

Figure 5.1 Cumbria Site Locations

5. ARCHAEOLOGICAL SURVEY RESULTS: CUMBRIA

5.1 Introduction

The Cumbrian coast is the largest section of coastline in the study area. Following NWRZCA Phase 1, and further consultation with local authority archaeological officers in Cumbria and the Lake District National Park, the sites and areas outlined in Table 5.1 were selected as ‘at risk’ and in need of further survey during Phase 2.

Authority	Site name	SMP 2 policy	Significance	Risk
CU	Arnside Moss walkover	NAI	High	Medium
CU	Aldingham Motte-and-Bailey	NAI	High	High
CU	Aldingham Medieval Fish traps	Inter-tidal	Medium	High
CU	Greenodd, Ulverston and Baycliff quays	NAI	Medium	-
CU	Piel Castle	NAI	High	High
CU	WWI and WWII Hilpsford battery, Walney	NAI	Medium	High
CU	WWI Practice trenches, Walney	NAI	Medium	Medium
CU	WWI and WWII Battery H5, Walney	NAI	Medium	High
CU	Trough Head lithic scatter	NAI	Medium	High
CU	Cow Leys Lane lithic scatter	NAI	Medium	High
CU	North End Midden Mesolithic flint scatters	NAI	Medium	High
CU	North End Haws Neolithic flint scatter, Walney	NAI	Medium	Medium
CU	Sandscale Haws medieval bloomery	NAI	Medium	High
CU	Roanhead Neolithic structure	NAI	Medium	Medium
CU	Millom salt mounds	NAI	Medium	High
LDNPA	Eskmeals Neolithic flint scatter	NAI	Medium	High
LDNPA	Bronze Age lithic scatter at Eskmeals	NAI	Medium	High
LDNPA	St John’s Church, River Esk	NAI	Medium/High	High
LDNPA	Ravenglass Roman Fort	NAI	High	High
LDNPA	Burnt Mound, Drigg	NAI	Low	High
LDNPA	Drigg Roman bloomeries	NAI	Medium	High
CU	Post-Medieval saltworks, River Irt	NAI	Medium	High
CU	St Bee’s medieval fish traps	Inter-tidal	Medium	High
CU	Fish traps at Mawbray		Medium	High
CU	Saltom Bay colliery	H TL to NAI in 50 years	High	High
CU	Barrowmouth alabaster and gypsum mine	NAI	High	High
CU	Swarthy Hill hillfort	MR	High	High
CU	Roman milefortlet 20B (<i>Swarthy Hill</i>)	MR	High	High
CU	Roman milefortlet 15 (<i>Beckfoot</i>)	MR	High	High
CU	Beckfoot Roman cemetery	MR	High	High
CU	Roman Roads at Bowness, Beckfoot and Maryport	MR	Medium	Medium/High
CU	Salt sites on Solway Coast and Crosscannonby	MR	Medium	Medium/High
CU	Medieval Port, Skinburness	NAI	Medium	High
CU	Roman temporary camp at Knockcross (<i>Bowness</i>)	MR	Medium	High
CU	Rockcliffe Castle	MR	Medium/High	Medium

Table 5.1 Sites identified as potentially under threat from current or future coastal erosion in Cumbria.

The specific aims of the survey at these locations were:

- To provide an up-to-date condition assessment of surviving remains.
- Identify and record any previously unrecorded heritage assets
- To investigate the extent of erosion, and the risk faced to any surviving remains with reference to the preferred SMP2 policy in that area.

5.2 Arnside (Map Figure 5.8)

5.2.1 Location and geology

The town of Arnside (SD 45709 78462) lies on the southern side of the Kent Estuary, on the border between Lancashire and Cumbria. It is located in the northeastern corner of Morecambe Bay, c.4km north of Silverdale and c.4km west across the estuary from Grange-Over-Sands. The town was a small fishing port prior to the construction of the Ulverston and Lancaster Railway in 1848, which crosses the estuary at the Kent Viaduct in Arnside. The construction of the railway reputedly caused the estuary to silt-up and the fishing port was no longer viable. The character of the area then changed from a region of small enclosed farms, with a developing domestic industry, to a larger scale industrial area concerned with limestone extraction and lime working, together with mining and metal working (Askew 2009, 48).

The Kent Estuary is generally funnel-shaped, but has two pinch points – Arnside and Sandside - where high ground comes close to the southeastern shore. The solid geology on the banks of the River Kent is predominantly Carboniferous Limestone pavement with the limestone hill at Arnside Knott rising to the south of the town. The superficial geology is characterised by alluvial deposits and glacial sand and gravel (BGS 2008). The inter-tidal zone at the mouth of the estuary consists of wide sand flats, cut by the meander of the Kent Channel (Figure 5.2). The Kent Channel runs close to the estuary's southeastern shoreline limiting the inter-tidal zone. It is generally composed of sand banks and limited patches of salt marsh accumulation. To the north of the town a more extensive area of salt marsh provides some shoreline protection for Arnside Moss, whilst the town itself is provided with a man-made protective frontage. The principal soil at Arnside is Shallow Loam over limestone which is suited to stock rearing, recreation and limited arable in lowland areas (Farwell 2007). The Kent is one of relatively few rivers in the United Kingdom to experience tidal bores and currently has a mean spring tidal range of 9.8m (<http://www.estuary-guide.net>).

Land use in the outer reaches of the estuary is varied between small pockets of stock rearing and Arnside town which is a small residential area popular with tourists. Walkers make use of the coastal paths and walks up Arnside Knott where there are extensive views across the estuary and the wider panorama of Morecambe Bay. The shoreline from Arnside south to Silverdale is publicly accessible and is frequented by walkers, bird watchers, tourists and dog walkers. The Kent Estuary lies within the Morecambe Bay Site of Special Scientific Interest (SSSI).



Figure 5.2 View of the Inter-tidal zone at the mouth of Kent Estuary, west of Arnside Knott, looking north.

5.2.2 Previous research

The NWRCZA Phase 1 study looked at this part of the coastline as part of Block 2 of the study area (Johnson 2011) and did not highlight specific sites in Arnside as being potentially under threat of coastal erosion and requiring rapid survey.

The area between Arnside Moss and Jenny Brown's Point (see Section 4.9) was thought to have the potential to host evidence of the past industrial character of the area that may be under threat from coastal erosion.

5.2.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of this area covered safely accessible land along the coastline from Arnside Moss to Jenny Brown's Point.

5.2.4 Medieval

Arnside is not recorded in the Domesday Book (Hinde 1985). The oldest standing building is Arnside Tower, a mid-late 15th century Peel Tower standing in a ruinous condition at the foot of Arnside Knott. This tower testifies to the late-medieval occupation of the region. The area would have had rich fishing resources, prior to the silting up of the Kent Estuary. The tower lies within the NWRCZA assessment area, but is not considered to be at risk of coastal erosion. It has, however, been placed on the English Heritage Heritage at Risk Register as being at risk of neglect and continued slow decline. It is a Grade II* Listed Building (1312275) and is also recorded in the Cumbria HER (HER: 2522).

Further evidence of medieval occupation was recorded at Far Arnside, south of Arnside town, during the Phase 1 aerial photography transcription. This consisted of medieval

lynchets, a building platform and a medieval banked enclosure (NRHE: 1002528). The enclosure is also recorded on the Cumbria HER as a scattered hamlet of various earthworks and the foundation of one possible long house (HER: 4991).

The Phase 2 survey recorded the remains of medieval lynchets (32) and an enclosure (33) at Far Arnside. The lynchets (32) consisted of the typical series of parallel earthen banks and have been ground-truthed through the Phase 2 survey (Figure 5.3). The earthwork remains are well-preserved in an area currently used for stock grazing.



Figure 5.3 Medieval lynchet at Far Arnside

The enclosure (33) was recorded as the possible remains of collapsed stone walls, now partially embanked. These formed two sides of an artificially levelled, rectilinear enclosure measuring $\approx 22\text{m}$ north-south x $\approx 30\text{m}$ east-west (Figure 5.4). It was noted that the earthwork survival was less apparent than that on the aerial photography. A banked, ramped trackway was also recorded extending from the enclosure towards the current road and shoreline. This may be a modern feature, but could mirror the position of the original access to the site. No evidence of the proposed building foundation/long house foundation was recorded during the survey.



Figure 5.4 Medieval enclosure and lynchets at Far Arnside.

5.2.5 Post-medieval

Evidence of the limeworking industry at Arnside was recorded in the form of Blackstones limekiln, at Blackstone Point, north of Arnside Knot. This site was mapped as an area polygon as part of the Phase 1 aerial photography transcription (NRHE: 1487326) and is recorded in the Cumbria HER (HER: 15862). The kiln is not depicted on the Ordnance Survey map of 1862, but is marked as an 'Old Limekiln' on the Ordnance Survey map of 1894, so it had clearly gone out of use by this date. The kiln may be associated with an 'Old Quarry' marked on the same map a short distance to the northeast

The Phase 2 survey recorded the remains of the limekiln (34) as a largely ruinous, filled in structure that contrasts sharply with the well-maintained example recorded at Silverdale ≈ 3.5 km to the southeast (see Section 4.9.5). The level of vegetative growth at the site precluded a detailed study of the monument (Figure 5.5), however it was noted that the remains currently sit above the line of coastal erosion on the foreshore.

Around 380m northeast of the remains of the limekiln, the survey recorded a fragment of steel or cast iron (35) on the beach which appeared to be a structural element consisting of a riveted and hinged bracket and attached girder (Figure 5.6). This may have been from an offshore shipwreck, or may represent the only surviving element of a dump of building materials on the beach frontage. The function of the object is unknown.

The final site recorded in this area was the remains of a small jetty or pier (40) immediately to the south of the Arnside Viaduct. This feature appears on Ordnance Survey mapping for the first time in 1898 and consisted of a linear alignment of two sets of upright timber posts running for a length of c.27m out into the inter-tidal zone (Figure 5.7). Shipping would have been an important outlet for the products of industry around Arnside and several of these small piers must have existed along the coastline in this area.



Figure 5.5 Overgrown limekiln at Blackstones, looking southeast.



Figure 5.6 Structural fragment on the beach at Arnside (scale = 1m).



Figure 5.7 Possible jetty or pier, south of the Arnside Viaduct, looking northwest (scale = 1m).

5.2.6 Threat from erosion

Of the sites recorded at Arnside (Figure 5.7), the lynchets (32), enclosure (33), limekiln (34) and structural fragment (35) lie in the outer zone of the Kent Estuary in SMP2 policy unit 11c 8.1 which recommends 'No Active Intervention' for the next 100 years, whilst the possible jetty (40), also within the outer zone of the Kent Estuary, lies within SMP2 policy unit 11c 8.4 which recommends 'Hold the Line' for the next 100 years.

The mean spring tidal range in the northeastern corner of Morecambe Bay is 8.40m (Shoreline Management Partnership 1999) and due to its orientation, it is more exposed to south-westerly storm waves than the southern section of the bay. The main influence on shoreline evolution in this section of the bay is the Kent channel, which is believed to follow a cyclical meander through the bay and this has profound effects on the development and erosion of saltmarshes (Halcrow 2011). Far Arnside is composed of stable limestone outcroppings fronted by a short shingle beach and a narrow band of eroding saltmarsh.

Predictions of future shoreline evolution along this frontage are closely linked with the cyclical movement of the Kent Channel, which is thought to run through more than one migration cycle within a 100 year period (Halcrow 2011). The shoreline is currently in an erosional trend and this is predicted to continue, particularly in light of sea level rise (Halcrow 2011). The limestone outcroppings around Far Arnside and north towards Arnside Knott, are predicted to remain relatively stable with a loss of <0.1m per year (Halcrow 2011). However saltmarsh erosion along the frontage will be more prevalent with NCERM predictions of coastal erosion at Far Arnside at between 3.4 and 6.6m in the next 100 years under current management (NCERM 2012).

According to these predictions, the medieval sites (32, 33) recorded at Far Arnside will not become under threat of coastal erosion in the next 100 years. They are therefore not considered to be at immediate or longer term risk of coastal erosion. It should be noted, however, that the area polygon mapped as part of the Phase 1 aerial photography transcription will be impacted upon within the next 100 years and this may therefore impact upon previously unrecorded, buried archaeological remains.

The limekiln (34) recorded at Blackstones Point will be at risk of long term coastal erosion under existing predictions (that is within 100 years) and both the structural fragment (35) and the possible jetty (40) lie in the inter-tidal zone and are undergoing active erosion. These sites will not be protected under current SMP2 policies and are therefore considered to be at immediate and long term risk of coastal erosion.



Figure 5.8 Location of sites surveyed at Arnside

5.3 Greenodd, Ulverston and Baycliff (Map Figure 5.16)

5.3.1 Location and geology

Greenodd (SD 31655 82466) Ulverston (SD 31224 77392) and Baycliff (SD 29199 72312) are located along the eastern shore of the Furness Peninsula in the northwestern corner of Morecambe Bay. The village of Greenodd is the northernmost of the three and is situated in the inner reaches of the Leven Estuary, ≈ 17 km southeast of Windemere. The market town of Ulverston is located a further ≈ 6.4 km southeast at the mouth of the Leven Estuary, whilst the small village of Baycliff is situated ≈ 5.5 km south of that.

The solid geology of the Furness Peninsula is complex, with Silurian Sedimentary Units in the northern section, Carboniferous Limestone around the mouth of the Leven Estuary and Permian and Triassic Mudstone in the southern section, divided by a small pocket of Millstone Grit around Newbiggin (Johnson 2011, 25). The superficial geology is dominated by Quaternary deposits of Diamicton Till around Greenodd and Baycliff and Alluvial clays, silt and sand at Ulverston (BGS 2008). The principal soil in these three areas is Loam over Shale which is suited to dairying and limited cereal production in lowland areas (Farewell 2007). The shoreline topography at all three locations is somewhat similar, although Greenodd has the narrowest inter-tidal zone of the three, being located on the western banks of the River Leven, however extensive sand flats are located to the south of the village at Greenodd Sands. All three locations are fronted by inter-tidal sand flats backed by pebble beaches (Figure 5.9).



Figure 5.9 General view of the inter-tidal zone at Greenodd in the Leven Estuary.

Shoreline land use in Greenodd, Ulverston and Baycliff is predominantly stock grazing, outside of the bounds of the village/town. Public access to the shoreline is limited in the vicinity of Greenodd, however the shoreline at both Ulverston and Baycliff is publicly accessible and used by dog walkers and tourists. A privately owned beach exists at Conishead Priory near Ulverston, however this is opened to the public as part of the

gardens of the attached estate. All three areas are located within the Morecambe Bay SSSI.

5.3.2 Previous research

The NWRCZA Phase 1 study looked at this part of the coastline as part of Block 3 of the study area (Johnson 2011) and highlighted the Greenodd, Ulverston and Baycliff quays as being important examples of post-medieval shipping in Morecambe Bay that are under threat of coastal erosion and requiring rapid survey.

At Ulverston, the site of a medieval/early post-medieval landing stage is known to be located on the shoreline at Conishead Priory (HER: 2391). At Baycliff and Greenodd, however, the exact locations of the quays are unknown. The Cumbria HER contains records for at least four quays or wharfs in the vicinity of Greenodd (HER: 5547; 16340; 16336; 16337), along with a ship building yard (HER: 16341) and a quay in the vicinity of Baycliff (HER: 3148). These records are generally based on documentary evidence, so the Phase 2 survey aimed to locate, and provide an up-to-date condition statement, of any surviving remains of these features.

5.3.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of these areas included a shoreline walkover of publicly accessible land in the vicinity of the proposed location of the post-medieval quays.

5.3.4 Post-medieval

The development of shipping along the eastern shore of the Furness Peninsula is directly related to the post-medieval and industrial exploitation of that area. The quays were concerned with the transport of raw materials and finished products to ports within Morecambe Bay, and to Liverpool where much of this coastal trade was focused. The Quays formed an integral part of the transportation network prior to the construction and expansion of the Furness Railway.

The central quay in this group of three was Ulverston which is located on the shoreline directly east of Conishead Priory, which has medieval origins. The date of construction of the quayside is not known and Newman states that it may have been built to serve to the medieval priory (HER description). However, the earliest documentary evidence dates to the post-medieval period, when the quay was principally concerned with the transportation of iron ore. The surviving landing stage at Conishead formed the end of the line for an iron ore shipment track (Johnson 2011, 139). It would also have made use of the Ulverston Canal when it was built in the late 18th century. This was a short stretch of only 2km, linking the town of the Ulverston to the Leven Estuary. It is said to have been the deepest, widest and straightest canal in England.

The quay at Ulverston was in use up until the extension of the Furness Railway from Barrow to Ulverston in 1854, after which time it went into a period of slow decline as overland transport of raw materials became more economical. The Ulverston Canal was eventually allowed to silt up and is no longer navigable.

The quay at Greenodd is known from documentary sources to have handled such goods as copper, slate and lead from mines in southern Lakeland (Johnson 2011, 139), as well as limestone, sugar, cotton and coal. The Lowood Gunpower Works also imported two of its raw materials, Sulphur and Saltpetre, from traders operating out of the Greenodd which is also known to have had a ship building yard. The quay was clearly

an important focal point for transport of materials from south Lakeland around Morecambe Bay. Shipping lanes to Greenodd were blocked, however, in 1857, when the Leven Viaduct was opened extending from Cartmel Sands to Ulverston. This obviously had a devastating effect on the quay, although it would undoubtedly have gone into decline anyway following the extension of The Furness Railway up to Greenodd, and beyond to Lakeside, Windermere in 1869.

Not much is known of the quayside at Baycliff, \approx 5km south of Ulverston, other than that it transported iron ore and limestone up the Leven Estuary to Backbarrow (Johnson 2011, 139). Its decline was probably also linked to the construction of the Furness Railway.

The Phase 2 survey at Greenodd did not locate the remains of the documented quayside and these were also not located during the Phase 1 aerial photography transcription. The survey did record the remains of a disused railway platform (36), however, which is likely to have formed part of the now dismantled extension of the Furness Railway from Ulverston, through Greenodd, to Lakeside in Windermere. It is marked as Greenodd Station on the Ordnance Survey 1:2500 map of 1890, but is no longer depicted from 1973 onwards.

The remains consisted of a section of roughly coursed limestone walling standing to a height of \approx 1.5m, below a platform constructed of roughly cut limestone blocks. The platform tapers to the ground at each end, though the northern end is in a ruinous condition, either through the action of erosion and weathering, or through stone-robbing. The platform extends for a length of \approx 68m aligned roughly north/south (Figure 5.10).



Figure 5.10 Disused railway platform at Greenodd (scale = 1m)

At Ulverston the surviving remains of a jetty or landing stage (37) were recorded on the shoreline east of Conishead Priory. These consisted of two linear alignments of timber posts running roughly east-west for a length of c.24m, adjacent to two further linear alignments of less well-preserved posts running roughly north-south for a length of c.13-16m (Figure 5.11). The arrangement forms a T-shaped structure, the head of which runs parallel to the shoreline. The marked difference in the levels of preservation of the two sets of timbers may indicate either a difference in date between the two structures, or it may indicate that the east-west aligned structure remained in use longer than the north-south aligned structure.



Figure 5.11 Surviving remains of quayside at Ulverston (Conishead Priory), looking south (scale = 1m).

Around 250m north of the quayside the survey also recorded the location of an iron object (Figure 5.12) and associated pipe and upright timbers (38). The iron object is clearly not *in situ*, but appears to have fallen off a timber base located immediately to the south. A nearby pipe may also have been related to the object, though this could not be confirmed during the survey. This purpose of this feature is unknown, but it may represent the remains of an industrial boiler although its location in the inter-tidal zone is puzzling.



Figure 5.12 Surveying the remains of an iron object and associated timber structure and pipe.



Figure 5.13 Surveying the possible remains of Baycliff Quay, looking east (scale = 1m).

At Baycliff, ≈ 5 km south of Ulverston, the Phase 2 survey recorded the remains of a timber structure that may have formed part of the quay (39). The remains consist of a timber structure extending perpendicular to the shore for a length of ≈ 77 m on an east-west alignment (Figure 5.13). The structure consists of a row of upright timber posts surviving to a height of ≈ 2 m onto which diagonal supporting posts are attached with the use of large iron fixings. The diagonal posts are ≈ 2 m in length and their opposite end is

attached to a further row of upright timber posts that appear to have been cut off at ground level.

It is unusual that there would be only a single set of surviving timbers and this raises the question as to whether this structure is simply a very large groyne or breakwater. It is not known whether the shorter cut-off posts were ever higher than their present extent, therefore forming a jetty-like structure, or whether they were always shorter posts used as anchor points for the diagonal bracers. The latter option would imply that this structure was simply a breakwater, although its location and solitary nature would be unusual. The interpretation of this feature as the remains of the quayside is therefore open to debate.

Between Ulverston and Baycliff, further remains of maritime activity were recorded at Wadhead Scar, \approx 1km south of Ulverston. These are recorded in the English Heritage National Record of the Historic Environment Record (NRHE: 1024880) as two piers for the iron ore trade. Fell states that these were in use in 1737 (Fell 1908, 91 and 315).

The survey recorded these remains as consisting of a pier (42) with associated section of seawall (43), and a further pier \approx 200m to the north (44). The first pier (42) was constructed of well-coursed limestone masonry and bore the date of 1833 with the initials I.R.G.B, though this date stone may not be a contemporary feature. The pier was well-preserved and stood to a maximum height of \approx 2.5m running for a length of \approx 8.5m. The associated seawall (43) was constructed of laid limestone cobbling at an incline, running in a semi-circular arc around the front of the jetty. It survives to a length of \approx 42m and is bonded with mortar in places and shows signs of erosion (Figure 5.14).

Around 200m to the north of pier 42 the survey recorded a further pier (44). This was also constructed of well-coursed limestone masonry and was fronted by a limestone seawall of similar construction to that recorded to the south (43) (Figure 5.15).



Figure 5.14 Remains of a pier at Wadhead Scar (42) and associated seawall (43), looking west.



Figure 5.15 Recording the remains of a second pier (44) at Wadhead Scar, looking west (scale = 1m).

Both piers (42 and 44) and the seawall (43) are depicted on the Ordnance Survey 1:2500 map of 1889 and the seawall originally linked the two piers suggesting that these were in fact a single quayside with a north and south pier.

5.3.5 Threat from erosion

The site recorded at Greenodd lies within policy unit 11c12.2 in the inner reaches of the Leven Estuary. This recommends 'Hold the Line' for the next 100 years. The remaining sites at Ulverston, Bardsea and Baycliff lie within SMP2 policy units 11c11.6 and 11c13.1 both of which recommend 'No Active Intervention' for the next 100 years (Halcrow 2011).

The Inner Leven Estuary extends northwards from the Leven Viaduct to the tidal limit at Haverthwaite. The channel meanders through inter-tidal flats north of the viaduct before becoming constrained further north at Greenodd. The northerly orientation of the estuary means that wave energy in the inner estuary is not expected to be high and this has been limited by the construction of the Leven Viaduct and its associated breakwater in the mid 19th century (Halcrow 2011). The future response of the estuary to sea-level rise has not been formally modelled, however the inner reaches have been experiencing a general trend of slow accretion and this is expected to continue (Halcrow 2011). The eastern shoreline, however, is currently experiencing saltmarsh erosion due to the proximity of the channel to the shoreline (Shoreline Management Partnership 1999). This is expected to continue until the natural meander of the channel moves further from the shore.

In light of this information and the preferred SMP2 policy of 'Hold the Line', the railway platform recorded at Greenodd (36) is not considered to be at immediate or longer term threat of coastal erosion.

The Outer Leven Estuary and the eastern shoreline of the Furness Peninsula are influenced principally by the configuration of the Leven channel, and its proximity to the shore, but also by changes within the wider zone of Morecambe Bay (Halcrow 2011). There are a series of resistant scars (most notably Wadhead Scar) along this frontage that provide some shoreline protection by fixing the position of the channel away from the shoreline. This has led to the creation of small embayments which experience localised siltation and salt marsh growth. On the wider scale, however, the construction of the Leven Viaduct has caused the Leven channel to split into two downstream and move further west along this frontage. The shoreline at the mouth of the estuary is predicted to remain stable, with erosion rates modelled at 0.1- 0.5m per year at Wadhead Hill (Halcrow 2011). However, further south the unprotected shoreline is at a greater risk of coastal erosion. NCERM predicts that coastal erosion could see the loss of between 20 and 40m at Baycliff in the next 100 years (NCERM 2012).

In light of this information, and the preferred SMP2 policy of the 'No Active Intervention', the sites recorded at Ulverston (37-38), Wadhead Scar (42-44) and Baycliff (39) are considered to be at varying degrees of risk of coastal erosion. The quayside and possible iron boiler recorded south of Ulverston are located in the inter-tidal zone and are undergoing active erosion. If the channel configuration remains stable these sites are considered to be at immediate and longer term threat of coastal erosion.

The piers (42, 44) and seawall (43) at Wadhead Scar also show evidence of damage caused by coastal erosion. The shoreline in this area is thought to be stable, however these heritage assets are providing the current shoreline protection, rather than being protected themselves. For this reason, the sites recorded at Wadhead Scar are also considered to be at immediate and longer term risk of coastal erosion.

The possible jetty at Baycliff (39) is predominantly an inter-tidal feature, however the westernmost portion of the asset will currently only be under water at extreme high tides and storms. NCERM predicts a shoreline retreat of between 20 and 40m at this location under the 'No Active Intervention' scenario, this means that the jetty will come under increasing, unmanaged damage from coastal erosion that will ultimately lead to its complete destruction in the next 100 years. It is considered to be at high risk of coastal erosion.

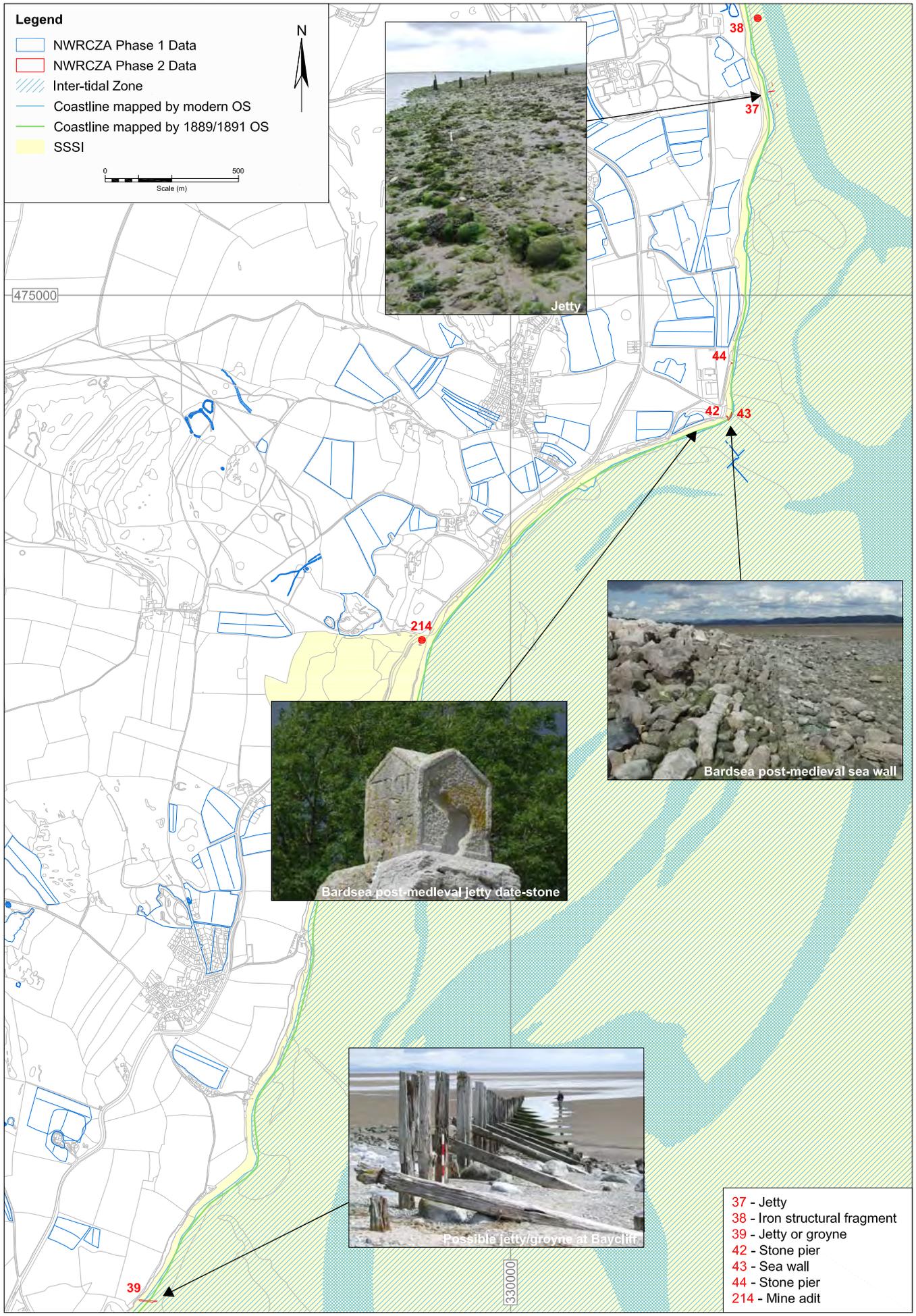


Figure 5.16 Location of sites surveyed at Ulverston, Baycliff and Bardsea

5.4 Aldingham (Map Figures 5.24 and 5.25)

5.4.1 Location and geology

Aldingham Parish (SD 34354 47807) lies on the eastern shore of the Furness Peninsula, on the northern arm of Morecambe Bay. It is c.4km south of Bardsea and contains several villages, including Aldingham, Newbiggin and Baycliff (see Section 5.3) along the coast.

The Furness Peninsula has a complex geological sequence (see Section 5.3.1), however the predominant solid geology in Aldingham Parish is Alston Formation Calcareous Mudstone with a superficial geology of Devensian Diamicton Till (BGS 2008). The shoreline is comprised of largely unprotected till cliffs in the south of the parish, with localised gabion walling, to protect the road infrastructure, and sea walls, to protect the church, in the north of the parish (Figure 5.17). The till cliffs are fronted by a narrow pebble beach and extensive inter-tidal sand flats. The principal soil in the area is Loam over Shale which is suited to stock rearing and limited cereal production in lowland areas (Farewell 2007).



Figure 5.17 The foreshore at Aldingham, looking north showing the narrow pebble beach with extensive inter-tidal sand flats. The sea wall in front of the church is visible in the background.

Land use in Aldingham is predominantly stock rearing and equestrian pursuits. The shoreline is publicly accessible as part of the Cumbria Coastal Way and is used predominantly by dog walkers and visitors from the nearby caravan park. Aldingham lies within the Morecambe Bay SSSI.

5.4.2 Previous research

The NWRCZA Phase 1 study looked at this part of the coastline as part of Block 3 of the study area (Johnson 2011). It highlighted Aldingham Motte and Bailey as undergoing active coastal erosion and requiring rapid survey. Aldingham Motte and Bailey was

mapped as part of the Phase 1 aerial photography transcription as the earthwork remains of a motte and bailey with an associated medieval ditch (NRHE: 37622). Both of these elements comprise a Scheduled Monument (27682), and both are recorded in the Cumbria HER (HER: 16082; 2613). Aerial photographs and Google Earth™ shows that around a third of the motte, and probably a significant part of the bailey, have already been lost to coastal erosion.

The motte and bailey was subject to a rescue excavation in 1968 due to the ongoing loss of the site to coastal erosion. The excavations, conducted by B.K. Davison for the Ministry of Public Buildings and Works (M.P.B.W.), revealed three main phases of activity at the site, beginning with its original construction as a ringwork castle in the early 12th century, and ending with its abandonment in the early 13th century (Wilson and Hurst 1969, 258). The excavation was published as a short report in *Current Archaeology* (Davison 1969), however a full excavation report has not been published.

5.4.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of this area involved a walk-over of publicly accessible areas along the shoreline of Aldingham Parish.

5.4.4 Prehistoric

Birkrigg Common lies just to the north of the parish boundary of Aldingham and is home to a concentric stone circle of Bronze Age date, known as the Druid's Temple or Druid's Circle. The site was mapped as part of the Phase 1 aerial photography transcription (NRHE: 38039) and is a Scheduled Monument (27658) also recorded in the Cumbria HER (HER: 2376).

The site consists of an inner and outer circle with diameters of *c.*8.5m and *c.*24m respectively, formed by low Carboniferous Limestone orthostats. The inner circle was excavated by Gedard and Dobson in 1911, with a further excavation carried out by the North Lonsdale Field Club in 1921. These revealed a cobbled pavement within the inner circle, beneath which five cremation burials were uncovered; three within pits, one on a cobbled surface and one beneath an inverted cinerary urn (Gedard and Dobson 1912). Further finds included a lump of red ochre, a sandstone disc, a stone knife and a possible pestle (Burl 2005, 69). The excavations also revealed several patches of blackened earth interpreted as the possible location of funeral pyres. The cobbled pavement extended outside the inner circle for *c.*0.5m, no further excavations are known to have been undertaken in the area between the outer and inner circle. The site is described as overgrown in Burl's *Stone Circles of the British Isles* (Burl 1976, 5) and is known to have a problem with bracken growth, obscuring the stones of the outer circle in particular. Further to this, the site has been placed on the English Heritage Heritage at Risk Register (2011) with its principal vulnerability being vandalism. This follows vandalism to the site when paint was thrown over the stones of the inner circle.

The Phase 2 survey recorded the remains of the stone circle (215) as consisting of two concentric rings of upstanding and recumbent stones forming the inner and outer circles (Figure 5.18). The inner circle was more apparent than the outer circle which was partially obscured by bracken. The site sits on a grassed flattened platform which shows signs of the previous excavations in the form of undulations within the inner circle and around its stones. The Phase 1 aerial photography transcription recorded the remains of an earthwork of uncertain date next to the stone circle (NRHE: 1487837). This feature had the appearance of a hollow way leading up to, and past, the stone circle site (Figure

5.19). However the date of this hollow way and its relationship with the stone circle is impossible to ascertain without excavation.



Figure 5.18 The inner circle of the Druid's Temple, Birkrigg, looking southeast.



Figure 5.19 Possible hollow way running towards the stone circle at Birkrigg, looking southeast.

The survey recorded the location of five additional stones (215) in the outer circle that were not mapped in the aerial photography transcription, presumably because these were overgrown at the time when the photographs were taken. Only around half of the stones

that comprise the outer circle were visible at the time of survey, the rest either being obscured by bracken or buried. Bracken is a significant problem at the site and most likely obscures the remains of further heritage assets across Birkkrigg Common which is known to contain an enclosed hut circle settlement (SAM: 27681) and several Bronze Age barrows and cairns (SAM: 27681; 27690; 27691; 27692) which lie outside the NWRCZA project area. Although these individual sites are all Scheduled Monuments, clearly Birkkrigg Common as a whole was a focus of Bronze-Age and perhaps earlier activity. The common is currently non-designated and no formal management of bracken is in place at the site. In the stone circle, the grassed area of the inner circle is said to be maintained simply by the level of footfall across this part of the site (David Coward pers. comm.)

The site was visited in November 2011 and March 2012 and on both occasions flowers had been placed next to stones of the inner circle, and a hearth in the centre of the circle showed signs of recent use. The site, situated on common land with extensive views across Morecambe Bay, is clearly important to local people and visited on a regular basis.

5.4.5 Medieval

Aldingham is recorded as a village in the Domesday Book of 1086 when it was listed as being king's land, held by the Anglo-Saxon, Ernulf (Hinde 1985, 155).

Excavations on the motte and bailey castle at Aldingham revealed that it was initially constructed as a ringwork castle in the early 12th century, based on the pottery typology (Davison 1969, 24). This phase of work is usually ascribed to either Roger de Poitevin or Micheal le Fleming. De Poitevin had extensive land holdings in the south of Lancashire and expanded these into North Lancashire and (modern) South Cumbria after 1092. However, he lost all of his English landholdings after 1102 when he supported Robert Curthose in his failed rebellion against Henry I. Based on the pottery evidence this means that the ringwork may also be ascribed to his successor Michael le Fleming who was granted De Poitevin's holdings in Aldingham sometime between 1107 and 1111 (Davison 1969, 23-4). Ringwork castles are generally considered to be the quickest and easiest form of castle to build and as such they form the first phase of construction at many castles across the British Isles (Liddiard 2005, 18). That such a castle should be built at Aldingham gives the impression that the construction took place whilst the land was still contested, giving some credence to its assignation as the work of de Poitevin in the early years of the Norman occupation of this area.

The second phase of construction, dated to the mid-12th century, saw the ringwork transformed into a motte and bailey when the enclosed area of the ringwork was infilled and levelled to form a low flat mound (Davison 1969, 24). This phase can perhaps be seen as Le Fleming's appropriation and development of the site in more settled times. The third phase of construction, dated to the late 12th – early 13th century saw the further heightening of the motte and the construction of a vertical timber revetment around the outside, disguising the typical sloping sides of the motte behind a facing wall of timber. Similar revetments may have been a common feature at castles of this type and were first noted during excavations at South Mimms in Hertfordshire (Kent 1963, 255). Nevertheless large-scale excavations of mottes are rare, so this remains one of the few examples of this feature in England (Goodall 2011, 76). The motte appears to have been abandoned in the early 13th century before this phase of work was complete (Davison 1969, 24).

Throughout the excavations in 1968 the excavated material from the eroding face of the motte was dumped over the cliff edge and washed away by the sea, leaving an exposed east-facing section *c.*3-5m from the cliff edge (Davison 1969, 24). It is not known whether this was provided with any form of protection following the completion of site works.

The Phase 2 survey recorded the remains of the motte and bailey as consisting of a motte with encircling moat and slight raised bank, together with an outer ditch interpreted as the bailey fosse (Figure 5.20). The erosion scar along the base of the till cliff, on which the motte and bailey sits, was surveyed on two occasions; in July 2011 (41) and March 2012 (236). The base of the cliff had shifted *c.*1m eastwards towards the shore by March 2012, presumably as a result of the slumping of material from the top of the cliff face to the base. This testifies to ongoing erosion at the site. Two points of significant erosion were also recorded (237, 238) and these corresponded with the points where the moat around the base of the motte meets the cliff edge (its entire eastern arm having eroded previously). Water from the surrounding fields drains into the moat which in turn channels this water over the cliff face, exacerbating cliff face erosion at these locations.



Figure 5.20 Aldingham motte and bailey showing the eroding cliff face and its situation in the landscape.

The motte and bailey is on private land and is fenced off from the surrounding fields, which are used for grazing horses associated with the nearby equestrian centre. Around 100m inland from the motte and bailey, in the same land parcel, are the remains of a square moated site which is also a Scheduled Monument (27683). It is not considered to be at risk of coastal erosion, but has a group relationship with the motte and bailey site (Scheduled Monument Description). The fields surrounding the motte and bailey also contain post-medieval narrow ridge and furrow (Figure 5.21).



Figure 5.21 Southern corner of Aldingham moated site to the left of the photograph, ridge and furrow in the foreground and motte and bailey castle in the background, looking southeast.

5.4.6 Post-medieval

As discussed in Section 5.3, the eastern shore of the Furness Peninsula was heavily involved in the mining and transportation of iron ore and copper. Immediately to the east of Birkrigg Common, the Cumbria HER records Sea Wood Copper Mine as the site of a disused mine shaft (HER: 18080).

The Phase 2 survey recorded the location of the entrance to this shaft (214) as consisting of a small, sheet-metal lined opening of $\approx 0.5 \times 0.4\text{m}$ at the foot of a quarried out section of the surrounding limestone outcrop (Figure 5.22). The shaft is disused and allegedly flooded to the roof due to the silting up of Morecambe Bay (David Coward pers. comm.). There are several remains of quarries, spoil heaps and mine shafts (HER: 5580; 18078; 18079; 18095; 18098) along the eastern edge of Birkrigg Common that give some semblance of the past industrial character of this area.

5.4.7 20th Century

The eastern shoreline of the Furness Peninsula is remarkably free from the 20th coastal defences that characterise much of the present shoreline elsewhere in the study area. This is presumably related to the sheltered location of this side of the peninsula, together with the concentration of defences present on Walney Island (see Section 5.6) and Barrow at

the entrance to Morecambe Bay. The Phase 2 survey recorded the remains of a demolished structure of presumed Second World War date (235) on the foreshore at Aldingham, c.250m northeast of the motte and bailey. The remains covered an area of c.135m² and consisted of concrete and sections of bonded brick walling (Figure 5.23). These remains were most likely brought to this location from elsewhere.



Figure 5.22 Entrance to Sea Wood Copper Mine, looking west (scale = 1m).



Figure 5.23 Remains of possible Second World War structure at Aldingham.

5.4.8 Threat from erosion

The sites recorded in Aldingham Parish (Figure 5.24 and 5.25) lie within SMP2 policy unit 11c13.1, which recommends 'No Active Intervention' for the next 100 years. This states 'allow natural processes to continue, however localised defences may be permitted subject to consent' (Halcrow 2011).

The eastern shoreline of the Furness Peninsula is influenced principally by changes within the wider zone of Morecambe Bay (Halcrow 2011). Along the frontage of Aldingham Parish the shoreline is provided with some natural protection in the form of a series of resistant scars (Leonard Scar, Newbiggin Scar, Moat Scar, Elbow Scar and Wadhead Scar) which fix the position of the low water channel away from the shoreline. Nevertheless, over the past 150 years the shoreline at Aldingham has experienced a gradual erosional trend due to the migration of the low water channel towards this shoreline. This increases the wave exposure at this location where there are only localised man-made defences (Halcrow 2011). The mean spring tidal range along this frontage is 8.2m (Shoreline Management Partnership 1999). Halcrow predict that under current management the shoreline at Aldingham will retreat by between 10 and 50m in the next 100 years, whilst NCERM predict a loss of between 20 and 40m (Halcrow 2011; NCERM 2012).

The significant rate of erosion at Aldingham clearly threatens the majority of the sites recorded in this location. Only the stone circle at Birkrigg (215) can be considered to be free from the threat of coastal erosion, owing to its location on high ground over 500m from the shore. This being said, Birkrigg is under threat of damage from other sources, such as vandalism, unmanaged bracken growth and footpath erosion.

The most significant site at risk of erosion in this location is clearly Aldingham Motte and Bailey (41) which has already lost a substantial proportion of its total area to coastal erosion and rescue excavation. Whilst the excavations have been informative about the morphological development of the site, they were less informative on the presence or absence of buildings within the complex, did not include the castle bailey and failed to investigate the relationship between the developments taking place within the castle and the establishment of the nearby moated site. The results of the excavation have never been fully published and a more rigorous analysis of the dating of the phases of construction may provide some clarification as to who was responsible for its initial construction. The site retains large amounts of undisturbed archaeological deposits and there are clearly questions about the site and its wider significance that remain unanswered.

A loss of 40 – 50m of ground at this location, assuming that the cliff edge remains at its current inclined angle, would see the complete loss of the motte within the next 100 years and the almost complete loss of its associated moat and bailey. It is therefore considered to be at immediate and longer term risk of coastal erosion. The SMP2 assessment of erosion at this site states that 'the seaward side of the monument has been partially destroyed by coastal erosion and is clearly at risk of further coastal erosion' (Halcrow 2011).

The mine shaft (214) and ruined Second World War (235) building recorded as part of the survey are also at immediate and longer term risk of coastal erosion under these predictions, although the later site is considered to be of negligible significance.

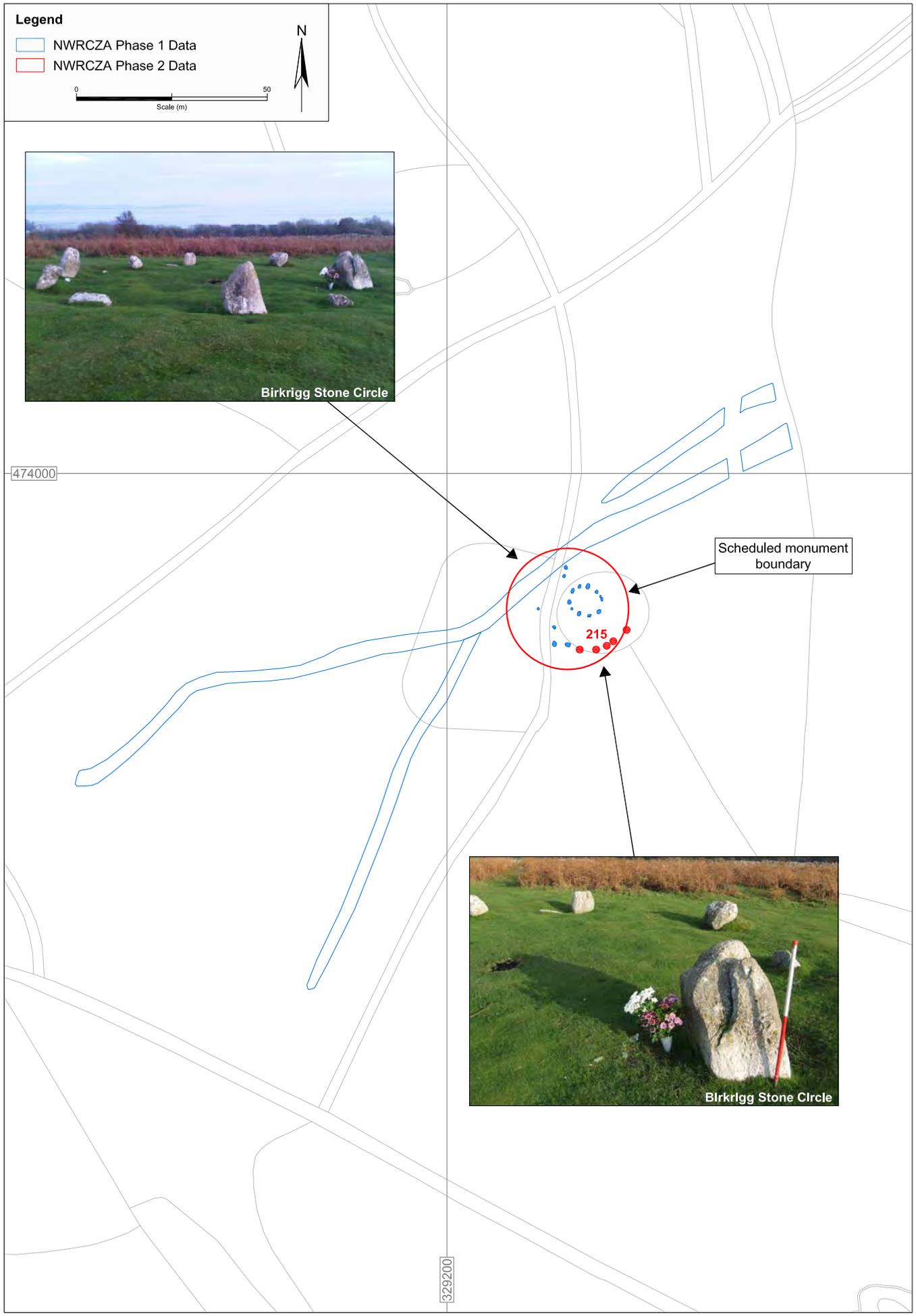


Figure 5.24 Location of sites surveyed at Birkrigg

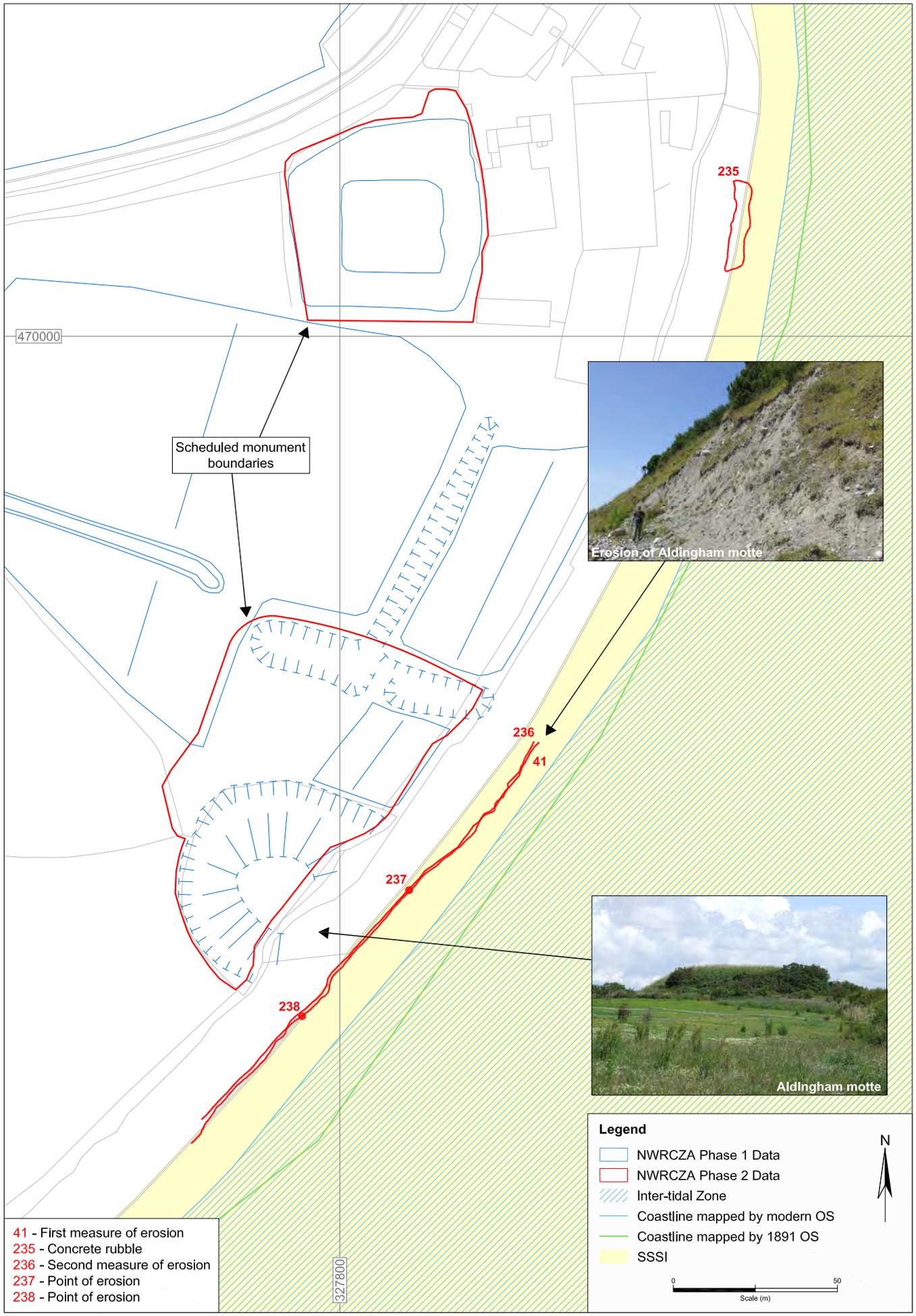


Figure 5.25 Location of sites surveyed at Aldingham

5.5 Piel Island (Map Figure 5.29)

5.5.1 Location and geology

Piel Island (SD 23198 63767) lies in the northwest corner of Morecambe Bay between Walney Island, ≈ 2 km to the west, and Roa Island, ≈ 0.75 km to the north. It is a small, tear-drop shaped island measuring ≈ 500 m in length and ≈ 300 m in width. The island can be accessed on foot from Walney Island at extreme low tide, however it is usually accessed by boat from nearby Roa Island.

Piel is a low lying inter-tidal Island, bounded on its north side by the Piel Channel that feeds into the Walney Channel to the northwest giving access to the docks of Barrow-in-Furness. It is characterised by a solid geology of St Bees Sandstone (Figure 5.26). The superficial geology on the north of the island is composed of Gravel Storm Beach deposits, whilst that on the southern half of the island is composed of Quaternary Devensian Diamicton Till (BGS 2008). There are a series of resistant scars between Piel and the Islands of Roa and Walney (Haws Scar, Coup Scar and Head Scar), and between Piel and the wider inter-tidal sands of Morecambe Bay (Foulney Twist, Conger Stones, High Bottom). The island's principal soil is Dune Sand which is suited to recreational usage and very limited agriculture (Farewell 2007). The natural till cliffs on the south of the island have been provided with localised coastal defences in the form a patched frontage of cobble and concrete walling. The shoreline is fronted by a narrow shingle beach.



Figure 5.26 Piel Island from Roe Island, looking south.

Piel Island was gifted to the people of Barrow-in-Furness by the Duke of Buccleuth in 1920 as a memorial to the First World War. It is managed by Barrow Borough Council and has a small residential population that includes the nominated 'King of Piel' – the landlord of the island's single public house. The coastline is publicly accessible and generally used by tourists, fishermen and bird watchers. The Island sits within the South Walney and Piel Channel Flats SSSI.

5.5.2 Previous research

The NWRCZA Phase 1 study looked at Piel Island as part of Block 4 of the study area (Johnson 2011). It highlighted Piel Castle as being potentially under threat of coastal erosion and requiring rapid survey. It was noted that the rapid survey should focus on the action of erosion at the site (Johnson 2011, 218).

The extent of Piel Castle was mapped as part of the Phase 1 aerial photography transcription as a medieval castle (NRHE: 37706). It is a Scheduled Monument (13566), and a Grade I Listed Building (388354) and is recorded in the Lancashire HER (HER: 2618). The castle has suffered from previous coastal erosion with the eastern portion of the donjon, and the southeastern curtain and corner tower of the inner bailey, having collapsed into the sea (Newman 1987, 102). It is now in the care of English Heritage and is open to the public.

The castle was partially restored in 1876-8 by the Duke of Buccleuth prior to his granting of the Island to Barrow-in-Furness. This included the reconstruction of the donjon's staircase, doorways and window surrounds, as well as the construction of a wallwalk along the top of the gate house into the inner bailey (Newman 1987, 115). Consolidation work at this time included placing a concrete capping on the top of all the walls and the construction of a sea wall, which slowed the rate of erosion along the southern and eastern side of the structure (Johnson 2011, 162).

The Cumbria and Lancashire Archaeological Unit conducted a structural survey and limited excavation at the castle in 1983-4 on behalf of English Heritage (Newman 1987, 101). This revealed two distinct phases of construction which began in the early-14th century, with the construction of the outer bailey, and ended with the addition of the donjon, inner gatehouse and inner northwestern tower. The donjon also exhibited evidence of changes to the original design during its construction (Newman 1987, 112). Few finds of medieval date were uncovered during the excavation, leading Newman to conclude that the castle was never intensely inhabited (Newman 1987, 116). She also argued against an entirely military interpretation of the site, since the donjon contained large first-floor windows which would undermine defensive measures in place elsewhere. She argues instead that it was intended as a retreat for Abbot of Furness, albeit a semi-fortified one in light of the threat of Scottish raids (Newman 1996, 116).

In 1987 Barrow District Council repaired the sea walls constructed by the Duke of Buccleuth in the late 19th century, following which English Heritage embarked on a five year consolidation and repair programme (Newman 1996, 122). This was designed to slow the erosion of the fabric, stabilise the monument for the next half century and deter vandalism. Periodic inspections of the site are made by English Heritage to assess the effectiveness of the seaward defences and provide up-to-date condition statements on the remains. One such inspection was carried out in 2009 when it was noted that some of the defence were in poor or very poor condition and recommendations were made for small-scale repairs (Purcell Miller Tritton 2009, A7.0).

The site was inspected in September 2010 as part of the English Heritage Coastal Estate Risk Assessment (Hunt 2011, 91-5) which noted that erosion of the castle's standing remains appears to be successfully managed by the programme of consolidation works and maintenance of the seawalls. It noted, however, that earthwork remains associated with the castle's environs were at risk of erosion, in particular a circular feature on the northeastern corner of the donjon (Hunt 2011, 93). The report recommended that an

earthwork survey to Level 3 standard (Ainsworth *et al* 2007) and perhaps geophysical survey of the castle and its vicinity would be beneficial in order to understand the significance of these remains prior to the production of suitable management options (Hunt 2011, 94-5).

The Phase 2 project design was drawn up prior to the publication of this English Heritage Coastal Estate Risk Assessment (Hunt 2011) and the Phase 2 site survey was also conducted prior to its publication. It therefore did not target the above mentioned earthwork remains for further assessment. The purpose of the Phase 2 survey in this location was to provide an up-to-date assessment of the condition of the seaward defences.

5.5.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of this area involved a walk-over of the shoreline south of the castle.

5.5.4 Medieval

Piel Island was known as Fotheray in the medieval period which appears to derive from the Old Norse *fouder*, meaning fodder and *ay* meaning island. The Island was granted to Savignac monks in 1127 by King Stephen and passed to the Cistercian Order when the Savignac's became part of that denomination. The Abbot of Furness Abbey was granted a Licence to Crenellate in 1327, though it appears that this simply regulated an existing building; it reads 'licence for the abbot and convent of Fourneys to crenellate their dwelling house of Fotheray in Fourneys, co. Lancaster' (Newman 1996, 101). The Abbot's petition cites the threat of Scottish raids as the reasoning behind fortification; however the control of access to sea fishing recourses and the levying of taxes upon traders from Ireland and the Isle of Man must also have come under their consideration (Goodall 2011, 247).

The masonry remains at the site largely date to the early-14th century and comprise a moated inner and outer bailey, donjon, gatehouse, mural corner towers and a free-standing structure usually interpreted as a chapel. It is constructed of cobbled rubble masonry with red sandstone dressings. The outer bailey only encloses the landward northwestern corner of the inner bailey, the southeastern corner being bounded by the sea. The inner bailey is accessed via a gatehouse over the moat and contains the square, three-storey donjon with diagonally buttressed corners. The donjon is unusual as it is constructed with two spine walls rather than a single spine wall and this creates a set of three parallel chambers of equal size at each level inside the structure (Scheduled Monument Description).

The Phase 2 survey recorded the remains of the castle as described in the Scheduled Monument and Listed Building descriptions (Figure 5.27). The specific aim of the survey was to further assess the action of erosion at the site. As stated, the shoreline is currently protected by a patched sea wall of cobbles and concrete. This is carried at an angle up the cliff edge around the southeastern corner of the island. The sea wall is showing some signs of decay, but is generally sound and is monitored regularly by English Heritage (Figure 5.28). The Phase 2 survey mapped the eroding shoreline in June 2011 (72). This will act as a benchmark against which future erosion can be measured.

Several large fragments of the castle have collapsed onto the beach and are actively eroding (Figure 5.28). These were recorded at 1:50 scale by The Cumbria and Lancashire Archaeological Unit in 1987 as part of consolidation works and are thought to comprise fragments of the inner and outer northeastern towers and the southern curtain wall (Newman 1996, 129-30). These largely collapsed in the 18th and early 19th century (Hunt 2011, 94).



Figure 5.27 Piel castle viewed from the south of Walney Island, looking north.



Figure 5.28 Sea wall and collapsed castle masonry on the southern shore of Piel Island.

5.5.5 Threat from erosion

Piel Island (Figure 5.28) lies within SMP2 policy unit 11c13.5, which recommends 'No Active Intervention' for the next 100 years. This states 'Limited defences present, allow natural processes to continue. However, localised defences may be permitted subject to consent, e.g. at Piel Castle' (Halcrow 2011).

Piel Island is located adjacent to the mouth of Morecambe Bay and sits next to the tidal Piel Channel, and as such it is more exposed to wave action than other parts of bay. This said, the island is provided with several points of protection, most notably its sheltered location behind Walney and Foulney Islands and south of Roe Island (Halcrow 2011). Also of note are the resistant scars that sit between it and the wider sands of Morecambe Bay. Direct wave exposure is therefore limited to waves which have been diffracted around Walney Island, locally-generated waves, and waves propagated from the Eastern Irish Sea into the mouth of Morecambe Bay (ABP Marine Environmental Research 2003). The channel configuration within the bay is an important contributing factor to erosion or accretion at Piel Island and the predictions of future shoreline behaviour are based upon the configuration remaining unchanged. It is predicted that existing defences will maintain the shoreline position, but that they will come under increasing pressure with sea-level rise, as will the protective resistant scars around the Island (Halcrow 2011). NCERM predict a loss of between 3.4 and 6.6m of coastline in the next 100 years under present management (NCERM 2012).

The erosion risk at Piel Castle is currently managed by English Heritage and previous erosion has been mitigated by consolidation works and detailed recording (Newman 1987; 1996). Despite this, if measured from the existing eroding shoreline (72), a loss of between 3.4 and 6.6m will impact upon the standing remains of the castle and any previously unknown buried archaeological deposits. The English Heritage Coastal Estate Risk Assessment noted the erosion of earthwork remains in the castle's environs. For this reason the castle and its immediate vicinity are considered to be at long term risk of coastal erosion, that is within the next 100 years. Halcrow's assessment of erosion at this site states that 'its location of Piel Island means there is a high risk from flooding and coastal erosion' (Halcrow 2011). The SMP2 does indicate that consent could be available for localised defence schemes to allow for the management of Piel Castle as a nationally important monument (Hunt 2011, 91).

It is noted that the consolidation works carried out in the late 1980s were designed to stabilise the remains for the following half century (Newman 1996, 121). This indicates that the work should come under review in 25 years time, by which point NCERM predicts that between 0.68 and 1.32m of ground will have been lost to coastal erosion (NCERM 2012). This review may provide an opportunity to measure the actual loss against the predictions and formulate future erosion risk management plans accordingly.

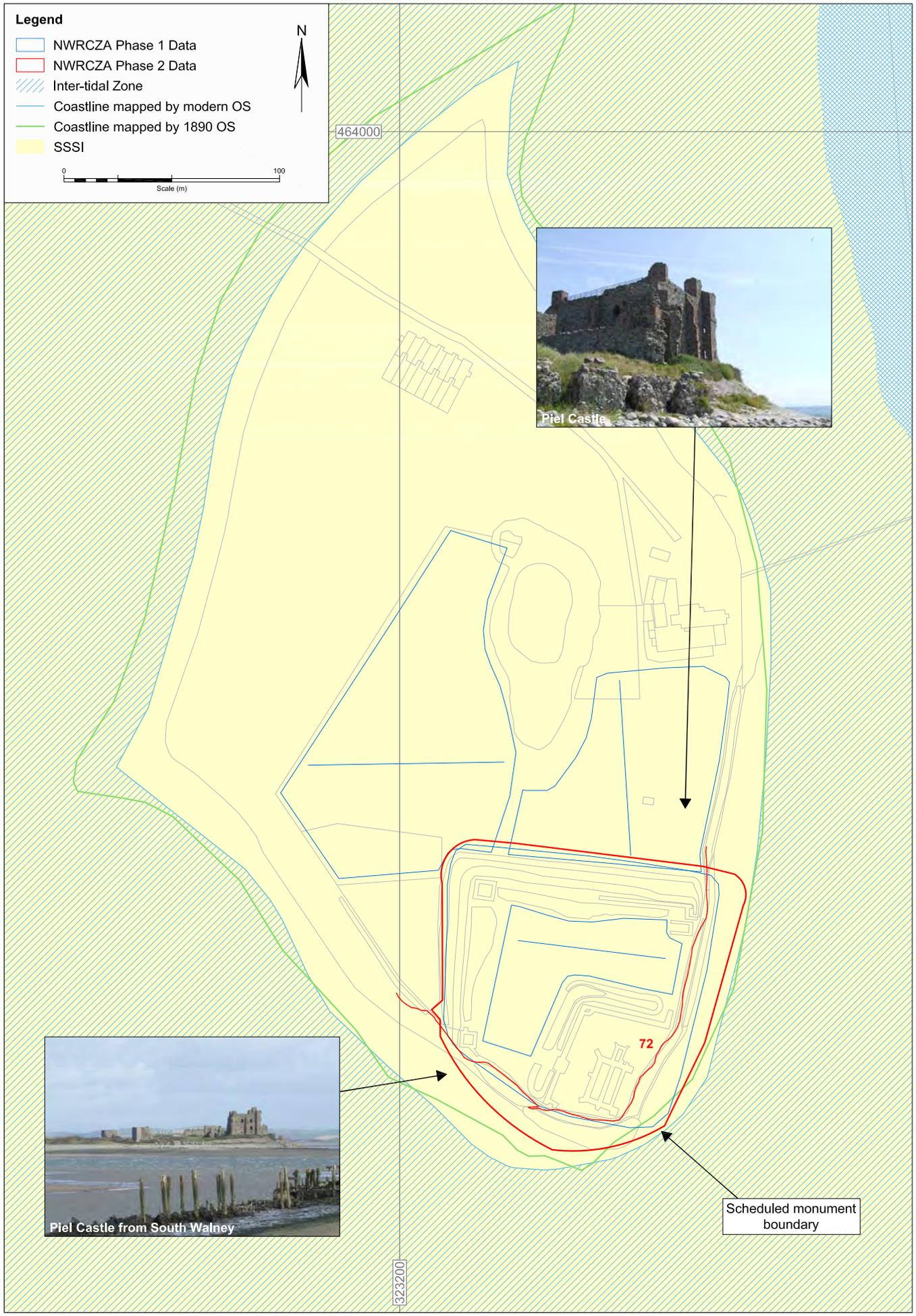


Figure 5.29 Location of sites surveyed on Piel Island

5.6 Walney Island (Map Figures 5.64 - 5.66)

5.6.1 Location and geology

Walney Island (SD 18713 66217) forms the northwestern corner of the mouth of Morecambe Bay and lies at the southwestern corner of the mouth of the Duddon Estuary. It is *c.*4km west of Barrow-in-Furness from whence it is accessed via Jubilee Bridge over the Walney channel. It is a long thin island measuring *c.*12.5km north-south and *c.*1km east-west at its widest point. On the northern and southern ends, large sand and shingle ridges project into the Duddon Estuary and Morecambe Bay respectively.

Walney Island is bounded by the Walney Channel to the east and the Irish Sea to the west. The island was formed following the last glaciation when the retreat of the ice sheet deposited various layers of sand, gravel and till (Halcrow 2011). It was eventually separated from the mainland following eustatic sea-level rise. The solid geology of the island is therefore a combination of Sidmouth Mudstone Formation and Triassic Mudstone, Siltstone and Sandstone (BGS 2008). This is topped by a superficial geology of Diamicton Till. The principal soils on the island are predominantly Dune Sands suited to recreation, with outcroppings of Seasonally Wet Deep Clay suited to the production of cereals, vegetables and horticultural crops (Farewell 2007). The coastline is largely undefended and is composed of low till cliffs fronted by shingle beaches, on the west side of the island, and mudflats and saltmarsh on the east (Figure 5.30).



Figure 5.30 Inter-tidal zone of the western side of Walney Island, looking northwest.

Current land-use on Walney varies between the urban conurbation of Vickerstown on the east side of the island, the nature reserves on the north and south of the island and stock grazing in the central portion. Much of the shoreline is publicly accessible, especially in the south where it forms part of the Cistercian Way, however access is limited at certain times of the year due to ground-nesting birds. The northern half of the island lies within the Duddon Estuary designated SSSI, whilst the southern half lies within the South Walney and Piel Channel Flats designated SSSI.

5.6.2 Previous research

The NWRCZA Phase 1 study looked at Walney Island as part of Block 4 of the study area (Johnson 2011). It highlighted the prehistoric lithic scatters and middens at Trough Head, Cow Leys Lane and North End, as well as the First and Second World War practices trenches and H5 and Hilpsford anti-aircraft batteries as being potentially under threat of coastal erosion and requiring rapid survey (Johnson 2011, 217).

The archaeology and palaeoenvironment of the Lowland Cumbrian Wetlands has been studied by Hodgkinson *et al.* (2000) as part of the North West Wetlands Survey. This states that the prehistoric occupation of Walney Island is evidenced by the recovery of significant concentrations of Mesolithic, Neolithic and Bronze Age lithics across the island, but mainly from its eroding western shoreline (Hodgkinson *et al.* 2000, 35). These mostly consist of isolated flint finds from the eroding cliff edge, however concentrations of Mesolithic material have been noted at Trough Head and Cow Leys Lane, both of which are recorded in the Cumbria HER (HER: 2616 and 2624/2735) and excavations at North End revealed evidence of Mesolithic settlement (HER: 1496). These areas formed the focus of the prehistoric element of the survey on Walney.

The more modern element of the survey focused on the First and Second World War periods, neither of which has been the focus of notable study, save for the aerial photography transcription of the island undertaken as part of Phase 1 of this project. This identified over 200 features of wartime date on Walney Island which acted as the main defence point for the ship building port at Barrow and the wider region of Morecambe Bay (Johnson 2011, 179).

5.6.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of this area involved a walk-over of publicly accessible land around the north, south and west of the island.

5.6.4 Prehistoric

Cow Leys Lane is described in the Cumbria HER (HER 2614/2735-6) as a flint chipping site, or lithic working site, where a small anvil stone, several flint scrapers and honey-coloured hollow scraper (HER: 5604) were recovered in the mid-1950s.

Trough Head is also described in the Cumbria HER (HER 2616) as a settlement site where Mesolithic flints including a broken perforated macehead, microliths, cores, blades, flakes and scapers were found eroding out of the till cliffs between 1950 and 1970. A sherd of a Western Neolithic bead-rimmed pot and two sherds of Bronze Age food vessels were also recovered in this location in 1950, suggesting that the site was also occupied in the Neolithic to Early Bronze Age transition.

Excavations were undertaken at North End from 1938-1950 and revealed evidence of Late Neolithic or Early Bronze Age flint chipping and settlement sites across the area. This included polished stone axeheads, flint scrapers, corers, barbed-and-tanged and leaf-shaped arrowheads, knives, anvils, cores and 'winkle pins' and a small amount of Beaker pottery. Evidence of settlement included midden refuse containing shells, charcoal and animal bones (Cross 1938; 1939; 1942; 1946; 1949; 1950).

The Phase 2 survey of Walney was conducted with the aid of local amateur archaeologist and ex-National Trust Warden David Coward, who has an extensive knowledge of the

area and its prehistory and palaeoenvironment. No eroding remains were recorded at the sites described above, suggesting that erosion of these prehistoric remains has ceased, at least temporarily. The survey did record accurate locations for areas where significant quantities of flints have been recovered in the past, and where there are suspected prehistoric habitation sites (203, 204).

The first site recorded (203) was a low uneven mound (Figure 5.31) said to contain shells and fire-cracked basalt rocks (David Coward *pers. comm.*). This is described in the Cumbria HER as the site of a possible hearth (HER: 41881) and lies about midway between the west and east shores of the island, c.300-450m from the sea.



Figure 5.31 Recording the low mound of uneven ground, interpreted as a possible hearth site (scale=1m).

A further group of suspected prehistoric habitation sites was recorded in the north end of the island (204). Each of these consisted of a large open area, possibly indicating the location of previous dune blow-outs, which contain a concentration of stones that do not have the appearance of beach cobbles (Figure 5.32). These may be the fire-cracked basalts from a prehistoric hearth (David Coward *pers. comm.*). These sites were located in areas where flint finds are common and were within c.150-300m of the excavated Neolithic settlement at North End (HER: 1496). Barnes states that the volume of material uncovered at North End, and the fact that it is still largely covered in a dune system, means that it will be many years before all of the prehistoric archaeology at Walney is identified and recorded (Barnes 1951, 10).

The suspected sites, recorded in Phase 2, together with the excavated examples therefore provide a glimpse of the prehistoric occupation of this island which appeared to favour the northern and seaward side of the island. Whilst this may be a consequence of the increased recovery of archaeological objects from the eroding sand dunes, Hodgkinson *et al.* (2000) argue that the extent of activity suggests that there are many more sites to be discovered, which are likely to be focused around resource-rich areas along the fossil coasts in and under the wetlands of Southern Cumbria (Hodgkinson *et al.* 2000, 59).



Figure 5.32 Large open area containing possible fire-cracked basalts (scale=1m).

One such fossilised coastline was recorded as part of the Phase 2 survey at the north end of Walney Island, where evidence of eroding glacial till and marine silt deposits (60) was recorded at the foot of a raised storm beach (61). David Coward has subsequently collected a selection of lithic artefacts and animal bone in the vicinity of this erosion scar (Figure 5.33) and has proposed a programme of further work to investigate this site in a methodical manner and monitor erosion.



Figure 5.33 A selection of artefacts recovered from the vicinity of site (60) in April 2012 (©David Coward).

At the south of the island hoofprints and faunal remains, including deer antlers and a cattle skull, have also been recovered from eroding inter-tidal silts, south of Hilpsford scar (Figure 5.34; Dave Coward *pers comm.*). This site could not be inspected during the Phase 2 survey owing to tidal conditions but it potentially provides important evidence of the past environment and ecology of the island. Their presence implies that prehistoric sediment units containing archaeological and palaeoenvironmental remains are being actively eroded from this stretch of coastline. These faunal remains have been submitted for radiocarbon dating as part of this project. It is possible that the faunal remains are related to the animal hoofprints and that they date to the same period of activity.

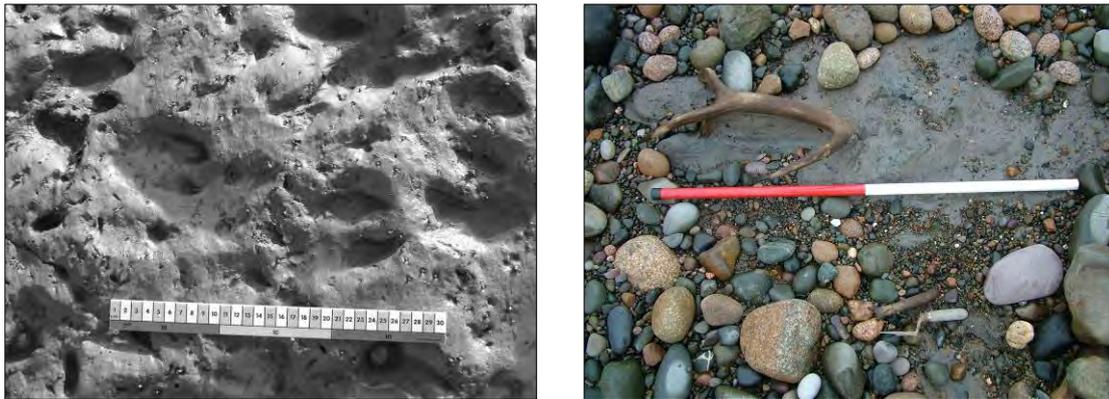


Figure 5.34 Hoofprints and antlers discovered in eroding inter-tidal silt deposits at South Walney (scale = 0.3m on the left photograph and 1m on the right photograph) (©David Coward).

On the western side of the island the palaeoenvironmental survey also recorded a series of inter-tidal peat exposures (245) which were sampled for both pollen analysis and radiocarbon dating as part of the Phase 2 survey. The results of this analysis are presented in Chapter 6.

5.6.5 Post-medieval

Throughout the medieval period, Walney Island, like Piel Island, was under the control of the monks of Furness Abbey who are thought to have established a grange in the village of Biggar and to have constructed Biggar Bank (Murphy 2009, 54). Settlement appears to have been limited throughout this period and the island remained largely agricultural up until the Industrial Revolution. Major changes to Walney came in the late 19th century with the construction of Vickerstown, a planned town to house workers from Barrow docks across the channel, and with the industrial-scale extraction and refining of salt in the southern part of the island. Salt was discovered on Walney by chance in the late 1880s whilst prospecting for coal. A group of local businessmen then formed the Barrow Salt Company and constructed Walney Salt Works in the 1890s. This consisted of land reservoirs, filter beds, an evaporation plant, six chimneys and 24 pans, and made use of an existing timber pier, built in 1870, for exportation. The salt works was successful and active until the beginning of the 20th century, when a decline in the value of salt meant that the enterprise was no longer viable. It finally closed in 1909 (www.walney-island.com).

The Phase 2 survey recorded the remains of the saltworks (64) as consisting of extensive earthwork remains and large water-filled pools (Figure 5.35), as well as the remains of the timber pier used for salt exportation. The earthworks and pools appear to have been sculpted as part of the South Walney Nature Reserve and provide important diverse habitats for local wildlife. The history of the site is outlined in a dedicated interpretation

panel. The timber pier lies in the inter-tidal zone and is in a ruinous state consisting of a series of upright timber posts and a few horizontal beams (Figure 5.36). There appeared to be stone footings along the seaward face of the timbers, however more detailed survey was not possible as access to the shore was restricted.



Figure 5.35 Remains of salt working industry on the south of Walney Island.



Figure 5.36 Remains of the 1870s timber pier used to export salt and gravel from South Walney.

Medieval ridge and furrow is recorded in the Cumbria HER in the fields adjacent to the H5 Battey in the south of the island (HER: 16729) and was mapped as part of the Phase 1 aerial photography transcription (NRHE: 1488302). This was noted as having a good level of survival during the Phase 2 survey. Similarly surviving post-medieval ridge and furrow is common across the fertile middle parts of the island and was also mapped as part of Phase 1 (NRHE: 1489071; 1488391; 1488306) and was ground-truthed during Phase 2. Eroding post-medieval field systems have been noted in the south part of the island by David Coward (Figure 5.37).



Figure 5.37 Eroding post-medieval field systems, on the southwest of Walney Island (scale = 1m)
(© David Coward).

5.6.6 20th Century

By the late 19th century, the discovery of hematite deposits near to Barrow-in-Furness had saw the town develop as an important steel manufacturer. The availability of steel, coupled with sheltered access to the sea, led to the development of Barrow Docks which specialised in the large-scale production of naval steel-hulled vessels, most importantly submarines (Bacilieri 2009, 52). These important ship-building capabilities made Barrow a target during the First and Second World Wars and Walney Island was developed as a focal point for its defence. As stated above, the Phase 1 aerial photography transcription mapped over 200 wartime features on Walney, and the following section outlines the Phase 2 assessment of a selection of these.

In the north of the island, the Phase 1 aerial photography transcription mapped a series of possible WW1 practice trenches (NRHE: 1488706) which look like crenellations in plan rather than the more common zig-zag trenches of World War Two (Lowry 2002, 26). One stretch of trenches was recorded during the Phase 2 survey as consisting of graded earthworks of box trenches (54, 55, 58) slit trenches (56) and mounds of upcast material (55, 57, 59). The line of box trenches (54) was partially obscured by long dune

grass, but was still discernable and recorded for a length of *c.*95m (Figure 5.38). As mapped, the recorded remains follow a crenellated plan form. Two further small box trenches were recorded at each end of these remains, immediately behind the first line (55, 58). These were accompanied by slit trenches (56) and mounds of upcast material (59), and may have formed a secondary redoubt or gun mounting position. These associated features were not mapped as part of the Phase 1 aerial photography transcription.



Figure 5.38 Recording the remains of possible First World War practice trenches in North Walney (surveyor is within the trench which runs diagonally across the photograph).

Whilst the Phase 1 transcription mapped these features as dating to the First World War, their location on the northern tip of the island may indicate a relationship between the trenches and the defence of Walney airfield immediately to the south. The airfield was not constructed until 1935, however, so dating these trenches is problematic.

The Phase 2 survey did not record Walney airfield (HER: 15626) as it is still in use and is privately owned by BAE Systems. However, one feature possibly associated with the airfield was recorded during the survey, consisting of a concrete platform (53) measuring *c.*2m x *c.*5m (Figure 5.38). This was located along the line of a barbed wire obstruction, forming the outer limit of the airfield, that was mapped as part of the Phase 1 aerial photography transcription (NRHE: 1383764). No remains of the barbed wire obstruction have survived, however the concrete platform may mark the location of an access point through the wire, for troop movement that avoided the other defensive features of the airfield. This would date the platform to the Second World War.



Figure 5.39 Recording a concrete platform possibly associated with Walney airfield (scale = 1m).

Around 130m south of the concrete platform, on the western side of Walney Island, the Phase 1 aerial photography transcription recorded a Second World War firing range (NRHE: 1383775). This was recorded during Phase 2 as consisting of the well-preserved remains of earthen banks with associated concrete walling and a line of mechanical iron fixings for raising targets. The recorded remains of the earthen embankments ran for a length of $\approx 35\text{m}$ on the north side, and $\approx 55\text{m}$ on the south.

The purpose of the northern embankment (Figure 5.40) was to collect discharged ammunition, which would have been fired from the south at targets placed above the southern embankment. The southern embankment had a concrete retaining wall along its north face, the western side of which was covered with modern graffiti. This graffiti was extended between the Phase 2 site visits of July and November 2011 showing that the site is visited, at least occasionally.

The wrought iron rotary mechanisms for raising targets above the southern embankment ran parallel to this retaining wall. These consisted of a series of frames, each with two pulley wheels (one at either end) connected by a horizontal shaft. These may have been powered by a second line shaft carried on wrought iron arms projecting from the concrete revetment behind, however no evidence of a second shaft survives. The frames are in a rusted deteriorating condition and none of the targets survive (Figure 5.41).



Figure 5.40 The northern embankment of the Second World War firing range at North Walney.



Figure 5.41 The southern embankment of the Second World War firing range at North Walney showing the concrete revetment and wrought iron mechanism for raising the targets.

Around 100m south of the firing range, the Phase 1 aerial photography transcription mapped the earthwork remains of an air gunner's range (NRHE: 1488708). This was recorded as part of the Phase 2 survey (49) as consisting of a series of earthworks and concrete walling that is ruinous, largely overgrown and covered with graffiti (Figure

5.42). These remains would have formed the target area for the gunner trainees to practice firing.

Two further points were recorded marking the location of the remains of a wire fence (50) found protruding from the sand dunes, and the remains of a possible trackway (51). The fence (50) took the form of a partially buried run of metal fixings which would have had wire fencing or barbed wire attached to form a barrier, presumably marking the outer extent of the air gunners range (Figure 5.42). Whilst the trackway (51) consisted of the partially buried remains of a curving metal rail and brick structure. This rail would have encircled the target area (49) and would have a mounted machine gun allowing the trainees to fire down into the target area, whilst moving along the rail. This therefore simulated firing upon a fixed target from a moving aircraft.



Figure 5.42 Remains of the air gunners range on North Walney; the ruined concrete remains of the target area (49), the metal fixing for a barbed wire fence (50) and the curving metal gunners' rail (51) (scale = 1m).

Around 700m south of the air gunners range a further concentration of Second World War features was recorded as part of the Phase 2 survey (Figure 5.43). These were most likely associated with the defence of Walney airfield and consisted of two large probable weapons pits (46, 47), a possible gun emplacement (45) and a trench (48). The weapons pits consisted of large hollowed-out areas that could be a natural feature of the dune system, but may also be man-made features. The larger of the two pits (46) had a diameter of $\approx 16.5\text{m}$. The trench recorded lies to the north of these pits and was much degraded. It ran for a length of $\approx 19\text{m}$ with a maximum width of $\approx 2\text{m}$. The possible gun emplacement consisted of a ruined concrete platform similar in appearance to known gun emplacements recorded in the south of the island (see below). It is surrounded by other building remnants of possible wartime date.



Figure 5.43 Features of Second World War date, possibly for defence of Walney airfield, consisting of weapons pits (46), a trench(48) and a possible gun emplacement (45) (scale = 1m).

The southern half of Walney Island was less densely populated with wartime features than the northern section.

The Phase 2 survey recorded the remains of a possible picket wire or barbed wire fence (70) along the western shore in the south of the island. This consisted of metal fixings seen eroding out of the till cliff edge. The remains may be in-situ but could also have been moved from elsewhere and used as a field boundary. The metal was corroded and only a small section of the fixing was visible in the cliff face (Figure 5.44).



Figure 5.44 Remains of picket wire or barbed wire fence in the eroding till cliff edge on South Walney.

Around 2km southeast of this feature, on the eastern shore of Walney island, the Phase 1 aerial photography transcription mapped the extent of a Second World War bombing decoy site in the marshlands at Wylock Marsh. These sites essentially mimicked known target sites, in this case most likely Barrow docks, in the hope that they would draw enemy fire away from the real target site. No remains of the decoy site in the marshland were recorded as part of the Phase 2 survey, however the control building for the decoy site was recorded *c.*350m to the north of the decoy.

This building is recorded in the Cumbria HER (HER: 19872) and consisted of a T-shaped brick structure with a flat concrete roof (Figure 5.45). There was a circular aperture on the west elevation and square gun port on the southeastern elevation, facing towards the decoy site. This is an unusual feature for a control building and suggests that the structure also served as a pillbox. The building was also fitted with an escape hatch in the roof accessed via an internal ladder.



Figure 5.45 Second World War decoy control building on South Walney

Around 1.3km southeast of the bombing decoy control building, the Phase 2 survey recorded the remains of a possible Second World War bunker (69). This consisted of a square brick-built structure laid to English garden bond with two projecting brick-built wings on the west elevation (Figure 5.46). The roof was constructed of flat concrete and appears to incorporate the footing for an attached gun position. To the north side of the possible bunker a man-made embankment may house an underground extension of this structure, though access could not be gained for inspection. This may also have been associated with the bombing decoy site on Wylock Marsh to the northwest.



Figure 5.46 Possible Second World War bunker on South Walney.

Around 1km south of the bunker a further Second World War air-raid shelter (62) was recorded as part of the Phase 2 survey. This consisted of a large earthen embankment surrounding a concrete structure measuring $\approx 20\text{m} \times \approx 12\text{m}$ (Figure 3.47). The entrance to this structure is now blocked, but was composed of concrete blockwork which projects from the east face of the embankment. The structure was provided with two brick-lined escape hatches in the roof, both of which are now blocked.



Figure 5.47 Possible Second World War air-raid shelter on South Walney.

Around 1.5km southeast of the shelter, the survey also recorded two entrances to underground shafts (63) which appeared to be of wartime construction (Figure 5.48). The first shaft was cylindrical and constructed of concrete with iron fixings for a cover on the top. It had internal iron steps leading to a water-filled chamber. The second shaft, $\approx 9.5\text{m}$ away, was square, constructed of concrete and on first inspection looked very similar to an anti-tank block. It retained the metal fixings for transportation on each of its four corners, however these were encased with concrete. The block was hollow with a permanently fixed metal cover on the top. The purpose of these shafts is not known.

The remaining wartime features surveyed on South Walney consist of the remains of the Hilpsford and H5 coastal batteries that were identified in Phase 1 as undergoing active erosion.

The Heavy Anti-Aircraft Battery H5 is located on the western shore at the south end of Walney Island, before it turns inland towards Morecambe Bay. It was mapped as part of the Phase 1 aerial photography transcription as the structural remains of an anti-aircraft battery and associated military camp (NRHE: 1471349), it is also recorded in the Cumbria HER (HER: 19875). The HER describes the site as having been established in July 1911 and manned by the Lancashire and Cheshire Royal Garrison Artillery. However this reference is related to 'Fort Walney' which encompasses several wartime defensive features on the island and may not indicate that the H5 battery itself had a First World War antecedent (www.users.globalnet.co.uk/~rwbarnes/defence/walney.htm).



Figure 5.48 Recording two possible wartime shafts on South Walney, looking west.

The Phase 2 survey recorded the remains of the H5 battery as consisting of a military camp (68), a control building (67d) and three gun emplacements (67a, 67b, 67c). The military camp (68) consisted of earthwork remains and concrete footings for demolished buildings (Figure 5.49). These were largely overgrown and the full extent of the remains, as mapped during Phase 1, could not be established on the ground. No standing structures survived, and this is a common feature of domestic camp sites which tend to have been cleared, leaving only the concrete hut bases to mark their former location (Lowry 2002, 104). The command post for the coastal battery consisted of the ruined remains of a flat-roofed concrete structure which appeared to have had internal brick partitions (Figure 5.50). Again, it was common for command posts to be deliberately destroyed after the war in order to render the battery unusable and this appears to have been the case at the H5 battery. The damage incurred cannot be explained by coastal erosion or other natural processes.

The gun emplacements recorded as part of the Phase 2 survey (67a, 67b, 67c) are only the most inland three of an original four emplacements at this location. The fourth, most seaward gun emplacement appears to have either been completely destroyed, or partially destroyed and buried beneath a shingle ridge on the beach front. The three surviving gun emplacements are in varying degrees of disrepair as a result of coastal erosion. The best preserved emplacement (67a) consisted of an octagonal concrete base with metal gun holdfast points in the centre. Along the northern side of the base there were three surviving ammunition lockers (Figure 5.51). There may once have been at least two more of these and a roof with only the coastal side of the gun emplacement open to allow firing, although the original form of this gun emplacement is difficult to discern. The remains of ruined ammunition lockers were noted in the vicinity of the structure. The other two gun emplacements survived as octagonal concrete bases with gun fixing positions only. The most seaward gun emplacement has been displaced and was lying at an angle partially buried in a large shingle ridge (Figure 5.52).



Figure 5.49 Concrete bases of dismantled buildings forming a Second World War Military camp.



Figure 5.50 Demolished command post for the H5 battery, looking southeast (scale = 1m).

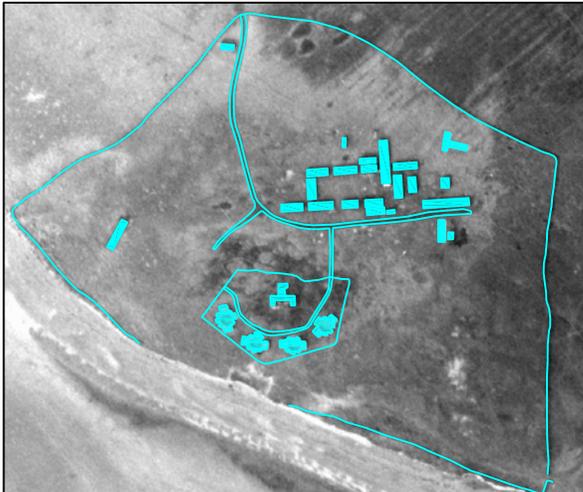


Figure 5.51 Best preserved gun emplacement on the H5 battery with surviving ammunition lockers, looking southeast (scale = 1m).



Figure 5.52 Recording the remains of the most seaward gun emplacement on the H5 battery surrounded by the demolished remains of ammunition lockers, looking southwest.

The Phase 1 aerial photography transcription was able to map the past erosion of this heritage asset, as there was a suitable number of well-dated photographs of the site spanning the past 60 years (Bacilieri 2009, 43). This measured assessment (over 80m loss in a 40 year period) has been updated with information from the Phase 2 survey. This shows that the unmitigated destruction of this site continues (Figure 5.53).



RAF 106G/UK/1334 5401 29-MAR-1946 English Heritage (NMR) RAF Photography

1946 - Immediately post-war the HAA Battery is almost completely intact, including the associated camp with road network and the barbed wire perimeter. Notably a length of this perimeter is missing along the shoreline, suggesting it was lost to coastal erosion.

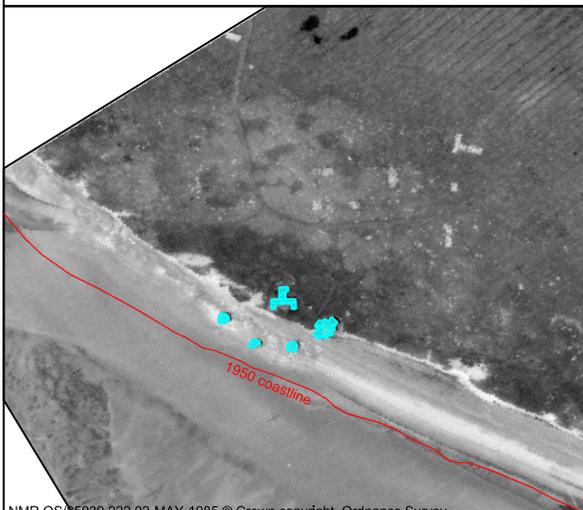


RAF 541/522 3047 12-MAY-1950 English Heritage (NMR) RAF Photography

1950 - Four years later the camp buildings have been demolished, and part of the trackway has been removed or overgrown. The battery itself remains fully intact with the barbed wire perimeter. Notably the shoreline has eroded over 20m losing more of the outer fence.



2011 - The overgrown ruins of the battery command post in the foreground, with the only in-situ gun emplacement behind. This gun position only retains the rear ammunition lockers. The others have collapsed through coastal erosion.



NMR OS/5039 222 02-MAY-1985 © Crown copyright, Ordnance Survey

1985 - The remainder of the barbed wire has been removed and the command bunker has been part demolished but still retains its footprint. Three of the gun emplacements are now on the beach and have lost their outer ammunition lockers due to a coastline retreat of up to 60m.



EARTH.GOOGLE.COM 01-JAN-2003 ACCESSED 25-NOV-2011 © Infoterra Ltd & Bluesky

2003 - A period of stability has seen a slight reclamation of the dunes for up to 22m. The command post has largely been covered. One of the emplacements has either been destroyed or buried under the storm beach.



2011 - The command post to the left, and surviving gun position on the summit of the old coastline with the collapsed ammunition lockers in front. Part buried in the beach is the footing of a second gun emplacement. A third should be visible in the immediate foreground, but has either been completely destroyed or is buried.

The Hिल्psford battery is located on the very southern tip of the island. It was mapped as part of the Phase 1 aerial photography transcription as the structural remains of a coastal battery (NRHE: 1429214), and it is also recorded in the Cumbria HER as a searchlight battery (HER: 19861).

Hिल्psford was constructed during 1914 as a First World War emergency battery, and was dismantled after the war in the 1920s. With the outbreak of World War Two, however, the battery was re-commissioned by the Royal Engineers and much of the surviving remains date to this period. The battery was fitted with six-inch hand-loaded guns which were used to train the Workington 406th Coast-Battery Home Guard Volunteers amongst others (www.users.globalnet.co.uk/~rwbarnes/defence/walney.htm). Emergency batteries were erected in rapid response to the threat of German invasion following Dunkirk and as such they tend to be of less sophisticated construction than their earlier or permanent contemporary counterparts (Osborne 2004, 27).

The Phase 2 survey recorded the remains of the Hिल्psford battery as consisting of two searchlights (65a, 65i), two shelters (65b, 65c), a gun store (65d), three gun emplacements (65e, 65f, 65h), a magazine (65g) and a spigot mortar (65j).

The two searchlight positions recorded (65a, 65i) were in a remarkably well-preserved state consisting of concrete square-shaped structures with D-shaped open fronts framed by wrought iron (Figure 5.54). The framing would have held sliding iron shutters, some panels of which still survive internally. The entrance was via an iron door in the rear of the structure. Searchlight 65a had a length of ruined concrete walling projecting from its northwestern corner suggesting that the battery was once enclosed. This wall does not survive elsewhere. The roof of this structure was also overgrown and this vegetation could eventually undermine the structural integrity of the building.



Figure 5.54 Searchlight 65a at Hिल्psford Battery, South Walney, looking north (scale = 1m).

Searchlight 65i had the interesting addition of a timber bird-hide on its roof, but was otherwise in a good state of repair with well-preserved internal iron fixings and shutters (Figure 5.55). The level to which the dune sands have partially buried the structure testifies to some accretion in this area since the 1940s and this is attributed to the now redundant groyne system along the western shoreline on the south of the island (Halcrow 2011).



Figure 5.55 Searchlight 65i at Hilpsford Battery, with Groyne Hide on the roof.

The two shelters recorded (65b, 65c) were also well-preserved. These were constructed of regular concrete blockwork with external concrete render and a flat roof (Figure 5.56). Each had an external, detached blast wall constructed of concrete blocks in front of the entrance, which was a simple doorway. Ventilation openings were present in each side wall, but the structures were otherwise windowless.



Figure 5.56 Recording shelter 65b at Hilpsford Battery, South Walney (scale = 1m).

Located $\approx 50\text{m}$ east of shelter 65c, was a brick and concrete ‘nissen hut’ style structure that has been interpreted as a possible gun store (Figure 5.57). It had brick-built front and end walls with a wide front opening, and adjacent window, and an entrance to the rear. The main body of the structure was constructed of concrete with a semi-circular section. This building was on private land and was not accessible for a more detailed survey.



Figure 5.57 Possible gun store 65d at Hilpsford Battery, South Walney (scale = 1m).

The three gun emplacements recorded (65e, 65f, 65h) are all in a ruinous condition, particularly site 65e which consists of the rubble remains of a concrete and brick structure (Figure 5.58). It was identified as a possible ancillary gun position although emergency batteries usually consist of only two gun emplacements (Osborne 2004, 25). This structure may also be the remains of the battery’s command post, similar to that seen at the H5 battery to the west (see Figure 5.49).

The remaining two gun emplacements (65f, 65i) were definitively identified as gun holdfast positions. They consisted of a concrete base with remaining metal fixings for securing the guns in place (Figure 5.59). There were also concrete rubble remains surrounding the bases, suggesting that they would have been more extensive structures, perhaps with storage lockers and roofs.

The two gun emplacements were connected to the rear to a shared magazine (65g) for the storage of ammunition (Figure 5.60). This consisted of a brick-built passage, now roofless, leading down to two long underground chambers of semi-circular section. The chambers had brick front and end walls with the main body constructed of pre-fabricated steel of ‘nissen hut’ style, rendered with concrete to a flat roof surface.



Figure 5.58 Possible ancillary gun emplacement 65e, looking southeast (scale = 1m).



Figure 5.59 Recording the remains of gun emplacement 65h, looking north with Walney Lighthouse in the background.



Figure 5.60 Magazine attached to the rear of the gun emplacements at Hilspsford Battery, South Walney (scale = 1m).

The final feature recorded as part of the Hilspsford battery was a spigot mortar located inland from all of the other remains. This was built upon a high dune to afford good views of the surrounding area. The remains were partially buried, however the concrete drum, or thimble, steel spider and stainless steel pivot were all visible, together with an outer ring of brick walling (Figure 5.61). Spigot Mortars had a range of $\approx 365\text{m}$ and are commonly found flanking coastal batteries (Lowry 2002, 91).



Figure 5.61 Spigot Mortar in the foreground with Walney lighthouse and other features of the Hilspsford Battery in the background, looking east (scale = 1m).

Other features associated with the coastal battery were observed during Phase 2, such as the remains of the original trackway (Figure 5.62) leading up to the battery (preserved as the driveway to the lightkeeper's house) and the lighthouse itself which almost certainly performed the function of a Battery Observation Post. These would usually be purpose-built structures unless a suitably high structure was located in the vicinity (Osborne 2004, 27). The present lighthouse was built in 1804 and is recorded in the Cumbria HER (HER: 18992), copies of photographs taken at the end of the Second World War show the lighthouse camouflaged in paint (Figure 5.63). Neither of these features was considered to be at risk of coastal erosion.



Figure 5.62 Second World War timber railed trackway leading to Hilpsford Battery (scale = 1m).



Figure 5.63 Walney Lighthouse camouflaged at the end of the Second World War (courtesy of Trish Chadwick, South Walney Nature Reserve).

5.6.7 Threat from erosion

The sites recorded across Walney Island (Figure 5.64-5.66) lie within varying SMP2 policy units in the Northern, Central and Southern parts of the island as defined by Halcrow (2011). These are outlined in Table 5.2.

Site name	Location	NWRCZA 2 No:	SMP 2 policy unit	SMP 2 policy at this site
Possible hearth	North Walney	203	11c 14.8	NAI
Lithic find locations and possible occupation sites	North Walney	204	11c 14.8	NAI
Eroding glacial till	North Walney	60	11c 14.8	NAI
Raised storm beach	North Walney	61	11c 14.8	NAI
Exposed inter-tidal peat	Central Walney	245	11c 14.5	NAI 0-20 years MR 20-100 years
Salt working site	South Walney	64	11c 14.1	NAI
WW1 trenches	North Walney	54	11c 14.8	NAI
WW1 trenches	North Walney	55	11c 14.8	NAI
WW1/WW2 slit trench	North Walney	56	11c 14.8	NAI
WW1 /WW2 earthwork	North Walney	57	11c 14.8	NAI
WW1 trenches	North Walney	58	11c 14.8	NAI
WW1 /WW2 earthwork	North Walney	59	11c 14.8	NAI
WW2 Platform-airfield	North Walney	53	11c 14.8	NAI
WW2 firing range	North Walney	52	11c 14.8	NAI
WW2 air gunner's range	North Walney	49	11c 14.8	NAI
WW2 wire fence	North Walney	50	11c 14.8	NAI
WW2 rail track	North Walney	51	11c 14.8	NAI
WW2 possible weapons pit	North Walney	46	11c 14.8	NAI
WW2 possible weapons pit	North Walney	47	11c 14.8	NAI
WW2 gun emplacement	North Walney	45	11c 14.8	NAI
WW2 trench	North Walney	48	11c 14.8	NAI
WW2 wire fence	Central Walney	70	11c 14.5	NAI 0-20 years MR 20-100 years
WW2 decoy control building	South Walney	202	11c 14.1	NAI
WW2 bunker	South Walney	69	11c 14.1	NAI
WW2 air-raid shelter	South Walney	62	11c 14.1	NAI
WW1 /WW1 underground chambers	South Walney	63	11c 14.1	NAI
WW2 H5 battery military camp	South Walney	68	11c 14.3	NAI
WW2 H5 battery	South Walney	67	11c 14.3	NAI
WW1/WW2 Hilpsford Battery	South Walney	65	11c 14.3	NAI

Table 5.2 Sites recorded during Phase 2 surveyed on Walney Island.

The majority of sites recorded lie within areas where the preferred SMP2 policy is 'No Active Intervention' for the next 100 years, whereas two sites are located in areas where the SMP2 policy calls for 'No Active Intervention' for the next 20 years and 'Managed Realignment' thereafter up to 100 years.

The north of Walney Island is characterised by an extensive sand dune system overlying substantial post-glacial shingle deposits (see Section 5.6.4). The spit extending into the Duddon Estuary provides shelter to the eastern shoreline of the island, where saltmarsh and mudflat accumulations provide coastal protection. The greatest influence on shoreline behaviour on the north of the island is tidal flow into and out of the Duddon

Estuary, in particular the changing position of the Scarth Channel. Atkins state that the this shoreline has been either stable or accreting for the past 150 years, but in the last 40 years a breakaway channel from the Jubilee Channel has caused the inter-tidal zone to narrow (Atkins 2000). Halcrow suggest that blow-outs within the dune system may enlarge under present management, but that this is dependent upon the configuration of the Scarth Channel (Halcrow 2002). Otherwise the shoreline is predicted to remain stable with limited loss as a result of sea-level rise and its effect of resistant scars along the coastline (Halcrow 2011). NCERM predict a loss of between 3.4m and 6.6m in the next 100 years (NCERM 2012)

In light of this information the possible prehistoric occupation sites (204), located in suspected dune blow-outs are a risk of erosion as the blow-outs enlarge. No modelled time-scale is provided for this process so, erring on the side of caution, these sites are considered to be at immediate and long term risk of erosion. The storm beach and marine silt deposits, with associated lithic scatter (60, 61) are undergoing active erosion and the relatively low levels of predicted erosion along this shoreline will not prevent this. They are therefore also considered to be at risk of immediate and long term coastal erosion. The possible prehistoric hearth (203) is not considered to be at risk of coastal erosion owing to its distance from the shoreline and the relatively low levels of predicted loss along this frontage.

Of the wartime features recorded, only a small portion of the air gunner's range (49-51) is at direct risk of coastal erosion in the longer term (i.e. within 100 years) under existing predictions of shoreline change. The remaining features including the possible World War One trenches (54-59) and the Second World War firing range (52) are not considered to be at risk of immediate or longer term coastal erosion, however they are at risk of flooding and lie within the Environment Agency flood risk area for extreme events.

Central Walney is characterised by low-lying land fronted by shingle storm beaches which are separated by sections of low glacial till cliffs at a height of *c.*15m aOD (Halcrow 2011). The western shore has localised coastal defences and the greatest exposure of inter-tidal resistant scars along the lower beach. The roughly north-south orientation of this coastline means that it is particularly vulnerable to perpendicular wave action which causes episodic erosion of the till cliffs under extreme high tides and storm conditions (Halcrow 2011). This stretch of coastline has been in an erosional trend for at least the past 100 years and probably more. Atkins measures this at a rate of *c.*1.3m/year and predicts significant future erosion of between 0.2m and 0.6m/year, as well as the increased risk of flooding of low lying areas (Atkins 2000). NCERM predict a loss of between 20m and 40m in the next 100 years, rising to a loss of between 53m and 97m near Bent Haw Scar (NCERM 2012). In contrast the sheltered eastern shoreline continues to accrete and has a protective band of extensive saltmarsh along the frontage.

In light of this information, the bombing decoy control building (202) and Second World bunker (69), located on the eastern shoreline, are not considered to be at immediate or longer term risk of coastal erosion. However, the remains of the Second World War wire fence on the west of the island are undergoing active erosion and are therefore considered to be at risk. The shoreline at this site is predicted to retreat by up to 40m under a 'Managed Realignment' scheme (NCERM 2012).

The South of Walney Island is characterised by an extensive sand dune system within a sand and shingle spit. The shoreline is composed of an upper shingle storm beach with a sandy lower beach section showing extensive ridges and runnels to the south (Halcrow 2011). The orientation of the shore in the southern section has a profound effect on the pattern of erosion and accretion seen along this frontage. Beach sands in the northern section of the western shoreline erode providing sediment for the accretion of the north-south aligned spit at the end of the island (Halcrow 2011). This has been a long-term process and under storm conditions further sediment is added from eroding low till cliffs contributing to a measured growth of $\approx 75\text{m}$ at the tip of the spit between 1963 and 1997 (Atkins 200). Erosion is also occurring near Hilpsford Scar where the shoreline orientation changes and this has been measured at a loss of 0.3km^2 in the past 150 years (Shoreline Management Partnership 2000). Future predictions of shoreline evolution state that the growth of the spit will eventually be limited by Walney Channel and that South East Point will erode to a more rounded profile (Halcrow 2011). This would transport shingle along the coast to Hilpsford scar, but would also increase the risk of flooding to low lying areas. NCERM predict a loss of between 53 and 97m along the seaward shores of the south of the island in the next 100 years (NCERM 2012).

In light of this information the post-medieval saltworking remains (64), wartime underground chambers (63) and air-raid shelter (62), recorded on the eastern shoreline, are not considered to be at immediate or longer term risk of coastal erosion. However the H5 Battery (67), associated military camp (68) and the Hilpsford Battery (65) are at immediate risk of coastal erosion that will see all of these sites almost entirely destroyed in the next 100 years, where predicted shoreline retreat is up to 97m (NCERM 2012).

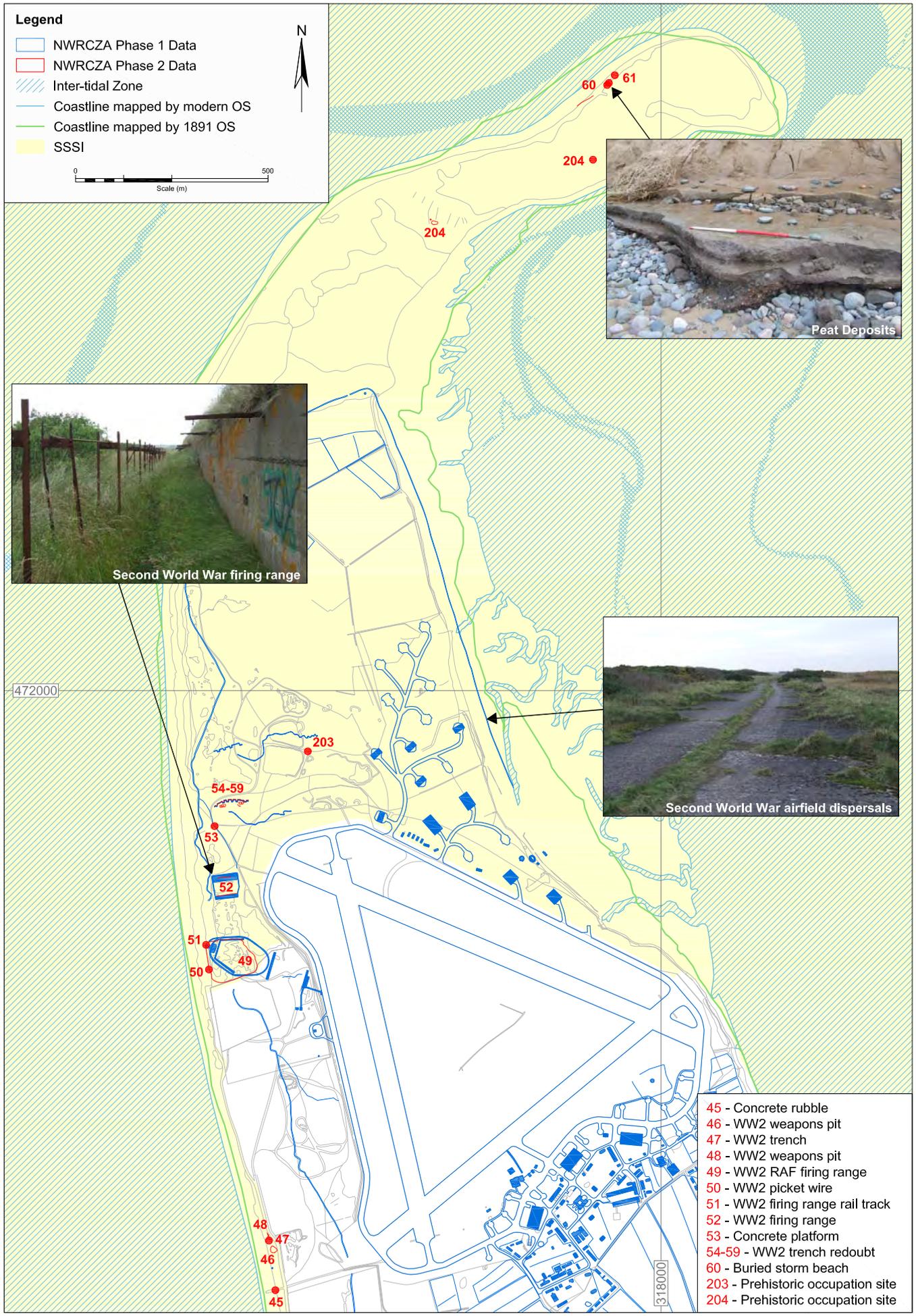


Figure 5.64 Location of sites surveyed on North Walney Island



Figure 5.65 Location of sites surveyed on Central Walney Island

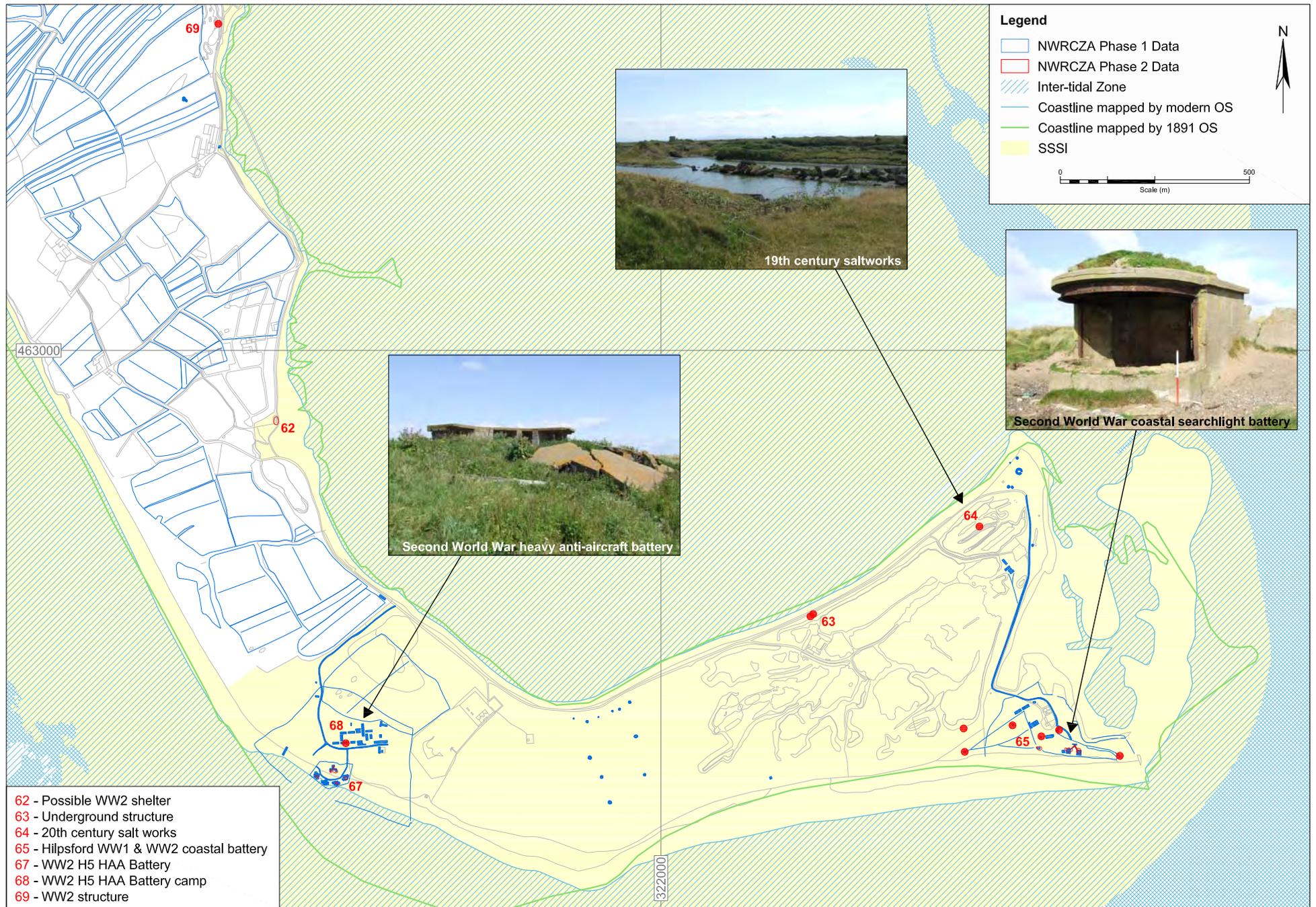


Figure 5.66 Location of sites surveyed on South Walney Island

5.7 Duddon Estuary (Map Figure 5.73)

5.7.1 Location and geology

The Duddon Estuary (SD 17733 77012) lies immediately north of Morecambe Bay, and is bounded to the south by the western side of the Furness Peninsula. It is ≈ 9 km west of Ulverston. The main towns along the estuary mouth are Millom on the north side and Askam-in-Furness on the south. Millom was established in the medieval period and is recorded in the Domesday Book (Hinde 1985, 64), whereas Askam-in-Furness was formed as an industrial town following the discovery of iron ore nearby in the late 19th century (Winchester 2006, 126).

The Duddon Estuary is orientated southwest to northeast and was probably formed during the Tertiary period and then modified during the last glaciation (Yasin 1991). It has a complex geological sequence characterised by Silurian Sedimentary Units in the upper reaches, Carboniferous Limestone in the middle reaches and Permian and Triassic Sandstones at the estuary mouth (Johnson 2011, 25). The superficial geology is dominated by blown sands at the estuary mouth around Sandscale, Diamicton Till at Millom and Quaternary Clay, Silt and Sand further up the estuary (BGS 2008). The superficial geology appears to influence the principal soils within the estuary which are composed of Dune Sand around Sandscale, Seasonally Wet Deep Silt around Millom and some saltmarsh accumulation on the western shores of the inner estuary. These soils will support a range of land uses including grassland, cereal cultivation and pasture (Farewell 2007). Much of the estuary shoreline is undefended (Figure 5.67).



Figure 5.67 Undefended coastline at Roanhead at the mouth of the Duddon Estuary, looking east.

The coastline on the southern side of the estuary mouth forms part of Sandscale National Nature Reserve. It is publicly accessible, as is much of the coastline around the estuary which forms part of the Cumbria Coastal Way. The Duddon Estuary is a designated SSSI and is championed by the Duddon Estuary Partnership who aim to support and enhance its important habitats.

5.7.2 Previous research

The NWRCZA Phase 1 study looked at the Duddon Estuary as part of Block 4 of the study area (Johnson 2011). It highlighted the suspected medieval bloomery at Sandscale and the excavated Late-Neolithic-Early-Bronze Age structure at Roanhead as being under threat of coastal erosion and requiring rapid survey (Johnson 2011, 217).

Following further consultation with local authority archaeological officers and partners, a walkover of Millom was added to the Phase 2 survey as there are known to be salt working sites in this area, but their full extents are unknown and they may be under threat of erosion.

The medieval bloomery site at Sandscale is recorded in the Cumbria HER (HER: 3974) although its exact location is unknown and a site visit in 1996 failed to locate any remains. The Phase 2 survey of Sandscale focused on identifying any surviving remains of this industry since the NWRRF states that bloomery sites, particularly in Furness, should be a focus of investigation by geophysics and excavation if appropriate (Brennand 2007, 112). The first step in this process must therefore be to record the precise location of these features.

The Late-Neolithic-Early-Bronze Age structure at Roanhead was first recorded in the 1950s and it is listed in the Cumbria HER (HER: 1498). In 2002, a dune blowout revealed a small thumbnail scraper and over the following twelve months over 200 lithics were collected in the vicinity of the site (Evans and Coward 2004, 16). Due to footpath erosion, it was subject to partial rescue excavation in 2003 which uncovered a sub-circular or D-shaped structure and associated pits (Evans and Coward 2004, 16). This has been dated typologically to the Late-Neolithic-Early-Bronze Age. The archaeology and palaeoenvironment of the Lowland Cumbrian Wetlands has been studied by Hodgkinson *et al.* (2000) as part of the North West Wetlands Survey, however this was prior to the excavation of the site at Roanhead and it is therefore not discussed.

A medieval salt working site at Millom is recorded at two locations in the Cumbria HER (HER: 41709). In 2006 the area was visited as part of the Solway Salt project by David Cranstone and he argued that the current farmhouse may be built upon the landscaped remains of a sleeching mound, with possible earthwork remains of salt working located to the northwest (Cranstone 2006, 103). The full extent of these remains was unknown and could be quite widespread. Brennand states that potential salt mounds are shown on Ordnance Survey photography from 1966 (Brennand *pers. comm.*) however these were not identified as such during the Phase 1 aerial photography transcription. The Phase 2 survey of this area was therefore focused on locating and extant remains of this industry.

5.7.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of this area involved a walk-over of publicly accessible land at Sandscale, Roanhead and Millom.

5.7.4 Prehistoric

The earliest traces of settlement at Roanhead/Sandscale come from the collection of over 200 lithics in the area, as well as the small rescue excavation carried out in 2003. The lithics recovered include scrapers, thumbnail scrapers, a small Group VI polished axehead, retouched flakes, barbed-and-tanged arrowheads, waste materials and an anvil stone (Evans and Coward 2004, 16). The excavation of the site did not recover many *in*

situ small finds as the area was much disturbed following the dune blow-out and footpath erosion. It uncovered the remains of eleven post holes surrounded by rough boulder settings sitting almost directly on top of a low shingle ridge. This formed a small sub-circular or D-shaped structure without a hearth (thought to have been lost to erosion) and measuring $\approx 3\text{m} \times \approx 2\text{m}$. A group of four shallow pits were found associated with the post holes showing a particular concentration around the northern perimeter of the structure, a broken flint scraper and flake of non-local flint were uncovered in the westernmost of these, whilst one pit to the south contained a broken and retouched flint flake (Evans and Coward 2004, 16).

This structure is the first of its type to be uncovered on the Cumbrian Coast, however lithic scatters and prehistoric occupation sites are relatively common in coastal South Cumbria, testifying to its importance in the prehistoric period (see North Walney Section 5.6.4 and Eskmeals Section 5.8.4).

The Phase 2 survey of Roanhead and Sandscale was conducted with the aid of local amateur archaeologist and ex-National Trust Warden David Coward, who has an extensive knowledge of the area and its prehistory and palaeoenvironment. He also undertook the excavation of the occupation site that forms the focus of this part of the survey.

The survey recorded the accurate location of the excavations conducted in 2003 (71) which are now covered with a deliberate dump of slag waste, charcoal, brick and glass fragments (Figure 5.68). This has been put in place in an attempt to stabilise the dune system and protect the remaining part of the occupation site that was not excavated in 2003 (David Coward pers. comm.). This man-made mound covers an area $\approx 30\text{m}$ in diameter and at present it appears to be successful in protecting the eroded remains.



Figure 5.68 Recording the location of the excavated Late-Neolithic-Early Bronze Age occupation site at Roanhead, note the mound of dumped slag waste.

The survey also recorded an exposure of blue/grey marine silty clay (206) of presumed Holocene date in the inter-tidal zone (Figure 5.69). This extended for a length of $\approx 34\text{m}$ and had a maximum width of $\approx 8.4\text{m}$. It did not appear to have high organic content, however it may prove to be an important indicator of the sequential development of this coastline, should a more extensive sequence be found elsewhere. Previous exposures of similar material have included evidence of vegetation and hazelnuts (David Coward *pers. comm.*), however none of this was evident at the time of survey.



Figure 5.69 Recording a marine silt and clay exposure at Sandscale, looking east.

5.7.5 Medieval

Medieval bloomeries are known to have existed on the iron-rich Furness peninsula. These would most likely have used water power to operate both a forge hammer and the bellows and are therefore likely to be sited with access to running water. On the west coast of England water-powered bloomeries remained popular into the post-medieval period despite the advent of the blast furnace in 1491. Those in Cumberland and Furness are said to have remained operational into the early 17th century (Schubert 1957). The location of the supposed medieval bloomery site at Sandscale is unknown and attempts to locate it in 1996 failed, either due to ‘environmental conditions’ or the nature of the archaeological evidence (Martin 1996).

The Phase 2 survey did not locate any remains that could be interpreted as a medieval bloomery site, nor have any such remains been identified in the vicinity in recent years (David Coward *pers. comm.*). It is clear that this site is no longer apparent as a surface feature, however this does not provide evidence of its complete destruction. Previously unknown buried remains of this site may still exist and may be at risk of coastal erosion.

Documentary sources indicate that Calder Abbey, Furness Abbey and St Bees Priory all had saltworking holdings in the vicinity of Millom. Studies of medieval saltworking

generally use the distribution of salterns (*salinae*) in the Domesday Book as a starting point for analysis (Cranstone 2006, 13). However no *salinae* is recorded in the Domesday entry for Millom (Hinde 1985, 64), suggesting that salt working developed here as a result of more intensified Norman occupation in the decades after Domesday. It is assumed that the most common form of medieval saltworking was 'sleeching', where the salt-encrusted surface of inter-tidal silts or salt marsh was scraped off, the salt content leached out with seawater, and the resulting strong brine boiled in a 'saltcote' (Cranstone 2008, 1). The resultant salt was then sold and the remaining clean silt was piled up into a 'sleeching mound', many of which are still recognisable in the landscape today.

Cranstone (2006) completed a survey of the saltworking sites of the Solway coast and concluded that sleeching mounds are a rare occurrence on the west coast in comparison with their relative abundance on the east coast (Cranstone 2006, 16). Where sleeching mounds were recorded in the Solway, they were usually on the backslope of the saltmarsh, where the current margin of active saltmarsh is located near the backslope (Cranstone 2006, 16).

Cranstone identified a possible sleeching mound and salt working site at Salthouse Farm in Millom (Cranstone 2006, 103), located along the backslope of the current saltmarsh. The Phase 2 survey has added to this with another possible sleeching mound to the south of the farm at Millom School (85). This consisted of a mound of material running for a length of $\approx 18\text{m}$ beside the school playing fields (Figure 5.70). This record extends the potential saltworking evidence further south in Millom and this is in keeping with the documentary evidence where Cranstone notes that the St Bees saltworking holdings in Millom were particularly extensive, indicating production on an industrial scale (Cranstone 2006, 103).



Figure 5.70 Remains of a possible sleeching mound at Millom School (right of the photograph).

The identification of this site as a medieval sleeching mound is based upon the known presence of salt working in this area and the fact that it appears to have been man-made.

It is therefore noted only as a possible sleeching mound and further investigation would be required to ascertain its true nature. It may for instance represent landscaping associated with the nearby school.

5.7.6 Post-Medieval

The towns of Askam and Millom developed as centres of the iron and steel industry in the post-medieval period. The population of Askam increased from 400 people in 1865 to 3000 in 1873 and similarly in Millom the population increased from 180 people in 1861 to 4000 in 1876 (Winchester 2006, 126).

The Phase 2 survey recorded remnants of this industry in the coastal area of Sandscale, west of Askam. This consisted of the remains of a possible jetty (205), as well as a shipwrecked cargo of iron production wastes (207).

The possible jetty (205) was recorded as four vertical timbers projecting from the shingle inter-tidal beach deposits (Figure 5.71). These stood to a height of $\approx 0.2\text{m}$ and covered an area of $\approx 1\text{m}^2$. The tops of the timbers appeared to have been sawn off, suggesting the deliberate destruction of the feature, which may explain why further remains were not discovered in the vicinity. The purpose of the timbers has been interpreted as a possible jetty, but it may be also have formed a platform for a different industrial purpose, such as a sea water pump or cistern.



Figure 5.71 Possible jetty at Sandscale (scale = 1m).

Evidence of a probable timber shipwreck site (207) was recorded at Sandscale as consisting of a spread of iron production waste in the inter-tidal zone (Figure 5.72). This appears to be the remains of a small ship's cargo, the remainder of the ship having been re-used or otherwise destroyed. The cargo covers a distinct area of $\approx 52\text{m}^2$.



Figure 5.72 Iron production waste, possible evidence of a shipwreck, looking west (scale = 1m).

4.7.7 Threat from erosion

The sites recorded (Figure 5.73) on the south side of the Duddon Estuary (71, 205-7) lie within SMP2 policy unit 11c16.1 which recommends 'No Active Intervention' for the next 100 years, whilst that on the north side (85) lies within SMP2 policy unit 11c 16.9 which recommends 'Hold the Line' for the next 20 years and 'Managed Realignment' thereafter up to 100 years.

The potential 'Managed Realignment' Scheme at Millom would allow the shoreline to retreat as far as possible whilst retaining the coastal railway line, and Halcrow states that this may impact upon the saltworking remains. The remains recorded as part of the Phase 2 survey (85) lie behind the line of the railway and should therefore be protected from the risk of coastal erosion, as should the remains identified by Cranstone (2006) and recorded in the Cumbria HER (HER: 41709). The method of salt working that would produce the recorded features, however, involves the scraping of saltmarsh deposits and it is this saltmarsh that stands to be lost under the current management scenario. Potential remains located in the marshland are therefore considered to be at risk of erosion in the medium term (i.e. within 50 years).

The Duddon forms a shallow, macro-tidal estuary, with an average tidal range of 6.5m, and a maximum range of 10.4m. Sandscale lies in the outer estuary and is composed of a sand dune system of three dune ridge separated by two areas of dune slack (Yasin 1991). These overly limestone and till and shingle deposits. The dunes are fronted by a wide, sandy inter-tidal zone with a series of resistant coastal scars. Historic mapping indicates that the northern shoreline has accreted since the 1800s where an area depicted as shingle is now part of the dune system (Halcrow 2011). To the west, however, the shoreline is in an erosion trend and a series of dune blow-outs have developed. Future shoreline evolution is dependent upon the position of the channels within the estuary and it is predicted that, should these remain the same, the shoreline will remain relatively

stable with some dune erosion during storm events (Halcrow 2011). NCERM predict a loss of between 3.4m and 6.6m in the next 100 years (NCERM 2012).

In light of this information, the excavated prehistoric occupation site (71) recorded in Sandscale dunes is considered to be at long term threat of coastal erosion (i.e. within 100 years), whilst the remaining sites (205-7), which are located in the inter-tidal zone, are undergoing active erosion and are therefore considered to be at immediate risk. These sites are, however, considered to be of lesser significance, in terms of the potential knowledge gain, than the prehistoric site (71) located just a few metres further landward.

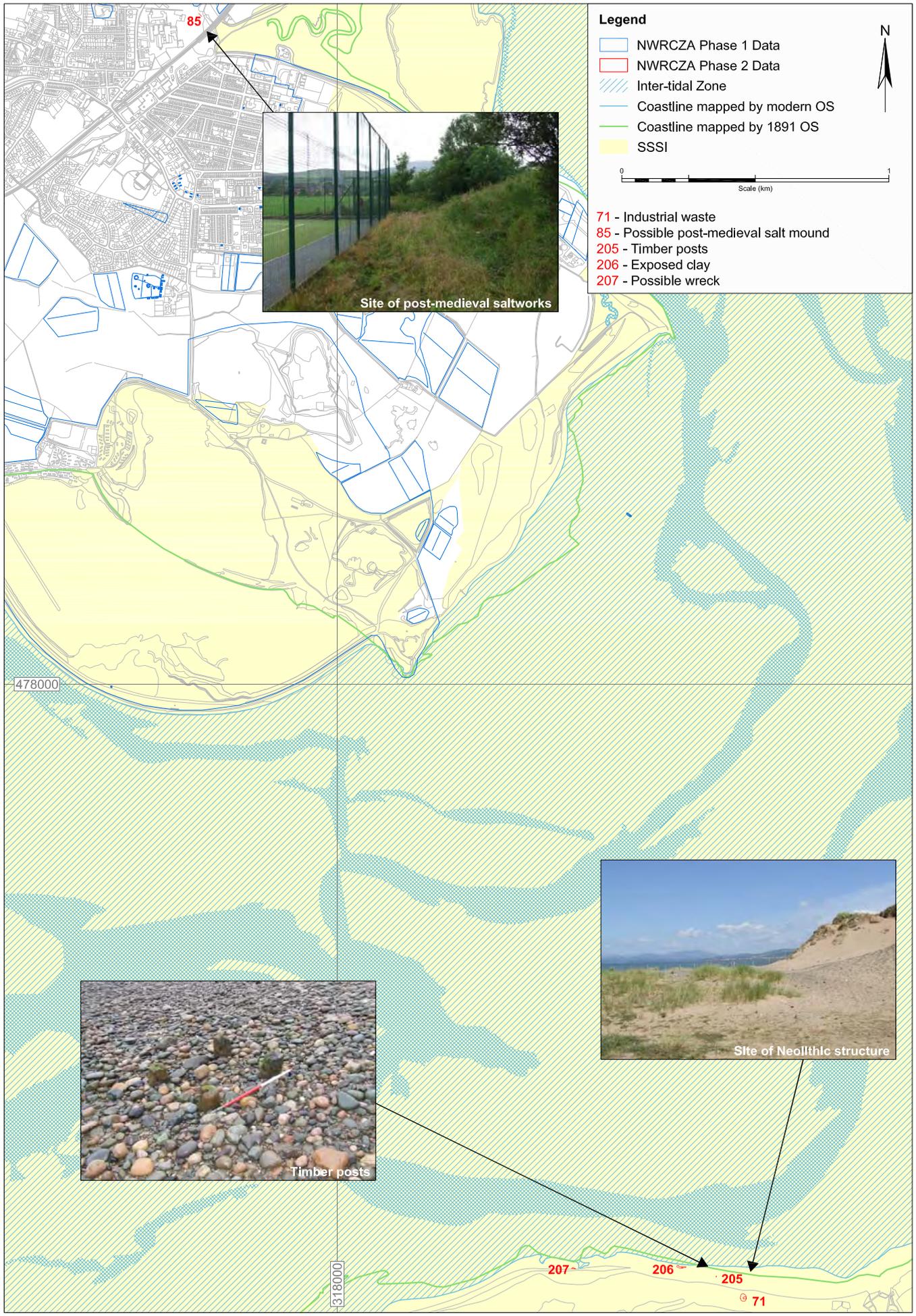


Figure 5.73 Location of sites surveyed in the Duddon Estuary

5.8 Ravenglass Estuary Complex (Map Figure 5.90)

5.8.1 Location and geology

The Ravenglass Estuary Complex (SD 07828 95477) is formed by three Rivers, the Irt, Esk and Mite. These come together at Ravenglass Harbour, situated in a small village of the same name, within the Lake District National Park. It is backed by the Cumbrian Fells to the east and the Irish Sea to the West. The village is well-known for its narrow gauge steam railway which runs from Ravenglass to Eskdale.

The Rivers Irt, Esk and Mite converge to form a single channel as they exit into the Irish Sea between Drigg spit to the north, and Eskmeals spit to the south. The Solid geology of the area is predominantly Calder Sandstone Formation with a superficial geology of Blown Sands around Drigg and Eskmeals and Devensian Diamicton Till inland at Ravenglass (BGS 2008). The principal soils in the area vary between Seasonally Deep loams and clays and dune sands on the Drigg and Eskmeals spits. These are suited to a varied regime of recreation, cereal production and stock rearing (Farewell 2007). The inter-tidal zone is predominantly sand and mud flats with some saltmarsh accumulation near Saltcoats (Figure 5.74). Saltcoats has also been provided with shoreline protection as has a localised section of the Ravenglass to Eskdale railway. The remainder of the coastline in this area is unprotected.



Figure 5.74 Inter-tidal sand and mud flats at Ravenglass, looking south towards Eskmeals spit.

Ravenglass served as an important port from the Roman period and throughout the Industrial Revolution, after which time the silting up of the estuary led to its gradual decline in importance. Current land use is predominantly residential and recreational. It is the only coastal town within the Late District National Park and fishing is still important in the area. The shoreline around Ravenglass is publicly accessible as part of the Cumbria Coastal Way before it moves inland at Saltcoats and out to the coast again at Drigg. The confluence of the three rivers and their exit into the Irish Sea is within the Drigg Coast designated SSSI.

5.8.2 Previous research

The NWRCZA Phase 1 study looked at this part of the coastline as part of Block 4 of the study area (Johnson 2011). It highlighted the Bronze Age and Neolithic lithic scatters at Eskmeals, Ravenglass Roman Fort, St John's Church on the River Esk and saltworking sites along the River Irt as being potentially under threat of coastal erosion and requiring rapid survey.

Lithic artefacts have been found in the Eskmeals area since the late 1960s and 70s (Cherry 1969; Bonsall *et al.* 1986, 175). The prehistoric lithic scatters selected for survey as part of Phase 2 were identified during systematic fieldwalking by Cherry in the late 1980s and consist of concentrations of both Neolithic and Bronze Age material (Cherry and Cherry 1986). Detailed excavation of Mesolithic sites at Monks Moors sites 1 and 2 and Williamsons Moss were conducted by Bonsall *et al.* between 1974 and 1986 and these sites lie only a short distance to the southeast of the Eskmeals dunes (Bonsall *et al.* 1986).

Ravenglass Roman Fort is a Scheduled Monument (139569) and lies within the 'Frontiers of the Roman Empire (Hadrian's Wall)' UNESCO World Heritage Site. It is also recorded in the Lake District National Park HER (HER: 1378). It is bisected by the Carlisle to Barrow-in-Furness railway which separates the fort into the eroding western section and the eastern section which lies within the delimited Park and Garden of Muncaster Castle. The site is owned by the Muncaster Estate and in 1885-6 the then Lord Muncaster undertook limited excavations at the site, revealing 'a short length of the western wall' (Potter 1979, 4). This suggests that significant erosion of the site has taken place since these excavations, and in 1976 The University of Lancaster undertook rescue excavations on the eroding western portion on behalf of the Department of the Environment (Potter 1979). These revealed the remains of an earlier fortlet under the Hadrianic fort, as well as evidence of continuous occupation until the early 5th century (Potter 1979, 48-50). In 1998 the entire fort and its ditches and ramparts were surveyed by Keith Blood of the RCHME to assist with appropriate management of the site (Blood 1998). The associated *vicus* is thought to be located in fields to the east and northeast of the fort (Clifford Jones *pers comm.*) and is not at risk of coastal erosion.

St John's church is thought to have been founded in the 13th century. It is not recorded in the Lake District National Park HER, but is a Grade II* Listed Building (76290). However, the presence of an Anglo-Saxon cross shaft in the churchyard may indicate that the church had an earlier precedent. No formal investigations of this possibility have been undertaken.

The Phase 1 aerial photography transcription mapped the remains of possible salt pans alongside the River Irt as it enters Ravenglass Harbour (NRHE: 1492717). These are not recorded in the Lake District National Park HER and may represent remains of important industrial activity in this location. The Phase 2 survey, therefore, aimed to ground-truth these remains and provide a description of their significance and state of preservation.

5.8.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of this area focused on publicly accessible land around Ravenglass Harbour and Saltcoats, as well as land within the ownership of QinetiQ weapons testing facility.

5.8.4 Prehistoric

The archaeology and palaeoenvironment of the Lowland Cumbrian Wetlands has been studied by Hodgkinson *et al.* (2000) as part of the North West Wetlands Survey.

Eskmeals is described as an important focus for Mesolithic, Neolithic and Bronze Age activity particularly in the vicinity of Skelda Hill, Williamsons Moss and Monks Moors (Hodgkinson *et al.* 2000, 70-1). Whilst Cherry states that ‘the overall picture at Eskmeals is of a group of Mesolithic habitation sites clustered above and along the eight metre contour, with later Neolithic and Bronze-Age occupation at a slightly lower level on the raised beach gravels’ (Cherry and Cherry 1986, 14). These occupation sites are identified through concentrations of lithic artefacts recovered on the surface, with a predominant use of local beach pebbles. Finds in the area have included microliths, an anvil stone, cores, blades, flakes, scrapers, arrowheads and barbed-and-tanged arrowheads (Cherry 1969; Cherry and Cherry 1986). They testify to the importance of the Eskmeals spit throughout the prehistoric period.

The Eskmeals spit is currently in the ownership of QuinetiQ and is used as a weapons testing facility. Supervised access was provided for the purposes of the Phase 2 survey which targeted areas of known lithic concentrations, predominantly Bronze Age in date (HER: 1381). The operators of QuinetiQ are aware of these sites and they are no longer in active use as part of the facility. This protects the remains from further damage as part of the weapons facility, but has also led to the area becoming overgrown with gorse. This will stabilise the dune system but makes walkover survey and recovery of loose finds problematic. No lithics were recovered at the time of the survey.

One cleared area containing similar ‘fire cracked’ stones to the prehistoric occupation sites on Walney Island (see Section 5.6.4) was noted during the survey and recorded as an area polygon (216). This covered an area *c.*25m in length and *c.*12m in width (Figure 5.75). It may represent the location of a buried prehistoric occupation site, which at this elevation would be expected to date to the Bronze Age (Cherry and Cherry 1986, 14).



Figure 5.75 Possible prehistoric occupation site at Eskmeals (scale = 1m).

The survey of the Ravenglass area was assisted by local archaeologist Clifford Jones, who drew attention to the site of a further excavation revealing prehistoric timber hut sites and hearths, alongside a palaeobeach near to Waberthwaite. The description of the site certainly bears a resemblance to the topographical location and the nature of excavated material at Williamsons Moss nearby (Bonsall *et al.* 1986), however this excavation has apparently never been published (Clifford Jones *pers. comm.*). The site is not recorded in the Lake District National Park HER.

The location of this alleged excavation was recorded as part of the Phase 2 survey (222) with the site situated on the southern shore of the River Esk, behind an area of saltmarsh accumulation. No evidence of the excavation or any prehistoric occupation was apparent at the time of survey, however a natural ridge in the landscape may represent the palaeobeach described (Figure 5.76).



Figure 5.76 Site of alleged excavation of prehistoric hut sites, looking southeast.

Across the estuary to the north, Clifford Jones has been involved in a research project focused on the area around Brighthouse Farm, south of Ravenglass Roman Fort. Here Jones identified a 'lozenge-shaped' enclosure on military aerial photography which he suggests may be prehistoric in date, possibly Iron Age (Clifford Jones *pers. comm.*). This extended northwest from Brighthouse Farm for a length of c.250m (Clifford Jones *pers. comm.*). A geophysical survey of land immediately south and west of Brighthouse Farm was conducted by Timescape Surveys in association with Clifford Jones and identified a series of anomalies, possibly representing pits, post holes, walls, water channels and a road (Biggins *et al.* 2007, 13-23). A further 'doughnut-shaped' anomaly was also noted to the southwest of the farmhouse, which Jones considers to be a possible Roman dock site or turning point associated with the fort to the north (Clifford Jones *pers. comm.*). It is discussed here in the prehistoric section, however, since it is related with the geophysical research discussed and does not have a definite Roman date. A programme of evaluation trenching to establish the nature of these anomalies, as suggested within the geophysical

survey report, is currently under development (Biggins *et al.* 2007, 24; Clifford Jones *pers. comm.*).

The phase 2 survey investigated the sites of the 'lozenge-shaped' enclosure and 'doughnut-shaped' anomaly, neither of which were particularly evident as surface features. The site of the 'lozenge-shaped' enclosure (223) was evident as an area of slightly elevated, flatter ground than the surrounding terrain, however this could not be definitively identified as a man-made feature (Figure 5.77), whilst the site of the 'doughnut' shaped anomaly (225) showed no surface expression. The location of both anomalies was recorded as part of the survey since future intrusive investigation may reveal significant archaeological remains in this area and this should be noted in the HER for future planning enquiries.



Figure 5.77 Brighthouse Farm sitting within the 'lozenge-shaped' enclosure noted as an area of slightly elevated flatter ground than the surrounding terrain, looking southeast.

5.8.5 Roman

Glannaventa was the Roman name for the fort at Ravenglass which excavations have shown to have been constructed initially as a fortlet or milefortlet of probable Hadrianic date, being replaced by the present fort c.120-130AD (Potter 1979, 18). The presence of the earlier fortlet was unknown prior to excavation and suggests that the line of fortlets and turrets, now well known along the North Cumbrian coast, may have extended as far south as Ravenglass if not further (Potter 1979, 18). In evidence of this Potter draws attention to a reference in *The Guardian Newspaper* of June 1978 which describes 'traces of a Roman camp and remains of a rectangular earthwork' on the Eskmeals dunes almost exactly 1620 yards (a Roman mile) to the south of Ravenglass fortlet (Potter 1979, 18). This fortlet is recorded in the Lake District National Park HER (HER: 1379).

The present fort is dated on pottery evidence to c.120-130AD. It superseded and enlarged the fortlet to an area of around 3.6 acres on a different orientation (Potter 1979, 48). The excavations uncovered the remains of routeways and timber barrack-blocks which were subsequently burnt down and replaced in four major phases, until the fort went out of use in the early 5th century (Potter 1979 48-9).

The Phase 2 survey recorded the remains of the fort as consisting of the low, grassed-over mound and ditch visible on the eastern side of the railway, and the same low mound with eroding till cliff section on the western side (74). The survey also recorded the associated Roman Bath House to the northeast of the fort which is thought to contain the highest section of standing Roman masonry in England (73).

The earthwork survey of Ravenglass Fort refers to the area east of the railway as being covered in dense woodland (Blood 1998, 9). This is no longer the case as clearance must have taken place in the intervening period allowing the remains to be fully appreciated. There did not appear to be significant earthwork remains within the fort, but its extent and outer ditch was discernable (Figure 5.78).



Figure 5.78 The eastern section of Ravenglass Roman Fort showing the northern ditch and location of the railway line marked by tree growth, looking west.

The remains of the western section of the fort are clearly visible from the shoreline at Ravenglass where the truncated remains of the outer ditch demarcate the northern and southern extent of the fort's interior (Figure 5.79). The Phase 2 survey measured the present line of the base of the eroding till cliff in order to provide a measured benchmark against which future erosion can be measured (74). An old retaining wall was noted c.10m in front of the eroding face and according to local knowledge this wall used to retain the fort c.30 years ago (Clifford Jones *pers comm.*). This suggests a loss of 10m of the fort in the past 30 years. Significant archaeological features were noted eroding in section at the top of the till cliff face, including structural remains and a cut feature towards the southern end of the fort (Figure 5.80).



Figure 5.79 The western section of Ravenglass Roman Fort showing the extent of erosion. The remains of a wall in the foreground are allegedly a former retaining wall for the fort that was in use \approx 30 years ago, looking north (scale = 1m).



Figure 5.80 Eroding archaeological deposits at the southern end of the fort, looking east.

The fort was visited in July 2011 and March 2012 and on both occasions eroding artefacts were recovered from the base of the cliff face (75). These have been analysed by Ruth Leary and Gwladys Monteil and consist of building material, pottery sherds and Samian Ware generally dating to the 2nd and 3rd centuries AD (Figure 5.81 and 5.82). The full reports are reproduced below. The presence of these eroding artefacts and features indicates that the rescue excavation, although extensive, has not recovered all of the available information on the western portion of the fort.



Figure 5.81 Ceramic building materials recovered from Ravenglass Roman Fort (scale = 0.1m).

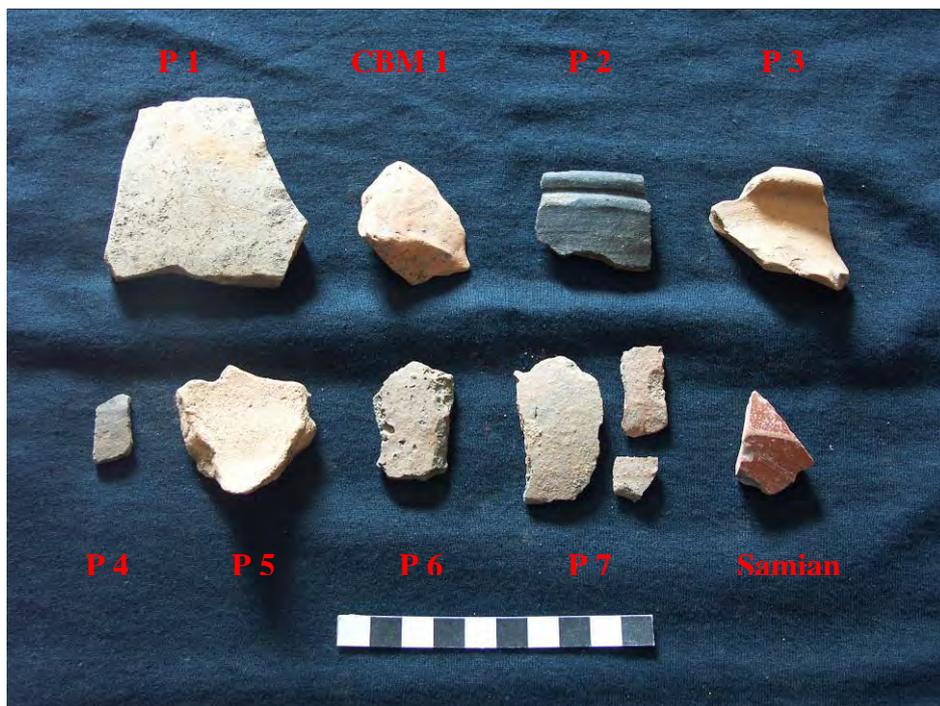


Figure 5.82 Ceramic building material, pottery sherds and Samian ware (scale = 0.1m).

**Ravenglass: Samian ware assessment
(For Archaeological Research Services Ltd April 2012)**

G. Monteil

A single fragment of Samian Ware was recovered from Ravenglass Roman fort and submitted for assessment. The sherd was examined, after taking a small fresh break, under a x 20 binocular microscope in order to identify the fabric.

The fragment, weighing 7g, comes from the junction between the wall and base of a Central Gaulish dish form, probably Dr.31R which is usually dated AD 150 to 200. The slip is quite abraded but the external surface shows evidence of wear.

Since there is neither stamp nor other distinguishable feature such as a rim or base, no further work is recommended.

**Ravenglass: Romano-British Pottery and ceramic building material assessment
(For Archaeological Research Services Ltd April 2012)**

R.S. Leary

Four fragments of ceramic building material and seven sherds of pottery were submitted for comment. The ceramic building material comprised the following:

Ceramic building material

- CBM 1. Abraded fragment in a fine orange fabric 13.5g with traces of plaster or some sort of rendering
- CBM 2. Curving fragment of tile, roof tile, sanded internally. 59.1g
- CBM 3. Fragment of flat tile, 262.8g
- CBM 4. Fragment of tile with right angle, probably roof tile, tegula. Heavily sanded on one outer face. 436.3g

Fragments 2-4 were in an orange fabric with abundant quartz inclusions

Pottery

- P 1. Dressel 20 amphora sherd, 61.8g
- P 2. BB1 grooved-rim dish with burnished intersecting loops. Gillam 1976 nos 69-70, late second to early third century. 15.7g.
- P 3. Oxidised ware bead-rim narrow-necked jar with internal groove. This is similar to Severn Valley types but is not a Severn Valley fabric. Likely to be produced in the North West, second or third century in date. Antonine or third century. The form compares well with Potter 1979 fig. 43 no. 69 for which a source at the Hadrianic-Antonine kiln at Muncaster is suggested. 15.7g.
- P 4. BB1 small scrap from jar with burnished lattice decoration, burnt. Hadrianic-Antonine. 1.6g.
- P 5. Oxidised ware basal sherd from jar. Roman
- P 6. Vesicular sherd in pale brown/buff ware. Date uncertain. 6.5

P 7. Coarse orange sherd. The back has entirely flaked off. This looks somewhat handmade.11g

The coarser brick and tile fragments are likely to be from the Muncaster kilns as is the narrow-necked jar. The kilns have been dated to the Hadrianic-Antonine period and this fits with the date of the BB1 dish. The fabric of the Dressel 20 oil amphora sherd belongs to the later period of production in the second or third century.

Around 30m northeast of the fort site, the Phase 2 survey recorded the remains of Ravenglass Roman bathhouse, known as Walls Castle (73). This is a Scheduled Monument (13570) and lies within the 'Frontiers of the Roman Empire (Hadrian's Wall)' UNESCO World Heritage Site. The walls are among the tallest surviving Roman remains in Britain and are managed by English Heritage, and are open to public free of charge. The bathhouse was excavated in the late 19th century and surveyed in 1985, both of which concluded that it was once more extensive than the existing remains. It would have extended beyond the present field boundary, making it larger than the bathhouse at Hardknott Fort to the east (Shotter 1998, 348). The Phase 2 survey recorded the remains as consisting of well-preserved and well-maintained sandstone walling (Figure 5.83). All door and window surrounds have been robbed out, however an internal niche for a statue survives giving some indication of the opulence of its interior.



Figure 5.83 Remains of Ravenglass Roman bathhouse (73), looking northwest (scale = 0.1m).

The final site of suspected Roman date recorded during the Phase 2 survey was identified from aerial photography by Clifford Jones and consists of a suspected milefortlet or tower at Saltcoats, c.2km north-north-east of Ravenglass. The aerial photography shows a square enclosure or foundation with a further square feature in the interior (Clifford Jones *pers. comm.*). The presence of a Roman fortlet in this location would add credence to Potter's theory that the Roman defences of the western frontier extended as far south

as Ravenglass and possibly beyond (Potter 1979, 18). The Phase 2 survey recorded the location of the suspected fortlet, which was discernable as a slight rise (232) in the pasture field where it was located (Figure 5.84). This could not be definitively identified as a man-made feature however.



Figure 5.84 Remains of a possible Roman fortlet, looking northwest (Clifford Jones pers. comm.).

5.8.6 Medieval

The excavations conducted on the Roman Fort at Ravenglass also uncovered the remains of a medieval stone-lined burial, aligned east-west. This was described as ‘undressed and irregular slabs of limestone, placed so as to form a cist, measuring internally 1.34m x 29cm...shallow 29cm in depth’ (Potter 1979, 47). The cist did not contain any human remains (owing to the acidic nature of the soil) or artefacts and was dated principally on stratigraphic grounds.

The Phase 2 survey recorded the remains of a possible cist (228) *c.*170m south of the fort, which may therefore date to the same period as the excavated example. The remains were located on the top of the eroding till cliff, obscured by trees. The railway line at this point is closer to the cliff edge than at Ravenglass fort, and the possible cist was essentially sandwiched between the railway line and the cliff edge. It consisted of irregular slabs of stone and slate arranged to form three sides of a stone-lined trough (Figure 5.85). This measured *c.*1.25m in length but appeared to have been truncated along one side by erosion of the till cliff on which it stands. There was a depression in the centre of the trough suggesting that it may have undergone excavation previously, an assumption which is further corroborated by the presence of a neatly stacked pile of stones to the side of the feature. There is no modern record of this excavation, or of the possible cist feature which is not recorded in the Lake District National Park HER.



Figure 5.85 Remains of possible cist south of Ravenglass Roman Fort, looking south (scale = 1m).

A further 'pit' feature (231) was recorded in the Brighthouse area *c.*200m southeast of the possible cist and it was thought to correspond to a record from the construction of the railway line in the mid 19th century. This states that a pit had been discovered containing some 'old bones and cloth' which were not considered to be of any value (Clifford Jones *pers. comm.*). The pit recorded at Brighthouse could not be accessed for detailed study as it lay in a fenced off area close to the railway line. It consisted of a relatively large square-shaped 'dip' in the natural terrain partly obscured by grasses, but appeared man-made on initial assessment (Figure 5.86). Its identification as the pit described by the railway workers is open to debate, more so because it does not appear on Ordnance Survey mapping until the National Grid 1:2500 map of 1971.

Nevertheless the presence of a number of possible medieval grave sites in the vicinity of Ravenglass may attest to its continued importance throughout the medieval period. Indeed the rare level of survival of the Roman bathhouse is attributed to the building having been used for domestic purposes in the Middle Ages (Shotter 1998, 348).



Figure 5.86 Possible pit feature at Brighthouse, looking north.

The Phase 2 survey of medieval sites in this area was targeted on the 13th century Church of St John's near Waberthwaite and the Anglo-Saxon cross shaft in its churchyard, both of which were recorded as part of the survey (77 and 230 respectively).

The Parish Church of St. John is a Grade II* Listed Building (76290). It is described as a 13th century foundation with later alterations and additions, constructed of wet-dashed rubble with a graduated slate roof and stone copings. The bellcote and south porch are later additions, with the panel above the door showing a George III coat-of-arms dated 1778. Internally, the church has a single chamber with stone benches and a stone font of probable medieval date.

The Phase 2 survey recorded St John's Church (77) as described in the Listed Building Description. It was well-maintained and still in use as a Parish Church (Figure 5.87). The church sits within a raised platform with a stone built retaining wall, similar to the church at Beckermet to the north (see Section 5.10.4). At Beckermet the platform is thought to be the remains of an Anglo-Saxon church with the later Norman church built in the same location, using the platform as the churchyard.



Figure 5.87 St John's Church, Waberthwaite looking north.

It is possible that the same situation existed at St John's as the late 9th century to early 10th century cross shaft in the churchyard is thought to be in its original socket stone, lending some weight to this area having some importance prior to the 13th century. The Cross Shaft is a Scheduled Monument (23779) and is recorded in the Lake District National Park HER (HER: 3984). It was uncovered in 1825 during works in the church porch and was subsequently used as a door lintel. The shaft was re-erected in what is thought to be its original socket stone within the churchyard in the 1880s.

The Scheduled Monument description describes the cross shaft as an Anglo-Scandinavian high cross constructed of red sandstone and rectangular in cross section, tapering slightly towards the top. 'The east face is divided into four panels and depicts animal figures together with roll moulding and interlace carving. The west face depicts a single panel divided by a vertical moulding into two parallel strips of interlace carving. The north face depicts interlace carving while the south face also depicts interlace with the addition of a bird-like head towards the top of the shaft. This decoration combines Viking period interlace carving with the earlier Anglian artistic tradition of winged birds and animals' (Scheduled Monument Description).

The Phase 2 survey recorded the remains of the cross shaft (230) as being largely as described in the Scheduled Monument Description, except that the bird-like head is actually on the wider east face of the cross shaft, rather than the south face which is a side panel containing interlace carving only (the same as the north face). The east face also contains the carving of a horse surrounded by interlace in the mid-section. Only three of the four panels on the east face are decorated, the basal panel containing interlace carving (Figure 5.88). Collingwood, who also provides a drawing of the shaft, describes these features as dating to the mid-10th century (Collingwood 1927, 152-3). The shaft is suffering from erosion and lichen growth that is damaging the decorative panels

and its outdoor location leaves it susceptible to the damaging effects of freeze-thaw action.



Figure 5.88 Cross shaft at St John's Church, Waberthwaite showing the west and north faces (scale = 1m).

5.8.7 Post-medieval

The survey of post-medieval archaeology in this area was targeted on the remains of possible salt pans along the River Irt that were identified in the Phase 1 aerial photography transcription (NRHE: 1492717). However, ground-truthing during the Phase 2 survey confirmed that these remains are actually Second World War bomb craters, rather than salt pans. All records should be amended accordingly.

The Phase 2 survey recorded the remains of a suspected copper working site (224) near Brighthouse on the River Esk, south of Ravenglass. The possible copper working site consisted of the ephemeral earthwork remains of a shallow circular feature, c.3m in diameter which may have been of past industrial use. It may be a salt pan, however some evidence points to the possibility of copper working at the site. The field in which these remains are located is known as Greenhills and Ravenglass was an important port in the post-medieval and industrial periods shipping out slate, granite, copper and iron ores mined in the local area and brought to the port by rail (Clifford Jones *pers. comm.*). The remains are not discernable in site photography and would need to be photographed during optimum conditions for earthwork survey (light frost/dusting of snow and low light) in order for a photographic record to be made.

The Phase 1 aerial photography transcription mapped the remains of an extensive post-medieval fish trap in front of Ravenglass Roman Fort (NRHE: 1157584). This was ground-truthed during the Phase 2 survey as consisting of a zig-zag shaped timber fish trap (78). The trap was constructed of thin upright timber posts extending from a shingle ridge and it crossed the entire width of the eastern inter-tidal zone of the River Esk at

this point. It has a total length of c.350m and contains two narrow ‘eyes’ where trapped fish would be collected, probably in wicker baskets (Jecock 2011a, 3). The degraded remains of these traps survive at the ‘eyes’ (Figure 5.89) and would likely have been similar to those recorded at Morecambe (see Section 4.8.4, Figure 4.65). In places traces of timber wattling also survives on the river bed which would have been weaved between the posts to form the barrier.

The dating of coastal and river fish weirs is difficult owing to the fact that the principals of their design changed little from the Anglo-Saxon period to the post-medieval (Jecock 2011a, 4). This site is marked on the Ordnance Survey 1st edition 1:2500 map of 1863 as a Salmon Fishery on a Muscle Bed. For this reason it has been placed in the post-medieval section of this report, but it may be earlier. The site remained in use until the 1970s (Clifford Jones *pers. comm.*).



Figure 5.89 Fish trap on the River Esk at Ravenglass with a degraded trap at the ‘eye’ on the right, looking north.

5.8.8 Threat from erosion

Of the sites recorded in the Ravenglass Estuary Complex (Figure 5.90), the vast majority lie within SMP2 policy unit 11d3.1 which recommends ‘No Active Intervention’ for the next 100 years, likewise the possible Roman fortlet at Saltcoates lies within SMP2 policy unit 11d3.3 which also recommends ‘No Active Intervention’ for the next 100 years. The possible prehistoric occupation site at Eskmeals lies in SMP2 Policy unit 11d2.2 which recommends ‘Managed Realignment’ for the next 100 years. This states that it will ‘allow continued natural coastal evolution and roll-back of dunes with localised limited intervention to manage risk to assets. Beach management measures should be incorporated along the frontage’ (Halcrow 2011). Halcrow (2011) states that this will have no known impact on the historic environment.

The Ravenglass Estuary was formed through the overdeepening of the Irt, Mite and Esk valleys during the last glaciation which led to the submergence of these three channels. Speed's map from the 1600s suggests that the rivers used to discharge separately, and it has also been argued that the position of the coast during the earlier Holocene lay over a kilometre seaward of its current position, again with the three rivers discharging separately to the sea (Kelly and Emptage, 1992). Reworking of the glacial sediments resulted in the development of the Drigg and Eskmeals spits, which must have caused the Irt and the Esk to divert and combine with the outflow of the Mite, though the timing of this is uncertain.

The estuary is macro-tidal, with a mean spring tidal range of over 7m (Halcrow 2011). It has relatively high tidal discharges and velocities owing to it being the convergence of three river systems, despite the fact that the rivers feeding the estuary have relatively low discharges (Assinder *et al.* 1985). Due to the orientation of the estuary mouth and the protection afforded to it by the opposing spit, it is only exposed to storms from a southwesterly direction. The future response of the estuary to sea-level rise is difficult to predict and Halcrow argue that one of two things could happen. Sea-level rise would increase the tidal prism and tidal power leading to either a widening of the estuary mouth, or increased sediment transport across the mouth meaning that it stays largely in its current state (Halcrow 2011). Any erosion at the estuary mouth is likely to increase sediment input to the estuary and may lead to saltmarsh accumulation. Halcrow did not model the response of the inner estuary to sea-level rise, however NCERM data places predicts a loss of between 3.4m and 6.6m in the next 100 years at Ravenglass Roman Fort (75) and its immediate vicinity. NCERM predict that there will be no retreat of the shoreline in the upper reaches of the Rivers Esk and Mite, where St John's Church (77) and the possible Roman fortlet (232) are located (NCERM 2012).

St John's church (77) and the cross shaft in its churchyard (230) are therefore not considered to be at risk of coastal erosion in the immediate or longer term. Flooding may become a problem following sea-level rise, however, as it lies alongside both the River Esk and Broadoak Beck. The cross shaft is also undergoing natural weathering processes owing to its outdoor location. The possible tower at Saltcoates lies c.400m from the shore and is not considered to be at immediate or longer term risk of coastal erosion. Similarly the Ravenglass Roman bathhouse (73), the possible lozenge shaped enclosure (223), possible harbour site (225) and possible copper working remains (224) are not considered to be at risk of erosion under current predictions of shoreline retreat.

The remaining sites, Ravenglass roman fort (75), the post-medieval fishtrap (78) and possible medieval cist (228) are undergoing active erosion and are therefore considered to be at immediate and continued risk of coastal erosion. The most significant of these sites is the Scheduled Monument of Ravenglass Roman Fort where the Phase 2 survey recovered significant quantities of building material and ceramic vessel sherds eroded from the monument and which are therefore without context. The eroding western portion of the site has been subject to rescue excavation, however the presence of these building materials and vessel sherds testifies to the fact that further remains exist on the site that have yet to be fully investigated and recorded. Clear remains of stone walls belonging to internal buildings within the fort could be seen eroding from the cliff face.

The possible medieval cist (228) is worthy of note as it may provide further evidence of the medieval occupation of Ravenglass and its environs. It appears to have lost its

western side to erosion already and a loss of between 3.4 and 6.6m of coastline would see this site entirely destroyed within the next 100 years.

Finally, although the possible Bronze Age occupation site at Eskmeals (216) lies over 400m from the shore and is therefore not considered to be at risk of erosion, the possibility exists that the managed realignment scheme at this locality will see the erosion of significant, previously unrecorded, prehistoric remains. This area has been shown to have been an important settlement locale from the Mesolithic through to the Bronze Age and a predicted loss of between 20m and 40m in the next 100 years may reveal further prehistoric remains (NCERM 2012).

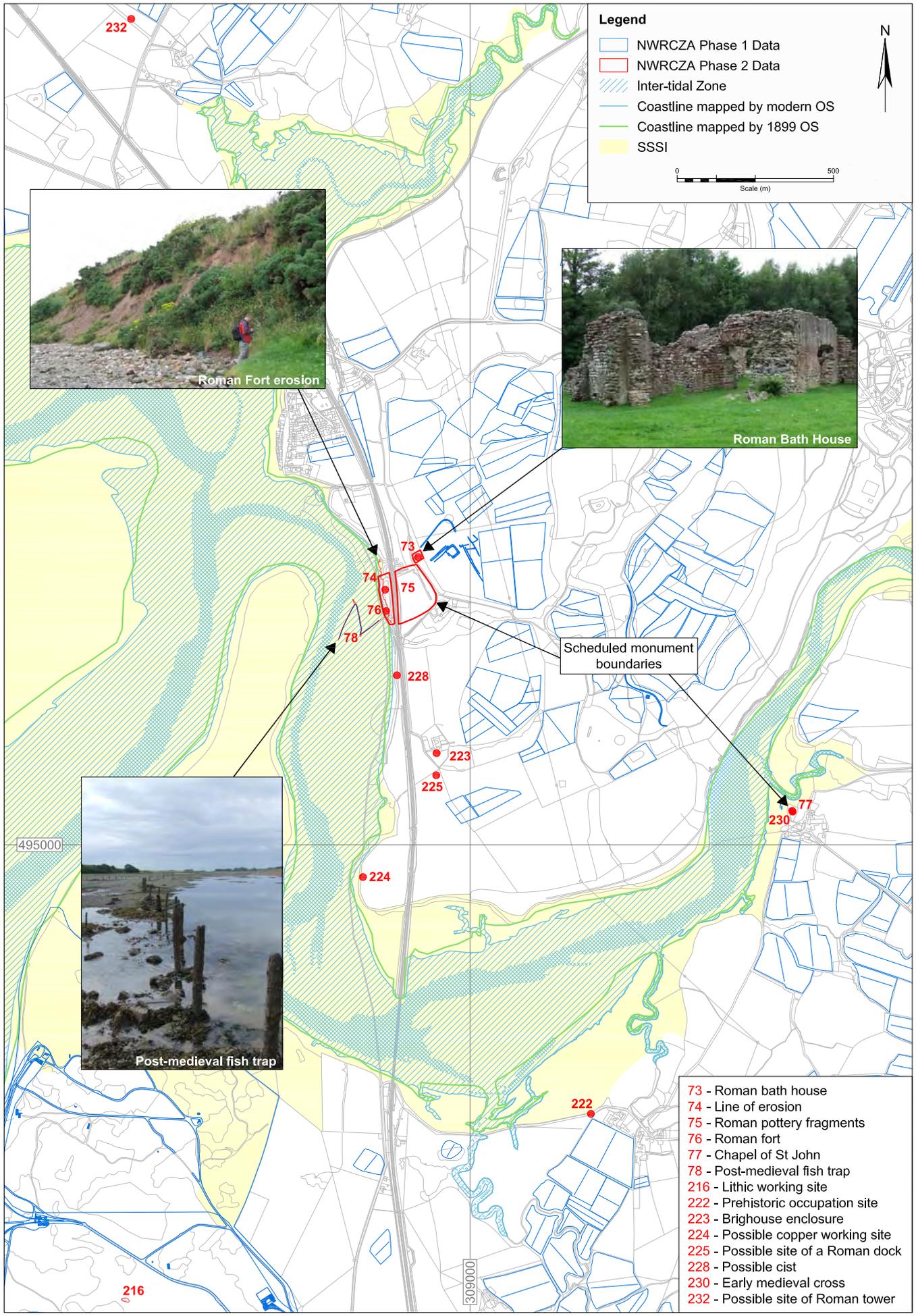


Figure 5.90 Location of sites surveyed in the Ravenglass Estuary Complex

5.9 Drigg (Map Figure 5.106)

5.9.1 Location and geology

Drigg spit (SD 05968 97037) extends from the mouth of the Ravenglass Estuary Complex in the south up to Barn's Scar in the north. It is effectively a peninsula of 4km in length, aligned southeast-northwest, and bounded by the River Irt to the east and the Irish Sea to the west. The southern portion of the spit lies within the Lake District National Park whilst the northern section comes under the authority of Cumbria County Council. The inland village of Drigg and the coastal town of Seascale are the nearest residential centres, although the spit itself is uninhabited.

Drigg spit has a solid geology of Calder Limestone formation with a superficial geology of Blown Sand (BGS 2008). It forms the mouth of the Ravenglass Estuary Complex discussed in Section 5.8.2. The principal soil in this area is Dune Sand suited to recreational uses (Farewell 2007) and the shoreline is composed of a narrow shingle beach fronted by wide inter-tidal sand and shingle flats (Figure 5.91). It is not provided with shoreline defences.



Figure 5.91 The inter-tidal zone at Drigg spit, looking south.

Drigg spit is used for recreational purposes and the southern tip of the spit comprises the Drigg Dunes and Gulley Local Nature Reserve. The shoreline is publicly accessible with the Cumbria Coastal Way joining the coast here from its inland course through Saltcoats. The area is used predominantly by dog walkers and bird watchers. Drigg Coast is a designated SSSI.

5.9.2 Previous research

The NWRCZA Phase 1 study looked at this part of the coastline as part of Block 4 of the study area (Johnson 2011). It highlighted the remains of a burnt mound and

suspected Roman bloomeries at Drigg as potentially at risk of coastal erosion and requiring rapid survey (Johnson 2011, 217).

The archaeology and palaeoenvironment of the Lowland Cumbrian Wetlands has been studied by Hodgkinson *et al.* (2000) as part of the North West Wetlands Survey. The burnt mound at Drigg was discovered following coastal erosion in 1967 and is recorded in the Cumbria HER (HER: 4300). Several lithic scatters were reported along the length of the spit between the 1960s and the late 1980s (Cherry 1965; Cherry and Cherry 1985, 1-5). The eroding section of the mound was cleaned and recorded by Cherry in 1982 and then partially excavated in 1999 and 2000 by the Lancaster University Archaeology Unit (Cherry 1982; Croft 2002).

The exact location of the Romano-British bloomery site at Drigg is unknown. It is recorded in the Cumbria HER as the 'site of a Romano British bloomery' (HER: 15922), but its location places it far from the shore in the inter-tidal zone. The Phase 2 survey therefore attempted to accurately locate the remains of the bloomery site and ascertain the level of risk of erosion at the site.

5.9.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of Drigg spit involved a walkover of publicly accessible land along the shoreline as well as the dune system.

5.9.4 Prehistoric

The burnt mound at Drigg was described by Cherry in 1982 as consisting of an oval-shaped concentration of 'fire cracked granites' and a timber structure lying within and above an organic band eroding from the dune face. Cleaning of the eroding section at this time revealed five flint artefacts consisting of lightly patinated beach pebble cores, and blades and a single microlith discovered beneath the 'hearth' (Cherry 1982, 4). The organic band was sampled for palynological analysis which concluded that the base of the organic band may coincide with the Elm Decline of c.3000 cal BC (Pennington 1965, 83).

The excavations in 2000 revealed parts of the timber 'structure' which showed similarities to excavated examples at Eskmeals, particularly the presence of large timbers above a bark 'mat'. The excavation concluded, however, that the 'structure' and 'bark mat' could have been formed through natural processes, noting that the timbers did not show any evidence of tooling (Croft 2002, 17). It was also argued that a 'cobble pavement', again similar to Bonsall's excavation at Eskmeals, was also likely to have formed naturally following an inundation of the site. The excavation recovered a single in-situ undiagnostic flint and noted several lenses of charcoal within the peat section. Despite these findings the excavation concluded that the site is of 'great importance' (Croft 2002, 19).

The Phase 2 survey of this area was assisted by Clifford Jones and David Coward who are familiar with the archaeology of this area, as well as Dr Ian Boomer as part of the palaeoenvironmental survey. David Coward also assisted in the excavation of the site in 2000 (David Coward *pers. comm.*). The area of the excavation was clearly demarcated by the presence of a timber board across the excavated section face. This was left in place to enable further excavation and palaeoenvironmental sampling of the site, as well as to protect the excavated deposits from further erosion. The location of the site was

therefore accurately located (213), c.216m away from its location recorded in the Cumbria HER (4300).

The organic band described by Cherry (1982) and Croft (2000) was clearly visible in the eroding cliff section and extends beyond the area of the suspected burnt mound (Figure 5.92). It was measured (212) and sampled for pollen analysis and radiocarbon dating as part of this project and the results are presented in Chapter 6.



Figure 5.92 Eroding organic band and site of the excavated burnt mound (cut section to the left of the photograph) at Drigg, looking east.

Some uncertainty remains in the interpretation of this site as a burnt mound as the excavations in 2000 failed to recover any evidence of prehistoric human intervention, save for the presence of charcoal bands within the peat deposits. Whilst the most likely explanation for the charcoal is anthropogenic, the possibility that it was formed through natural forest fires or clearance activities some distance from the site cannot be discounted. The palaeoenvironmental survey also suggested that the site may actually be a kettlehole deposit that has been misinterpreted as a man-made feature (Ian Boomer *pers. comm.*). The exact nature and significance of the site will therefore need to be established prior to the development of suitable management plans, if indeed these are necessary.

The site of a second suspected burnt mound was also recorded as part of the survey (211), c.60m north of the previous site. This was seen eroding from the cliff edge whilst the excavations of the southern burnt mound were being undertaken in 2000 (Croft 2002, 19). This consisted of similar ‘fire cracked basalt’ as identified by Cherry to the south (David Coward *pers comm.*). The erosion of this cliff section has stabilised, at least temporarily, and the remains are grassed over (Figure 5.93). No surface features associated with a burnt mound were recorded during the survey, but its location was accurately recorded to aid future management.



Figure 5.93 Investigating the site of the second suspected burnt mound with David Coward.

The Phase 2 survey also recorded the location of a possible flint working site (210) identified by Cherry within the dune system. Cherry recovered a large number of flint artefacts from fieldwalking in the dunes and noted this location as having a particular concentration, possibly representing a production site (David Coward *pers. comm.*). This site was known to David Coward but is not recorded in the Cumbria HER. No artefacts or features of prehistoric date were recorded at the time of survey, as dune erosion has stabilised and vegetation has become established (Figure 5.94). The area of previous dune erosion is marked by the change of vegetation in this area.



Figure 5.94 Recording the location of a suspected flint working site identified by Cherry, looking southeast.

5.9.5 Roman

The survey of Roman archaeology in this area was targeted on the Roman bloomery recorded in the Cumbria HER without an accurate location (HER: 15922).

The Phase 2 survey of this site was hampered by the lack of information available regarding its form and location. The project team consulted with local archaeologists Clifford Jones and David Coward, as well as Jamie Quartermine, landscape and industrial archaeologist at Oxford Archaeology North, however this failed to provide any further detail on the suspected site. A walkover of the shoreline and dune system at Drigg did not locate any remains that could be interpreted as a bloomery site. This suggests that it is either a rogue record in the HER, has already been lost to coastal erosion, or it has been buried by newly formed dunes and vegetation.

5.9.6 Post-medieval

The Phase 2 survey recorded the remains of a large enclosed area (227) at the back of the dune system in an area used as pasture fields. This consisted of a large rectilinear enclosure, measuring $\approx 235\text{m} \times \approx 60\text{m}$, demarcated by a raised bank and external ditch (Figure 5.95). A possible entrance into the enclosure was noted in the northeast corner as an area without the bank and ditch feature, though it may have been truncated at this point at a later date. The purpose of this feature is unknown, however Clifford Jones believes that it may be connected with oyster farming and pearl processing at Drigg in the 19th century (Clifford Jones *pers. comm.*).

The assessment of these remains as being of post-medieval date is linked to the level of preservation of the remains, as well as the shape and size of the feature. It bears similarity to a post-medieval field system, though the enclosure is certainly not a simple post-medieval field boundary.



Figure 5.95 Earthwork remains of rectilinear enclosure at Drigg showing the external ditch with reed growth and the bank where Clifford Jones is standing, looking north (scale = 1m).

5.9.7 20th century

Around 175m to the north of the possible post-medieval enclosure, the survey recorded the remains of a Second World War military camp (226) not mapped during the Phase 1 aerial photography transcription. This consisted of the brick and concrete footings for a number of buildings, within which remains of drainage systems indicated the position of former toilet blocks (Figure 5.95). Trackways were also recorded linking the building platforms together. The survey recorded remains covering an area $\approx 80\text{m} \times \approx 65\text{m}$, though it is probable that further remains exist at the site that were not mapped. To the south of the concrete footings, the earthwork remains of a series of domed platforms were also recorded (Figure 5.96). Seven platforms were recorded as part of the survey although further platforms were observed, but were too extensive to map. The purpose of these raised platforms is not known and their mapped extent does not follow any logical pattern. They may simply be dumped building materials from the demolition of the military camp, but they could be underground bunkers. Further investigation of these features would be required in order to determine their purpose and significance.



Figure 5.96 Remains of a military camp (226) at Drigg consisting of brick and concrete building platforms, remains of toilet blocks and dome-shaped raised earthwork platforms (scale = 1m).

A further Second World War military camp (82) was recorded within the dune system to the northeast of the burnt mound site. Again the remains consisted of concrete footings for a number of buildings spread across large areas of the dunes (Figure 5.97). These footings were not as well preserved as those recorded at the back of the dunes (226) and the lack of stock grazing in this area also meant that they were more overgrown. No specific functions for the structures could be identified.



Figure 5.97 Recording the remains of a military camp (82) at Drigg consisting of concrete building platforms, (scale = 1m).

Around 350m south of the military camp, the survey recorded the remains of a brick-built pillbox (79), together with an identical pillbox located *c.*1.4km further south (81). The northernmost pillbox lies within the remit of Cumbria County Council and is recorded in the Cumbria HER (HER: 16875). That in the south lies within the Lake District National Park and is not recorded in the HER. The similarities in form between the two structures suggest that they should be viewed and managed as a pair, regardless of them being located within different local authority areas.

The pillboxes consisted of small brick-built structures with flat concrete roofs. They were square in plan with half-round front projections containing wrought iron, shuttered, horizontal gun ports (Figure 5.98). The buildings appear to have been disguised, both by the use of false four-paned windows in each of their side walls and by the addition of a concrete projection on the roof. These features, together with the plan form of the buildings, combine to give them the appearance of small boats or ship wrecks, thus deterring enemy attack (Figure 5.99). The northernmost pillbox was in a better state of preservation than that to the south which was partially buried in dune sand and which has suffered from subsidence. Both pillboxes had significant cracks three to four courses beneath the roof.

These structures have been interpreted as pillboxes, however they may be the remains of quadrant towers associated with an artillery range (Osborne 2006, 198), and as such they would be used to plot the exact angle that ammunition hits the water. Drigg dunes was an important training centre for soldiers during the Second World War and the purpose of these structures may therefore be related to that, rather than the active defence of the coast.



Figure 5.98 Northernmost brick-built pillbox (79), looking northeast (scale = 1m).



Figure 5.99 Northernmost pillbox disguised as a small boat or wreck in the dunes, looking southeast.

A further pillbox (83) was recorded $\approx 530\text{m}$ to the north of the military camp. This was a very simple concrete square-shaped structure with a flat roof (Figure 5.100). It has a wide gun port on its western elevation, small ventilation openings on each side wall and an entrance to the rear, eastern elevation. This feature may have been associated with a Second World War firing range that was mapped as part of the Phase 1 aerial photography transcription directly in front of this structure (NRHE: 1413082). No remains of the firing range were identified during the Phase 2 survey.



Figure 5.100 Recording the remains of a concrete pillbox overlooking the location of a Second World War firing range, looking southwest (scale = 1m).

In the inter-tidal zone, $\approx 560\text{m}$ southwest of the concrete pillbox, the survey recorded the remains of a shipwreck (80), or gunnery target, of probable wartime date. The remains of the iron-hulled wreck were spread across an area of $\approx 300\text{m}^2$, with the main body of the ship covering an area of $\approx 170\text{m}$. The wreck had sustained significant damage to the ribs which were twisted with shear breaks (Figure 5.101). This may have been caused by the wreck having rolled onto the beach during storm conditions, or it may have been fired upon as part of the training exercises taking place in Drigg dunes. Enough of the wreck survives to appreciate its original form and further research would undoubtedly identify the type and date of the vessel (Figure 5.102).

Also on the beach front, the survey recorded the remains of a ruined pillbox or gun emplacement (84) consisting of a concrete block with a iron pivot, or gun mounting position (Figure 5.103). This was surrounded by further concrete and iron remains. This site may have been destroyed through coastal erosion.



Figure 5.101 Iron-hulled wreck in the inter-tidal zone at Drigg, showing the sheared and twisted nature of the ribs, looking east (scale = 1m).



Figure 5.102 Iron-hulled wreck in the inter-tidal zone at Drigg, looking south (scale = 1m).



Figure 5.103 Remains of possible gun emplacement or pillbox (84), looking east.

In the dune system $\approx 180\text{m}$ south of this feature, the survey recorded the earthwork remains of a minefield (209) that was mapped as part of the Phase 1 aerial photography transcription as running for a length of $\approx 2.5\text{km}$ along the coast (NRHE: 1492518). The remains recorded consisted of two craters covering an area of $\approx 160\text{m}$ (Figure 5.104). These were mapped as an area polygon to give some idea of the character of these remains. Further remains of the minefield are likely to survive along the coast, but were too extensive to map as part of this project.



Figure 5.104 Remains of a minefield in the dune system at Drigg, looking southwest (scale = 1m).

A further earthwork depression in the dune system was recorded immediately to the north of the remains but appeared to be a rectilinear cut feature, rather than a mine crater (Figure 5.105). This was interpreted as a Second World War trench (208).



Figure 5.105 Remains of a trench in the dune system at Drigg, looking west (scale = 1m).

5.9.8 Threat from erosion

The sites recorded at Drigg (Figure 5.106) lie within SMP2 policy unit 11d4.1 which recommends 'No Active Intervention' for the next 100 years.

The dune system of Drigg spit appears stable and well-vegetated with limited mobility, except for along the dune face where bare sand is notable and erosion is ongoing. The spit runs to a significant resistant scar (Barn Scar) in the north which influences the shoreline position and provides some protection to the frontage in this area. North of Barn Scar the dune system sits above relatively high till cliffs, though these are unconsolidated and provide limited protection against erosion. Slumping is a key characteristic of erosion in this area, making it difficult to measure previous erosion of the shoreline from Ordnance Survey mapping. Predictions of future shoreline evolution contained within the SMP2 document were contradictory with Bullen Consultants predicting a loss of 75m in the next 100 years (Bullen Consultants 1998), and Futurecoast stating that erosion would be negligible, except for at Barn Scar where the cliffs would retreat at a rate of between 0.1m and 0.5m per year (Halcrow 2002). The more recent NCERM predictions see a loss of between 53m and 97m in the next 100 years under current management practices (NCERM 2012).

In light of these predictions, the majority of sites recorded in this area are at immediate and long term risk of coastal erosion and this includes the potentially very significant remains of prehistoric settlement (210, 211, 213) and palaeoenvironmental deposits (212) along this coastline. The only sites that are not considered to be at risk of coastal erosion

are the Second World War military camp (226) and post-medieval enclosure (227) recorded at the rear of the dune system, as these lie over 300m from the shore.

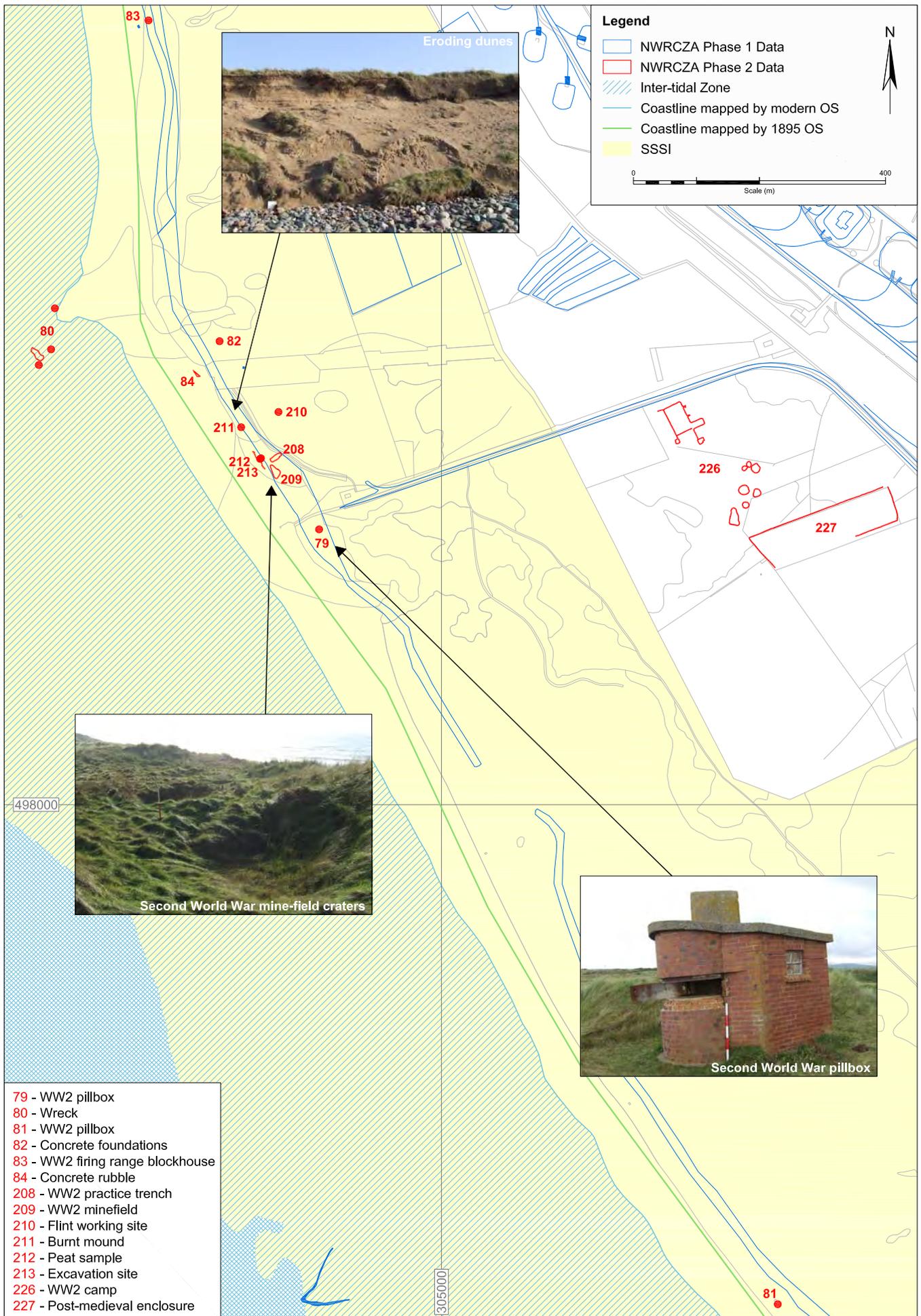


Figure 5.106 Location of sites surveyed at Drigg

5.10 Nethertown (Map Figure 5.112)

5.10.1 Location and geology

Nethertown (NX 98933 07352) is located on the Irish Sea coast \approx 11km south of Whitehaven and \approx 4.5km southwest of Egremont. The town was established as an anti-aircraft training camp during the Second World War and further developed throughout the 1940s and 1950s when Sellafield Nuclear Plant was under construction \approx 5km to the southeast.

The coastline at Nethertown is aligned roughly southeast-northwest and has a predominant solid geology of Triassic St Bees Sandstone Formation. The superficial geology is characterised by Quaternary Glaciofluvial deposits of Devensian Sand and Gravel with outcroppings of Diamicton Till (BGS 2008). The principal soil in this area is Deep Loam which is suited to cereal production and some horticultural crops, although stock rearing and dairying is more common in Cumbria (Farewell 2007). The shoreline is composed of unconsolidated sediments and is largely undefended except for the Cumbrian Coast railway line which runs very close to the shore at this point (Figure 5.107).



Figure 5.107 The coastline at Nethertown, looking south (© Tony Peacock).

Land use in Nethertown is predominantly residential with pastoral agriculture surrounding the small town. The shoreline is publicly accessible as part of the Cumbria Coastal Way and is frequented by dog walkers.

5.10.2 Previous research

The NWRCZA Phase 1 study looked at this part of the coastline as part of Block 4 of the study area (Johnson 2011). It highlighted a medieval fish trap in Nethertown, close to St Bees, as being at risk of coastal erosion and requiring rapid survey (Johnson 2011, 217).

The Phase 1 aerial photography transcription mapped the remains of a medieval fish trap in the inter-tidal zone at Nethertown (NRHE: 1493094). It may be associated with fishing rights from St Bees Priory, but did not appear on the most recent aerial photographs of this area. The Phase 2 survey therefore aimed to provide an up-to-date assessment of the present condition of these remains.

5.10.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of Nethertown involved a walkover of the inter-tidal zone at this location.

5.10.4 Medieval

The Phase 2 survey at Nethertown was assisted by Peter Murphy of English Heritage. It recorded the remains of the medieval fish trap (139) as consisting of a well-preserved, rubble-built, V-shaped fish trap with concave sides (Figure 5.108). The side arms of the trap extended for c.105m into the inter-tidal zone and were designed to trap fish at the apex or 'eye' during the ebb tide.



Figure 5.108 V-shaped, stone-built, medieval fish trap at Nethertown, looking southwest.

The stone-built nature of this fish trap contrasts sharply with the fish traps recorded so far along the North West Coast as part of the Phase 2 survey. These have universally been built of upright timber posts designed to carry wattle side walls (see for example Section 4.8.4). Jecock states that fish weirs constructed entirely of rubble walls seem confined to the South West Coast of England and Wales (Jecock 2011a, 3). If this trap was originally built entirely of rubble walling, therefore, this may be a significant site type in this region.

Further walkovers in the vicinity of Nethertown were conducted with the assistance of local archaeologist Clifford Jones, who drew attention to medieval remains in Beckermert and Braystones that were subsequently added to the Phase 2 survey.

The Cumbria HER records the location of a possible motte at Braystones, c.2km southeast of Nethertown. It is said to have been the seat of the de Braithstones family (HER: 5644). No formal investigations of the site have taken place and it has been suggested that the 'motte' is a natural formation, rather than a man-made mound (King 1983, 96). The suspected motte is now topped by Braystones Tower, a Grade II Listed memorial tower to Queen Victoria's Diamond Jubilee (351971). It was built in 1897 and used as a further memorial to the fallen of the First World War in 1920. The Listed Building Description does not include any reference to the motte

The Phase 2 survey recorded the remains of the motte and Braystones Tower (234) as consisting of a large, probably natural mound, topped by a 19th century battlemented tower of red sandstone (Figure 5.109). The tower was as described in the Listed Building description with no major damage or subsidence problems noted at the time of survey.

The suspected motte appears convincing from the north, east and west approaches alongside the canalised river, however from the landward southern side it takes on the appearance of a natural raised spur. Whilst this may indicate that the bailey was located on this site, there is no evidence of an associated bailey enclosure and even then the motte would normally be cut off from the bailey by a water-filled moat. That the site is not a man-made mound, however, does not necessarily mean that it was not used by the Normans in a similar fashion, as medieval castle sites generally made use of natural topography where possible. The location of the site on raised ground next to a possible river crossing would make it a desirable location for the establishment of a castle and past landscape evidence may even show that the spur was cut off by water during high tide as the surrounding land is a low lying infilled estuary. Further research on documentary sources and limited excavation work could elucidate some of these points, and would allow for more informed and appropriate future management of the site.



Figure 5.109 Natural spur possibly used as a Norman motte with Braystones Tower on the summit, looking north.

St Bridget's Church in Beckermet is a Grade II* Listed Building (76363) described as the remains of a medieval church with some 17th century alterations. It is currently on the Heritage at Risk Register due to water ingress and stone decay. It is recorded in the Cumbria HER as a Norman church with an Anglo-Saxon foundation and a pair of Anglo-Saxon cross shafts in its churchyard (HER: 1259). The cross shafts together form a Scheduled Monument composed of a 9th century Anglian cross and a late 10th/early 11th century Anglo-Scandinavian cross (23784). The churchyard is believed to be of Anglo-Saxon origin with the Norman church replacing an earlier ecclesiastical building in this location.

The Phase 2 survey of St Bridget's recorded the remains of the church, the churchyard and the two cross shafts (233). The church was as described in the Listed Building Description and lay within a raised churchyard with a stone-built retaining wall (Figure 5.110). This is a similar arrangement to that recorded at the Parish Church of St John in Waberthwaite (see Section 5.8.6) which is also considered to be an Anglo-Saxon foundation. The presence of two cross shafts within the churchyard lends further weight to the argument that this was an important ecclesiastical area prior to the Norman Conquest.



Figure 5.110 St Bridget's Church, Beckermet sitting on a raised platform within its churchyard, looking south.

The earlier of the two cross shafts is described in the Scheduled Monument Description as being carved in yellow sandstone with a circular profile to the base and a square profile with rounded corners to the shaft. This is similar to the famous cross at Gosforth, c.6km to the southeast (Collingwood 1927, 6). An inscription on the west face of this shaft has not yet been deciphered, and the language in which it was written has not yet been identified (Scheduled Monument Description). This earlier shaft has been illustrated and described by Collingwood (Collingwood 1927, 6 and 147). The later cross shaft is constructed of red sandstone and has a similar profile with a circular base below a rectangular shaft.

The Phase 2 survey recorded the cross shafts as described in the Scheduled Monument Description (Figure 5.111). The shafts are within socket stones but are most likely not in their original location as their proximity to each other would allow very little space between the shafts for the side arms of the crosses, if these had survived. One, or both, of the cross shafts is likely to have been moved to its present location after the crosses had been broken. Both shafts are suffering from erosion and lichen growth that is damaging the decorative panels and their location outdoors leaves them susceptible to the damaging effects of freeze-thaw action.



Figure 5.111 Two cross shafts in the churchyard at St Bridget's Church, Beckermet. Late 10th - early 11th century cross on the left and 9th century cross on the right.

5.10.5 Threat from erosion

The sites recorded in Nethertown (139), Braystones (234) and Beckermet (233) lie within SMP2 policy unit 11d5.5 which recommends 'Managed Realignment' for the next 20 years and 'No Active Intervention' therefore up to 100 years (Figure 5.112). The managed realignment scheme proposes to monitor the flood and erosion risk to the railway and only carry out works if the railway is at risk. It also recommends the development of an adaptation strategy for properties on the beach and, subject to consent, conduct ongoing beach management to help reduce risks in the short term. No further development will be permitted along the beach (Halcrow 2011).

The coastline from Braystones to Nethertown is composed of varied cliffs of till, sands and gravels, railway embankment and outcroppings of sandstone. The shoreline is orientated to the predominant wave direction, limiting net sediment drift. *Sabellaria* reef was observed on the shingle scars at Nethertown during the course of the Phase 2 survey and this is indicative of limited mobility in the shoreline system. Halcrow state that present beach levels are sufficient to guard against erosion of the toe of the cliff with erosion risk being generally confined to storm conditions. Detailed modelling of the

effects of sea-level rise on this frontage is hampered by the varied make-up of the coastal material, however some data is available. Storm events likely to cause erosion are predicted to take place once every 5 years, eroding between 5 and 15m of coastline within the next 50 years (JBA 2005). NCERM models this at a loss of 10m in the Braystones area in the next 100 years and between 3.4m and 6.6m at Nethertown for the same period (NCERM 2012).

All of the sites recorded in this section are significant for various reasons. The most at risk of coastal erosion is clearly the inter-tidal fish trap at Nethertown which is apparently a rare example of a stone-built fish trap in this location. Its possible association with the ecclesiastical establishment at St Bees, c.5.5km to the north, also gives it added significance. It is undergoing active erosion and therefore considered to be at immediate and long term risk of coastal erosion. Should there be any buried timber elements at this site, a radiocarbon date could prove useful for establishing the development of this fish trap and its chronological relationship with those recorded in other areas along the North West Coast.

Owing to their distance from the shoreline, the suspected motte at Braystones and the Anglo-Saxon church of St Bridget's in Beckermet are not considered to be at immediate or longer term risk of coastal erosion. However, their location within an infilled estuary leaves them at risk of flooding with the surrounding land being particularly low lying. Both sites lie within the Environment Agency's Coastal Flood Risk Area for extreme events.



Figure 5.112 Location of sites surveyed at Nethertown and Beckermat

5.11 St Bees (Map Figure 5.117)

5.11.1 Location and geology

St Bees Head (NX 97068 11797) is the most westerly point along the North West Coast of England and has the only significant sea cliff in the study area, rising to a height of 141m aOD. The village of St Bees appears to have been settled by Irish-Norse Vikings in the 10th century and its name is a corruption of the Norse for ‘Church town of Bega’. Bega was allegedly an Irish princess who fled across the Irish Sea to escape an arranged marriage, landing at St Bess.

The coastline at St Bees has the same geological characteristics as that at Nethertown (see Section 5.10.1), with large cliffs of Triassic St Bees Sandstone forming St Bees Head (Figure 5.113). The shoreline immediately south of St Bees Head is provided with seaward defences in the form of St Bees Promenade, with a seawall fronted by groynes. The remainder to the south consists largely of unconsolidated sediments with only localised defences. The inter-tidal zone is characterised by a narrow shingle beach with extensive inter-tidal sand flats.



Figure 5.113 The coastline at St Bees, looking north to St Bees Head.

Land use in St Bees is predominantly residential with pastoral agriculture in surrounding countryside. The area is a popular holiday destination for families and walkers and forms the start of Wainwright’s famous Coast-to-Coast walk. The shoreline is publicly accessible as part of the Cumbria Coastal Way and is frequented by holiday makers, walkers and dog walkers. St Bees Head and the coastline immediately to the south lie within the St Bees Head designated SSSI.

5.11.2 Previous research

The NWRCZA Phase 1 study looked at this part of the coastline as part of Block 4 of the study area (Johnson 2011). It highlighted a medieval fish trap in St Bees as being at risk of coastal erosion and requiring rapid survey (Johnson 2011, 217).

The Phase 1 aerial photography transcription mapped the remains of a medieval fish trap in the inter-tidal zone at St Bees (NRHE: 1493459). It is also recorded as a fish garth in the Cumbria HER (HER: 4452). The site may be associated with fishing rights from St Bees Priory, but did not appear on the most recent aerial photographs of this area. The Phase 2 survey therefore aimed to provide an up-to-date assessment of the present condition of these remains.

5.11.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of St Bees involved a walkover of the inter-tidal zone at this location.

5.11.4 Prehistoric

The palaeoenvironmental survey at St Bees recorded an extensive exposure of peat with surviving tree boles and surface timbers in the upper beach section (246). In the lower beach section a further deposit of marine clay was recorded with a lower level of preservation (247). These exposures were sampled for pollen analysis and radiocarbon dating, the results of which are presented in Chapter 6.

5.11.5 Medieval

The Phase 2 survey at St Bees was assisted by Peter Murphy of English Heritage. It recorded the remains of the medieval fish trap (138) as consisting of a reasonably well-preserved, rubble-built, fish trap extending for a visible length of $\approx 15\text{m}$ seaward before turning at a roughly 90° angle and continuing for a length of $\approx 20\text{m}$ (Figure 5.114). This section of visible fish trap represents only the mouth of what was a very large, probably V-shaped, structure mapped from aerial photography and extending for a length of $\approx 80\text{m}$ into the inter-tidal zone. The remainder of the fish trap is likely to survive but was not observed due to tidal conditions.



Figure 5.114 Stone-built, possibly medieval fish trap at St Bees, looking northwest (scale = 2m).

A second possible rubble-built fish trap (137) was recorded $\approx 80\text{m}$ to the south of this feature. It consisted of a possible man-made alignment of stones extending for a visible length of $\approx 10\text{m}$ out into the inter-tidal zone (Figure 5.115). Further study of this feature would be necessary in order for it to be classified with certainty.



Figure 5.115 Possible fish trap at St Bees, looking west (scale = 2m)

Similar to Nethertown, these stone-built fish traps are a rare feature outside the South West Coast of England and Wales and as such they are significant survivals of past fishing practices (Jecock 2011a, 3).

5.11.4 Threat from erosion

The definite fish trap (138) lies within SMP2 policy unit 11d 5.7 which recommends 'Hold the Line' for the next 100 years, whilst the possible fish trap (137) and peat and marine clay exposure (246-7) lie within the SMP2 policy units 11d 5.6 and 11d 6.1 respectively, both of which recommend 'No Active Intervention' for the next 100 years.

The location of the recorded features (Figure 5.115), in the inter-tidal zone, means that they will not be protected by seaward defences, regardless of the SMP2 policy in place. The orientation of the shoreline at St Bees, and the protection afforded by St Bees Head, however, means that the beach is only exposed to waves from the south-west to south-south-east (Halcrow 2011). This means that there is limited scope for sediment movement within the system, with the shingle upper beach section only becoming mobilised during extreme events. During such events, material has a tendency to draw down, leaving the toe of the till cliffs exposed to wave action (Halcrow 2011). The effects of draw down were noted during the Phase 2 survey of the marine clay exposure which has been scoured, probably due to shingle movement, into a series of peaks and troughs (Figure 5.116).



Figure 5.116 Effects of draw down on the exposed marine clay in the lower beach section at St Bees, looking west (scale = 1m).

The inter-tidal fish traps at St Bees are apparently a rare example of a stone-built fish traps in this area and their possible association with the ecclesiastical establishment at St Bees also adds significance to these features. Their full extent and form is yet to be recorded and, should there be any buried timber elements at these sites, a radiocarbon date could prove useful for establishing the development of the fish trap/s and their chronological relationship to those recorded in other areas along the North West Coast. The fish traps are undergoing erosion owing to their inter-tidal location, though this may be at a slow rate due to the slightly protected nature of this shoreline. Nevertheless they are considered to be at immediate and long term threat of coastal erosion.

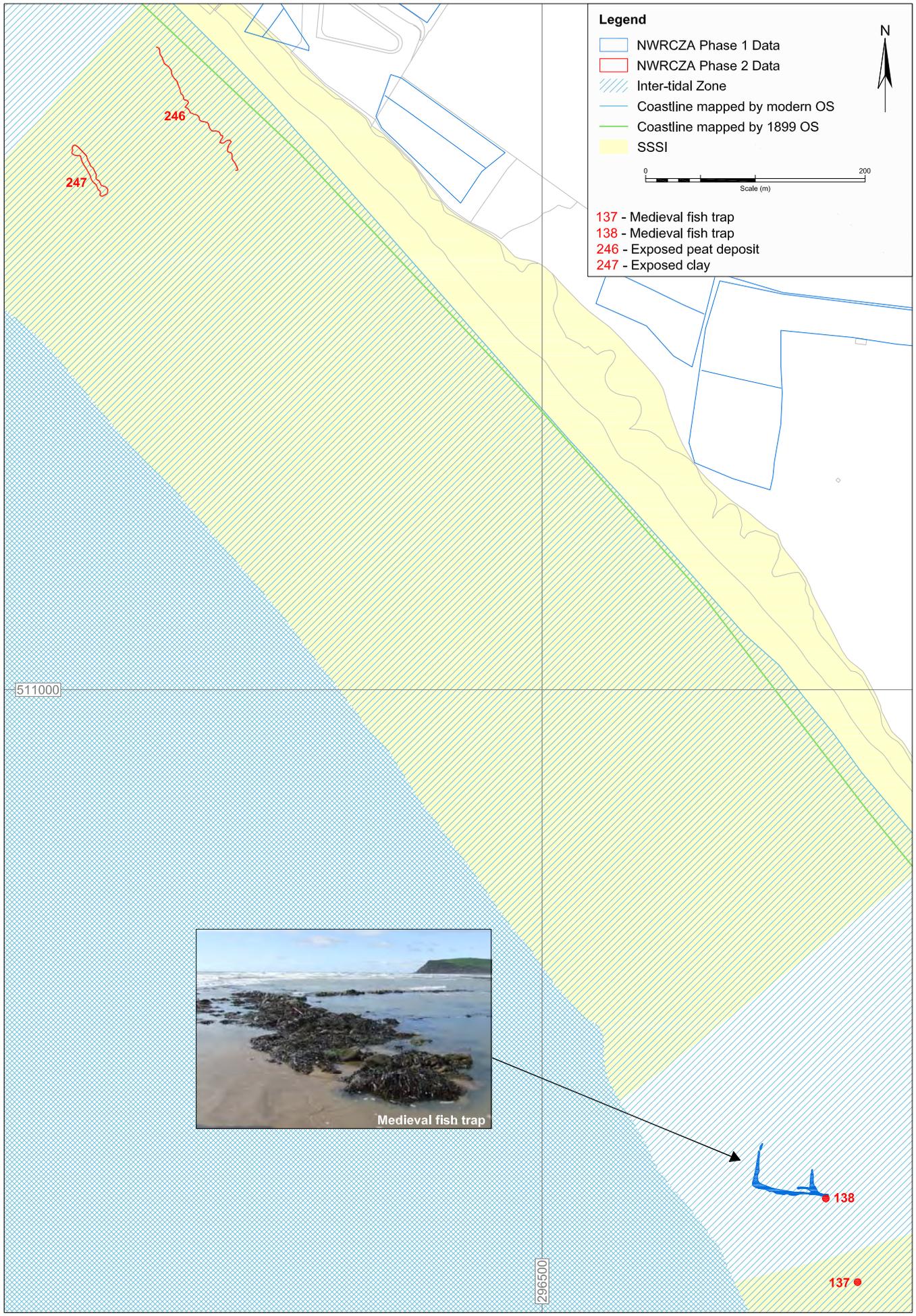


Figure 5.117 Location of sites surveyed at St. Bees

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