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Historical study of sites of natural sea wall failures in Essex

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1 Background

1.1 Rationale behind the project

There is presently a great deal of interest in the use of saltings as an aid to sea defence along many stretches of coastline which are protected by artificial sea defence embankments. The presence of a salting in front of a sea wall acts as a buffer, reducing the energy of the incoming waves and therefore reducing the risk of overtopping or damage to the wall. However, many of the saltings are eroding rapidly, particularly in south-east England, possibly due to the relative sea level rise which has been experienced here for many years. The loss of the saltings is threatening the stability of the embankments, many of which are being undermined and will require a significant capital expenditure to upgrade and maintain the walls to the required standard.

As part of a programme of research into alternative methods of sea defence the possibility of managed retreat is being investigated. This involves setting back the line of actively maintained defence, either to high land or to an earlier sea wall which has been abandoned as land is claimed from the sea. To this end a small experimental scheme has been implemented at Northey Island in the Blackwater Estuary, Essex. Although this experiment is invaluable as a means of investigating practical methods for set-back it is difficult to use the results to predict the outcome of using similar methods in different geographical locations and environments.

There are, however, many locations in Essex where the sea wall has failed in the past for various reasons, and the land behind has been re-opened to tidal inundation in the same way as would occur in the managed retreat situation. Some of these 'natural set-back' sites have reverted to apparently healthy saltmarsh, while others are degenerating rapidly, and the inner line of defence is now itself becoming seriously threatened. It is essential, therefore, to identify the differences in the original sites which may be causing the differing results when the land is re-flooded.

1.2 The need for a historical study

Over 30 sites of sea wall failure have been identified in Essex alone. The locations of these sites are shown in Figure 1. These have been subject to different historical regimes which need to be investigated before an examination of the results of re-flooding will be meaningful. It is therefore necessary to determine factors such as the dates of original enclosure, the agricultural management methods employed while the land was enclosed, and the date of the sea wall failure. This information may then be

used to assess whether the degree of success of marsh re-creation is merely due to the timescale or whether there are other factors to be taken into consideration. The results of this work may then be taken forward into the next phase of the study, to examine the actual fate of the reverted land in terms of the survival of the resulting habitats.

2 Sources of information

The Records Office of the Essex County Council in Chelmsford, Essex, holds a considerable store of historical information which is readily available for inspection. The types of data stored include:

- a wide range of books covering all aspects of Essex history,
- parish records,
- property deeds,
- county and private estate maps,
- tithe maps and rolls,
- estate and farm records,
- results of historical surveys,
- old photographs and many other types of historical data.

2.1 Compiled reports

Many major projects have been carried out over the years using information stored in the Records Office. The final outputs from these projects may be books or theses, which are usually also stored at the Records Office. These include two works in particular which proved of invaluable use in the present study, having already compiled large amounts of relevant information. The first of these was "The Great Tide" by Hilda Grieve (1959), which gives a complete account of the 1953 floods, and includes a record of the history of sea walls in Essex. The second important work was an M.A. thesis by D.W. Gramolt (1961) on "The coastal marshlands of Essex between the 17th and 19th centuries". This gives a detailed record of the changing stages of land claim in Essex, with an analysis of old maps to show the dates of all the enclosed land throughout the county. In addition, there is a general account of the different types of sea wall construction and changing agricultural methods on the inned land.

2.2 County maps

The ECC Records Office holds an extensive collection of maps of the whole county, and of individual areas and private estates. Gramolt (1961) highlighted several problems with the comparison of historical maps, many of which were highly inaccurate before the use of accurate surveying techniques. Some county maps could be used to compare gains and losses of land areas but many of the enclosed areas were of small area, and were therefore not identifiable on the small map scales. Maps before the late 18th century were therefore unreliable because of the small scale, lack of accuracy, and the fact that the sea wall was not marked in many cases. Some maps were of more use in showing whether creeks were still open or had been dammed, but this was the limit of their usefulness.

The first set of reasonably accurate maps was those of Chapman and André, published in 1777 from surveys in 1774, at a scale of 2" to 1 mile. The first edition Ordnance Survey maps published in 1805 at a scale of 1" to 1 mile were apparently based very largely on the Chapman and André maps. Later maps include the second edition 1" to 1 mile Ordnance Survey series of 1838-1844, the tithe survey maps in 1840 and the first edition of 6" to 1 mile OS series in 1874. By the time of the latter maps the enclosure of land had more or less ceased. Each of the later editions of the 6" to 1 mile OS maps are stored in the British Museum map library, and provide a series of maps for 1874, 1896 and 1921. Although further revisions were available between 1930 and 1950 these did not add any further information.

Gramolt (1961) assimilated the information from most of these maps for his M.A. thesis, resulting in a series of maps on which a time period is given for the reclamation of each area of land around most of the Essex coastline. These maps are reproduced in the figures with the permission of the Essex Records Office. Where possible an actual date has been found from other sources for construction of the final wall in question in the study areas. However, it is often not possible to determine an exact year, as was found by F.C.J.Spurrell, who carried out a survey of the Thameside walls in 1885 (see section 2.4), and by Gramolt (1961). Where no additional data could be found, the periods defined by Gramolt (1961) are given.

2.3 Tithe maps

Other useful sources of information for determining the agricultural land use of individual areas were the 1840 tithe maps. These provide a complete coverage of the county, with maps showing individual numbered fields which may then be referred to

the tithe rolls which give the field names, acreages and land use. The tithes only record whether the fields were arable or pasture (or woodland, grassland, water, marsh etc), and only provide a record for one instant in time although the land use may have changed many times during the history of the site. However, the tithe maps provide coverage of all the sites and therefore constitute the most complete information source, although some of the sites, such as Bridgemarsh Island, may have more detailed information available from various other sources.

2.4 Estate and farm records and accounts

Historical estate and farm records are a potential source of data on actual dates of inning, but this is fraught with problems as was found by Gramolt (1961), and by Spurrell (1885) when he attempted to trace the origins of the Thames estuary sea walls. The major problem when using this written form of record was demonstrated by Spurrell (1885) when he wrote:

> "The common form of speech by which enclosed marshes are named in deeds, is to speak of the newest as the 'inned' marsh or by some such term (much like that of 'baby' in a largely increasing family), but which affords no means of deciding which marsh it is among its neighbours, or whether it was inned for the first or the fiftieth time."

To add to the problems of terminology, many of the marshes were inned, allowed to revert to saltings and then reclaimed again many years later, making it difficult to determine the relevant dates of construction and breaching for the individual areas in the study. Another problem is that although the marsh may be mentioned in the records it does not follow that it had been fully reclaimed, but merely that the margin was sometimes dry. For example, as noted by Gramolt (1961) the bailiff's accounts for the manor of Langenhoe in the Colne Estuary for the period 1324 to 1414 refer to 'schepes bregges' (sheep's bridges) made of 'flakis' (wattle hurdles) and 'pettynges' (raised causeways of peat sods, often hundreds of yards long) to allow sheep grazing on saltings to escape after exceptionally high tides, but there was no wall constructed at this time.

2.5 Aerial photographs

The British Museum map library holds a series of photomosaics for the southern half of the county, flown by the RAF in July 1945, which provided a useful source of

information on some of the later breaches, as well as comparative data for the vegetated state of the saltings.

Aerial photographs flown in 1988 were also examined for each site to determine the location of the present sea walls, and relic walls where these are still visible.

3 History of the early sea walls in Essex

In general marshland was considered suitable for enclosure when there was a reasonable area which had accreted to a level at or above MHWS. The areas enclosed were usually small so that construction of the wall could be completed within one season, usually between March and October. The material used to build the walls was marsh clay, either from borrow pits on the landward side of the wall or from the saltings in front.

The walls were built in two arms extending from high land, or an earlier adjacent wall, towards the lowest point to be enclosed. The proposed line of the wall was first cleared of vegetation, a trench dug to grip the new clay, and the rills, creeks and hollows filled with brushwood and good clay. The two arms of the wall were constructed at approximately their full height to prevent erosion by the tides, although the tidal scour increased considerably as the gap became narrower. It was therefore necessary to complete the final closure of the wall as quickly as possible during calm weather.

The walls were maintained at a level approximately one foot above the highest level reached by the sea in the locality, which required constant raising of the walls as sea levels rose and the incidence of higher tides increased. The thickness of the walls was required to be sufficient to withstand the pressure from the sea, and therefore as wall heights were increased so the thickness of the wall base was increased to prevent slumping. The cross section of the wall varied from place to place, but in general the seaward slope was gradual and the landward slope as steep as possible. In 1844 the Dengie Commissioners for Sewers recommended that the seaward slope should be 1 in 3, and the landward slope only 1 in 1.5.

Facing of the walls was required to prevent erosion by the waves. The actual method of facing varied with time and locality, depending on the development of techniques and the availability of materials.

Vegetation: normally natural colonisation, although by 1805 there was an increasing use of grass seeds in sparse areas, and turfing was used from c.1843. Management of

the walls required the vegetation to be close cropped or mown to prevent the growth of tussocks which caused bare patches. The most common vegetation was twitch or sea couch, with the added advantage of being unpalatable to cattle and horses, and therefore reducing the problem of poaching of the wall.

Brushwood: this was normally used as a temporary covering while the vegetation colonised, or as a permanent covering in areas where the vegetation was sparse. The brushwood was bound into faggots and placed vertically (thatching) or horizontally (hakeing), and secured with cross-pins of chestnut. This facing method required constant maintenance and renewal.

Chalk and piles were used from c.1830, with a line of piles driven in along the face of the wall to retain the earth and chalk heaped in the resulting angles formed. The later use of stone meant that the face of the wall could be made even and covered with a continuous layer of stone, which formed a stronger wall.

The vulnerability of the wall depended to a large extent on the state of the foreshore. In situations such as the River Crouch where the walls sloped steeply into deep water extensive piling and facing was necessary. Because of the recognised valued of a width of saltings in front of a wall there were often attempts to protect the seaward edge of the saltings themselves with piles or chalk facings.

4 History of land use on enclosed marshes in Essex

Although some of the Essex marshland had been ploughed in the Middle Ages most was still used mainly for "pasture for sheep" by the early 17th century. By the mid 17th century the planting of certain crops was found to be suitable for the Essex marshland, and indeed seemed to assist in the improvement of newly enclosed lands, for example W.Blith (1652) noted that

> "the planting of Cole-seed or Rape-seed is ... excellent good means for the improving land, the Cole-seed is of late dayes best esteemed. And it is most especially useful upon your Marsh-land, Fen-land, or upon your new recovered Sea-land, or any lands, very ranke and fat, whether arable or pasture."

The existence of common grazing rights and the attitudes of landowners were instrumental in reducing the spread of arable cultivation, however. Many landowners strictly limited the amount of land their tenants were allowed to break up, and some

forbade the ploughing of marsh land altogether. Despite these attitudes the major reasons for continuance of marshes as pasture in the 17th century were undoubtedly physical, with inadequate drainage, uncertain sea defences and the recent reclamation of much of the land. The spread of arable land was also limited by the presence of malaria. Tenant farmers themselves often did not live on their lowland farms because of this risk, instead employing 'lookers' who were generally shepherds rather than farmers. Although malaria persisted into the mid 19th century, eventually better drainage, presence of stock during winter allowing mosquitoes to transfer attentions to the animals, brighter houses, and the introduction of quinine in c.1820 all aided the control of malaria.

Despite the fact that the heavy marsh land soils were not suitable for many crops, several areas, such as much of Foulness, were put under arable cultivation in the 18th century. It was found that certain crops, such as black mustard, did well on the heavy soils, although tending to persist as a weed for years after cropping. The increase in arable farming did not necessarily reduce the stock numbers, however. For example horses were fed on oats, sheep on cole, pigs were turned on to bean stubbles, cattle fed on straw and green fodder. Also turnips and clover began to appear on the Essex leases from the early 18th century. There were still restrictions placed on the amount of land which could be ploughed, for example, in Dengie certain proportions of some marshes could be ploughed, provided an equal quantity was laid to grass, although other areas were strictly retained as permanent pasture, which could be made most productive if properly managed.

By the 1780s many areas, notably in Foulness, also started to be improved by the application of chalk rubbish from Kent. The chalk made the soil more easily workable with a better structure, in addition to countering calcium deficiencies.

In the late 18th and early 19th century there was an acceleration in the rate of change in agriculture and agricultural improvements. At this time most of the marshlands around Hamford Water, in the Mersea region and around the Blackwater were still pasture, as were many of the western, older marshes in south east Essex. The quality of the pasture varied greatly, however, depending on the methods of management. In 1795 a relative assessment of the quality of marsh pasture rated Dengie as the most highly valued, with those on the south shore of the Blackwater next best, followed by the Crouch and the north shore of the Blackwater, and those around Hamford Water the poorest quality. The quality of pasture was poorest in areas where the surfaces remained irregular, as when they were first enclosed, often with immense ant hills. Improvements were carried out by transferring mounds to fill rills to produce a level

surface and therefore a better grass cover. Mowing was often limited in land leases as excessive mowing smothers clover and therefore reduces fertility. Some landlords promoted improvements by allowing tenants to cultivate the land for a period, then requiring that specified seed mixtures, notably including clover, were laid down. It was also essential to ensure that weeds, including thistles and samphire were eradicated from the pasture.

In the early 19th century many marshes along the Crouch, in the Blackwater and some in the extreme south east and north east of Essex were ploughed for the first time. One possible reason for the increase in arable cultivation at this time may have been the uncertain foreign situation (Napoleonic era) which required a reduction in the net import of wheat from levels which had occurred by the end of the 18th century. Towards the end of the 18th century there was also an increasing use of under-draining 20-30 inches below the surface instead of draining solely by surface ditches or furrows. Until cylindrical tile-pipes were invented in the 19th century the underground drains were simply filled with brushwood, faggots, straw or shingle to keep the passage open. This drainage technique, together with higher crop prices made cultivation of the marshes more practicable. This technique would also have a significant effect on the fate of the new saltings after the land was re-opened to tidal inundation. With the use of these improved drainage techniques farmers found that yields from the marshland soils were not only very high but also of excellent quality. Some of the marshes remained unsuitable for arable farming due to a high water table, also ensuring that pasture grasses did not burn up at the end of the summer, which had been a common problem on some of the drier pastures. Further applications of chalk to the surface aided the arable cultivation of the marshes, often at a rate of 6 or more wagon loads of 90 bushels each to the acre. This was sometimes re-applied after 20 years. The amount of time the newly enclosed land was left before it was available for arable cultivation was very important. John Harriott, who enclosed Rushley Island, ploughed the land soon after enclosure instead of waiting until the winter rains had cleared the land of salt. The result was that the salt came to the surface each summer thereafter and the crops failed. Most Essex farmers left an interval of at least 30 years after enclosure before attempting cultivation.

The severe depression at the end of the Napoleonic wars, c.1835, again meant changes in the agricultural land use. Many of the arable fields were reverted to pasture, the management being too expensive, and crop prices too low to retain viability, especially in marginal areas. Some farmers, however, attempted to get more from the land by ploughing greater acreages, by fallowing less frequently, by sowing larger proportions with smaller seeds, and by importing smaller quantities of chalk. New manures were

also introduced at this time, e.g. guano, while many farmers used sprats, starfish and mussels from local estuaries.

It is clear from this account that there were many instances of changes in the history of individual areas from one period to another. For example, two thirds of Southwick Farm, Southminster was under arable cultivation in 1775, but all was under pasture again in 1842 when the tithe survey was carried out. It is therefore impossible to make assumptions on the overall history of an area from a record at one point in time. However, although the tithe surveys only give a record of one time period they are still useful for those areas which are recorded as arable, since this would indicate that some of the above management techniques had been used, e.g. under-draining or chalk applications which may have a subsequent effect on the site.

4.1 Countering the effects of sea water

The methods employed in countering the after-effects of tidal flooding have had a significant effect on the chemical history of the enclosed land, not only with the numerous extensive applications of chalk to promote arable cultivation, but in remedial measures which are taken after flooding incidents. After the 1897 flood a report was written investigating the effects of sea water on the land (Dymond & Hughes, 1899). From an analysis of a sample of flooded soil these chemists concluded that one effect of the salt was to eliminate lime and other bases from the clay and make it unworkable. They therefore recommended as treatment for flooded land "opening, aeration and drainage" with dressings of lime for the permanent improvement of the condition of the soil, cultivation to open it up and let the air in, and keeping drains running freely to wash out the salt as quickly as possible in rainwater. Later, after the floods in 1953 vast quantities of gypsum were dumped on the land to counteract the effects of salt.

5 History of the floods in Essex

The enclosed land in Essex has been repeatedly subject to inundations of increasing frequency and magnitude and the old walls have proved not to be high enough or strong enough (Grieve, 1959). Indeed, over the years the walls enclosing successive areas of inned land needed to be built higher than each of the previous walls. It was not until 1887, however, that a writer to the Essex Naturalist noted the presence of ancient brick buildings exposed at low water of spring tides on the outer edge of the Bradwell mudflats, and added "there are reasons for supposing that a slow subsidence is in progress at the present time", as an explanation of the continued problem. In a later

report from the Royal Commission on Coastal Erosion and Reclamation of Tidal Lands in 1906 it was reported that

> "It is believed that either the coastline of this part of Essex is gradually sinking, or that from some unknown cause the tides are higher than formerly, inasmuch as the tides wash over the walls more frequently than was formerly the case; and further, large portions of what were formerly good marshlands and some parts of common lands have become submerged and totally lost for any agricultural purpose."

Recognition of the presence of surges which were causing the floods when occurring at the same time as high water, came in 1928 together with the first recognition of the possibility that land subsidence could be a result of the effects of the Ice Age.

5.1 Dates of floods

Records in farm accounts, financial arrangements for sea wall repair, and items in newpapers and magazines provide a documentary of floods on the Essex coastline. The main recorded dates, with the major floods highlighted, are shown below.

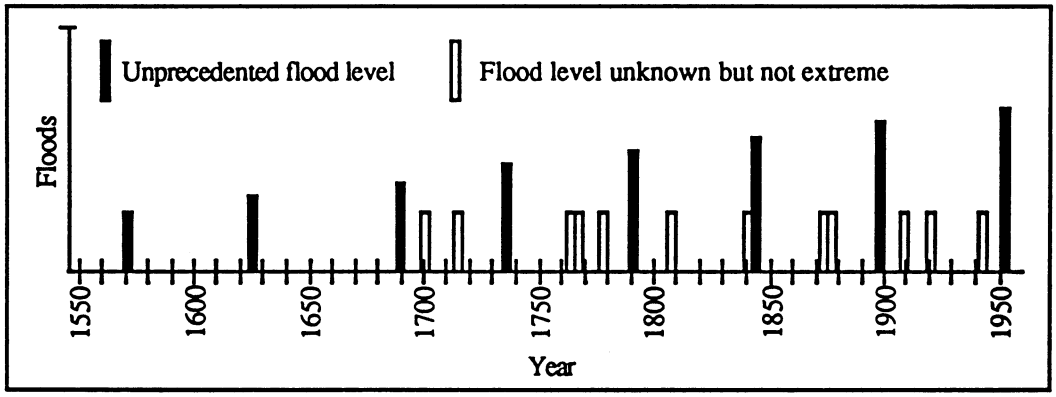
Table 1. Dates on which major floods occurred in Essex

Date	Year	Level
October 20th	1570	Unprecedented
	1625	Unprecedented
December	1690	Unprecedented
	1703	
	1715/1723?	
	1736	Unprecedented
September 28th	1764	
January 2nd	1767	
October 4th	1778	
February 2nd	1791	Unprecedented
January 14th	1808	
October 18th	1841	
December 11th	1845	Unprecedented
March 18th	1874	
January 1st	1877	

November 29th	1897	Unprecedented
November	1910	
December	1921	
February	1943	
January 31st	1953	Unprecedented

The dates in this table and the figure below show that historically the major floods of unprecedented level have continued to occur at intervals of approximately 55 years. This indicates that although sea level is rising, which accounts for the successive unprecedented flood heights, the rate of sea level rise has not increased.

Figure 2. Pattern of flood occurrence in Essex



Although many of these floods, particularly those of unprecedented level, resulted in sea wall breaches and the flooding of large areas of land, the value of the inned agricultural land meant that most of the breaches were repaired and the land reclaimed again. The first flood which resulted in the reversion of one of the study areas was in 1874 when Stone Marsh in Hamford Water was breached, although this may have been exacerbated by roll-over of the seaward beach ridge.

5.2 29th November 1897

The first major flood which led to the total abandonment of large tracts of inned land, and contributed many of the sites in this study, occurred on the night of 29th November 1897 and resulted in the inundation of between 30,000 and 35,000 acres of land. Several large areas were lost as the direct result of this flood, through the presence of breaches which were too large to be repaired. These main areas were Pewit Island in Hamford Water, Northey Island, North and South Fambridge, Bridgemarsh Island and most of New England Island. Many small areas were also flooded but most were

recovered, although at great expense, and because of the depressed state of agriculture at this time many of the larger areas had to be abandoned.

The results of this flood were more serious than on previous occasions for several reasons, as reported by engineers to both the Dengie and Fobbing 'Commissioners for Sewers'.

- The walls were cracked and porous, especially at the top, as the result of a long period of dry weather to the end of November.
- When the water reached unprecedented high levels, due to the combination of weather and tide conditions, it entered the cracks and passed downwards to outlets at lower levels.
- As the water passed through the walls it carried part of the earthwork and enlarged the outlets.
- The back portion of the wall was thus loosened and gave way, resulting in the collapse of the front portion, and the wall being washed away with the tidal flow.

An interesting comment regarding the change from enclosed land to salting was from the rector of North Fambridge who wrote nearly a year after the flood,

> "Several farms are flooded more or less - some have as much as half the land under water. The land is now covered with seaweed and marsh samphire or glasswort is growing everywhere. The gulls and other sea birds are making the fields their feeding grounds."

Another report in the Essex Naturalist in 1898 regarding the abandoned farms between Dovercourt and Great Oakley stated that the sea walls had fallen in and been "left to their fate", and the "rich pasturing fields" were now "great stretches of ooze and saltings". A further report on the area of Bramble Island which was subsequently reclaimed may reflect a different attitude in stating that the luxuriant pasture had been turned into "an enormous waste of black rotting mud and weeds".

A further high tide on 28th November 1901, which was said to be 6 inches higher at Maldon than that of 1897, burst many of the repaired breaches again. Another on the night of 12th/13th February 1938 caused damage in Hamford Water, St Osyth, Colne, Blackwater and Crouch. Wallasea Island was breached, as were Potton and Rushley Islands. Again, high tide on 1st March 1949 flooded Bramble and Horsey Islands, Kirby and St.Osyth, Flag Creek, Langenhoe and Salcott, Old Hall, S.Blackwater,

Battlesbridge, Stambridge, Upper Raypits, Wallasea Island, and several stretches of the Roach. Elsewhere, however, the walls stood, although suffering slips, partial breaches and damage.

5.3 31st January 1953

In the extreme flooding which occurred on the the night of 30th January/1st February 1953, of the 308 miles of tidal defences maintained by the Essex River Board 88 miles were overtopped and damaged or weakened, without actual failure; 44 more miles were overtopped, slipped at the back and scoured out; and 23 more miles failed primarily as a result of seepage and pressure. This resulted in a total of 155 miles where the water had broken through, with a total of 839 separate breaches, and 49,000 acres of land flooded. Of the flooded areas 41,760 acres were agricultural and the rest industrial and residential areas. 119 lives were lost and 21,000 people made homeless (statistics from Grieve, 1959).

6 History of the reverted saltings

6.1 Hamford Water

Because most of Hamford Water consists of saltings and mudflats none of the early maps and charts depict this area with any degree of accuracy. It is difficult, therefore, to determine how the early coastline differed from its later form. Figure 3 gives a comparison of three of the historical maps of Hamford Water from 1777 to 1838.

Two major land claim schemes were proposed for Hamford Water in the 19th century when the rush to gain new land from the sea was at its height. In the mid 19th century an unnamed "eminent engineer" proposed a scheme to build a raised causeway from Stone Point to Dovercourt on the opposite shore across the mouth of Hamford Water "shutting out the sea, regulating the flow of the tidal waters, reclaiming many thousand acres of valuable land and establishing a direct communication by land with the Harwich coast". This proposal met with opposition since it would cut off access from landing stages within Hamford Water to the open sea, and severely affect the oyster industry. There were also practical difficulties as some of the deep channels posed serious construction problems. The scheme was therefore abandoned.

The second, slightly less ambitious, scheme was proposed in the 1860s for the Horsey Island area. The object of this scheme was to join Horsey and Hedge End Islands to the mainland to the south. A company was set up and incorporated with powers to purchase all the land and build embankments, but the scheme was a failure and only one section of wall was actually built. This wall remains to the north of Hedge End Island, on the east side of the area of marsh now known as Standcreek Salts (see Figure 6).

6.1.1 Foulton Hall

The historical maps (figure 8) indicate that the marsh around Foulton Hall was enclosed, and two counter walls constructed along the major creek, some time before the Chapman and André survey of 1774.

Subsequent Ordnance Survey maps at 6" to 1 mile showed the location of the first major breach in the north of the area this area having reverted to saltings by 1896 (figure 10b),. By 1921 the rest of the area had been flooded, a new counter wall constructed along the present line to the south, and a significant area on the seaward side of the marsh lost to erosion. No record was found to determine the dates of

construction of the west walls around the present area, but this was presumably later than 1921.

A comparison of the 1840 tithe map with the 1983 1:10,000 map shows a significant loss of area, totalling approximately 90 acres. Of the total area of the flooded site and lost land, 144 acres (56%) was recorded as grassland in 1840, 35 acres (14%) as arable, 44 acres (17%) of pasture, and 32 acres with no record (probably marsh or grassland). From the tithe records it is often possible to determine the use of the fields by their names, for example, at the Foulton Hall site there are four fields called "Horse Marsh", presumably used for grazing horses and two called "Mown" or "Mowing Marsh", used for hay.

6.1.2 Pewit Island

Pewit Island (or part thereof) was first reclaimed in 1688 together with part of Horsey Island and 300 acres in Beaumont cum Moze, according to returns of concealed marshes which had been reclaimed. However, in 1840 the island was once again recorded as being "an expanse of saltings", and was still covered at high water in records around 1850. In the late 1860s William Russ, a civil engineer, and Stephen Green, a land agent, took over Pewit Island and reclaimed approximately 230 acres.

The island was first re-inundated on the extreme tide of March 1874, which also flooded Bramble Island and Garnham's Island. Despite financial difficulties at this time all the lands were recovered, but another very high tide in January 1877 put all three areas under water again. Once again Pewit Island (and Bramble Island) was recovered, but the major storm of 29th November 1897 produced the final breach. There was further damage on 28th November 1901 when the tide was six feet higher than that of 1897, but Pewit Island had been abandoned by this time. A comparison of the 1896 OS map, before the breach , with that for 1921 shows a dramatic loss of saltings along the eastern edge of the island, with a significant change in the line of the sea wall. The present outline of the island shows that, although most of the island has remained much the same, the eastern edge, exposed to the dominant north eastern wave action, has suffered significant further losses to erosion.

There are no 1840 tithe records for Pewit Island, since it was not included in the parish records of either Little Oakley or Great Oakley. It is most likely that the island was only used for pasture, being relatively inaccessible.

6.1.3 Garnham's Island

The land around Beaumont cum Moze has been subject to land claim for many years, the Garnham's Island area being the most recent. The original land claim was the 300 acres recorded in 1688 together with Horsey and Pewit Islands. The Guy's Hospital estate owned large areas of land in this area for many years in the 19th century and annual reports between 1853 and 1873 provided a trace of progress of the schemes. An early survey of the out marshes and Pewit Island in 1862 stated that the deposit of warp was very slow and of a poor description, but in 1863 there was a decision to enclose a small piece of land containing approximately 50 acres adjacent to Old Moze Hall farm. In the spring of 1870 the 172 acres of Bramble Island were reclaimed and work had been started on the adjacent area of saltings at Garnham's Island. 365 acres of this area had been embanked by 1872.

The older enclosure of Bramble Island was inundated in December 1863 and repaired, but the high tide of March 1874 inundated both Bramble Island and the new Garnham's Island enclosures as well as Pewit Island. The lands were again recovered, despite problems with salt water seeping into the old enclosed marshes and the escape of freshwater being impeded. Again in 1877, all three areas were once again put under salt water, and although Pewit and Bramble Island were repaired Garnham's Island was abandoned at this stage. Since Garnham's Island was only enclosed between 1872 and 1877 it is unlikely that any agricultural improvements were carried out.

The land loss on the Garnham's Island saltings following the 1877 breach was extremely rapid. The 1896 OS map shows that most of the enclosed land had already been lost, leaving only fringing saltings immediately inside the wall.

6.1.4 Skipper's Island

Skipper's Island was enclosed in 1840 by a sea wall around the island and a counter wall running across. The three patches of London Clay in this island were used as arable land, and were called "islands", while the rest of the enclosed land was called "Marsh Saltings" and was used as pasture.

No evidence of a breach was recorded on any of the early 6" to 1 mile OS maps, neither was a breach visible on the 1945 RAF flight of the county. It is therefore assumed that the walls were breached during the 1953 flood.

6.1.5 Hedge End Island

Horsey Island and Hedge End Island were shown as one island at the time of the tithe survey. The Gramolt analysis of historical maps indicates that Hedge End Island itself was enclosed after 1840, although an embankment is marked on the 1840 tithe maps. A small enclosure in the north-west corner of Hedge End Island was actually embanked in 1840.

6.1.6 NE corner of Horsey Island

The earliest record of the presence of fresh marsh on Horsey Island was in 1665, followed by a record of a breach and subsequent repair in 1691. Unfortunately these records are not specific about the location of the wall at this time. The 1840 tithe map shows that most of Horsey Island which was embanked by this stage, although a counter wall could indicate that the north east of the island may have been reclaimed at a different time to the remainder.

Since the north east corner of Horsey Island was still marked as enclosed by the time of the 1945 RAF aerial photographs, and in the absence of any indication to the contrary, it is believed that this area was not lost until the 1953 floods.

6.1.7 Stone Marsh

The 1840 tithe map (figure 15a) shows that the Stone Marsh saltings at Stone Point had been enclosed prior to this time, and were being used as grassland, probably for grazing. However, this area had reverted to saltings by 1874 following a failure of the wall on the seaward side. The height of the walls was originally only 7 feet above O.D.

6.1.8 Walton Central Marsh

Attempts had been made to enclose the central portion of marsh, between Stone Marsh and Cormorant Creek, by 1874, but the failure of the Stone Marsh wall occurred at the same time and it is uncertain whether the central saltings were used for any practical purpose. The wall enclosing the Walton marshes was raised to 12-13 feet above O.D., probably as a result of the 1897 floods, and by 1938 the enclosing wall had been breached on the seaward side.

A report by Rayner (1971) showed that the seaward margin of the marsh had experienced erosion of 380 yards (± 20 yards) in the 82 years from 1874 to 1956. This represents a 41% loss in over 82 years, due to roll-over of the beach ridge during storm

conditions. Figure 15b shows the gradual loss of the seaward edge of the saltings between 1874 and 1921, and this can be compared with the present day situation in figure 15c.

6.2 River Colne

6.2.1 Ferry Lane

The map of the Colne Estuary compiled by Gramolt did not extend as far upstream as this site, and the historical map evidence is inconclusive. The 1801 Ordnance map denoted the two small areas of land concerned as fresh although not walled, and the 1840 tithe map (figure 19) appears to have a wall around the area, but the enclosed land is still recorded as saltings on the tithe rolls. No evidence for the date of the breach could be found.

6.2.2 Aldboro Point

Although not included in the original specification for this study observations from the field and map evidence indicate that the saltings at Aldboro Point were originally enclosed. The Gramolt analysis of historical maps, and the 1840 tithe survey show that the saltings were enclosed sometime after 1840. The 6" to 1 mile OS maps show that there was no wall present by 1874, but the area had been enclosed by the next edition in 1896. The 1921 revision of the OS maps indicate that the area was saltings again by this time, presumably following a breach on the south west corner of the enclosed area.

6.2.3 Fingringhoe Marshes

A small inner portion of these marshes was enclosed between 1774 and 1799. A further 180 acres of marsh between the North and South Geedon channels were reclaimed by 1840. The presence of a counter wall between these two areas of marsh suggests that these marshes were enclosed in two pieces. Some confusion exists about the exact date of the enclosure because part of the Fingringhoe saltings was common land and the parish was the subject of an Enclosure Award in 1815. Around this time there was a complaint that the "Saltings Inclosed lately" were part of the common land, and a sale catalogue of 1857 refers to "old and new enclosed marshes", but "enclosed" in this context may have been used in either a legal or a physical sense (Gramolt, 1961).

The majority of the enclosed fields in the Fingringhoe Saltings were used as grassland or pasture by the 1840 tithes, with only the smaller, inner fields being used for arable purposes, as shown on figure 21a.

Both inner and outer areas of the Fingringhoe saltings reverted to saltings in the period between the 1896 OS map and the 1921 OS map, following a breach on the south side of the area as shown on Figure 21a. It is likely, therefore, that the breach occurred during the 1897 storm.

The single wall running down the length of the adjacent Geedon Saltings was the result of an attempt at enclosure in 1819 which failed because of poor workmanship.

6.2.4 Barrow Hill

The map evidence suggests that this area was enclosed in the period between 1774 and 1799, and certainly the whole area was walled and in use as pasture by the time of the 1840 tithe survey (figure 19).

Although verbal evidence implies that this area was breached in the 1953 floods there is evidence of a breach in the north of the enclosed area on the 1945 RAF aerial survey. It is possible that this was subsequently reclaimed, with a final major breach occurring on the west side in 1953.

6.2.5 · Langenhoe

The large expanse of saltings between the South Geedon channel and the Pyefleet channel were enclosed between 1800 and 1840. A record of a major enclosure in the Langenhoe Hall area, completed in 1838 may refer to this area. The tithe file for Langenhoe described this as "new inclosed marsh", which had not yet been levelled.

Most of this area remains enclosed as grazing marsh and freshwater, the site at the extreme eastern end being a freshwater scrape, possibly with occasional saline inundations.

6.2.6 N.shore St.Osyth Creek

The sea wall along St Osyth Creek remains in its original line, partially enclosed before 1774, and completed by the Ordnance Survey map of 1843. No record of a permanent breach in this area could be found.

6.3 River Blackwater

6.3.1 Sampson's Creek

The head of Sampson's Creek was originally dammed at the same time as the head of Ray Channel, and both converted to fresh marsh, between 1774 and 1799. The small,

triangular area of set-back marsh, as shown on figures 18 and 22, was enclosed later, between 1800 and 1840.

This area was breached between the time of the 1921 OS map and the 1945 RAF aerial survey, where a breach is visible on the southern tip of the triangular area.

6.3.2 Stansgate Abbey

The walls between Stansgate Abbey and Steeple Creek remain in the original line which was enclosed between 1800 and 1840, and therefore this does not constitute a set-back site.

6.3.3 Northey Island

The walls around the main area of Northey Island were in place before the Chapman and André survey of 1774, although no information regarding the actual date of construction could be found during this study. The small area of saltings in the south west corner, currently being actively set-back, was not enclosed until after the 1840 tithe survey (as seen on figure 25a), although the walls had been constructed by the time of the 1st edition Ordnance Survey 6 inch map in 1873.

Only the areas of high land on the island were used for arable purposes at the time of the tithe survey, the enclosed saltings being used only as pasture.

Northey Island was one of the large areas breached during the storm of 1897. A year later, when the island was visited by a writer to the Essex Naturalist, the enclosed marshes were rapidly reverting to saltings, and had been abandoned by 1901. The more recently enclosed area in the south west corner was retained as agricultural land until the managed retreat project in 1991.

6.3.4 Pewet Island

Like Aldboro Point, Pewet Island was not originally included in the list of study sites. However, there are several references to reclamation of a small portion of the island, which make it clear that some of the marsh was originally enclosed. A reference to 10 acres being reclaimed by Mr Spurgin of Bradwell in 1813, combined with map evidence which suggested that this reclamation was not on the mainland, led to Gramolt concluding that the enclosure must have been on Pewet Island which formed part of Mr Spurgin's rented farm at the time.

However, later in a draft letter of 1835 to Captain Fanshaw regarding his rights in Pewet Island and the adjacent oyster layings, and referring to a map of Hyde Farm in Bradwell-juxta-Mare, C.C. Parker wrote

> "Mud Island I believe to be only profitable to the Men who executed the Map and Peewit Island only yields some Sea Gulls' Eggs ... when not taken by the Fishermen."

Later still, in 1877, an oyster fishery scheme was proposed which included Pewet Island. The agent to the estate wrote to the landowner that "it is so improbable that the island can ever be turned to any profitable account", but found on further enquiry that a low earth wall had previously been constructed and the enclosed land cultivated, probably in the 1850s. It seems likely, therefore, that Pewet Island was actually reclaimed twice during the 19th century and each time allowed to revert to saltings shortly afterwards.

6.4 River Crouch

The importance of saltings to sea defence has long been known in the River Crouch (and the River Roach) where the walls had little or no protection from saltings, the foreshore sloping steeply in to deep water. These walls have always been vulnerable and costly to repair, and indeed when Ferry Farm on Wallasea Island was being sold in 1823 a clear distinction was made between the stretches of wall which required protection by chalk and piles and the remainder. During north-easterly gales there is often much damage to these unsupported walls at the mouth of the river. Gramolt (1961) stated that

> "The heavy sea, a peculiar side erosion and the depth of the river combined to make the mouth of the Crouch notorious amongst civil engineers"

More problems occurred with the walls on the south shore of the Crouch than those along the north shore which were well protected.

6.4.1 Wallasea Island

Repeated breaches along the north side of Wallasea Island have arisen because of the problems of foreshore instability on the Crouch. New walls were built on Ringwood and All Fleets farms around 1740, and similar slips occurred at East Grapnells Farm in 1829. On each occasion new inset walls had to be constructed on the landward side of the slip, thus abandoning a strip of marsh in order to gain a more secure foundation.

These works probably brought the line of walls to the configuration prior to the latest set of breaches. Only two areas of breach are relevant to the present study, these are at grid references TQ 943952 and TQ 972947, and remained intact until after the 1945 RAF aerial photographs although the successive revisions of the OS maps indicate increased degrees of armouring along the seaward side of all the walls.

Figure 29 shows the tithe survey for the first (westernmost) of these two breaches, and indicates that the breached area was arable land in 1840. Similarly, although the map for the second (eastern) site is not included, this was also arable at the time of the tithe survey.

Although it appears from current aerial photographs that two additional areas at the eastern end of the island have been affected these are still walled along their original lines. The areas behind these walls are filled with foul brackish water and are used as tipping ponds.

6.4.2 Bridgemarsh Island

The main area of the island, in the Latchingdon parish to the west, was originally known to be enclosed some time before 1736, because of a record of a flood during a major storm in that year. At that time the island was being used as pasture since a map compiled at that time noted that it was "under every flood tyde; here was 220 sheep and 77 bullocks drowned". Any attempts to repair the breaches were unsuccessful and the enclosed marsh reverted to saltings.

All or part of the western end of the island was reclaimed again around 1760, but again was flooded by the great tide of 28th September 1764. An article from the Chelmsford Chronicle at the time stated that "Bridgemarsh Island was lately walled in, but is now entirely gone to the sea". A paragraph in May 1766 in a London magazine reported that

> Bridge Marsh, a small island within 9 miles of Maldon in Essex, which was over flowed by the Sea upwards of thirty years ago, is now draining, piling and enclosing, the Sea being withdrawn from the same. It is upwards of a mile and a half in length and nearly half that in breadth. It appears at present very green with a tall strong grass."

Two years later, in 1768, the island was being assessed for rates for the first time, with Johnson as tenant. The reclamation of 110 acres at the west end was completed in 1814 after Henry Coape bought the island. By the time of the tithe survey in 1839 all

of the Latchingdon part of the island was in arable cultivation, the survey in this case recording the crops grown, which included Coleseed, Mangel, Spinach and 6 acres sown with Lucerne. Approximately 6 acres were lost around this time when the wall was breached and a new inset wall was constructed. This is clearly seen on the map in Figure 4.

The 40 acres at the eastern end of the island in the parish of Althorne had been reclaimed initially prior to 1799, but had reverted to salt marsh again by 1812, possibly as a result of the very high tide of 1808. Henry Coape enclosed some marsh in the east of the island and probably also extended the walls seaward in the south. The marshes at the extreme eastern end were referred to as "new enclosed land" and "saltings recently enclosed" by a "new river wall" in 1827. Most of the Althorne end of the island was used as marsh pasture, although the land at the extreme eastern end was inferior because the rills and creeks had not been infilled. Ten years later much of the eastern island had been put into arable cultivation, whereas the older land in the west was back to marsh pasture, demonstrating the constantly changing history of land use of any individual area.

A causeway across to the island from Latchingdon may have dated back to a former period when the island formed a useful agricultural unit. Most of the produce was exported by barge, as indicated by the field name 'Dock Marsh' at the time of the tithe survey. In the latter part of the 19th century a brick works was also established on the island, based on the alluvial clays.

The island was flooded in 1845, but was recovered by 1854 when it was estimated that there were 183 acres under crops and 104 acres of grassland. The stock at this time included 6 working horses, 359 sheep, 140 lambs, 2 Welsh heifers, a cow and a large number of domestic fowl.

The great tide of 1897 completely overran the island, submerging even the walls at one stage and resulting in the deaths of all the stock, although the human inhabitants were rescued. At the time, agriculture was in a depressed state and the owner claimed that repair of the walls was the responsibility of the County Council or the State. The island was, in fact, reclaimed again, although much of the land around remained flooded through lack of money. Once again, however, the island was inundated in 1928, when it was flooded "brim to brim" and many sheep were drowned, after which the island was more or less abandoned except for the wildfowlers.

6.4.3 Blue House breaches

The walls along the north shore of the Crouch were all in place before 1774. During the flood in November 1897 two stretches of wall east of the Fambridge ferry, near Blue House farm, previously thought to be impregnable, were seriously breached. This area being outside the jurisdiction of the Dengie Commissioners for Sewers the two farmers involved wrangled over the repair of the walls while successive tides widened the breaches until the cost of repair was beyond the resources of either man. At high tides the water stretched from Snoreham to Woodham Ferrers, the road to the Fambridge ferry was under water and between the Ferry Boat Inn and the sea wall lay 300 yards of flooded marsh on the site of the former salt production works. An embankment was raised on the east side of the ferry road by the Maldon Rural District Council to provide access to the ferry while the road was flooded.

Lord Rayleigh, who owned Blue House farm, made several attempts to repair the wall with inset walls which were also breached eventually. Finally, the Working Colonies Committee of the Central (Unemployed) Body for London, together with Maldon Rural District Council, Essex County Council and local landowners produced a plan for repairing the wall using unemployed Londoners as the workforce (Board, 1987). The work was implemented in 1906 and completed in 1907, although in March 1906 another high tide enlarged the breaches, until the larger breach reached a width of 700 feet. The location and extent of the land lost before the inset walls could be positioned are shown on figure 5.

6.4.4 North Fambridge

Most of the land on the west side of the ferry was reclaimed in the first half of the 17th century. The marsh in North Fambridge at the head of Stow Creek (adjacent to Groom's Farm) was inned well before 1638, for the return of this year refers to "Groome old inned marshe". In the parish of Stow Maries (the extreme western end of the re-flooded area), much of the land was enclosed towards the end of the 16th century. In the return of 1638 Sir Thomas Gardiner "inned and gayned" 230 acres of Hedgewell and Stow Marshes. This may have been the work which brought the sea walls to their positions as recorded on the 1774 maps. No marshes in this area were newly enclosed after 1774.

Most of the North Fambridge site was flooded by the great tide of 1897, and had been abandoned and started to revert to saltings by 1898, although there is also a record that the wall at the head of Stow Creek was breached and not reclaimed in 1902.

Nearly 70% of the re-flooded area of North Fambridge was used as arable land in 1840, evidence of this remaining in the form of numerous parallel drain lines on the present saltings.

6.4.5 Brandy Hole (South Fambridge)

Like the enclosed marshes on the north side of the river the sea walls on the south side had reached their greatest extent by the time of the Chapman and André survey in 1774.

The tithe survey showed that approximately 50% of the area was arable, and 50% pasture in 1840. Like the areas of reverted marsh at North Fambridge the arable areas are identifiable on current aerial photographs by numerous parallel drain lines.

In 1872 a breach occurred in the sea wall adjoining Brickhouse Farm which flooded several hundred acres, including the farm itself. The breach, 150 feet wide and 25 feet deep was finally stopped in March 1873. Eventually the final breach occurred during the flood of November 1897, resulting in the abandonment of huge tracts of land by 1901.

6.4.6 Clementsgreen Creek

The walls along both sides of Clementsgreen Creek were in place before 1774, together with the other walls along this stretch of the River Crouch. A record for Clements Marsh for 1815 may refer to this area, stating that the marsh was first ploughed at this time and planted with small seeds.

The Ordnance Survey 6" to 1 mile map (figure 33b) indicated that the area was still walled in 1896, but had been breached by 1921. In common with many of the areas around, the Clementsgreen Creek marsh was probably re-inundated during the 1897 flood.

6.5 River Roach and Foulness complex

6.5.1 Mucking Hall

The area of saltings on the south side of the River Roach adjacent to Mucking Hall has never been entirely enclosed, and no record can be found to indicate that the present line of the walls is different to the original line. This is therefore not a site of natural set-back.

6.5.2 E.bank Potton Creek

There is no indication that the walls around Potton Island have been breached, or altered from their original lines. This is therefore not considered to be a set-back site.

6.5.3 Rushley Island

Rushley Island was originally enclosed in 1781 by John Harriott of Great Stambridge. He encountered severe problems due to ploughing too early, resulting in the loss of his crops at that stage. Later fire destroyed most of his buildings, and a serious flood in 1791 filled the island with water. Although the island was drained again Harriott was in debt and could not afford to repair the damage nor wait until the land recovered. He therefore abandoned Rushley to the sea, although it was later reclaimed again, and remains enclosed along its original lines to this day.

Although there appear to be two converging linear structures on the west side of Rushley Island, outside the present line of sea walls, these have never formed part of an additional enclosure. It is likely that these are the remains of old fording roads which originally linked the islands in the Foulness complex. Rushley Island therefore does not constitute a site of natural set back.

6.6 River Thames

6.6.1 Wat Tyler Country Park

There has been no set-back in this area of the upper reaches of Vange Creek. The area which was apparently enclosed near Wat Tyler Country Park was walled recently, and is now used as a rubbish tip.

6.6.2 Fobbing Marshes

The area of Fobbing Horse at TQ 737847 has never, in fact, been walled, and the stretches further into Fobbing Creek at TQ 733843 were walled recently and are now fresh marsh. There has been no other natural set-back in this area.

6.6.3 Two Tree Island

The enclosed marsh at the eastern end of Two Tree Island at TQ 830854 is still walled to the same extent as the original enclosure, having suffered no breaches to date. There is, however, the line of an old wall extending to the east from this enclosure, which originally ran alongside a series of old oyster beds. This also does not constitute a site of natural set-back.

6.6.4 Canvey Point

An additional site was identified at Canvey Point. An enclosed area with identifiable fields was shown on the first edition 6" to 1 mile map of 1843, with an additional counter wall, or walkway extending eastwards to Canvey Point itself. The first breach was visible from the 1874 Ordnance Survey map at 6" to 1 mile. The series of maps (figure 37a-d) shows the disintegration of this area on the succeeding Ordnance Survey maps.

7 Phase II - Mapping and monitoring

The main aim of this study is to assess whether the history of enclosed land is an important factor in determining the fate of the land when re-opened to tidal inundations either by natural breaches or by active management. In order to assess the degree of success with which the enclosed land has reverted to saltings, or to determine a possible timescale in the deterioration of some breached sites, it will be necessary to carry out detailed field surveys of the sites. A brief summary of the recommendations for survey is therefore included below.

7.1 Site selection

A more complete data source, and therefore better predictive ability, will be obtained if field data is collected for each of the sites identified in this study. However, since this covers a large number of sites it may be possible to reduce the numbers by carrying out a preliminary survey of all sites to identify those sites in each enclosure period (see Appendix 8.2) which have similar marsh types. A full field survey would then be carried out on a representative sample of sites in each estuary for each enclosure period. It should be stressed, however, that if this method is adopted it will be necessary to make assumptions regarding similarities between sites, which may reduce the accuracy of any eventual predictions.

7.2 Field survey

For each site the following information should be collected:

- tidal characteristics in the adjacent estuary from existing data;
- suspended sediment concentrations in the flooding sea water;
- a map of the extent of the saline area and location of breach(es);
- a map of the creek system from aerial photographs;
- current velocities in major creeks in the flooded site;

- a height transect or limited topographic survey of the site;
- a map of National Vegetation Classification plant communities for the whole of the flooded area;
- cores of sediment samples to determine sediment type, grain size, clay mineralogy and selected chemical properties. The depth of the core will be dependant on an assessment of the marsh accretion rates on each site to assess the depth accreted after reversion to saltings.

7.3 National survey

To complete this work it is recommended that further historical studies, backed up by field survey, are carried out for additional areas around Britain. This is important in order to compare sites in different sedimentological regimes and in areas with different sea level rise scenarios.

8 References

BLITH, W. (1652) *The Englisher Improver Improved.* London

BOARD, B.A. (1987) The Fambridge colony: an experiment in land reclamation by unemployed Londoners, 1906-7. *Trans. Essex Soc. for Arch. and Hist., 18(3),* pp.75-87.

DRAGE, R.J. (1966) *The changing landscape of the south Essex marshes.* B.A.Thesis, University of Wales, Swansea

DUGDALE, W. (1772) *The history of Imbanking and Draining of Divers Fens and Marshes, 1662 and 1772.*

DYMOND, T.S. & HUGHES, F. (1899) *Investigation into the effects of sea water flooding on the land.* Report to the county Technical Laboratories, Chelmsford.

GRAMOLT, D.W. (1961) *The coastal marshlands of Essex between the 17th and mid 19th centuries.* M.A.Thesis, University of London

GRIEVE, H. (1959) *The Great Tide. The story of the 1953 flood disaster in Essex.* County Council of Essex.

RAYNER, G. (1971) *Recent coastal evolution at Walton-on-the-Naze, Essex.* B.A.Thesis, University College of Wales, Aberystwyth.

SCARFE, N.V. (1942) The land of Britain. Report on Land Utilization Survey of Great Britain. ed. L.Dudley Stamp. part 82, Essex.

SPURRELL, F.C.J. (1885) Early sites and embankments on the margins of the Thames Estuary. *Arch. J. XLII*, p.285.

9 Appendices

9.1 Summary of information known for each site

Site	Enclosure dates	Land Use	Dates of breaches
Hamford Water			
1. Foulton Hall	<1774		N.part by 1896 OS All saltings by 1921 OS
2. Pewit Island	<1774 First 1688 (with Horsey Is.) then late 1860s		1874, 1877 finally 1897
3. Garnham's Island	>1840 Actually 1872	All fresh on 1874 OS	1874, finally 1877
4. Skipper's Island	<1774 (?1840)	Patches of London Clay = arable islands	After 1896 OS (mb 1953
5. Hedge End Island	>1840 1840 - small square in NW corner	All fresh on 1874 OS	
6. NE corner of Horsey Island	1574-1774	All fresh on 1874 OS	1953? After 1896 OS
7. Stone Marsh	1800-1840		1874 Wall failed on seaward side Saltings on 1874 OS
8. Walton Central Marsh	1800-1840 actually 1874?		By 1938 ?1897 flood Saltings on 1874 OS
Colne			
9. Ferry Lane	Fresh on 1801 OS map but not walled Walled by 1843 revision of OS 1 inch map	Left side pasture Right side arable??	
9a. Aldboro Point	>1840 No wall 1874 Wall by 1896		Saltings again by 1921 OS
10. Fingringhoe Marsh (inner)	1774-1799	Common land, subject to Enclosure Award 1815.	Saltings by 1921 OS Breach on south side
11. Fingringhoe Marsh (outer)	1800-1840	As above	As above
13. Barrow Hill	1774-1799		1953? Poss. breach on RAF AP July 1945 (recent: no creek meanders), in north Main breach on W. side
14. Langenhoe	1800-1840 (major scheme completed by 1838)	Currently grazing marsh and fresh water	Is this breached? Field observations imply area still fresh marsh.
15. N.shore St.Osyth Creek	part <1774 Wall extended further east than present (OS 1843 revision)	NOT A SET-BACK SITE	
Blackwater			
16. Sampson's Creek	1800-1840		Breach in S.corner on RAF AP July 1945
17. Stansgate Abbey (SW)	not wholly walled?	NOT A SET-BACK SITE	
18. Stansgate Abbey (S)	1800-1840	NOT A SET-BACK SITE	

19. Northey Island (main)	<1774	Mainly sheep and cattle, some arable fields near farm	1897 reverting to saltings one year after breach
20. Northey Island (SW corner)	after 1840, before 1873		Active set-back 1991
20a. Pewet Island	1800-1840 Originally 1813, then 1850s (low earth wall)	Cultivated in 1850s?	Reclaimed twice and allowed to revert to saltings shortly after each.

Crouch

21. Clements Green Creek	<1774 (c.1711-1774)		Still walled 1896 OS Breached by 1921 OS
22a. N.Fambridge (W .of ferry)	1574-1774 (?1638) Most land W. of ferry reclaimed in 1st half 17th century.		1897 (1898 "seaweed, samphire and sea birds")
22b. N.Fambridge (Stow Creek)	<1774 1638 return refers to "Groome old inned marshes"		1897 (1902 wall at head of Stow Creek?)
23. Brandy Hole	<1774		Still walled 1896 OS Breached by 1921 OS 1872 breach at Brickhouse Farm. Uncertain whether repaired at this time, but derelict by 1901.
23a. Blue House breaches	<1774		1897, repaired with inset walls using unemployed Londoners 1907. Intervening land lost.
24a. Bridgemarsh Island (main)	<1774 <1736 but reverted to saltings, then 1760, flooded 1764, reclaimed 1766, finally 1814.	Originally pasture - many sheep and bullocks drowned in earlier floods. 1839 tithe - Latchingdon area arable, Althorne area marsh pasture. Brickworks based on alluvial clays established in West Marsh late 19th century.	Sea wall breached and repaired with inset wall 1839. Flooded 1845, recovered by 1854. Flooded 1897 - farmer claimed Council resp. for repairs. Repaired again, then whole island left derelict by 1928.
24b. Bridgemarsh Island (east)	1774-1799 First 1791 but reverted 1808, walls extended east in 1814, finally enclosed 1827.	Inferior pasture because rills and creeks not infilled, but in arable cultivation by 1837, sown with Coleseed, Mangels and Spinach, also 6 acres with Lucerne.	As main part of island.
25. Wallasea Island (4 areas)	prob. <1774.	Two eastern areas are still walled on same line, used as tipping ponds	Walls on S.bank Crouch fail repeatedly - very vulnerable because no support from fronting saltings. Additional armouring on all exposed areas on 1896 OS, still same line by 1921 OS.and 1945 APs.

Roach-Foulness

26. Mucking Hall	No evidence of enclosure	NOT A SET-BACK SITE
27. E. bank Potton Creek	Potton Is. inned <1774	NOT A SET-BACK SITE

28. Rushley Island	Rushley Is. inned 1781 Signs of outer 'walls' may be remains of old fording roads between islands	NOT A SET-BACK SITE	

Thames

29. Wat Tyler Country Park	Enclosed recently	Now used as a rubbish tip	NOT A SET-BACK SITE
30. Fobbing Marshes (a)	Fobbing Horse has never been enclosed	NOT A SET-BACK SITE	
31. Fobbing Marshes (b)	Inner area enclosed recently, and now fresh marsh.	NOT A SET-BACK SITE	
32. Two Tree Island	Walled before 1874 OS		Large area at east end of island still enclosed. Other walls only surround old oyster ponds.
32a. Canvey Point	Enclosing wall and counter wall extending part way to Point on 1843 revision of OS map.		First breach noted on 1874 OS, sucessive reductions in area thereafter
	First set of dates from Gramolt (1961). Others from various sources, mainly Gramolt, Grieve and OS maps.	Maps of 1840 tithe surveys available, showing areas of arable vs pasture.	

9.2 Comparison of dates of enclosure and breach for each site

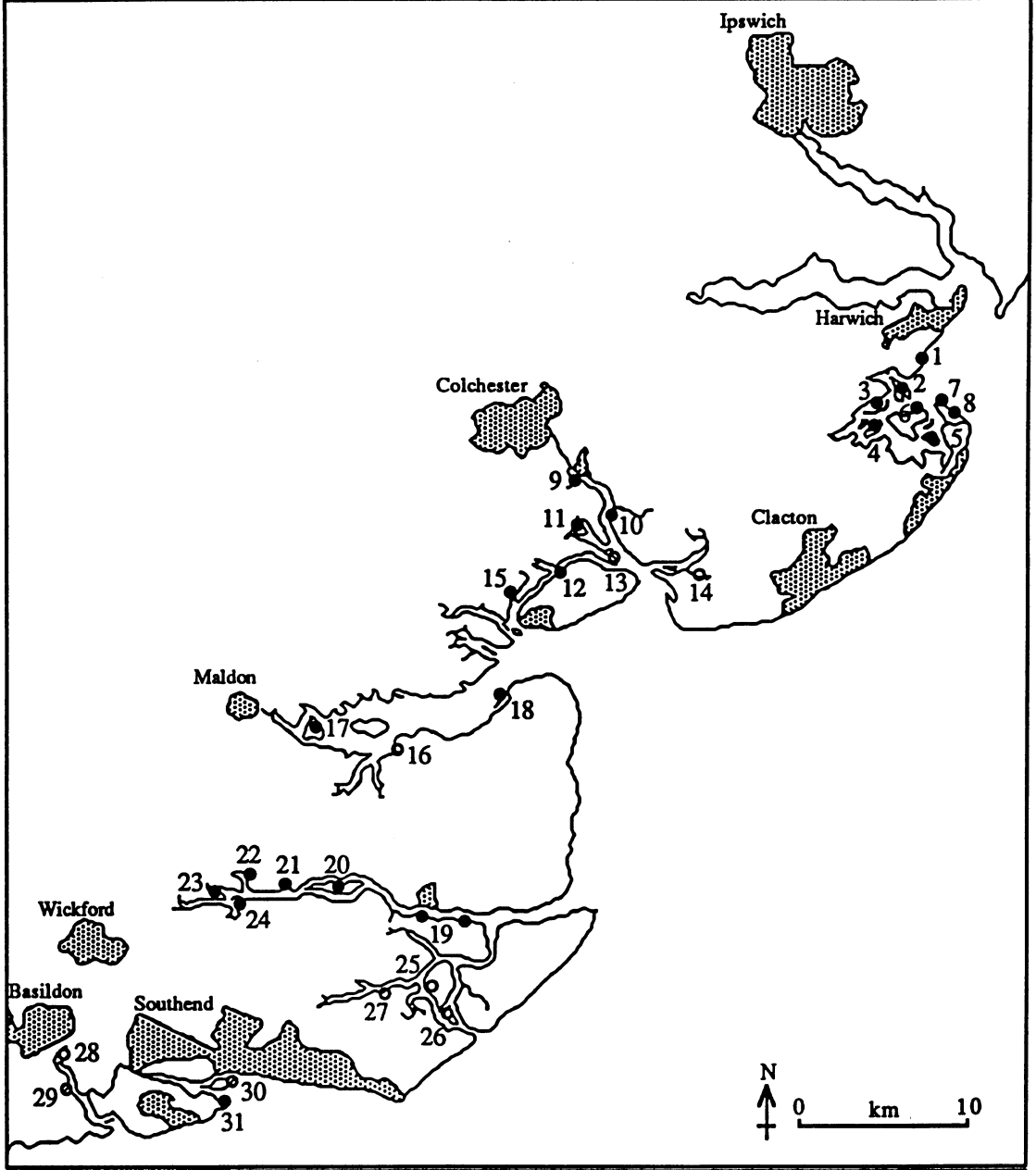
The columns in this table represent the period during which the sites were enclosed. The date of the final breach is given in brackets for each site, and the sites ordered within the columns according to the breach date.

<1774	1574-1774	1774-1799	1800-1840	>1840
Foulton Hall (<1896 & <1921)	N.Famb (W.of ferry) (1897)	Fingringoe (inner) (1897)?	Pewet Island (1850s)	Garnham's Island (1877)
Pewit Island (1897)	NE corner Horsey Is (1953)?	Bridgemarsh Is (east) (1920s)	Stone Marsh (1874)	Aldboro Point (1896-1921)
Northey Is. (main) (1897)		Barrow Hill (1953)?	Canvey Point (1874-1896)	Hedge End Island (1953)?
Clementsgreen Creek (1897)?			Fingringhoe (outer) (1897)?	Northey Is (SW) (1991)
N.Famb (Stow Ck) (1897)			Walton Central (1897)?	
Brandy Hole (1897)?			Ferry Lane (1921 -1945)?	
Blue House breaches (1897)				
Bridgemarsh (main) (1920s)				
Skipper's Island (1953)?				
Wallasea Island (1953)?				

Ordering the sites by date of breach within groups of similar enclosure periods allows similarities of timescale to be identified which may be useful when the actual fate of the sites is determined in Phase II of the study.

10 Figures

Figure 1. Location of sites of sea wall failure in Essex



Key to sites

1. Foulton Hall
2. Pewit Island
3. Garnham's Island
4. Skipper's Island
5. Hedge End Island
6. Horsey Island
7. Stone Marsh
8. Walton Central Marsh
9. Ferry Lane
10. Aldboro Point
11. Fingringhoe Marsh
12. Barrow Hill
13. Langenhoe
14. St. Osyth Creek
15. Sampson's Creek
16. Stansgate Abbey
17. Northey Island
18. Pewet Island
19. Wallasea Island
20. Bridgemarsh Island
21. Blue House breaches
22. North Fambridge
23. Clementsgreen Creek
24. Brandy Hole
25. Potton Island
26. Rushley Island
27. Mucking Hall
28. Wat Tyler Country Park
29. Fobbing Marshes
30. Two Tree Island
31. Canvey Point

● Sites of wall failure
o Sites in study where no failure has actually occurred

Figure 3. Comparison of historical maps of Hamford Water

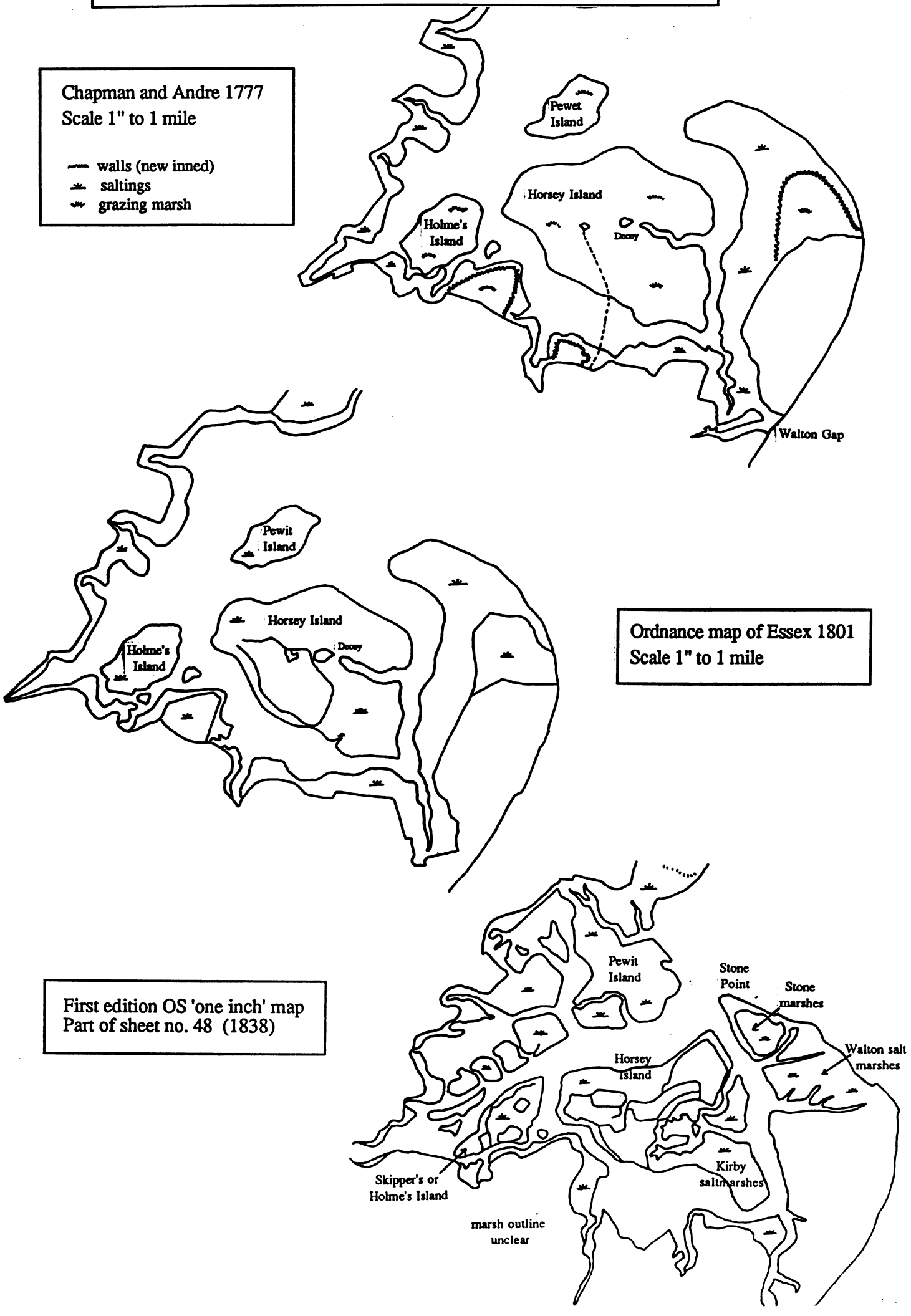


Figure 4. Bridgemarsh Island in 1875 (from Gramolt, 1961)

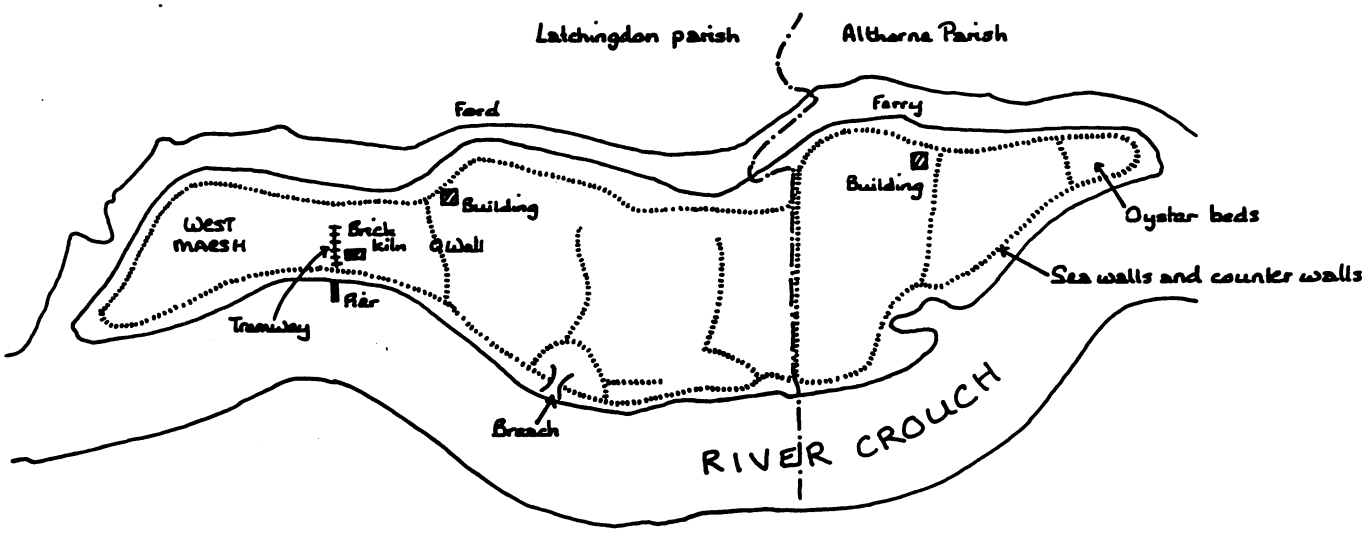


Figure 5. Original line of sea wall before breaches at Blue House

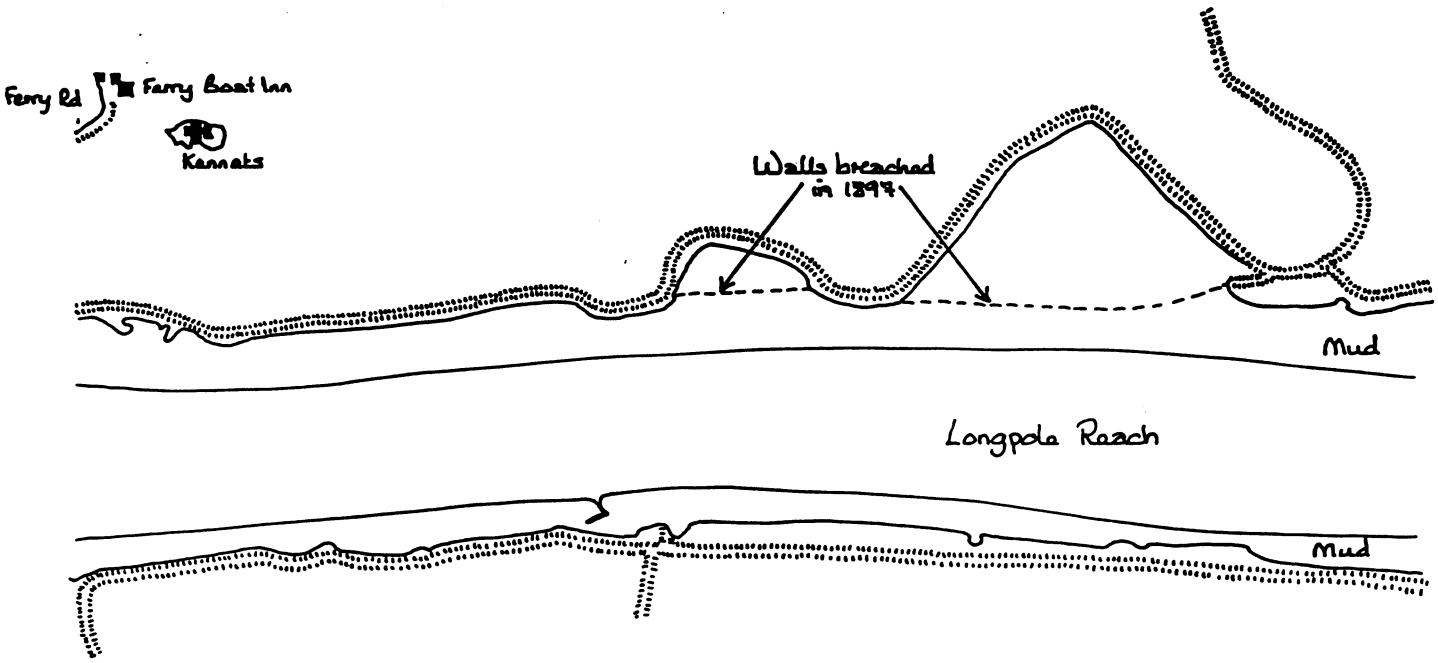
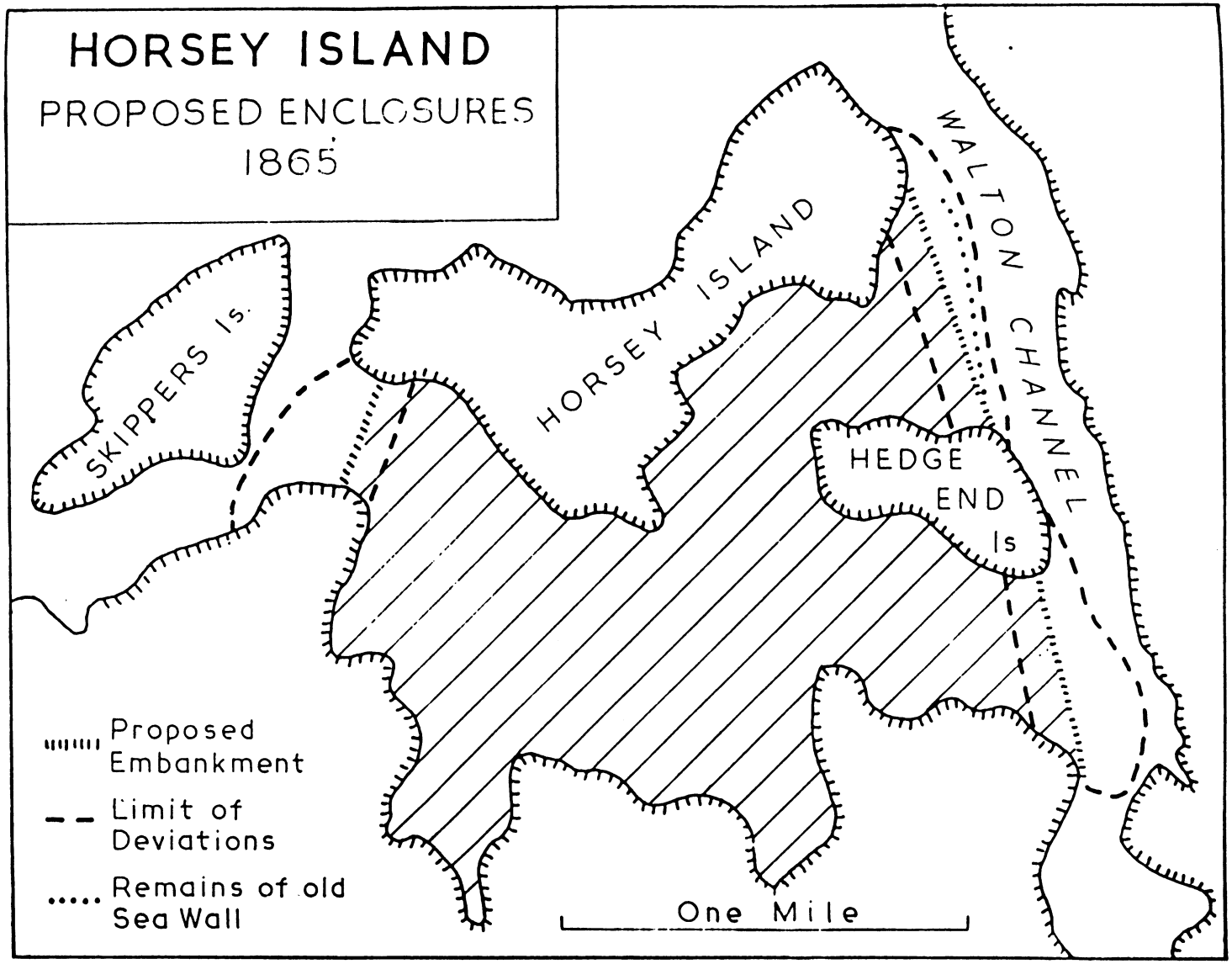


Figure 6. Proposed enclosures around Horsey Island, 1865



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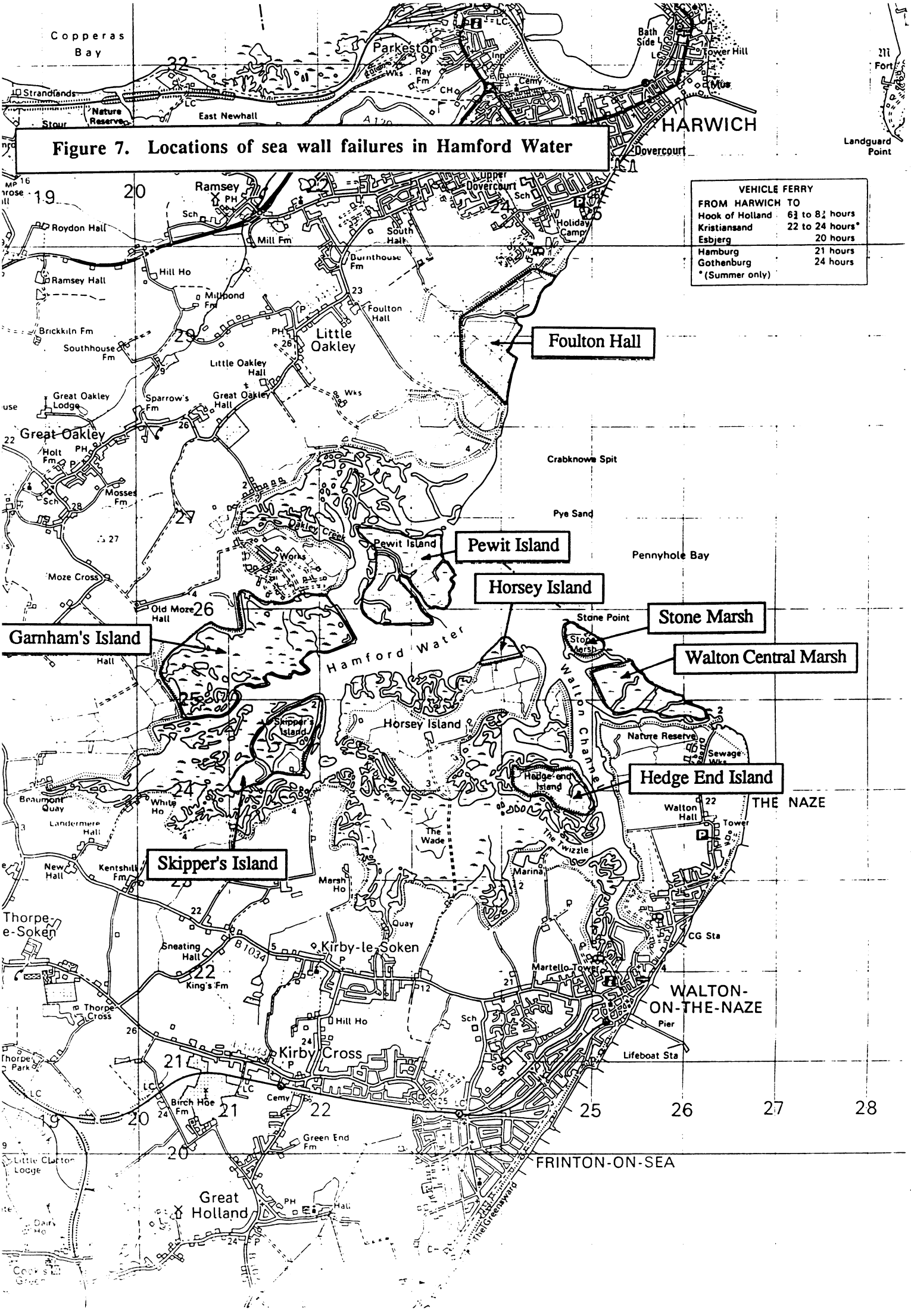

Figure 7. Locations of sea wall failures in Hamford Water

Figure 8. Reclamation in the North-East Tendring Hundred (North Hamford Water)

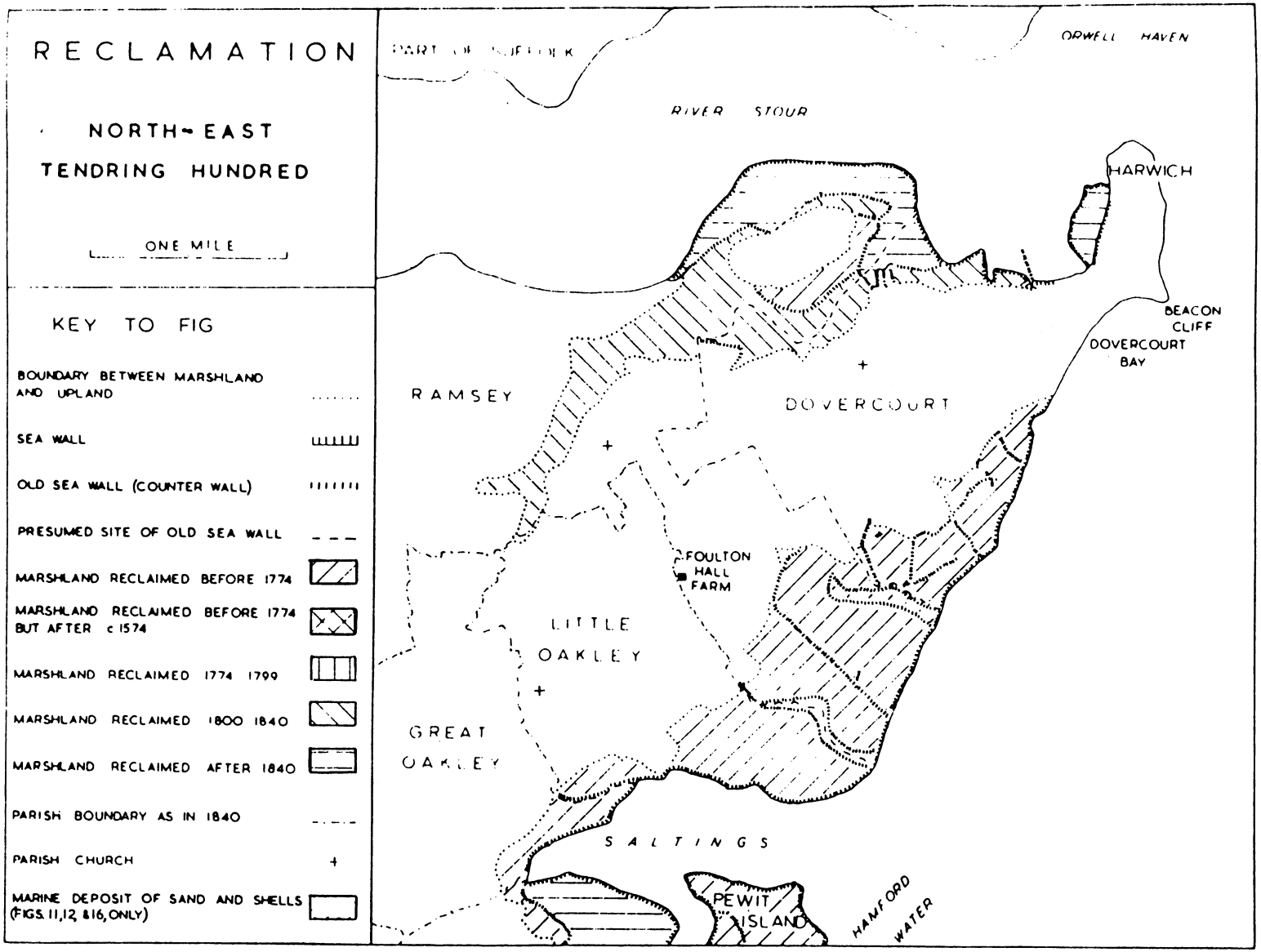

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Figure 9. Reclamation in Hamford Water

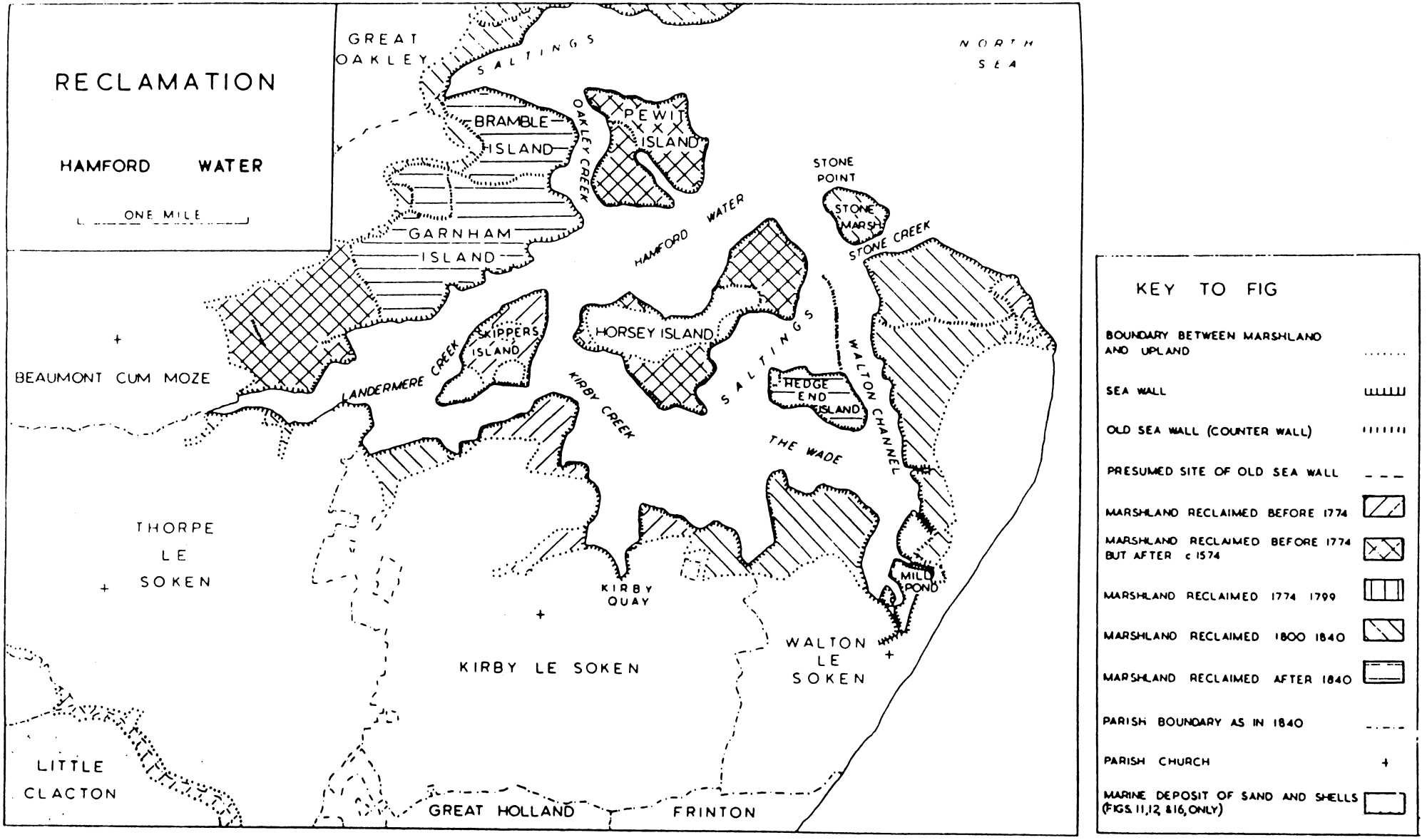

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Figure 10a. Foulton Hall: 1840 tithe map

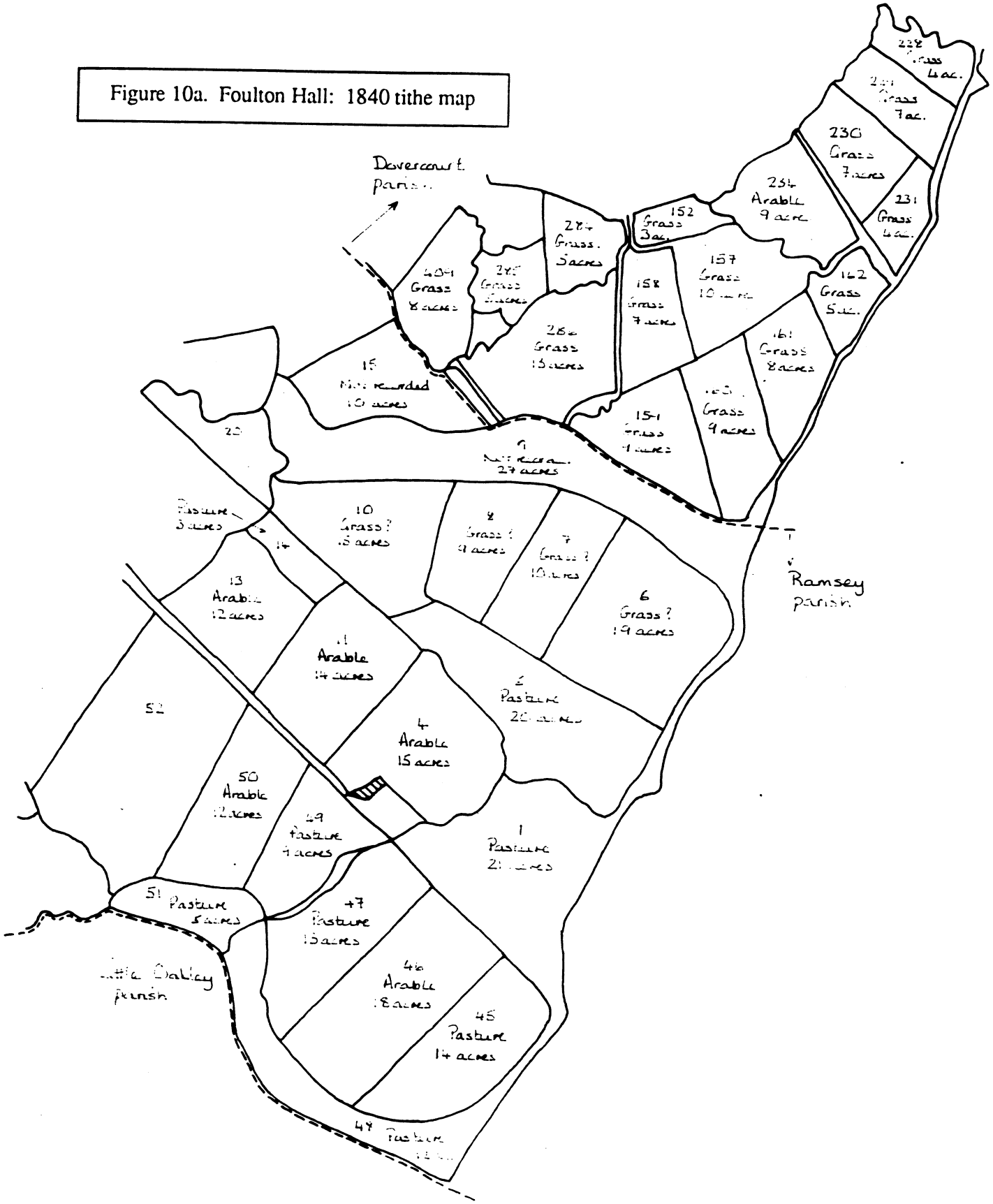


Figure 10b. Foulton Hall: changes from 1896 to 1921

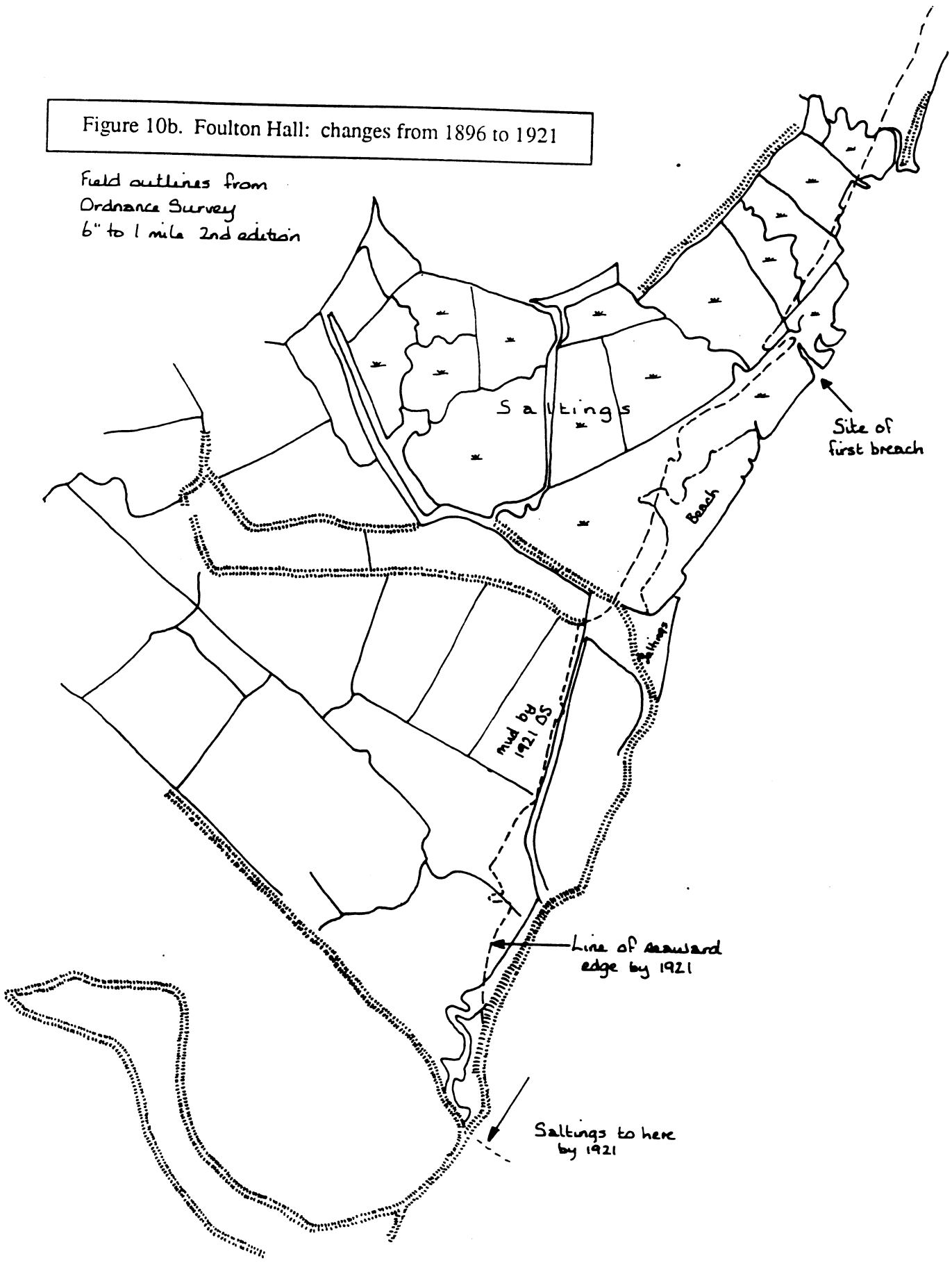


Figure 10c. Foulton Hall: present day 1:10,000 Ordnance Survey map

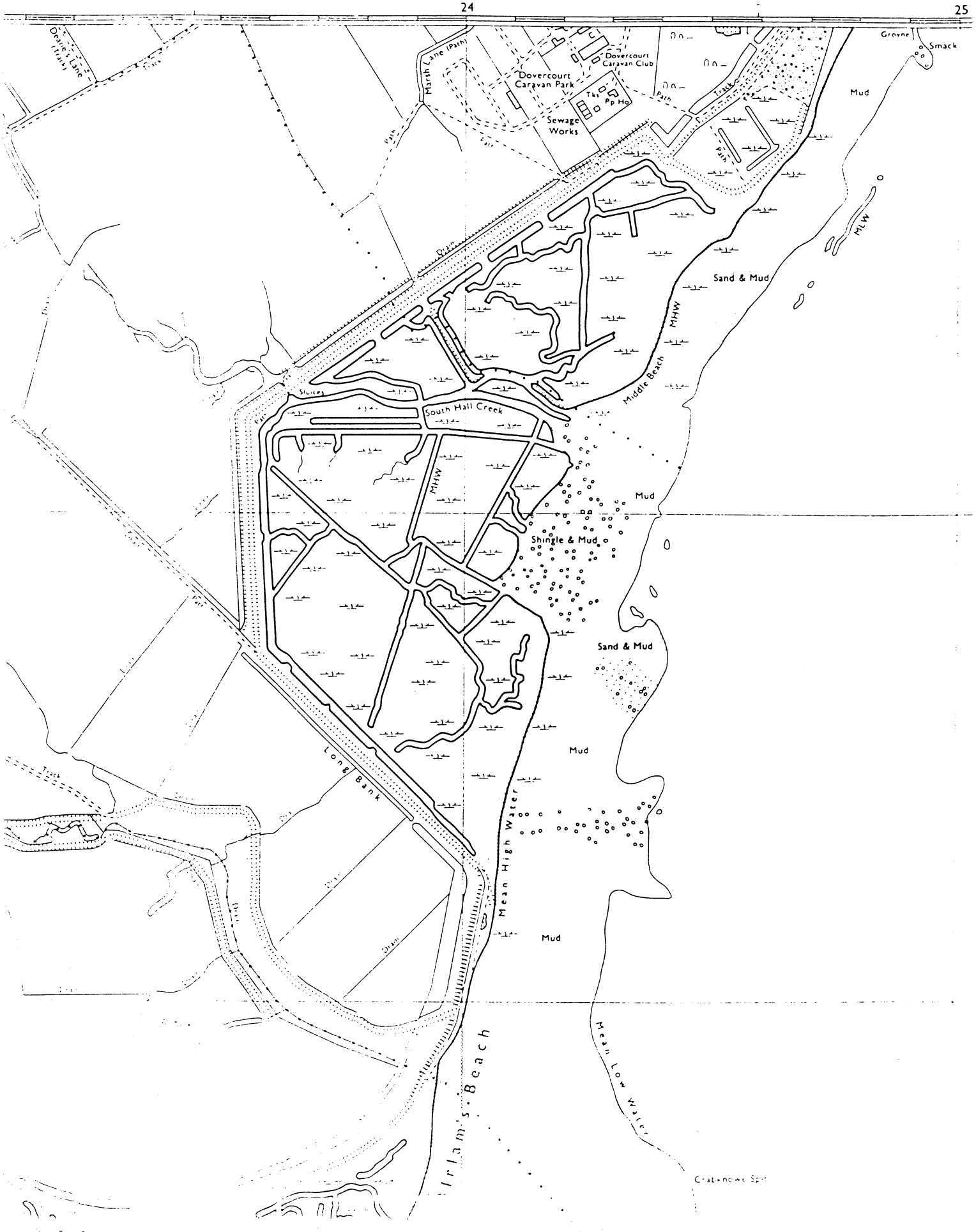


Figure 11a. Pewit Island: Outline from 1896 OS map (6" to 1 mile, 2nd edition), and changes to 1921

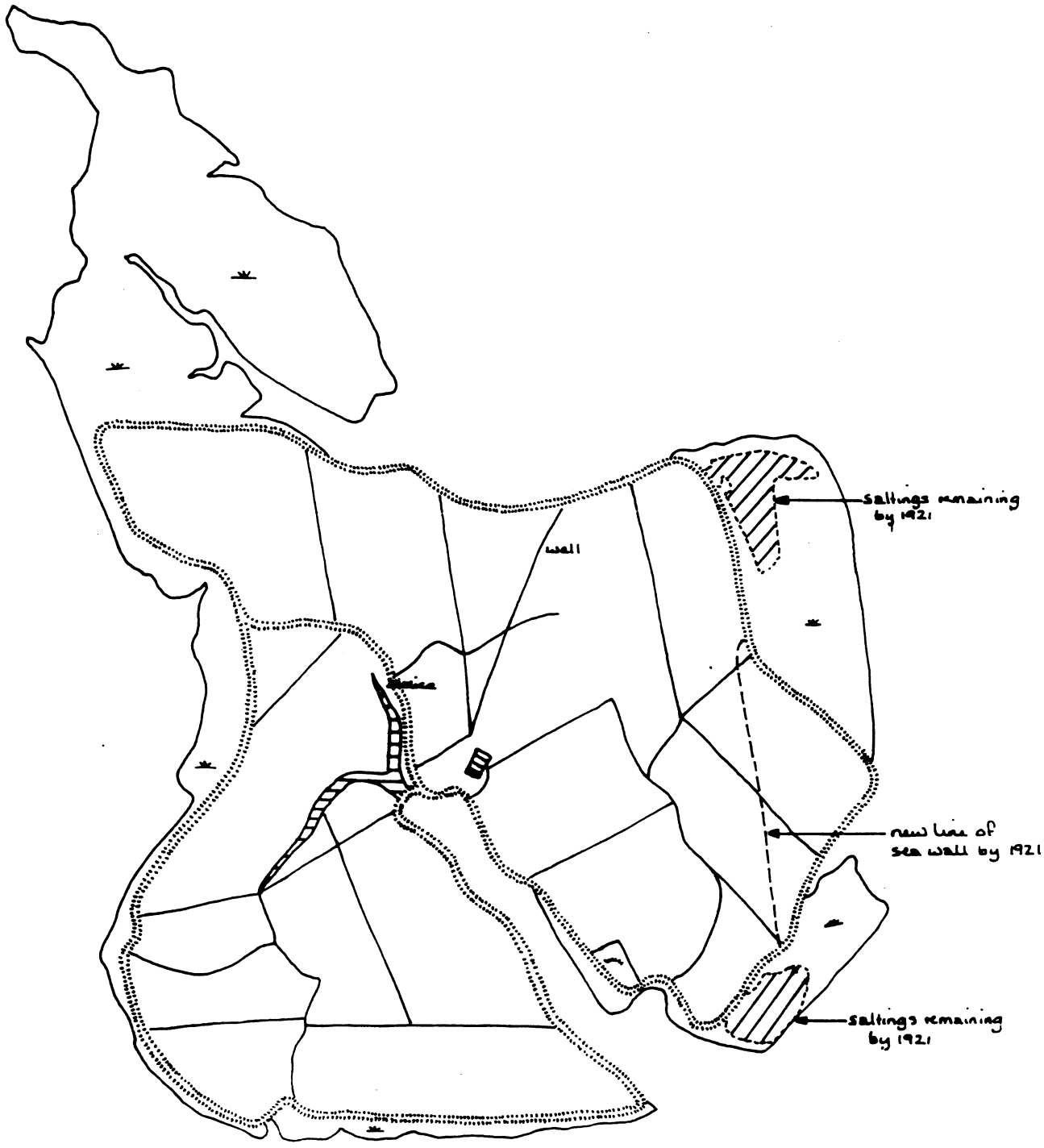


Figure 11b. Pewit Island: present day 1:10,000 Ordnance Survey map

Figure 12a. Garnham's Island: outline from OS 6" to 1 mile, 2nd edition (1896)

Figure 12b. Garnham's Island: present day 1:10,000 Ordnance Survey map

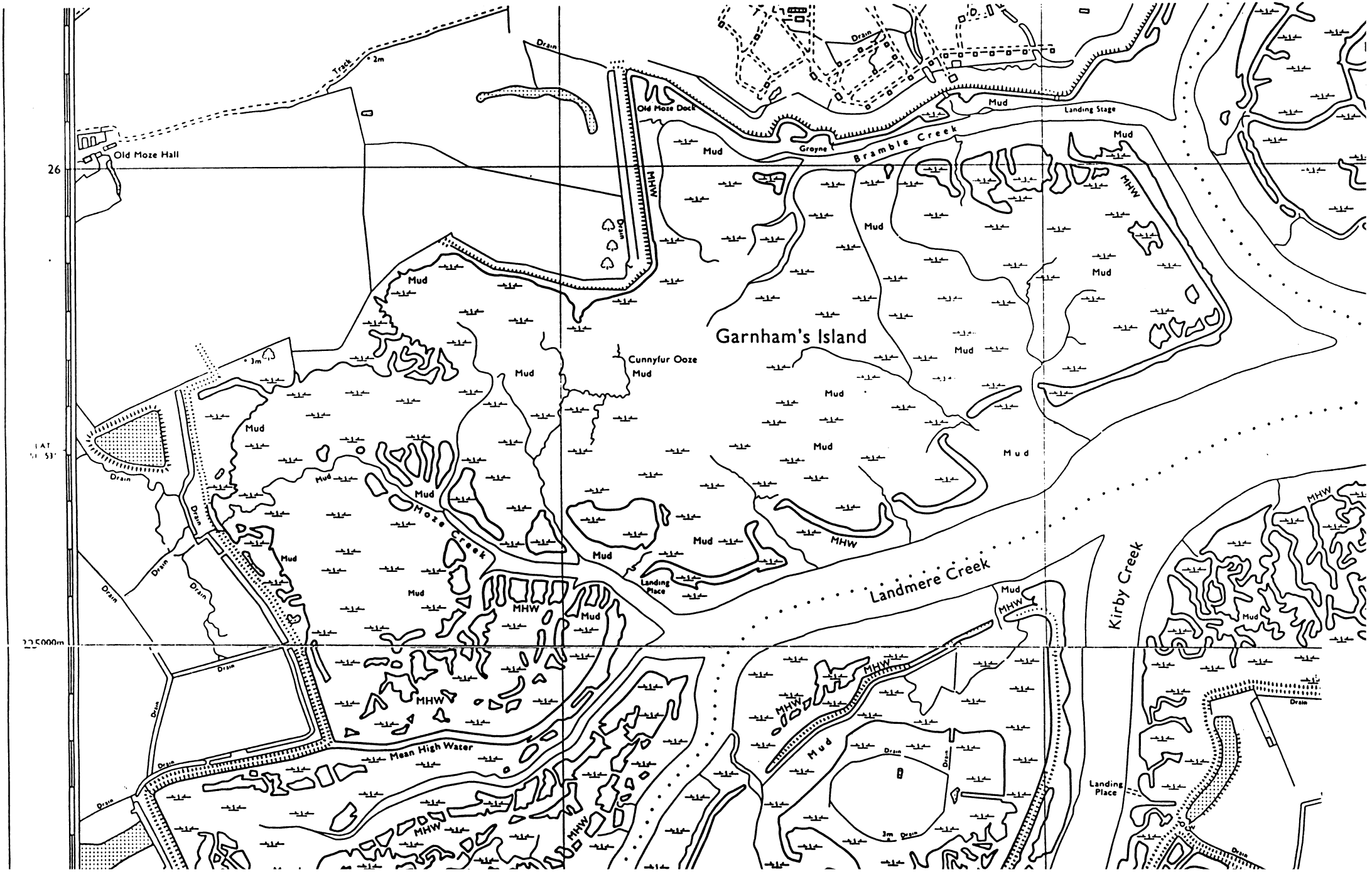
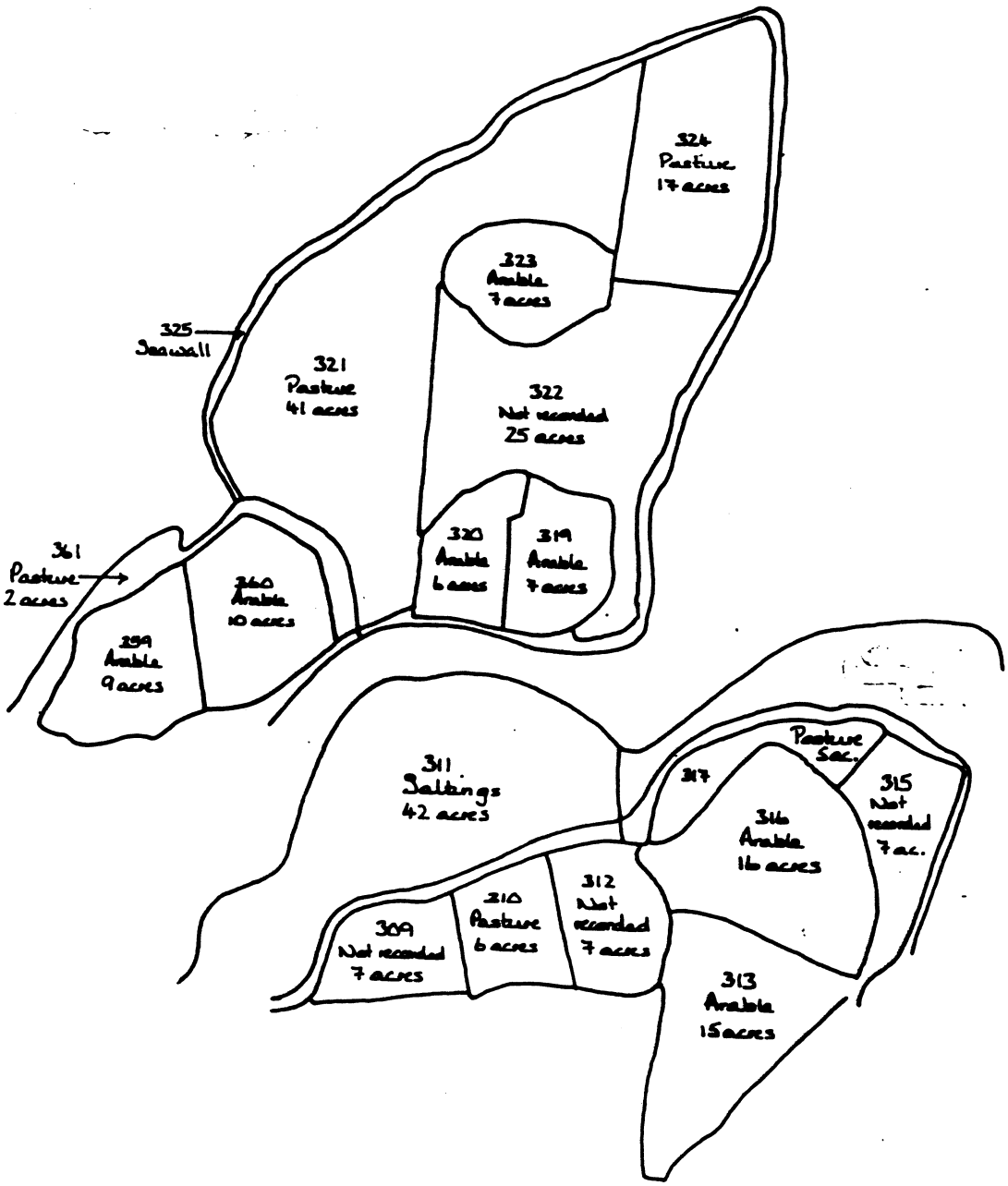


Figure 13a. Skipper's Island: 1840 tithe map



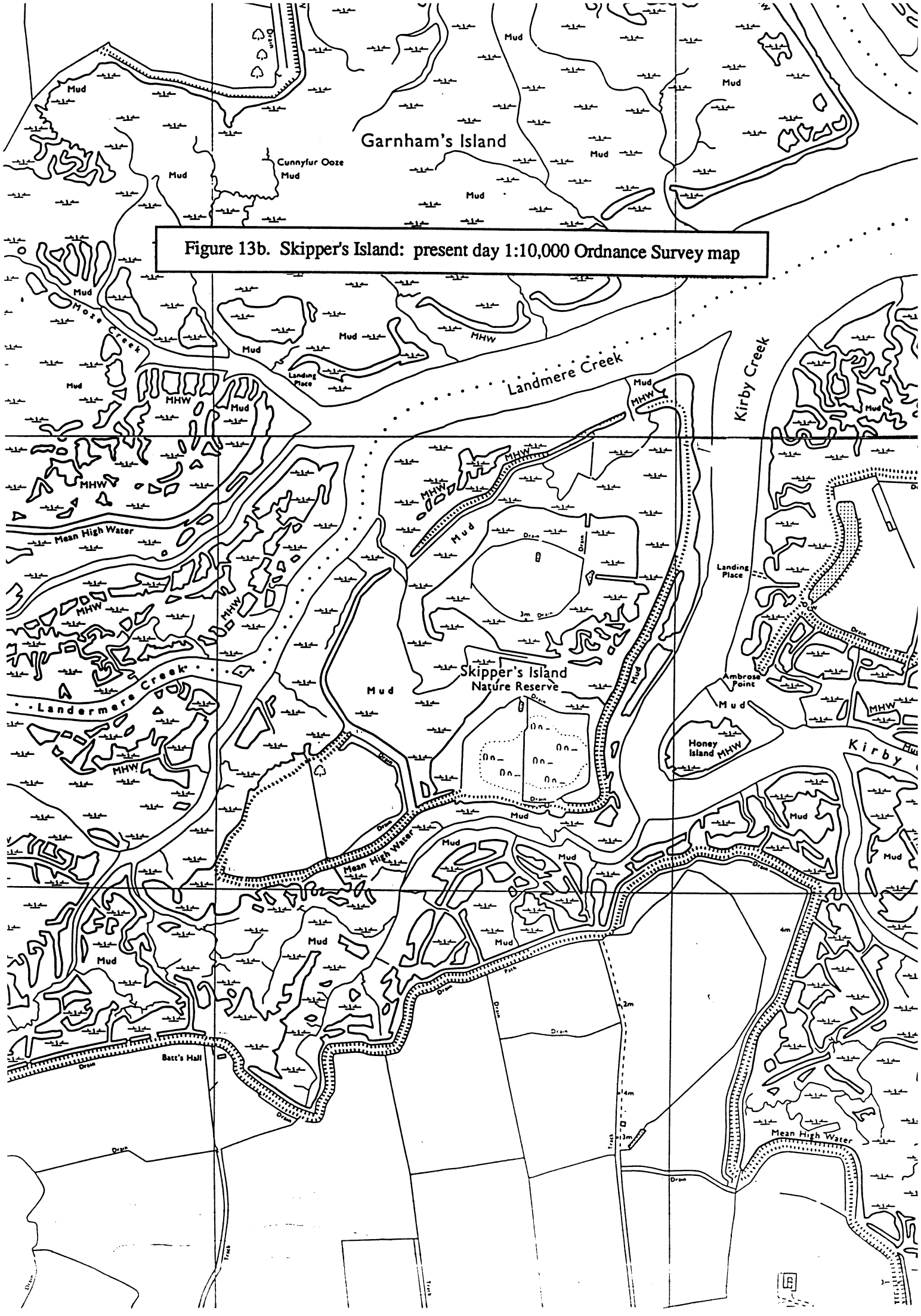


Figure 13b. Skipper's Island: present day 1:10,000 Ordnance Survey map

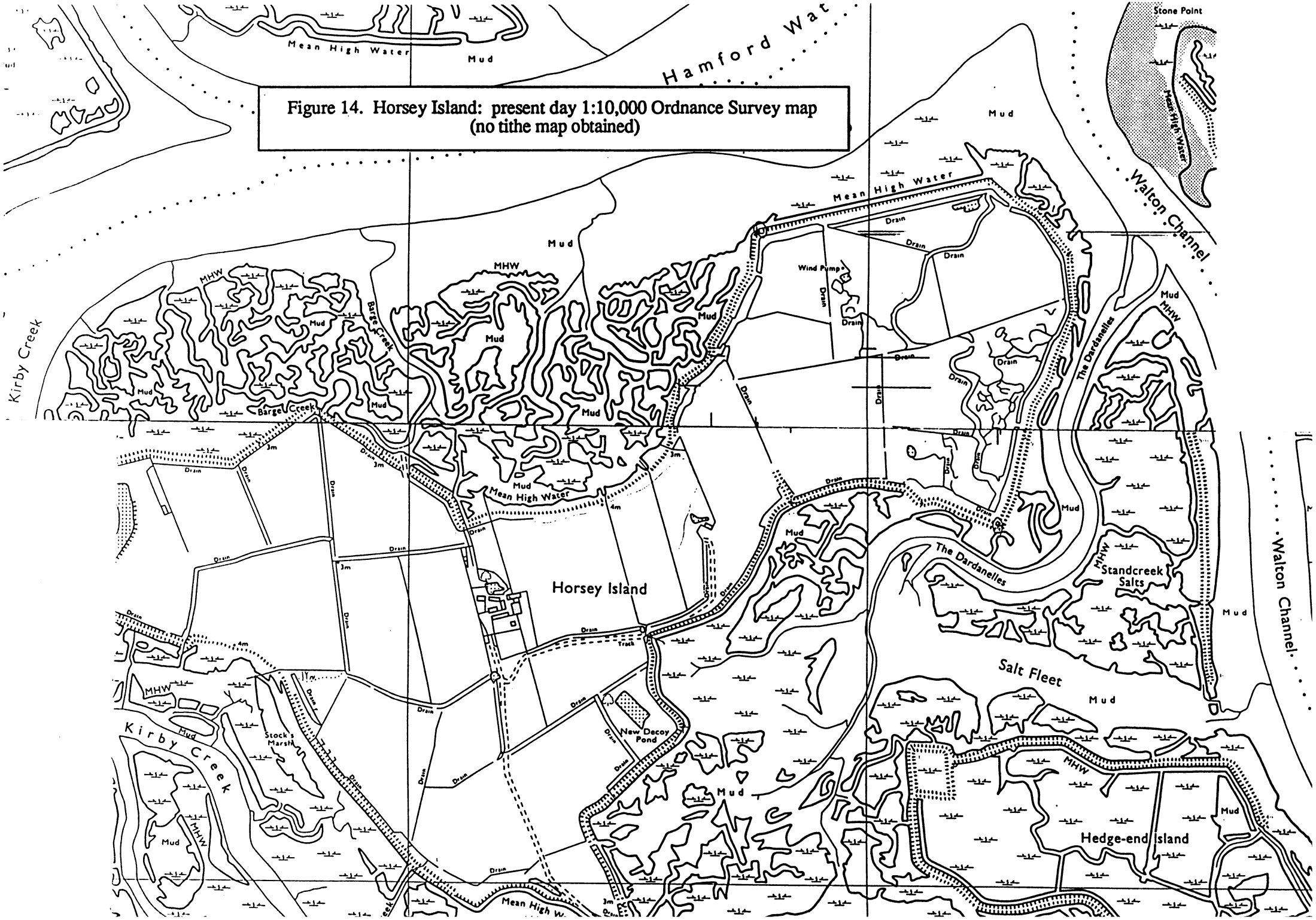


Figure 14. Horsey Island: present day 1:10,000 Ordnance Survey map (no tithe map obtained)

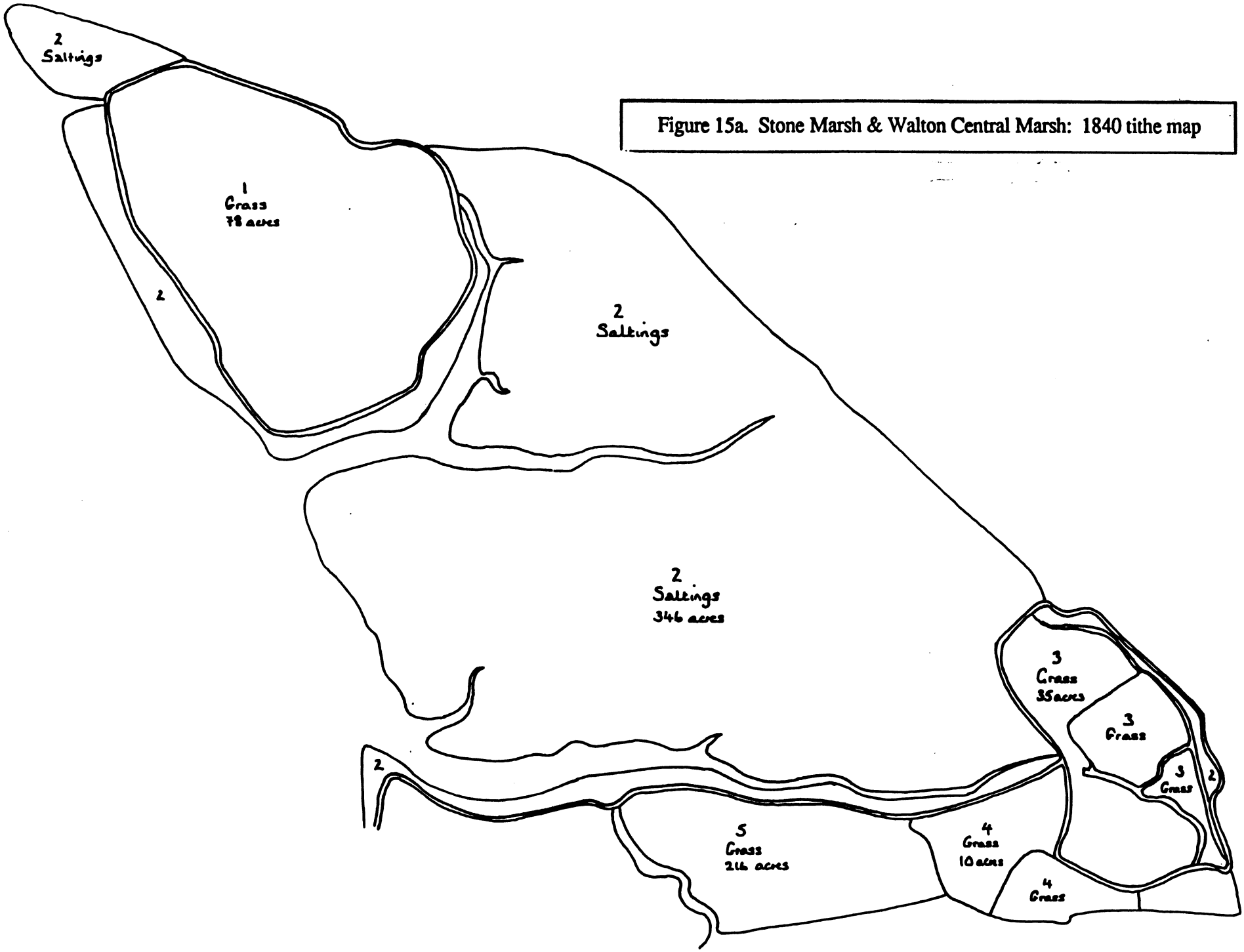


Figure 15a. Stone Marsh & Walton Central Marsh: 1840 tithe map

Figure 15b. Stone Marsh & Walton Central Marsh: changes in outline between 1874 and 1921

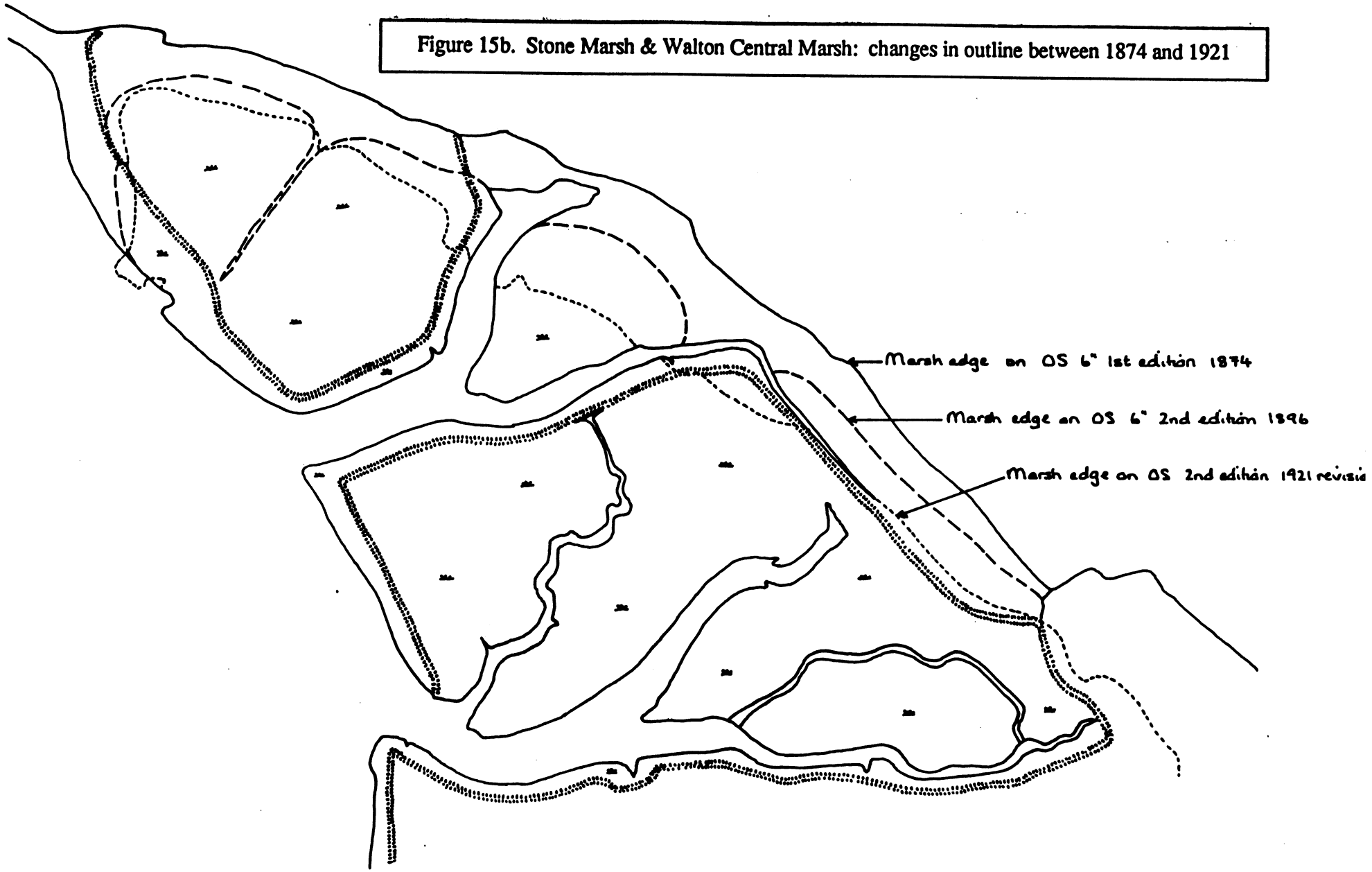
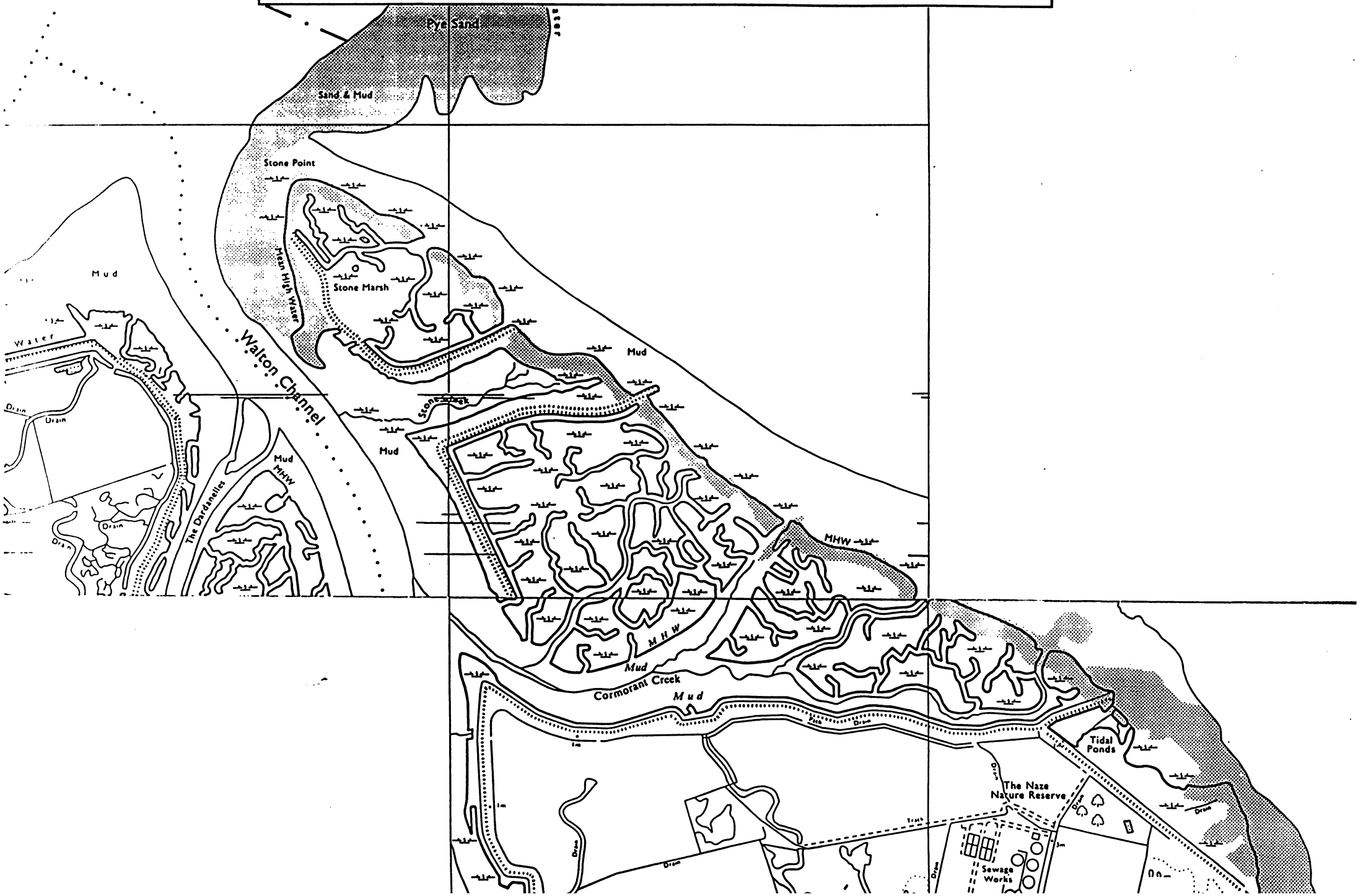


Figure 15c. Stone Marsh & Walton Central Marsh: present day 1:10,000 Ordnance Survey map



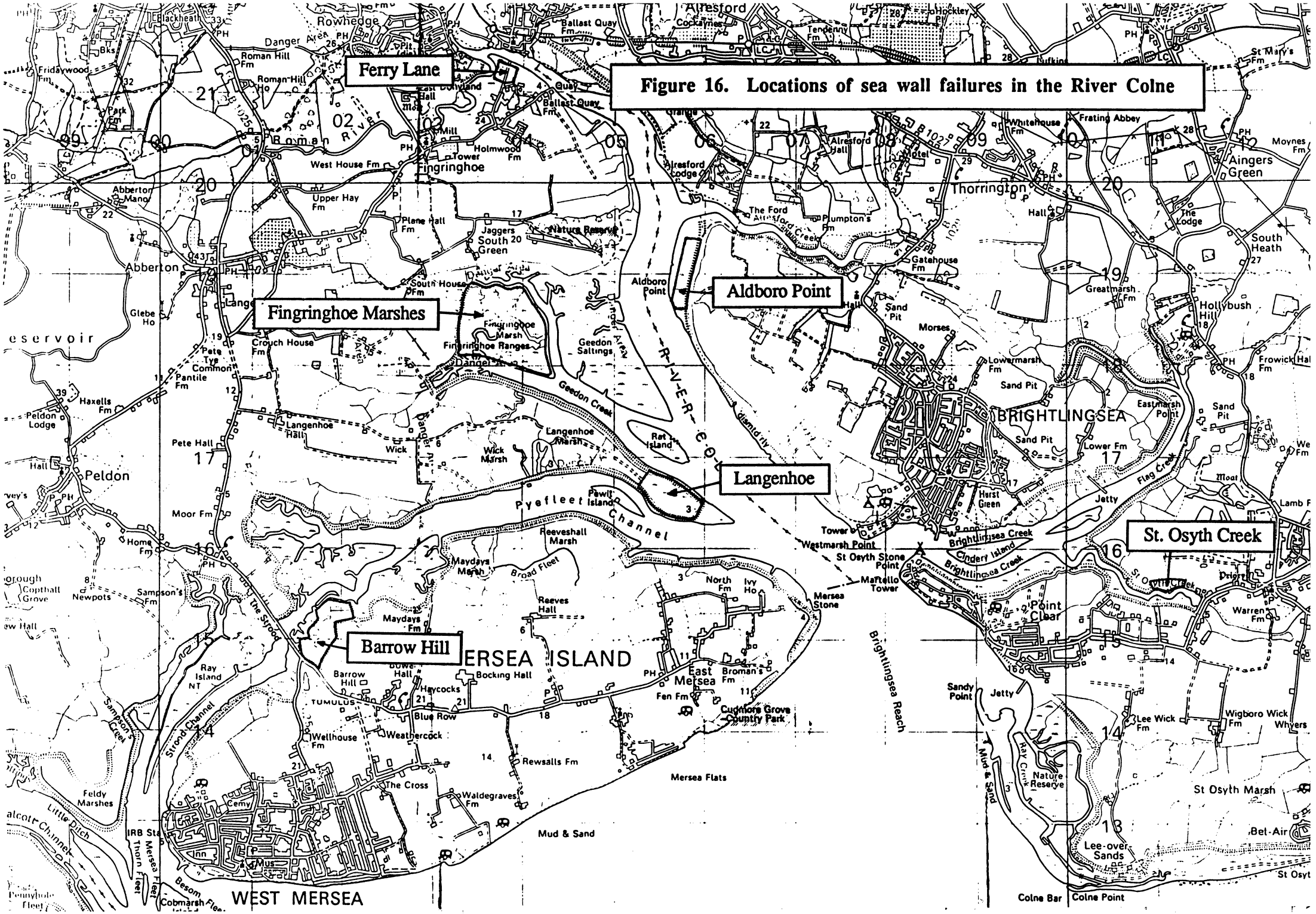


Figure 16. Locations of sea wall failures in the River Colne

Figure 17. Reclamation between Brightlingsea and St. Osyth (Colne Estuary)

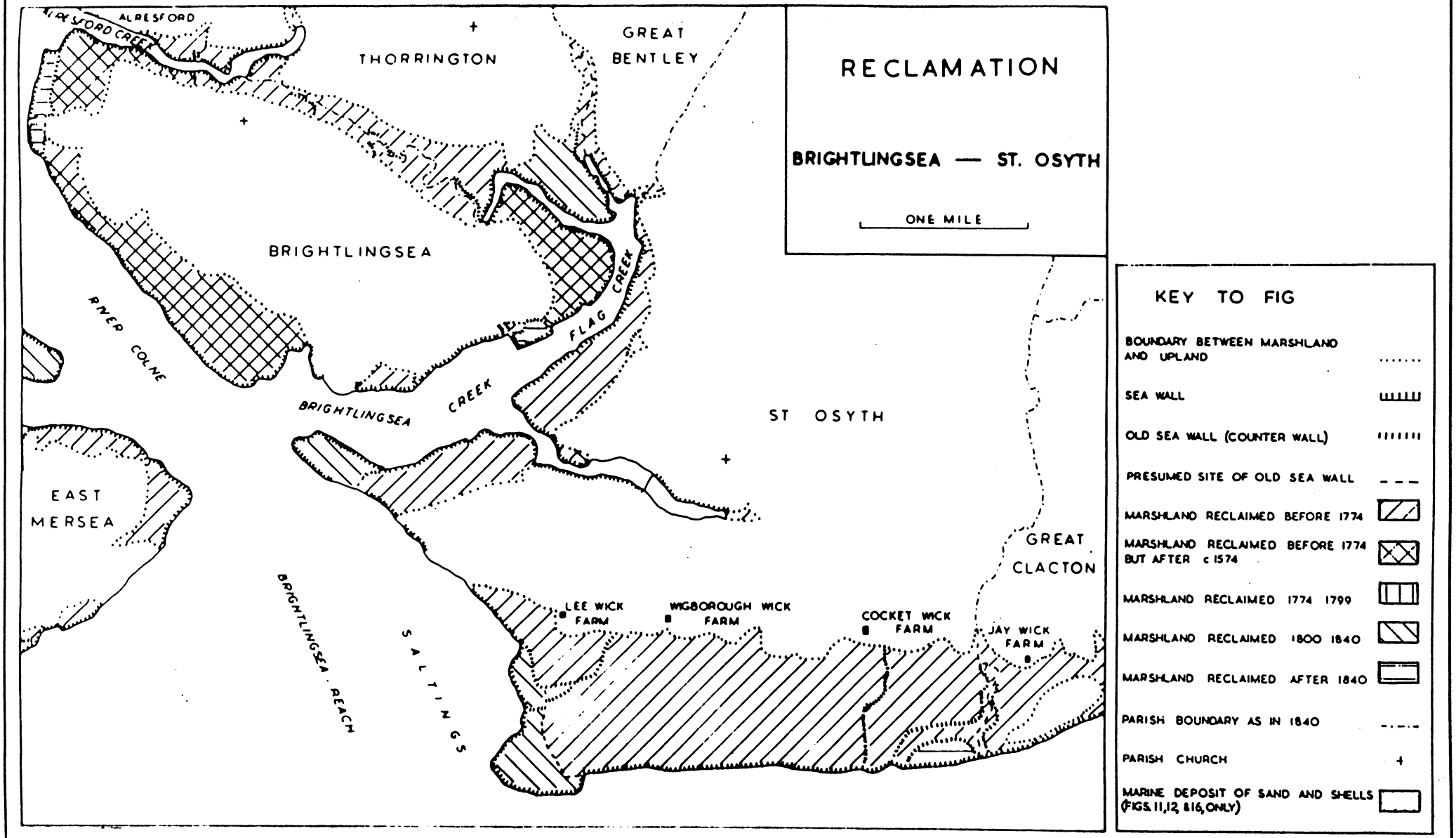


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Figure 18. Reclamation in the Winstree Hundred (Colne and Blackwater Estuaries)

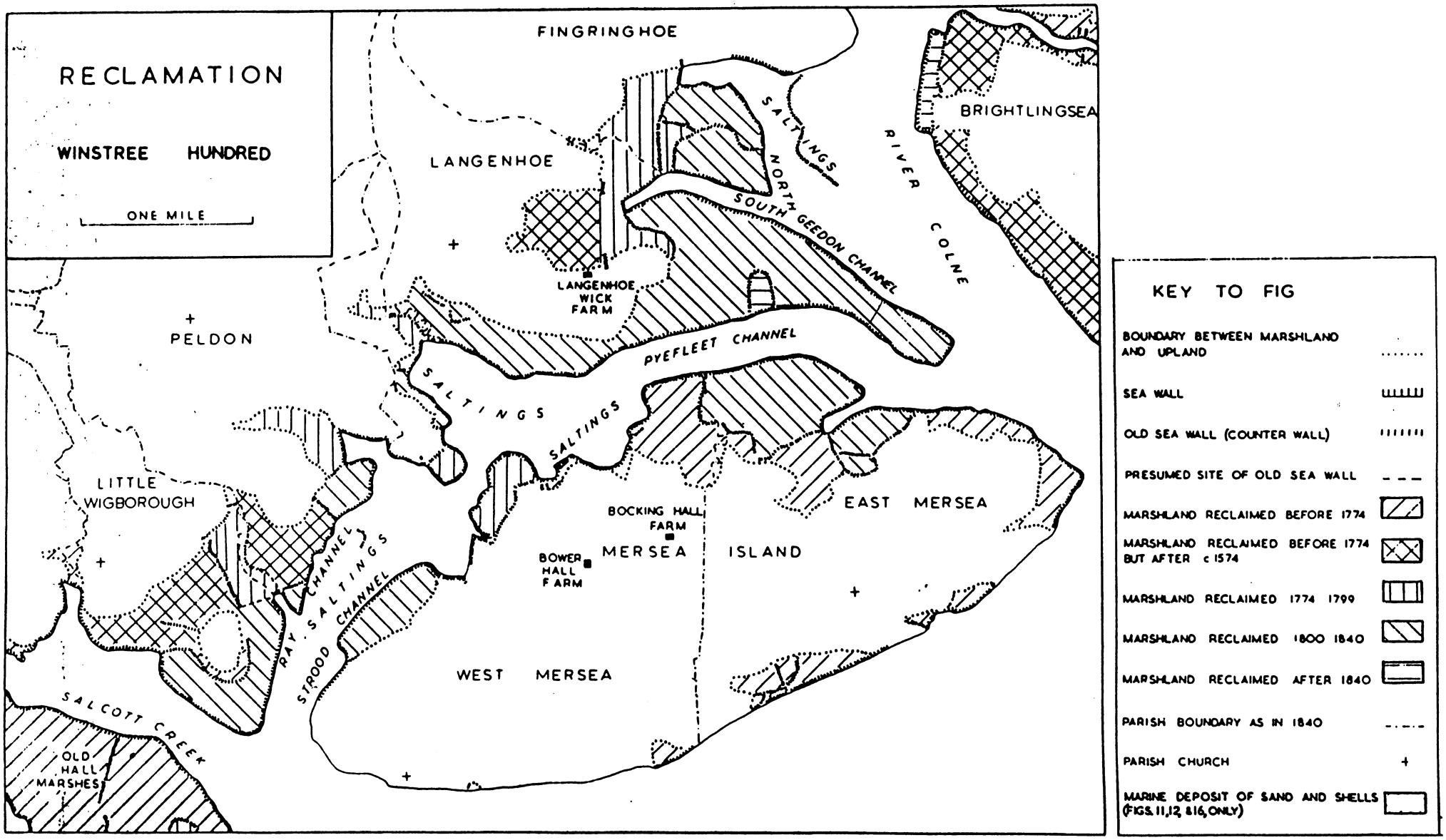

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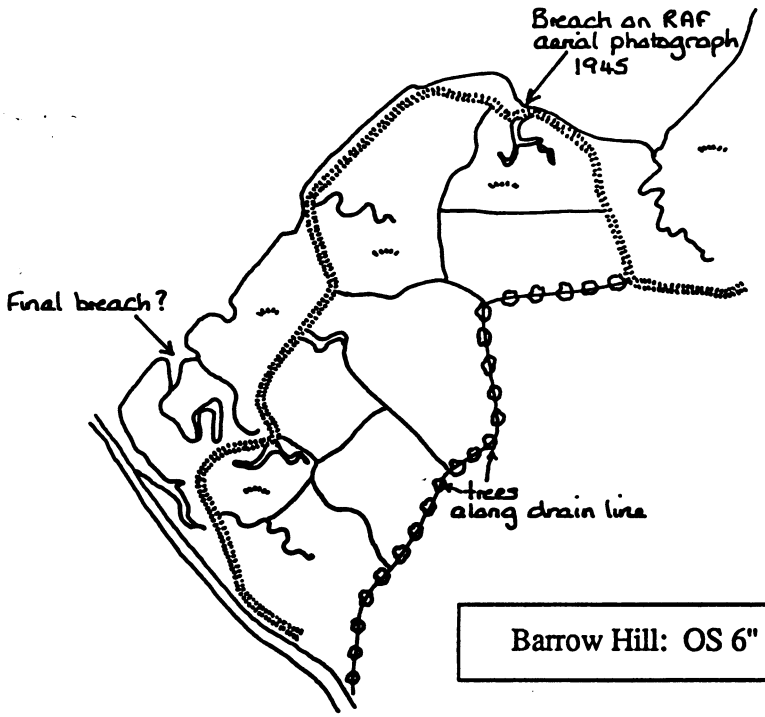
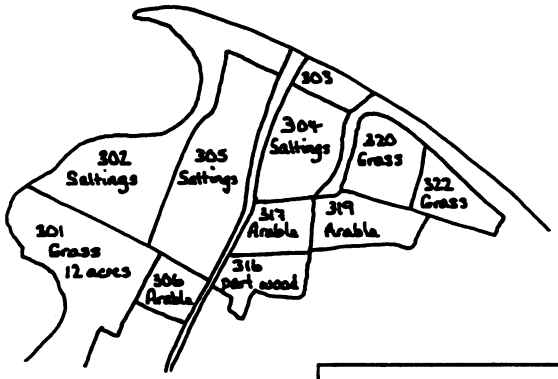
Figure 19. Colne Estuary: miscellaneous maps



Barrow Hill: OS 6" to 1 mile, 1st edition (1874)



Ferry Road: 1840 tithe map

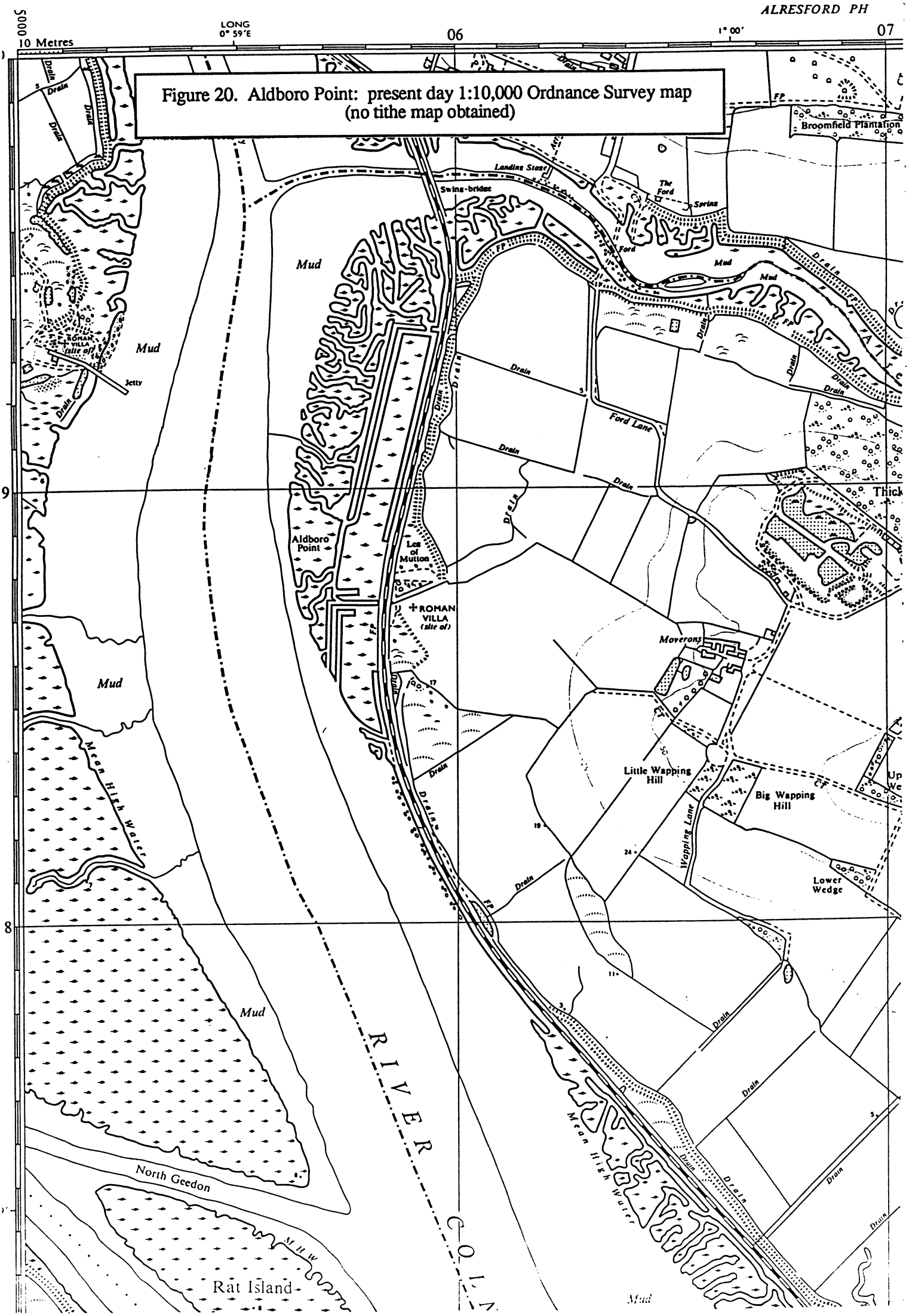


Figure 20. Aldboro Point: present day 1:10,000 Ordnance Survey map (no tithe map obtained)

Figure 21a. Fingringhoe Marshes: 1840 tithe map

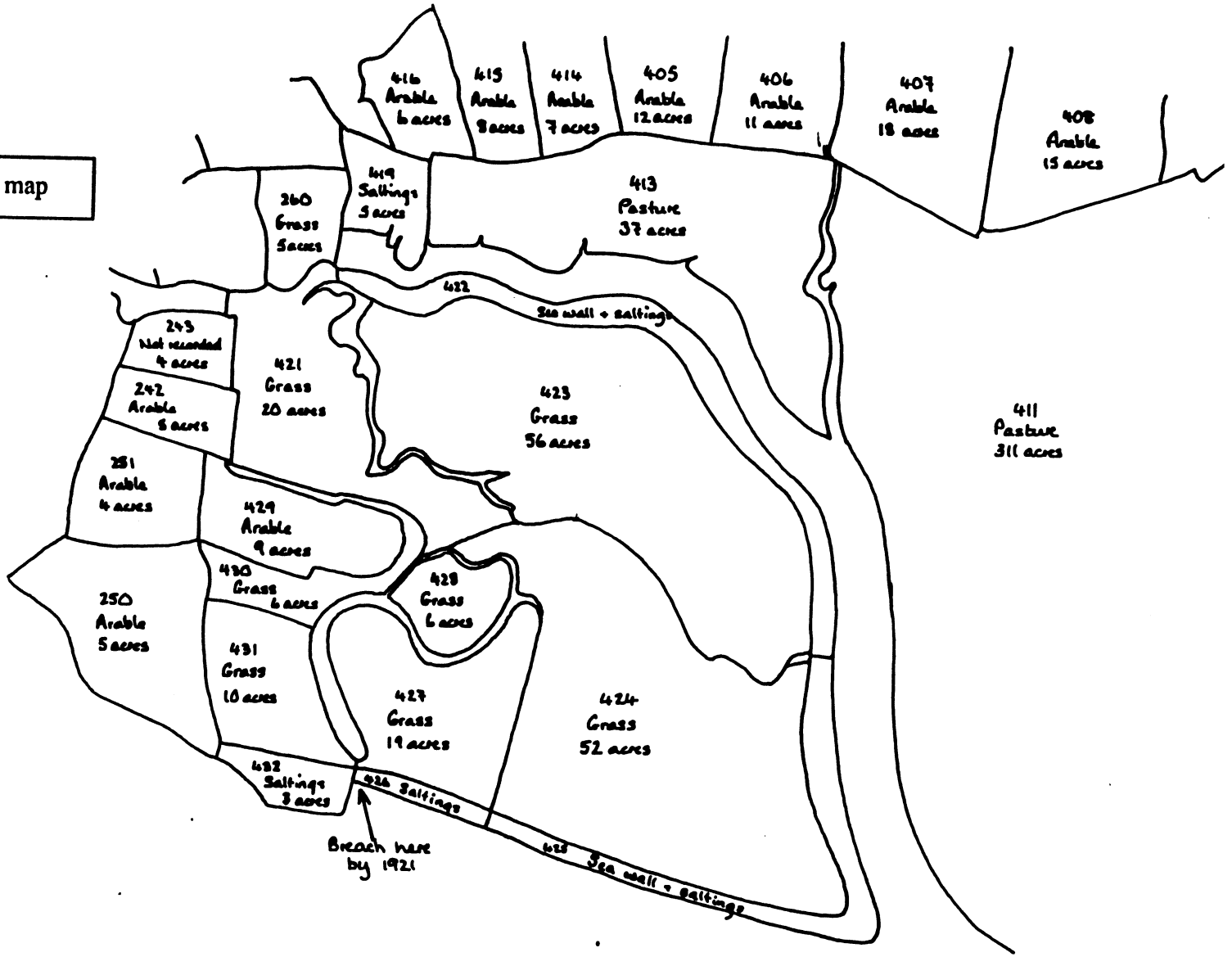
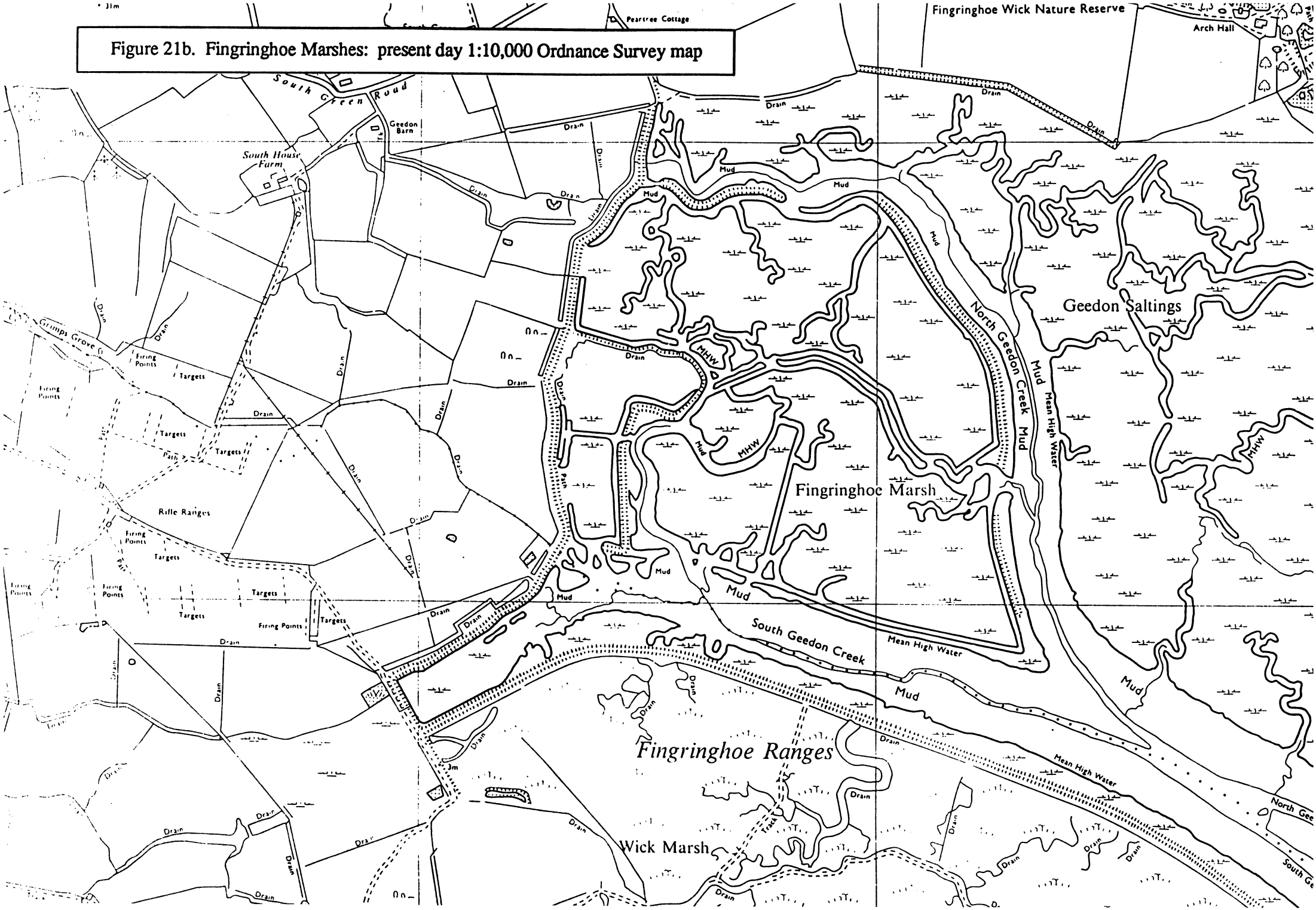


Figure 21b. Fingringhoe Marshes: present day 1:10,000 Ordnance Survey map



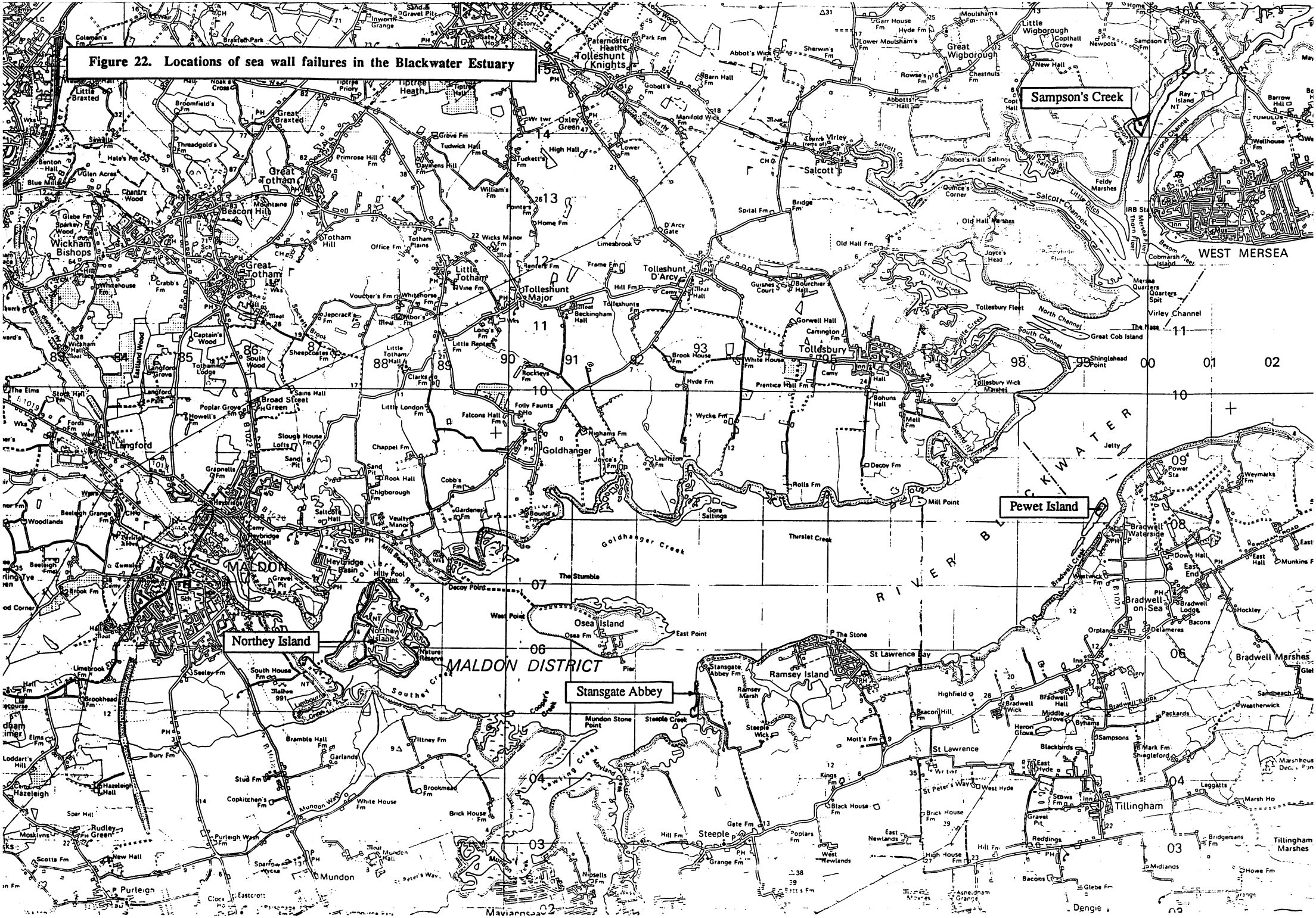
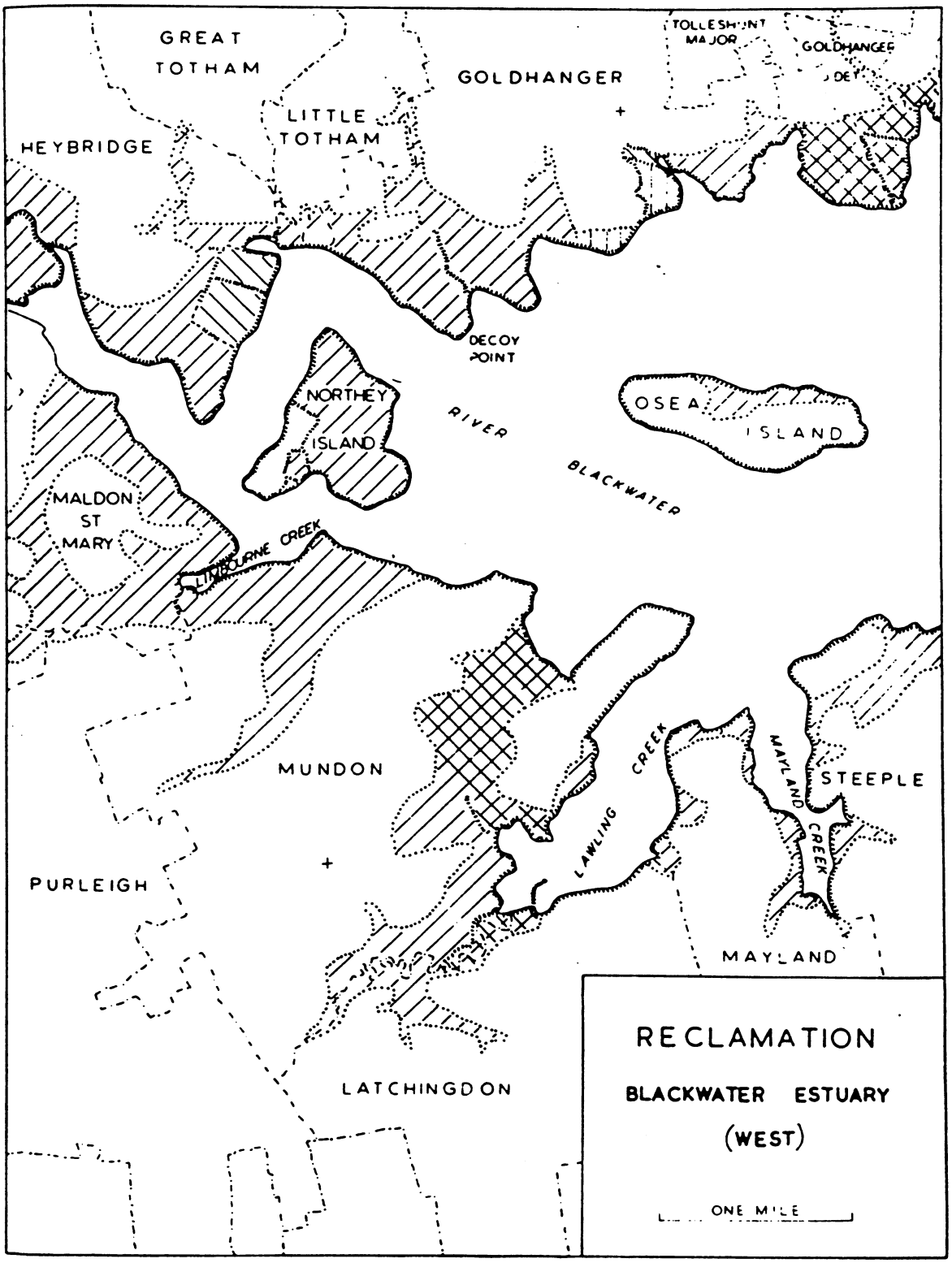


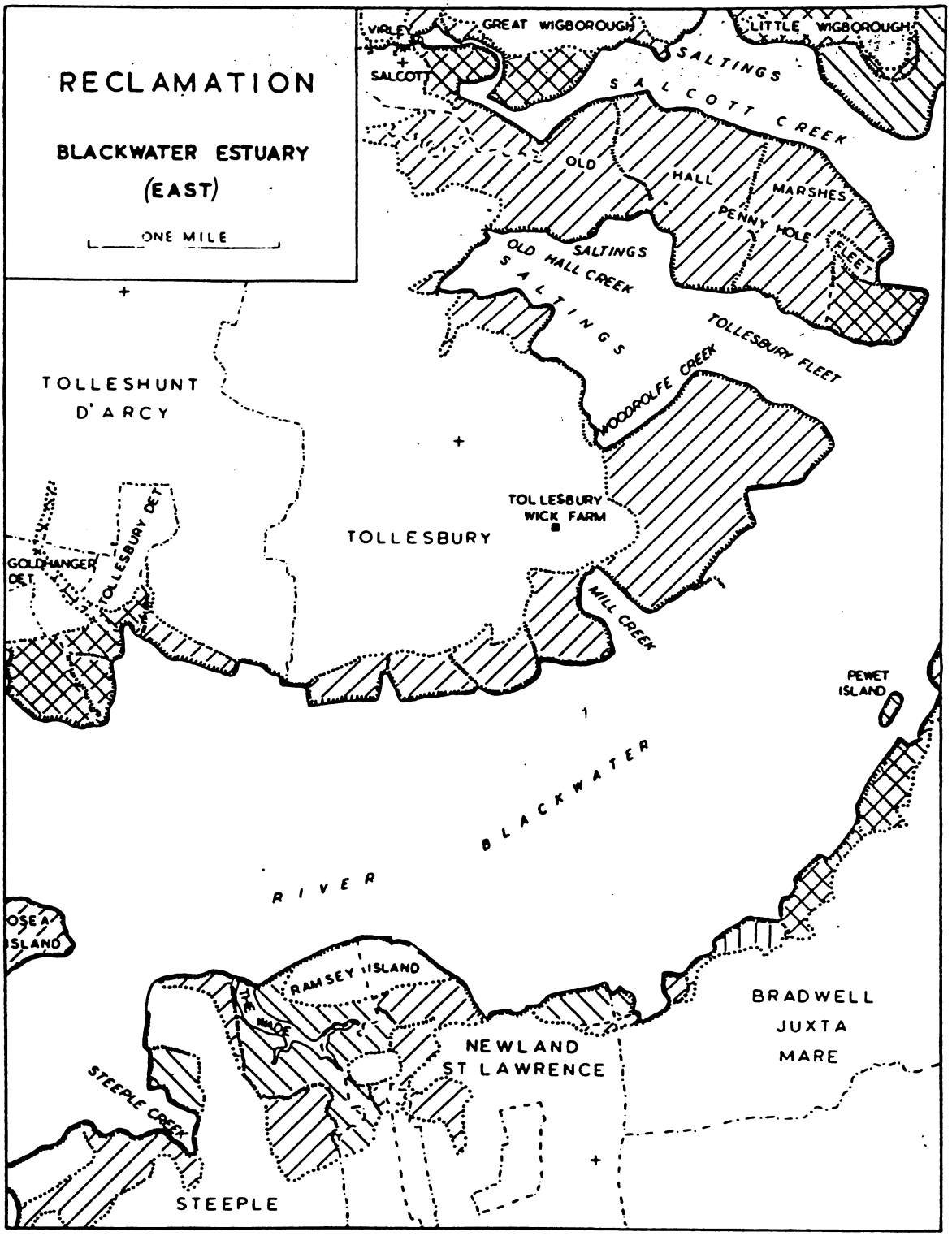
Figure 22. Locations of sea wall failures in the Blackwater Estuary
Sampson's Creek
Pewet Island
Northey Island
Stansgate Abbey
MALDON DISTRICT
WEST MERSEA
MALDON
Osea Island
Ramsey Island
Bradwell-on-Sea
Tillingham
Mundon
Steeple
Goldhanger
Tolleshunt Knights
Great Totham
Tolleshunt D'Arcy
Tolleshunt Major
Tollesbury
Salcott
Virley
Langford
Heybridge Basin
Bradwell Waterside
Bradwell Marshes
Tillingham Marshes
RIVER BLACKWATER
Goldhanger Creek
Thirslet Creek
Bradwell Creek
Southey Creek
Lawling Creek
Mundon Stone Point
Steeple Creek
Decoy Point
West Point
The Stumble
Mill Point
Gore Saltings
Salcott Channel
Virley Channel
North Channel
South Channel
Tollesbury Fleet
Old Hall Marshes
Tollesbury Wick Marshes
Great Cob Island
Cobmarsh Island
Mersea Quarters
Quarters Spit
Shingleshead Point
Bradwell Waterside
St Lawrence Bay
St Lawrence
Bradwell Marshes
Tillingham Marshes
Dengie
Mayland
Purleigh
Hazeleigh
Rudley Green
Woodham Mortimer
Woodham Walter
Wickham Bishops
Little Braxted
Great Braxted
Tiptree
Tiptree Heath
Little Totham
Beacon Hill
Chantry Wood
Eastland Wood
South Wood
Broad Street Green
Sheepcotes Fm
Stansgate Abbey Fm
Osea Fm
Northey Island
Nature Reserve
Hilly Pool Point
Collier's Reach
Mill Beach
Gravel Pit
Sand Pit
Pier
Jetty
Power Sta
Curry
Inn
Hall
Church
Sch
Cemy
Wks
Mill
Windmill
Pumping Station
Coastguard Station
Lifeboat Station
Radio Mast
Wr twr
Ferry
Slipway
Footbridge
Causeway
Embankment
Sea Wall
Saltings
Mudflats
Creek
Channel
Fleet
Ditch
Marsh
Island
Point
Spit
Beach
Quay
Harbour
Marina
Yacht Club
Sailing Club
Golf Course
Caravan Site
Camping Site
Nature Reserve
Country Park
Recreation Ground
Sports Ground
Cricket Ground
Football Ground
Tennis Court
Swimming Pool
Bowling Green
Allotments
Orchard
Vineyard
Nursery
Farm
Fm
Manor
Hall
House
Lodge
Cottage
Barn
Oast
Mill
Windmill
Watermill
Pumping Station
Power Station
Sub Station
Transformer
Pylon
Telegraph Pole
Post Office
Telephone
Public House
Inn
Hotel
Restaurant
Shop
Garage
Petrol Station
Car Park
Bus Station
Railway Station
Level Crossing
Tunnel
Bridge
Viaduct
Aqueduct
Lock
Weir
Sluice
Culvert
Ford
Footpath
Bridleway
Byway
Road
Lane
Track
Path
Gate
Stile
Milestone
Boundary Stone
Parish Boundary
County Boundary
District Boundary
Ward Boundary
Constituency Boundary
Grid Line
Trig Point
Spot Height
Contour
Cliff
Escarpment
Quarry
Pit
Tip
Refuse Tip
Sewage Works
Water Tower
Reservoir
Well
Spring
Boundary Stone
Milestone
Signpost
Guidepost
Memorial
Monument
Cross
Church
Chapel
Meeting House
Synagogue
Mosque
Temple
Cemetery
Churchyard
Graveyard
Crematorium
Hospital
Clinic
Surgery
Pharmacy
Dentist
Veterinary Surgery
Police Station
Fire Station
Ambulance Station
Coastguard Station
Lifeboat Station
Radio Mast
Wr twr
Ferry
Slipway
Footbridge
Causeway
Embankment
Sea Wall
Saltings
Mudflats
Creek
Channel
Fleet
Ditch
Marsh
Island
Point
Spit
Beach
Quay
Harbour
Marina
Yacht Club
Sailing Club
Golf Course
Caravan Site
Camping Site
Nature Reserve
Country Park
Recreation Ground
Sports Ground
Cricket Ground
Football Ground
Tennis Court
Swimming Pool
Bowling Green
Allotments
Orchard
Vineyard
Nursery
Farm
Fm
Manor
Hall
House
Lodge
Cottage
Barn
Oast
Mill
Windmill
Watermill
Pumping Station
Power Station
Sub Station
Transformer
Pylon
Telegraph Pole
Post Office
Telephone
Public House
Inn
Hotel
Restaurant
Shop
Garage
Petrol Station
Car Park
Bus Station
Railway Station
Level Crossing
Tunnel
Bridge
Viaduct
Aqueduct
Lock
Weir
Sluice
Culvert
Ford
Footpath
Bridleway
Byway
Road
Lane
Track
Path
Gate
Stile
Milestone
Boundary Stone
Parish Boundary
County Boundary
District Boundary
Ward Boundary
Constituency Boundary
Grid Line
Trig Point
Spot Height
Contour
Cliff
Escarpment
Quarry
Pit
Tip
Refuse Tip
Sewage Works
Water Tower
Reservoir
Well
Spring
Boundary Stone
Milestone
Signpost
Guidepost
Memorial
Monument
Cross
Church
Chapel
Meeting House
Synagogue
Mosque
Temple
Cemetery
Churchyard
Graveyard
Crematorium
Hospital
Clinic
Surgery
Pharmacy
Dentist
Veterinary Surgery
Police Station
Fire Station
Ambulance Station

Figure 24. Reclamation in the Blackwater Estuary (West)



KEY TO FIG

- BOUNDARY BETWEEN MARSHLAND AND UPLAND
- SEA WALL
- OLD SEA WALL (COUNTER WALL)
- PRESUMED SITE OF OLD SEA WALL
- MARSHLAND RECLAIMED BEFORE 1774
- MARSHLAND RECLAIMED BEFORE 1774 BUT AFTER c 1574
- MARSHLAND RECLAIMED 1774 1799
- MARSHLAND RECLAIMED 1800 1840
- MARSHLAND RECLAIMED AFTER 1840
- PARISH BOUNDARY AS IN 1840
- PARISH CHURCH
- MARINE DEPOSIT OF SAND AND SHELLS (FIGS. 11, 12 & 16, ONLY)



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- BOUNDARY BETWEEN MARSHLAND AND UPLAND
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- PRESUMED SITE OF OLD SEA WALL
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- MARSHLAND RECLAIMED BEFORE 1774 BUT AFTER c 1574
- MARSHLAND RECLAIMED 1774 1799
- MARSHLAND RECLAIMED 1800 1840
- MARSHLAND RECLAIMED AFTER 1840
- PARISH BOUNDARY AS IN 1840
- PARISH CHURCH
- MARINE DEPOSIT OF SAND AND SHELLS (FIGS. 11, 12, & 16, ONLY)

Figure 23. Reclamation in the Blackwater Estuary (East)

Figure 25a. Northey Island: 1840 tithe map

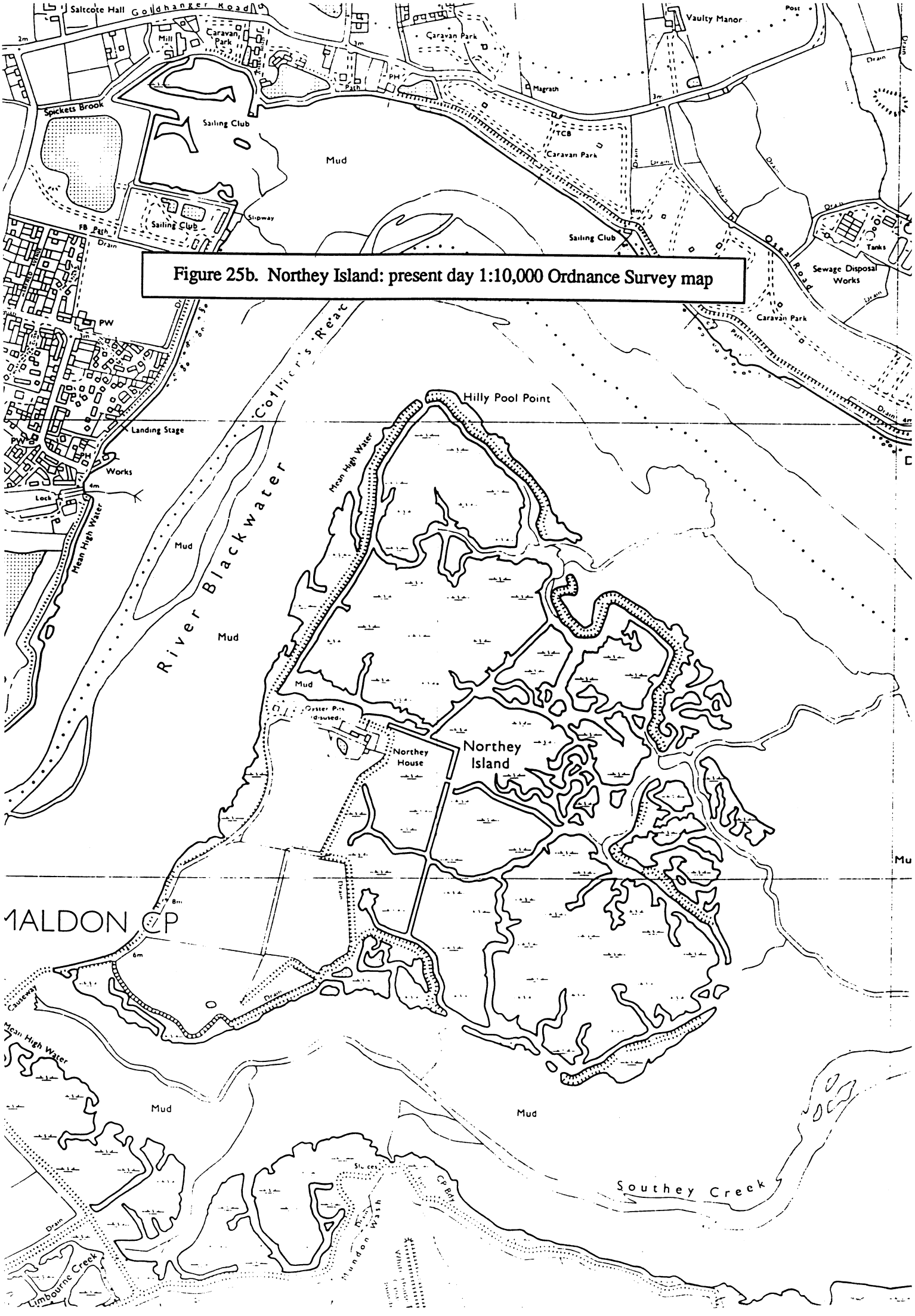
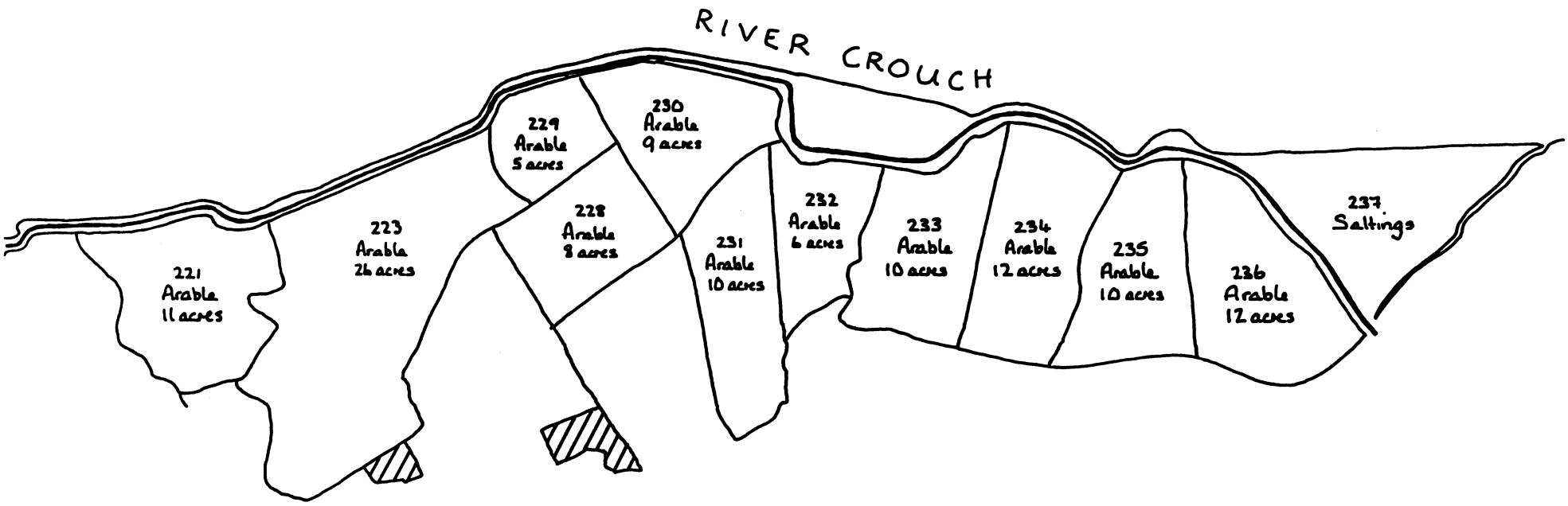


Figure 25b. Northey Island: present day 1:10,000 Ordnance Survey map

Figure 26. Locations of sea wall failures in the River Crouch

Figure 29. Wallasea Island (west): 1840 tithe map



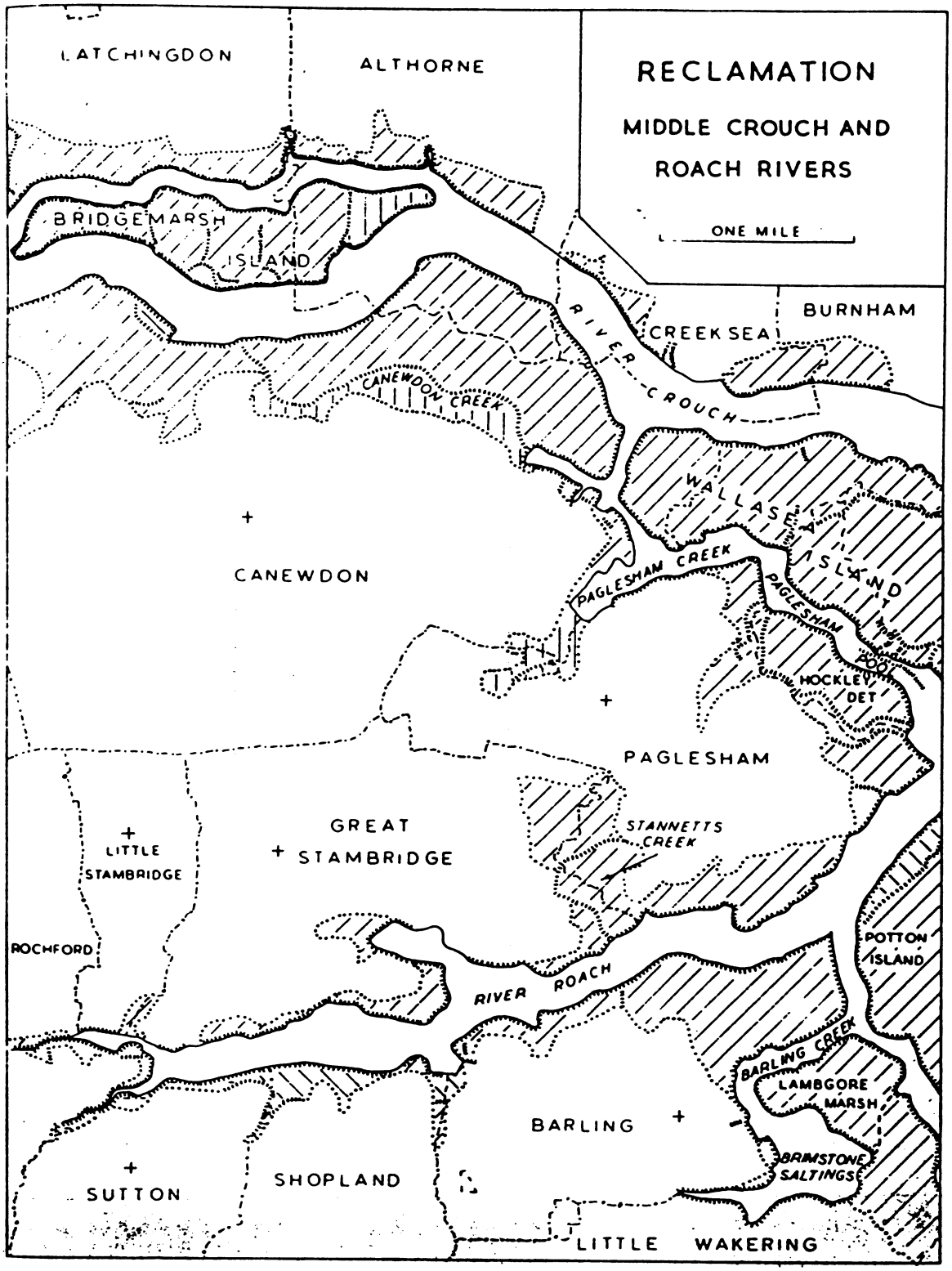


Figure 28. Reclamation in the middle Crouch and Roach rivers

Figure 27. Reclamation in the upper Crouch Estuary

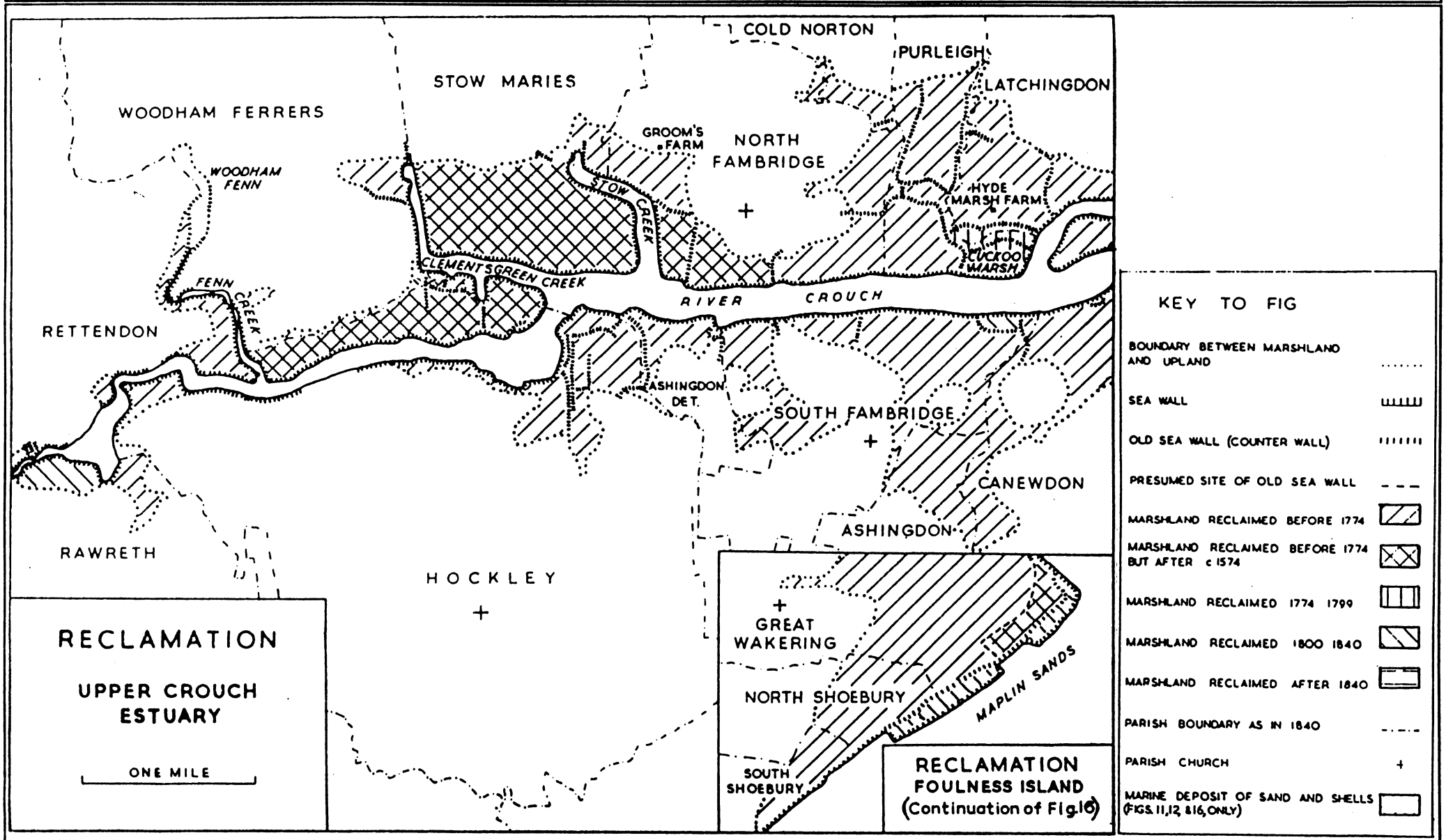


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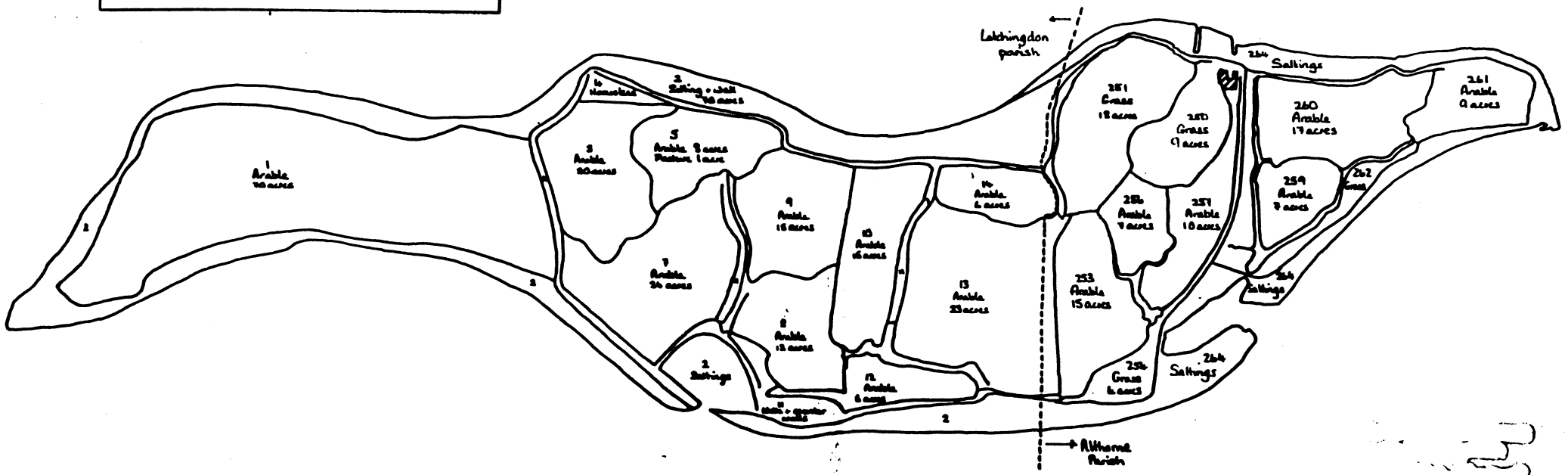
Figure 30a. Bridgemarsh Island: 1840 tithe map



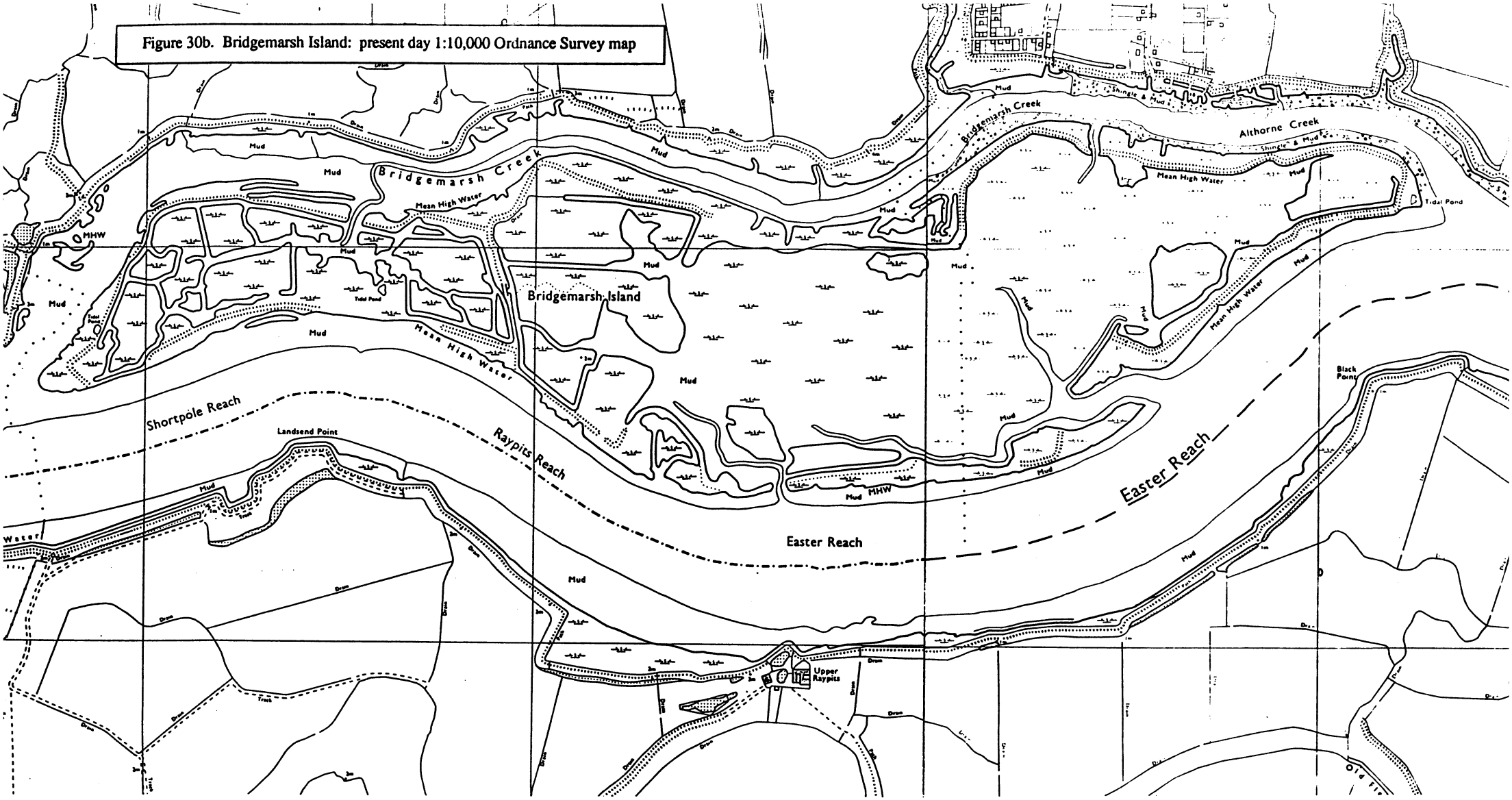
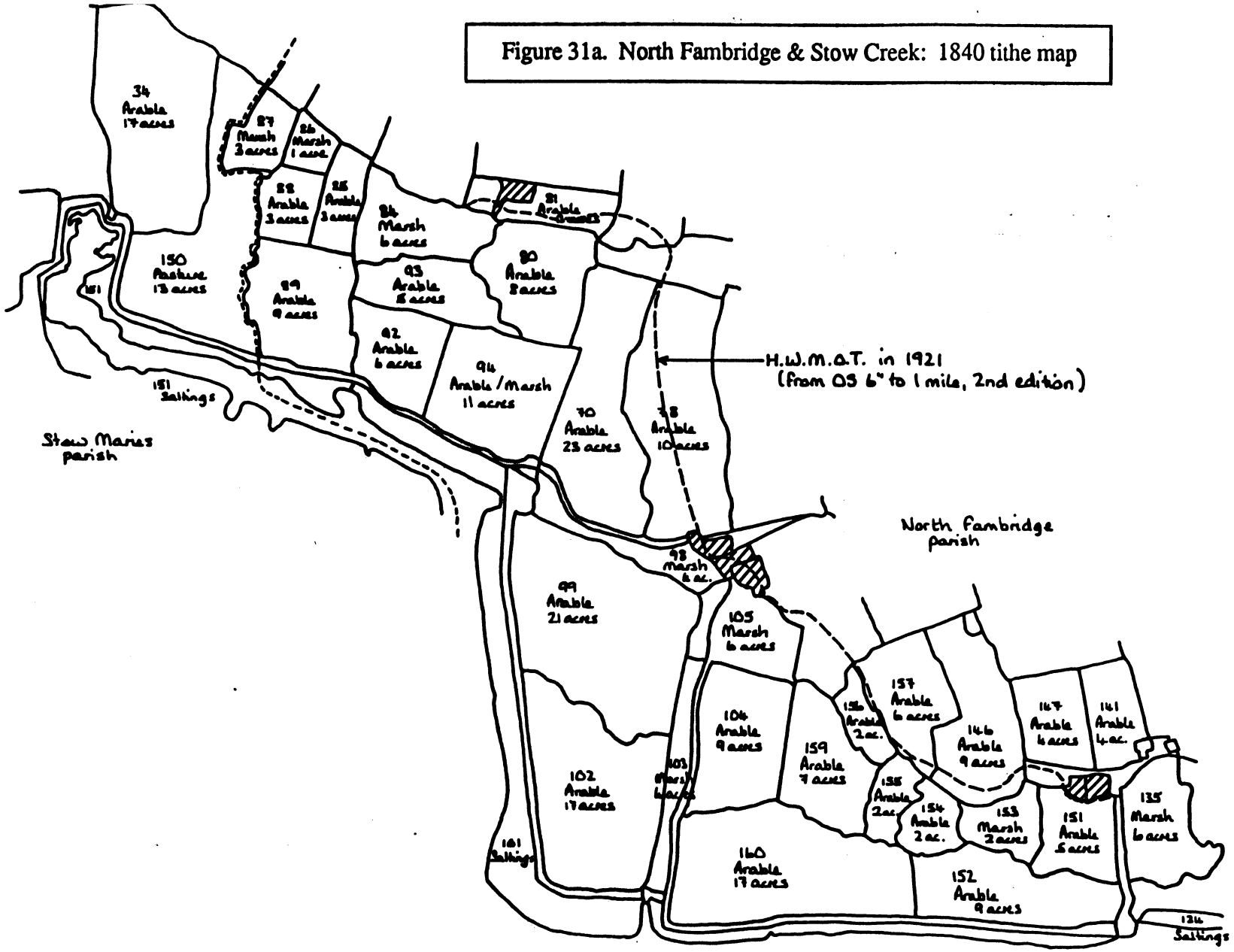


Figure 30b. Bridgemarsh Island: present day 1:10,000 Ordnance Survey map

Figure 31a. North Fambridge & Stow Creek: 1840 tithe map



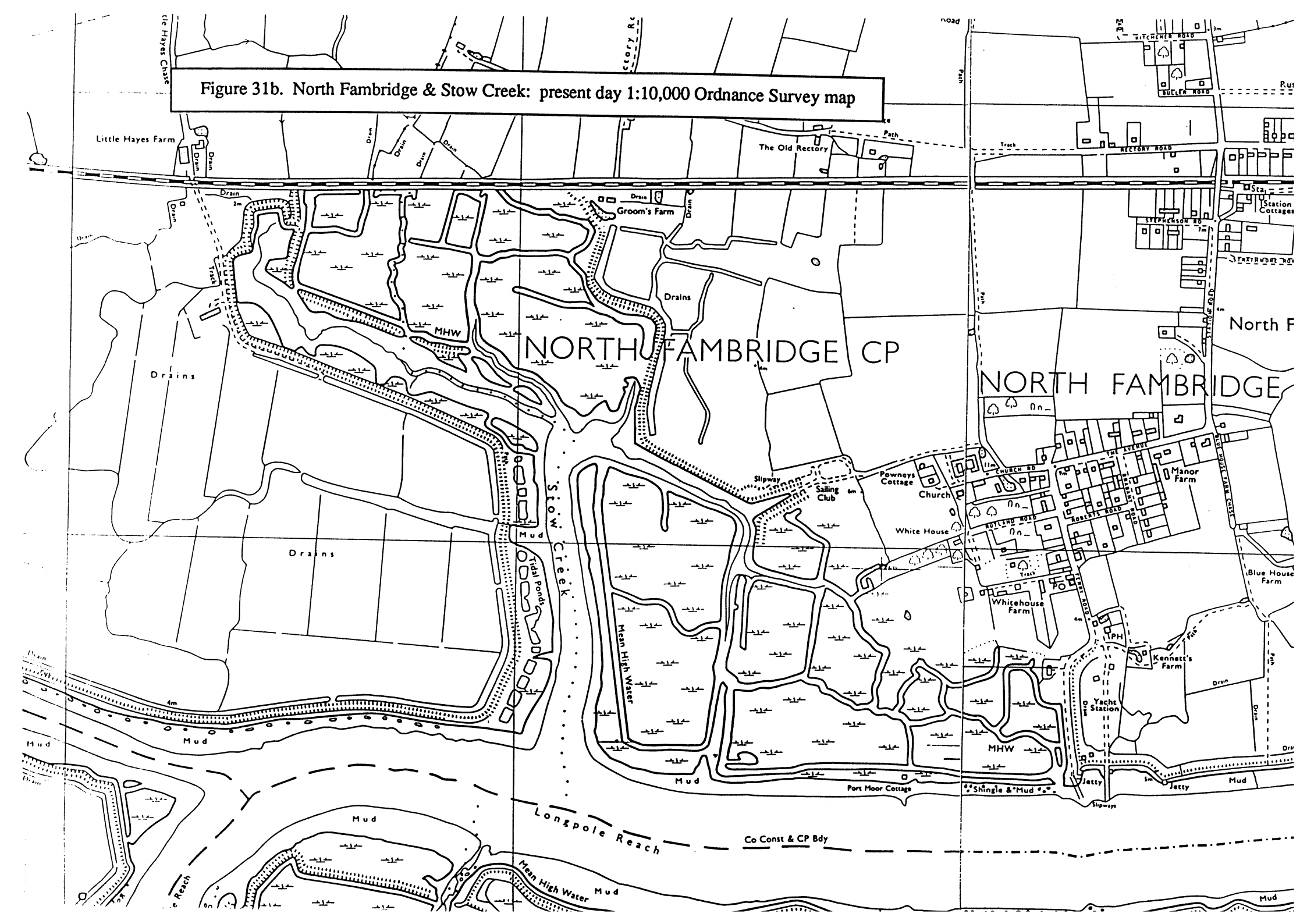
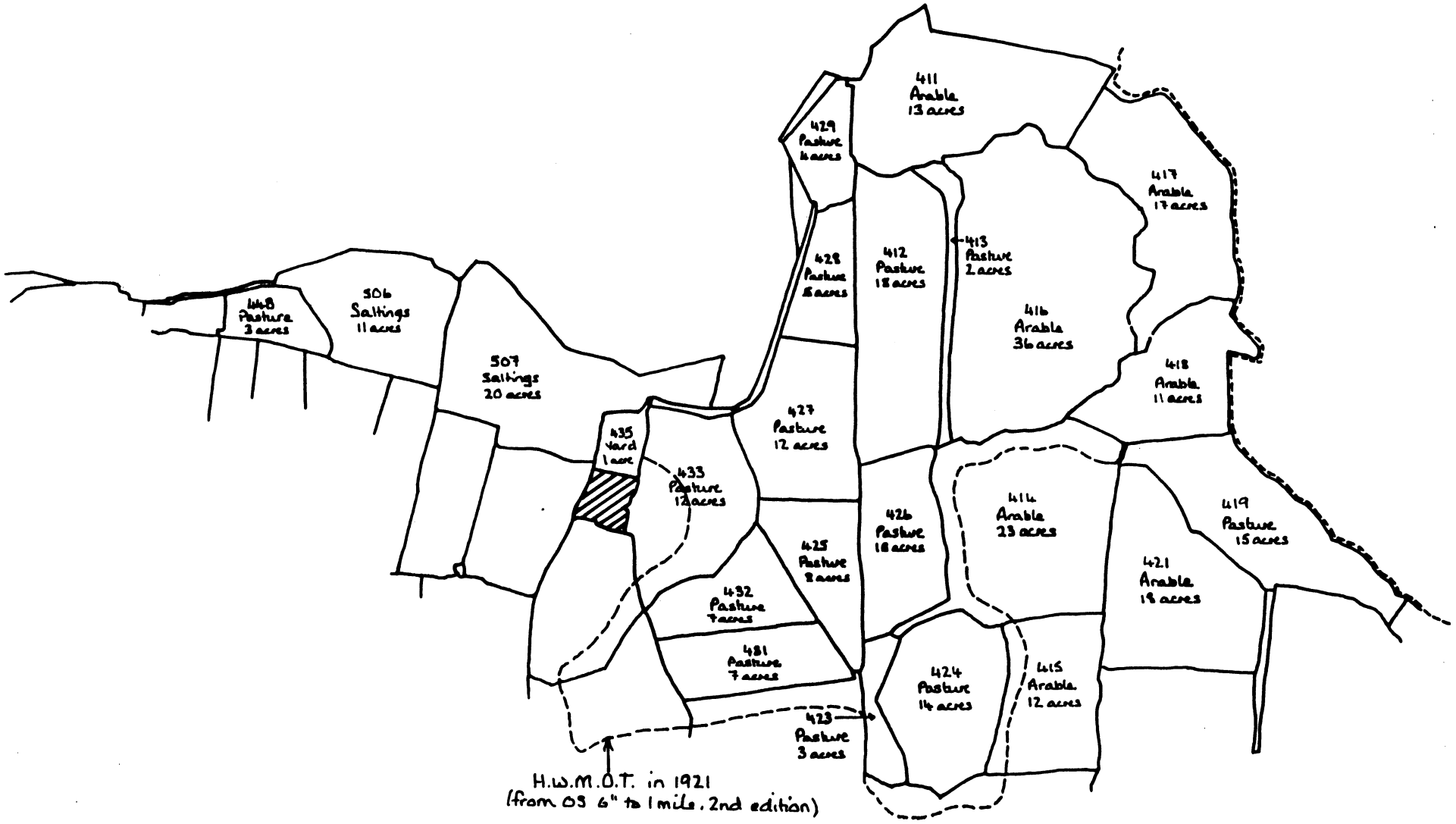


Figure 31b. North Fambridge & Stow Creek: present day 1:10,000 Ordnance Survey map

Figure 32a. Brandy Hole (South Fambridge): 1840 tithe map, and limit of HWMOT by 1921



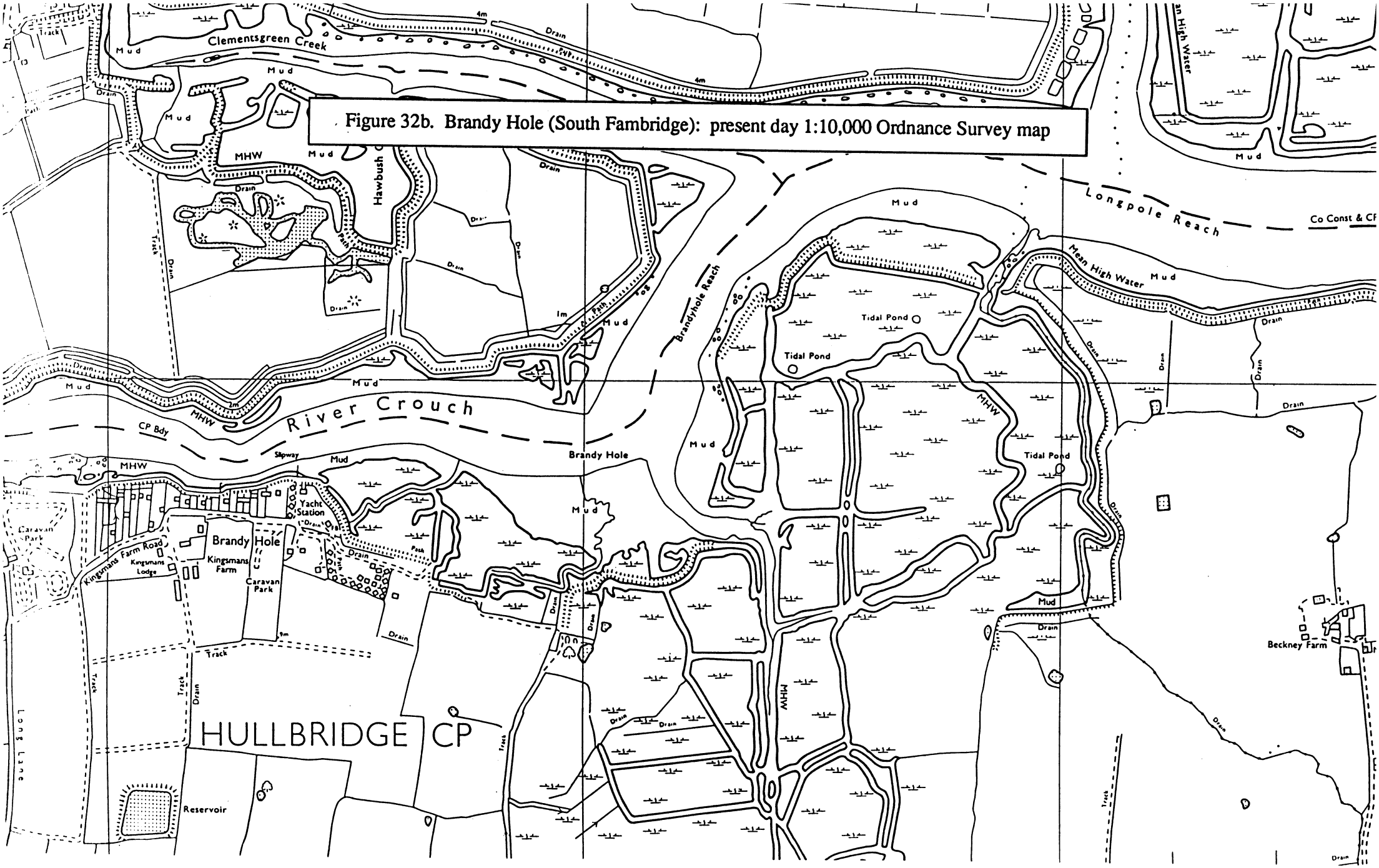


Figure 32b. Brandy Hole (South Fambridge): present day 1:10,000 Ordnance Survey map

Figure 33a. Clementsgreen Creek: 1840 tithe map

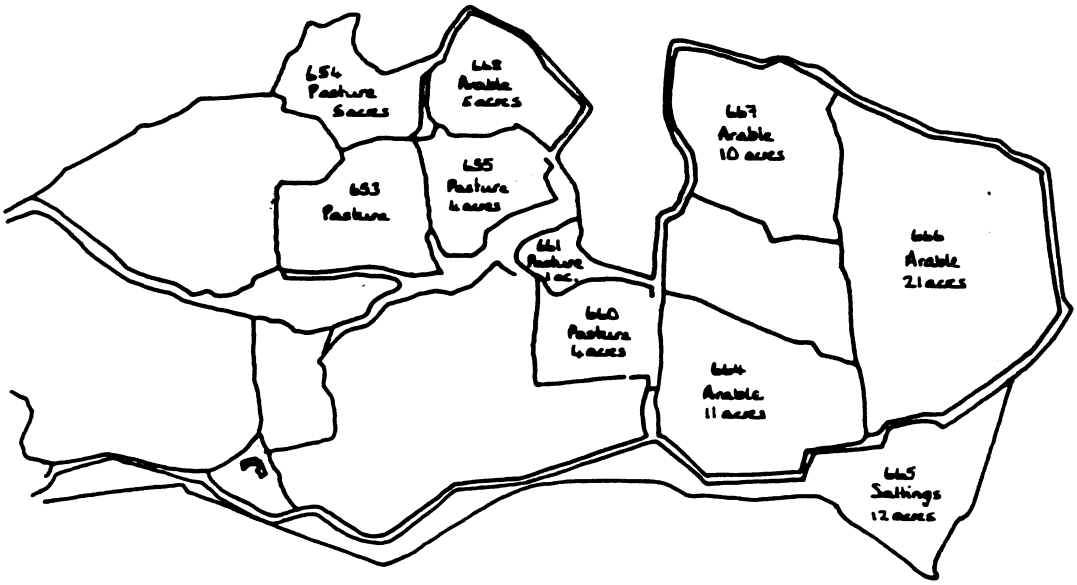
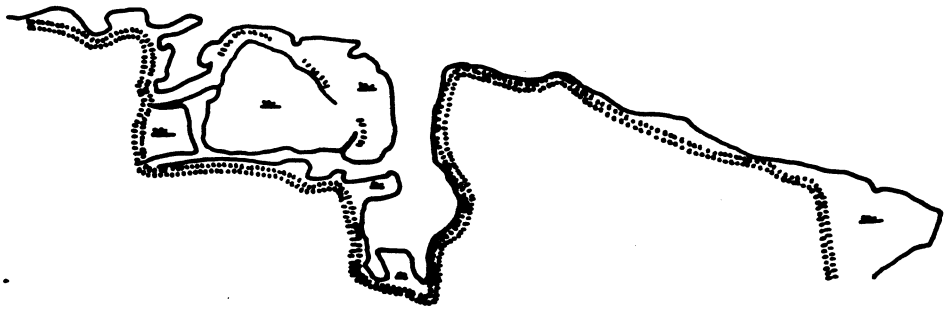


Figure 33b. Clementsgreen Creek: OS 6" to 1 mile, 2nd edition (1921)



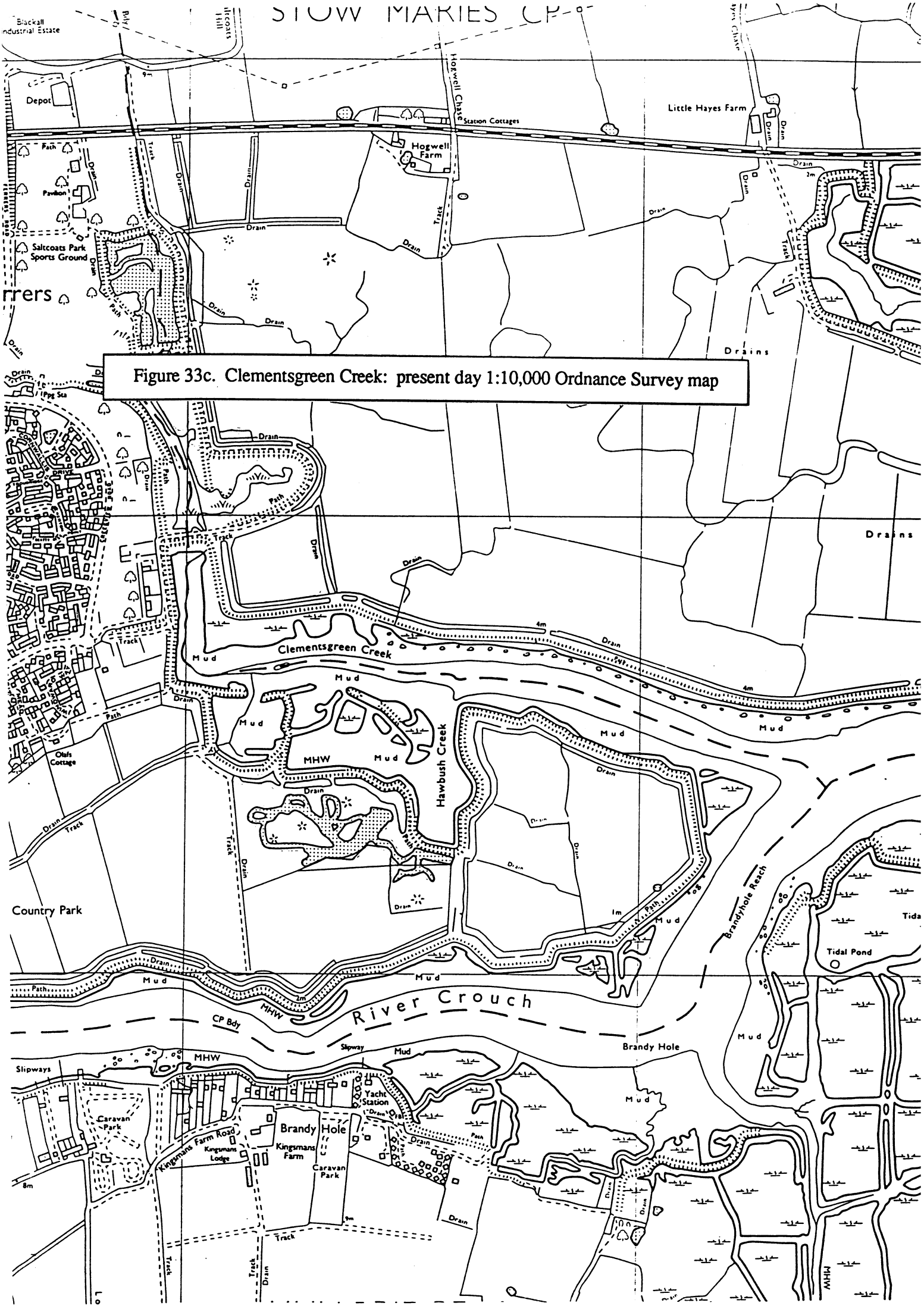
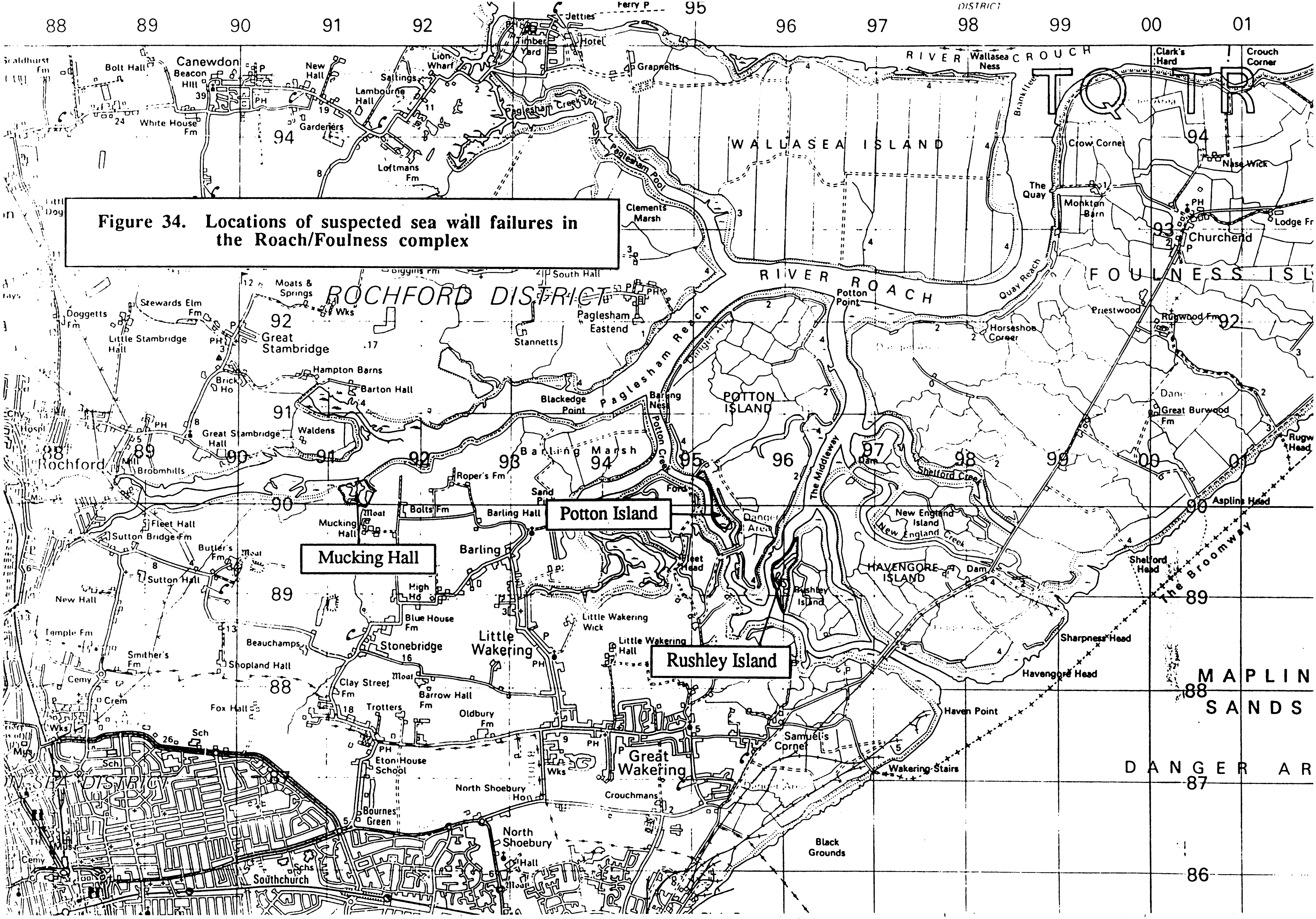


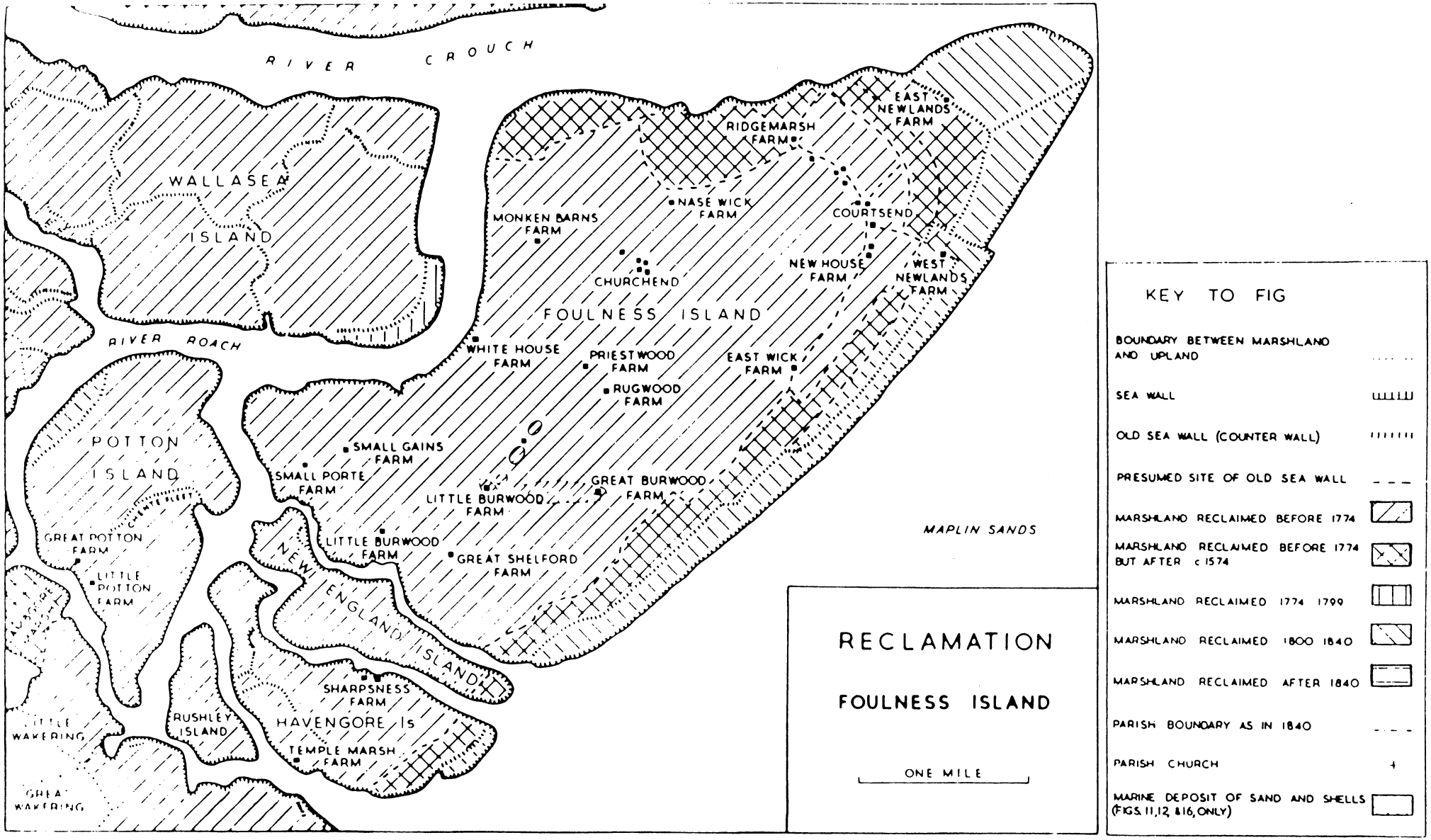
Figure 33c. Clementsgreen Creek: present day 1:10,000 Ordnance Survey map



Potton Island
Rushley Island
Mucking Hall
RIVER CROUCH
RIVER ROACH
WALLASEA ISLAND
FOULNESS ISL
POTTON ISLAND
HAVENGORE ISLAND
ROCHFORD DISTRICT
MAPLIN SANDS
DANGER AR
Canewdon
Great Stambridge
Paglesham Eastend
Barling
Little Wakering
Great Wakering
North Shoebury
Southchurch
Rochford
Churchend
Stonebridge
The Middleway
The Broomway
Paglesham Reach
Potton Creek
Shelford Creek
New England Creek
Barling Marsh
Paglesham Pool
Paglesham Creek
Quay Reach
Black Grounds
Wakering Stairs
Havengore Head
Sharpness Head
Shelford Head
Asplins Head
Haven Point

Figure 34. Locations of suspected sea wall failures in the Roach/Foulness complex

Figure 35. Reclamation around Foulness Island



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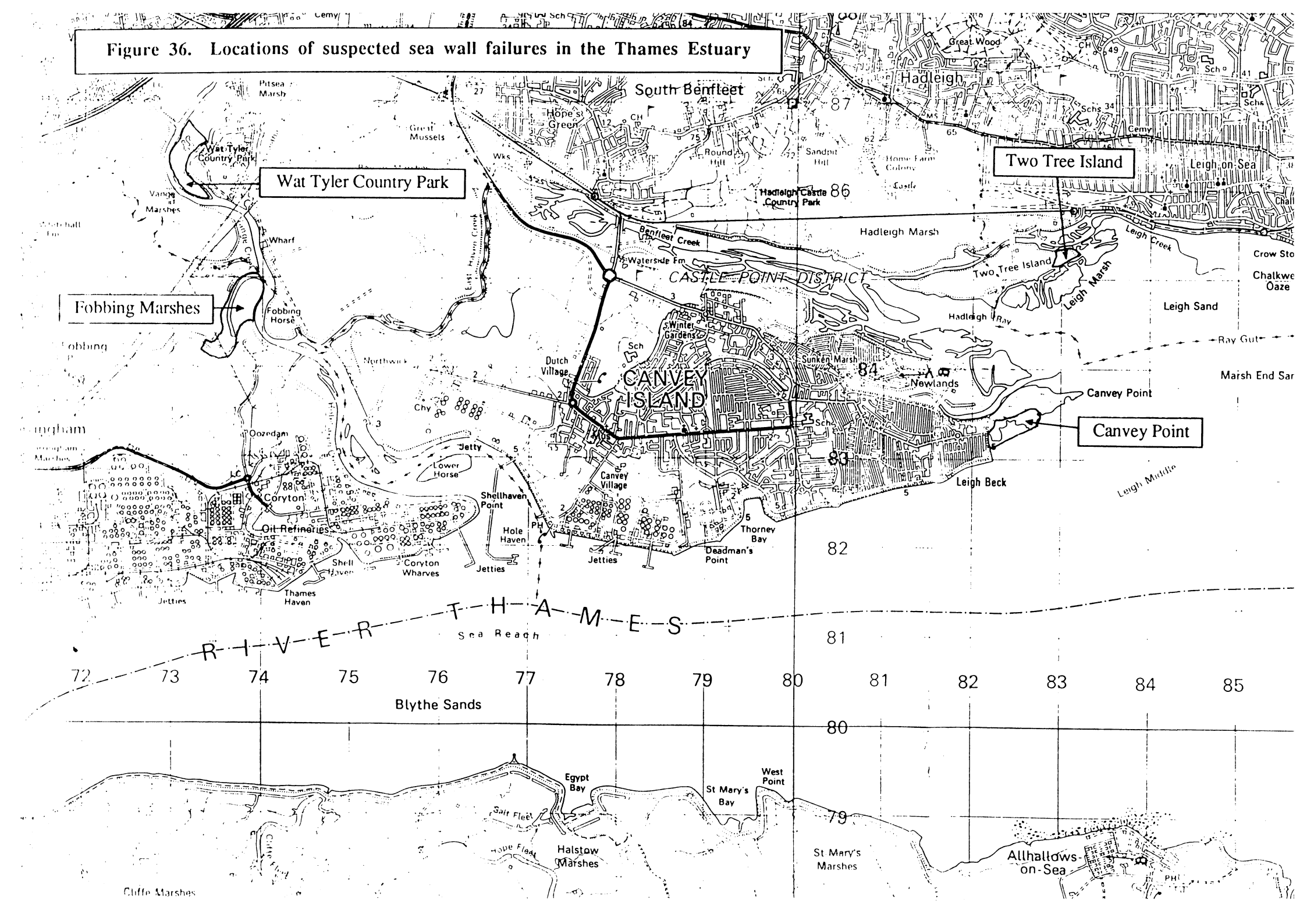

Figure 36. Locations of suspected sea wall failures in the Thames Estuary

Figure 37a. Canvey Point: OS 6" to 1 mile, 2nd edition (1921 revision)

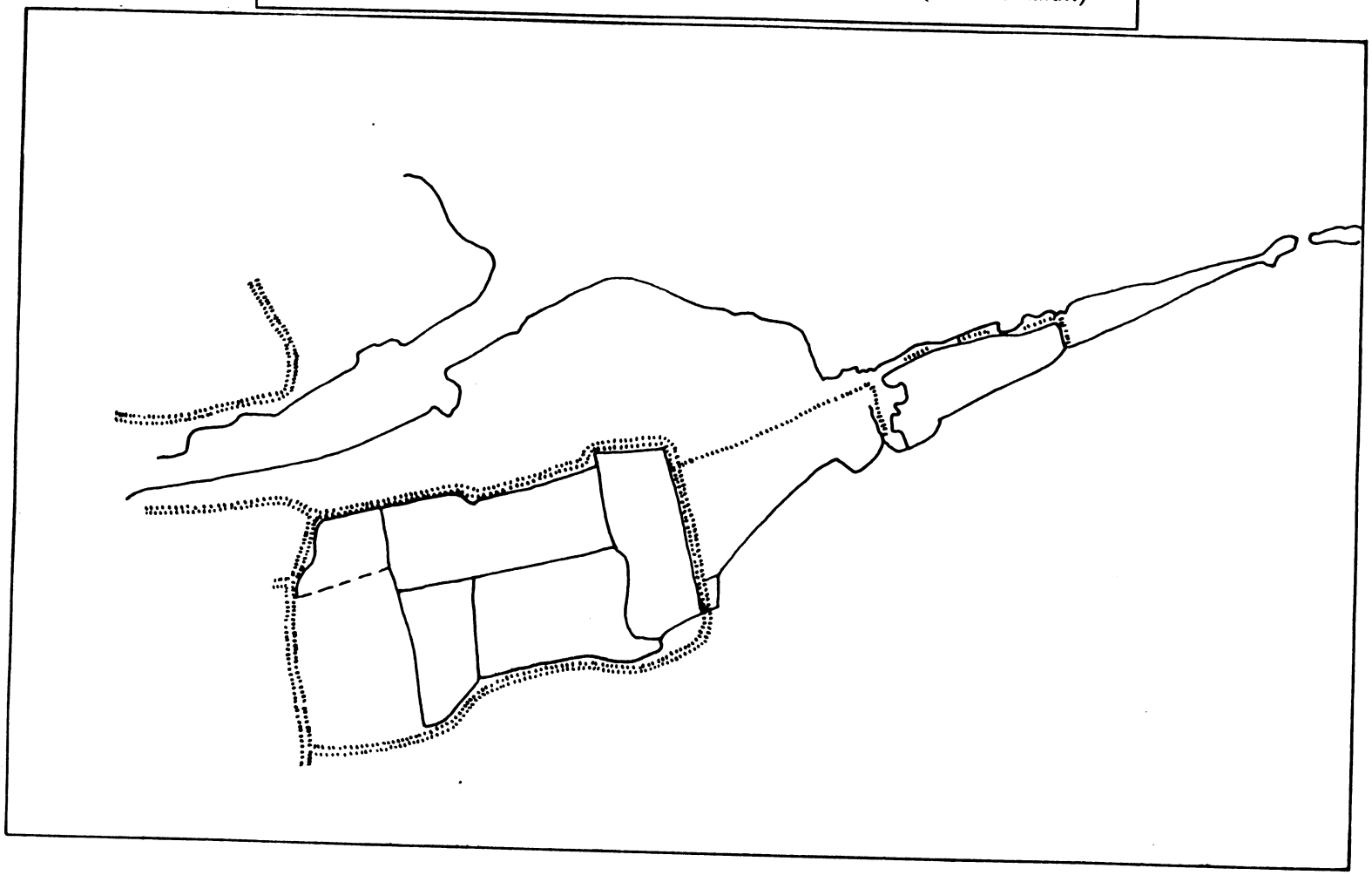

Figure 37b. Canvey Point: OS 6" to 1 mile, 2nd edition (1896)

Figure 37c. Canvey Point: OS 6" to 1 mile, 1st edition (1874)

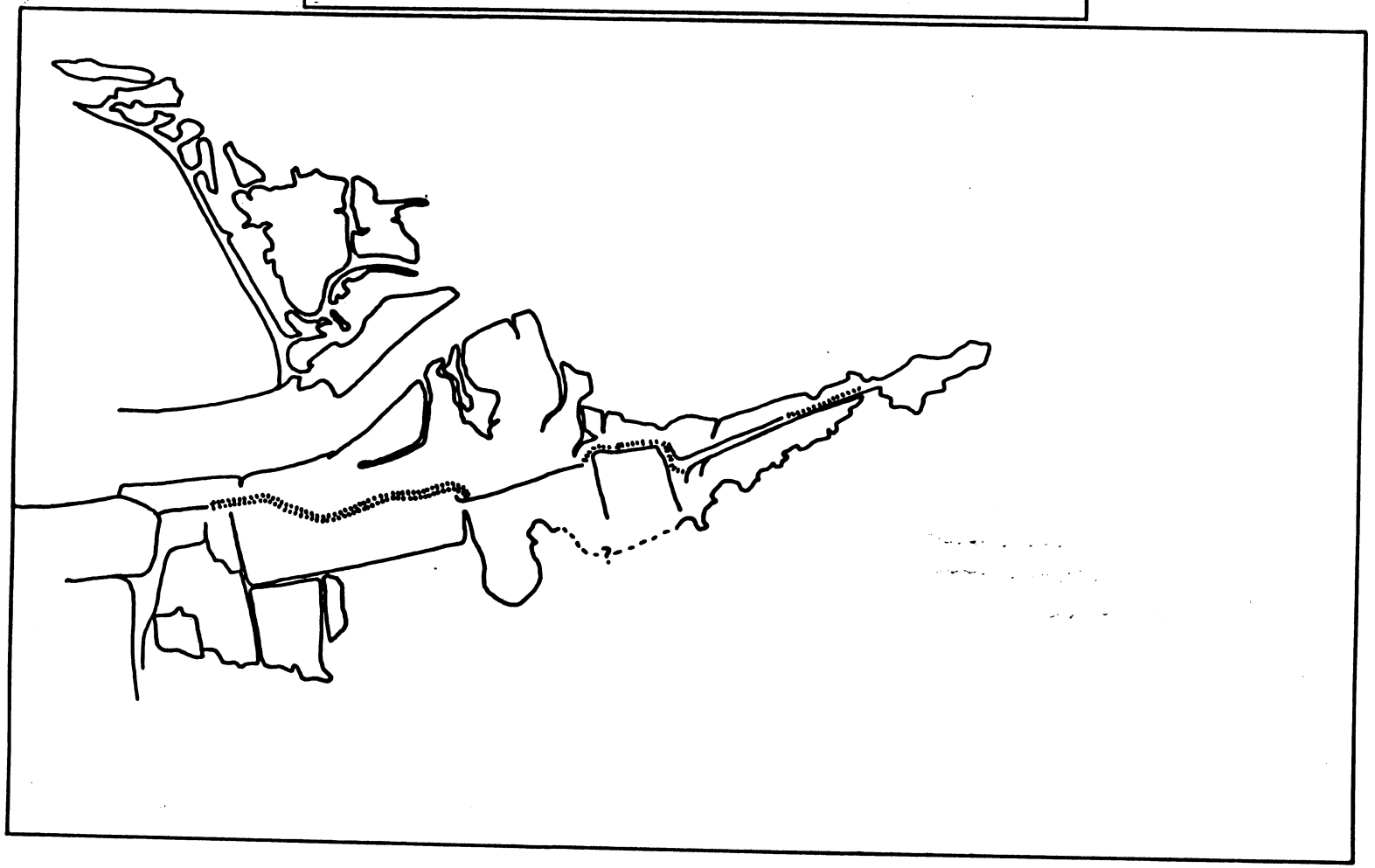

Figure 37d. Canvey Point: outline from RAF aerial photograph (1945)