



## **Cell 1 Regional Coastal Monitoring Programme Walkover Inspection Surveys 2016**

**Redcar & Cleveland  
Borough Council**

**September 2016**



# Redcar & Cleveland Borough Council

## Walkover Inspection Surveys 2016

### Contents Amendment Record

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## Contents

Disclaimer .....	i
Preamble .....	ii
1. Introduction .....	1
1.1 Study Area .....	1
1.2 Methodology.....	1
2. Overview.....	4
3. Condition Assessment .....	5
3.1 Coatham Sands.....	5
3.2 Redcar .....	8
3.3 East Redcar to Saltburn-by-the-Sea .....	10
3.4 Saltburn-by-the-Sea .....	15
3.5 Cliffs northeast of Saltburn .....	20
3.6 Hunt Cliff and Warsett Hill .....	21
3.7 Cattersty Cliff and Skinningrove .....	22
3.8 Skinningrove to Boulby.....	27
3.9 Boulby to Cowbar Nab.....	29
4. Comparison with Previous Assessment .....	31
5. Problems Encountered and Uncertainty in Analysis .....	31
6. Conclusions and Recommended Actions .....	31

## Appendices

Appendix A	Asset Location Maps
Appendix B	Cliff Behaviour Units
Appendix C	Asset Condition & Recommendations
Appendix D	Cliff Condition Assessments

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<sup>1</sup> Scarborough Borough Council is acting as client on behalf of all Local Authorities within 'Coastal Cell 1'.



## Preamble

The Cell 1 Regional Coastal Monitoring Programme covers approximately 300km of the north east coastline, from the Scottish Border (just south of St. Abb's Head) to Flamborough Head in East Yorkshire. This coastline is often referred to as 'Coastal Sediment Cell 1' in England and Wales (Figure 0-1). Within this frontage the coastal landforms vary considerably, comprising low-lying tidal flats with fringing salt marshes, hard rock cliffs that are mantled with glacial till to varying thicknesses, softer rock cliffs, and extensive landslide complexes.

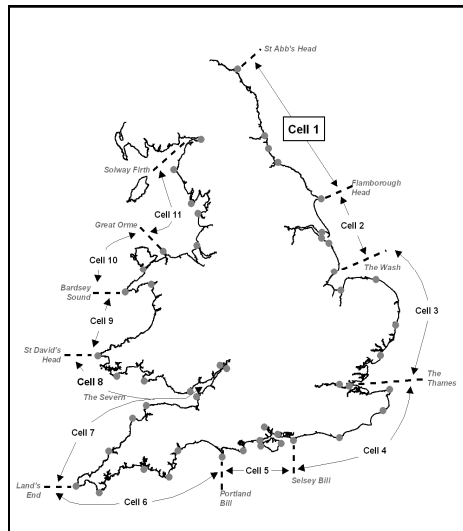


Figure 0-1 - Sediment Cells in England and Wales

The work commenced with a three-year monitoring programme in 2008 that was managed by Scarborough Borough Council on behalf of the North East Coastal Group. This initial phase was followed by a five-year programme which started in 2011 and the current five-year programme which started in 2016. The programme funded by the Environment Agency, working in partnership with the following organisations.



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

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

Royal HaskoningDHV has been appointed to provide Analytical Services in relation to the Cell 1 Regional Coastal Monitoring Programme 2016 - 2021.

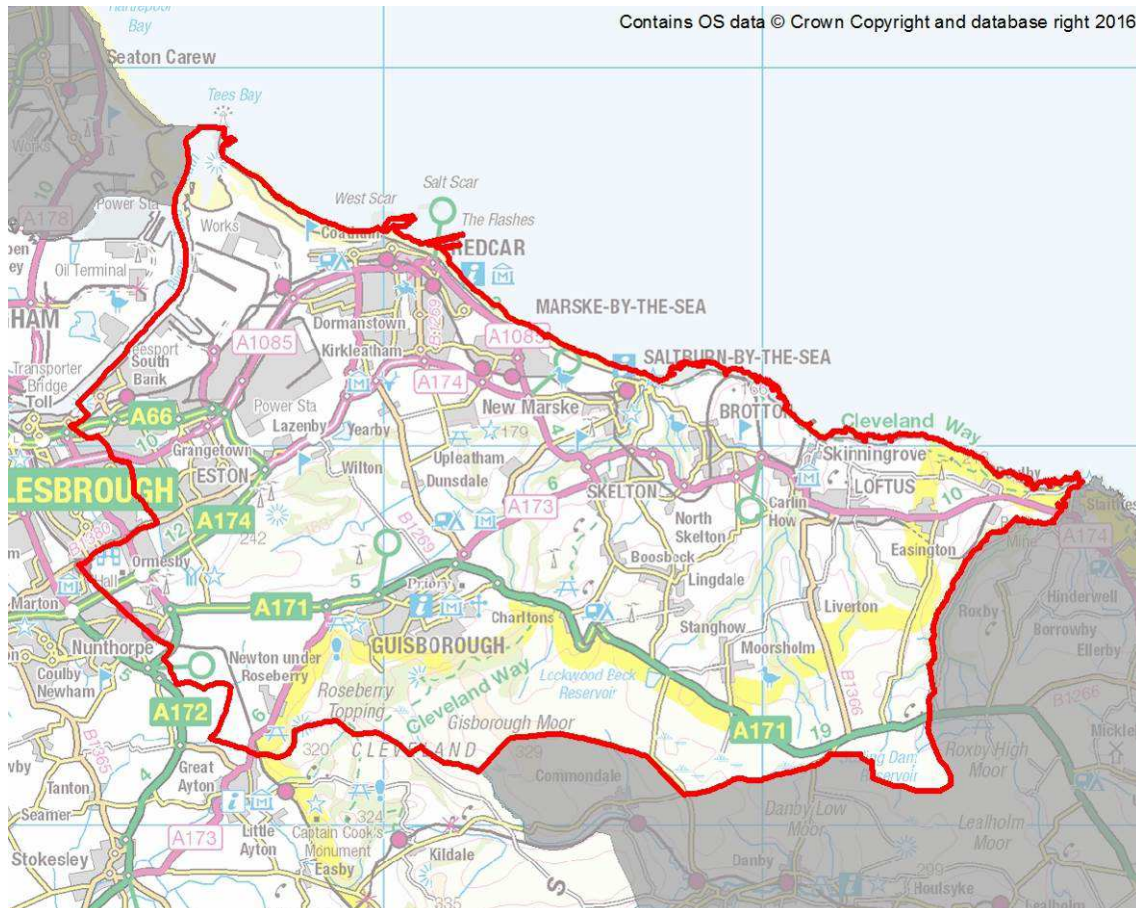
The present report is **Walkover Inspection Surveys 2016** and provides a summary of the main findings from the walkover inspections of Redcar & Cleveland Borough Council's frontage that are undertaken once every 2 years.

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

# 1. Introduction

## 1.1 Study Area

Redcar & Cleveland Borough Council's coastal frontage extends from South Gare at the mouth of the River Tees in the north, to Cowbar Nab in the south, and is shown in **Figure 1-1**. Detailed maps showing the location of each of the coastal defence assets considered in this report are presented in **Appendix A**. In addition, the cliffs within the frontage have been classified according to their characteristic behaviour condition and a series of Cliff Behaviour Units (CBUs) have been defined and mapped. The location of the CBUs is presented in **Appendix B**.



**Figure 1-1: Redcar & Cleveland Borough Council study area**

## 1.2 Methodology

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

The walkover inspection surveys for the Redcar & Cleveland Borough Council frontage were undertaken on 24<sup>th</sup> June, 18<sup>th</sup> July and 8<sup>th</sup> August 2016. The weather experienced during the inspections was generally warm and fine with no access or visibility problems caused by adverse weather despite some sea fret on occasions.

The frontage has been split into a number of 'asset lengths' (Appendix A), as defined in the National Flood and Coastal Defence Database (NFCD) that was established by the Environment Agency.

The walkover inspections cover both built defence assets and natural defence assets such as cliffs, slopes and dunes. All assets were visually inspected, photographed and graded based on their condition and an estimate made of their residual life.

For built assets the grading classification was undertaken in accordance with the Condition Assessment Manual (EA, 2012), with estimates made of the urgency of any necessary repairs. An extract of the grading classification for built assets is presented in **Table 1-1**. For ease of reference the built asset photographs presented in this report have also been bordered with the colours key indicated below.

Grade	Rating	Description
1	Very Good	'As built' condition or cosmetic defects that have no effect on performance.
2	Good	Minor defects that will not reduce overall performance of the asset.
3	Fair	Defects that could reduce overall performance of the asset.
4	Poor	Defects that would significantly reduce overall performance of the asset.
5	Very Poor	Severe defects resulting in overall performance failure of the asset.

*Table 1-1: Condition assessment grading for man-made assets.*

In addition to the above grading classification, for natural assets such as cliffs and slopes the same five point activity scale used in previous walkover inspections within Cell 1 was used. This grading classification is presented in **Table 1-2**. For ease of reference the natural asset photographs presented in this report have also been bordered with the colours key indicated below.

Grade	Class	Description
1	Dormant	Features with no interaction with marine processes.
2	Inactive	Features with no visible evidence of erosion or landsliding activity.
3	Locally active	Features with localised evidence of small erosion or landsliding activity.
4	Partly active	Features with widespread evidence of small erosion or landsliding activity or areas of intense erosion or landsliding.
5	Totally active	Features with large-scale or intense erosion or landsliding.

*Table 1-2: Condition assessment grading used for natural assets (cliffs/ slopes).*

This report provides an overview of the findings from the walkover inspections, summarising each locality in general but also specifically identifying individual assets in 'poor' or 'very poor' condition. It is anticipated that this summary will help identify areas for maintenance or capital investment. Full details of the inspection of each asset are provided in **Appendix B**.

In addition to this report, full details of the inspection and a selection of appropriate photographs have been entered into the SANDS (Shoreline And Nearshore Database System) database and provided along with this report with SANDS viewer software.

## 2. Overview

The following significant findings were observed during the 2016 walkover inspection surveys:

- **South Gare Breakwater** – The structure remains in poor condition, with extensive cracking and spalling, exposure of reinforcing steel, missing mortar/open joints, damaged render, missing masonry, undercutting and void formation beneath slag embankments, failure/collapse of the historic western pier arm structure, damaged concrete Accropode and rock armour units and displacement of/poor interlock between armour units.
- **Coatham Sands** – The dunes remain stable and well vegetated
- **Redcar** – The new sea defences, completed in 2013, generally remain in very good condition, although several minor defects were noted. These included minor cracking in larger *in situ* concrete panels at access ramps and staining of the concrete beneath drainage outfalls. A particular area of concern was the seawall fronting the Redcar Beacon, which appeared to be missing flexible sealant in many of the joints, with filler board visible indicating that sealant was never present.
- **The Stray** - Several timber elements are missing from the groynes, particularly towards their seaward ends. However, the groynes do appear to be performing satisfactorily, with beach levels maintained and cobble size material accumulating to the rear of the beach.
- **Saltburn-by-the-Sea** - Missing coping stones and local damage (cracking and spalling) to the concrete wall and access ramp surface were noted, as in previous inspections. At the eastern end of the frontage, the masonry and concrete seawalls and concrete aprons protecting the public house and land to the east of the slipway are in poor condition. The concrete apron/revetment poured to east of the defence is undercut with voids forming. A series of masonry walls higher up the slope were also undercut.
- **Skinningrove** – A recent coastal defence scheme (completed in 2015) has repaired and improved the previously poor condition of the Skinningrove Jetty, with its present condition being improved to good. A number of small defects remain however, including corroded steel sheet piling, cracked and abraded concrete and some of the new works have poorly inserted sealant in construction joints and exposed reinforcement bars, which could lead to future maintenance problems.
- **Cowbar** - An area of particular and long standing concern is adjacent to Cowbar Lane. Here an upper till unit is undergoing severe erosion and there is evidence of recent rockfall from the lower part of the cliff. This is resulting in the loss of the now abandoned parts of Cowbar Lane. In addition to this concern, a fresh rockfall occurred in 2016 immediately adjacent to the access footpath to Cowbar Nab, leading to further slippage in the till cliffs above and closure by The National Trust of access to the Nab.



### 3. Condition Assessment

#### 3.1 Coatham Sands

##### *Coastal Slope Condition Assessment*

As reported in previous inspections from 2008 onwards, the sand dunes along Coatham Sands were generally stable with a good coverage of established vegetation. Minor erosion, loss of vegetation and lowering of dune crest was evident locally at more frequently used beach access points (the northern and southern extents of the dunes). Dunes appeared to continue to roll back into the caravan park and former site compound areas. A healthy beach level was maintained throughout Coatham Sands.



*View looking north west from caravan site (/C0506C01)*



*View looking south east from South Gare Breakwater (/C0506C01)*



*Dunes fronting caravan site (/C0506C01)*



*View looking north west (/C0506C01)*

##### *Coastal Protection Asset Condition Assessment*

The northern extent of Redcar & Cleveland Borough Council's coastal frontage is marked by the South Gare Breakwater. The structure has been graded in poor condition from the 2008 survey and this remains the case, although the structure continues to provide protection to the navigation channel to the west and control of Coatham Sands to the east.

The structure is privately owned by PD Teesport and signage was present to instruct members of public not to progress onto the structure beyond the boundary fencing for the existing navigation infrastructure. No physical barriers prevented access and it is understood that members of the public, in particular anglers, frequently venture onto the structure.





Western face (/C0506C01)



Western face (/C0506C01)



Northern extent of upper structure (/C0506C01)



Eastern face (/C0506C01)



Warning signage (/C0506C01)

Observed defects to the structure included extensive cracking and spalling, exposure of reinforcing steel, missing mortar/open joints, damaged render, missing masonry, undercutting and void formation beneath slag embankments, failure/collapse of historic western pier arm structure, damaged concrete Accropode units and rock armour units and displacement of/poor interlock between armour units. Multiple patchwork and ad-hoc repairs were evident throughout. As noted in previous surveys, a detailed survey of the structure is beyond the scope of the present inspections and a full structural survey of the breakwater is recommended in order to establish the full extent of the damage and identify any remedial works.

To the west of Redcar, defences comprise a concrete crest wall with grouted stone revetment fronting the promenade and car park. These remained in fair condition at the time of the inspections. Beach levels were slightly higher than in 2014 and may have obscured some of the defects previously identified, such as exposure/undermining of the northeastern extent of the wall and promenade, however local areas of damage and missing blocks were still visible. The concrete wall was generally in fair condition, with the approximately two metre gap towards the northeastern extent still present. Wind-blown sand was evident along much of the landward side of the crest wall.



*View looking south east (/C0601C01)*



*Grouted stone revetment (/C0601C01)*



*Gap in concrete wall (/C0601C01)*



## 3.2 Redcar

### *Coastal Slope Condition Assessment*

CBU **E52/11** which runs along the rear of the promenade along The Stray retains a Dormant grading. The vegetated slopes along this frontage are afforded protection from the upgraded blockwork revetment and the beach material retained by the refurbishment of the groynes.

### *Coastal Protection Asset Condition Assessment*

The Environment Agency-funded extensive capital works to upgrade the 2.7km of assets from Coatham to the eastern extent of The Stray were completed in 2013. The new defences follow similar alignments to the previous assets and, for the purposes of this report, the original NFCDD references have been retained. In the accompanying SANDS database, the GIS linework has been amended to the revised extents. The assets generally remained in very good condition, although with several minor defects noted. Minor cracking was observed in larger *in situ* concrete panels at access ramps and staining of the concrete was evident beneath drainage outfalls. A particular area of concern was the seawall fronting the Redcar Beacon, which appeared to be missing flexible sealant in many of the joints, with filler board visible indicating that sealant was never present.



Concrete sea wall at Redcar Beacon  
(/C0602C03)



Loose and missing flexible joint sealant  
(/C0506C01)



Missing flexible joint sealant in vertical joint. No sealant in horizontal joint – black filler board visible  
(/C0602C03)



Exposed concrete apron – no sealant in joints – black filler board visible  
(/C0602C03)

The seawall at the cinema was not upgraded as part of the Redcar scheme. Beach levels were higher than in 2014 and the undermining of the toe apron at the north west corner was obscured. The wall is generally in fair condition, with cracking locally and evidence of previous repairs. The interfaces with the more recently constructed defences adjacent on both sides remained in good condition.



*Cinema seawall (/C0602C05)*



*Cinema seawall (/C0602C05)*



*Cracking and local damage to surface of RNLI slipway (/C0602C02)*



*South eastern access ramp. Loss of concrete render exposing grouted stone fill beneath concrete deck slab (/C0602C01)*



*South eastern extent of stepped concrete defences (/C0602C01)*



*Accretion of sand and formation of embryo dunes (/C0602C01)*





View looking north west – beach levels lower around access ramp and The Flashes rock outcrop (/C0602C01)



Local minor damage to lower in situ concrete toe section where exposed (/C0602C01)

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

#### *Coastal Slope Condition Assessment*

The CBUs between Redcar and Saltburn show evidence of recent instability.

Unit **E52/10** was graded as Partly Active during the 2014 inspection as the whole unit was showing signs of erosion, particularly around the subtle headland approximately mid-length of the unit. This continues to be the case and the status of Partly Active has been retained. A concrete outfall structure is present within this unit and instability/scour was evident adjacent to the same. The gabion baskets fronting the outfall were failing and the concrete blockwork revetment showed signs of settlement. An informal access ramp was present at the interface with the hard defences at the south eastern extent of The Stray and the crest level is lower in this location. This should be monitored to ensure the condition does not deteriorate with consideration given to fencing/signage to marshal pedestrian access towards the formal access points.



View looking south east (/C0701C01) CBU E52/10



Concrete outfall structure (/C0701C01) CBU E52/10



*Informal access at interface with hard defences (/C0701C01) CBU E52/10*

The cliffs in Units **E52/9** and **E52/8** are afforded some protection by the wide beach at the toe, particularly at **E52/9** where there is a substantial coarse (cobble-size) fraction in the beach material. Both units have retained the statuses allocated to them in 2014.



*View looking south east (CBU E52/8)*



*View looking south east- erosion predominantly due to pedestrian access (/C0701C01) CBU E52/9*

Immediately to the north of Marske, **E52/7** is classified as Dormant as it is defended at its toe by low level sand dunes and a series of masonry and concrete walls, is well vegetated and shows no evidence of recent activity.



*Vegetated slope above masonry wall CBU E52/7*





At the headland at Marske, **E52/6** there are low accreting dunes protecting the cliff toe and the unit is therefore classified as Inactive.



*View looking north east (CBU E52/6)*



*Exposure of timber piles at foot of concrete footpath (CBU E52/6)*

From Marske to Saltburn the crest level of the coastal slopes increases and the slopes increasingly active. **E52/5** shows evidence of toe erosion and localised activity in the upper slopes and is classified as Locally Active, whereas erosion of the toe and mudsliding is more widespread in **E52/4** which is classified as Partly Active.



*North western extent of CBU (CBU E52/5)*



*View looking south east (CBU E52/5)*



*Southern extent of CBU (CBU E52/4)*



*View looking north west (CBU E52/4)*



### *Coastal Protection Asset Condition Assessment*

The frontage to the east of Redcar along The Stray to Mill Howle consists of concrete block revetment and concrete promenade constructed as part of the Redcar Coastal Defence Scheme which remained in very good condition.

As observed in 2014, several timber elements were missing from the groynes, particularly towards the seaward ends. The groynes appeared to be performing satisfactorily, with beach levels maintained and cobble size material accumulating to the rear of the beach.



*View on The Stray frontage looking south east (C0603C01)*



*View on The Stray frontage looking north west (C0603C01)*

The coastal defences at Marske are protected by a wide beach and so only exposed to marine action during storm events. The low masonry wall and revetment around the headland to the north west of the beach access at Marske was largely covered by beach levels which were higher than during the 2014 inspections, but where exposed was in fair condition, although as identified in previous inspections there were some missing coping blocks and there was evidence of lateral movement / settlement of the wall which remained stable.

The concrete wall at the toe of the vegetated slope was reported as cracked through its full height in all inspections from 2008 onwards, however the defect appeared to be of the same width and extent in the present inspections. The slope above showed no evidence of recent movement or any placement of excessive loading on the structure.



*Crack in wall – no apparent change  
(/C0702C03)*



*High beach levels (/C0702C03)*



*High beach levels and vegetation cover obscuring masonry wall and revetment north west of beach entrance (/C0702C01)*



The masonry wall to the southeast of the beach access at Marske had settlement cracks through the full height and missing bricks at the seaward end, with scour evident to the rear of the structure. The landward, concrete wall was generally in fair condition, although as reported in previous surveys, displayed vertical cracks locally.



*Masonry wall south east of beach entrance (/C0702C01)*



### 3.4 Saltburn-by-the-Sea

#### *Coastal Slope Condition Assessment*

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

Units **E52/3b** and **E52/3a** above Saltburn Sands are again classified as Inactive as in 2014, these units are defended at the toe by a sea wall and are well vegetated. Several unvegetated areas where shallow failures had exposed underlying material were noted in December 2013, but these do not appear to have developed since and vegetation appears to be re-establishing.

**E52/2** remains grade as Dormant as per 2014 survey due to a lack of evidence for failures in this section of cliff.

CBU **E52/1** shows a little more activity, with loose materials and localised erosion at the head of the large mound situated just east of Saltburn Gill. However, the activity is minimal and this unit was downgraded from Locally Active to Inactive in 2014 and retains this status to 2016. CBU **E53/5** was classified as Locally Active in 2012 due to shallow slumping which occurred on the cliff face and the unit was reclassified as Locally Active. The slumping has occurred despite the presence of toe protection and probably occurred in response to the wet weather experienced in the latter half of 2012. Evidence of activity still remains, so a status of Locally Active has been retained for this unit in 2014.



*View looking north west (E52/3b)*



*View from pier (/E52/3a)*



*View looking west (E52/3b)*



(E52/1)



(E53/5)

### *Coast Protection Asset Condition Assessment*

Hazel Grove Foot marks the north western extent of the hard defences which run along the Saltburn frontage. Missing coping stones and local damage (cracking and spalling) to the concrete wall and access ramp surface were present, as noted in 2014, and do not appear to have worsened resulting in a fair condition grading.

A health and safety issue was presented by the open security grille which allowed access to the culvert.



*Missing coping stone exposing fill beneath promenade surface (/C0703C02)*



*Security grille open (/C0703C02)*

South of Hazel Grove Foot, the frontage is defended by a masonry seawall. Shingle/cobble beach levels were higher than observed in 2014. All visible masonry was generally in good condition with previous repairs and repointing works also in good condition. Most mortar joints were in good condition although there was some missing mortar in localised areas (slipway at RLNI station and seawall beneath pier). Local damage was present in the low concrete wall to the rear of the promenade, comprising local cracking and abrasion.





View looking northwest. High beach levels. Open joints to lower section of masonry access ramp (/C0702C04)



Exposed masonry at slipway (/C0702C04)



Local damage to pedestrian guardrail (/C0702C04)



Local damage to concrete wall (/C0702C04)

To the south east of the pier, the defences comprise a masonry blockwork revetment which is generally in good condition with some missing mortar observed locally. Cobble beach levels appeared lower at the 'apex' of the curve of the structure, with more of the blockwork exposed. The concrete blockwork wall to the west of Skelton Beck was generally in fair condition although a section was missing coping stones, leaving the footway fill material exposed. Grouted masonry apron and masonry abutments to pedestrian bridge appeared to be in fair condition.



View looking north west (/C0704C01)



Missing coping blocks (/C0704C06)





*View looking southeast from pier. Beach levels lower at 'apex' of headland (/C0704C01)*



*Vegetation establishment fronting car park (/C0704C02)*



*Exposure of corner of car park (/C0704C02)*

To the east of Skelton Beck, the frontage is undefended past the boat/car park .Erosion/lowering of the cobble beach was evident at the eastern extent. Vegetation had begun to establish toward the crest of the shingle although local erosion was apparent, potentially as a result of members of public accessing the beach from the car park. Possibly a general lowering of beach levels on the east bank of Skelton Beck indicated by the exposure of the crest of the grouted rock revetment (although no significant change from 2014).



*Exposed crest of grouted rock revetment (/C0704C06)*

To the south of the boat park is a set back wall protected by a high cobble beach. The wall is in good condition with local defects such as minor cracking and loss of render. Vegetation had established the top of the material towards the east. The recently refurbished concrete slipway was generally in good condition, however flexible joint sealant was observed to be loose and missing locally. The vertical face of the slipway was visible on the western side of the structure and minor abrasion was evident (the southern face of the structure was obscured by the high cobble beach).



*View looking west (/C0704C03)*



*Western face of concrete slipway (/C0704C03)*

The most southerly section of coastal defences at Saltburn comprises the masonry and concrete seawalls and concrete aprons protecting the public house and land to the east of the slipway. Cracking and abrasion of concrete blocks to the east and missing mortar and masonry to the west was observed. Beach levels appeared similar to those of 2014 and therefore covering the toe of the structure and potentially obscuring undercutting and voiding as in 2010 and 2012 surveys. The overall condition grading remained as poor.

The concrete apron/revetment poured to east of the defence is undercut with voids forming. A series of masonry walls higher up the slope were also undercut.



*View looking west (/C0704C05)*



*Undercutting/voiding in in situ concrete apron (/C0704C05)*



### 3.5 Cliffs northeast of Saltburn

#### *Coastal Slope Condition Assessment*

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

Whilst previous mudslides had been observed in Units **53/4** and **53/2** during the 2014 inspections, it is only in Unit **53/2** that mudslides appear more widespread in 2016. Therefore all units from **E53/5** to **E53/1** have been classed as Local Active except Unit **53/2** which remains as Partly Active in 2016.



**E53/3 to E53/1** Generally small scale slumping in the till layer of the cliff northeast of Saltburn (Locally Active except E53/2, right).



**E53/2** slumping in the till layer of the cliff northeast of Saltburn (Partly Active)

#### *Coast Protection Asset Condition Assessment*

There are no coastal assets within this area.

### 3.6 Hunt Cliff and Warsett Hill

#### *Coastal Slope Condition Assessment*

The cliffs are characterised a slope-over-wall form, comprising vertical rock cliffs capped by weaker till. There is evidence of localised and recent rock fall activity in the cliff and mudsliding. These high, steep cliffs were all classified as Partly Active during the 2016 walkover survey.



**E54/4** looking northwest along Hunt Cliff showing active cliff face and debris apron (Partly Active)



**E54/3a** proximity of footpath and railway line to actively eroding cliff top (Partly Active)

#### *Coast Protection Asset Condition Assessment*

There are no coastal assets within this area.

### 3.7 Cattersty Cliff and Skinningrove

#### *Coastal Slope Condition Assessment*

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

**E54/1**, is characterised by a vegetated layer of till, which sits above the Lower Jurassic bedrock. Lower down the cliff, the cliff face is largely obscured by periodically active debris lobes that are undergoing marine erosion at the toe. This unit was classified as Locally Active in 2016.

Units **E55/3, E55/2 and E55/1** have a small, steep debris apron that is sparsely vegetated. Most of the debris apron shows evidence of recent activity and is subject to ongoing toe erosion. The till in the upper cliff is subject to localised mudslide development and headscarp recession. These units are Partly Active in 2016.

Unit **E56/2a and 56/2b** are above Cattersty Sands (immediately west of the jetty). Both units are Locally Active in 2016, since the slumping is not widespread. The cliffs here have a shallower gradient with extensive vegetation cover. They are also provided protection at their base by a set of embryo dunes. The development of these dunes and lack of erosional activity within this unit is due to the protection afforded by the adjacent jetty.



**E54/1** Vegetated layer of till, which sits above the Lower Jurassic bedrock (Locally Active)



**E56/2a and 56/2b** Cliffs above Cattersty Sands, looking towards Skinningrove (Locally Active)

Unit **E56/1** is located to the east of the jetty and adjacent to the mouth of the beck. The slopes within this unit are well-vegetated. There no current evidence of recent sliding activity and since modification of the rock revetment, the unit has been downgraded to inactive at the present time.



*Coast Protection Asset Condition Assessment*

Although Skinningrove Jetty (Asset Ref No. 1221D901D0201C02) is redundant for its original purpose, the export of pig iron, and until recently has been in a failing state, the massive structure provides some coastal stabilisation, fixing the orientation of the adjacent bay to the east and giving some protection to Skinningrove village to the south east. It also helps hold the beach in front of the undefended cliffs to the west. Refurbishment works were undertaken in 2015 to repair a failed section of crest wall and damaged jetty decking, whilst placing additional rock armour protection on the collapsing seaward side. These works improved the condition of the jetty from poor to good. A number of small defects remain however, including corroded steel sheet piling, cracked and abraded concrete and some of the new works have poorly inserted sealant in construction joints and exposed reinforcement bars, which could lead to future maintenance problems.



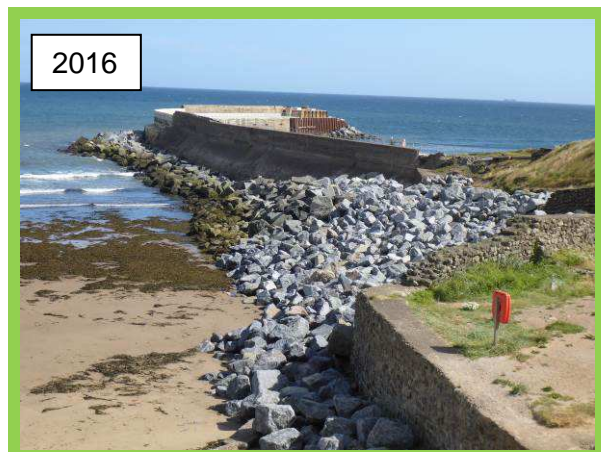
View of crest from access gate showing missing section of crest wall and damaged deck in 2014  
(Asset Ref No. 1221D901D0201C02)



Voiding and collapse of west side of jetty structure in 2014  
(Asset Ref No. 1221D901D0201C02)



Repaired and improved structure in 2016  
(Asset Ref No. 1221D901D0201C02)



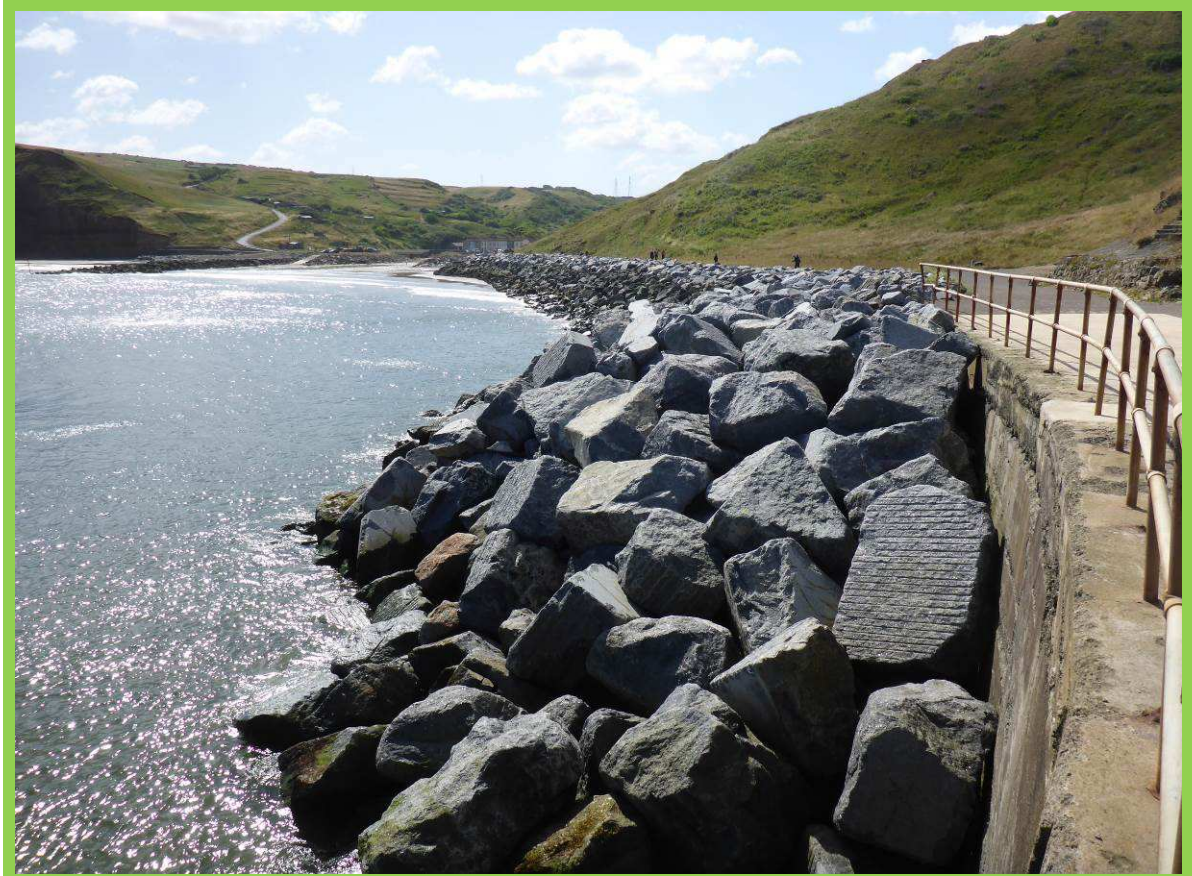
Repaired and improved structure in 2016  
(Asset Ref No. 1221D901D0201C02)



Rebuilt jetty wall (Asset Ref No. 1221D901D0201C02)



The rock armour defence between Cattersty Jetty and Skinningrove village, (Asset Ref No 1221D901D0202C01) was re-profiled as part of the recent Skinningrove coastal defence works, with an extension of the armour around the inner face of the jetty. This appears to offer good protection against overtopping as there was no evidence of slippage in the backing slopes. The crest of the berm has also been surfaced as part of those works.



Modified rock revetment protecting inner face of jetty (Asset Ref No. 1221D901D0202C01)



General view of revetment looking from Jetty towards village in 2014 (Asset Ref No. 1221D901D0202C01)



General view of modified revetment and surfaced path looking from Jetty towards village in 2016 (Asset Ref No. 1221D901D0202C01)



Defences to the east of Kilton Beck were also modified during the recent works, with the fishtail groyne being reduced in size and a small detached breakwater being constructed. Future monitoring and inspections should be used to determine the location and scale of beach changes that may result as a consequence of these modifications.



Original defences to the east of Kilton Beck, 2014



Modified defences to the east of Kilton Beck, 2016



### 3.8 Skinninggrove to Boulby

#### *Coastal Slope Condition Assessment*

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

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

Unit **E57/7** has widespread erosion and is classed as Partly Active in 2016. Unit **E57/6** is a high rock cliff with a thin cap of till above which is deemed to be Locally Active.



**E57/7** Slumping cliffs (Partly Active)



**E57/6** High rock cliff with till cap (Locally Active)

Units **E57/5 to E57/1** form a small bay near Hummersea Scar and remain classed as Locally Active since there is evidence for localised erosion.

Unit **E58/6** cover a section of cliff known as 'The Warren' and represents a change in behaviour between the naturally formed cliffs to the west and the cliffs formed, at least in part, by quarrying and tipping of waste. This unit is classified as Locally Active in 2016, unchanged since 2012.

To the east of The Warren, the cliffs rise to become some of the highest in Britain. Here the cliff form owes its character to the large abandoned alum quarries which were operational in this area during the 19<sup>th</sup> Century. Units **E58/5 to E58/2** each has an upper and lower unit. The upper parts of the quarry units are backed by steep sandstone cliffs and feature heavily vegetated, undulating terrain, possibly the product of past rockfalls as a result it is classified as Locally Active in 2016, unchanged since 2012. The lower part of the cliff is exposed to marine attack, is steep and comprises exposed shales that are heavily weathered and prone to ongoing and intense erosion. Consequently these lower units are all classified as Partly Active in 2016, unchanged since 2012. Below Rockhole Hill there is a single unit (**E58/1c**) classified as Partly Active.



**E58/5 to E58/2** – Cliffs of the Loftus Alum Quarries  
(Locally Active upper sections and Partly Active lower sections)

*Coast Protection Asset Condition Assessment*

There are no coastal protection assets within this area.

### 3.9 Boulby to Cowbar Nab

#### *Coastal Slope Condition Assessment*

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



**E58/1 to E/59/6** Soft, slumping, upper till resting upon harder rock (Partly Active)



**E58/1 to E/59/6** Soft upper till resting upon harder rock subject to rock fall (Partly Active)

An area of particular and long standing concern along this stretch is adjacent to Cowbar Lane. Here units **E59/5** to **E59/1** are all classified as Partly Active in 2016, unchanged from 2012. They are characterised by an upper till unit which is undergoing severe erosion and there is evidence of recent rockfall from the lower part of the cliff. This is resulting in the loss of the now abandoned parts of Cowbar Lane. Rock armour is also locally present along the toe of unit **E60/1b**, which is acting to locally protect the base of the cliffs, but is not able to prevent failures in the till materials above. However, a fresh rockfall occurred in 2016 immediately adjacent to the rock armour, leading to further slippage in the till cliffs above and closure by The National Trust of public access to Cowbar Nab.





**E59/3 and E59/4** Loss of road due to ongoing erosion at Cowbar Lane



**E60/1** Closure of access to Cowbar Nab



**E60/1** Closure of access to Cowbar Nab

*Coast Protection Asset Condition Assessment*

Although the NFCDD records show no specific coastal defence assets within this area there are two sections of rock armour that give some protection to the cliff toe adjacent to local ‘pinch points’ next to the cottages on Cowbar Lane, constructed as part of the 2002 scheme at Staithes harbour. The rock armour was in fair condition, similar to that observed in 2012, and appears to comprise a mixture of imported granite and smaller locally sourced rock. The crest level is relatively low and the length of cliff protected short, so appears to be designed as an adaptive measure to slow the rate of erosion locally. In addition, netting has been used to help stabilise the till slopes in local sections along Cowbar Lane.

#### 4. Comparison with Previous Assessment

The previous formal assessment across the whole study frontage was undertaken in autumn 2014.

Since that time it is notable that Skinningrove in particular has benefited from a capital investment in repairs and improved defences.

Of the remaining areas, the most major changes since 2014 exist along undefended cliffs, especially near Cowbar Nab where a recent erosion event has forced The National Trust to close public access to the Nab. Generally, however, the cliff behaviour categories remain largely unaltered from the 2014 inspections, except for a few areas where the classification has been downgraded.

There are several built assets whose condition remains as poor, most notably the South Gare Breakwater.

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

Very few problems were encountered on site during the condition assessment. Access issues posed the largest potential problems although most assets were located in public spaces and were easily accessible with due consideration and planning around tides. In several locations the beaches were higher than in 2012 and 2014, obscuring lower parts of the structures. However, these issues are not considered to have affected the quality of the assessment.

The South Gare Breakwater was not accessible to members of the public and therefore inspection of this structure was limited.

Views of the lower part of the cliffs were sometimes limited, especially between units **E58/5** to **E58/1c** due to the steep, complex terrain of the former quarries. At locations where observations were difficult, judgements about cliff behaviour activity status were made based on the visible cliff sections and informed by previous assessments and additional data derived from aerial survey data collected as part of Cell 1 Regional Coastal Monitoring programme.

#### 6. Conclusions and Recommended Actions

Further to the visual inspection of all assets, specific conclusions and recommendations for individual assets are given in **Appendix C**. The main urgent recommendations are:

- South Gare Breakwater – survey required to ascertain nature and extent of defects. Repairs are required to maintain the integrity of the structure. Potential health and safety issues due to the ease of access to the seaward elements of the structure.
- Potential health and safety issues were presented by the open security grille at the culvert outfall to the north-western extent of the promenade at Saltburn, which allowed public access into the confined space.

In addition, the cliffs have been characterised according to their present activity status and details are given in **Appendix D**.

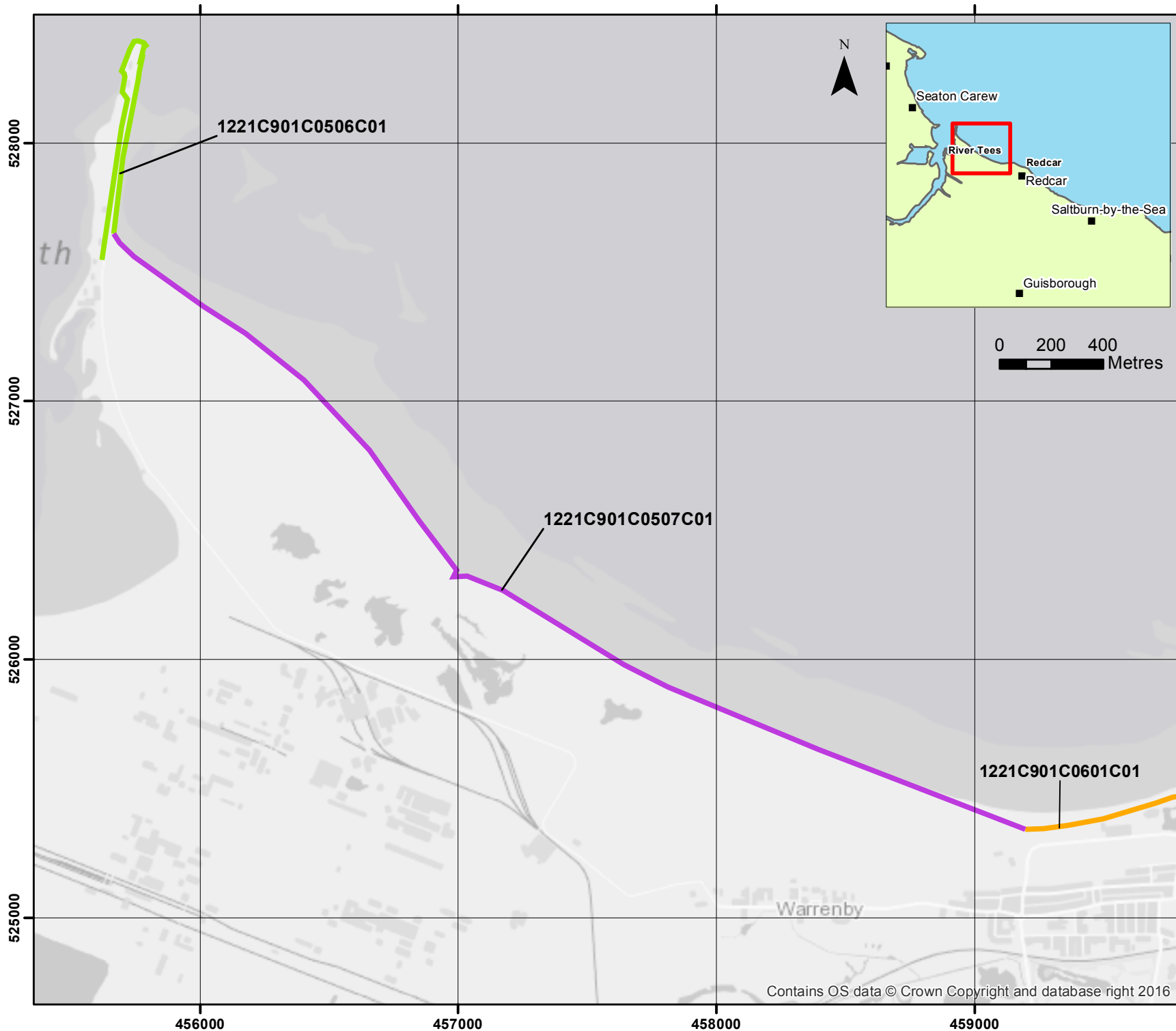
All condition assessment data and selected photographs have been uploaded to SANDS (Shoreline And Nearshore Database System).

# Appendices



# **Appendix A**

## **Asset Location Maps**



**Legend**

- Asset location
- NFCDD Asset Number

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

**Figure 1 - Map 1**  
**Redcar & Cleveland Borough Council Frontage**  
 Asset Inspection Report

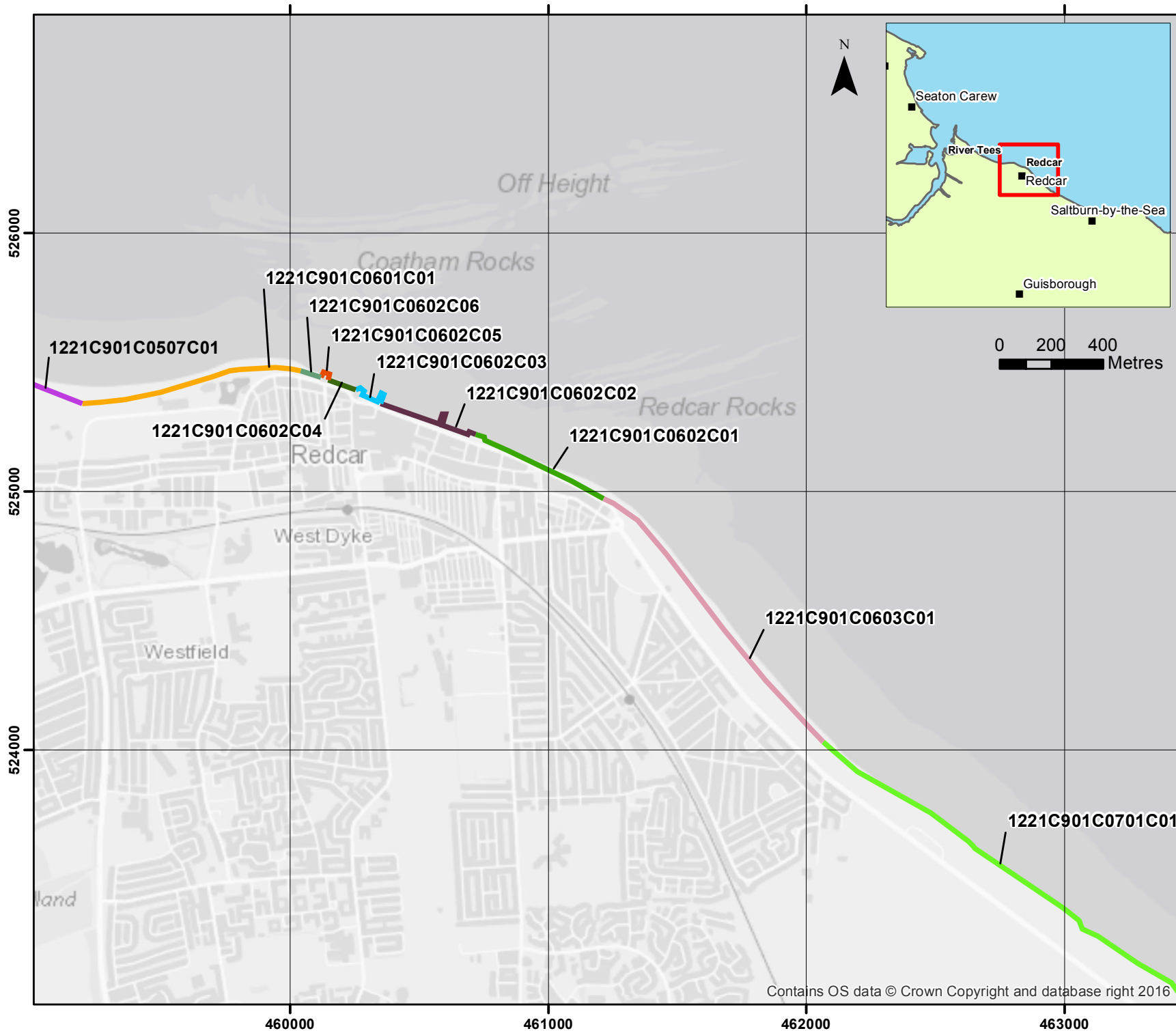
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**Legend**

- Asset location
- NFCDD Asset Number

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

**Figure 1 - Map 2**  
**Redcar & Cleveland Borough Council Frontage**  
 Asset Inspection Report

Drawing Scale at A4 1:20,000

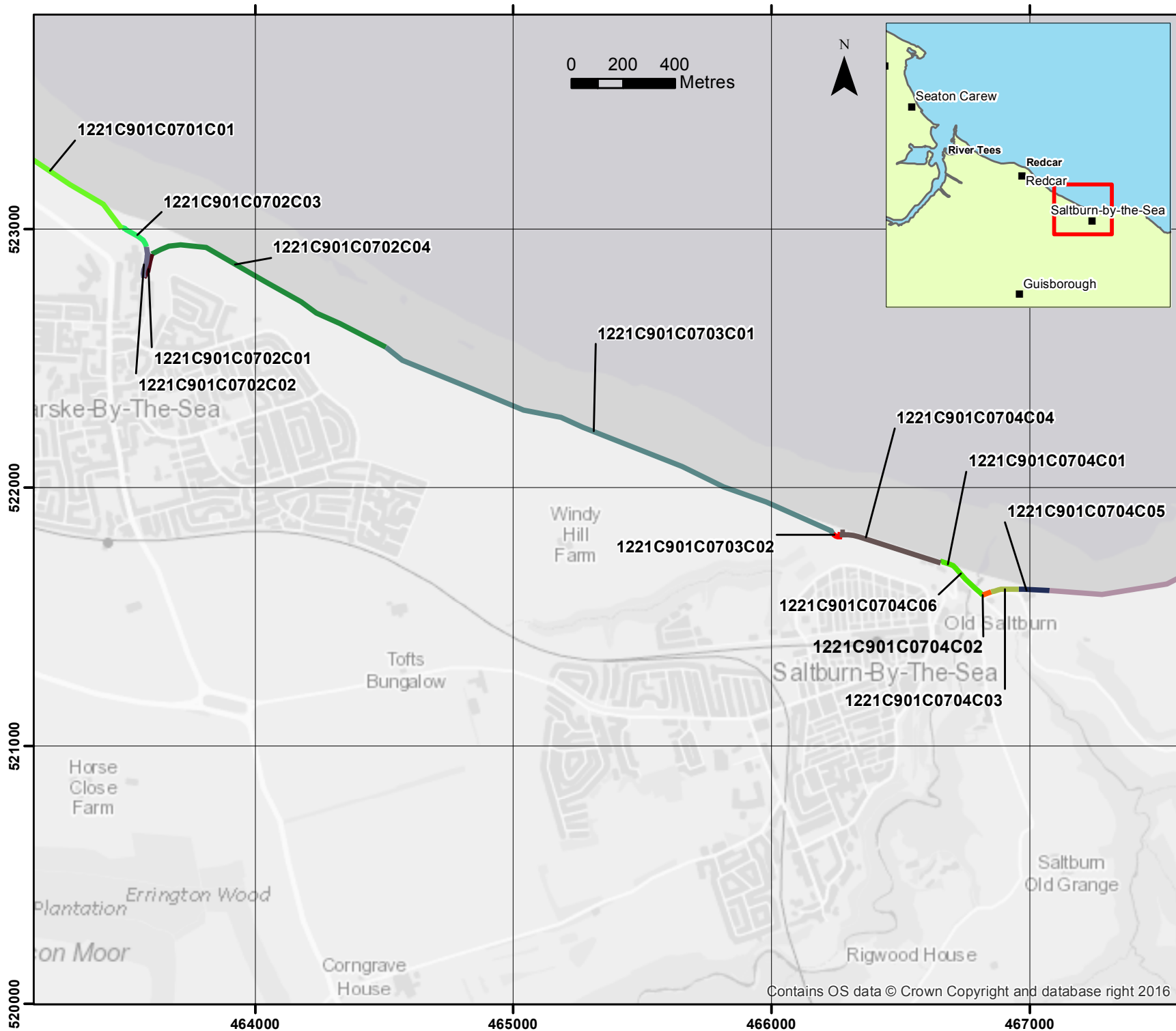
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**Legend**

Asset location

NFCDD Asset Number

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 1 - Map 3**

**Redcar & Cleveland Borough Council Frontage**

Asset Inspection Report

Drawing Scale at A4 1:20,000

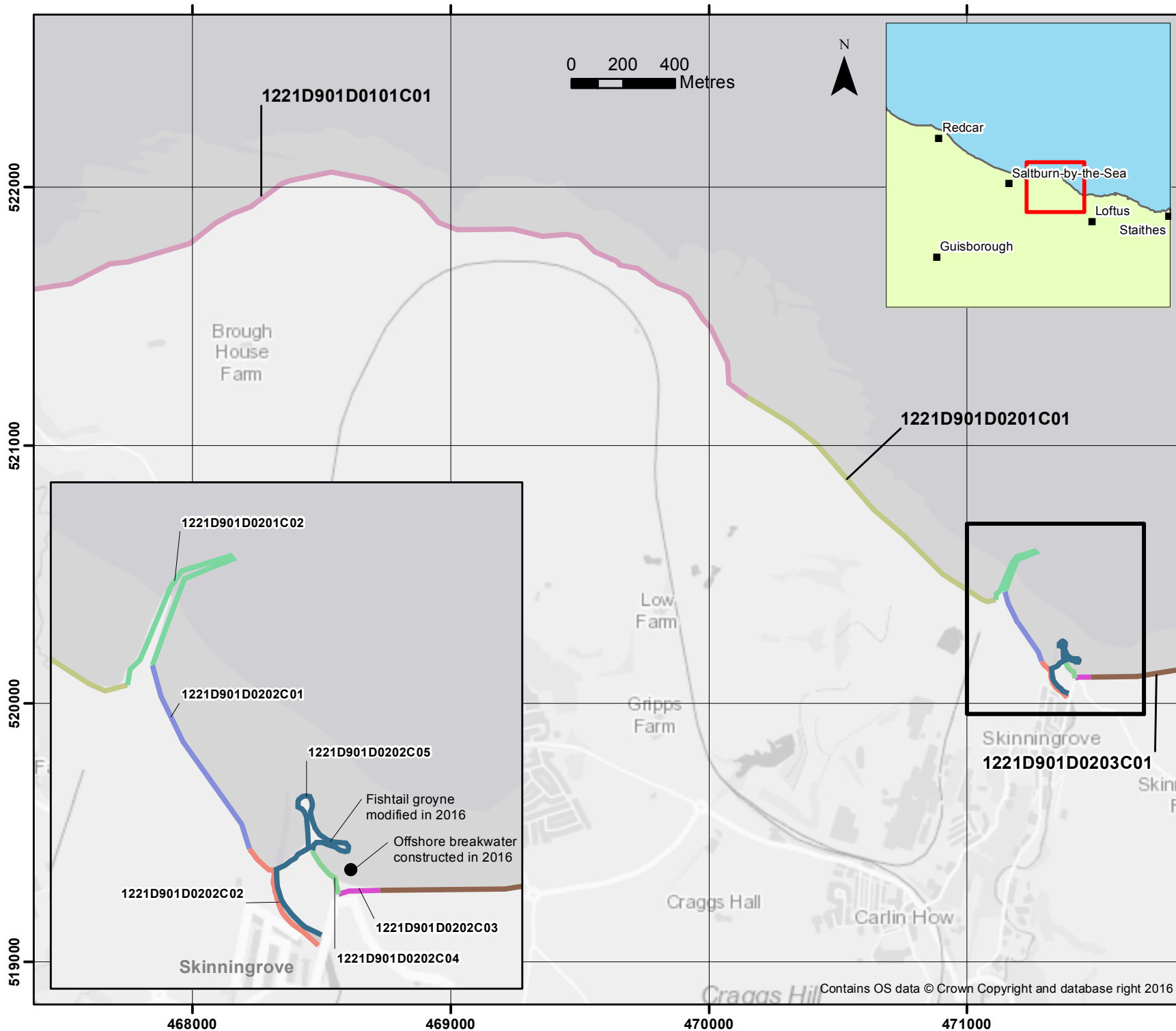
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**Legend**

- Asset location
- NFCDD Asset Number

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

**Figure 1 - Map 4**

**Redcar & Cleveland Borough Council Frontage**

Asset Inspection Report

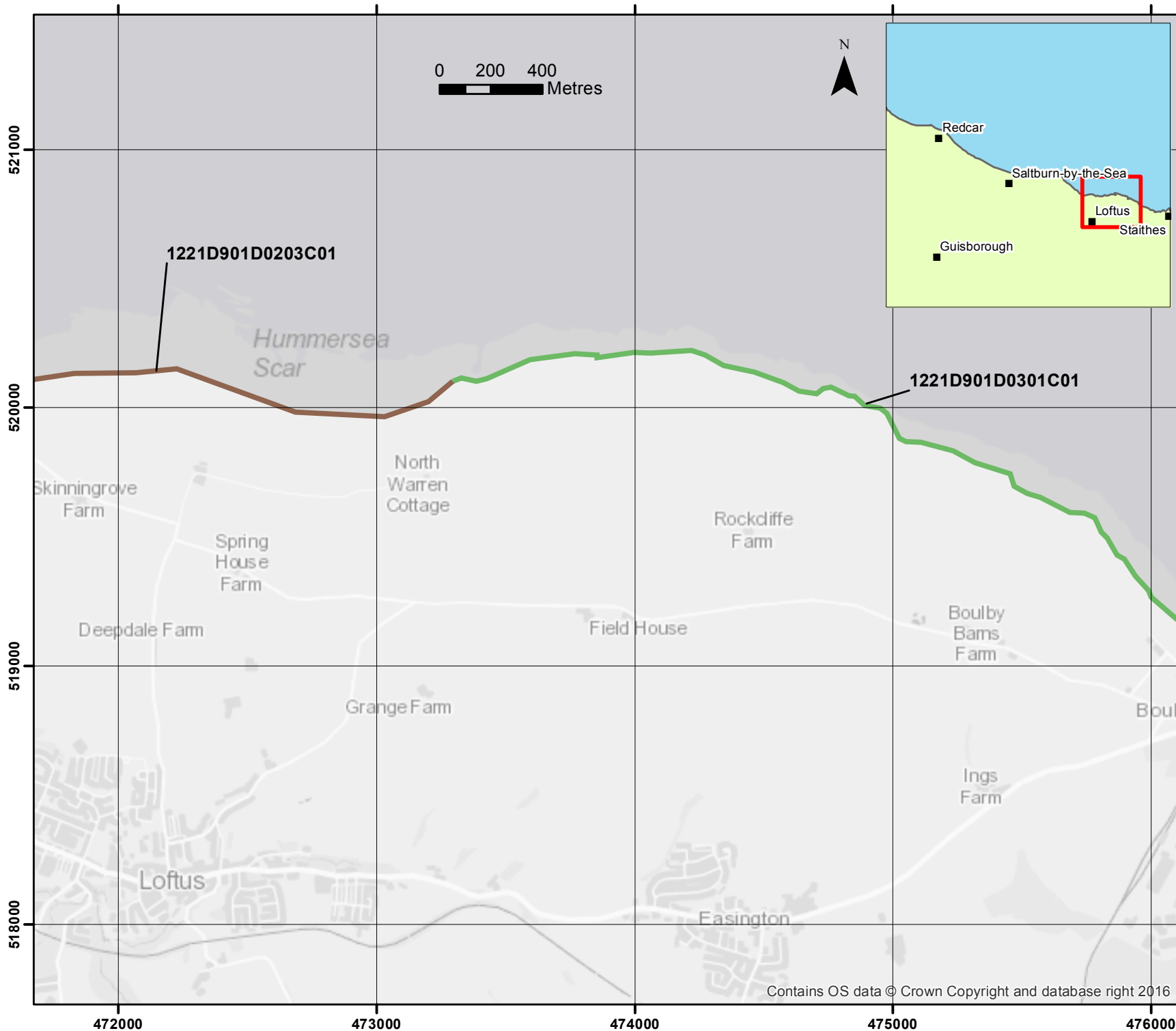
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**Legend**  
 — Asset location  
 — NFCDD Asset Number

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

**Figure 1 - Map 5**  
**Redcar & Cleveland Borough Council Frontage**  
 Asset Inspection Report

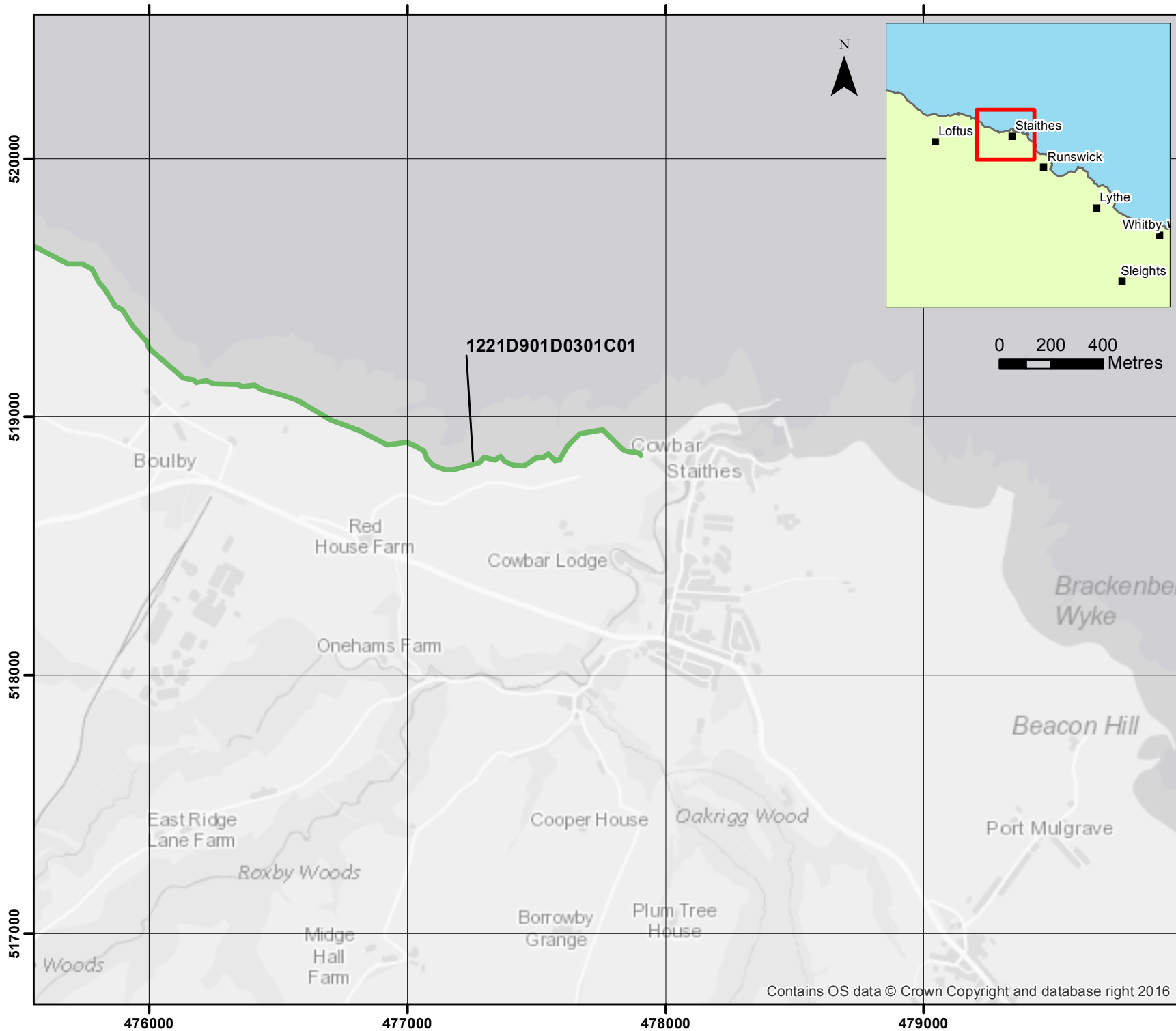
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**Legend**

- Asset location
- NFCDD Asset Number

Note: The area of Cowbar is covered by Cliff Behaviour Units

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

**Figure 1 - Map 6**

**Redcar & Cleveland Borough Council Frontage Asset Inspection Report**

Drawing Scale at A4 1:20,000

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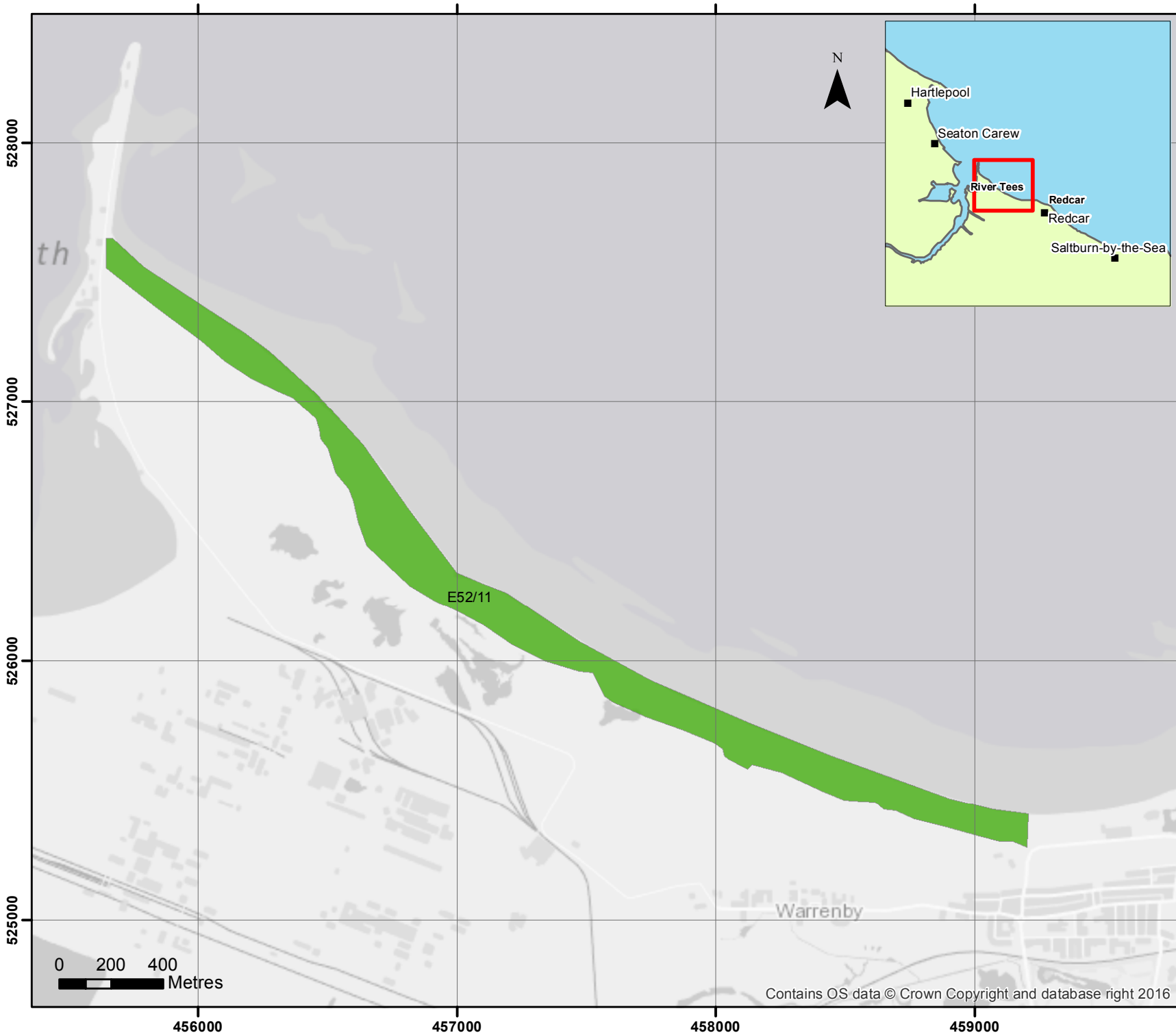
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# **Appendix B**

## **Cliff Behaviour Units**



- Legend**
- Cliff Activity Status 2016**
- Dormant
  - Inactive
  - Locally Active
  - Locally active
  - Partly Active
  - Totally Active

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

**Figure 2- Map 1**

**Redcar & Cleveland  
 Borough Council  
 Frontage**

Coastal Slope Condition 2016

Drawing Scale at A4 1:20,000

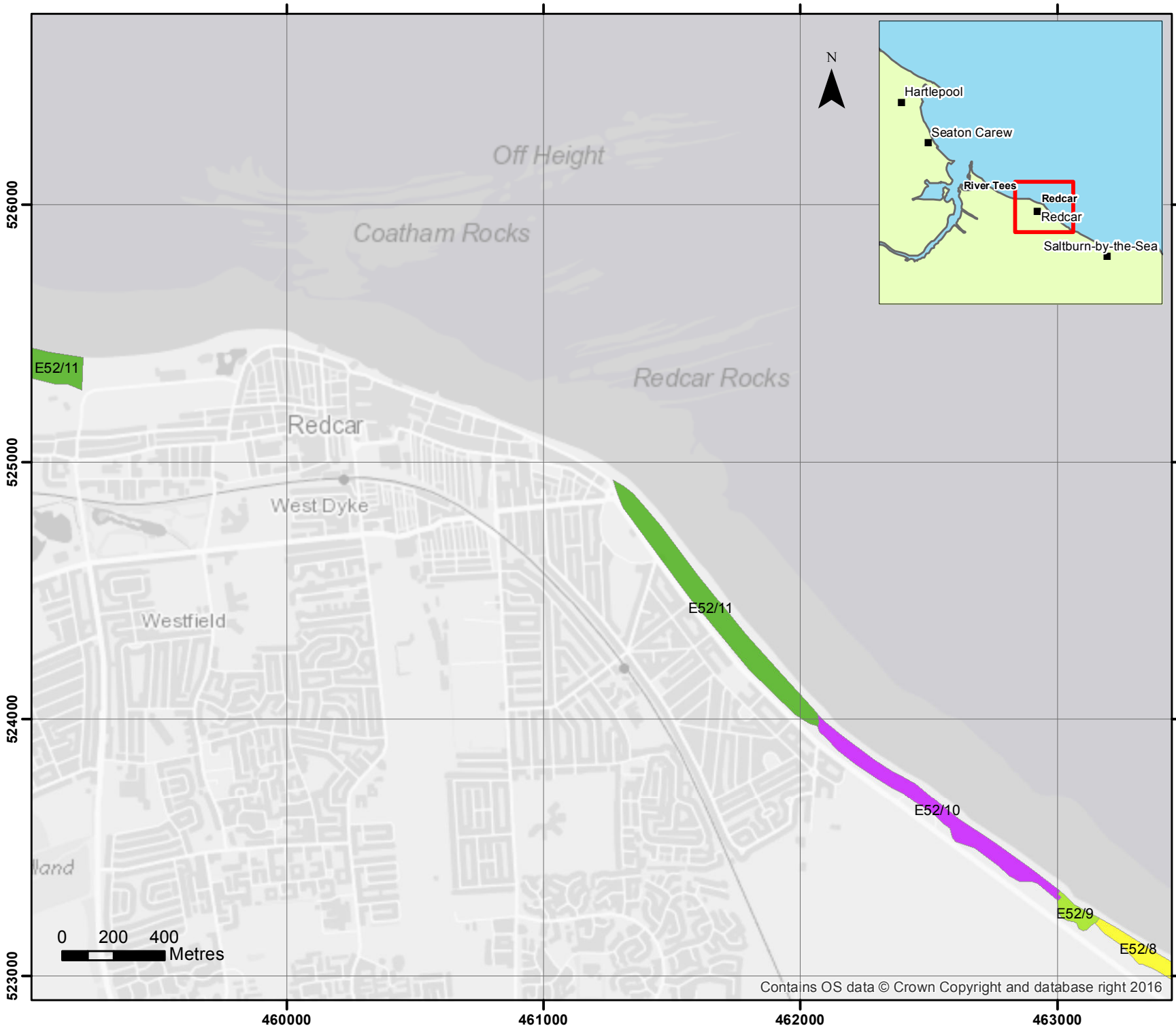
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**Legend**

**Cliff Activity Status 2016**

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

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

**Figure 2- Map 2**

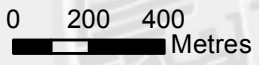
**Redcar & Cleveland Borough Council Frontage**

Coastal Slope Condition 2016

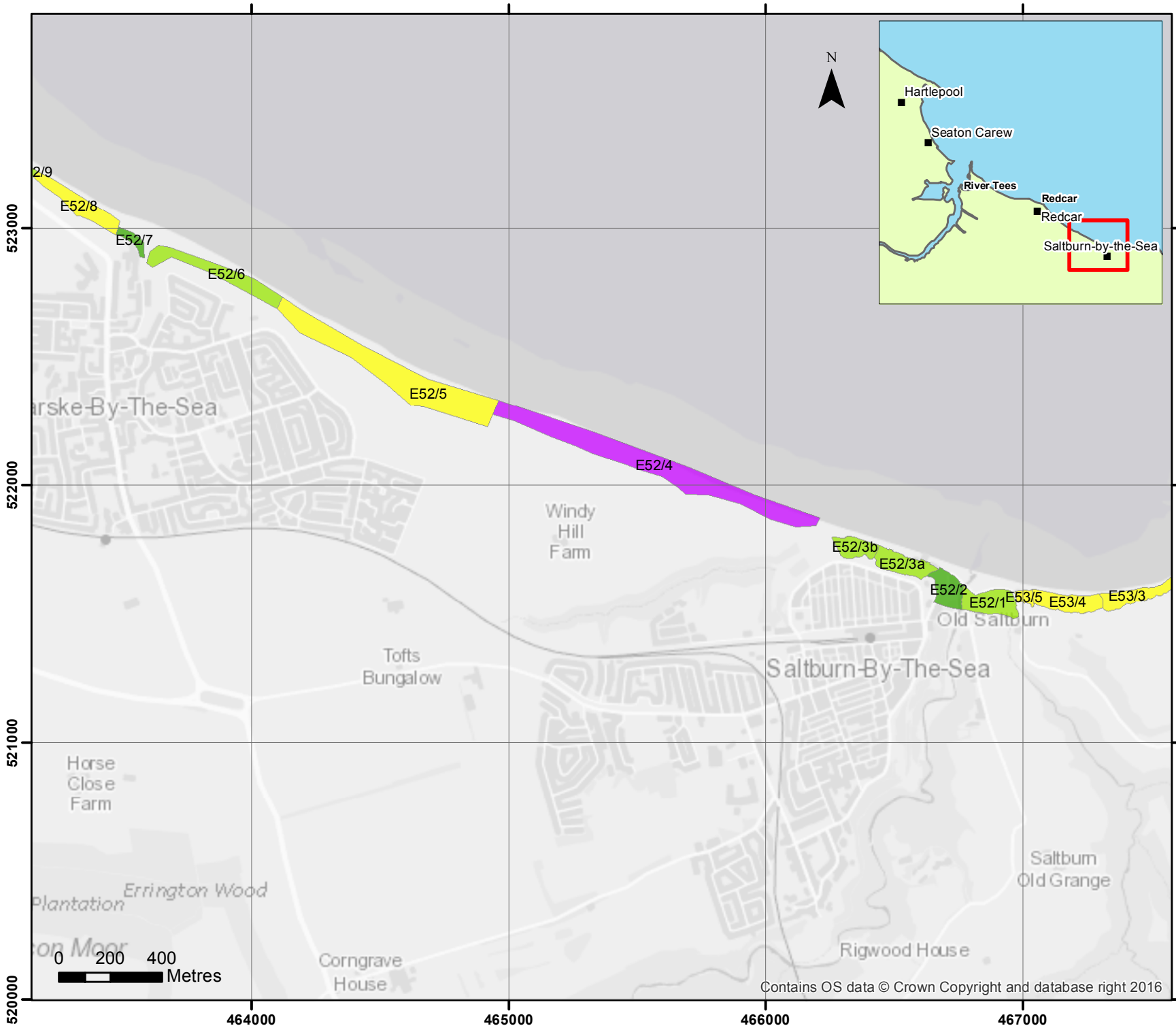
Drawing Scale at A4 1:20,017

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**Legend**

**Cliff Activity Status 2016**

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

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

**Figure 2- Map 3**  
**Redcar & Cleveland Borough Council Frontage**  
 Coastal Slope Condition 2016

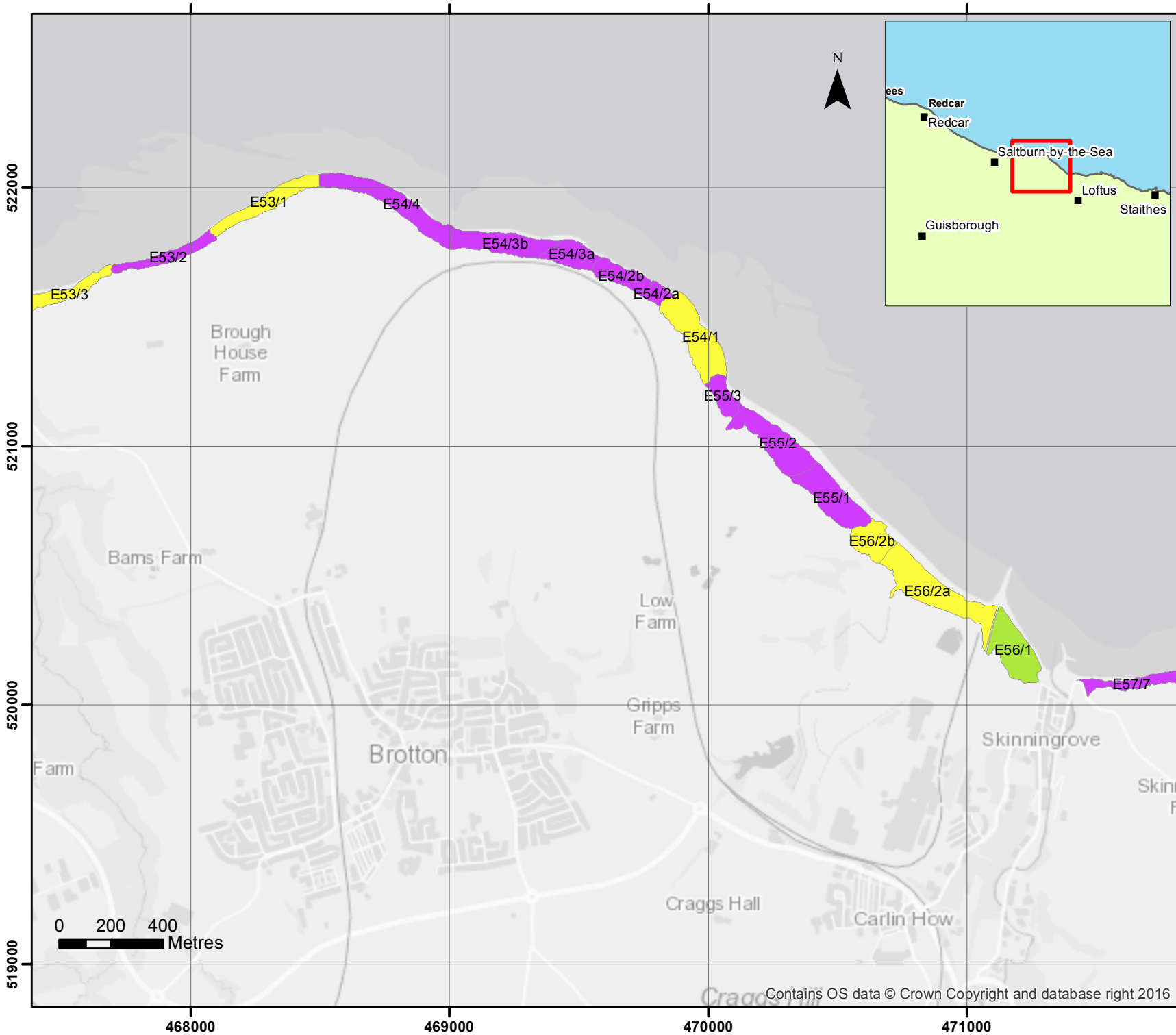
Drawing Scale at A4 1:20,017

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**Legend**

**Cliff Activity Status 2016**

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

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

**Figure 2- Map 4**  
**Redcar & Cleveland Borough Council Frontage**  
 Coastal Slope Condition 2016

Drawing Scale at A4 1:20,017

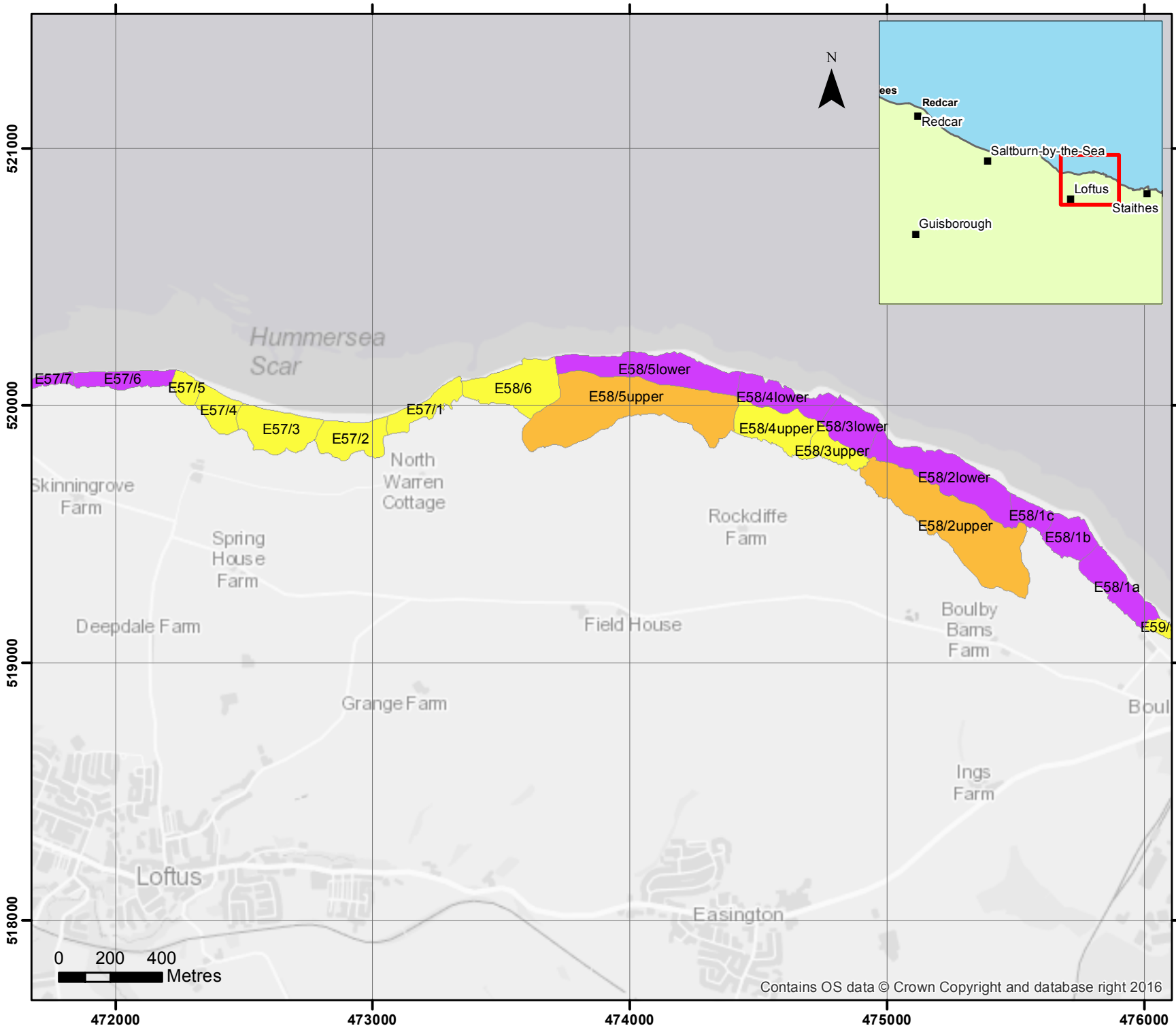
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**Legend**

**Cliff Activity Status 2016**

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

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

**Figure 2- Map 5**

**Redcar & Cleveland Borough Council Frontage**

Coastal Slope Condition 2016

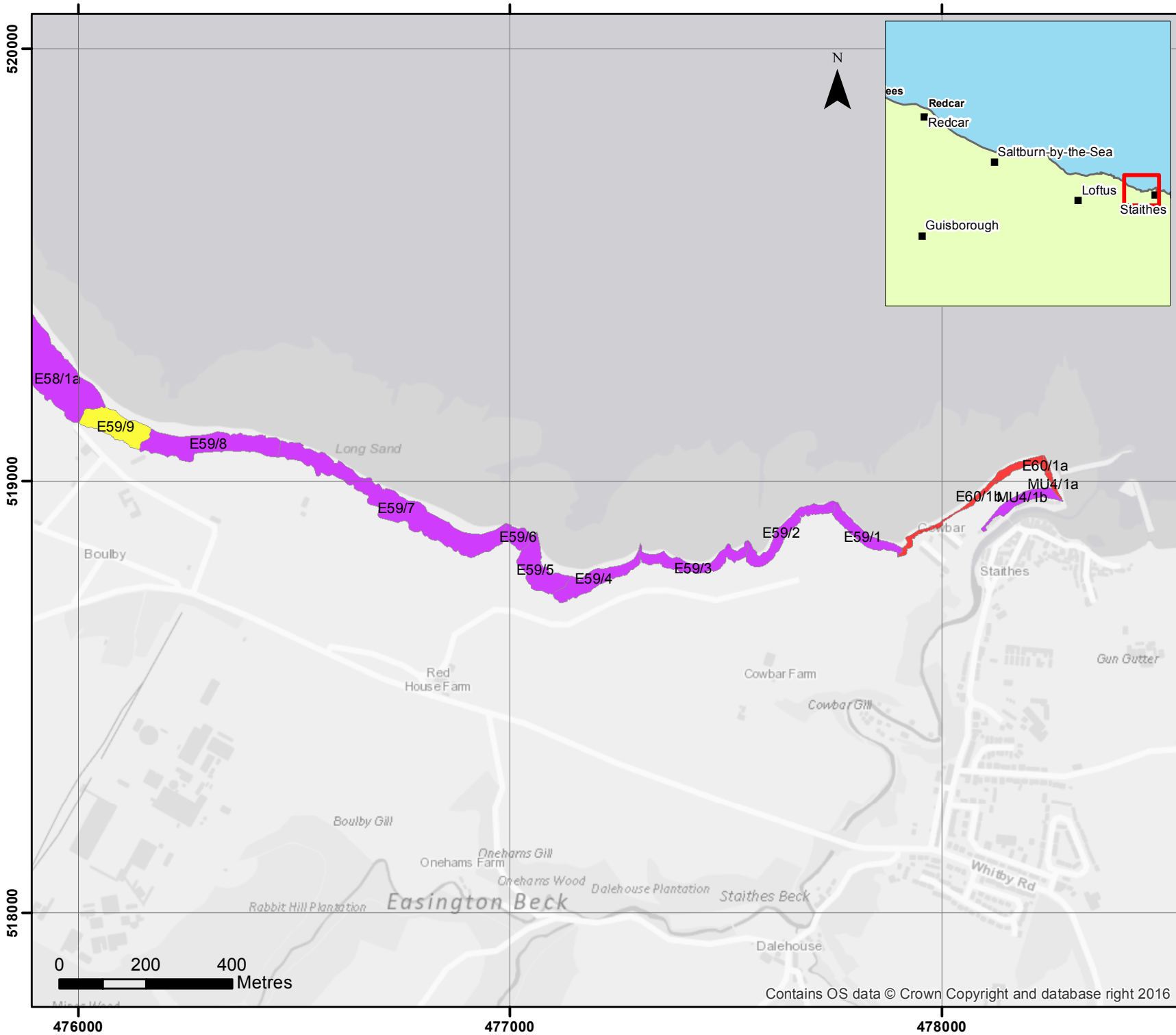
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**Legend**

**Cliff Activity Status 2016**

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

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

**Figure 2- Map 6**  
**Redcar & Cleveland Borough Council Frontage**  
 Coastal Slope Condition 2016

Drawing Scale at A4 1:12,000

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# **Appendix C Asset Condition & Recommendations**



Asset Name	Description	Type	Length	Inspection Date	Inspector	Comments	Overall Condition	Residual Life	Recommendations	Urgency
1221C901C0506C01	South Gare Breakwater. Protects Coatham Sands to south and Tees entrance to north.	Breakwater	1672.5	06/06/2016	Royal HaskoningDHV	Generally poor condition. Multiple defects including extensive cracking and spalling, exposure of reinforcing steel, missing mortar/open joints, damaged render, missing masonry, undercutting and void formation beneath slag embankments, failure/collapse of historic western pier arm structure, damaged concrete Accropode units and rock armour units and displacement of/poor interlock between armour units.	4	11 - 20	Structural inspection incl, boat/dive survey. Continue to monitor.	routine
1221C901C0507C01	Undefended	Undefended	4330.2	06/06/2016	Royal HaskoningDHV	Good coverage of established vegetation. Local erosion due to public access at NW and SE extents. Continued accretion & roll back at caravan park and former site compound adjacent to car park. Wide, healthy beach.	2	>20	Continue to monitor. Routine inspection & maintenance	routine
1221C901C0601C01	Concrete crest wall above part length of grouted stone revetment.	Revetment	861.5	06/06/2016	Royal HaskoningDHV	Gap in crest wall (approx. 2m). Local damage to grouted stone slope incl missing render and blocks although largely covered by high beach levels.	3	11 - 20	Local repairs. Infill gap in crest wall.	routine
1221C901C0602C06	Rough concrete revetment over old 1890's slag revetment.	Revetment	82.1	06/06/2016	Royal HaskoningDHV	Stepped seawall and recurve wave wall – as new condition	1	>20	Routine inspection & maintenance.	routine
1221C901C0602C05	Massive concrete wall to rear of cinema. Crest level reduces towards shore.	Wall	68.7	06/06/2016	Royal HaskoningDHV	Cinema building. Fair to poor condition, multiple cracks and previous repairs. Undercutting noted in 2014 obscured by high beach levels.	3	11 - 20	Continue to monitor.	no repairs
1221C901C0602C04	Former concrete promenade shelter, now has voids infilled with brick work (internal structure unknown).	Wall	113.9	06/06/2016	Royal HaskoningDHV	Stepped seawall and recurve wave wall – as new condition.	1	>20	Continue to monitor.	routine
1221C901C0602C03	Stepped seawall to main sea frontage.	Wall	206.4	06/06/2016	Royal HaskoningDHV	Concrete seawall around Beacon. Missing flexible sealant in places. Loose in others. Horizontal joints and joints in apron had no sealant and filler-board could be seen suggesting never sealant present.	1	>20	Replace/install flexible joint sealant. Routine inspection & maintenance.	routine
1221C901C0602C02	Concrete revetment below concrete seawall.	Revetment	480.7	06/06/2016	Royal HaskoningDHV	Stepped seawall and recurve wave wall – as new condition. Localised damage to surface of RNLI slipway. Low beach levels at access ramp expose pre-cast concrete toe steps with minor local damage.	1	>20	Local repairs to slipway. Routine inspection & maintenance	routine
1221C901C0602C01	Concrete toe to revetment.	Apron	559.2	06/06/2016	Royal HaskoningDHV	Stepped seawall and recurve wave wall – as new condition. Accretion of material and embryo dunes/vegetation towards SE.	1	>20	Routine inspection & maintenance.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comments	Overall Condition	Residual Life	Recommendations	Urgency
1221C901C0603C01	Grouted masonry revetment in front of promenade & The Stray. Concrete splash wall landward of promenade. Accretion of sand & dunes behind.	Splash Wall	1273	06/06/2016	Royal HaskoningDHV	Concrete block revetment tied into concrete promenade. As new condition. Some vegetation growth where sand has accumulated in joints. Timber groynes in good condition – some missing timbers, notably towards seaward ends.	1	11 - 20	Continue to monitor. Routine inspection & maintenance. Local repairs to groynes.	routine
1221C901C0701C01	Undefended Frontage	Undefended Frontage	1765.3	06/06/2016	Royal HaskoningDHV	Informal access ramp at interface with hard defences – local lowering of embankment crest. Headwall structure elements in very poor condition. Local scour to bank. More stable slopes to SE, more active to NW and around central 'headland/prominence'.	3	11 - 20	Continue to monitor.	routine
1221C901C0702C03	Lower masonry wall to path. Upper wall varies (concrete/masonry), coastal slope to rear.	Wall	125.9	06/06/2016	Royal HaskoningDHV	High beach levels. Accretion in front of wall with formation of dunes. Local defects to masonry wall – missing coping stones. Full height vertical cracks in rear concrete wall appear to be stable (noted in 2008,2010,2012,2014).	3	11 - 20	Infill cracks. Replace missing blocks. Continue to monitor wall for movement.	routine
1221C901C0702C02	Masonry revetment to path and coastal slope above masonry wall. Coastal slope with access to properties above.	Revetment	122.2	06/06/2016	Royal HaskoningDHV	Extensive vegetation growth and high beach level largely obscuring blockwork revetment and wall. Visible sections in fair condition.	3	11 - 20	Repoint masonry, clear vegetation. Replace missing blocks.	routine
1221C901C0702C01	Brick wall enclosure of boat park and access. Short length of concrete wall with lower crest level.	Wall	97.2	06/06/2016	Royal HaskoningDHV	Damage to seaward end of masonry wall. Scour to rear. Vertical cracks through full height as reported previously. Landward concrete wall in fair condition with vertical cracks locally.	3	11 - 20	Repoint masonry, replace missing masonry/tidy seaward end of wall. Fill cracks.	routine
1221C901C0702C04	Undefended Frontage	Undefended Frontage	1011.6	06/06/2016	Royal HaskoningDHV	Low, accreting dunes fronting mostly vegetated slopes. Local erosion through pedestrian access. At SE extent, timber piles at toe of concrete ramp exposed.	2	>20	Continue to monitor.	routine
1221C901C0703C01	Undefended Frontage	Undefended Frontage	1883.2	06/06/2016	Royal HaskoningDHV	Partly active. Erosion of the toe and land sliding is more widespread. NW extent and SE extent are most active (least vegetation). Good vegetation cover elsewhere.	4	>20	Continue to monitor.	routine
1221C901C0703C02	Concrete wall including outfall and two concrete slipways to coastal slope.	Wall	46.8	06/06/2016	Royal HaskoningDHV	Generally fair condition. Minor cracking and spalling remains but appears not to have worsened. Missing coping at top of south access ramp. Security grille open.	3	>20	Routine: Infill cracks. Replace missing copes. Urgent: Secure security grille.	urgent

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comments	Overall Condition	Residual Life	Recommendations	Urgency
1221C901C0704C04	Masonry wall in good condition, generally high sand with shingle to east end. Concrete splash wall to rear of promenade below coastal slope.	Sea Wall	415	06/06/2016	Royal HaskoningDHV	High cobble beach covering much of wall. Masonry in good condition along with previous repointing/repairs where visible. Slipway/RNLI station frontage more visible. Minor mortar loss locally underneath pier structure and no mortar in lower visible section of masonry slipway. Local defects to concrete wall at rear of promenade (cracking and abrasion). Improve/soften interface with undefended frontage to east e.g. rock armour revetment.	2	>20	Local repairs masonry/concrete walls. consider new rock revetm to east	routine
1221C901C0704C01	661501 Large masonry block revetment protecting carpark, road and coastal slope. Masonry slipway is also present.	Revetment	65.8	06/06/2016	Royal HaskoningDHV	Minor mortar loss locally. High cobble beach levels. Minor local damage to concrete wall at foot of slope. Masonry access ramp at RNLI station open-jointed in lower section (assume covered in beach material when re-pointing undertaken).	2	>20	Local repairs to concrete wall. Local repairs to pedestrian guardrail. Monitor.	routine
1221C901C0704C06	Concrete blockwork seawall protecting pavement, handrail and tarmac road. This section also includes bridging point over river, continuation of sea wall on the southern side.	Sea Wall	147.1	06/06/2016	Royal HaskoningDHV	High beach level protecting toe of wall. Levels lower at apex of bend. Minor local abrasion and cracking. Vegetation growth. Missing coping block(s) exposing backing footway material. Missing mortar locally to sloped sections. Exposed crest of rock armour to south of South of Skelton Beck indicative of beach lowering (noted 2014).	3	>20	Replace missing coping blocks. Repoint locally. Monitor beach levels at Skelton	routine
1221C901C0704C02		Carpark.	35.7	06/06/2016	Royal HaskoningDHV	Erosion/lowering on beach on SE of watercourse. Crest of rock armour revetment exposed (noted in 2014). Local erosion around corners of car park. Vegetation established in front of car park, however accumulated material was 'cliffing' indicating recent erosion.	3		Continue to monitor. Consider reprofiling shingle.	
1221C901C0704C03	661701 White rendered sea wall set back from the beach, cobbles have collected on the seaward side protecting the toe. Boat handling area, carpark and PH located behind. Slipway is also present giving access to the beach.	Wall	106.8	06/06/2016	Royal HaskoningDHV	Some cracking and loss of concrete render. Paving/promenade in good condition. Concrete slipway in good condition – vertical concrete face visible on western side. Loose/missing joint sealant.	2	11 - 20	Replace flexible joint sealant to access ramp. Local repairs to wall.	routine



Asset Name	Description	Type	Length	Inspection Date	Inspector	Comments	Overall Condition	Residual Life	Recommendations	Urgency
1221C901C0704C05	661801 Various concrete and masonry walls to private property with various degrees of concrete apron with typical level of 4.7 mODN.	Wall	118.7	06/06/2016	Royal HaskoningDHV	Ship Inn. High beach levels covering toe (and previously reported undercutting/voiding). Poured concrete apron/revetment at E end undercut and voids forming. Concrete cracked locally. Concrete blockwork abraded and vertical crack through full height. Masonry wall missing mortar and masonry locally.	4	1 - 5	Repointing ramp as beach levels allow.	urgent
1221D901D0101C01	High cliffs are locally active above beach east of Saltburn. Cliffs much more active (partly active) along Hunt Cliff above shore platform, specifically where railway nears cliff edge. Further east, cliffs are less high and locally active.	Undefined high cliffs.	3551.2	08/08/2016	Royal HaskoningDHV		3	>20	Continue to monitor.	
1221D901D0201C01	Cliffs to NW partly active, slumping of soft upper slopes, erosion of harder lower cliff, some veg. Cliffs to SE support more veg, small dune system at toe, less active (locally active/inactive).	Undefined high cliffs.	1262.3	09/08/2016	Royal HaskoningDHV		4	>20	Continue to monitor.	
1221D901D0201C02	Skinningrove Jetty	Breakwater	477	10/08/2016	Royal HaskoningDHV	Skinningrove jetty repaired and improved with new crest wall, repaired deck and rock armour. Small defects remain (corroded steel piling, cracked concrete, poor joint sealant).	2	>20	Repair remaining defects and monitor effectiveness of repairs.	routine
1221D901D0202C01	Rock armour defence from jetty to village protects coastal slope and footpath	Armour	305.1	11/08/2016	Royal HaskoningDHV	Re-profiled rock armour offers good protection. Backing slopes stable. New footpath laid.	3	>20	Monitor effectiveness of re-profiled rock armour and stability of slope.	routine
1221D901D0202C02	662103 Masonry wall behind rock revetment, severely overtopped prior to breakwater and beck control works.	Wall	182.4	12/08/2016	Royal HaskoningDHV	Rock armour in fair to good cond, but some gaps in coverage.	3	>20	Continue active monitoring.	routine
1221D901D0202C05	662201 Offshore fishtail breakwater protecting fontage and stabilizing beach levels. Concrete slipway also included in defence providing access for fishermen. Highground is natural main land.	Breakwater	450.4	13/08/2016	Royal HaskoningDHV	Remains in good condition following modifications to the structure.	3	>20	Repair nav mark. monitor armour, reprofile in future.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comments	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D0202C04	Beach frontage with shingle, cobbles and boulders giving protection to soil embankment and fishing area. Small detached rock berm constructed in 2016 (using rock armour from former fishtail groyne 1221D901D0202C05)	Beach frontage.	77.2	14/08/2016	Royal HaskoningDHV	Beach in fair condition, still modifying in response to changes in former fishtail groyne (1221D901D0202C05) and construction of new small detached breakwater.	2	>20	Continue to monitor beach response to structural change.	routine
1221D901D0202C03	662301 Concrete wall in moderate condition to end of protection offered by breakwater. Protects road.	Wall	60.5	15/08/2016	Royal HaskoningDHV	Fair condition.	3	>20	Continue to monitor.	routine

# **Appendix D**

## **Cliff Condition Assessments**

UNIT	2008	2010	2012	2013 (post-surge)	2014	2016	2018	2020
E52/1	Locally active	Locally Active	Locally Active	Inactive	Inactive	Inactive		
E52/2	Inactive	Inactive	Inactive	Inactive	Dormant	Dormant		
E52/3a	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive		
E52/3b	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive		
E52/4	Not Inspected	Not Inspected	Partly Active	Partly Active	Partly Active	Partly Active		
E52/5	Not Inspected	Not Inspected	Inactive	Locally Active	Locally Active	Locally Active		
E52/6	Not Inspected	Not Inspected	Inactive	Inactive	Inactive	Inactive		
E52/7	Not Inspected	Not Inspected	Dormant	Dormant	Dormant	Dormant		
E52/8	Not Inspected	Not Inspected	Locally Active	Locally Active	Locally Active	Locally Active		
E52/9	Not Inspected	Not Inspected	Locally Active	Inactive	Inactive	Inactive		
E52/10	Not Inspected	Not Inspected	Locally Active	Partly Active	Partly Active	Partly Active		
E52/11	Not Inspected	Not Inspected	Inactive	Dormant	Dormant	Dormant		
E53/1	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active	Locally Active		
E53/2	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E53/3	Locally active	Locally Active	Locally Active	Locally Active	Locally Active	Locally Active		
E53/4	Locally active	Locally Active	Locally Active	Partly Active	Partly Active	Locally Active		
E53/5	Dormant	Dormant	Locally Active	Locally Active	Locally Active	Locally Active		
E54/1	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active	Locally Active		
E54/2a	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E54/2b	Totally Active	Totally Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E54/3a	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E54/3b	Totally Active	Totally Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E54/4	Totally Active	Totally Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E55/1	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E55/2	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E55/3	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active	Partly Active		



UNIT	2008	2010	2012	2013 (post-surge)	2014	2016	2018	2020
E56/1	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active	Inactive		
E56/2a	Inactive	Inactive	Locally Active	Not Inspected	Locally Active	Locally Active		
E56/2b	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active	Locally Active		
E57/1	Partly Active	Partly Active	Locally Active	Not Inspected	Partly Active	Locally Active		
E57/2	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active	Locally Active		
E57/3	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active	Locally Active		
E57/4	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active	Locally Active		
E57/5	Partly Active	Locally Active	Locally Active	Not Inspected	Locally Active	Locally Active		
E57/6	Locally active	Locally Active	Locally Active	Not Inspected	Partly Active	Partly Active		
E57/7	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E58/1a	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E58/1b	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E58/1c	Totally Active	Totally Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E58/6	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active	Locally Active		
E58/2 Lower	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E58/2 Upper	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active	Locally Active		
E58/3 Lower	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E58/3 Upper	Partly Active	Partly Active	Locally Active	Not Inspected	Locally Active	Locally Active		
E58/4 Lower	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E58/4 Upper	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active	Locally Active		
E58/5 Lower	Locally active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E58/5 Upper	Locally active	Locally Active	Locally Active	Not Inspected	Locally Active	Locally Active		
E59/1	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E59/2	Partly Active	Partly Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E59/3	Totally Active	Totally Active	Partly Active	Not Inspected	Partly Active	Partly Active		
E59/4	Partly Active	Totally Active	Partly Active	Not Inspected	Partly Active	Partly Active		

