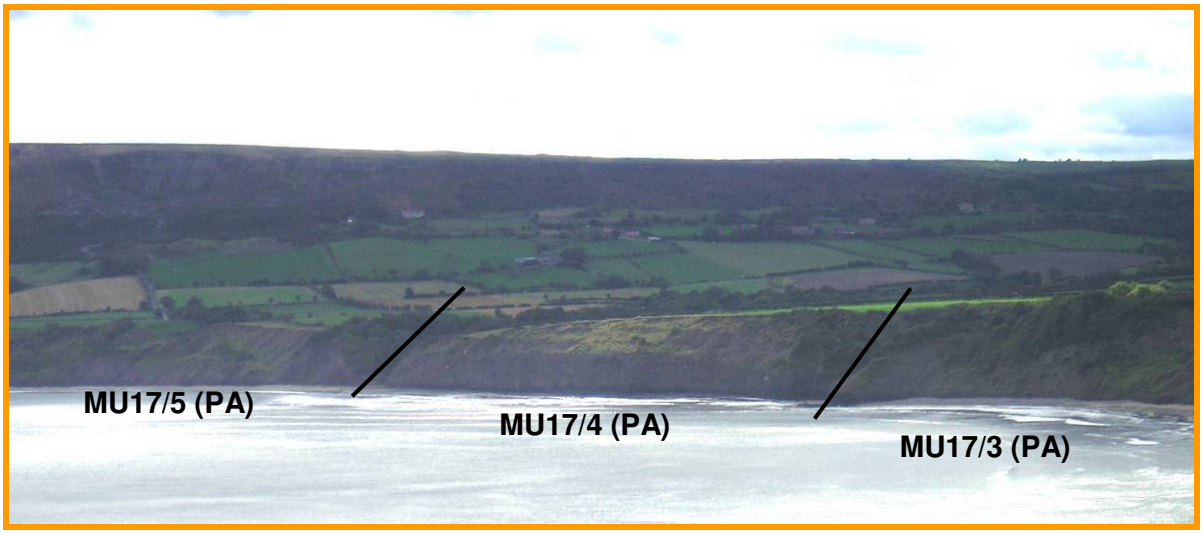
This Sub-Management Unit consists of **units MU17/4 to MU17/9.**

Units MU17/4 and MU17/5 are located south of Boggle Hole and are classified as Partly Active. The lower cliff face is near vertical and lacking in vegetation cover. The upper cliff is a shallower gradient, composed of softer, glacial sediments, and is better vegetated. Within **unit MU17/5** there is evidence of recent sliding and toppling activity from the lower slopes onto the beach.

Further south, units **MU17/6 and MU17/7** are classified as Locally Active. The upper slopes of these units are more stable with more continuous, dense vegetation cover than those units to the north. Some localised activity at the headscarp and toe is evident.

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.

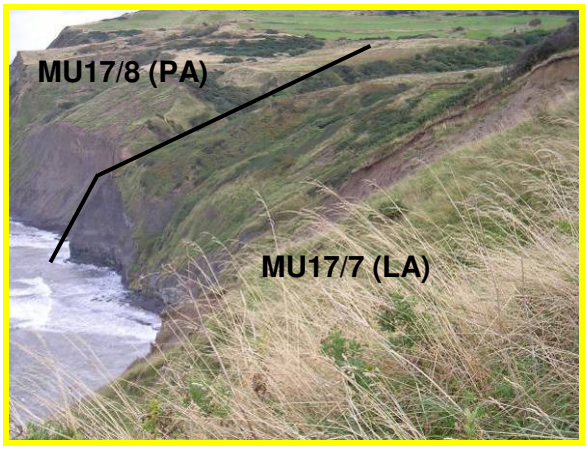
None of these units has experienced a change in activity level since the 2008 inspection.



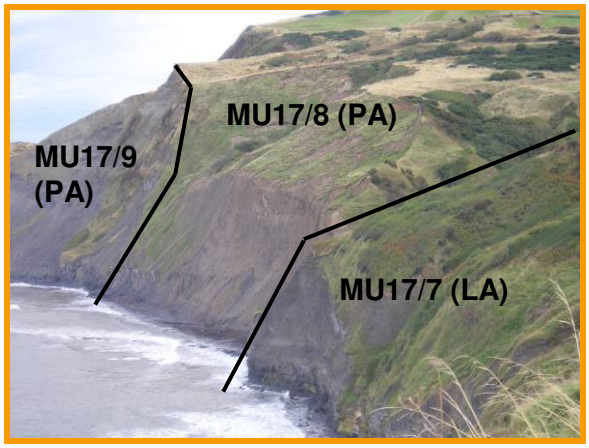
MU17/3, MU17/4 and **MU17/5** All units Partly Active (approx. unit extents shown)

MU17/5 Recent failure onto the beach (Partly Active)

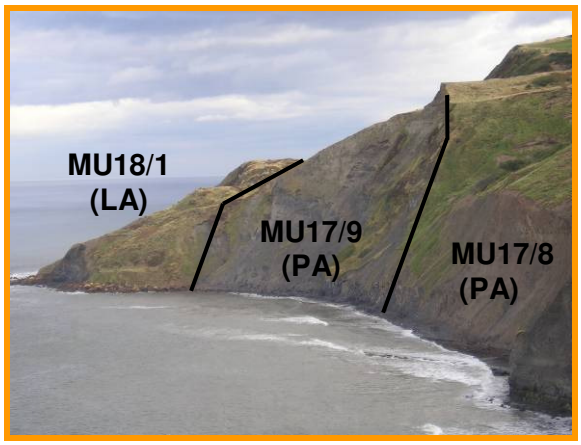
MU17/5 Looking northwards (Partly Active)



MU17/7 Locally Active and **MU17/8** Partly Active (approx. unit extents shown)



MU17/7 (Locally Active), **MU17/8** and **MU17/9** (Partly Active) West of Peak Steel (approx. unit extents shown)



MU17/8 and **MU17/9** in the foreground (Partly Active)

Coast Protection Asset Condition Assessment
(Map 31 Robin Hoods Bay to Hayburn Wyke)

Mu17A – Boggle Hole
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. Access is provided to the beach via a concrete slipway.

Mu17B – Boggle Hole to Peak Steel
A short section of rock armour revetment and concrete and timber piling are providing protection to the mouth of the Stoupe Beck (Asset Ref No.1221D901D1003C08), however these are fluvial rather than coastal sea defences and therefore are inspected by the Environment Agency.

Stone slipway giving access to beach and water at Boggle Hole

Looking upstream at Boggle Hole Youth Hostel, footbridge, slipway and fuel bund.

Mouth of Stoupe Beck
(Asset Ref No.1221D901D1003C08)

Rock armour revetment at the mouth of Stoupe Beck
(Asset Ref No.1221D901D1003C08)

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

Coastal Slope Condition Assessment
(Map 6 – Tinkler's Stone to Common Cliff and Map 7 – Beast Cliff to Hundale Point)

This Management Unit is divided into 2 Sub-Management Units, as follows:

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 with slides and falls evident. This unit is classified as Locally Active.

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

Neither of these units has changed activity status since 2008.

MU18/1 Peak Steel (Locally Active)

MU18/2 Distinct two-tiered cliffs (Inactive)

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 stepped terrain is a likely relict of former slumps or debris flow events. The slopes are well vegetated with only localised patches of activity evident at the slope toe. These units have not changed activity status since 2008.

MU18/3 Looking south (Locally Active)

MU18/3 Densely vegetated relict cliffs (Locally Active)

Coast Protection Asset Condition Assessment
(Map 31 Robin Hoods Bay to Hayburn Wyke)

There are no coastal assets within this Management Unit.

3.16 Management Unit 19 – Beast Cliff to Scalby Ness

Coastal Slope Condition Assessment
(Map 7 – Beast Cliff to Hundale Point and Map 8 – Scarborough North)

This Management Unit is divided into 5 Sub-Management Units:

Mu19A – Beast Cliff to Herbert Hole
This Sub-Management Unit consists of **unit MU19/1** only. Within this unit the cliffs are generally well vegetated, with minor localised patches of erosion at the unit toe. There is some evidence of marine erosion and small scale rockfall. This unit is classified as Locally Active, as it was in 2008.

MU19/1 Localised erosion at the unit toe (Locally Active)

MU19/1 Looking north (Locally Active)

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 to the north side of Hayburn Wyke and is classified as Locally Active. There is minor activity at the headscarp and some evidence of past rock falls at the toe. The slopes around the footpath on the northern side of Hayburn Wyke itself have been susceptible to instability in the past, but recent stabilisation works have remedied immediate problems.

Unit MU19/3 is located around and to the south of Hayburn Wyke. These cliffs are well vegetated in most places, with only minor localised erosion evident at the toe and headscarp.

Neither of these units have shown a change in the level of activity between the 2008 and 2009 walkover surveys.

MU19/2 Looking north across Hayburn Wyke (Locally Active)

MU19/3 Looking south across Hayburn Wyke (Locally Active)

MU19/3 Showing localised erosion (Locally Active)

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

Unit MU19/4 is located just north of Cloughton Wyke. The unit is characterised by high, steep cliffs which are more active than those cliffs further north. There is some recession of the headscarp, sliding and falling of materials down the mid-slopes to form debris cones and rock fall deposits at the cliff base. This unit is classified as Partly Active, as it was in 2008.

Mu19/4 Looking north (Partly active)

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

Unit MU19/5 is located on the northern side of Cloughton Wyke and is classified as Locally Active. The near vertical cliffs are composed of a hard blocky material which has produced small scale rock fall onto the shore in the past. The cliffs support some vegetation 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 with a general absence of vegetation cover. There is evidence of rockfall from this layer onto the shoreline below. The upper part of the cliff is shallower, composed of softer material and is fairly well vegetated. This unit is classified as Locally Active.

Neither of these units has changed activity status since the 2008 walkover survey.

MU19/5 Northern side of Cloughton Wyke (Locally Active)

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

MU19/6 Well vegetated cliffs south of Cloughton Wyke (Locally Active)

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. The cliffs are generally well vegetated, with boulder deposits at the base of the cliff. Minor activity is evident at the toe as a result of marine action and there is localisation recession of the headscarp.

Units MU19/9 and MU19/10 are located between Cromer Point and Scalby Ness and are classified as Partly Active. The toe of these units is subject to continual marine action and is slumped in places. The headscarp is steep, exposed and actively receding over much of the unit lengths. Despite the vegetation cover, mid-slope there are very common tension cracks, slumping, sliding and gliding blocks indicating ongoing activity.

The Scalby Ness headland comprises **unit MU19/11**. This area is well vegetated with only localised activity evident at the toe and some recession at the headscarp. This unit is classified as Locally Active.

None of these units have changed activity status since the 2008 walkover survey.

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

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

MU19/9 Headscarp erosion (Partly Active)

MU19/9 Partly Active

MU19/10 Mid-slope activity (Partly Active)

MU19/11 Scalby Beck (Locally Active)

MU19/11 Toe erosion at Scalby Ness (Locally Active)

MU19/11 Localised toe and headscarp activity at Scalby Ness (Locally Active)

Coast Protection Asset Condition Assessment
(Map 32 – Hayburn Wyke to Burniston and Map 33 - Scarborough)

The only coastal assets within this Management Unit are located in the Scalby Mills area of Sub-Management Unit Mu19E.

Mu19E – Hundale Point to Scalby Ness
There are no formal sea defences within the Scalby Mills area. However there is a coastal asset - a service pipe which has been laid across the mouth of Scalby Beck (Asset Ref. 1221D901D1201C09). This acts as a fixed crest weir controlling the flow of the beck at low tide. In a high tide situation this would have minimal affect on water dynamics, be they tidal or fluvial. At low tide, the pipe can be inspected throughout its length. It is in fair condition, with localised cracking and spalling. Repair work is recommended in order to prevent potential sewage pollution in the future.

Service pipe running across the mouth of Scalby Beck (Asset Ref. 1221D901D1201C09)

Service pipe running across the mouth of Scalby Beck (Asset Ref. 1221D901D1201C09)

3.17 Management Unit 20 – Scarborough North Bay

Coastal Slope Condition Assessment
(Map 8 – Scarborough North)

This Management Unit is divided into 2 Sub-Management Units:

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 and show no obvious evidence of recent activity, thus they are both classified as Dormant, as they were in 2008.

MU20/1 Dormant

MU20/2 Behind the sea wall (Dormant)

Mu20B – Southern North Bay

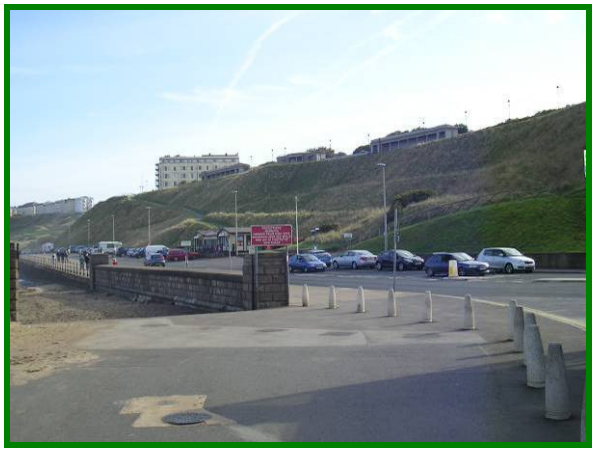
This Sub-Management Unit comprises **units MU20/3, MU20/4a and MU20/4b.**

Unit MU20/3 is well vegetated and shows no obvious evidence of recent instabilities. It is therefore classified as Dormant.

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.

Unit MU20/4b covers the area of Clarence Gardens and exhibits slightly more activity than the adjacent unit MU20/4a. For the most part the slopes are well vegetated with the exception of exposed rock at the headscarp. There is also some localised evidence of small scale sliding mid-slope. This unit is classified as Locally Active.

None of these units have changed activity status between the 2008 and 2009 walkover surveys.



MU20/3 Well vegetated slopes (Dormant)

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

MU20/4b Exposed rock headscarp (Locally Active)

Coast Protection Asset Condition Assessment
(Map 34 – Scarborough and Map 34A – Scarborough)

The coastline of Scarborough stretches for approximately 6.5km and is protected by a wide variety and large number of coastal flood defences.

Mu20A and Mu20B – Northern North Bay and Southern North Bay
Individual slipway and stair structures were included in the inspection for the North Bay promenade. These structures ranged in condition with the residual life of the assets from 6-10 through to over 20 years. Due to a high beach level most of the structures where largely buried, and therefore full inspections of the assets were not possible. Erosion and cracks, as well as rounding of step edges have occurred to most of the structures. Erosion and cracks are occurring to the side walls of the stairs at the North end of the promenade and are in need of repair (Asset Ref. 1221D901D1201C26001).

Erosion evident to stairs and side walls
(Asset Ref. 1221D901D1201C26001)

High beach level covering most of stairs
(Asset Ref. 1221D901D1201C12001)

There are formal defences throughout the whole length of the North Bay, many of which are currently stable but show some evidence of damage; cracking, loss of mortar and expanding sealant and surface erosion are common to virtually all concrete and blockwork structures. The promenade shows many gaps at joints and lateral cracks which run parallel with the shore, set back about 1m from the top of the wall. There are also a number of structural cracks in the back wall behind the promenade which acts as a retaining wall to the road.

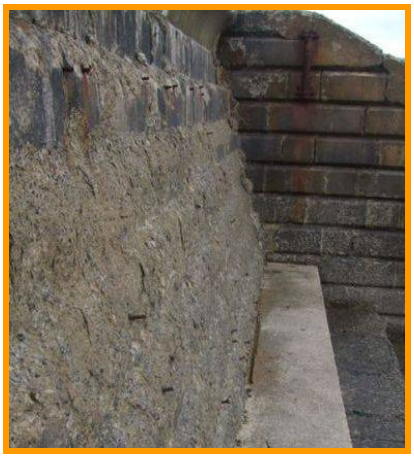
Mu20A – Northern North Bay

Sea walls (Asset Refs. 1221D901D1201C01, C02, C03, C04, C05, C06, C07, C08, C09, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C24 and C25), are curved or vertical and formed of blockwork with a concrete crest wall with a promenade beyond. In many places large vertical cracks running the full height of the sea wall are evident, such as near the Sea Life Centre (Asset Refs. 1221D901D1201C02 and 1221D901D1201C03). Repair work is evident to some of these cracks, although additional repair work to remaining cracks and to the cracked crest wall is needed. These cracks are now more evident than in the previous survey. The front face of blockwork making up Asset Ref. 1221D901D1201C03 shows degradation and it appears that repairs to this face have failed, as reinforcement bars are exposed on the sea wall here. Beach erosion is evident in the north, where in places the sheet pile toe (Asset Ref. 1221D901D1201C02) or concrete toe (Asset Ref. 1221D901D1201C24) has been exposed and is corroded or eroded. This may present a risk to public health and safety due to the sharp edges present on the sheet piling along parts of the beach side.

North Bay sea wall and exposed toe
(Asset Ref. 1221D901D1201C02)

Full height vertical crack
(Asset Ref. 1221D901D1201C02)

Full height vertical crack and exposed toe
(Asset Ref. 1221D901D1201C03)



Eroded and abraded front face, exposed steel
(Asset Ref. 1221D901D1201C03)

Exposed sheet pile toe
(Asset Ref. 1221D901D1201C02)

Exposed concrete toe
(Asset Ref. 1221D901D1201C24)

Mu20A – Southern North Bay

There is cracking along joints and loss of material in several parts of the sea wall, as well as vertical cracks the full height of the wall with some partly repaired (Asset Refs. 1221D901D1201C07 opposite Alexandra Gardens and 1221D901D1201C21 to the north of Clarence Gardens). The promenade also shows cracking in many places, with additional cracks between the coping stones and promenade in places. The slipway in the south also shows several structural cracks running the full height of the wall. These represent significant damage to the sea wall and threaten the integrity of the overall defence, and need to be addressed. Repair work to the vertical cracks is needed along with additional repair work to the cracks previously repaired, this is likely to require capital investment.

Looking northwards along wall, with filled lateral joints visible (Asset Ref. 1221D901D1201C07)

Cracking through and beneath capping, near southern end of defence (Asset Ref. 1221D901D1201C07)

Example of repaired and re-opened crack (Asset Ref. 1221D901D1201C07)

Seepage through wall and open joints (Asset Ref. 1221D901D1201C07)

Erosion at joints and cracking to promenade
(Asset Ref. 1221D901D1201C07)

Erosion at joints and repairs to promenade, and damaged coping
(Asset Ref. 1221D901D1201C21)

Vertical crack running the full height of the slipway sea wall
(Asset Ref. 1221D901D1201C21)

Second large crack and deep void in slipway sea wall
(Asset Ref. 1221D901D1201C21)

Large vertical cracks running the full height of the sea wall with repair work
(Asset Ref. 1221D901D1201C21)

Exposed toe
(Asset Ref. 1221D901D1201C21)

To the southern end of the North Bay there is a stepped concrete blockwork sea wall structure (Asset Ref. 1221D901D1201C08 – just north of Albert Road) constructed with numerous buttresses/bastions which protrude from land out onto the beach. The buttresses/bastions vary in height and length. The toe of the wall is severely eroded and there is severe cracking to outbuilt sections particularly at north end. There is a concrete berm above the buttresses, this is in good condition. Above this is the sea wall and promenade, and a second wall at the back of the promenade. Both the promenade and the second wall show cracking. There are localised signs of repair to eroded faces of blockwork and to buttresses, however, additional repairs are now required.

Looking north along berm from south end
(Asset Ref. 1221D901D1201C08)

Looking north, showing eroded toe and repairs to blockwork face
(Asset Ref. 1221D901D1201C08)

Cracking outbuilt section at north of defence.
(Asset Ref. 1221D901D1201C08)

Repaired and damaged promenade, with cracking throughout
(Asset Ref. 1221D901D1201C08)

There is a short section of defence (Asset Ref. 1221D901D1202C23) between this wall and the rock armour section. This short wall is formed of stepped blockwork and shows 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.

Overview of construction
(Asset Ref. 1221D901D1202C23)

Missing blockwork and damage
(Asset Ref. 1221D901D1202C23)

 Example of cracking (Asset Ref. 1221D901D1202C23)	 Full height cracks to left and right of corner of secondary wall beyond promenade (Asset Ref. 1221D901D1202C23)

3.18 Management Unit 21 – Castle Cliff, Scarborough

Coastal Slope Condition Assessment
(Map 8 – Hundale Point to Scarborough North and Map 9 – Scarborough South to Cayton Bay)

This Management Unit is divided into 2 Sub-Management Units:

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

Unit MU21/1 is located at The Holms and is classified as Inactive. This represents a reduction in activity status since the 2008 walkover survey. This is mostly due to the lack of ongoing rockfall from the exposed, well jointed rock and because the rest of the unit is well vegetated with little evidence of recent activity. Despite this drop in classification it should be noted that there remains the potential for significant rockfalls at this location putting the road and skate park at risk.

Unit MU21/2 comprises the area known as Castle Cliff and is classified as Locally Active as it was in 2008. The cliffs are steep with variable vegetation cover. Locally, the well jointed hard rock of which the cliffs are composed is exposed and subject to on-going weathering and erosion. Like unit MU21/1, there is the potential for significant rockfall within this unit although such activity is not currently being displayed.

MU21/1 Well jointed hard rock behind the skate park (location of former rockfall) (Inactive)

MU21/1 Well vegetated slopes of most of this unit (Inactive)

MU21/2 Well jointed hard rock layer within this unit (Locally Active)

MU21/2 Steep, exposed cliff (Locally Active)

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

Coast Protection Asset Condition Assessment
(Map 34 – Scarborough and Map 34B – Scarborough)

Mu21A – Castle Cliff

There is a large extent of rock armour and tetrapods around the south end of North Bay which continues around the headland (from Management Unit 20A into Management Unit Mu21A) and towards the harbour (Asset Refs. 1221D901D1202C04 and 1221D901D1202C02 respectively). These were built in approximately 2005 and are, on the whole, in good condition with some evidence of cracking and erosion along the arm edges. Several individual blocks forming the crest wall show full height cracks, these are currently of no concern, but monitoring may be useful to detect further deterioration. It was not possible to inspect the toe as it was below water in all tide conditions.

Overview of rock armour with raised crest wall (Asset Refs. 1221D901D1202C01)

Overview of rock armour with concrete piles visible (Asset Refs. 1221D901D1202C03)

Example of crack through centre of raised wall
(Asset Ref. 1221D901D1202C03)

Overview of armour looking north
(Asset Ref. 1221D901D1202C02)

Mu21B – The Harbour

Scarborough Harbour runs from the southern side of the headland and through the centre of the town. There are continuous formal defences throughout the whole extent. These range from very new rock armour and tetrapod 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 harbour wall (Asset Ref. 1221D901D1301C01) is in very good condition, with only minor cracking to the crest wall and individual tetrapods. A raised section has recently been added to the top of the existing defence along almost the entire length with minor erosion and cracks present (see photo below, top left). At one point at the seaward end of the harbour arm the rock armour is less tightly packed then it is along the rest of the headland.

The new harbour wall with rock armour, tetrapods and raised section
(Asset Ref. 1221D901D1301C01)

Tightly packed rock armour and tetrapods present behind the harbour wall
(Asset Ref. 1221D901D1301C01)

Far end of harbour arm showing potential lack of armour fill
(Asset Ref. 1221D901D1301C01)

Far end of harbour arm showing potential lack of armour fill
(Asset Ref. 1221D901D1301C01)

The faces of many blocks are missing or cracked at the seaward end of the original harbour wall, with cracks appearing throughout the top layer of concrete and the wall (Asset Ref. 1221D901D1301C16). Minor missing joints and cracks appear throughout the harbour masonry walls with recent maintenance work visible to the landward part of the harbour arms. The timber fenders also appear newer on the landward side of the arm then they do on the seaward side, with many of the seaward side fenders deteriorating. Stairs set into this defence should be monitored to ensure stability, as washout is visible in some places.

Filled and repaired wall
(Asset Ref. 1221D901D1301C16)

Deterioration of timber fenders throughout inner harbour
(Asset Ref. 1221D901D1301C16)

Overview of wall showing newer timber fenders
(Asset Ref. 1221D901D1301C16)

Washout behind steps
(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. In parts of the piling the concrete capping is cracked in places (Asset Ref. 1221D901D1301C13).

Cracking to concrete capping of sheet piling
(Asset Ref. 1221D901D1301C13)

Overview of asset near the market on West Pier
(Asset Ref. 1221D901D1301C13)

Overview of asset
(Asset Ref. 1221D901D1301C17)

Significant corrosion of steel piling
(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 although still structurally sound. There are also cracks forming on the columns and beams to the underside of the extended jetty with exposed reinforcement bar in places.

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

Exposed re bar and erosion to the concrete jetty supports.
(Asset Ref. 1221D901D1301C06)

The west pier appears to be in fair condition, the sheet metal piling on the inner side of the harbour wall is corroded, although intact (Asset Ref. 1221D901D1301C13). The outer side (Asset Refs. 1221D901D1301C07 and Asset Ref. 1221D901D1301C19) shows several significant defects including large full height cracks and exposure of aggregates. During the inspection at low tide the toe was exposed, this shows potential undercutting. 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.

Significant cracking with exposed toe
(Asset Ref. 1221D901D1301C07)

Exposed toe
(Asset Ref. 1221D901D1301C07)

Overview of wall
(Asset Ref. 1221D901D1301C19)

Large vertical crack extending through the wall
(Asset Ref. 1221D901D1301C19)

3.19 Management Unit 22 – Scarborough South Bay

Coastal Slope Condition Assessment
(Map 9 – Scarborough South to Cayton Bay)

This Management Unit is divided into two smaller Sub-Management Units:

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. It is well vegetated with only minor, localised activity evident as footpath cracks.

Unit MU22/2 comprises the area around and to the north of the Spa Complex. This unit is classified as Locally Active as a result of evidence of recent and ongoing instability and loss of footpaths. There is also significant cracking to the remaining footpaths within this area.

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 apart from cracking to footpaths. Therefore, this unit is classified as Inactive.

Units MU22/4 and MU22/5 comprise the northern part of the South Cliff Gardens and are both classified as Inactive. These units are generally well vegetated and appear to be largely stable. Locally, there are some minor cracks within footpaths and some exposed rock faces near the cliff toe.

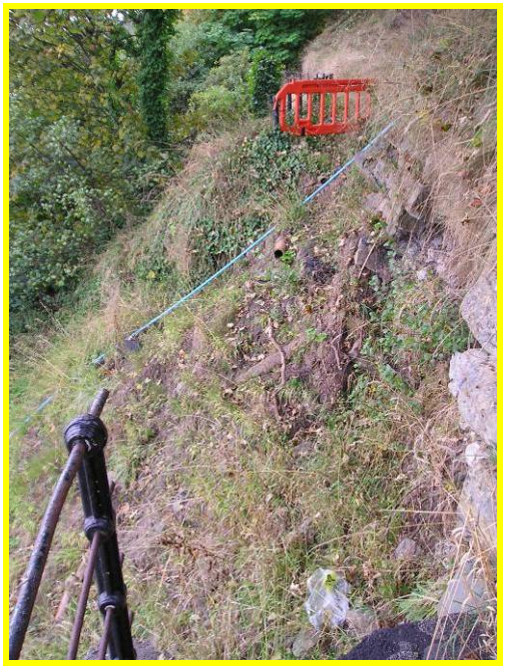
Unit Mu22/6 is located behind the semi-circular form of the promenade and is classified as Locally Active. The slopes of this unit are quite well vegetated although there are some signs of fresh rockfall and sliding near the unit toe.

Unit MU22/7 is located at Holbeck Gardens (just north of the run-out lobe) and is classified as Inactive. A number of footpaths in this area remain closed due to cracking and ongoing instability. However this does not represent an increase in activity since 2008. Otherwise, the slopes are well vegetated.

Unit MU22/8 comprises the Holbeck Hall landslide run-out lobe and is protected at the toe by boulder armour. The slopes here are hummocky, support almost continuous vegetation cover and appear to be mostly stable. There are, however, localised exposed sections near the head of the unit which are undergoing erosion. This unit is classified as Locally Active.

None of these units have changed activity status since the 2008 walkover survey.

MU22/1 Well vegetated slopes (Inactive)



MU22/2 Recent activity and footpath closure (Locally Active)

MU22/2 Extensive cracking to footpaths (Locally Active)

MU22/3 Looking down towards the cliff lift (Inactive)

MU22/4 Well vegetated and largely stable (Inactive)

MU22/5 Exposed rock faces near the unit toe (Inactive)

MU22/6 Well vegetated slopes behind the promenade (Locally Active)

MU22/7 Cracking of footpath- common within this Sub-Management Unit (Inactive)

MU22/8 Localised activity at the headscarp of the Holbeck Hall landslide run-out (Locally Active)

Coast Protection Asset Condition Assessment
(Map 34 – Scarborough and Map 34B – Scarborough)

Within South Bay are a wide range of coastal defence assets. Throughout the defences there are vertical cracks and areas of heavily eroded blockwork. Although there are numerous defects to the sea walls, they are all structurally sound with only repair work needed to improve the condition of the assets. Common defects visible throughout include mortar loss and surface cracking.

Mu22A – St Nicholas Cliff
The sea wall runs in front of Foreshore Road, backing the beach at South Sands. Due to high beach levels only the top two courses of bricks are visible here. However, where visible, the sea wall is in good condition with only minor missing joints and erosion evident (Asset Ref. 1221D901D1301C15). The sea wall protecting the Lifeboat Station is also in good condition with minor mortar loss of joints and erosion (Asset Ref No.1221D901D1301C08).

Large vertical cracks are evident in parts of the wall at the back of the promenade (Asset Ref. 1221D901D1301C09). Repair work to the vertical cracks is advised to prevent further cracking to the wall.

View of blockwork wall beneath life boat station
(Asset Ref. 1221D901D1301C08)

Tell tale on wall of life boat station
(Asset Ref. 1221D901D1301C08)

Missing joints and erosion to top part of wall
(Asset Ref. 1221D901D1301C15)

High beach level along sea wall running in front of Foreshore Road, South Bay
(Asset Ref. 1221D901D1301C15)

Vertical crack to second wall protecting road.
(Asset Ref. 1221D901D1301C09)

Second stage wall, sea wall and promenade at end of Foreshore Road
(Asset Ref. 1221D901D1301C09)

Mu22B – South Cliff and Holbeck Gardens

A sea wall and promenade runs the whole length of this section. The recurved sea wall (Asset Ref. 1221D901D1301C10) shows defects throughout, such as washout of joints and erosion to the blockwork surface is prevalent. It is recommended that repointing is undertaken to prevent future washout and further damage. The recurved sea wall at “The Spa” shows signs of undercutting, with an exposed apron as well as cracking to the capping beam in many places along length (Asset Ref. 1221D901D1301C28). Repair work to the capping beam and undercutting would be beneficial to the structural stability of the wall.

At the southern end of the sea wall the blockwork is in poor condition (Asset Ref. 1221D901D1303C02). Areas of the wall have deeply washed out joints horizontally along the wall. There is also a section of concrete where corroded rebar is exposed on the capping beam (Asset Ref. 1221D901D1304C02). Many large cracks and poor areas are evident in the back wall and the capping beam.

The lower section of the concrete wall and capping beam is showing evidence of significant surface erosion exposing aggregate throughout the defence. It is recommended that the wall needs re-surfacing in places. Replacement of the capping beam and wall is evident mid section of the wall.

A relatively new rock armour revetment defends the relict debris flow lobe at Holbeck. This is in good condition, is tightly packed and has good coverage. There are no signs of deformation or rock movement (Asset Ref. 1221D901D1304C01).

Missing joints throughout blockwork wall
(Asset Ref. 1221D901D1301C10)

Cracking to the splash beam
(Asset Ref. 1221D901D1301C28)

Undercutting to the sea wall
(Asset Ref. 1221D901D1301C28)

Cracked and eroded capping beam with exposing reinforcement bar
(Asset Ref. 1221D901D1304C02)

Large missing horizontal joints to wall
(Asset Ref. 1221D901D1303C02)

Repaired wall eroded with sections of replaced wall and capping beams
(Asset Ref. 1221D901D1302C02)

3.20 Management Unit 23 – Holbeck to Knipe Point

Coastal Slope Condition Assessment
(Map 9 – Scarborough South to Cayton Bay)

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.

Unit MU23/A is located immediately south of the Holbeck Hall landslide run-out lobe and is classified as Partly Active. This unit appears to have well vegetated upper slopes, however the lower part of this unit is exposed and activity eroding as a result of marine action.

Units MU23/B and MU23/C are both classified as Locally Active. The majority of the units are well vegetated with only localised patches of erosion. The exception is the unit toes which are steep, exposed and subject to ongoing erosion by the sea. There is evidence of ongoing slumping, sliding and rockfall onto the beach.

Units MU23/D1, MU23/D2 and MU23/D3 are located at Wheatcroft Cliff, above Black Rocks and are all classified as Partly Active. These units are active down much of their length, with ongoing recession of the headscarp, slumping and sliding mid-slope and active marine erosion of the toe.

MU23/A Well vegetated slopes, looking north (Partly Active) (more active section not visible here)

MU23/C Localised erosion of the unit toe (Locally Active)

MU23/D1 and **MU23/D2** Ongoing erosion down most of unit lengths (Partly Active)

MU23/D1 Less active upper slopes, looking north (Partly Active)

MU23/D2 Recession at the headscarp and erosion mid-slope (Partly Active)

MU23/D3 Mid-slope slumping and sliding (Partly Active)

Unit MU23/E is located at White Nab and has been assigned the Locally Active classification. 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 long, thin unit which forms a recently re-engineered outflow channel for a pipeline from the nearby Pumping Station. The slopes are well vegetated and show very little evidence of recent activity. As a result, this unit is classified as Inactive.

MU23/E Vegetation and localised erosion (Locally Active)

MU23/F Re-engineered channel with little evidence of activity (Inactive)

Units MU23/G1 and MU23/G2 form the northern part of Frank Cliff and are both classified as Partly Active. 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. This classification represents an increase in activity observed within unit MU23/G1 between the 2008 and 2009 walkover surveys.

Unit MU23/H forms the back of a large mudslide embayment of Frank Cliff. It is largely well vegetated with local areas of erosion and is therefore classified as Locally Active. **Unit MU23/H2** sits beneath and is displaying a greater level of activity, with reduced presence of vegetation. It is classified as

Partly Active. At the very base of the embayment are **units MU23/H1, MU23/H2a, MU23/H2b and MU23/H3** all of which are Totally Active. They are displaying intense erosion, likely resulting from marine action, and ongoing recession of the unit head by slumping and sliding.

MU23/G1 Highly active toe section (Partly Active)

MU23/G2 Erosion of the unit toe (Partly Active)

MU23/H Well vegetated upper part of embayment (Locally Active)

MU23/H2, H2a and **H2b** Intense erosion at lower part of embayment (mix of Totally and Partly Active)

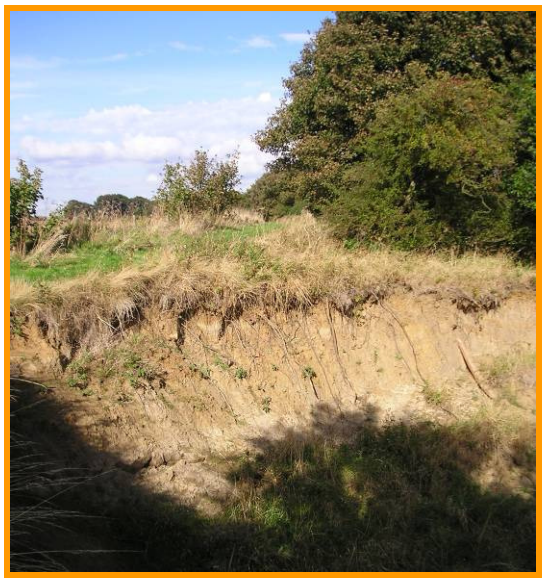
MU23/H1 Lower unit almost entirely affected by intense erosion (Totally Active)

MU23/H2b and **H3** Lower units almost entirely affected by intense erosion (Totally Active)

Unit MU23/I comprises the back of the Cornelian cliff embayment and is classified as Partly Active. Although the majority of this unit is densely vegetated, there is recent evidence of increasing activity. For example, there has been active recession of the headscarp in the form of localised slumps. This represents an increase in activity class between the 2008 and 2009 walkover surveys and indicates the potential for reactivation of this relict landslide system. **Units MU23/I1, MU23/I2 and Mu23/I3** sit beneath this unit and are Partly (MU23/I1) and Locally Active (MU23/I2 and I3) respectively. All units are exposed to marine erosion, although the slopes of MU23/I1 are steeper and less vegetated than the other two units.

Unit MU23/I4 situated on the north side of Knipe Point is composed of soft glacial material and is classified as Totally Active. The retreating cliffs of this unit are almost entirely affected by intense erosion, with very little vegetative cover. Marine activity is eroding the toe, with slumping, sliding, rilling and gullying occurring down most of the unit length.

MU23/I Densely vegetated upper part of Cornelian cliff (Partly Active)



MU23/I Recent headscarp activity at Cornelian cliff (Partly Active)

MU23/I Recent headscarp activity between Cayton and Cornelian Bays (Partly Active)

MU23/I1 Toe unit within Cornelian Bay (Partly Active)

MU23/I3 Less active toe unit within Cornelian Bay (Locally Active)

MU23/I4 Intense erosion of the north side of Knipe Point (Totally Active)

Unit MU23/J is also located on the north side of Knipe Point. This unit is composed of hard, well jointed rock and is classified as Locally Active. There is some recession at the headscarp and some evidence of past rockfall at the unit base.

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. The unit frontages are almost entirely exposed and experiencing intense erosion. There is some evidence of past rockfall activity.

Except where specified, the units within this Sub-Management Unit have not experienced a change in activity between the 2008 and 2009 walkover surveys.

MU23/J Rock face of the north side of Knipe Point (Locally Active)

MU24/A7 Exposed slopes (Partly Active)

MU24/A8 Intense erosion to the east facing side of Knipe Point, and evidence of rockfall events (Partly Active)

Coast Protection Asset Condition Assessment
(Map 35 - Cayton Bay to Blue Dolphin Holiday Park)

There are no coastal assets within this Management Unit.

3.21 Management Unit 24 – Cayton Bay

Coastal Slope Condition Assessment
(Map 9 – Scarborough South to Cayton Bay and Map 10 – Cayton Bay to North Cliff)

This Management Unit is divided into 2 Sub-Management Units:

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 and **unit MU24/A2** forms the landslide toe, including sea cliff and uplifted sections. This landslide is the subject of an on-going investigation by Halcrow on behalf of Scarborough Borough Council and the National Trust following reactivation of the system in April 2008. Significant recession of the headscarp was observed at this time resulting in the loss of land and property at Knipe Point Drive. During 2009, headscarp recession and activity within the body of the landslide appear to have slowed and the system has become more stable. As a result, the classification of the main unit has been reduced from Totally to Partly Active. The landslide toe unit remains Totally Active. The potential for further significant activity in the future however, should not be ruled out.

Unit MU24/B forms the main part of Tenants' Cliff and is classified as Inactive. The unit supports dense vegetation cover and shows very few signs of recent activity. The lower part of Tenants' Cliff is comprised of a number of small toe units **MU24/B1 to B10**, all of which are classified as Locally Active. There is variable vegetation cover within these units and evidence of localised erosion and rockfall. None of these units have changed activity status since the 2008 walkover survey.

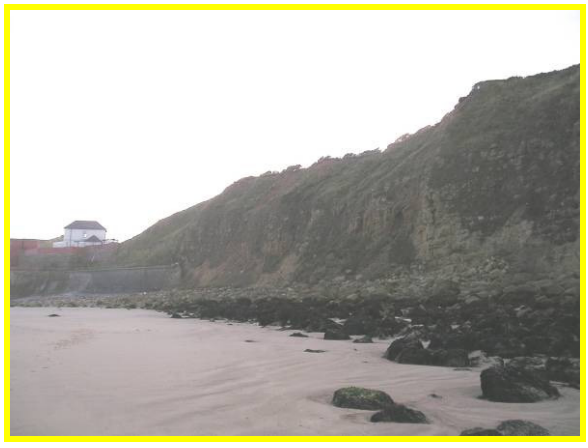
MU24/A Headscarp of Cayton Cliff (Partly Active)

MU24/A2 Cayton Cliff toe unit (Totally Active)

MU24/B Upper slopes of Tenants' Cliff (Inactive)

MU24/B1 A toe unit of Tenants' Cliff (Locally Active)

MU24/B4 Localised erosion and rockfall (Locally Active)



MU24/B7 to **B9** Looking southwards (Locally Active)

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 glacial 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 possible beach uplift. These units are classified as Partly Active. This classification represents an increase in activity for units MU24/C and D between the 2008 and 2009 walkover surveys.

The small embayments of **units MU24/F and MU24/G** are well vegetated with localised erosion at the toe and the headscarp. They are both classified as Locally Active.

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

Units MU24/I, MU24/J, MU24/K and MU24/L are located above Cayton Sands and classified as Locally Active. Within these units there is localised recession at the headscarp and erosion mid-slope. Vegetation cover is variable.

Between **units MU24/M1 and MU25/T**, all units are classified as Partly Active with the exception of MU24/O (discussed below). **Units M1, M2, N, P and Q** are cut within the soft glacial sediments and as a results are characterised by a retreating cliffline, slumping and sliding down most of the unit lengths and an eroding toe. At **unit MU24/R**, the cliff becomes much higher, steeper and is composed of a more resistant geology. The mechanism of erosion changes accordingly, so that within units **MU24/R, S and T** the dominant processes are now rockfall and weathering. The classification of **MU24/R** as Partly Active represents an increase in activity level for this unit.

Unit MU24/O is classified as Totally Active as it is almost entirely affected by mudsliding. This appears to signify an increase in activity since the 2008 walkover survey. In fact, this results from an error in the spatial identification of units during the 2008 survey and therefore does not represent a real change in the level of activity here. The same is true for unit MU24/N which seems to have dropped an activity class.

Except where specified, the activity status for cliff units is the same as that given in 2008.

MU24/C Headscarp recession and mid-slope activity (Partly Active)

MU24/D Toe slumping (Partly Active)

MU24/E Looking south (Partly Active)

MU24/F Well vegetated slopes (Locally Active)

MU24/H Access route to Cayton Sands (Inactive)

MU24/J Localised headscarp recession (Locally Active)

MU24/M1 Retreating cliff line (Partly Active)

MU24/O Mudsliding (Totally Active)

MU24/R and **MU24/S** Rockfall and weathering (Partly Active)

Coast Protection Asset Condition Assessment
(Map 35 - Cayton Bay to Blue Dolphin Holiday Park and Map 35A Cayton Bay to Blue Dolphin Holiday Park)

Mu24A – Cayton Bay North
There are no coastal assets within this Sub-Management Unit.

Mu24B – Cayton Bay South
Cayton Bay is predominantly a natural bay free from coastal defences. Cayton pumping station, (located 506665,484520 OS Grid) is protected against wave attack by a series of blockwork and concrete sea walls (Asset Ref. 1221D901D1402C05). The condition of the defences varies from good to very poor and relates to the height from the high water mark. The higher, red brick walls are in a sound condition, displaying limited mortar washout (see photo below, top left). The lower, concrete and sandstone blockwork is of fair to poor condition with joint and minor blockwork washout and movement in the blockwork. Repair work is visible to the previous blockwork washout throughout the defence (see photo below, top right Asset Ref. 1221D901D1402C05). Joints require repointing to sections which are showing evidence of mortar loss. Access may be difficult as the pumping station is situated on private land.

High sea defences below the pumping station, including the upper tier of red brick walls (Asset Ref. 1221D901D1402C05)

Lower section of concrete and sandstone, with joint wash out and repairs (Asset Ref. 1221D901D1402C05)

The southern end of the pumping station defences, consist of a patchwork of makeshift additions which lack unity (Asset Ref. 1221D901D1402C04, see photo below, bottom left). This has resulted in major undercutting, blockwork washout, parts of upper wall missing and significant damage. It is advised that the repair work for this asset is included in capital investment due to the amount of repair work needed. The last defence in the south is in fair to poor condition with large cracks and voids throughout the concrete apron (Asset Ref. 1221D901D1402C06). Repair work consisting of a concrete skim over the voids is apparent, although more repair work is needed to the voids. Any repairs here should be prioritised towards the area around the pumping station, where the defences are essential; however, public access to the beach is poor due to the condition of the defences.

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

South end defence of the pumping station (Asset Ref. 1221D901D1402C06)

3.22 Management Unit 25 – Lebberston Cliff and Gristhorpe Cliff

Coastal Slope Condition Assessment
(Map 10 – Cayton Bay to North Cliff)

This Management Unit consists of **units MU25/U** at Lebberston Cliff **to MU25/AE** at the eastern end of Gristhorpe Cliff.

Unit MU25/U is located above Red Cliff Hole and is classified as Locally Active. The steep cliffs are characterised by localised areas of erosion, but are otherwise fairly well vegetated. This classification represents a minor reduction in activity for this unit since the 2008 walkover survey.

Unit MU25/V is located at Lebberston Cliff and comprises a large, active mudslide system. The entirety of this unit is active and it is therefore classified as Totally Active. The spatial extent of this unit was incorrectly identified during the 2008 walkover survey and therefore the apparent major increase in activity of this unit does not represent a real change.

Unit MU25/W is situated at Red Cliff Point and is classified as Locally Active. The slopes of this unit are generally well vegetated with localised exposed zones exhibiting cracking and sliding activity. The spatial extent of this unit was incorrectly identified during the 2008 walkover survey and therefore the apparent major decrease in activity of this unit does not represent a real change.

MU25/U Steep, vegetation cliffs (Locally Active)

MU25/V Upper part of active mudslide system (Totally Active)

MU25/V Mid-part of active mudslide system (Totally Active)

MU25/W Localised erosion and vegetation cover (Locally Active)

Unit MU25/X is classified as Partly Active. 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 Locally Active. These units are characterised by localised patches of activity in the form of headscarp erosion and recession, slumping and sliding mid-slope and marine driven erosion of the steep toe sections.

Unit MU25/AA is a hotspot of activity along this section of cliff and is classified as Totally Active accordingly. Despite some patchy vegetation cover, almost the entirety of this unit is active. The soft till cliff is being eroded at the headscarp with slumping, sliding and rilling mid-slope and marine erosion of the unit toe. This classification represents an increase in activity for this unit between the 2008 and 2009 walkover surveys.

MU25/X Looking down the unit (Partly Active)

MU25/Y Headscarp recession and mid-slope activity (Locally Active)

MU25/Z Toe erosion (Locally Active)

MU25/AA Mudsliding and patchy vegetation cover (Totally Active)

Units MU25/AB and MU25/AC form the main section of Gristhorpe Cliff, adjacent to the caravan parks, and are both classified as Partly Active. The upper slopes of these units are composed of soft glacial tills and whilst generally well vegetated are experiencing some slumping, sliding, rilling and recession at the head. Lower down, the cliffs become much steeper and are composed of more resistant material. The lower slopes are exposed and weathered with slumped material below.

Units MU25/AD and MU25/AE are similar in form to adjacent units MU25/AB and AC, as discussed above. However, the lower slopes of these units appear more stable than those of the adjacent units,

and support more continuous vegetation cover. 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.

Cliff units have not changed activity status since the 2008 survey except where specified.

MU25/AB Upper vegetated slopes (Partly Active)

MU25/AC Steep, exposed lower cliffs (Partly Active)

MU25/AD Looking northwest (Locally Active)

MU25/AE Localised activity on lower slopes (Locally Active)

Coast Protection Asset Condition Assessment
(Map 36 - Blue Dolphin Holiday Park to Primrose Valley)

There are no coastal assets within this Management Unit.

3.23 Management Unit 26 – Newbiggin Cliff and North Cliff

Coastal Slope Condition Assessment
(Map 10 – Cayton Bay to North Cliff)

This Management Unit comprises **unit MU26/AF** in the northwest **to unit MU26/AX** just to the west of Filey Brigg.

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. These units are characterised by an upper layer composed of soft tills, a more resistant rock middle layer and a series of vegetated debris slumps at the unit toes. There is minor, localised activity within the upper layer including recession of the headscarp in places. The middle layer appears to be largely stable, albeit there is evidence of past rockfall at the cliff toe. The lower slopes are partly vegetated and subject to marine erosion.

Units MU26/AI, MU26/AJ, MU26/AK and MU26/AL form the western part of Newbiggin Cliff and are all Partly Active. These units are of a similar form to the adjacent Locally Active units, as 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/AF Rockfall evidence at the unit toe (Locally Active)

MU26/AG and MU26/AH Soft upper layer, resistant rock middle layer and debris cones at the toe (Locally Active)

MU26/AI Recession and slumping within upper till layer (Partly Active)

MU26/AJ, MU26/AK and **MU26/AL** Exposed lower cliff (Partly Active)

Units MU26/AM, MU26/AN and MU26/AO form the main part of Newbiggin Cliff and are classified as Locally Active. 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.

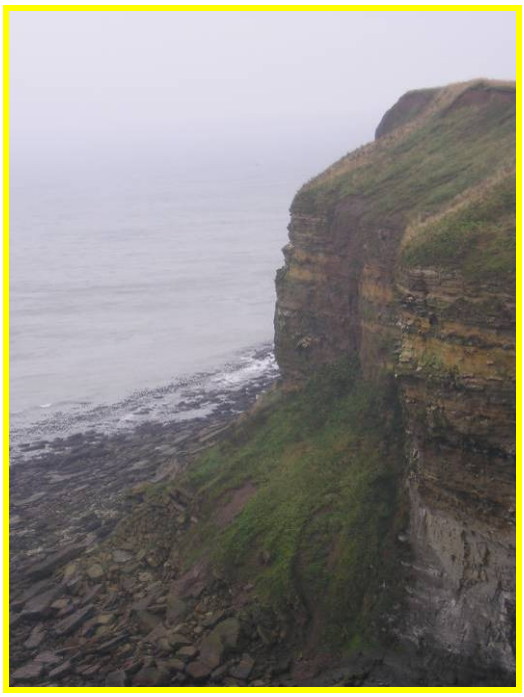
Units MU26/AP and MU26/AQ are classified as Partly Active. These units feature localised erosion of the soft upper till layer and a largely exposed, vertical lower layer. This lower layer is devoid of vegetation cover and is subject to marine erosion at the toe. This classification represents an increase in activity within unit MU26/AP since the 2009 walkover survey.

Units MU26/AR to MU26/AX form the main part of North Cliff with all units assigned the Locally Active status during the 2009 walkover. These units are characterised by the three-tiered stratigraphy which is present through much of this Management Unit. The upper soft glacial till layer is exhibiting localised erosion in the form of headscarp recession and some sliding. There is variable erosion of the unit toes as a result of marine activity and the presence or absence of basal debris cones. This classification represents a decrease in activity level for unit MU26/AX between the 2008 and 2009 walkover surveys.

Except where stated, none of the units within this Management Unit have changed activity status since 2008.

MU26/**AM** to **MU26**/**AO** Locally Active

MU26/**AQ** Exposed, vertical lower cliff (Partly Active)



MU26/**AR** Three-tiered stratigraphy (Locally Active)

MU26/**AX** Localised erosion of upper soft till layer (Locally Active)

Coast Protection Asset Condition Assessment
(Map 36 Blue Dolphin Holiday Park to Primrose Valley)

There are no coastal assets within this Management Unit.

3.24 Management Unit 27 – Filey Brigg

Coastal Slope Condition Assessment
(Map 10 – Cayton Bay to North Cliff and Map 11 – Filey Brigg to Reighton)

This Management Unit comprises **units MU27/AY to MU27/O** around Filey Brigg.

Unit MU27/AY has a similar form to those units described in Management Unit 26 and is classified as Locally Active. The upper slopes are well vegetated with intermittent zones of activity in the form of headscarp recession, sliding and rilling. The base of this unit was largely obscured from the cliff top but it is not anticipated to show a departure from the Locally Active classification.

Unit MU27/AZ is very similar to unit MU27/AY but has the higher classification of Partly Active. This is because the upper slopes of this unit show more widespread, intense levels of activity and less continuous vegetation cover.

Unit MU27/BA is composed of an upper layer of erodible glacial sediment and a lower more resistant rock layer. The upper layer is undergoing mass failure at this location. There is little vegetation cover and the headscarp is receding. This unit is therefore classified as Totally Active.

Units MU27/BB to MU27/BE are located on the northern side of Filey Brigg and are all Partly Active. The upper slopes of these units support some discontinuous vegetation cover. Headscarp recession, slumping, sliding and rilling are common. The lower slopes are composed of more resistant, stratified rock which is subject to marine erosion.

Unit MU27/BF is located on the northern side of Filey Brigg but is less active than adjacent units. The upper slopes are generally well vegetated with only localised areas of erosion. Therefore, this unit is classified as Locally Active.

Units MU27/A to MU27/D, located around the end of Filey Brigg, are all classified as Partly Active. These units are composed entirely of the soft glacial material which particularly susceptible to erosion. Despite some vegetation cover, there is frequent cracking, slumping, sliding and toppling observed within these units.

Units MU27/E to MU27/I are located on the south side of Filey Brigg and are all classified as Locally Active. These units support much more continuous vegetation cover than those units on the north of the Brigg. There is localised activity mid-slope and erosion of the unit toes which is likely to result from marine action.

Units MU27/J and MU27/K are also located on the south side of the Brigg. These units are undergoing quite intense erosion down much of their length and are therefore classified as Partly Active. This represents a minor increase in activity for unit MU27/J since the 2008 walkover survey.

The southwest corner of Filey Brigg comprises units **MU27/L to MU27/O**, all of which are classified as Totally Active. These units are almost entirely affected by intense erosion in the form of rilling, gullying and sliding.

With the exception of **unit MU27/J**, none of the other units within this Management Unit have changed activity status between the 2008 and 2009 walkover surveys. Despite this, all units around Filey Brigg are experiencing significant and ongoing erosion which is likely to continue, if not increase in the future.

MU27/AY Well vegetated upper slopes (Locally Active)

MU27/AZ Common areas of intense erosion (Partly Active)

MU27/BA Mass failure of upper layer (Totally Active)

MU27/BC Slumping, sliding and rilling (Partly Active)

MU27/BD Erosion of the upper layer (Partly Active)

MU27/BF Well vegetated slopes (Locally Active)

MU27/B Cracking and slumping activity (Partly Active)

MU27/H Well vegetated slopes with localised erosion (Locally Active)

MU27/J Intense erosion (Partly Active)

MU27/L Intense rilling and gullying (Totally Active)

Coast Protection Asset Condition Assessment
(Map 36 Blue Dolphin Holiday Park to Primrose Valley)

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. 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.

View of wall and cabin looking North West
(Asset Ref. 1221D901D1502C01001)

View of wall from Filey Brigg
(Asset Ref. 1221D901D1502C01001)

3.25 Management Unit 28 – Filey Bay North

(Map 11 – Filey Brigg to Reighton)

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

Mu28A – North of Filey Town
This Sub-Management Unit consists of **units MU27/P to MU27/X**, located to the north of Filey town. None of which have experienced a change in activity status since the 2008 walkover survey.

Units MU27/P to MU27/S are situated below the North Cliff Country Park and are all classified as Partly Active. These cliffs are composed of glacial till and are undergoing erosion down much of their length. This erosion is particularly intense at the steep unit toe area where the cliffs are subject to marine action. Up slope, there is greater vegetation cover 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 are classified as Locally Active. These units are better vegetated than those Partly Active units to the north, yet feature localised common areas of erosion. There is minor activity at the unit head scarps and toes, with some slumping and sliding mid-slope.

Unit MU27/V, located just south of the sailing club, is Partly Active. This unit is lacking in vegetation cover, receding at the headscarp and is heavily rilled and gullied.

Units MU27/W and MU27/X lie immediately north of Filey itself. 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. These units are classified as Locally Active.

MU27/Q to **MU27/S** Erosion of glacial till cliffs (Partly Active)

MU27/T Slopes around Filey sailing club (Locally Active)

MU27/W and **MU27/X** Localised activity at the head and toe (Locally Active)

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**. There is some evidence of minor instability, including cracks to footpaths, walls and other structures. Otherwise however, there are no obvious signs of activity on the coastal slopes. Therefore this unit is classified as Inactive, as it was in 2008.

Unit MU28/Z is located at the southern end of Filey and is classified as Locally Active. There is evidence of ongoing minor instability in this area with the associated closure of footpaths; however this does not represent a change since 2008. Recently, significant slope stabilisation works have been undertaken within the ravine.

MU28/Y Cracking to wall (Inactive)

MU28/Y Repaired cracks to footpath (Inactive)

MU28/Y Regraded slopes, no current signs of instability (Inactive)

MU28/Y Cracking of footpath (Inactive)

MU28/Z Recent landslide activity and footpath closure (Locally Active)

MU28/Z Ongoing slope instability and footpath closure (Locally Active)

MU28/Z New slope stabilisation works to the ravine (Locally Active)

Coast Protection Asset Condition Assessment
(Map 36 - Blue Dolphin Holiday Park to Primrose Valley and Map 36A - Filey)

Mu28A – North of Filey Town
To the north of the town, Filey Sailing Club is located at the back of the beach and is protected by a primitive concrete and sheet pile construction (Asset Ref. 1221D901D1601C03). The piles at the northern end of the Sailing Club show surface corrosion but are generally in a sound condition. At this location there is also a concrete slipway giving access to the beach and a natural accumulation of pebbles in front of the structures. Minor repair work is needed to the slipway where cracks have occurred. The sheet piles at the southern end of the Sailing Club are in poor condition. The piles have corroded away, leading to undercutting of the slipway and outflanking of adjacent piles. It is recommended that repair work is needed to prevent any further undercutting.

Mu28B – Filey Town Frontage
The Filey frontage is protected by a sea wall as described running adjacent to The Beach Road (Asset Refs. 1221D901D1602C02, 1221D901D1602C03, 1221D901D1602C08, and 1221D901D1602C09). The sea wall shows evidence of minor, localised defects including cracks and chipping within the capping beam, surface erosion and mortar loss (see photo below, top and bottom left). Neart the lifeboat station at Cobble Landinf there is a full height crack which requires repair (Asset Ref. 1221D901D1602C09). The worst abrasion to the sea wall including missing blocks is

seen at the south section of The Beach Road (Asset Ref. 1221D901D1602C03). Although the overall condition is fair, some repair work is needed to the poor sections of the capping beam. Some urgent repair work is needed to the corroded and loose hand railing as this could pose a risk to public health and safety (Asset Ref. 1221D901D1602C03). Six access points (slipways) are built into the sea wall along with a number of outfalls or flap valves (200mm – 1500mm). Active repair work is also apparent. A short section of rock revetment is located at the southern end of the coastal defences, with gabion baskets beneath (Asset Ref. 1221D901D1602C02, see near Martin's Gill). This defence extends into Sub-Management Unit Mu29A. The revetment does run through the whole defence, which may be the result of washout or on-going stability issues in the glacial sediments. An area of collapse has occurred at the north end of the defence where there is no apparent toe protection. The rock armour has degraded since the previous inspection. Improving compaction of armour and rebuilding south end would be beneficial to the defence.

Sea wall with minor, localised defects
(Asset Ref. 1221D901D1602C08)

Full height crack at Cobble Landing
(Asset Ref. 1221D901D1602C09)

Concrete and sheet pile defences at the northern end of the Sailing Club
(Asset Ref. 1221D901D1601C03)

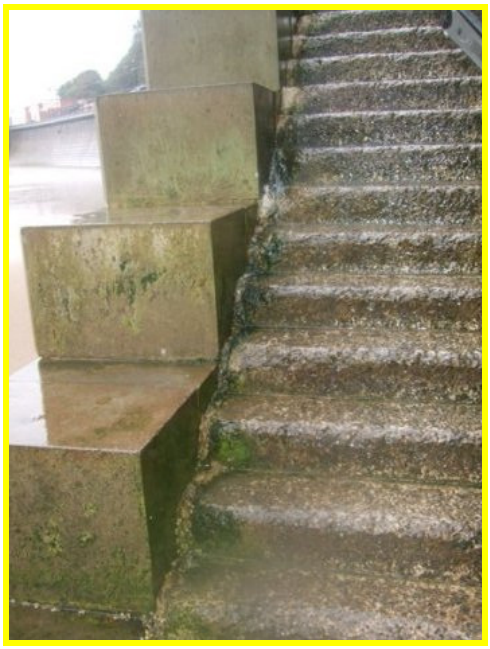
Corroded concrete and sheet pile defence at the southern end of the Sailing Club
(Asset Ref. 1221D901D1601C03)

Erosion to sea wall and replaced capping beam
(Asset Ref. 1221D901D1602C03)

Rock revetment with gabion baskets beneath
(Asset Ref. 1221D901D1602C02)

Individual slipway and stair structures were included in the inspection for the Filey stretch of defences. These structures where all in fair condition with the residual life of the assets ranging from 11-20 to over 20 years. Most of the slipways need some minor form of repair due to cracks appearing and joints needing re-pointing. Erosion to parts of the stair structures is evident with the edges of the stairs rounded and in need of re edging.

Erosion to the slipway wall
(Asset Ref. 1221D901D1602C09002)



Stairs with rounded edges
(Asset Ref. 1221D901D1602C04001)

3.26 Management Unit 29 – Filey Bay

Coastal Slope Condition Assessment
(Map 11 – Filey Brigg to Reighton)

This Management Unit is divided into three smaller Sub-Management Units, as follows:

Mu29A – Muston Sands
This Sub-Management Unit comprises **units MU29/AA to MU29/AI** along Muston Sands. None of these units has shown a change in activity level since the 2008 walkover survey.

Units MU29/AA and MU29/AB are located immediately south of Filey town and are classified as Partly Active. 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 to MU29/AI extend southwards to Mile Haven and are all classified as Locally Active. These relatively shallow cliffs are cut into soft glacial tills which are vulnerable to erosion. They are generally well vegetated however, with only localised areas of erosion. For example, the unit toes are steep and exposed with evidence of mudsliding onto the beach. There is recession of the headscarp in places, and some sliding and slumping mid-slope.

MU29/AA Very common intense erosion and headscarp recession (Partly Active)

MU29/AB Eroding toe and sliding mid-slope (Partly Active)

MU29/AC Well vegetated with some toe erosion (Locally Active)

MU29/AE Recession of the headscarp (Locally Active)

MU29/AG Erosion of lower slopes
(Locally Active)

MU29/AI Steep, exposed unit toe
(Locally Active)

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 is classified as Partly Active. It is characterised by a receding cliff line, slumping and sliding mid-slope and erosion at the toe.

Units MU29/AK to MU29/BA comprise the area in and around Flat Cliff, extending southwards to Butcher Haven. With the exception of **unit MU29/AO** (see description below) all units are classified as Locally Active. The low lying cliffs are generally well vegetated with localised areas of erosion. The hamlet at Flat Cliff has experienced some problems with instability in the past. Cracking to roads, walls and footpaths was evident during this walkover survey; however there has not been any noticeable increase in activity since the 2008 survey.

Unit MU29/AO is a small unit located just north of Flat Cliff. This unit is characterised by very common areas of intense erosion, sliding and cracking. There is recession at the headscarp and erosion at the unit toe. This unit has experienced a minor increase in activity since the 2008 walkover survey and is now classified as Partly Active.

Units MU29/BB to MU29/BE are located between Butcher Haven and Hunmanby Gap and are all classified as Partly Active. 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.

Unit MU29/BE2 is a newly defined unit which is situated 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.

Except where specified, the units within this Sub-Management Unit have not changed activity status between the 2008 and 2009 walkover surveys albeit there is ongoing instability in many locations.

MU29/AJ Very common areas of intense erosion (Partly Active)

MU29/AK Fairly well vegetated low lying cliffs (Locally Active)

MU29/AO Intense erosion at the toe and headscarp, sliding mid-slope (Partly Active)

MU29/AR Toe erosion at Flat Cliff (Locally Active)

MU29/AS Minor cracks to the road at Flat Cliff (Locally Active)

MU29/AS Cracking of a wall at Flat Cliff (Locally Active)

MU29/BB Steeper cliffs with very common areas of intense erosion (Partly Active)

MU29/BD Slumping and sliding on the beach (Partly Active)

MU29/BE Headscarp and toe erosion (Partly Active)

MU29/BE2 New unit at Hunmanby Gap (Locally Active)

Mu29C – Reighton Sands
This Sub-Management Unit consists of **units MU29/BF** near Hunmanby Gap **to MU29/BQ** below Reighton Moor.

Units MU29/BF, MU29/BG and MU29/BH are located just south of Hunmanby Gap and are all classified as Totally Active. These cliffs are steep and affected by intense erosion down most of their length. The headscarp is retreating and there is some slumping of materials onto the beach.

Further south**, units MU29/BI to MU29/BQ** are located above Reighton Sands and all classified as Partly 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.

None of the units within this area have changed activity status since 2008, with the exception of unit **MU29/BI**. This unit has shown a minor decrease in activity from Totally to Partly Active.

MU29/BF and **MU29/BG** Steep, intensely eroding cliffs (Totally Active)

MU29/BH Headscarp recession and slumping of material onto the beach (Totally Active)

MU29/BI Steep slopes with some vegetation cover (Partly Active)

MU29/BN to **MU29/BQ** (approx.) Intense erosion of the unit toes (Partly Active)

Mu29A – Muston Sands
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 assets within this Sub-Management Unit.

Mu29B – Hunmanby Sands
No formal coastal defence structures exist along this length of coastline. Historical structures including World War II pill box relics and temporary localised coastal defences are located intermittently and are in a variable condition.

For example, at approximately 512469, 478254 (east of Flat Cliffs) there is a poured concrete structure which appears to be giving protection to a service pipe underneath (Asset Ref. 1221D901D1603C01). This structure is now being outflanked and undercut (see photo below, top left).

At another location situated at approximately 513050, 477410 (Hunmanby Gap, seaward end of Sands Road) an outfall is evident which was previously supported by gabion baskets (Asset Ref. 1221D901D1603C01). The baskets have deformed so that they now only offer limited protection and support to the outfall. It is possible that the failure of these defences has also lead to destabilisation of the cliff toe behind.

Mu29C – Reighton Sands
There are no 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, as follows:

Mu30A – Reighton Gap

This Sub-Management Unit 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 all assigned the Partly Active classification during the 2009 walkover survey. These units support some vegetation cover, but are actively eroding at the head and toe with slumping onto the beach. Mid-slope there is also a fair amount of intense erosion in the form of cracking and mudsliding.

Unit MU29/CB forms a small mudslide embayment at the eastern end of the Holiday Village. The entire system is active with a retreating headscarp and cracking down the entire length. As a result, this unit is classified as Totally Active.

Unit MU29/CCa forms a shallower and less active embayment than the adjacent MU29/CB and is classified as Locally Active. The slopes are generally well vegetated with localised areas of erosion near the unit head and toe.

None of the cliffs within this Sub-Management unit have changed activity status since the 2008 walkover survey.

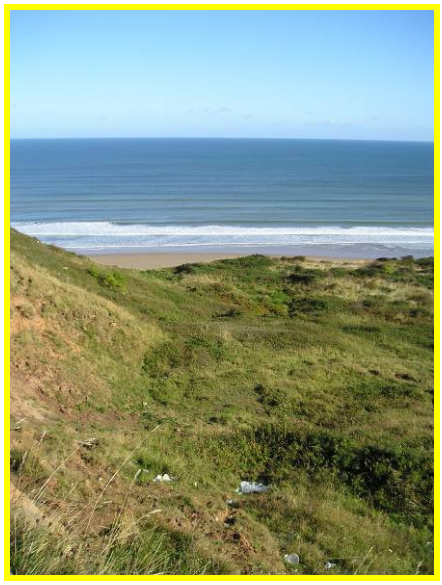
MU29/BR Active toe erosion (Partly Active)

MU29/BS Headscarp recession (Partly Active)

MU29/CA Slumping onto the beach (Partly Active)

MU29/CA Intense erosion and mudsliding near unit head (Partly Active)

MU29/CB Mudslide system (Totally Active)



MU29/CCa Well vegetated (Locally Active)

Mu30B – Speeton Sands

This Sub-Management Unit comprises units MU29/CC to MU29/CJ above Speeton Sands.

Unit MU29/CC forms a large, shallow, well vegetated embayment known as Middle Cliff. With the exception of localised activity at the unit head and mid-slope, there are very few signs of recent instability within this unit. Therefore it is classified as Locally Active.

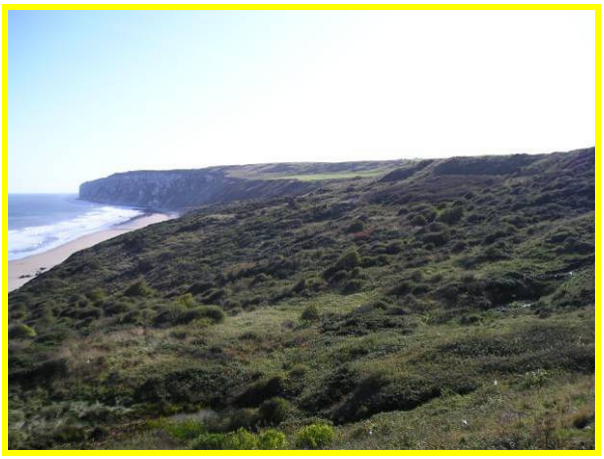
Unit MU29/CD forms another large shallow embayment which is also well vegetated. Despite this though, the slopes are almost entirely affected by activity in the form of cracking and sliding especially on the mid-slopes. As a result this unit is classified as Partly Active – this represents a minor increase in activity since the 2008 walkover survey.

Unit MU29/CE is very similar in form to unit MU29/CC and is also classified as Locally Active. The slopes are well vegetated with dense trees and shrubs in places. There is some erosion occurring mid-slope and the headscarp.

Units MU29/CF to MU29/CI are located at Speeton Cliffs and are all classified as Partly Active. 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 is classified as Locally Active.

With the exception of unit MU29/CD, all units within this Sub-Management unit have remained at the same level of activity as in 2008.



MU29/CC Middle Cliff embayment (Locally Active)

MU29/CD Mid-slope cracking and sliding (Partly Active)

MU29/CE Well vegetated cliffs (Locally Active)

MU29/CF Chalk outcrops at beach level (Partly Active)

MU29/CJ High, chalk cliffs (Locally Active)

Coast Protection Asset Condition Assessment
(Map 37 Primrose Valley to Reighton Gap and Map 38 Reighton Gap to Former RAF Brempton)

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 13 to 24. Areas of increased or sustained high levels of activity are summarised below:

Increased activity

Notable areas of increased activity during the 2009 walkover survey were found at Cornelian Bay and Cayton Bay. Other areas of increased activity are shown in Maps 13-24, however these are less significant.

- Cornelian Bay (Units MU23/G1 and MU23/I)

Units MU23/G1 (northern part of Frank Cliff) and MU23/I (Cornelian cliff embayment) and are both classified as Partly Active, and have shown an increase in activity since 2008.

The former unit is characterised by a highly active toe section with evidence of rockfalls, slumping and sliding onto the beach below. This classification reflects the generally high level of activity observed within the larger Cornelian Bay area.

The latter unit has recently shown evidence of increasing activity in the form of headscarp recession and localised slumping. This may be related to recent landslide activity at Cayton Cliff and highlights the potential for landslide reactivation within Cornelian Bay.

- Cayton Bay (Units MU24/C, MU24/D)

A number of units within Cayton Bay have displayed increased activity since 2008. Units MU24/C and MU24/D are small embayments cut into weak glacial sediments which are vulnerable to erosion. In 2009 these units featured a reduced vegetation cover and more widespread activity in the form of headscarp retreat and localised mid-slope failures. It is likely that high levels of activity will be sustained within the embayments of Cayton Bay in general due to the composition of the cliffs and ongoing marine erosion at the toe.

Sustained high activity

Sustained levels of high activity were observed at the following locations. These units were classified as Totally Active in both 2008 and 2009.

- Staithes (MU4/1a) The steep face of Cowbar Nab is subject to large rockfall activity.
- Far Jetticks (Mu15/2) This is a steep, exposed cliff face with ongoing failures on its entire height.
- Cornelian Bay (Mu23): The particularly active units here are the toe of a larger mudslide embayment.
- Knipe Point (MU23/I4): This unit is located on the northern side of Knipe Point, adjacent to Cornelian Bay and is entirely active.
- Cayton Bay (MU24/A2) The toe unit located below the main landslide at Cayton Cliff is actively eroding largely as a result of marine erosion.
- Cayton Bay South (MU24/O): Sustained high activity is observed within this mudslide embayment towards the southern end of Cayton Bay.
- Lebberston Cliff (MU25/V): The large mudslide here remains active.
- Filey Brigg (Mu27) A number of units here show ongoing intense erosion and failure of the glacial sediments.

- Hunmanby Gap (MU29/BH to BF): These steep cliffs are almost entirely affected by intense erosion and mudslides.

- Reighton Sands (MU29/CB) This entire embayment near the Reighton Sands Holiday Village is active, with ongoing mudsliding.

4.2 Coast Protection Asset Condition Assessment

Generally, the condition of the defences has not changed dramatically since the 2008 inspection, with many just suffering from minor erosion. Recent repair work was evident in places and therefore some conditions of the defences improved, with upgraded residual life classification of 11-20 or >20 years. However in some defences where repair work has not taken place they 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 2008 in the condition grading of the defences within Staithes harbour, which range from a classification of fair to poor. The breakwaters are in good condition, and have not changed recently. The sheet piling to the West breakwater remains significantly corroded and undercutting is starting to occur in places.

The harbour sea wall made from a mixture of concrete, blockwork and masonry materials backing on to residential properties (Asset Ref No. 1221D901D0402C22) has deteriorated since the last inspection. 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 as in the previous survey.

Mu6 - Port Mulgrave

The condition of assets at Port Mulgrave, including the breakwater, has not changed significantly since the previous survey (Halcrow 2008). The jetty remains in a poor condition, which appears to be worsening.

Mu7 - Runswick Bay

Many of the defences along the sea front at Runswick Bay remain in a similar condition as reported by the Halcrow 2008 inspection. There is a large crack in sea wall here (Asset Ref. 1221D901D0601C01), and large horizontal cracks to the breakwater (Asset Ref. 1221D901D0601C02). Repair work to cracks are evident throughout the northern defences, although where some cracks have been repaired, additional new cracks have appeared which also need repair work. Furthermore some sealant within joints has deteriorated and is in need of replacement.

Mu9 – Sandsend Village

Most of the defences along Sandsend Village have not changed since the Halcrow 2008 inspections with only a few defences showing signs of minor deteriorating. Repair work to the concrete revetment east of Sandsend is apparent at the western end, although repair work is still needed as undercutting and erosion is apparent throughout the whole defence.

Mu11-13 - Whitby

Defences along West Cliff in Whitby appear to be in a generally good condition, with no major change from the previous inspection.

The two breakwaters in Whitby (1221D901D0803C02 and 1221D901D0803C03) continue to show some signs of deformation as well as evidence of block displacement. Emergency repair works to the eastern breakwater are currently being developed. It was not possible to survey the outer breakwater walls (1221D901D0803C01 and 1221D901D0803C04) very closely as this would require boat access. The same applies to the harbour wall (Asset Ref. 1221D901D0803C06).

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. Investigation into the pontoon structure attached to the RNLI wall (Asset Ref. 1221D901D0803C08) is required due to missing and corroded bolts and movement.

Stair and slipway structures have been inspected for the coastal defences of Whitby Sands. As these are the first inspections on the assets no comparisons are available although repair work is needed.

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 seepage and cracking, while the adjacent exposed section of cliff is subject to erosion, and may require future protection. The short, low section of defence (Asset Ref. 1221D901D1003C04) continues to show erosion, joint washout and cracking, as well as the repair works evident to the vertical cracks need repairing again. Rock armour is still advised at the southern end of Robin Hood's Bay Village due to continuing slumping of the coastal slope.

Stair and slipway structures have been inspected for the coastal defences of Robin Hoods Bay. As these are the first inspections on the assets no comparisons are available and no repair work is needed.

Mu20-21 – Scarborough North Bay
Defences here are generally in a similar state than when visited previously. Vertical cracks at the full height of the sea wall are still evident throughout the sea walls (Asset Refs. 1221D901D1201C02, 1221D901D1201C03, 1221D901D1201C07, 1221D901D1201C08, 1221D901D1201C21 and 1221D901D1202C23), as well as repair work to parts of the vertical cracks. Repair work to continuing cracks and joint loss is still needed. The beach level throughout the North Bay Promenade was very high with only half a meter of the sea wall in parts visible. High beach level was also encountered in the previous inspections and therefore full inspections of the defence were limited.

The area between the North and South bay consists of new rock armour and tetrapods with a raised concrete sea wall behind. Vertical cracks have started to occur in many of the crest walls since the last inspection; it is recommended that these cracks are monitored.

Stair and slipway structures have been inspected for the North Bay Promenade of Scarborough. As these are the first inspections on the assets no comparisons are available although repair work is needed.

Mu21-22 – Scarborough Harbour
No major changes are visible to the defences from the last inspection by Halcrow 2009. The walls around the Old Harbour are still aged and exhibiting mortar loss in many places throughout their lengths, with the timber fenders used for protection rotten and in need of replacing. 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 Halcrow 2008 survey. Loss of joint material and full height cracks (Asset Ref. 1221D901D1301C09) are visible as well as severe erosion to the walls. Sand levels were very high during the survey therefore anchors and ties were not observed during this and last years surveys. The defences south of the Spa are in poor condition and are in need of additional repair (Asset Refs. 1221D901D1303C02 and 1221D901D1304C02).

Mu24-25 – Cayton Bay
Although it appears that parts of several defences in Cayton Bay have undergone localised repair since the previous Halcrow 2008 survey, there are still defects in need of urgent repair as large voids, undercutting and displaced blockwork are still apparent throughout (Asset Ref. 1221D901D1402C04).

Mu28a-29a – Filey

Defences to the north of Filey around the sailing club (Asset Ref. 1221D901D1601C03) continue to show significant corrosion and washout, and are in a similar state as when previously surveyed. Defences present through the town show evidence of maintenance and repair in the form of repointing and the replacement of coping stones. However several full height cracks (Asset Ref. 1221D901D1602C09) are still in evident and still require repair. Likewise rock armour and gabion defences to the south are still affected by wave action and are no longer tightly packed (Asset Ref. 1221D901D1602C02).

Stair and slipway structures have been inspected for the coastal defences of Filey. As these are the first inspections on the assets no comparisons are available although repair work is needed.

5 Problems Encountered and Uncertainty in Analysis

Coastal Slope Condition Assessment
As in 2008, no significant problems were encountered in the 2009 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. In future the condition assessment will benefit from analysis of orthorectified imagery, due for collection in 2010 under the Cell One programme.

Coast Protection Asset Assessment
Very few problems were encountered onsite during the Coast Protection Asset Assessment. Access issues posed the largest problem although most assets were located in public spaces and were easily accessible. Access to private property was not an issue. Local tides tables provided key information for the appropriate planning of each day's inspections. Assets around Castle Cliff and Scarborough Harbour are constantly submerged and therefore an inspection of only the visible elements has been undertaken. High beach levels particularly in 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 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;

- 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 use 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. It would be necessary to consult the harbour master before any 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.

It is recommended that hotspots of activity continue to be inspected annually in the field to ensure that they are being monitored and managed effectively. That includes areas of sustained high activity, or areas which have shown an increase in activity since the 2008 walkover survey.

Areas of particular concern are as follows.

- **Cayton Bay North**: During 2008 there was a reactivation of large scale landsliding at Cayton Cliff. Whilst activity has slowed in recent months, the A174 coast road and properties near Knipe Point remain at risk.

- **Cayton Bay South:** The CBUs along this frontage are highly susceptible to slumping and sliding with some units showing increased activity since 2008. Continued erosion presents a risk to nearby properties, public access to the beach and to users of the beach below.

- **Filey Town:** Localised cliff instability was evident in 2008 which had led to the closure of some footpaths. Other impacts of the 2007 rainstorm event have been remediated, but the Town's coastal cliffs should be regularly inspected to minimise the threat to people and property.

- **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.

- **Cornelian Bay:** The toe units at Cornelian Bay have sustained a high level of activity since the 2008 inspection. The main embayment has seen an increase in activity since 2008, indicating the potential for landslide activity here which would put nearby land and property at risk.

- **Robin Hoods Bay:** Attention should also be paid to the undefended section of cliff at Robin Hoods' Bay between the sea wall and rock armour to prevent the development of instability in this area.

It is highly recommended that continued monitoring of all coast protection assets is undertaken, with more specific recommendations for individual assets given in the table below.

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 extracts below are those where recommendations have been made, which are in addition to the requirement to undertake regular condition assessment inspections. 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. The recommended actions for each inspected coastal defence assets are shown in the table below, split up by locality. All assets classified as requiring "urgent" attention have been highlighted.

For detailed comments on asset construction and condition, as well as photos and locations refer to NFCDD for each area.

Staithes – see Map 25A – Staithes

Asset Reference	Asset Type	Urgency	Recommendations	Residual Life	Overall Cond	Worst Cond
1221D901D0402C01	Break water	Routine	Repair cracks, monitor sheet piling corrosion and repair undercutting to wall.	>20	3	4
1221D901D0402C02	Seawall with rock armour	Routine	Continue to monitor repair cracked wall and repair promenade surface.	11 - 20	2	3
1221D901D0402C03	Seawall	Routine	Continue active monitoring and repair cracks to wall.	>20	3	3
1221D901D0402C04	Seawall	Routine	Continue to monitor and repair cracks and undercutting to toe.	11 - 20	3	4
1221D901D0402C05	Seawall	Routine	Continue to monitor and repair cracks and joints.	>20	3	3
1221D901D0402C06	Wall	Routine	Continue to monitor and repair handrails as H&S issue.	11 - 20	2	2
1221D901D0402C22	Seawall	**Urgent**	Urgent maintenance to the cracked wall, repair cracks and toe.	6 - 10	4	4
1221D901D0403C01	Seawall	Routine	Continue to monitor and repair crack to wall and promenade cracking.	11 - 20	3	3
1221D901D0403C03	Break Water	Routine	Continue to monitor, monitor cracks and repair spalling.	>20	2	3
1221D901D0403C07	Groynes	Routine	Continue to monitor and repair crack.	>20	3	3

Port Mulgrave – see Map 25B – Port Mulgrave

Asset Reference	Asset Type	Urgency	Recommendations	Residual Life	Overall Cond	Worst Cond
1221D901D0502C01	Pier	Routine	Assume as redundant, needs confirming.- same as previous inspection	1 - 5	5	5

Runswick Bay – see Map 25C – Runswick Bay

Asset Reference	Asset Type	Urgency	Recommendations	Residual Life	Overall Cond	Worst Cond
1221D901D0601C01	Seawall	Routine	Repair joints, cracks and undercutting as well as fill the voids to wall.	>20	3	3
1221D901D0601C02	Break water	**Urgent**	Repair cracks and continue to monitor.	11 – 20	3	3
1221D901D0601C03	Seawall	Routine	Continue to monitor and repair cracks, voids and undercutting.	>20	3	4

1221D901D0601C04	Revet ment	Routine	Continue to monitor and repair cracks to north slipways.	11 - 20	2	3
1221D901D0601C06	Seawall	Routine	Continue to monitor and repair cracks.	>20	3	3
1221D901D0602C05	Seawall	Routine	Continue to monitor and repair cracks.	11 - 20	2	3

Sandsend – see Map 27A – Sandsend

Asset Reference	Asset Type	Urgency	Recommendations	Residual Life	Overall Cond	Worst Cond
1221D901D0701C02	Seawall	Routine	Continue to monitor and repair undercutting and cover exposed re bar.	11 - 20	3	3
1221D901D0702C01	Seawall	Routine	Re-seal joints between poured sections of sea wall, and replace apron.	>20	4	5
1221D901D0702C02	Revet Ment	Routine	Repair cracks and undercutting and continue to monitor.	6 - 10	3	3
1221D901D0702C04	Seawall	Routine	Continue to monitor.	11 - 20	4	5

Whitby – see Map 28A – Whitby

Asset Reference	Asset Type	Urgency	Recommendations	Residual Life	Overall Cond	Worst Cond
1221D901D0801C01	Seawall	Routine	Continue to monitor surface cracking in promenade.	>20	2	3
1221D901D0801C01002	Stairs	Routine	Continue to monitor, repair when necessary. Renew non-slip if required.	11 - 20	2	2
1221D901D0802C03	Seawall	Routine	Continue to monitor condition of surface erosion and repair toe.	>20	4	4
1221D901D0802C03001	Stairs	Routine	Investigate and repair undercutting	6 - 10	3	3
1221D901D0802C04	Seawall	No repairs	Repaint hand rails, repair eroded front face.	11 - 20	3	3
1221D901D0802C04001	Stairs	Routine	Improve form of steps. Repair undercutting.	11 - 20	3	3
1221D901D0802C05	Seawall	Routine	Continue active monitoring, potential undercutting.	>20	3	3
1221D901D0802C06	Seawall	Routine	Repair cracking in masonry wall. Repair pipe.	11 - 20	4	4
1221D901D0802C06001	Slipway	Routine	Repoint sea ward side. Continue to monitor.	11 - 20	3	3
1221D901D0802C07	Seawall	Routine	Repoint blockwork.	>20	3	3
1221D901D0802C09	Seawall	Routine	Repair undercutting	>20	2	2
1221D901D0802C13	Seawall	Routine	Repair cracks to wall above slipway. Fill joint gap.	>20	3	3

1221D901D0802C13001	Stairs	Routine	Repair form of stairs and tread in middle.	6 - 10	4	4
1221D901D0802C13002	Slipway	Routine	Repair front face on sea ward side, and deck near base.	11 - 20	3	3
1221D901D0802C14	Seawall	Routine	Repair chipped areas approx 0.5m from edge throughout.	11 - 20	3	3
1221D901D0802C15	Seawall	Routine	Continue to monitor – install telltale and undertake deformation monitoring is required. Repair undercutting.	11 - 20	3	3
1221D901D0802C10	Seawall	Routine	Continue to monitor repair hole in joint and exposed re bar.	11 - 20	3	3
1221D901D0802C12	Seawall	Routine	Continue to monitor and repair deep voids cracks and monitor erosion.	11 - 20	4	4
1221D901D0803C01	Break water	Routine	Repair concrete cracked joints and improve slippery planks for H&S.	>20	3	3
1221D901D0803C02	Break water	**Urgent**	Investigate and repair displacement of blocks at NZ8991511648, repair blockwork.	11 - 20	4	4
1221D901D0803C03	Break water	**Urgent**	Continue to monitor and repair cracks to promenade and wall.	>20	3	3
1221D901D0803C04	Break water	Routine	Continue to monitor and inspect when access possible.	11 - 20	3	3
1221D901D0803C05	Rock armour	Routine	Continue to monitor and add rock armour to parts.	6 - 10	3	3
1221D901D0803C06	Harbour wall	Routine	Re-inspect with a boat.	>20	3	3
1221D901D0803C07	Harbour wall	Routine	Remove vegetation growth.	>20	2	2
1221D901D0803C09	Harbour wall	Routine	Continue to monitor, repoint where needed. Replace missing blocks.	11 - 20	3	3
1221D901D0803C08	Harbour wall	**Urgent**	Re inspect parts from boat, as well as repair voids, cracks and joints.	11 - 20	4	4
1221D901D0803C10	Harbour wall	Routine	Continue to monitor and repair washed out joints to wall.	>20	3	3

Robin Hoods Bay – see Map 30A – Robin Hoods Bay

Asset Reference	Asset Type	Urgency	Recommendations	Residual Life	Overall Cond	Worst Cond

1221D901D1003C07	Seawall	Routine	Possible extension to southern end. Recent slumping.	>20	2	2
1221D901D1003C04	Seawall	Routine	Repoint masonry joints, repair toe-undercuting, repair cracks.	>20	3	4
1221D901D1003C06	Seawall	Routine	Repair large cracks to S end of concrete toe.	11 - 20	2	2

Scarborough North Bay – see Map 34A – Scarborough

Asset Reference	Asset Type	Urgency	Recommendations	Residual Life	Overall Cond	Worst Cond
1221D901D1201C04001	Slipway	Routine	Repoint missing mortar to slipway wall, replace missing cracked blockwork	11 - 20	3	3
1221D901D1201C05	Seawall	Routine	Repair rear wall section at TA0371289908.	11 - 20	3	3
1221D901D1201C05001	Stairs	Routine	Re-inspect at lower beach levels.	>20	3	3
1221D901D1201C06	Seawall	Routine	Repair cracks, investigate reason for cracking to new wall.	11 - 20	3	3
1221D901D1201C07	Seawall	**Urgent**	Cracks need repointing throughout sea wall, repair needed to major cracks.	11 - 20	3	3
1221D901D1201C10	Seawall	Routine	Repoint missing mortar to sea wall.	11 - 20	2	3
1221D901D1201C11	Seawall	Routine	Repair cracks to capping.	11 - 20	3	3
1221D901D1201C11001	Stairs	Routine	Re edge rounded stairs due to H&S.	11 - 20	3	3
1221D901D1201C12	Seawall	Routine	Repair cracks to capping.	11 - 20	3	3
1221D901D1201C12001	Stairs	Routine	Continue to monitor and check at low beach level.	11 - 20	3	3
1221D901D1201C13	Seawall	Routine	Repair cracks to capping and inspect when blockwork visible.	11 - 20	3	3
1221D901D1201C13001	Stairs	Routine	Continue to monitor and check at low beach level	11 - 20	3	3
1221D901D1201C14	Seawall	Routine	Repoint mortar loss and repair cracks to capping.	11 - 20	3	3
1221D901D1201C14001	Stairs	Routine	Repair cracks and rounding of steps due to H&S	11 - 20	2	2
1221D901D1201C15	Seawall	Routine	Continue to monitor.	11 - 20	3	3
1221D901D1201C15001	Stairs	Routine	Repair cracks to side walls and monitor at lower beach height.	11 - 20	3	3
1221D901D1201C16	Seawall	Routine	Repair cracks to capping and inspect at low beach height.	11 - 20	3	3
1221D901D1201C16001	Stairs	Routine	Continue to monitor and inspect at low beach height.	11 - 20	3	3

1221D901D1201C17	Seawall	Routine	Repair joints between coping.	>20	3	3
1221D901D1201C17001	Stairs	Routine	Repair hole in promenade above steps.	>20	3	3
1221D901D1201C18	Seawall	Routine	Repair/replace damaged capping beams.	11 - 20	3	3
1221D901D1201C26001	Stairs	Routine	Repair cracks and reform steps.	11 - 20	3	3
1221D901D1201C01	Seawall	Routine	Continue to monitor and repair vertical construction joint and cracks.	11 - 20	2	2
1221D901D1201C02	Seawall	**Urgent**	Continue to monitor, refill filler to joints and repair cracks.	>20	3	3
1221D901D1201C03	Seawall	**Urgent**	Continue to monitor and repair cracks to wall and handrail.	>20	4	4
1221D901D1201C04	Seawall	Routine	Continue to monitor repair cracks and missing blockwork. MISSING element	11 - 20	3	3
1221D901D1201C08	Seawall	**Urgent**	Continue to monitor and repair cracks, monitor beach levels.	11 - 20	3	4
1221D901D1201C19	Seawall	Routine	Repair missing joints and chipped parts of capping and splash beams.	11 - 20	3	3
1221D901D1201C20	Seawall	Routine	Continue to monitor inspect at low beach height, and repoint missing joints.	11 - 20	3	3
1221D901D1201C21	Seawall	**Urgent**	Repair cracks and missing joints as well as exposed toe and beach level.	11 - 20	3	3
1221D901D1201C24	Seawall	Routine	Continue to monitor and repair cracked capping beam and cracks in promenade.	11 - 20	3	3
1221D901D1201C25	Seawall	Routine	Continue to monitor and repair cracks.	11 - 20	3	3
1221D901D1202C02	Seawall	**Urgent**	Continue to monitor and repair cracks and joints to splash wall.	1 - 5	3	3
1221D901D1202C23	Seawall	**Urgent**	Continue to monitor, repair all cracks and monitor beach level.	11 - 20	3	3

Scarborough Harbour – see Map 34B – Scarborough

Asset Reference	Asset Type	Urgency	Recommendations	Residual Life	Overall Cond	Worst Cond
1221D901D1301C01	Break water	Routine	Continue to monitor. Investigate gaps in rock armour.	>20	3	4

1221D901D1301C02	Seawall	Routine	Continue active monitoring, repoint missing joints to wall.	>20	3	3
1221D901D1301C03	Break water	Routine	Continue to monitor and repoint cracks and joints.	11 - 20	3	3
1221D901D1301C04	Break water	Routine	Continue to monitor and repoint cracks and missing joints.	11 - 20	3	3
1221D901D1301C05	Seawall	Routine	Continue to monitor repair cracks and missing joints.	>20	3	3
1221D901D1301C06	Seawall	Routine	Continue active monitoring repair underside of extension and cracks to wall.	11 - 20	3	3
1221D901D1301C07	Break water	Routine	Continue to monitor and repair cracks.	11 - 20	3	3
1221D901D1301C11	Seawall	Routine	Continue active monitoring repair cracks.	>20	2	2
1221D901D1301C13	Piling	Routine	Continue to monitor repair cracks to concrete backfill.	11 - 20	3	3
1221D901D1301C14	Revet ment	Routine	Continue active monitoring repoint missing joints.	>20	2	3
1221D901D1301C16	Break water	Routine	Continue to monitor, replace timber fenders and repoint cracks.	>20	3	3
1221D901D1301C17	Break water	Routine	Continue active monitoring, repair cracks.	6 - 10	3	3
1221D901D1301C18	Break water	Routine	Continue to monitor, repair cracks to promenade.	11 - 20	3	3
1221D901D1301C19	Break water	Routine	Continue to monitor and repair cracks.	11 - 20	4	4

Scarborough South Bay – see Map 34B – Scarborough

Asset Reference	Asset Type	Urgency	Recommendations	Residual Life	Overall Cond	Worst Cond
1221D901D1301C08	Seawall	Routine	Continue active monitoring, repair joints.	>20	3	3
1221D901D1301C09	Seawall	Routine	Continue to monitor and repair joints and cracks.	11 - 20	3	3
1221D901D1301C10	Seawall	Routine	Continue to monitor, repair cracks and joints.	11 - 20	3	3
1221D901D1301C15	Seawall	Routine	Continue to monitor and repair joints.	11 - 20	3	3
1221D901D1301C20	Slipway wall	Routine	Repair missing joints and cracks and inspect at low beach height.	11 - 20	3	3
1221D901D1301C25	Seawall	Routine	Continue to monitor and repair joints, inspect at low beach level.	11 - 20	3	3
1221D901D1301C27	Seawall	Routine	Continue to monitor and repair cracks and joints monitor undercutting.	11 - 20	3	3

1221D901D1301C28	Seawall	Routine	Continue to monitor and repair cracks, joints and toe of wall.	6 - 10	3	4
1221D901D1301C29	Seawall	Routine	Continue to monitor repair joints and monitor erosion.	11 - 20	3	3
1221D901D1302C01	Seawall	Routine	Continue to monitor and repair cracks and joints.	>20	3	3
1221D901D1302C02	Seawall	Routine	Continue to monitor and repair cracks, joints, splash beam and exposed rebar.	6 - 10	4	5
1221D901D1302C03	Seawall	Routine	Continue to monitor and repair joints, cracks and void.	6 - 10	3	3
1221D901D1303C02	Seawall	**Urgent**	Urgently repair voids to lower wall, and repair cracks throughout.	11 - 20	4	4
1221D901D1304C01	Rock armour	Routine	Continue to monitor, monitor stability of cliffs, repair cracked slipway.	>20	2	2
1221D901D1304C02	Bastion and seawall	**Urgent**	Urgent repair work to deep voids, repair cracks and exposed re bar.	11 - 20	3	4

Cayton Bay – see Map 35A – Cayton Bay to Blue Dolphin Holiday Park

Asset Reference	Asset Type	Urgency	Recommendations	Residual Life	Overall Cond	Worst Cond
1221D901D1402C02	Seawall	Routine	Continue to monitor condition of wall, joints and surface erosion.	>20	2	3
1221D901D1402C04	Seawall	**Urgent**	Overall repair work needed. Capital investment.	6 - 10	4	5
1221D901D1402C05	Seawall	Routine	Repoint and replace missing blockwork.	6 - 10	3	4
1221D901D1402C06	Seawall	Routine	Monitor voids, fill when necessary.	6 - 10	3	3

Filey – see Map 36A – Filey

Asset Reference	Asset Type	Urgency	Recommendations	Residual Life	Overall Cond	Worst Cond
1221D901D1602C02	Seawall	Routine	Improve compaction of stones, rebuild at S end if required. Regular monitoring.	6 - 10	3	4
1221D901D1602C03	Seawall	**Urgent**	Replace chipped and broken coping where required. Repair hand rail.	1 - 5	3	3
1221D901D1602C03001	Stairs	Routine	Repair crack. Repaint lower hand rail.	>20	2	2
1221D901D1602C03002	Slipway	Routine	Repointing mid lower slope. Repair cracks to side walls.	11 - 20	3	3

1221D901D1602C04	Seawall	Routine	Renew brittle mastic throughout. Renew front faces.	>20	3	3
1221D901D1602C04001	Stairs	Routine	Fill joint down side of upper flight. Re-form lower steps.	>20	3	3
1221D901D1602C04002	Stairs	Routine	Repoint central section. Replace blocks in 2 sections in lower slope.	>20	3	3
1221D901D1602C05	Seawall	Routine	Renew external face and miss	>20	3	3
1221D901D1602C05001	Stairs	Routine	Repair lowest flight of stairs. Repair toe of seaward wall.	>20	3	3
1221D901D1602C06001	Slipway	Routine	Repoint constr. joints. Raise ground level behind wall.	11 - 20	3	3
1221D901D1602C07	Seawall	Routine	Repair front faces of blocks.	>20	3	3
1221D901D1602C08	Seawall	Routine	Replace cracked coping section. Repair other cracked blocks.	>20	3	3
1221D901D1601C02	Breast work	No repairs	Rebuild or allow to become fully redundant.	11 - 20	5	5
1221D901D1601C03	Piling	Routine	Replace sheet piling with new.	6 - 10	4	4
1221D901D1601C03001	Slipway	Routine	Repair cracks in mass concrete when necessary.	>20	2	2
1221D901D1602C01	Seawall	Routine	Repair to face work to middle of wall.	>20	3	3
1221D901D1602C03003	Bridge	Routine	Repair cracks to brick and stone supporting walls.	11 - 20	3	3
1221D901D1602C06	Seawall	Routine	Repointing. Repair numerous coping stone.	11 - 20	2	3
1221D901D1602C08001	Slipway	Routine	Continue to monitor, repair when necessary.	>20	2	2
1221D901D1602C09	Seawall	Routine	Repair large crack. Repoint. Renew damaged blocks.	11 - 20	3	4
1221D901D1602C09001	Slipway	Routine	Localised repointing.	>20	2	2
1221D901D1602C09002	Slipway	Routine	Monitor cracks and repair when necessary.	11 - 20	3	3
1221D901D1502C01001	Slipway	Routine	Continue to monitor.	6 - 10	3	3

Appendix A

Coastal Slope Condition

Maps 1 -12

N

0 0.25 0.5 1 1.5 Km

Cu4 Cu5 Cu6 Cu7

Mu4 Mu5 Mu6A Mu6B Mu6C Mu7A Mu7B

Cowbar Nab
MU4/1a
MU4/1b
MU4/2
MU4/3
Jet Wyke
MU5/1
Brackenberry Wyke
Staithes
MU6/1
MU6/2
MU6/3
MU6/4
MU6/5
MU6/6
Lingrow Cliffs
Port Mulgrave
MU6/7
MU6/8
MU7/1
MU7/2
MU7/3
MU7/4
MU8/1
Runswick Bay

520000 519000 518000 517000 516000

479000 480000 481000 482000

Area covered by main map

Saltburn-by-the-Sea
Whitby
Scarborough
Filey

Legend

Cliff Activity Status 2009

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 1 - Staithes to Runswick Bay

Coastal Slope Condition 2009

Drawing Scale 1:15,000 at A3

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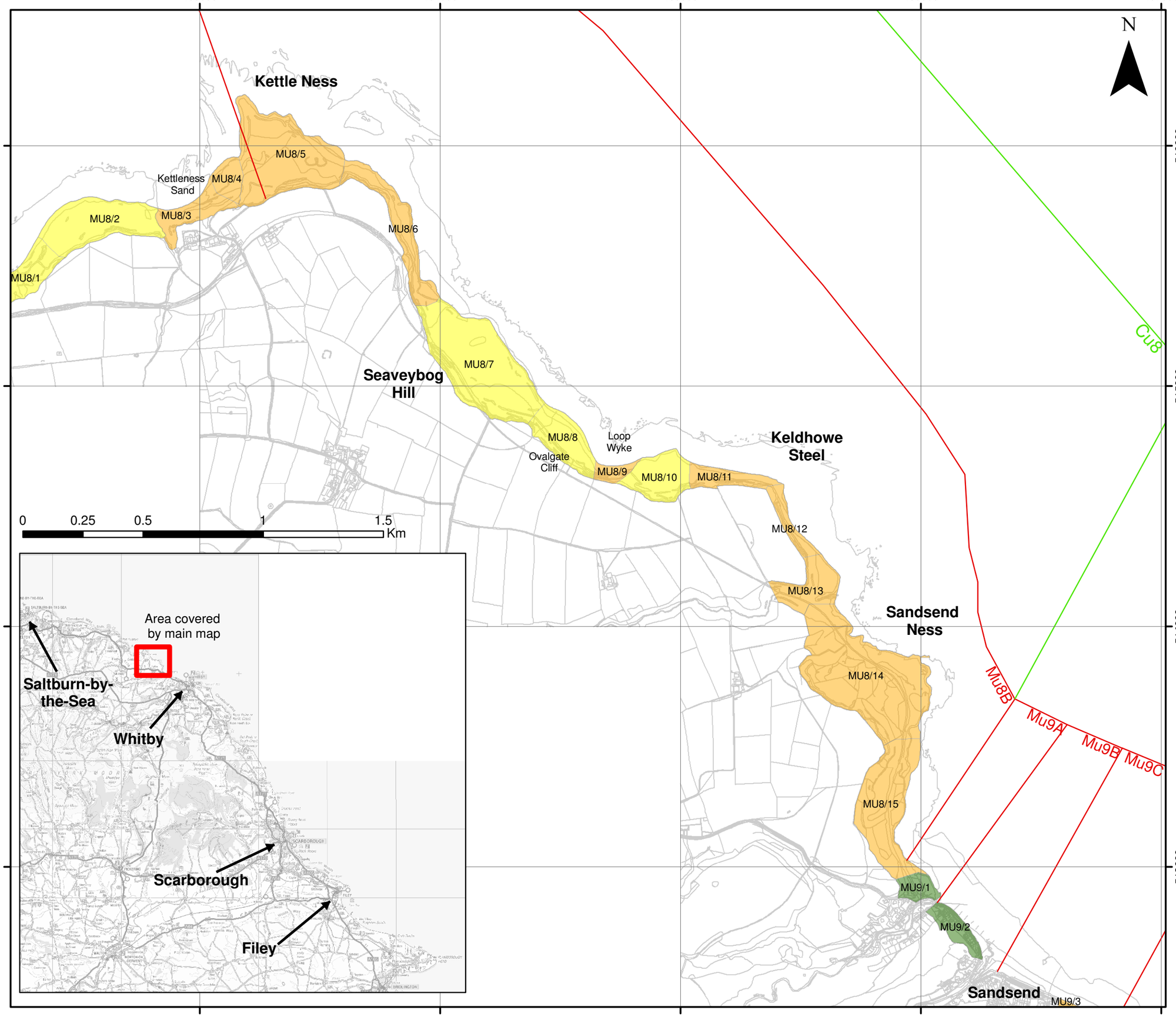
GIS Filename: SBC Map 1_2009.mxd



Legend

Cliff Activity Status 2009

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 2 - Runswick Bay to Sandsend

Coastal Slope Condition 2009

Drawing Scale 1:15,000 at A3

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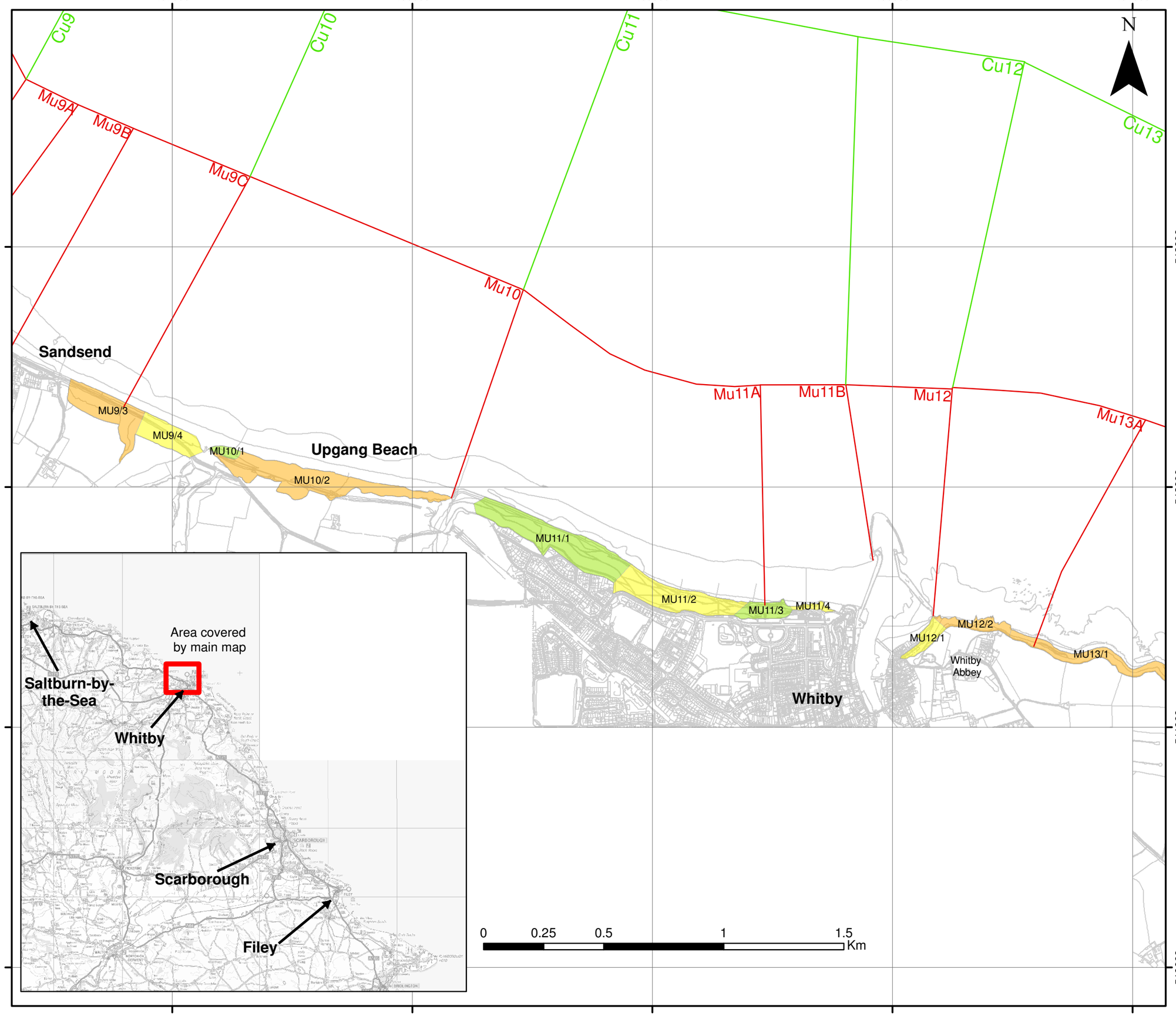

Legend

Cliff Activity Status 2009

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 3 - Sandsend to Whitby East

Coastal Slope Condition 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: SBC Map 3_2009.mxd

N

0 0.25 0.5 1 1.5 Km

Saltwick Nab

MU13/1

MU13/2

Saltwick Bay

MU13/3

Black Nab

MU13/4

MU13/5

MU13/6

Whitby Fog Signal

Cu13

Cu14

Mu13B

Widdy Head

MU14/1

Mu14

Mu15

Pursglove Stye

MU15/1

MU15/2

511000

510000

509000

508000

507000

491000

492000

493000

494000

495000

Area covered by main map

Saltburn-by-the-Sea

Whitby

Scarborough

Filey

Legend

Cliff Activity Status 2009

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 4 - Whitby East to Pursglove Stye

Coastal Slope Condition 2009

Drawing Scale 1:15,000 at A3

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N

0 0.25 0.5 1 1.5 Km

MU14/1

Pursglove Stye

MU15/1

Far Jetticks

MU15/2

Bay Ness

MU15/3

MU15/4

Robin Hood's Bay

MU16/1

MU16/2

MU16/3

MU17/1

MU17/2

MU17/3

MU17/4

MU17/5

Tinkler's Stone

Boggle Hole

Mu15

Mu16A

Mu16B

Mu16C

Mu17A

508000

507000

506000

505000

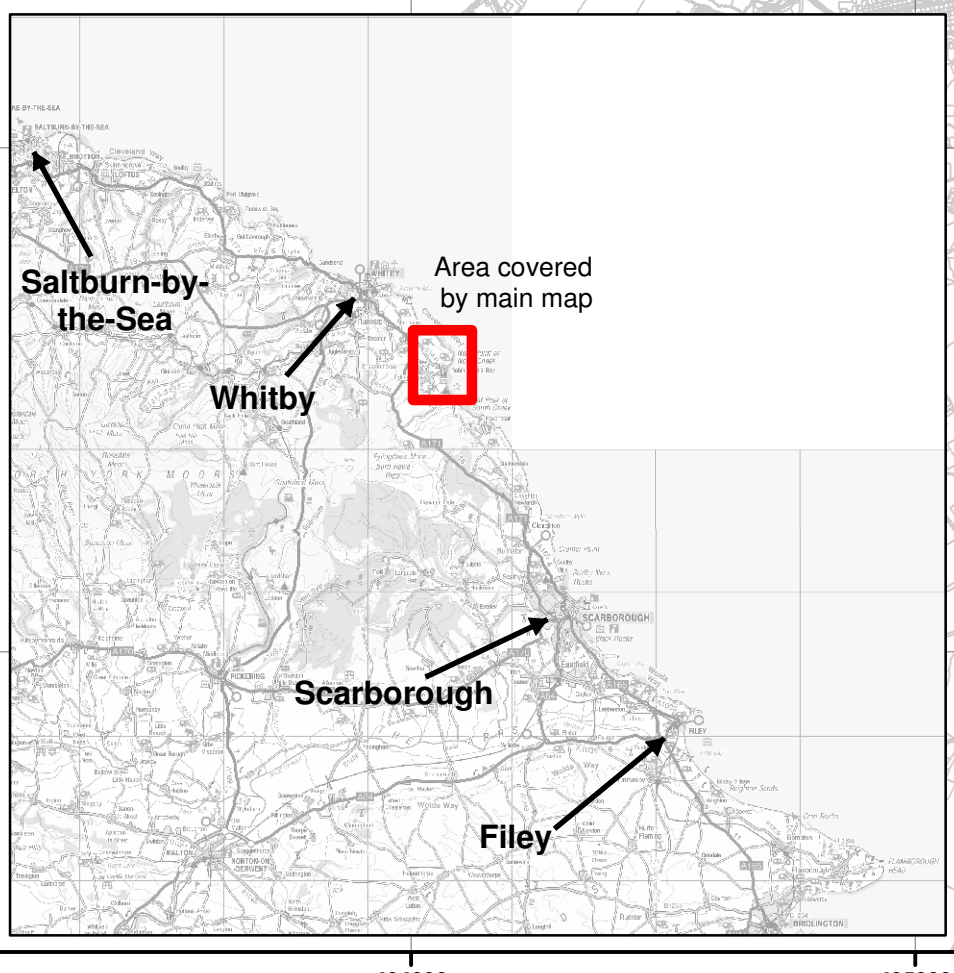
504000

494000

495000

496000

497000



Legend

Cliff Activity Status 2009

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 5 - Pursglove Stye to Tinkler's Stone

Coastal Slope Condition 2009

Drawing Scale 1:15,000 at A3

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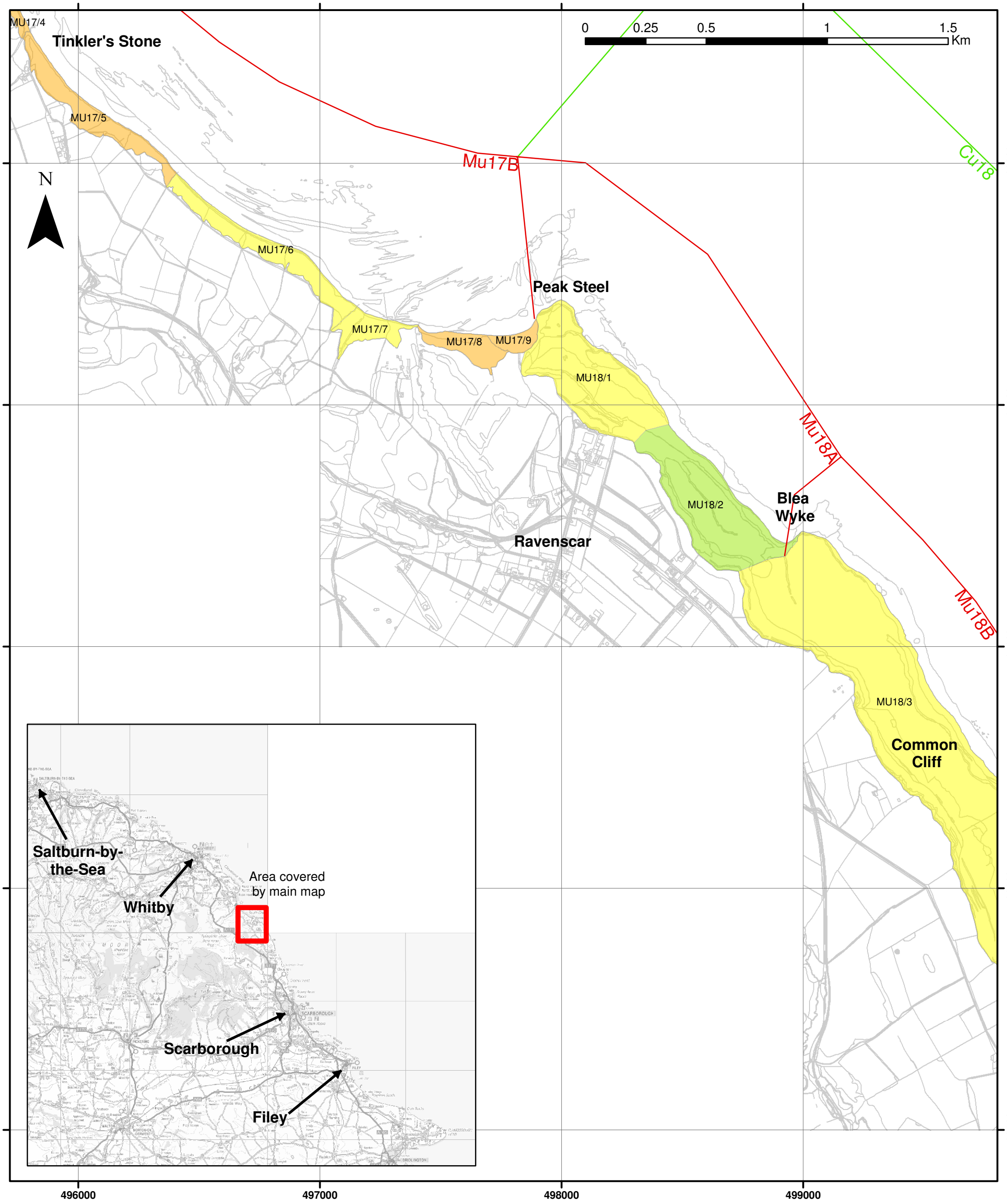

Legend

Cliff Activity Status 2009

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 6 - Tinkler's Stone to Common Cliff

Coastal Slope Condition 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: SBC Map 6_2009.mxd

N

0 0.25 0.5 1 1.5 Km

Beast Cliff

MU18/3

MU18/4

Mu18B

Cu18

Cu19

MU19/1

Mu19A

Herbert Hole

MU19/2

Hayburn Wyke

Mu19B

MU19/3

MU19/4

Mu19C

MU19/5

Cloughton Wyke

MU19/6

Hundale Point

Saltburn-by-the-Sea

Whitby

Area covered by main map

Scarborough

Filey

499000 500000 501000 502000 503000

496000 497000 498000 499000 495000

Legend

Cliff Activity Status 2009

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 7 - Beast Cliff to Hundale Point

Coastal Slope Condition 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: SBC Map 7_2009.mxd

N

0 0.25 0.5 1 1.5 Km

The Hundales

MU19/6

Long Nab

MU19/7

MU19/8

Cromer Point

MU19/9

MU19/10

Scalby Ness

MU19/11

Mu19E

Cu19

Scalby Mills

MU20/1

MU20/2

Mu20A

494000

493000

492000

491000

490000

501000

502000

503000

504000

Saltburn-by-the-Sea

Whitby

Area covered by main map

Scarborough

Filey

Legend

Cliff Activity Status 2009

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 8 - Scarborough North

Coastal Slope Condition 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: SBC Map 8_2009.mxd

N

MU20/3
Mu20B
Mu21A
MU20/4a
MU20/4b
MU21/1
The Holms
MU21/2
Castle Cliff
Scarborough
Mu21B
Mu22A
Cu21
Cu22
Mu22B
MU22/1
South Bay
South Cliff Gardens
MU22/2
The Spa Complex
MU22/3
MU22/4
MU22/5
MU22/6
Holbeck Gardens
MU22/7
MU22/8
Mu23
0 0.25 0.5 1 1.5 Km
MU23/A
MU23/B
MU23/C
MU23/D1
MU23/D3
MU23/D2
Wheatcroft Cliff
MU23/E
MU23/F
MU23/G1
MU23/H1
MU23/H2a
MU23/H2b
Cornelian Bay
MU23/G2
Frank Cliff
MU23/H
MU23/H3
MU23/H2
MU23/I1
MU23/I2
MU23/I3
MU23/I
MU23/I4
Knipe Point
MU23/J
MU24/A8
Mu24/A7
MU24/A
Cayton Bay
MU24/A2
Mu24/B1
Saltburn-by-the-Sea
Whitby
Area covered by main map
Scarborough
Filey
504000
505000
506000
507000
489000
488000
487000
486000
485000

Legend

Cliff Activity Status 2009

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 9 - Scarborough South to Cayton Bay

Coastal Slope Condition 2009

Drawing Scale 1:15,000 at A3

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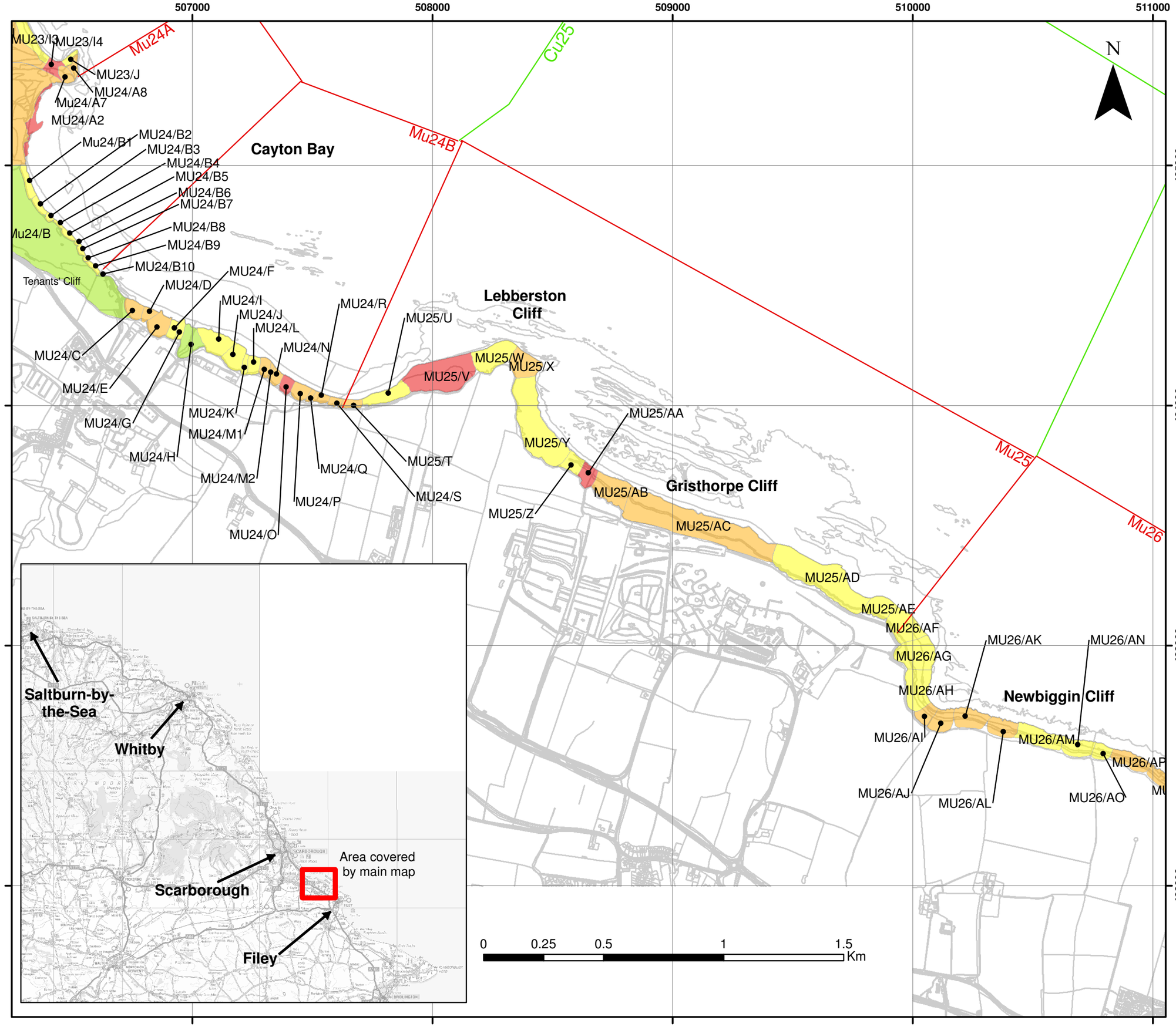
GIS Filename: SBC Map 9_2009.mxd



Legend

Cliff Activity Status 2009

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 10 - Cayton Bay to North Cliff

Coastal Slope Condition 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: SBC Map 10_2009.mxd

N

MU26/AQ
MU26/AR
MU26/AS
MU26/AT
MU26/AU
North Cliff
MU26/AV
MU26/AW
MU26/AX
MU27/AY
MU27/AZ
MU27/BA
MU27/BB
MU27/BC
MU27/BD
MU27/BE
MU27/BF
MU27/A
MU27/B
MU27/C
MU27/D
MU27/E
MU27/F
MU27/G
MU27/H
MU27/I
MU27/J
MU27/K
MU27/L
MU27/M
MU27/N
MU27/O
MU27/P
MU27/Q
MU27/R
MU27/S
MU27/T
MU27/U
MU27/V
MU27/W
MU27/X
MU28/Y
MU28/Z
MU29/AA
MU29/AB
MU29/AC
MU29/AD
MU29/AE
MU29/AF
MU29/AG
MU29/AH
MU29/AI
MU29/AJ
MU29/AK
MU29/AL
MU29/AM
MU29/AN
MU29/AO
MU29/AP
MU29/AQ
MU29/AR
MU29/AS
MU29/AT
MU29/BA
MU29/BB

Mu27
Mu28B
Mu29A
Mu29B
Mu29C

Filey Brigg
Filey
Muston Sands
Mile Haven
Primrose Valley Holiday Village
Flat Cliff
Butcher Haven

Saltburn-by-the-Sea
Whitby
Scarborough
Filey
Area covered by main map

482000
481000
480000
479000
478000
511000
512000
513000
514000

0 0.25 0.5 1 1.5 Km

Legend

Cliff Activity Status 2009

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 11 - Filey Brigg to Reighton

Coastal Slope Condition 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: SBC Map 11_2009.mxd

513000 514000 515000 516000 517000

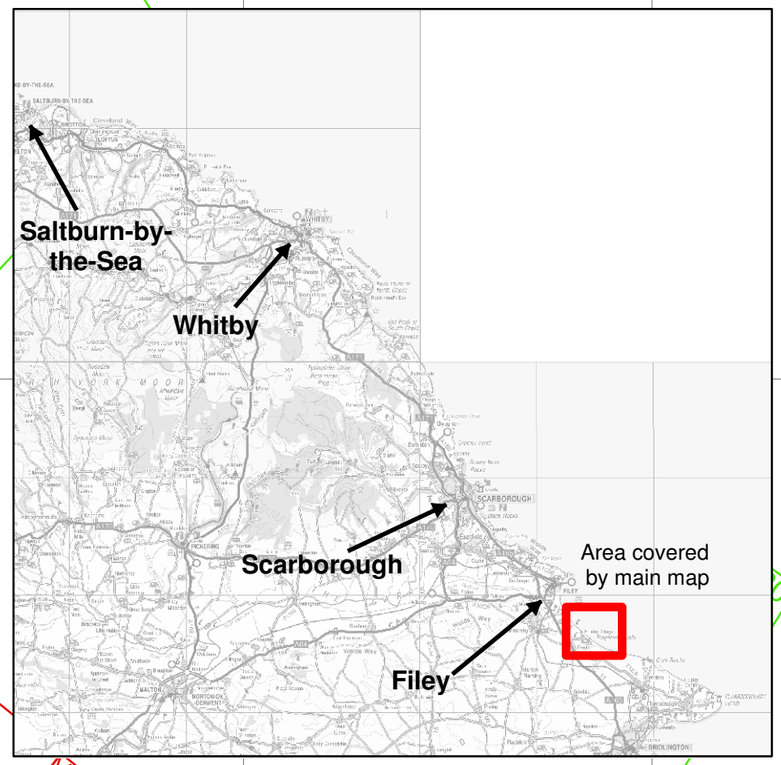
478000 477000 476000 475000

N

Mu29B Mu29C Mu30A Mu30B

MU29/AT
Butcher Haven
MU29/BA
MU29/BB
MU29/BC
MU29/BD
MU29/BE
Hunmanby Gap
MU29/BE2
MU29/BF to BH
MU29/BI
MU29/BJ
Reighton Sands
MU29/BK
MU29/BL
MU29/BM
MU29/BN
MU29/BO
MU29/BP
MU29/BQ
MU29/BR
MU29/BS
MU29/CA
MU29/CB
MU29/CCa
Reighton Sands Holiday Village
Speeton Sands
MU29/CC
Middle Cliff
MU29/CD
MU29/CE
MU29/CF
Speeton Cliffs
MU29/CG
MU29/CH
MU29/CI
MU29/CJ

0 0.25 0.5 1 1.5 Km



Legend

Cliff Activity Status 2009

- Dormant
- Inactive
- Locally active
- Partly active
- Totally active

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 12 - Reighton to Speeton

Coastal Slope Condition 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: SBC Map 12_2009.mxd

Appendix B

Coastal Slope Condition Change Analysis

Maps 13 – 24

N

0 0.25 0.5 1 1.5 Km

Cu4 Cu5 Cu6 Cu7

Mu4 Mu5 Mu6A Mu6B Mu6C Mu7A Mu7B

Cowbar Nab
MU4/1a
MU4/1b
MU4/2
MU4/3
Jet Wyke
MU5/1
Staithes
Brackenberry Wyke
MU6/1
MU6/2
MU6/3
Port Mulgrave
MU6/4
MU6/5
MU6/6
Lingrow Cliffs
MU6/7
MU6/8
MU7/1
MU7/2
Runswick Bay
MU7/3
MU7/4
MU8/1

Area covered by main map
Saltburn-by-the-Sea
Whitby
Scarborough
Filey

520000
519000
518000
517000
516000
479000
480000
481000
482000

Legend

Change in Activity 2008-2009

- Major increase in activity
- Minor increase in activity
- No change
- Minor decrease in activity
- Major decrease in activity

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 13 - Staithes to Runswick Bay

Coastal Slope Condition
Change Analysis 2008 to 2009

Drawing Scale 1:15,000 at A3

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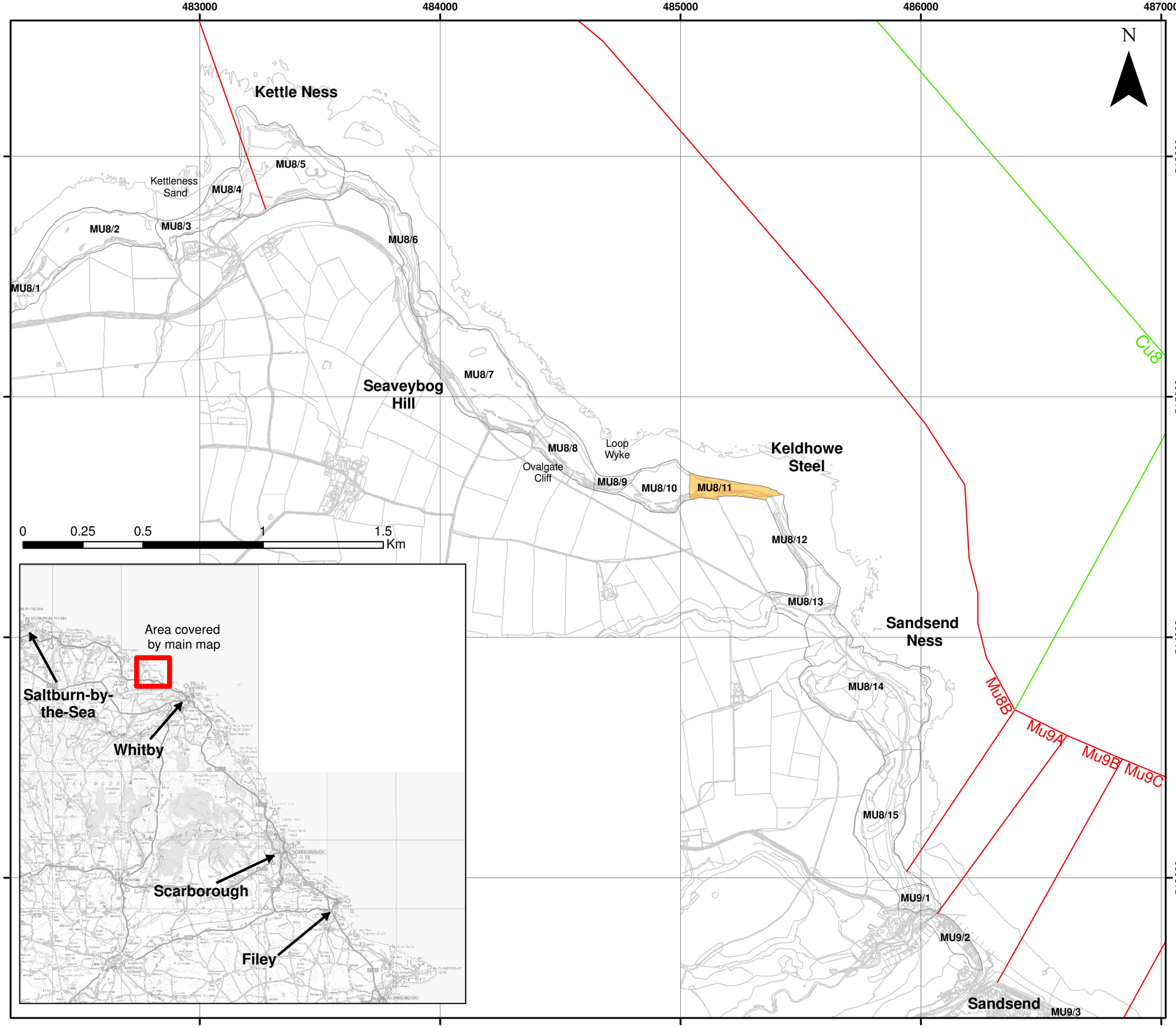
GIS Filename: SBC Map 13 CHANGE_2009.mxd



Legend

Change in Activity 2008-2009

- Major increase in activity
- Minor increase in activity
- No change
- Minor decrease in activity
- Major decrease in activity

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 14 - Runswick Bay to Sandsend

Coastal Slope Condition
Change Analysis 2008 to 2009

Drawing Scale 1:15,000 at A3

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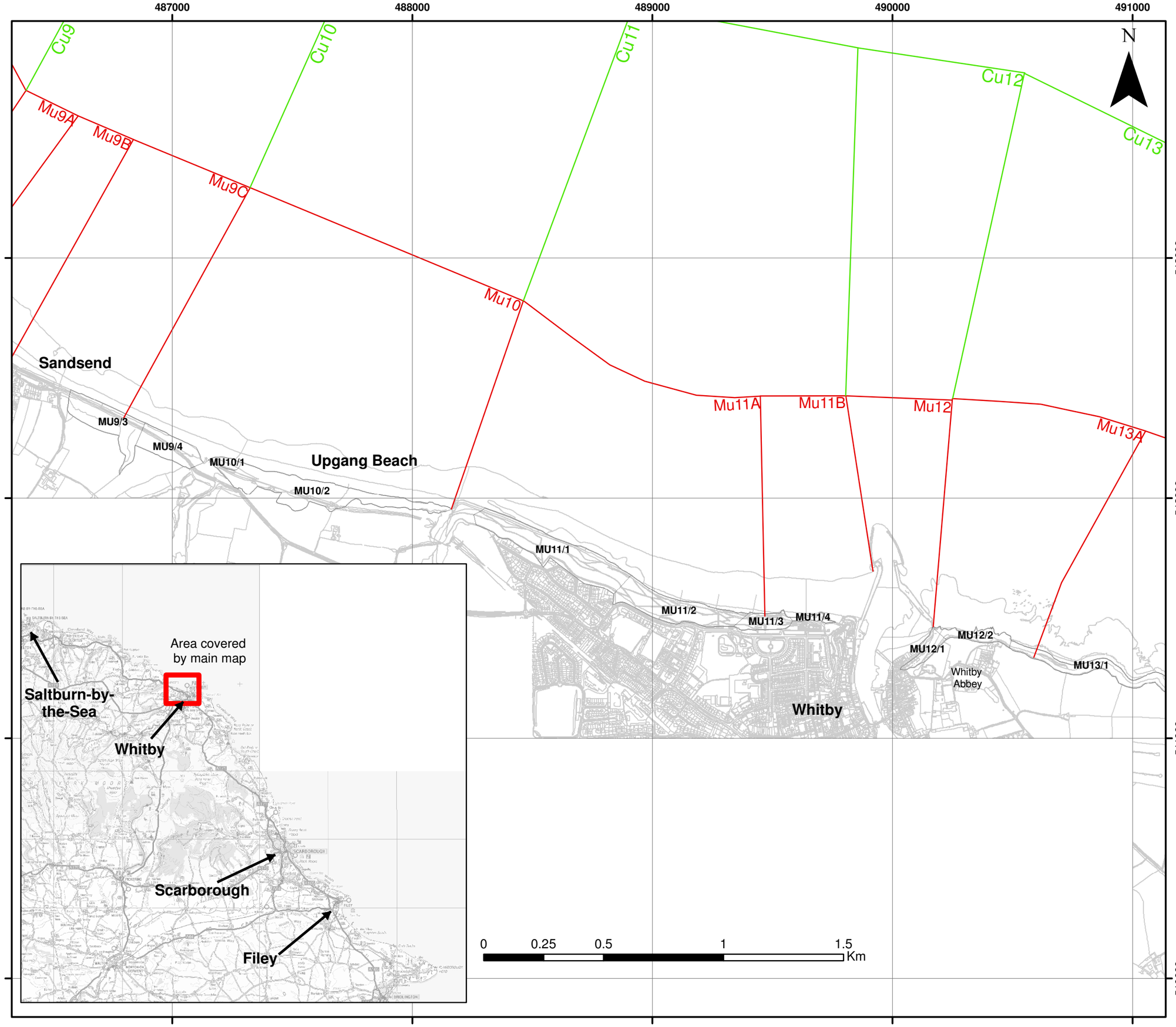

Legend

Change in Activity 2008-2009

- Major increase in activity
- Minor increase in activity
- No change
- Minor decrease in activity
- Major decrease in activity

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 15 - Sandsend to Whitby East

Coastal Slope Condition
Change Analysis 2008 to 2009

Drawing Scale 1:15,000 at A3

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N

0 0.25 0.5 1 1.5 Km

Saltwick Nab

MU13/1

MU13/2

Saltwick Bay

MU13/3

Black Nab

MU13/4

MU13/5

MU13/6

Whitby Fog Signal

Cu13

Cu14

Mu13B

Widdy Head

MU14/1

Mu14

Mu15

Pursglove Stye

MU15/1

MU15/2

Area covered by main map

Saltburn-by-the-Sea

Whitby

Scarborough

Filey

511000

510000

509000

508000

507000

491000

492000

493000

494000

495000

Legend

Change in Activity 2008-2009

- Major increase in activity
- Minor increase in activity
- No change
- Minor decrease in activity
- Major decrease in activity

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 16 - Whitby East to Pursglove Stye

Coastal Slope Condition
Change Analysis 2008 to 2009

Drawing Scale 1:15,000 at A3

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N

0 0.25 0.5 1 1.5 Km

MU14/1

Pursglove Stye

MU15/1

Far Jetticks

MU15/2

Bay Ness

MU15/3

MU15/4

Robin Hood's Bay

MU16/1

Mu15

MU16/2

MU16/3

Mu16A

Mu16B

MU17/1

MU17/2

Mu16C

MU17/3

Mu17A

Boggle Hole

MU17/4

Tinkler's Stone

MU17/5

Saltburn-by-the-Sea

Whitby

Scarborough

Filey

Area covered by main map

508000

507000

506000

505000

504000

494000

495000

496000

497000

Legend

Change in Activity 2008-2009

- Major increase in activity
- Minor increase in activity
- No change
- Minor decrease in activity
- Major decrease in activity

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 17 - Pursglove Stye to Tinkler's Stone

Coastal Slope Condition Change Analysis 2008 to 2009

Drawing Scale 1:15,000 at A3

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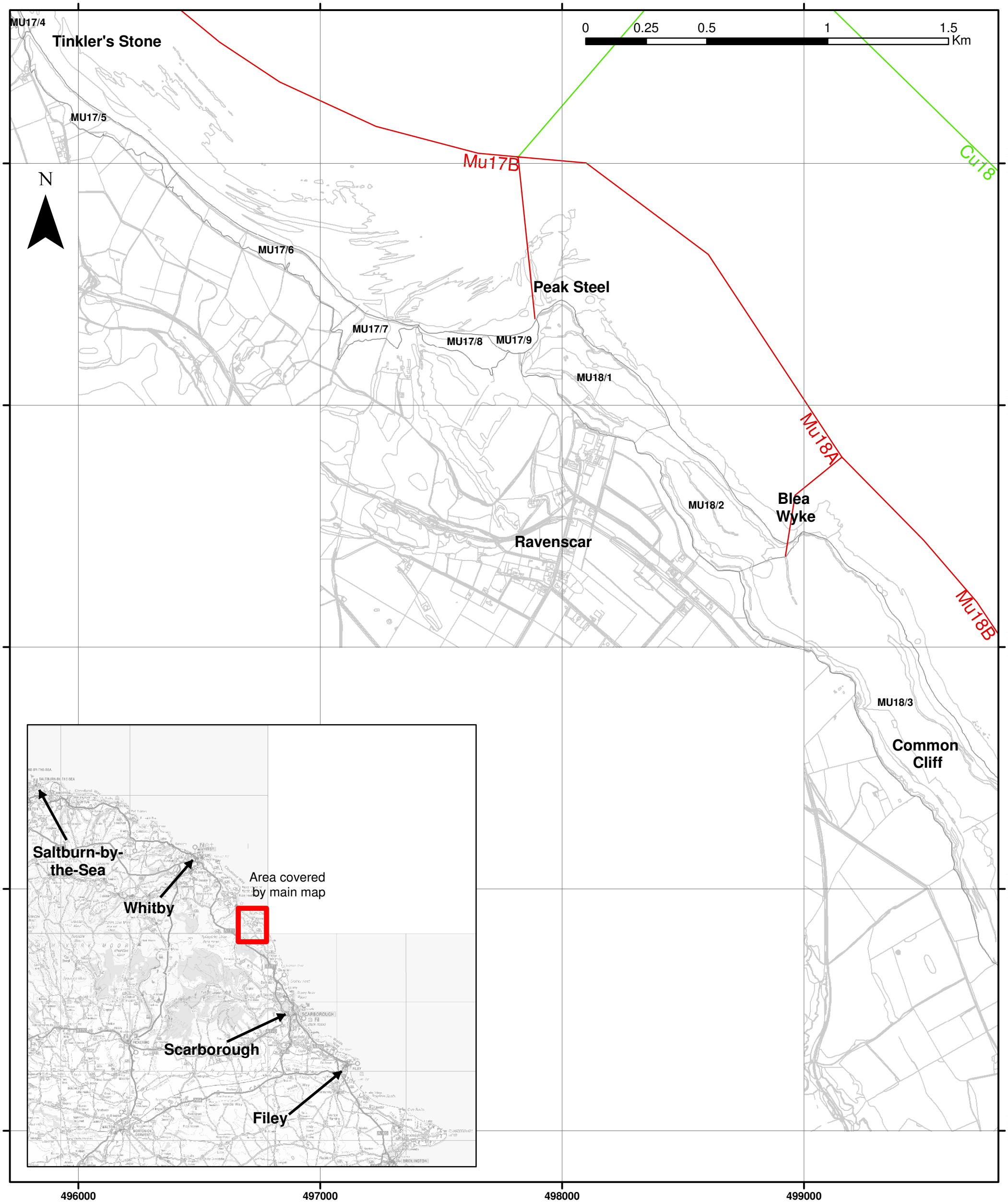
GIS Filename: SBC Map 17 CHANGE_2009.mxd



Legend

Change in Activity 2008-2009

- Major increase in activity
- Minor increase in activity
- No change
- Minor decrease in activity
- Major decrease in activity

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 18 - Tinkler's Stone to Common Cliff

Coastal Slope Condition Change Analysis 2008 to 2009

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GIS Filename: SBC Map 18 CHANGE_2009.mxd

N

0 0.25 0.5 1 1.5 Km

Beast Cliff

MU18/3

MU18/4

Mu18B

Cu18

Cu19

MU19/1

Mu19A

Herbert Hole

MU19/2

Hayburn Wyke

Mu19B

MU19/3

MU19/4

Mu19C

MU19/5

Cloughton Wyke

MU19/6

Hundale Point

Saltburn-by-the-Sea

Whitby

Area covered by main map

Scarborough

Filey

499000 500000 501000 502000 503000

499000 498000 497000 496000 495000

Legend

Change in Activity 2008-2009

- Major increase in activity
- Minor increase in activity
- No change
- Minor decrease in activity
- Major decrease in activity

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 19 - Beast Cliff to Hundale Point

Coastal Slope Condition
Change Analysis 2008 to 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: SBC Map 19 CHANGE_2009.mxd

N

0 0.25 0.5 1 1.5 Km

The Hundales

MU19/6

Long Nab

MU19/7

MU19/8

Cromer Point

MU19/9

MU19/10

Scalby Ness

MU19/11

Mu19E

Cu19

Scalby Mills

MU20/1

MU20/2

Mu20A

494000

493000

492000

491000

490000

501000

502000

503000

504000

Saltburn-by-the-Sea

Whitby

Scarborough

Filey

Area covered by main map

Legend

Change in Activity 2008-2009

- Major increase in activity
- Minor increase in activity
- No change
- Minor decrease in activity
- Major decrease in activity

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 20 - Scarborough North

Coastal Slope Condition Change Analysis 2008 to 2009

Drawing Scale 1:15,000 at A3

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N

MU20/3

Mu20B

Mu21A

MU20/4a

MU21/1

MU21/2

MU20/4b

Scarborough

Mu21B

Mu22A

Cu21

Cu22

Mu22B

South Bay

MU22/1

MU22/2

The Spa Complex

South Cliff Gardens

MU22/3

MU22/4

MU22/5

MU22/6

Holbeck Gardens

MU22/7

MU22/8

Mu23

0 0.25 0.5 1 1.5 Km

MU23/A

MU23/B

MU23/C

MU23/D1

MU23/D3

MU23/D2

Wheatcroft Cliff

MU23/E

MU23/F

MU23/G1

MU23/H1

Cornelian Bay

MU23/H2a

MU23/G2

MU23/H2b

Frank Cliff

MU23/H

MU23/H3

MU23/I1

MU23/H2

MU23/I2

MU23/I3

MU23/I

MU23/I4

MU23/J

Knipe Point

MU24/A8

Mu24/A7

MU24/A

Cayton Bay

MU24/A2

Mu24/B1

Mu24/B

MU24/B2

Saltburn-by-the-Sea

Whitby

Area covered by main map

Scarborough

Filey

489000

488000

487000

486000

485000

504000

505000

506000

507000

Legend

Change in Activity 2008-2009

- Major increase in activity
- Minor increase in activity
- No change
- Minor decrease in activity
- Major decrease in activity

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 21 - Scarborough South to Cayton Bay

Coastal Slope Condition Change Analysis 2008 to 2009

Drawing Scale 1:15,000 at A3

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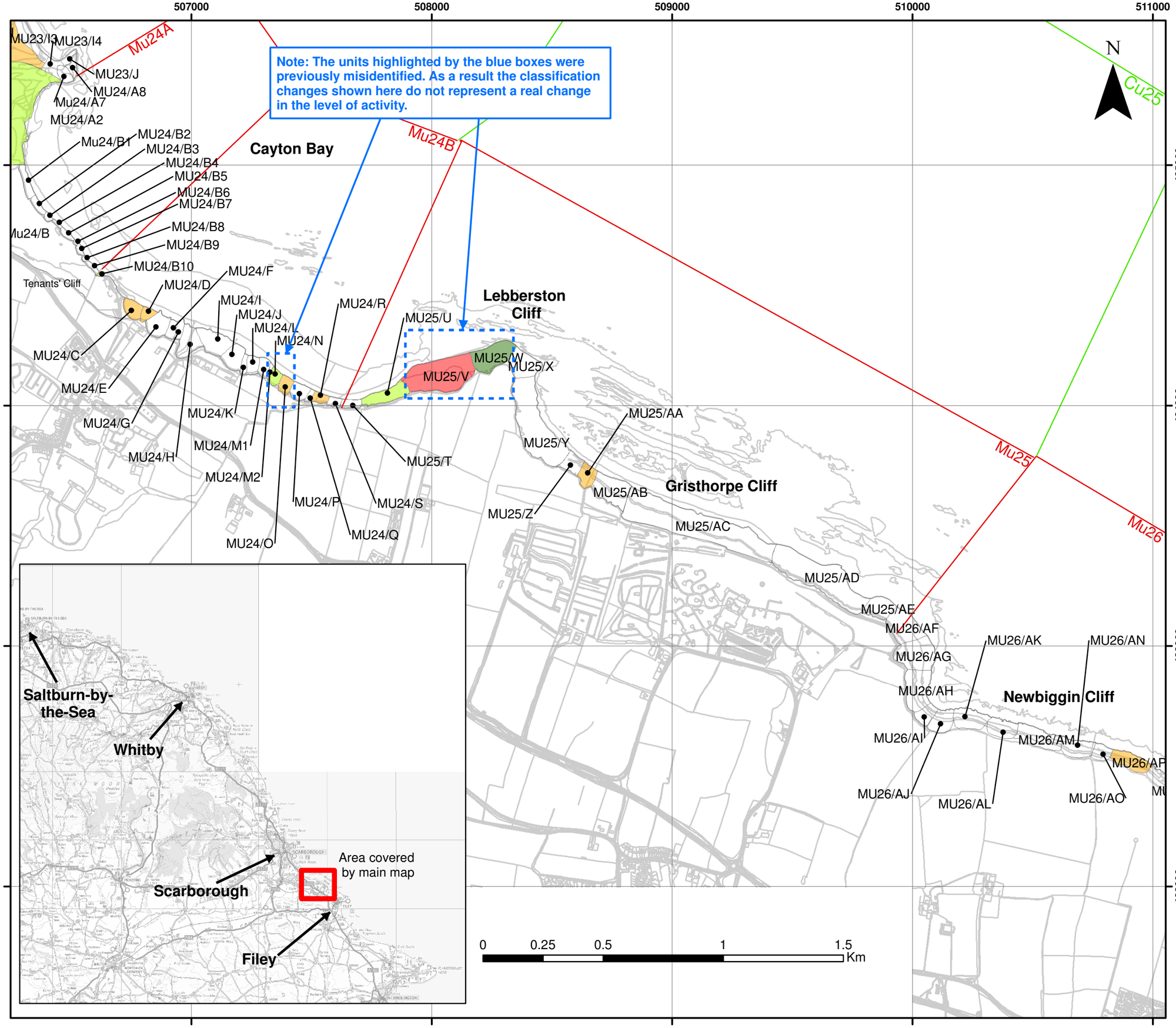
Approved by: PRF Date: Nov 2009

GIS Filename: SBC Map 21 CHANGE_2009.mxd



Legend

Change in Activity 2008-2009

- Major increase in activity
- Minor increase in activity
- No change
- Minor decrease in activity
- Major decrease in activity

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 22 - Cayton Bay to North Cliff

Coastal Slope Condition Change Analysis 2008 to 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: SBC Map 22 CHANGE_2009.mxd

N

MU26/AQ
MU26/AR
MU26/AS
MU26/AT
MU26/AU
MU26/AV
MU26/AW
North Cliff
MU26/AX
MU27/AY
MU27/AZ
MU27/BA
MU27/BB
MU27/BC
MU27/BD
MU27/BE
MU27/BF
MU27/A
MU27/B
MU27/C
MU27/D
MU27/E
MU27/F
MU27/G
MU27/H
MU27/I
MU27/J
MU27/K
MU27/L
MU27/M
MU27/N
MU27/O
MU27/P
MU27/Q
MU27/R
MU27/S
MU27/T
MU27/U
MU27/V
MU27/W
MU27/X
MU28/Y
MU28/Z
MU29/AA
MU29/AB
MU29/AC
MU29/AD
MU29/AE
MU29/AF
MU29/AG
MU29/AH
MU29/AI
MU29/AJ
MU29/AK
MU29/AL
MU29/AM
MU29/AN
MU29/AO
MU29/AP
MU29/AQ
MU29/AR
MU29/AS
MU29/AT
MU29/BA
MU29/BB

Mu27
Mu28B
Mu29A
Mu29B
Mu29C

Filey Brigg
Filey
Muston Sands
Mile Haven
Primrose Valley Holiday Village
Flat Cliff
Butcher Haven

Saltburn-by-the-Sea
Whitby
Scarborough
Filey
Area covered by main map

482000
481000
480000
479000
478000

511000
512000
513000
514000

0 0.25 0.5 1 1.5 Km

Legend

Change in Activity 2008-2009

- Major increase in activity
- Minor increase in activity
- No change
- Minor decrease in activity
- Major decrease in activity

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 23 - Filey Brigg to Reighton

Coastal Slope Condition
Change Analysis 2008 to 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: SBC Map 23 CHANGE_2009.mxd

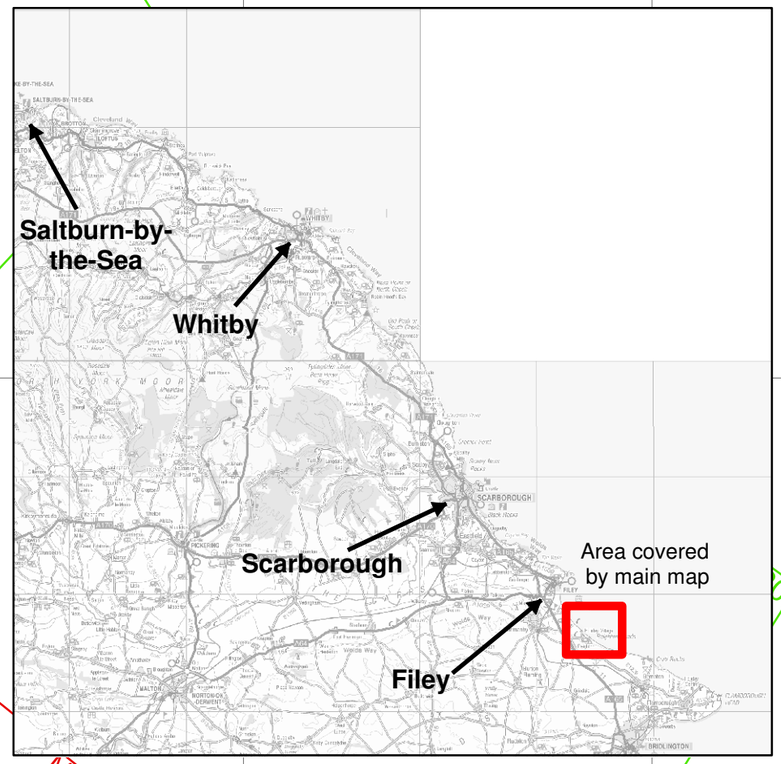
513000 514000 515000 516000 517000

478000 477000 476000 475000

N

Mu29B Mu29C Mu30A Mu30B

MU29/AT
Butcher Haven
MU29/BA
MU29/BB
MU29/BC
MU29/BD
MU29/BE
Hunmanby Gap
MU29/BF
MU29/BG
MU29/BH
MU29/BI
MU29/BJ
Reighton Sands
MU29/BK
MU29/BL
MU29/BM
MU29/BN
MU29/BO
MU29/BP
MU29/BQ
MU29/BR
MU29/BS
Reighton Sands Holiday Village
MU29/CA
MU29/CB
MU29/CCa
Speeton Sands
MU29/CC
Middle Cliff
MU29/CD
MU29/CE
MU29/CF
Speeton Cliffs
MU29/CG
MU29/CH
MU29/CI
MU29/CJ



0 0.25 0.5 1 1.5 Km

Legend

Change in Activity 2008-2009

- Major increase in activity
- Minor increase in activity
- No change
- Minor decrease in activity
- Major decrease in activity

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell One Coastal Monitoring

Map 24 - Reighton to Speeton

Coastal Slope Condition
Change Analysis 2008 to 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: SBC Map 24 CHANGE_2009.mxd

Appendix C

Coast Protection Assets

Maps 25 - 38

N

0 0.25 0.5 1 1.5 Km

Cu4 Mu4 Cu5 Mu5 Mu6A Cu6 Mu6B Mu6C

Staithes

Map 25A

1221D901D0401C01

1221D901D0402C01

1221D901D0501C01

Map 25B

Area covered by main map

1221D901D0503C01

Map 25C

Runswick Bay

1221D901D0602C02

1221D901D0602C03

1221D901D0602C03

520000 519000 518000 517000 516000

478000 479000 480000 481000

Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 25 - Staithes to Runswick Bay

Coast Protection Asset Condition 2009

Drawing Scale 1:15,000 at A3

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Drawn by: JH Date: Dec 2009

Checked by: RA Date: Dec 2009

Approved by: RA Date: Dec 2009

GIS Filename: Map_25.mxd

N

0 0.05 0.1 Kilometers

Mu4

519000

1221D901D0401C01

Map 25A

1221D901D0402C01

1221D901D0402C02

1221D901D0402C03

1221D901D0402C06

1221D901D0402C04

1221D901D0402C22

1221D901D0402C05

Staithes

Map 25B

1221D901D0403C03

1221D901D0403C01

1221D901D0403C06

1221D901D0501C01

Map 25C

Runswick Bay

Legend

Asset Condition (Linear Defences)

- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)

- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 25A - Staithes

Coast Protection Asset Condition 2009

Drawing Scale 1:1,500 at A3

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GIS Filename: Map_25A.mxd

N

0 0.05 0.1 Km

1221D901D0502C02

1221D901D0502C01

Rosedale Lane

Map 25B

Map 25C

1221D901D0502C01

480000

Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 25B - Rosedale Lane

Coast Protection Asset Condition 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: Map_25B.mxd

N

0 0.05 0.1 Km

1221D901D0601C01

1221D901D0601C03

Mu7A

1221D901D0601C02

1221D901D0601C04

Runswick Bay

516000

1221D901D0602C01

1221D901D0602C02

1221D901D0602C02

1221D901D0602C02

1221D901D0602C01

Map 25C

1221D901D0602C03

481000

Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 25C - Runswick Bay

Coast Protection Asset Condition 2009

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N

0 0.25 0.5 1 1.5 Km

Cu7

Cu8

Mu6C

Mu7A

Mu7B

Mu8A

Mu8B

1221D901D0503C01

Runswick Bay

Map 25C

1221D901D0602C02

1221D901D0602C01

1221D901D0602C03

Map 26A

1221D901D0602C04

1221D901D0602C04

1221D901D0603C01

Kettleness

517000
516000
515000
514000

481000 482000 483000 484000 485000

Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 26 - Runswick Bay to Kettleness

Coast Protection Asset Condition 2009

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N

0 0.05 0.1 Km

1221D901D0602C03

1221D901D0602C03

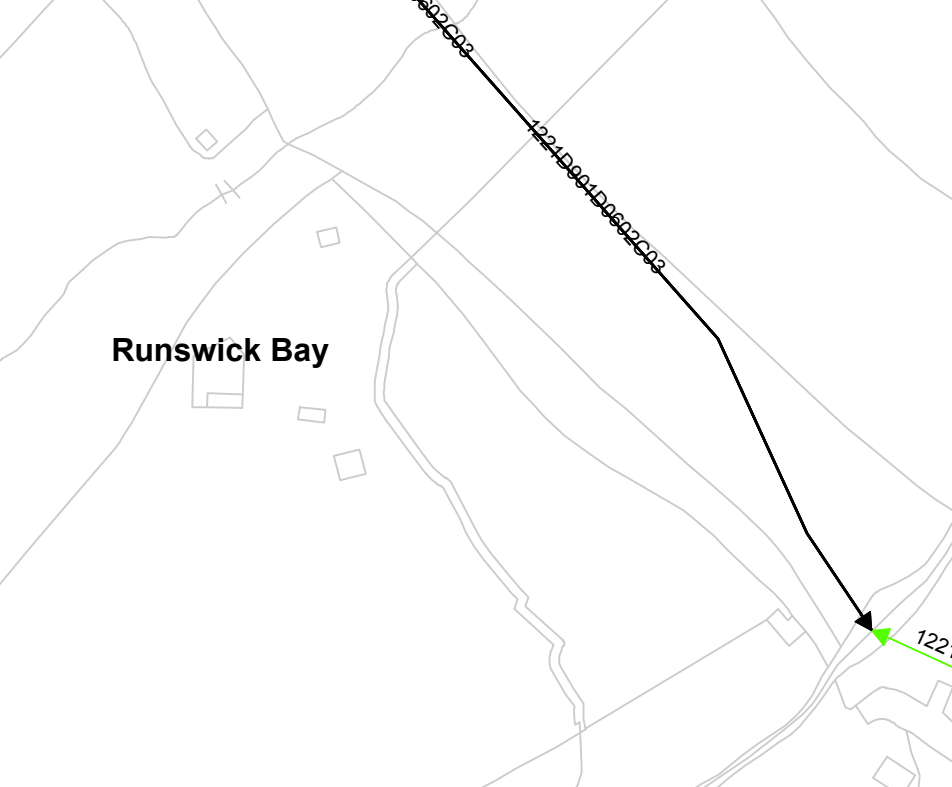
Runswick Bay

1221D901D0602C05

1221D901D0602C04

1221D901D0602C04

Kettleness



Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 26A - Runswick Bay

Coast Protection Asset Condition 2009

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N

Kettleness

0 0.25 0.5 1 1.5 Km

1221D901D0603C01

1221D901D0701C01

Map 27A

1221D901D0702C01

1221D901D0702C02

1221D901D0704C01

1221D901D0801C01001

1221D901D0801C01

1221D901D0801C01002

1221D901D0802C02001

Whitby

Cu9

Cu10

Mu8B

Mu9A

Mu9B

Mu9C

Mu10

Mu11A

514000

513000

512000

511000

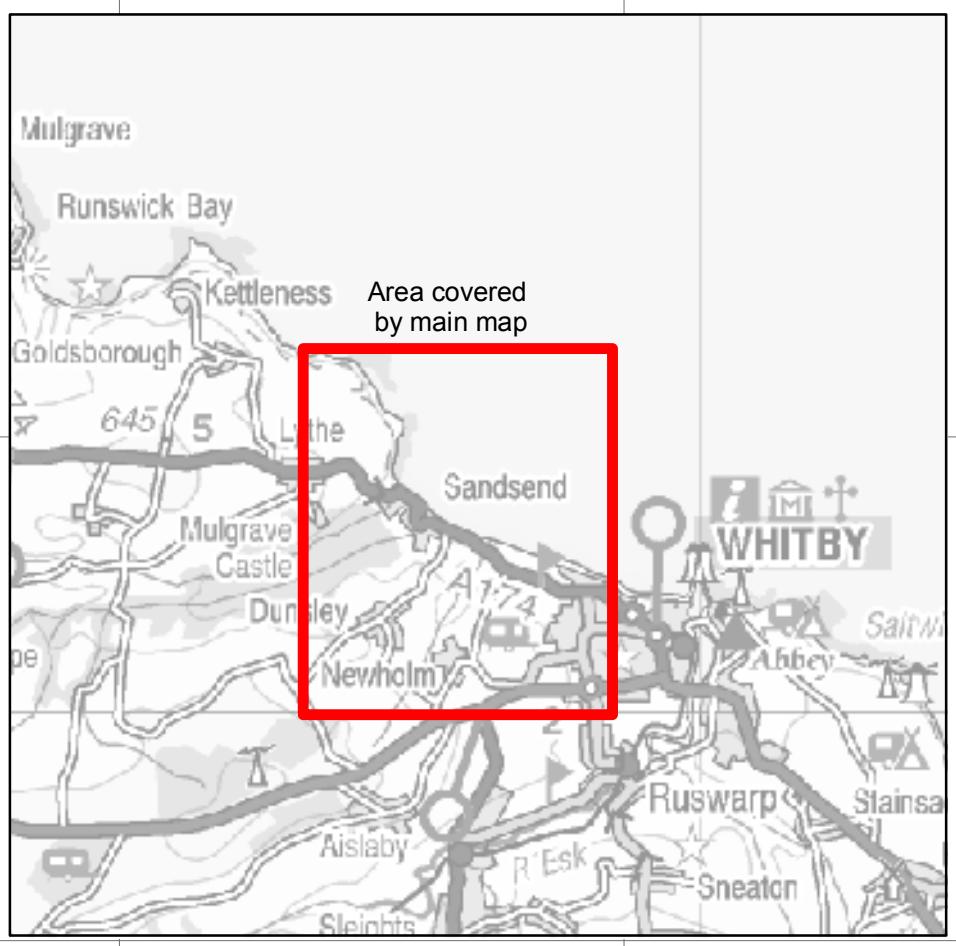
510000

485000

486000

487000

488000



Legend

Asset Condition (Linear Defences)

- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)

- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 27 - Kettleness to Whitby

Coast Protection Asset Condition 2009

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GIS Filename: Map 27.mxd

N

0 0.25 0.5 1 1.5 Km

Cu10 Cu11 Cu12 Cu13

Mu10 Mu11A Mu11B Mu12 Mu13A Mu13B

Map 28A

1221D901D0704C01
1221D901D0801C01001
1221D901D0801C01
1221D901D0801C01002
1221D901D0802C02
1221D901D0802C02001
1221D901D0802C03001
1221D901D0802C13001
1221D901D0802C07001
1221D901D0802C06001
1221D901D0802C04001

Whitby

1222101600101L01
1222101600101R01
1222101600101R03

1221D901D0901C01
1221D901D1001C01

Saltwick Bay

Area covered by main map

Lythe Sandsend Whitby Dunsley Saltwick Bay Newholm Abbey Ruswarp Stainsacre Aislaby Sneaton Hawsker Sleights Ugglebarnby

488000 489000 490000 491000

514000 513000 512000 511000 510000

Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 28 - Whitby to Saltwick Bay

Coast Protection Asset Condition 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: Map_28.mxd

N

0 0.25 0.5 Km

Cu11 Cu12 Cu13

Mu10 Mu11A Mu11B Mu12 Mu13A

1221D901D0801C01001
1221D901D0801C01
1221D901D0801C01002
1221D901D0802C02
1221D901D0802C02001
1221D901D0802C03001
1221D901D0802C13
1221D901D0802C13001
1221D901D0802C13002
1221D901D0802C04001
1221D901D0802C06001
1221D901D0802C07001
1221D901D0803C01
1221D901D0803C02
1221D901D0803C04
1221D901D0803C06
1221D901D0803C08
1222101600101R01
1222101600101R02
1222101600101R03
1222101600101L01

Whitby

Area covered by main map

Sandsend
WHITBY
Abbey

513000
512000
511000
510000

488000 489000 490000

Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 28A - Whitby

Coast Protection Asset Condition 2009

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N

Saltwick Bay

1221D901D1001C01

0 0.25 0.5 1 1.5 Km

Cu13

Cu14

Mu13B

Mu14

Mu15

1221D901D1001C01

Raw Pasture Bank

511000

510000

509000

508000

507000

492000

493000

494000

495000

Legend

Asset Condition (Linear Defences)	Asset Condition (Point Structures)
Undefended Frontage	Uninspected Assets
1	1
2	2
3	3
4	4
5	5

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 29 - Saltwick Bay to Raw Pasture Bank

Coast Protection Asset Condition 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: Map_29.mxd

Raw Pasture Bank

N

0 0.25 0.5 1 1.5 Km

Map 30A

1221D901D1003C01001

1221D901D1003C09001

1221D901D1003C07001

Mu16A

Mu16B

Mu16C

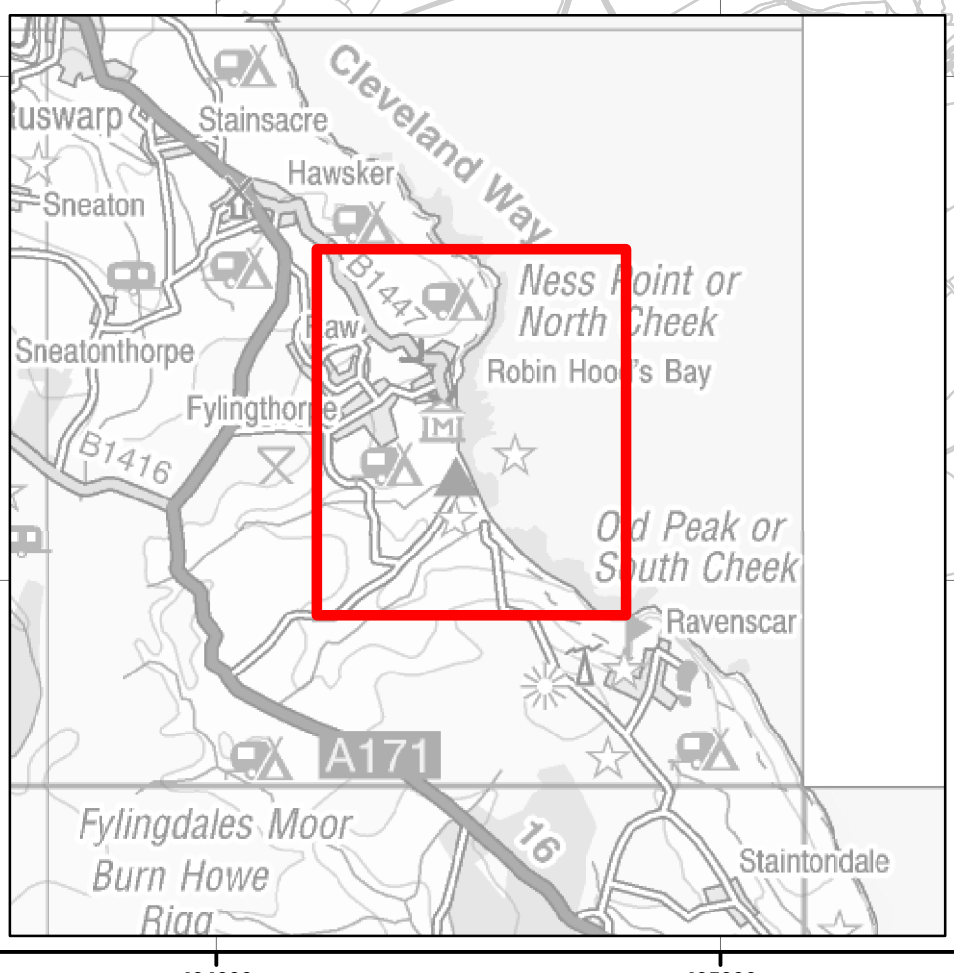
Mu17A

Mu17B

Mu15

1221D901D1003C08

Robin Hoods Bay



494000 495000 496000 497000

507000 506000 505000 504000 503000

Legend

Asset Condition (Linear Defences)	Asset Condition (Point Structures)
Undefended Frontage	Uninspected Assets
1	1
2	2
3	3
4	4
5	5

Unit Divisions

Management Unit

Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 30 - Robin Hoods Bay

Coast Protection Asset Condition 2009

Drawing Scale 1:15,000 at A3

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GIS Filename: Map_30.mxd

N

0 0.1 0.2 Km

1221D901D1002C01

1221D901D1003C01001

1221D901D1003C01

Robin Hoods Bay

1221D901D1003C03

1221D901D1003C02

1221D901D1003C09001

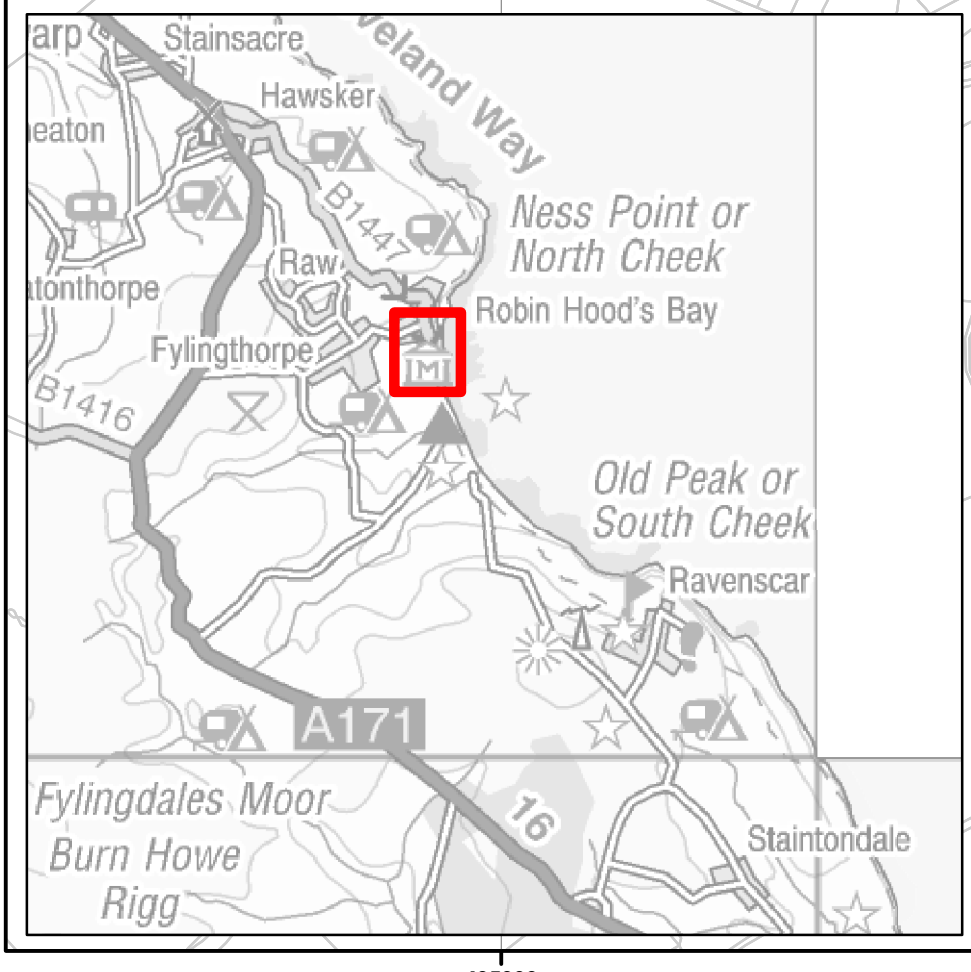
1221D901D1003C09

1221D901D1003C07001

1221D901D1003C08

505000

495000



Legend

Asset Condition (Linear Defences)

- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)

- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 30A - Robin Hoods Bay

Coast Protection Asset Condition 2009

Drawing Scale 1:3000 at A3

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N

Robin Hoods Bay

0 0.25 0.5 1 1.5 Km

Mu18A

Cu18

1221D901D1003C08

Mu18B

Mu19A

Hayburn Wyke

502000

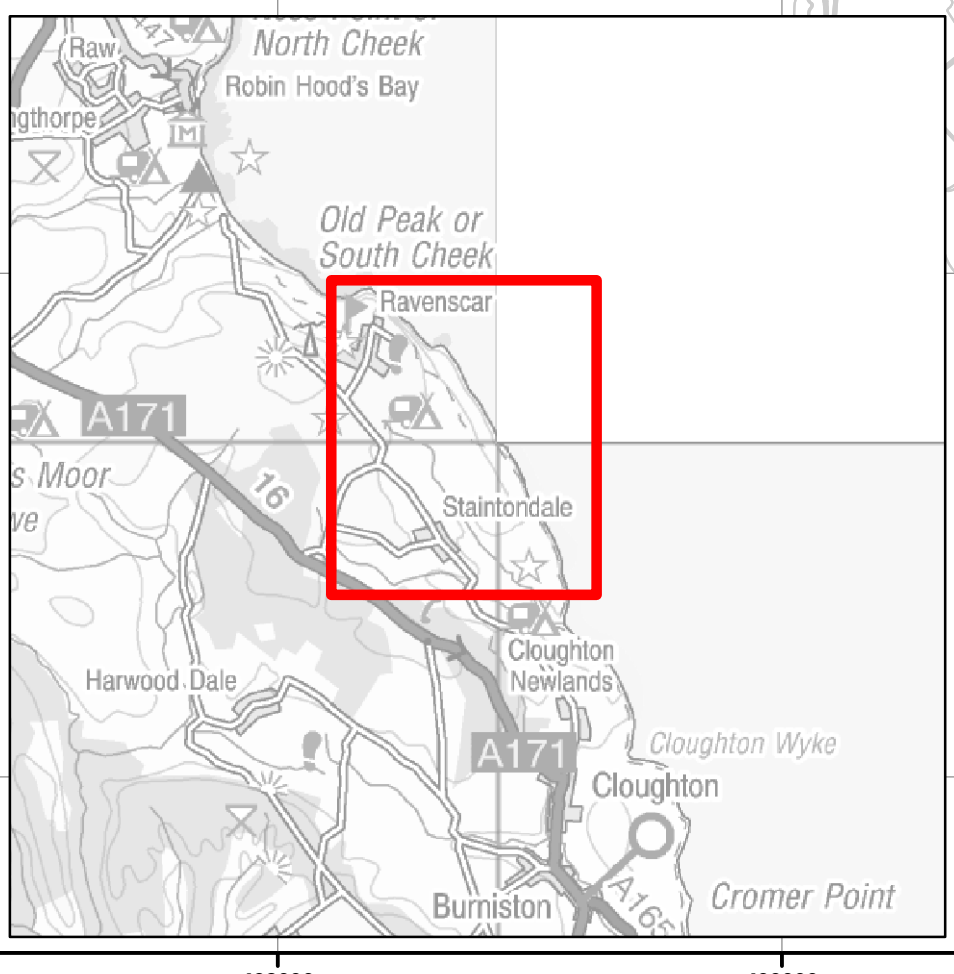
501000

500000

499000

498000

498000 499000 500000 501000



Legend

Asset Condition (Linear Defences)	Asset Condition (Point Structures)
Undefended Frontage	Uninspected Assets
1	1
2	2
3	3
4	4
5	5

Unit Divisions

Management Unit

Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 31 - Robin Hoods Bay to Hayburn Wyke

Coast Protection Asset Condition 2009

Drawing Scale 1:15,000 at A3

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N

Hayburn Wyke

0 0.25 0.5 1 1.5 Km

Mu19A

Mu19B

1221D901D1003C08

Mu19C

Mu19D

Cu19

Burniston

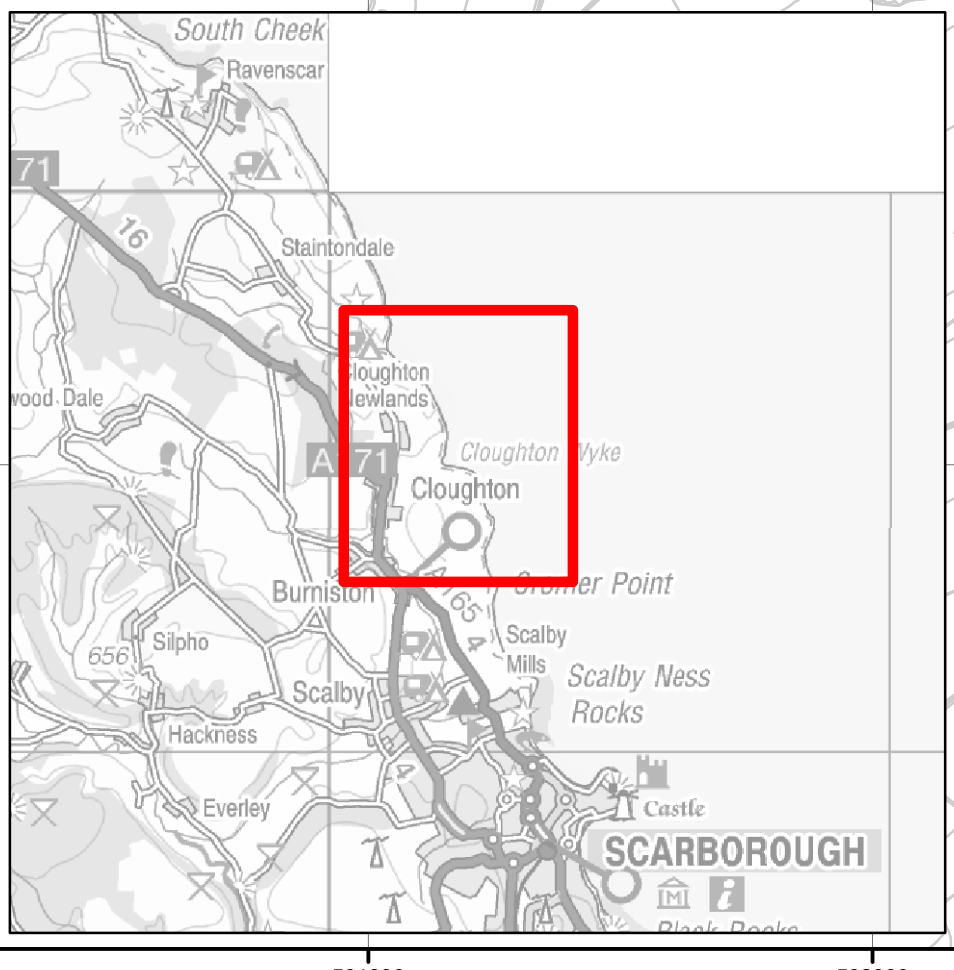
497000

496000

495000

494000

501000 502000 503000 504000



Legend

Asset Condition (Linear Defences)	Asset Condition (Point Structures)
Undefended Frontage	Uninspected Assets
1	1
2	2
3	3
4	4
5	5

Unit Divisions

Management Unit

Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 32 - Hayburn Wyke to Burniston

Coast Protection Asset Condition 2009

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N

0 0.25 0.5 1 1.5 Km

1221D901D1003C08

Mu19D

Cu19

Burniston

Staintondale

Cloughton Newlands

Cloughton Wyke

Cloughton

Burniston

Cromer Point

Scalby Mills

Scalby Ness Rocks

Silpho

Scalby

Hackness

Everley

Castle

SCARBOROUGH

Black Rocks

1221101710201R01

1221D901D1201C09

1221D901D1201C02002

Scarborough

Mu19E

495000

494000

493000

492000

491000

501000

502000

503000

504000

Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 33 - Burniston to Scarborough

Coast Protection Asset Condition 2009

Drawing Scale 1:15,000 at A3

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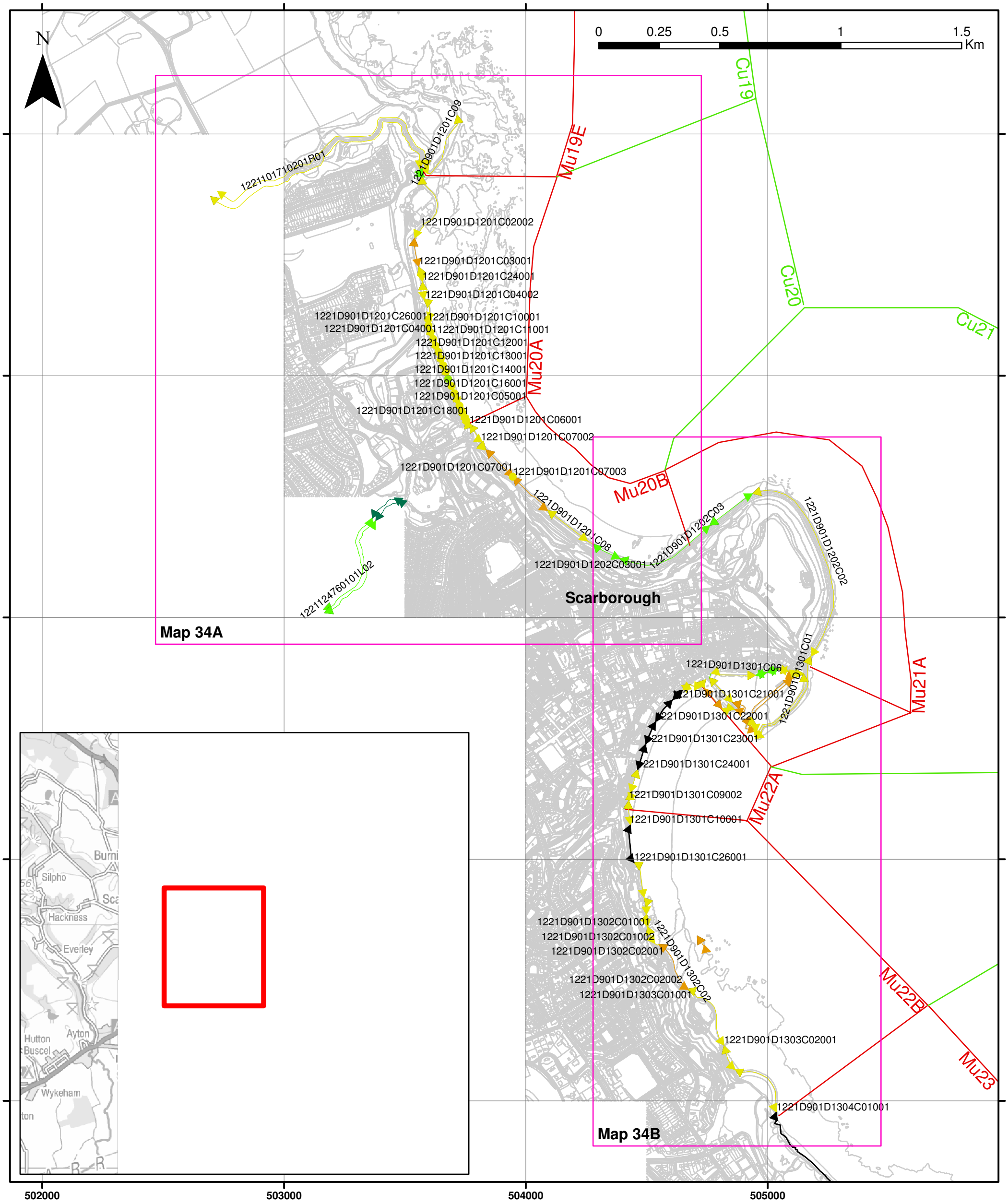

Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 34 - Scarborough

Coast Protection Asset Condition 2009

Drawing Scale 1:15,000 at A3

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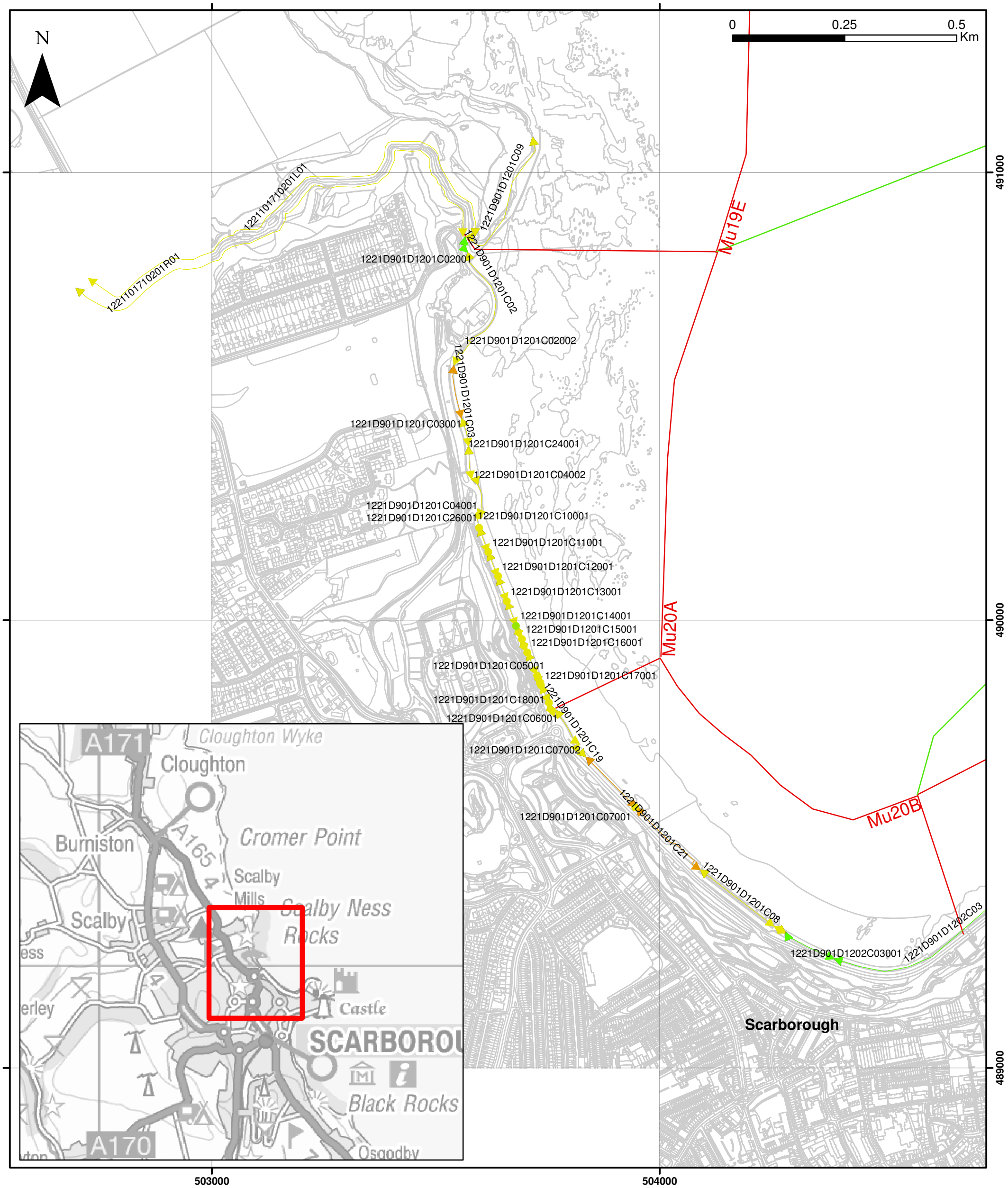

Legend

Asset Condition (Linear Defences)	Asset Condition (Point Structures)
Undefended Frontage	Uninspected Assets
1	1
2	2
3	3
4	4
5	5

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 34A - Scarborough

Coast Protection Asset Condition 2009

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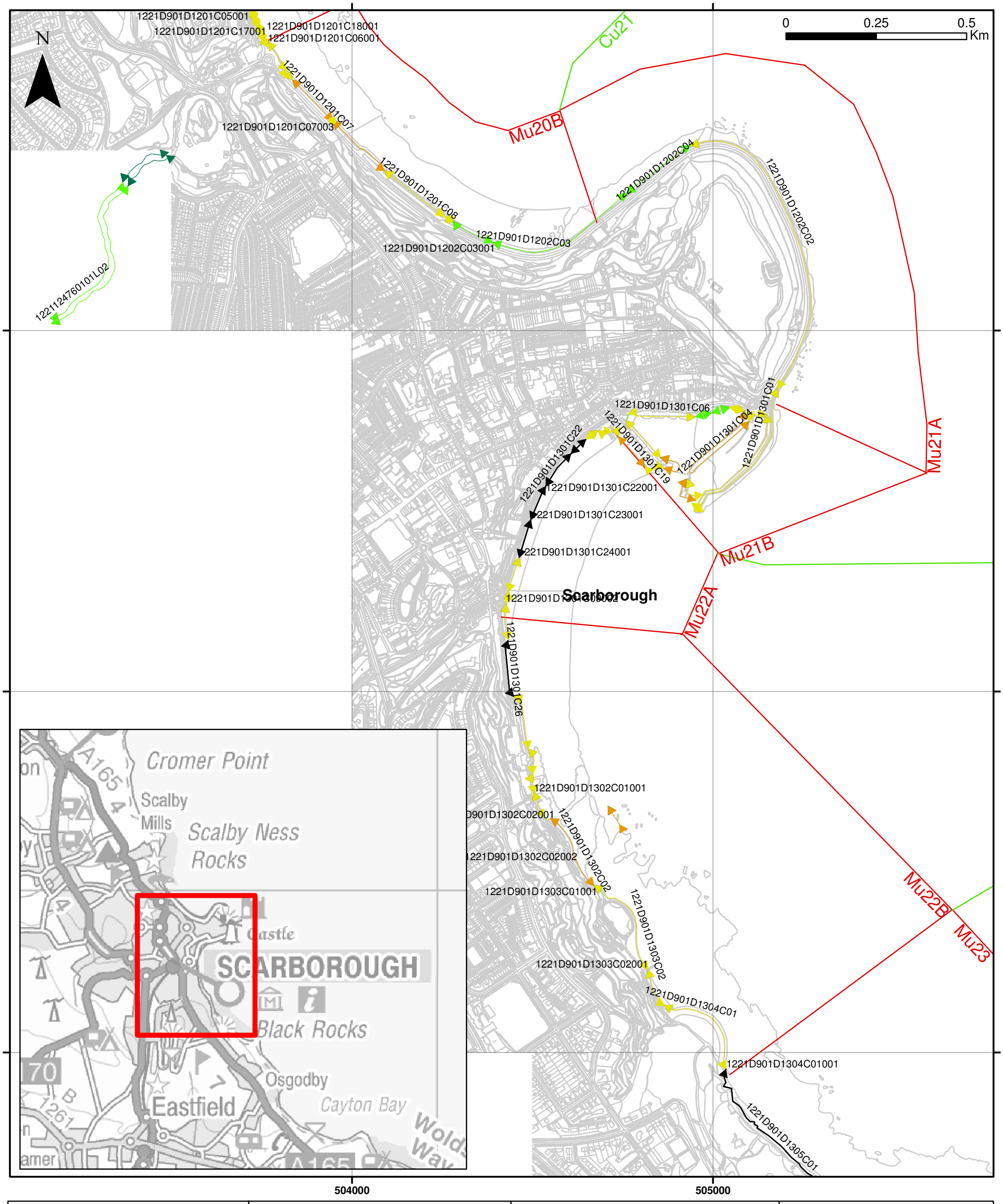

Legend

Asset Condition (Linear Defences)	Asset Condition (Point Structures)
Undefended Frontage	Uninspected Assets
1	1
2	2
3	3
4	4
5	5

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 34B - Scarborough

Coast Protection Asset Condition 2009

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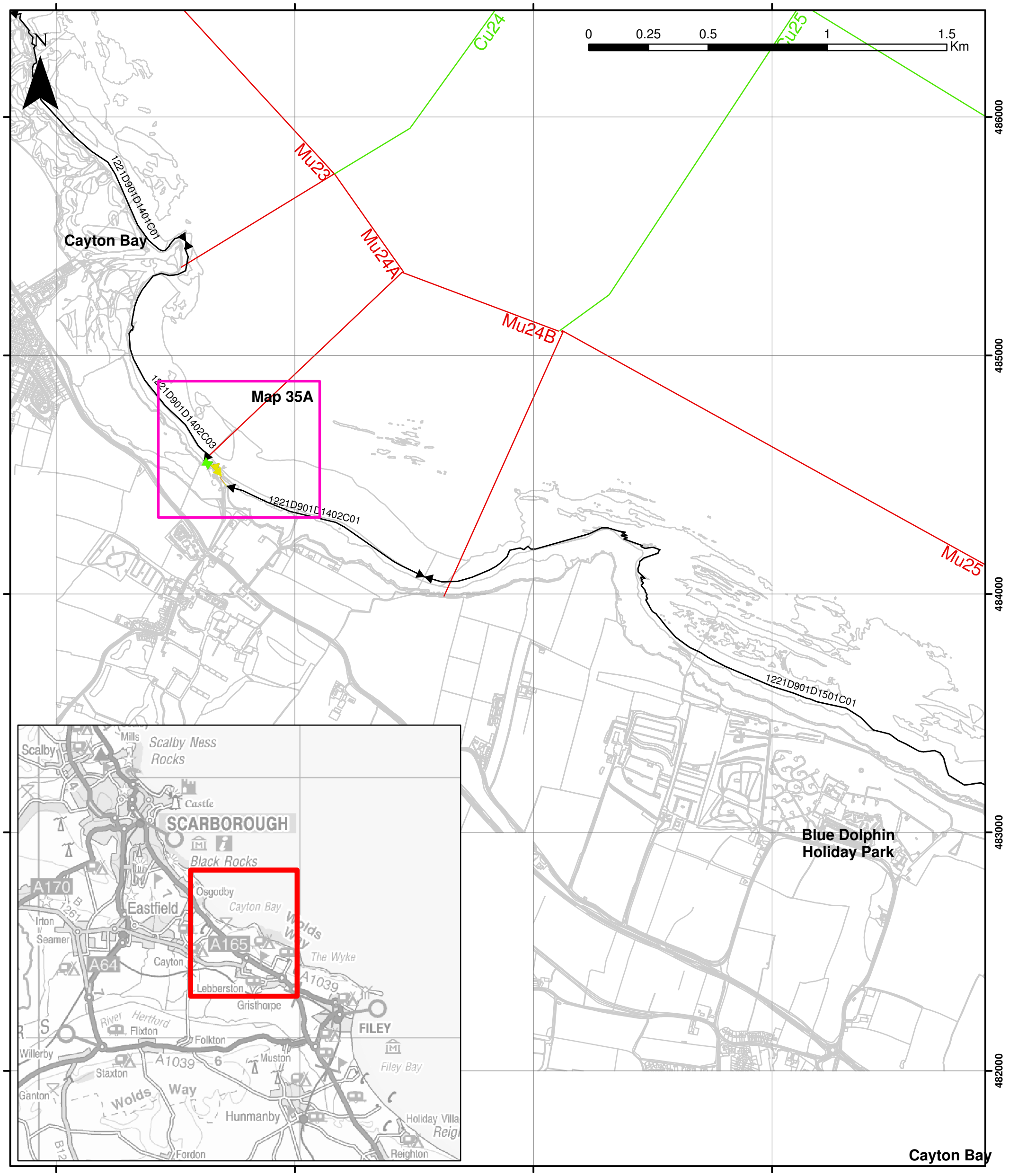
GIS Filename: Map_34B_v2.mxd



Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 35 - Cayton Bay to Blue Dolphin Holiday Park

Coast Protection Asset Condition 2009

Drawing Scale 1:15,000 at A3

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Approved by:	RA	Date:	Dec 2009

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N

0 0.05 0.1 Km

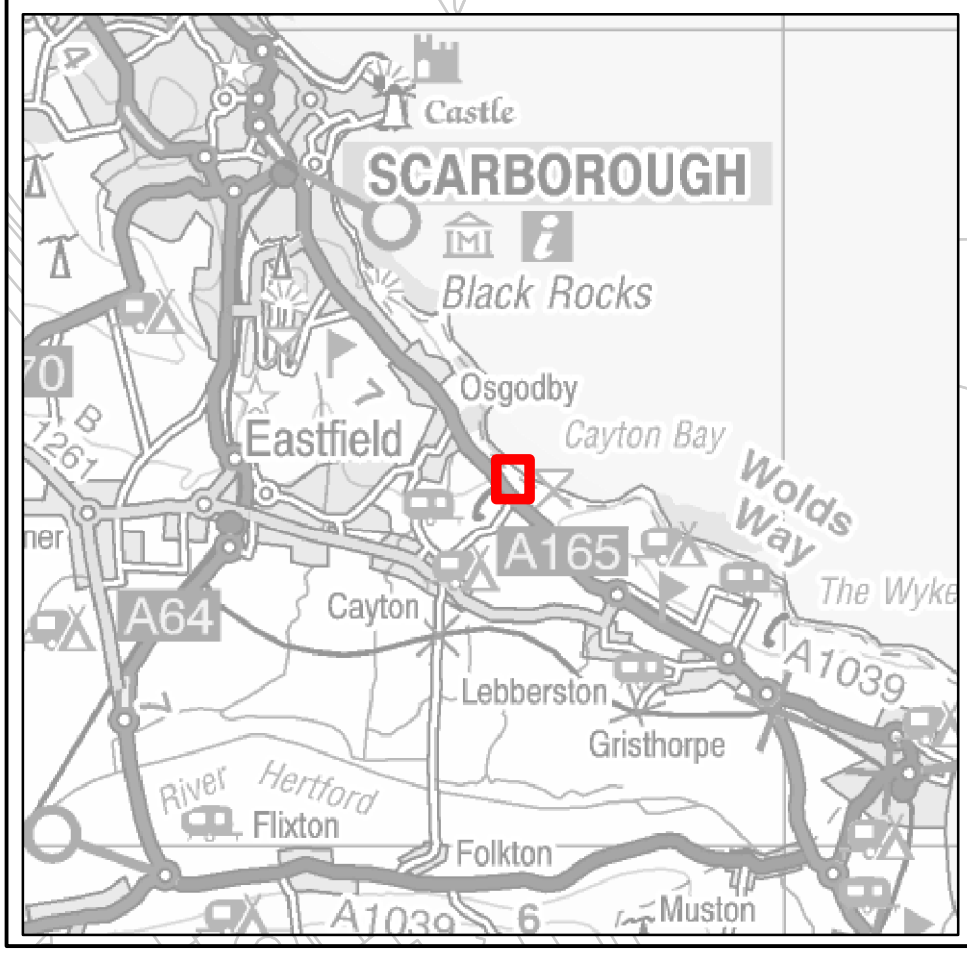
MDP4B

1221D901D1402C03

1221D901D1402C02

1221D901D1402C04

1221D901D1402C01



Cayton Bay

Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 35A - Cayton Bay to Blue Dolphin Holiday Park

Coast Protection Asset Condition 2009

Drawing Scale 1:1,500 at A3

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N

Blue Dolphin Holiday Park

Cayton Bay

Primrose Valley

0 0.25 0.5 1 1.5 Km

Mu26

Mu27

Mu28A

Mu28B

Mu29A

Map 36A

1221D901D1502C01

1221D901D1502C01001

1221D901D1601C03001

1221D901D1601C04

1221D901D1602C09002

1221D901D1602C09001

1221D901D1602C08001

1221D901D1602C03002

1221D901D1602C03003

1221D901D1602C03

1221D901D1602C03001

1221D901D1602C04002

1221D901D1602C04001

1221D901D1602C05001

1221D901D1602C06001

1221D901D1003C08

1221D901D1802C02

1221D901D1603C01

483000

482000

481000

480000

479000

510000

511000

512000

513000

Legend

Asset Condition (Linear Defences)

- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)

- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions

- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 36 - Blue Dolphin Holiday Park to Primrose Valley

Coast Protection Asset Condition 2009

Drawing Scale 1:15,000 at A3

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N

0 0.1 0.2 Km

481000

480000

512000

1221D901D1601C01

1221D901D1601C03001

1221D901D1601C04

1221D901D1602C09001

1221D901D1602C09002

1221D901D1602C06

1221D901D1602C08001

Mu28B

1221D901D1602C08

1221D901D1602C030031221D901D1602C03002

1221D901D1602C03

1221D901D1602C04002

1221D901D1602C03001

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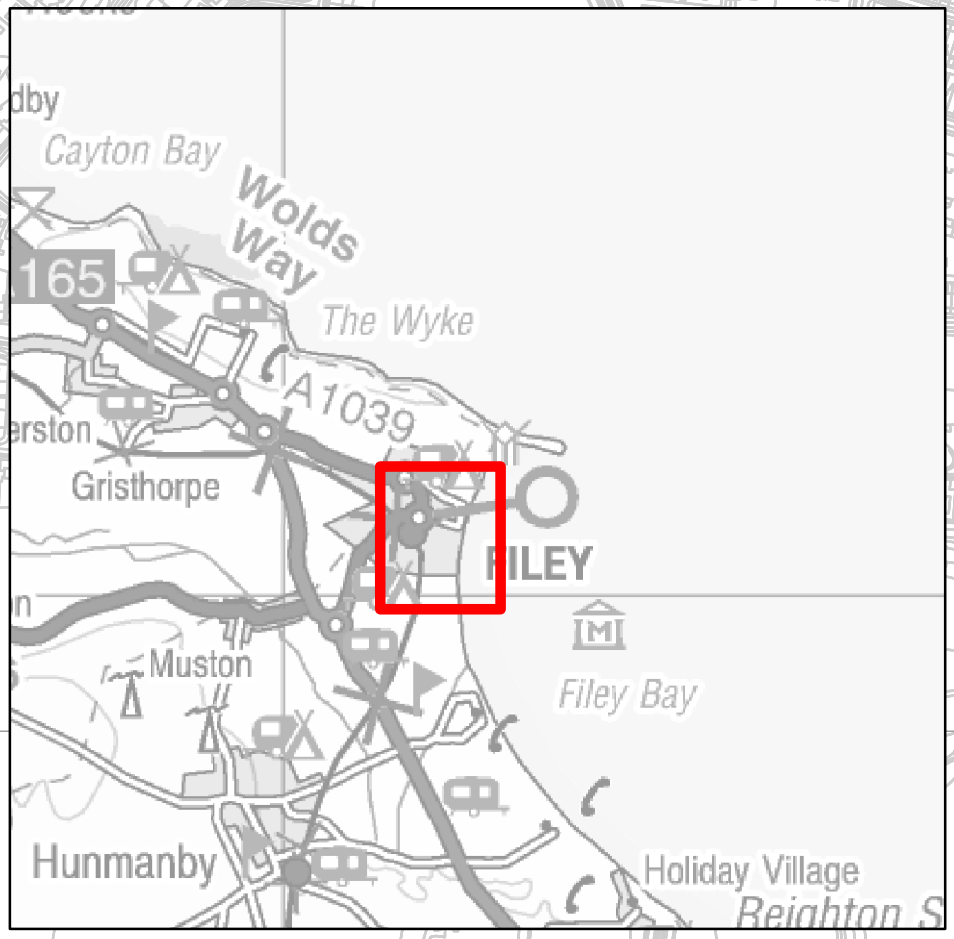
1221D901D1602C05001

1221D901D1602C06001

Mu29A



Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 36A - Filey

Coast Protection Asset Condition 2009

Drawing Scale 1:5,000 at A3

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N

Primrose Valley

0 0.25 0.5 1 1.5 Km

Mu29B

Mu29C

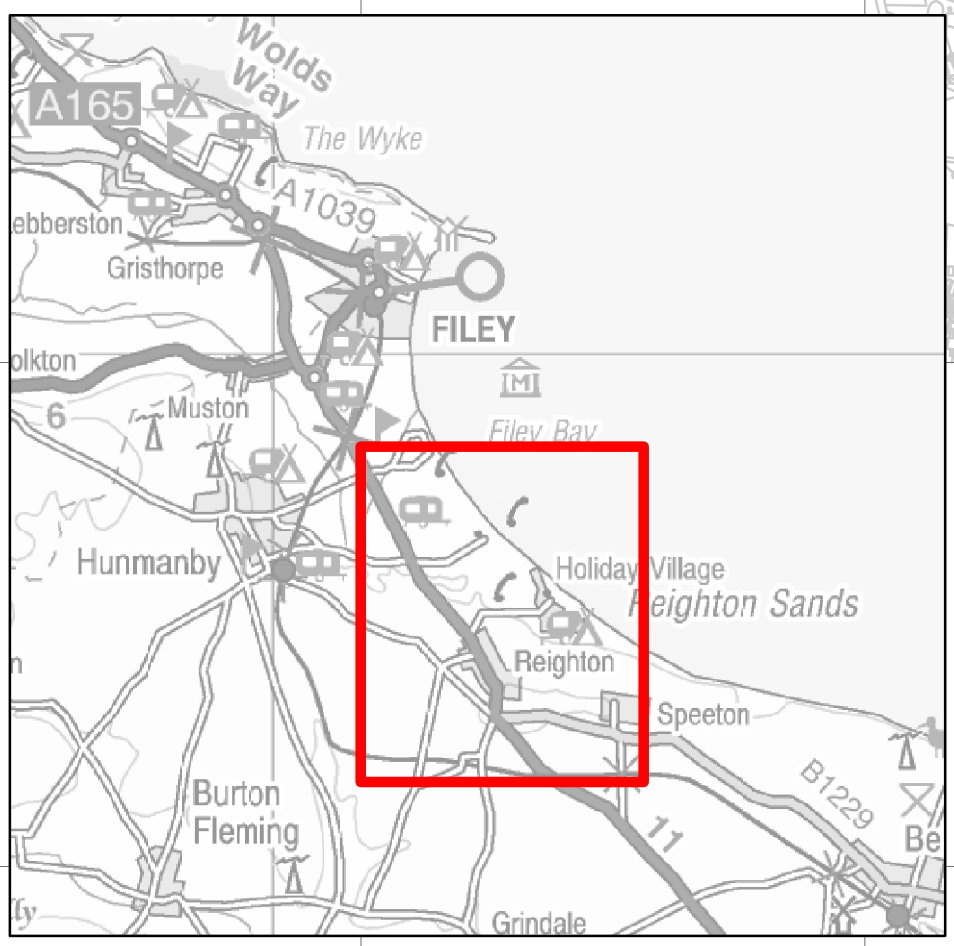
Mu30A

1221D901D1603C01001

1221D901D1603C01

1221D901D1801C01

Reighton Gap



478000

477000

476000

475000

474000

512000 513000 514000 515000

Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 37 - Primrose Valley to Reighton Gap

Coast Protection Asset Condition 2009

Drawing Scale 1:15,000 at A3

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N

Mu30B

1221D901D1801C01

1221D901D1802C02

Reighton Gap

Former RAF Brempton

0 0.25 0.5 1 1.5 Km

476000

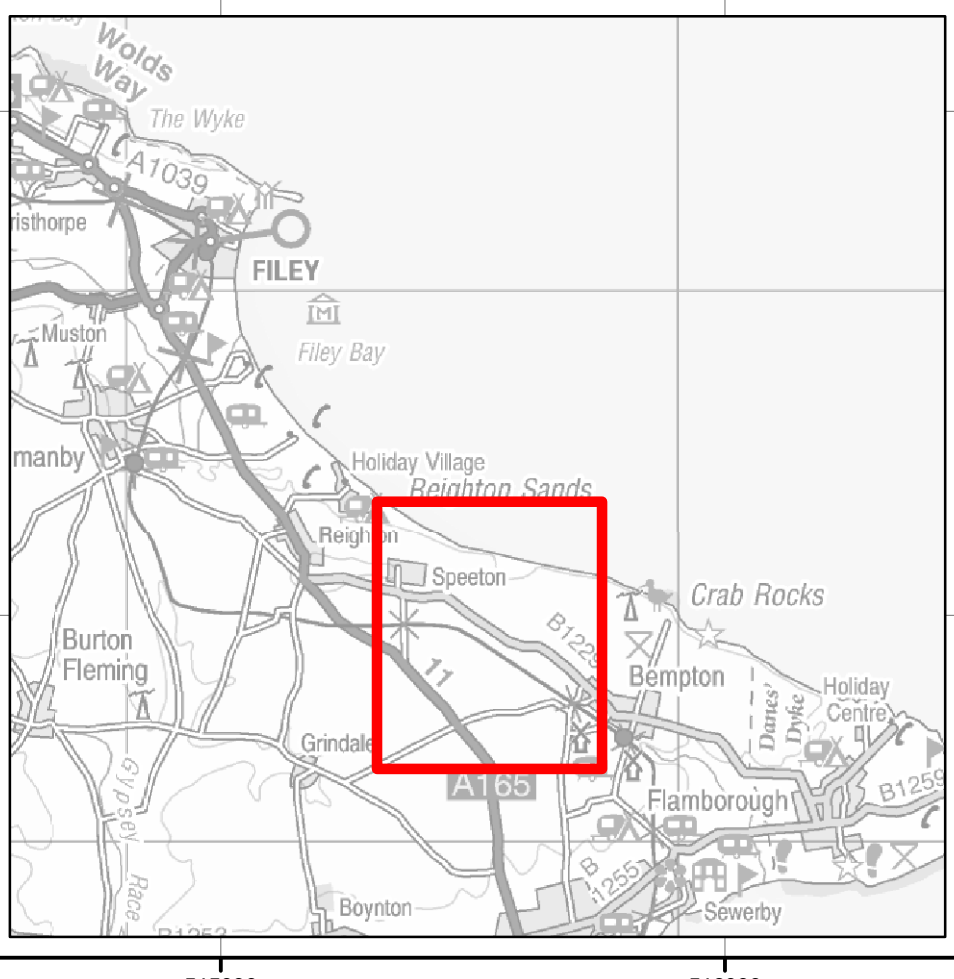
475000

474000

473000

472000

515000 516000 517000 518000



Legend

Asset Condition (Linear Defences)
- Undefended Frontage
- 1
- 2
- 3
- 4
- 5

Asset Condition (Point Structures)
- Uninspected Assets
- 1
- 2
- 3
- 4
- 5

Unit Divisions
- Management Unit
- Sub-Management Unit

Client: Scarborough Borough Council

Project: Cell 1 Coastal Monitoring

Map 38 - Reighton Gap to Former RAF Brempton

Coast Protection Asset Condition 2009

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