



Cell 1 Regional Coastal Monitoring Programme Walkover Inspection Surveys 2022



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**Scarborough
Borough Council**

November 2022

Scarborough Borough Council

Walkover Inspection Surveys 2022

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
2.1 Overview of Coastal Slope Condition Assessment	4
2.2 Overview of Coast Protection Asset Condition Assessment	4
3 Condition Assessment	9
3.1 Management Unit 4 – Staithes	9
3.2 Management Unit 5 – Jet Wyke	25
3.3 Management Unit 6 - Old Nab to Runswick Bay	26
3.4 Management Unit 7 – Runswick Bay	32
3.5 Management Unit 8 - Runswick Bay to Sandsend	43
3.6 Management Unit 9 – Sandsend	49
3.7 Management Unit 10 – Upgang Beach	54
3.8 Management Unit 11 – Whitby West	55
3.9 Management Unit 12 – Whitby	58
3.10 Management Unit 13 – Whitby East	63
3.11 Management Unit 14 – Widdy Head to Pursglove Styé Batts	68
3.12 Management Unit 15 – Pursglove Styé Batts to Robin Hood’s Bay	69
3.13 Management Unit 16 – Robin Hood’s Bay	71
3.14 Management Unit 17 – Cowling Scar to Peak Steel	80
3.15 Management Unit 18 – Peak Steel to southern end of Beast Cliff	83
3.16 Management Unit 19 – Beast Cliff to Scalby Ness	85
3.17 Management Unit 20 – Scarborough North Bay	90
3.18 Management Unit 21 – Castle Cliff, Scarborough	99
3.19 Management Unit 22 – Scarborough South Bay	109
3.20 Management Unit 23 – Holbeck to Knipe Point	126
3.21 Management Unit 24 – Cayton Bay	130
3.22 Management Unit 25 – Leberston Cliff and Gristhorpe Cliff	142
3.23 Management Unit 26 – Newbiggin Cliff and North Cliff	145
3.24 Management Unit 27 – Filey Brigg	147
3.25 Management Unit 28 – Filey Bay North	150
3.26 Management Unit 29 – Filey Bay	160
3.27 Management Unit 30 – Filey Bay South	168
4. Comparison with Previous Assessment	171
4.1 Coastal Slope Condition Assessment	171
4.2 Coast Protection Asset Condition Assessment	171
5. Problems Encountered and Uncertainty in Analysis	175
5.1 Coastal Slope Condition Assessment	175
5.2 Coast Protection Asset Condition Assessment	175
6. Conclusions and Recommended Actions	175

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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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 Cell 1 Regional Coastal Monitoring Programme commenced in 2008 and is managed by Scarborough Borough Council on behalf of the North East Coastal Group. The programme is 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 seabed 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 2021 - 2027.

The present report is **Walkover Inspection Surveys 2022** and provides a summary of the main findings from the walkover inspections of Scarborough 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 seabed sediment data collection, and aerial photography.

1. Introduction

1.1 Study Area

Scarborough Borough Council’s coastal frontage extends from Staithes in the north to Speeton 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: Scarborough Borough Council study area

1.2 Methodology

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

The walkover inspection surveys for the Scarborough Borough Council frontage were undertaken between March and October 2022. The weather conditions experienced during the inspections were generally fine with no access or visibility problems caused by adverse weather despite some drizzle and light rain 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 (NFCDD) 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.

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.

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2. Overview

2.1 Overview of Coastal Slope Condition Assessment

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

In total 266 cliff behaviour units (CBUs) have been assessed across the region during the 2022 walkover survey, of which Partly Active and Locally Active cliffs are the most common equating to 84% of the total. (Figure 1).

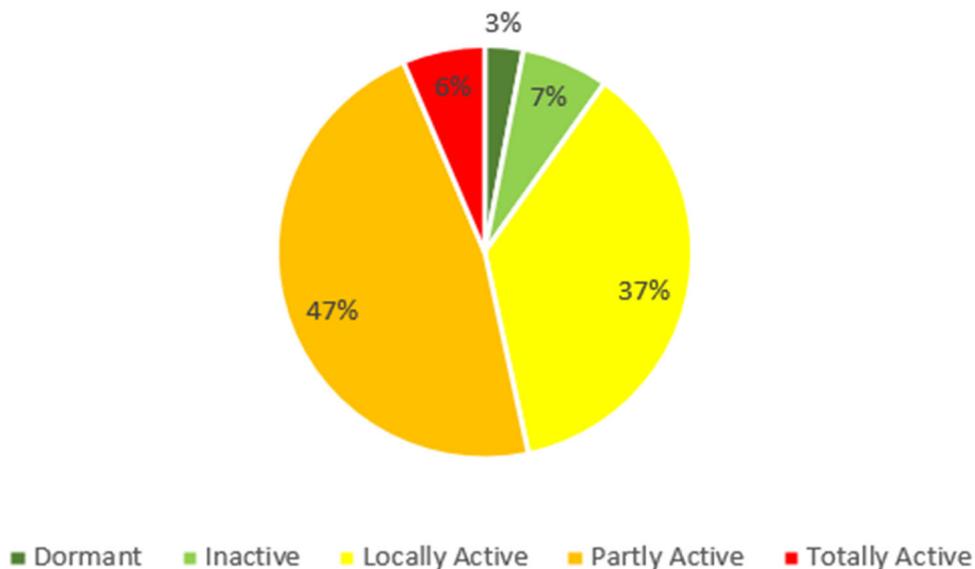


Figure 1 – Cliff activity classification within SBC frontage

The clear majority (approximately 97%) of the 266 units surveyed during the 2022 walkover retained the same activity status as they had in 2020, with only around 4% worsening and less than 1% improving in condition (this was due to the completion of the South Cliff Clock Café stabilisation scheme).

2.2 Overview of Coast Protection Asset Condition Assessment

There is a large number of built coastal defence assets along this stretch of coastline, generally associated with the coastal towns and villages. Many of these assets are in good or fair condition but there is a large number that require minor repair works, a few where more significant works are recommended and several locations where urgent attention to provide further, more detailed, assessments are recommended. The most common works required include blockwork repointing, resealing of joints, reinforcement of undercut sections, repairing cracks and resurfacing.

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

MU4 – Staithes

- The North Breakwater has been undercut on the inner-facing side, perhaps caused or exacerbated by propeller thrust. The sheet piles around the seaward end of the structure are significantly corroded although it is assumed that these are permanent formwork for previous *in situ* concrete pours rather than structural elements.

- Some of the structures extending into the beck as either riverside walls or property walls are locally in poor condition, with notable gaps and voids, despite previous repairs. Vegetation growth at higher levels is likely to exacerbate defects in the masonry.
- Previously identified undercutting of the concrete toe wall was observed where low beach levels exposed a small void locally between concrete and bedrock.

MU7 - Runswick Bay

- Two landslips were identified, one to the north of the defences in the bay and one to the south of the bay.
- There is ongoing erosion of the coastal slopes to the south of the rock armour revetment protecting the car parks and beach access. Surplus rock armour from the Runswick Bay Coastal Protection Scheme was placed in July 2018 continues to provide some protection against outflanking of the revetment. Beyond the rock armour, the slopes should continue to be monitored.

MU9 – Sandsend Village

- A landslip occurred In January 2021 along part of the Cleveland Way located around 400m north of the car park at the northern end of Sandsend. This caused North York Moors National Park Authority (NYMNP) to divert the footpath inland while a temporary and permanent solution is being investigated. This has caused reclassification of this cliff behaviour unit to Totally Active in 2022, pending stabilisation works.
- The concrete sea wall around the car park at the western end of Sandsend has previously shown exposed rebar on the apron which should be re-covered, although was buried by high beach levels during the 2020 inspections.
- The concrete sea wall extending from Sandsend Beck to the east is generally in poor condition. At the time of the 2022 inspections, sand levels were low and revealed much of the timber breastwork and system of concrete-filled barrels used to construct the toe.
- The stepped concrete revetment along the Sandsend Road frontage was constructed in 2015/16 to replace a failing older asset. The defence remains in very good (as built) condition, but with some (structurally insignificant) chipping to the step edges. Outflanking at the eastern end has been noted, but this is now being countered by the placement of large beach boulders. Consistently low beach levels during 2022 revealed a section of the toe beam that had suffered minor displacement, but by the time of the survey (September 2022) this had been repaired and no further defects were observed.

MU11-13 – Whitby

- Whitby West Beach promenade deck has suffered cracking in the past. A programme of capital maintenance was carried out in 2022 to address areas where the deck had cracked or suffered localised displacement, though some sections still require further attention.
- The sea wall sections of West Beach not protected by a fronting rock revetment have extensive abrasion and undercutting. Some affected sections have been covered by a new toe beam, but this does not cover the full extent of defective toe.
- The defences below Whitby Pavilion Theatre remain in poor condition and would benefit from repairs.

- A major capital scheme to refurbish the Whitby Harbour Piers was undertaken in 2018/19. The scheme addressed the structurally significant defects, and no further substantive deterioration was observed during the 2022 survey.
- The quay walls within Whitby Harbour are generally in fair condition, but with some locally specific defects.
- Beach levels between the Fish Pier and Tate Hill Pier are significantly lower than the historic levels, and are reported locally to have been gradually dropping. This has revealed a greater proportion of the foundations of adjacent properties, though significant defects were not observed.

MU16 – Robin Hood’s Bay

- The large vertical defence wall continues to show deterioration with seepage, cracking and outflanking of the northern end now evident. The wall is scheduled for capital refurbishment, though the scheme is currently on hold.
- Outflanking of the rock revetment to the south of the village, caused by activity in the cliff units in this area.

MU20-21 – Scarborough North Bay and Headland

- Overall, the structures in North Bay are in fair condition, but due to their age require ongoing maintenance to infill open joints and cracks.
- The stretch of frontage immediately north of Peasholm Gap, in front of the beach huts, continues to experience high beach levels in 2022, with the beach reaching and overtopping the crest of the seawall in places.
- The asset in the poorest condition is the slipway in front of Oasis Café. A pre-existing large vertical crack on the wingwall has deteriorated and a block is now missing adjacent to the crack. Surrounding blocks appear loose and are at risk of being displaced. Furthermore there was a large open void in the deck of the slipway at the time of the inspection, although it is understood that this was repaired by the Council soon after the inspection. Although the slipway is fenced off it is understood that members of the public still use this as an access.

MU21-22 – Scarborough Harbour

- Overall, the structures are in fair condition and have experienced previous repairs and maintenance works. However, due to their age they require ongoing maintenance to infill open joints and cracks.
- The most notable defects are on the seaward end and outer face of the West Pier, where repairs are recommended.
- The courses along the inner face of the East Pier were also noted as having deteriorated, in particular the lower courses of blockwork, where there is frequent missing mortar, numerous failing repairs and displacement of concrete step units.
- The new RNLI station was completed in 2016 including new lengths of surrounding seawall and remains in good condition.

MU22-23 – Scarborough South Bay

- Overall, the structures are in fair condition, but due to their age require ongoing maintenance to infill open joints and cracks.
- Some capital refurbishment works were undertaken on the Spa sea wall as part of the wider coast protection and slope stabilisation works. Generally, the repairs remained in fair to good condition.
- At the promenade, between the Scarborough Spa and the Clock Tower Café a steel framework has been erected beneath the upper promenade. The condition of the steelwork and associated concrete is fair. However, the promenade structure itself including the upper and lower deck is in poor condition and continues to deteriorate.
- The Scarborough Spa Cliff Stabilisation Scheme commenced in June 2018 and completed in February 2020. The works comprised installation of around 4,500 soil nails from 4m to 20m in length to stabilise shallow slips and installation of around 200 piles from 20m to 35m in length to stabilise deeper-seated slips. Drainage was also installed to help relieve ground water pressure. It was noted during the 2022 inspections that the slopes where the soil nails and piles were installed are now fully vegetated.
- In March 2018, the retaining wall behind the southernmost row of historic chalets on the slope below the Clock Café failed. A capital scheme was completed in late 2020. The works comprised the removal of damaged chalets, collapsed wall and failed slope material, re-grading the remaining slope. Installation of approximately 90 soil nails, installation of high tensile steel surface mesh, installation of drainage and construction of reinforced earth retaining wall using layers of geogrid with integrated concrete blockwork. The works were generally in as-built condition however it was noted that the coping stones along some sections of (non-retaining) wall were loose or missing.

MU24-25 – Cayton Bay

- The repairs to the defences around the public access steps which were undertaken shortly after the 2016 inspection were found to be in fair condition. However, overall, the structures remain in very poor condition and present a potentially significant health and safety risk to members of the public. Higher beach levels in 2022 meant that some of the voids reported in the structure to the south of the pumphouse were not visible.

MU28a-29a – Filey

- The slipway at Filey sailing club was in fair condition with previous undercut sections having been repaired. However it was noted that there was evidence of further voiding and undercutting. The scour hole at the north end of sheet pile defences has been repaired. The sheet pile wall is missing some sections of concrete coping at its northern end.
- The main sea wall defences through the town remain largely unchanged since 2020. The structures show evidence of significant maintenance and repair works over recent years, but ongoing maintenance work is required due to the age of the structure. The abrasion to the lower courses of blockwork does appear to have worsened locally, with water noted to be seeping out in places. Some of the drains were exposed by low beach levels, where visible they were typically blocked with sediment.
- A short section of rock revetment, with gabion baskets beneath, is located at the southern end of the sea wall near Martin's Gill. A depression in the crest of this structure suggests movement of the cliff behind, although this has not worsened since 2020. It was noted that gabion baskets at the southern end of the revetment have split, although there did not appear to have been any immediate impact on the stability of the rock armour. The coastal slopes behind the revetment

still appear to be active and some form of improved outflanking defence remains necessary in the medium term.

- The Flat Cliffs emergency works were completed in 2018. During the 2022 inspection it was noted that the toe of the cliff has continued to retreat and left the sub-horizontal drainage pipes exposed along the full length of the works. In many places, the drains have come separated at their terminal end. It was noteworthy that several of the drainage pipes were discharging water at the time of inspection suggesting they are still operating as expected.

3 Condition Assessment

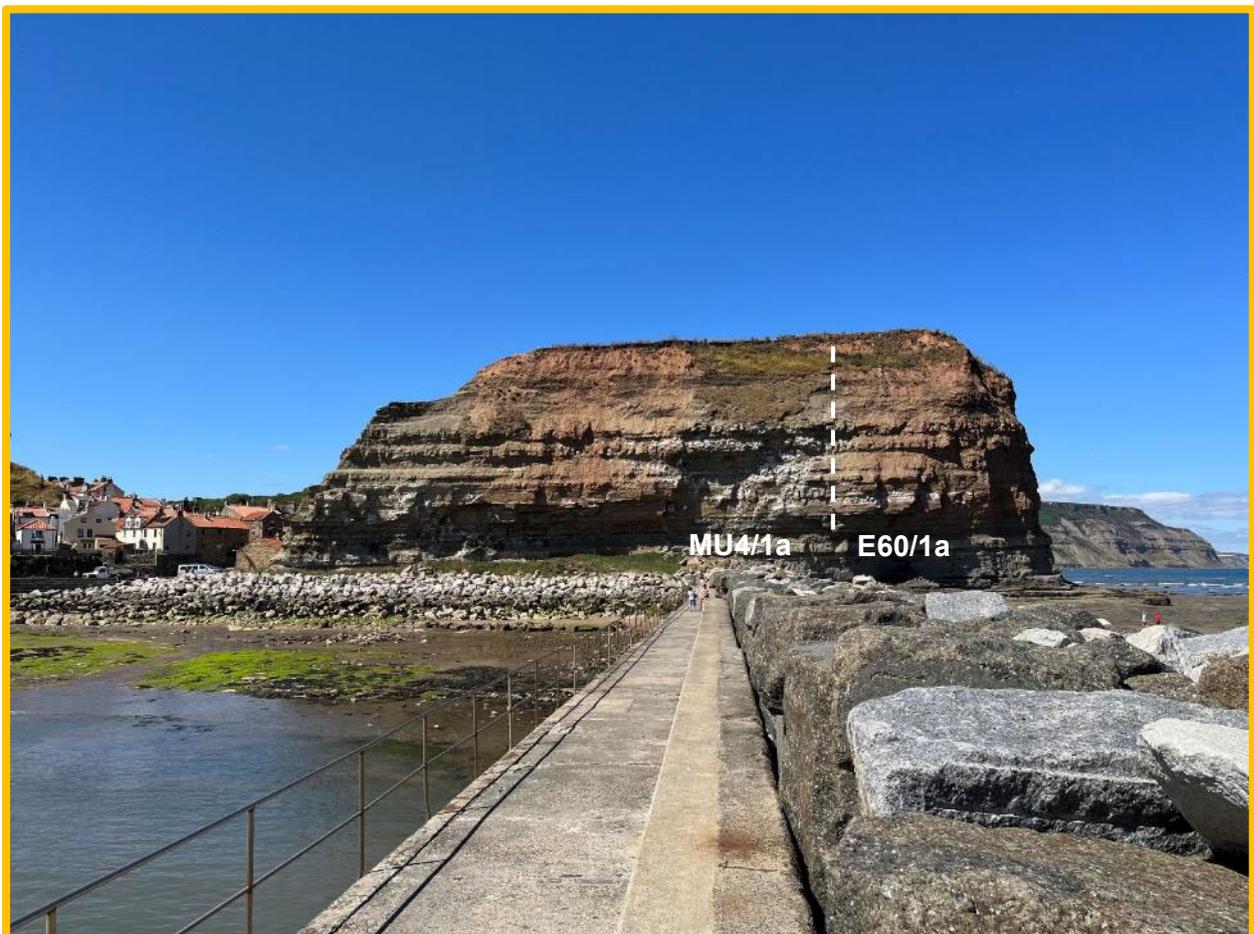
3.1 Management Unit 4 – Staithes

Coastal Slope Condition Assessment

This Management Unit comprises the high cliffs of Cowbar Nab composed of sandstone and those behind and immediately to the east of Staithes composed of sandstone overlain by ironstone, all fronted by a rock platform.

The eastward facing cliff of Cowbar Nab (MU4/1a and E60/1a) is steep and composed of unvegetated sandstone. The cliff exhibits overhangs and scars with some rock falls at its base. This level of activity means that these units are classified as Partly Active, unchanged from 2020. During the survey, significant bird activity on the cliff face was causing small sized material to fall from the cliff. Signage is present to warn people of the danger of falling rocks.

Unit MU4/1b is the south facing side of Cowbar Nab which runs adjacent to the north bank of Staithes Beck. This sandstone unit is sheltered from wave action behind the harbour walls. The cliff fails occasionally, e.g. January 2021 when following heavy rainfall and storms cliff material and vegetation slipped to the rear of Aunt Annie’s Cottage and is therefore classified as Locally Active, unchanged from 2020.



East-facing Cowbar Nab. E60/1a (right) and MU4/1a (left). Partly Active in July 2022



East-facing Cowbar Nab. MU4/1a. Partly Active in July 2022

Unit MU4/2 is located behind Staithes Harbour. This sandstone cliff is well vegetated with small localised slumps and is classified as Locally Active, unchanged from 2020.

Further east, beyond the extent of Staithes Harbour is unit MU4/3. The cliffs are steep and the unvegetated sandstone is exposed to wave action at the toe. The unit is classified as Locally Active.

During July and August 2018 some high-profile incidents of cliff activity occurred along the coastline within the north of the borough, including the collapse of a section of cliff to the east of Staithes on 8th August, where tragically a young child was killed. These units are classed as Locally Active and as such are expected to experience some localised occurrences of activity and indeed there are warning signs erected on the cliff face and the approaches to the foreshore to this effect. Despite the signage, on the day of the survey (as on the day of the 2020 survey), people were observed in close proximity to the bottom of the cliffs. This is likely to remain an issue in this area, particularly with children due to the “interesting” cliff face (caves/cracks etc.) which is easily accessible from the popular beach.



MU4/2 Locally Active in July 2022



Accumulation of small stone fallen from above.
MU4/2 Locally Active in July 2022



“Interesting” cliff face **MU4/2** Locally Active in July 2022



MU4/3 Locally Active in July 2022

Coast Protection Asset Condition Assessment

Upstream of the Staithes Beck footbridge, there are two areas of repair which were completed in 2013 and appeared to remain in good condition. These areas do not constitute coast protection assets in the present inspections but are included here for wider interest.



North bank: Works completed in 2013 to repair collapsed cliff (no asset ref)



South bank: Stone-filled gabion baskets constructed in 2013 to repair collapsed wall (no asset ref)

The lower rails of the guardrails crossing the footbridge were observed to be significantly corroded and the steel tubes had rusted through locally.



Footbridge – significant corrosion of bottom rail (no asset ref).

At Staithes Harbour, the breakwater arms were protected in 2002 through the placement of 5-8 tonne rock armour on the seaward side. This acts to provide a greater defended height and to dissipate wave energy from the breakwater surface. Stainless steel handrails and a new concrete topping, cast over the original outer breakwater, added further height to the structures.

The North Breakwater (0402C01) is in fair condition overall, but certain elements are poor. The rock armour added in 2002 to the seaward face and extending around the seaward end of the breakwater mostly remains in Good condition, tightly packed and maintaining a consistent profile, however two crest blocks are missing (approx. 30m from landward end and approx. 10m from seaward end). There appears to have been some historic movement of rock armour at the eastern extent of the structure where a gap/low spot in the armour at crest level appears to coincide with high block(s) at the toe. This has been observed previously over a number of surveys and the rock armour appears stable. Steel handrails are in good condition throughout.

Local abrasion and spalling of the concrete cap/crest along the southern edge may present a health and safety risk as the size of the gap between the bottom rail and the crest is increased locally in combination with a potential trip hazard due to uneven surface of the deck. Although dry during the 2022 inspection, it was evident that some areas would lead to ponding of surface water (as observed in 2020) which leaves them susceptible to freeze-thaw action. On the inside face of the breakwater, construction joints/cold joints appear to be opening locally, however there was no significant visual change since the 2020 inspection.



Rock armour revetment on seaward face of North Breakwater (/0402C01)



Corroded steel sheet piling on inner face of North Breakwater. Rock armour profile appears similar to 2020 inspection (/0402C01)

The sheet piling on the inner face and the seaward end of the breakwater is heavily corroded with significant loss of section in the uppermost 2m. It is assumed that this sheet piling served as formwork for *in situ* concrete pours rather than a standalone structural element.

Thirty metres from the landward extent of the structure, the deck splits into two levels, with the lower level having cracking and abrasion locally. There is also abrasion, significant in localised patches, and rust-staining along parts of the inner-facing edge of the North Breakwater's deck and wall. The eastern-most sixty metres, (beyond the first elbow) is more significantly affected as the wall is of thinner section over this length (appears not to have received a more recent concrete cladding as per the landward section of the structure).

Twenty metres from the eastern end of the breakwater there is a crack which runs the full width of the deck and the full thickness of the crest wall suggesting a previous global movement. The crack has previously been filled with sealant, however this has now largely been washed-out/lost. The dimensions and extent of the crack has not changed significantly since the July 2018 inspection.

Undercutting / opening of a construction joint along the inner-facing side of the North Breakwater wall was previously reported in 2016 and 2018 inspections although water levels in 2020 and 2022 prevented observation of the same, with the exception of the landward extent of the structure. The undercutting appears to affect the outer concrete cladding of the structure.

The concrete access ramp and baffle units at the landward extent of the structure are in good condition. Several smaller rock armour units have fallen/washed onto the ramp but there is no sign of damage and any significant detriment to performance of wider revetment is not expected.



Cracking and abrasion in deck and crest wall (/0402C01).



Damage to base fixings of life-ring mount (/0402C01).



Crack, abrasion and rust staining of crest wall (/0402C01). No significant change from 2020.



Significant corrosion / loss of section of sheet piles (/0402C01).



Rust staining and opening of construction joint on inside face of structure (/0402C01)



Abrasion to deck along inside edge of structure (/0402C01)



Inside face of breakwater structure (/0402C01)



Detail on potential undercutting (left) and opening of construction joint (right) (/0402C01)

The rock armour revetment running south from the North Breakwater to the end of Cowbar Lane (/0402C02) was constructed after the 2002 upgrade to the main breakwaters and is generally in good condition. The crest level at the northern extent appears to be slightly lower, exposing the concrete walkway to the rear. It is not clear if rock armour has been displaced or if the revetment has undergone a larger scale movement/settlement although this area appears very similar to 2018 and 2020 so assumed to be stable. The short section of seawall which is exposed at the southern end of the rock armour, adjacent to the slipway, is in fair condition, with evidence of local abrasion of the vertical faces and the crest, and cracking and open joints between concrete blocks.



Lower crest level at northern extent of rock revetment (/0402C02) Southern extent of rock revetment (/0402C02)

The defences that extend into the northern side of Staithes Beck are split into two asset lengths (/0402C03 and /0402C06), with the intersection at the west side of the RNLI slipway. The eastern section (/0402C03), which is in fair overall condition includes the slipway with gabion baskets beneath and a vertical concrete wall to the rear, tapering into a stone blockwork wall at the landward end of the slipway. High beach levels and vegetation cover largely obscured the gabions however the visible sections suggested these remain in a fair condition despite some potential settlement indicated by variation in crest levels. A timber and masonry training wall structure was largely obscured by vegetation. Small voids were visible, however there were no visual signs of global movement/distress. The masonry wall is in poor condition along its length, with open joints between blocks and one local void caused by a missing block. This void is now approximately 1m deep and 1m below retained ground level. As this area can be loaded by vehicles, it may be prudent to fill this void to avoid further deterioration potentially extending to the surface. Masonry has continued to erode since the 2020 survey, leaving the mortar of previous repointing standing proud. The concrete wall to the rear of the slipway appears in fair condition along its landward section, but in poor condition further seaward with longitudinal cracks and cold joints evident.



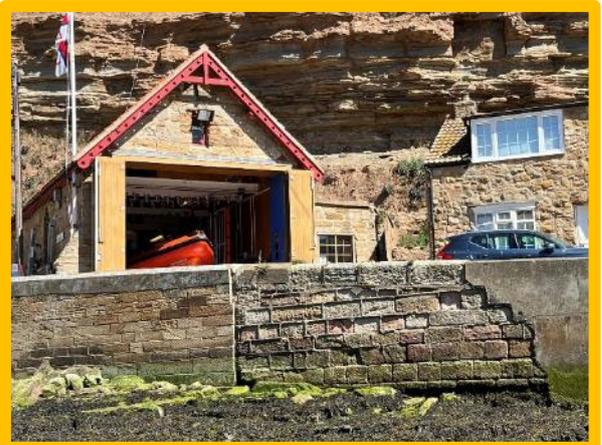
Poor condition masonry wall to rear of slipway (/0402C03)



Missing blockwork in masonry wall to rear of slipway (/0402C03)



Cracks and cold joints in concrete seawall to rear of slipway (/0402C03)



Potential void beneath un-rendered section of masonry wall (/0402C03)

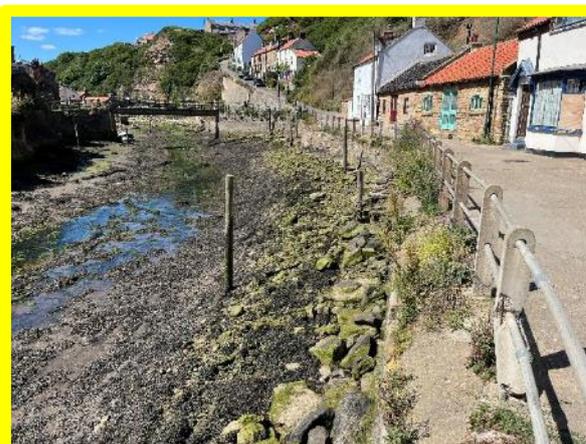


*High beach levels beneath slipway.
Timber training wall structure to left of image (/0402C03)*

The walls between the RNLI slipway and the footbridge over Staithes Beck (/0402C06) comprise a variety of masonry and concrete blockwork structures and are generally in a fair condition, reduced to poor condition locally with missing mortar, settlement of blockwork and exposure of the toe (previous small boulder sized rock appears to have been largely washed away). The more recently constructed wall immediately in front of the RNLI building is in good condition, however there is a void beneath the un-rendered, older stonewall close to the interface with the newer wall which could compromise overall stability if voiding occurs behind. The external dimensions of this void do not appear to have increased since first reported in 2016.



Wall on northern side of beck (missing blocks, open joints and voids) (/0402C06)



Vegetation growth along crest and into joints in upper part of wall face. (/0402C06)

On the south side of the beck, a variety of wall construction details extends from the footbridge over Staithes Beck (/0402C04). There is evidence of previous repairs, with the overall condition of the asset generally fair, locally this reduces to poor, with sections of open joints, loose blockwork, abrasion, cracking and vegetation growth.



Variety of masonry and concrete walls. Vegetation growth locally (/0402C04)



Open joints and loose masonry blocks locally (/0402C04)

The walls continue as a series of masonry blockwork walls, often exterior walls of private properties (/0402C22), which continue to display visible loss of mortar causing open joints and missing blocks and vegetation growth locally. It is recognised that some previous repairs have been undertaken, but deterioration continues. Undercutting of the toe has previously been reported in several locations, exposing timber piling, this was not observed during the 2018 and 2020 inspections due to high beach levels. During the 2022 survey, a 2m long, 100mm tall, 300mm deep void between the concrete toe wall and the foreshore rock was observed approximately mid-way between the slipway and groyne structures.



Cracking and open joints locally (/0402C22)



Cracking and open joints locally (/0402C22)



Undercutting of concrete wall – partially visible in (/0402C22)

The masonry blockwork side walls to the slipway (/0403C05), are in poor condition, with missing blocks, open joints and undermining at the toe, more apparent at the lower elevations at the seaward extent of the structure. Some of the open joints are in an area of previous repair and need re-filling to prevent further deterioration. A void at the interface between the concrete abutment of the seawall fronting the Crab and Lobster and the south face of the slipway remained visible with a similar appearance to that observed in 2020.



North face of slipway (I0403C05)



South face of slipway (I0403C05)



Void at interface between sea wall and south face of slipway (I0403C05)

Whilst repairs and improvements have previously been undertaken to the sea wall west of the Cod & Lobster (I0403C05), the wall remains heavily abraded and cracked in places, although generally in fair overall condition. There is notable cracking and loss of render at the interface between adjacent seawall sections. The concrete groyne (I0403C07) limiting sediment movement within the harbour is in fair condition.



Concrete groyne (/0403C07)



Concrete sea wall in Fair condition (/0403C05)



Abrasion and cracking to seawall face and crest at interface between different wall sections (/0403C05)

The seawalls extending to the Staithes Harbour Office (/0403C01 and /0403C02) are in fair condition, with previous repairs to cracks holding well. However, there is one full height vertical crack at the interface of adjacent wall sections which needs re-filling. This was reported in the 2018 and 2020 inspections and does not appear to have deteriorated significantly although has widened/opened slightly, more apparent in the lower section of the wall. The slipway and adjacent boat storage area at Staithes Harbour Office remain in good condition.



Concrete access steps (/0403C02)



Concrete seawall (/0403C01)



Slipway and access steps at Staithes Harbour Office (/0403C05)



Slipway and access steps at Staithes Harbour Office (/0403C05)

The inner harbour concrete breakwater (/0403C04) remains in good condition. A crack was observed at the crest on the inside/south face. At approximately mid-length, a crack extends the full width of the in-situ deck and aligns with vertical cracks in the walls however these appear to be historic and do not suggest continued global movement/displacement, with no apparent changes from 2020 inspection. Steel guardrails appeared to be in good condition.

The main South Breakwater of Staithes harbour (/0403C03) is also in good overall condition, although there is minor abrasion and spalling at the access steps and around construction joints and one local area of cracking at the edge of the deck and wall on the lower (inner-most) deck of the structure. This may have been caused by an impact from a vessel (noting local deformation of guardrail tube). This defect has worsened slightly since 2018 inspection as more loose concrete has been washed out. Steel guardrails generally appeared to be in good condition.

The majority of expansion joints in the concrete structure are missing flexible sealant and where sealant is present, this is cracked/brittle.



Inner harbour concrete breakwater (/0403C04)



Inner harbour concrete breakwater (/0403C04)



Local abrasion, cracking and spalling inside face of South Breakwater (/0403C03)



Brittle/missing flexible sealant from expansion joints (/0403C03)



2020 - Local damage. Cracking and loose concrete to crest of South Breakwater (/0403C03)



2022 – local repairs underway (/0403C03)

The rock armour revetment appears to be in good condition with generally consistent crest level and slope profiles. Several smaller rock armour pieces appear to have been lifted/displaced and are sitting on top of the larger armour and four small rock armour pieces are located on the concrete crest (outer limb of the structure) having been displaced from the rock armour crest. There is no apparent damage to the concrete crest and the absence of these units will not be of significant detriment to the performance of the wider revetment. No significant change from 2020 inspection. The rock armour fillet between the two breakwaters has several blocks displaced locally and sitting slightly seaward of most of the rock however the defence is generally in good condition.



Displaced rock armour on concrete crest (/0403C03)



Rock armour on East face of breakwater (/0403C03)

3.2 Management Unit 5 – Jet Wyke

Coastal Slope Condition Assessment

Jet Wyke forms the embayment between Penny Steel and Old Nab and consists of unit MU5/1, which remains classified as Partly Active in 2022. The lower slopes of the cliff are very steep, unvegetated and subject to gradual marine erosion. Evidence of several small-scale local failures, most recent of which appearing towards the northern extent of the CBU. The upper cliff is composed of softer material and supports some vegetation cover, with evidence of small-scale local slumps.

At the eastern extent of the unit is the western side of Old Nab, a headland composed of highly weathered shales with sparse vegetation cover. This unit has not changed activity status and remains as Partly Active in 2022.



MU5/1 Partly Active in July 2022.



***Extensively weathered headland at Old Nab
MU5/1 Partly Active in July 2022.***

Coast Protection Asset Condition Assessment

There are no coastal defence assets within this Management Unit.

3.3 Management Unit 6 - Old Nab to Runswick Bay

This Management Unit consists of three Sub-management Units; MU6A – Brackenberry Wyke, MU6B - Port Mulgrave; and MU6C – Lingrow Cliffs.

MU6A – Brackenberry Wyke

This Sub-management unit consists of unit MU6/1 only.

This section of cliff line remains classified as Partly Active in 2020, unchanged since 2012. The northern extent of MU6/1 forms the eastern side of Old Nab, characterised by steep slopes with no vegetation cover. Further south in the bay, some vegetation is supported on the upper slopes with exposed shales lower down showing evidence of on-going erosion. Marine erosion is cutting into the stratified rock at the base of the cliffs.



Looking south across Brackenberry Wyke. MU6/1 Partly Active in July 2022.



Looking south across Brackenberry Wyke. MU6/1 Partly Active in July 2022.

MU6B – Port Mulgrave

This Sub-management unit consists of units MU6/2 to MU6/5.

Units MU6/2 (debris lobe), MU6/3 and MU6/4 (coastal slopes) all show evidence of localised instability but also are substantively vegetated and therefore remain classified as Locally Active in 2022.



MU6/2 Locally Active in July 2022.



Steepest slopes with no vegetation cover and evidence of minor local activity. MU6/3 Locally Active in July 2022.

In early 2016, a large landslide occurred within unit MU6/5, rendering the public footpaths unsafe. As a result, the public footpaths in Unit MU6/4 and MU6/5 were temporarily closed by the North York Moors National Park Authority. By the September 2020 survey, the footpaths had been reopened, with addition of some access steps. A landslide occurred in January 2021 following heavy rain and freezing temperatures, leaving the foot of the steel steps suspended 1.5m above ground level and cutting off access to the foreshore. The steel structure appeared to be in good condition with no visual indication of displacement. Temporary barrier/roping off the steps was evident in July 2022, however evidence suggested that these measures were bypassed by visitors.



“Unauthorised” access route to foreshore within MU6/4 July 2018.



Upgraded access route within MU6/4 September 2020.



Landslip at foot of steps MU6/4 July 2022.



Temporary barrier at foot of steps MU6/4 July 2022.

There is a lack of evidence of significant continued activity other than minor changes in the size of debris fan and a reprofiling of the toe section of the failure and this unit remains as Partly Active in July 2022.



MU6/5 – View of the landslide looking across Port Mulgrave from west to east (Partly Active in September 2020).



MU6/5 – View of the landslide looking across Port Mulgrave from west to east (Partly Active in July 2022).

MU6C – Lingrow Cliffs

This Sub-management unit consists of units MU6/6 to MU6/8.

Unit MU6/6 forms the northern part of the Lingrow Cliffs. The upper slopes support some vegetation cover while lower slopes are actively eroding. A debris fan from a localised rock fall observed in the 2018 survey remained largely unchanged. The unit continues to be classified as Partly Active in 2022 due to cracks/fractures in the upper material and evidence of rock falls.

MU6/6 – Localised rock fall (Partly Active)



MU6/6 – Localised rock fall and debris fan, Partly Active in September 2020.



MU6/6 – Localised rock fall and debris. Partly Active in July 2022.

Unit MU6/7 forms the central part of this Sub-management unit and consists of a large relict debris run-out lobe. The cliff is well-vegetated with only localised activity at the toe. It remains classified as Locally Active in 2022, unchanged since 2002.



MU6/7 – Vegetated run-out lobe, Locally Active in July 2022.

Unit MU6/8 is located north of the hard defence of the Runswick Bay seawall and rock armour. The main bulk of the cliff is mudstone capped by sandstone. The main mudstone part of the cliff is vegetated in its upper part and is eroding in its lower part with debris fans splayed across the toe and occasional rock falls at the base. The sandstone top is a near vertical unvegetated cliff. The activity in the mudstone cliff means the unit is classified as Partly Active in 2022, unchanged since 2002.



MU6/8, Partly Active in September 2020.



MU6/8, Partly Active in July 2022, recent activity indicated



MU6/8 Recent slope failure north of Runswick defences.



MU6/8 Recent slope failure north of Runswick defences.

Coast Protection Asset Condition Assessment

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

MU6B (MA20) – Port Mulgrave

The jetty of the former port and ironstone mine at Port Mulgrave has been derelict for many years and is considered to be redundant. Virtually all coastal defences have been lost to the sea. What is left of the southern breakwater is undergoing large scale cracking, deformation, undercutting and outflanking and failure of more recently added gabions. It is estimated that more than half of its original length has now been eroded. The rate of deterioration appears to have slowed as the remains of the structure appeared very similar to observed in 2018 and 2020 (\0502C01).



Dilapidated asset in 2020 (\D0502C01)



Dilapidated asset in 2020 (/D0502C01)



Dilapidated asset in 2022 (\D0502C01)



Dilapidated asset in 2022 (/D0502C01)

3.4 Management Unit 7 – Runswick Bay

Runswick Bay is a deep, wide bay located between mudstone headlands to the west (Cobble Dump) and east (Kettle Ness). The bay has a sand beach in its western two-thirds where the backing cliffs are composed of glacial till at sea level. Further to the east the beach gives way to a rock shore platform where the backing cliffs are mudstone. The village of Runswick Bay is protected by concrete seawalls and rock revetments.

This Management Unit is divided into two Sub-management Units; MU7A – Runswick Bay Village and MU7B – Runswick Sands.

MU7A – Runswick Bay Village

This Sub-management Unit consists of units MU7/1 and MU7/2.

Unit MU7/1 includes Runswick Bay village and the adjacent glacial till slopes. It is well vegetated and defended at the toe by seawalls and rock armour. This unit is classified as Dormant in 2022, unchanged since 2018.

Unit MU7/2 occupies the area adjacent to and south of Runswick Bay village. It is well vegetated glacial till and defended at the toe by rock armour. The southern extent of the existing revetment was strengthened in July 2018 using surplus rock armour from the Coastal Protection works. A rock armour fillet was extended for approx. 30m to the south along the toe of the coastal slopes. There is evidence of minor shallow slumps to the southern extent of Unit MU7/2 and therefore it is classified as Locally Active in 2022, unchanged from 2020.



Slopes of Runswick Bay village. MU7/1 Dormant in July 2022.



MU7/2 Locally Active behind rock armour fillet in July 2022.

MU7B – Runswick Sands

This Sub-management Unit consists of units MU7/3 and MU7/4.

Unit MU7/3N is adjacent to and south of the southern end of Runswick Bay sea defences and comprises glacial till forming a landslide complex down to beach level. A rock armour fillet was formed along the toe of the slope over a length of approximately 30m south of the existing revetment using surplus (8-10 Tonne) rock from the Coastal Protection works (July 2018). The cliff slope is relatively shallow and well vegetated, and erosion is occurring along the active toe. Beach levels were higher than during the 2020 survey, particularly around the rock armour and this will offer some protection to the toe, however mudslides and shallow slumps are evident at the top of the beach, and the unit retains the 2018 grading of Partly Active in 2022.

Unit MU7/3S is located to the south of the access to the sailing club boat storage area and is of a similar geomorphology to unit MU7/3N, however the till is well vegetated almost to beach level. Single layer of rock armour (<500kg) used to protect slope at the mouth of the river. Smaller cobbles/beach material also appears to have been used but has been displaced. There is little evidence of significant activity at the toe, and so is classified as Locally Active, the same as 2018.



MU7/3N foreground and MU7/3S background.



Active toe of till cliffs in Runswick Bay. MU7/3N Partly Active in July 2022.



*Well vegetated till in Runswick Bay. **MU7/3S** Locally Active in July 2022.*

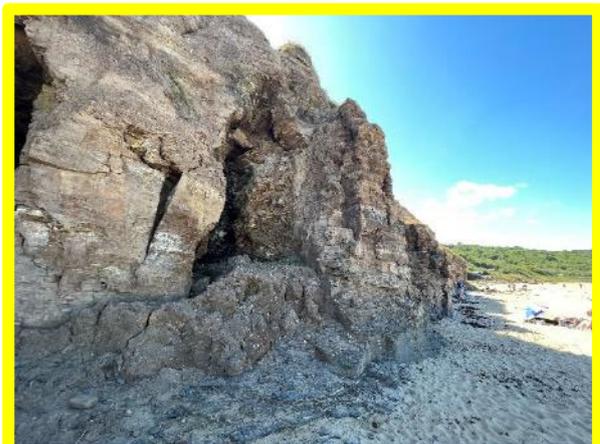


*Localised scour around pill box **MU7/3S**, Locally Active in July 2022.*

MU7/4 consists of a steep unvegetated cliff toe composed of mudstone, behind which are shallower well-vegetated, mid-to-upper slopes of till with local slumping. The cliff toe is generally steep, and several small caves are evident at the northern extent. The caves do not appear to have changed significantly since the 2018 and 2020 inspections. The unit remains classified as Locally Active.



*Caves in mudstone cliffs. **MU7/4** Locally Active in July 2022*



*Caves in mudstone cliffs. **MU7/4** Locally Active in July 2022*

MU7A – Runswick Bay

Properties in the north of Runswick Bay are protected by sea wall defences, while rock armour revetment extends around the toe of the cliffs further south in the village to reduce the risk of landslips. Capital works were undertaken between March and July 2018, comprising the construction of the Runswick Bay Coastal Protection Scheme. Enabling works were completed by Yorkshire Water in 2017, comprising the realignment of a combined sewer on the foreshore, to run immediately in front of the seawall. The sewer is now buried beneath the rock armour.

The Coastal Protection Scheme comprised installation of concrete toe protection and local repairs to the existing masonry seawalls and prior to the construction of a rock armour fillet at the toe to protect the seawall over approximately 250m length of frontage (from the Yorkshire Water pumping station to approximately 15m North of the Upgarth Hill / Cauldron Cliff seawall with breaks for public access and the Runswick Beck). The scheme incorporated a new set of reinforced concrete access steps through the rock armour.

Existing foreshore rocks were placed against the toe rocks of the new structure to allow seeding of the new rock armour and to encourage fast colonisation of vegetation/fauna. Environmental enhancement was provided through increasing the textural complexity of the granite rock armour blocks by cutting artificial rock pools and grooves into selected rocks to encourage the colonisation and survival of intertidal species.

Surplus rock armour was placed at the southern end of the existing rock revetment protecting the car parks (/0602C01), over a length of approximately 30m. This rock acts to protect the high-tide beach access ramp and to reduce the risk of outflanking of the revetment and excessive erosion of the coastal slopes to the south.



Rock armour fillet at toe of existing seawall, seed rocks seaward of toe as constructed, July 2022.1

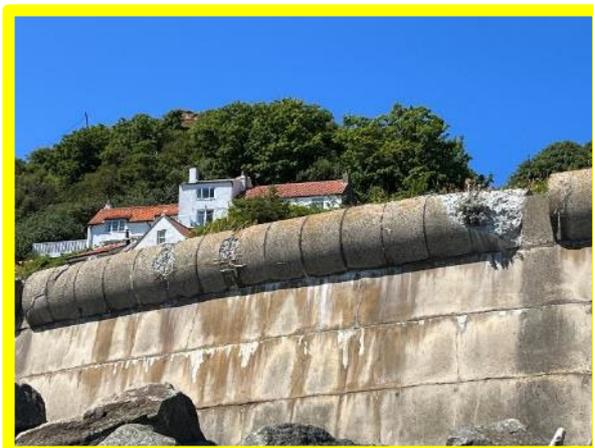


Artificial rock pools – ecological enhancement at the toe of the new rock armour fillet.

The rock armour revetment remains in Very Good condition. The typical detail is a minimum 3.5m wide crest and a 1:3 slope profile to toe rocks which are placed in a trench excavated 0.5m into the bedrock. The foreshore had recovered, and beach levels were similar to those observed in the 2020 inspection. The rock armour retains a consistent seaward slope profile and crest height, with good interlock between armourstone pieces.

The 2018 wall repairs focused on repairing abrasion at the toe of the wall and did not address the previously reported issues in the upper sections of the seawall which remain in 2022.

Above the rock armour fillet, the northernmost sea wall (/0601C01) is suffering from heavy surface abrasion on its facing, cracking and spalling to the concrete coping and wash-out of the joints under the coping along most of its length. The flexible sealant in the expansion joints between the capping beam and the deck slabs and separating the deck slabs is brittle and washed out across most of the structure. The joints are open to around 20mm width and there is minor differential settlement between slabs. Vegetation is present in some of the joints. The defects did not appear to have significantly worsened from the 2020 inspection.



Abrasion and cracking of concrete coping (/0601C01)



Loss / wash-out of mortar beneath coping. Local abrasion (/0601C01)



Open expansion joint with vegetation growth (/0601C01)

Surface cracking/abrasion (/0601C01)

Moving south, the protruding section of wall (/0601C06) protecting the thatched cottage is in fair condition. Previously identified cracks in the concrete wall and toe apron were repaired and the masonry wall repointed locally prior to the placement of rock armour in 2018. These repairs are holding well in 2022.

Cracks in the upper masonry seawall were filled and the wall repointed locally with marine mortar. The bag work and mass concrete structures to the rear of the rock armour and moving up the Runswick Beck are generally in Fair to Poor condition with cracking and open joints, with no significant deterioration from 2020 survey, although more vegetation growth was evident. The Thatched Cottage has significant cracks running the full height of the gable end, with no significant visual change observed from the 2018 inspection.



Variety of concrete bag work and in situ concrete pours at Runswick Beck (/0601C06)



View on Runswick Beck along redundant YW outfall (/0601C06)

The main length of masonry sea wall below the properties (/0601C03) is in good condition. Previous repair work to masonry wall are evident, particularly at the crest where a range of materials including concrete, brickwork and cobbles have been used to fill voids or replace missing blocks. The masonry wall was repointed with marine mortar during the 2018 works.

In this section, the rock armour crest detail was modified locally to accommodate access to two existing Yorkshire Water rodding eyes from the crest of the seawall. Smaller rock armour pieces are

placed to surround the raised concrete platform and pipework. No significant displacement of rock was observed and the rodding eyes still accessible in 2022.

A set of 2.5m wide reinforced concrete access steps (three flights and two landings) was installed, centred on the location of the previous narrow access steps which were backfilled with mass concrete. SBC installed handrails shortly after the 2018 inspection. The rock armour detail is modified locally to tie into the steps (higher crest, rocks down profile above step tread level). The steps and rock armour locally appeared in Good condition.

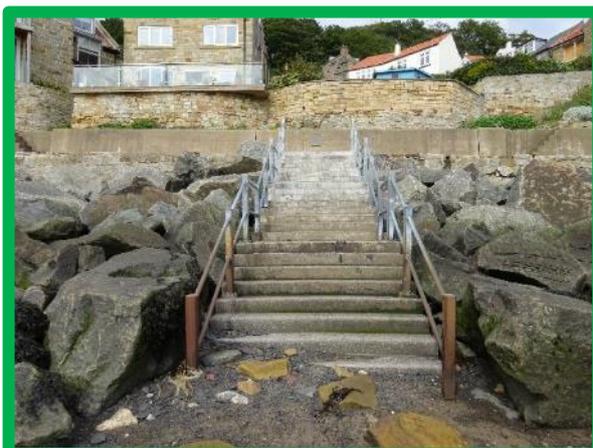
The concrete deck and crest wall above the rock armour and seawall are generally in fair condition with evidence of previous repairs locally which are holding up reasonably well. The flexible sealant in the expansion joints is brittle and missing in places. The structures at the foot of the slope comprise masonry retaining walls/property walls which vary from Good to Fair condition. Minor cracking, open joints and recessed mortar were observed locally.



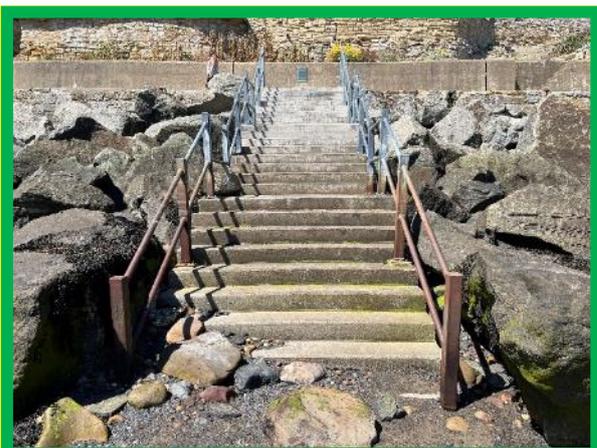
Concrete crest wall (retaining wall and property walls) (/0601C03)



Brittle/missing sealant in expansion joints (vertical and horizontal). Vegetation growth locally. (/0601C03)



September 2020 Reinforced Concrete access steps (/060C03)



July 2022 reinforced concrete access steps, railings added August 2018 (/060C03).

To facilitate access during the construction of the Coastal Protection Scheme, the concrete breakwater or groyne (/0601C02) to the north of the pumping station was broken out over approximately 10m length, centred on the elbow/bend of the structure. This work identified the construction detail of the breakwater as mass concrete/boulder core with a concrete outer casing (walls and crest) with minimal reinforcement (mesh and dowels locally). Upon completion of rock

armour placement, the breakwater was reinstated through casting mass concrete. On the western face at the inside of the elbow a joint can be seen – this was a later concrete pour undertaken to correct a misalignment in the shutters during the initial concrete pour.

Whilst the new concrete is in Good condition and local repairs/filling of cracks and voids were also carried out in the original concrete at the tie-ins, overall the structure remains in Poor condition due to significant abrasion of concrete, opening of the construction joint between wall and crest concrete and potential undermining of the seaward end (observed in 2018, however not observed in 2020 and 2022 as obscured by higher beach levels).

The landward section of the breakwater (approx. 4m from seawall on crest and 10m from seawall on either side) is covered by rock armour.



Significant abrasion of concrete. Opening of joint between wall and crest concrete – largely obscured by vegetation (/0601C02)

High beach levels obscuring undercutting identified in 2018 (/0601C02)

The sea wall around the Yorkshire Water pumping station comprises masonry cladding to a reinforced concrete structure with concrete toe protection and is in Good condition (/0601C07), with minor loss of mortar locally. Immediately to the north of the pumping station, Yorkshire Water raised the existing manhole chamber to match the crest height of the seawall to ensure the chamber was accessible after the construction of the rock armour fillet. The mass concrete surround (to precast concrete manhole rings) is in very good condition as is the new edge protection/handrailing installed at the crest. The rock armour fillet incorporates a break to allow access to the existing steps and then runs to its easternmost extent at which point it ties into the former lifeboat slipway. The two exposed ends of rock armour are in good condition with no evidence of displacement and the access to the steps remains clear. Beach levels are higher than 2020 survey, now burying a significant proportion of the rock armour.



Break in rock armour fillet at pumping station (/0601C07)



Pumping station and raised manhole chamber (/0601C07)

South of the pumping station, the defences comprise the slipway of the former lifeboat station which is generally in Fair condition with abraded concrete piers and severely corroded steel edge protection. The timber decking was generally in good condition. The Runswick Rescue slipway features open joints and cracks in the concrete to the exposed face but overall, the structure appeared in Fair condition. The concrete forming the boat storage area and the access ramp in front of the café is in Good condition with only minor local defects such as abrasion on exposed edges at construction joints, minor cracking and loose timbers/steps. A minor longitudinal crack was observed in the centre of the top two concrete panels of the access ramp.



Former lifeboat slipway. Beach levels and seaweed largely obscure previous repairs/concrete pours at the toe (/1003C04)



Open joints / cracks in Runswick Rescue slipway (/1003C04)



Boat storage area (/1003C04)



Concrete access ramp (/1003C04)

The rock armour revetment (/0602C01) remains generally in Very Good condition, with the rocks tightly packed with no significant voids and consistent crest level and seaward slope profile.

The high-level beach access ramp (facilitating access during high tides which cut off the main concrete slipway) was refurbished in July 2018. Surplus rock armour from the CPS works was placed along the seaward edge of the ramp and forming a fillet at the toe of the previously undefended cliffs to the south over a length of approximately 30m with the aim of mitigating the risk of outflanking.

The large rock armour units to the seaward side of the access ramp remain in situ and continue to provide protection to the ramp and the toe of the coastal slope. The surface of the path appeared to have recently been dressed with smaller stone and sand (an activity understood to be carried out periodically by SBC).



Rock armour revetment (/0602C01)



High level access ramp (/0602C01)

MU7B – Runswick Sands

The Sailing Club is located in the bay some 600m south of the village, where the beach is wider. It has been constructed on timber struts and features a mix of coastal defences (/0602C05).

A number of boulders and concrete blocks are present in front of a timber sleeper retaining wall defences. This defence, and the backing white-washed concrete wall to the north, are both in fair condition, however, the condition of several of the timber sleepers appears to have deteriorated since the 2020 inspection. Timber sleepers are exposed and damaged locally, however the concrete

behind appears in fair condition – the timber appears to be permanent formwork for *in situ* concrete pour.

South of the whitewashed wall, the retaining wall is formed from pre-cast concrete beams below timber sleepers, both set between steel I-beams at 3m centres.

Single layer rock armour protection is present on slopes both sides of the Calais Beck to the north of the Sailing Club.

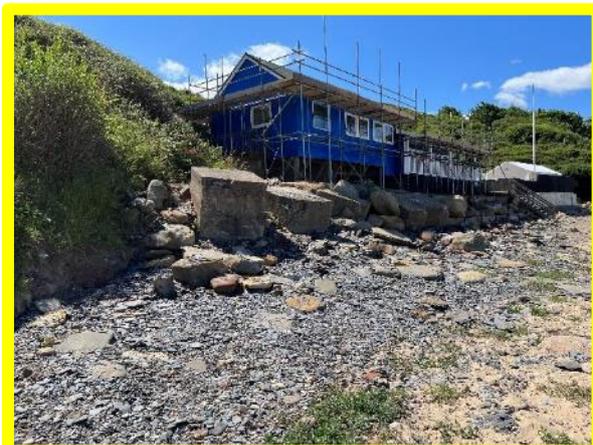
The southern extent of the asset comprises concrete cubes/tank blocks and rock armour. This is not of formal construction detail, however, appears to be offering some protection to the slope and building behind. Evidence of potential scour of the toe of the slope to the south of the blocks was observed.



Rotten/missing timber (permanent formwork for concrete behind) (/0602C05)



Crack in concrete wall (/0602C05)



Informal defences (/0602C05)



Scour of slopes south of concrete defences (/0602C05)

3.5 Management Unit 8 - Runswick Bay to Sandsend

This Management Unit is divided into two Sub-management Units; MU8A – Runswick Sands to Kettle Ness and MU8B - Kettle Ness to Sandsend.

MU8A – Runswick Sands to Kettle Ness

This Sub-management Unit consists of units MU8/1 to MU8/4.

Unit MU8/1 is located behind Runswick Sands. The toe is steep with little or no vegetation cover and composed of mudstone (a continuation of unit MU7/4). The mid and upper slopes comprise more densely vegetated till with localised slumping. Significant slips (one widely estimated at 200t of material) occurred following prolonged heavy rainfall and storms in January 2021. The unit is classified as Partly Active in 2022, changed from Locally Active in 2020.

Unit MU8/2 is a shallow-angle relict debris run-out lobe with a well-defined head scarp. The cliff toe is steep and composed of mudstone with localised rock falls on the fronting shore platform. The mid and upper slope is densely vegetated. This unit is classified as Locally Active in 2022, unchanged from 2020.

MU8/3 is located in front of the village of Kettleness. The cliff is high and steep with only the very top part covered in vegetation. The cliff slope comprises large debris flows, which extend as fans from near the cliff top to the toe, and slumps. This level of activity means this unit is classified as Partly Active, the same as 2020.

MU8/4 is immediately west of Kettle Ness headland. This unit is classified as Partly Active in 2020, unchanged since 2002.



Steep mudstone cliffs with overlying shallower sloping till with significant local slumps. MU8/1 Partly Active in July 2022.



*Relict debris run-out lobe. **MU8/2** Locally Active in July 2022.*



***MU8/3** and **MU 8/4** steep cliff with debris flows. Partly Active in July 2022.*

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. This area has historically been extensively quarried for alum and as a result is now subject to ongoing erosion of the exposed weak bedrock. It remains classified as Partly Active in 2022, unchanged since 2020.



West side of Kettleness headland. MU8/5 Partly Active in July 2022.



East side of Kettleness headland. MU8/5 Partly Active in July 2022.

Unit MU8/6 is located to the east of the Kettle Ness headland and remains classified as Partly Active in 2020. Along most of its length this unit is steep with little vegetation cover. Evidence of recent erosion/slips were observed in the headscarp.



MU8/6 Partly Active in July 2022.



MU8/7, Locally Active in July 2022.

Units MU8/7 and MU8/8 comprise the relict debris run out lobes of Seaveybog Hill and Ovalgate Cliff. They are generally well-vegetated, but localised activity at the toe and headscarp mean the units are classified as Locally Active in 2022.

Unit MU8/9 is located at Loop Wyke and is classified as Partly Active in 2022. The upper slopes support extensive vegetation cover, but the lower slopes are steeper, free of vegetation and subject to on-going toe erosion. The exposed headscarp comprises exposed rock which is steep and heavily weathered.



MU8/8 Locally Active in July 2022.



MU8/9 Partly Active in July 2022.

Unit MU8/10 forms a relict debris slide lobe. The unit is well-vegetated with localised erosion at the headscarp and the toe. This unit is classified as Locally Active in 2022.

Unit MU8/11 is located at Keldhowe Steel and is classified as Partly Active in 2022. The upper slopes are vegetated, with localised areas of activity at the headscarp. The lower slopes are experiencing ongoing toe erosion.

Unit MU8/12 is south of Keldhowe Steel and is classified as Partly Active in 2022. The upper slopes are vegetated, with localised areas of activity at the headscarp. The lower slopes are experiencing on-going toe erosion.

Units MU8/13, MU8/14 form the headland of Sandsend Ness and its adjacent cliffs. All units remain classified as Partly Active in 2022. The toes of these cliffs are subject to ongoing erosion and there is also evidence of localised erosion on the upper slopes.



MU8/10 is a debris slide deposit classified as Partly Active in July 2022.



Cracking in headscarp material. **MU8/10** Partly Active in July 2022.



MU8/13 Partly Active in July 2022.



MU8/14 Partly Active in July 2022.



MU8/14 Partly Active in July 2022.

Unit MU8/15 experienced a landslip In January 2021 along part of the Cleveland Way located around 400m north of the car park at the northern end of Sandsend. This caused North York Moors National Park Authority (NYMNPA) to divert the footpath inland while a temporary and permanent solution is being investigated. This has caused reclassification of this cliff behaviour unit to Totally Active in 2022, pending stabilisation works.



MU8/15 Totally Active in July 2022 following January 2021 landslip (southern end of slip)



MU8/15 Totally Active in July 2022 following January 2021 landslip (northern end of slip)

Coast Protection Asset Condition Assessment

Two short lengths of retaining walls believed to have been originally intended to protect and support the disused railway line were identified along this section of coast in the 2009 inspection report. These are a brickwork wall at Deepgrove Wyke and a masonry wall south of The Scar that was noted to have failed. However, these two walls were not classed as coastal defences and were reported to be redundant in 2010, so as in all inspections since 2010, they have not been included in this inspection report. There is no safe means of access to inspect the structures in detail, however from a distance, there appears to be little change in the structures or their immediate surroundings.



*Redundant masonry retaining wall in **MU8/14***

3.6 Management Unit 9 – Sandsend

Coastal Slope Condition Assessment

This Management Unit is divided into three Sub-management Units.

MU9A and MU9B – Sandsend Village

Management units MU9/1 and MU9/2 are Dormant cliffs behind Sandsend village. They are defended at the toe by a sea wall, groynes and rock armour. No evidence of activity was seen in 2022.



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

MU9C – East Sandsend

This Sub-management unit consists of unit MU9/3 only. This unit is located above the concrete revetment sea defences immediately to the east of Sandsend. The previously failing sea defences had been replaced by a new stepped concrete apron with upper Dycel units by the time of the 2016 inspections, and the backing slopes had been stabilised. The slopes had historically been subject to slippage which, at times, caused the temporary closure of the A174 Sandsend Road. The intent of the slope stabilisation works was to improve the condition of the slopes to an inactive state through means of re-grading, drainage and seeding. Overall the stabilization scheme continues to work well. One local area of shallow slippage observed in 2018 was remediated prior to the 2020 survey, and no further activity has been observed. Vegetation has been slow to establish on the North facing slope, with some significant areas of exposed clay still visible, though this is gradually improving over time.



MU9/3 Coastal slopes to rear of new sea defences generally in an inactive state following capital works involving re-grading, drainage and seeding as part of the Sandsend Road Coast Protection & Slope Stabilisation Scheme

MU9A and MU9B – Sandsend Village

Coastal defences at Sandsend village vary from fair to poor condition.

The most northerly defence is located at Sandsend car park. It is a sloping concrete revetment with a recurve crest wall (D0701C02). The concrete wall remains in fair condition with minimal damage to the surface. At the time of the inspections there were low beach levels, revealing that the revetment has lost thickness of concrete at the base through abrasion, with exposure of reinforcement bars. Encasement of this reinforcement is advised from a structural perspective, as well as preventing any Health & Safety incidents occurring due to sharp edges of the exposed bars on this popular amenity beach. At the northern end of the structure is a tie-in section, comprised of steel sheet piling which is heavily corroded. At the southern end is a slipway adjacent to Sandsend Beck. The slipway is undermined in places, and there are a number of cracks and areas of minor displacement, despite previous repairs at this location.



Sandsend car park sea wall (D0701C02)



Exposed rebar evident at toe (D0701C02)

A concrete seawall (D0702C01) extends from Sandsend Beck towards the east. The groyne field fronting the seawall is derelict and the remains have no significant impact on sand movement. The wall is heavily abraded. The timber breastwork and concrete-filled barrel toe structure was exposed at the toe, as it was previously during the 2009 and 2016 surveys and continues to deteriorate, having been covered by beach sand at the time of the 2018 and 2020 inspections. There are occasional cracks in the wall and significant abrasion at the steps.



Toe structure formed from concrete-filled barrels (D0702C01)



Displacement of some parts of the toe structure (D0702C01)

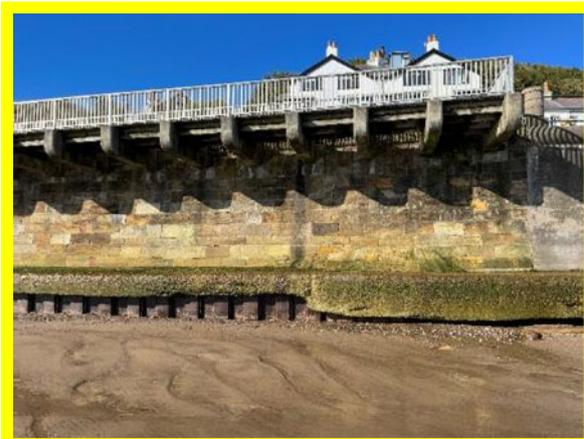


Poor condition sea wall (D0702C01)



Poor condition sea wall (D0702C01)

The newer short section of masonry blockwork sea wall (D0702C04) that supports a cantilevered promenade just north of East Row Beck is in fair condition. The steel toe piling is corroded and abraded, and the concrete toe structure is subject to undercutting it was covered by beach sand at the time of the 2018 and 2020 inspections. Towards the eastern end, there are voids and undermining of a concrete apron which should be further investigated. The new cantilever footway constructed to replace the previous structure that was destroyed during the December 2013 remains in good condition.



Toe structure undercut below masonry blockwork sea wall with cantilevered footway (D0702C04)



Toe structure undercut below masonry blockwork sea wall with cantilevered footway (D0702C04)

The low masonry wall (D0702C03) that returns into both sides of East Row Beck adjacent to the road bridge is in fair condition. There is a slipway on each side of the beck, with gabion baskets on the eastern side protecting the café. These gabions are in fair condition, but with some 'sagging' of the baskets, perhaps due to being under filled.

MU9C – East Sandsend

Coastal defences were constructed along the A174 Sandsend Road between early 2015 and summer 2016, replacing a failing sloping concrete revetment. The new defences (D0702C02) comprise a lower section with a stepped revetment built from pre-cast concrete units and a buried concrete toe beam that was cast *in situ*, with an upper section of interlocking pre-cast Dycel units. Natural coastal slope extends above the upper units to the plateau upon which the highway and footpaths sit, with re-graded and stabilised high coastal slopes to landward of the road. Sloping concrete tie-in revetments exist at either end of the structure. The overall plan form of the new defence adopts a subtle 'S' curve when viewed in plan.



Coastal defences at Sandsend Road showing stepped pre-cast apron and upper Dycel units (D0702C02)

At lengths along the frontage is a series of ribs used as areas for connecting pre-cast units and accommodating subtle changes in alignment. Several of the ribs incorporate drainage outfalls. Formalised access steps are located at discrete points along the frontage.

The main observations from the 2022 inspections are:

- Outfall drains are freely running
- The upper section of the toe beam and all the lower steps were exposed and in good order. The part of the toe beam where remedial action has been taken in 2022 to re-seat a section of toe beam was covered by sand and therefore not visible.
- Evidence of loss of foam strips used as packing between the structural elements was observed, though with not obvious impact upon structural integrity.
- Abrasion of the in situ concrete toe beam has exposed some of the plastic fibre reinforcement
- Some chipping damage has occurred to the edge of the steps (confined to lower steps at the western end but becoming more frequent and higher up the structure to its central and southern sections).
- Outflanking at the eastern end is being adequately addressed by large beach boulders



Loss of foam strips, abrasion to the toe beam, and at the leading edge of some stepped units

At the eastern end of the concrete defences, Raithwaite Gill has been infilled with material won from re-grading of the backing coastal slopes. The outfall which discharges through the gill has been extended to accommodate this infill. Vegetation on the slopes within the gill is becoming well established after a slow start on the North-facing slope.



Sloping revetment structures at each end of the structure

With construction of the scheme having been completed in August 2016, the new defences remain in very good condition, but with some minor (cosmetic) chipping to the step edges.

3.7 Management Unit 10 – Upgang Beach

Coastal Slope Condition Assessment

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

Unit MU9/4 is comprised of well vegetated slopes which are protected along part of its length by the new coastal defence scheme which was officially opened on 19th August 2016. The slope stabilisation works have also extended partly into this unit and their intent is to render the slopes inactive. At the eastern end of the unit, where the new coastal defences tie-in into Raithwaite Gill, material won from the slope re-grading works in Units MU9/3 and MU9/4 has been placed to substantially infill Raithwaite Gill. The original outfall through the Gill was extended and material was placed and shaped within the Gill, with a new footpath constructed to provide access from the highway to the foreshore. The backing slopes behind the new coastal defences and the material infilling Raithwaite Gill are both currently inactive and have become well vegetated since the 2016 inspections.

MU10/1 was inactive in 2012, but this was revised to Locally Active following the December 2013 storm surge that caused toe erosion. This erosion has stopped and the classification returned to inactive in 2016 and has remain as such ever since.

MU10/2 comprises the till cliffs behind Upgang Beach that are prone to episodic mudslides and block failures. Vegetation cover is limited along the cliff face and the unit is classified as Partly Active in 2020, unchanged since the 2005 survey.



MU9/4 Infilling of Raithwaite Gill at the eastern end of the coastal slopes (Inactive)



MU10/2 Slumping cliffs along Uppang beach (Partly Active) i

Coast Protection Asset Condition Assessment

There are no coast protection assets within this Management Unit.

3.8 Management Unit 11 – Whitby West

Coastal Slope Condition Assessment

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 re-graded slopes protected by a sea wall and promenade. The slopes are well-vegetated, and whilst they are generally stable, with very little change since the 2020 survey, there is evidence of localised instability in the slope in places within both units. There is evidence of some previous stabilisation works and in one location within MU11/1 these have become exposed and the stone-filled plastic baskets have split, requiring repair or replacement. Both these units are classified Locally Active.



MU11/1 Evidence of slumping and broken pipe in the lower coastal slopes (Locally Active)



MU11/1 Cliff drainage (Locally Active)

MU11B – Whitby Sands East

This Management Sub-Unit consists of units **MU11/3** and **MU11/4** that are protected by a variety of coastal structures. The coastal slope of **MU11/3** has localised failures of the till and is therefore classified as Locally Active. Exposed rock faces are showing minor erosion in the absence of defences in places within **unit MU11/4**, which remains classified as Locally Active.

Coast Protection Asset Condition Assessment

MU11A – Whitby Sands West and MU11B – Whitby Sands East

This Management Unit encompasses various sea walls and rock revetment to the west of Whitby Harbour. The most westerly defence is a rock armour revetment fronting the seawall and promenade (D0801C01). As in previous inspections, the rock armour is in good condition with only minor movement visible. The asset is in overall good condition although the promenade is rated as fair despite areas of repairs, due to previous longitudinal cracking. Local damage to the wall to the rear of the promenade has been noted, though the asset has benefited from a comprehensive programme of repairs and is generally in better condition than when last surveyed.



Rock revetment, promenade and coastal slopes of Whitby West Cliff (D0802C02)



Promenade railings above section of wall without rock armour (D0802C03)

There are two sections of seawall along the frontage with no protective rock armour. One occupies a short gap between the two areas of rock armour, whilst the other is to the east, backed by beach chalets on the promenade. Both sections have experienced abrasion damage to the face. Due to

the absence of rock armour, the toe at both sections has also been subject to undercutting. Repairs carried out prior to the 2016 inspection comprising a new concrete toe over some affected sections, have limited the extent and rate of deterioration in those locations but their overall condition remains poor and there are short lengths adjacent to where the new toe ends where boulders and rock outcrops are present and the original toe is still being undercut. There is also local damage (cracking and abrasion) to the wall coping beam and at each set of access steps along these lengths with no protective rock armour.

The overall condition of the asset has improved since the last survey, following a number of substantial repairs to the promenade, which were completed in 2022.

East of the beach chalets the steps and ramps show signs of repairs, but are generally in poor overall condition with defects such as undercutting, erosion, cracking, exposure of aggregate and rounding of step edges. In general, all sections of sea wall between the eastern end of the rock revetment and the Whitby Pavilion show extensive damage to the coping and abrasion to the face and are in overall poor condition.



Masonry seawall and slipway in front of RNLI station (D0802C13)



Seawall in front of the Beach Management Centre on the promenade (D0802C13)

The masonry blockwork walls by the RNLI lifeguard station are in fair overall, with a new capping beam relatively recently constructed to repair previously reported damage.

The area below the Whitby Pavilion consists of a variety of defences, which are formed in several vertical stages or layers, with concrete/stone on the beach and with cliff toe protection walls formed of timber breastwork, rock armour and vertical walls. These have multiple defects and remain in poor condition. To the east of the theatre, the natural cliff is intermittently defended with a series of blockwork and brickwork sections. These vary in construction and are generally in fair condition. Previously reported areas of undercutting were not noted during the inspections due to high beach levels.

The Battery Wall, just west of Whitby West Pier, is formed of large sandstone blocks. Although repairs to some gaps between blocks are evident, further repairs are deemed advisable pro-active measures, especially at the wing wall of the access steps to the beach. Despite this, the asset remains in overall fair condition.



Open joints in wing wall to access steps (D0802C12)



Battery Wall, with some open joints between blocks (D0802C12)

3.9 Management Unit 12 – Whitby

Coastal Slope Condition Assessment

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



MU12/1 Slumps in lower cliff (Locally Active)

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

Coast Protection Asset Condition Assessment

This Management Unit encompasses the harbour structures and quay walls of Whitby Harbour.

The harbour piers and pier extensions were inspected during a low spring tide to maximise the visibility, but even at low tide parts of the structures are below water and so not visible.

The main piers have each been classified as very good following the 2018/19 capital refurbishment works which have rectified many previously identified defects. There are new chain link barriers that can be erected when overtopping conditions persist on both piers, and signs on the East Pier warning the public of risks from high winds, sea states (overtopping), uneven surface, trips, and falls from unguarded edges. A new wave run-up deflector wall has been constructed at the top of the Battery Parade slipway, adjacent to the West Pier.



West Pier, very good condition following capital works (1803C02)



East Pier, very good condition following capital works (1803C02)



West Pier extension, generally in fair condition (1803C01)



East Pier extension, generally in fair condition (1803C04)

The pier extensions are generally considered to be in fair condition, despite considerable abrasion along almost their entire length, although it should be noted that the lower sections of each structure were fully submerged by water at the time of the inspections. An urgent works scheme was undertaken in 2011/12 to repair the southern end of the East Pier extension where a large void had formed in the structure behind the sheet pile toe which had failed following corrosion and abrasion.

The western quayside of the Risk Esk from the harbour to the Swing Bridge consists partly of blockwall quay walls, similar in construction to the harbour piers, and partly of sections of concrete slab suspended over the original quay wall with concrete filled vertical and raking steel pile supports. The quayside structures are generally in fair condition, but poor in places due to specific localised defects. For example, in the blockwork sections, there are sections of wall with open joints which require sealing. In the suspended deck section, there remains corrosion to the steel piles. It was not possible to inspect the underside properly as this would require a boat even at low tide. A more detailed structural inspection of the quay walls was carried out by Scarborough Borough Council in 2022.

The eastern quayside of the Risk Esk consists partly of blockwall quay walls, similar in construction to the harbour piers, and partly of sections of property walls. Like the western quayside, the quayside structures are generally in fair condition, but poor in places due to specific localised defects. For example, in the property wall sections there are areas of sunken blocks or missing pointing and in the blockwork quay walls there are also several areas of open joints and heavily abraded blocks, most notably on Tate Hill Pier.

Beach levels in the harbour on Tate Hill Sands and between Tate Hill Pier and the Fish (Lifeboat) Pier have dropped significantly in comparison to historic levels. Between Tate Hill Pier and the Fish Pier in particular, this has exposed the lower sections of the harbourside riparian owned property walls - to a greater extent than previously observed - though no specific defects were noted.

North of Tate Hill Pier, the harbour is continues to be fronted by a variety of riparian walls at the back, and then with a rock revetment protecting the toe of the slope at the Haggerlythe. Due to near-vertical nature of the slopes immediately above the revetment, before they taper back to a more nature angle, this area should be given further consideration in due course, as recommended in the Whitby Coastal Strategy.

The steep access ramp to the East pier indicates a degree of movement, though remains in fair condition. The adjacent slopes have geotextile slope protection netting in place.



Access ramp to the East Pier (D0803C05)



Slope protection netting above the access ramp (D0803C05)

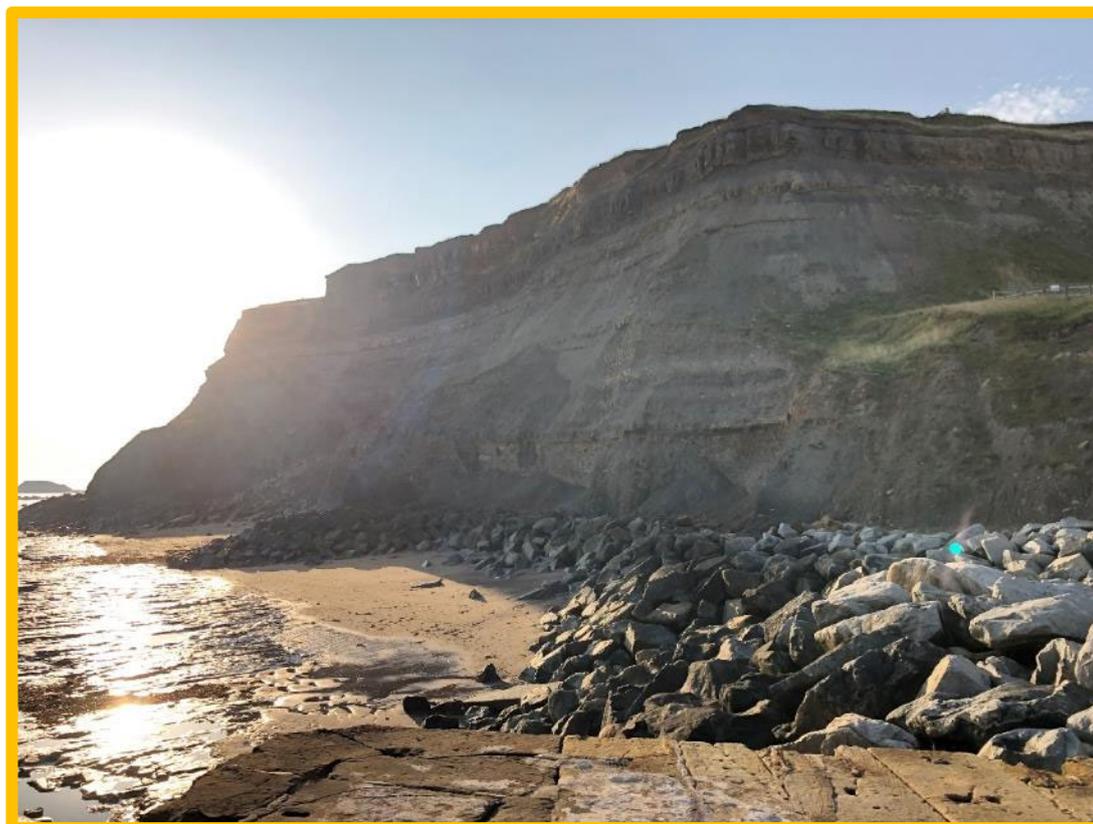
3.10 Management Unit 13 – Whitby East

Coastal Slope Condition Assessment

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

MU13A – Cliffs east of Whitby Harbour

Unit **MU12/2** comprises high cliffs protected by rock armour. There is evidence of a past rockfalls from the upper part of the cliff in the form of debris slopes and almost the entire cliff face is exposed, with very little vegetation cover. The cliffs therefore remain classified as Partly Active.



MU12/2 Cliffs east of Whitby (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 is discussed under Management Unit 14).

Unit MU13/1 is located immediately east of Whitby and is again classified as Partly Active in 2022. The lower slopes are almost entirely exposed and are subject to marine erosion. The scar is generally fully exposed due to the impact of the piers on the prevailing direction of longshore drift. The upper slopes are actively retreating through periodic rockfalls. Erosion of the upper slopes is encroaching on the coastal path in several areas, and as a result the ongoing diversion of the coastal path is evident. Sections of the coastal path were closed and moved back during the period since the last survey in 2020, though the new route remains immediately adjacent to the cliff top with no buffer from the coastal footpath to the cliff top (photograph below). Consideration should be given to the movement of the path to create a buffer area.

Unit MU13/2 comprises the eroded headland of Saltwick Nab. This unit is continuing to actively erode and supports little vegetation cover. Riling and gulying is evident on the exposed faces. As a result, this unit remains classified as Partly Active in 2022.

The cliffs within **unit MU13/3** are located within Saltwick Bay and contain access onto the beach. The cliffs in this section are protected to some extent from marine action by the high stable beach. As a result, the unit is generally less active and well vegetated and as a result is classified as Locally Active.



MU13/1 Cliffs east of Whitby (Partly Active)



MU13/1 Cliff erosion close to coastal path (Partly Active)



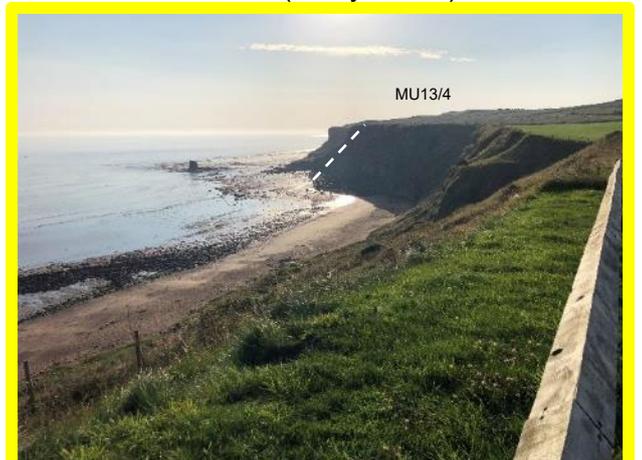
MU13/2 Saltwick Nab (Partly Active)



MU13/2 Saltwick Nab (Partly Active)



MU 13/3 Saltwick Bay (Locally Active)



MU13/4 East of Saltwick Bay (Locally Active)



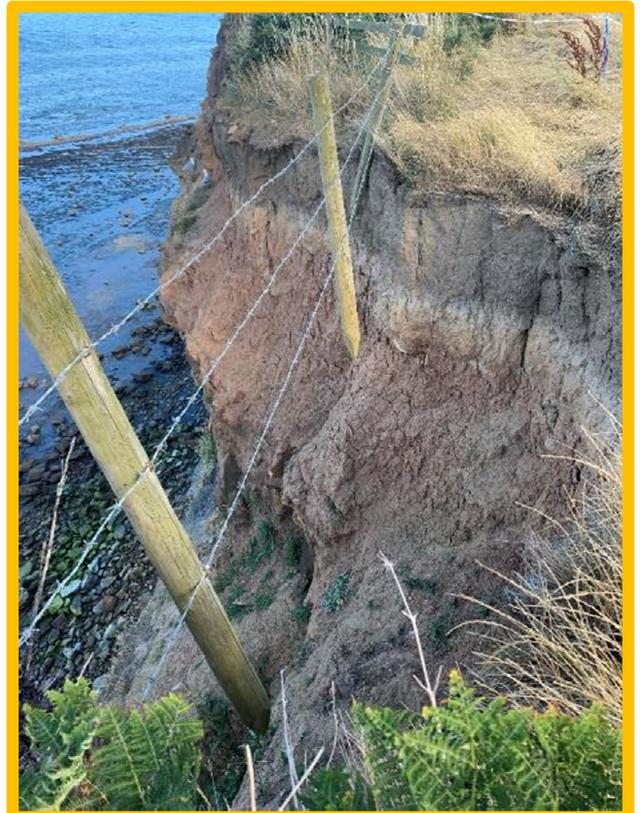
MU 13/5 Black Nab and Saltwick Nab (Locally Active)



MU13/5 Vegetation covering majority of debris lobe at Black Nab (Locally Active)



MU 13/6 Unvegetated eroding cliffs at Whitby Lighthouse (Partly Active)



MU13/6 Recent slump encroaching coastal path. (Partly Active)

Unit MU13/4 is located in the southern half of Saltwick Bay up until the eroded headland of Black Nab. The beach narrows as it progresses south. Consequently, the cliff unit is subject to more regular wave attack at the toe and some of the slopes are active and exposed. There is evidence of small slumps of debris and rockfall activity and ongoing localised and minor recession of the headscarp. This unit remains classified as Locally Active in 2022.

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 localised activity evident at the toe. The unit remains classified as locally active in 2022.

Unit MU13/6 is a long, steep-faced unit near the Whitby Fog Signal and the Lighthouse. The slopes are largely exposed with evidence of rockfalls from the upper cliff. There are also signs of ongoing weathering and marine erosion of the lower layers. This is particular apparent to the North of the lighthouse. This unit remains classified as Partly Active in 2022.

Coast Protection Asset Condition Assessment

MU13A – Cliffs east of Whitby Harbour

There is a section of rock armour giving protection to the toe of Abbey Cliff directly to the east of Whitby Harbour's East Pier. The rock armour varies in size from 1-4 tonnes to 5-8 tonnes. It remains in fair overall condition in 2022.



Rock armour protection to toe of Abbey Cliff (1803C06)

MU13B – Whitby East to Widdy Head

There are no coastal assets within this Sub-management Unit.

3.11 Management Unit 14 – Widdy Head to Pursglove Stye Batts

Coastal Slope Condition Assessment

The only unit within this Management Unit is **MU14/1**. The slopes are generally steep and partly vegetated. Small areas of erosion are evident, particular in the upper till layers, despite this the cliffs appear stable. The cliffs within this unit remain classified as Locally Active.



MU 14/1 Looking North - Vegetation growing locally on face of cliff (Locally Active)



MU 14/1 Stable cliffs, upper slopes and debris aprons generally vegetated (Locally Active)

Coast Protection Asset Condition Assessment

There are no coastal assets within this Management Unit.

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

Coastal Slope Condition Assessment

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

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

Unit MU15/2 is known locally as Far Jetticks. This cliff has widespread activity, with ongoing marine erosion evident at the toe and localised activity on the cliff face. It remains classified as Partly Active in 2022. A series of arcuate tension cracks were observed during the 2014 inspections (and seen during the subsequent inspections including 2022) on the cliff top at grid reference 495076 507274, indicating an incipient failure that poses a hazard to walkers on the Cleveland Way. The site has previously been brought to the attention of Scarborough Borough Council who have informed the North York Moors National Park Authority. It appears the tension cracks have not significantly worsened since 2018, demonstrated in the comparison photos below. Tension cracks were also observed adjacent to the coastal footpath to the south of Far Jetticks and should be monitored.

Unit MU15/3 is largely comprised of the headland of Bay Ness, north of Robin Hood's Bay. The cliffs are high and steep and composed mainly of sandstone overlain by a thin cap of glacial till. There is evidence of debris fans in the lower half of the cliff face with localised slumping of the head scarp cut into the till. Several exposed head scarps have the potential to undermine the Cleveland Way. This unit was downgraded from Partly Active to Locally Active in 2014 and remains classified as Locally Active in 2022.

Just north of Robin Hood's Bay village is **Unit MU15/4**, which has a similar geomorphology to MU15/3, although the till cap appears to be less active than further north. A loose debris apron is present locally at the toe of the cliffs towards the south of the unit. This unit remains classified as Locally Active in 2022, downgraded from Partly Active in 2014.



MU15/1 Vegetated slopes at cliff top (Locally Active)



MU15/2 Ongoing erosion at Far Jetticks (Partly Active)



Stable upper cliffs with debris aprons MU15/4 (Partly Active)



Local Slumping at MU15/3 (Partly Active)



MU15/3 Vegetated slopes at cliff top (Locally Active)



MU15/2 Tension cracks on access path to the south of Far Jetticks



MU15/4 Local slumping of headscarp adjacent coastal path (Locally Active)



MU15/4 Local slumping of headscarp adjacent coastal path (Locally Active)

Coast Protection Asset Condition Assessment

There are no coastal assets within this Management Unit.

3.13 Management Unit 16 – Robin Hood’s Bay

Coastal Slope Condition Assessment

This stretch of coast comprises a deep, wide bay located between a sandstone, ironstone and mudstone headland to the north and sandstone and mudstone to the south. Although similar in shape to other bays, Robin Hood’s Bay is not ‘till controlled’ but formed in an anticlinal structure where less resistant mudstone located centrally has been eroded. The bay contains an extensive shore platform of mudstone. At points around the bay, till approaches sea level and forms the entire cliff.

This Management Unit is divided into three Sub-management Units; Mu16A – Robin Hood’s Bay Village, Mu16B – South of Robin Hood’s Bay Village and Mu16C – Cowling Scar.

MU16A – Robin Hood’s Bay Village

This Sub-management Unit is composed of units MU16/1, MU16/2 and MU16/3.

Unit MU16/1 is the composite cliff complex fronting the northern part of Robin Hood’s Bay village and is classified as Partly Active in 2022, no change from 2014. The cliff comprises a near-vertical lower cliff of mainly sandstone overlain by shallower sloping heavily vegetated glacial till with evidence of slumping and recession of the head scarp.

Units MU16/2 is a stabilised landslide that forms the southern part of Robin Hood’s Bay village. There is little evidence of any activity and so it remains classified as Inactive in 2022. MU16/3 protected by sea defences retains its Dormant status in 2022.



MU16/1 Sandstone cliff overlain by shallow till (Partly Active)



MU16/2 Stabilised landslide (Inactive)

MU16B – South of Robin Hood’s Bay Village

This Sub-management Unit consists of unit MU17/1, which is defended at the toe by a seawall and rock armour. The slopes show little evidence of recent activity. As a result, this unit is classified as Dormant in 2022, no change from 2014.

MU16C – Cowling Scar

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

Unit MU17/2 comprises glacial till cliffs to beach level protected by rock armour at their toe. The slopes are vegetated however the area of exposed cliff has steadily increased since the 2016 survey. Generally, the flatter mid-slope is well vegetated whilst the headscarp and toe are exposed with extensive evidence of recent slumping. This unit remains classified as Partly Active in 2018, due to widespread evidence of instability. During the 2018 survey it was noted that the Cleveland Way footpath has been severely undermined along the headscarp of the management unit. This has led to a section of the footpath being lost through landslip. A series of temporary and permanent diversions have been necessary in recent years as the headscarp continues to retreat. Stone flagstones which have fallen down the face of the cliff highlight the rapid erosion on this stretch. Erosion is significantly more pronounced in locations where local field drainage issues onto the coastal slope.



Head scarp of MU17/2 (Partly Active in June 2016)



MU17/2 Undermined Cleveland Way footpath route and temporary diversion (Partly Active).



Head scarp of MU17/2 (Partly Active in August 2022)



MU17/2 Undermined Cleveland Way with exposed land drainage (Partly Active).



Toe of MU17/2 showing extensive activity (Partly Active).



2018

Slumped toe of till cliffs adjacent revetment.. MU17/2 (Partly Active in June 2018)



2022

Continued Slumping at toe of till cliffs adjacent revetment. MU17/2 (Partly Active August 2022)

Further south, within unit MU17/3, defences are absent and the cliffs are active. There is massive slumping at beach level and in the mid to upper slopes. This unit is classified as Partly Active in 2022, no change from 2014.



Active toe of till cliffs in Robin Hood's Bay.
MU17/3 (Partly Active)



Active toe of till cliffs in Robin Hood's Bay.
MU17/3 (Partly Active)



Vegetated mid-slope above exposed glacial till
lower slope - MU17/3 (Partly Active)



Redcar Mudstone' formation North of Boggle
Hole - MU17/3 (Partly Active)

MU16A – Robin Hood’s Bay

Robin Hood’s Bay village is defended by an extensive system of coast protection defences which was upgraded and extended in 2001. Most of the defences at Robin Hoods Bay are in a fair to good condition, but the older original structures dating from the 1970s are showing evidence of damage and defects. The latest Project Appraisal Report has proposed a capital scheme for the large vertical sea wall (/D1003C02) that protects the main part of the lower village. Maintenance recommendations elsewhere include re-pointing and repairing cracks in the walls and keeping localised areas of vegetation growth in the walls under control to avoid damage.

The most northern defence is a section of rock armour that gives some limited protection to the cliff toe to the north of the northern slipway / beach access ramp (/1002C02). This rock armour was constructed as part of the 2001 scheme and remains in good condition. As the rock armour extends south (/1002C01) it fronts the wingwall of a slipway / ramp from the boatyard and then a large blockwork sea wall that was built in 2001. Overall, both the wall and the revetment are in good condition. Cliffs to the rear of the slipway have rock netting which remains in good condition. It was noted during the 2018 inspection that there had been a small rockfall above the slipway just north of the rock netting. It is recommended that this netting is extended to prevent further activity.



Rock revetment fronting sea cliffs (/1002C02)

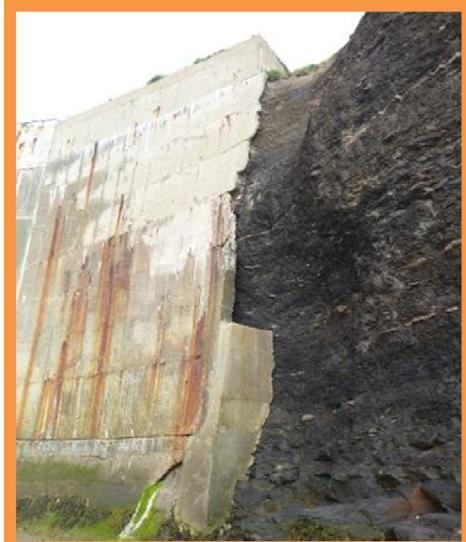


Rock revetment fronting large sea wall (/1003C01)

The rock armour extends south of the end of the wall, remaining in good condition, to protrude beyond the toe of the short length (~25m) of adjacent undefended shale cliffs. The cliffs (/1003C03) are generally eroding at slow rates, except for in one location at the cliff top near the interface with the southern large sea wall where a local slippage has occurred in the overlying till. The minor outflanking noted in 2016 at this location has worsened slightly as predicted.



Rock revetment protruding beyond undefended cliffs (/1003C01)



Erosion of cliffs immediately adjacent to large northern end of large sea wall (/1003C03)

The large vertical pre-cast concrete panel wall that was constructed in 1975 (1003C02) remains in poor condition, showing evidence of surface cracking, rust marks indicating corrosion of the reinforcement steel, mineral encrustation, seepage, frequent open joints, and extensive cracking and repair work to the crest of the wall. Generally, the wall appeared in similar condition to 2018, when it was noted that there was further damage and outflanking of the transition to the shale cliffs at the north end of the wall.

Whilst previous inspections noted some evidence of undercutting of the toe this was not visible in 2022.



Large sea wall in poor condition will benefit from future planned capital scheme (/1003C02)



Typical defects on large sea wall (/1003C02)

Immediately south of the large concrete sea wall, a private blockwork wall fronts the Bay Hotel (/1003C04). This wall extends south to the central slipway and is in overall poor condition. Some repairs have been undertaken since the 2016 inspection. These include grouting of open joints and sealing the open interface with the precast concrete seawall to the north. Generally, the repairs appear to be working effectively, however there are still a number of open joints visible in the wall face. Additionally, the low beach levels exposed voids in the concrete toe at beach level.



Blockwork wall in poor condition fronting the Bay Hotel (/1003C04)



Blockwork wall flanking the slipway and culvert outfall (/1003C04)

The adjacent central slipway (/1003C05) is in an overall fair condition, with minor damage and undercutting to an area of previous concrete repairs near one corner. The concrete apron at the seaward end of the slipway is presently being undercut and generally is in poor condition.

The mixed construction defence (/1003C06) on the south side of the slipway has mass concrete toe at the base with a variety of stone and blockwork above. The defence has a patchwork of previous repairs and repointing throughout but despite this a small number of open joints remain (mostly in areas of previous repairs) and there is one area of cracking in the concrete at the apron. This does not appear to have worsened since the 2018 inspection, but it is recommended that this is repaired to prevent further damage to the structure. Overall the structure remains in fair condition, but it would benefit from some minor maintenance.



Slipway in fair condition, but with undercutting at the toe (/1003C05)



Undercutting of slipway toe and damage to previous repairs. (/1003C05)



Blockwork wall (/1003C06)



Typical defects (gaps) on blockwork wall (/1003C06)



Typical defects (cracking) on toe apron (/1003C06)



Typical defects (cracking) on toe apron (/1003C06)

At the south of the village is the concrete sea wall(/1003C10). This structure was given rock armour toe protection as part of the 2001 scheme. The rock armour remains in good condition with the sea wall in fair condition. There are some notable defects at the access steps at the southern end of the wall, with render cracking and falling away and abrasion of the concrete beneath and this has deteriorated further since the last inspection. There is also some local abrasion and spalling at the coping and around joints. There has been some localised loss of joint sealant, however generally the sealant remains in good condition.



Concrete sea wall generally in fair condition (/1003C10)



Defects at access steps (/1003C10)

South of the sea wall there is a length of rock armour defence with a slipway / ramp, both of which were constructed in 2001 and remain in good condition in 20122 (/1003C09).

To the immediate south of the ramp is a short section of rock armour built in 2001 to stabilise the cliff (/1003C07). Since 2016 there has been further significant slumping behind the revetment and in one place, just south of the snout of the slipway, the cliff has overtopped the crest. In addition to this, the defence is at risk of being outflanked at its southern end, though this has not increased since the last inspection. It is recommended that the situation in this area is monitored and considerations are made for the revetment to be realigned once the cliff has retreated sufficiently.



Rock revetment and slipway remain in good condition (/1003C09)



Slumping of cliffs immediately adjacent to southern end of rock armour (/1003C07)



Slumping of cliffs behind rock armour (/1003C07)



Slumping of cliffs behind rock armour (/1003C07)

3.14 Management Unit 17 – Cowling Scar to Peak Steel

Coastal Slope Condition Assessment

This Management Unit is divided into two Sub-management Units; MU17A – Boggle Hole and MU17B– Boggle Hole to Peak Steel.

MU17A – Boggle Hole

This Sub-management Unit consists of part of unit MU17/3 only. This unit is described under Management Unit 16C.

MU17B – Boggle Hole to Peak Steel

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

Units MU17/4 is located between Boggle Hole and just west of Stoupe Beck and has a near-vertical lower cliff formed in mudstone and an upper shallower part formed in glacial till. The unit was downgraded from Partly Active in 2014, to Locally Active in 2016, during the 2018 survey it was noted that there appears to have been significant and ongoing activity. As such, the unit returned to Partly Active in 2018. This classification was confirmed by the 2022 survey.

MU17/5 is located south of Stoupe Beck and is classified as Partly Active, no change since 2014. The cliff toe is slumped till at beach level nearer Stoupe Beck becoming bedrock with overlying till to the southeast, which is regularly slumped over the cliff face and on to the beach. The mid and upper slopes of the composite cliff are shallower gradient. There is an ongoing active retreat of the unit headscarp undermining the Cleveland Way footpath, which in parts appears to have been diverted and stabilised since the last inspection.



Mudstone cliff overlain by till. MU17/4 (Partly Active).



Cave forming on the southern flank of Mill Beck MU17/4 (Partly Active)



Steep composite cliff of mudstone overlain by till. MU17/4 (Partly Active).



Active retreat of headscarp undermining footpath . MU17/4 (Partly Active).

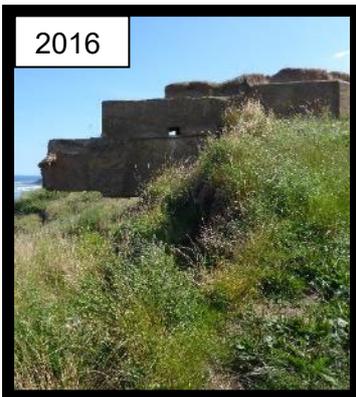


Active till cliffs down to beach level in Robin Hood's Bay. MU17/5 (Partly Active).



Active till cliffs down to beach level in Robin Hood's Bay. MU17/5 (Partly Active).

In addition to the cliff activity within MU17/5 it is worth noting that the retreat of the headscarp has undercut a historic WW2 pill box which during the 2016 survey was seen to be at risk of collapse. The structure has now been undercut and severed in two when surveyed in 2018, and by 2022 the seaward facing section had fallen away altogether with panels visible at different points down the cliff face towards the beach.



Historic WW2 pillbox in 2016. MU17/5.



Historic WW2 pill box in 2018. MU17/5.



Historic WW2 pill box in 2022. MU17/5.

Further southeast, units MU17/6 and MU17/7 remain classified as Locally Active after being downgraded from Partly Active in 2016. The lower slopes are steep cliffs composed of mudstone overlain by shallower sloping till. The cliff face suffers localised rock falls and localised slumping of till from above.



Steep composite cliff of mudstone overlain by till. MU17/6 (Locally Active August 2022)



Recent local rock fall in the mudstone cliff. MU17/5 (Locally Active).

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. **Unit MU17/9** is steep with little vegetation. These units remain classified as Partly Active in 2018, as they have been since 2002.



Significant recent slip MU17/9 (Partly Active).



Ongoing erosion of cliff face along MU17/9 (Partly Active)

Coast Protection Asset Condition Assessment

MU17A and MU17B – Boggle Hole to Peak Steel

There are no coastal defences present here, but fluvial assets include a stone slipway integrated with a concrete revetment, a fuel bund and the outfall of Mill Beck. Boggle Hole Youth Hostel and footbridge is located 50m upstream of the mouth of the beck. Access is provided to the beach via a concrete slipway.

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

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

Coastal Slope Condition Assessment

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

MU18A – Peak Steel to Blea Wyke Steel

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

Unit MU18/1 is located at Peak Steel, below Ravenscar. The cliffs in this region have a distinct two-tiered form. Much of the upper headscarp is densely vegetated with little evidence of recent activity. The lower headscarp, exposed to the sea, is more active and subject to episodic slides with localised falls evident. This unit is classified as Locally Active in 2022

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



MU18/1 The footpath has been diverted on Peak Steel away from the recent landslip on the Northern face (Locally Active)



MU18/1 Peak Steel recent activity on lower slopes (Locally Active)



MU18/1 Peak Steel recent activity (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 cliffs have a distinct ‘undercliff’, likely to be formed by seepage erosion and landsliding processes. The slopes show only localised patches of activity.

As in MU18/2, the cliffs in this region have a distinct two-tiered form. Much of the upper headscarp is densely vegetated with little evidence of recent activity. The lower headscarp, exposed to the sea, is more active and subject to episodic slides with localised falls evident. This unit is classified as Locally Active in 2022.



MU18/2 Distinct two-tiered cliffs
(Inactive)

Coast Protection Asset Condition Assessment

There are no coastal assets within this Management Unit.

3.16 Management Unit 19 – Beast Cliff to Scalby Ness

Coastal Slope Condition Assessment

This Management Unit is divided into 5 Sub-management Units (Appendix A, Maps 5 and 6).



Vegetated slopes and debris apron (Partially active)



Vegetated upper slopes

MU19A – Beast Cliff to Herbert Hole

This Sub-management Unit consists of **unit MU19/1** only. Due to the temporary footpath closure, it was not possible to assess the condition of the unit. In the 2020 report, the condition of the unit was changed to Partly Active following recent movement and the need to divert a significant part of the Cleveland Way coastal path. The 2022 inspection did not highlight any further significant activity, but the partly Active classification has nevertheless been retained.

MU19B – Herbert Hole to Tindall Point

This Sub-management Unit consists of **unit MU19/2** and **part of units MU19/1** (described previously) **and MU19/3**.

Unit MU19/2 is located on the north side of Hayburn Wyke and remains classified as Locally Active because of minor activity at the headscarp and some evidence of recent rockfalls at the toe. It was noted during the 2018 survey that there had been several large rockfalls near the access to the beach (see images below). Due to the proximity of the rockfalls to the access and the significance of the risk associated with rockfalls of such a magnitude it is recommended that MU19/2 is monitored for further change, particularly following periods of adverse weather where the cliffs may become unstable. However due to the localised nature of the activity the overall condition of the unit remains unchanged.



MU19/2 Rockfall at the toe of cliff.



MU19/2 – Rockfall at toe of cliff, adjacent to waterfall.

The stabilisation works at the slopes around the footpath on the northern side of Hayburn Wyke were reported in the 2012 survey as being effective. Subsequent inspections have noted deformation of the steps here, indicating possible renewed movement. During the 2022 inspection the condition of the steps was found to be in poor condition in places, with evidence of recent ongoing maintenance.

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



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



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

MU19C – Tindall Point to North of Cloughton Wyke

This Sub-management Unit comprises parts of **units MU19/3** (described above) and **MU19/4**.

Unit MU19/4 is located immediately to the north of Cloughton Wyke. The unit is characterised by high, steep cliffs which are more active than those cliffs further north and south. There is some recession of the headscarp. This unit condition was noted as being Locally Active in 2022. Although there is evidence of some minor rockfall along the head scarp

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, unchanged since 2012. The near vertical cliffs are composed of hard rock which have failed through a series of small rockfalls. The cliffs support some vegetation, primarily in the northern end of the unit

cover and are subject to ongoing marine erosion at the toe. The 2022 survey captured evidence of recent minor rockfall activity at several points on the cliffs in MU19/43, MU19/4 and MU19/5 and several areas of reduced vegetation coverage on the upper slopes where minor slips have occurred were also noted.

Unit MU19/6 forms the southern part of Cloughton Wyke and extends southwards to Long Nab. The lower cliff is near vertical and actively eroding. There is evidence of rockfall (large, angular boulders) from this part of the cliff onto the shoreline below. The upper part of the cliff is shallower angled and much less active. This unit condition was changed to Locally Active in 2018 and continued to exhibit these characteristics in 2022



MU19/4 Rockfall on southern side of Cloughton Wyke (Locally Active)



MU19/5 Rockfall on southern side of Cloughton Wyke (Locally Active)

MU19E – Hundale Point to Scalby Ness

This Sub-management Unit consists of part 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 remain classified as Locally Active in 2018 because minor activity is evident at the toe because of marine action and there is localised recession of the headscarp.



MU19/7 Long Nab (Partly Active)



MU19/8 Rockfall on southern side of Long Nab (Partly Active)

Units MU19/9 and MU19/10 are located between Cromer Point and Scalby Ness. The toe of these units is subject to marine action and the headscarp is steep, exposed and actively retreating through slippages at numerous places throughout the units. The cliffs have been given a worsened status of Partly Active because of the extent of activity along their lengths being more than simply 'local'.

During the 2022 survey it was noted that the headscarp was continuing to actively undercut the footpath and there was a significant risk to users of the path along several sections. This was due to the instability of the ground, evidenced by many minor landslips across the cliffs upper reach.



MU19/9 Retreat of headscarp (Partly Active)



MU19/9 Landsliding and retreat of headscarp (Partly Active)

The Scalby Ness headland comprises **unit MU19/11**. This area is well vegetated on its more landward extents, but was noted during the December 2013 inspections to be eroding severely in

the lower half of the cliff with some failure in the upper part and was therefore upgraded to Partly Active; this status has been retained for the 2022 inspection.

Coast Protection Asset Condition Assessment

MU19 – Beast Cliff to Scalby Ness

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

3.17 Management Unit 20 – Scarborough North Bay

Coastal Slope Condition Assessment

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



MU20/1 Cliffs in northern North Bay (Dormant)



MU20/2 Cliffs (to rear of beach huts) in northern North Bay (Dormant)

MU20B – Southern North Bay

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

Unit MU20/3 fronts Clifton Hotel and the Scarborough Bowls Centre. As per previous surveys the unit is well vegetated and shows no obvious evidence of recent instabilities. It is again classified as Dormant in 2022.

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



Looking across to North Sands Unit **MU20/4b** **MU20/4a** & **MU20/3**

Unit MU20/4b covers the area of Clarence Gardens and has previously been slightly more active than the adjacent unit MU20/4a. However, remediation works have repaired cracks and the slopes are now well vegetated with exposed rock at the headscarp. This unit was downgraded to Inactive in 2012 and retained this status in 2014. However, because of evidence of some (very) shallow slips in one local area near to parking bays, it was altered to Locally Active in 2016 and 2018. In 2020, the cliff unit was classed as inactive. However, during the inspection in 2022 a number of very shallow localised slips were noted and as such the unit is now classed as Locally Active.



MU20/4b Cliffs in southern North Bay (Locally Active)



MU20/4b Cliffs in southern North Bay (Locally Active)



MU20/4b Locally Active, **MU21/1** Inactive



MU20/4b Locally Active

Coast Protection Asset Condition Assessment

MU20 – Scarborough North Bay

There are formal defences throughout the whole length of Scarborough North Bay, many of which are currently in fair condition but most of the concrete and blockwork structures show some evidence of defects such as cracking, loss of mortar, loss of expanding sealant and surface abrasion to the front face. There are also many defects such as structural cracks and abrasion in the back wall behind the promenade where this acts as a retaining wall to the road and in the promenade deck. Many major repairs and capital works improvement to refurbish the North Bay defences were undertaken in 2014 and are generally holding up well.

MU20A – Northern North Bay

Sealife Centre 20A/1

The most northerly seawall (/1201C01) starts adjacent to the footbridge at Scalby Mills and remains in fair condition. Moving south the seawall (/1201C02), around the promontory on which the Sea Life centre is built is in overall fair condition, but with some local areas of abrasion; most notably at the stepped concrete toe, north of the slipway. In the same location there is a failed outlet that has a broken crown although it is not envisaged to affect the performance. Due to the tide it was not possible to inspect the outlet during the 2022. There is also heavy abrasion around the access steps at the junction with the adjacent seawall to the south. Previous joint repairs are holding well however, it was noted that there were a number of new open cracks in the crest wall some of which had not yet been repaired.



Fair condition seawall at Scalby Beck (/1201C01)



Access Steps at Scalby Beck (/1201C01 001)



Fair condition seawall at Sea Life Centre (/1201C02)



Cracking in crest wall (/1201C02)

North Bay Cliffs – 20A/2 to 20A/7

A series of seawalls (/1201C03, C24, C25, and C04) lie between the Sea Life Centre and the small promontory at the south of the mini golf course. The seawalls within this frontage are formed of blockwork with a concrete crest wall with a promenade beyond, backed by a grouted stone revetment. There is abrasion damage to the front face and spalling of the capping beam along the entire length of this frontage. The grouted stone revetment at the rear of the promenade is in poor condition and there are numerous repairs in varying conditions.

The northernmost section (/1201C03) has a short length of heavily corroded handrailing at the seaward edge of the promenade and notable abrasion damage to the deck. There also is a section (4-5m) of heavily abraded seawall face to the north that is now exposing reinforcement and requires attention. The grouted stone revetment at the rear of the promenade has a number of ad hoc in-situ concrete repairs, many of which have failed.



Heavily corroded handrail (/1201C03)



Fair condition seawall with recent repairs to toe apron (/1201C24)

The beach access steps along this frontage are particularly heavily abraded. The southernmost set of steps have been subject to substantial repairs which, were noted to be in fair condition during the 2022 inspection. The beach levels were generally higher than during the 2020 inspection. Previous reports have noted that the sheet piles show signs of corrosion at pile head highlighted by colour disfiguration and uneven surface. The side sheet piles appeared to have a minor lean seaward suggesting possible lateral movement, this should be monitored although it is thought that if movement was significant that the concrete would also be showing signs of stress which it was not. The concrete repairs extend northwards from the steps along the toe apron and remain effective.

As reported in 2020, the damage to the wave return wall, steps and grouted stone revetment at the rear of the promenade has been repaired.

The small crack between the repaired steps and the seawall, reported in 2018, did not appear to have deteriorated but should continue to be monitored



Concrete foundation to access step landing. Sheet piles not visible in 2022 (/1201C24)



Corroded sheet Piles with minor seaward visible in 2020 (/1201C24)

The wall around the promontory (/1201C04) is more exposed and has had relatively recent repairs to both the front face and the low crest wall, these are still holding up well in 2022. It was reported in 2018 that heavy abrasion damage remained in other places (especially on the unrepaired sections of lower wall), although this was buried by high beach levels in 2022. There is damage to the rear promenade wall in two places – notable a section of missing blockwork, approx. four blocks, that requires attention, this remains unchanged in 2022. The new drainage outfall, entry guard and WaStop are in good condition were not visible due to the tide levels.



Area of recent repairs around outfall and to promontory wall (/1201C04)



Missing blockwork in rear wall (/1201C04)

Between the promontory and Peasholm Gap, the frontage has been split into a series of asset lengths (/1201C10, C26, C11, C12, C13, C14, C15, C16, C05, C17, C18 and C06, running from north to south). The beach levels along this frontage were high during the 2022 inspection although not as high as the exceptionally high levels reported in 2020. Beach levels increase in the south of the frontage, with the highest levels close to Peasholm Gap and the lowest levels near to the promontory. Along this frontage the beach levels typically cover much of the wall height and in places reach the crest, particularly along the southernmost of these assets (/1201C17, C18 and C06) where there is evidence that the beach level overtops the crest of the wall. Unlike in 2020, none of the beach access steps were fully submerged, however several of the steps were only partly exposed with between 1 and 3 steps visible. The coping stone shows continuing signs of abrasion along its full extent, some sections have recently been replaced or repaired and are in good condition. This is also reflected in the upper courses of blockwork which were visible, with evidence of extensive abrasion and some open joints. A particular hotspot for abrasion damage was the intersection between the coping stone and the abutments on either side of the access steps.

Previous repairs to the grouted stone revetment to the rear of the promenade, below the beach huts, remained generally effective, however locally there are a number of loose or missing stones. Furthermore, there is vegetation growth noted on the crest and face of the revetment, it is recommended that this is removed. Abrasion damage continues to be evident to the access steps along this section, although several sets have been repaired and are in good condition.



High beach levels cover most of wall (/1201C15)



Vegetation growth in crest (/1201C12)

As reported in 2018, the wall to the north of the ramp at Peasholm Gap (/1201C06) shows several (minor) vertical cracks. These were noted not to have worsened since the previous inspection. There was an area of notable abrasion damage to the facing.



Vertical cracks in wall protecting recent development (/1201C06)



Vertical crack (seen from rear of crest wall) (/1201C06)

Southern North Bay

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

The beach levels at the wall at Peasholm Gap (/1201C19) were lower in 2022 than during the 2022 inspection, although these are still significantly higher than the 2018 inspection before that. As a result, much of the lower courses of blockwork, including the outlet, were buried. The extensive repairs, completed in 2014, are in good condition and holding well. Elsewhere along the face of the wall, there are locally some areas of damaged blockwork including abrasion, spalling and missing joint sealant. The recurve feature and crest wall are in fair condition with local evidence of abrasion and spalling. Overall, the wall remains in fair condition.



Previous repairs to wall at Peasholm Gap (/1201C19)



Slip way in fair condition (/1201C20)

South of Peasholm Gap, Royal Albert Drive is protected by an increasingly high curve-profiled blockwork wall (/1201C07 and C21 respectively) that runs south to the slight promontory at the ramp opposite the recently redeveloped Oasis Café. The wall is in a generally fair condition. As reported in 2020, previous repairs to joints, damaged wing-walls to beach access steps and entire sections of full height wall are in good condition. The lower courses of brickwork show signs of abrasion. There are a couple of missing blocks adjacent to the access steps, these should be replaced before the defect deteriorates.

The access steps are in fair condition, however there is minor undercutting of the lower steps. A full height vertical crack in the rear wall between the two sets of steps should continue to be monitored.

The promenade along part of this section was re-laid in 2012. Whilst the new in-situ cast concrete slabs are generally in good condition, elsewhere the promenade remains in poor condition. In particular at the interface between the newer slabs and the original slabs where there are occasional chipped or abraded joints which cause a potential trip hazard and have the effect of locally increasing the rate of deterioration. The beach levels were relatively low at the time of the inspections, exposing the concrete apron which seems in fair condition although was subject to extensive algae growth.



High curved-profile seawall (/1201C07)



Missing blockwork (/1201C07)

The slipway in front Oasis Café is fenced off to prevent access. However, it is understood that members of the public do still use the slipway by climbing over the fence. During the 2022 inspection a large void was discovered in the surface of the slipway. Due to the extent and depth of the void this was immediately reported to Scarborough Borough Council, who later that day (01/03/2022) came to site to assess the defect.

The large vertical crack on the wingwall has deteriorated and a block is now missing adjacent to the crack. Surrounding blocks appear loose and are at risk of being displaced. The crack and blockwork defects appear to correlate to a depression in the deck suggesting settlement issues.



Access ramp still in use despite fencing (/1201C08)

Wing-wall at access ramp - 2020 (/1201C21)

At the southern end of the North Bay, there is a large stepped concrete blockwork sea wall structure (/1201C08) constructed with nine large buttresses/bastions which protrude from the wall out onto the beach. The apron of the structure is most exposed at the northern end of structure. There is one longitudinal crack in the blockwork across several adjacent blocks. Although noticeable, this has not deteriorated since the last inspection. The promenade surface is poor in places.



Concrete blockwall wall with buttresses (/1201C08)

Longitudinal crack in blockwall wall (/1201C08)

There is a short section of vertical blockwork wall (/1202C23) between the stepped concrete blockwork wall and the rock armour revetment to the south. This short wall is in fair condition overall, the missing blockwork at its southern end has been repaired. However, the lower three courses remain heavily abraded. A secondary wall which sits to the rear of the promenade and adjoins the access steps has a notable full height crack.

The southern-most section of defence in North Bay is the first section of the rock armour at Clarence Gardens that was constructed in 2004/5 (1202C01). This remains in good condition in 2020, protecting the original wall behind.



Repairs to southern end of wall (/1202C23)



Rock revetment fronting seawall remains in good condition (/1202C01)

3.18 Management Unit 21 – Castle Cliff, Scarborough

Coastal Slope Condition Assessment

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 continues to be classified as Inactive, unchanged from previous surveys. The unit comprises a series of relict rotational landslides and is prone to rockfalls. However, there was no evidence during the 2022 inspection of recent rockfall activity.



MU21/1 Historic rotational slip (Inactive)



MU21/1 and MU21/2 Rock fall debris at toe of cliff

Unit MU21/2 forms the Castle Cliff promontory and continues to be classified as Locally Active, unchanged from recent inspections. The cliffs are steep with extensive toe protection measures and rock netting on exposed faces. Locally, bedrock is exposed where it is subject to ongoing weathering and erosion from rainfall. There are rock fall debris piles at the toe of the cliff highlighting past activity. There is one historic rotational slip behind seating area on Marina Drive.



MU21/2 Historic rotational slip (Locally Active)



MU21/2 Rock fall debris at toe of cliff

MU21B – The Harbour

There are no natural cliff units within this Sub-management Unit.

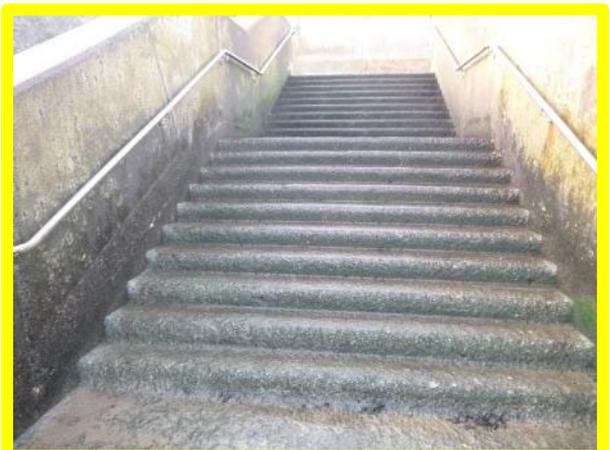
MU21A/1 and 21A/2 – The Holms and Castle Headland

Part of the wider East Pier to the Holms Coast Protection Scheme, constructed between 2003 and 2005, protects this frontage with a rock armour revetment which extends from the southern end of North Bay (/1202C03). This continues through the Holms as rock armour with concrete toe piles to reduce the footprint of the defence, thus limiting encroachment into the foreshore SSSI (/1202C04). The toe piles appear to be effective but could only be inspected from the promenade, a healthy build-up of natural rock in front of the piling is offering further protection.

There is a continuous wave return wall along the crest of these defences, which remains in good condition along both asset lengths. Where there are beach access steps through the rock armour in the south part of North Bay (/1202C01), there is considerable abrasion damage to the steps although the structures themselves remain sound. Scour holes at the foot of several sets of the steps were not observed in 2022, as it appeared that high beach levels and the local accretion of beach material had filled these in. The lower sections of the access steps (/1202C01) have steel edges in place which are now heavily corroded and are a trip hazard.



Steps in fair condition (/1202C01)



Heavily abraded steps with rounded edges (/1202C01)



Rock armour revetment and wave return wall (/1202C03)



Rock armour revetment and with natural rocks offering protection (/1202C04)

The section of defence continuing around the Castle Headland to the harbour is an Accropode revetment with concrete toe piles and a rock armourstone crest, with a concrete wave return wall (/1202C02). As reported previously, the inspection was limited to views from the crest wall and it was not possible to inspect the toe as along most of the length it is below water in all tide conditions. Overall, these defences remain in good condition with only localised evidence of concrete abrasion and cracks in the Accropodes. There was one notable example of cracking and subsequent movement of several Accropode units on the northern apex of the headland. Given the location and potential risk further movement this should be monitored. The crest wall is generally sound with only minor cracking and good joint seals. The promenade remains in overall good condition in the 2022 inspection.



Accropode revetment with concrete toe piles, rock crest and wave return wall (/1202C02)



Example of locally cracking and movement of Accropode units, but otherwise revetment in good condition (/1202C02)

MU21B/1 and 21B/2 – The Harbour

Scarborough Harbour comprises both the inner Old Harbour and the newer East Harbour and is located at the southern side of the Castle Headland at the old part of the town. There are continuous formal defences throughout the whole extent, ranging from the 2005 rock armour and Accropode sections to very old stone quay walls. Around the commercial side of the harbour many of the defences are aged and are constructed using sheet metal piles backfilled with mass concrete.

The outer face of East Harbour’s outer pier is protected by rock armour and Accropode units (/1301C01) and is in good overall condition. Towards the seaward end of the pier, many of the original wall blocks on the crest of the outer wall are heavily abraded and some are partially cracked.



East Harbour outer pier (/1301C01)



Abrasion towards seaward end of East harbour outer wall (/1301C01)



East Harbour inner pier, historically repaired joints visible (/1301C16)



Open joints at base of wall, principal blockwork appears in fair condition (/1301C16)

The inner facing wall of East Harbour's outer pier (/1301C16) was refurbished as part of the 2005 scheme, with missing blocks replaced and joints filled. The 2022 inspection of this asset was timed around a low spring tide and a thorough inspection of the inner wall face was possible from the harbour bed. The inspection notes that there was extensive evidence of missing mortar from joints, heavily abraded sections of masonry blockwork, movement or failure of access steps and deterioration of previous repairs. However, there did not appear to be any significant movement of blocks in the wall face. The overall condition of the inner face remains fair.

Despite timing the inspection around the low tide, the seaward end of the East Harbour's outer pier could not be inspected as it remained underwater. When looking back towards the pier from the south it was possible to identify several large lateral voids in the seaward face of the structure. These were not visible from the pier itself. A more thorough structural inspection of this area (by boat) is recommended to determine the size and nature of these voids.



Access steps at nose of East Harbour pier in fair condition. (/01301C01)



Access steps at root of East Harbour pier in poor condition. (/1301C01)



Repairs to the crest of the original wall toward the seaward end of the East Harbour outer pier (/1301C16)



voids visible around low water mark. (/1301C16)

At the landward end of East Harbour is a short section of low wall (/1301C02) which is largely obscured by an overhanging platform which houses fairground attractions and arcades. As such the wall could not easily be inspected. However, as this wall is not subject to marine influence, its condition is somewhat less critical than other harbour structures. Where observable, the pointing between blocks was in good condition but render on the upper section of wall is starting the break away in places. This wall extends to a slipway to East Harbour which is located on the inner side of Vincent's Pier and remains in fair condition with some evidence of abrasion missing mortar between cobbles.



Low masonry wall underneath overhanging wooden promenade. (/1301C02)



Slipway which separates (/1301C02) and (/1301C04) in fair condition.

Vincent's Pier (/1301C04) separates East Harbour from Old Harbour and is in overall fair condition. The wall facing East Harbour is largely covered by timber boarding and algae growth, making inspection difficult, but where visible the blockwork and joints are sound. The pier deck is in good condition.



Wall of Vincent Pier facing east (/1301C04)



Wall of Vincent's Pier facing west (/1301C04)

At the harbour arm beyond the Captain Sydney Smith Bridge, near the lighthouse, the steel sheet piling on the outer wall (/1301C17) is corroded but no holes were obviously apparent. It was noted in the 2022 inspection that the seaward edge of the structure was fenced off with Heras fencing, which restricted inspection of the access steps on the western face of the wall. It is notable that the blockwork walls at the end and inner facing walls (/1301C03) of this pier have evidence of missing mortar and joints, the overall condition of the pier remains fair. The floating pontoons are constrained by vertical guide posts which are mounted onto the masonry wall (/1301C03). In several locations the pontoons appeared to be sagging. This may locally increase loading on the guide post and the connections into the masonry wall. It is recommended that the pontoons, guide posts and connections are inspected in detail.



Corroded steel sheet piling (/1301C17)

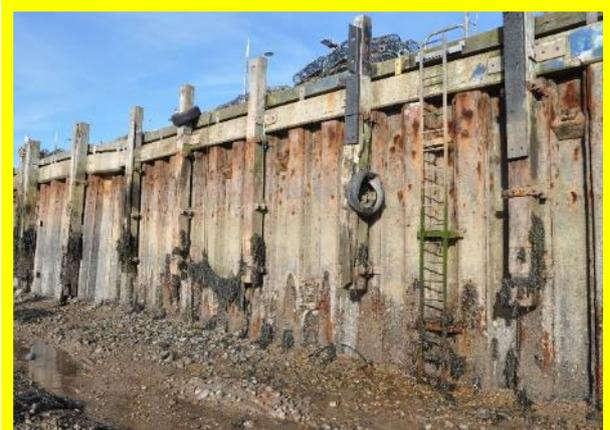


Cracks and missing mortar on inner wall at entrance breakwater (/1301C03)

Moving westwards from the landward end of Vincent's Pier, the temporary portable cabins used by the RNLI have been removed upon completion of the new lifeboat station immediately adjacent to West Pier at the northern end of Scarborough South Bay. The promenade eastwards of here is supported by several arches built in front of the original quay. These remain in fair condition with well pointed stonework, however the previously reported damage to the concrete capping apron remains unrepaired and is in poor condition.



Some Cracking and missing joints to capping apron to wall south of roundabout opposite arcade. (/1301C05)



Corrosion and vegetation growth on steel sheet pile wall. (/1301C12)

West of the arches, the quay wall leading to the slipway midway along Sandgate is formed by steel sheet piling (1301C12) which is corroded but otherwise appears in fair condition. The slipway (1301C11) remains in fair condition, albeit with several large recent concrete repairs visible. The short length of visible blockwork quay wall (1301C06) adjacent to the slipway is also in fair condition with evidence of missing mortar and abrasion of the blocks visible under the suspended deck. The handrail which runs along the edge of the blockwork key wall, above the slipway has been repaired having been reported as damaged in the 2020 inspection.

Immediately west of here is a concrete jetty which has been constructed to extend a suspended deck seaward of the wall. Previous inspections have reported signs of movement of the jetty and original quay wall, but this is not obviously apparent as has been reported in recent walkover inspection. There was no sign of cracking or lateral movement across the deck. The slipway and wall at the western end of Sandgate (/1301C14), adjacent to the West Pier, is generally in fair condition. The sheet piles at the toe of the slipway show signs of vegetation growth and some minor corrosion but appear in fair condition. As has been reported in previous inspections the low blockwork wall on the northern edge of the slipways has experienced some localised displacement resulting in movement of the blocks and coping.



Slipway, quay wall and concrete jetty (/1301C11 and C06)



Suspended deck of concrete jetty (/1301C06)



Suspended deck of concrete jetty (/1301C06)



Abrasion to quay wall beneath suspended deck (/1301C06)



Looking towards slipway at western end of Sandgate (/1301C14)



Minor damage and displacement to blockwork wall (/1301C14)

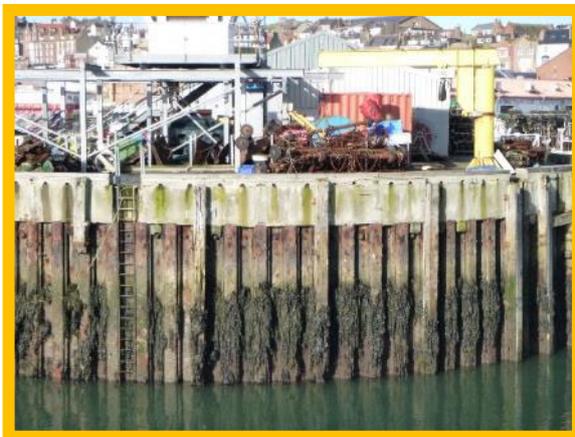
The inner face of the West Pier (/1301C13) appears to be mostly in fair condition, but the steel sheet piling is corroded. In particular at the landward end directly adjacent the slipway where a void was visible. This instance of corrosion may be indicative of the levels of corrosion elsewhere and should be monitored. The seaward end (/1301C18) also has corroded steel sheet piling and longitudinal cracks in the concrete capping beam, as reported in the 2018 inspection. As such the poor condition rating is retained following the 2022 inspection. Immediate repairs are recommended throughout the structure. It is understood that recent dive surveys have recorded large voids around the seaward end of the structure and there is a weight limit for vehicles in place on the structure. It is recommended that the deterioration is monitored before a capital scheme is in place.



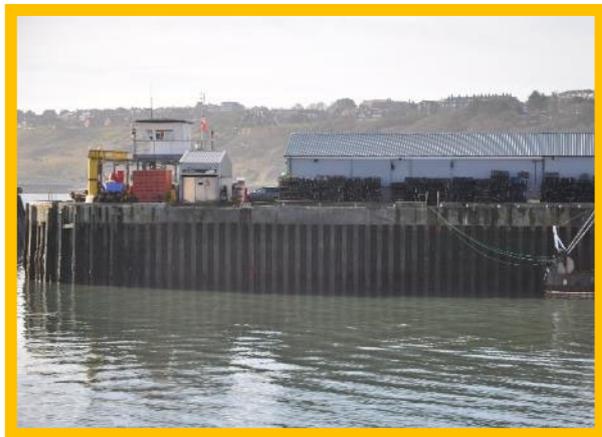
Corroded steel sheet piling on inner face of West Pier (/1301C13)



Corroded steel sheet piling notably worse directly adjacent slipway (/1301C13)



Corroded steel and cracked capping beam on seaward end of West Pier (/1301C1718)

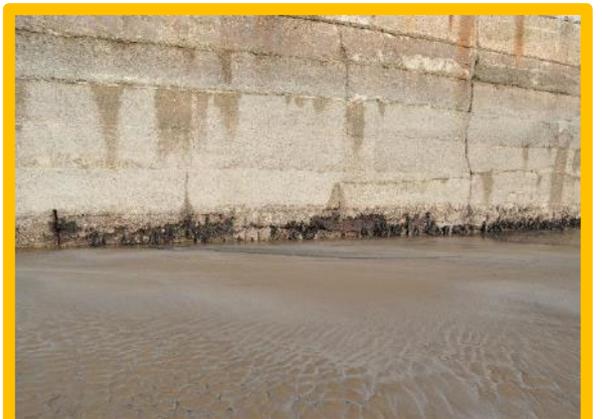


Corroded steel and damage to capping beam on inner face of West Pier (/1301C1718)

The outer face of West Pier (/1301C07) continues to show several significant defects including numerous longitudinal cold joints, several large full height cracks and exposure of aggregates. Its condition has been recorded as poor since 2009. Some previous repairs are obvious but in places cracks remain partly open. There is one area of voiding near the toe of the wall which was reported in 2018 and remains unchanged. During the 2022 inspection the timber piles at the toe of the structure were visible. There is extensive spalling and loss of render near the seaward end of this southern face. Repairs are recommended.



Longitudinal cold joints in south face of West Pier wall (/1301C07)



Timber piles visible in south face of West Pier wall (/1301C07)



2018: Void at toe in south face of West Pier wall and damaged conduit (/1301C07)



Spalling and loss of render in south face of West Pier wall. Void remains unchanged (/1301C07)

The poor condition of the seawall extends to its landward end (/1301C19), unchanged since 2020 and urgent repairs are recommended now that the RNLI lifeboat station is complete. During the 2022 inspection the timber piles at the base of the structure were visible.



Large open joints and cracks are evident from along the wall's full extent (/1301C19)



timber piles visible at toe of wall (/1301C07)

3.19 Management Unit 22 – Scarborough South Bay

Coastal Slope Condition Assessment

This Management Unit is divided into two smaller Sub-management Units.

MU22A – St Nicholas Cliff

There are no natural cliff units defined within this Sub-management Unit, but terraced gardens are present near the Town Hall.



Terraced gardens at St. Nicholas Cliff

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. Some areas within South Cliff Gardens have been subject to historic shallow slips which have been remediated by soil nails.

A major slope stabilisation scheme to reduce the risk of both shallow and deep-seated failures behind the Spa was completed at the end of 2019.

In March 2018, a section of retaining wall behind the chalets situated on the cliff failed and the area was fenced off awaiting repair. Capital works to provide localised slope stabilisation in this location and to prevent further failures of the slope directly below the Clock Tower Café were completed in late 2020.

Holbeck Gardens was subject to a catastrophic deep-seated landslide in 1993 but has been stabilised since.

Unit MU22/1 is the most northerly unit located in Scarborough's South Bay and is classified as Inactive in 2022.



MU22/1 Inactive



MU22/1 Inactive

Unit MU22/2 comprises the area around and to the north of the Spa complex. The unit was downgraded from Locally Active to Inactive in 2012. Works to stabilise the cliffs behind the Spa begun in June 2018 and were completed in January 2020. The works undertaken included; installation of 4,585 no. soil nails to reduce the risk of shallow failures, and 225 no. steel piles to reduce the risk of deep-seated failures. Furthermore, an extensive programme of footpath reinstatement and landscaping was undertaken improving the condition and safety of the slopes. During the 2022 inspection, vegetation across all slopes was found to be well established and in good condition. Timber handrails and access path surfaces were all in as-built condition. The unit retains its Inactive status in 2022.



MU22/2 Soil nail installation on coastal slopes near the Spa in 2018



MU22/2 Soil nail and slope mesh installation behind main Spa building in 2018



MU22/2 in 2022 the vegetation on the upper slopes was found to be well established.



MU22/2 looking down behind main Spa building in 2022.

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



MU22/3 Coastal slopes behind Spa adjacent cliff lift



MU22/4 Inactive in 2022.

Units MU22/4 and MU22/5 comprise the northern part of the South Cliff Gardens and were both classified as Inactive in 2016, unchanged since previous surveys. In March 2018, a retaining wall at the back of some chalets below the Clock Café failed. This also caused large cracks to appear in the footpath above. A capital scheme which comprised slope stabilisation works to reduce the risk of localised failures was completed in late 2020. MU22/4 was not classified in 2020 due to the ongoing works, however in 2022 the unit was found to be inactive. MU22/5 also retains its inactive status. The slope stabilisation works involved the construction of a new retaining wall and the installation of soil nails. The works (where visible) were generally found to be in as-built (very good) condition. However it was noted that a low (non-retaining) wall had missing and loose coping stones. These presented a health and safety hazard and over time may result in the deterioration of the wall due to seepage.



MU22/4 large cracks in footpath above chalets in the location of the wall failure (Photo from 2018 Report).



MU22/4 slope stabilisation works ongoing during the 2020 inspection.



MU22/4 - recently completed retaining wall (left) transitioning into repointed pre-existing masonry retaining wall (right)



MU22/4 – recently refurbished retaining wall and newly constructed



MU22/4 wall coping found to be loose, damaged and missing in places.



MU22/4 – Inactive in 2022.

Unit MU22/6 is located behind the former bathing pool and is classified as Inactive in 2022, unchanged since previous surveys.

Unit MU22/7 is located at Holbeck Gardens and is classified as Locally Active in 2022, downgraded from Inactive in 2016 due to increased activity at the cliff toe. A number of footpaths within the unit have previously been closed due to cracking and ongoing instability. Generally, the slopes are well vegetated except for an area of exposed bedrock subject to small rockfalls at the cliff toe. The promenade at the base of the cliff is protected by a rockfall catch fence however since 2018 the promenade has been closed due to the increasing risk of rockfall from the cliff face.

Unit MU22/8 comprises the stabilised Holbeck Hall landslide run-out lobe and is protected at the toe by boulder armour. Localised sections near the headscarp are exposed. This unit is classified as Locally Active in 2022, unchanged since 2016.



MU22/8 The lower section of the slope at Holbeck Hall landslide (Locally Active)



MU22/8 Holbeck Hall landslide (Locally Active)

MU22 – Scarborough South Bay

A wide range of coastal defence assets are located in Scarborough South Bay. Throughout the defences there are vertical cracks, defects and areas of heavily abraded blockwork. Although there are numerous defects to the sea walls, the structures are generally sound and well maintained but ongoing repair work is needed to maintain or improve the condition of the assets and capital schemes have been recommended in the Coastal Strategy at several locations. Common defects visible throughout include mortar loss, blockwork abrasion and surface cracking.

During the 2022 inspection beach levels across the northern end of the south bay were high meaning that many of the assets were not fully visible.

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

The South Bay defences start at the RNLI lifeboat station, adjacent to West Pier (/1301C08). The construction of the new RNLI Lifeboat Station was completed in November 2016 and were generally found to remain in As Built condition during the 2022 inspection. Around the full perimeter of the seawall vegetation growth was observed. Although this does not pose an immediate risk to the structure it may lead to defects being missed or not identified. This impact of this is most notable beneath the slipway where vegetation growth now obscures the full height of the wall. One small defect was observed adjacent the slipway where a block has come loose from the wall itself. Due to the small voids which have appeared either side of the block the defect poses a risk of water ingress into the structure itself, particularly if the block is further dislodged.



New RNLI lifeboat station and slipway (/1301C08)



New RNLI lifeboat station wall (/1301C08)



New RNLI lifeboat station wall beneath slipway (/1301C08)



Dislodged block on new seawall (/1301C08)



Slipway next to RNLI station (/1301C20)

The low defence wall along the east side of Foreshore Road is split into a number of asset lengths between sets of access steps. These are, running from north to south /1301C15, C21, C22, C23, C24 and C25. Due to high beach levels at the time of inspections, sand was often flush with the promenade or, at best, only the top one or two courses of stone blocks were visible along most of this length. Due to the high beach levels, the northern section of frontage is classed as being in good condition, no change since 2020. The wall, where exposed, around the Olympia Leisure facility was in fair condition because of frequent washed out joints and abrasion to blocks, which would benefit from repair.



Beach levels flush with promenade at north end of Foreshore Road seawall (/1301C15)



An area of abrasion at top of wall (/1301C23)

At the subway beach access in the vicinity of the Spa Bridge (1301C09), repairs have previously been made to the northern section of beach landing apron to the access steps and these remain in good condition. Prior to the 2020 repairs were made to the northern access steps and apron. The repairs remain in good condition and appear to have increased the resilience of the apron and access steps. During the 2022 inspection it was noted that a new pair of handrails have been installed from the apron down to beach level. Due to the high beach levels at the time of the inspection these were partially buried as can be seen in the photograph below. The new handrails appeared in good condition. The central and southern section of the concrete apron remain in fair condition but with signs of abrasion and cracking. Beach levels in 2022 appeared similar to those observed in this location in 2020.



Repairs remain in good condition locally, but overall asset condition is fair (/1301C09)



Abrasion of toe apron south of previous repairs beach levels notably higher than 2018 (/1301C09)

Immediately south of the beach access steps, this wall continues alongside a beach access ramp (1301C10) and there is a vertical crack in the brick retaining wall to the rear of the ramp which needs monitoring for further movement and repair. It was noted in the 2022 inspection that there is now a second vertical crack to the south of the previously reported crack. Recent repairs have been undertaken on the main wall where significant defects were identified in the 2020 inspection. In particular the missing blocks around the spa feature fountain have been replaced along with extensive repointing at the southern end of the wall. The coping stone of the adjacent slipway has also undergone repair and is now in good condition. There are however some remaining defects including missing mortar, longitudinal and vertical cracks, gaps between the wall and its coping stone. Due to the repair work undertaken since the previous inspection, the wall has been upgraded to fair condition. Previous repairs to the seaward end of the slipway remain in good condition.



Original vertical crack in wall above access ramp (/1301C10)



New vertical crack (/1301C10)



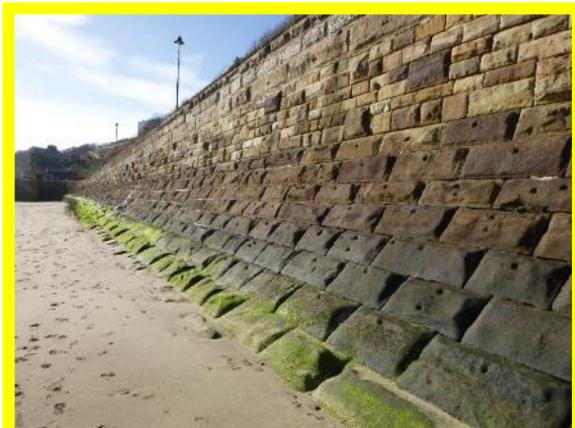
Repaired section of coping (/1301C10)



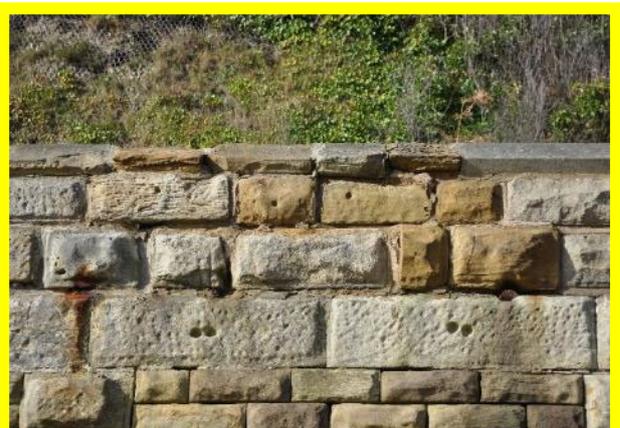
Repairs around Spa feature (/1301C10)

Spa Chalet – MU 22/A3

The recurved sea wall between Valley Road and the promontory at the Spa (/1301C26) continues to show occasional defects throughout, such as washout of joints and abrasion to the blockwork surface or coping, and some cracked blocks although they appear stable. The wall is in fair overall condition, with some of the upper courses, crest wall and coping having been previously repaired. Beach levels in 2022 were too high to inspect the toe of the structure or the timber piles which have been visible in previous inspection. It was noted that the crest wall is generally in a worse condition than the rest of the wall, with many historic repairs in poor condition. The crest wall is notably thin and as such unstable and may be prone to increasing levels of wave inflicted damage.



Occasional minor defects but overall fair condition seawall (/1301C26)



Crest wall generally in fair to poor condition (/1301C26)

The Spa – MU 22A/4 to 22B/2

The Spa frontage comprises the following elements:

- Northern tie-in – masonry blockwork wall with access steps to the beach.
- Northern section (Spa and Sun Court) - masonry blockwork wall with splash wall along the crest, and a concrete apron/sheet piling toe along part of the length. The section in front of the Sun Court additionally has a wave deflector just below the parapet.
- Closed colonnade section - masonry blockwork wall with historic colonnade section, now closed-off with in-filled concrete blockwork.
- Open colonnade section – featuring a sheltered seating area on the lower level and steps to the beach and upper promenade/road.
- Southern tie-in – masonry blockwork wall with access steps to the beach.

The masonry sea wall at the northern end of the Spa frontage (/1301C27) remains in fair condition following previous repairs, including reinstatement of a section of the masonry/concrete parapet after December 2013 storm damage. Previous repairs to fill joints between blocks in the wall's face also remain effective, however there are remaining open joints between blocks which require filling and cracks are still evident across the corners or full height of the face of some blocks. There is one notable vertical crack which has propagated through of the wall, and extends across the concrete apron (see comment below). In front of the Spa building's entrance, one section of sea wall has longitudinal cracks across three adjacent masonry blocks, which is likely to be an area of potential weakness.

Works were undertaken in June to August 2018 to construct a reinforced concrete toe to the northern section of (/1301C27). The more southern part of the wall already had an existing concrete toe with edge piles. The more recently constructed reinforced concrete toe generally remains in good condition although some minor vegetation growth obscured the inspection somewhat.

The most notable defect in this section of wall is a vertical crack which has propagated through the masonry wall and across the recently constructed apron.

The remainder of the wall remains in fair condition. Beach levels were low enough in places to show that some of the toe piles on the more northern section are severely corroded with some voiding visible, although there was no notable change from 2018 or 2020.

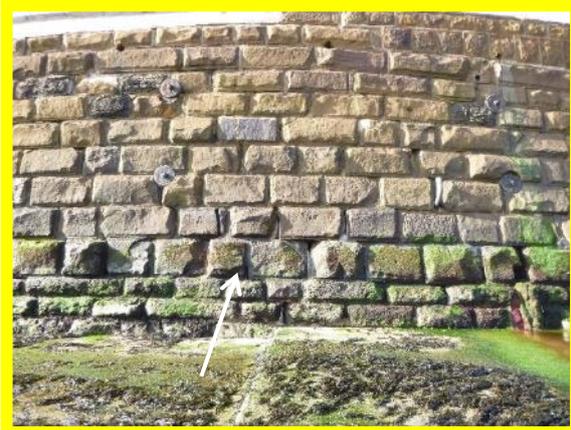
The drainage holes appear mostly in working order and the local area of wall containing ties shows no obvious signs of deflection.



Masonry sea wall with exposed piles at The Spa access steps in fair overall condition (/1301C27)



Corroded sheet piling along concrete apron(/1301C27)

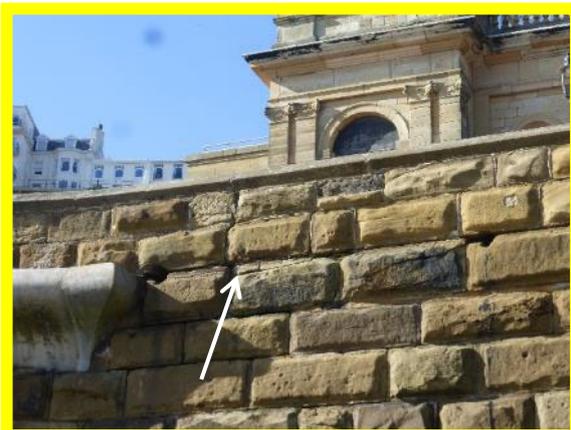


Vertical crack propagating through masonry wall (/1301C27)

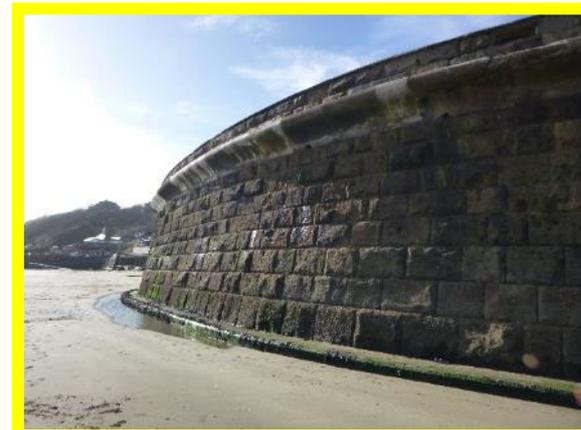


Crack along joint in concrete apron (/1301C28)

In front of the Sun Court (/1301C28), the wall has a concrete 'nosing' intended to act as a wave deflector below the parapet. Previous repairs to this element remain effective. There was one new section of damage noted on the wave deflector nosing. It is recommended that this is repaired. The concrete toe beam was partially exposed along the length of the Sun Court and visible sections appeared in fair condition.



Longitudinal cracks across blocks in sea wall (/1301C27)



Masonry wall in front of the Sun Court. Concrete toe partially visible (/1301C28)



One remaining section of damage to the bullnose wave deflector (/1301C27)



Previous repairs to the bullnose wave deflector in good condition (/1301C28)

The wall between the Sun Court and the closed colonnade (/1301C29), remains in fair overall condition but has several small open joints. Along the closed colonnade section (/1301C29) there have been a number of patch repairs undertaken in recent years. The lower splash beam, below the bricked-up openings has been repaired and the repairs appear to remain in good condition. Elsewhere however along this wall the condition remains fair due to evidence of spalling, loss of concrete and open joints. Previously, repairs have been undertaken to the adjacent steps. The pillars between adjacent in-filled openings show some minor cracking and spalling.

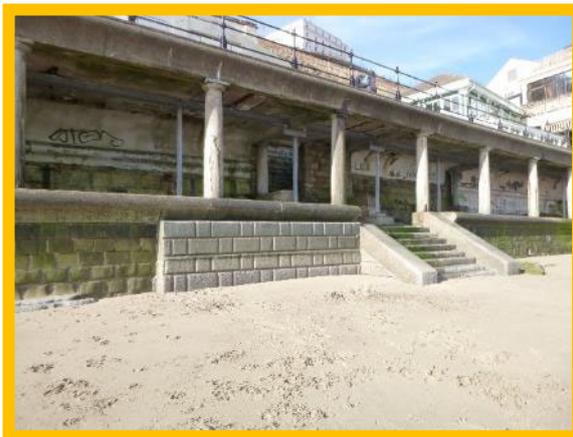


Closed colonnade section of wall in fair condition (/1301C29)



Repaired sections of beam in good condition (/1301C29)

Along the open colonnade section (1302C01) there are three flights of access steps from the low-level promenade to the beach, all of which are heavily abraded. The wall itself is in generally in poor condition despite previous December 2013 repairs remaining effective, with significant areas of open joints in other sections of the lower wall. Prior to the 2020 inspection works were undertaken to support the upper promenade from beneath. The works are formed from a framework of galvanised steel columns set into square plinths. A horizontal I-section beam runs the full length of low-level promenade between the galvanised steel columns. During the 2022 inspection the steelwork and concrete works were found to be in fair condition. The concrete support pillars which form part of the original structure remain in a poor to very-poor condition. The underside of the upper promenade deck is in very-poor condition with extensive cracking, spalling and corrosion staining visible. Repairs to the face and toe of the lower wall were noted as being in good condition with the original sections in fair condition. The access steps to the beach at the southern tie-in have been subjected to extensive repairs following previous damage in December 2013 and remain in fair condition.



Repairs to lower wall at the open colonnade are in good condition with remaining sections of original wall in fair condition. (/1302C01)



Previous repairs at southern tie-in following December 2013 storm damage (/1302C01)



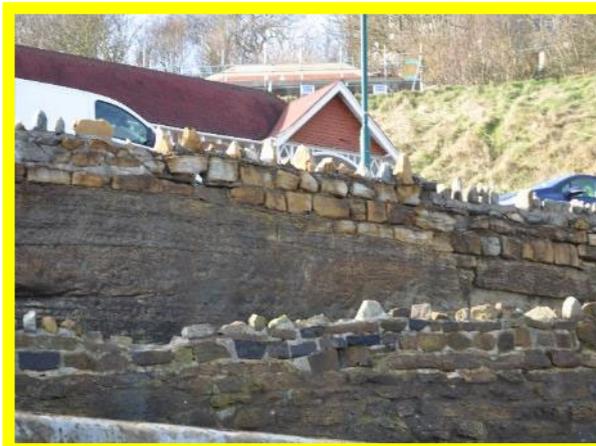
Steel columns and support beam supporting upper promenade (/1302C01)



Damage to underside of upper promenade (/1302C01)

South Cliff Gardens – MU 22B/3 and 22B/4

The low stone wall at South Cliff Gardens (/1302C03) has had a considerable number of repairs and rebuilding over the last few years, however notable cracks and gaps remain in need of further attention. There was evidence of recent repointing on the crest wall which appeared in fair condition. The wall remains largely unchanged in 2020. Behind the low stone wall is a secondary wall which is in fair to poor condition, most notably along the crest wall which appears to have some loose blocks and open joints.



Overall fair condition of low stone wall. Damaged section of crest wall visible in centre of image(/1302C03)



Overall fair condition of low stone wall and access steps (/1302C03)

The low stone wall continues at the rear of the promenade around South Cliff Gardens with a seawall in front (/1302C02). The seawall has a considerable number of historic repairs to the blocks and coping. The repairs, undertaken between 2018 and 2020, to a damaged section of coping, upper splash wall and at the southern end of the wall to the bagwork tie-in wall appeared to be in good condition. At the southern tie-in the upper courses of the wall have been replaced with a tiered concrete wall which sits upon the original bagwork. Elsewhere the wall is showing signs of age-related deterioration such as heavy abrasion of the facing blockwork, open joints and further localised damage (cracking and abrasion) of the coping stone. Overall the wall is in fair condition and would benefit from a programme of capital maintenance to address the deterioration of the blockwork before further major defects occur.

Capital works to the slope at the rear of the low stone wall beneath the Clock Tower Café were completed in 2020. The works comprised construction of a new retaining wall and soil nails to stabilise the cliff face surrounding the wall. The new retaining wall appeared in as-built condition however a minor defect was observed on one of the adjacent low stone walls where the coping stone was loose along a significant length of the wall (for further details refer to comments above in discussion of MU22/4).



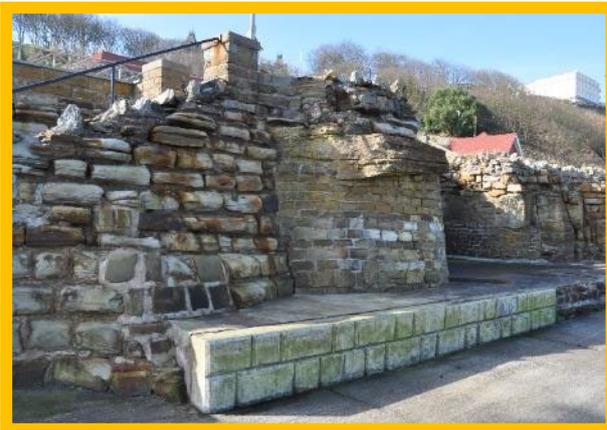
Overall fair condition seawall is fair (/1302C02)



Bagwork/screed wall (/1302C02)



Repairs to wall face and coping in good condition. Extensive abrasion of adjacent blocks (/1302C02)



Repairs to splash wall on promenade in good condition (/1302C02).

South Bay Pool MU 22B/5

A concrete block wall (/1303C02) extends around the infilled lido pool, which is now used as a Star Disc. This wall has slightly stepped blocks on its face and these blocks and the wave return coping show extensive signs of age-related deterioration including abrasion and rounding of block edges and cracking and chipping of blocks and coping. There are also a number of lateral open joints where the joint sealant has washed out. Some areas of the wall have been subject to beneficial repairs, but there are numerous other areas of open joints. In one location, a failed outfall pipe extends across the foreshore. The wall's condition has retained its poor condition rating in 2022. It is recommended that a programme of capital repair work is undertaken to address the ongoing deterioration in the structure prior to any significant defects occurring. The wave return coping stone has been sporadically repaired and in these places it is in good condition, however elsewhere it remains poor.



Concrete block wall with open joints and heavy abrasion (/1303C02)



Previous repairs to wave return coping (/1303C02)

Holbeck Gardens MU 22B/6

There is a bastion groyne at the north of this frontage (/1304C02) which has trapped sand between here and the rock revetment around the Holbeck Hall landslide to the south. The groyne is in fair condition, showing some signs of abrasion a small degree of undercutting on its northern aspect. The lower sections of the backing seawall have historic repairs however the majority of the wall, in particular the coping is heavily abraded. The upper wall also has a number of previous repairs however is also in poor condition due to a large number of remaining defects including cracking, abrasion, damage to the coping, corroded handrail and extensive corrosion staining. The promenade deck which sits above the wall remains closed due to rockfall from the cliffs to its rear and as such could not be inspected along its full length. It was possible to view the promenade from a distance from the south and the condition appeared poor with evidence of extensive cracking and vegetation growth from cracks and between slabs.



Bastion groyne in overall fair condition (/1304C02)



Seawall in overall poor condition Cracks to bastion throughout. Mortar missing between blockwork in lower wall. (/1304C02)



Upper prom has been fenced off and is in poor condition, heavily abraded and damaged handrail (/1304C02)



Missing pointing / open joints and damaged parts of upper and lower capping beam (/1304C02)

Holbeck Cliff MU 22B/7

The rock armour revetment (/1304C01) defending the relict debris flow lobe at the site of the Holbeck Hall landslide remains in good condition in 2022. The armour remains tightly packed and with a good coverage and no evidence of movement. It was noted that there appeared to be some washout of the material at the crest of the embankment, likely due to wave overtopping of the revetment. This may increase the risk of localised settlement to the rock armour. At the southern end of the defence the beach access ramp has a vertical drop onto the rocky foreshore making its use difficult. Furthermore, during the 2022 inspection it was noted that there appeared to be undercutting and cracking of the most seaward concrete slab. The condition of the slipway is such that it does present a health and safety risk to members of the public who may choose to access the beach in this location.



Rock revetment around debris lobe of Holbeck Hall landslide (/1304C01)



Vertical drop and crack in concrete at end of access ramp at south end of revetment (/1304C01)



Rock revetment around debris lobe of Holbeck Hall landslide (/1304C01)

3.20 Management Unit 23 – Holbeck to Knipe Point

Coastal Slope Condition Assessment

This Management Unit consists of a large number of units, from MU23/A in the north to MU24/A7 at Knipe Point in the south.

Unit MU23/A is located immediately south of the Holbeck Hall landslide run-out lobe and is classified as Partly Active in 2022. This unit has well-vegetated upper slopes, but the cliff experiences ongoing marine action and rockfalls with evidence of recent activity on the cliff section of the slope. At the interface between MU23/A and MU23/B a recent landslip and debris lobe was observed. Evidence of the slip is also present in arial imagery from 2021 of the frontage.

Unit MU23/B continues to be classified as Partly Active in 2022 due to ongoing activity at the cliff toe.

Unit MU23/C is well-vegetated in the upper cliff but with a steep and eroding cliff toe and remains classified as Partly Active in 2022.

Units MU23/D1, MU23/D2 and MU23/D3 are located at Wheatcroft Cliff above Black Rocks. These units are active along much of their length, with ongoing recession of the headscarp, slumping in the mid-slope and erosion of the toe. They are classified as Partly Active in 2022.



MU23/A Partially active evidence of significant amount of fallen rock at toe of cliff



MU23/A & B Partially active landslip and debris lobe visible



MU23/C Partially active with ongoing recession at the headscarp

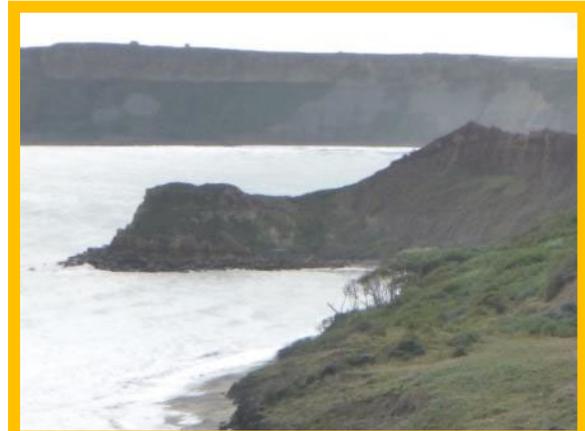


MU23/D Partially active with ongoing recession at the headscarp and evidence of activity on mid and lower slopes

View from MU23/A to MU23/D3 All Partly Active

Unit MU23/E is located at White Nab and remains classified as Locally Active in 2022. The slopes of this unit support some vegetation cover with intermittent areas of more intense erosion mid-slope and at the unit toe.

Unit MU23/F is a narrow, thin unit which follows a small valley occupied by an outflow channel for a pipeline and pumping station. The slopes inland are well vegetated and show very little evidence of recent activity. As a result, this unit has been classified as Locally Active in 2022. Works have been undertaken to repair the Yorkshire Water outfall at this site relatively recently (with a replacement long sea outfall scheduled to be built in the future).



View from **MU23/F** to **MU23/J** (status varies as below)

MU23/I4 and **MU23/J** (Knipe Point).



Headscarp recession has encroached on footpath. Note temporary boards to stabilise and mark path edge **MU23/F**.



Localised activity across mid slope of **MU23/F** (Locally Active in 2022).



Localised erosion at toe of MU23/G1 and G2.



Erosion of toe and evidence of activity across mid-slope along **MU23/I**.

Units MU23/G1 and MU23/G2 form the northern part of Frank Cliff and are both classified as Partly Active in 2022. The upper slopes of these units support some vegetative cover. The unit toes are highly active with evidence of rockfalls, slumping and sliding onto the beach below.

Unit MU23/H forms the headscarp and upper zone of a large mudslide embayment at Frank Cliff. Little erosion is evident, and it is classified as Locally Active in 2022. **Unit MU23/H2** forms the main body of the mudslide and has a greater level of activity and is classified as Partly Active. The mudslide toe comprises a series of smaller mudslides forming **units MU23/H1, MU23/H2a, MU23/H2b and MU23/H3**. In 2022, Partly Active status has been retained for these lower units due to evident toe erosion.



Headscarp recession has encroached on footpath **MU23/I**.



Evidence of localised activity along toe of **MU23/I1, 2 and 3**.

Unit MU23/I comprises the main body of the Cornelian Bay mudslide and was classified as Locally Active in 2020. Although the overall condition of this management unit remains unchanged in 2022 it is worth noting that ongoing headscarp recession within the unit continues to pose a risk to the footpath however there was no evidence of recent activity. **Units MU23/I1, MU23/I2 and MU23/I3** form smaller mudslides at the toe of unit 23/I. All these units have been classified as Locally Active.

Unit MU23/I4 is situated on the north side of the Knipe Point headland and is composed of soft glacial material. The unit was downgraded from Totally Active to Locally Active in 2012 before being upgraded to Partly Active in 2018, a grading it retains in 2022 due to persistent ongoing erosion.

Unit MU23/J is also located on the north side of Knipe Point. This unit is composed of hard, well jointed rock and was upgraded from Locally Active to Partly Active in 2014 due to the actively

receding toe and exposed bedrock in the mid-cliff which is a source of rockfall. This classification is retained in 2022.

Coast Protection Asset Condition Assessment

There are no coastal defence assets within this Management Unit.

3.21 Management Unit 24 – Cayton Bay

Coastal Slope Condition Assessment

This Management Unit is divided into two Sub-management Units.

MU24A – Cayton Bay North

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

Immediately south of Osgodby Point, unit MU24/A comprises mudstone at beach level of the Cayton Cliff landslide complex. The wide expanse of Cayton Cliff is capped by till which is heavily vegetated. Significant recession of the head scarp occurred during an event in 2008-2009, resulting in the loss of land and properties at Knipe Point Drive. The cliff at the toe of the complex is steep and comprises uplifted debris from deep landslide movement. Only localised activity is evident at the toe and head scarp, with no evidence for movement in the body of the landslide, and so the unit is Locally Active in 2022, unchanged since 2012. The only notable change was that the upper beach levels appeared lower around the toe of the debris lobe when comparing with the previous 2018 and 2020 inspections. This appears to be locally increasing rates of erosion along the toe. The eastern and southern faces of Knipe Point (sub-unit MU24/A7 and A8 respectively) were found to be Partly Active in 2022, as they have been since 2008.



Heavily vegetated till of Cayton Cliff. **MU24/A** Locally Active in September 2022



Toe of Cayton Cliff. **MU24/A** Locally Active in September 2022



Toe of Cayton Cliff. **MU24/A & A7** Locally Active in 2022



MU24/A7 Partly Active in 2022

Tenants' Cliff is a complex of terraced landslips in mudstone and sandstone and is divided into 11 units. Unit MU24/B forms the main part of the Tenants' Cliff landslide and is classified as Inactive in 2022, no change from 2016. The toe of Tenants' Cliff is categorised into ten smaller landslide units comprised of massive displaced blocks of sandstone.

The most northerly unit (MU24/B1) is classified as Locally Active. Along the toe of these units there is an ongoing accretion of pebbly material with the beach profile increasing in gradient into MU24/B2 which was observed to be Partly Active in 2022. along with MU24/B3 to MU24/B8 which all remain classed as Partly Active in 2022. It was noted in the 2022 inspection that a set of timber access steps onto the foreshore had been repaired and were in good condition, providing a safe access onto the beach.

At MU24/B9, there is intense ongoing erosion of the unit toe, and the unit retains its Totally Active status in 2022. It was also noted that various ad hoc repairs have been made to the northern end of the adjacent coastal defence wall to counteract the outflanking caused by the retreat of this unit. All these units are classified the same as they were in 2020. MU24/B10 is protected by the seawall which extends northwards from the pumping station. During the 2022 survey it was completely vegetated and is classified as Inactive.



Heavily vegetated part of Tenants' Cliff complex. **MU24/B** Inactive in August 2020



Steps at toe of Tenants' Cliff complex. **MU24/B1** in good condition



Toe of Tenants' Cliff complex **MU24/B1** Locally Active in 2022



Toe of Tenants' Cliff complex. **MU24/B2** Locally Active in 2022



Toe of Tenants' Cliff complex. **MU24/B6** (left) to **MU24/B3** (right) Partly Active in 2022



Intense erosion in **MU24/B9** (Totally Active in 2022)

MU24B – Cayton Bay South

This Sub-management Unit consists of units MU24/C to MU25/T.

Units MU24/C to MU24/O are composed of glacial till down to beach level and stretch south from the pumping station as Killerby Cliffs. Apart from MU24/F, MU24/G, MU24/H, they are all classified as Partly Active in 2022, unchanged from 2014.

The Partly Active units show active recession of the head scarp and slumping in mid and lower slopes. At the cliff toes, there is evidence of instability through slumping and erosion. The exception to the Locally and Partly Active classifications is MU24/H which comprises the access route to the beach. The slope of this unit is engineered and well vegetated, with no obvious signs of recent activity, and so is classified as Inactive.

The large bowl to the west of the beach access comprising of MU24/F and MU24G was noted as being well vegetated in 2022 with only some minor erosion of the toe, as such these units are classed as Locally Active. To the east of the beach access at MU24/I and MU24/J there is activity along the head scarp, and so both units are classified as Locally Active.

In the south-central units (MU24/K to MU24/O), the slumped till may be masking bedrock in the lower cliff. These cliff units show ongoing slumping and erosion and remain classed as Partly Active in 2022.



Toe of Killerby Cliffs. **MU24/C** Partly Active in September 2022



Till of Killerby Cliffs. **MU24/D** Partly Active in 2022



Vegetated till slopes of Killerby Cliffs. **MU24/F** Locally Active in 2022



Toe of Killerby Cliffs. **MU24/G** Locally Active in 2022.



MU24/H Inactive in 2022



Toe of Killerby Cliffs. **MU24/I** Partly Active in 2022.



Toe of Killerby Cliffs. **MU24/J** Partly Active in 2022



Till of Killerby Cliffs. **MU24/M1** (right) and **MU24/M2** (left) (both Partly Active in 2022)

Units MU24/P to MU25/T are predominantly exposed near-vertical sandstone at the toe of a steep cliff overlain by mudstone with a thin capping of till. The sandstone is characterised by local rock falls on to the beach and platform with local small debris cones off the base of the mudstone. In 2016 all units MU24/P to MU25/T were upgraded from Partly Active (in 2014) to Locally Active. In 2018 MU24/P, MU24/Q and MU24/T showed further signs of activity and so regained their Partly Active status. Following the 2020 walkover inspection MU24/R and MU24/S also regained their Partly Active status. All units retain the same status Partly Active status as observed in 2020.

In 2020 due to the activity within cliff units MU24/L and MU24/M1 and the retreat of the headscarp at the boundary between the two units a historic WW2 pill box was significantly undercut and at imminent risk of collapse. In the 2020 walkover inspection it was noted that the undercut concrete base of the structure has collapsed and now rests high on the cliff face and is at risk of sliding onto the beach. Following the 2020 inspection, the pill box has been demolished and removed from the headscarp. This has mitigated the risk of the dilapidated structure collapsing onto the cliff / beach below. In 2022 the condition of units MU24/L and MU24/M1 remains as Partly Active due to the high degree of activity across the full cliff profile.



Looking from up from the beach at the base of **MU24/M1** in September 2018, note undercutting of Pill Box.



Looking from up from the beach at the base of **MU24/M1** in August 2022.



Composite sandstone and mudstone cliffs in south Cayton Bay. **MU24/N** (right) and **MU24/O**(left) (both Partly Active in 2022)



Local rock fall and debris cone in **MU24/P** (Partly Active in 2022)

Coast Protection Asset Condition Assessment

MU24A – Cayton Bay North

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

MU24B – Cayton Bay South

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

To the north of the pumping station (which is now converted to a private residence) is a private blockwork defence with concrete toe slab (/1402C02), which ties into the eroding cliffs to the north with a mixture of brick, stone blocks and concrete. The wall itself remains in fair condition and appears newer than the wall to the south. At the interface with the adjoining defence to the south there is evidence of leaching and moisture draining down the face of the wall from the cliff unit above. During the 2022 inspection it was noted that high beach levels in part covered a large void in the apron of 1402C02. The depth of the void is unknown however in previous inspections it appeared to be in the order of 2 metres and may be encroaching beneath the base of the wall. Despite the higher beach levels in 2022 it is recommended that further investigation of this defect is undertaken determine the risk to the wall's stability. The remainder of the toe is in poor condition and is undercut in several places. The erosion of the undefended cliff immediately to the north of the tie-in appears to have slowed. Between 2012 and 2014, the wall became outflanked but in recent years it does not appear to have worsened. Despite this the northern transition remains at risk of being compromised by rockfall and erosional activity in this cliff unit.



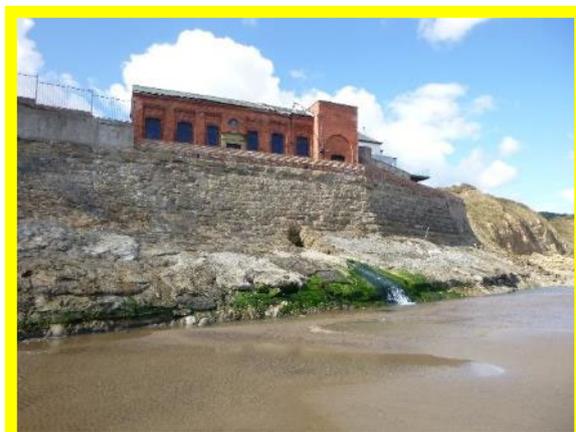
Private sea wall in fair condition. Large void visible in wall apron. (/1402C02)



Erosion of undefended cliffs at tie-in of sea wall private sea wall (/1402C02)



Interface between (/1402C02) and (/1402C05)



Private sea wall in fair overall condition but with the concrete apron is subject to ad hoc repairs in varying condition (/1402C05)

There is a complex series of private blockwork and concrete sea walls (/1402C05) protecting the main pumping station building.

The condition of the defences varies with the higher, red brick walls appearing sound, the lower, concrete and sandstone blockwork remaining in fair condition but the apron at the toe being the worst affected. There was no notable change between the 2020 and the 2022 inspections. Numerous *ad hoc* repairs were noted as being in a variety of conditions with the lower grouted repairs being in the worst condition and the more recent repairs on the upper wall splash wall generally in better condition. In some locations undercutting of the concrete apron is visible, and particularly around the apex of the bend in the structure, marine vegetation may have obscured further voiding. One sizeable void was noted higher up on the apron, the void is not new and does not appear to have increased in size however the depth and size of the void is unknown and requires further investigation.

Overall, the structure remains in fair condition following the 2022 inspection however, it is suggested that the condition is monitored closely if beach levels recede.



Private sea wall in fair overall condition but with the toe apron subject to ad hoc repairs and localised undermining (/1402C05)



Evidence of voiding and deteriorations of grouted revetment at southern end of defence(/1402C05)

Between the southern end of the pumping station defences and the landing of the beach access steps, there is a length of defence (/1402C04) which exhibited major undercutting and blockwork loss leading to washout of backing material observed during the 2016 inspection. Numerous repairs were made to the defence including a new section of mass concrete wall, repairs to the decking and infilling of the large voids created by washout of fill material. Beach levels along this section are up to 0.7m higher than in 2018 (0.3m higher than in 2020), meaning undercutting and voiding which has previously been reported in this location is now fully concealed. Despite the repairs made following the damage in 2016 the defence remains in very poor condition and is considered a risk to the public due to; potential voids within the structure, the great variation in surface condition of the deck's slab and the localised outflanking and undermining of the footpath and upper retaining wall fronting the vegetated slope. It was noted during the 2020 inspection that the mass concrete repair made to the wall following the 2016 inspection was undercut and outflanked at one end. In 2022 the undercutting was no longer visible due to the higher beach levels. At the interface with the adjoining asset to the east (/1402C04), the wall continues to be undercut and there are numerous voids in the wall face.



Damage to seawall in June 2016 (/1402C04)



Seawall in August 2020. (/1402C04)



Undercutting at toe leading to voiding behind and break-up of deck (/1402C04)



Mass concrete repair to damaged section of wall note undercutting in foreground. (/1402C04)



Voiding and undercutting of structure at the interface between (/1402C04) and (/1402C06).



Deck slab repairs in fair condition. (/1402C04)



Missing mortar and damaged blockwork (/1402C04)



Continued outflanking of upper retaining wall (/1402C04)

The concrete structure at the beach landing of the public access point remains in a very poor condition with large cracks and voids throughout (/1402C06). Ongoing maintenance activity, comprised of a poured concrete skim over much of the deck of structure, has covered and filled most voids resulting in a reduced the risk to the public. However, slumping and erosion in the cliff at the rear of the structure continue to threaten the upper access steps and structure as a whole. During the 2020 inspection the beach levels across Cayton Bay were found to be higher than in 2018, not quite returning to the 2016 levels. This is evidenced by an approximately 300mm rise in the beach level at the lower access steps, seen in the images below. During the 2020 inspection it was noted that the lower step has been extended at lower beach access steps. This has reduced the risk to members of the public accessing the beach via the steps. Due to higher beach levels it was not possible to examine the base of the platform or whether there is an additional lower step. It is recommended that this structure is urgently demolished, removed and replaced with a simple, safer and more adaptable public access.



Beach access in 2018 (/1402C06)



Beach access in 2022, notably higher than 2020 and 2018 (/1402C06)



Concrete skim repair has filled voids and cracks (/1402C06)



Concrete skim repair to deck slab in poor condition (/1402C04)

In addition to the damage sustained to the defence to the north of the beach access steps, the structure is also being undercut and outflanked at its western end and towards its rear. The footpath which runs up the bank towards Lucy's Shack is being undercut. A retaining sheet pile wall is supporting the path; however, it can only be a temporary solution due to the risk of further outflanking and undermining.



Damage to rear of structure, washout of fill material (/1402C06)



Undermining of footpath beneath 'Lucy's Shack' (/1402C04)

Despite recent reactive repair work the condition of the defences at the Cayton Bay pump house access remains classified as very poor in 2022. The structures present a significant health and safety risk to the general public. It is recommended that access arrangements to Cayton Bay at this location are re-evaluated at the earliest opportunity in line with the *Filey & Cayton Bay Coastal Strategy*.

Around 300m south of the pumping station beach access, there is beach access point for the path from the public car park at the surf shop. There are a set of beach access steps that were previously protected by gabion baskets, which have distorted and split under wave action. This is not a formal coastal defence, so has no asset number. The structure presents a health and safety risk to the public due to the partially unprotected edges and is at risk of collapse due to outflanking and undermining.



Failed gabion baskets at surf shop car park beach access (*no asset reference*)



Failed gabion baskets at surf shop car park beach access (*no asset reference*)

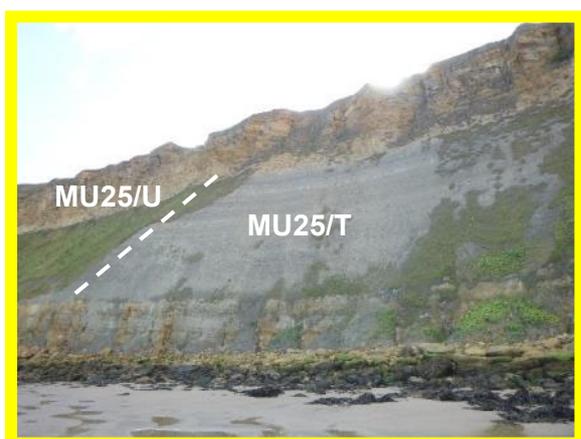
3.22 Management Unit 25 – Lebberston Cliff and Gristhorpe Cliff

Coastal Slope Condition Assessment

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

Unit MU25/U is located above Red Cliff Hole and is classified as Locally Active in 2022, unchanged from 2016. The steep cliffs are characterised by localised areas of erosion but are otherwise well vegetated.

Unit MU25/V is located at Lebberston Cliff and comprises a large, periodically active mudslide system. The unit appears to be prone to regular change and recession. In 2022 the headscarp shows signs of continuing activity and now encroaches on the route of the footpath. This unit was downgraded from Totally Active to Partly Active following the 2012 walkover and this grading has been retained in 2022.



Composite sandstone and mudstone cliffs in south Cayton Bay. **MU24/T** (right) to **MU24/U** (left) (both Locally Active in 2022)



MU24/V - view from directly above the mudslide (Partly Active). [Reproduced from August 2014].

Unit MU25/W is situated at Red Cliff Point and ongoing headscarp activity has caused this unit to retain its Partly Active status in 2022.

Unit MU25/X is classified as Partly Active in 2022. Despite being well vegetated, the slopes of this unit are subject to ongoing instability, with evidence of mud sliding and recession at the headscarp.

Unit MU25/Y is located south of Yons Nab at the north western end of Gristhorpe Cliff. In 2022 it was noted that there had been a large landslide approximately 85m across and spanning from the toe of the cliff right up to the cliff top. The headscarp of the slip has retreated across the footpath resulting in path users creating a 'desire line' diversion over a length of approximately 50m. Due to this intense level of large scale activity in this unit the condition has been upgraded to Totally Active in 2022. The unit has typically been characterised by numerous areas of activity, with a general trend of headscarp recession and slump across the mid-slope. This landslide appears to be the most significant incidence of activity in recent times within this and its neighbouring units.

Unit MU25/Z is located at the northwest end of Gristhorpe Cliff and is classified as Partly Active in 2022. The units is characterised by numerous areas of activity, with ongoing headscarp recession, slumps across the mid-slope and erosion at the toe.



Unit **MU25/Y** with Yons Nab protruding seawards.



View looking down onto debris lobe (**MU25/Y**).



Large scale landslide in **MU25/Y**.



Looking across Gristhorpe Sands and Gristhorpe Cliff, Cunstone Nab is visible in the background.

Unit MU25/AA comprises soft till cliff which continues to erode at the headscarp with slumping and sliding mid-slope. Marine erosion is apparent at the cliff toe and therefore a Partly Active status has been retained in 2022.

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

Units MU25/AD and MU25/AE are similar in form to adjacent units MU25/AB and AC. There is some erosion of the headscarp and localised areas of more intense erosion on the lower slopes. These units are classified as Locally Active in 2022, unchanged since 2012.



Looking eastwards along upper slope of MU25/AC.



Headscarp recession along unit MU25/AD.

Coast Protection Asset Condition Assessment

There are no coastal assets within this Management Unit.

3.23 Management Unit 26 – Newbiggin Cliff and North Cliff

Coastal Slope Condition Assessment

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

Units MU26/AF, MU26/AG and MU26/AH are located at The Wyke, to the west of Newbiggin Cliff and are all classified as **Locally Active** in 2022, unchanged since inspections began in 2002. These units are characterised by a soft till overlying resistant rock cliff that is fronted by a debris apron. There is minor, localised activity within the till capping including recession of the headscarp in places. The rock cliff is largely stable, but the debris apron shows evidence of recent rock falls and is subjected to marine erosion.

Units MU26/AI and MU26/AJ form the western part of Newbiggin Cliff and are both classified as **Partly Active** in 2022. These units are of a similar form to the adjacent **Locally Active** units, described above. However, they are characterised by a greater level of activity within both the upper and lower cliff layers and less continuous vegetation cover.

MU26/AK and MU26/AL were changed in grading to **Partly Active** in 2016, having experienced widespread rockfalls and mudslides along their length. This status has been retained following the 2022 inspection. Recent activity was evident, particularly in **MU26/AK** where a large rockfall has occurred from the upper cliff, resulting in a large debris cone. It was noted that the debris cones along the base of these units have receded slightly indicating that the cliffs experience some degree of erosion along their toe. This may also indicate that they are not being recharged as regularly from activity in the cliff units above.



MU26/AF and MU26/AG Soft till overlying resistant rock (Locally Active).



MU26/AJ to MU26/AN Cliffs experiencing rockfalls and mudslides.

Units MU26/AM, MU26/AN and MU26/AO form the main part of Newbiggin Cliff and are classified as **Locally Active** in 2022, unchanged since 2002. 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. All debris cones appeared reasonably stable and well vegetated with only localised areas of activity.

Unit MU26/AP was classified **Partly Active** in 2012 but downgraded to **Locally Active** during the 2014 survey. This classification has been retained in 2022 as there is no evidence of any increased activity.

Unit MU26/AQ was upgraded to **Locally Active** from **Partly Active** in the 2018 walkover inspection. There is no evidence of increased activity in 2022 and therefore the grading of **Locally Active** is retained.

Unit MU26/AR shows few signs of instability in the upper cliff and has been assigned Locally Active status in the 2022 survey.

Units MU26/AS to MU26/AT have all been assigned a status of Partly Active in 2022 due to intensive erosion of the headscarp. The remaining Units **MU26/AU to MU26/AX** retain their Locally Active status in 2022. These cliffs are comprised of soft glacial sediment and exhibit only localized, rather than widespread, erosion in the form of headscarp recession and mud sliding. There is also localised marine erosion of the toe.



MU26/AT Ongoing recession of the headscarp (Partly Active).



MU26/AY and MU26/AZ Locally Active headscarp overlying stable rock cliff in eastern end of **MU26**.

Coast Protection Asset Condition Assessment

There are no coastal assets within this Management Unit.

3.24 Management Unit 27 – Filey Brigg

Coastal Slope Condition Assessment

This Management Unit comprises units MU27/AY to MU27/O on the northern and southern sides Filey Brigg.

Units MU27/AY and MU27/AZ both have a similar form to those units described in Management Unit 26, with till overlying rock cliffs and both are classified as Locally Active in 2022. The upper slopes are generally well vegetated and show intermittent zones of activity in the form of headscarp recession and rilling of exposed sediment.

Units MU27/BA to MU27/BD are located on the northern side of Filey Brigg and are all Partly Active in 2022. The upper slopes of these units support some discontinuous vegetation cover. Headscarp recession, localised mudslides and rilling are common in the upper till unit.

Unit MU27/BE, and 27/BF are also located on the northern side of Filey Brigg but until 2012 were less active than adjacent units. However, much of the upper slopes have been unvegetated and eroding since then and both retain classification of Partly Active in 2022.



Mainly unvegetated and eroding upper slopes on the north side of Filey Brigg. **MU27/BC to MU27/BF** (Partly Active in 2022)



Headscarp recession and mudslides in upper and mid till unit on north side of Filey Brigg. **MU27/BC** (Partly Active in 2022)

Units MU27/A and MU27/B are located at the tip of Filey Brigg. Both remain classified as Partly Active in 2022. These units are composed entirely of the soft glacial material which is particularly susceptible to erosion. There is frequent mud sliding within these units.

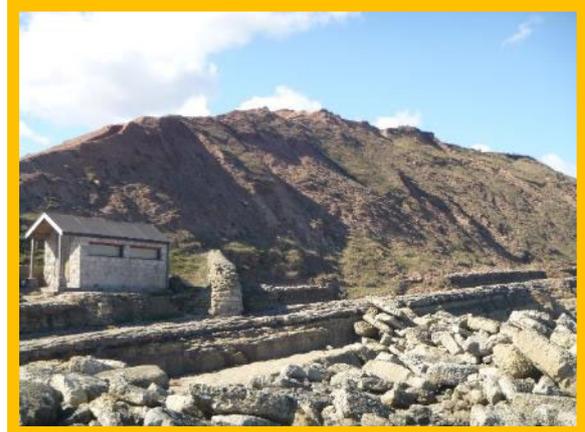
Units MU27/C to MU27/G are located at the eastern end of the south side and of Filey Brigg. The cliffs are composed predominantly of vegetated glacial till with a low underlying cliff of limestone and sandstone to beach level. They contain local mid-slope activity and erosion of the cliff toes and are therefore classified as Locally Active in 2022, no change since 2012.

MU27H and MU27/I are in the central part of the south side of Filey Brigg and are variously vegetated and unvegetated. These units comprise simple mudslides, each with an arcuate head scarp and elongate flow tracks. They are classified as **Partly Active** in 2022, unchanged since 2016.

Units MU27/J to MU27/O are also located on the south side of the Brigg at its western end. They are predominantly unvegetated and are undergoing intense erosion. Therefore, they are classified as **Totally Active** in 2022.



Steep partially vegetated eroding till slope on north side of Filey Brigg, slumping evident on midslope. **MU27/BE** (Partly Active in 2022)



Headscarp recession and mudslides in upper till unit on north side of Filey Brigg. **MU27/B** (Partly Active in 2022)



Composite cliffs on the south side of Filey Brigg. **MU27/C** (right) to **MU27/F** (left) (**MU27/C** Partly Active, the remainder Locally Active in 2022)



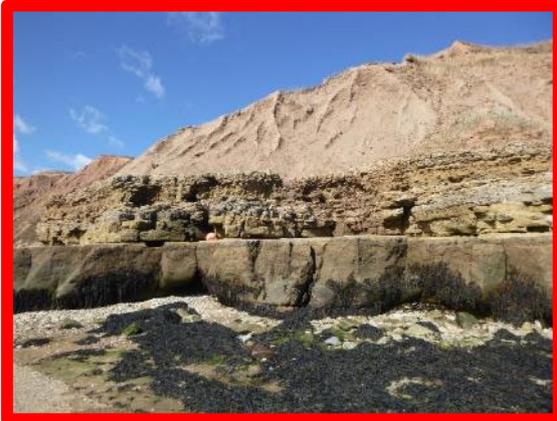
Composite cliffs on the south side of Filey Brigg **MU27/E** (Partly Active in 2022)



Composite cliffs on the south side of Filey. Locally Active around access steps in unit **MU27/F** in 2022.



Active headscarp recession along **MU27/I** and **MU27/H**, Partly Active in 2022.



Composite cliffs on the south side of Filey Brigg **MU27/J** (Totally Active in 2020).



Composite cliffs on the south side of Filey Brigg. **MU27/K** (Totally Active in 2020).



Composite cliffs on the south side of Filey Brigg (all Totally Active in 2020).



Composite cliffs on the south side of Filey Brigg (all Totally Active in 2020).

Coast Protection Asset Condition Assessment

There are no formal coast protection structures in this unit. However, at the eastern end of Filey Brigg a cabin structure and wall exists, tucked away against the cliffs. The structure comprises of a blockwork wall, poured concrete apron and blockwork cabin build onto the cliff strata. The previous inspection noted that undercutting is occurring to the apron as well as washout of the joints to the wall, the cabin is in structurally sound condition. Access is restricted due to the eroded path leading to the asset and as it is not a formal coast protection asset and has not been inspected since 2012.

3.25 Management Unit 28 – Filey Bay North

Coastal Slope Condition Assessment

This Management Unit is divided into two Sub-management Units; MU28A – North of Filey Town and MU28B – Filey Town Frontage.

MU28A – North of Filey Town

This Sub-management Unit consists of units MU27/P to MU27/X, located to the north of Filey town. **Units MU27/P to MU27/S** are situated below the North Cliff Country Park. These cliffs are composed of glacial till down to beach level and are undergoing erosion down much of their length.

The upper and mid slope of units **MU27/P**, **MU27/Q** and **MU27/R** units is generally more well vegetated than the adjacent units on the south side of Filey Brigg itself. However there is intense and wide spread erosion along the toe of the units. The units were upgraded to **Totally Active** in 2020 and they retain this status in 2022.

MU27/S which is located to the north of the boat yard and remains classified as **Partly Active** in 2022.

Unit **MU27/T** surrounds the boat yard storage and comprises glacial till down to beach level. The cliff slope is relatively shallow with an exposed eroding toe, and shallow slumps across better vegetated mid- to upper slopes. This unit is classified as **Partly Active** in 2022, unchanged since 2014.

Unit **MU27/U** surrounds Filey sailing club is generally well vegetated although localised erosion along the headscarp was noted. This unit remains classified as **Locally Active** in 2022.



Till cliffs between Filey Brigg and Filey sailing club (**MU27/Q** Totally Active in 2022).



Till cliffs between Filey Brigg and Filey sailing club (**MU27/R** Totally Active in 2022).



Till cliffs between Filey Brigg and Filey sailing club **MU27/S** Partly Active in 2022



Till cliffs fronting Filey Sailing Club and boat yard **MU27/T** Partly Active in 2022

Units MU27/V and MU27/W are located between the sailing club and the north end of Filey seawall. These units are classified as **Partly Active** in 2022 with ongoing large-scale head scarp recession, and evidence of slumping throughout the profile. The units also experience ongoing erosion along their toe. Cliff warning signs have been dislodged indicating slope movement.

Unit MU27/X is located behind the northern end of Filey seawall and town. It is classified as **Locally Active** in 2022, upgraded from Inactive in 2020, returning to the same status it held in in 2014.



Ongoing slumping and erosion along toe of till cliffs between Filey Sailing Club and Filey town. **MU27/V** Partly Active in 2022. Note evidence of headscarp recession at cliff top.



Till cliffs between Filey sailing club and Filey town. **MU27/W** Partly Active in 2022



Toe of **MU27/X** Locally Active in 2022.



Toe of **MU27/X** showing signs of some localised recession adjacent to the Filey sea defences increasing the risk of outflanking.

MU28B – Filey Town Frontage

This Sub-management Unit consists of units **MU28/Y** and **MU28/Z** at Filey town.

Units MU28/Y and MU28/Z are located behind Filey seawall and town. They are classified as **Inactive** in 2022.

Coast Protection Asset Condition Assessment

MU28A – North of Filey Town

To the north of the town, Filey Sailing Club is located at the back of the beach and is partly protected by some coastal defences. However, the section of cliff below the boat park (which is located on a terrace part way up the cliff) north of the club building is undefended (/1601C01) and suffering active slumping along its length.

Immediately north of the club building there was formerly a defence structure (/1601C02) that consisted of timber breastwork retaining rock armour. However, all that remains of this now failed structure is the rock debris scattered on the beach. This asset is unchanged since 2018.

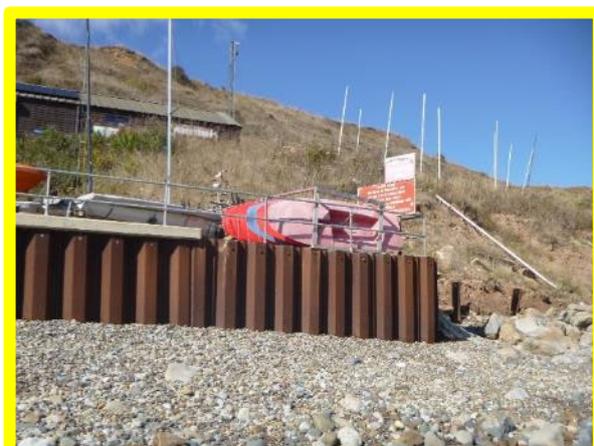


Undefended cliffs below boat storage yard (/1601C01)



Remnants of former defences north of club building (/1601C02)

At the club building, there is a section of sheet piling (/1601C03) which showed significant corrosion leading to sizeable holes forming in the steel in the central section and voids behind due to wash out of material in May 2015. At that time, the concrete slipway had been repaired not long before and the southern sections of steel piles had been replaced between 2009 and 2012. However, repairs have been made since May 2015 and the sheet piling is now in good condition, although minor surface corrosion noted. It was also noted that there is a section of missing concrete coping on the northernmost section of the sheet pile. High shingle levels concealed much of the lower sheet piles and the outfall during the 2022 inspection. The scour hole (approx. 2m depth) that was noted at the northern end of the promenade in 2018 has since been repaired with concrete.



Missing coping at northern end of sheet pile wall (/1601C03).



High shingle levels conceal much of the sheet pile wall (/1601C03).



Evidence of voids forming beneath boatyard ramp (/1601C03)



Some localised slumping of soft till onto upper section of slipway (/1601C03)

The previously repaired lower section of the access slipway remains in good condition. However, the ongoing undercutting and voiding along the ramp, as reported previously, is deteriorating and requires attention. There was a small amount of debris on the upper portion of the slipway ramp, indicating some ongoing, localised movement in the lower cliff unit.

MU28B – Filey Town Frontage

The Filey Town frontage is protected by a sea wall just over 1km in length between Coble Landing in the north and Martin’s Gill at the south and is split into 9 asset lengths. The sea wall generally remains graded in fair condition in the 2020 inspection. Although it shows evidence of minor, localised defects including cracks and chipping within the capping beam, surface abrasion to the face of lower blocks and mortar loss. However, the significant number of repairs and maintenance works to the defences between 2012 and 2014 are working effectively. The description of the inspection runs from north to south.

The most northerly asset in the defence system consists of the rear wall and slipway at Coble Landing (/1602C01). The slipway blockwork appeared in fair condition although high sediment levels concealed much of the lower slipway. As noted during previous inspections, the rear wall below the chalets has several horizontal cracks in the wall and is in fair to poor condition. The concrete cope beam, which was replaced prior to the 2018 inspection, remains in good condition. The concrete rear ramp/wall is in poor condition with heavy abrasion, particularly at the wall joint, and voids in the deck towards toe of structure.



Voids in deck of rear ramp/wall at Coble Landing (/1602C01)



Heavy Abrasion damage to the rear wall (/1602C01)



Longitudinal cracks in rear wall, open joint (/1602C01)

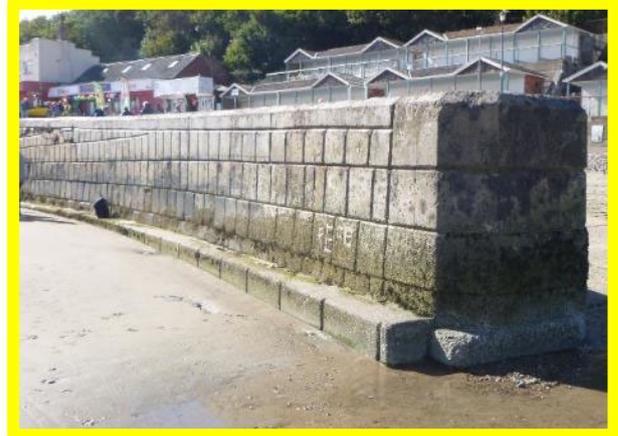


Coble Landing slipway blockwork in fair condition (/1602C01)

The next asset (/1602C09) is essentially a wing wall protecting the slipway, it remains in fair condition. Repairs to this wall were made between 2012 and 2014 and are holding well. Further repairs to the toe apron were observed in 2018 appear in good condition. The undercutting of the end of wall does not appear to have worsened.



Previous repairs to crest of slipway 'wing-wall' (/1602C09)



Undercutting at end of 'wing-wall' partially buried (/1602C09)

The wall located north of Ravine Road (/1602C06) is in fair overall condition, although there are areas of damage that have been previously repaired. There are cracks / washed out joints / missing mortar between the masonry blocks at several locations.



Sea wall near Ravine Road in fair condition (/1602C06)



Occasional open joints with missing mortar and evidence of ongoing abrasion (/1602C06)

The sections of sea wall between Ravine Road and the access point east of Cargate Hill Road (/1602C08) and between Cargate Hill Road and Crescent Hill (/1602C03) are both in fair overall condition, although in some sections several blocks have abrasion damage to the front face, particularly just above beach level. Many of the splash coping blocks have been replaced along the length of these assets, but others are cracked or damaged. The damage appears to get worse with progression south and is mainly focused around the lower blockwork or upper splash wall / coping.

During the 2022 inspection it was notable that historic timber piles were visible on the foreshore adjacent to the toe of the wall, directly south of the Ravine.

Across the full length of the Filey Seawall, but in particular assets (/1602C08) and (/1602C03), there is a characteristic abrasion 'pockmark' pattern on the seawall blocks. The pattern is typically formed from a circular depression propagating from the centre of the block face. The depression is caused by continuing abrasion due to wave action and mobilised sediment. The blocks themselves are comprised of a facing layer of concrete with a small dark jagged aggregate in a fine matrix. Behind the facing layer the block is comprised of a river washed pebble aggregate with a coarser matrix. Once the depression in the facing layer exposes the block proper behind the rate of abrasion increases significantly. It is understood that the Council has an ongoing maintenance regime which sees an encasement of affected blocks with a in-situ concrete pour cast with patterned formwork to replicate the blockwork pattern. Across both assets, the repairs appear to be effective, however it is noted that the rate of abrasion elsewhere is increasing as the structure ages.



Historic timber piles exposed by low beach levels (/1602C08)



Evidence of ongoing abrasion on wall face. Low beach levels expose concrete toe (/1602C08)



Abrasion damage and open joints in sea wall south of Cargate Hill (/1602C03)



Abrasion damage and several leaking joints (/1602C03)



Example of 'pockmark' abrasion pattern which is common along the Filey Seawall (/1602C03)



Example of replaced section of block work. Concrete repair undertaken with patterned shuttering to achieve blockwork effect (/1602C03)

The next defence assets to the south are the wall around the Royal Parade promontory (/1602C04) and the wall between here and the southern-most promontory (/1602C07). These sections of wall are in fair overall condition (including previous repairs to one long vertical gap between adjacent blocks running over half the height of the wall), although there is cracking to the coping and numerous abraded, chipped or damaged blocks. Previous repairs to the lower section of the access steps at Royal Parade are holding well but the cracks and open joints in the southern set of access steps makes it vulnerable to damage during storms.



Access steps in fair condition, note abraded block facing (/1602C04)



Historic horizontal cracking and abraded blocks (/1602C05)

The southernmost section of the main wall includes the southern promontory and the return section to Martin's Gill (/1602C05). This structure is overall in fair condition, although there is chipping and cracking to the coping in small areas throughout length and numerous lower blocks area abraded. Cracks in the side wall to the slipway / access ramp at the southern end of the wall appear to have been filled. A drainage pipe behind the slipway was noted to be broken and it appears there has also been some washout of stone material. There was no observed change in 2022.

A short section of rock revetment with gabion baskets beneath is located at the southern end of the sea wall near Martin's Gill (/1602C02). This defence extends into Sub-management Unit MU29A and is intended to manage the interface between the hard defences to the north and eroding natural cliff to the south. The rock armour has been re-profiled on occasion after movement of some armour stones during storms. A depression in the crest of the gabion baskets and armour stones was noted, however it is believed this was present in 2018 and has not worsened. During 2022 it was noted that some of the gabion baskets at the southern end of the revetment have split. As the coastal slopes behind the revetment are still locally active some form of improved outflanking defence remains necessary in the medium term.



Slipway / access ramp at southern end of Filey Sea Wall (/1602C02)



Crest depression in rock revetment at southern end of Filey Sea Wall (/1602C02)

Broken drainage outlet and washout of material behind slipway (/1602C02)



Crest depression in rock revetment at southern end of Filey Sea Wall (/1602C02)

3.26 Management Unit 29 – Filey Bay

Coastal Slope Condition Assessment

This Management Unit is divided into three Sub-management Units.

MU29A – Muston Sands

This Sub-management Unit comprises **units MU29/AA to MU29/AI** along Muston Sands.

Units MU29/AA and MU29/AI which are composed of glacial till down to beach level and stretch south of Filey town. **MU29/AA to MU29/AF** are all classified as Partly Active in 2022, unchanged from 2018.

MU29/AG to MU29/AI were downgraded to locally active in 2020, a status they retain in 2022. The entire length of cliff is partly vegetated and suffers from ongoing headscarp erosion and slumps and slides are causing failure throughout the cliff face. The toe undergoes a varying degrees of marine erosion and it is for this reason that the units to the south have been downgraded.

The concrete ramp / outfall structure at the Primrose Valley access **MU29/AI** and **MU29/AJ** was notably undermined.



Till cliffs adjacent to Filey town **MU29/AA** Partly Active in 2022



Till cliffs along Muston Sands **MU29/AB** Partly Active in 2022 with evidence of historic deep seated failures and more recent shallow failures.



Till cliffs along Muston Sands **MU29/AC** Partly Active in 2022



Till cliffs along Muston Sands looking North. **MU29/AD** in foreground Partly Active in 2022



Till cliffs along Muston Sands **MU29/AE** Partly Active in 2022



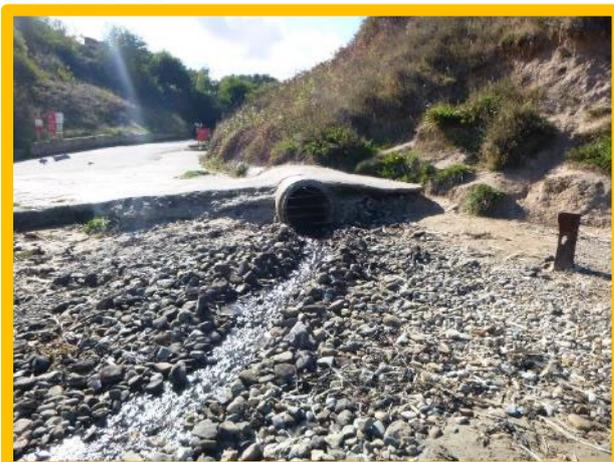
Till cliffs along Muston Sands **MU29/AF** (right) Locally Active transitioning to **MU29/AG** (left) Partly Active in 2022



Till cliffs along Muston Sands **MU29/AH** Locally Active in 2022



Till cliffs along Muston Sands. **MU29/AI** Locally Active in 2022



Undermined concrete access ramp and outfall between **MU29/AI** and **MU29/AJ**



Low concrete retaining at toe of **MU29/AJ**. Evidence of localised slumping at rear of wall.

MU29B – Hunmanby Sands

This Sub-management Unit consists of units MU29/AJ at Mile Haven to MU29/BE2 at Hunmanby Gap.

Units MU29/AJ to MU29/AP are classified as Locally Active in 2022 (down from Partly Active in 2018). The slopes are generally well vegetated, although as reported in 2018 there is local signs of slumping in the profiles. The toe erosion is less significant than elsewhere along the frontage.

At **MU29/AQ** the Flat Cliffs coastal slope stabilisation project was complete in 2018 which included the installation of inclined sub-horizontal drains in the cliff and geotextile sand containers at the toe. During the 2022 inspection it was noted that the cliff toe has continued to recede in this location. The sub-horizontal drains are now exposed, and in some cases are damaged. The geotextile sand containers now stand approximately 6m seaward from the toe. The sand containers were largely buried with beach sediment, and therefore were not inspected. It was noted that several of the drainage pipes were discharging water at the time of the inspection meaning they are still performing as intended.

At **MU29/AS**, the gabion baskets below the outfall pipe have been replaced with a concrete equivalent, no sewage was observed on the structure. The rising main thrust block at the toe of the cliffs continues to be undermined/outflanked locally.



Till cliffs along Hunmanby Sands, **MU29/AJ** Locally Active in 2022



Till cliffs along Hunmanby Sands. **MU29/AK** Locally Active in 2022



Till cliffs along Hunmanby Sands. **MU29/AP** Locally Active 2022



Toe of till cliffs at Flat Cliffs. **MU29/AQ** Partly Active in 2020

Eroded toe of till cliffs exposing sub-horizontal drains at Flat Cliffs. **MU29/AQ** Partly Active 2022



Toe of till cliffs at Flat Cliffs **MU29/AR** Partly Active in 2022



Replaced gabion baskets and outflanked rising main **MU29/AS** Partly Active in 2022.

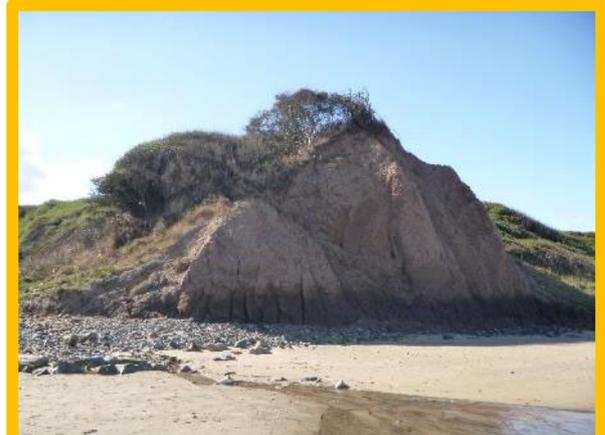


Exposed drain **MU29/AS** Partly Active in 2022.

MU29/AT is classified as Locally Active in 2022 (unchanged from 2018) as it is generally well vegetated and there is only local evidence for toe erosion or activity at mid to upper levels. More intense erosion was again present along the full height of the cliff adjacent Butcher's Gap, with evidence of recent mud slips.



Well vegetated till cliffs along Hunmanby Sands. **MU29/AT** Locally Active in 2022



More intense erosion locally at Butcher's Gap **MU29/AT** Locally Active in 2022

Units MU29/BA to MU29/BE2 are located between Butcher Haven and Hunmanby Gap and are all classified as Partly Active, unchanged from 2018. These cliffs are steeper than further north and are characterised by head scarp erosion and common areas of intense erosion. The toe of the cliffs are active with slumping and sliding on to the beach. A failed gabion structure in management unit **MU29/BE2** should be removed from the foreshore. Adjacent to the failed structure a new outfall structure has been constructed and was found to be in good condition.



Till cliffs north of Hunmanby Gap. **MU29/BB** Partly Active in 2022



Till cliffs north of Hunmanby Gap. **MU29/BD** Partly Active 2020



Till cliffs north of Hunmanby Gap. **MU29/BE** Partly Active 2022

Till cliffs at Hunmanby Gap. **MU29/BE2** Partly Active 2022

MU29C – Reighton Sands

This Sub-management Unit consists of units MU29/BF near Hunmanby Gap to MU29/BQ below Reighton Moor.

Unit **MU29/BF** includes Hunmanby Gap itself. This unit is partly shielded from wave erosion by unit **MU29/BG** and is classified as Locally Active in 2022, unchanged from 2016. **MU29/BG** to **MU29/BJ** are located south of Hunmanby Gap. These cliffs are steep and affected by intense erosion throughout most of their height. The head scarp is retreating and there is significant slumping on to the beach. **MU29/BG** to **MU29/BJ** are classified as Totally Active in 2022, unchanged from 2016. In **MU29/BH**, a small dilapidated masonry structure at crest of the cliff is at risk of collapsing onto the foreshore.



Intense erosion of till cliffs south of Hunmanby Gap. (**MU29/BG** – Totally Active) shielding Hunmanby Gap itself (**MU29/BF** – Locally Active)



Intense erosion of till cliffs south of Hunmanby Gap. **MU29/BH** Totally Active in 2022



Intense erosion of till cliffs south of Hunmanby Gap. **MU29/BI** Totally Active in 2022



Intense erosion of till cliffs south of Hunmanby Gap. **MU29/BJ** Totally Active in 2022

Further south, units **MU29/BK** to **MU29/BQ** are located above Reighton Sands. These units are again classified as Partly Active in 2022. They are characterised by steep slopes partially covered in vegetation. There is recession of the headscarp, common areas of erosion in the mid-slopes and slumping on to the beach. The toes are steep and eroding.



Till cliffs at Reighton Sands. **MU29/BL** Partly Active 2022



Till cliffs at Reighton Sands. **MU29/BM** Partly Active 2022



Till cliffs at Reighton Sands. **MU29/BQ** Partly Active 2022

Coast Protection Asset Condition Assessment

There are no formal coastal defence assets within Management Unit 29, although the rock revetment and baskets extend into this Sub-management Unit from MU28B. See the Coast Protection Asset Assessment section for MU28B for details. There are no other coastal defence assets within this Sub-management Unit.

3.27 Management Unit 30 – Filey Bay South

Coastal Slope Condition Assessment

This Management Unit is divided into two Sub-management Units.

MU30A – Reighton Gap

Sub-management Unit MU30A is located beneath 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 are classified as Partly Active in 2022 with no change to status since 2020. These units are partially vegetated, and contain large slumps, erosion at their head scarp.



Till cliffs beneath Reighton Sands Holiday Village. **MU29/BR** Partly Active 2022



Till cliffs beneath Reighton Sands Holiday Village. **MU29/BR** Partly Active 2022



Till cliffs beneath Reighton Sands Holiday Village. **MU29/BS** Partly Active in 2022



Till cliffs beneath Reighton Sands Holiday Village. **MU29/CA** Partly Active in 2022.

Unit **MU29/CB** is at the eastern end of the holiday village. The unit exhibits mudslides and an eroding head scarp, and is classified as Partly Active in 2022. The pillbox has been bypassed by the retreating cliff crest and appears at risk of toppling. Unit **MU29/CCa** forms a shallow mudslide embayment extending on to the beach. The unit is classified as Partly Active.



Till cliffs in **MU29/CB** (Left) Partly Active 2022 Till cliffs in **MU29/CCa** Partly Active 2022

Sub-management Unit 30B comprises units MU29/CC to MU29/CJ above Speeton Sands.

Unit MU29/CC forms a large, shallow, well vegetated embayment known as Middle Cliff with a steep well-defined eroding toe in mud. There is also activity at the unit head and mid slope. The unit is classified as **Partly Active** in 2022.

Unit MU29/CD is similar to MU29/CC but with more recent activity in the form of slumps, slides, block failures and mudflows at the toe. As a result, this unit is classified as **Partly Active** (unchanged)



Toe of mud cliff in **MU29/CC** Partly Active 2022 Toe of mud cliff in **MU29/CE** looking towards **MU29/CD** Partly Active 2022

Unit MU29/CE is similar in form to unit MU29/CC. It has been downgraded to Partly Active in 2022 due to the steep eroding toe along sections. The upper slopes remain well vegetated.

Units MU29/CF to MU29/CI are located at Speeton Cliffs and are all classified as Locally Active in 2022. 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. This unit can only be inspected from afar as the tide reaches the toe of the cliffs even at low tide. As in 2020, there is evidence of ongoing rockfall and marine erosion at the cliff base but otherwise the cliffs appear fairly stable. It is classified as Locally Active in 2022.



Well vegetated upper slope above steep eroding toe **MU29/CE** Partly Active 2022



Eroding chalk outcrop at toe **MU29/CF** Locally Active 2022



Eroding chalk outcrop at toe **MU29/CG** Locally Active 2022



Evidence of ongoing erosion and activity on lower and mid-slope **MU29/CH** Locally Active 2022



View southwards looking towards **MU29/CI** and **MU29/CJ** Locally Active 2022

Coast Protection Asset Condition Assessment

There are no coastal defence assets within this Management Unit.

4. Comparison with Previous Assessment

4.1 Coastal Slope Condition Assessment

The clear majority (**approximately 97%**) of the 266 units surveyed during the 2022 walkover retained the same activity status as they had in 2020. Indicating little significant change along the frontage.

Around **2%** of the units exhibited a worsening in condition, mostly changing from Locally Active to Partly Active. Some of this is due to an actual change in conditions at the site, but it must be acknowledged that some may be attributable to different interpretations of classification gradings by different cliff inspectors (or by the same cliff inspections on successive surveys).

Less than **1%** of units demonstrated an improvement in condition, due to stabilisation works.

A landslip occurred In January 2021 along part of the Cleveland Way located around 400m north of the car park at the northern end of Sandsend. This caused North York Moors National Park Authority (NYMNP) to divert the footpath inland while a temporary and permanent solution is being investigated. This has caused reclassification of this cliff behaviour unit to Totally Active in 2022, pending stabilisation works.

To the east of Cayton Bay, south of Yons Nab, a large landslip was found to have occurred. From inspection of aerial imagery it is suspected that this occurred at some point in the first half of 2021. The landslide has led to parts of the Cleveland Way public footpath being lost, and an informal 'desire-line' diversion is in place around the headscarp of the landslide.

As was previously reported sustained levels of high erosion were observed along part of **Tenants' Cliff** within Cayton Bay, along the south side of **Filey Brigg** and at **Hunmanby Gap**.

The Scarborough Spa Slope Stabilisation scheme was completed in February 2020 and is designed to ensure that the stability of the slopes to the rear of the Spa Complex is improved for the next 100 years. The works were found to be in as-built condition and the slopes are now fully vegetated.

At the South Cliff Clock Café, a shallow-seated slippage occurred early in 2018 which lead to the collapse of a historic masonry retaining wall and resulted in the closure of the Victorian beach chalets. A capital scheme was completed in later 2020 which stabilised the slope and involved construction of a new retaining wall.

Within Filey Bay, the Flat Cliffs emergency works were completed in summer 2018. The works were designed to (temporary) improve the stability of the cliffs at the sole access road to the Flat Cliffs hamlet. The drainage pipes appeared to be working as designed during the 2022 inspection although the toe of the cliff has retreated significantly and exposed all drainage pipe outlets.

4.2 Coast Protection Asset Condition Assessment

Generally, the condition of the defences has not changed dramatically since the last inspections in summer 2020. Recent repair work was evident in many places and therefore conditions of some defences improved. However, some defences where repair work has not been undertaken have deteriorated and are now in further need of repair.

MU4 – Staithes

There is little change since the previous inspections in the condition grading of the defences within Staithes harbour, with the overall classification generally ranging from fair to poor.

The rock armour to the harbour breakwaters remains mostly in good condition but the concrete piers and sea wall structures within the harbour are abraded in places and, where used, steel sheet piling is generally heavily corroded. The North Breakwater has undercutting on the inner-facing side, perhaps caused or exacerbated by propeller thrust.

Some of the structures extending into the beck as either riverside walls or property walls are locally poor in condition, despite obvious previous repairs. Typical defects include voids, missing blockwork and undercutting.

MU7 - Runswick Bay

The Runswick Bay Coastal Protection Scheme, constructed in 2017, has improved the condition of many of the assets along the seafront, particularly those towards the north of the Lifeboat station.

The scheme comprises of a rock armour fillet fronting the historic masonry blockwork seawall. Defects which were previously reported on the seawall, such as erosion, abrasion and undercutting were repaired prior to the construction of the rock armour fillet.

The older rock armour defences in front of the car park remain generally in very good condition, with the rocks tightly packed to a consistent profile. The southern extent of the revetment was refurbished in June 2018 using surplus rock armour from the Coastal Protection Scheme and appears to continue to protect the revetment from outflanking in addition to offering some protection to the high-level beach access ramp.

Defence to the Sailing Club, located some 600m south of the village, had been improved prior to the 2016 inspection. The defences which consist of the placement of a number of boulders and concrete blocks in front of the timber sleeper retaining wall remain in fair condition.

MU9 – Sandsend Village

The concrete sea wall around the car park at the western end of Sandsend was showing exposed rebar on the apron but this was not observed in 2020 due to high beach levels. The concrete sea wall extending from Sandsend Beck to the east had exposed timber breastwork at the toe in 2018 but again this was not observed in 2020 due to high beach levels.

During 2015/16, the failing sloping concrete revetment protecting Sandsend Road was replaced with a new defence structure. This comprises stepped concrete revetment with upper Dycel units and a concrete toe beam. This improved the condition of the defences from very poor to very good. Some local damage to the step corners on some of the pre-cast units exists, however this is cosmetic damage that does not unduly affect its coast protection function.

MU11-13 - Whitby

Whitby West Beach promenade deck has suffered cracking in the past. Some previous repairs are re-opening, requiring further attention. The sea wall sections not protected by a fronting rock revetment have extensive abrasion and undercutting. Some affected sections have been covered by a new toe beam, but this does not cover the full extent of defective toe. The defences below Whitby Pavilion Theatre remain in poor condition and would benefit from repairs.

Previous identified defects at Whitby Harbour Piers were repaired as part of a major capital scheme to refurbish the structures in 2019.

The quay walls within Whitby Harbour are generally in fair condition, but locally poor in places due to specific defects. For example, in the blockwork sections, there are sections of wall with open joints which require sealing and in the suspended deck section on the western quay there remains corrosion to the steel piles.

MU16 – Robin Hood's Bay

Defences around the settlement of Robin Hood's Bay are in a similar state to that observed during the 2018 surveys. The large vertical defence wall continues to show deterioration with spalling, seepage and cracking and is scheduled for capital refurbishment. Capital works are known to be planned in this frontage.

MU20-21 – Scarborough North Bay and Headland

Overall, the structures are in fair condition, but due to their age require ongoing maintenance to infill open joints and cracks. The stretch of frontage immediately north of Peasholm Gap, in front of the beach huts, experienced high beach levels, as in 2020, reaching and overtopping the crest of the seawall in places.

The asset in the poorest condition is the slipway in front of Oasis Café. A large vertical crack on the wingwall has deteriorated and a block is now missing adjacent to the crack. Surrounding blocks appear loose and are at risk of being displaced. Although it is fenced off, numerous members of the public were observed using this as an access route.

The rock armour and Accropode revetment with a raised concrete sea wall behind between the south end of Clarence Gardens and the East Pier of Scarborough Harbour remain in good condition.

MU21-22 – Scarborough Harbour

Overall, the structures are in fair condition and have experienced previous repairs and maintenance works. However, due to their age they require ongoing maintenance to infill open joints and cracks. The most notable defects are on the seaward end and outer face of the West Pier, where repairs are recommended. Due to low spring tide during the inspection of the harbour area it was possible to inspect a considerable length of the inner face of the East Pier. There is evidence of missing mortar, displaced blockwork and void formation along the toe of Pier.

MU22-23 – Scarborough South Bay

As is the case for North Bay, the defences in South Bay are generally in a similar state to when visited in 2020 and benefit from ongoing maintenance (joint sealing) in recent years around Foreshore Road and repairs around Spa Chalet (rebuilt wall sections). Overall, the structures are generally in fair condition, but due to their age require ongoing maintenance to infill open joints and cracks. High beach levels in 2022 meant that some previously reported defects were not visible at the time of the inspections.

Some capital refurbishment works were undertaken along the Spa sea wall in 2018 as part of the wider coast protection and slope stabilisation works. The repairs generally remain in good condition. To the north of the Spa, there was evidence of ongoing abrasion to the narrow splash wall which sits atop the main seawall, furthermore there is historic evidence that sections of this wall and the coping have been damaged and subsequently repaired.

South of the Spa, beneath the Spa Promenade a steelwork support frame was erected prior to the 2020 inspection. The framework was found to be in fair condition although the underside of the promenade continues to deteriorate.

Many of the sea walls south of the Spa are heavily abraded and locally damaged. Low beach levels had exposed the toe piles of several of the defences, in places these were found to be heavily corroded.

Capital works at the Clock Café Retaining Wall which were completed in late 2020 were found to generally be in as-built condition however it was noted that several sections of coping stone were missing on a low section of wall fronting the main retaining wall.

MU24-25 – Cayton Bay

The repairs to the defences around the public access steps which were undertaken shortly after the 2016 inspection were found to remain in fair condition. However, overall the structures remain in very poor condition and present a health and safety risk to members of the public accessing the beach. There was no significant worsening of the structures within the Bay.

MU28a-29a – Filey

The slipway at Filey sailing club is continuous to be undercut, with a significant section of the slipway breaking away. The scour hole at the north end of sheet pile defences has been repaired, although it was noted that the coping concrete was missing along the northern part of the sheetpile wall.

The main sea wall through the town remain largely unchanged since 2020. The structure shows evidence of significant ongoing maintenance and repair works over recent years. It is critical that the level of maintenance activity is sustained in the short to medium term to ensure the integrity of the structure any structural defects before they become significant. The abrasion experience along the lower courses of blockwork continues to worsen when no intervention is undertaken. There is sustained evidence of seepage through open joints. Lower beach levels exposed some of the drains, many of which were blocked. In places the concrete toe of the wall was visible, where visible it appeared in fair to good condition.

A short section of rock revetment with gabion baskets beneath is located at the southern end of the sea wall near Martin's Gill. A depression in the crest of this structure suggests movement of the cliff behind, although this has not worsened since 2020. There was evidence that gabion baskets at the southern end of the revetment have split since the 2020 inspection, although currently this has not had an impact on the rock armour position. The coastal slopes behind the revetment still appear to be active and some form of improved outflanking defence remains necessary in the short term.

The Flat Cliffs emergency works were completed in 2018. The geotextile bags at the toe of the cliff were mostly fully buried by beach sediment at the time of the 2020 inspections. The toe of the cliff has retreated quite significantly, exposing drainage pipes along the full length of the works area. The drains are severed in places and protrude from the near shear face of the cliff toe. It is noteworthy that several of the drainage pipes were discharging water at the time of inspection suggesting they are still operating as expected.

5. Problems Encountered and Uncertainty in Analysis

5.1 Coastal Slope Condition Assessment

As in 2020, no significant problems were encountered during the inspections of the coastal slopes. Whilst a limited view of the cliff was afforded at a small number of locations, sufficient lengths of the cliff could be seen to assess its overall condition. Generally, the inspections along the more rural sections were undertaken from the clifftop path, but where public access permitted visits were made to additionally view the cliffs from the foreshore. The cliffs along the urban areas (such as Scarborough and Whitby) were observed from the promenade and from the cliff top.

5.2 Coast Protection Asset Condition Assessment

Very few problems were encountered during inspections of the coastal defence assets, largely due to careful logistical planning in advance to avoid the main tourist areas during busier times of the day.

The toe of structures around Staithes Harbour, Whitby Harbour, Castle Cliff and Scarborough Harbour are constantly submerged by the tide and therefore an inspection of only the visible elements from land or pier deck was undertaken. If and when more detailed inspections of these assets are required, a vessel-based survey is recommended.

6. Conclusions and Recommended Actions

Further to the visual inspection of all assets, specific conclusions and recommendations for individual structural assets are given in the separate **Scarborough Asset Inspections Report 2022**.

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

All condition assessment data and selected photographs have been uploaded to SANDS (Shoreline and Nearshore Database System). This includes all data and photographs from the previous inspections since 2008.

Appendices

Appendix A

Asset Location Maps

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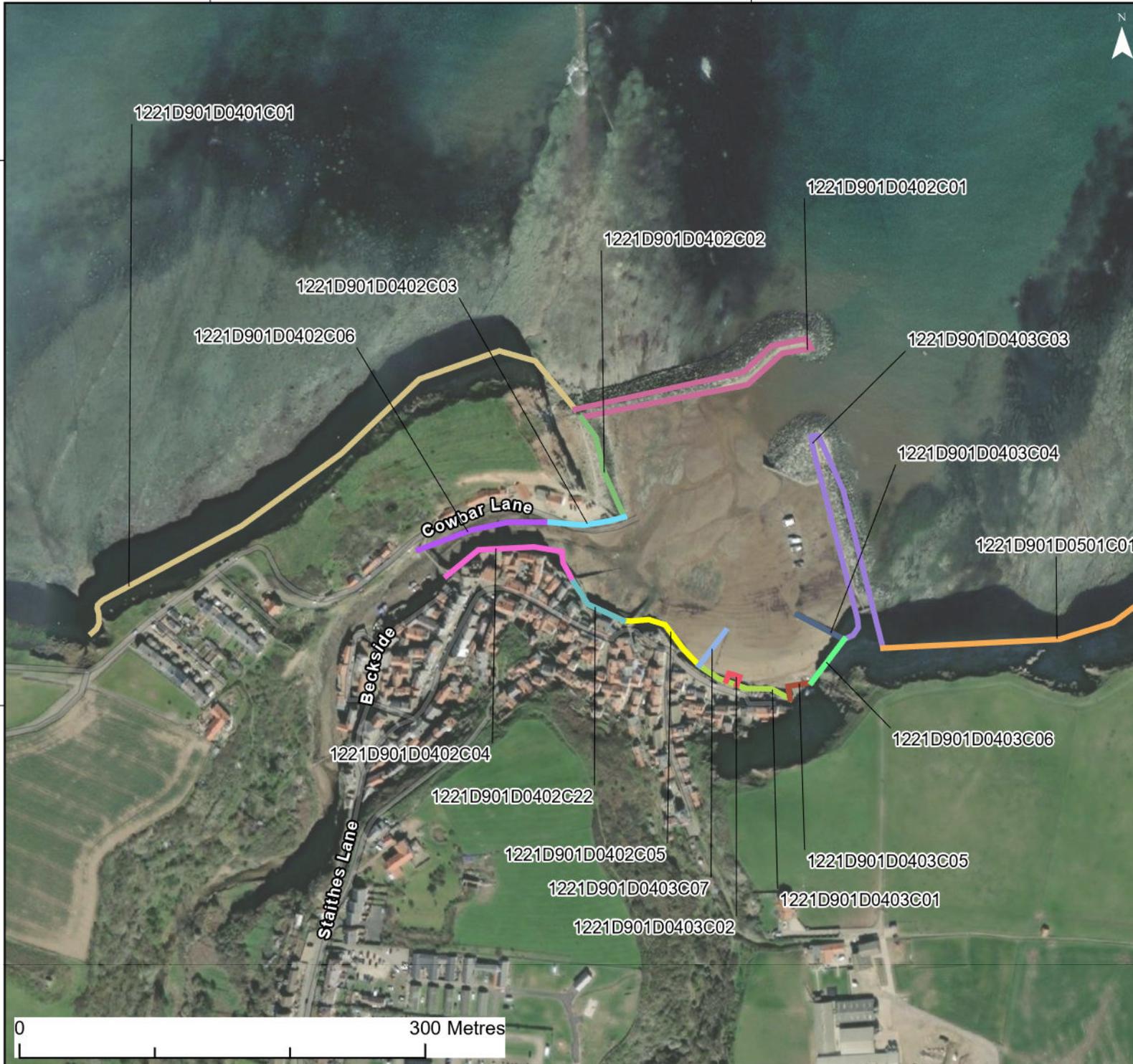
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Figure 1 - Map 1

COASTAL ASSET LOCATIONS

Scarborough Borough Council Frontage

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Figure 1 - Map 2

COASTAL ASSET LOCATIONS

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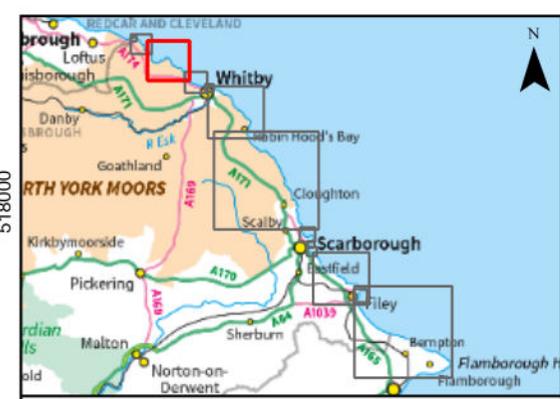
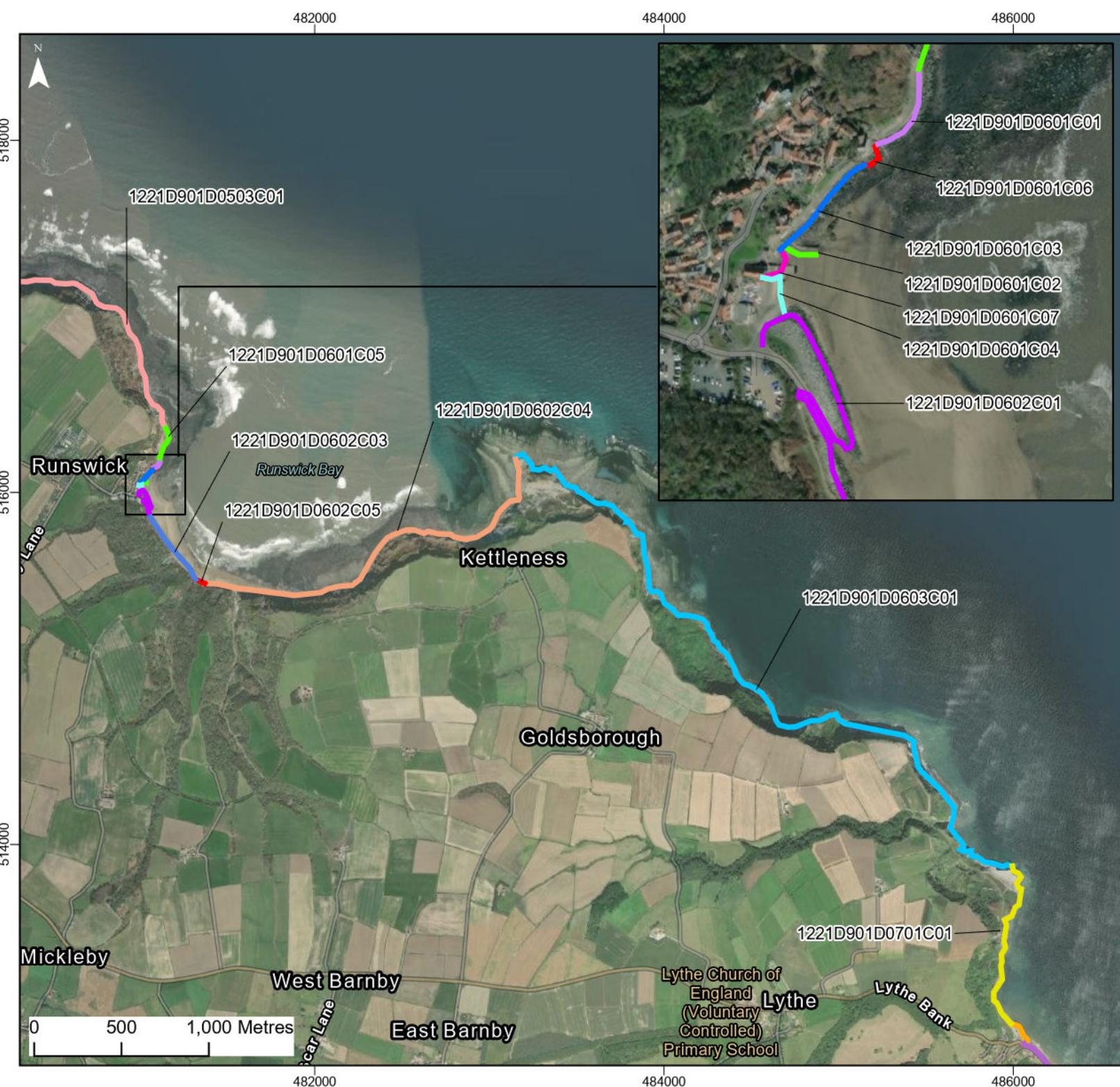
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Figure 1 - Map 3

COASTAL ASSET LOCATIONS

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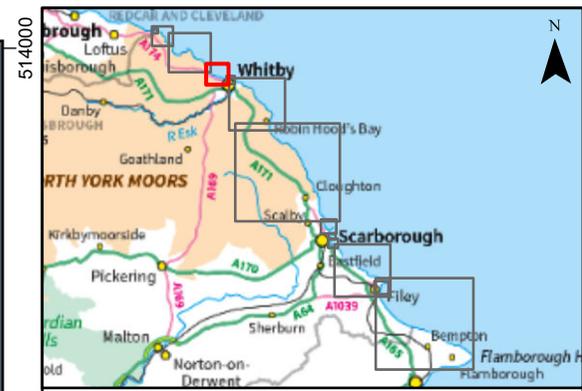
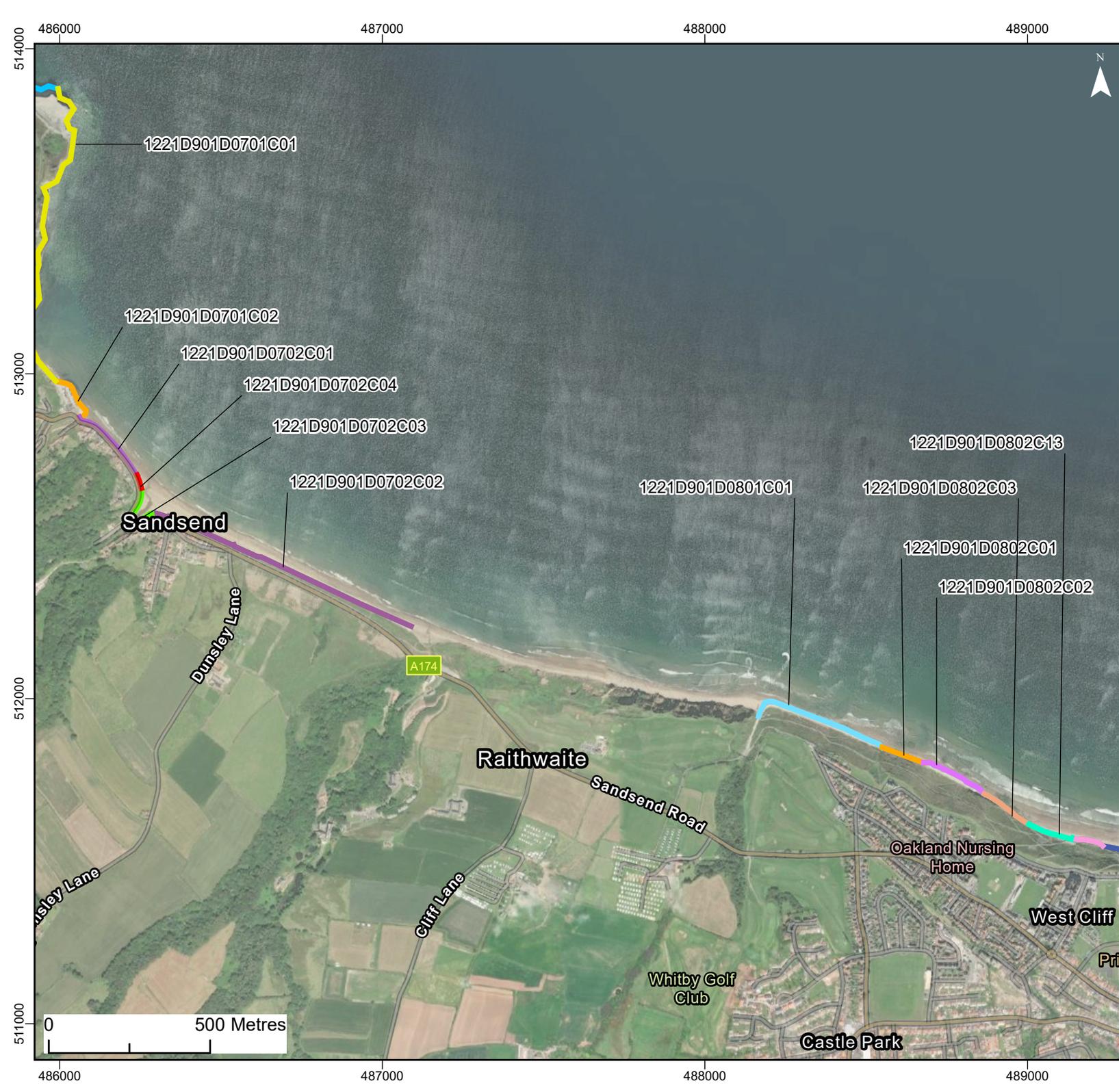
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Figure 1 - Map 4

COASTAL ASSET LOCATIONS

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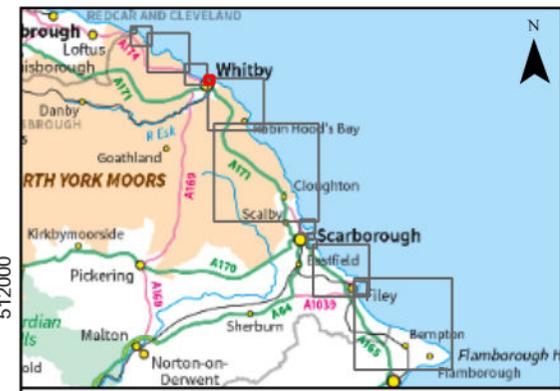
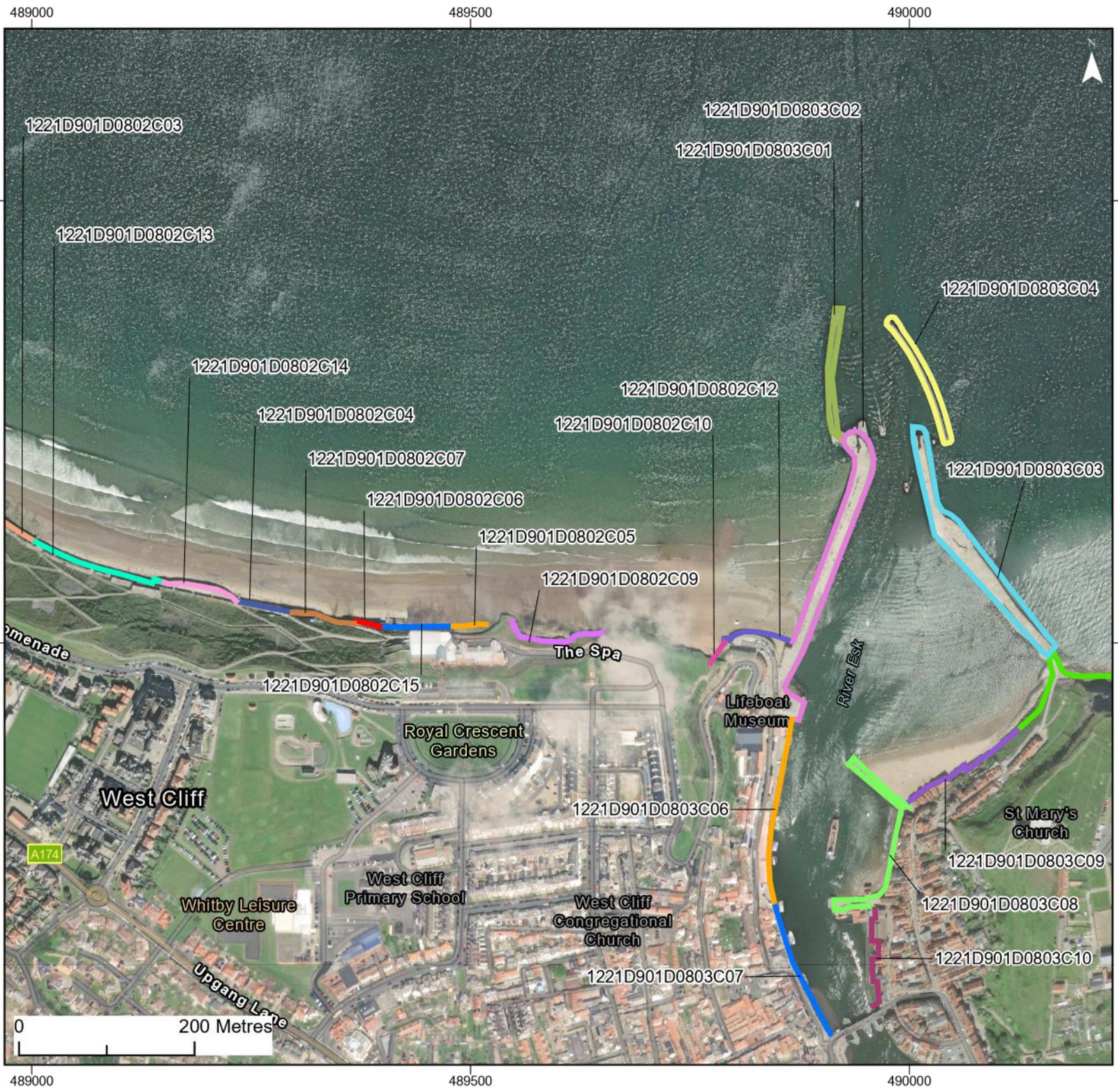
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Figure 1 - Map 5
COASTAL ASSET LOCATIONS
Scarborough Borough Council Frontage

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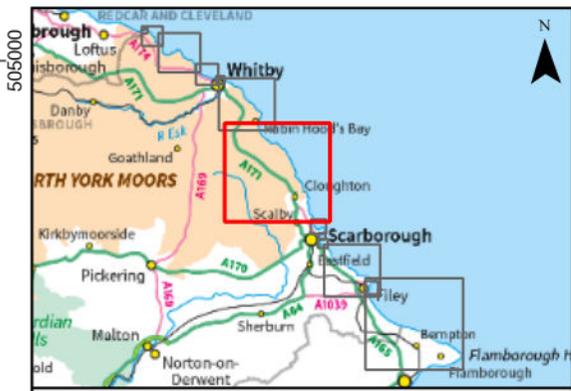
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Figure 1 - Map 7

COASTAL ASSET LOCATIONS

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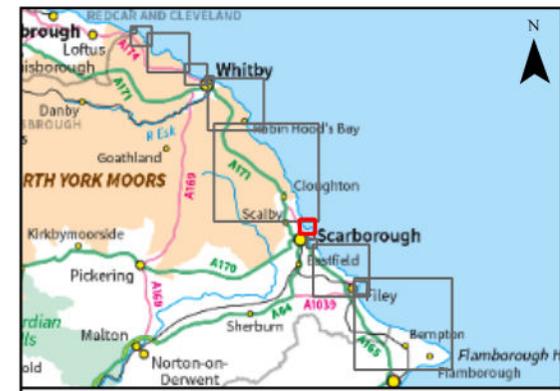
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Figure 1 - Map 8

COASTAL ASSET LOCATIONS

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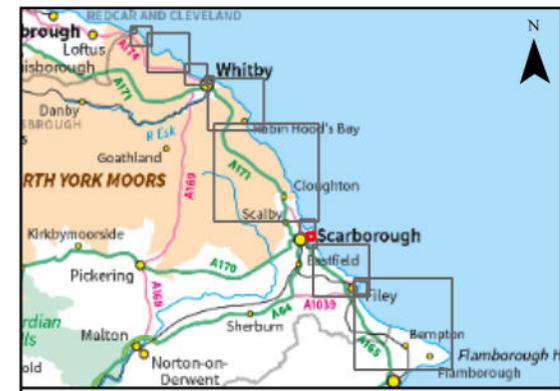
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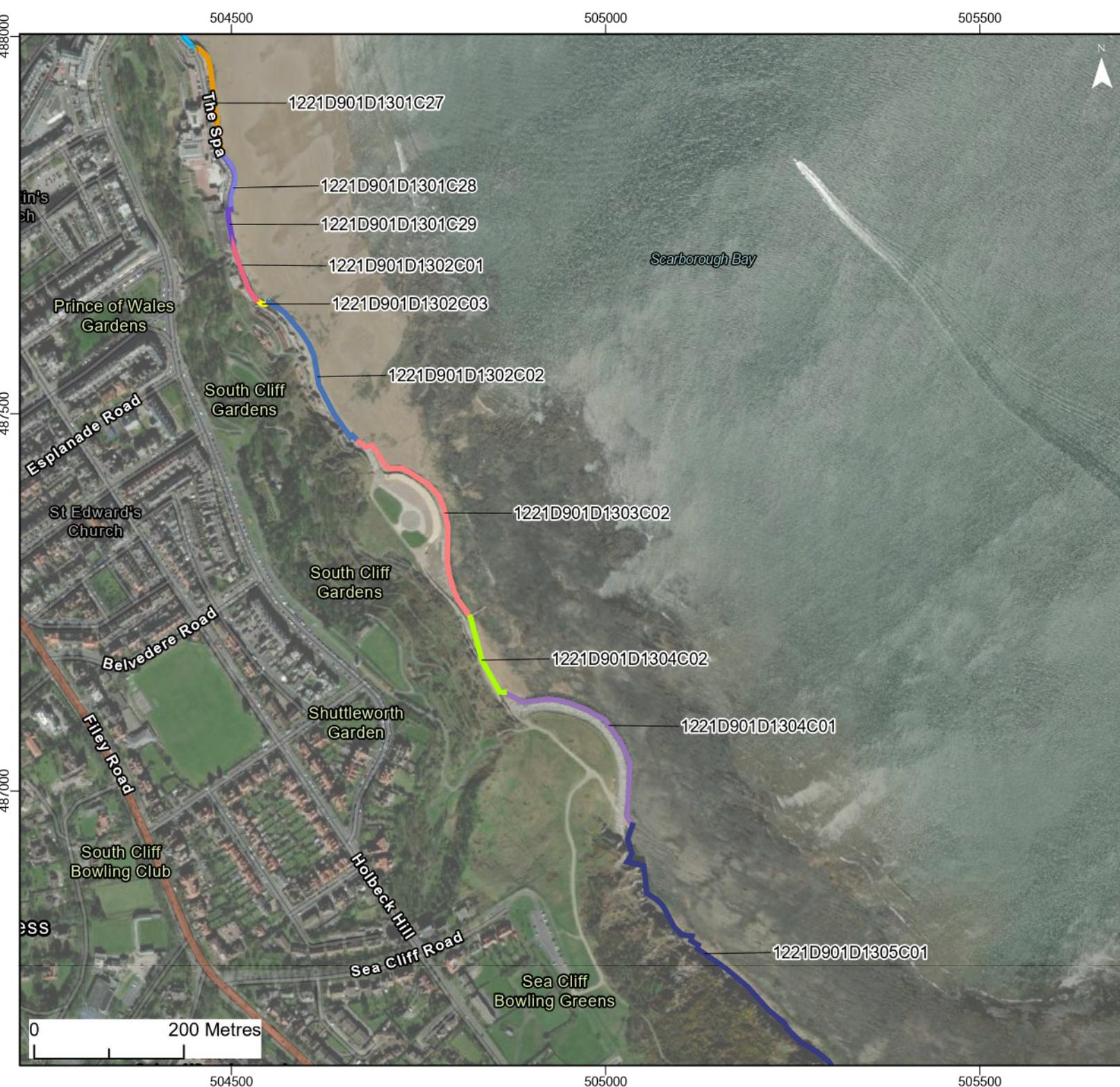
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Figure 1 - Map 9
COASTAL ASSET LOCATIONS
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Figure 1 - Map 10

COASTAL ASSET LOCATIONS

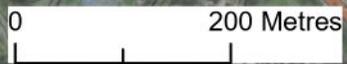
Scarborough Borough Council Frontage

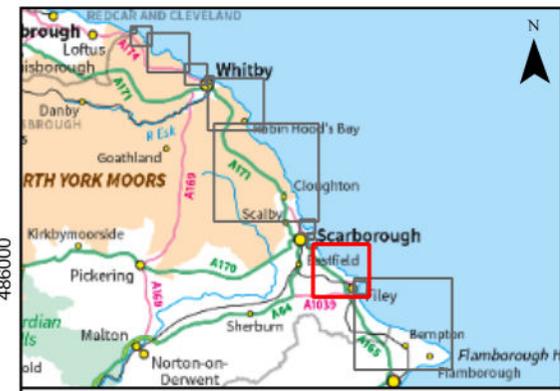
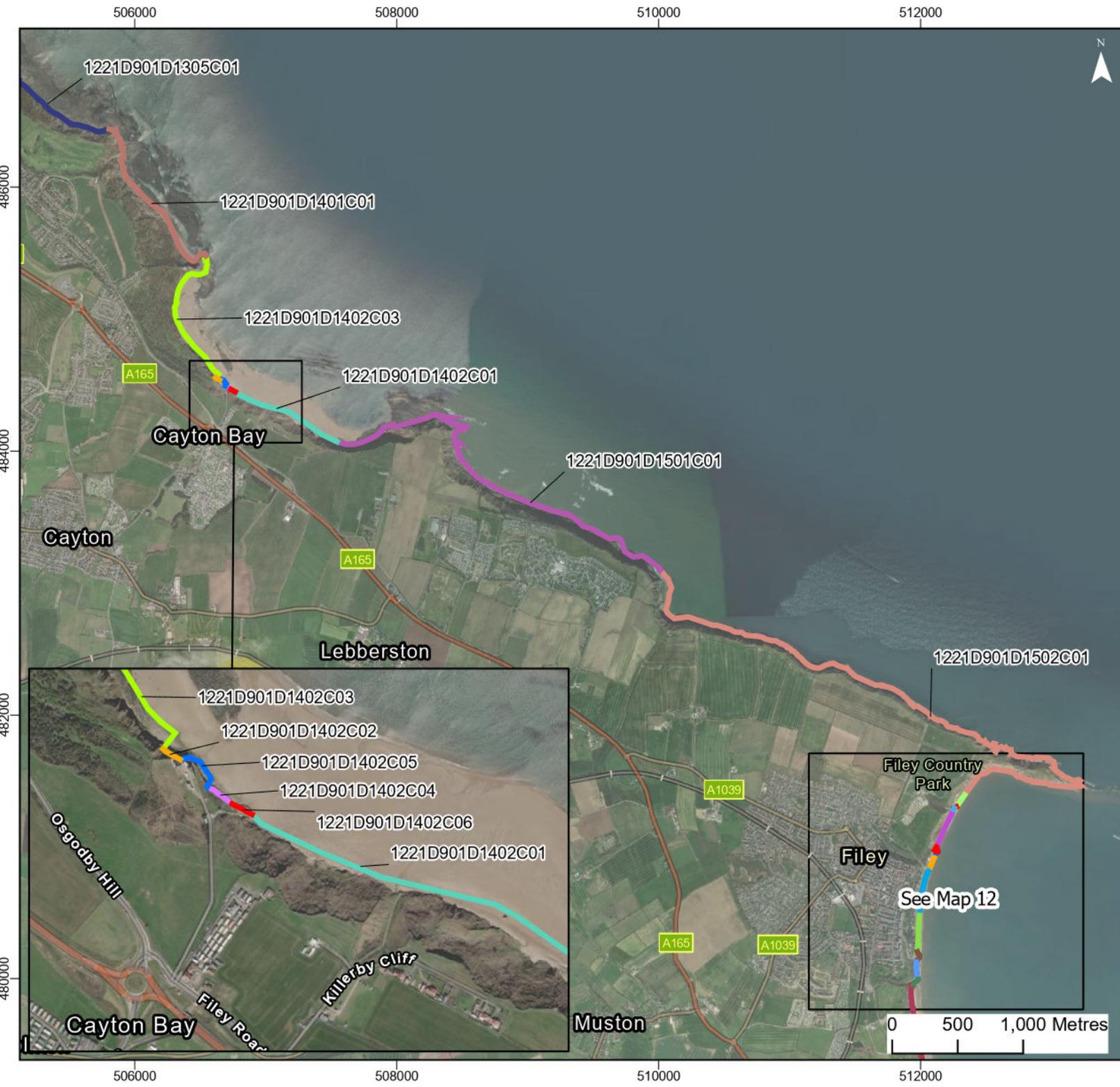
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Figure 1 - Map 11

COASTAL ASSET LOCATIONS

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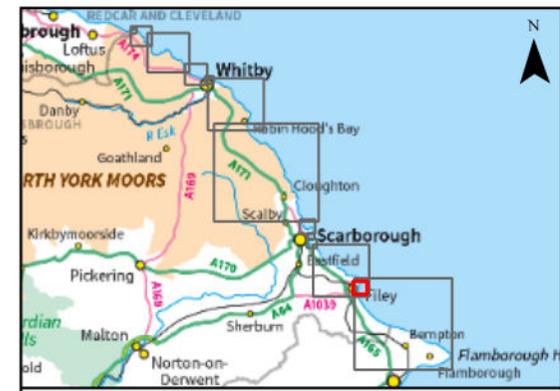
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Figure 1 - Map 12

COASTAL ASSET LOCATIONS

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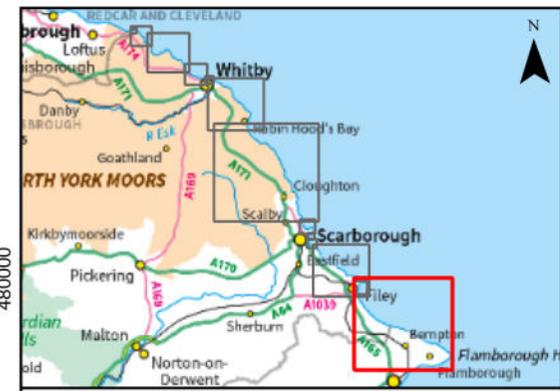
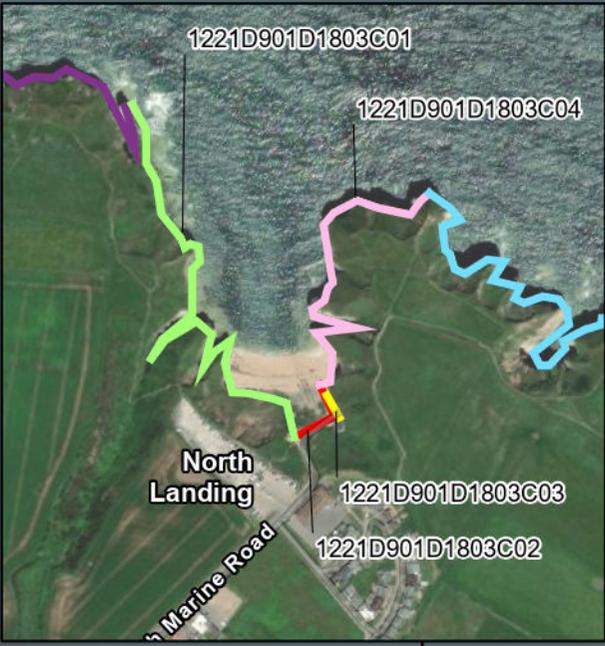
Report:

Asset Inspection Report

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Co-ordinate system: British National Grid





Legend

- Coastal Asset location
- NFCDD Asset Number

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

Title:

Figure 1 - Map 13

COASTAL ASSET LOCATIONS

Scarborough Borough Council Frontage

Report:

Asset Inspection Report

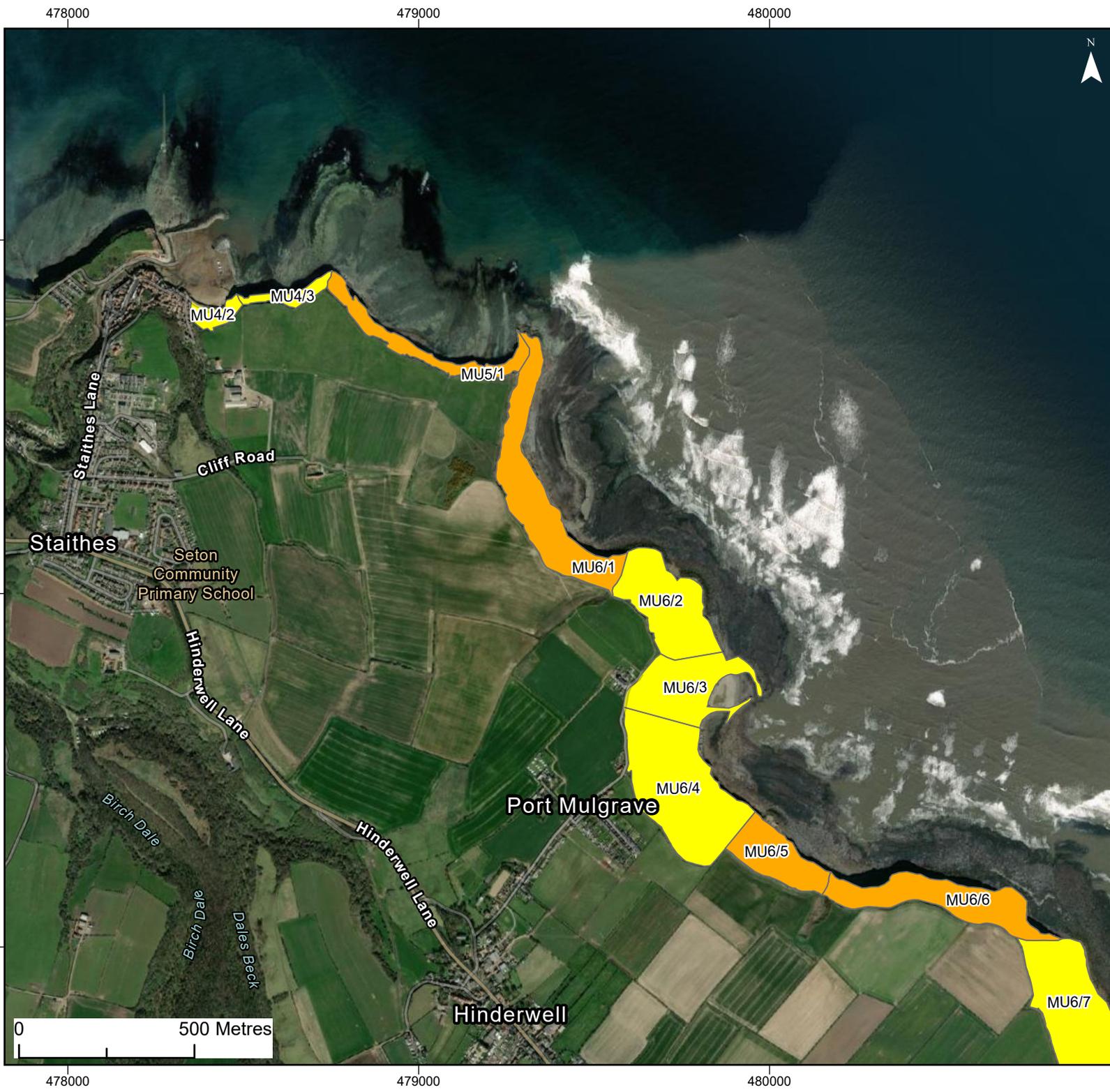
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Co-ordinate system: British National Grid



Appendix B

Cliff Behaviour Units



Legend

Cliff Activity Status

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

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Client:	Project:
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Title:

Figure 1 - Map 1

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

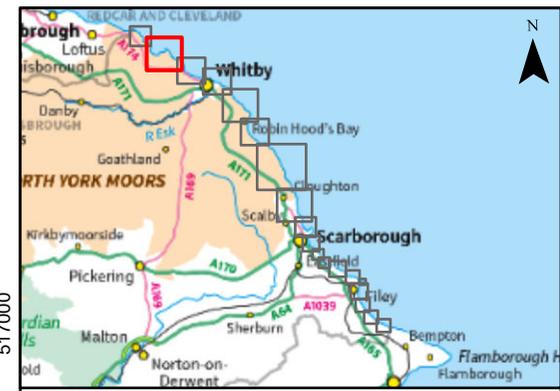
Report:

Asset Inspection Report

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Legend

Cliff Activity Status

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

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Client: North East Coastal Group	Project: Cell 1 Regional Coastal Monitoring Programme
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Figure 1 - Map 2
COASTAL SLOPE CONDITION 2022
Scarborough Borough Council Frontage

Report:
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Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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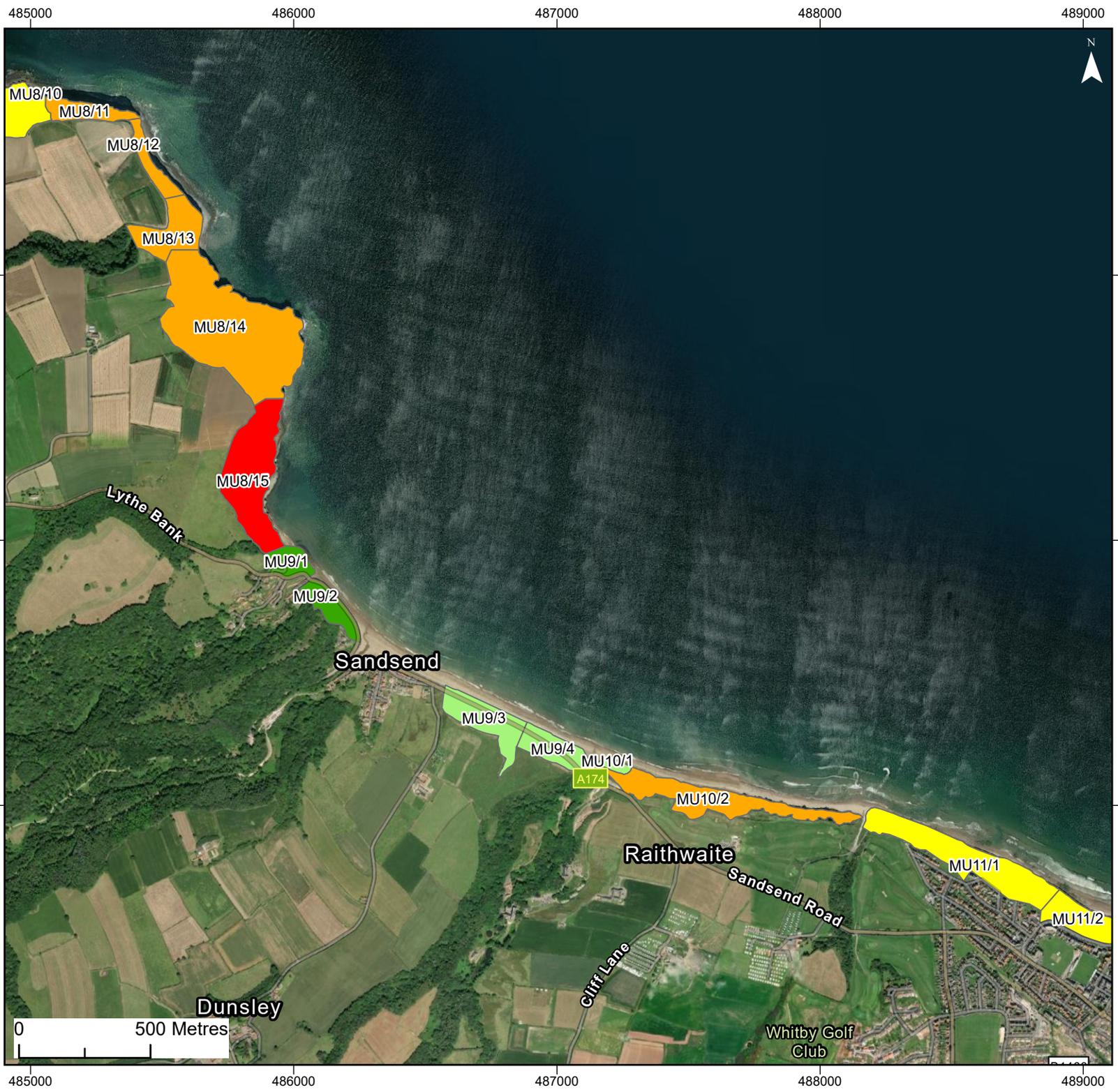
Co-ordinate system: British National Grid



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Legend

Cliff Activity Status

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

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

Title: **Figure 1 - Map 3**
COASTAL SLOPE CONDITION 2022
Scarborough Borough Council Frontage

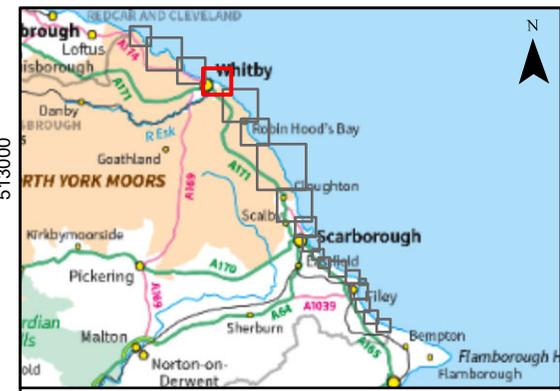
Report: **Asset Inspection Report**

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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Legend

Cliff Activity Status

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

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Figure 1 - Map 4
COASTAL SLOPE CONDITION 2022
Scarborough Borough Council Frontage

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Cliff Activity Status

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

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Title:

Figure 1 - Map 5

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

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Asset Inspection Report

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	n/a	TC	NJC	A4	1:25,000

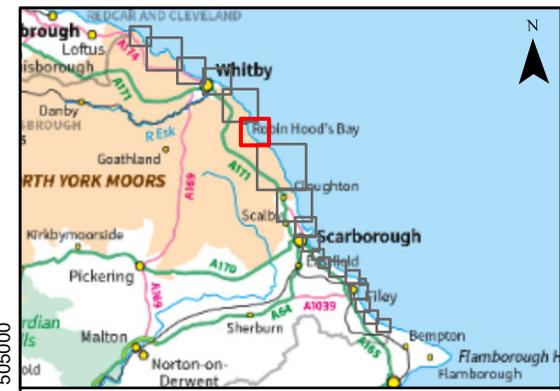
Co-ordinate system: British National Grid



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Cliff Activity Status

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

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Figure 1 - Map 6
COASTAL SLOPE CONDITION 2022
Scarborough Borough Council Frontage

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0	n/a	TC	NJC	A4	1:20,000

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Cliff Activity Status

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

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-------------------------------------	--

Figure 1 - Map 7

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

Report:
Asset Inspection Report

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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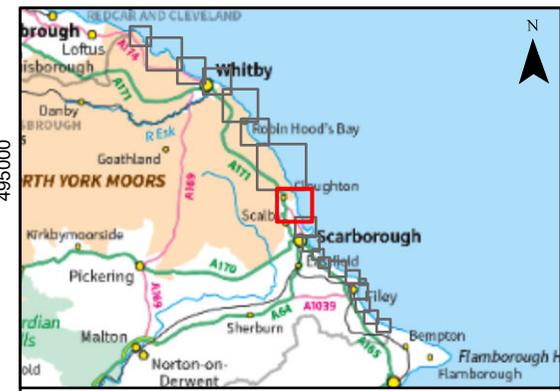
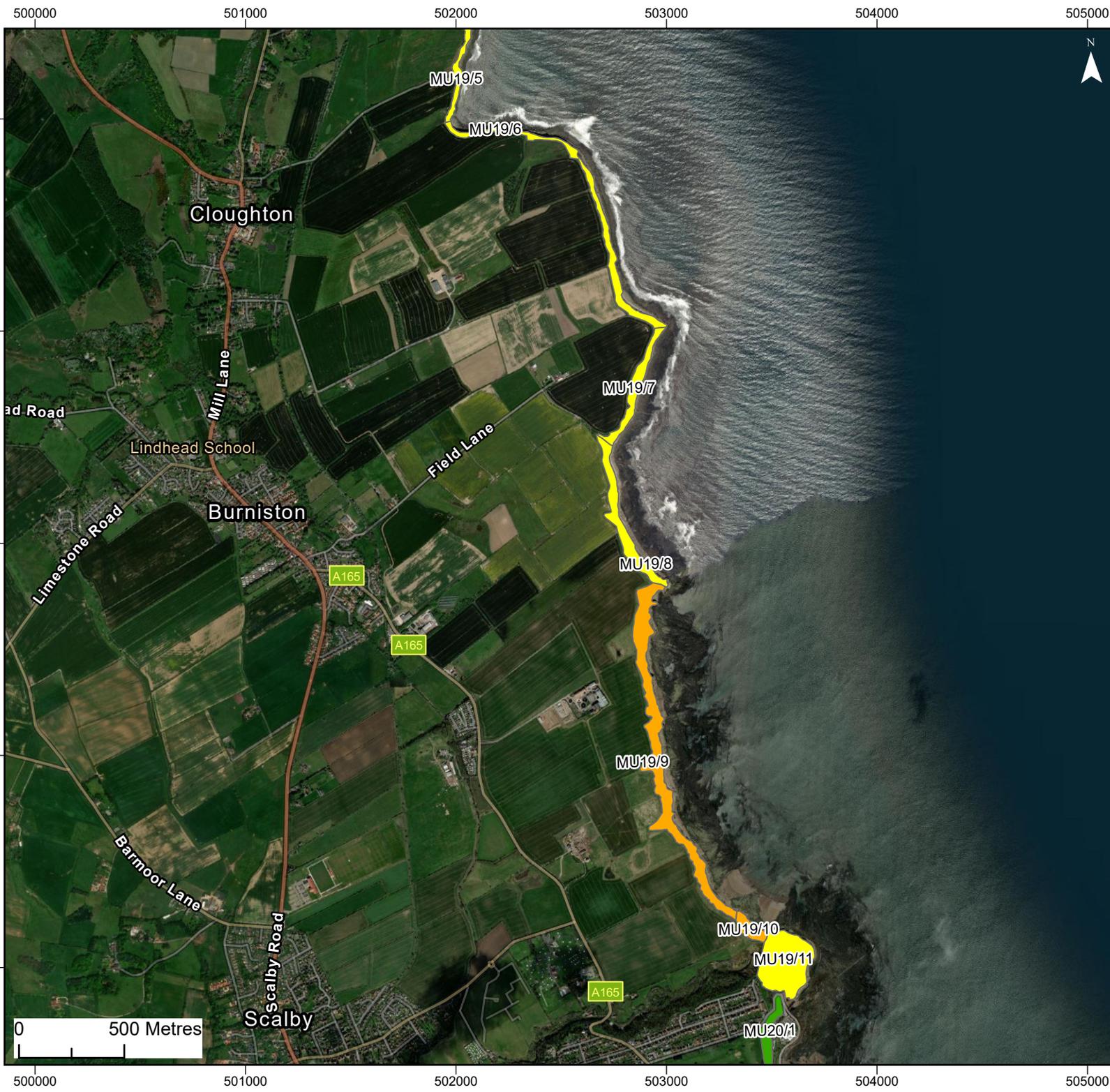
Co-ordinate system: British National Grid



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Legend

Cliff Activity Status

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

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Figure 1 - Map 8

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

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Legend

Cliff Activity Status

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- Inactive
- Locally Active
- Partly Active
- Totally Active

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Figure 1 - Map 9

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

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0	n/a	TC	NJC	A4	1:15,000

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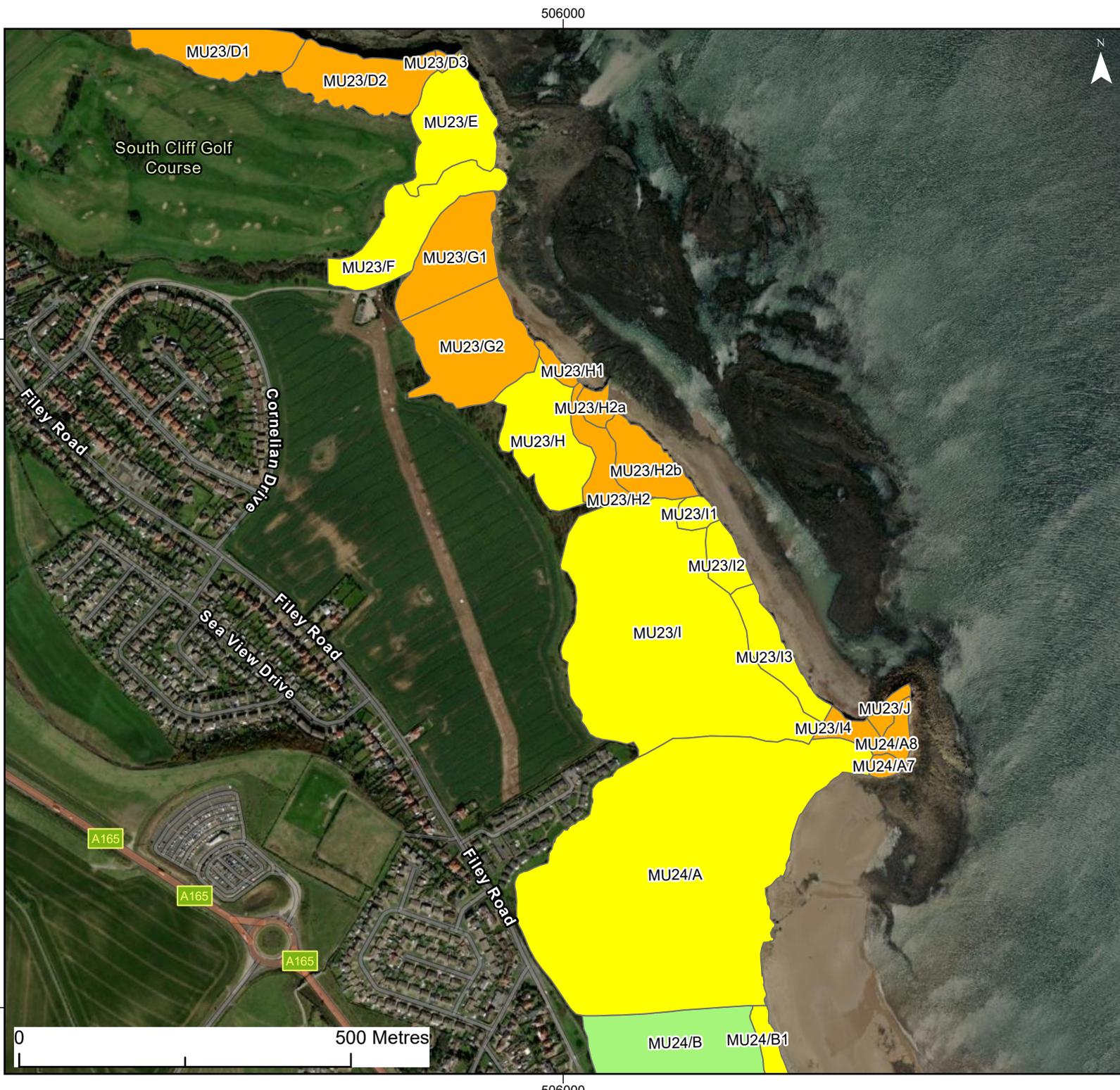
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Figure 1 - Map 10
COASTAL SLOPE CONDITION 2022
Scarborough Borough Council Frontage

Report:
 Asset Inspection Report

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	n/a	TC	NJC	A4	1:12,000

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Title:

Figure 1 - Map 11

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

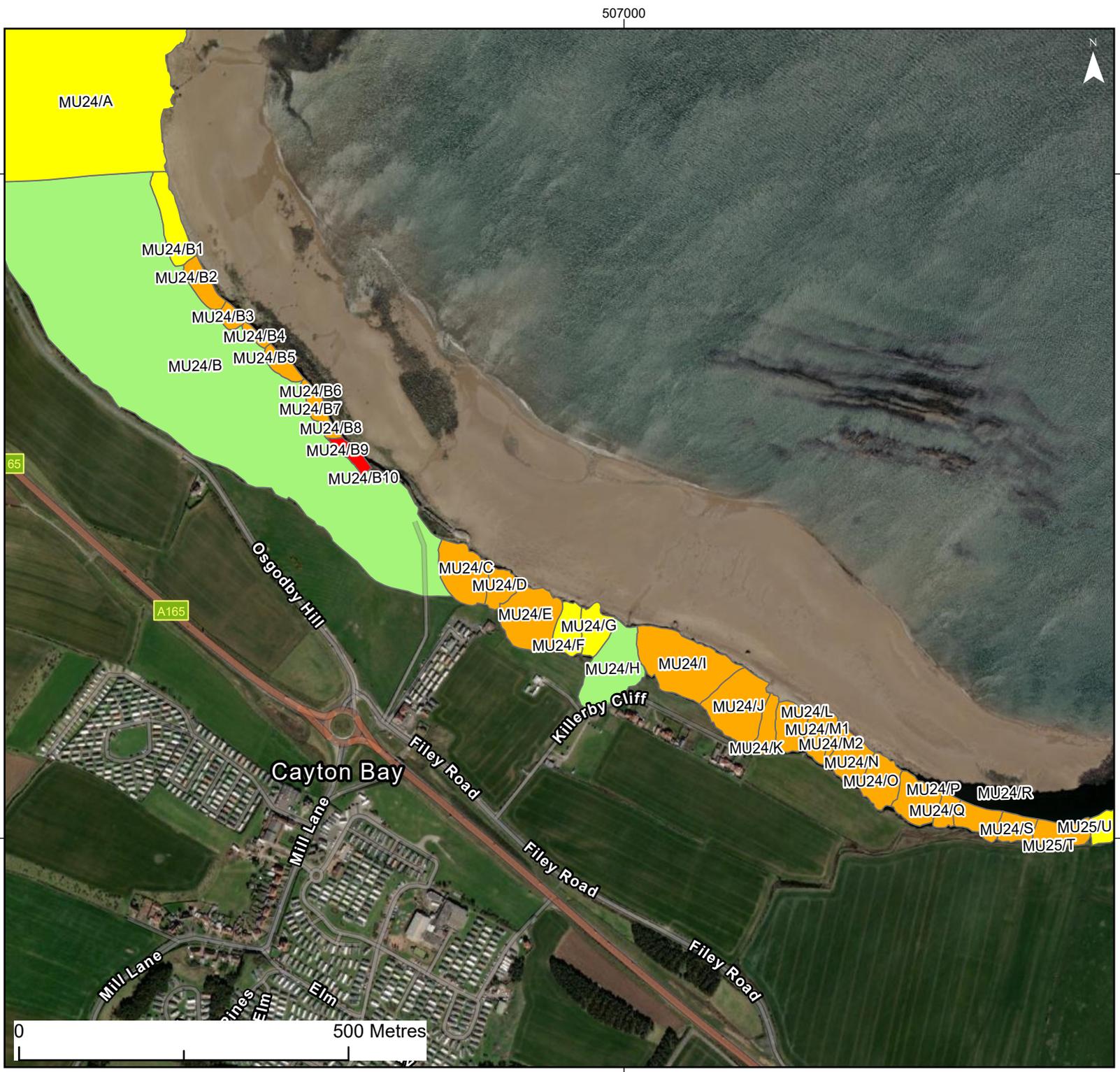
Report:

Asset Inspection Report

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid



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Title:

Figure 1 - Map 12

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

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Title: **Figure 1 - Map 13**
COASTAL SLOPE CONDITION 2022
Scarborough Borough Council Frontage

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Title:

Figure 1 - Map 14

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

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Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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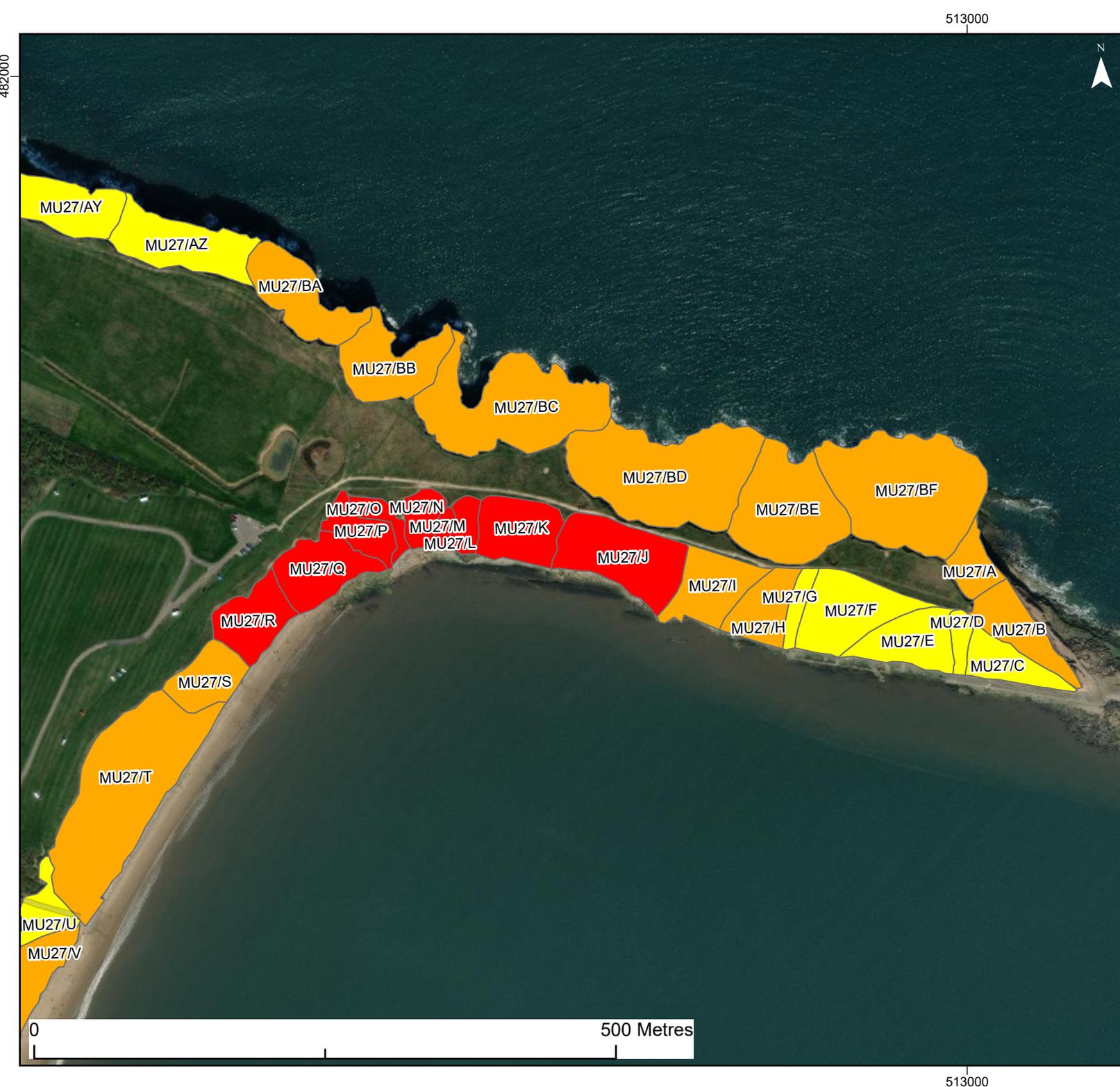
Co-ordinate system: British National Grid



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Cliff Activity Status

- Dormant
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- Partly Active
- Totally Active

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Figure 1 - Map 15

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

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Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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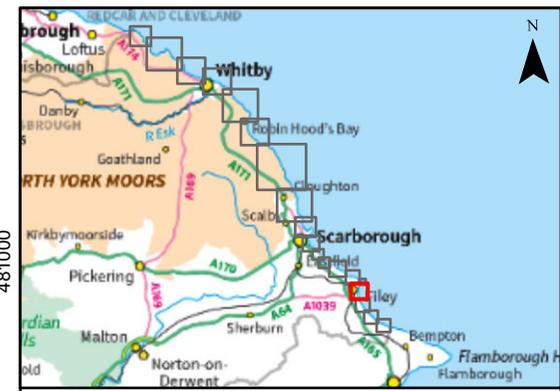
Co-ordinate system: British National Grid



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Cliff Activity Status

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- Inactive
- Locally Active
- Partly Active
- Totally Active

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Client:	Project:
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Title:

Figure 1 - Map 16

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

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

Title:

Figure 1 - Map 17

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

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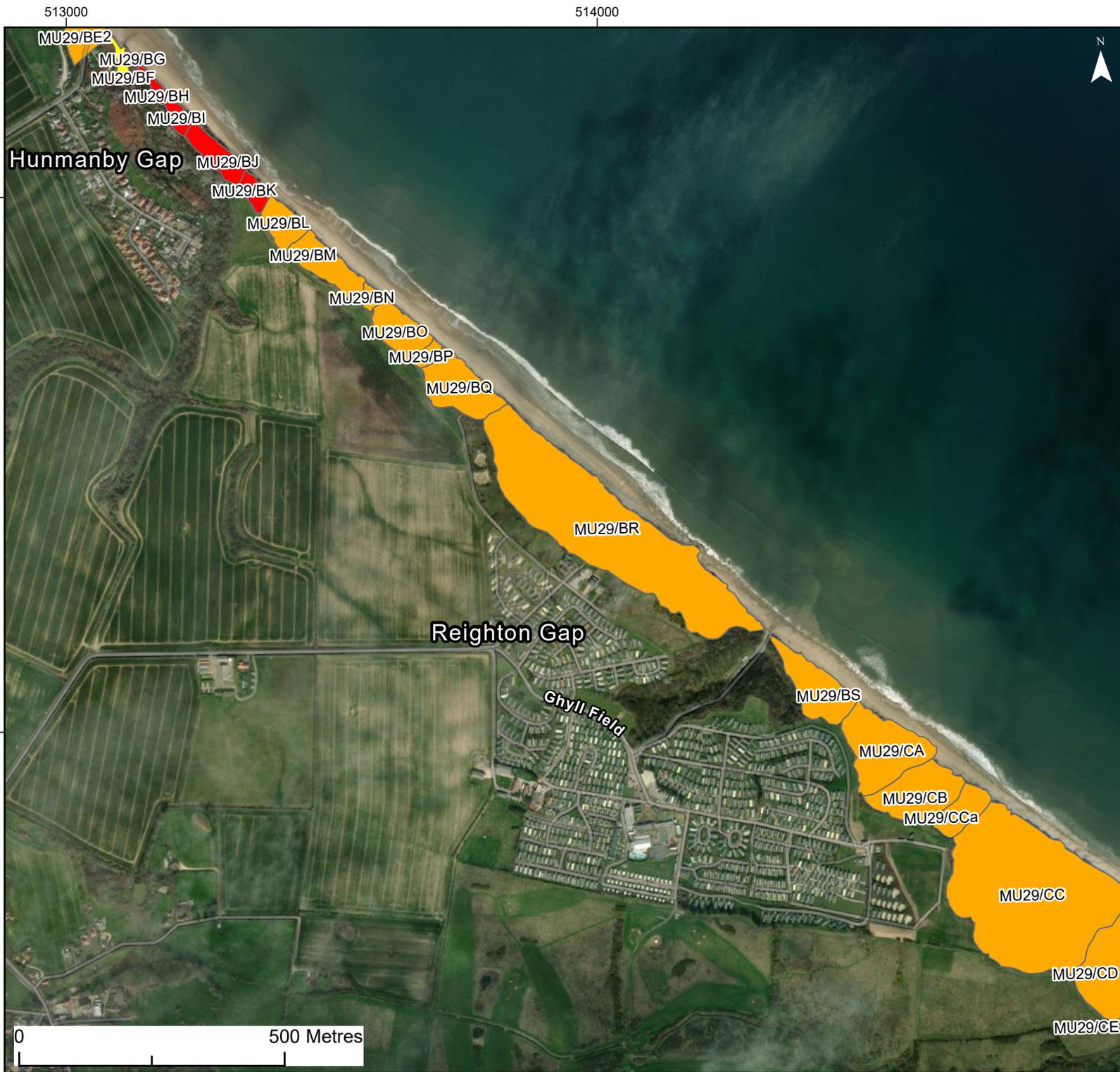
Co-ordinate system: British National Grid



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Cliff Activity Status

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- Locally Active
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- Totally Active

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Title:

Figure 1 - Map 18

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

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Co-ordinate system: British National Grid



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Legend

Cliff Activity Status

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- Inactive
- Locally Active
- Partly Active
- Totally Active

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

Title:

Figure 1 - Map 19

COASTAL SLOPE CONDITION 2022

Scarborough Borough Council Frontage

Report:

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Co-ordinate system: British National Grid



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Appendix C

Asset Condition & Recommendations

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
Staithes										
1221D901D0402C01	Breakwater	NZ78271901, NZ78441906. North breakwater.	370.8	13/07/2022	Royal HaskoningDHV	Rock armour tightly packed to consistent profile. No evidence of significant displacement/movement. Possible local displacement of rock armour from crest at head of structure on inside east face although no significant movement from 2020. Two of stacked/pinned crest blocks missing adjacent to walkway (possible remains on foreshore). Heavily corroded steel sheet piling, particularly in uppermost 2m. Cracking to deck and crest wall. Crack to full width of deck and crest wall approx. 20m from seaward extent. Previous repair (grout/concrete infill) evident, Cracking and abrasion to crest, particularly coping on inside face. Rust staining of crest wall. Stainless steel guardrail in good condition although gap beneath bottom rail is large in areas with abrasion of crest. Possible evidence of undercutting of outer concrete face exposed by low beach levels close to landward end. Access ramp and concrete "baffles" at landward end in good condition 2 No. approx. 0.5t armour rocks sitting on concrete access ramp.	3	11-20	Grout voids in structure. Monitor rock armour at head (inside toe) and potential undercutting of inside concrete face (likely requiring boat survey). Repair crest/deck locally. Replace flexible sealant. Adjust guard railing to reduce risk of pedestrians falling. Secure life-ring mount.	routine
1221D901D0402C02	Sea wall with rock armour	NZ78301893, NZ78271901. South of Northern breakwater.	91.4	13/07/2022	Royal HaskoningDHV	Rock armour generally in good condition, with consistent profile and no evidence of significant displacement. Crest at northern extent appeared slightly lower (exposing concrete walkway behind). Rock armour on foreshore in front of toe – possibly displaced from crest. Unchanged from 2020 survey suggesting stable. Concrete seawall at southern end in fair condition with exposed aggregate/abrasion and open joints, esp. close to crest. Minor cracking evident. Abrasion on wall crest and promenade.	2	>20	Continue to monitor. Reprofile rock at northern extent. Minor repairs to seawall (pointing/fill cracks).	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D0402C03	Sea wall	NZ78251893, NZ78301893. RNLI slipway.	55.3	13/07/2022	Royal HaskoningDHV	Abrasion / opening of horizontal construction joints in concrete wall. Slipway surface in good condition, but timber piles cracked and weathered. Gabion baskets generally in good condition although limited visibility due to high beach levels and vegetation cover. Previous survey suggested potential settlement – not evident here. Long standing void in masonry river wall – now approx. 1m deep – beneath area subject to vehicle loading. Significant abrasion of masonry leaving mortar from previous repointing standing proud.	3	11 - 20	Monitoring and repair cracks to wall. Infill void.	routine
1221D901D0402C06	Channel side.	Staithes, LB of River D/S of footbridge.	100.3	13/07/2022	Royal HaskoningDHV	Promenade / road in fair condition. Wall has missing blocks and open joints locally. Vegetation growth at top of wall causing damage to concrete render. Small voids in timber and masonry training wall – largely obscured by marine vegetation growth, however no visible signs of global movement or distress of the structure	3	11 - 20	Clear vegetation. Replace missing blocks and repoint open joints. Grout voids.	routine
1221D901D0402C04	Sea wall.	NZ78261889, NZ78301886. South bank from bridge.	117.1	13/07/2022	Royal HaskoningDHV	Repair work to parts of wall evident. Vegetation growing in joints/voids locally. Minor cracks evident throughout wall. Open joints and loose masonry blocks locally (two areas in property walls backing onto Staithes Beck in poor condition as a result). Undercutting of toe reported in 2014 partially visible in 2018 not observed in 2020 or 2022 due to higher beach level and marine vegetation growth.	3	11 - 20	Clear vegetation. Repair cracks, repoint masonry, fill voids. Continue to monitor.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D0402C22	Wall	Between slipway and groyne on South wall.	47.7	13/07/2022	Royal HaskoningDHV	Repairs evident to cracks and missing blocks replaced. Two groynes in good condition (concrete and rock armour sections). Cracking and abrasion locally. Significant horizontal crack at base of structure wall on top of seawall. Vegetation growth throughout. Partially visible in 2022 – approx. 2m long, 100mm tall, 300mm deep void between concrete wall and rock on foreshore. Located approx. mid-point between slipway and groyne structure.	3	11 - 20	Clear vegetation. Repairs to walls joints, cracks and infill voids at toe. Consider investigation to expose voids and determine extent/take remedial action in advance of natural beach lowering.	routine
1221D901D0402C05	Wall	NZ78301886, NZ78361882. Between East groyne and slipway.	70.5	13/07/2022	Royal HaskoningDHV	Multiple cracks and spalling, but signs of multiple repair works. Some loose blocks to slipway walls. Significant vegetation growth obscuring north face of slipway. Cracks along promenade. Additional toe berm placed along short length since 2012. Cope repair patches holding well.	3	11 - 20	Continue to monitor. Clear vegetation, repair cracks and joints.	routine
1221D901D0403C07	Groynes.	NZ78361882, NZ78381885. In-between South slipways.	32.0	13/07/2022	Royal HaskoningDHV	Groyne in good condition. Minor cracking to second "step". Vegetation cover at seaward end. Handrail in good condition.	2	>20	Continue to monitor.	routine
1221D901D0403C01	Wall.	NZ78361882, NZ78421880 South wall next to last slipway.	73.1	13/07/2022	Royal HaskoningDHV	Vertical full height cracks through the wall between access steps and groyne has been filled although would benefit from further attention due to abrasion at surface. Exposure of aggregate throughout wall. Vegetation growing at top of wall. Cracking to promenade.	3	11 - 20	Continue to monitor. Remove vegetation. Re-visit previous infill repair to full-height crack. More general repairs to wall and promenade cracking.	routine
1221D901D0403C02	Steps and hand railing.	NZ78381881, NZ78391882	20.0	13/07/2022	Royal HaskoningDHV	Concrete steps in fair condition. Handrails in fair condition.	3	>20	Continue to monitor.	routine
1221D901D0403C05	Revetment/slipway.	NZ78421881, NZ78441881 Next to cliff.	26.8	13/07/2022	Royal HaskoningDHV	Concrete ramp and steps in good to fair condition. Loss of joint filler and minor abrasion at exposed edges at construction joints.	2	>20	Continue to monitor. Replace joint filler.	routine
1221D901D0403C04	Breakwater with rock armour	NZ78431886, NZ78461884 Behind South breakwater.	39.0	13/07/2022	Royal HaskoningDHV	Good condition concrete breakwater, some cracking in crest. Vegetation growth to vertical faces. Crack in vertical face at seaward end. At mid-length, vertical crack full width of deck and corresponding crack in vertical faces – appeared historic/stable. Handrails in good condition throughout.	2	>20	Fill cracks. Continue to monitor.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D0403C03	Breakwater	NZ78491884, South Breakwater.	327.5	13/07/2022	Royal HaskoningDHV	Concrete crest cracked in the middle of the length. Rock armour mostly tightly packed and maintaining good profile although some smaller rocks displaced and sitting on top of rock armour and four rocks on concrete deck (at seaward end). Opening of construction joints to the old part of the wall (visible on inner face). Notable construction joint between wall concrete and crest concrete look to be widening esp. around historic ladders. Local cracking and loose concrete locally at crest on inside face at approx. Mid-length possibly as a result of vessel impact. Minor deformation of handrails in same location. Local repairs ongoing July 2022.	2	>20	Continue to monitor. Move smaller rock armour pieces from concrete crest back into revetment (H&S/access/aesthetic – not critical for performance of structure).	routine
Port Mulgrave										
1221D901D0502C01	Pier.	NZ79871763, NZ79941769. Port	161.4				5	1 - 5	Not inspected - redundant.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
Runswick Bay										
1221D901D0601C01	Wall	NZ81081614, NZ81111619. Next to Upgarth Hill	72.4	13/07/2022	Royal HaskoningDHV	<p>Previously reported defects (erosion/abrasion & undercutting to the wall toe) were repaired via local concrete repairs in advance of construction of rock armour fillet as part of Coastal Protection Scheme (July 2018). Rock armour extends approx. 15m west of seawall to tie-in at Cauldron Cliff.</p> <p>Wash out of the joints under the capping beam. Local cracking and abrasion/spalling of reinforced concrete coping/capping beam continues to worsen. Brittle/missing joint filler on promenade parallel to capping beam (up to 20mm wide joint). Vegetation growth in joints. Route for surface water to enter backfill – increased risk of freeze-thaw action. Differential settlement of promenade slabs. 10-20mm vertically.</p>	3	11 - 20	Local repairs to concrete coping, fill open joints. Remove vegetation. Replace joint filler. Continue to monitor.	routine
1221D901D0601C06	Sea wall.	North side of Runswick Bay	25.3	13/07/2022	Royal HaskoningDHV	<p>Rock armour fillet constructed as part of Coastal Protection Scheme (July 2018). Local repointing and repairing of cracks to masonry sea wall and concrete apron in advance of rock placement. Rock armour maintains good interlock and consistent profile throughout.</p>	2	6 - 10	Continue to monitor.	routine
1221D901D0601C03	Sea wall.	NZ81001604, NZ81081614. North of breakwater.	91.3	13/07/2022	Royal HaskoningDHV	<p>Rock armour fillet constructed as part of Coastal Protection Scheme (July 2018). Local repointing of masonry sea wall and repairs to coping in advance of rock placement. Minor cracking in concrete of promenade. Recessed mortar in structure and slope protection above seawall, to eastern extent of asset. Brittle/missing joint filler to promenade and concrete retaining wall to rear. Rock armour maintains good interlock and consistent profile throughout. YW rodding eyes remain visible/accessible from promenade.</p>	2	>20	Continue to monitor. Repair cracks, replace joint filler, repoint masonry of structures and slope protection.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D0601C02	Breakwater	NZ81011606, NZ81031605.	26.1	13/07/2022	Royal HaskoningDHV	Breakwater / groyne in poor condition overall. Landward section of structure covered by rock armour fillet (approx. 4m length of crest & 10m length on both faces). Smaller vertical cracks to breakwater at seaward end. Section of breakwater around elbow broken out temporarily to allow access for construction of Coastal Protection Works (this section was previously in very poor condition). Reinstated with 16m3 of in situ cast concrete in July 2018. Crack/displacement of concrete in crest of existing structure at seaward end of infill section. Extensive vegetation coverage. Significant abrasion. Opening of joint between crest and walls. Higher beach levels obscuring potential undercutting reported in 2018.	3	6 - 10	Continue to monitor. Consider removal.	routine
1221D901D0601C07	Pumping station.	Runswick Bay. Pumping station.	33.3	13/07/2022	Royal HaskoningDHV	Yorkshire Water constructed concrete manhole chamber immediately to north in advance of Coastal Protection Scheme (July 2018). Remains in good condition as are handrails. Minor local damage/abrasion to surface and edges of concrete access steps. Several steps buried beneath sand. Minor loss of mortar locally. Small flap valve no longer operational and in need of replacement. Rock fillet in good condition – no evidence of global displacement. Gap remains for access to foot of steps.	2	>20	Continue to monitor. Replace flap valve.	routine
1221D901D0601C04	Revetment	NZ81011601. Lifeboat slipway.	43.8	13/07/2022	Royal HaskoningDHV	Rotting timber supports to historic lifeboat slipway. Deck timbers in good condition. Cracks/open joints to side walls of Runswick Rescue slipway. Southern slipway / beach access ramp concrete in good condition with local abrasion at construction joints and minor longitudinal crack in top two panels. Concrete revetment including timber steps in good condition.	2	11 - 20	Repair cracks to slipway, replace rotten/missing timbers. Continue to monitor.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D0602C01	Rock armour.	NZ81051591, NZ81011601	318.0	13/07/2022	Royal HaskoningDHV	Rock armour generally in good condition. Consistent crest and slope profile. No evidence of significant global movement / displacement. Toe rocks well buried in sand. High level access ramp (Cleveland Way) well protected – armour stone “edging” remains in place. Backfill/surfacing in fair condition (smaller rocks and sand placed by SBC).	2	>20	Continue to monitor.	routine
1221D901D0602C05	Wall	South end of bay.	56.2	13/07/2022	Royal HaskoningDHV	North: Rock armour slope protection at mouth of stream. Concrete seawall and apron above timber toe beams (likely permanent formwork). South: Boulders and concrete blocks placed informally on/in front of retaining wall formed from timber sleepers fixed between vertical steel columns. Boulders and large concrete tank blocks to tie into coastal slope.	3	11 - 20	Continue to monitor. Replace/reprofile rock to protect timber retaining wall.	routine
Sandsend										
1221D901D0701C02	Recurved Wall.	NZ86061286, NZ85981297. Wall protecting car park.	174.5	13/09/2022	Royal HaskoningDHV	Sloping concrete revetment with a recurve crest wall. The concrete wall remains in fair condition with minimal damage to the surface, however the revetment has lost thickness of concrete at the base through abrasion, with exposure of reinforcement bars	3	11 - 20	Encasement of this reinforcement is advised from a structural perspective, as well as preventing any Health & Safety incidents occurring due to sharp edges of the exposed bars on this popular amenity beach. Cracks towards southern end (near slipway) need filling.	routine
1221D901D0702C01	Wall	NZ86061286, NZ86241268	259.1	13/09/2022	Royal HaskoningDHV	Groynes derelict. Apron substantially exposed. Very poor with adjacent timber planks and stakes missing and rotten. Concrete-filled barrel toe structure exposed, with significant displacement of some elements Missing joint filler under capping beam. Some sections of missing sealant in most joints in wall, with minor abrasion around joints.	4	11 - 20	Re-seal joints where missing between poured sections of sea wall and replace/encase apron. Whilst not yet ‘urgent’ the structure would benefit from works within a few years.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D0702C04	Wall.	NZ86251264, NZ86241268. NE of East Row Bridge.	42.1	13/09/2022	Royal HaskoningDHV	Steel toe piles exposed during the 2022 survey, as in 2016, with substantial voids under the toe apron. Buried/submerged by ponded water in 2018 and only one small section exposed in 2020. Groynes derelict. Vertical crack to masonry wall near pipe at centre of wall. Some mortar missing in some joints in masonry wall. Timber walkway in good condition.	4	11 - 20	Expose and repair voids under toe apron.	routine
1221D901D0702C03	Wall.	NZ86211252, NZ86251264. Wall extending from East Row Bridge	232.4	13/09/2022	Royal HaskoningDHV	Slipway in good condition overall. One or two gaps in the blockwork wing wall recorded in 2018 infilled.	3	>20	Continue to monitor	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D0702C02	New coastal defences constructed between early 2015 and summer 2016	NZ8628 1257, NZ8698 1226. North of Raven Hill.	774.5	13/09/2022	Royal HaskoningDHV	<p>Coastal defences constructed between early 2015 and summer 2016. The new defences comprise a lower section with a stepped revetment built from pre-cast concrete units and a buried concrete toe beam that was cast in situ, with an upper section of interlocking pre-cast Dycel units.</p> <p>Natural coastal slope extends above the upper units to the plateau upon which the highway and footpaths sit, with re-graded and stabilised high coastal slopes to landward of the road.</p> <p>Sloping concrete tie-in revetments at either end of the structure are in good condition.</p> <ul style="list-style-type: none"> • Outfall drains are freely running • A significant length of the upper section of the toe beam, and all the lower steps are were exposed during the 2022 inspection. The section of toe beam recently repaired following displacement was not however visible • Evidence of loss of foam strips used as packing between the structural elements was observed, though with no obvious impact upon structural integrity. • Abrasion of the in situ concrete toe beam has exposed some of the plastic fibre reinforcement • Some chipping damage has occurred to the edge of the steps (confined to lower steps at the western end but becoming more frequent and higher up the structure to its central and southern sections). • Outflanking at the eastern end is being adequately addressed by large beach 	1	>20	Continue to monitor	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
Whitby										
1221D901D0801C01	Wall.	NZ88161194, NZ88541185	439.3	13/09/2022	Royal HaskoningDHV	Rock armour generally good, well packed but movement in several local areas. Some smaller armour loosely packed on crest. Promenade has occasional minor open joints / cracks / missing sealant, but nothing appears to have worsened since previous inspections.	3	>20	Continue to monitor surface cracking in promenade and reactive repairs on an 'as needs' basis.	routine
1221D901D0802C01	Wall	NZ88541185, NZ88671180	136.6	13/09/2022	Royal HaskoningDHV	Concrete wall has extensive, though minor, cracking. Abrasion over whole lower part of wal is heavy in places!. Toe is also heavily abraded. Local damage to capping has been repaired in the past. Promenade has no major defects, with no deterioration to minor defects or previously filled cracks. Handrails remain in good condition. Note – Cliffs behind this section in poor condition with past slippages evident.	3	6 - 10	Consider placing rock armourstone at toe of wall to create one continuous revetment, rather than leaving this small gap.	routine
1221D901D0802C02	Wall.	NZ88671180, NZ88861170	216.1	13/09/2022	Royal HaskoningDHV	Rock armour in good condition, closely packed, and good coverage. Some smaller rocks on crest lost interlock. Promenade surface showing some signs of cracking and sealant loss between concrete sections.	2	>20	Continue to monitor.	routine
1221D901D0802C03	Wall.	NZ88861170, NZ89231154	166.8	13/09/2022	Royal HaskoningDHV	Lower half of wall abraded/eroded. Toe apron exposed along whole length due to low sand level but heavily covered by seaweed in places. Apron missing locally and in poor condition, but with some sections refurbished. Promenade fair, signs of wave overtopping causing damage.	3	11 - 20	Consider extending rock armour along this section.	routine
1221D901D0802C13	Wall	NZ88861170, NZ89231154	158.4	13/09/2022	Royal HaskoningDHV	Horizontal cracks to wall visible near slipway, east of Beach Management Centre and North Beach cafe. Beach level high and wall's toe not exposed. Handrail is relatively new. Some anchor bolts showing signs of corrosion. Concrete facing weathered/abraded.	3	11 - 20	Repair cracks (likely cold joints) to wall near slipway.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D0802C14	Sea wall		86.2	13/09/2022	Royal HaskoningDHV	Erosion/abrasion to lower half of wall. Minor damage throughout. Apron buried (was partly exposed in 2018). Minor cracking to promenade throughout. Areas of chipping/cracking along top edge. Handrails have been replaced relatively recently.	3	11 - 20	Repair chipped areas approx. 0.5m from edge throughout.	routine
1221D901D0802C04	Sea wall.	NZ89231154, NZ89291153	65.4	13/09/2022	Royal HaskoningDHV	One minor vertical crack / joint in eastern third of wall. Concrete coping replaced at western end. Erosion/abrasion to lower half of wall, including exposed sections of apron. Handrails are in good condition and are relatively new – some corrosion of the fixing bolt. Minor cracking to promenade. Evidence of recent repairs to the promenade with some panels replace in 2022.	3	11 - 20	Repair abraded front face. Infill crack.	routine
1221D901D0802C07	Sea wall.	NZ89291153, NZ89361152	71.9	13/09/2022	Royal HaskoningDHV	Blockwork wall - cracking/loss of mortar and abraded blocks in places, but with evidence of ongoing maintenance to replace lost mortar. Joints missing locally. Generally stable although these points of weakness could cause failure. Higher concrete wall in a fair condition. Minor cracking in promenade. New coping beam since 2014. Evidence of recent repairs to the promenade with some panels replaced in 2022.	3	11 - 20	Repair/replace damaged blocks and grout joints	routine
1221D901D0802C06	Wall.	NZ89361152, NZ89401152	37.5	13/09/2022	Royal HaskoningDHV	Blockwork wall with many previously open joints repointed prior to 2020 inspection, and repairs remain in good order. Abrasion and loss mortar in lower section eviden, as in earlier inspections due to lower beach levels (not visible during 2020 inspection). No water observed seeping through wall in 2022, as observed in 2012 and 2016.	3	11 - 20	Repair or encase toe. Repair cracking in masonry wall.	routine
1221D901D0802C15	Beneath red brick building (Whitby Pavilion).		71.8	13/09/2022	Royal HaskoningDHV	Concrete toe showing signs of cracking, abrasion and loss of concrete and undercutting. Evidence of previous repairs. Blockwork walls below Pavilion appear to be sound, but with some loss of mortar. Minor surface slips in cliff between upper wall and toe structure.	4	11 - 20	Stabilise and repair cliff. Repair toe.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D0802C05	Wall	NZ89401152, NZ89511152	43.1	13/09/2022	Royal HaskoningDHV	Concrete apron seaward of timber breastwork exposed in 2022, and as with previous inspections shows undercutting with large voids beneath, and though some localised historic repairs are evident, part of the lower section of apron is breaking up. Blockwork walls below Pavilion and its access road appear sound but slips / falls in cliff below and some loss of mortar.	4	6-10	Repairs to toe.	routine
1221D901D0802C09	Sea wall.	NZ89541152, NZ89651151	115.8	13/09/2022	Royal HaskoningDHV	High sections of blockwork sea wall facing in between in- situ rock outcrops. Sections of masonry appear sound condition, some mortar loss, but not worse than noted previously. In several locations tie-in of edges into cliff is showing some evidence of outflanking and abrasion.	3	>20	Repair edges of panels where tie in to cliff.	routine
1221D901D0802C10	Wall.	NZ89771147, NZ89781150. West side of West Pier.	26.8	13/09/2022	Royal HaskoningDHV	In situ concrete retaining wall. Abrasion has led to areas of exposed aggregates. Fair condition overall despite abraded face.	3	11 - 20	Continue to monitor.	routine
1221D901D0802C12	Wall.	NZ89781150, NZ89861150 Start of west pier at slipway.	87.7	13/09/2022	Royal HaskoningDHV	Battery wall. Deep voids between blockwork, with a few blocks vertically cracked. Voids between corners of blocks. Slipway wall capping beam and wall to west is abraded. Slipway in fair condition. Toe exposed during 2022 survey, revealing the junction with the bedrock and earlier cobbled sections. Uneven, but in overall fair condition. Damaged apron. Promenade in fair condition.	3	11 - 20	Continue to monitor and repair deep voids and cracks.	routine
1221D901D0803C02	West Pier	NZ89861145, NZ89931173	639.7	13/09/2022	Royal HaskoningDHV	Major refurbishment undertaken in 2018/19. No visible defects following capital works.	1	>20	None.	routine
1221D901D0803C01	West Pier Extension	NZ89921172, NZ89921187	315.5	13/09/2022	Royal HaskoningDHV	2022 Survey from boat (inner side only) showed overall fair condition but limited inspection as toe is covered in water even at low tide. Abrasion to edges of concrete structure and exposure of aggregate. Timber supporting structure weathered. Some planks on the timber deck replaced since previous inspection.	3	>20	Continue to monitor and replace planks in promenade deck as necessary. Detailed low water inspection from vessel recommended every 10 years.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D0803C06	Harbour Wall	LB Whitby Harbour	215.4	13/09/2022	Royal HaskoningDHV	Timber edge beam and fenders remain in good condition following recent replacement/refurbishment. Metal deck support piles to suspended quay deck are corroding. Original sandstone blockwork wall viewed from ends only but looks fair. Some voids to blockwork.	3	6 - 10	Detailed inspection of supporting piles to deck required.	urgent
1221D901D0803C07	Harbour Wall	LB Whitby Harbour	157.4	13/09/2022	Royal HaskoningDHV	Timber edge beam and fenders remain in good condition following recent replacement/refurbishment. Promenade in good condition. Lower wall obscured by seaweed. Steps cracked and open joints at mid-length. Concrete steps repaired but cracking and abrasion still evident. No handrail.	2	>20	Repair and repoint joints at steps.	routine
1221D901D0803C10	Harbour Wall	RB D/S of Whitby Bridge	135.2	13/09/2022	Royal HaskoningDHV	No direct access but appears in fair condition when viewed from distance (limited access, visual inspection from RNLI, bridge and boat survey). Some joint washout to riparian walls. Area of damage to blocks 20m downstream of bridge. Concrete apron near to the bridge appears in fair condition including the sheet pile toe.	3	>20	Continue to monitor – repair washed out joints to wall.	routine
1221D901D0803C08	Harbour wall.	RB Whitby Harbour RNLI Station and Pier.	391.3	13/09/2022	Royal HaskoningDHV	Very weathered blocks with gaps on east side of old RNLI pier but overall fair. High levels of abrasion, marine growth and steel sheet pile corrosion to old Boathouse 'block'. Coping damage on the slipway but fair overall condition. Walls between piers of mixed construction, fair to poor condition. Beach levels at the toe of the riparian foundation walls very low. Missing mortar between blocks and cracked blocks. Tate Hill Pier has deep joints and block eroding. Steps weathered with corroding handrail at bottom section. Top revetment in fair condition. Healthy beach sand on north side of pier, but very low on south side.	4	11 - 20	Fill voids, cracks and open joints. Consider toe protection for riparian wall exposed by reduced beach levels.	urgent

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D0803C09	Harbour Wall	South of Collier Hope and Mussel Beds	154.9	13/09/2022	Royal HaskoningDHV	Riparian walls of (variably) brickwork, sandstone, and boulder construction in various conditions, some quite poor. Protected by sand and cobble beach. Spalling to the render and exposure of the aggregate. Slipway and steps weathered with missing joints.	3	11 - 20	Continue to monitor, repoint where needed. Replace missing blocks.	routine
1221D901D0803C03	East Pier	NZ90161146, NZ90001174	637.0	13/09/2022	Royal HaskoningDHV	Major refurbishment undertaken in 2018/19. No visible defects following capital works to walls, toe, deck. Signs erected warning users of winds, wave overtopping, trips, edges.	1	>20	None.	routine
1221D901D0803C04	East Pier Extension	NZ90041172, NZ89971186	330.9	13/09/2022	Royal HaskoningDHV	Access now possible due to replacement bridge erected in 2019. Survey from boat (inner side only) indicates generally fair condition but limited inspection as toe is covered in water even at low tide.	3	11 - 20	Continue to monitor and replace planks in promenade deck as necessary. Detailed low water inspection from vessel recommended every 10 years.	routine
1221D901D0803C05	Rock Armour	NZ90171146, NZ90421143	420.7	13/09/2022	Royal HaskoningDHV	A relatively low bank of Rock armour is generally in fair condition. There is some exposed erosion-control matting on the cliff above.	3	11 - 20	Continue to monitor.	routine
Robin Hoods Bay										
1221D901D1002C02	Rock armour.	Robin Hood's Bay.	59.4	31/05/2022	Royal HaskoningDHV	Rock armour remains tightly packed and in good condition. Installed in 2001. Some activity on cliffs to rear.	2	>20	Continue to monitor.	routine
1221D901D1003C01	Rock armour revetment	NZ95340504, NZ95270520	183.4	31/05/2022	Royal HaskoningDHV	Wall was built in 2001. Rock armour in good condition with good coverage, profile and interlock. Slipway ramp in good condition, some abrasion to slab and joints near toe. Fence / edge protection repaired since previous inspection as indicated above. Precast concrete sea wall in good condition. Short section of blocks missing from along the crest of the wall. This is assumed to be a historic defect. There is a small accumulation of material on the revetment crest, this does not appear to have changed since 2020.	2	>20	Continue to monitor.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D1003C02	Wall.	NZ95330488, NZ95310502	150.5	31/05/2022	Royal HaskoningDHV	Toe not visible high beach levels. Concrete wall in poor condition. Wall displays surface cracking, spalling, rust staining and mineral encrustation. Defects appear significantly worse at northern transition. Transition is an area of longstanding outflanking concern; a recent mass concrete repair appears to have improved the condition in the lower reaches of the wall. Headscarp recession of the adjoining cliff has increased outflanking risk at the wall crest. Wall crest shows further cracking and spalling. Signs of recent and ongoing repairs and repainting on crest wall. Prom fair.	4	6 - 10	Continue to monitor. Undertake capital repairs.	urgent
1221D901D1003C04	Wall	NZ95320486, NZ95330488	29.3	31/05/2022	Royal HaskoningDHV	Repairs to open joints and voids noted and appear to be working effectively. Some areas of surface erosion and joint washout still exist. Voids and open joints in masonry near tie in to concrete wall have been grouted. Toe visible due to low beach levels. Toe appears in poor condition, with some cracking and a potential void forming at its base.	4	6 - 10	Continue to monitor remaining voids and joints. Monitor repairs. Perform detailed inspection of wall toe.	routine
1221D901D1003C05	Apron	NZ95310485, NZ95320486	15.6	31/05/2022	Royal HaskoningDHV	Slipway generally in fair condition. Some cracking but appears stable at present. Previous repairs are generally effective and in good condition. A number of cracks and small voids remain, particularly on the concrete apron, which is undercut and generally in poor condition. Washout at toe.	2	11 - 20	Continue to monitor, reactive maintenance, repoint as necessary. Monitor beach levels and extent of undercutting to concrete apron.	routine
1221D901D1003C06	Wall	NZ95310481, NZ95310485	51.9	31/05/2022	Royal HaskoningDHV	Patchwork of repairs/repointing throughout. Void / undercutting to south end of concrete toe. Large crack through concrete toe and blinding layer at dogleg. No change since 2020.	3	6 - 10	Continue to monitor and repoint/repair. Repair crack at dogleg to prevent further damage to structure.	routine
1221D901D1003C10	Wall.	NZ95320468, NZ95310481	29.2	31/05/2022	Royal HaskoningDHV	Cracks and spalling to capping beam. Damage to previous repairs to South end of wall. Rock armour at toe in good condition, good interlock and profile.	3	11 - 20	Continue to monitor. Repair spalling and joints where necessary.	routine
1221D901D1003C09	Wall.	NZ95320468, NZ95310481	62.0	31/05/2022	Royal HaskoningDHV	Rock armour is generally tightly packed and good cover. Some smaller rocks show signs of movement. Promenade in good condition. Overall good.	2	>20	Monitor armour for need to re-profile in future.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D1003C07	Wall.	NZ95320468, NZ95310481	54.3	31/05/2022	Royal HaskoningDHV	Rock armour mostly well packed, but cliffs slumping from rear over top of revetment continues to damage and displace rock, particular just South of slipway / ramp and at the southern end of revetment.	4	6 - 10	Continue to monitor rock armour and cliff. Considerations should be made for the revetment to be realigned when the cliff has retreated sufficiently.	routine
Scarborough North Bay										
1221D901D1201C01	WaIISBC 38-20A-01	TA03569082, TA03569085. North of the Sea Life Centre.	37.4	01/03/2022	Royal HaskoningDHV	Promenade in good condition. Wall in fair condition. No change identified in 2022.	3	11 - 20	Continue to monitor.	routine
1221D901D1201C02	Wall.SBC 39-20A-02	TA03549057, TA03569082. Wall and promenade next to Sea Life Centre.	327.2	01/03/2022	Royal HaskoningDHV	Cracks to splash wall but looks sound. Prom good condition. Wall in fair condition. Stepped toe showing signs of abrasion. 1No. outlet failed but performance not affected.	3	11 - 20	Continue to monitor, refill joints and repair cracks.	routine
1221D901D1201C03	Wall.SBC40-20A-02	TA03589031, South of Sea Life Centre.	120.6	01/03/2022	Royal HaskoningDHV	Abrasion of external blockwork throughout sea wall, particularly to the north of the asset where reinforcement is exposed. Stepped concrete toe is heavily abraded. Corroded handrails. As reported in 2020, there is cracking and spalling to prom slabs and some missing sealant between slabs. Sections of rear splash wall and revetment have been repaired since previous inspection.	3	>20	Undertake repairs to northern extents of seawall face where reinforcement is exposed. Repair stone revetment and splash wall.	routine
1221D901D1201C24	Wall.SBC 40-20A-04	TA03589031, TA03549057	65.0	01/03/2022	Royal HaskoningDHV	Exposed aggregate and abrasion / spalling to capping beam and facing blockwork. Cracks throughout promenade. Repairs evident in rear revetment. Recent repairs to toe beam to the south remain in good condition.	3	11 - 20	Continue to monitor. Repair damaged capping beam and cracks in promenade.	routine
1221D901D1201C25	Wall.SBC 40-20A-06	TA0357690349 North of slipway and beach huts.	73.8	01/03/2022	Royal HaskoningDHV	Face loss with exposed aggregates – Repairs to section of blockwork in centre remains in good condition. Cracking to parts of promenade. Revetment to rear of prom appears in good condition, recently repaired.	3	11 - 20	Continue to monitor and repair cracks.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D1201C04	Sea wall.SBC 41-20A-02	TA03599020, TA03589031 At North end of beach huts.	99.1	01/03/2022	Royal HaskoningDHV	No significant change observed in 2022. As reported previously repairs appear to be holding. Spalling coping next to southern ramp. Promenade in good condition. Heavily abrasion to unrepaired lower sections. Missing blockwork to low wall to grassed area at back of promenade. Outlet in good condition.	3	11 - 20	Continue to monitor, repair cracks and coping. Repair wall at back of promenade.	routine
1221D901D1201C10	Sea wall.SBC 41-20A-04	TA03599020, TA03589031	13.0	01/03/2022	Royal HaskoningDHV	No significant change observed in 2022. As reported previously few cracks appear on capping beam, adjacent to N ramp to prom. Damage to recurve splash wall. Promenade in good condition.	2	11 - 20	Repoint missing mortar to sea wall.	routine
1221D901D1201C26	Sea wall.SBC 42-20A-02	TA03758981, TA03599020	13.7	01/03/2022	Royal HaskoningDHV	Unchanged. Spalling in poured concrete capping to wall. Wall face along section largely covered by beach levels. No evidence to suggest any significant change. Toe not visible due to beach level.	3	11 - 20	Continue to monitor and maintain.	routine
1221D901D1201C11	Sea wall.SBC 42-20A-04	TA03758981, TA03599020	58.7	01/03/2022	Royal HaskoningDHV	Unchanged. High beach levels concealed more of the wall. Sediment repairs to capping remain in good condition. Abrasion to wall blocks and steps rounded. Cracks in poured concrete capping to wall, promenade in good condition. Rear revetment looks fair.	3	11 - 20	Continue to monitor.	routine
1221D901D1201C12	Sea wall.SBC 42-20A-06	TA03758981, TA03599020	58.4	01/03/2022	Royal HaskoningDHV	Sediment buried much of the seawall bar the cope stones and first course of blockwork. Repaired sections of cope are in good condition. Promenade in good condition but some spalling adjacent to coping. Rear revetment in fair condition, although mature vegetation growth was noted, some spalling to splash wall beneath revetment.	3	11 - 20	Continue to monitor. Remove mature vegetation.	routine
1221D901D1201C13	Sea wall.SBC 42-20A-08	TA03758981, TA03599020	58.2	01/03/2022	Royal HaskoningDHV	Beach levels high during the inspections, reaching upper block course of wall. Some spalling to joints between sections of capping, erosion to capping exposing aggregate. Some signs of abrasion on blockwork visible. Mature vegetation in revetment.	3	11 - 20	Repair cracks to capping and inspect when toe visible. Remove mature vegetation from revetment.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D1201C14	Sea wall.SBC 42-20A-10.	TA03758981, TA03599020	58.4	01/03/2022	Royal HaskoningDHV	Beach levels high during the inspections, reaching upper course of blockwork. Previous inspections have noted cracks to capping with some erosion exposing aggregate in places, some capping slabs repaired, but remaining showing signs of damage. Rear revetment fair condition with recent repairs – although mature vegetation growth noted in crest.	3	11 - 20	Monitor and repair spalling to wall capping.	routine
1221D901D1201C15	Sea wall.SBC 42-20A-12	TA03758981, TA03599020	31.9	01/03/2022	Royal HaskoningDHV	Beach levels high during the inspections, Previous inspections have noted wall capping and promenade in fair condition. Some missing joints between capping and promenade slab. Some signs of abrasion to blockwork.	3	11 - 20	Continue to monitor.	routine
1221D901D1201C16	Sea wall.SBC 42-20A-14	TA03758981, TA03599020. In front of Beach Management Centre.	32.0	01/03/2022	Royal HaskoningDHV	Beach levels high during the 2022 inspection. Promenade in good condition. Some abrasion to deckslab. Some cracks to capping. It was previously reported that there is missing mortar to blockwork. Recently repaired coping stone in fair condition.	3	11 - 20	Repair cracks to capping and repoint blockwork. Inspect when toe of wall visible.	routine
1221D901D1201C05	Sea wall.SBC 42-20A-16	TA03758981, TA03599020	55.6	01/03/2022	Royal HaskoningDHV	Beach levels high during the inspections, coming to the crest of the wall. Evidence of beach material being deposited on deckslab. Sections of cope have been replaced prior to 2020 remained in good condition.	3	11 - 20	Monitor and repair coping.	routine
1221D901D1201C17	Sea wall.SBC 42-20A-18	In front on new apartments.	22.8	01/03/2022	Royal HaskoningDHV	Unchanged in 2022. Only coping stone and top course of blocks visible. Abrasion/cracks to coping/prom edge. Prom in good condition.	3	>20	Repair defects to coping / prom edge and rear revetment.	routine
1221D901D1201C18	Sea wall.SBC 42-20A-20	In front of new apartments.	43.0	01/03/2022	Royal HaskoningDHV	Cracking and spalling to wall coping continues to deteriorate. Beach level covering most of wall. Evidence of localised accumulation of beach material on promenade. Promenade in good condition.	3	11 - 20	Repair/replace damaged capping / coping beams.	routine
1221D901D1201C06	Sea wall.SBC 43-20B-01	TA03818971, TA03758981	34.2	01/03/2022	Royal HaskoningDHV	Wall has been repaired since 2012 and is in good condition. South section rebuilt / overlaid. One full height crack evident in middle section although not worsened since 2020.	3	11 - 20	Monitor and repair cracks.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D1201C19	Sea wall.SBC 43-20B-03	TA03818971, TA03758981. In front of new development.	93.2	01/03/2022	Royal HaskoningDHV	Unchanged since 2020. High beach level concealed much of the toe. Upper wall has been rebuilt at North end. Some missing joints and chipping of capping beam and splash beam.	3	11 - 20	Repair missing joints and chipped parts of capping and splash beams.	routine
1221D901D1201C20	Sea wall (raised).SBC 44- 20B-01	South of new development.	40.8	01/03/2022	Royal HaskoningDHV	Slipway. Deck slab appeared in fair condition. Blockwork wall damaged along upper slipway. Section of coping previously repaired.	3	11 - 20	Seal joints and repair cracks in coping and slabs. Continue to monitor.	routine
1221D901D1201C07	Sea wall.SBC 44-20B-02	TA03818971, TA04078946 East of Alexandra Gardens.	158.9	01/03/2022	Royal HaskoningDHV	Wall overall appeared in fair condition. Lower course of blockwork abraded. As are section of cope stone. Handrails corroded. As reported in 2020, Leaking evident through previous crack repairs with oily residue, likely from road runoff. Prom re-laid in concrete in 2012 in good cond. Two blocks missing in seawall adjacent to southern access steps exposing reinforcement.	4	11 - 20	Cracks need repointing throughout sea wall. Repair damage to coping and toe. Repair missing blocks.	routine
1221D901D1201C21	Seawall.SBC 44-20B-05	TA03818971, TA04078946 East of Alexandra Gardens.	211.1	01/03/2022	Royal HaskoningDHV	No significant change since 2020. Prom surface replaced in 2012 at N and S ends, but centre still to do. Erosion to capping at edge of prom, patch repairs carried out with tarmac.	3	11 - 20	Continue to monitor.	routine
1221D901D1201C08	Sea wall with buttresses.SBC 45-20B-02	TA04078945, TA04288930	206.9	01/03/2022	Royal HaskoningDHV	Major void in slipway during inspection. Otherwise, no significant change since 2020. Some prom slabs have been repaired but significant abrasion to surface of many slabs remains. Repair / replacement work on some of the steps / toe in 2011/2013, but some horizontal cracks in original blocks remain.	4	11 - 20	Continue to monitor and repair cracks and resurface rest of prom. Carry out repairs to make slipway safe or prevent public access (at the bottom as well as top).	routine
The Holms and Castle Headland										
1221D901D1202C23	Sea wall.SBC 45-20B-03	North of Albert Road.	31.5	01/03/2022	Royal HaskoningDHV	Fair condition. Recent repairs holding. Lower courses remain heavily abraded. Full height crack through wall at back of prom to south of steps. Cracks through prom slabs and coping to abutments either side of steps.	3	11 - 20	Undertake repairs and continue to monitor.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D1202C01	Wall.SBC 46-20B-01	TA04288929, TA0493895. East of Albert Road.	124.8	01/03/2022	Royal HaskoningDHV	No significant change since 2020. Original wall mostly hidden by rock armour; splash wall seems to be in good condition. Tightly packed rock armour with good coverage. Scour pool at toe of steps makes use at low tide difficult. Missing mortar to wall at rear of prom. Prom slab abraded where not replaced.	2	>20	Replace mortar to wall at rear of prom. Continue to monitor. Look to replace remaining sections of prom.	routine
1221D901D1202C03	Wall.SBC 46-20B-04		429.2	01/03/2022	Royal HaskoningDHV	Constructed 2003ish. The Holms. Prom & Splash wall in good condition. Armour well packed and good cover. Original wall not visible.	2	>20	Continue to monitor.	routine
1221D901D1202C04	Wall.SBC 46-20B-07		219.9	01/03/2022	Royal HaskoningDHV	Original wall hidden by armour; splash wall seems to be in good condition. Tightly packed rock armour appears stable, no loose rocks. Toe piling appears to be working well, although could only be inspected from the promenade. Healthy levels of natural rock against piling offering further protection. Prom good condition.	2	>20	Continue to monitor.	routine
1221D901D1202C02	Wall.	TA05178883, TA04988952. East of Scarborough Castle.	886.7	01/03/2022	Royal HaskoningDHV	Accropodes slightly abraded and chipped throughout. One notable area of movement at apex of curve in defence. No significant cause for concern at present.	3	>20	Continue to monitor.	routine
Scarborough Harbour and South Bay										
1221D901D1301C01	Breakwater.	TA04958849, TA05178883 North Harbour Breakwater.	444.9	01/03/2022	Royal HaskoningDHV	Crest wall good. Rock armour & accropodes generally in good condition, well packed. Less tightly packed or missing armour units at south end of wall. Several cracked pieces of armour. Evidence of lateral voids at seaward end of breakwater visible during inspection from the beach to the south.	2	>20	Continue to monitor. Inspection of seaward end of structure required from boat.	routine
1221D901D1301C16	Breakwater.	Scarborough Harbour. North inner breakwater wall. -	362.1	01/03/2022	Royal HaskoningDHV	Vegetation at bottom half of wall. Wall was repaired 2004/5. Generally, repairs holding, but some voids at toe. Some cracks to promenade. Evidence of lateral voids at seaward end of breakwater. Visible during inspection from the beach to the south.	4	11 - 20	Continue to monitor. Repair toe voids. Inspection of seaward end of structure required from boat.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D1301C02	Wall.	TA05108874, TA05148874. Next to fair ground.	77.9	01/03/2022	Royal HaskoningDHV	Wall unable to be inspected thoroughly due to timber overhang. Generally appears in fair condition, some signs of render breaking away.	4	11 - 20	Report missing joints to spillway wall and repair slipway surfacing.	routine
1221D901D1301C04	Breakwater.	TA04948860, TA05088877. Inner wall promenade breakwater.	463.1	01/03/2022	Royal HaskoningDHV	Appears fair. Missing fill between blocks throughout wall, fenders, vegetation and boats obscuring the lower parts of wall on old harbour side. Promenade in good condition	3	11 - 20	Continue to monitor and repoint cracks and missing joints.	routine
1221D901D1301C03	Breakwater	TA04958853, TA04938860. Lighthouse island.	83.5	01/03/2022	Royal HaskoningDHV	Inner wall at entrance breakwater. Numerous cracks to blocks and missing mortar in joints. Vegetation and fenders obscuring most of walls. Stop logs in place during inspection. Damage to marina pontoons.	4	11 - 20	Continue to monitor and repoint cracks and joints.	routine
1221D901D1301C17	Breakwater.	TA04958853, TA04938860. Wall at south side of Lighthouse island	97.0	01/03/2022	Royal HaskoningDHV	Outer face. Sheet piles heavily corroded, although obscured by vegetation growing on the bottom of the piling. Cracks to concrete side wall to steps. Only inspected from distance. Perimeter of structure fenced off with heras fencing.	3	11 - 20	Repair cracks. Continue to monitor.	routine
1221D901D1301C05	Wall.	TA05048878, TA05088877. South of roundabout opposite	43.2	01/03/2022	Royal HaskoningDHV	Cracking and missing joints to top of capping, arches look structurally sound. Promenade in good condition.	3	11 - 20	Repair cracks and damage to coping.	routine
1221D901D1301C12	Wall	TA04998877, TA05048878. Next to masonry arches.	51.7	01/03/2022	Royal HaskoningDHV	Corrosion evident sheet piles, especially lower part, but appear fair. Promenade in good condition.	4	11 - 20	Continue to monitor.	routine
1221D901D1301C11	Wall.	TA04958876, TA04998877, Opposite Subway restaurant.	47.0	01/03/2022	Royal HaskoningDHV	Few minor cracks to wall, spalling to capping. Promenade in good condition. Upper wall good. Slipway fair. Concrete piles at lower wall appear to have rotated in past but appear to be stable. Cracks to lower slabs in slipway. Damage to handrailing noted during 2020 inspection has been repaired.	3	11 - 20	Continue monitoring, repair cracks/joints. Repair damaged section of handrailing.	routine
1221D901D1301C06	Wall.	TA04768876, TA04958876. Opposite Information centre.	195.8	01/03/2022	Royal HaskoningDHV	Back wall difficult to view, appears to be fair, where visible, some cracks and missing joints in places. Suspended quay appears to be fair condition, some cracks in protective coating. Promenade good. Timber edging rail decaying.	3	11 - 20	Monitor cracks to wall.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D1301C14	Revetment	TA04758875, TA04768876. West of Information centre.	19.5	01/03/2022	Royal HaskoningDHV	Fair overall, only minor gaps. Damaged section of blockwork wall beneath coping stone on low northern tie in wall.	3	>20	Continue active monitoring. Repoint missing joints and damaged section of blockwork wall.	routine
1221D901D1301C13	Piling.	TA04758875, TA04908862. West pier wall.	140.2	01/03/2022	Royal HaskoningDHV	Sheet piles appear fair where visible, but only inspected from distance at low water. Promenade in good condition.	3	11 - 20	Consider future inspection of quay from boat.	routine
1221D901D1301C18	Breakwater.	West Pier, Scarborough South Bay.	115.6	01/03/2022	Royal HaskoningDHV	Section remains in poor condition. Heavily corroded piles throughout. Cracking coping beam. Vehicle weight limit on end of structure	4	1 - 5	Continue to monitor. Inspect piles, repair cracks.	routine
1221D901D1301C07	Breakwater.SBC 49-21B-04	TA04738870, TA04908862. Beach end of West Pier, between	58.7	01/03/2022	Royal HaskoningDHV	Scour apron not visible due to beach level. Horizontal and vertical cracking at bend of wall, has had repairs carried out. Exposed aggregate throughout wall. Numerous cracks throughout wall. Exposed timber toe piles rotten with scoured concrete wall behind.	4	6 - 10	Continue to monitor and repair cracks, voids and damaged apron. Improve toe protection.	routine
1221D901D1301C19	Breakwater.SBC 49-21B- 02	TA04738870, TA04908862. Shore end of West Pier.	110.4	01/03/2022	Royal HaskoningDHV	Vertical crack from top to bottom of wall at middle section of length, appears same as last inspection. Horizontal and vertical cracks and exposed aggregate throughout wall. Rotten timber toe piles exposed at deeper end. Scour hole developing behind the timber piles. Few minor cracks to promenade.	4	6 - 10	Continue to monitor and repair cracks and improve toe protection.	routine
1221D901D1301C08	Sea wall.SBC 49-21B-01	TA04708872, TA04738870	69.2	01/03/2022	Royal HaskoningDHV	Wall now replaced as part of RNLI development. New wall generally in good condition. Vegetation growth around full perimeter of wall may obscure defects. Vegetation coverage most dense beneath the slipway. One displaced block was noted to the south of the slipway.	2	>20	Repair damaged blockwork. Clean vegetation, particularly beneath slipway.	routine
1221D901D1301C20	Slipway with wall. SBC 51-22A-01	Next to Life boat house.	28.5	01/03/2022	Royal HaskoningDHV	Slipway appears in fair condition. Some cracked blocks and mortar required. High beach levels in 2022 obscured view of much of the slipway.	2	11 - 20	Repoint and replace blocks as required.	routine
1221D901D1301C15	Wall.SBC 51-22A-02	TA04538856, TA04698873	40.3	01/03/2022	Royal HaskoningDHV	Limited height of wall visible due to beach levels. Some missing mortar and corrosion to handrails.	2	11 - 20	Repair joints between blocks. Treat handrails.	routine

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1221D901D1301C21	Wall. SBC 51-22A-04	TA04538856, TA04698873	57.8	01/03/2022	Royal HaskoningDHV	Only the coping stone and occasionally the top course of blockwork was visible during the 2022 inspection. What was visible was in fair condition with some joints missing mortar and some spalling around the base of the iron fence posts.	2	11 - 20	Repoint when necessary.	routine
1221D901D1301C22	Wall. SBC 51-22A-06	TA04538856, TA04698873	114.9	01/03/2022	Royal HaskoningDHV	Limited height of wall visible due to beach level.	2	11 - 20	Repair handrails. Repoint blocks.	routine
1221D901D1301C23	Wall. SBC 51-22A-08	TA04538856, TA04698873	101.8	01/03/2022	Royal HaskoningDHV	Only upper wall inspected due to beach level. Wall appears in fair to good condition although missing joints in places with some failing repairs around bases of railing posts.	3	11 - 20	Repoint as required. Ensure historic repairs to posts are still effective.	routine
1221D901D1301C24	Wall. SBC 51-22A-10	TA04538856, TA04698873	109.7	01/03/2022	Royal HaskoningDHV	Some missing mortar between blocks, cracks, missing blocks and previous repairs. Promenade good.	3	11 - 20	Monitor, replace blocks, seal cracks and repoint when necessary.	routine
1221D901D1301C25	Wall.SBC 51-22A-12	TA04538856, TA04698873. In front of Hotel.	99.1	01/03/2022	Royal HaskoningDHV	Missing mortar in joints in places and signs of abrasion. Repairs suggested.	3	6 - 10	Continue to monitor and repair joints, inspect at low beach level.	routine
1221D901D1301C09	Wall.SBC 52-22A-02	TA04428822, TA04438827. Wall at underground tunnel entrance.	41.5	01/03/2022	Royal HaskoningDHV	Toe apron has been repaired / overlaid repairs in good condition. New handrail installed in 2022 partially buried. Elsewhere, localised missing mortar in joints to wall, signs of abrasion and cracking & abrasion to unrepaired sections of original apron. Several full height vertical cracks to upper road wall. Promenade in good condition.	2	11 - 20	Continue to monitor and repair joints and cracks.	routine
1221D901D1301C10	Wall.SBC 52-22A-04	TA04508772, — TA04428822. South of slipway.	100.7	01/03/2022	Royal HaskoningDHV	Missing mortar joints to wall, occasional cracked blockwork and missing blocks to lower part of wall, vegetation near slipway. Cracking in upper retaining wall between prom and slipway. Recent repairs to slipway toe and sections of replaced mortar are holding. Recent repairs around Spa feature are in fair condition.	4	6 - 10	Continue to monitor, repair cracks, replace blocks and joints.	routine
1221D901D1301C26	Wall. SBC 53-22B-02	TA04508772, TA04428822. South of slipway.	162.1	01/03/2022	Royal HaskoningDHV	Wall in fair condition. Some cracked blocks but seem stable. Missing mortar / open joints here and there. Crest wall repairs evident with some sections of coping repaired but others abraded.	2	11 - 20	Grout joints. Continue to monitor.	routine

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1221D901D1301C27	Wall.SBC 53-22B-05	TA04508772, TA04428822. North of The Spa.	158.1	01/03/2022	Royal HaskoningDHV	Multiple repairs. Repaired section of crest wall rebuilt after Dec 13 storm, in fair condition. Wall remains in poor condition elsewhere. Many cracks, open joints and displaced blocks in main wall. New toe constructed to northern section of wall June-August 2018 remains in good condition. Sheetpiles at edge of toe constructed previously severely corroded with holes in places with evidencing of voids beneath concrete toe.	3	6 - 10	Repair cracks, joints and sheetpile toe.	urgent
1221D901D1301C28	Wall.SBC 53-22B-06	TA04508772, TA04428822 Opposite Spa	76.4	01/03/2022	Royal HaskoningDHV	Repairs undertaken in 2017 to install new concrete toe. Concrete toe only partially visible, appears in fair condition. Bullnose wave return feature is heavily abraded and cracked in places. Some recent repairs to the feature appear to be in fair condition.	3	11 - 20	Continue to monitor, repoint as necessary, repair damaged section of bullnose.	urgent
1221D901D1301C29	Wall.SBC 53-22B-07	TA04508772, — TA04428822. South of The Spa.	57.4	01/03/2022	Royal HaskoningDHV	Open joints in main wall. Repairs to lower splash beam in good condition. Beach levels generally similar than to 2020 burying undercutting to stepped out section of wall. Promenade in good condition.	3	6 - 10	Continue to repair joints and monitor.	urgent
1221D901D1302C01	Wall.SBC 54-22B-01	TA04538765, TA04508772. Next to cliff railway.	77.5	01/03/2022	Royal HaskoningDHV	Lower wall has repairs to 2 large areas which remain in good condition. A framework of steel supports and horizontal I-section support beam beneath upper prom has been constructed and appears in good condition. The condition of the promenade remains unchanged in a poor state of repair. There are numerous cracks and extensive corrosion/rust staining to beams supporting upper prom near stairs. Cracking & rust staining to cols. Major weathering loss of stone blocks in rear splash wall.	4	1 - 5	Monitor steel support structure. Capital scheme to improve long term resilience of the asset.	urgent
1221D901D1302C03	Wall.SBC 54-22B-03	TA04628752, TA04538765. South of cliff railway.	19.2	01/03/2022	Royal HaskoningDHV	Repairs evident with blocks replaced and joints filled.	3	1 - 5	Regular repair to joints, particularly on steps.	urgent

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1221D901D1302C02	Wall.SBC 55-22B-01	TA04628752, TA04538765. In front of Beach Chalets.	231.8	01/03/2022	Royal HaskoningDHV	Numerous historic and recent repairs in varying conditions Generally the condition of the asset is in a fair condition with recent repairs to the main wall, coping and wave wall in good condition. Some evidence of spalling and open joints throughout structure.	3	6 - 10	Replace missing filler in joints in promenade.	urgent
1221D901D1303C02	Sea wall.SBC 56-22B-05	TA04828723, TA04668746.Wall at Dickinsons Point.	308.2	01/03/2022	Royal HaskoningDHV	Still some missing joints in blockwork in lower wall. Repairs undertaken since last inspection to scour holes, coping and deck slabs. Many open joints between concrete slabs in lower prom remain. Ongoing damage and loss of facing to upper wall, cracks/spalling to splash beam.	3	6 - 10	Repair missing joints in lower blockwork wall and open joints in lower prom. Continue to monitor.	urgent
1221D901D1304C02	Bastion and sea walls.SBC 56-22B-07	TA04868713, TA04828723. East of Holbeck Gardens.	112.5	01/03/2022	Royal HaskoningDHV	Cracks to bastion throughout. Missing pointing / open joints and damaged parts of upper and lower capping beam. Limited height of lower wall visible due to beach level. Mortar missing between blockwork in lower wall. Corroded handrail with missing sections. Upper prom has been fenced off and is in poor condition. Full height cracks through uppermost wall.	3	11 - 20	Repair facing and copings. Replace mortar. Seal cracks. Replace broken handrails.	routine
1221D901D1304C01	Rock armour.SBC 56-22B-08	TA05038695, TA04868713. Land slip.	294.7	01/03/2022	Royal HaskoningDHV	Rock armour tightly packed, good cover and looks in good condition. Toe in good condition, rock socketed into wave cut platform of soft rock. Top of sheetpiles just visible at toe of revetment with concrete behind.	2	>20	Continue to monitor, monitor stability of cliffs.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
Cayton Bay										
1221D901D1402C02	Wall.SBC 58-24B-01	TA06618455, TA06648454	34.0	15/09/2022	Royal HaskoningDHV	North of old PS. Poured concrete and concrete blockwork toe below a stepped seawall with curved coping stone. More recent construction than adjacent walls. Cliff cutting back adjacent to North. Wall generally fair, but toe undercut at South. A large void beneath the apron of the structure is remains partially concealed by higher beach levels in 2022. Evidence of leaching and moisture seemingly draining from the cliff unit above.	3	11 - 20	Repair voids at toe of wall. Investigate source of moisture at the southern end of the defence. Continue to monitor recession of beach level along toe of structure. Monitor for outflanking at northern end.	routine
1221D901D1402C05	Sea wall.SBC-59-24B-01	TA06698449, TA06658454	67.3	15/09/2022	Royal HaskoningDHV	Private wall to old PS in poor condition. Lower apron has multiple patch repairs with poured concrete but has cracks. Recent re-pointing to main wall joints. Upper wall slightly better than lower. High beach levels in 2022 have in part concealed localised undercutting of the toe of the lower wall apron. Numerous voids visible in concrete apron.	3	11 - 20	Private maintenance.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D1402C04	Wall.SBC-60-24B-01	TA06698449, TA06758445	32.6	15/09/2022	Royal HaskoningDHV	<p>Southern section of apron is missing, lower sea wall has been undercut and failed. Blockwork missing and displaced. Some repairs to deck with concrete. Upper wall missing southern section. Toe undermined. Crest breaking up.</p> <p>Ongoing localised activity in cliff unit behind higher wall with access steps consolidated with trench sheets. Loss of material from behind upper wall caused by slip failure. Large voids in the lower wall at beach level. Further undermining of the footpath. Defence is at significant risk of washout in the event of rainfall event coupled with tidal surge /wave action. Runoff from slope to the rear of upper wall could lead to instability of the structure and cause collapse of access footpath. Repairs performed following 2016 inspection appear in fair condition however the mass concrete toe repair was noted in 2020 as being undercut and being undermined from its southern end. Due to high beach levels in 2022 the undercutting was buried.</p>	5	1 - 5	Repair or remove/make safe. Adapt long term strategic approach as defined in Filey and Cayton Bay Coastal Strategy.	urgent

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D1402C06	Wall/apron.SBC-60-24B- 01	Nr Pumping Station in Cayton Bay.	19.9	15/09/2022	Royal HaskoningDHV	<p>Mass concrete wall has failed and is breaking up. More patch repair work has been done to make safer for pedestrians. Large voids beneath deck structure. Needs removing and replacing with safer beach pedestrian access.</p> <p>Significant damage to the rear of the structure, washout out of fill material evidenced by undercutting and settlement of the structure.</p> <p>Higher beach levels have concealed the base of the structure. Repairs to step (addition of larger bottom step) made following 2018 inspection are in good condition. Repairs to steps not visible in 2022 due to high beach levels. Repairs undertaken to make safe in July 2016 noted as being in fair condition. Concrete skim on deck of structure noted as being in good condition and has temporarily filled open surface voids.</p>	5	1 - 5	Repair or remove/make safe beach access. Adapt long term strategic approach as defined in Filey and Cayton Bay Coastal Strategy.	urgent
Filey										
1221D901D1601C02	Breastwork	TAI2248126, TAI2278130	18.3	15/09/2022	Royal HaskoningDHV	Rock armour scattered and totally ineffective. Timber breastwork no longer evident. Coastal slope appears to be actively eroding. Rock armour originally placed in failed breastwork. No significant change in 2022.	5	11 - 20	Consider reprofiling rock to slow erosion at boat club.	no repairs
1221D901D1601C03	Piling.SBC-64-28A-02	TAI2228121, TAI2248126	55.8	15/09/2022	Royal HaskoningDHV	Sheet piling remains in good condition although surface corrosion present. High beach levels concealed much of the lower sheet piles, including outlet. Scour hole at north end of promenade identified in 2018 was repaired prior to 2020. Missing section of coping at northern end of sheet pile wall.	2	11 - 20	Replace damaged section of coping stone. Monitor for risk of outfanking. Continue to monitor.	routine
1221D901D1602C01	Wall	TAI2118095, TAI2128100	49.6	15/09/2022	Royal HaskoningDHV	The concrete cope beam, replaced prior to 2018, remains in good condition. Abrasion of wall. Concrete block wall adjacent in poor condition – leans seaward, open joints, damaged blocks.	3	11 - 20	Repair damaged wall. Monitor leaning wall.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D1602C09	Sea wall.	N of promenade, Filey.	38.8	15/09/2022	Royal HaskoningDHV	Horizontal cracks and open joints throughout structure. Degradation of front faces of blocks and capping. Crest section repaired locally. Toe of wall abraded/undermined at bottom of slipway. Large crack through wingwall approx. 7m from extremity of wall possibly due to settlement. No significant change in 2022.	3	11 - 20	Repair undermining at slipway, monitor and repair damage.	routine
1221D901D1602C06	Sea wall.SBC-67-28B-01	North of promenade, Filey.	109.8	15/09/2022	Royal HaskoningDHV	No significant change in 2022. Missing pointing between blocks on wall. Damage to front face of several blocks. Concrete toe apron exposed locally. In 2022, beach levels varied with some drainage outlets buried and some exposed.	3	11 - 20	Repointing. Seal cracks below coping.	routine
1221D901D1602C08	Wall.SBC-67-28B-03	TA11978020, TAI2068082	301.6	15/09/2022	Royal HaskoningDHV	Abrasion to front face, particularly just above beach level appeared to have worsened slightly. As reported in 2022, many of the bullnose coping blocks have been repaired, but others are cracked/damaged. Several open joints leaking water. Lower beach levels exposed several drainage outlets, some of which appeared to be blocked. Previously observed bubbling water on beach approx. 1m off toe of wall was not observed in 2022, it is believed this is due to a buried outfall pipe. Handrails corroded.	3	>20	Replace/repair cracked coping and repair damaged blocks. Repair handrails. Confirm "bubbling" is due to buried outlet.	routine
1221D901D1602C03	Wall.SBC-67-28B-05	TA11978020, TAI2068082	318.8	15/09/2022	Royal HaskoningDHV	Abraded blockwork continues to deteriorate. Loss of face to many blocks throughout, particularly at lower levels at South end. Water observed seeping from between abraded blocks in area. Several new / repaired coping blocks. Handrails corroding at many joints. Cracked coping beam with missing joints sealant in several places. Some drainage outlets were visible due to lower beach levels.	4	11 - 20	Monitor abrasion and reface in blocks. Repair/replace handrails. Repair missing joints.	routine
1221D901D1602C04	Splash WallSBC-67-28B-07	TA11968012, TA11978020	91.8	15/09/2022	Royal HaskoningDHV	Overall fair condition, some abrasion to facing of blocks, open/missing joints between a few blocks. No change in 2022. Shingle levels lower across lower part of slipway. Frequent missing mortar and open joints between stone blocks on slipway.	3	>20	Seal open joints, repair abrasion damage to facing of blocks.	routine

Asset Name	Description	Type	Length	Inspection Date	Inspector	Comment	Overall Condition	Residual Life	Recommendations	Urgency
1221D901D1602C07	Wall.SBC-67-28B-09		98.0	15/09/2022	Royal HaskoningDHV	Cracking to bullnose coping stone in a few places, with evidence of historic repairs. Numerous chipped / damaged facing blocks, but overall condition remains fair. Cracks and open joints in blockwork of southern steps buttress. Promenade fair to good. Potholes in asphalt reported in 2018.	3	>20	Repair cracks and loose blocks. Fill joints. Continue to monitor.	routine
1221D901D1602C05	Wall.SBC-67-28B-11	TA11957997, TA11968012	103.9	15/09/2022	Royal HaskoningDHV	Some damage to seaward edge of prom. Repairs to splash beam by outfall holding (reported in 2018). Numerous lower blocks damaged on front face between beach level and 2m height not significantly worsened. Horizontal crack on seaward section as 2012. Cracks in retaining wall to slipway. Only a small flow discharging from outfall on day of inspection. Outfall grate corroded.	3	>20	Monitor damage to blocks and repair where necessary. Treat/replace handrailing.	routine
1221D901D1602C02	Wall.SBC-67-28B-13	TAI2068082, TAI2118095	18.5	15/09/2022	Royal HaskoningDHV	Gabion baskets fronted by rock armour and concrete blocks, with gravel/stone infill to rear. Slumping cliffs behind may be pushing rock onto beach highlighted by the depression in the crest of the gabion baskets and rock armour. At least two gabion baskets have split, asset at risk of unravelling due to outflanking.	4	1 - 5	Continue to monitor and reposition rocks as required. Consider placement of larger rock armour. Repair broken gabion baskets.	urgent

Appendix D

Cliff Condition Assessments

