



**Cell 1 Regional Coastal Monitoring Programme
Coastal Walkover Inspections 2010**



South Tyneside Council

**South Tyneside Council
Final Report**

June 2010

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Appendix A Asset Locations

Abbreviations and Acronyms

Acronym / Abbreviation	Definition
CAM	Condition Assessment Manual
NFCDD	National Flood and Coastal Defence Database

Asset Condition Grades

Grade	Condition Description
1	Very Good
2	Good
3	Fair
4	Poor
5	Very Poor

Glossary of Terms

Term	Definition
Beach nourishment	Artificial process of replenishing a beach with material from another source.
Berm crest	Ridge of sand or gravel deposited by wave action on the shore just above the normal high water mark.
Breaker zone	Area in the sea where the waves break.
Coastal squeeze	The reduction in habitat area which can arise if the natural landward migration of a habitat under sea level rise is prevented by the fixing of the high water mark, e.g. a sea wall.
Downdrift	Direction of alongshore movement of beach materials.
Ebb-tide	The falling tide, part of the tidal cycle between high water and the next low water.
Fetch	Length of water over which a given wind has blown that determines the size of the waves produced.
Flood-tide	Rising tide, part of the tidal cycle between low water and the next high water.
Foreshore	Zone between the high water and low water marks, also known as the inter-tidal zone.
Geomorphology	The branch of physical geography/geology which deals with the form of the Earth, the general configuration of its surface, the distribution of the land, water, etc.
Groyne	Shore protection structure built perpendicular to the shore; designed to trap sediment.
Mean High Water (MHW)	The average of all high waters observed over a sufficiently long period.
Mean Low Water (MLW)	The average of all low waters observed over a sufficiently long period.
Mean Sea Level (MSL)	Average height of the sea surface over a 19-year period.
Offshore zone	Extends from the low water mark to a water depth of about 15 m and is permanently covered with water.
Storm surge	A rise in the sea surface on an open coast, resulting from a storm.
Swell	Waves that have travelled out of the area in which they were generated.
Tidal prism	The volume of water within the estuary between the level of high and low tide, typically taken for mean spring tides.
Tide	Periodic rising and falling of large bodies of water resulting from the gravitational attraction of the moon and sun acting on the rotating earth.
Topography	Configuration of a surface including its relief and the position of its natural and man-made features.
Transgression	The landward movement of the shoreline in response to a rise in relative sea level.
Updrift	Direction opposite to the predominant movement of longshore transport.
Wave direction	Direction from which a wave approaches.
Wave refraction	Process by which the direction of approach of a wave changes as it moves into shallow water.

Preamble

The Cell 1 Regional Coastal Monitoring Programme covers approximately 300km of the north east coastline, from the Scottish Border (just south of St. Abb's Head) to Flamborough Head in East Yorkshire. This coastline is often referred to as 'Coastal Sediment Cell 1' in England and Wales (Figure 1). 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.

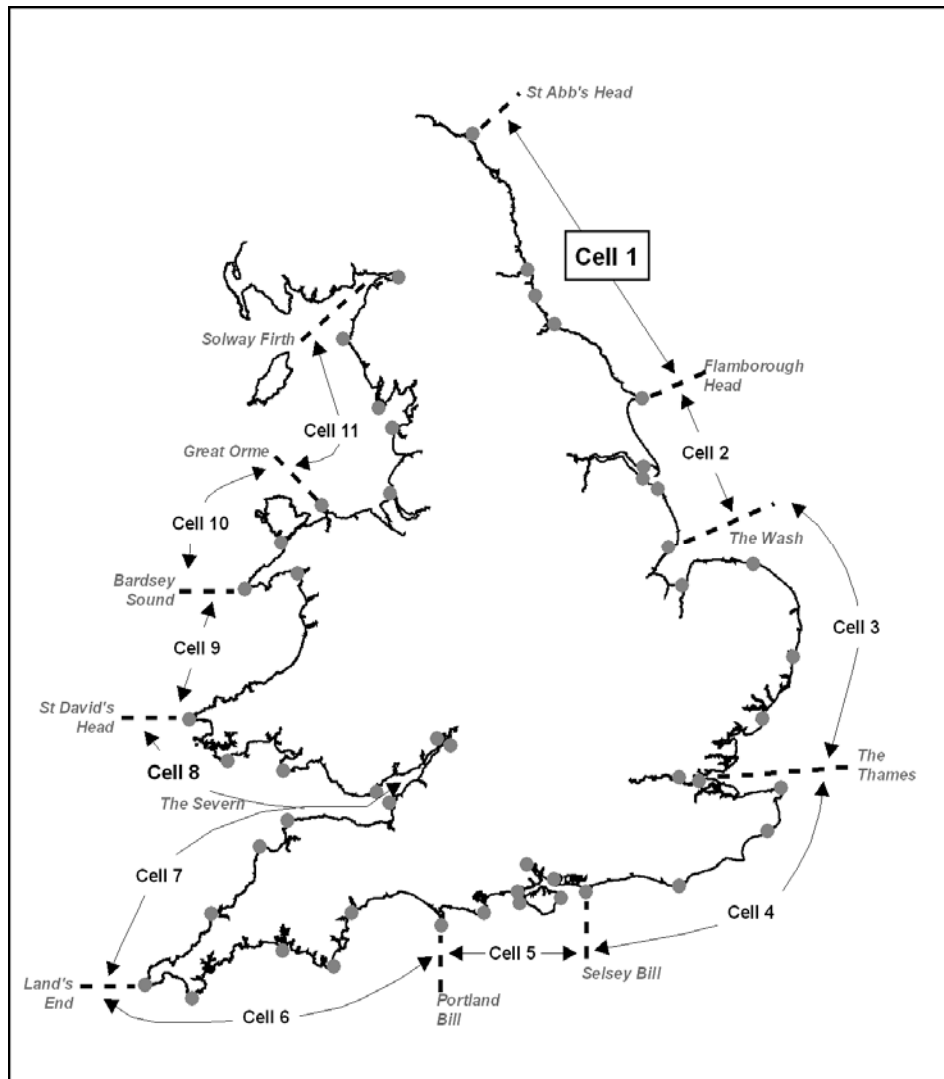


Figure 1 - Sediment Cells in England and Wales

The programme commenced in its present guise in September 2008 and is managed by Scarborough Borough Council on behalf of the North East Coastal Group. It is funded by the Environment Agency, working in partnership with the following organisations.



The data collection, analysis and reporting is being undertaken as a partnership between the following organisations:



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

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

The present report is **Coastal Walkover Inspections 2010** and provides a summary of the main findings from the walkover inspections of South Tyneside Council’s frontage that are undertaken once every 2 years.

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

1. Introduction

1.1 Study Area

South Tyneside Council's frontage extends from the mouth of the River Tyne estuary in the north, to the outfall south of Whitburn in the south. The frontage can be split into two characteristic lengths; the northern section of the frontage, from the River Tyne to Frenchman's Point is generally characterised by man-made defences and sand dunes, whilst the southern section from Frenchman's Point to south of Whitburn is generally characterised by undefended Magnesian Limestone cliffs.

1.2 Methodology

The walkover inspections for the South Tyneside Council frontage were undertaken on the 1st June 2010. The weather experienced during the inspections was calm but wet although there were no visibility problems.

The frontage has been split into a number of 'asset lengths' (Appendix A), the location and numbering of which correlates with those defined in the National Flood and Coastal Defence Database (NFCDD) which is maintained by the Environment Agency. All maritime Local Authorities that act as Coast Protection Authorities have a duty to report findings from walkover inspections into the NFCDD.

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 in accordance with the Environment Agency's Condition Assessment Manual (CAM), with estimates made of their residual life and assessments made of the urgency of any necessary repair work.

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, all detailed inspection reports and a selection of appropriate photographs have been entered into the NFCDD.

2. Overview

There have been significant changes in the condition of a number of the built and natural defence assets along the South Tyneside frontage since the previous formal inspections in November 2008.

The winter of 2009/2010 was particularly harsh, with sub-zero temperatures for considerable durations and heavy snowfall and rainfall. Cycles of freeze-thaw within the rock cliffs would have weakened their structure in places, causing existing fissures to widen and perhaps creating new fissures. The thick layers of snow lying on the cliff top would then have placed increased loading on the surface and with marine action attacking the toe, especially during winter storms and high tides, failures were triggered in several locations.

In addition, the high tides during the spring equinox of March 2010 coincided with storm conditions, leading to notable wave overtopping at Littlehaven and causing additional pressure on other frontages.

As a result of these weather and marine conditions, the following significant findings were observed during the 2010 inspections:

- **Littlehaven Sea Wall** – the structure remains in a very poor condition and is actively failing. There is exposed timber piling, cracks, abrasion and undermining. A large section of the wall adjacent to a recently-failed section is extensively cracked and is likely to be the next section to fail. The horizontal nature of that crack could mean that a collapse occurs along a significant length. A capital investment needs to be made at this frontage. The preferred approach is to re-align the sea wall landwards, but there may be a delay in progression of this scheme. An intermediary contingency plan should be developed to suggest a suitable response should the wall fail. **This is a significant issue that requires urgent attention.**
- **Sandhaven** – the donkey track is unravelling along the southern sections, especially where protective coping stones are missing. Some vermin control is recommended at the southern end and some remedial work to the concrete slipway adjacent to Trow Point is required to prevent its failure.
- **Trow Point and Target Rock** – these headlands have experienced rock falls and erosion. Target Rock in particular should be visited at quarterly intervals for ongoing visual observations (as recommended in the *Trow Quarry Coastal Defence Scheme Monitoring Plan*). Some vermin control is recommended at Trow Quarry to prevent burrowing from destabilising the re-graded coastal slopes.
- **Frenchman's Bay** – a 50m section of cliff collapsed on 21st march 2010 and further, more local, rock falls and slumps are expected due to the formation of caves and overhangs in the cliff face.
- **Marsden Bay** – Recent localised rock falls and residual rock overhangs can be observed through most of the bay, and it is anticipated that the fissured rock near Lot's Wife and, more extensively, south of Pompey's Pillar will fail. This will start to present problems in the south of the bay where the road is in close proximity to the cliff top. The concrete bunker near the cliff top, the wall at the toe of the disused lifeguard station, and the apron to the Redwell Steps are all in a very poor condition and present a safety hazard to the public.

- **Lizard Point** – the south-east corner of the Lizard Point car park is located in close proximity to cliffs that have experienced significant recent failures. Across the whole Lizard Point headland, including the section along the access road to the car park, the cliffs are in an unstable condition due to extensive cave formation, overhangs and fissures and further failures are expected. The car park should remain close to safeguard the public from further significant rock falls.
- **Old Harbour Quarry** – the problems at Old Harbour Quarry relate to cave formation at the base at the cliffs and breaching through the limestone ridge at the back of these caves into the waste material that was used to in-fill the former quarry behind. These problems are being considered through the design of a capital scheme at present. Currently only one cave has breached the limestone ridge, causing a sink hole to be formed in the backing land, but others are likely to occur in the near future.
- **Whitburn Nature Reserve and Rifle Ranges** – Local slumps have eroded the cliff top back to close to the public footpath in places.

3. Condition Assessment

3.1 Littlehaven

Wave Basin

The grouted masonry revetment starts at the boat slipway and extends along the eastern side of the wave basin (below left) to join the landward root of the South Groyne. It is the responsibility of the Port of Tyne. The revetment was in fair condition although voids were observed at the toe due to erosion of mortar and missing masonry blocks (below right). Local repairs to infill the voids recommended in 2008 do not appear to have been carried out, but the voids have only marginally worsened. However, small holes were observed in the ground at the top of the revetment behind the upper layer of stonework. This may be indicative of wash-out of core material and it therefore remains recommended that void filling, especially at the toe, is undertaken. This should be accompanied by the general replacement or in-filling of missing masonry blocks and filling of cracked mortar where this occurs throughout the structure.



South Groyne

Along the northern (river-facing) side of the South Groyne there was evidence of previous concrete and asphalt repairs (below left). In one area the concrete repairs have become slightly damaged and the asphalt deck immediately behind is showing signs of cracking. This zone requires some routine remedial attention. Elsewhere along the river-facing side, there is occasional missing stonework and in one location armour stone placed on the river bed in front of the structure has been displaced.

At the seaward tip of the structure, there remains evidence of cracking in the asphalt deck (below right). The pattern of this cracking appears similar to that recorded in 2008 and recent discussions with the Port of Tyne reveal that they are aware of this area and believe it to be surface cracking and not a consequence of structural settlement.



The southern side of the South Groyne faces into Littlehaven and is generally less exposed and in a better condition than the river-facing side.

Near the landward root, however, there is evidence of cracking and the onset of voiding in the concrete near the asphalt deck (right).



Littlehaven Dunes

The strand line was a reasonable distance down the foreshore, indicating a wide and healthy beach at this location. The beach width increases in the lee of the South Groyne.



There was no evidence of dune erosion and the vegetation was well established (left). Some narrow informal access tracks have been created by visitors, but this does not present a concern.

Beach profile data from this frontage suggests that the area is accreting with sediment, showing the effectiveness of the South Groyne in preventing material from entering the navigation channel of the River Tyne estuary.

Littlehaven Sea Wall

The section of sea wall between its protruding 'nose' and the dunes is in a very poor condition and at real risk of imminent failure. Here beach levels can typically vary by in excess of 1m between successive events. Even between the inspection on 1st June 2010 and the following day, sedimentation had resulted in a drainage outfall through the wall being blocked (below).



The worst affected length is at the protruding nose, where a large section of concrete has recently (April 2010) failed (below left), exposing an extensive area of the timber piles behind (below right). In addition, there are a total of 22 other (smaller) areas along this section of the wall where the timber piling is exposed through concrete damage and degradation.



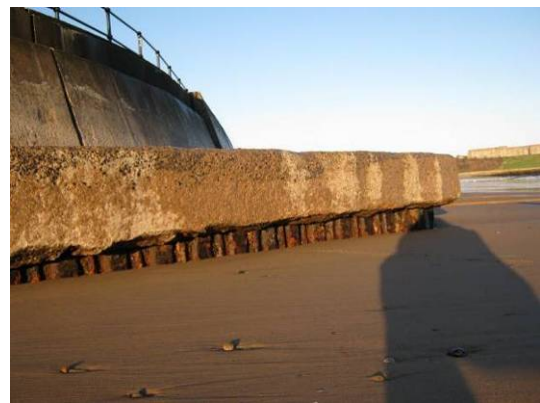
One section of wall at the nose was rendered with a new concrete facing as a purely cosmetic activity when the Tall Ships Race visited the River Tyne in 2005. The concrete render is now coming away from the wall, and a gap at the joint is clearly visible (below left). In this section, repairs have been made to the damaged hand railing and asphalt (below centre) and concrete coping (below right), although there remain numerous areas where coping stones are missing, concrete voids are present and the asphalt is at risk of unravelling.



Along this frontage, overtopping can be violent. The overtopping associated with the high tides of the spring equinox in 2010 (below left) caused significant flooding of the land behind the wall and also deposited a lot of beach sediment across the promenade and car park (below right).



This overtopping was particularly severe in late spring 2010 because the high spring tides also coincided with low beach levels, during which timber foundations of the sea wall were exposed at its toe (below left) and concrete sheet piling was exposed at the toe of the apron (below right). During the inspections, beach levels had recovered to cover the toe foundations, but the wet-splashed promenade showed signs that overtopping had occurred earlier that day, and some occasional light spray was observed coming over the wall even several hours after high tide.



The ongoing deterioration of this section of sea wall is a real and immediate concern and with a potential capital scheme not achieving a suitable national scoring of priority, an intermediary plan and action needs to be put in place in the event that the wall were to fail.

Between the protruding section of sea wall and the South Pier, the alignment follows a 'return section' and then a section running along the back of the beach. In the return section, the concrete is badly abraded and cracked in places and there appears to be evidence of some local settlement (below left). The construction joints remain well filled. Part way along the return section is a former crane derrick. Here the exposed sheet piles are extremely badly corroded (below right) and there is clear evidence of settlement and the breaking up of the structure.



The present state of this section represents an ongoing deterioration in condition from the 2008 survey, with sections of wall visibly failing (below left) and reinforcement bars becoming exposed (below right). Despite some recent repairs to the asphalt, this section remains in poor condition, especially around the derrick base.



The section running parallel with the shore along the back of the beach is fronted by a wide beach. At one location there is a pedestrian access gap in the wall, which reduces its effectiveness as a sea defence to the backing promenade. Some wind-blown sand was observed along the promenade near the root of the South Pier and immediately behind the wall. Along the sea wall, the concrete was showing signs of spalling on the crest and a previous render was coming away from the crest. One large vertical crack was observed, along with other smaller vertical and diagonal cracks. Some of these have previously been filled but ten remain open. The toe of the wall was covered by beach sand and therefore not inspected. There was localised cliffing in the wide beach immediately adjacent to the South Pier (below left). The (obsolete) outfall along the beach is in a very poor condition (below right).



3.2 South Pier

The South Pier remains in good condition, with minor repointing and replacement of missing or cracked blocks expected to be undertaken as part of routine maintenance.

3.3 Sandhaven

The northern section of Sandhaven, between South Pier and the children's play area, has a cobble berm in front of the dunes at its northern end, which narrows and thins with progression south. A 'donkey track' extends from the South Pier, initially behind the dunes and then switching to seaward of the dunes, to meet the Lifeguard Station. There are no signs of erosion at any point in the dunes along this frontage, but the donkey track starts to show signs of distress as soon as it switches in front of the dunes (below left). Near the Lifeguard Station the donkey track has relatively substantial coping on its seaward edge but this is showing signs of abrasion. Some previous asphalt repairs are identified in the donkey track and there are several areas where asphalt unravelling behind the coping has been in-filled naturally with sand (below right).



South of the Lifeguard Station, the dunes are barren of vegetation and have become 'hollowed' by intensive recreational activity, but still provide a good buffer in front of the promenade and the backing amenity assets. Efforts are being made to enhance sedimentation rates in the dunes through brushwood fencing (below left) and plans are being considered for zoning of public access to assist recovery further. At the very southern end of the dunes the damage to the donkey track is notable, with displaced coping and unravelling tarmac.



At the time of the inspections the promenade behind the dunes was shut to public access because of ongoing construction activities associated with the Sea Change project.

In front of the amphitheatre, construction works were also taking place, with the Sea Change project enabling the placement of new promenade furniture (below left) on timber bases protruding seaward from the promenade in three areas, and new patterned promenade paving (below right). Beach levels were flush with the promenade, covering the sea wall.



Further south of the construction works, the sea wall fronting the originally-paved promenade was covered by high beach levels, with much wind-blown sand deposited on the promenade in front of the car park (below left). The small protruding base areas with seating remains in a very poor condition, with recent failure of the coping resulting in concrete debris strewn across the beach. Previous render repairs have been made, but extensive cracking, spalling and abrasion remains evident. Reinforcement bars are exposed and corroding (below right)



The sloping concrete that extends further south is in fair condition, with some spalling and abrasion, especially around the beach access steps from the Lifeguard Station. Construction joints remain suitably filled. The last section of revetment, south of the Lifeguard Station, shows some signs of minor settlement due to discontinuity in slope form, but no cracks have opened.

The dunes at the southern end of Sandhaven are narrow but generally in good condition, covering buried gabions. There are several informal access routes caused by trampling, extending both through the dunes (especially by Mangos Public House) and along the dune crest. In two areas there is poured concrete and rubble underlying the sand and one rabbit hole was observed, suggesting that some vermin control would be appropriate.

3.4 Trow Quarry

Trow Point

After virtually no change over recent years, the large headland at Trow Point has suffered some local rock falls (below left) within the harder rock and local slumps in the overlying softer material (below right) over the severe winter of 2009/2010. This particularly occurred along the seaward-facing front of the headland. Despite this, the headland remains as a competent mass controlling evolution of the bay to its south, Graham's Sand. Some areas of softer material remain in an over-steep condition and therefore further local slumps should be expected. Several rabbit holes were identified across the headland and vermin control may be warranted.



In addition to the main headland, the concrete slipway at the landward root of the northern side of the headland (i.e. at the very southern end of Sandhaven beach) is now experiencing undermining which needs to be arrested through maintenance to avoid its deterioration and eventual collapse.

Graham's Sand

The rock revetment and re-graded slope was in very good condition. Some very large (natural) rocks were noted on the foreshore adjacent to the permanent rocky outcrop within the bay, suggesting that they had been driven into the bay during severe storm activity.

During the inspections, members of the public were observed climbing across and along the rocks, despite warning signs to the contrary. Additionally, several rabbits were observed running across the revetment. Vermin control should be implemented to avoid them burrowing in the re-graded slope and destabilising it.

Target Rock

This headland has always been the most vulnerable of the three headlands at Trow Quarry due to its partly fragmented state, with undercutting at lower levels and, in at least one location, a cave formed at the base. Over the severe winter of 2009/2010, a fresh rockfall has occurred (below left) in the small rock stack that lies between the two larger, more competent rock masses at Target Rock headland. In addition, the material in between the rock masses has started to become eroded, with rock debris and brickwork evident on the foreshore (below right).



At present, there is sufficient residual rock headland not to cause a concern relating to potential outflanking of the defences in Graham's Sand and Southern Bay, but this situation should be closely monitored. In the previous *Trow Quarry Coastal Defence Scheme Monitoring Plan – Year 0 (Baseline)* a recommendation was made for Council staff to visit Target Rock quarterly and take notes and fixed aspect photographic records. This recommendation remains valid in light of the recent changes.

Southern Bay

The rock revetment and re-graded slope was in very good condition.

Frenchman's Point

The rock headland was in a competent form and presents no concerns.

3.5 Frenchman's Bay and Man Haven

Just to the south of Frenchman's Point, the cliffs have a number of arches formed at their toe (below left) and within the main section of Frenchman's Bay a dramatic rock fall occurred on 21st March 2010 resulting in the collapse of around a 50m section of frontage (below right).



This cut the cliff top back by around 20m, sufficient to affect a length of approximately 15m of the footpath and low-level barrier (below left), both of which have now been re-diverted inland by The National Trust (below right). Following the collapse an emergency response plan was swiftly implemented and a temporary safety fence was initially installed along with new warning signs. The National Trust's policy is to realign the path and barrier to more landward positions as future erosion occurs.



The rock debris at the toe of the cliffs (left) will now provide a degree of protection to the cliff toe until the material becomes moved away by marine action and the process occurs again.

Further south of the collapsed cliff, there remain other precarious locations within Frenchman's Bay and between here and Man Haven, with arches and caves formed at the cliff toe, over-hanging rocks (right) and recent slumps in the overlying softer material, including several locations where the footpath and fencing is close presently to the cliff edge. Further local falls and slumps are expected in these locations over time.



Within Man Haven Bay, and within the northern most of the three mini-bays between here and Camel Island, there appears to be evidence of debris flow (below left). This may have occurred over the harsh winter of 2009/2010 when snow melt may have mobilised some of the sediments within the softer overlying cliff material and washed it away down the cliff face. At Man Haven, one section of rock cliff underlying the debris flow also has a large vertical crack. Elsewhere between Man Haven and Camel Island, the frontage is heavily affected by cave and arch formation at the toe of the cliffs (below right).



3.6 Marsden Bay

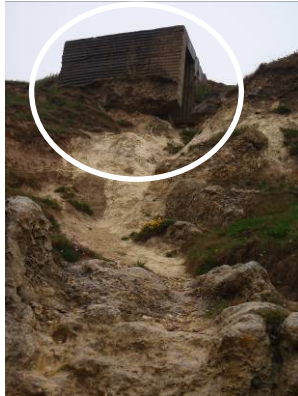
At the northern end of Marsden Bay, the cliff and arch formation at the toe of the cliffs continues and there is evidence of relatively recent rock falls (below left) and residual rock overhangs (below right). The National Trust has re-aligned the public footpath at the top of the cliffs landwards in response to some recent, localised, failures.



In other places the rock structure has become fractured (below left) and one area of cliff in particular has cracked (below right) with a failure due to this likely to occur.



Also within the northern end of Marsden Bay there are three structures; all of which are in very poor condition. Along the access ramp to the northern end of Marsden Bay (by Camel Island) there is a concrete bunker located high up the cliff. This is perilously perched on the cliff face with previous cliff failures leaving a corner section of the bunker overhanging. There is also a stone-faced wall at the base of the disused Lifeboat Station which is now undermined and failing at its northern corner (below right). It appears that previous damage to the (former) stone-facing at this section has previously been repaired by brickwork, but this patch-up is now failing. Along the stone-faced section of this wall, there are numerous notable gaps between the stone-work and the coping.



The buttress to the Redwell Steps is badly damaged along its length. The National Trust has guided access down the steps along specified routes using hand-railing in order to ensure the public avoids the worst affected areas and has bolted a temporary metal step at the base of the concrete steps to ease access to the beach (below left). In many places along the toe, the buttress is undermined, badly abraded and the reinforcement bars are exposed (below right), including in some areas of previous repairs. Several sections of the buttress are actively failing and the debris remains on the beach.



Between the Redwell Steps and the Grotto Public House, the cliffs have small arches and caves along their base in places (below left) and there is one cracked rock near Lot's Wife which is likely to fail due to toppling (below right).



At Marsden Grotto, the masonry wall is well protected by a cobble berm on the upper beach and the rock netting constructed in 2007 remains in very good condition.



Between the Grotto and the access road to Lizard Point car park, the cliffs generally appear somewhat more stable than those in the north of the bay and in places are fronted by small cobble berms (below left). However, occasional rock falls (below right) and numerous caves and arches at the base of the cliffs are still evident.



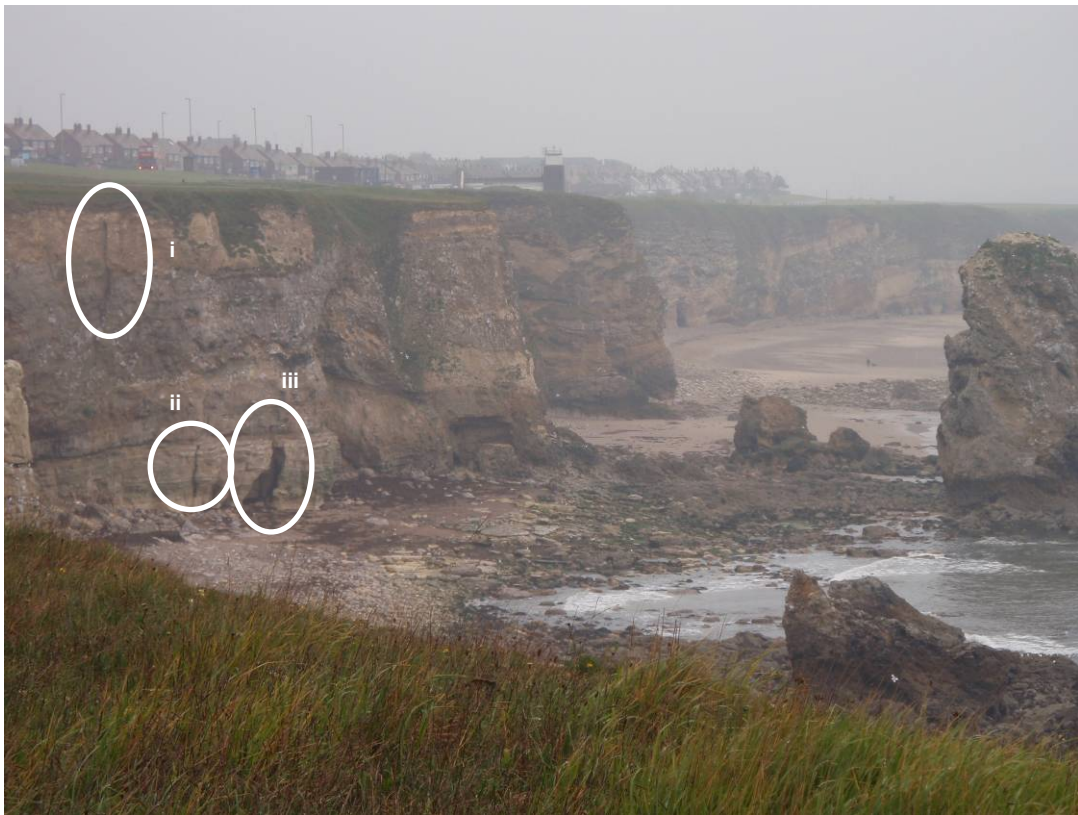
There are two locations, just south of Pompey's Pillar where the cliff-line 'pinches' close to the road, where there are large vertical cracks in the cliff (as shown below). These cracks were evident in a previous survey in August 2009 and have not worsened since, but rock falls in these locations will occur at some time. Nesting fulmar in the cliff face suggest that the cliffs remain relatively stable at the present time, since fulmar are known to have avoided nesting in areas that have subsequently failed soon after.



Elsewhere along this southern section of Marsden Bay, there are several other areas where small and localised toppling or slumping has occurred in the softer material that overlays the harder rock structure, including several areas where further local slumping is imminent (below left). Additionally, there is a further large vertical crack in the cliff face (below right).



One of the fractured sections of rock face (below) has: (i) a large vertical crack in the cliff top; (ii) a large vertical crack in the cliff base; (iii) a cave formed at the base. It is highly likely that this section of cliff will fail in the future due to these weaknesses in cliff structure.



3.7 Lizard Point Access Road, Car Park and Headland

The section of cliff that extends along the access road to Lizard Point car park currently appears generally stable along most of its length, but does have four caves formed along its base (below).



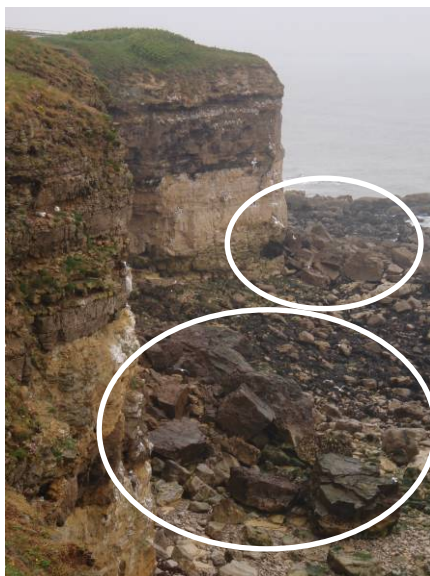
Further towards the car park end of the access road, the cliff top is notably cracked in one location and here a small and localised toppling failure appears imminent (left).

At this location, notable sections of the upper cliff face are overhanging the sheer lower cliffs (also shown left).

Further around the headland, along the section immediately fronting Lizard Point car park, there have been significant recent cliff failures. In response to this The National Trust has closed the car park (below) since March 2010.



The condition of the cliff in the section fronting the car park, extending along to Concrete Pillar, is highly unstable. The worst affected section is in the lee of Jack Rock (the area immediately in front of the south east corner of the car park) where two recent rock falls have occurred (below).



The rock falls have left extensive sections of cliff as sheer overhangs (below left) or in a highly fissured state (below right) and this section of cliff will experience further failures. The timescale of this is uncertain and depends largely on storm conditions acting at the toe of the cliff as well as general meteorological conditions.



In between the area of the two rock falls a wide but shallow cave has formed, with overhanging rock (below left). Immediately above the roof of this cave, an old stone wall sits precariously on an overhang near the cliff top.



Further south of Jack Rock, extending to Concrete Pillar, the cliff remains active, but on a lesser scale. There are areas where caves have formed at the base of the cliffs (below left) and other areas where there have been recent cliff failures of a more local nature (below right).



This whole section of cliff between Lizard Point car park and Concrete Pillar remains highly unstable and further failures are expected due to the overhangs, caves and extensive fissures in the rock structure.

3.8 Whitburn Coastal Park

South of Lizard Point itself to the southern end of Potter's Hole, the frontage is typically characterised by the formation of caves, arches (below left) and sea stacks (below right) caused by erosion of the cliffs.



Whitburn Coastal Park covers the area of the former Old Harbour Quarry, which has been subsequently infilled with waste material. At the headland separating Byer's Hole from Potter's Hole, cave formation (below left) has breached the limestone ridge that was left at the seaward edge of the former quarry, causing the wash-out of the fill material and, in one location, creating a sink hole to open in the backing ground (below right).



The National Trust has now fenced off this area, placed warning signs and diverted the public footpath and a scheme development remains ongoing. Since a previous scheme-specific survey in August 2009 the cave formation does not appear to have increased and the adjacent caves still have not yet breached through the limestone ridge. The existing concrete defences, previously used to 'plug' two of the nearby caves at this headland, are continuing to become undermined.



3.9 Whitburn Point Nature Reserve

Along the Whitburn Nature Research, erosion has in a small number of locations caused the cliff top to come in close proximity to the public footpath (example below left). Low-level fencing and warning signs (below right) have been placed by The National Trust in these areas. Elsewhere the cliffs remain stable.



3.9 Rifle Ranges

The northern section of the rifle ranges frontage (extending southwards to Souter Point) exhibits a different character to adjacent sections of coast and therefore has now been separated out as a discrete 'asset length' in NFCDD. This is because the frontage comprises a wide raised beach (possibly comprising colliery spoil, although this is unconfirmed; below left). As a result of this, the coastal slopes behind the raised beach are not currently exposed to marine action and therefore are highly stable at present.

The southern section of the rifle ranges is actively experiencing small and localised slumps, a few of which are becoming close to the public footpath (below right), but nothing of major concern. In one area, close to the mound and military building, concrete blocks appear to have been dumped at the toe of the cliffs to slow their recession.



3.10 The Steels

South of the rifle ranges to the outfall at the southern end of Whitburn, the cliffs are locally active, with some slumping observed, but again there are no issues of major concern.



4. Comparison with Previous Assessment

The previous formal assessment across the whole study frontage was undertaken in November 2008.

The most major changes since then exist at Littlehaven Sea Wall, where in early April 2010 a section of the wall collapsed following the heavy storms that coincided with the high spring equinox tides. The November 2008 inspections occurred at a time of relatively low beach levels, which exposed the timber foundations at the toe of the wall and revealed a diagonal crack in the wall (circled below) and a more extensive horizontal crack. The failed section of wall (from the circled area) was easily identified during the June 2010 inspection, but the relatively high beach levels at the time masked the more extensive horizontal crack and could, if unaware of the results from the previous inspections, have given rise to a lesser sense of urgency. The fluctuations in beach levels mean that at times that horizontal crack is exposed (as was the case during an intermediate visit on 7th April 2010).





Comparison with previous inspections therefore reveals that not only is the Littlehaven Sea Wall in a **very poor condition**, but it is **actively failing** and the existing patch repairs are unlikely to prevent a larger failure from occurring.

The other areas of significant change are at Frenchman's Bay, where a major cliff failure has occurred, and at Lizard Point car park where two major rock falls have occurred.

Less significant changes have also been identified at Trow Point and Target Rock (rock falls), Sandhaven (unravelling of the donkey track), Marsden Bay (rock falls and very poor condition local structures), Old Harbour Quarry (expansion of the sink hole), and Whitburn Nature Reserve and Rifle Ranges (local slumping).

5. Problems Encountered and Uncertainty in Analysis

All assets were inspected at suitable stages of the tide and therefore there were no problems encountered.

6. Conclusions and Recommended Actions

<p>There is an urgent need for capital investment in the Littlehaven Sea Wall in advance of its collapse. The plan to realign the wall may be placed on hold due to funding issues, but an intermediary contingency plan needs to be developed to provide a course of action should the wall fail.</p>
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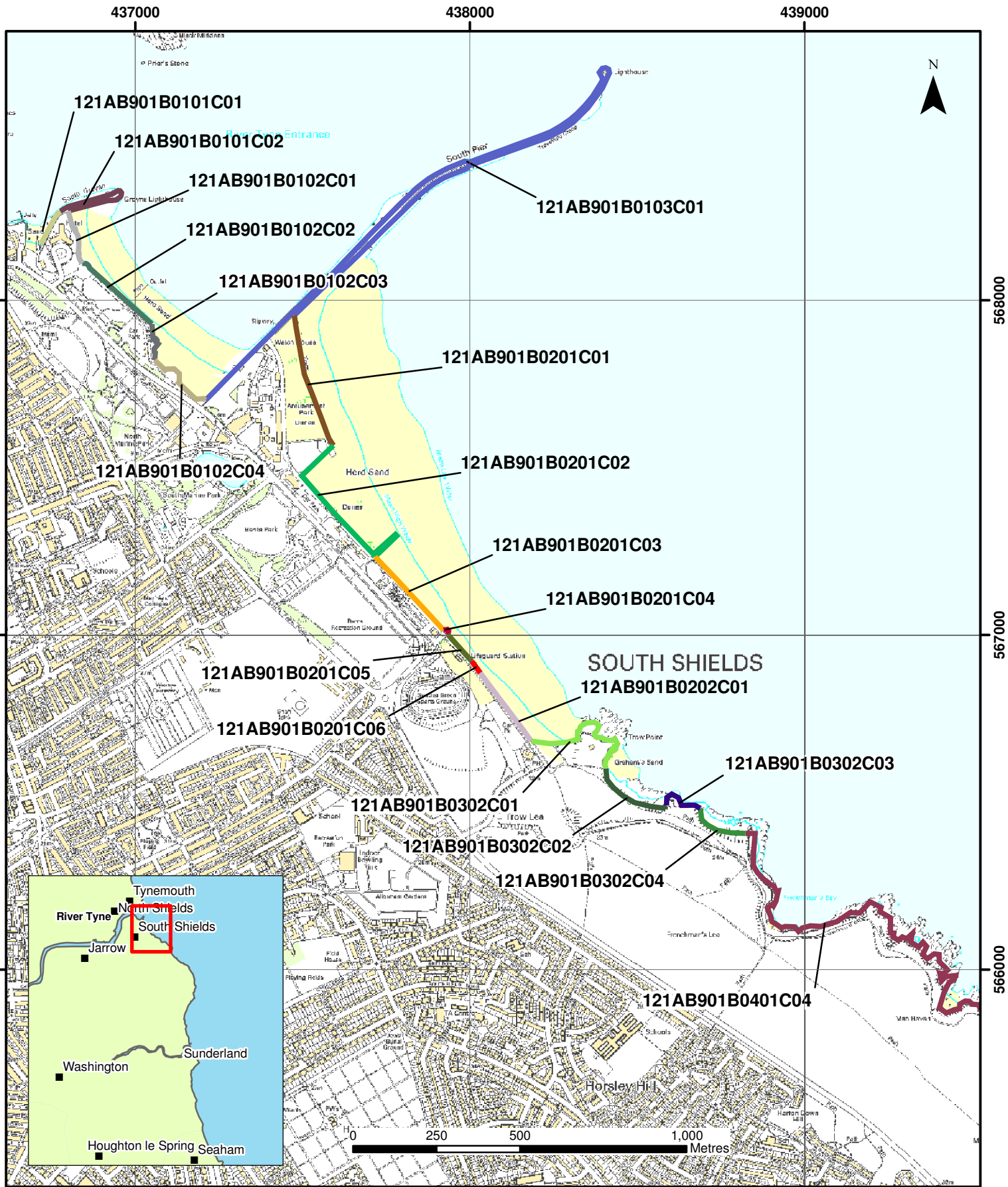
There is also the need for continued actions with respect to public safety, especially in areas where cliffs are susceptible to collapse (e.g. especially Frenchman's Bay, Marsden Bay, Lizard Point car park) and where there are structures at imminent risk of failure (e.g. Littlehaven sea wall, Sandhaven donkey track, Marsden Bay lifeguard station and access steps).

It is highly recommended that continued monitoring is undertaken for all assets, with specific recommendations for individual assets given in the table below:


Defence	Location	Description	Priority	Recommended Action Date	Recommended Action	Details
121AB901B0101C01	Wave Basin	Revetment	routine	31/12/2010	notify third party and seek action	Infill voids - prioritise work at toe.
121AB901B0101C02	South Groyne	Breakwater	routine	31/12/2010	notify third party and seek action	Infill cracks in deck. Patch repairs to missing mortar and blocks.
121AB901B0102C01	Littlehaven	Dunes	routine	31/12/2012	continue active monitoring	
121AB901B0102C02	Littlehaven Seawall	Seawall	urgent	31/12/2010	include in capital programme	Develop a capital scheme to preferably realign the seawall landwards. Prepare contingency plan in event of seawall failure before scheme approval.
121AB901B0102C03	Littlehaven Seawall	Seawall	urgent	31/12/2010	include in capital programme	Develop a capital scheme to preferably realign the seawall landwards. Prepare contingency plan in event of seawall failure before scheme approval.
121AB901B0102C04	Littlehaven Seawall	Seawall	routine	31/12/2010	improve condition through maintenance	Infill cracks.
121AB901B0103C01	South Pier	Breakwater	routine	31/12/2010	notify third party and seek action	Minor repointing and replacement of missing/cracked masonry blocks as part of routine maintenance.
121AB901B0201C01	Herd Sands	Berm - Dunes	routine	31/12/2012	continue active monitoring	
121AB901B0201C02	Herd Sands	Dunes	routine	31/12/2012	continue active monitoring	Efforts to enhance sedimentation and 'zone' dune access.
121AB901B0201C03	Herd Sands	Wall	routine	31/12/2012	continue active monitoring	
121AB901B0201C04	Herd Sands	Wall	routine	31/12/2010	improve condition through maintenance	Infill cracks and voids and render wall.
121AB901B0201C05	Herd Sands	Revetment	routine	31/12/2010	improve condition through maintenance	Routine maintenance.
121AB901B0201C06	Herd Sands	Revetment	routine	31/12/2010	improve condition through maintenance	Routine maintenance.
121AB901B0202C01	Herd Sands	Dune	routine	31/12/2010	improve condition through maintenance	Zoning of dune access. Vermin control. Ongoing monitoring.
121AB901B0302C01	Trow Point	Cliff / Scarp	routine	31/12/2012	continue active monitoring	'Fill voids created under concrete slipway.
121AB901B0302C02	Graham's Sands	Rock revetment	routine	31/12/2012	continue active monitoring	Vermin control to prevent rabbit burrowing and de-stabilising the slope.
121AB901B0302C03	Target Rock	Cliff / Scarp	urgent	31/12/2012	continue active monitoring	Quarterly visits with photographic records.
121AB901B0302C04	Southern Bay	Rock Revetment	routine	31/12/2012	continue active monitoring	
121AB901B0401C04	Frenchman's Bay and Marsden Bay (north)	Cliff / Scarp	routine	31/12/2012	continue active monitoring	
121AB901B0401C01	Redwell Steps	Wall	routine	31/12/2010	improve condition through maintenance	Maintenance repairs needed to failing sections of masonry-faced wall to Lifeguard Station and concrete buttress to Redwell Steps.
121AB901B0401C03	Marsden Bay (Central)	Cliff / Scarp	routine	31/12/2012	continue active monitoring	Re-align path landwards when cliffs fail. Warn public on risks of rock falls.
121AB901B0401C02	Grotto	Wall	routine	31/12/2012	continue active monitoring	
121AB901B0401C05	Marsden Bay (South)	Cliff / Scarp	routine	31/12/2012	continue active monitoring	Warn public of rock falls. Re-align footpath when needed. Longer-term plan to re-align road.
121AB901B0402C01	Lizard Point	Cliff / Scarp	routine	31/12/2010	work required for health and safety	
121AB901B0501C01	Whitburn Coastal Park	Cliff / Scarp	urgent	31/12/2010	include in capital programme	Develop scheme to re-align coast rather than 'plug' holes all along coastline.
121AB901B0502C01	Whitburn Nature Reserve	Cliff / Scarp	routine	31/12/2012	continue active monitoring	
121AB901B0502C02	Rifle Ranges (North)	Cliff / Scarp	routine	31/12/2012	continue active monitoring	


Appendix A

Asset Locations



Legend

 Asset location

 NFCDD Asset Number

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

**Figure 1 - Map 1
 South Tyneside
 Council Frontage**

Asset Inspection
 Report 2010

Drawing Scale 1:15,000 at A4

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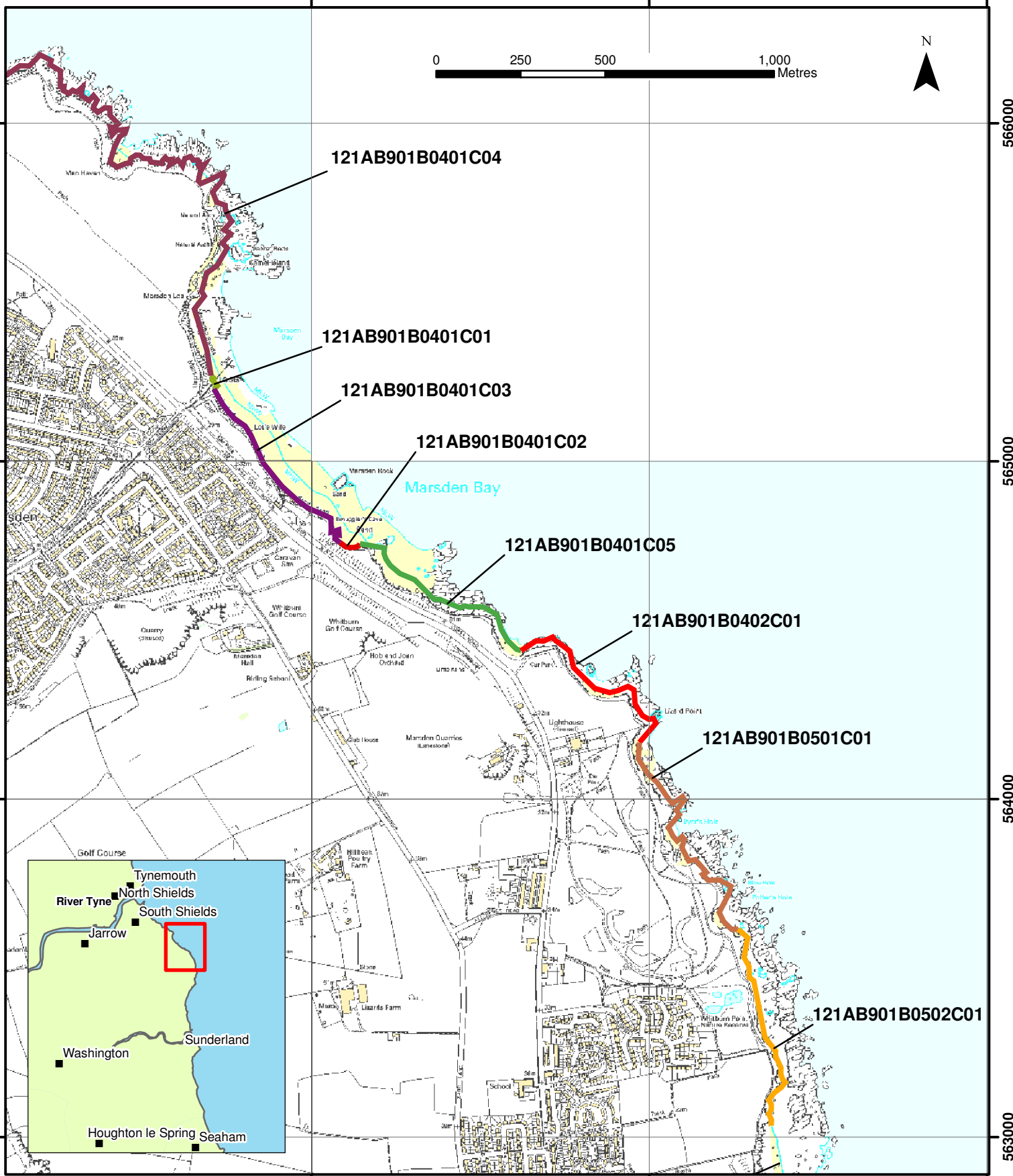
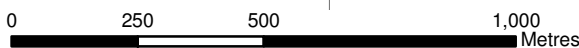
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Checked by: MD	Date: 28/05/2010
Approved by: NC	Date: 28/05/2010

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121AB901B0401C04

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121AB901B0401C05

121AB901B0402C01

121AB901B0501C01

121AB901B0502C01

Legend

-  Asset location
-  NCFDD Asset Number

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

**Figure 1 - Map 2
 South Tyneside
 Council Frontage**

Asset Inspection
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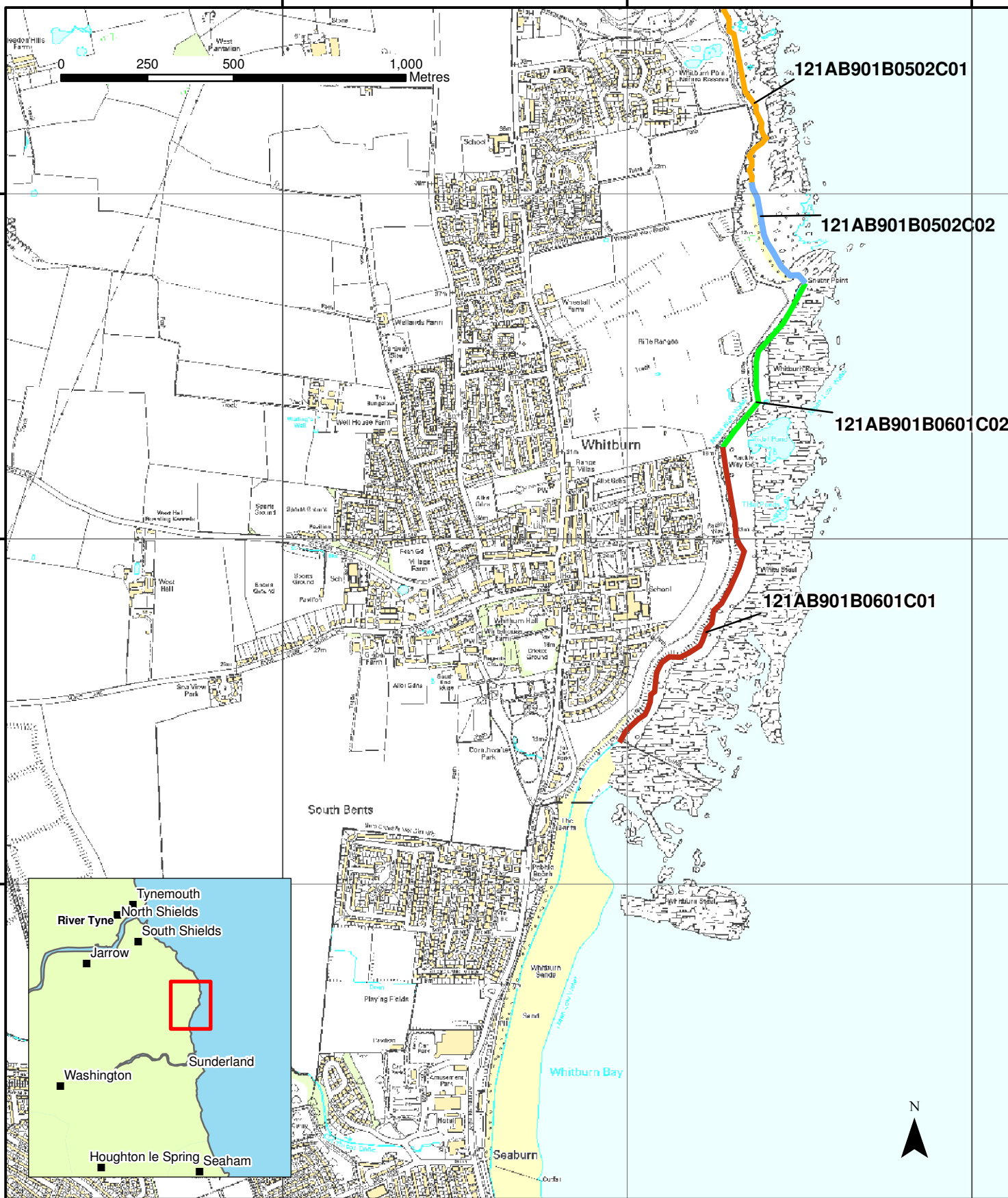
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Legend

 Asset location

 NFCDD Asset Number

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

**Figure 1 - Map 3
 South Tyneside
 Council Frontage**

Asset Inspection
 Report 2010

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