ANCIENT MONUMENTS LABORATORY

REPORT

2842

SERIES/No CONTRACTOR

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TITLE A preliminary study of the Holocene coastal sediments • Brancaster Marsh, Norfolk

Brancaster Marsh, Norfolk : A preliminary study of the Holocene coastal sediments

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Introduction

The present form and recent development of the complex of sandflats, marshes, creeks, shingle ridges and dunes along the coastline of North Norfolk have been extensively studied (Steers, 1960), though relatively little attention has hitherto been given to earlier phases in the development during the Holocene of this coastline. There is, however, no doubt that major changes have taken place in the coastal environment since the Roman period, when the Saxon shore fort at Brancaster was occupied. The purpose of the present report is to describe the results of a preliminary examination of the sediments underlying Brancaster Marsh made during the summer of 1978 in an attempt to provide some information about the nature of the Roman coastline at Brancaster.

Brancaster Marsh extends northwards for some 900 m. from the edge of the upland to the shingle ridge and dune system now occupied by the Golf Course. It is drained by small incised creeks emptying eventually into the main channel of Mow Creek. Southwards from Mow Creek for some 165 m. the marsh surface is at 2.84 to 3.00 m. O.D., a level thought to be between Mean High Water Neaps and Mean High Water Springs. The surface is firm and relatively dry, with a vegetation cover of the late Aster community (Chapman 1960). Further south is a reed-bed nearly 90 m. across. Between this reed-bed and the coastal path the vegetation is lower, with grasses, rushes, Triglochin, Cochlearia officinalis, Plantago maritima and Armeria maritima.

Methods

Thirteen Hiller auger holes were sunk in the area between Mow Creek and the crop mark 1004 (Edwards 1976, 258). This auger could not penetrate more than a few centimetres into consolidated sand and gravel deposits, so at one point (Hole 5) a powered 'Minuteman' borer was used to examine the deeper sediments.*

Small sediment samples (approximately 100g.) were taken at 30 cm. intervals from auger holes 5 and 12 and also from the basal sands for the recovery of foraminifera. These were extracted by the method of Funnell (West, 1977, 415).

* Footnote : Chalk, overlain by over 5m of sands and gravels was just reached at a depth of 8m. below the present surface.

Molluscs and seeds have not been examined in detail since the samples obtained were too small to provide statistically reliable assemblages of these macrofossils, though where conspicuous concentrations were encountered numerically important taxa have been identified.

Results

1. Sediments

An interpretation of the section revealed is given in Fig. 1.

The uppermost deposit in all auger holes was an intertidal mud. Generally the mud contained only a trace of sand, but in several holes it was coarser towards the base of the deposit; in particular the lower sediments in hole 10 contained significant quantities of sand and pebbles. The mud varied in colour from greyish-brown to grey and black (10 YR 4.5/2; 4.5/1; 2/1) reflecting variations in its oxidation state. The upper aerated layer included large quantities of fine fibrous roots, and, beneath the reed-bed, abundant Phragmites remains. Shells of Hydrobia ulvae, Scrobicularia plana and Littorina sp. were present in small numbers throughout the deposit and in concentrations towards the base of the mud in auger holes 8 and 9. Foraminifera were abundant.

In auger holes 5,7 and 8 the mud overlay black peat and organic loam layers up to 50 cm. thick, resting on a sand surface between - 0.34 and + 0.39m. O.D. A sample from bore 7 was of brushwood peat, containing Alnus fruits and wood fragments. This peat, like the Judy Hard peat (Godwin and Godwin 1960, 74) rests on sand though it was at a higher level, (-0.34 to + 0.75 m. O.D. compared with -3.00 to -0.40 m. O.D.) The two peats may be of approximately the same date despite this difference in levels. The Judy Hard peat covers the Boreal-Early Atlantic transition. The more recent Harbour Channel and Lower Golf Club peats rest on intertidal clays and the Upper Golf Club peat, though resting on sand is covered by recent dune sand. (Godwin and Godwin, ibid.).

In all auger holes the basal sediments were sand and gravels. These are thought to be of two types. The coarse sand at the base of hole 9 is clearly a marine deposit; it produced shell fragments of Ostrea edulis and Cerastoderma sp. with specimens of the foraminifers Ammonia beccarii and Elphidium williamsoni, which are characteristic of the open coast. The form of the upper surface of the sand in auger-holes 9-13 suggests that the basal sand in these holes may be part of a small spit or barrier beach. By contrast samples of the basal sand in bores 1-8 produced no biological remains. The surface of this sand slopes regularly downwards to the north and could have been interpreted as a

Holocene beach profile were it not for the fact that it is partly overlain by the alder-brushwood peat, which is believed to be of Boreal/Atlantic age. If this assumption is correct the basal sand in holes 1-8 must pre-date the local postglacial marine transgression, and a soliflucted periglacial or glacial origin for this sand seems possible.

The belt of low vegetation, noted above, between the reed bed and the coast path has been interpreted on the basis of air photographs as part of a vegetation-mark reflecting the presence of a double-ditch forming the northern boundary of a rectangular ditched enclosure (1004; Edwards, ibid.). Indeed it was in the hope that a stratigraphic relationship could be established between these ditches and the marsh sediments that this particular part of the marsh was selected for study. However, although probes were made into the marsh mud at 1 m. intervals from auger-hole 1 southwards to the coast-path, no evidence for these suggested ditches was found. The firm underlying sand and gravel surface sloped regularly up to the path.

2. Foraminifera

Arenaceous salt marsh formainifers were found throughout the intertidal mud of auger holes 5 and 12. Two species dominate the aesemblages present and earlier hppes of estimating past tidal levels from the composition of the assemblages have not been realised during this preliminary investigation. The two species mainly represented are Trochammina inflata and Jadammina macrescens Jadammina is more common at depth in the mud, Trochammina in the upper part (see Table 1). The ratio probably changes with tidal level but no significant changes in sea-level can however be inferred during the period of mud accumulation.

Table 1: Foraminifera from Holocene mud

	Hole No.			
Depth in cm	12		5	
	Total No.	% Trochammina	Total No.	% Trochammina
0 - 30	250	48	84*	90
30 - 60	122	79	22	91
60 - 90	172	13	21	71
90 - 120	-	-	9	89
120 - 150	-	-	46	30
150 - 180	-	-	44	16
180 - 210	-	-	-	-
210 - 220	-	-	9	11

* Elphidium williamsoni and Streblus sp. also present.

Discussion

On the basis of this preliminary investigation the following sequence of events may be suggested, although future investigations may modify the present interpretation of the sediments:

1. Deposition of soliflucted sand and gravel under periglacial or glacial conditions.

2. Formation of alder brushwood peat on this inclined sand surface.

3. Submergence of these peat and sand layers during the local Flandrian marine transgression.

4. Development of a small spit or barrier beach moving shore-wards possibly over the peat and any intertidal mud formed in phase (3).

5. Continued accretion of intertidal mud and the development of the modern salt-marsh.

In the absence of direct or inferred dating evidence for the later phases of this sequence it is impossible to say whether the sand bank thought to be present beneath holes 9-13 was in existence during the Roman period. Even before the suggested development of this feature, however, the evidence is that there was no great depth of water. The marsh mud extends only to a depth of about 0.0m. OD, approximately 0.3m below mean tide level. Consequently a large stretch of peat and sand would have been exposed on the shore at low tide before the marsh mud began to accumulate. The water would not have been more than 3.0m deep even at Mean High Water Spring Tides, and generally considerably less. Deeper water could however have been present further seawards before the emplacement of the suggested sand-bank.

In the absence of creeks or channels crossing the intertidal mud flats, the coast immediately to the north of the site would have been unsuitable for craft with a deep draught; small boats capable of reaching the short at high tide would have been beached, whilst larger vessels would have had to anchor offshore. More extensive augering would be required to determine whether such channels were formerly present.

References

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Acknowledgements

We are grateful to the National Trust for permission to work on Brancaster Marshes, to John Gater for assisting with the Hiller augering, to Derek Edwards for determining the levels of the marsh surface and to Laurie Cartwight for assisting with the Minuteman augering.

Appendix : Details of auger holes (not for publication)

Hole 1 (AB)

0-30 cm. Soft humose mud, with modern roots and a few sand grains. Dark greyish brown (10 YR 4/2) to black. Merging boundary.

30-45 cm. Soft humose mud similar to above, but with black and reddish mottles, and less plant material.

45-60 cm. Sand with flint pebbles up to 15 mm. Slightly coherent. Predominantly greyish brown (10 YR 4.5/2), with grey and yellowish brown mottles.

Hole 2 (A)

0-30 cm. Soft humose mud with Phragmites remains and fibrous roots. Greyish brown (10 YR 4.5/2) with black mottles. Very occasional sand grains. Merging boundary.

30-120 cm. Very soft mud with occasional sand grains. Some roots in upper 30 cm.; decayed plant material throughout. Greyish brown (10 YR 4.5/2) with black mottles; blacker towards base.

120 cm + Impenetrable with borer. Sounded 'gravelly'.

Hole 3 (B)

0-60 cm. Humose mud with Phragmites remains and fibrous roots. A few sand grains. Greyish brown (10 YR 4.5/2) to black. Merging boundary.

60-90 cm. Very soft mud with some plant material and occasional sand grains. Greyish brown (10 YR 5/2) to very dark grey.

90 cm. + Impenetrable, traces of sand on tip of borer.

Hole 4 (BB)

0-180 cm. Very soft mud humose in upper 90 cm. with Phragmites remains. Dark greyish brown (10 YR 4/1.5) to greyish brown (10 YR 5/2) with black mottles, becoming generally greyer with depth. Occasional sand grains throughout.

180 cm + Impenetrable sandy horizon.

Hole 5 (C)

0-30 cm. Soft humose mud with a few sand grains. Dark greyish brown (10 YR 4/2) with black mottles. Many fibrous roots. Merging boundary.

30-90 cm. Soft humose mud with a few sand grains. Greyish brown (10 YR 5/2.5) with small black and yellowish brown mottles. Few fibrous roots in upper 30 cm. Merging boundary.

90-220 cm. Very soft mud with occasional sand grains. Geryish brown to dark grey (10 YR 5/2; 4/1). No obvious plant remains. Sharp boundary.

220-243cm. Black sandy peat with large clay inclusions in upper 10 cm. Merging boundary.

243-255cm. Humose loam. Very dark grey (10 YR 3/1). Merging boundary.

255-270cm. Friable, slightly coherent, sand (includes some clay and silt) with flint pebbles up to 5mm. Greyish brown (10 YR 4.5/2).

Hole 6 (D)

0-60 cm. Soft humose mud with fibrous roots. Grey (10 YR 4.5/1) with brown and darker grey mottles. Occasional sand grains throughout. Merging boundary.

60-282 cm. Very soft mud. Greyish brown (10 YR 5/1; 5/2) at top, becoming greyer (10 YR 4/1) with black mottles at base. Occasional sand grains. Sharp boundary.

282-300 cm. Coarse sand with flints up to 2 mm. Greyish brown (10 YR 4.5/2).

Hole 7 (E)

0-30 cm. Soft humose mud with fibrous roots. Grey (10 YR 4.5/1) with brown mottles. Occasional sand grains. Merging boundary.

30-237 cm. Very soft mud with occasional sand grains. Some fibrous roots in upper 30 cm. Dark greyish brown (10 YR 4/2) at top, becoming grey (10 YR 4.5/1) with black mottles.

237-280cm. Black sandy peat with some grey clay mottling in upper few cm. Alnus fruits at 260 cm., with wood fragments. Merging boundary.

280-290cm. Peaty sandy loam with flint pebbles up to 5mm. Very dark grey (10 YR 3/1) to black. Merging boundary.

290-300cm. Coarse sand with flint pebbles up to 7 mm. Mottled greyish brown (10 YR 5/2) and black.

Hole 8 (EE)

0-257 cm. Soft mud, humose in upper 30 cm. with many fibrous roots. Dark greyish brown (10 YR 4.5/2) with brown and grey mottles at top, becoming greyer (10 YR 5/1.5) with darker grey and black mottles below. Softer with increasing depth. Occasional sand grains throughout. Bivalve fragments and Hydrobia ulvae in lowest 20 cm. Merging boundary.

257-290cm. Similar soft mud with traces of peat and very large number of Hydrobia ulvae and occasional specimens of Scrobicularia plana and immature Littorina. Merging boundary.

290-318cm. Black sandy peat with traces of clay and wood fragments.

318-320cm. Traces of clean coarse sand on tip of borer (impenetrable).

Hole 9 (EE)

0-90 cm. Soft humose mud with fibrous roots. Greyish brown (10 YR 4.5/2) with brown and yellowish brown mottles. Reddish (5 YR 5/8) mottles at base. Few sand grains. Merging boundary.

90-220 cm. Very soft mud. Very dark grey (10 YR 3/1) to black. Occasional sand grains, becoming more sandy at base. Shells of Hydrobia ulvae and Scrobicularia plana. Merging boundary.

220-240cm. Coarse sand with pebbles up to 9mm. Very dark grey to black. Shell fragments of Ostrea edulis and Cerastoderma sp.

Hole 10 (F)

0-110 cm. Soft mud, humose with fibrous roots in upper 30 cm. Dark greyish brown (10 YR 4.5/2) with grey mottles at top, becoming dark grey (10 YR 4/1) with black mottles at base. Softer with increasing depth. Occasional sand grains throughout. Merging boundary.

110-135cm. Similar matrix, slightly more sandy, but with flint pebbles up to 15 mm. Merging boundary.

135-190cm. More sandy with more, and larger, pebbles (up to 26 mm). Merging boundary.

mud. 190-240cm. Very soft coarse sandy clay with flint pebbles up to 25 mm. Mottled dark grey and dark greyish brown (10 YR 4.5/1; 4.5/2).

240 cm + Impenetrable sandy horizon.

Hole 11 (G)

0-30 cm. Soft humose mud with fibrous roots. Dark greyish brown (10 YR 4/2.5). Occasional sand grains. Merging boundary.

30-70 cm. Soft mud with occasional sand grains. Dark greyish brown (10 YR 4/2) with brown mottles.

70 cm + Impenetrable sandy horizon.

Hole 12 (H)

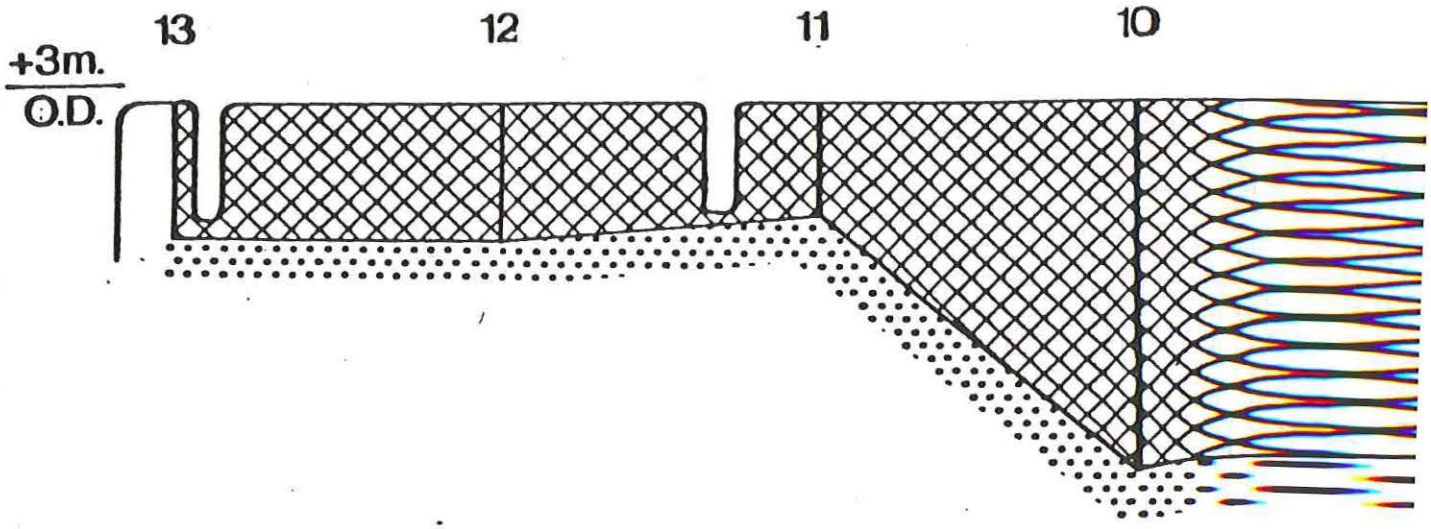
0-90 cm. Soft mud, humose and with fibrous roots in upper 30 cm. Greyish brown (10 YR 4.5/2) with yellowish brown and brown mottles at top, becoming greyer with very dark grey mottles towards base. Occasional sand grains throughout.

90 cm+ Impenetrable, traces of sand on tip of borer.

Hole 13 (I)

0-90 cm. Soft mud, humose and with fibrous roots in upper 30 cm. Greyish brown (10 YR 4.5/2) at top, becoming grey (10 YR 4/1.5) mottled dark grey and black at base. Occasional sand grains throughout. Few Hydrobia ulvae shells in lower 30 cm.

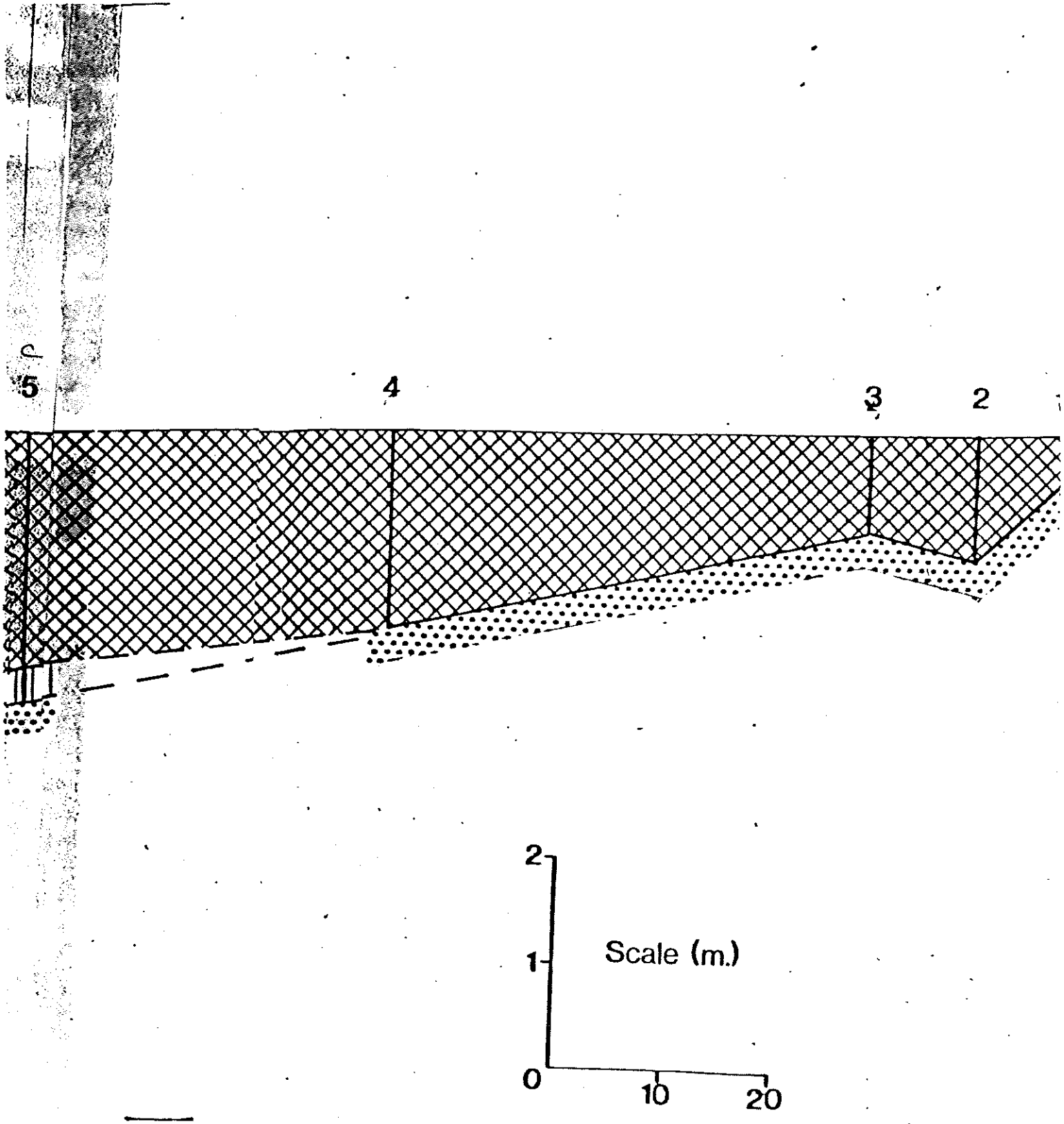
90 cm + Impenetrable sandy horizon.



Marsh mud

Peat

Sand and gravel surfaces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Scale (m.)
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