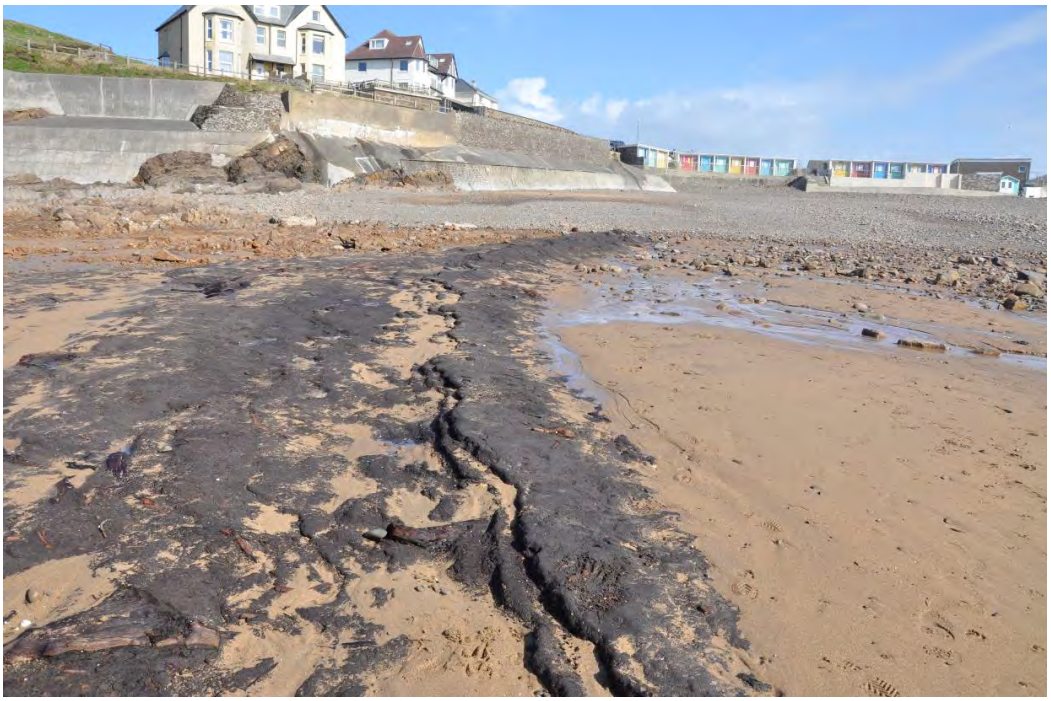
Crooklets Beach Peat Deposits, North Cornwall

Background and Site Visit Report



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1. Introduction

Sediment movements around the UK coast over winter 2019/20 have caused the reduction of covering sediment levels in a number of areas. In North Cornwall local geologist Jane Anderson estimates that between 1.5 - 2 metres of sand has been scoured from the coast due to the large number and intensity of storms over winter. Jane's report on social media (Facebook, 10 March 2020) highlighted the exposure of peat deposits on Crooklets Beach, Bude, Cornwall, she stated: "These pics are of the recently exposed 5000-year-old submerged forest at Crooklets Beach, Bude. It is very rarely seen. All the humpy bits are the bases of tree trunks with their roots growing in thick hardish peat. The forest was drowned after the sea level rose as the ice retreated from Britain at the end of the Devensian Ice Age".

To determine the extent and character of these exposures a site visit was undertaken on 21th March 2020. The visit was undertaken at low tide, however, the peat exposures were visible further up the beach profile and extreme low tide was not needed to inspect them (see figure one for location of Crooklets Beach).

The exposure of this site adjacent to an urban settlement and within an area of underlying hard rock coastline has relevance for the current SARCC project (Sustainable and Resilient Coastal Cities). The pilot study in Newlyn, Cornwall, has a recorded peat deposit that is periodically exposed in the intertidal area to the north east of the planned breakwater extension; the site at Bude demonstrates the extent to which analogous prehistoric landscape deposits can survive and how they inform on past and present coastal changes.

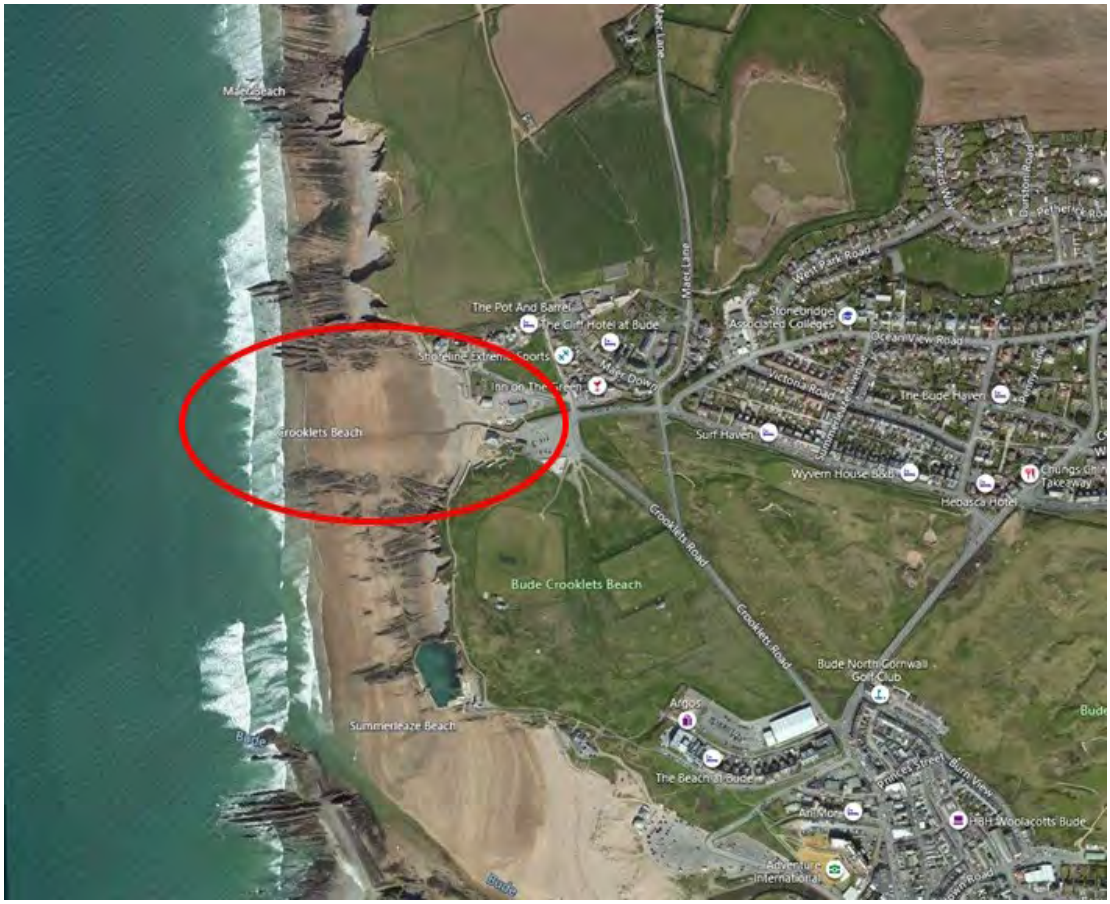

Figure 1: Crooklets Beach is located within the North Cornwall coastal town of Bude, it is the most Northerly of the town's two main beaches.

2. Crooklets Beach Peat Deposits Background

Although recently exposed, the peat deposits at Crooklets have been recognised since the 19th century as being of geological and geomorphological interest. The site was highlighted in the 2014 project *Archaeology, Art and Coastal Heritage – tools to support coastal management and climate change planning across the Channel Regional Sea* (Arch-Manche). The report stated:

"The North Cornwall and North Devon study area contains a wealth of archaeological and palaeoenvironmental evidence which can improve our understanding of past sea level and environmental change. Evidence from Crooklets Beach was ranked the highest, the site contains a submerged forest, peat deposits containing timber fragments, and a Mesolithic flint working site nearby. The forest was first recorded on a map in 1848, it is also shown on the 1880 Ordnance Survey map just below mean high water (see Figure 2).

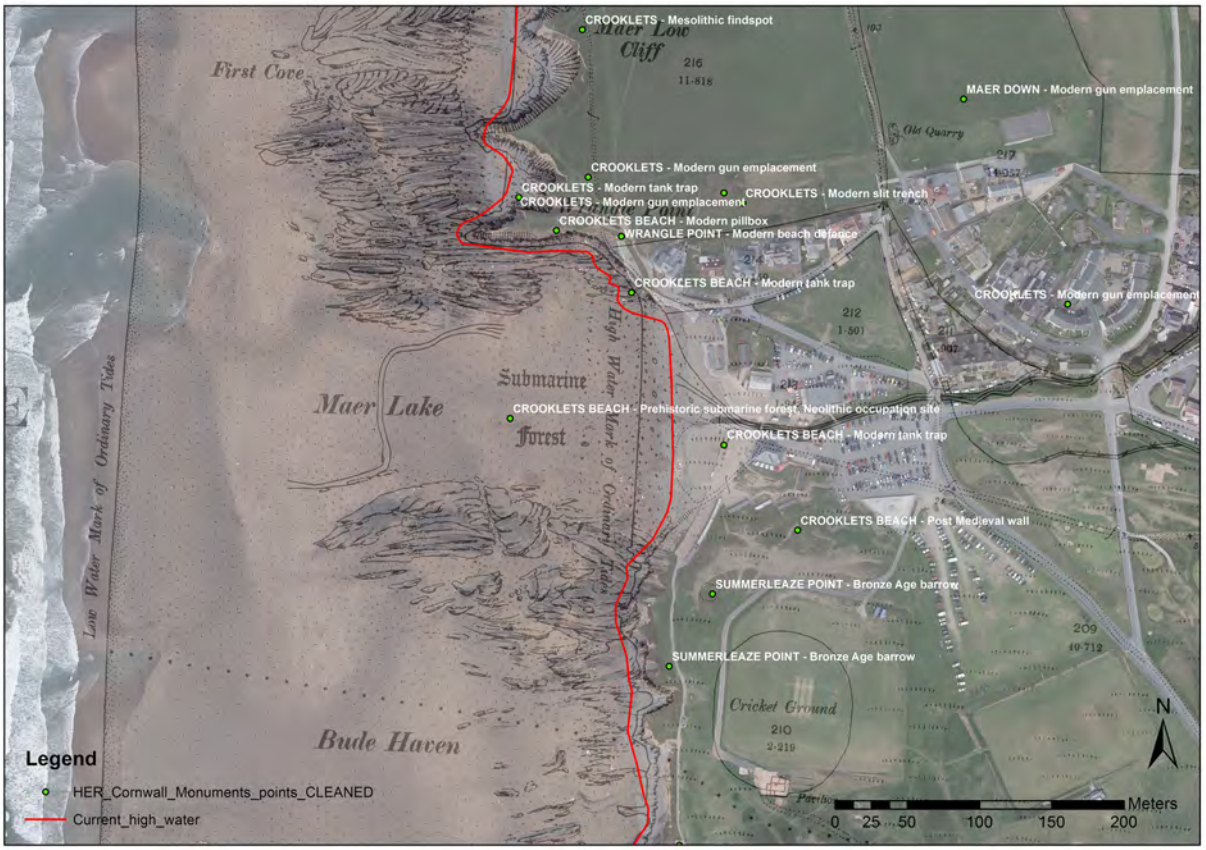

Figure 2: Map showing the location of the submerged forest at Crooklets Beach from the 1880 Ordnance Survey Map overlain on 2013 Aerial Photography (Channel Coastal Observatory). The red line shows the current high water mark, which in the centre of Crooklets Beach is 24m further inland than then HW mark on the 1880 map. The green dots show site data obtained from the Cornwall HER (Figure taken from Arch-Manche Technical Report).

Environmental analysis of further material recovered during cable works in 2000 revealed that the environment of Crooklets Beach was predominantly woodland with swamp and freshwater pools dating to at least 3750-2200 BC (Kirkham & Herring, 2006:172). The submerged forest was mainly oak and alder with some ash and willow and has been radiocarbon dated to between 3750-3500 BC, open water pools also existed as evidenced by finds of aquatic plants and the Crooklets stream is said to have flowed through swampy environment, then woodland on the lower slopes of the bay and then out to sea (Kirkham & Herring, 2006:172). Although no evidence of human activity was found in this area a flint knapping site from the late Mesolithic was recorded inland from the beach, flints were first discovered eroding from the cliff in 1972. This data can help to reconstruct the prehistoric

landscape, and to understand the change in sea level since this period" (Satchell, J & Tidbury, L (eds) 2014, Section 3G) *Arch-Manche Technical Report*. Arch-Manche Technical Report, Section 3G).

The peat deposits were not exposed at the time of the Arch-Manche project, local anecdotal evidence suggests the last time the peat deposits were exposed was around ten years ago.

3. Peat Exposure 2020

The site visit determined there were two main areas of peat exposure which are situated at either side of Crooklets Beach (Figure 3), a northerly exposure and a southerly exposure both indicated on Figure 3 with red circles showing their approximate location.

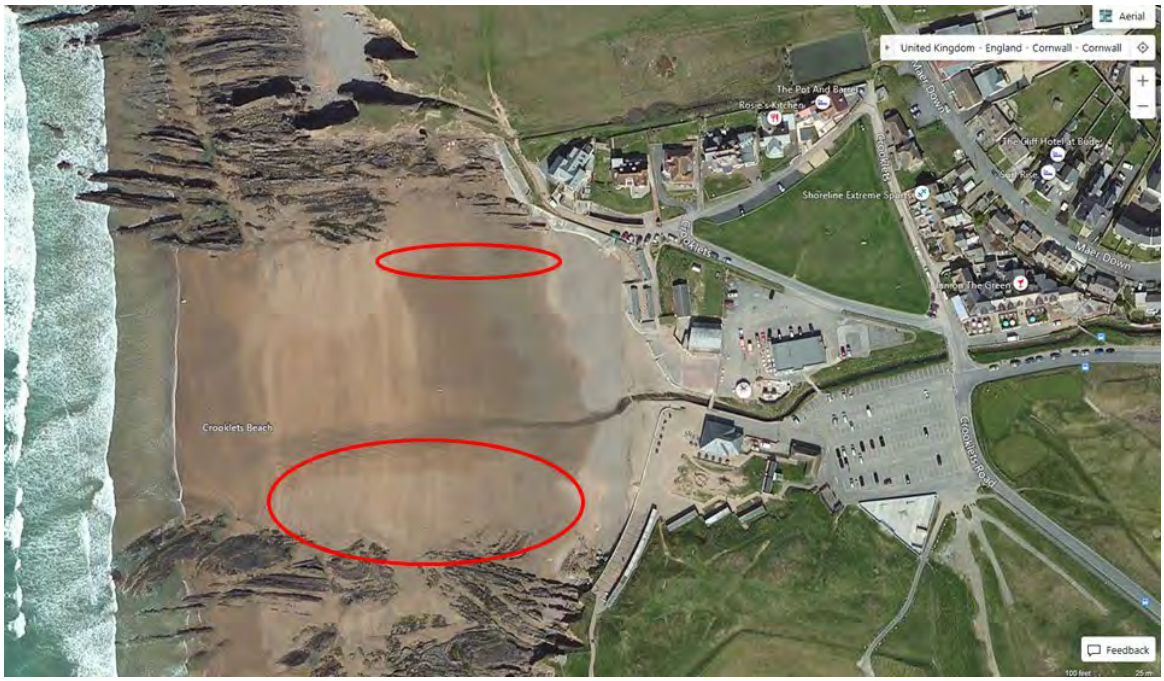

Figure 3: The areas where the peat has been exposed on Crooklets beach in 2020.

3.1 NORTHERLY PEAT EXPOSURE

The peat exposure extended between 30 to 40m east to west, while the width of the exposure was approximately 5m (see Figure 4). At the eastern end of the exposure it formed a narrower 'wedge' which was angled with the high point along the northern edge and a slope across the face towards the south. Further seaward, to the west, the deposit was a flatter exposure (as can be seen in Figure 5).

Along the norther edge of the eastern section it was possible to see the peat in profile and how it relates to the underlying deposits, thought to be estuarine clays, some of which were also exposed in plan view (Figures 6 and 7).

The positions for the exposures were taken using a phone-based location feature which only provides resolution within a few metres; two positions were taken at the peat deposit, one at its easterly extent where it disappears under the shingle deposits: 50, 50',8"N / 4, 33', 13" W. A further position taken approximately half way along the feature on the northern edge: 50, 50',11"N / 4, 33', 17" W.

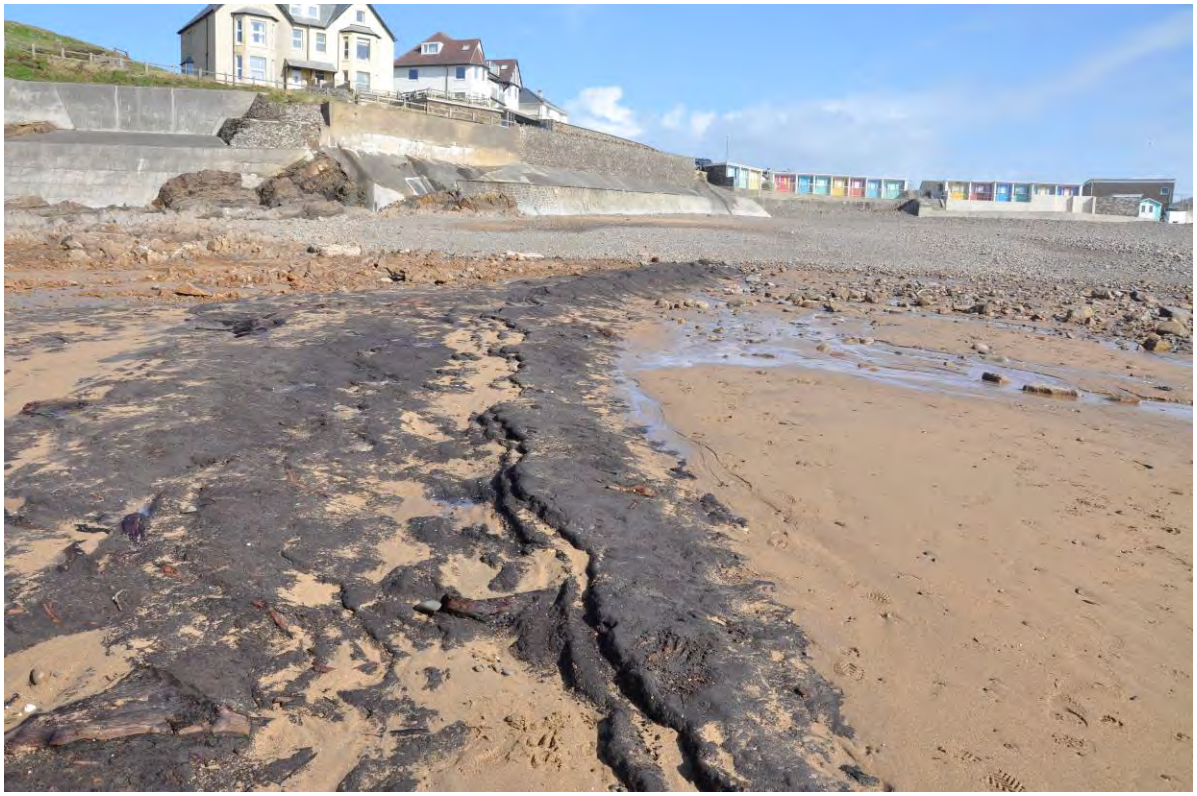

Figure 4: The northerly peat exposure taken from approximately half way down the exposure looking east toward the shore with the coastal buildings and defences visible in the background.

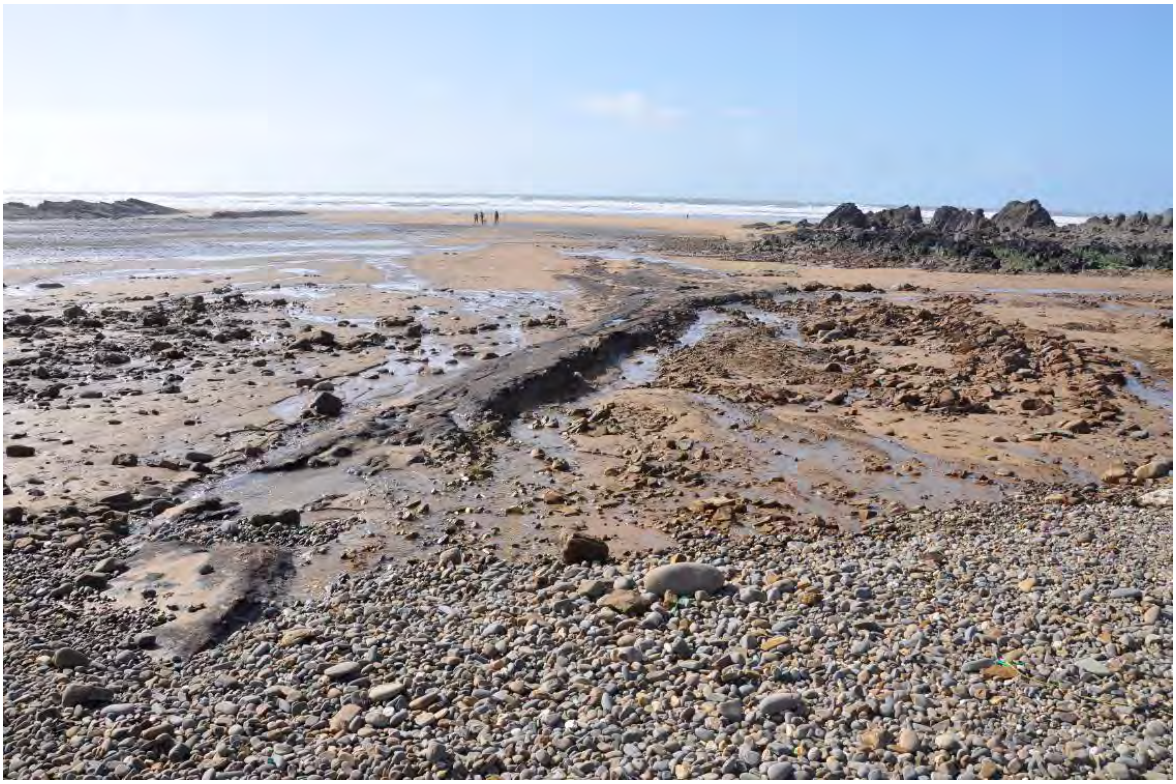

Figure 5: The northerly peat exposure showing its full extent. Taken from a position to the east of the exposure looking west (seaward).

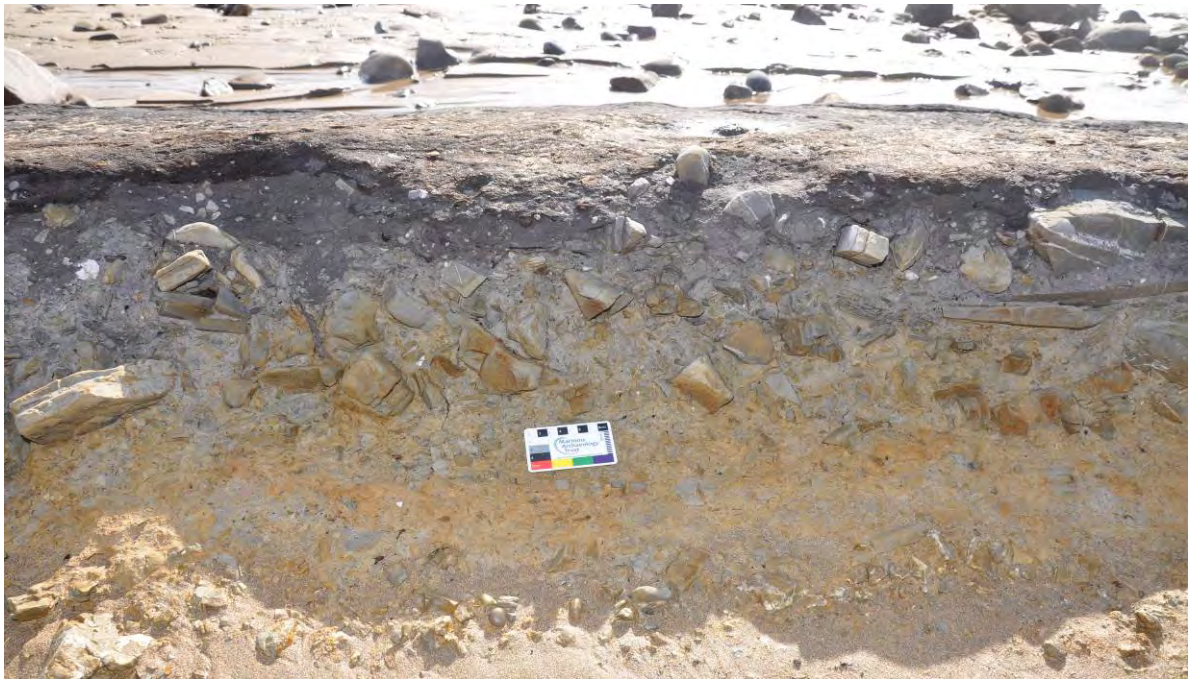

Figure 6: Profile view of the northerly peat exposure. Showing the section on the northern side which has been created by erosion.

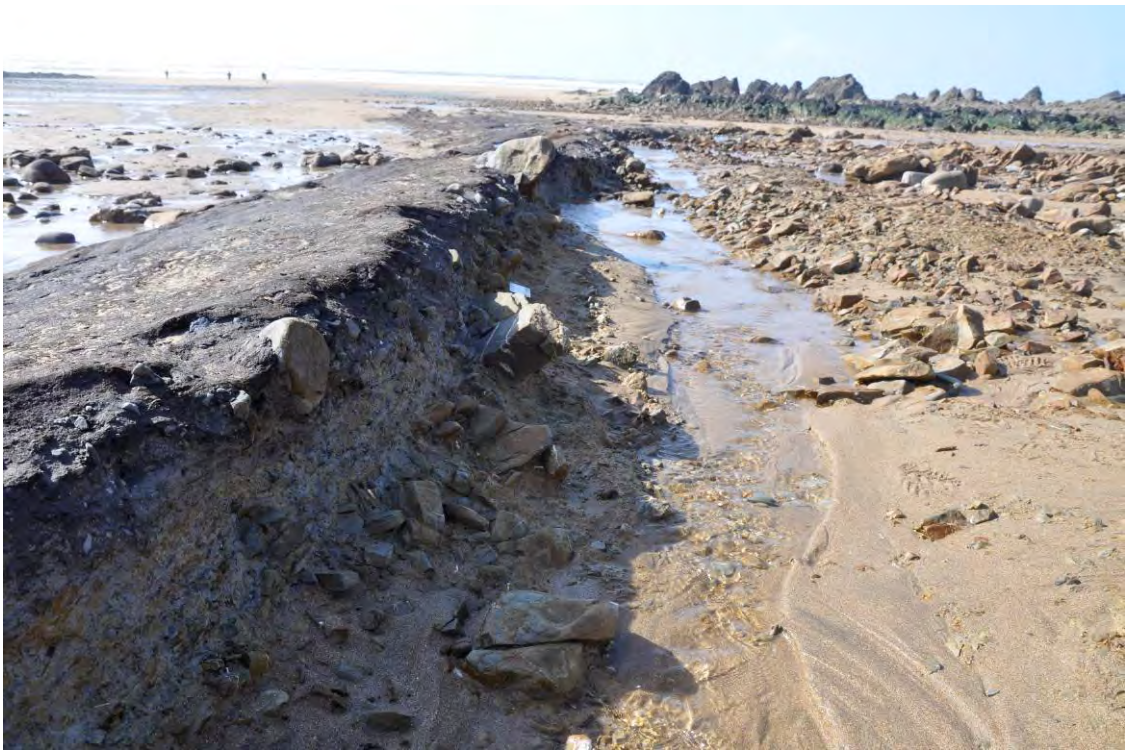

Figure 7: Looking along the northern edge of the northerly peat exposure, showing the relationship of the surviving deposits in relation to the underlying beach deposits.

Right across the exposure it was possible to see remains of trees and plant material – the reported 'submerged forest' from early mapping and which featured within environmental samples (Figure 8). There was also what appeared to be a 'tree bole' which had left a significant hole in the peat, likely to be from the loss of the tree which was once there (Figure 9).

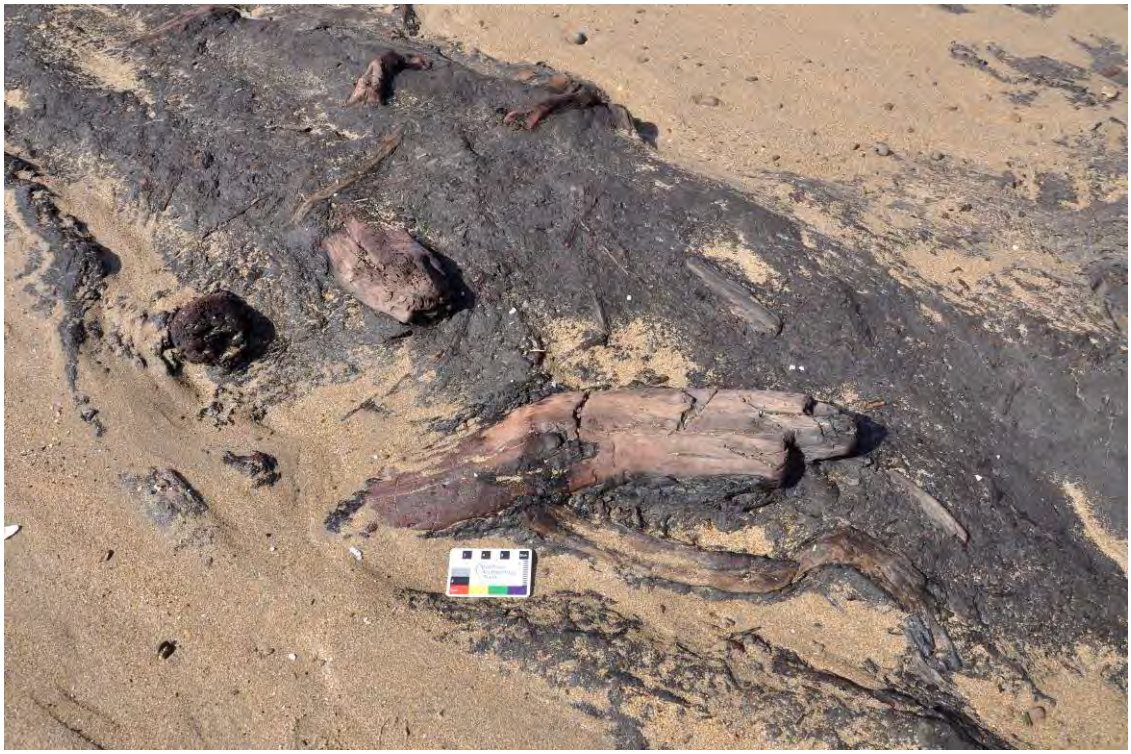

Figure 8: Tree and plant remains of various sizes are visible embedded within the peat deposit.

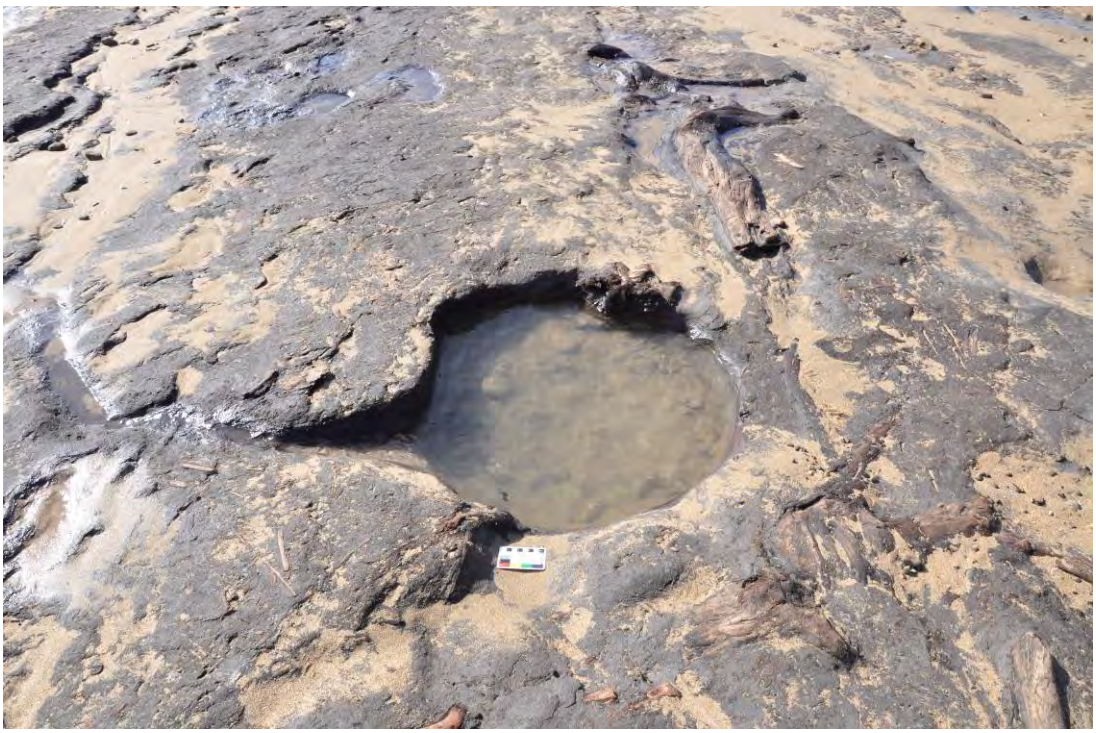

Figure 9: What appears to be a 'tree bole' where the tree has been scoured out of the deposit along with its root system leaving a hole.

Walk over survey of the beach close to the high tide mark revealed a number of pieces of peat which had become dislodged from one of the exposures (Figure 10). The severe storms battering the coast, which were continuing at the time of the field visit, were inevitably causing damage to the exposures.

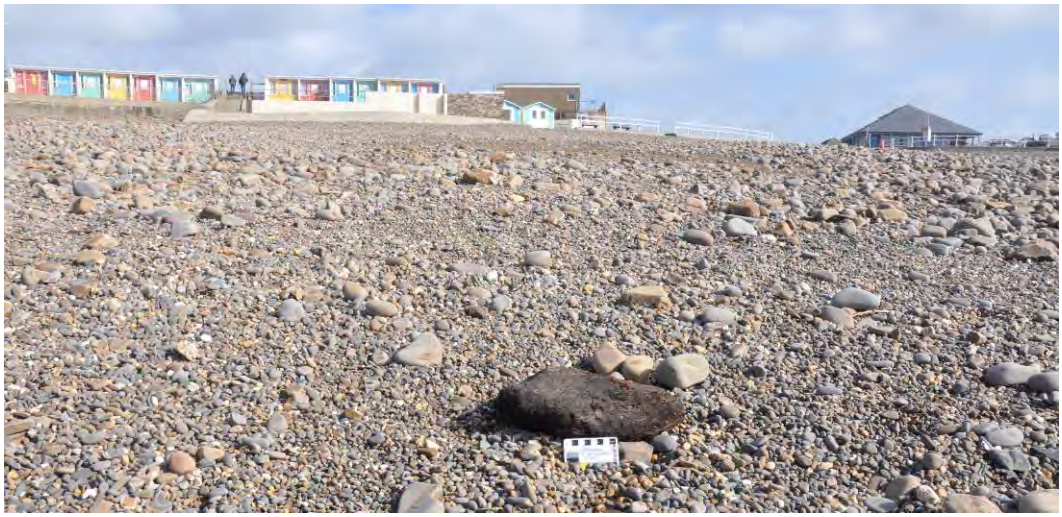

Figure 10: Piece of peat which has become dislodged from the main area of deposit

3.2 SOUTHERLY PEAT EXPOSURE

The southerly peat exposure is larger than the northerly exposure and could be seen to continue over a relatively large area with peat visible in patches below the sand covering. The current stream also runs partly over the peat exposure which obscured some areas from view (Figure 11).

The position at the seaward extent of the exposure was 50, 50’ 10”N / 4, 33’14” W, with the landward extent at 50, 50’ 8”N / 4, 33’ 13” W

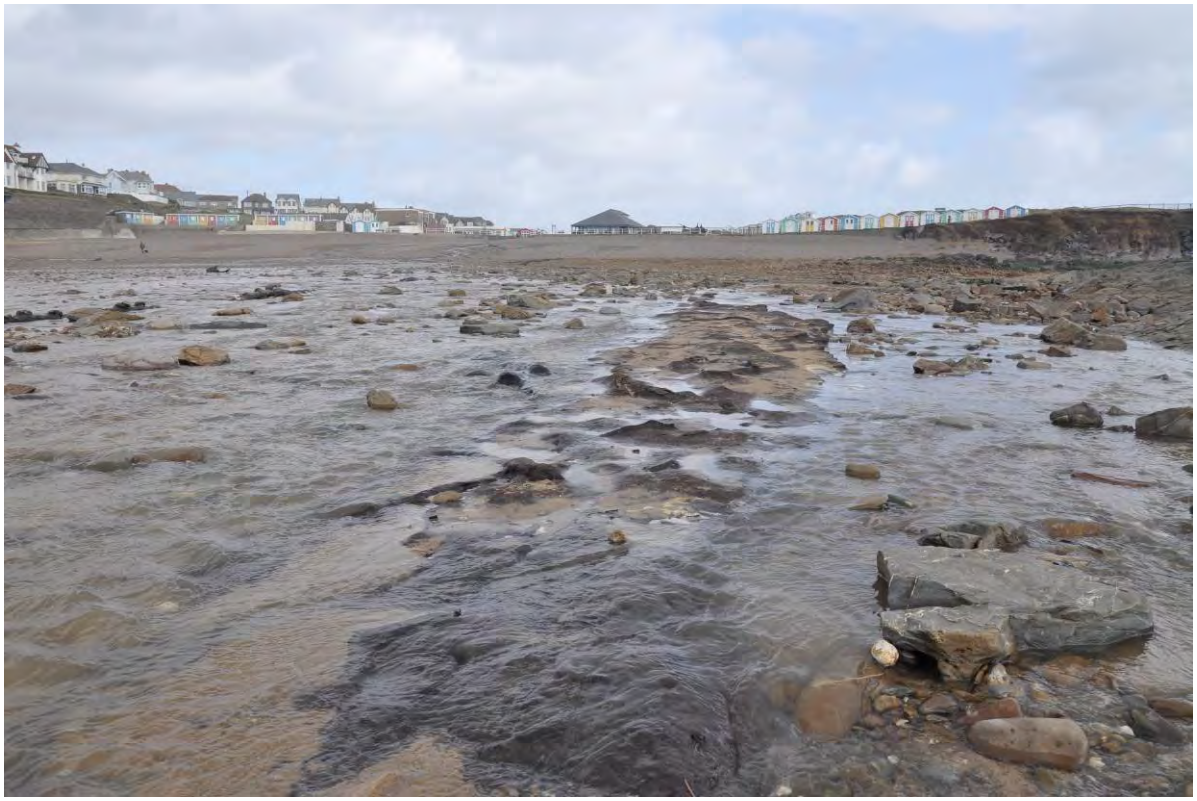

Figure 11: The southerly peat deposit which runs below a significant part of the beach deposits. Looking north. The modern stream flows over the exposure.

This peat exposure is relatively flat, which is likely to be a product of more recent erosion acting on the deposits. At a number of points along the southern edge of this exposure there is a slight rise in the deposits and a small section has been exposed showing the relationship with the underlying deposits (Figure 12). There are remains of trees, small pieces of wood, and likely root systems, visible within the surface of the exposure (Figures 13 and 14).

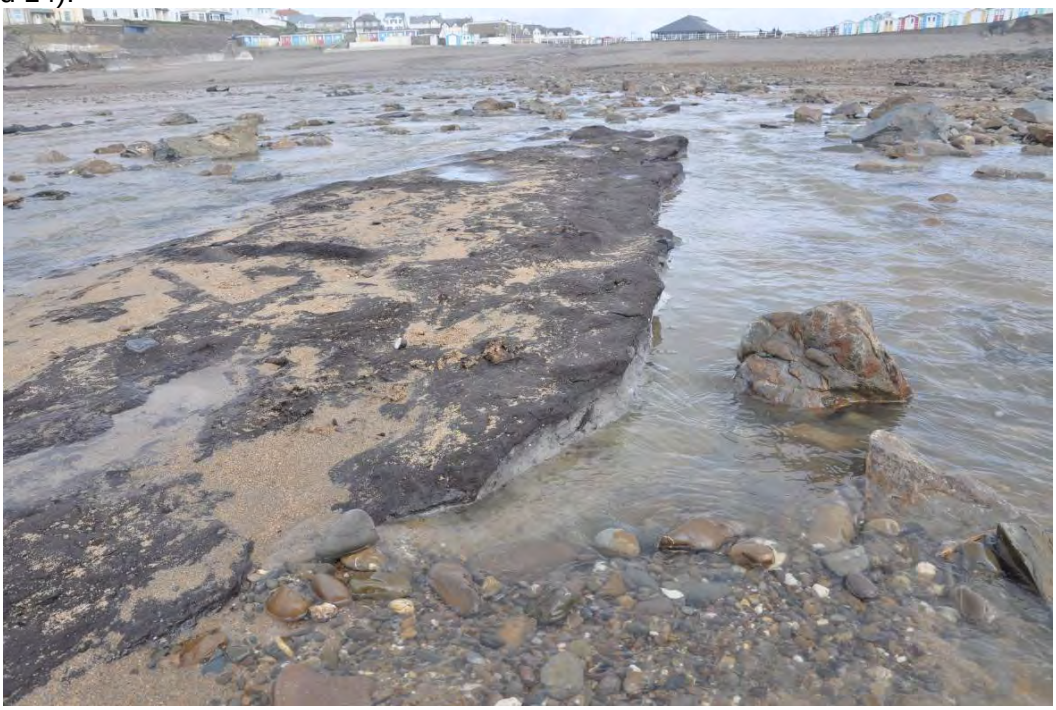

Figure 12: The southerly edge of the southerly peat exposure showing the relationship of the peat deposit to underlying estuarine deposits and the rocky geology which lies below.

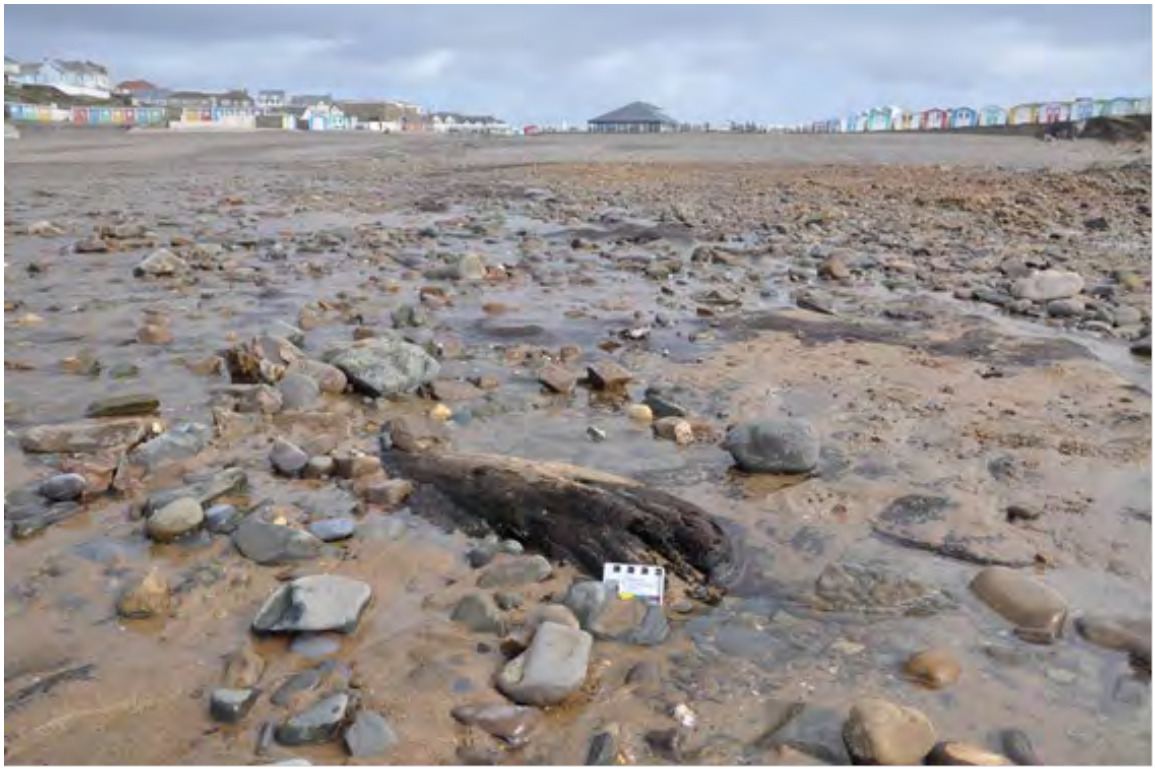

Figure 13: Looking north-north west from a position to the south of the southerly peat exposure. Tree remains are visible within the surface of the peat.

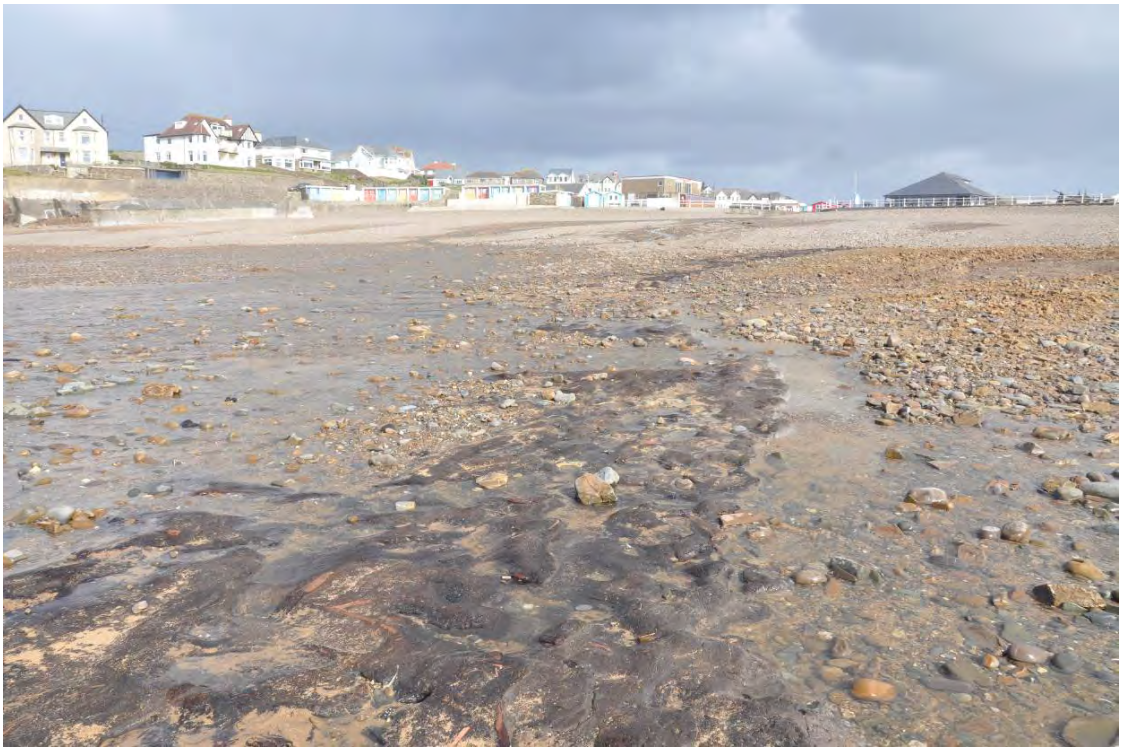

Figure 14: Looking north west. Tree remains are visible within the surface of the peat.

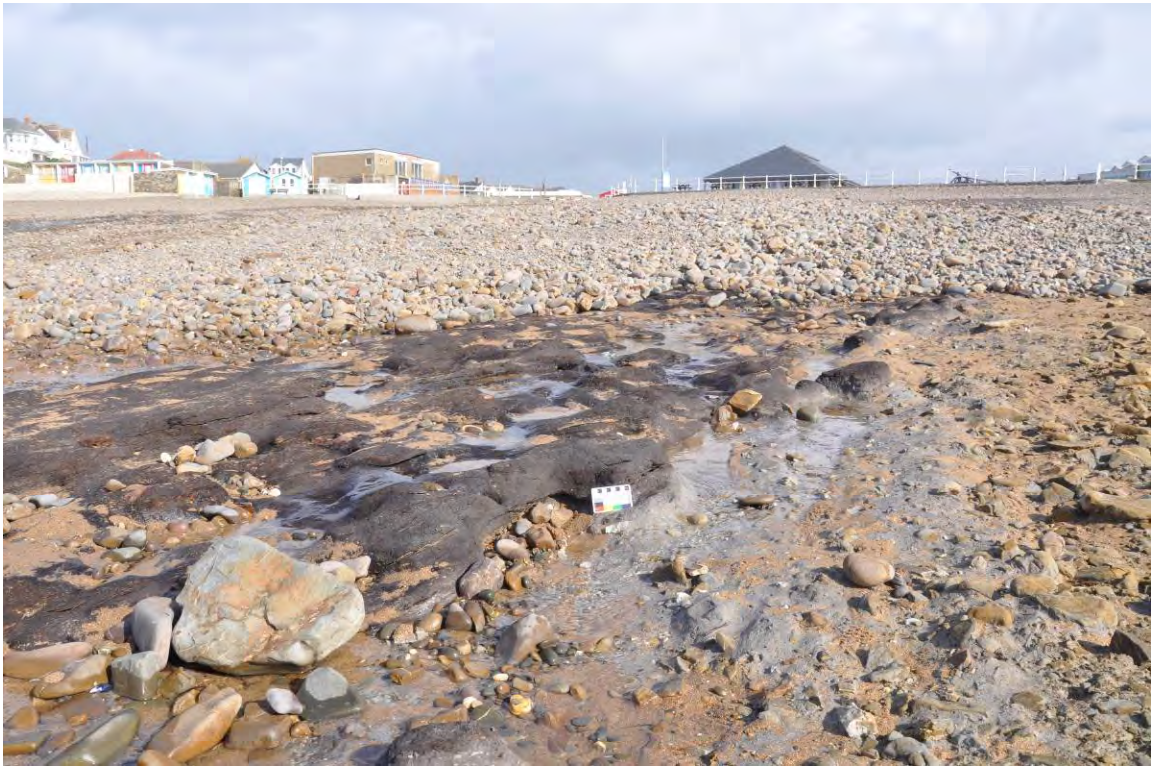

Figure 15: Looking north west from a position to the south of the southerly peat exposure. Peat is visible exposed right up to the shingle towards the high tide mark.

The peat exposure runs under the shingle material towards the shore (Figure 15), so its northerly extent is unknown. The southern edge of the peat deposit appears to be marked by a change in the underlying geology where rock is present at higher levels. It is likely this forms the southern boundary of what would have been an small estuary system. As the peat deposits appear to extend under the sand to the south and west it is not possible to

determine the full extent of this area. Further comparison of this information with data from trenches and boreholes that have been subject to analysis would help to further understand the extent of these deposits.

3.3 Relationship to Modern Shore and Stream

The modern shoreline at Crooklets is protected by small concrete walls and revetments which protect the coast and properties which lie either side of a stream which flows through the urban area out across the beach (Figure 16). The hard geology underlying this area means there is likely to have been little change in the course of this stream, which is further evidenced through historic mapping and the long paleoenvironmental sequence visible through the peats and underlying estuary deposits.

Crooklets Beach is the entry point for a number of Trans-Atlantic cables and it is through the installation of such infrastructure that sampling, analysis and dating of these deposits has been undertaken. Any future works have the potential to further investigate these deposits.

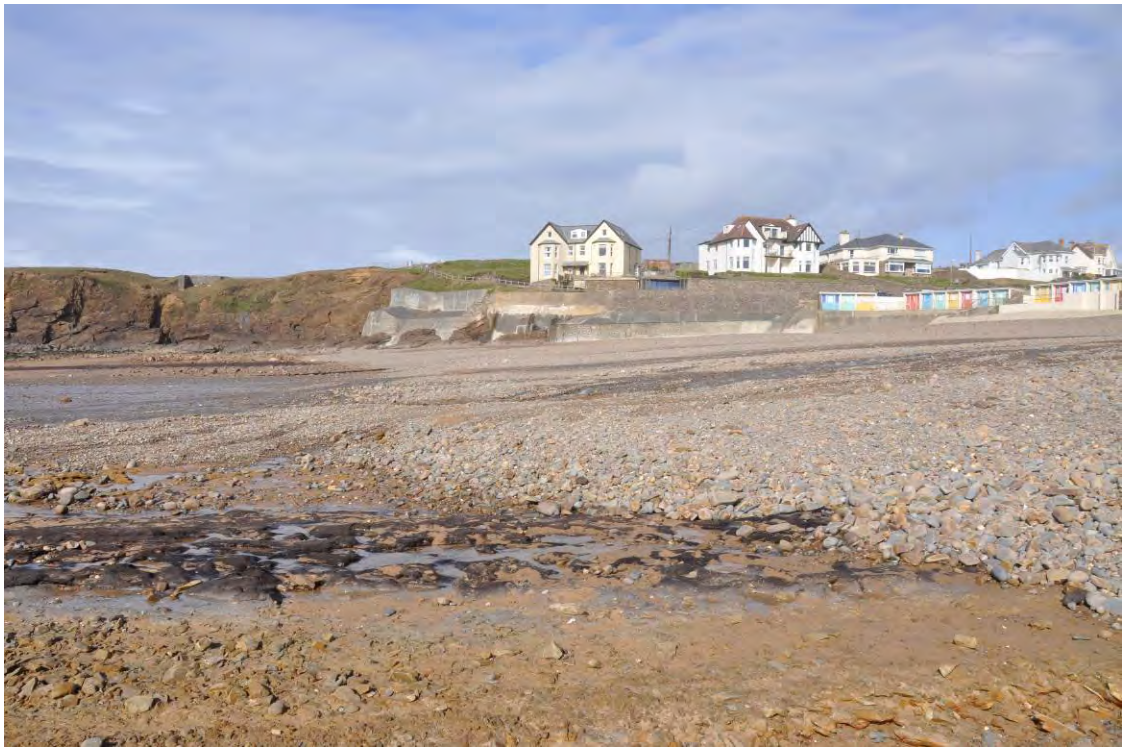

Figure 16: The relationship of the peat exposures to the modern shoreline which is protected by concrete revetments.

4. Potential of Site to Inform on Coastal Change

The recent publication of the Rapid Coastal Zone Assessment Survey (Grant et al 2019) which included the North Cornwall coast presented further detail from the analysis of the peat deposits at Crooklets, a summary is included in the gazetteer of their publication (2019: 109), it outlined that:

> "A submerged forest on Crooklets Beach had been recorded as early as 1848 and further identified on the 1880 OS map. The site was confirmed by investigations by Thorpe (2000), Cole (2001) and Ransley et al. (2002) who encountered the submerged forest within a series of trenches and boreholes laid across the beach preceding cable installations.
> Environmental sampling by Cole (2001) recovered pollen and plant macrofossil remains that revealed that beach contained a complex range of plant communities comprised of woodland, swamp, freshwater pools, cliff top and beach communities. The central portion of the modern

> beach contained evidence of a wooded environment, with the pollen evidence suggesting that the dominant species were oak and alder, along with ash and willow. Ransley (2002) interpreted the peat layer as indicating a sequence beginning with carr woodland, fen carr and reed beds in a system of freshwater streams and ponds. This underwent stabilisation through time, possibly due to the development of a sand bar across the valley mouth, with water lilies within areas of standing freshwater. It was suggested that breaching of the barrier may have led to the end of these peat-forming communities.
>
> Four radiocarbon dates were obtained. Two dates were from the centre of the beach, one on the northern side where oak fragments at Site H were dated 3520-3090 cal. BC (4580±60 BP; Wk-8777), and one on the south between point X-Y from the top of the peat sequence dated 3520-3090 cal. BC (4570±60; Wk-8780). At site BS, close to the slipway, dates from the top and bottom of the sequence provided dates of 2590-2200 cal. BC (3940±60 BP; Wk-8778) and 3640-3110 cal. BC (4640±70 BP; Wk-8779) respectively".

Having a range of radio carbon dates available, particularly those which determine the upper and lower date ranges for the peat near the top of the beach enhances the potential for utilising these deposits to understand the relative position of sea level at particular times and the impact that changes in this had on the surrounding environment. The palaeoenvironmental information on the fauna within the deposits has been used to postulate the processes of coastal change that resulted in the formation of the peat deposits.

Considering the long-term evolution of the coast, the preservation of these peat deposits within an otherwise rocky shoreline and in relation to modern beach levels and movement provides further opportunities to understand how current climate change is impacting shorelines, exposing material that is usually covered. In this area storm driven events appear to be the driving factor causing the exposure, when this is coupled with higher sea levels the long-term prospect is for increasing exposure and impact on these and more recent coastal deposits.

The preservation of the peat deposits at Crooklets demonstrates the potential for prehistoric landscape deposits to be preserved within coastal and estuary systems along dynamic areas of the coast. Grant et al 2019 outline that the Bude Basin "is a shallow undulating basin that rises up to the Culm Plateau in the east and is bounded by the coast in the west. The mixed hard rock is from the Carboniferous era, known as the Bude Formation, comprised of massive sandstones and thin interbedded shales. The faulting and folding of these Carboniferous shales and sandstones is a dominant Landscape Characteristic of the coastline with good examples at the major beaches of Widemouth, Bude and Crooklets." (2019: 31).

Peat deposits have also been encountered at Widemouth, which helps further demonstrate the potential for preservation of prehistoric landscape deposits within these former estuary systems. The location of these deposits adjacent to urban and tourist areas provides opportunities for modelling coastal change and how local communities may be impacted in the future.

5. References

Cole, R. 2001. *Crooklets Beach Cable-laying, Bude: Archaeological recording*. Cornwall Archaeological Unit, Truro.

Grant, G, Westley, K., and Sturt, F. 2019 Rapid Coastal Zone Assessment Survey for South-West England: North Coast of Devon (excluding Exmoor) and North Coast of Cornwall, Phase One Desk-Based Assessment. University of Southampton for Historic England.

Kirkham, G and Herring, P (eds). 2006. *Cornish Archaeology*. Cornwall Archaeological Society.

Ransley, J. 2002. *Crooklets Beach, Bude, Geo-Archaeological Borehole Survey*. Wessex Archaeology.

Satchell, J & Tidbury, L (eds) 2014, Archaeology, Art and Coastal Heritage – tools to support coastal management and climate change planning across the Channel Regional Sea (Arch-Manche) Project. Technical Report, Section 3G North Cornwall and North Devon. Pages: 439-453.