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Lowland Cornwall: the Hidden Landscape
Volume Four

The study areas

Historic Environment Projects

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Abbreviations

BGS	British Geological Survey
CAU	Cornwall Archaeological Unit
CC	Cornwall Council
CUCAP	Cambridge University Committee for Aerial Photography
EH	English Heritage
GIS	Geographic Information System
HER	Cornwall and the Isles of Scilly Historic Environment Record
HLC	Historic Landscape Characterisation
NGR	National Grid Reference
NMP	National Mapping Programme
OD	Ordnance Datum
OS	Ordnance Survey
PRN	Primary Record Number in Cornwall HER

Summary

Background

Cornwall's lowland areas probably have the highest archaeological potential in the county, but are poorly understood and increasingly subject to the impacts of major change in land use and development. The Lowland Cornwall project attempts to address this issue by developing a method for predictive modelling of the lowland prehistoric and Romano-British landscape. The models produced by the project will better inform future management and land use decisions.

The project consists of four stages: preparation of datasets and high level predictive models; deepening or refinement of Historic Landscape Characterisation (HLC); further analysis of the archaeological resource and the preparation of predictive models using the refined HLC; and the presentation of final results. This report is the fourth of five volumes and sets out the detailed analysis of the archaeological resource and the results of models based on the refined HLC in each of four selected study areas.

The four study areas are composed of groups of ecclesiastical parishes and cover an area of 384 sq km in total. A number of criteria determined their selection, including geographical remoteness from each other, differing levels of known prehistoric archaeology, and range of HLC Types within each. The four areas were named as Probus, Penwith, Pelynt and Poundstock, and they range in size from 65 sq km (Poundstock) to 135 sq km (Probus), with Penwith and Pelynt each covering approximately 90 sq km.

Archaeological resource

The principal site types for which analysis of distribution and form was carried out were enclosures, field systems and barrows, although other prehistoric site types, such as hillforts and round houses, were also considered. There were considerable differences in the number of sites recorded from each study area with, for example, 267 recorded in Probus, but only 83 in Pelynt.

The most numerous sites are the enclosures, with 305 in the dataset, almost half of which are in the Probus study area: by contrast only 22 are recorded from Pelynt. The majority are recorded as cropmarks and more are recorded from documentary references (either antiquarian observation or Cornish place-name evidence) than have surviving earthwork remains. There is a particular concentration of enclosures recorded from documentary references in the Penwith study area, perhaps reflecting the amount of antiquarian work carried out there. More than half the enclosures appear to be bounded by a ditch (or ditches) alone, with smaller numbers bounded by bank and ditch or earth/stone bank only. In Penwith, however, the majority of enclosures are bounded by a bank, which may be a result of the greater availability of stone at surface here than in the other study areas.

The great majority of enclosures are located on hill slopes and occupy the middle ground in terms of topography, generally between the 70m and 105m contours. There appears to be no pattern with regard to favoured aspect: the siting of enclosures in effect follows the general lie of the land. This is in contrast to the siting of early medieval settlements, which for the most part tend to be situated in lower-lying land with southerly aspects: only in the Poundstock study area is this not the case.

The great majority of the enclosures are bounded by a single circuit and typically the enclosed area measures less than 0.25ha. More than half are curvilinear in shape, most frequently oval, but with some sub-circular and C-shaped forms. Two thirds of the rectilinear forms are four-sided and the commonest shape is polygonal with four or more sides. Typically the rectilinear enclosures are towards the smaller end of the general size range.

A small number of enclosures are multivallate, bounded by more than one circuit, and a few enclosures have secondary enclosures appended to their circuit. Most of the multivallate enclosures have two close-spaced ditches or banks and are essentially a variant on the more usual univallate enclosures in that they enclose a single defined space, but with two ditches rather than one. Those enclosures with wide-spaced ditches are quite different in that they contain an extensive intervallate area. There is much variation among the wide-spaced multivallate enclosures in terms of size and shape and the same is true of the appended enclosures. Apart from these, a small number of other enclosures were identified as unusual, either because of their large size (three enclose more than 1ha), their atypical shape, or some other distinctive characteristic.

Compared with the enclosures there are few prehistoric or Romano-British field systems or field boundaries recorded from the four study areas – only 66. In addition there are 32 records for undated fields which could potentially be prehistoric. The fields are virtually confined to the Penwith and Probus study areas, with only four in Poundstock and ten in Pelynt.

Two thirds of the fields are recorded as cropmarks and those with upstanding remains are largely confined to Penwith. Similarly, whilst almost all the fields in Penwith are recorded as being bounded by banks, elsewhere the field boundaries are formed almost exclusively by ditches, with a handful bounded by both ditch and bank. Like the enclosures the fields are predominantly located on hill slopes and similarly between the 70m and 105m contours. This is unsurprising given that nearly two thirds of the fields are interpreted as being associated with enclosures.

The fields are predominantly rectilinear in shape, with only four classed as curvilinear. However, the remains of most field systems are fragmentary and appear to be incomplete, so much so that it was difficult to obtain measurements of typical field size. From those that could be measured regional differences were apparent, with average field size in Penwith being the smallest and in Probus the largest – those in Probus were four times the size of the Penwith fields. It is quite possible that the apparently fragmentary nature of many of the field systems reflects partial visibility. We are not seeing their full extent because only the major boundaries have produced clear cropmarks: sub-dividing boundaries do exist but are not visible.

A notable feature of the distribution of enclosures in Lowland Cornwall is that two or more are often situated in close proximity to each other and in places there are dense concentrations of enclosures and other associated features. To try and quantify this, polygons were drawn around features or groups of features in the project GIS. In total 186 of these 'settlement polygons' were created around features dated as prehistoric or Romano-British and a further 55 around undated features which are potentially prehistoric. The number of polygons varies considerably between study areas, with the largest number being in Probus. The Probus study area also contains the highest proportion of large polygons. For instance, 12 polygons are greater than 20ha in extent and 10 of these are located in Probus. The average polygon size across the project area is 5.3ha.

More than three quarters of the polygons contain one or more enclosures and more than a third contain one or more enclosures and associated features such as field boundaries, round houses, ditches or pits. Just under one third contain a solitary enclosure with no visible associated features. Seventeen per cent of the polygons contain field systems with no associated enclosures and most of these are located in the Penwith stud area.

In total 229 Bronze Age barrows are recorded from the four study areas, although seven of these could be reinterpreted as early to middle Neolithic oval barrows on the basis of their shape. Almost half the barrows have surviving above ground earthwork remains and of the remainder, there are roughly equal numbers recorded as cropmarks and from documentary evidence. Most are located on land between the 70m and 145m contours, with more than half occupying land above the 105m contour. The favoured location in the landscape is hill slopes, but there are also considerable numbers of barrows on ridges and hill tops. There are variations in favoured locations between the four study areas with, for instance, a higher proportion of barrows located on slopes in Penwith than any of the other study areas.

For those barrows whose dimensions are measurable the predominant size range is between 11m and 20m in diameter, with nine measuring less than 10m and only four more than 30m in diameter. They are recorded predominantly as mounds, whether extant or plough-levelled, with less than third identified as ring ditches and only 2% with visible mound and ditch.

In Penwith the barrows are loosely distributed throughout the study area but elsewhere there are notable foci where there are clusters of barrows – for instance on the high ground at Newlyn Downs in the Probus study area. Roughly half the barrows appear to be located singly in isolation. In places two barrows are situated in close proximity to each other, and there are 19 groups or cemeteries consisting of three or more barrows. Only one of these cemeteries is recorded from the Penwith study area, and the other three all contain roughly equal numbers. In eight of the cemeteries the barrows are in a distinctly linear alignment, 11 are tightly defined with the barrows in a cluster, and in Penwith the single cemetery is loosely defined or dispersed.

Predictive models

Predictive models were created for enclosures, settlement polygons and barrows using techniques developed in the Netherlands. It was hoped that by using the Lowland Cornwall HLC more precise models (in which the proportion of the study area taken up by the high probability zone is as small as possible) could be achieved than was the case with the 1994 HLC. At the same time the aim was to create models whose high probability zones captured 70% or more of the sites. The method involved correlating HER data with land classes and comparing the number of sites captured within each land class with the proportion of the study area taken up by each land class. The land classes were then ranked in order of predictive importance using a formula known as the Kj parameters. The aim was to produce three zone models with zones of high, medium and low probability. The Dutch method uses the Kj parameters to also define the cut-off points between each zone, but the experience of Lowland Cornwall was that this did not always work satisfactorily and that for some models the zones were better defined using another formula, the Relative Gain measure. Models were made based not only on the Lowland Cornwall HLC but also on hypothetical areas of early medieval land use.

It has been suggested (Preston-Jones and Rose 1986, 143-4) that Cornish place-name elements can be used to define the extent of the early medieval core settlement area (place-names in *tre*), and also to define a notional tidal zone into which a later medieval expansion of settlement took place (topographical place-names). The remainder of the landscape would have been a marginal zone, in which there was no settlement. Previous models suggest that either the early medieval core settlement area was a continuation of the prehistoric/Romano-British core settlement area, or that prehistoric and Romano-British settlement was focussed in the tidal area and that in the early medieval period there was a shift of settlement into the slightly lower ground occupied by the *tre* settlements.

Using a combination of place-name evidence and the Lowland Cornwall HLC a layer called Landuse was created in the project GIS to define those areas identified as core, tidal and marginal. This was very much a subjective process and there were difficulties in trying to assess the extent of farmed land associated with any one early medieval settlement. When the enclosures were modelled against this Landuse layer, in broad terms the result was a two-zone model, with the marginal land forming the low probability zone where the fewest number of enclosures is found, but with little distinction between core and tidal zones in terms of probability. The models were accurate, capturing a large number of enclosures, but not very precise because the high probability zones covered an extensive area.

There were also quite notable regional differences to the models: in Probus and Pelynt the core area formed the high probability zone, in Penwith the tidal zone was ranked highest but more enclosures than expected were captured in the marginal zone, in Poundstock the model indicates a by chance distribution, with all three zones producing similar gain measures, and here the marginal zone was ranked higher than the core zone.

These regional differences were underlined when the models for each study area were tested using the models from the other three. Although the test models fitted Probus and Pelynt relatively well, the same was not the case for Penwith or Poundstock. Overall the performance of the models can be described as inconclusive.

The models based on Landuse for the settlement polygons were unsatisfactory. Although for the four study areas taken together the core zone is ranked highest, tidal ranked second and marginal third, this pattern is not replicated in each study area. Only in Probus is the core zone ranked highest, in Pelynt it is actually ranked third, and in Penwith and Poundstock the marginal zone is ranked highest.

There are similar inconsistencies when the barrows are modelled against Landuse. Overall the marginal zone forms the high probability zone, even though it only captures just under half the total number of barrows. But the order in which the three zones are ranked is different in all four study areas. In Penwith and Pelynt the core zone is ranked highest and in Pelynt the marginal zone is ranked third. It appears from the models that the barrows fall into two categories: those in prominent locations on high ground, which fall mainly into the marginal zone, and those on lower lying land with no clear pattern in terms of Landuse zones.

The Lowland Cornwall HLC was used to create models using both HLC Types and Sub-Types for some or all of the four time-slices. In the case of the enclosures, additional models were created using the combinations of Sub-Types through all four time-slices. However, as this was a time-consuming process, resources did not allow for it to be repeated for the settlement polygons or barrows.

Overall the models for enclosures produced better results than those achieved by the 1994 HLC model. The high probability zones captured more enclosures and, especially when using HLC Sub-Types as variables, were a little more precise. The high probability zones were all dominated by Medieval Enclosed Land Sub-Types, although this pattern was less marked in the Poundstock study area. Another difference in the Poundstock study area was that the make-up of the high probability zones differed significantly from time-slice to time-slice: in the other three study areas the combinations of Sub-Types forming the high probability zones were consistent through all the time-slices.

The models created by using the combinations of Sub-Types through all four time-slices produced two-zone models with a high and low probability zone but in which part of the high probability zone could be considered to be a zone of very high probability. These very high probability zones captured large numbers of enclosures and were considerably smaller than the overall high probability zone and therefore much more precise. The highest-ranked Sub-Type for most of Lowland Cornwall was Medieval Enclosed Land whose fields had been amalgamated during the twentieth century or earlier. The reason for amalgamation or enlargement of fields is likely to be that it makes arable production more commercially viable. It is not clear, however, whether this means amalgamated fields are more likely to support cereal cultivation and therefore more likely to produce cropmark enclosures, or whether the fact that they represent the most fertile land is what attracted the establishment of enclosures in the first place.

The exception to the predominance of amalgamated fields is once again the Poundstock study area, where sub-divided fields are the highest-ranked. And there were other differences in the make-up of the very high probability zones across the four study areas. As a result, when testing was carried out in each study area using models from the other three, the very high probability zones captured fewer enclosures than predicted in almost every case. By contrast the overall high probability zones of the models accurately captured large numbers of enclosures in every instance. What the models demonstrate is that there is a correlation between the distribution of enclosures and Medieval Enclosed Land, but this can only be successfully predicted at the high rather than finer grained level.

The models for settlement polygons did not produce totally satisfactory results. Although the high probability zones in each study area were accurate, capturing a high percentage of the polygons, and were consistent throughout all time-slices, there were significant differences between the study areas. In Probus the high probability zones were formed exclusively by Medieval Enclosed Land, in Penwith by Medieval and Prehistoric Enclosed Land and by rough ground and former rough ground, in Pelynt Medieval Enclosed Land and rough ground/former rough ground, and in Poundstock by Post-Medieval Enclosed Land and Medieval Enclosed Land.

These differences explain why, when each study area was tested by a model created from the whole dataset, the test model only fitted the Probus study area: in all the others a smaller percentage of the polygons than expected was captured in the high probability zone. In part this inconsistency can be explained by the great difference in size of the polygon areas across the project area, with Probus heavily influencing the model created from the whole dataset. Another factor is the high probability zones in both the Pelynt and Poundstock study areas being skewed by a single large polygon. Despite these mitigating factors it seems that there is no clear pattern for the settlement polygons across the project area.

Nor were the models created for barrows very satisfactory. Although in both Probus and Poundstock the high probability zones are dominated by rough ground and former rough ground, in Pelynt they are dominated by Medieval Enclosed Land and in Penwith there appears to be no clear pattern, the high probability zones containing rough ground and former rough ground, Medieval and Prehistoric Enclosed Land. Even in Probus and Poundstock the high probability zones for some time-slices include Medieval Enclosed Land Sub-Types.

This apparent lack of a clear pattern is underlined when a model was made for all Lowland Cornwall barrows. This was applied to each study area in turn as a rough test and was found to fit each relatively well. The high probability zone of this model is formed by Modern, Early modern, Post-Medieval, Medieval and Prehistoric Enclosed Land as well as Coastal Rough Ground. The conclusion to be drawn from this is that the barrows models have little predictive power.

1 Introduction

1.1 Project background

Lowland Cornwall consists of those areas of the county which are predominantly actively farmed, including land which is improved in some way rather than left as unimproved grassland or rough ground. These areas probably have the highest archaeological potential in the county, but are poorly understood and increasingly subject to the impacts of major change in land use and development. To address this issue Cornwall Council has for some years been using HLC as a predictive tool for justifying planning conditions to development proposals, most notably in areas classed as Anciently Enclosed Land (AEL). The Lowland Cornwall project attempts to test this existing model and to develop a statistical method for predictive modelling of the lowland prehistoric and Romano-British landscape. Predictive models will better inform future management and land use decisions and increase confidence in responses to development proposals in areas where the Historic Environment Record (HER) currently shows no below-ground features. The method may also have the potential for application in other parts of the country.

The project comprises an appraisal of currently available data from a range of sources in order to develop models of past land-use, settlement patterns and landscape development. Whilst the primary aim is to indicate areas of high archaeological potential, at the same time it addresses key research agenda and contributes towards developing our understanding of historic landscape character.

The idea for the project was developed from a series of discussions with the County Archaeologist and other senior officers within Historic Environment Cornwall Council (HE), and with the English Heritage South West regional and Characterisation teams. The project was commissioned by English Heritage (EH) following the submission of a project design in early 2009 (Young 2009).

1.2 Aims and objectives

1.2.1 Aims

1. To demonstrate the potential and significance of below-ground archaeology in lowland Cornwall, in particular to develop a better understanding of the extent and character of the prehistoric and Romano-British landscape. This improved understanding will better inform both development control and management and land use decisions in lowland Cornwall, the latter by highlighting those areas with high archaeological potential and thus higher priority in terms of most effective targeting of agri-environment schemes and other landscape-scale management initiatives. On a strategic level the better understanding and predictive modelling resulting from the project will provide a more meaningful context in which to specify the scope of future development-led work and to assess the results of such work.

2. To define models for prehistoric settlement patterns and landscape development in lowland Cornwall and by exploring the relationship between these patterns and the early medieval and medieval patterns of settlement and land use, gain a better understanding both of the development of Cornwall's early society and economy and of the character and patterning of the county's buried archaeological remains.

3. To test and review interpretations of the development and potential of historic landscape character types.

1.2.2 Objectives

1. To review currently available HER, National Mapping Programme (NMP) and Events Record data. In particular to examine the range of settlement types, evidence for field systems and land use, and evidence for phasing and change.
2. To propose models for prehistoric settlement distribution and landscape development by linking the results of this review with Historic Landscape Characterisation (HLC) data to identify patterns in settlement distribution, in the spatial relationships between settlements and field systems, and in the relationships between areas of intense activity and areas which are apparently blank.
3. To review current interpretations of the development and potential of HLC Types by better defining the extent of Anciently Enclosed Land and Recently Enclosed Land Types.

1.3 Report layout

The project comprised three distinct stages and generated an enormous amount of data. In order to present the results of the project in an accessible format, the final report is published as five separate volumes.

1.3.1 Volume 1

During stage one data for selected site types was extracted from the Cornwall HER and correlated with the existing HLC Types in order to identify recurring distribution patterns and to create high level predictive models. Volume 1 presents the outcome of this work, describing the methodology used to create the models, the results of the modelling and a discussion and set of conclusions drawn from this research. Volume 1 also outlines the background to, and scope of, the whole project.

1.3.2 Volume 2

Also during stage one an assessment was made of the extent to which other factors, such as soils and geology, may influence known distribution patterns of below-ground archaeology. High level models were built based on correlations between site distribution and geology and soil types. The distribution of geology and soils was then joined with the pattern of aerial reconnaissance in Cornwall to produce a visibility map showing where below-ground archaeology is most likely to occur and where it is most likely to have been identified and recorded.

More than half of the enclosures in lowland Cornwall are recorded as cropmarks and additional models were made based on the correlation of their distribution with that of soil and geology types for comparison with the models for cropmarks generally. Further research was carried out into enclosures by combining soil and geology types with HLC Types and correlating these combinations with the distribution of enclosures to create combined models. Volume 2 presents the results of this research.

1.3.3 Volume 3

Stage two involved refining or deepening HLC in four selected study areas. The HLC refinement comprised a more detailed analysis than that carried out for Cornwall’s existing HLC. Specifically, some HLC Types were broken down into Sub-Types and characterisation was carried out for a number of time slices. The results of HLC refinement are presented in Volume 3.

1.3.4 Volume 4

Stage three involved building predictive models based on correlations between site distribution and the refined HLC Types and Sub-Types, to see whether more accurate and precise models could be achieved using the refined HLC. A detailed analysis of the sites within each study area was also produced. Volume 4 (this volume) presents the results of this work.

1.3.5 Volume 5

Volume 5 draws together and summarises the data and conclusions from the previous four volumes and presents the overall conclusions arising from the project.

1.4 Background to Volume 4

The results presented in Lowland Cornwall Volume 1 include a series of high level predictive models for selected site types, built by correlating known site distribution against HLC Types. The models define those areas where sites are most or least likely to occur as zones of high, medium or low probability.

One outcome of constructing predictive models for the distribution of known sites using HLC Types as the sole variable is that whilst some of the models accurately indicate the areas where sites are most likely to be found, in many the zone of high probability covers a substantial portion of the project area (e.g. Lowland Cornwall Volume 1, fig 21) so that they provide little in the way of precision. The principal reason for this is that the HLC Type Farmland Medieval, which is included in the high probability zone of many of the models, covers a very extensive area (52% of the Lowland Cornwall project area). Whilst this does not invalidate the models, it does weaken their predictive power: the most effective predictive models are those in which the largest possible number of sites is captured in the high probability zone and in which this zone covers the smallest possible area. The relative lack of precision in the Lowland Cornwall models was anticipated at the outset (Young 2009, 17-18) and is one reason why phase two of the project involved the refinement or deepening of Cornwall's existing HLC. The aim was to sub-divide some HLC Types, including Farmland Medieval, into a series of HLC Sub-Types and to correlate site distributions with these Sub-Types on the premise that sites are more likely to be found in some Sub-Types than in others, thereby enabling the development of predictive models with smaller, more precise high probability zones. Project resources did not allow HLC refinement to be undertaken for the whole of lowland Cornwall so four discrete study areas were selected for this purpose (section 2 below).

As well as outlining attempts to produce more precise predictive models this volume also presents detailed assessments of the known prehistoric and Romano-British archaeological resource in each of the study areas. As stated in the project aims and objectives (section 1.2), these assessments were carried out in order to examine the range of settlement types, to identify patterns in settlement distribution, in the spatial relationships between settlements and field systems, and in the relationships between areas of intense activity and areas which are apparently blank.

1.5 Background to the archaeological analysis

The Lowland Cornwall HER dataset is made up of a range of selected site types (Lowland Cornwall Volume 1, section 5). These are:

- rounds and enclosures
- field systems and field boundaries
- open settlements (hut circles/round houses)
- barrows
- hillforts
- cliff castles
- find spots

During phase 1 of the project when high level probability models were built, it became clear that the distribution of find spots recorded in the HER is heavily influenced by the activities of individual finds collectors and that there are other inherent weaknesses in the finds data (Lowland Cornwall Volume 1, 102). For this reason only the monument site types were considered in the analysis of the archaeological resource of the study areas presented in this volume.

1.5.1 All monuments

Prior to building the probability models based on the correlation of sites with HLC Types in phase 1 of the project, Chi Squared tests were run for each of the various site types. As a result of Chi Squared procedures it was concluded that the distribution of hillforts within each of the HLC Types could simply be a by chance pattern with no statistical significance (Lowland Cornwall Volume 1, section 6.2). Because of this no models were built for hillforts. Similarly no models were built for cliff castles because more than 80% of all those recorded in the dataset are located in the HLC Type Coastal Rough Ground and producing a statistic-based model is not necessary.

Hillforts and cliff castles are, however, considered in the analysis of the archaeological resource because they were obviously important features in the Iron Age landscape and are widely understood to have been social, administrative or territorial foci for contemporary settlement (e.g. Herring 1994; 2011, 34-5). As such they are likely to have had a profound influence on the settlement pattern. Similarly the settlement type courtyard house was not included in the phase 1 work because of its highly localised distribution (confined to West Penwith), but courtyard houses are considered in the following analyses because they make up an integral part of the Iron Age/Romano-British settlement pattern in the Penwith study area.

In the first stage of the analysis all the sites were classed according to their form of remains. This was interpreted on the following categories:

- **Extant** (upstanding feature).
- **Documentary** (based upon documentary sources, which may be place-name evidence or antiquarian reports).
- **Cropmark** (recorded from aerial photographs based on differences in vegetation).
- **Geophysica**l (recorded from geophysical survey only).
- **Site of** (former site of an archaeological feature, originally recorded as either documentary or extant, but now destroyed).

Further attribute fields were added to the dataset to enable further analysis and interpretation of the monuments. The attribute fields were based on the definitions included in the Morph2 guidance document (RCHME 1987), which was developed to accompany the Morph database used in the early phases of the NMP.

The additional fields comprise:

- **Height** Metres above Ordnance Datum – OD, including Low and High (e.g. for a site falling between the 55 and 60m contours Low would be entered as 55 and High as 60).)
- **Location**:
  - Cliff top.
  - Hill top.
  - Plateau.
  - Promontory (at the end of a ridge on a spur).
  - Ridge (top of a linear area of high ground).

- Slope.
- Various (a range of locations due to the large area of a site).
- Valley floor (low-lying bottom of valley).

- **Aspect** (East, Southeast, South, Southwest, West, Northwest, North, Northeast and All).
- **Validity** This was based on the Validity field contained in the Morph 2 database and represents a measure of confidence of interpretation on a scale of 1 to 5, with the following definitions:
  - 1 – insufficient data
  - 2 – potential
  - 3 – possible
  - 4 – probable
  - 5 – certain

The validity field was used in the analysis to differentiate between those monuments whose interpretation is tentative (validity score of 1 or 2) and those which can be identified as prehistoric features with some degree of confidence (validity scores of 3-5). The aim was to provide some measure of how far the analysis might be skewed by unreliable data. It should be noted that only those monuments mapped as part of Cornwall's NMP will have been allocated a validity rating. In particular sites recorded from documentary sources will have a validity score of zero.

1.5.2 Rounds and enclosures

In addition to topographical information, the archaeological analysis includes definitions of the morphological characteristics of the monument types rounds/enclosures and field systems. Obviously this is only possible for those sites for which a measured plan is available and for the most part this equates with features mapped as part of Cornwall's NMP. The size (i.e. area enclosed) and shape of the features could only be reliably defined when two dimensions were visible and in some cases, where cropmarks of sites were not fully visible, this was not possible. Typically sites where size and shape has not been defined are those which have been identified from documentary evidence (with no visible remains), those not visible on aerial photographs (e.g. sites in woodland) and those which were only partially visible or obscured by later features such as field hedges.

The attribute fields for rounds and enclosures are:

- **Shape description**. Definitions based on the Morph s user's guide.
  - Rectilinear (a majority of straight elements)
  - Curvilinear (a majority of curved rather than straight elements)
  - Mixed (formed by a mixture of straight and curving elements but where neither is predominant).
- **Size** (area enclosed in m sq). During the analysis the enclosures were classified according to size under five categories based on hectares enclosed:
  - <0.1ha
  - 0.1 – 0.25ha
  - 0.25 – 0.5ha
  - 0.5ha – 1.0ha
  - >1.0ha

- **Sides R**. Number of sides for rectilinear enclosures only.
- **Additional**. Any additional information, including more specific description of shape (e.g. sub-rectangular; contains internal features and visible entrance)
- **Circuit**. Bank; ditch; bank and ditch

Further analysis of enclosure shape was undertaken using definitions contained in the Morph user's guide:

Curvilinear enclosures:

- **Circular** (symmetric in shape, and a perfect circle).
- **Sub-circular** (symmetric in shape, approximate to a circle but not oval).
- **Oval** (symmetric in shape which is elliptical or egg-shaped/ovate).
- **Regular** (symmetric but not circular, oval or sub-circular).
- **Irregular** (non-symmetric in shape).

In addition the term C-shaped was used to describe enclosures which may have been deliberately designed as 'open-ended' structures.

Rectilinear enclosures:

- **Square** (precisely square, with a proviso that sides can be concave or convex).
- **Sub-square** (square shaped but not perfect)
- **Rectangular** (longer than it is broad, with four sides at right-angles to each other).
- **Sub-rectangular** (broadly rectangular but where the sides are not at perfect right-angles).
- **Polygonal** (rectilinear with four sides or more that is not square or rectangular).

The term 'D-shaped' was also used to record mixed enclosures that include a substantial, but not dominant, curvilinear element.

The enclosures were further divided into those with a complex structure and those that are simple. Enclosures were interpreted either as:

- Univallate (i.e. simple with a single enclosing circuit).
- Multivallate (i.e. complex, with more than one enclosing circuit).
- Addition of annexes (i.e. complex).

Multivallate enclosures were further classified upon the spacing of their enclosing circuits and were distinguished as:

- Close-spaced (double-ditched).
- Wide-spaced (where the area of the outer enclosure is at least twice that of the inner enclosure).

1.5.3 Field systems

A broadly similar set of attributes were recorded for field systems:

- **Shape**.
    - Rectilinear (a majority of straight elements)
    - Curvilinear (a majority of curved rather than straight elements)
    - Mixed (formed by a mixture of straight and curving elements but where neither is predominant).

- **Width**. In metres
- **Length**. In metres
- **Field area**. Typical sized field in m sq
- **Build**. Bank, ditch or bank and ditch
- **Association.** Associated with other features? (e.g. enclosures, enclosure complex)

1.5.4 The settlement and farming pattern

Certain locations appear to be the focus of prehistoric activity, with clusters of settlements and field systems identified in close proximity to one and another. These concentrations were spatially defined using polygons to show the potential extent of settlement and farming communities (whilst accepting that defining the polygons is a somewhat subjective process).

The following attribute fields were added to the dataset to describe the polygons:

- **Site types.** Listing the range of site types within each polygon (e.g. enclosure, field boundaries, trackway)
- **Periods**.
- **Comments**. A description of the monuments within each polygon where appropriate (e.g. double-ditched square enclosure, smaller enclosure and fragmented rectilinear field system)
- **Main type**. The dominant monument in the group
- **Validity**. Validity rating (1-5) of the main monument type
- **Area**. Area covered by the polygon (m sq)

1.5.5 Barrow cemeteries

Polygons were also drawn round Bronze Age barrows, whether they occur individually or in groups or 'cemeteries'. The following attribute fields were added to the dataset to describe the polygons:

- **Comments**.
- **Validity**. Validity rating (1-5)
- **Area**. Area covered by the polygon (m sq)
- **Cemetery**. Definition of cemetery type (where relevant) using the following categories:
    - Linear. (Three or more barrows set out in a straight line)
    - Dispersed. (A group of barrows relatively close together but apparently randomly sited, with no recognisable focus)
    - Clustered. (A group of barrows sited close together in a small area)
    - Accreted. (A linear or clustered group of barrows with other barrows nearby which appear to have been built at a later date)
- **Number**. Number of barrows within the polygon

2 The four study areas

At the outset it was estimated that the resources available to the project would enable the existing HLC (the 1994 HLC) to be deepened over an area totalling approximately 450 square kilometres, based on an anticipated rate of HLC mapping of five square kilometres per day. Rather than carrying out HLC refinement in a single 450 km sq area the preferred option was to look at several smaller areas in order to compare geographically different parts of the county. As well as HLC refinement the project aims included analysis of the archaeological resource in the study areas, focusing in particular on features mapped as part of Cornwall's NMP. In order for this analysis to produce meaningful results it was acknowledged that it should be undertaken over as extensive blocks of landscape as possible. Therefore it was proposed to examine four study areas, each covering between 100-120 km sq.

The figure of 450 km sq was subsequently revised downwards (because the 5 sq kms per day mapping rate was seen as over-ambitious) and in the event the four selected areas covered a total area of 384 km sq. In defining these discrete study areas a number of factors were taken into consideration.

1. The definition of the study areas should be based on ecclesiastical parishes rather than the OS national grid.
2. Ideally the study areas should be geographically remote from each other and have contrasting landscape characters.
3. The four areas should have contrasting levels of high or low visibility, as identified in the Lowland Cornwall cropmark visibility model (Lowland Cornwall Volume 2, section 7)).
4. They should have differing levels of NMP mapped sites (i.e. an area of high site density and an area where little was mapped).
5. There should be consideration of the 1994 HLC. For instance, an area of Anciently Enclosed Land (AEL) which is close to an extensive area of Upland Rough Ground (URG), and an area of AEL which is distant from any extensive area of URG, to more fully explore the relationship between AEL and URG.
6. There should be consideration of any anomalies, inconsistencies or notable patterns arising from the high level models (Lowland Cornwall Volume 1). A good candidate would be parts of the West Penwith lowlands to enable the deepening of the HLC Type Farmland Prehistoric.
7. Areas of the HLC Type Farmland Prehistoric beyond its limit as defined in the 1994 HLC might be identified by selecting parts of the Lizard Peninsula or St Hilary parish as a study area.
8. Some, or all, of the study areas should contain as many different HLC Types as possible to enable a comprehensive comparison of refined HLC and 1994 HLC, and also to compare the 2011 time slice with previous time slices in as wide a range of Types as possible.
9. Consideration should be given to the geographical cover provided by data and information sources, in particular digital Tithe mapping.

The criteria listed above pointed to certain areas as likely candidates:

- Areas of low visibility are mainly located in east Cornwall; areas of high visibility in central and west Cornwall
- Areas where many below-ground sites were mapped during NMP include the Camel and Helford Estuaries, the area between Truro and Newquay, the area around Gwinear and Gwithian, and the Roseland Peninsula. By contrast few sites were recorded in east and southeast Cornwall.

- Areas of AEL close to URG include the Camel Estuary, the area between Truro and Newquay, and lowland parts of West Penwith. As for areas distant from URG, anywhere between Fowey and Saltash generally would be a good candidate (not just because of distance from URG, but because parts of this area fall in the high visibility zone but are relatively empty of sites).
- Areas with apparent anomalies or notable patterns include West Penwith (as mentioned above in point 6) and also southeast Cornwall where fewer sites (especially cropmarks) have been recorded than might be expected.

Following a meeting in September 2009 between project staff, the EH Inspector and members of the EH Characterisation Team, it was agreed that HLC refinement and archaeological characterisation be carried out in the four study areas listed below.

Probus (135.5 sq kms).

The Probus study area comprises the ecclesiastical parishes of Probus, St Enoder, St Newlyn East, St Erme and Ladock. The study area contains 15 of the 20 1994 HLC Types. It contains large tracts of rich land; much of it falls within the high visibility zone and many below ground prehistoric features were mapped here during Cornwall's NMP. It borders the Upland Rough Ground of the Hensbarrow granite and parts of it could be described as quintessentially 'lowland Cornwall'.

Penwith (93.8 sq kms).

The Penwith study area comprises the ecclesiastical parishes of Paul, Marazion, St Hilary and Perranuthnoe, most of the parishes of St Buryan and Ludgvan, and parts of Lelant, Gulval and Madron (the remainder of these parishes are located in upland areas of Penwith and are therefore outside the overall project area). The study area contains 17 of the 20 1994 HLC Types. Large parts of this study area fall within the high visibility zone and a number of below-ground features were recorded here during Cornwall's NMP. It borders the West Penwith uplands area of upland Rough Ground.

Pelynt (89.2 sq kms).

The Pelynt study area comprises the ecclesiastical parishes of Boconnoc, Fowey, Golant, Lanreath, Lanteglos by Fowey, Pelynt and St Veep. The study area contains 15 of the 20 1994 HLC Types. Most of the area falls within the high visibility zone, but there are significant belts of land falling in the medium and low visibility zones. Few below-ground features were recorded here during Cornwall's NMP. The Pelynt study area lies a considerable distance from any extensive area of rough ground (the nearest being Bodmin Moor).

Poundstock (65.6sq kms).

The Poundstock study area comprises the ecclesiastical parishes of Jacobstowe e, Marhamchurch, Poundstock and Whitstone. Originally it was planned to include the Week St Mary parish but digitised Tithe map data was unavailable so the parish was omitted. As a result this study area encompasses a less contiguous block of landscape than the other three and is the smallest of the four. This study are contains only 14 of the 1994 HLC Types. Northern and southern parts of the study area fall within the high visibility zone, the central area is in the medium visibility zone and western and eastern parts are in the low visibility zone. Very few below-ground features were recorded here during Cornwall's NMP. It lies some 8.5 kms from the northern part of Bodmin Moor, which is the nearest extensive area of Upland Rough Ground.

The underlying bedrock geology and soils differs in each of the four study areas and, as can be seen in Fig 1, they are widely dispersed in different parts of the county.

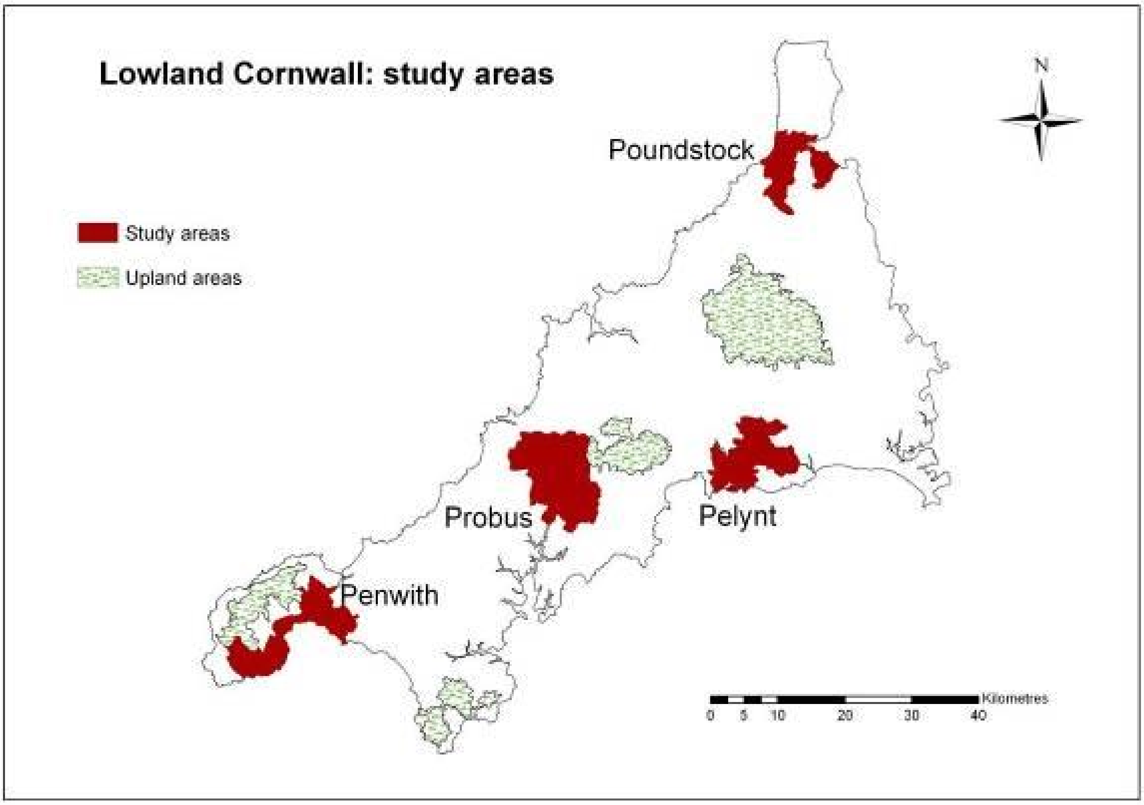

Fig 1. The four study areas.

3 Probus

3.1 Character of the Probus study area

The Probus study area is located in mid Cornwall, occupying an area of 135.5 km sq (Figs 1 and 2). It comprises the ecclesiastical parishes of Probus, Ladock, Newlyn East, St Enoder and St Erme. Its southern edge is near the sheltered south coast, its northern edge closer to the more windswept north coast. Because of its central location the study area is almost land-locked, but there are peripheral areas of saltmarsh around the intertidal reaches of the Tresillian River in the south (Fig 3).

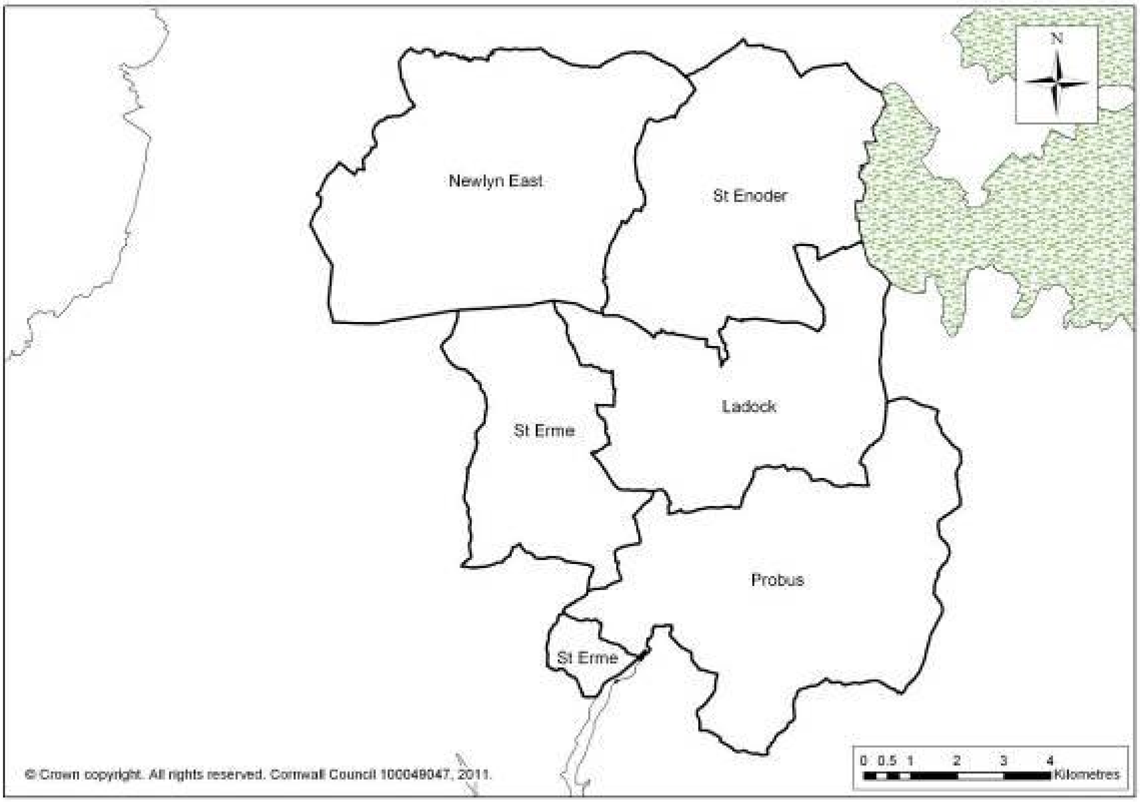

Fig 2. The Probus study area showing Ecclesiastical parishes.

The area is characterised by a dispersed settlement pattern made up of villages, hamlets, farmsteads, single farms and other single dwellings. The largest settlement is Probus itself, but other (relatively) substantial settlements are Newlyn East, St Erme, Fraddon and Tresillian in the far south (Fig 3). A number of major roads run through the study area, most notably the A30 – the main spinal route traversing Cornwall from west to east. In the southern part of the area the Truro to St Austell stretch of the Great Western Railway runs roughly west–east.

The study area is characterised by dendritic stream valleys which lead inland from estuary systems (Gannel and Tresillian Rivers). These are flanked by ridges of higher ground leading to Newlyn Downs, a central east-west ridge of high ground standing at 110m to 145m OD between the western edge of the study area and Mitchell (Fig 4). In the parishes of Ladock and St Enoder, the upper reaches of the steeper-sided valleys open to form more shallow-sided open areas with poorer drainage. Near Fraddon, the northeast corner of the area rises to 220m OD, lying on the edge of the high ground of the Hensbarrow granite.

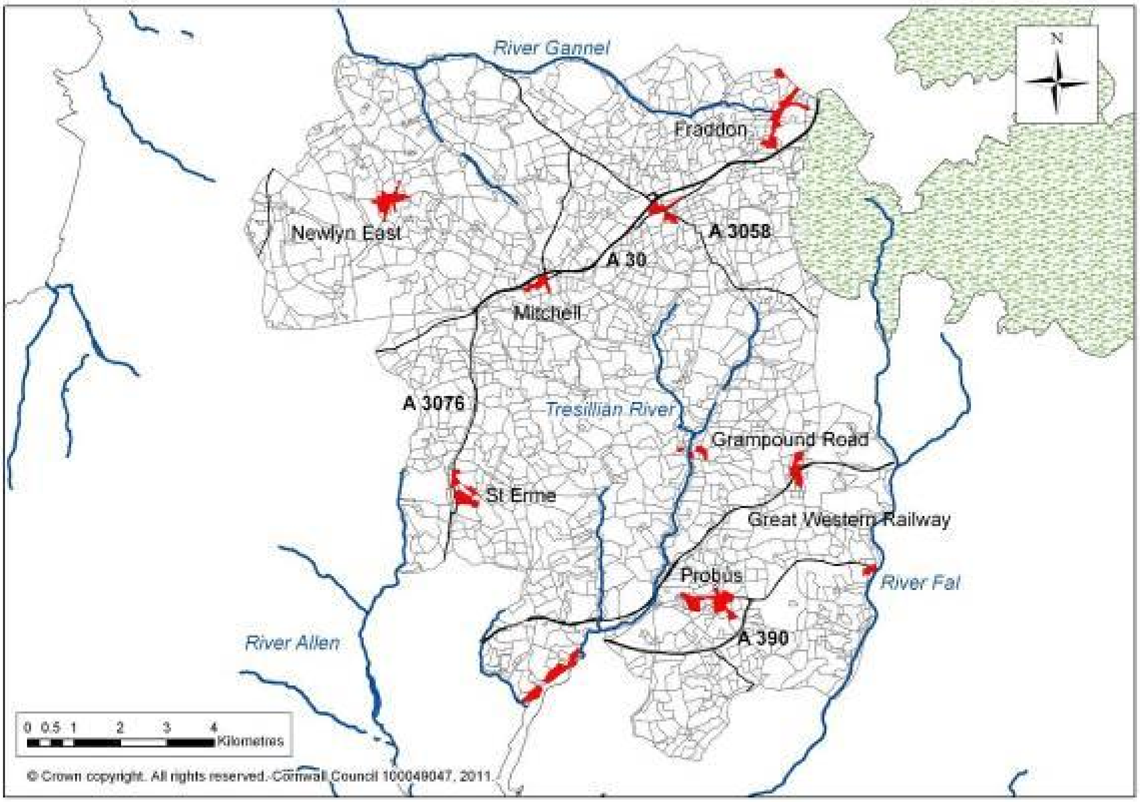

Fig 3. The Probus study are showing major settlements, rivers and lines of communication

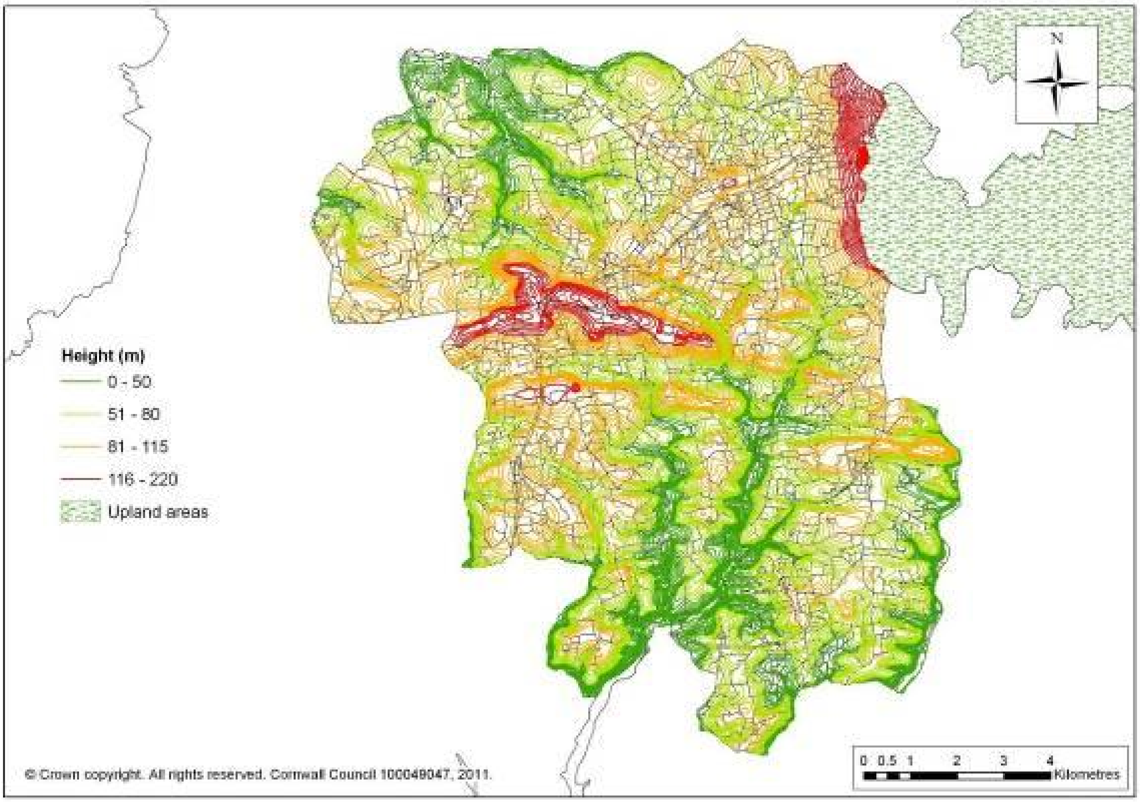

Fig 4. The topography of the Probus study area

The river valleys are an important part of the physical and human landscape, forming significant landscape boundaries. Sections of these natural features have been used to demarcate the line of parishes: part of the northern parish boundary of St Newlyn East (and the northern boundary of the study area) is formed by the River Gannel running east-west. A section of the western parish boundary of St Erme (and part of the western boundary of the study area) is formed by the River Allen running north-south. The eastern parish boundary of Probus (and part of the eastern boundary of the study area) is formed by the River Fal running north–south. The Tresillian River runs north–south through the parishes of Probus and Ladock.

The underlying bedrock geology consists of three broad east-west bands: a central band formed by the mid-late Devonian Gramscathos Beds consisting of mudstone and sandstone; a band in the north formed by interbedded slate and sandstone of the early Devonian Meadfoot Series, intersected by veins of Permian Felsite; in the south there is a lesser band of interbedded sandstone and argillaceous rocks of the mid to late Devonian Portscatho Beds. The eastern fringe of the study area is characterised by a slightly more complex geology, with the occurrence of early Devonian Meadfoot Group Hornfelsed slate and Hornfelsed sandstone and slate, siltstone and sandstone (although there is some disagreement whether this might, in fact be slate and sandstone interbedded) (Fig 5). In the southeast there is a small area of mid Devonian Grampound Formation siltstone and mudstone and mid Devonian sandstone. The only superficial geological deposits are alluvium and Head in the river valleys.

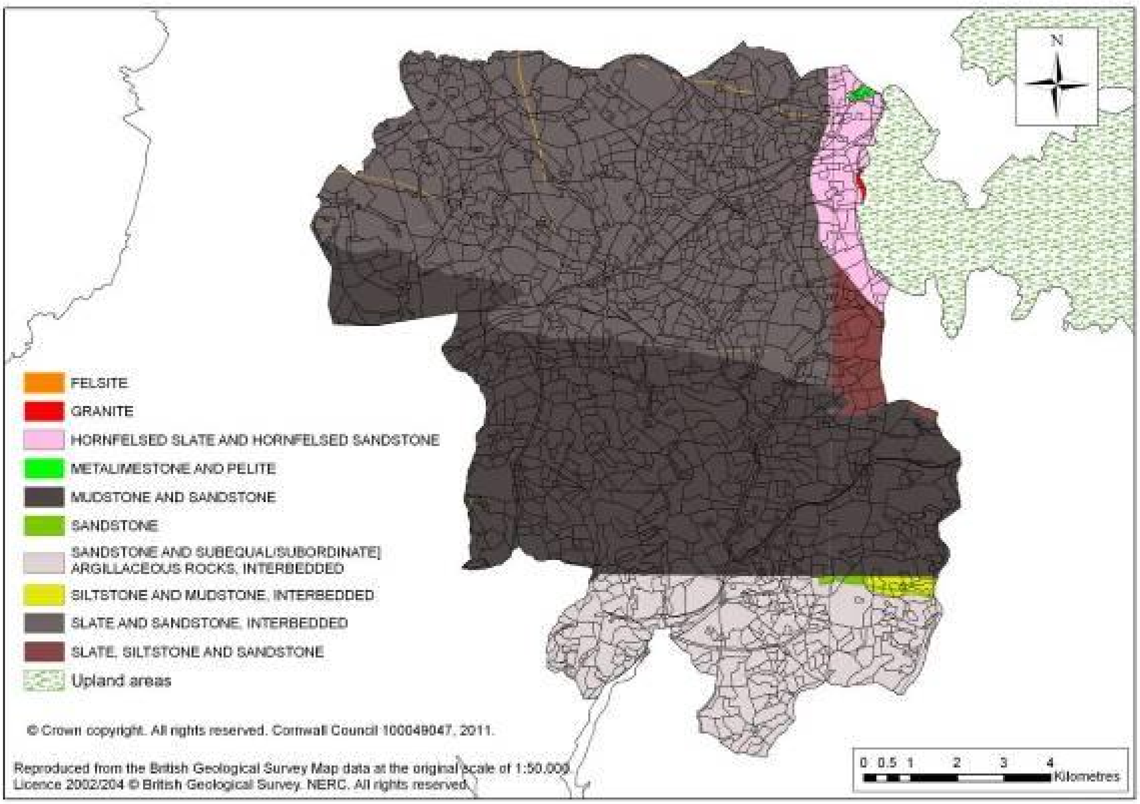

Fig 5. The Probus study area: simplified bedrock geology

The predominant soils are Denbigh 2 fine loams which occur throughout much of the study area (Fig 6). Other soil types that are present are Denbigh 1 loams (mainly in the river valleys), Manod loams (in the east), Powys loams in the Tresillian valley, seasonally wet Yeollandpark loams (mainly in the north) and seasonally wet Sportsmans loam around Newlyn Downs. In parts of the Tresillian valley there are small areas of Hense peat loams, typical of wetland woodland environments.

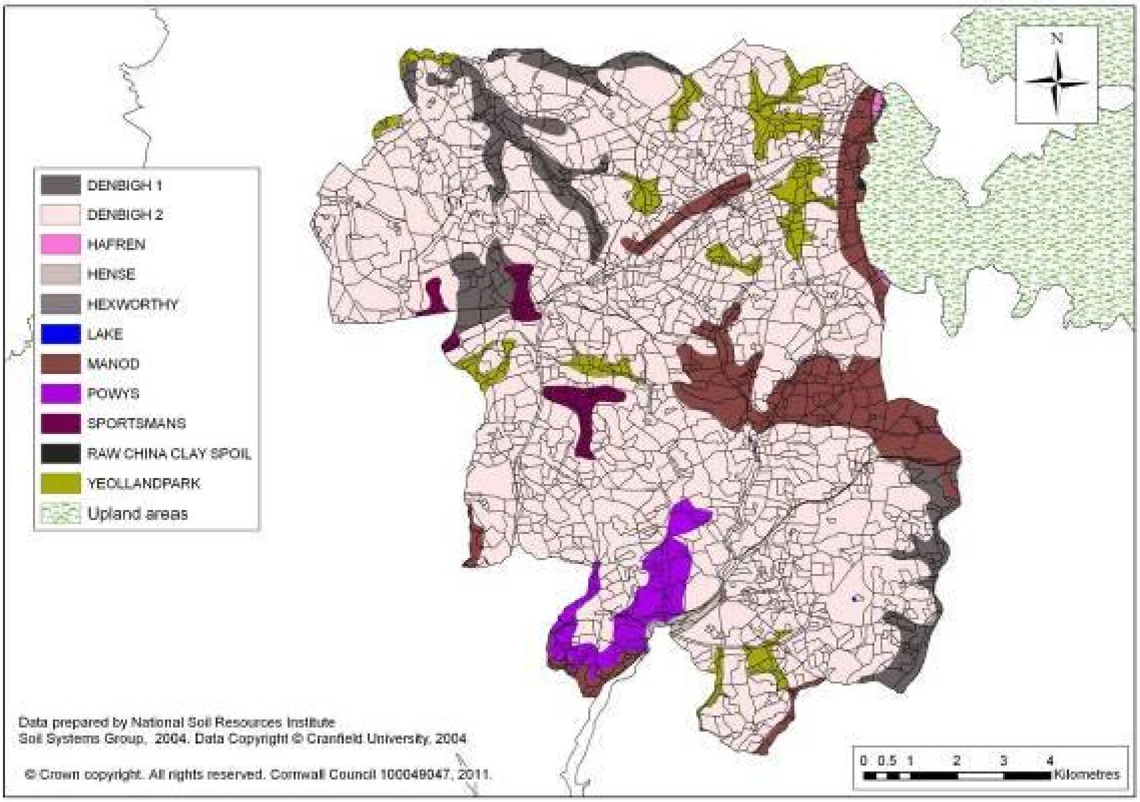

Fig 6. Soil types in the Probus study area

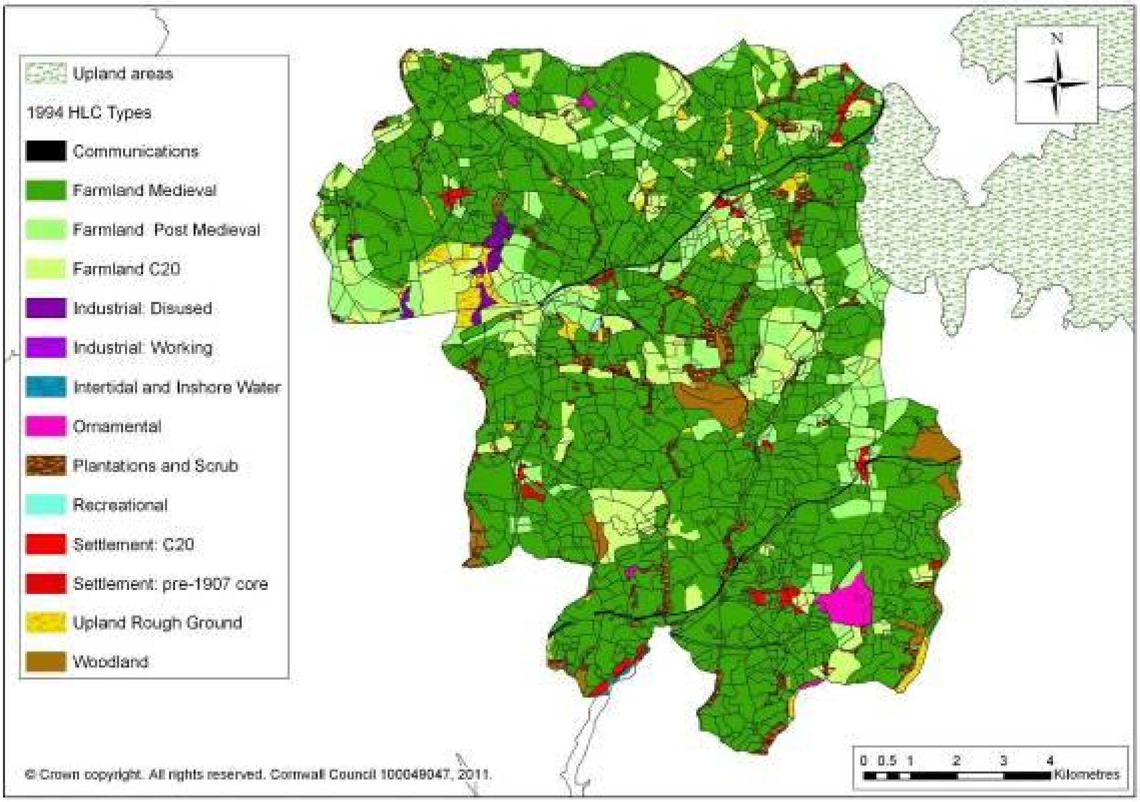

Fig 7. The 1994 HLC for the Probus study area.

The landscape in the Probus study area is one of predominantly enclosed farmland, which covers more than 85% of the area. The majority of this farmland was classed in the 1994 HLC as the HLC Type Farmland Medieval, which covers some 57% of the area; this compares with Lowland Cornwall as a whole, where Farmland Medieval covers 52% of the area. The next most extensive HLC Type is Farmland Post Medieval, covering 25%, which is 9% greater coverage than in Lowland Cornwall as a whole. By contrast Farmland C20 covers only 3.4% of the study area, whereas in Lowland Cornwall it makes up 11% of the area. Four percent of the study area is taken up by Upland Rough Ground and the Woodland HLC Type covers a similar sized area: in both cases this is twice as much as in Lowland Cornwall generally.

Following the deepening or refining of HLC within the Probus study area carried out as part of this project (Lowland Cornwall Volume 3) the proportions of the area taken up by the various Types is slightly different (Fig 8).

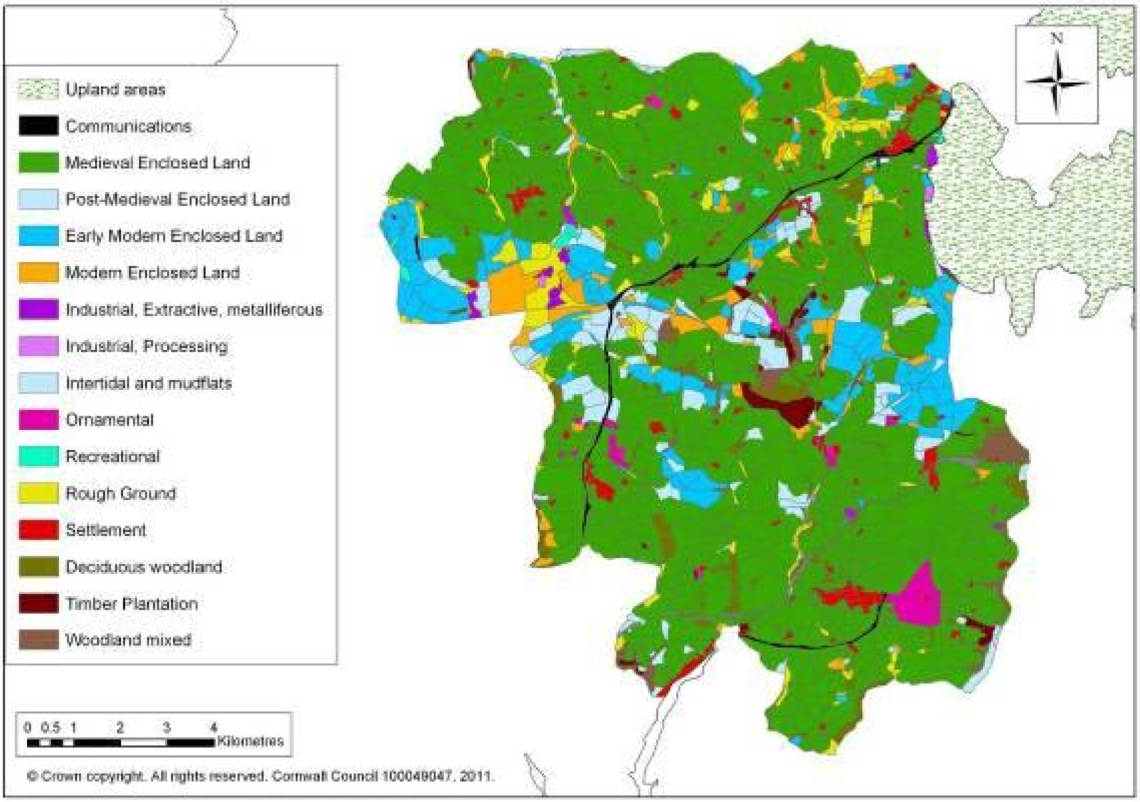

Fig 8. Probus study area showing the refined HLC 2011 time slice.

The main difference is that whereas 25% of the farmed land was interpreted as Post-Medieval Enclosed Land in the 1994 HLC, this figure has dropped to 6% in the 2011 revised HLC - 19% less. Roughly half has been re-interpreted as Modern or Early Modern Enclosed Land and half as Medieval Enclosed Land. In the refined HLC, Medieval Enclosed Land covers 66% of the study area as opposed to 57% in the 1994 HLC and Modern Enclosed Land covers 12% rather than 3.4% in the 1994 HLC.

The method for HLC refinement in the Lowland Cornwall project involved identifying HLC over three time slices based on modern OS maps (the 2011 time-slice), First Edition OS maps (1880) and Tithe maps (1840). An additional late medieval time-slice was based on the mapper's interpretation (Lowland Cornwall Volume 3, 15-19 and 46-47). By comparing the HLC of each of the four time slices the extent to which the area covered by each of the main HLC Types has changed over time, reflecting changing land use patterns, can be traced. It is very clear from this comparison that the growth of Post Medieval Enclosed and, more recently, Early Modern and Modern Enclosed Land has been primarily at the expense of rough ground Types. For instance, in the late medieval time slice (Fig 9) Upland Rough Ground covers almost a quarter of the Probus area, yet by 2011 it covers only 4% (Lowland Cornwall Volume 3, table 4).

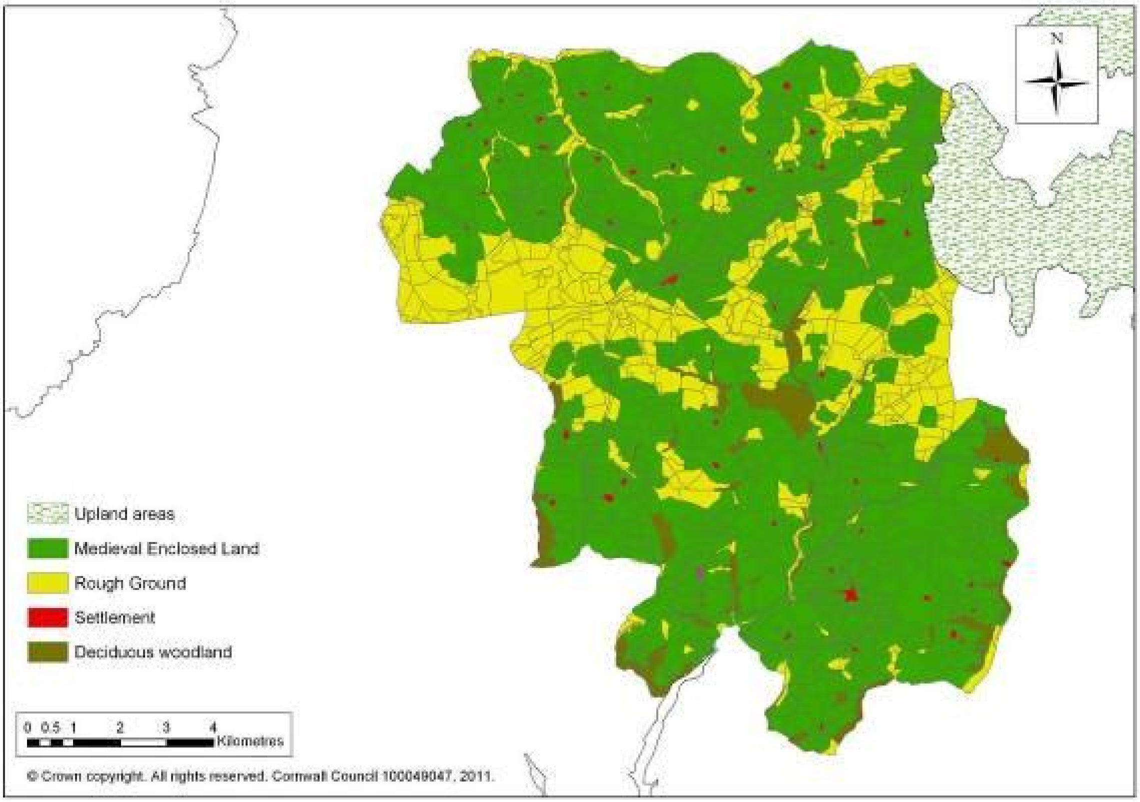

Fig 9. Probus study area showing the late medieval time-slice HLC.

The late medieval HLC shows how the Probus study area can be divided into three broad zones: a southern zone made up predominantly of Medieval Enclosed Land and some areas of woodland; a central zone formed predominantly by Upland Rough Ground, and a northern zone made up predominantly by Medieval Enclosed Land, interspersed with some areas of Upland Rough Ground. Both the northern and southern zones contain a number of relatively substantial settlements.

During the HLC refinement stage of the project further context was provided by a separate Historic Settlement dataset. Its basis was the HE transcription of the Institute of Cornish Studies (ICS) Place-name Index (Historic Environment, Cornwall Council nd). The interpretation and dating of Cornish, and to a lesser extent, English place-name elements was used to give a potential indication of a settlement's earliest date. This is easiest to postulate for the Cornish place-name elements *tre/tref* (farming estate), *bod/bos* (dwelling), *hendre* (old settlement, winter or main dwelling), *lann* (Christian enclosure or site)*, ker* (fort, enclosure) and *lys* ('palace' or administrative centre – perhaps a high status site) which probably date in use to between the fifth and tenth centuries AD (Padel 1985).

Mapping of settlements with these early place-name elements indicates the potential settlement pattern in the early medieval period and this is very much as expected, given the postulated late medieval time-slice HLC. There is the usual Cornish pattern of regularly dispersed hamlets (Preston-Jones and Rose 1986) with the settlements scattered throughout the northern and southern zones, and none in the central area (Fig 10).

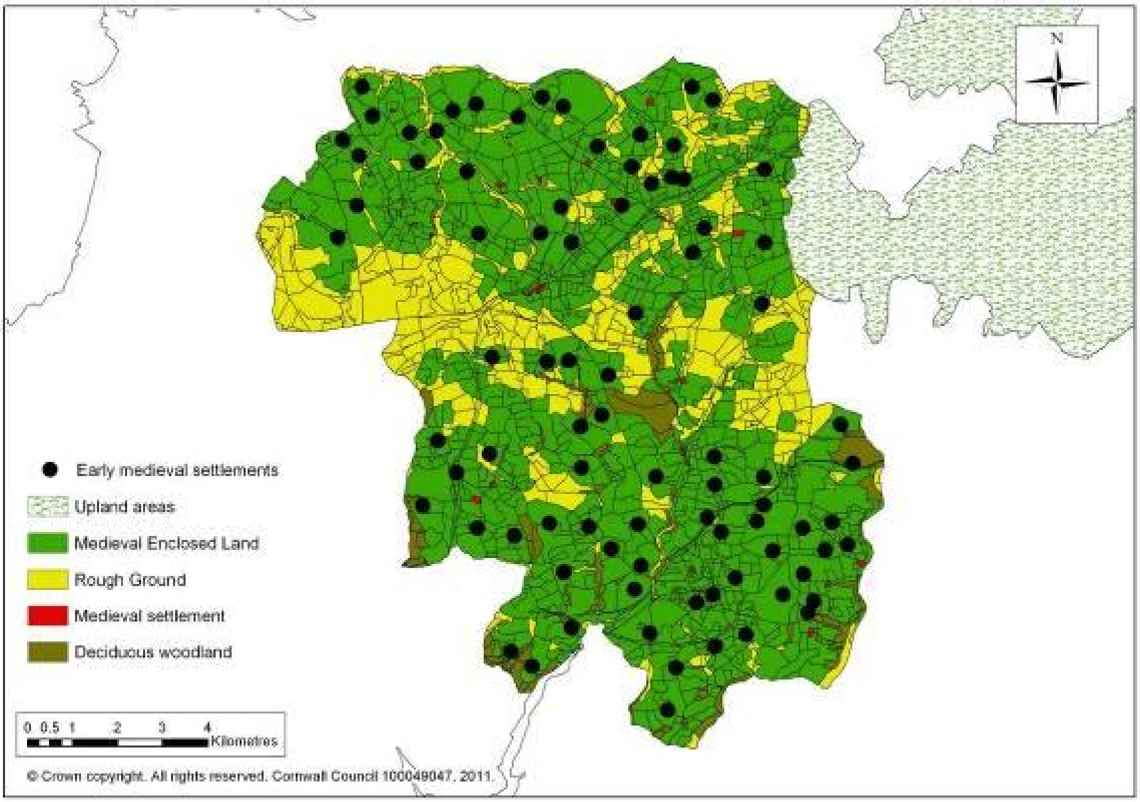

Fig 10. Distribution of early medieval settlements in the Probus study area. Background is the late medieval time-slice HLC.

3.2 Prehistoric and Romano-British archaeology in the Probus study area

The Lowland Cornwall HER dataset is made up of a range of selected site types. These are rounds and enclosures, field systems, open settlements (hut circles/round houses), barrows, hillforts and find spots. During phase 1 of the project when high level probability models were built, it became clear that the distribution of find spots recorded in the HER is heavily influenced by the activities of individual finds collectors and that there are other inherent weaknesses in the finds data (Lowland Cornwall Volume 1, 102). For this reason only the monument site types were considered in the analysis of the archaeological resource of the study areas.

The Lowland Cornwall cropmark visibility model, which indicates those areas where cropmarks are most likely to form and are most likely to be visible, classes 73% of the Probus study area as falling within the high visibility zone (Fig 11). Only 5% is placed in the low visibility zone and 22% in the medium probability zone. This is no surprise because the Probus study area forms part of a larger block of landscape between Truro and Newquay in which numerous archaeological features were recorded during Cornwall's NMP. A total of 267 monument sites in the project dataset are located within this study area (Fig 12), which equates to a site density of 1.97 sites/km sq. Of these, 138 (52%) are recorded as cropmarks, 73 (27%) as earthworks, 46 (17%) from documentary references and 10 (4%) as 'site of'. Of these monuments, 226 (85%) are captured in the high visibility zone of the model, 39 (14%) in the medium zone, and 2 (1%) in the low probability zone. While this may be taken as confirming the veracity of the visibility model, it is acknowledged elsewhere (Lowland Cornwall Volume 2, 44) that this model is retrodictive: it indicates those areas where known sites are located rather than where undiscovered sites are likely to be found. Nonetheless it does illustrate that the Probus study area contains a rich prehistoric archaeological resource.

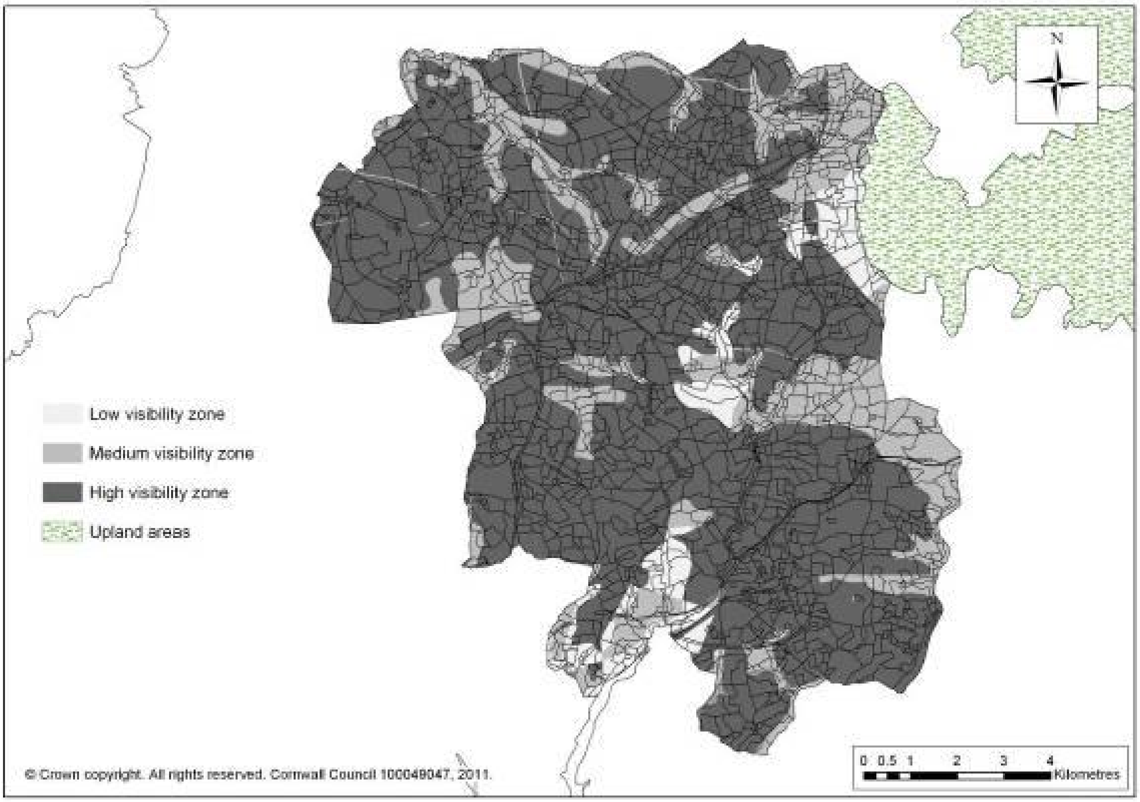

Fig 11. The Lowland Cornwall visibility model for the Probus study area.

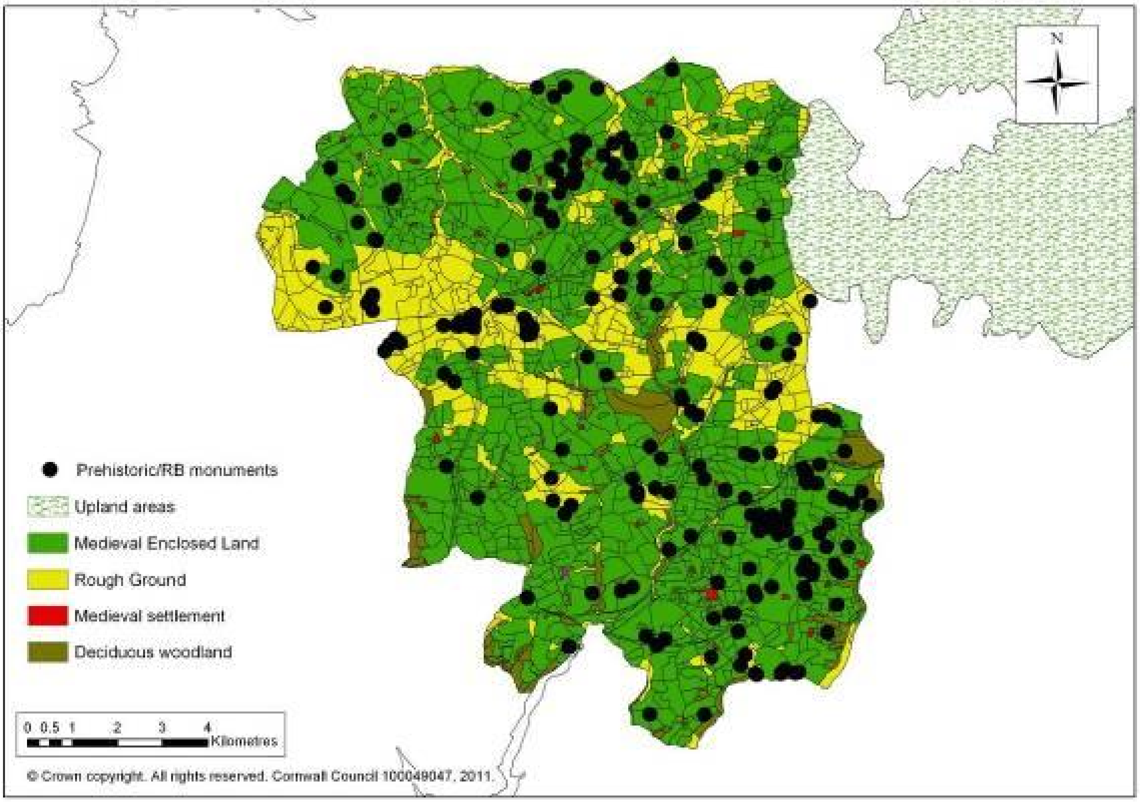

Fig 12. The distribution of all prehistoric/RB monument sites in the Probus study area. Background formed by the late medieval time-slice HLC.

A majority of the prehistoric sites recorded in the Probus area are settlement related, listed in the HER as either enclosures or rounds, although barrows are also numerous. A breakdown of site types is set out in table 1 below.

Site type	Number	Percentage
Round	84	31%
Enclosure	61	23%
Barrow	84	31%
Field system	21	8%
Field boundary	5	2%
Hillfort	8	3%
Round house	4	2%
Total	267	

Table 1. Breakdown of prehistoric site types recorded from the Probus study area

Although there are records in the HER for both 'round' and 'enclosure' there are no obvious criteria for distinguishing one from the other. For the sake of consistency these sites will be referred to in the following sections simply as enclosures.

3.2.1 Enclosures

There are 145 enclosures in the Lowland Cornwall dataset for the Probus study area. The great majority (114) were mapped and recorded during Cornwall's NMP and of these, 83 were assigned a validity score of 3 or higher and these are referred to below as 'high validity' enclosures (see section 1.5.1). The remaining 62 enclosures, with a validity rating of 1 or 2 or with no validity rating (i.e. those not mapped during the NMP), are referred to as 'low validity' enclosures.

3.2.1.1 Evidence for the enclosures

The evidence for the enclosures is summarised in the table below.

Evidence	High validity enclosures	Low validity enclosures	Total
Cropmark	67 (81%)	33 (53%)	100 (69%)
Extant	15 (18%)	7 (12%)	22 (15%)
Documentary	1 (1%)	20 (32%)	21 (14%)
Site of	0	2 (3%)	2 (1%)
Total	**83**	**62**	**145**

Table 2. Evidence for all 145 enclosures (percentages are rounded up or down for clarity).

In broad terms almost 70% of the enclosures do not have above ground remains and are visible only as cropmarks or soilmarks. The reason why the percentage of cropmarks is higher than this in the high validity sample is because only one enclosure recorded in the HER from documentary evidence has visible remains. As a result the other 20 documentary enclosures were not mapped during the NMP project and were therefore not ascribed a validity value. The proportions of enclosures with earthwork remains ('extant') and those identified from documentary evidence are broadly similar (15% and 14% respectively). The ratio of high validity enclosures recorded as cropmarks to high validity enclosures recorded as earthworks (4.5) is very similar to the ratio of low validity cropmark enclosures to low validity earthwork enclosures (4.7). The distributions of cropmark, earthwork and documentary enclosures are broadly analogous (Fig 13) and in some cases cropmark enclosures are situated close by earthwork enclosures (e.g. at St Enoder and at Parkengear, Probus).

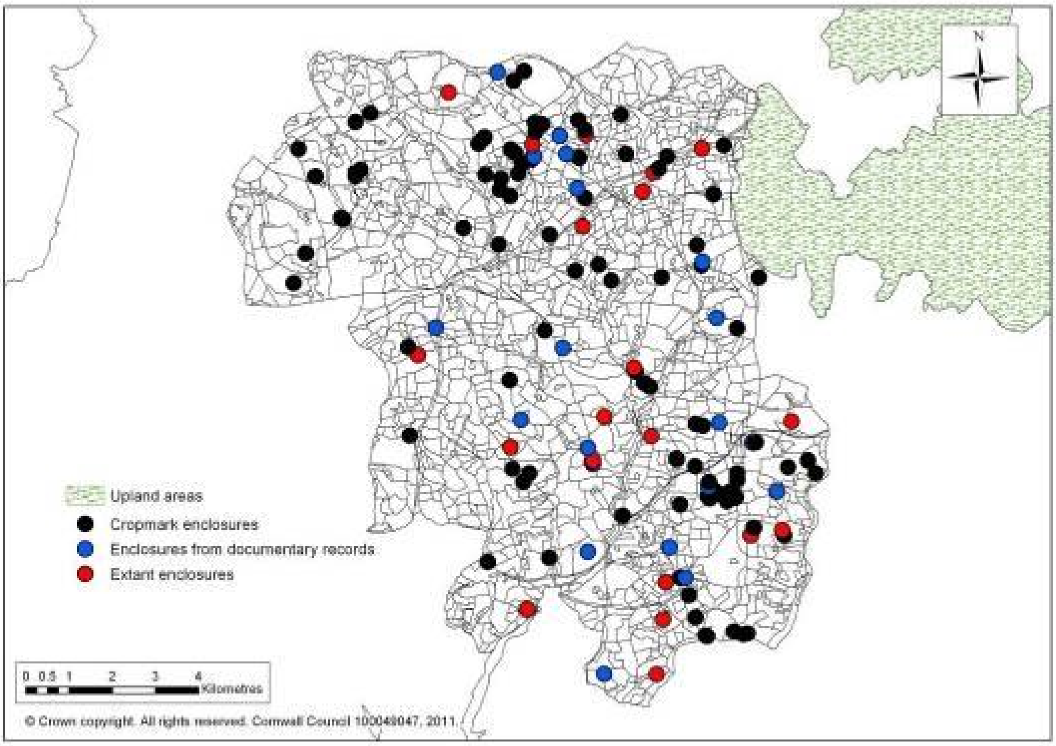

Fig 13. Distribution of enclosures recorded as cropmarks, extant monuments or from documentary sources in the Probus study area.

3.2.1.2 Distribution of enclosures

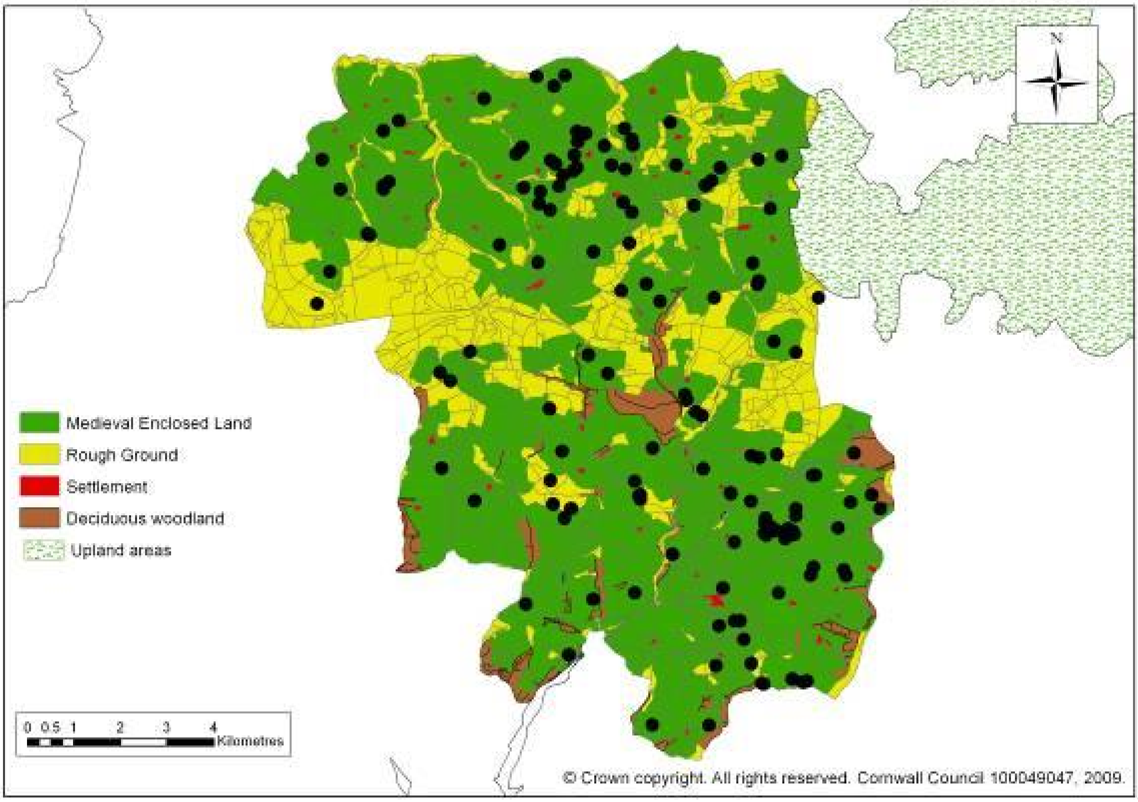

Fig 14. Distribution of enclosures in the Probus study area. Background formed by the late medieval HLC time slice

In many respects the distribution of the enclosures resembles that of early medieval settlements (Figs 10 and 14), with the sites almost entirely absent from the central band of rough ground. However the enclosures are less evenly spread in the landscape by comparison, with a number of clusters. The enclosures are situated in a range of locations in the landscape, but predominantly on slopes.

Location	High validity enclosures	Low validity enclosures	All enclosures
Hill top	8 (9%)	2 (3%)	10 (7%)
Plateau	1 (1%)	1 (2%)	2 (1%)
Promontory	3 (3%)	3 (5%)	6 (4%)
Ridge	9 (11%)	7 (11%)	16 (11%)
Slope	62 (74%)	47 (76%)	109 (75%)
Flat	0	2 (3%)	2 (1%)
Total	**83**	**62**	**145**

Table 3. Topographical location of the enclosures in the landscape

The enclosures are for the most part located between the 50 and 115m contours, and predominantly between the 80 and 115m contours.

Height	High validity enclosures	Low validity enclosures	All enclosures
30-50m	6 (7%)	5 (8%)	11 (8%)
51-80m	22 (27%)	20 (32%)	42 (28%)
81-115m	54 (65%)	37 (60%)	91 (63%)
115m+	1 (1%)	0	1 (1%)
Total	**83**	**62**	**145**

Table 4. Location of the enclosures by height OD

There does not appear to be a particularly favoured aspect for the siting of the enclosures. For instance, although few enclosures face directly north, 15% face northwest and only 7% face south. When the enclosures are grouped together according to their broad aspect there appears to be a slight preference for westerly-facing locations (those facing west, northwest or southwest) (table 5). There are virtually identical numbers of enclosures in easterly, northerly and southerly-facing locations. A clear minority face all aspects (on ridges or hilltops).

Location	High validity enclosures	Low validity enclosures	All enclosures
Western (W, NW, SW)	28	25	53
Eastern (E, NE, SE)	29	17	46
Northern (N, NE, NW)	22	18	40
Southern (S, SE, SW)	27	20	47
All aspects	16	11	27

Table 5. Overall geographical aspect of the enclosure locations

In terms of topographical setting, then, it can be said that the vast majority of enclosures are sited on sloping ground between the 80 and 115m contours, with some in slightly lower lying locations. The enclosures fit into the general lie of the land regardless of aspect. For instance a high proportion of the northerly-facing enclosures are located in the parishes of St Enoder and St Newlyn East in the northernmost part of the study area, where the land generally slopes to the north away from the high ground of Newlyn Downs. That said, there does appear to be a slight preference for westerly-facing locations. A marked minority of enclosures are sited on hill tops and ridges and it is possible that these differed in function or status from the slope-based enclosures.

It is of interest to compare the location of prehistoric enclosures with that of early medieval settlements. Whilst the percentages are similar for enclosures and early medieval settlements in the lowest and highest ground (note that the figure for high validity enclosures sited between the 25 and 50m contours is 7% - the same as for early medieval settlements), the distribution patterns for the 50-80m and 80-115m contours are quite different. Sixty two percent of early medieval settlements are situated below the 80m contour as opposed to only 36% of enclosures and conversely 64% of enclosures are situated above the 80m contour opposed to 38% of early medieval settlements (table 6).

Height	EM settlements	% EM settlements	% rounds/enclosures
25-50m	6	7%	8%
51-80m	47	55%	28%
81-115m	32	37%	63%
115m+	1	1%	1%
Total	86		

Table 6. Comparison of height OD between prehistoric enclosures and early medieval settlements in the Probus study area

The favouring of gentle slopes as the siting of settlements is even more marked for early medieval sites than it is for prehistoric enclosures: a single settlement (Great Trewergie – the southernmost settlement in the study area) is located on a hill top; all the others are on slopes. There are also differences in the geographical aspects favoured by early medieval settlements to those favoured by prehistoric enclosures (table 7). The most favoured aspects are southeast (17 settlements) and east (15 settlements) but overall, sites with a southerly aspect (facing south, southeast or southwest) are the most favoured locations. This contrasts with the prehistoric enclosures, which are most frequently located on sites with a westerly aspect.

Aspect	EM settlements	Enclosures
Western (W, NW, SW)	31	53
Eastern (E, NE, SE)	36	46
Northern (N, NE, NW)	19	40
Southern (S, SE, SW)	40	47
All	1	27

Table 7. Comparison of geographical aspect of early medieval settlements and prehistoric enclosures in the Probus study area

This data suggests that although early medieval settlements were established in the same broad landscape zones as prehistoric enclosures, there was a movement away from more exposed locations such as hill tops, ridges and promontories. There was also a shift towards lower-lying locations with a slight preference for southerly facing sites and an avoidance of northerly aspects.

3.2.1.3 Size and form of the enclosures

The size and form of the enclosures was defined for all where a measured plan was available: for the most part this equates with enclosures mapped as part of Cornwall's NMP. The size (i.e. area enclosed) of the enclosures could only be reliably measured when two dimensions were apparent and in some cases, where cropmarks of enclosures were not fully visible, this was not possible. Size was measured for 76 of the high validity enclosures and 29 of the low validity enclosures. The remainder include the 20 enclosures identified from documentary evidence (with no visible remains) and those which were only partially visible or obscured by later features such as field hedges. Partial visibility is one of the main reasons behind the low validity ascribed to some enclosures – more than half the low validity enclosures do not have two measurable dimensions.

For those enclosures which could be measured the size range was broken down into five categories based on a hectare. The smallest category includes those enclosing less than 1,000 sq m (0.1 ha). The other categories are 0.1–0.25ha, 0.25–0.5ha, 0.5ha–1ha and greater than 1ha.

Similarly the form (the basic shape of the enclosure) could only be described for those enclosures whose dimensions could be measured. Three basic descriptions of form were used: 'curvilinear', 'rectilinear' and 'mixed'. Curvilinear and rectilinear are based on the definitions contained in the NMP Morph User's Guide (RCHME 1987): curvilinear = 'made up of a majority of curved elements', rectilinear = 'made up of a majority of straight rather than curved elements'. Mixed was used where an enclosure is formed by a mixture of straight and curving elements but where neither is predominant. Size and form of the enclosures is summarised in tables 8 – 11 below.

High validity enclosures				
Size	**Curvilinear**	**Mixed**	**Rectilinear**	**Total**
<0.1ha	9 (24%)	3 (14%)	8 (47%)	**20 (26%)**
0.1-0.25ha	13 (35%)	5 (23%)	5 (29%)	**23 (30%)**
0.25-0.5ha	9 (24%)	12 (54%)	1 (6%)	**22 (29%)**
0.5-1ha	5 (14%)	2 (9%)	2 (12%)	**9 (12%)**
>1ha	1 (3%)	0	1 (6%)	**2 (3%)**
Total	**37 (49%)**	**22 (29%)**	**17 (22%)**	**76**

Table 8. Measurable size and form of the high validity enclosures

Low validity enclosures				
Size	**Curvilinear**	**Mixed**	**Rectilinear**	**Total**
<0.1ha	8 (40%)	0	2 (33%)	**10 (34%)**
0.1-0.25ha	6 (30%)	3 (100%)	1 (17%)	**10 (34%)**
0.25-0.5ha	5 (25%)	0	2 (33%)	**7 (24%)**
0.5-1ha	1 (5%)	0	1 (17%)	**2 (6%)**
>1ha	0	0	0	**0**
Total	**20 (69%)**	**3 (10%)**	**6 (21%)**	**29**

Table 9. Measurable size and form of the low validity enclosures

All enclosures				
Size	**Curvilinear**	**Mixed**	**Rectilinear**	**Total**
<0.1ha	17 (30%)	3 (12%)	10 (43%)	**30(29%)**
0.1-0.25ha	19 (33%)	8 (32%)	6 (26%)	**33(31%)**
0.25-0.5ha	14 (25%)	12 (48%)	3 (13%)	**29(28%)**
0.5-1ha	6 (10%)	2 (8%)	3 (13%)	**12 (11%)**
>1ha	1 (2%)	0	1 (4%)	**2 (2%)**
Total	**57 (54%)**	**25 (24%)**	**23 (22%)**	**105**

Table 10. Measurable size and form of all enclosures

The important point regarding size is that the enclosures typically cover less than 0.5ha. Eighty eight percent of the enclosures fall into this size bracket, including 85% of the high validity enclosures. Sixty three percent of the enclosures cover less than 0.25ha (including 56% of the high validity enclosures). The rectilinear enclosures in particular tend to be at the smaller end of the scale – 69% of all rectilinear enclosures and 76% of rectilinear high validity enclosures cover less than 0.25ha.

When the level of survival of the enclosures is analysed it seems that there is some correlation between size and survival of earthwork remains. Only one site enclosing less than 0.1ha survives as an earthwork and there is a larger proportion of earthwork enclosures covering an area greater than 0.25ha compared to the sample as a whole.

Size	**Earthworks**	**Cropmarks**	**All enclosures**
<0.1ha	1 (6%)	29 (34%)	30 (27%)
0.1-0.25ha	5 (29%)	27 (32%)	32 (33%)
0.25-0.5ha	8 (47%)	19 (22%)	27 (28%)
0.5-1ha	2 (12%)	9 (11%)	11 (9%)
>1ha	1 (6%)	1 (3%)	2 (3%)
Total	**17**	**85**	**105**

Table 11. Measurable size of earthwork and cropmark enclosures

The majority of enclosures (54%) are curvilinear in form and there are broadly similar numbers of rectilinear and mixed forms.

Curvilinear enclosures

Fifty seven of the enclosures are classed as curvilinear in form; this figure includes 37 high validity enclosures and 20 low validity enclosures. Of these, 44 have sufficiently extensive visible remains to allow a closer definition of their form (table 12).

Form	**High validity enclosures**	**Low validity enclosures**	**Total**
Circular	0	1	1
Sub-circular	5	2	7
Oval	6	4	10
Regular	6	3	9
Irregular	6	2	8
C-shaped	5	4	9
Total	**28**	**16**	**44**

Table 12. Form of curvilinear enclosures

It is clear from table 9 that whilst truly circular enclosures are unusual, there is no favoured form, with broadly equal numbers of each enclosure type. This is the case regardless whether all the enclosures are considered or only those with high validity ratings.

Rectilinear enclosures

The majority of rectilinear enclosures are four-sided, but there are examples of three-, five- and six-sided enclosures.

No. of sides	High validity enclosures	Low validity enclosures	Total
3	6	3	**9**
4	12	3	**15**
5	6	0	**6**
6	1	0	**1**
Total	**25**	**6**	**31**

Table 13. Number of three-, four-, five- and six-sided rectilinear enclosures

Two of the high validity enclosures with three visible sides are classed as D-shaped, one is rectangular but with one side missing (it is possible that this enclosure may have been deliberately designed as a staple-shaped structure). All the other three-sided enclosures are interpreted as being incomplete or not completely visible and, in all likelihood, would originally have had four or more sides. This data suggests that four-sided enclosures are the predominant type, particularly when the high validity enclosures are considered in isolation.

The majority of rectilinear enclosures are polygonal in form. This is obviously the case for high validity enclosures with more than four sides but also holds good for the four-sided enclosures. Of the 31 rectilinear enclosures whose form can confidently be defined, 16 (52%) are polygonal, including those with four or more sides.

Form	High validity enclosures	Low validity enclosures	Total
Square	0	0	**0**
Sub-square	3	0	**3**
Rectangular	0	1	**1**
Sub-rectangular	1	1	**2**
Polygonal	8	1	**9**
D-shaped	0	0	**0**
Total	**12**	**3**	**15**

Table 14. Form of four-sided rectilinear enclosures where definable.

3.2.1.4 Form of the enclosing circuits

Another aspect to consider with regard to the form of the enclosures is the nature of the enclosing circuit.

Form	High validity enclosures	Low validity enclosures	Total
Ditch	55 (72%)	16 (55%)	**71 (68%)**
Bank	8 (11%)	8 (28%)	**16 (15%)**
Ditch and bank	13 (17%)	5 (17%)	**18 (17%)**
Total	**76**	**29**	**105**

Table 15. Form of enclosing circuit where recorded.

These figures suggest that the great majority of enclosures are bounded by a ditch only, but the figures are likely to be skewed by the fact that, in Cornwall, ditches tend to produce more clearly defined cropmarks than banks.

3.2.1.5 Complexity

The enclosures were classed as 'simple' or 'complex' according to the nature and extent of their visible remains. Simple enclosures are those with a single enclosing circuit, regardless of their size and shape: complex enclosures include those with associated external features – most often an appended enclosure or annexe - and multivallate enclosures (enclosures with more than one enclosing circuit). Simple univallate enclosures are by far the most numerous, making up 85% of the Probus sample.

Twenty one enclosures were classed as complex. Four (three high validity enclosures and one low validity enclosure) have annexes attached (Fig 15) and 17 are multivallate (Fig 16). Multivallate enclosures were further classified as those with close-spaced enclosing ditches (e.g. enclosures 23026, 22239 and 178224 in Fig 16) and those with wide-spaced ditches (where the area of the outer enclosure is twice that of the inner enclosure or more, such as enclosures 32020 and 55226 in Fig 16).

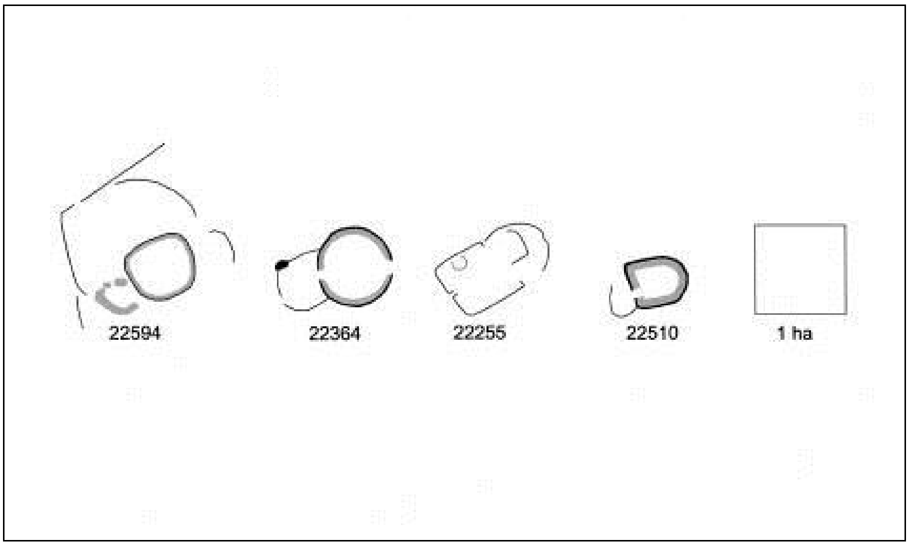

Fig 15. The four enclosures with appended enclosures or 'annexes' in the Probus study area. Ditches are represented by black lines; banks by grey lines.

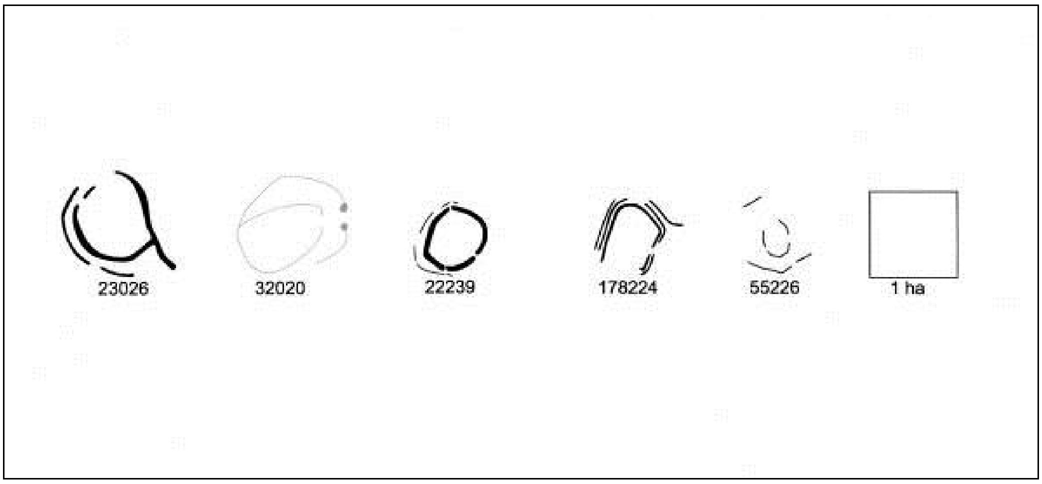

Fig 16. A sample of the multivallate enclosures recorded in the Probus study area. Ditches are represented by black lines; banks by grey lines.

Seventeen percent of high validity enclosures with visible remains (13 out of 76) are multivallate as are 14% of the low validity enclosures (four out of 29).

Enclosing circuits	High validity enclosures	Low validity enclosures	Total
Close-spaced	7	2	**9**
Wide-spaced	6	2	**8**
Total	**13**	**4**	**17**

Table 16. Breakdown of multivallate enclosures in the Probus area.

Analysis of the form, size and location in the landscape of multivallate enclosures with close-spaced and wide-spaced enclosing ditches is presented in tables 17 and 18 below.

Form	**High validity enclosures**	**Low validity enclosures**	**Total**
Curvilinear	2	0	**2**
Mixed	4	0	**4**
Rectilinear	1	2	**3**
Location			
Promontory	1	0	**1**
Ridge	3	1	**4**
Slope	3	1	**4**
Size			
<0.1ha	0	0	**0**
0.1-0.25ha	2	0	**2**
0.25-0.5ha	3	2	**5**
0.5-1ha	2	0	**2**

Table 17. Analysis of multivallate enclosures with close-spaced enclosing ditches

Although the small size of the sample (only nine enclosures) means that it would be unwise to read too much into the data, there is certainly a suggestion that in comparison with the enclosure dataset as a whole, multivallate enclosures with close-spaced circuits are more likely to be rectilinear or mixed than the average (77% against 49%), that they favour locations on ridges as well as slopes (44% against 10% of all enclosures) and that they tend to be larger than the norm (22% enclose between 0.5 and 1ha against 9% of all enclosures and 77% enclose between 0.25 and 0.5ha against 29%).

Form	**High validity enclosures**	**Low validity enclosures**	**Total**
Curvilinear	4	1	**5**
Mixed	1	1	**2**
Rectilinear	1	0	**1**
Location			
Promontory	0	0	**0**
Ridge	0	1	**1**
Hill top	0	1	**1**
Slope	6	0	**6**
Size			
<0.1ha	2	1	**3**
0.1-0.25ha	3	1	**4**
0.25-0.5ha	0	0	**0**
0.5-1ha	1	0	**1**

Table 18. Analysis of multivallate enclosures with wide-spaced enclosing ditches

The column showing the size of the enclosures refers only to the inner enclosure. Comparison of the size of the inner and outer enclosures for the multivallate enclosures with wide-spaced ditches is shown in table 19 below.

Site ID	Inner enclosure (ha)	Outer enclosure (ha)	Ratio of outer: inner
High validity enclosures			
32027	0.07	0.44	6.3
55226	0.09	0.47	5.2
55651	0.13	*0.31	2.4
22257	0.16	*0.33	2.0
22291	0.23	*0.79	3.4
32020	0.56	1.05	1.9
Low validity enclosures			
55644	0.008	0.05	6.3
55240	0.24	*2.47	10.3

*Table 19. Multivallate enclosures with wide-spaced ditches. Comparison of the size of the inner and outer enclosures. Those marked with * indicate that the outer circuit is not completely visible and the size listed is the minimum likely area enclosed.*

The striking aspect of this analysis of multivallate enclosures is the great variety within the sample. The size of the inner enclosures ranges from less than 0.1ha to 0.56ha; in general the outer circuits enclose between 0.3ha and 0.5ha, but with notable exceptions (as little as 0.05ha and as much as 2.47ha) and the ratio of the outer to inner enclosures varies from 1:9 to 10.3 (in other words the outer circuit of enclosure 55240 is more than 10 times the size of its inner circuit). The average ratio between the area enclosed by outer and inner circuits is 4.75 for all the enclosures and 3.5 for the high validity enclosures only.

Further analysis of the size of the high validity enclosures highlights a notable variance from that of all the enclosures. The average sizes of the inner and outer circuits of the high validity enclosures are 0.12ha and 0.34ha respectively; the average sizes for the whole sample are 0.16 and 0.64ha. The obvious cause of this disparity is the large area enclosed by the outer circuit of enclosure 55240. This enclosure, at Arrallas, St Enoder, is also unusual in that it is located on a hill top. It was recorded as a cropmark from aerial photographs but was only ascribed a validity rating of 1, suggesting considerable doubt over its interpretation. Furthermore only a short (127m) length of the putative outer circuit is visible some 80m to the west of the inner enclosure. It seems that this is an example where the level of doubt over interpretation warrants the exclusion of this enclosure from the analysis. When the Arrallas enclosure is excluded the average sizes of inner and outer circuits of the remaining nine enclosures are 0.14 and 0.39 – much closer to the figures for the high validity enclosures.

Even when the Arrallas enclosure is discounted the great variety in the size of the wide-spaced multivallate enclosures and in the ratios of their inner and outer circuits strongly suggests that it is not legitimate to treat them as representative of a single enclosure type - of a particular design and similar function. Pertinent to this is the fact that one of these enclosures – PRN 32027 at Killigrew – has undergone excavation that demonstrated that it was a dedicated metal-working site rather than a domestic settlement (Cole and Nowakowski forthcoming). It should also be noted that the only other multivallate enclosure with wide-spaced ditches to have been subjected to anything like extensive excavation was Reawla, Gwinear, where the function of the very large intervallate area could not be reliably established (Appleton-Fox 1992) so that, in fact, very little is known about these enclosures in Cornwall.

3.2.1.6 Summary

Much of the Probus study area falls within the high visibility zone of the Lowland Cornwall cropmark visibility model and is covered by extensive tracts of soil and bedrock types that are not only conducive to cropmark formation but also seem to have been favoured by late prehistoric and Romano-British farmers (Lowland Cornwall Volume 2). Sixty per cent of the study area is characterised by the HLC Types Farmland Medieval and Farmland C20, both of which form the high probability zone of the enclosures/HLC probability model (Lowland Cornwall Volume 1).

Unsurprisingly therefore, numerous enclosures are recorded from Probus – considerably more than from any of the other three study areas.

The evidence for these enclosures is mostly from aerial photographs – three quarters are recorded as cropmarks, the other quarter being made up equally of sites recorded either as extant or documentary.

The distribution of the enclosures is focused in the northern and southern parts of the study area, avoiding the central band of rough ground and recently enclosed land (from the post medieval period onwards). The enclosures are located predominantly on sloping ground between the 80 and 115m contours, with no obviously favoured aspect.

The distribution of early medieval settlements follows the same broad pattern as the enclosures, but in terms of topographical location there seems to have been a shift towards lower-lying locations and a preference for southerly facing situations.

The majority enclose between 0.1ha and 0.5ha, but with 25% enclosing less than 0.1ha: only 3% enclose an area in excess of 1ha. Enclosures with surviving earthwork remains tend to be towards the larger end of the size spectrum.

Just over half the enclosures are curvilinear in form (the remainder are either rectilinear or contain a mixture of curvilinear and rectilinear elements). Curvilinear enclosures tend to be sub-circular, oval, regular, irregular or c-shaped; true circular forms are very unusual. The majority of rectilinear enclosures are polygonal and tend towards the smaller end of the size spectrum.

A large majority of the enclosures appear from the photographs to be bounded by a ditch only. However, it is probable that in many cases there is an accompanying bank but this is not visible as a cropmark

A large majority (85%) of enclosures are univallate, four have annexes appended and 17 are bounded by two or more circuits. Roughly half of these multivallate enclosures have close-spaced enclosing ditches (double-ditched enclosures) and half have wide-spaced ditches, forming a correspondingly large intervallate area.

Double-ditched enclosures are more often rectilinear or mixed than curvilinear, are more likely to be sited on ridges than the univallate enclosures and tend to be larger than the norm.

Multivallate enclosures with wide-spaced circuits are best not regarded as a singular enclosure type, given the great range in size and form within the Probus sample.

3.2.2 Unenclosed settlements

Four records for 'hut circle' or 'round house' in the Probus study area are contained in the Lowland Cornwall dataset. Two of these are within the large enclosure or 'hillfort' of Carvossa so that, in effect, only two sites which could be interpreted as unenclosed settlements are recorded. These are a round house identified from aerial photography as a cropmark at Whitecross, St Enoder, in the far northeast of the study area, and the former site of a round house at Carland Cross, St Erme, on the high ground of St Newlyn Downs. This latter site has since been destroyed.

This, however, is unlikely to be a representative picture of the extent of unenclosed settlement in the Probus area. The relatively slight ditches forming drip gullies, or the circular arrangement of post holes forming the structural evidence for round houses are not easily identifiable from aerial photography. Ample evidence for this is provided by the fact that within the 145 enclosures mapped in the Probus study area, internal round houses have been recorded in only six. It should be borne in mind that, in identifying these round houses, the attention of aerial photographic interpreters will have initially been drawn to the much more obvious enclosure ditches so it is reasonable to assume that, in the absence of substantial enclosing ditches, the faint traces of unenclosed settlements are unlikely to have been picked up.

An additional five unenclosed settlements have been identified as a result of archaeological mitigation works. These are contained in the Events Record but have not yet been input to the HER. These settlements are at Penhale, Fraddon (adjacent to the enclosed settlement of Penhale round and contemporary with at least one of its phases); at Lower Penhale; at Trenance, St Newlyn East; the Bronze Age settlement at Trevilson, St Newlyn East, and at Trelowthas, Probus.

Although this total of seven unenclosed settlements is too small a sample to be considered in its own right it is worth noting that their location within the landscape closely reflects that of enclosures. Six of the settlements are in the HLC Type Medieval Enclosed Land (in fields classed as cropping units or former cropping units which have been amalgamated at a later date) and six are sited on slopes; four lie between the 80 and 115m contours and two between the 50 and 80m contours; four are in westerly facing aspects (west, northwest or southwest), two in easterly facing aspects and two in southerly facing.

3.2.3 Field systems

In lowland Cornwall generally there is far less evidence available for prehistoric/Romano-British field systems than for enclosures (there are 529 records for rounds and field systems or field boundaries in the dataset as opposed to 1,957 records for enclosures). In the Probus study area 26 prehistoric or Romano-British field boundaries or field systems are recorded. All but one were assigned a validity score in Morph of 3 or higher, the one exception being a single field boundary. During the analysis stage a further 24 field systems/boundaries of uncertain date were identified as being potentially prehistoric/Romano-British: these are referred to below as 'uncertain' fields. In total, therefore, 50 prehistoric/Romano-British field systems have been identified in the Probus study area with varying degrees of confidence.

3.2.3.1 Evidence for the field systems

The evidence for the fields is summarised in the table below.

Evidence	Fields	Uncertain fields	Total
Cropmark	23 (88%)	24 (100%)	47 (94%)
Extant	3 (12%)	0	3 (6%)
Documentary	0	0	0
Site of	0	0	0
Total	**26**	**24**	**50**

Table 20. Evidence for all 50 field systems (percentages are rounded up or down for clarity).

All three extant sites are the south eastern part of the study area – one consists of three parallel banks adjacent to the Carvossa 'hillfort'; the others are more extensive field systems associated with the Trenithan Bennett settlement complex (section 3.2.5, Fig 25) and were visible as low banks on RAF photos from the 1940s. Otherwise all the fields are recorded exclusively as cropmarks.

3.2.3.2 Distribution of the field systems

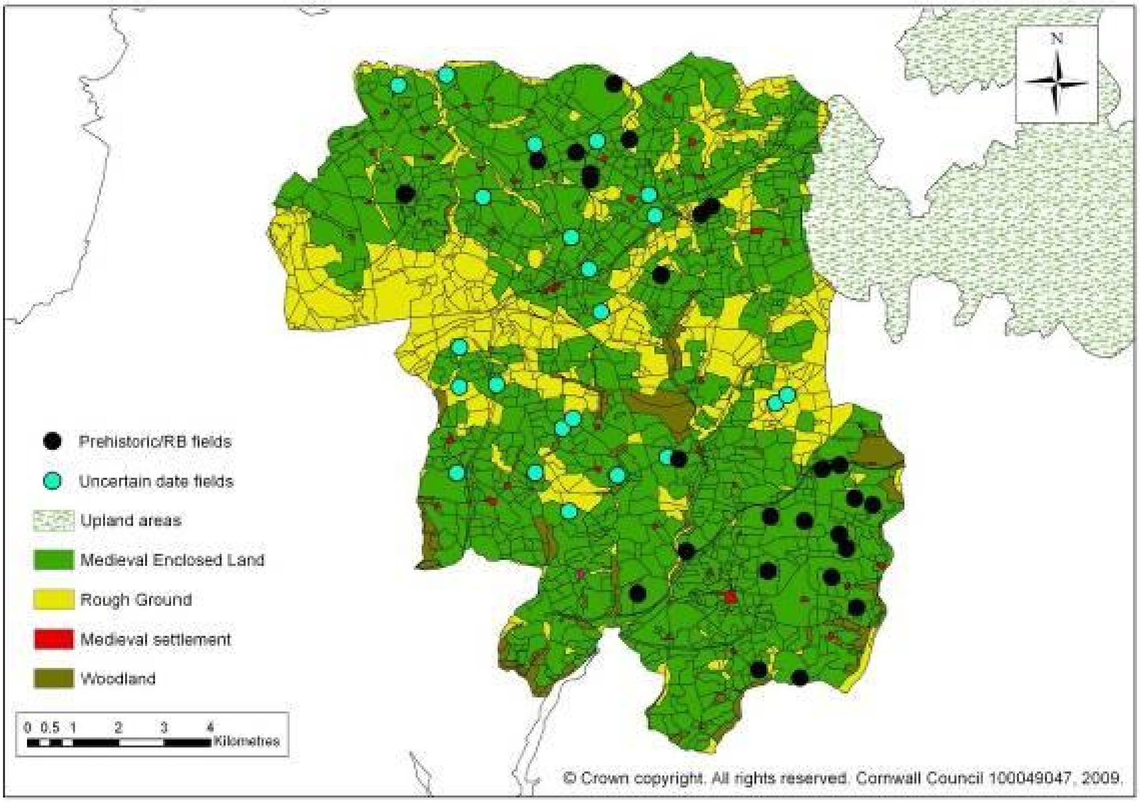

Fig 17. Distribution of field systems in the Probus study area.

To a great extent the distribution of field systems replicates that of rounds and enclosures, with the majority found in the northern and southern parts of the area. There are however two field systems of uncertain date in the central band of rough ground and recently enclosed land at Carnemough, Ladock, and a third at Ennis, St Erme in the foothills of St Newlyn Downs.

There are some differences in the distribution pattern of prehistoric/RB fields and the uncertain date fields For instance the prehistoric fields are confined to the northern and southern parts of the study area with none in the central zone, whereas the uncertain fields are found in central and northern areas but are largely absent from the south.

3.2.3.3 Topographic location of the field systems

The fields are situated in a range of locations in the landscape but, like the enclosures, are found overwhelmingly (84-92%) on gentle slopes.

Location	Fields	Uncertain fields	All fields
Hill top	0	2 (8%)	2 (4%)
Plateau	0	0	0
Promontory	0	0	0
Ridge	1 (4%)	2 (8%)	3 (6%)
Slope	24 (92%)	20 (84%)	44 (88%)
Various	1 (4%)	0	1 (2%)
Total	**26**	**24**	**50**

Table 21. Topographical location of the fields in the landscape.

Again reflecting the general distribution and location of enclosures, the fields are for the most part located between the 50 and 115m contours, and predominantly between the 80 and 115m contours, but a higher percentage of the uncertain field systems are sited in low-lying ground below the 50m contour.

Height	Fields	Uncertain fields	All fields
15-50m	1 (4%)	2 (8%)	3 (6%)
51-80m	11 (42%)	3 (13%)	14 (28%)
81-115m	14 (54%)	18 (75%)	32 (64%)
115m+	0	1 (4%)	1 (2%)
Total	**26**	**24**	**50**

Table 22. Location of the fields by height OD.

These figures are not totally precise (especially when distinguishing between the 51-80m and 81-115m ranges) because some of the field boundaries are relatively long and therefore traverse a number of contours. For instance one field system is located between the 60m and 95m contours; this and several others are classed here as lying within the 81-115m range. Even so it is very clear that the field systems are predominantly on slopes between the 50 and 115m contours. From table 22 above it can be seen that 96% of prehistoric fields and 88% of uncertain fields (92% of all fields) are situated within this topographic zone. The uncertain fields tend to be in higher ground than those with more certain prehistoric credentials.

Although the fields face a range of aspects, few face west or southwest. The lack of westerly-facing fields is clear when the field systems are grouped together according to their broad aspect.

Location	Fields	Uncertain fields	All fields
Western (W, NW, SW)	3	6	9
Eastern (E, NE, SE)	11	4	15
Northern (N, NE, NW)	11	11	22
Southern (S, SE, SW)	10	8	18
All aspects	2	4	6

Table 23. Overall topographical aspect of the fields

There appears to be a slight preference for northerly-facing locations (those facing north, northwest or northeast) but it should be noted that these include 11 of the uncertain fields. There are very similar numbers of fields in easterly, northerly and southerly facing locations.

In terms of topographical setting, then, it can be said that the majority of the field systems are sited on sloping ground between the 50 and 115m contours. A minority are sited on hill tops and ridges and westerly facing slopes. There are some differences in the distribution pattern of prehistoric/RB field and uncertain fields – most notably that fewer uncertain fields are recorded from easterly-facing aspects and they tend to favour higher ground (more in the 81-115m contour zone).

3.2.3.4 Size and form of the fields

As noted above the fields are almost exclusively recorded as cropmarks. Many of these are only partially visible. As a result most of the field systems appear to be fragmentary and incomplete. Of the prehistoric field systems, the average length and breadth of the fields can only be reliably measured in seven cases and the typical area enclosed by the fields can only be calculated in six instances. In all other examples only one dimension can be measured and this is assumed here to be the field width rather than length. In the seven instances where width and length are measurable, the average field size is 109m x 64m and where typical field area can be calculated the average is 0.67ha. However there is considerable variation, with dimensions ranging from 42m x 38m to 205m x 87m and from 0.15ha to 1.5ha in area.

The survival of the uncertain fields is generally more coherent, with measurable lengths and breadths for 10 of the field systems. Again, however, typical area enclosed is measurable in only six cases. The average dimensions are 90m x 65m and the average area is 0.46ha. The fields range from 0.33ha to 0.69ha in area, so are generally smaller than the prehistoric fields (these differences may suggest that the uncertain date fields are not prehistoric/Romano-British but may be later in date).

Despite the fragmentary nature of the field systems, there is sufficient survival to allow definitions of basic shape and form for all the fields. Three basic descriptions of form were used: 'curvilinear', 'rectilinear' and 'mixed' (see section 1.5.3 for a definition of these descriptions).

Of the prehistoric fields, 16 are rectilinear in form, three are curvilinear, six are mixed and one long linear feature is double-indexed as a field boundary and/or trackway. Of the uncertain fields 16 are rectilinear, one is curvilinear, three are mixed and four are linear features double-indexed as possible trackways.

Form	Fields	Uncertain fields	All fields
Rectilinear	16	16	32
Curvilinear	3	1	4
Mixed	6	3	9
Linear	1	4	5
Total	**26**	**24**	**50**

Table 24. Form and shape of field systems in the Probus area.

Of the prehistoric fields, four are recorded as being constructed of banks, four as bank and ditch and 18 as ditch only. Of the uncertain fields, two are recorded as banks, one as ditch and bank and the remaining 21 as ditch only. In other words 69% of prehistoric fields, 87% of the uncertain fields and 78% of all fields are ditched and only 12% of all fields are banked.

Construction	Fields	Uncertain fields	All fields
Ditch	18	21	39
Bank	4	2	6
Ditch and bank	4	1	5
Total	**26**	**24**	**50**

Table 25. Construction of field boundaries in the Probus area.

The fragmentary nature of the survival of field systems in the Probus study area is illustrated in Figs 18 to 20 below.

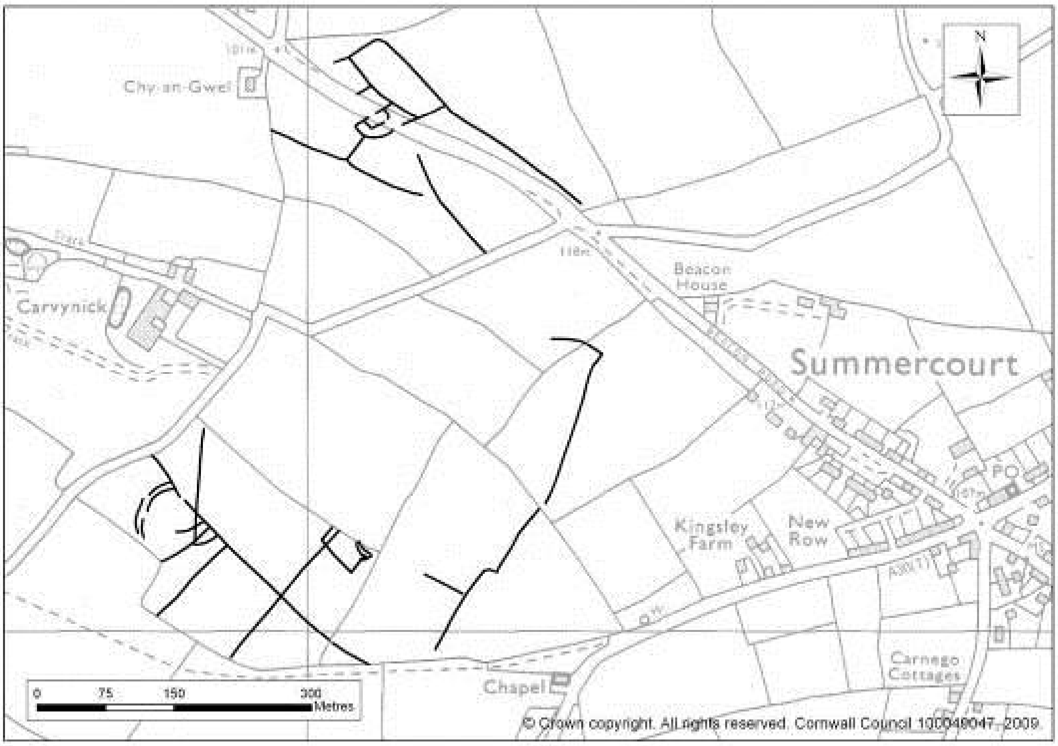

Fig 18. Prehistoric/Romano-British and uncertain date field systems and enclosures in the vicinity of Summercourt, St Enoder.

There appear to be two separate groups of fields to the west of Summercourt (Fig 18), both possibly associated with enclosures. The regular, rectangular fields towards the bottom left measure 86m x at least 100m and are on a southwest-facing ridge between the 105 and 110m contours. Their relationship with the curvilinear, double-ditched enclosure is uncertain: they may post-date the enclosure but it is also possible that the enclosure is appended to the long northwest-southeast boundary and is using it as its northeast side. This possibility is suggested by the fact that there is a gap in the boundary at this point – a possible entrance to the enclosure.

To the north a less regular rectilinear field system is more clearly associated with a small enclosure. These fields run between the 105 and 115m contours on a northwest-facing slope and the one complete field encloses 0.4ha. It is possible that the long easternmost boundary connects the two groups of fields and that the boundaries are forming part of a coaxial system aligned northwest-southeast, with some boundaries fossilised in the present day field pattern. Alternatively, it could be argued that the present day field pattern is derived from medieval strip fields and that the entire group of fields in the lower left of the illustration could be medieval or post medieval in date. Nevertheless, the upper portion of the long easternmost boundary runs contrary to the alignment of the present day field pattern, suggesting that all the cropmark boundaries are prehistoric in origin.

Again there are two distinctive groups of field boundaries at Resparva, St Enoder (Fig 19). Three, running along a northwest-southeast alignment contrary to the present day field pattern (this is defined in the HLC as Medieval Enclosed Land, originally derived from cropping units but recently amalgamated), are clearly associated with an enclosure. The middle of the three boundaries may be doubling up as the southwest side of this enclosure. To the north a fourth boundary is on a similar alignment and may be forming part of this field 'system', and the parallel layout of the boundaries suggest they may be part of a formerly more extensive coaxial system. Not enough of this field system is visible to suggest dimensions, the distances between the lower three boundaries being 48m and 102m. These boundaries are in an unusual location, straddling the 100 and 105m contours on a saddle of land below two high points on a hill top, facing all aspects.

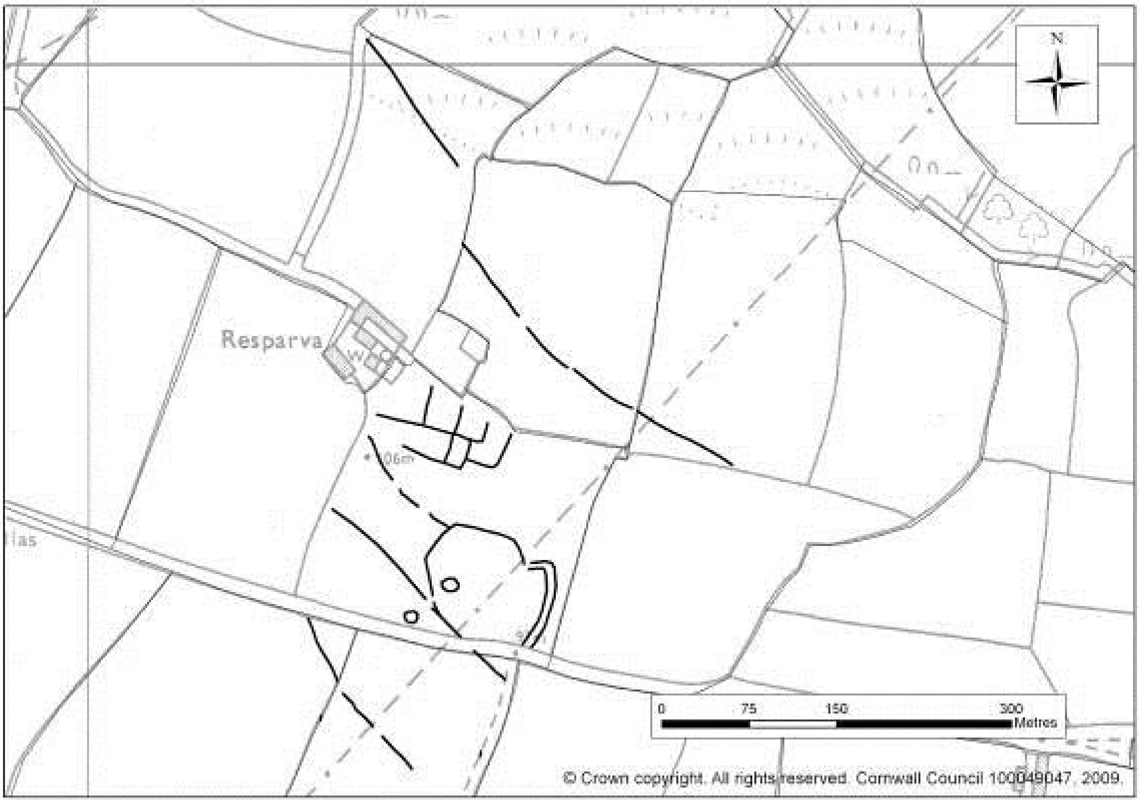

Fig 19. Prehistoric or Romano-British field systems and enclosure at Resparva, St Enoder.

The second group of fields is totally different, consisting of a tight knit series of small rectilinear enclosures, typically measuring 30m x 25m and forming a coherent 'system'. However these features are more likely to be associated with the medieval settlement of Resparva (first recorded in 1341).

A complex range of field boundaries has been mapped around Nancolleth and Tresillian, Newlyn East (Fig 20). The predominant, albeit extremely fragmented, field layout is aligned southwest-northeast, made up of rectilinear fields which are most coherent in the south. Here the fields appear to be associated with an enclosure (the southernmost of a group of four). These fields measure between 55 and 75m across but are nowhere sufficiently complete to enable measurement of their length. Fields on this alignment continue in fragmentary fashion to the north, the most complete element being the reverse L- shaped boundary in the centre of the map. This boundary is appended to a rectilinear enclosure which has been truncated by a present day field boundary.

In the south, by the group of four enclosures, this field system seems to have been overlain by rectilinear fields with a double-ditched element and it is possible that these later fields represent the enclosure of medieval cropping units. In the east are traces of irregular, partly curvilinear ditches which may also represent prehistoric field boundaries. In the west is a long sinuous ditch which probably formed a substantial boundary rather than simply being a field ditch.

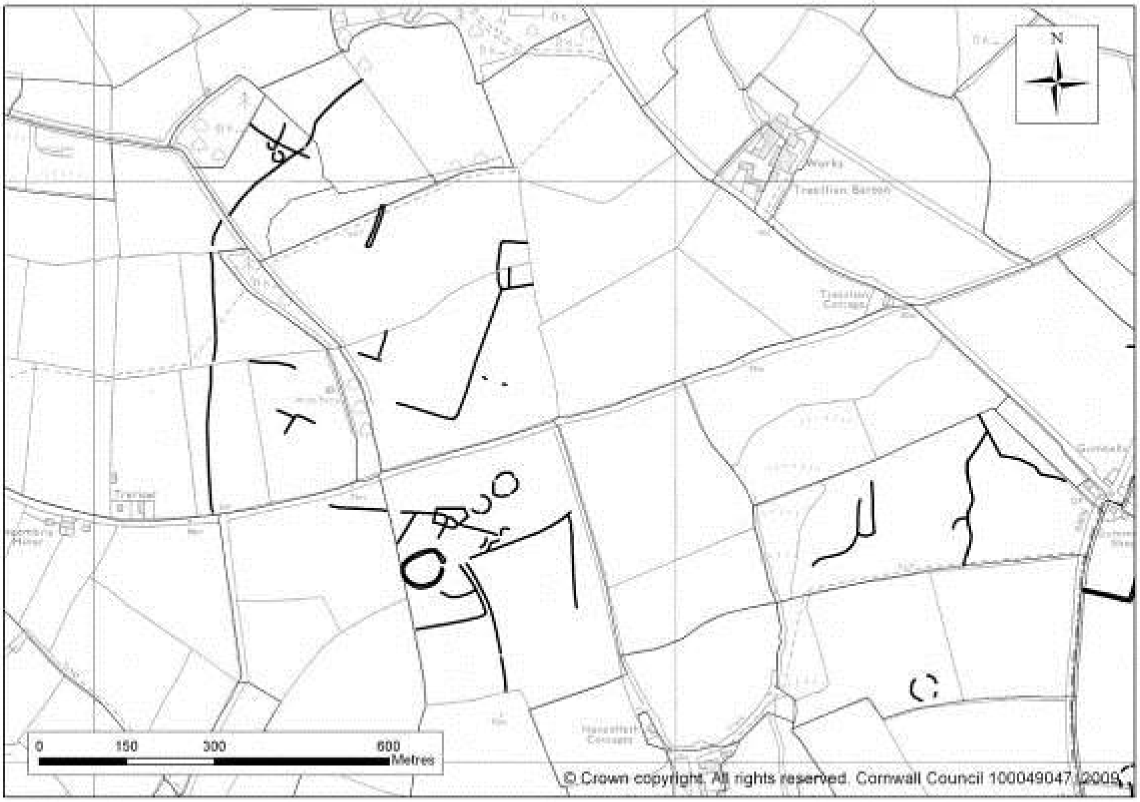

Fig 20. Prehistoric or Romano-British field systems and enclosures in the vicinity of Nancolleth and Tresillian, St Newlyn East.

3.2.4 Summary

Virtually all the field systems in the Probus study area are recorded as cropmarks and the great majority of the boundaries are formed by a single ditch, although there are examples of boundaries consisting of a bank or ditch and bank.

The distribution of the fields closely resembles that of the enclosures, predominantly in the northern and southern part of the study area and situated on slopes between the 50m and 115m contours.

The majority of the field systems are rectilinear in shape, with very few curvilinear examples. The average size of the fields, where measurable, is 109m x 64m and the average area for individual fields is 0.67ha. However, because of the fragmentary survival of the fields and the small measurable sample these figures may not be very reliable. If the figures are accepted then the systems consist of large rectangular fields. In these respects they differ significantly in character from the small block-shaped fields defined by substantial lynchets in the West Penwith uplands. They are also much larger than the rectilinear fields detected by geophysical survey in other parts of lowland Cornwall; for example Higher Besore, Truro (Gossip forthcoming) and Tremough, Penryn (Gossip and Jones 2007). It could be argued, on the other hand, that some of the boundaries may be part of coaxial systems, those at Summercourt (Fig 18) and Resparva (Fig 19) being cases in point. It is possible that only the major boundaries are visible and that less substantial ditches forming sub-dividing boundaries do not generally produce cropmarks.

Figs 18-20 and Figs 23-25 show the highly fragmented nature of the field systems (or at least their fragmentary visibility on aerial photographs). They also highlight the difficulties inherent in their interpretation. In fact little is known about the nature or extent of prehistoric field systems in lowland Cornwall compared with the upland areas, in particular Bodmin Moor and parts of West Penwith.

Although it is possible that the lines of some prehistoric field boundaries in the Probus study area may have been perpetuated by medieval and early post medieval enclosure (those at Carvynick (Fig 18) are a possible example) and so might be fossilised in the present day field pattern, the aerial photographic evidence suggests that for the most part the layout of medieval open field systems was carried out with no regard for the former fieldscape and the medieval fields were on a completely different alignment to the prehistoric and Romano-British fields.

3.2.5 The settlement and farming pattern

The Probus study area is one of the most frequently flown areas of Cornwall and has, over the years, produced extensive evidence for prehistoric and Romano-British settlement and activity. At some locations there appear to be centres of intensive occupation in addition to the more typical (for lowland Cornwall) pattern of dispersed, isolated enclosures. It appears that certain favourable locations were either settled over a long period or sustained relatively large populations (or both). This can be represented to some degree by using polygons to define the extent of settlement and farming communities. The polygons were created manually in GIS, their boundaries drawn around groups of features lying in close proximity to one another. Although every effort was made to apply this method as consistently as possible it was, to some degree, a somewhat subjective process.

Ninety three polygons were created for prehistoric settlement clusters in the Probus study area. In addition a further 16 polygons were drawn around sites or groups of sites recorded in the HER as being of uncertain date but which could potentially be prehistoric in origin. These undated sites included 12 enclosures and 11 field systems or groups of field boundaries. In total, then, there are 109 polygons in the Probus study area (Fig 21).

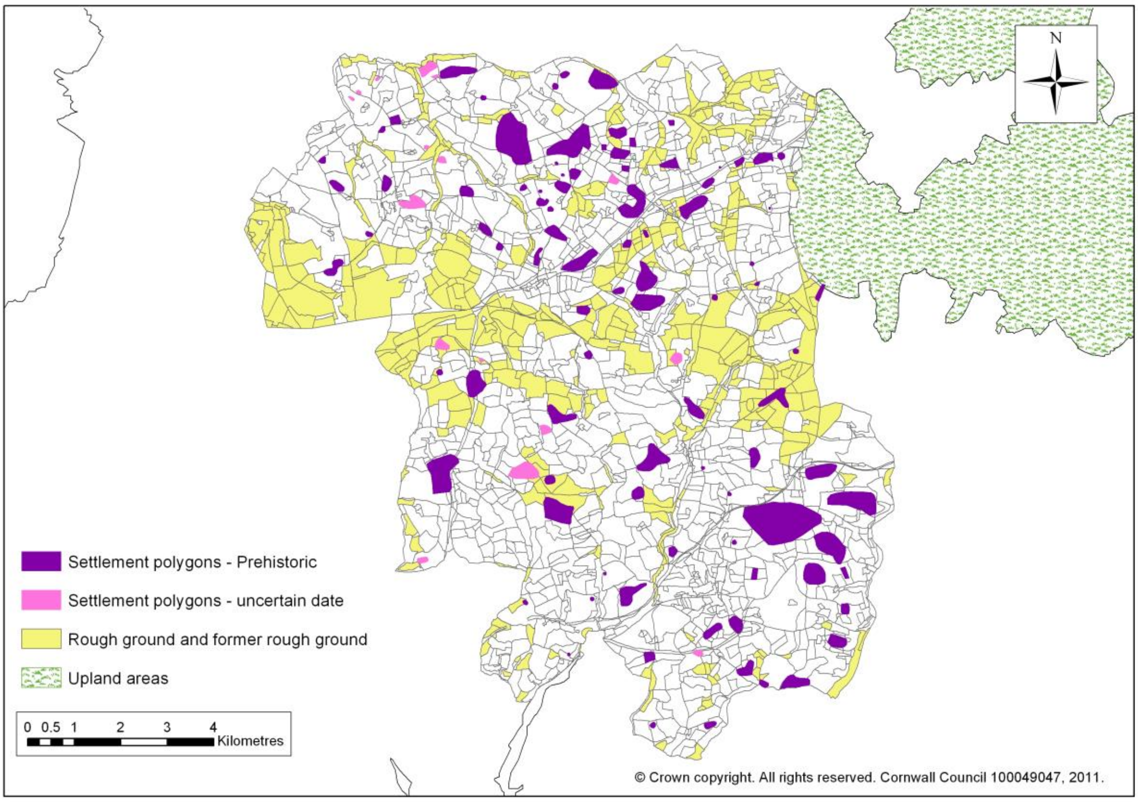

Fig 21. Probus study area: distribution of settlement polygons and rough ground (including former rough ground).

Whilst the polygons indicate the extent of settlement it is clear that there was an ample supply of rough ground, providing fuel and seasonal grazing land, across the centre of the study area as well as in the Hensbarrow upland to the east of the area.

The polygons range in size from 0.08ha (a single round house at Whitecross, St Enoder) to 109.6ha (Trenithan Bennett, Probus). The average size of the polygons is 8.4ha and only 27 are larger than this (table 26).

Size range of polygons (ha)	No. of polygons
<1.0	20
1.1 - 5.0	44
5.1 - 10	20
10.1 - 20	15
20.1 - 50	8
>50	2
Total	109

Table 26. Probus study area: size range of the settlement polygons.

The archaeological components vary from polygon to polygon, but the dominant features are the enclosures: 92 polygons contain at least one enclosure. Twenty seven polygons contain a single enclosure with no visible associated features and a further 23 contain a single enclosure with associated field boundaries and/or other associated features such as ditches, pits and trackways. Forty two polygons contain more than one enclosure, of which 29 are accompanied by associated features. A summary of the components making up each polygon is set out in table below.

Components	No of polygons
Single enclosure	27
Single enclosure and ditches	2
Single enclosure and field boundaries	7
Single enclosure and field system/s	7
Single enclosure, field system and trackways	1
Single enclosure and pits	1
Single enclosure and trackway	2
Single enclosure, round house and ditches	2
Single enclosure, round houses, field boundaries and pits	1
More than one enclosure	13
Enclosures and field boundaries	9
Enclosures and field systems	8
Enclosures, field system and trackways	1
Enclosures, field system and pits	3
Enclosures, round house and trackway	1
Enclosures, field boundaries and trackway	1
Enclosures, field boundaries, trackway and pits	1
Enclosures and trackways	1

Enclosures and ditches	1
Enclosures, ditches and pits	1
Hillfort	1
Hillfort, enclosure and pits	1
Hillfort, enclosures and trackways	1
Hillfort and field boundaries	1
Round house	1
Round houses, pits, post holes and ditches	2
Field system only	3
Field systems only	6
Field boundaries and trackways	1
Single field boundary	2
Total	109

Table 27. Probus study area: features contained in the settlement polygons.

NMP mapping extracts give some impression of the range of features in each polygon and the variety between different polygons.

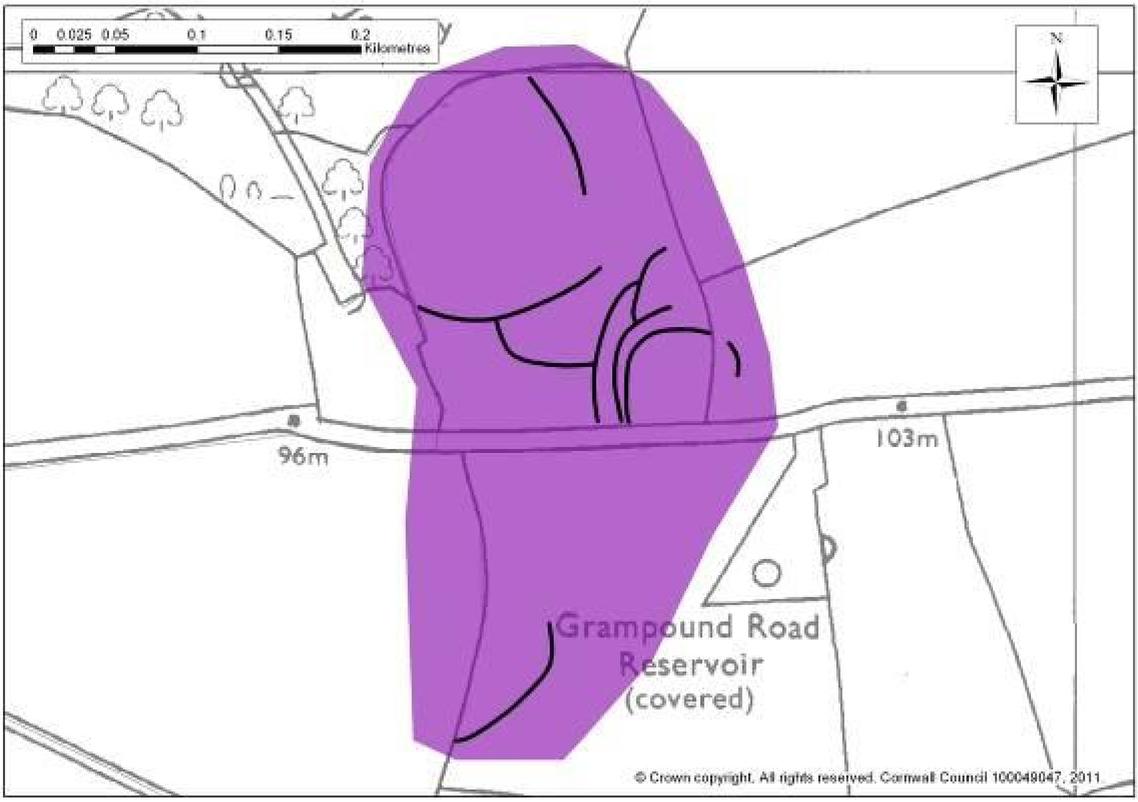

Fig 22. Settlement polygon at Grampound Road, Ladock.

The polygon at Grampound Road, Ladock covers slightly more than 8ha so represents the Probus study area average in terms of area covered. Just to the north of the west-east road are the partial cropmark remains of a multivallate enclosure situated on a ridge between the 95m and 100m contours. The inner enclosing ditch probably enclosed 0.26ha, but because the enclosure has been truncated by the road it is not possible to make an accurate measurement. The enclosure has at least one outer ditch, possibly two, and a possible appended enclosure or annex on its northern side. Where the ground slopes away to the northwest there are associated cropmark ditches. It is suggested in the HER that these are forming an enclosure whose circuit is partially fossilised in the existing field hedge. If so this enclosure would be notably large, covering 0.85ha. It is probably more likely that the ditches are the remnants of a field system. All these features were mapped during Cornwall's NMP and were assigned a high validity score. They are located in Medieval Enclosed land comprising former cropping units which had been re-arranged and at a later date amalgamated.

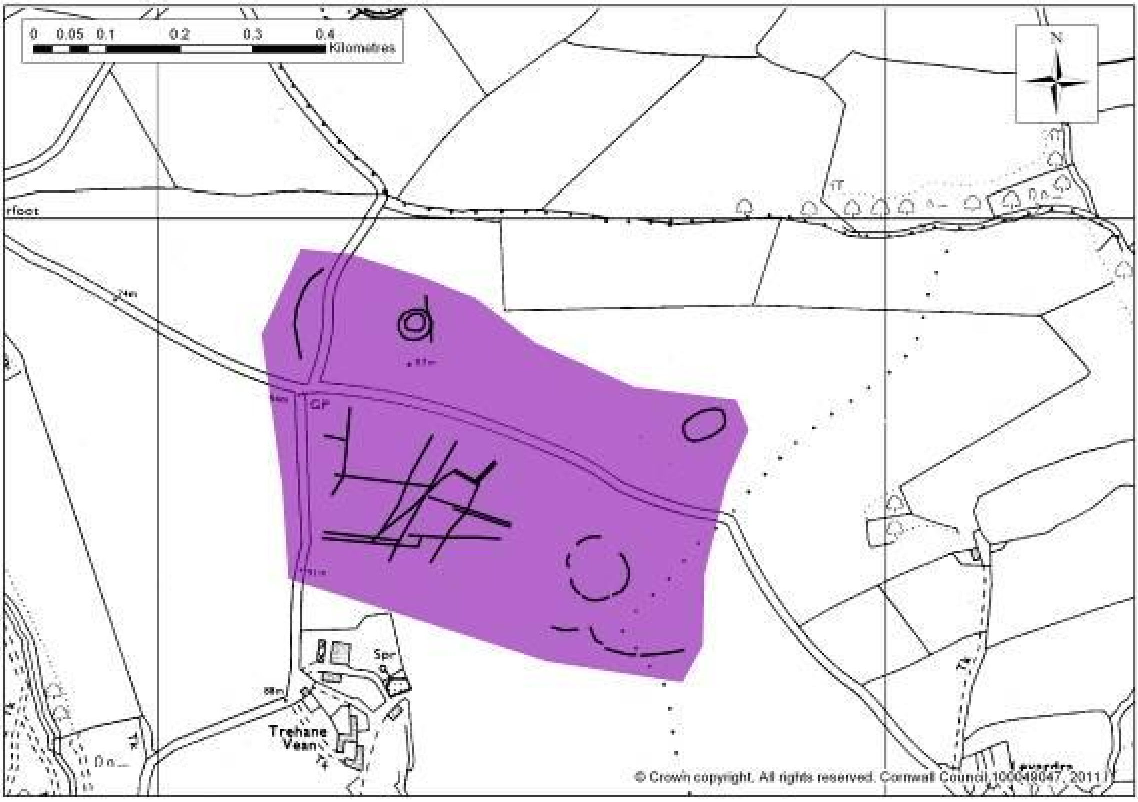

Fig 23. Settlement polygon at Trehane Vean, St Erme.

At Trehane Vean, St Erme a larger polygon covering 26.5ha contains the fragmentary remains of a field system and three possible prehistoric enclosures (Fig 23). The field system is recoded in the HER as being of early medieval date. However, there is clearly more than one phase of field boundary construction so part of this system could potentially be prehistoric in origin. The fields are rectilinear, formed by both ditch and bank and the typical field dimensions are 86m x 79m. The field system is situated on a hill top at 95m OD. The ground slopes away to the north where there is a small, curvilinear, double-banked enclosure covering 0.06ha in area. Where the ground slopes to the east there is an elongated oval enclosure bounded by a single ditch and enclosing 0.17ha. Where the ground slopes to the southeast there is a larger single-ditched enclosure, and 38m to the south of this a possibly associated curvilinear ditch. This enclosure appears as a fragmented cropmark ditch, although it is possible that the circuit of the enclosing ditch is interrupted, with two possible entrances in its western side. It encloses an area of 0.56ha. The two smaller enclosures are located in Early Modern Enclosed Land which was formerly Upland Rough Ground, while the field system and larger enclosure are in Medieval Enclosed Land (former cropping units which had been re-arranged during the twentieth century). All these features were plotted during Cornwall's NMP: the field system was allotted a high validity score of 4, whilst all three enclosures are of low validity.

At Goonhoskyn (Fig 24) a large polygon covering 36.3ha contains as its central feature a low validity single-ditched rectilinear cropmark enclosure covering 0.76ha. The enclosure appears to be truncated along its northwest side by the present day road. It is situated between 90m and 95m OD on west-facing ground sloping down from a ridge 145m to the northeast. A smaller single-ditched cropmark enclosure sits on the ridge. This enclosure covers 0.18ha and has a possible entrance in its southwest side. During Cornwall's NMP this enclosure was allocated a high validity score.

Between the two enclosures are a series of curving linear cropmark features which may be the remnants of an associated field system, with two possible small enclosures, both of which have been truncated. Further down the slope, to the west of Goonhoskyn, is a low validity oval enclosure bounded by a single bank surviving as a low earthwork between the 85m and 90m contours. It covers 0.17ha and has a likely entrance in its eastern side. It appears to have been cut by a later field boundary. To the west are a series of erratic, curvilinear ditches visible as cropmarks and interpreted as prehistoric field boundaries.

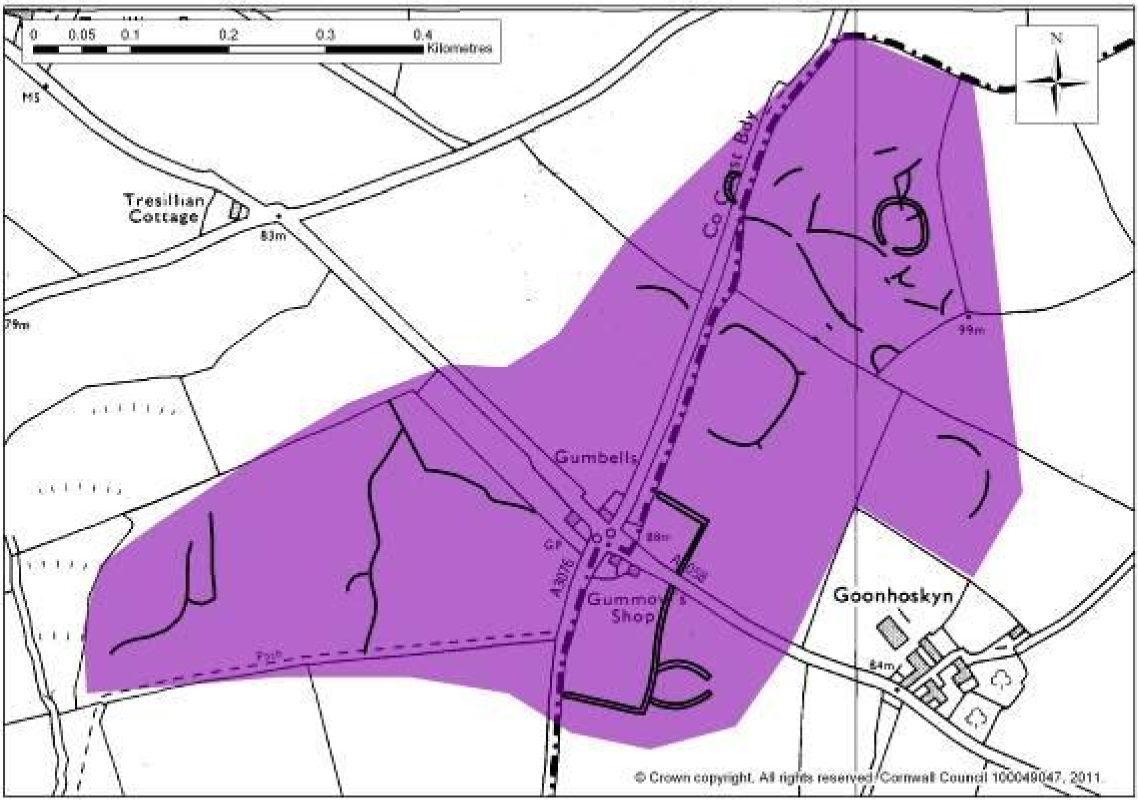

Fig 24. Settlement polygon at Goonhoskyn, St Enoder.

The settlement polygon at Trenithan Bennett, Probus is by far the largest from any of the four study areas (Fig 25). The polygon is situated between the 80m and 95m contours and contains Medieval Enclosed Land comprising former cropping units which had been amalgamated in the twentieth century. There are nine enclosures of various size and shape within the polygon. The most interesting is that towards the southeast (PRN 23019): this encloses 0.5ha, has a southeast-facing entrance and traces of a second enclosing ditch. It appears to have a small enclosure appended to its southern side and there are several internal features including a probable oval round house, suggesting a Romano-British date. Also of note, because of its notably reverse D-shaped form, is the northernmost enclosure (PRN 22969) which covers 0.3ha. Both these enclosures were allocated a high validity score during Cornwall's NMP.

In addition to the enclosures there numerous fragmentary linear features some of which are interpreted as field boundaries or trackways. Some may indeed be the surviving remnants of formerly more extensive field systems. The most coherent 'system' is that at the westernmost part of the polygon. This field system was visible on 1946 RAF aerial photographs as a series of low earthwork banks. There are two elements to it: larger fields in the west, typically measuring 148m x 63m, and smaller fields in the east, the best defined of which measures 35m square. All the other features in the Trenithan Bennett polygon are recorded as cropmark ditches. One notable feature is the centrally-located small circular enclosure with an internal pit. This feature is interpreted as a round barrow. The barrow, and those features in its close proximity, is situated on a hill top at 95m OD. Elsewhere the land slopes away to the north, south, northeast and southeast.

Clearly not all the Trenithan Bennett settlement features are contemporary but this complex of sites does demonstrate that in favourable locations in lowland Cornwall there was considerable density and continuity of occupation during the late prehistoric and Romano-British period.

Fig 25. Settlement polygon at Trenithan Bennett, Probus.

3.2.6 Barrows

The Lowland Cornwall dataset contains records for 84 barrows in the Probus study area. Of these only 35 were assigned a Morph validity of 3 or more and these are referred to below as high validity barrows. The remaining 49 are referred to below as low validity barrows. Forty of these were not mapped during Cornwall's NMP and therefore were not assigned a validity rating. Two of these were recorded as cropmarks in the HER (although were not mapped by the NMP team), 22 were recorded from documentary references and three as 'site of'. That leaves 13 low validity barrows classed as extant, three of which are situated in woodland and one in parkland (presumably these barrows were not visible on aerial photographs and were therefore not mapped).

3.2.6.1 Evidence for the barrows

The great majority of the high validity barrows have extant above ground remains (table 28) and a reasonable proportion of the low validity barrows are also recorded as extant in the dataset. When comparing the form of the high and low validity barrows similar proportions are recorded as cropmarks and as 'site of' (the three high validity barrows recorded as 'site of' were visible as cropmarks on aerial photographs examined by the NMP team).

Location	High validity barrows	Low validity barrows	All barrows
Cropmark	6 (17%)	8 (16%)	**14 (17%)**
Extant	26 (74%)	15 (31%)	**41 (49%)**
Documentary	0	22 (45%)	**22 (26%)**
Site of	3 (9%)	4 (8%)	**7 (8%)**
Total	**35**	**49**	**84**

Table 28. Probus study area: Barrows – types of evidence.

3.2.6.2 Distribution of the barrows

There are two main foci for the distribution of high validity barrows – around the high ground of Newlyn Downs and in the south eastern part of the study area (Fig 26).

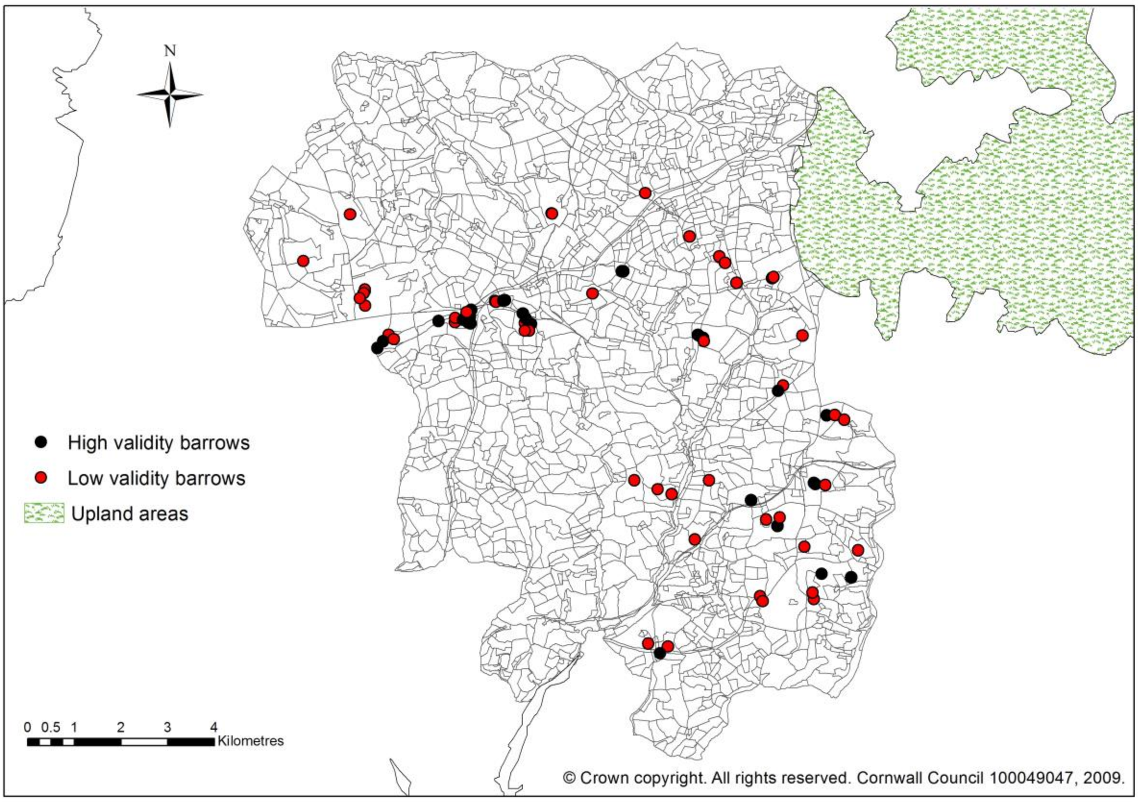

Fig 26. Distribution of high validity and low validity barrows in the Probus study area

In some cases low validity barrows are recorded from these same two focal points, but they also are recorded from other parts of the study area where no high validity barrows were identified. To a large extent this reflects the evidence for the barrows in that there is a dense cluster of extant barrows on Newlyn Downs and a number of those in the southeast also have extant above ground remains (as well as others in this location which were visible as clear cropmarks). By contrast the majority of the barrows in central and northern areas are recorded from documentary references (Fig 27)

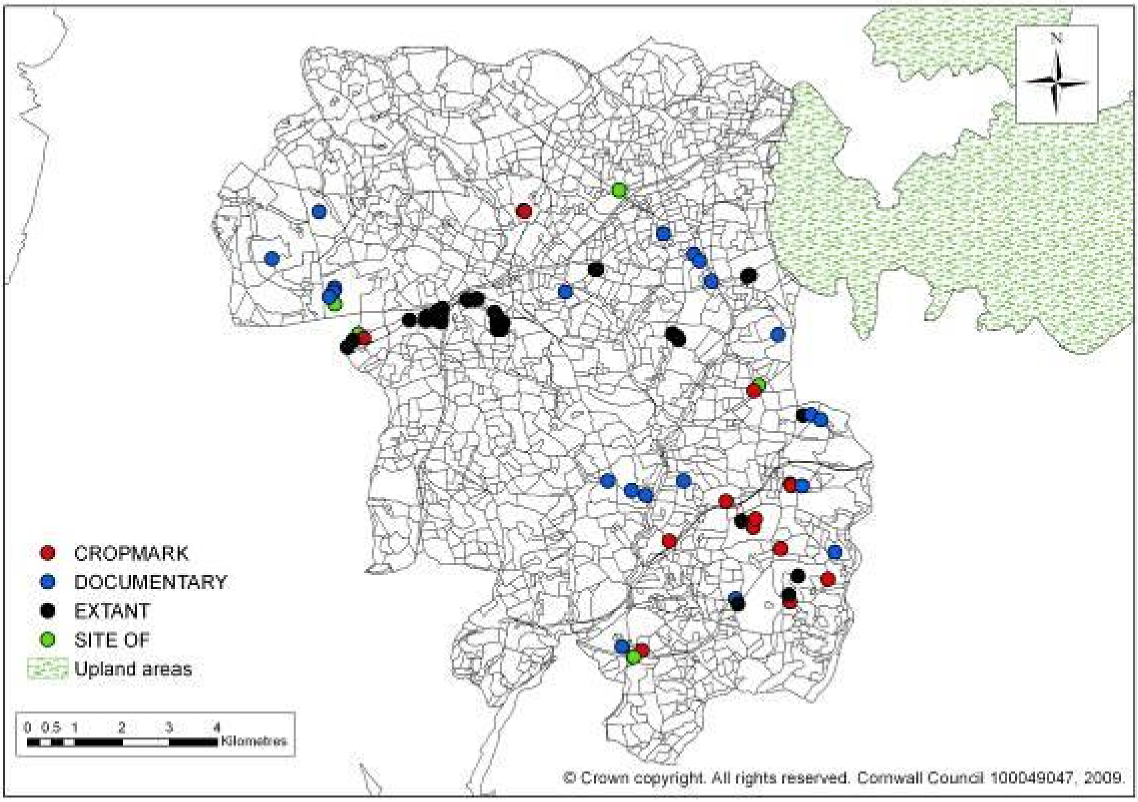

Fig 27. Distribution of barrows colour coded by evidence in the Probus study area

In total 35 of the barrows occur in isolation and elsewhere two or three are found together in proximity (for instance at Carnwinnick, Probus there are three barrows within a distance of 385m of each other). But the distribution pattern is notable for the proliferation of cemeteries in the northwest. At Penglaze, St Erme, in former rough ground to the immediate south of Newlyn Downs is a linear group of three barrows with a cropmark outlier. A kilometre to the north at Fiddler's Green is another linear group of three barrows, with three others in close proximity but not on the same linear alignment, and an outlier 200m to the south.

At Carland Cross, 1.5km to the east, is a group of 10 extant barrows which form a loosely defined cemetery, although three (and possible a fourth) are aligned northwest – southeast in a linear arrangement. There are two barrows 450m to the east of this cemetery and 130m further east is a well-defined linear cemetery consisting of three extant barrows. Seven hundred metres to the southeast, at Hendra Wood, is another linear cemetery, in this case formed by five extant barrows, with five outliers. Overall there are seven groups of three or more barrows which could be described as cemeteries.

3.2.6.3 Topographical location of the barrows

The barrows are situated in a range of locations in the landscape, but 72% of high validity barrows are found predominantly in prominent positions on ridge lines and hill tops. Only 37% of low validity barrows are located in these prominent locations, with 41% located on sloping ground.

Location	High validity barrows	Low validity barrows	All barrows
Hill top	4 (12%)	5 (10%)	**9 (11%)**
Plateau	2 (6%)	4 (8%)	**6 (7%)**
Promontory	0	1 (2%)	**1 (1%)**
Ridge	21 (60%)	13 (27%)	**34 (41%)**
Slope	8 (23%)	25 (51%)	**33 (39%)**
Valley floor	0	1 (2%)	**1 (1%)**
Total	**35**	**49**	**84**

Table 29. Probus study area: Barrows – location in the landscape.

Whereas the majority of high validity barrows are situated above the 115m contour, the low validity barrows are more evenly spaced above the 80m contour with a greater proportion found between the 80m and 115m contour (table 30).

Height	High validity barrows	Low validity barrows	All barrows
30-50m	0	0	**0**
51-80m	5 (14%)	12 (24.5%)	**17 (20%)**
81-115m	11 (32%)	26 (53.1%)	**37 (44%)**
115m+	19 (54%)	11 (22.4%)	**30 (36%)**
Total	**35**	**49**	**84**

Table 30. Probus study area: Barrows – altitude.

When topographical aspect is considered unsurprisingly the majority of high validity barrows, predominantly sited on ridges and hill tops, face all aspects (table 31). A majority of low validity barrows also face all aspects, but this is less clear than is the case with the high validity barrows as many of the low validity barrows are located on lower lying slopes.

Aspect	High validity barrows	Low validity barrows	All barrows
All aspects	22 (63%)	15 (31%)	**37 (44%)**
E	4 (11%)	8 (16%)	**12 (14%)**
N	2 (6%)	7 (14%)	**9 (11%)**
NE	0	3 (6%)	**3 (4%)**
NW	0	3 (6%)	**3 (4%)**
S	1 (3%)	1 (2%)	**2 (2%)**
SE	2 (6%)	3 (6%)	**5 (6%)**
SW	2 (6%)	7 (14%)	**9 (11%)**
W	2 (6%)	2 (4%)	**4 (5%)**
Total	**35**	**49**	**84**

Table 31. Probus study area: barrows – topographical aspect.

When the broad aspects faced by the barrows is analysed there is a considerable difference between the high validity and low validity barrows (table 32). There is a clear preference for locations facing all aspects within the high validity barrows sample but the aspects faced by low validity barrows are roughly equally divided between the five options.

Broad aspect	High validity barrows	Low validity barrows	All barrows
Western (W, NW, SW)	4	12	16
Eastern (E, NE, SE)	6	14	20
Northern (N, NE, NW)	2	13	15
Southern (S, SE, SW)	5	11	16
All aspects	22	15	37

Table 32. Probus study area: barrows – broad topographical aspect

3.2.6.4 Size and form of the barrows

The size of the barrows could be reliably measured in 42 cases. Diameters range from 8m to 37m, although the average diameter is 16m. The barrows were all recorded in the HER as either 'round barrow' or 'bowl barrow', but on measuring the mapped barrows, it was found that two are actually oval in shape. These are one of two conjoined barrows (PRN 32021.1) on Newlyn Downs, St Newlyn East, which measured 14m x 11m, and PRN 50692 at Resparveth, Probus, which measured 27m x 16m. Both were recorded as cropmark ditches and were assigned high validity scores of 5 and 3 respectively. A summary breakdown of diameter lengths for the remaining 40 measurable barrows is set out in table 33 below.

Diameter (m^2)	High validity barrows	Low validity barrows	All barrows
5-10	3	0	**3**
11-15	11	2	**13**
16-20	11	6	**17**
21-25	4	1	**5**
26-30	1	0	**1**
31-35	0	0	**0**
36-40	1	0	**1**
Total	**31**	**9**	**40**

Table 33. Probus study area: barrows – measurable diameters.

The barrows were predominantly recorded as earthen mounds (whether extant or plough levelled) but nine were identified as ring ditches and three consisted of a mound with surrounding ditch (table 34).

Form	High validity barrows	Low validity barrows	All barrows
Mound	24	6	**30**
Ditch	6	3	**9**
Mound and ditch	3	0	**3**
Total	**33**	**9**	**42**

Table 34. Probus study area: barrows – form of remains.

Although the barrows are overwhelmingly recorded as simple circular mounds or ring ditches there are a few which differ from this template. Apart from the two oval barrows mentioned above (one of which appears to be a pair of conjoined barrows), there are two which have double ditches. These are PRN 22492.1 at Mitchell, St Newlyn East and PRN 22370.1 at Trendeal, Ladock. And at Trenithan Bennett, Probus PRN 22970 appears to contain a large internal pit (Fig 25).

4 Penwith

4.1 Character of the Penwith study area

The Penwith study area is located in the far west of Cornwall (Fig 28). It comprises the civil parishes of Paul, Penzance, Marazion, St Hilary, Perranuthnoe and most of the parishes of St Buryan and Ludgvan (the remainder of these parishes are within the upland area and are therefore outside the scope of the project). The definition of this study area was based on civil rather than ecclesiastical parishes in order to conform to size constraints: the civil parish of Penzance is made up of former parts of the large ecclesiastical parishes of Lelant, Gulval and Madron. In total the study area covers 93.838 km sq including approximately 23 km of coastline around Mounts Bay.

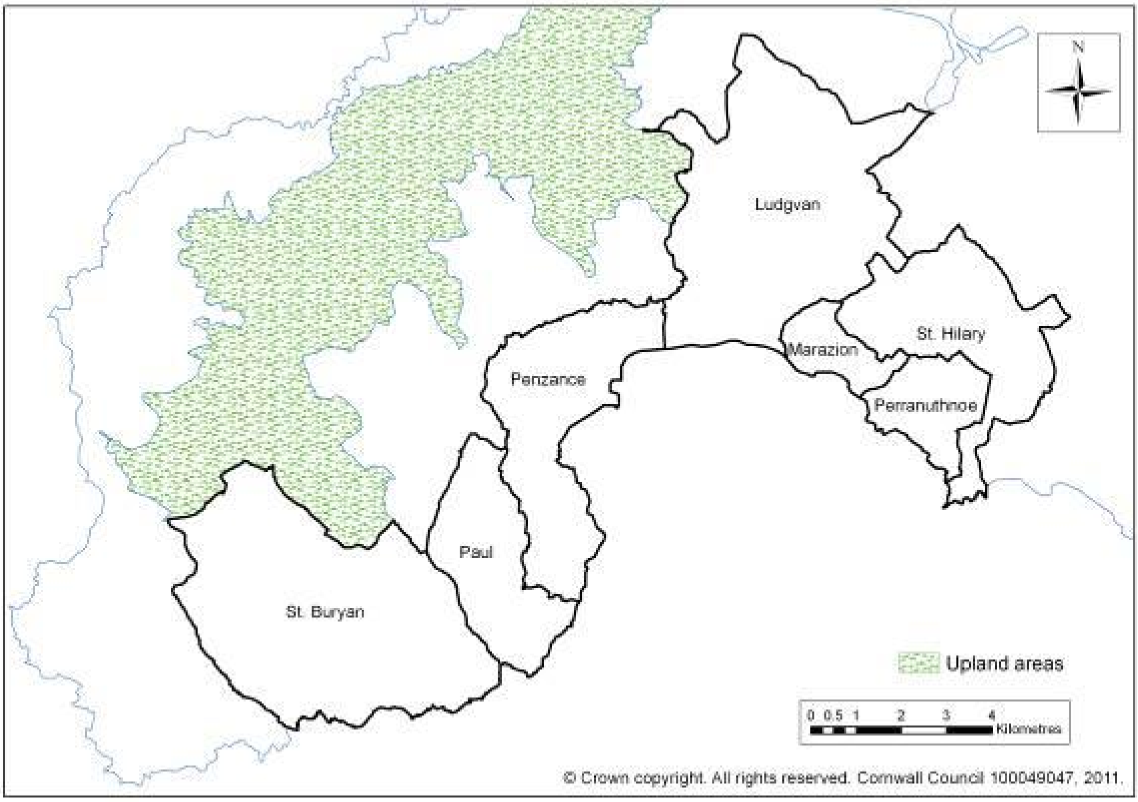

Fig 28. The Penwith study area showing civil parishes.

The central feature of the study area is Penzance and Newlyn, one of the largest urban centres in Cornwall, which has grown substantially since the end of the nineteenth century (Fig 29). Other substantial (relatively speaking) coastal settlements are Mousehole and Marazion. Inland the main settlements are St Buryan in the west and Goldsithney and Crowlas in the east. Elsewhere the landscape is quite densely populated with the typical dispersed settlement pattern of villages, hamlets, farmsteads, single farms and other single dwellings. The A30 passes through Penzance on its way to Land's End and Penzance is also the western terminus for the Great Western Railway, which runs out of the study area northeast from Penzance parallel with the east-bound A30. The area is a popular holiday destination and there are numerous camp and caravan sites and recreational facilities, especially along the coast. Penzance is a working port and Newlyn is one of the largest fishing ports in the UK. Inland the areas around Crowlas and St Buryan are major agricultural centres.

Much of the land located on the eastern edge of Mount's Bay, in the parishes of St Hilary, Perranuthnoe, Marazion and Penzance, is low lying (below the 65m contour). This includes the area of Marazion Marsh, a large open area of pools and rushes, which extends inland before narrowing into a river valley.

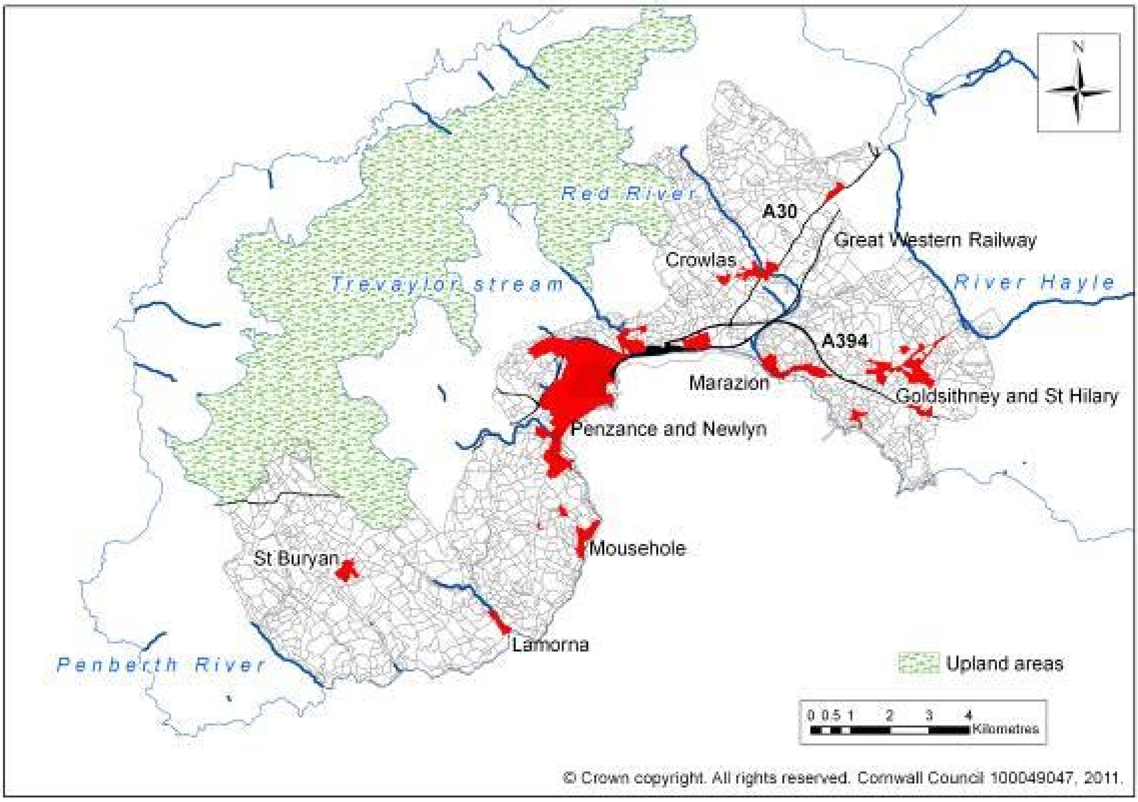

Fig 29. The Penwith study area showing major settlements, rivers and lines of communication.

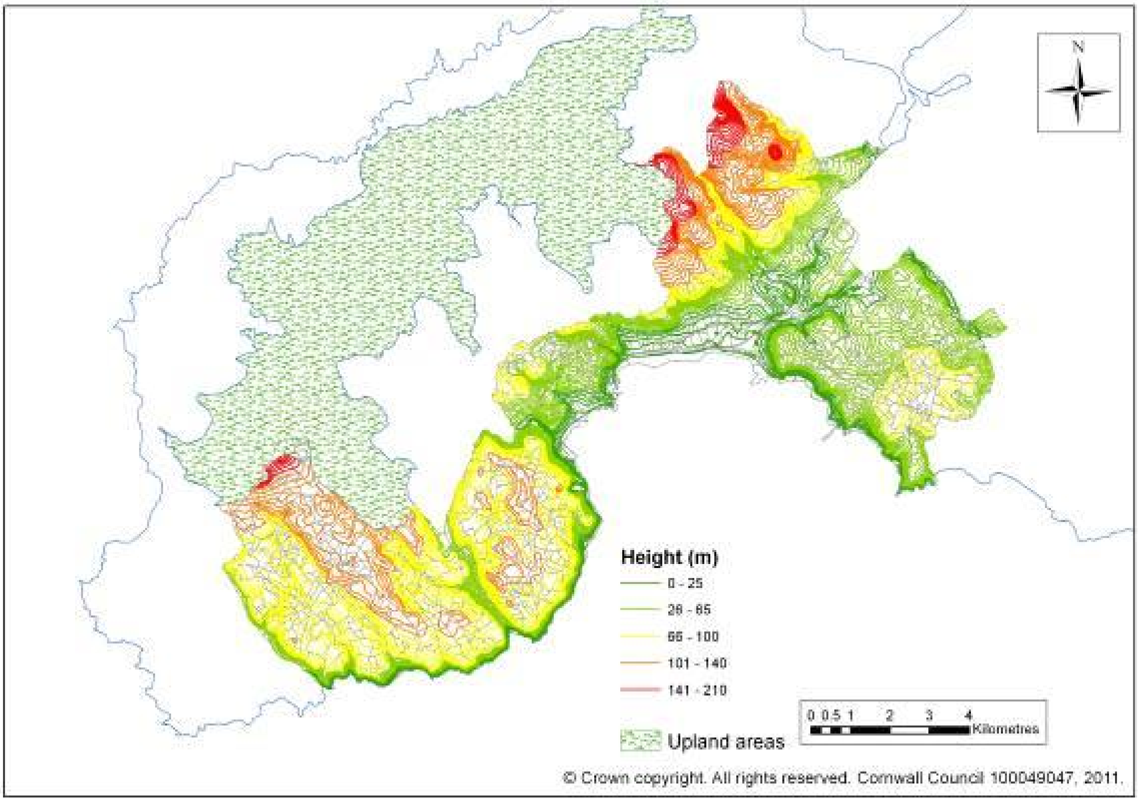

Fig 30. Topography of the Penwith study area.

Where the area overlies the West Penwith granite the ground rises to the ridge that forms the backbone of the peninsula (Fig 30). In the northern parts of Ludgvan and St Buryan, the area includes high ground, including Trencrom Hill (170m) and the shoulder of Carn Brea (175m), with the summit of Trink Hill, near Nancledra, Ludgvan, forming the highest point at 210m.

The granite area is characterised by a drainage pattern of stream valleys that run inland in a general northwest – southeast orientation e.g. Penberth, St Loy, Lamorna, Newlyn, Larrigan, Chyandour, Ponsandane, Rosmorran, Treassow, Red River and the valley at Trevethoe.

The eastern boundary of St Hilary parish, and the study area, is defined by the River Hayle, a prominent landscape feature in the area.

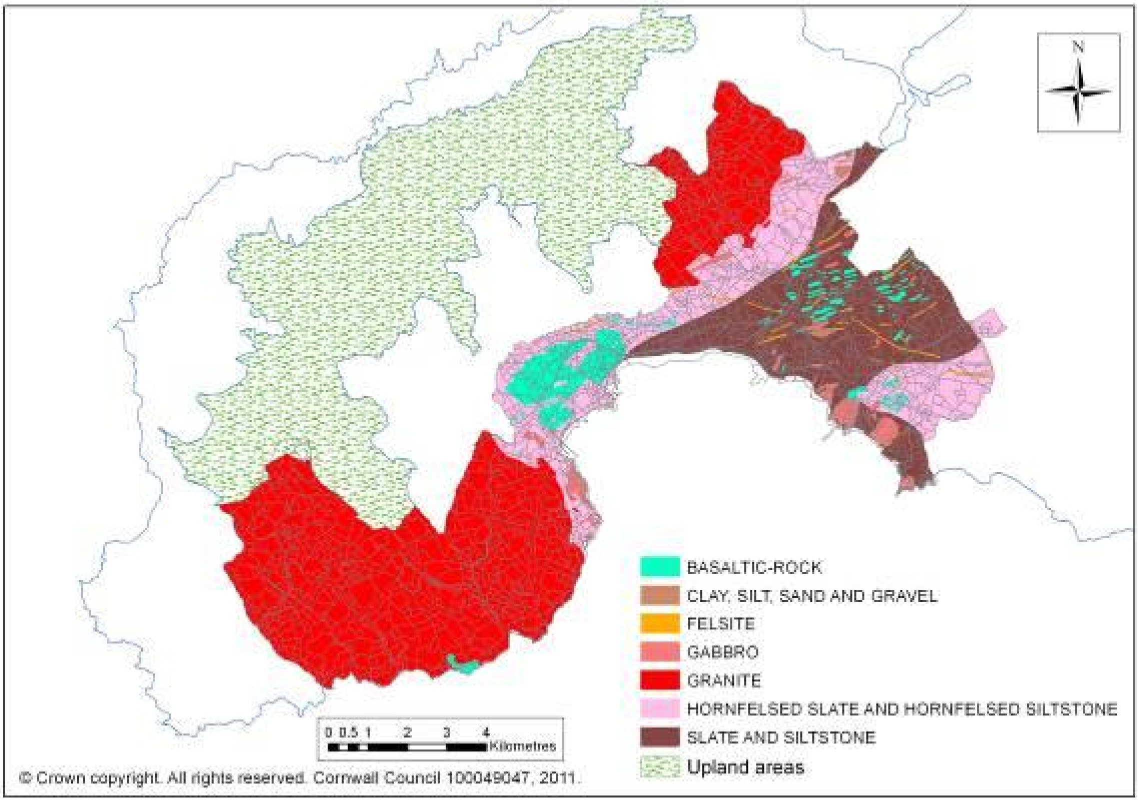

Fig 31. The Penwith study area: simplified bedrock geology.

The underlying bedrock geology can be broadly characterised as forming three zones (Fig 31). To the west of Newlyn the bedrock is entirely granite of the Land's End Intrusion apart from a small area of metabasalt of the Mylor Slate formation at Tregiffian. Penzance and Newlyn overlie Mylor slate deposits of Hornfelsed slate and Hornfelsed siltstone, interspersed with metabasalt. In the east there are further deposits of Hornfelsed slate and Hornfelsed siltstone, bisected by a large band of slate and siltstone with lenses of basaltic rock and felsite. In the northernmost part of this eastern zone there is more granite on the edge of the Penwith uplands. At various points around the coast are dotted deposits of gabro and microgabro.

The granite is overlain for the most part by well drained gritty loams of the Moretonhampstead soil type, although in places this gives way to Laployd seasonally wet peaty loams (Fig 32). The slate and siltstones are overlain predominantly by Denbigh 2 well drained fine loams, with Manod and Trusham loams in places. Marazion marsh is characterised by fine silty and clayey soils of the Conway type.

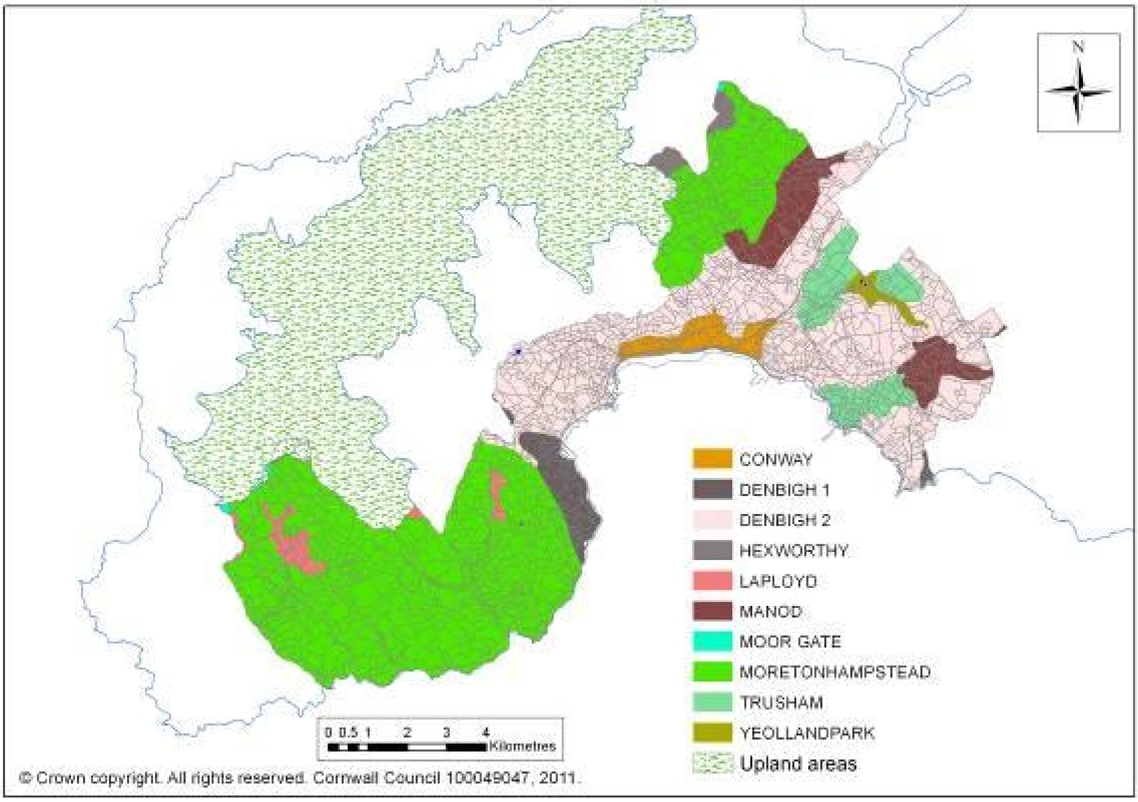

Fig 32. Soil types in the Penwith study area.

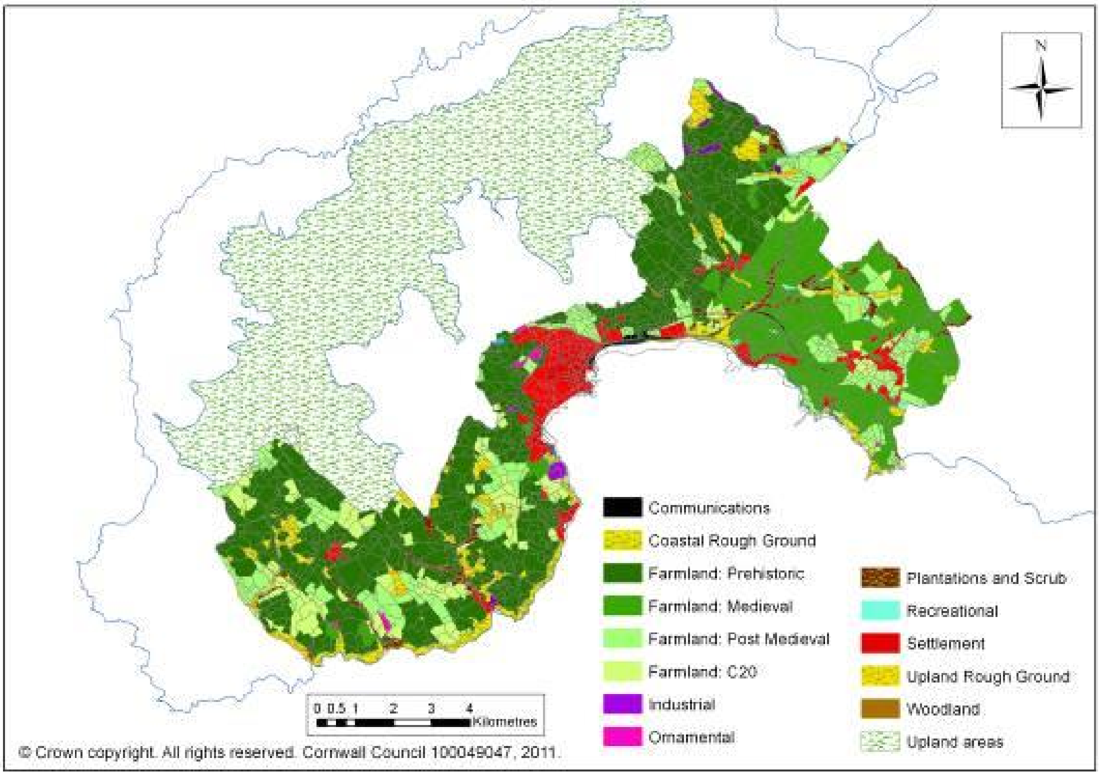

Fig 33. The 1994 HLC for the Penwith study area.

When considering the 1994 HLC, there are significant differences in the relative proportion of the study area covered by the various enclosed land HLC types compared with Lowland Cornwall as a whole (Fig 33). Primarily this is because West Penwith was the only area of the county where the present day field pattern could be confidently said to fossilise the pattern of the later prehistoric field layout and be classed as Farmland: Prehistoric. In the Penwith study area 40.6% of the area is taken up by this HLC Type, as opposed to only 3% for Lowland Cornwall overall. One ramification of this is that the HLC Type Farmland: Medieval only covers 18% of the study area compared with 52% in Lowland Cornwall as a whole. The extent of the 1994 HLC Types Farmland: Post-medieval and Farmland: C20 are also less than in Lowland Cornwall generally (3% less in both cases). Other differences are that in Penwith the proportions of Upland and Coastal Rough Ground are somewhat higher than the Lowland Cornwall average, and the extent of settlement is almost twice as great. Conversely the extent of woodland HLC Types is significantly less (0.06% as opposed to 2% for Lowland Cornwall).

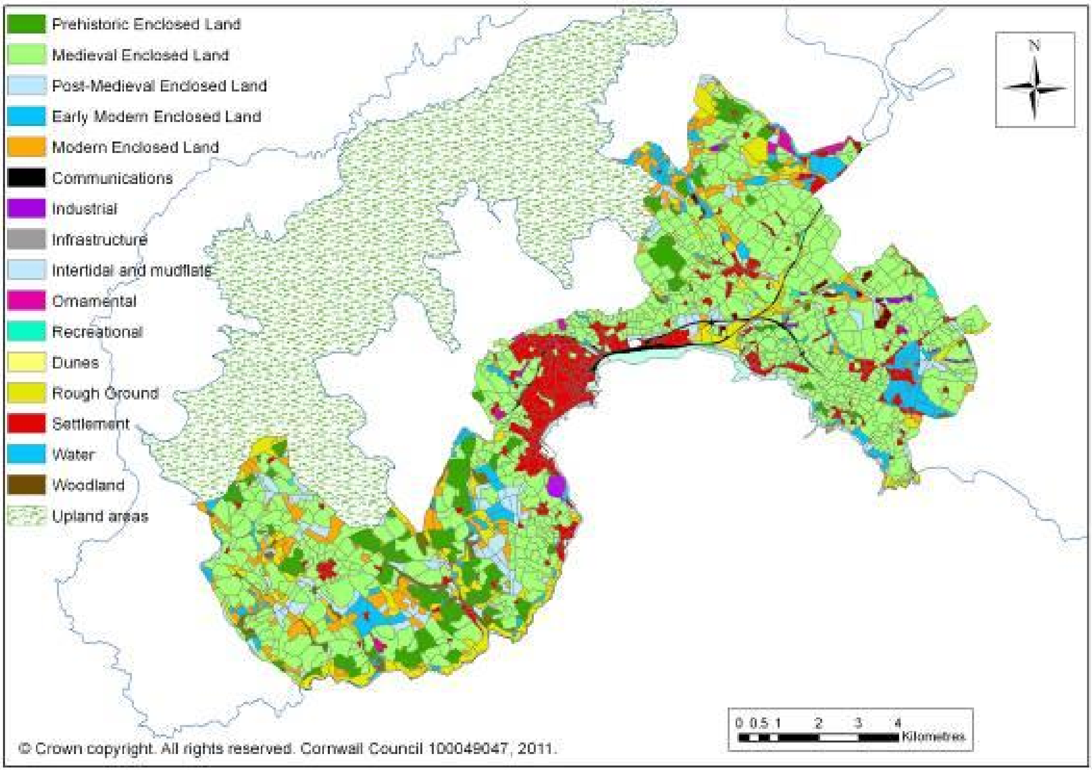

Fig 34. Penwith study area showing the refined HLC 2011 time-slice.

Like the other three study areas the landscape in Penwith is predominantly one of enclosed farmland: enclosed land forms 80% of the study area (Figs 33 and 34). This is a similar proportion to the Pelynt study area, but less than either Probus or Poundstock (85% and 87% respectively). In the case of Penwith the lower percentage of enclosed land is due partly to the more extensive areas of coastal and upland rough ground but, in particular, to the significantly larger area taken up by settlement. Indeed the rate at which the area of settlement is expanding is made clear by comparison of the refined HLC carried out as part of this project with that undertaken in 1994. In the 1994 HLC settlement types formed 6.7% of the study area; in 2011 this figure had risen to 8.5%.

A more significant difference between the 1994 HLC and the Lowland Cornwall refined HLC is the extent of land classed as the HLC Type Farmland: Prehistoric. Much of this type has been reclassified as Medieval Enclosed Land as a result of the more fine grained analysis undertaken during this project. A detailed discussion of the refined HLC is contained in Lowland Cornwall Volume 3, but the suggestion is that, whilst this land is likely to have been first enclosed in prehistory, alterations in the medieval period have changed its character to such an extent that it should better be characterised as Medieval Enclosed Land. As a result the extent of Prehistoric enclosed land forms only 7.5% of the Penwith study area in the refined HLC and the extent of medieval enclosed land has conversely expanded to 51.7% as opposed to the 18% identified in the 1994 HLC (Figs 33 and 34).

Another difference, similar to that in the Probus study area, is that a significant portion of the land classed in 1994 as post medieval enclosed land has been reinterpreted as either Modern enclosed land, Early modern enclosed land or as Medieval enclosed land (the extent of post medieval enclosed land in the 2011 HLC is approximately half that in the 1994 HLC).

In the HLC 2011 time-slice land classed as rough ground covers less than 10% of the study area, whereas analysis of the late medieval time-slice shows that rough ground covered almost a third of the area (Fig 35). Most of this former rough ground has been enclosed in the post medieval, early modern and Modern periods.

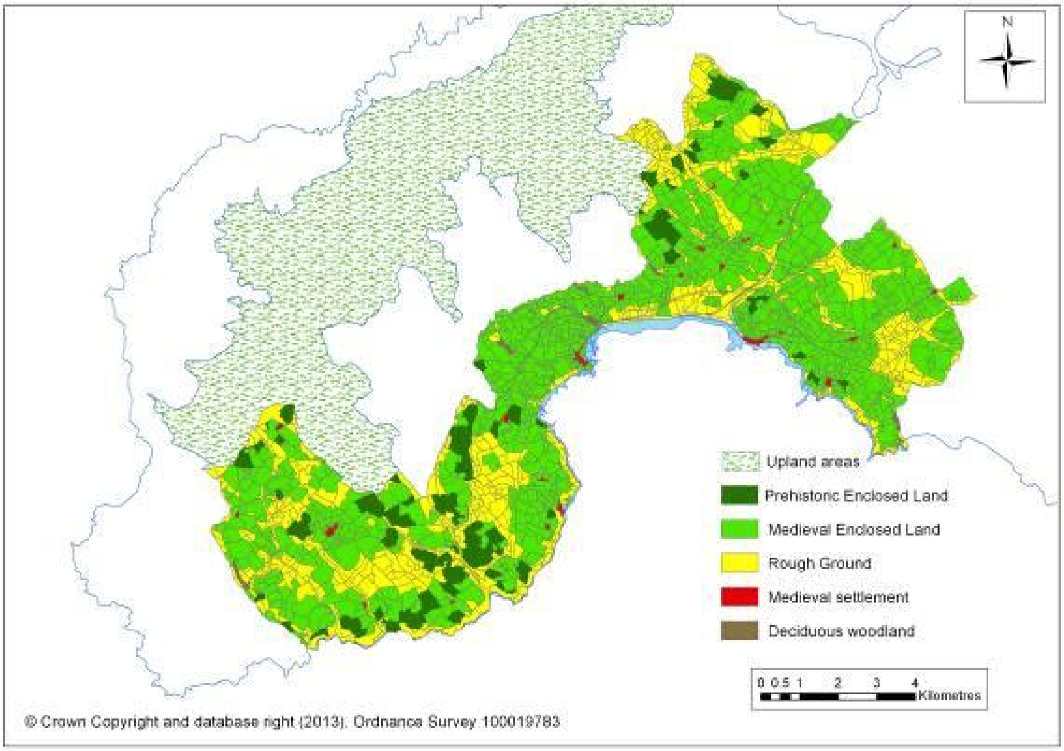

Fig 35. Penwith study area showing the refined HLC late medieval time-slice.

The late medieval HLC shows that the distribution of rough ground and enclosed land is more interspersed than in the Probus study area. Although there is little rough ground in the area that is now Penzance and Newlyn, there are substantial tracts to both east and west and these are intermingled with areas of enclosed land. It is clear from this map that the farmers who enclosed the land had ready access to a plentiful supply of rough ground. Also clear from the late medieval HLC time-slice is the relative absence of woodland: out of the four study areas Penwith is the least wooded. Only 1.5% percent of the area is covered by woodland, compared with more than 4% for Probus and Poundstock and 8% for Pelynt.

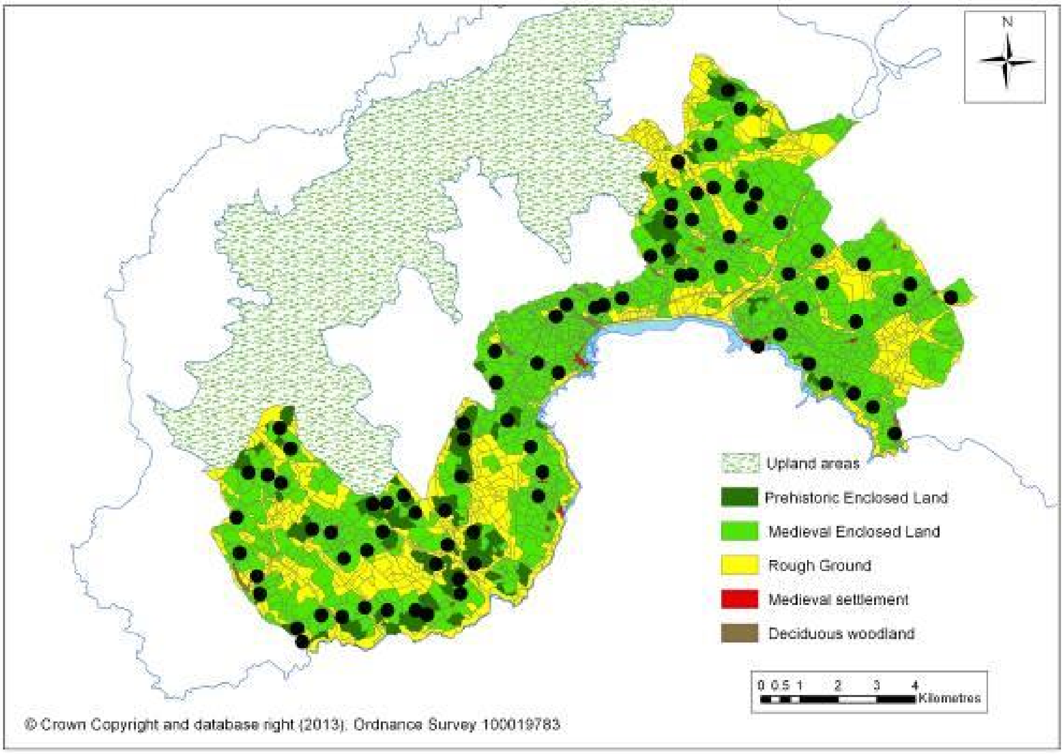

Fig 36. Distribution of early medieval settlements in the Penwith study area. Background is the late medieval time-slice.

Mapping of settlements with early place-name elements indicates the potential settlement pattern of the early medieval period and, as in the Probus study area, this corresponds closely with the late medieval time-slice (Fig 36). Of the 84 early medieval settlements all but two are located in areas of enclosed land; nine are sited in Prehistoric Enclosed Land and 73 in Medieval Enclosed Land. Two are located in land classed as Valley Rough Ground and both are within 50m of enclosed land.

4.2 Prehistoric and Romano-British archaeology in the Penwith study area

The Lowland Cornwall cropmark visibility model, which indicates those areas where cropmarks are most likely to form and are most likely to be visible, classes 64% of the Penwith study area as falling within the high visibility zone (Fig 37). The low visibility zone is considerably larger than that of the Probus study area, covering 29%, and the medium probability zone covers 22%. The large high visibility zone is no surprise because West Penwith is recognised as a nationally (and internationally) important historic landscape containing many well-known monuments and it has been flown on numerous occasions. In addition a relatively high number of previously unknown sites were recorded here during Cornwall's NMP.

A total of 208 monument sites in the project dataset are located within this study area (Fig 38), which equates to a site density of 2.23 sites/km sq. Of these, 154 (74%) are captured in the high visibility zone of the model, 25 (12%) in the medium zone, and 29 (14%) in the low probability zone. So in the Penwith study area the visibility model does not work as well as in Probus: fewer sites are captured in the high visibility zone and the medium and low visibility zones appear to be interchangeable. Nonetheless the performance of the high visibility zone is reasonably accurate.

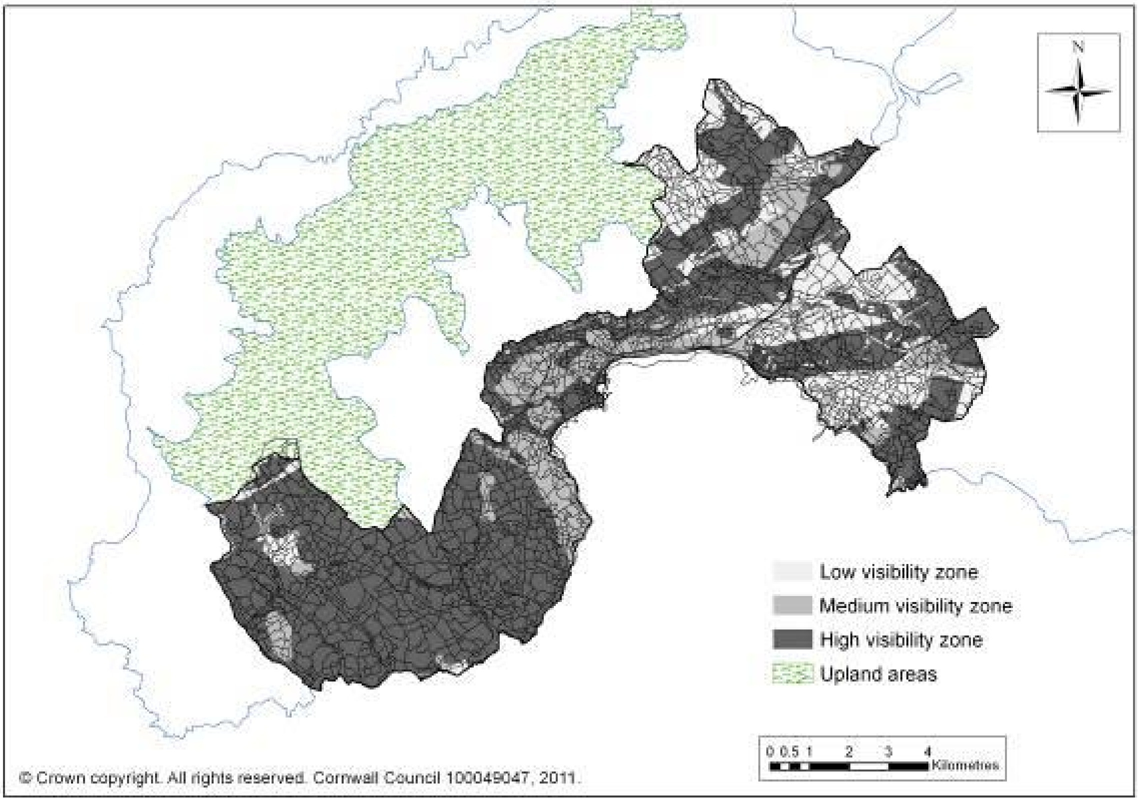

Fig 37. The Lowland Cornwall cropmark visibility model for the Penwith study area.

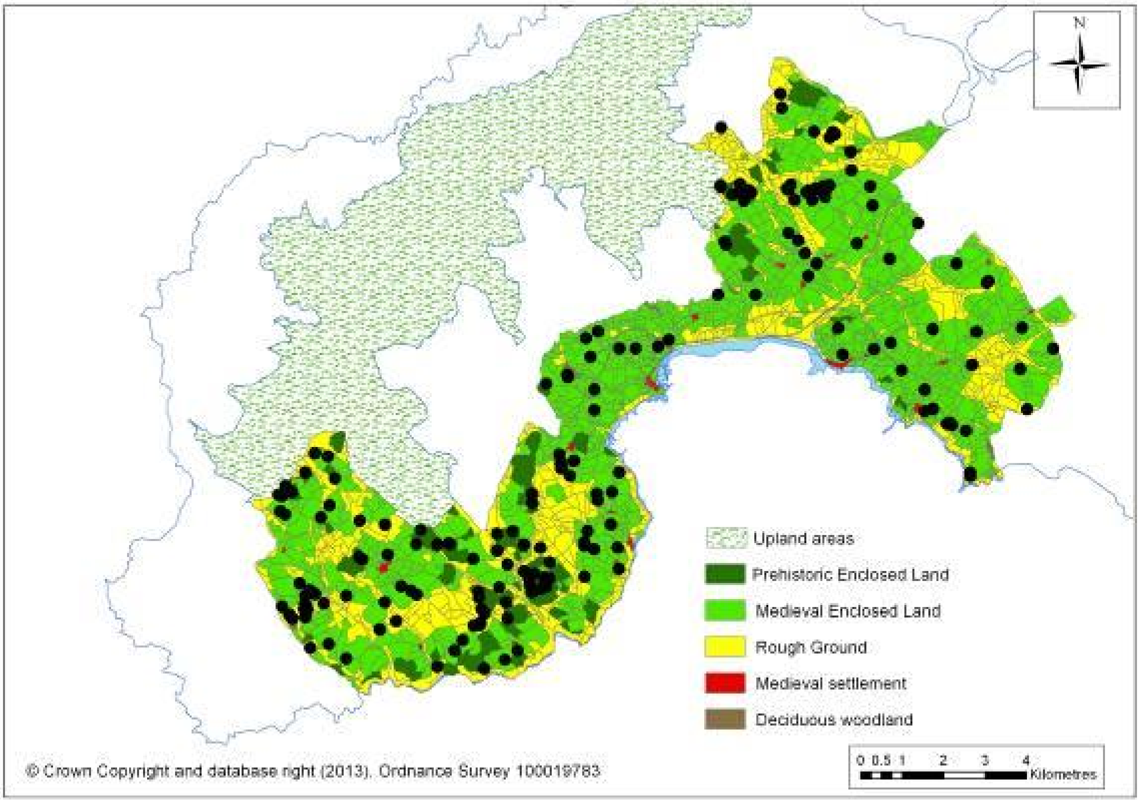

Fig 38. The distribution of all prehistoric/RB monument sites in the Penwith study area. Background formed by the late medieval time-slice.

One site was identified from geophysical survey and five are recorded as 'site of' – formerly known sites which have since been destroyed. The form of the remaining 203 sites is equally divided between those with extant remains (68 sites), those visible as cropmarks (68 sites) and those recorded from documentary sources (67 sites).

Whilst the proportion of sites surviving as earthworks is broadly similar to that in the Probus study area (32% in Penwith, 27% in Probus), the proportion of cropmark sites and those recorded from documentary sources are significantly different: whereas almost a third of the monuments in Penwith are recorded from documentary evidence, the corresponding figure for Probus was only 17%. Conversely only a third of sites in Penwith are recorded as cropmarks; in Probus this figure was more than 50%. As in the Probus study area the great majority of sites recorded in the Penwith study area are settlement related, listed in the HER as rounds, enclosures, round houses and courtyard house settlements. A breakdown of site types is set out in table 35 below.

Site type	**Number**	**Percentage**
Round	73	34.9%
Enclosure	32	15.3%
Barrow	46	22.0%
Field system	26	12.4%
Field boundary	8	4.3%
Hillfort	5	2.4%
Round house	15	7.2%
Courtyard house settlement	3	1.4%
Total	**208**	

Table 35. *Breakdown of prehistoric/RB site types recorded from the Penwith study area*

Overall site density in the Penwith study area is marginally higher than in Probus and there are also some differences in the proportions of site types making up the dataset. Rounds and enclosures form a slightly smaller proportion of the Penwith dataset and barrows form a considerably smaller proportion (22% compared with 31% in Probus). On the other hand there are proportionately considerably more field systems, field boundaries and round houses recorded from Penwith. Despite the long coastline no cliff castles are recorded in the Lowland Cornwall dataset for the Penwith study area.

4.2.1 Enclosures

There are 105 enclosures in the Lowland Cornwall dataset for the Penwith study area. Fifty six were mapped and recorded during Cornwall's NMP and of these, 44 were assigned a validity score of 3 or higher and these are referred to below as 'high validity' enclosures (see section 1.5.1 for definition). The remaining 61 enclosures, with a validity rating of 1 or 2 or with no validity rating (i.e. those not mapped during the NMP), are referred to as 'low validity' enclosures. Of those with a zero validity rating, 37 are listed in the HER as sourced from documentary references and therefore have no visible surviving remains. Three are records for 'site of' and one is recorded by geophysical survey (PRN 29033 at Treveneage). Seven are listed as extant features and one as a cropmark. It is unclear why the cropmark and extant rounds were not mapped during Cornwall's NMP.

4.2.1.1 Evidence for the enclosures

The evidence for the enclosures is summarised in the table below.

Evidence	High validity enclosures	Low validity enclosures	Total
Cropmark	35 (80%)	9 (15%)	44 (42%)
Extant	8 (18%)	11 (18%)	19(18%)
Documentary	1 (2%)	37 (61%)	38(36%)
Geophysical	0	1 (1%)	1 (1%)
Site of	0	3 (5%)	3 (3%)
Total	**44**	**61**	**105**

Table 36. Evidence for all 105 enclosures (percentages are rounded up or down for clarity).

In broad terms more than twice as many enclosures are only visible as cropmarks or soilmarks than have surviving above ground remains. The reason why the percentage of cropmarks is much higher than this in the high validity sample and lower in the low validity sample is because only one enclosure identified from documentary evidence has visible remains. As a result the other 37 documentary enclosures were not mapped during the NMP project and were therefore not ascribed a validity value. A high percentage of the enclosures are recorded from documentary references compared with the Probus study area.

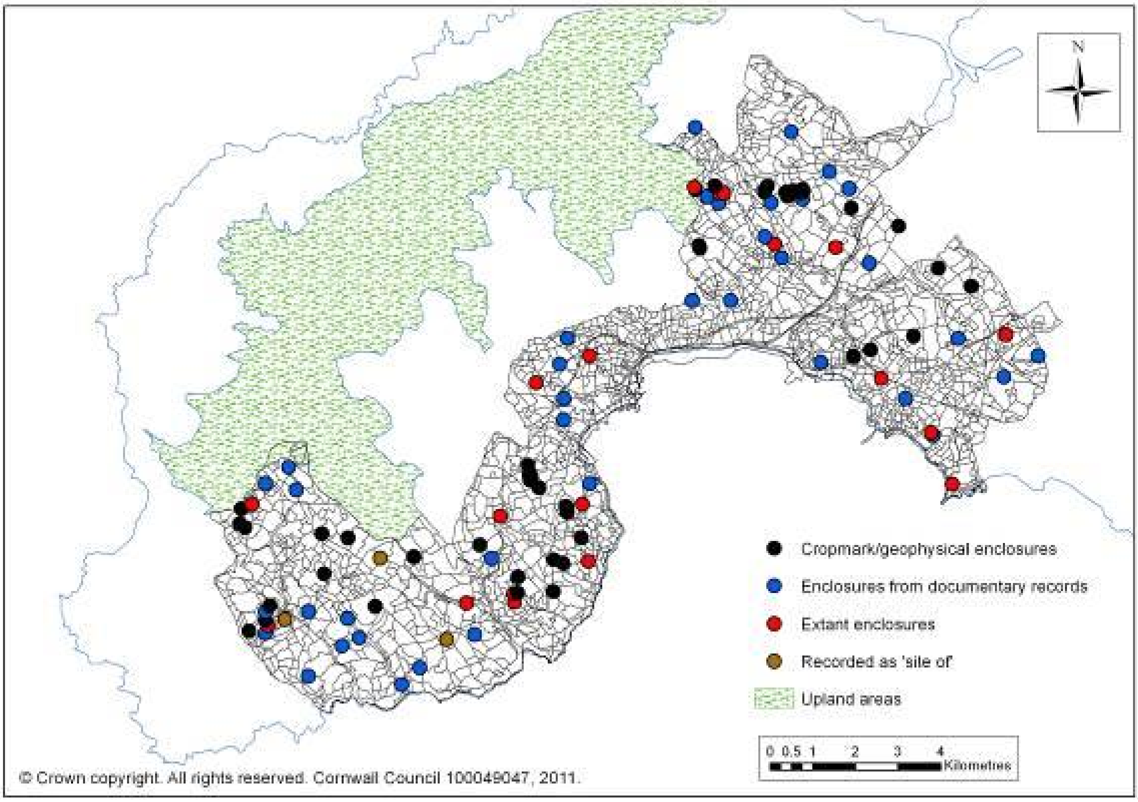

Fig 39. Form of enclosures in the Penwith study area.

There are no cropmark enclosures in the coastal strip between Newlyn and Marazion and there is a concentration of documented enclosures in the southern part of St Buryan parish. Otherwise the distributions of cropmark, earthwork and documentary enclosures are analogous and in some cases cropmark enclosures are situated close by earthwork enclosures and those recorded from documentary sources.

4.2.1.2 Distribution of enclosures

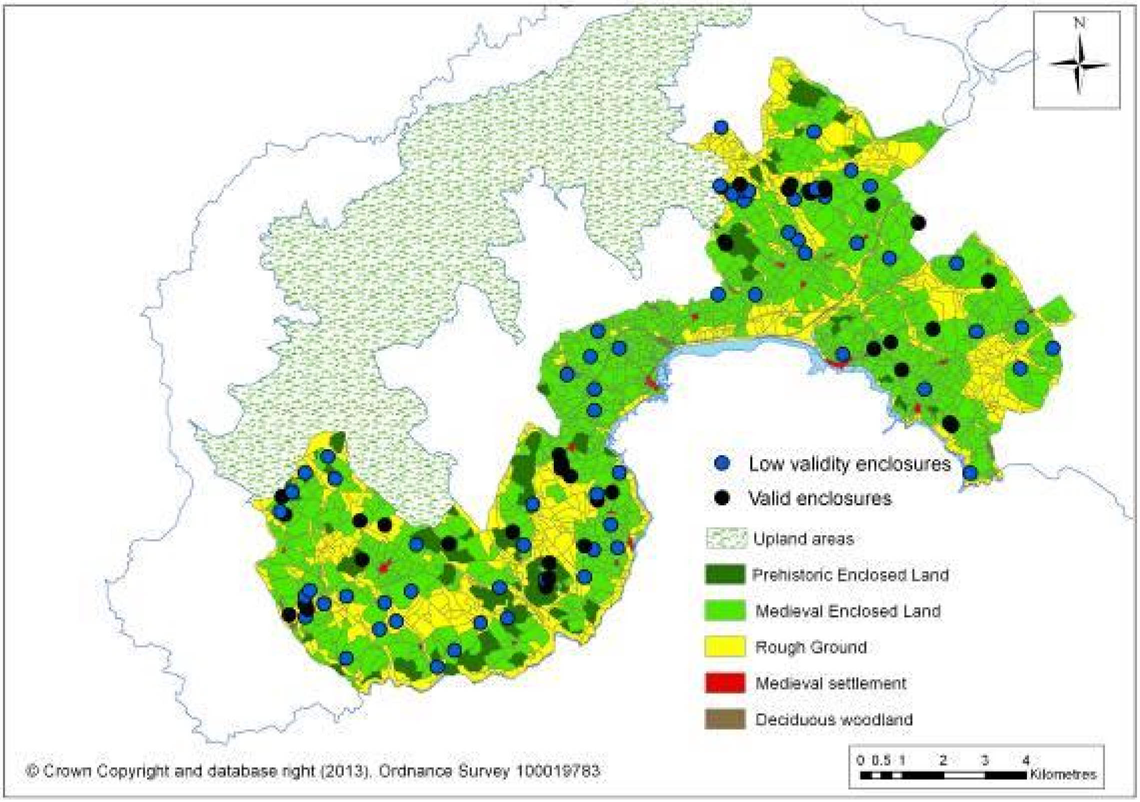

Fig 40. Distribution of enclosures in the Penwith study area. Background formed by the late medieval time-slice.

The pattern of enclosure distribution broadly resembles that of early medieval settlements when compared with the late medieval HLC time-slice (Fig 40). The great majority (79%) of enclosures are sited in enclosed land, whilst only 23 are recorded from land classed as Rough Ground. This is particularly clear in the western part of the study area, where the central band of rough ground appears to be avoided. In general the distribution pattern is less even than that of early medieval settlements, with a number of clusters, especially in the northeast. Of those enclosures located in rough ground, 17 are low validity enclosures: eight are recorded from documentary sources and three are recorded as 'site of', so the listed grid references may not necessarily be accurate. The enclosures are situated in a range of locations in the landscape, but predominantly on gentle slopes. A significantly higher proportion of the enclosures are on hill tops than is the case in the Probus study area (13% as opposed to 7%).

Location	High validity enclosures	Low validity enclosures	All enclosures
Cliff top	0	2 (3%)	2 (2%)
Hill top	8 (18%)	6 (10%)	14 (13%)
Plateau	2 (4.5%)	2 (3%)	4 (4%)
Promontory	2 (4.5%)	1 (2%)	3 (3%)
Ridge	4(10%)	1 (2%)	5 (5%)
Slope	27 (61%)	48 (78%)	75 (71%)
Flat	1 (2%)	1 (2%)	2 (2%)
Total	**44**	**61**	**105**

Table 37. Location of the enclosures in the landscape.

The enclosures are for the most part located between the 26 and 140m contours, and predominantly between the 65 and 140m contours. This is especially true of the high validity enclosures (80% are situated between the 65 and 140m contours). In fact the most favoured position for the high validity enclosures is land between the 101 and 140m contours. On the other hand a significantly higher percentage of the low validity enclosures are sited in lower lying ground.

Height	High validity enclosures	Low validity enclosures	All enclosures
26-65m	7 (16%)	16 (26%)	23 (22%)
66-100m	10 (23%)	21 (34%)	31 (30%)
101-140m	25 (57%)	17 (28%)	42 (40%)
141m+	2 (4%)	7 (12%)	9 (9%)
Total	**44**	**61**	**105**

Table 38. Topographic location of the enclosures

The favoured aspect for the siting of the enclosures appears to be south and east, with 25 facing southeast. There is a clear avoidance of north-facing aspects. It is also noticeable that a relatively high proportion of high validity enclosures face all aspects.

Location	High validity enclosures	Low validity enclosures	All enclosures
All aspects	15(35%)	10 (16%)	25 (24%)
E	1 (2%)	12 (20%)	13 (12%)
N	1 (2%)	1 (2%)	2 (2%)
NE	2 (4.5%)	7 (11%)	9 (9%)
NW	2 (4.5%)	2 (4%)	4 (4%)
S	4 (9%)	7 (11%)	11 (10%)
SE	12 (27%)	13 (21%)	25 (24%)
SW	4 (9%)	7 (11%)	11 (10%)
W	3 (7%)	2 (4%)	5 (5%)
Total	**44**	**61**	**105**

Table 39. Topographical aspect of the enclosures

This is clear when the enclosures are grouped together according to their broad aspect.

Location	High validity enclosures	Low validity enclosures	All enclosures
Western (W, NW, SW)	9	11	20
Eastern (E, NE, SE)	15	32	47
Northern (N, NE, NW)	5	10	15
Southern (S, SE, SW)	20	27	47
All aspects	15	10	25

Table 40. Overall topographical aspect of the enclosures

Whilst the avoidance of westerly-facing locations is likely to be in response to prevailing weather patterns, the bias in favour of southerly and easterly aspects (particularly south-easterly) may be simply coincidental. Much of the land in the Penwith study area slopes in a southerly or south-easterly direction and it is probable that, as in the Probus study area, the enclosures are fitting into the natural lie of the land.

In terms of topographical setting, then, it can be said that the vast majority of enclosures are sited on sloping ground between the 66 and 140m contours, with some in slightly lower lying locations. The enclosures fit into the general lie of the land although there does appear to be avoidance of northerly and western aspects.

It is of interest to compare the location of prehistoric enclosures with that of early medieval settlements. As in the case of the Probus study area the early medieval settlements appear to have favoured lower lying ground than the enclosures: whilst 50% of the enclosures are located above the 100m contour the same is true of only 30% of the early medieval settlements, and no enclosures are recorded from below the 26m contour.

Height	EM settlements	% EM settlements	% enclosures
0-25m	7	8%	0
26-65m	23	27%	22%
66-100m	29	35%	30%
101-140m	24	29%	40%
141m+	1	1%	9%
Total	84		

Table 41. Comparison of height OD between prehistoric enclosures and early medieval settlements in the Penwith study area

As in the Probus study area the favouring of gentle slopes as the siting of settlements is even more marked for early medieval sites than it is for prehistoric enclosures: 73 early medieval settlements (87%) are located on slopes; the remaining 11 settlements are sited in a variety of locations, including cliff top, hill top, plateau and promontory.

There are also similarities in the geographical aspects favoured by early medieval settlements to those favoured by prehistoric enclosures (table 42). As with the enclosures the favoured aspects are southerly and easterly, but with an apparent greater preference for southerly-facing aspects. It is of interest to note that the early medieval settlements in the Probus study area also favoured southerly aspects although this differed from the enclosures which tended to favour westerly-facing aspects.

Aspect	EM settlements	Enclosures
Western (W, NW, SW)	25	20
Eastern (E, NE, SE)	37	47
Northern (N, NE, NW)	9	15
Southern (S, SE, SW)	54	47
All	5	25

Table 42. Comparison of geographical aspect of early medieval settlements and prehistoric enclosures in the Probus study area

This data suggests that although early medieval settlements were established in the same broad landscape zones as prehistoric enclosures, there was a movement away from more exposed locations such as hill tops, ridges and promontories. There was also a shift towards lower-lying locations with a marked preference for southerly facing sites and an avoidance of northerly or westerly aspects.

4.2.1.3 Size and form of the enclosures

The size of the enclosures could be reliably measured only when two dimensions were visible. This was the case in 41 of the high validity enclosures and nine of the low validity enclosures. The remainder include the 37 enclosures identified from documentary evidence (with no visible remains) and those which were only partially visible or obscured by later features such as field hedges. Partial visibility is one of the main reasons behind the low validity ascribed to some of the enclosures – only nine of the low validity enclosures had two measurable dimensions.

All enclosures				
Size	**Curvilinear**	**Mixed**	**Rectilinear**	**Total**
<0.1ha	12 (48%)	7 (54%)	3 (25%)	**22 (44%)**
0.1-0.25ha	10 (40%)	3 (23%)	9 (75%)	**22 (44%)**
0.25-0.5ha	3 (12%)	3 (23%)	0	**6 (12%)**
0.5-1ha	0	0	0	**0**
>1ha	0	0	0	**0**
Total	**25(50%)**	**13(26%)**	**12(24%)**	**50**

Table 43. Penwith study area: Enclosures – size and form of all enclosures.

Overall half of the enclosures are curvilinear in shape (table 43), with rectilinear enclosures and those of mixed (rectilinear and curvilinear) shape forming roughly equal proportions. However there are differences between the high validity and low validity enclosure datasets (tables 44 and 45). Among the high validity enclosures the proportion of curvilinear and other shapes is broadly equal (19 curvilinear enclosures opposed to 22 others). By contrast twice as many of the low validity enclosures are curvilinear in form as rectilinear and mixed combined. In this respect the make-up of the enclosure dataset in the Penwith study is very similar to that in Probus in that there is an even division of curvilinear and other enclosures in both datasets. Also, when comparing the high and low validity enclosures there are similarities between the two study areas – among the high validity enclosures the proportion of curvilinear and other enclosures is broadly half and half, but among the low validity enclosures the curvilinear forms far outnumber those with rectilinear or mixed designs.

High validity enclosures				
Size	**Curvilinear**	**Mixed**	**Rectilinear**	**Total**
<0.1ha	9 (47%)	7 (64%)	3 (27%)	**19 (46%)**
0.1-0.25ha	8 (42%)	2 (18%)	8 (73%)	**18 (44%)**
0.25-0.5ha	2 (11%)	2(18%)	0	**4 (10%)**
0.5-0.1ha	0	0	0	**0**
>1ha	0	0	0	**0**
Total	**19(46%)**	**11(27%)**	**11(27%)**	**41**

Table 44. Penwith study area: Enclosures – size and form of the high validity enclosures.

Low validity enclosures				
Size	**Curvilinear**	**Mixed**	**Rectilinear**	**Total**
<0.1ha	3 (50%)	0	0	**3 (33%)**
0.1-0.25ha	2 (33%)	1 (50%)	1(100%)	**4(44%)**
0.25-0.5ha	1 (17%)	1(50%)	0	**2 (23%)**
0.5-1ha	0	0	0	**0**
>1ha	0	0	0	**0**
Total	**6(67%)**	**2(22%)**	**1(11)**	**9**

Table 45. Penwith study area: Enclosures – size and form of the low validity enclosures.

In terms of size the Penwith enclosures can be said to be characteristically small – 88% of those in the dataset enclose an area smaller than 0.25ha and none covers more than 0.5ha. When considering only the high validity enclosures this trend is even more marked, with 90% of the enclosures covering less than 0.25ha and 46% smaller than 0.1ha.

In general the Penwith enclosures are smaller on average than those in the Probus study area. One similarity between the two datasets is the tendency for rectilinear enclosures to be at the smaller end of the scale – none of the rectilinear enclosures in Penwith cover an area greater than 0.25ha.

When the level of survival of the enclosures is analysed there is a similar correlation between size and survival of earthwork remains to that in the Probus study area, albeit not as marked. That is, those enclosures with earthwork remains tend to be at the larger end of the scale: 90% of cropmark enclosures cover less than 0.25ha, whereas for earthwork enclosures the corresponding figure is only 80%.

Size	Earthworks	Cropmarks	All enclosures
<0.1ha	4 (40%)	18 (45%)	**22 (44%)**
0.1-0.25ha	4 (40%)	18 (45%)	**22 (44%)**
0.25-0.5ha	2 (20%)	4 (10%)	**6 (12%)**
0.5-1ha	0	0	**0**
>1ha	0	0	**0**
Total	**10**	**40**	**50**

Table 46. Penwith study area: Enclosures – measurable size of earthwork and cropmark enclosures.

Curvilinear enclosures

Twenty five of the enclosures are classed as curvilinear in form. This includes 19 of the high validity enclosures and six of the low validity enclosures. Of these, 20 have sufficiently extensive visible remains to allow a closer definition of their form (table 47).

Form	High validity enclosures	Low validity enclosures	All enclosures
Circular	0	0	**0**
Sub-circular	5	1	**6**
Oval	6	3	**9**
Regular	0	1	**1**
Irregular	1	0	**1**
C-shaped	2	1	**3**
Total	**14**	**6**	**20**

Table 47. Penwith study area: Enclosures – form of the curvilinear enclosures.

It is clear that truly circular enclosures are absent and that the majority are either oval or sub-circular in form (in all 75% of the total). This is in contrast to the Probus study area, where there were roughly equal numbers of each form (other than a virtual absence of truly circular enclosures).

Rectilinear enclosures

Overall 11 of the high validity enclosures and one low validity enclosure were classed as rectilinear, and all had sufficiently visible extensive remains to allow a closer definition of their form. Three quarters of them are four-sided, with no five- or six-sided enclosures identified in the Penwith study area (Table 48).

No. of sides	High validity enclosures	Low validity enclosures	All enclosures
3	3	0	**3**
4	8	1	**9**
5	0	0	**0**
6	0	0	**0**
Total	**11**	**1**	**12**

Table 48. Penwith study area: Enclosures – number of three-, four-, five- and six-sided rectilinear enclosures.

None of the enclosures with three visible sides were classed as D-shaped. In fact two were interpreted as being incomplete or not completely visible and, in all likelihood, may have had four or more sides. The form of rectilinear enclosures varies in the Penwith area, with five sub-square and polygonal forms identified, as well as two rectangular forms.

Form	High validity enclosures	Low validity enclosures	Total
Square	0	0	**0**
Sub-square	5	0	**5**
Rectangular	2	0	**2**
Sub-rectangular	0	0	**0**
Polygonal	4	1	**5**
D-shaped	0	0	**0**
Total	**11**	**1**	**12**

Table 49. Penwith study area: Enclosures – form of four-sided rectilinear enclosures

Although the Penwith sample of 12 enclosures is small there seems to be less variety of rectilinear forms than in the Probus study area where there were five and six-sided enclosures and D-shaped enclosures. By contrast five sub-square enclosures were recorded in Penwith but only three from the larger sample in Probus.

4.2.1.4 Form of the enclosing circuits

The nature of the circuits of the enclosures in the Penwith study area is summarised in table 50 below.

Form	High validity enclosures	Low validity enclosures	Total
Ditch	12 (27%)	6(50%)	**18(32%)**
Bank	21 (48%)	4(33%)	**25(45%)**
Ditch and bank	11 (25%)	2(17%)	**13(23%)**
Total	**44**	**12**	**56**

Table 50. Penwith study area: Enclosures – form of enclosing circuit.

In the Penwith study area the form of construction of the enclosing circuits of 56 enclosures was identified from aerial photographs and recorded in the Morph database. Of these circuits the majority were formed by a bank alone, almost a third by a ditch only and roughly a quarter were formed by bank and ditch (Table 50). This is quite a different picture than in the Probus study area, where 72% of enclosures were bounded by a ditch and 13% were bounded only by a bank. It was suggested in section 3.2.1.4 that one possible reason why so many of the Probus enclosures are recorded as being enclosed by a ditch alone is that ditches produce more clearly defined cropmarks than banks. However the analysis of Penwith enclosures does not support that suggestion because, whilst overall there is a slightly higher percentage of earthwork enclosures than in Probus, 13 of the banked enclosures in Penwith (i.e. more than half) were recorded as cropmarks.

4.2.1.5 Complexity

Nine (less than 10%) of the enclosures in the Penwith study area can be classed as 'complex' (i.e. those which are multivallate or include associated external features such as appended enclosures); the vast majority are bounded by a single enclosing circuit. Of the nine complex enclosures, four have annexes attached, four are multivallate with wide-spaced ditches (in which the outer circuit encloses at least twice the area of the inner) and one is multivallate with close-spaced ditches (double-ditched). All the multivallate enclosures and three of those with annexes were assigned a high validity score; one of the annexed enclosures is low validity. The low validity enclosure (PRN 52866) was recorded as an extant earthwork; all the other complex enclosures were recorded as cropmarks. In the case of the double-ditched enclosure and one of the wide-spaced multivallate enclosures the outer circuit is incomplete and the enclosed area could therefore not be measured (Fig 41).

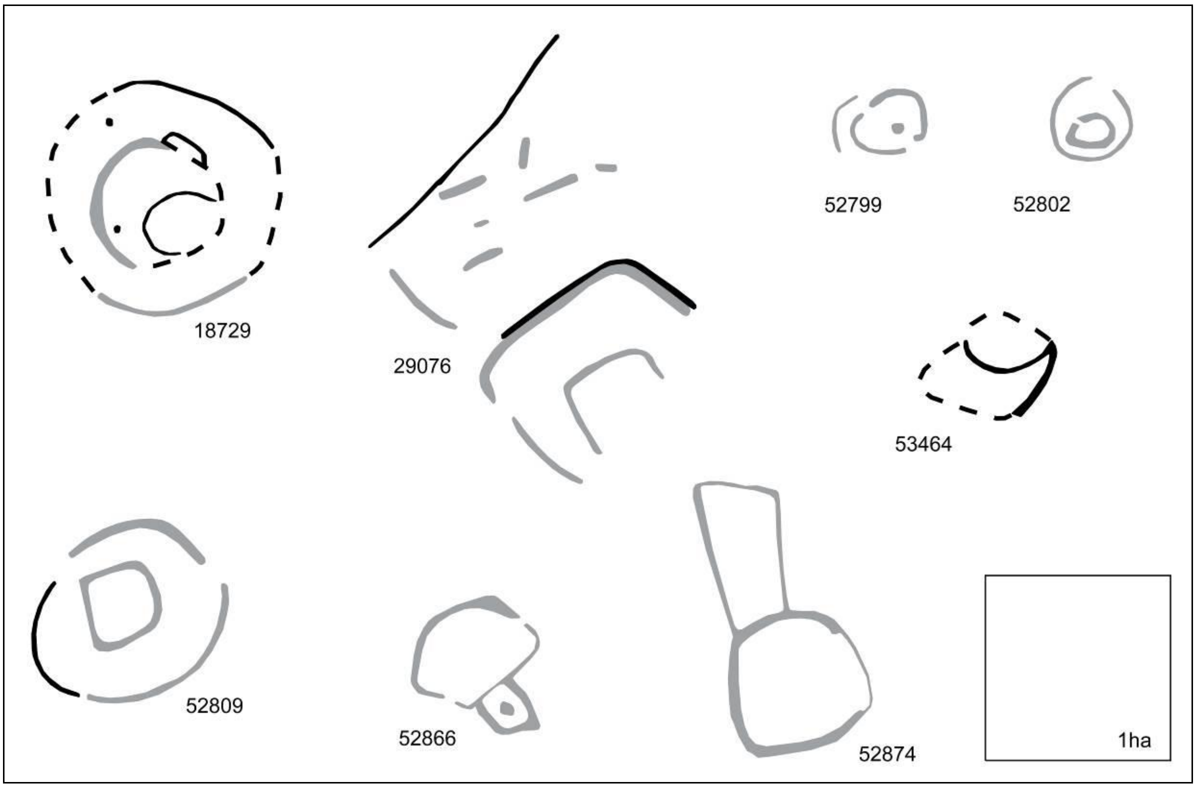

Fig 41. The four enclosures with appended enclosures or 'annexes' and the five multivallate enclosures in the Penwith study area. Ditches are represented by black lines; banks by grey lines.

In the Probus study area there was a suggestion that double-ditched enclosures are more likely to be rectilinear or mixed than curvilinear, that they favour locations on ridges as well as slopes and that they tend to be larger than the norm. Whilst the one double-ditched enclosure recorded in Penwith is mixed (being D-shaped), it is sited on a southeast facing slope and encloses less than 0.1ha.

Of the multivallate enclosures with wide-spaced ditches, two are sited on southeast-facing slopes, one is on a hilltop and the other is on a ridge. Two lie between the 25m and 65m contours and two lie between the 101m and 140m contours. As with the multivallate enclosures in the Probus study area, there appears to be no common pattern which could define these enclosures as a coherent group. Their shape can be curvilinear, rectilinear or mixed; they are sited in a range of topographic locations and the area enclosed by their inner circuit ranges from 919m sq to 3,512m sq. The ratio between the size of the inner and outer enclosures is also highly variable, ranging from 7.3 (i.e. the outer enclosure is 7.3 times larger than the inner) to 3.4 (Table 51)

Site ID	Inner enclosure (ha)	Outer enclosure (ha)	Ratio of outer: inner
52809	0.09	0.66	7.3
29076	0.14	*0.62	4.4
18729.1	0.35	1.20	3.4

Table 51. Multivallate enclosures with wide-spaced ditches. Comparison of the size of the inner and outer enclosures. That marked with * indicates that the outer circuit is not completely visible and the size quoted is the minimum likely area enclosed.

Similarly there is no coherent pattern to the enclosures with annexes. One is curvilinear in shape, one is rectilinear and two have a mixture of straight and curving sides. Two are sited on ridges and two on southeast-facing slopes and the area enclosed by the 'parent' enclosure ranges from 406sq m to 3,397sq m. One common factor, however, is that they are all situated above the 100m contour.

4.2.1.6 Summary

A large part of the Penwith study area falls into the high visibility zone of the Lowland Cornwall cropmark visibility model, particularly in the western part of the area, and 74% of the area is captured in the high probability zone of the 1994 enclosures/HLC probability model. In the western part of the study area Moretonhampstead soil types overlie granite bedrock and in the east for the most part Denbigh 2 soils overlie Hornfelsed slate and Hornfelsed siltstone: both of these combinations of soil and bedrock form part of the high probability zone of the enclosures/bedrock and soils probability models.

It follows, then, that many enclosures have been recorded from this area: although the figure is less than that for the Probus study area, the density of enclosures in the landscape – slightly more than 1 per km sq – is very similar for both areas.

More of the enclosures are recorded (as cropmarks) from aerial photographic evidence than any other source, but these only make up 42% of the Penwith sample; almost as many are recorded from documentary sources and roughly half as many are recorded as extant monuments with above ground remains. The percentage of documentary records for enclosures here is far higher than any of the other three study areas.

The distribution of enclosures is relatively even throughout the study area, although there are some concentrations in places, particularly in Ludgvan parish. The great majority of the enclosures (79%) are located in enclosed land. Although the number sited in rough ground or former rough ground is higher than in the Probus study area, the more extensive tracts of rough ground appear to be largely free of enclosures.

The enclosures tend to be situated on sloping ground, predominantly between the 65 and 140m contours, most commonly with southerly or easterly aspects and clearly avoiding northerly aspects. However, enclosures in the Penwith study area occur more frequently on hill tops and ridges than do those in Probus. As in Probus the distribution pattern of early medieval settlements is similar to that of the enclosures and again there appears to have been a shift to lower-lying areas in the early medieval period.

The Penwith enclosures tend to be smaller than those in Probus: 88% enclose an area less than 0.25ha and none encloses an area greater than 0.5ha (excluding the outer circuits of the multivallate enclosures).

For those enclosures whose shape can be defined, the clear majority are curvilinear in form (twice as many as are rectilinear or mixed). Most of the curvilinear enclosures are oval or sub-circular in shape: rectilinear forms occurring are sub-square, polygonal and rectangular.

Where the construction of the enclosures can be determined the majority appear to be bounded by a bank only, a significant number by a ditch only and a minority by a ditch and bank. This is the opposite of the Probus study area where the vast majority appear to be bounded by a ditch and a minority by a bank only.

The great majority of the Penwith enclosures are univallate in form; only nine can be classed as complex. Of these four have annexes appended, four are multivallate (with wide-spaced circuits) and one is double-ditched.

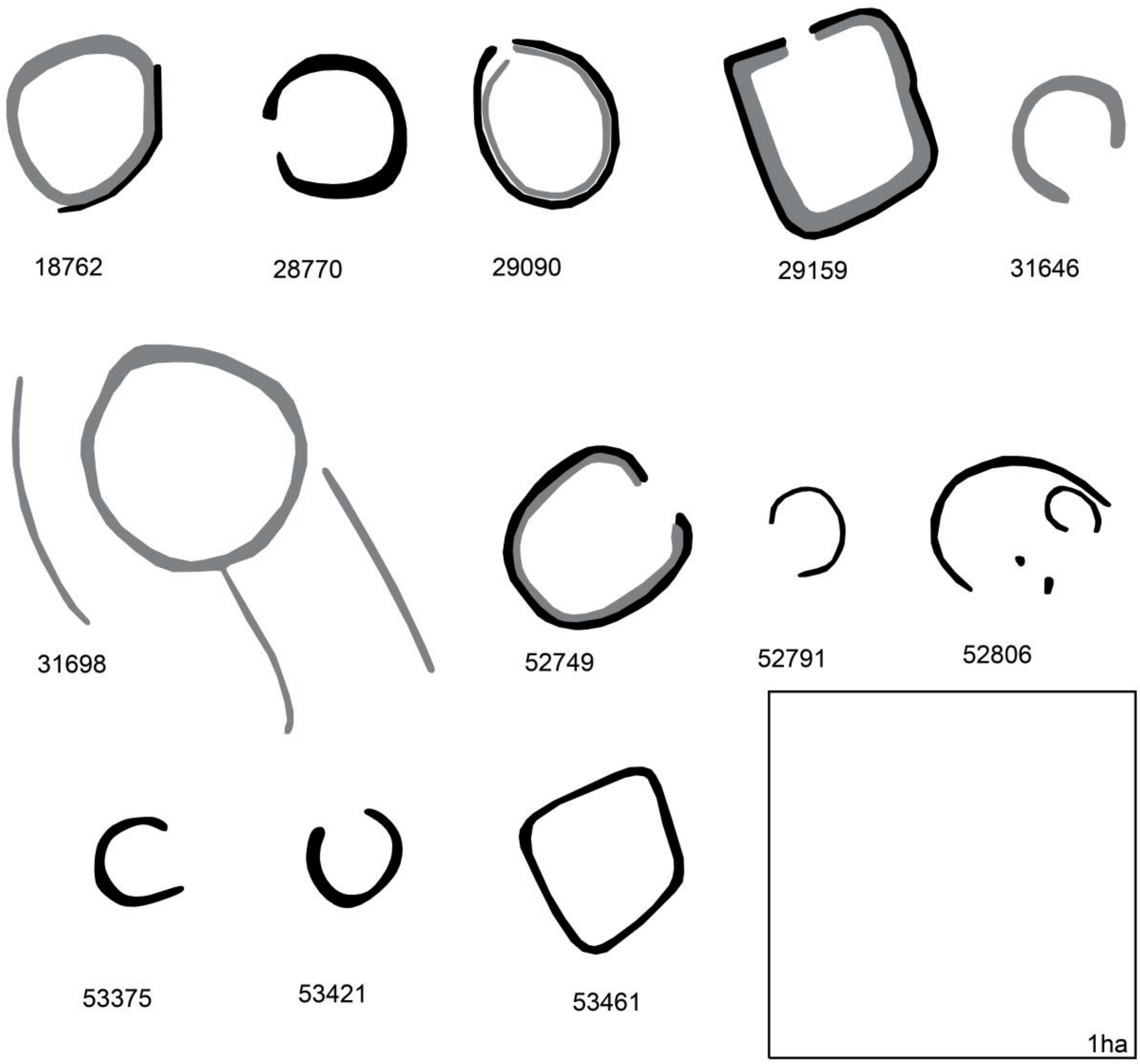

Fig 42. Sample of the typical Penwith study area enclosures.

4.2.2 Unenclosed settlements

In the Lowland Cornwall dataset there are 15 records for hut circle or round house for the Penwith study area. Five of these are located within Trencrom Castle hillfort (PRN 31136), so in total there are 10 sites that can be regarded as unenclosed prehistoric round house settlements in the study area. In addition there are three records for courtyard house settlements. However two of these, PRN 28917 and 53397, at Castallack Carn, Paul, may refer to the same site. PRN 28917 is sourced from a documentary reference, whereas PRN 53397 is recorded as a cropmark mapped during Cornwall's NMP at a slightly different location. The distribution of the 10 round house settlements and the two courtyard house settlements is shown in Fig 43 below.

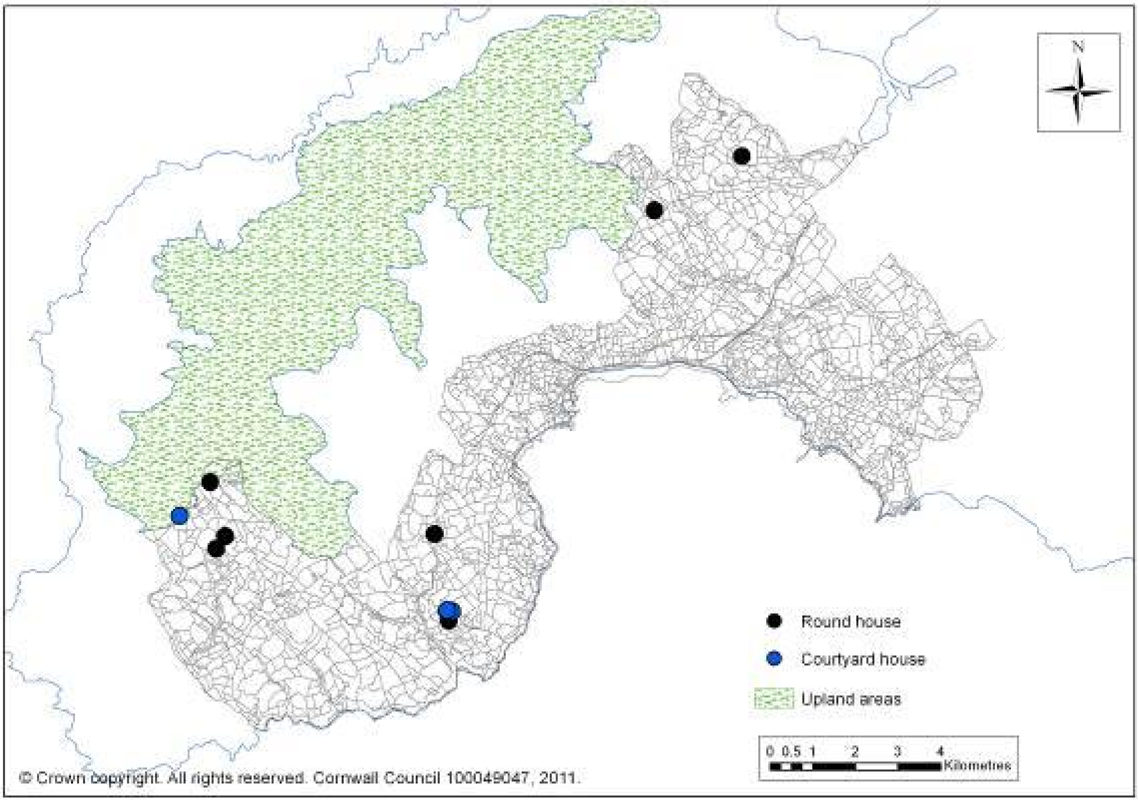

Fig 43. Distribution of unenclosed round house settlements and courtyard house settlements in the Penwith study area

There are three very broad groupings; those in the west and northeast are close to the border with the West Penwith upland area, where numerous round house settlements are recorded.

Five of the round houses are listed as extant sites with surviving earth- or stonework walls and four are sourced from documentary records. The tenth round house, which is located immediately outside the courtyard house settlement at Castallack Carn, is recorded as a cropmark (Fig 49). That courtyard house settlement was also identified as cropmarks from aerial photographs (PRN 53397 mentioned above); the other, PRN 16078 at Chycandra, St Buryan, has surviving stonework. All the round house records are for single structures apart from those on Castallack Carn. Here there are stonework remains of two complete houses and one partially surviving in a small croft. One hundred metres to the west is the cropmark round house mentioned above, and 225m to the south is another extant round house. Five of the round houses were assigned Morph validity scores of 3 of more: the five not mapped during the NMP are referred to below as low validity round houses.

It was possible to measure the dimensions of six of the round houses. The three adjacent ones on Castallack Carn range from 4 to 6m in diameter; the cropmark house nearby measures 13m in diameter; the one to the south is 12m in diameter and that at Chellew, Ludgvan (PRN 31644) measures 11m across.

The settlements are situated in a limited range of topographical locations (Table 52).

Location	High validity round houses	Low validity round houses	Courtyard houses	All settlements
Hill top	3	1		**4**
Ridge	1		1	**2**
Slope	1	4	1	**6**
Total	**5**	**5**	**2**	**12**

Table 52. Location of unenclosed settlements in the landscape.

As with the enclosures there appears to be a preference for locating unenclosed settlements on slopes, although hill top sites are not as uncommon as for enclosures. In terms of aspect, two settlements face west, two face southeast, four face southwest and five face all aspects. This is somewhat different from the aspects favoured by enclosures (which are frequently facing southeast in the Penwith study area), although there is a similar avoidance of northerly aspects. The unenclosed settlements tend to be found on higher ground – nine are sited between the 101 and 140m contours, and three on ground above the 140m contour. This differs from the enclosures, more than half of which are located below the 100m contour. Of course it could be that unenclosed round house settlements in lower ground have since been plough-levelled and have not yet been detected.

4.2.3 Field systems

In common with other parts of lowland Cornwall less evidence is available for prehistoric/Romano-British field systems than for enclosures. Compared with the Probus study area there is a higher ratio of field systems to enclosures in Penwith, with 26 records for field systems and eight for field boundaries. Thirty of the recorded sites were assigned a Morph validity score of 3 of more: only two field systems and two field boundaries were allocated a low validity score. A significant difference between the fields recorded in Penwith and those in the Probus study area is that a majority of the Penwith fields have extant earth or stone remains (18 as opposed to 16 recorded as cropmarks), whereas in Probus almost all the field systems were identified as cropmarks.

4.2.3.1 Distribution of field systems

Broadly speaking there is a concentration of field systems around the Lamorna Valley in St Buryan and Paul parishes, towards the west of the study area, with smaller clusters in the far west and the northernmost parts of the area, and others scattered along the coast. The majority (59%) of the fields are found in close proximity to enclosures although 12 are apparently isolated and not associated with any visible enclosure.

When the distribution of field systems is compared with the refined HLC late medieval time-slice (Fig 44), 24 (71%) fall within enclosed land HLC Types (13 in Prehistoric Enclosed Land and 11 in Medieval Enclosed Land). This is a somewhat lower percentage than the 79% of Penwith enclosures located within enclosed land, and the 96% of field systems in the Probus study area located in enclosed land in the late medieval time-slice. Of the fields found away from enclosed land, three are in Upland Rough Ground, four are in Valley Rough Ground, two are in Coastal Rough Ground and one is located in woodland.

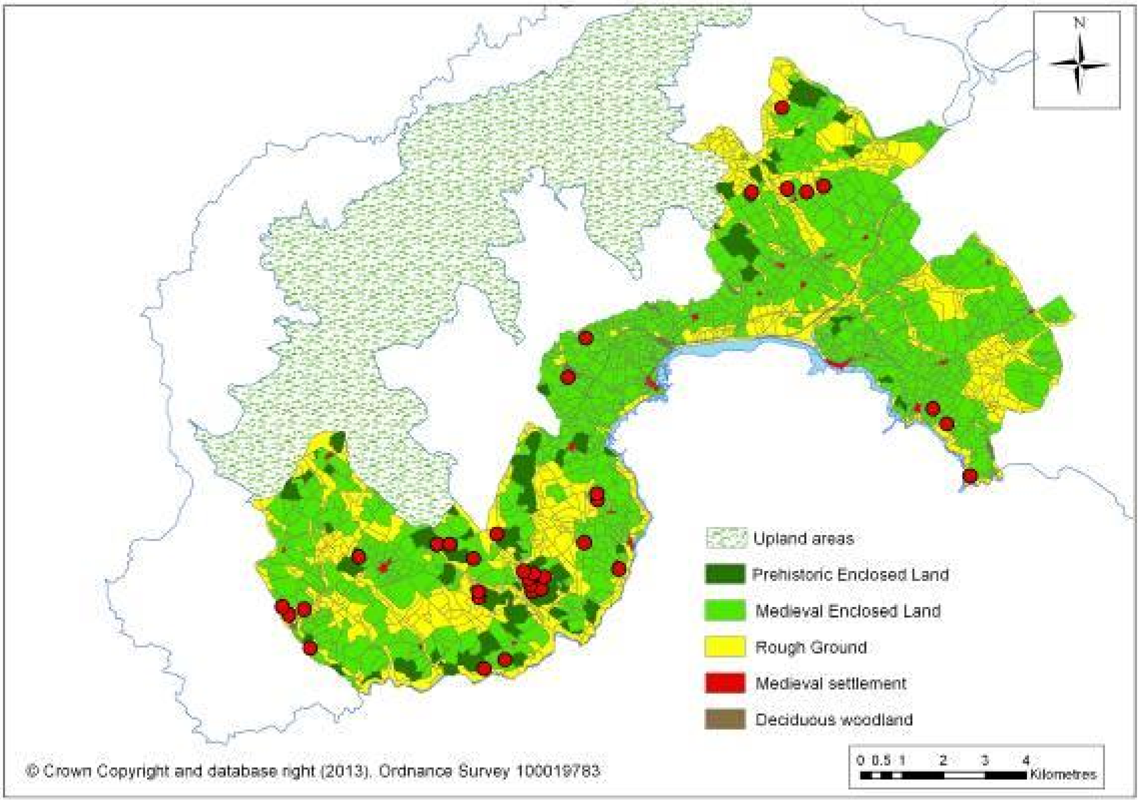

Fig 44. Distribution of field systems in the Penwith study area. Background formed by the late medieval time-slice HLC

4.2.3.2 Topographic location of the field systems

The fields are located predominantly located on sloping ground (table 53).

Location	Fields
Cliff top	2
Hill top	1
Promontory	1
Ridge	1
Slope	29
Total	**34**

Table 53. Penwith study area: Fields – location in the landscape.

The fields are for the most part located between the 65m and 115m contours, and predominantly between the 65m and 100m contours, with 20% situated in lower or higher ground (table 54).

Height	All Fields
26-65m	5
66-100m	17
101-140m	10
141m+	2
Total	**34**

Table 54. Penwith study area: location of fields by height OD.

Although the fields face a range of aspects, it is clear that southeast, southwest and west are favoured aspects, whilst none face north (table 55). This is similar to the favoured location of enclosures in Penwith, although a higher percentage of enclosures face south than do field systems.

Location	Fields
All aspects	2
E	3
N	0
NE	2
NW	1
S	2
SE	9
SW	9
W	6
Total	**34**

Table 55. Penwith study area: topographical aspect of the fields.

The avoidance of northerly aspects and a clear preference for southerly aspects is apparent when the field systems are grouped according to their broad aspect (table 56).

Location	Fields
Western (W, NW, SW)	16
Eastern (E, NE, SE)	14
Northern (N, NE, NW)	3
Southern (S, SE, SW)	20
All aspects	3

Table 56. Penwith study area: overall topographical aspect of the fields.

4.2.3.3 Size and form of the fields

Although the majority of field systems in the Penwith study area have above ground remains surviving, many are fragmentary or incomplete; as a result it was only possible to accurately define field shape at 23 sites and to measure the typical field size in 13 cases. Measurements of field width could, however, be made for a further five field systems.

There were no purely curvilinear field systems in the dataset; four were classed as mixed – with a combination of rectilinear and curvilinear boundaries – and 19 were classed as rectilinear. The size range of the fields is detailed in table 57 below.

Width (m)	Length (m)	Area (m^2)
11	0	0
34	0	0
35	0	0
45	0	0
50	0	0
22	28	176
18	26	468

Width (m)	Length (m)	Area (m^2)
16	30	480
20	30	600
23	32	736
23	35	805
21	40	840
30	42	1260
33	41	1353
37	62	2294
45	53	2385
53	66	3500
56	104	5824

Table 57. Penwith study area: average measurements of field systems

As can be seen from this data, there is considerable variation in the average field size among the field systems and in the measurable length and width of the individual fields. Widths vary from 11m to 56m, lengths from 26m to 104m and areas from 176sq m to 5,824sq m. Nonetheless the fields can be said to be generally small, with the majority measuring less than 50m x 30m. When all the field systems are considered as a whole, the average field size is 1,594sq m, which is considerably smaller than the measurable fields in the Probus study area (6,779sq m).

In terms of construction there was sufficient detail for 31 of the sites to be analysed further. Unlike the other three study areas where field boundaries (where visible) are predominantly formed by ditches, those in Penwith are for the most part recorded as earthen banks or stony banks (table 58).

Construction	Fields
Ditch	3
Ditch and bank	1
Earthen bank	5
Stony bank	22
Total	**31**

Table 58. Penwith study area: construction of field systems

Where the field systems are located in rough ground or on the edges of rough ground they tend to consist of the small rectangular fields which are typical of the West Penwith uplands. At Trink Hill (Fig 45) are the fragmentary remains of a field system (PRN 31012.02) associated with a destroyed courtyard house settlement (PRN 31012). These fields typically measure 38m x 25m; those at Castallack Carn (Fig 49) are very similar, at 35m x 25m. In enclosed land, where fields are visible they tend to be somewhat larger; those at Trevorgans, St Buryan, for instance (Fig 47) measure 45m x 40m.

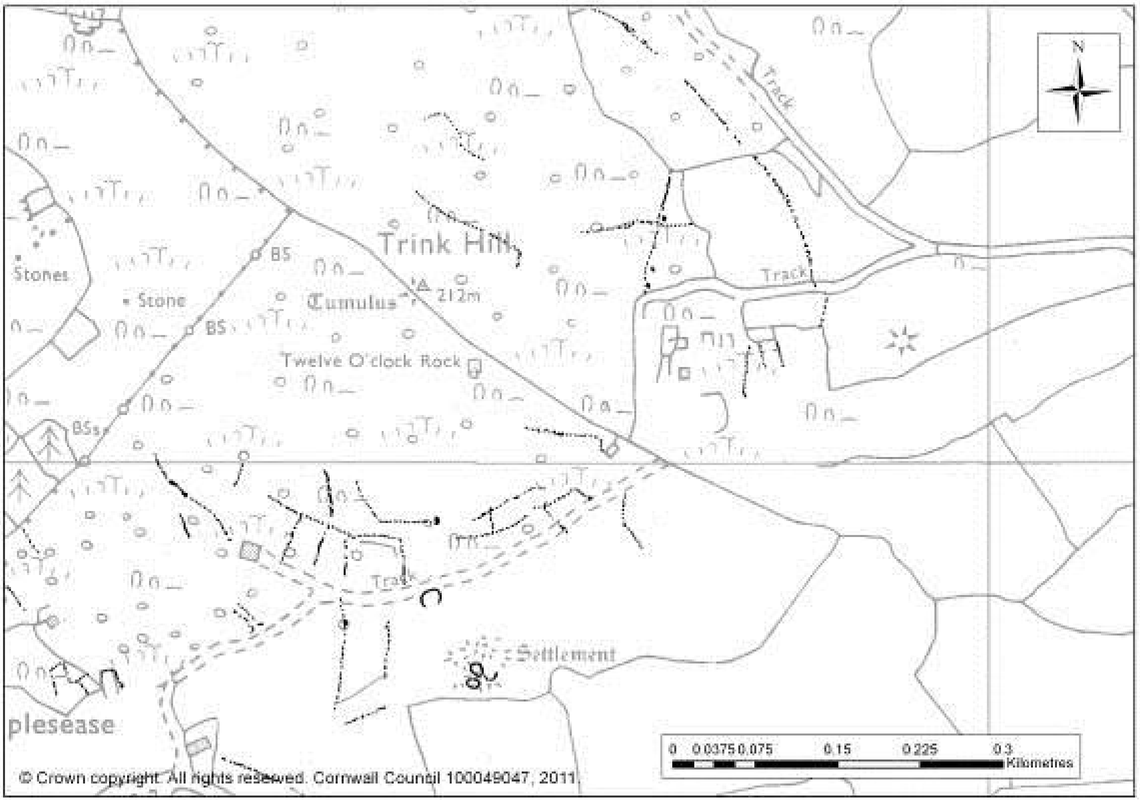

Fig 45. Remnants of prehistoric fields at Trink Hill, Lelant.

4.2.4 The settlement and farming pattern

Fifty six polygons were created for prehistoric settlement clusters in the Penwith study area. In addition a further 17 polygons were drawn around sites or groups of sites recorded in the HER as being of uncertain date but which could potentially be prehistoric in origin. These undated sites included seven single enclosures, one enclosure and associated field boundaries, and nine field systems or groups of field boundaries. In total, then, there are 73 polygons in the Penwith study area (Fig 46).

Whilst the polygons indicate the extent of settlement it is clear that there was an ample supply of rough ground, providing fuel and seasonal grazing land, in both eastern and western parts of the study area as well as in the Penwith uplands to the northwest.

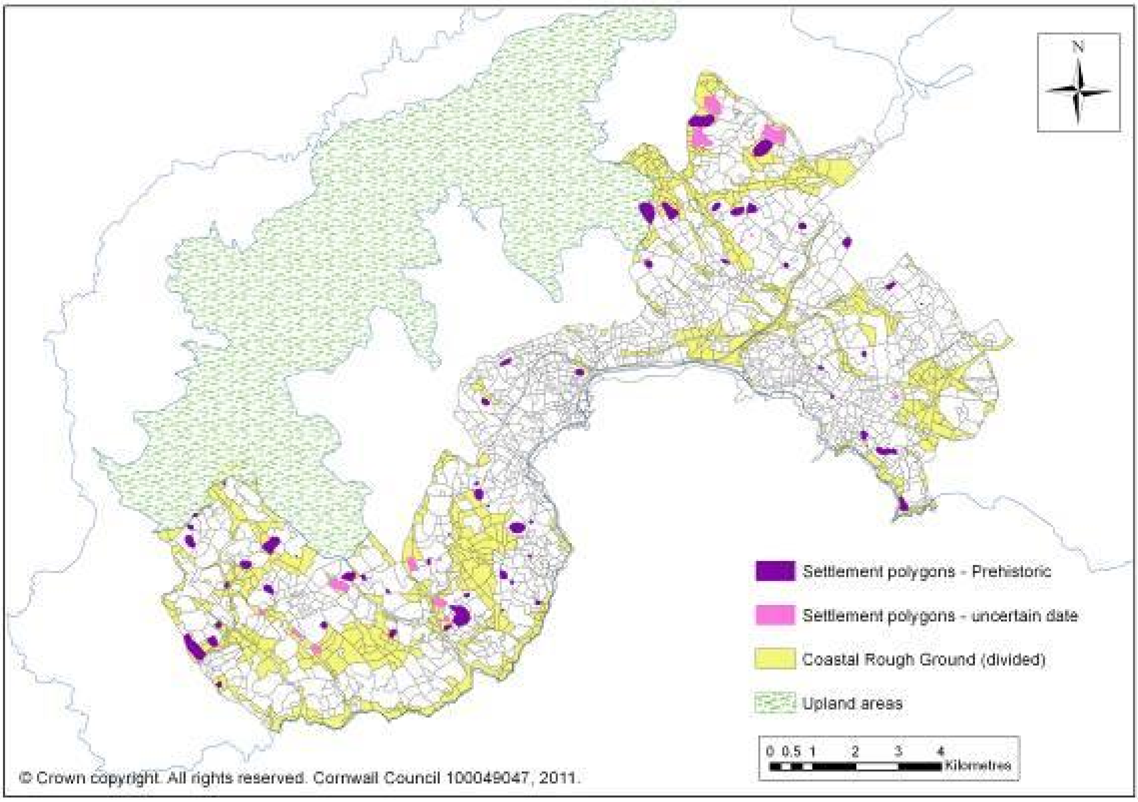

Fig 46. Penwith study area: distribution of settlement polygons and rough ground (including former rough ground).

The polygons range in size from 0.16ha (a single small enclosure of unknown function at Trevenner, Marazion, PRN 52826) to the complex at Castallack Carn (15.6ha) and a field system covering 15.9ha at Trencrom (PRN 52724). The average size of the polygons is 3.98ha and only 23 are larger than this.

Size range of polygons (ha)	No. of polygons
<1.0	18
1.1 - 5.0	36
5.1 - 10	9
10.1 - 20	10
20.1 - 50	0
>50	0
Total	73

Table 59. Penwith study area: size range of the settlement polygons.

The archaeological components vary from polygon to polygon. The dominant features are the enclosures, but not to the same extent as in Probus: 49 polygons contain at least one enclosure. Twenty seven polygons contain a single enclosure with no visible associated features and a further nine contain a single enclosure with associated field boundaries and/or other associated features such as ditches, pits and trackways. Thirteen polygons contain more than one enclosure, of which 12 are accompanied by associated features. Twenty polygons contain only field systems or groups of field boundaries. A summary of the components making up each polygon is set out in table 60 below.

Components	No. of polygons
Single enclosure	27
Single enclosure and field boundaries	2
Single enclosure and field system/s	5
Single enclosure, ditches pits and fogou	1
More than one enclosure	1
Enclosures and field boundaries	6
Enclosures and field system/s	3
Enclosures, mounds and field boundaries	1
Enclosures, round houses and field system	1
Hillfort	1
Hillfort and enclosures	1
Hillfort, enclosure, round house and field boundaries	1
Round house and field boundaries	1
Courtyard House settlement	1
Courtyard house settlement and field system	1
Field system	5
Field systems	12
Field boundaries and pits	1
Field boundaries	2
Total	**73**

Table 60. Penwith study area: features contained in the settlement polygons.

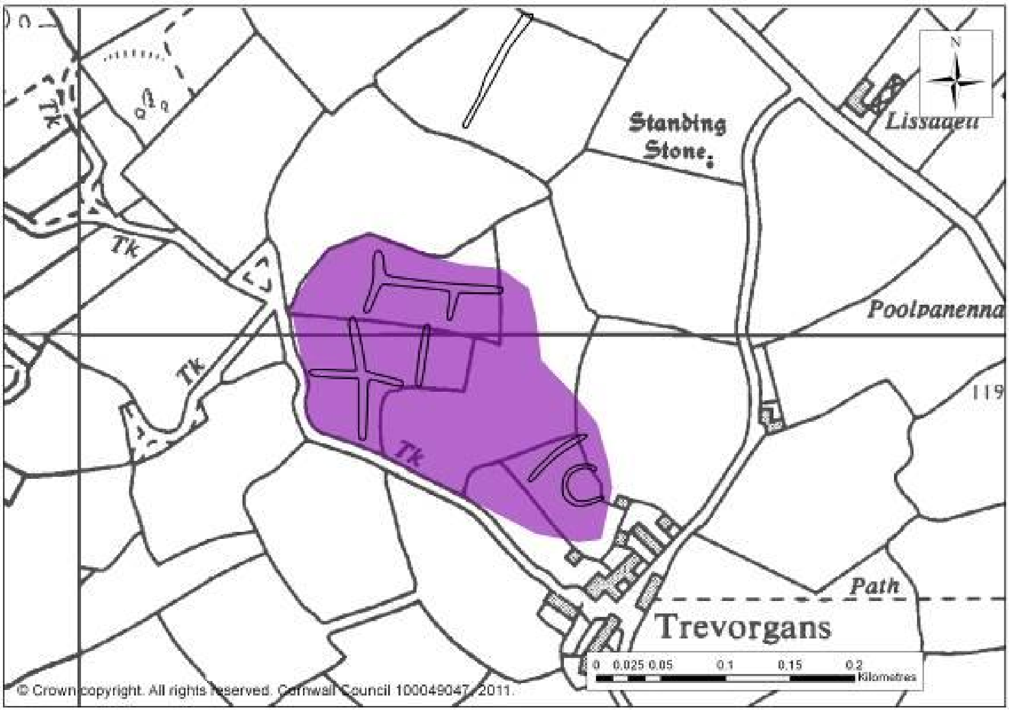

Fig 47. Prehistoric settlement polygon at Trevorgans, St Buryan.

The settlement polygon at Trevorgans, St Buryan (Fig 47) represents the average-sized polygon in the Penwith study area, covering as it does 3.7ha. It is situated on a southwest-facing slope between the 110m and 120m contours. The polygon contains a small curvilinear enclosure recorded as a cropmark ditch. It measures only 25m in diameter and its function is uncertain. It is not clear whether its eastern side has been truncated by the field hedge or whether the kink in the field hedge is fossilising the circuit of the enclosure. The enclosure is located in Medieval Enclosed Land comprising former cropping units which had been re-arranged by c1840.

To the northwest of the enclosure are the fragmentary remains of a rectilinear field system recorded as a series of cropmark banks. The fields are typically 45m wide and are located in Prehistoric Enclosed Land which has been re-arranged and amalgamated. It is possible that the present day field hedges are fossilising the former prehistoric boundaries, in which case the typical field size is 45m x 40m.

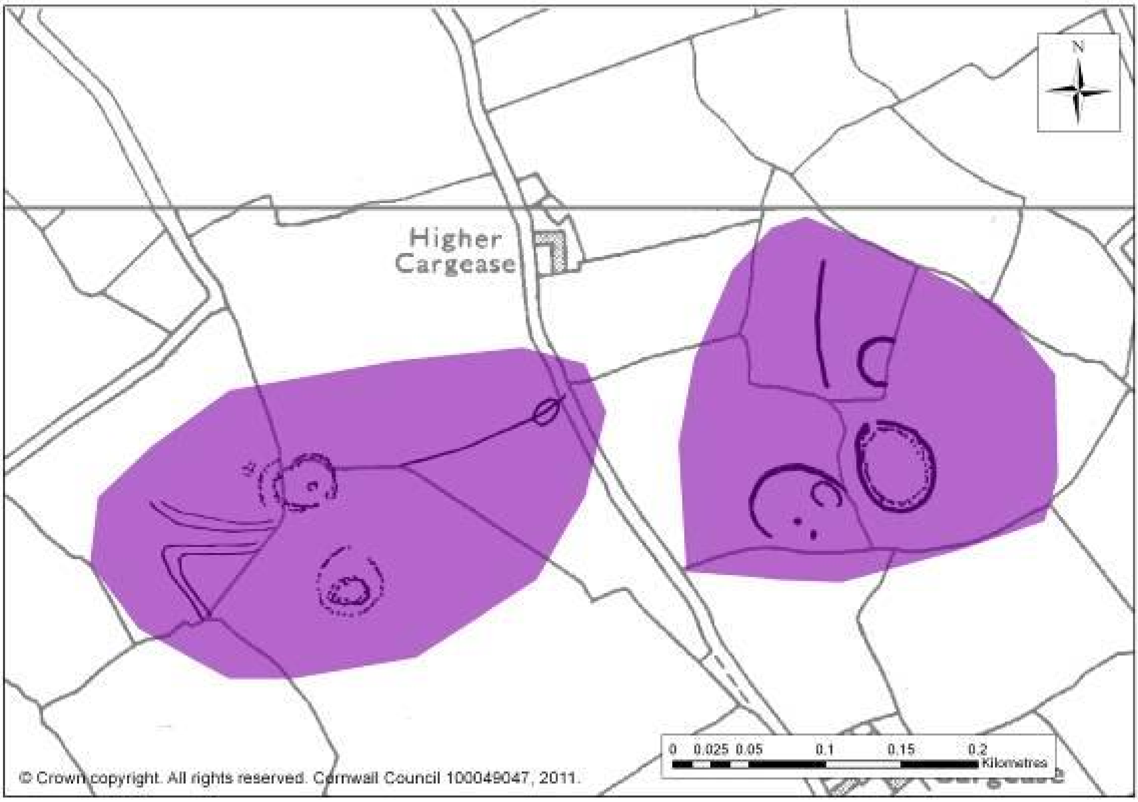

Fig 48. Prehistoric settlement polygons at Cargease, Ludgvan.

At Cargease, Ludgvan there are two settlement polygons in close proximity to each other (Fig 48). The westernmost covers 5.3ha and contains three cropmark enclosures and a series of fragmentary field boundaries. It is located on a southeast-facing slope between the 120m and 130m contours. The western part of the polygon lies in Medieval Enclosed Land consisting of former cropping units which have been sub-divided and then amalgamated: the eastern part lies in Modern Enclosed land which was formerly Upland Rough Ground.

The southernmost enclosure has two enclosing banks: the inner enclosure covers 407m sq and the outer covers 1,371m sq, and there is a possible north-facing entrance to the outer enclosure. Thirty five metres to the north is an enclosure covering 795m sq, with an entrance in the southeast and an internal feature of uncertain function. The enclosure is bounded by a bank and there are traces of an outer bank in the west. To the west of these enclosures are two cropmark banks which are interpreted as field boundaries. To the east is a small oval enclosure visible as a cropmark ditch. This enclosure covers only 129m sq and was allocated a low validity score during the NMP project.

The eastern polygon covers an area of 4.6ha. Its eastern part lies within Prehistoric Enclosed Land which has been amalgamated and its western part is in Medieval Enclosed Land comprising former cropping units which have been amalgamated and then sub-divided. It is situated on a southeast-facing slope between the 115m and 120m contours. The polygon contains three cropmark enclosures, all of which were allocated a high validity score during Cornwall's NMP. The most westerly of the enclosures appears to have been truncated by field hedges in the southeast, although it is possible that it was open-ended and this is its full extent. The enclosing ditch covers an area of approximately 0.18ha. Internal features consist of two pits or hollows and a possible oval house, suggesting a Romano-British date. Thirty five metres to the east is an oval enclosure bounded by a bank and ditch and covering an area of 0.17ha. There is a possible entrance facing north to northwest. The third enclosure is 20m to the north. This is bounded by a C-shaped ditch and covers 0.04ha. To its west is s single field boundary visible as a cropmark dich.

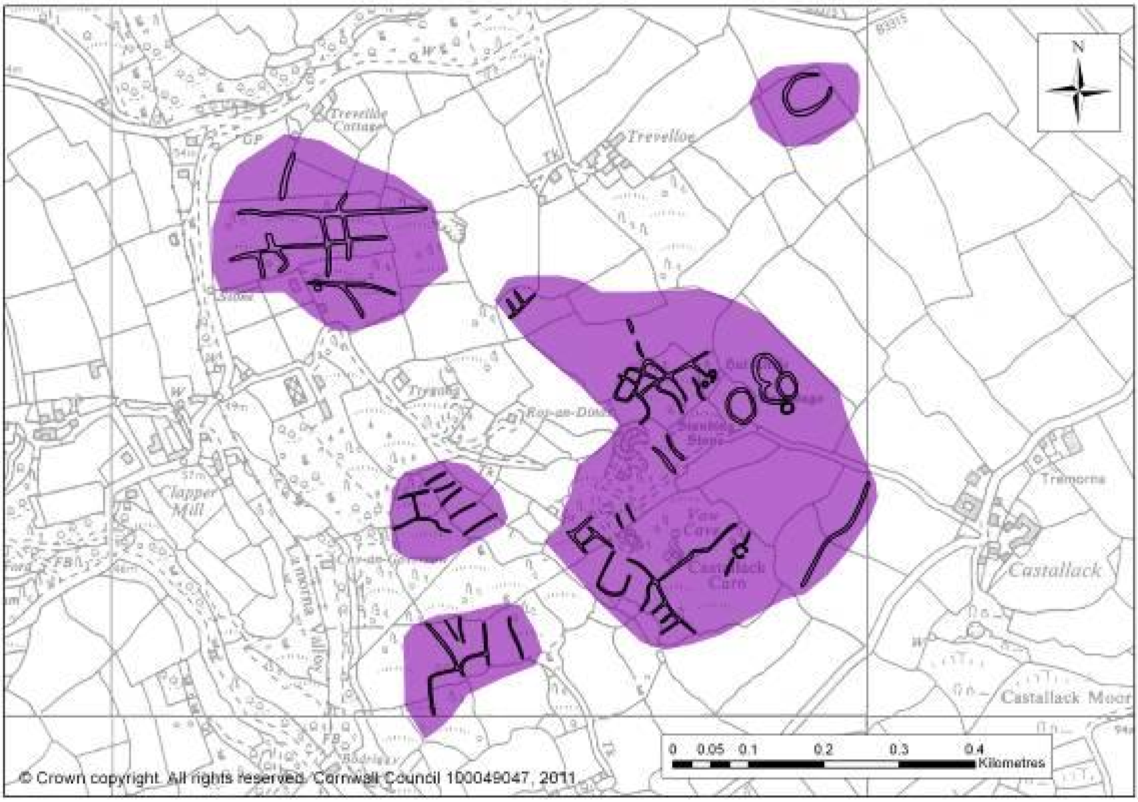

Fig 49. Prehistoric and uncertain date settlement polygons at Castallack Carn, Paul.

In the area around Castallack, Paul, there are a number of sites which illustrate the range and variety of settlement polygons in the Penwith study area (Fig 49). The northernmost contains a single cropmark enclosure with no visible associated features. In many respects this is typical of the Penwith study area enclosures: it is curvilinear, covers an area of 0.19ha, and is situated on sloping ground between the 105m and 110m contours. Unusually the slope is facing northwest. The enclosure is bounded by a single ditch with no sign of an enclosing bank.

In the west are three fragmented field systems all with extant low stony banks as boundaries. As far as they can be accurately measured the fields are typically 35m x 25m.

The settlement polygon on Castallack Carn is the largest in the Penwith study area, covering 15.6ha. In the northeast part of the polygon is a probable courtyard house settlement visible as a cropmark bank. This takes the form of a figure-of-eight enclosure with what appears to be a smaller enclosure appended to its southeast side, and a cropmark round house to its immediate south. It is possible that this is in fact two appended enclosures and a round house but a courtyard house settlement seems a more likely interpretation. This complex of features, which sit on a ridge between the 105m and 110m contours, was allotted a high validity score during Cornwall's NMP. To the southwest of these features is an enclosure covering 0.09ha, bounded by a low bank.

To the southeast and east are the remains of prehistoric fields. In the HER these are listed under two separate records, PRN 53396 and 28917.2 but in reality they may both be part of a single formerly more extensive field system. The fields are bounded by low stony banks and typical dimensions are 30m x 18m. The extant remains of three stone-built round houses are contained within the northernmost of the two field systems.

4.2.5 Barrows

There are 46 barrow sites in the dataset for the Penwith study area. Only 13 of these were assigned a validity score of 3 or more; these are referred to below as high validity barrows. The remainder are referred to as low validity barrows. Of these, two were mapped during Cornwall's NMP but were assigned a low validity rating. Of the remaining 31, 22 were recorded in the HER from documentary evidence and two are listed as 'site of'; none of these have any visible surviving remains. Although the remaining seven barrows are listed as extant in the HER, they were not visible on aerial photographs and consequently were not mapped during Cornwall's NMP and therefore have a validity score of zero.

4.2.5.1 Evidence for the barrows

A majority of the high validity barrows have extant above ground remains as do those low validity barrows which are not recorded from documentary evidence (table 61).

Evidence	High validity barrows	Low validity barrows	All barrows
Cropmark	5 (39%)	1 (3%)	**6 (13%)**
Extant	8 (62%)	8 (24%)	**16 (35%)**
Documentary	0	22 (67%)	**22 (48%)**
Site of	0	2 (6%)	**2 (4%)**
Total	**13**	**33**	**46**

Table 61. Penwith study area: barrows – types of evidence.

4.2.5.2 Distribution of the barrows

The barrows are loosely scattered throughout the study area (Fig 50).

The majority of the high validity barrows lie within the parishes of Paul and St Buryan in the western part of the study area whilst the low validity barrows are often found at locations where no high validity barrows are recorded – particularly in the eastern part of the study area. To some extent this contrasting distribution pattern reflects the evidence on which the records are based, with, for example, many of the low validity barrows in the east being identified from documentary sources, whereas the high validity barrows in Paul and St Buryan are recorded as extant features or as convincing cropmarks (Fig 51).

The distribution pattern is notable in that the barrows generally occur in isolation with no groupings that can be described as cemeteries. The only exception is a group of six barrows (four extant, one cropmark and one 'site of') forming part of a ceremonial landscape around the Merry Maidens stone circle (PRN 28200), which includes Tregiffian burial chamber (PRN 28192), The Pipers standing stones (PRN 28216) and Gun Rith standing stone (PRN 28191). However, these six barrows are dispersed over a distance of more than 1km.

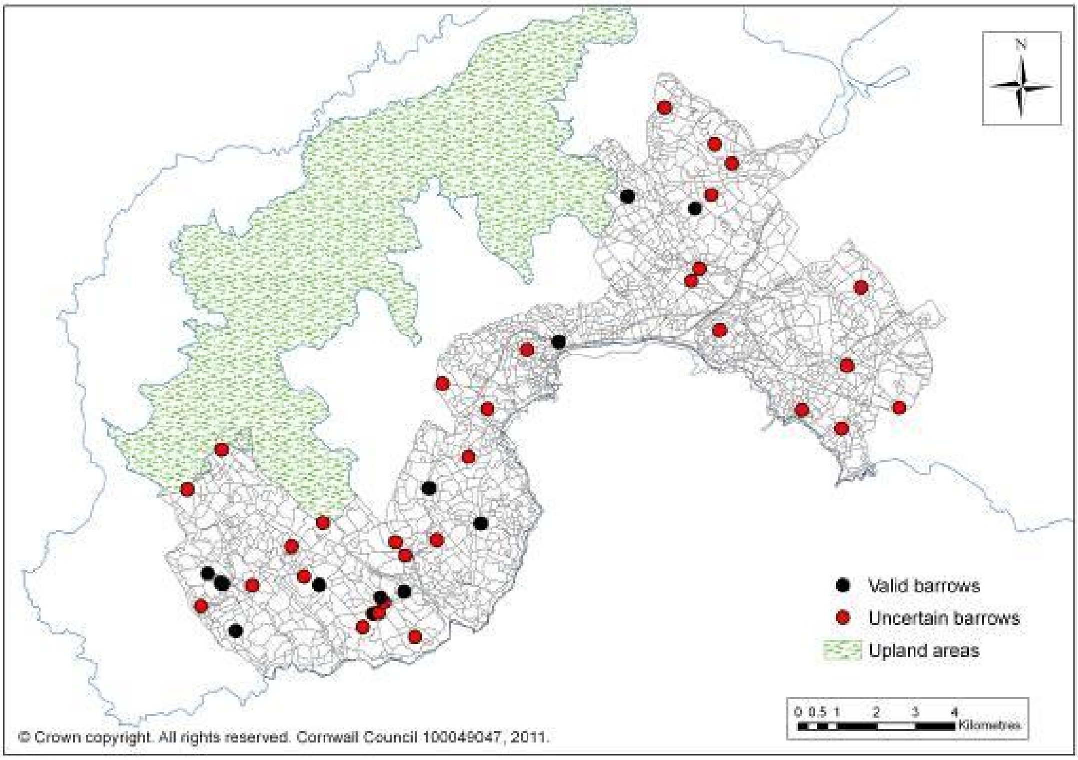

Fig 50. Penwith study area: distribution of high validity and low validity barrows

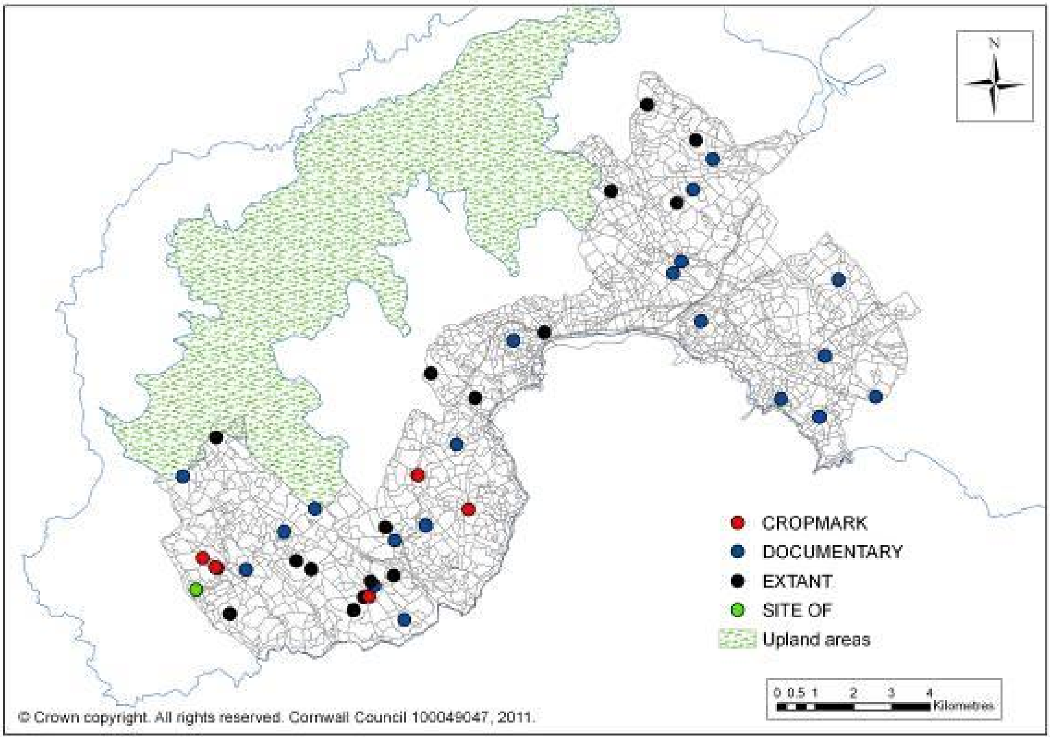

Fig 51. Penwith study area: evidence for the barrows

4.2.5.3 Topographic location of the barrows

The barrows are situated in a range of locations in the landscape, but are found mainly on slopes and, to a lesser extent, hill tops (table 62).

Location	High validity barrows	Low validity barrows	All barrows
Cliff top	0	3	**3 (7%)**
Hill top	3	9	**12 (26%)**
Plateau	0	3	**3 (7%)**
Promontory	2	0	**2 (5%)**
Ridge	1	1	**2 (5%)**
Slope	7	17	**24 (52%)**
Valley floor	0	0	**0**
Total	**13**	**33**	**46**

Table 62. Penwith study area: barrows – location in the landscape.

This is in contrast to the Probus study area, where barrows are situated predominantly on hill tops, ridges and other prominent locations.

Typically the high validity barrows are sited between the 65 and 140m contours (more specifically between the 65 and 125m contours) and this is the case also for the low validity barrows, although almost a third of these are situated in lower lying land (table 63).

Height	High validity barrows	Low validity barrows	All barrows
0-25m	0	1	**1**
25-65m	1	9	**10**
66-100m	4	9	**13**
101-140m	7	11	**18**
141-210m	1	3	**4**
Total	**13**	**33**	**46**

Table 63. Penwith study area: barrows – altitude.

In terms of topographical aspect there appears to be an avoidance of north-facing locations. Other than topographical locations such as hill tops and ridges which face all aspects, the majority of the barrows face east or southeast (table 64). When broad topographical aspect is analysed all aspects, easterly and southerly aspects are the most favoured (table 65). This may, however, merely reflect the lie of the land, much of which in the Penwith study area slopes to the south or southeast.

Location	High validity barrows	Low validity barrows	All barrows
All aspects	4	13	**17**
E	3	5	**8**
N	0	0	**0**
NE	1	1	**2**
NW	1	2	**3**
S	0	5	**5**
SE	4	4	**8**
SW	0	2	**2**

W	0	1	**1**
Total	**13**	**33**	**46**

Table 64. Penwith study area: barrows – topographical aspect.

Broad aspect	High validity barrows	Low validity barrows	All barrows
Western (W, NW, SW)	1	5	6
Eastern (E, NE, SE)	7	10	17
Northern (N, NE, NW)	2	3	5
Southern (S, SE, SW)	4	11	15
All aspects	4	13	17

Table 65. Penwith study area: barrows – broad topographical aspect.

4.2.5.4 Size and form of the barrows

All the barrows with visible remains are simple round barrows. Diameters were measurable for all 13 high validity barrows and two of the low validity barrows and these range from 8m to 24m. The average diameter is 16m – the same as for the barrows in the Probus study area – and the great majority of the barrows fall within the 11 – 20m category. A summary of barrow diameters is set out in table 66.

Diameter (m^2)	High validity barrows	Low validity barrows	All barrows
5-10	1	1	**2**
11-15	5	0	**5**
16-20	6	1	**7**
21-25	1	0	**1**
Total	**13**	**2**	**15**

Table 66. Penwith study area: barrows – measurable diameters.

All bar one of the high validity barrows and both low validity barrows are visible as mounds, whether extant or plough levelled. Only one barrow was visible as a ring ditch.

5 Pelynt

5.1 Character of the Pelynt study area

The Pelynt study area is located on the south coast of Cornwall, on and around the Fowey estuary. It comprises the ecclesiastical parishes of Boconnoc, Fowey, Golant, Lanreath, Lanteglos by Fowey, Pelynt and St Veep, in total covering an area of 89.155 sq km (see Fig 52).

It includes a six kilometre stretch of coastline characterised by moderately high cliffs and steep cliff slopes, stretching between Lansallos in the east and almost as far as Gribbin Head in the west.

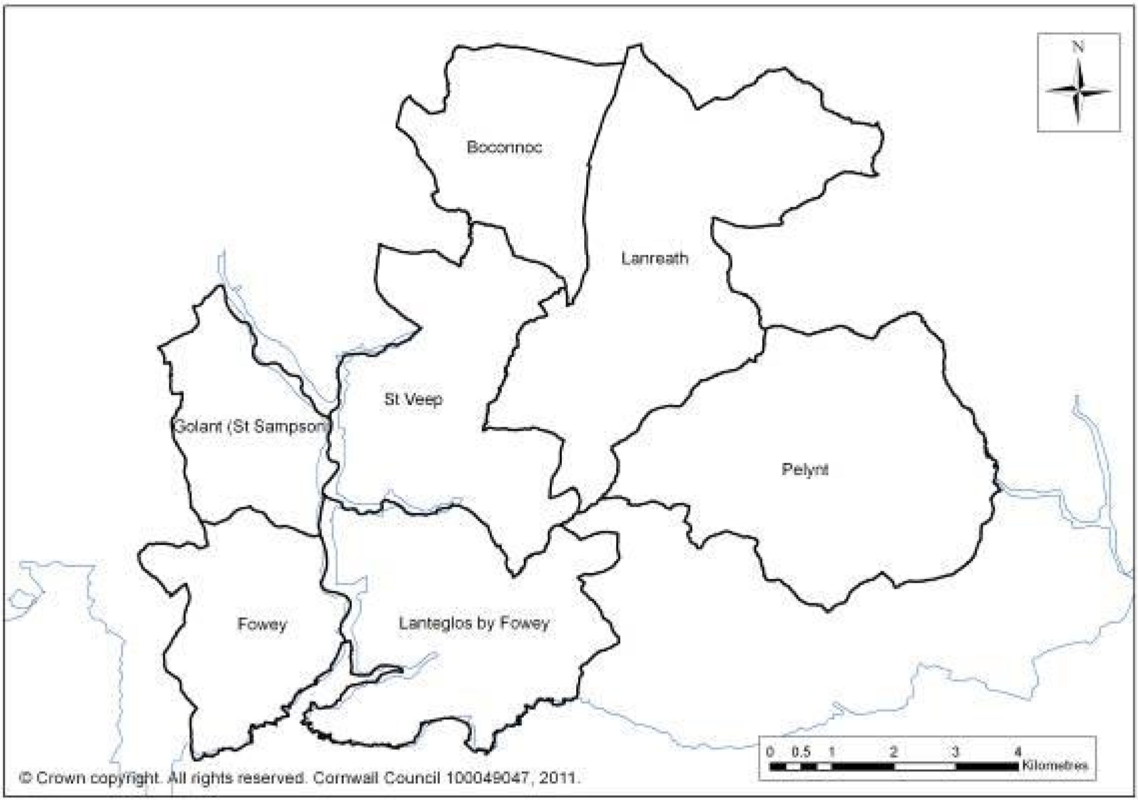

Fig 52. The Pelynt study area showing ecclesiastical parishes.

The Fowey estuary cuts inland from the coast leading to a series of tributaries, most notably the River Lerryn and Trebant Water. These rivers extend inland to form a dendritic drainage pattern and a predominantly undulating landscape of ridges incised by steep-sided valleys. The valleys often form the boundaries of parishes; the east the study area for example, bounded by the West Looe River, which forms the eastern edge of the parish of Pelynt.

Close to the rivers, much of the western part of the area is relatively low-lying, generally situated below the 100m contour. However, ridges of higher ground extend from the eastern edge of the Fowey estuary, leading eastward to a large ridge of higher ground that runs roughly south-north, reaching its highest point in the north eastern part of the study area at Bury Down (205m). The northernmost section of the study area lies upon the flank of the high ground of Braddock Down.

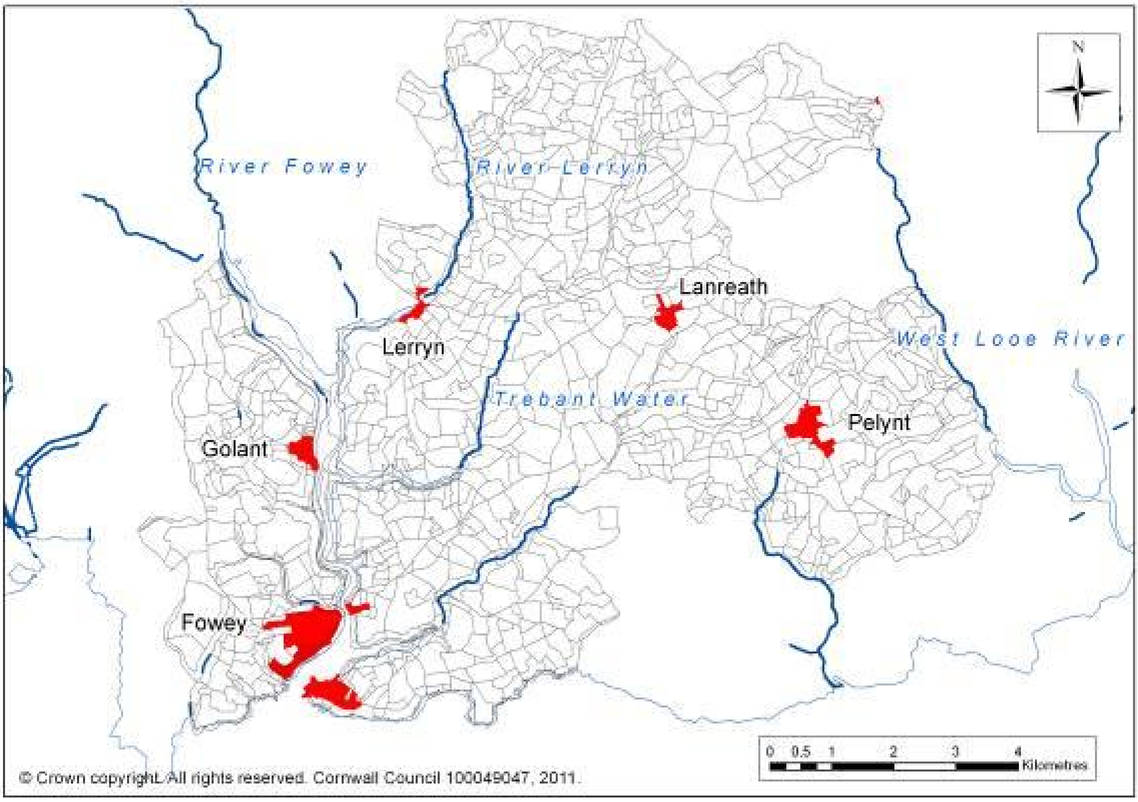

Fig 53. The Pelynt study area showing the main settlements and rivers.

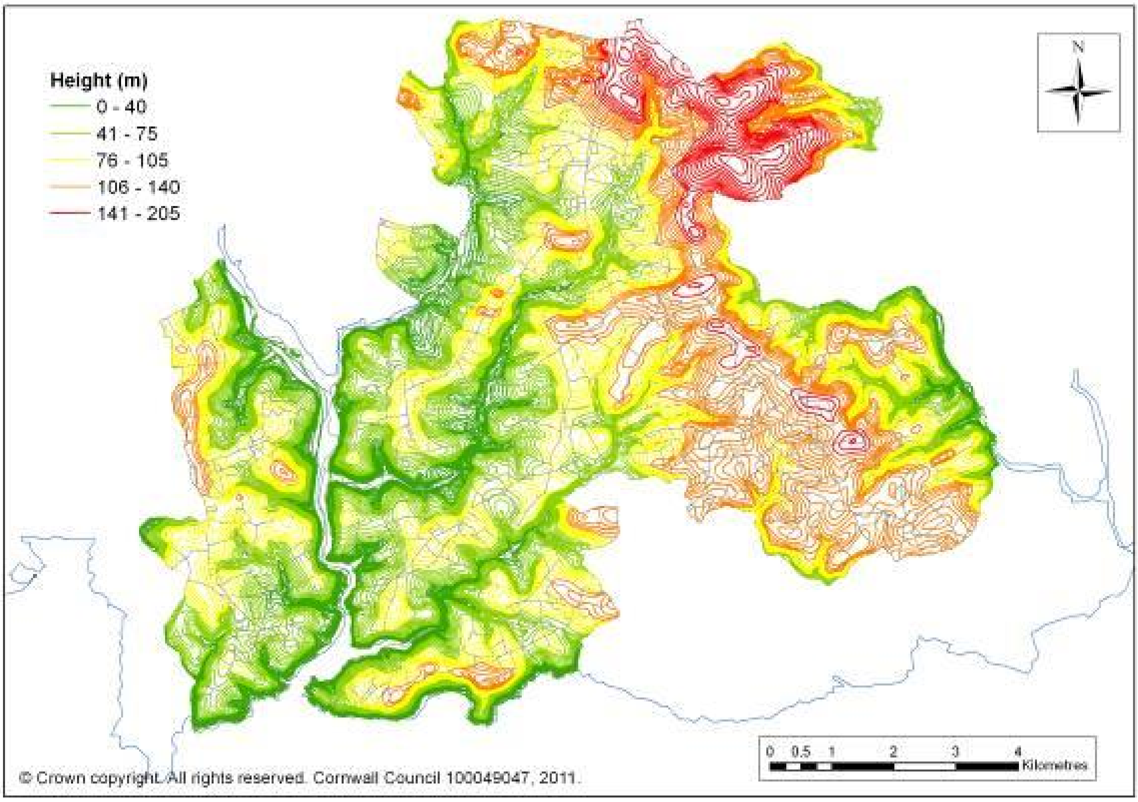

Fig 54. The topography of the Pelynt study area.

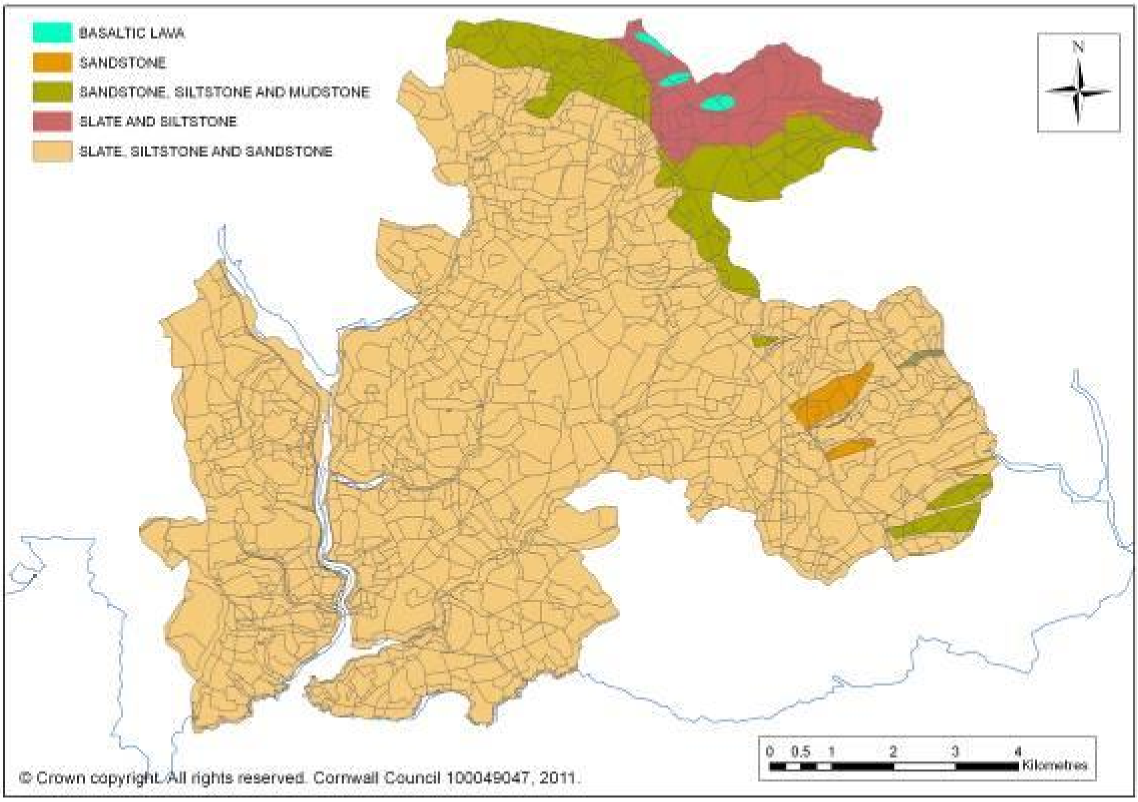

Fig 55. The Pelynt study area: simplified geology.

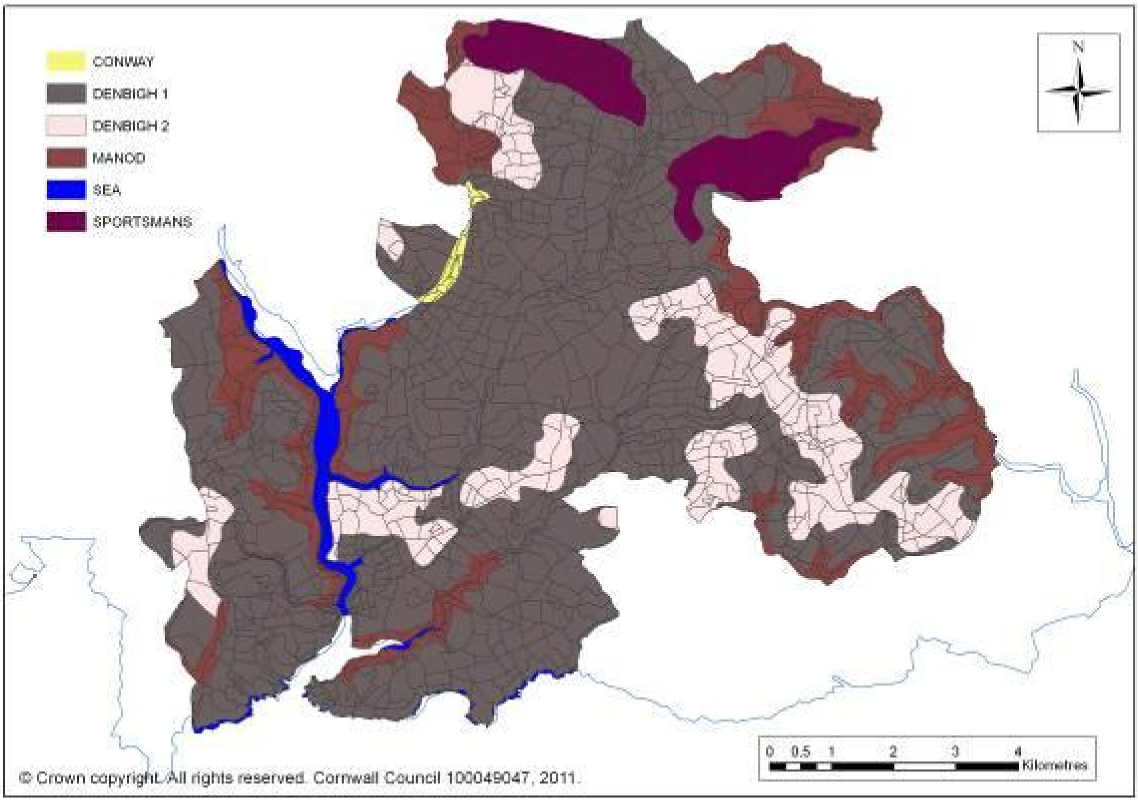

Fig 56. Soil types in the Pelynt study area.

The underlying bedrock geology is made up predominantly of Early Devonian slate, siltstone and sandstone of the Meadfoot beds (in the east and north) and of the Dartmouth beds (in the west). These rock types cover 85% of the study area and occur throughout, apart from the far north eastern tip of the area (Fig 55). In the northeast the underlying rocks include Upper Devonian slate and siltstone of the Saltash formation and Early Devonian sandstone, siltstone and mudstone of the Staddon formation. There are also small deposits of basaltic tuff and basaltic lava, and in the east small areas of Meadfoot bed sandstone.

Overlying the slate, siltstone and sandstone the predominant soils are the well-drained fine loams of the Denbigh1 and Denbigh2 series, with Manod series loams occurring primarily around the river valleys (Fig 56). In the northeast, overlying the sandstone, siltstone and mudstone, are seasonally wet loams of the Sportsman series on the higher ground.

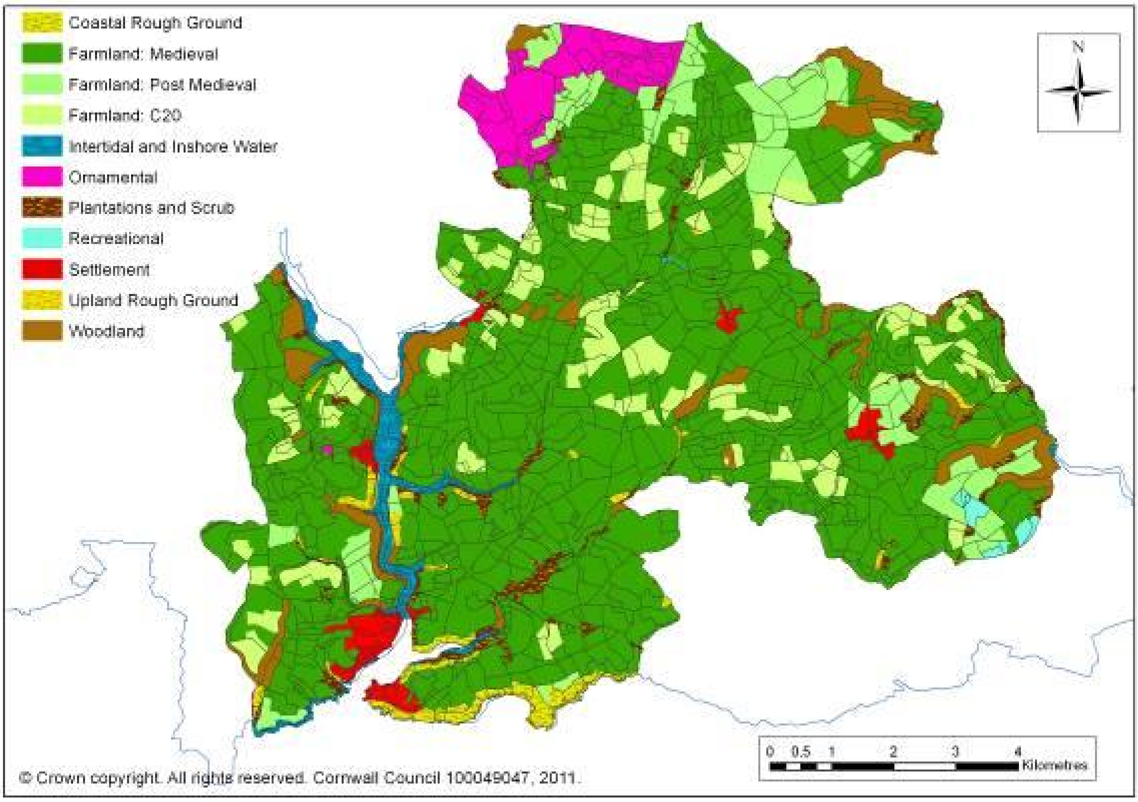

Fig 57. The 1994 HLC for the Pelynt study area.

During the 1994 HLC 81% of the Pelynt study area was classed as enclosed farmland (Fig 57). This is a similar proportion of enclosed land to the Penwith study area but rather less than either Probus or Poundstock. Primarily this is because Pelynt contains significantly more woodland than the other study areas. Woodland cover amounts to 8% of the land area (compared with 4% for Probus and Poundstock and less than 1% for Penwith), and this is four times more than the overall percentage of woodland in Lowland Cornwall as a whole.

Whilst the proportion of the study area covered by the HLC Type Farmland: Medieval is similar to that for Lowland Cornwall generally, the percentage of Farmland: Post medieval is significantly greater (27% as opposed to 16) and the extent of Farmland: C20 is much less than the Lowland Cornwall average (only 1% as opposed to 11). In this respect the proportions of enclosed land types in Pelynt are broadly similar to those in the Probus study area.

Other differences in the proportion of HLC Types in Pelynt from the overall Lowland Cornwall proportions are settlement (slightly less in Pelynt), Upland and Coastal Rough Ground (considerably less) and Ornamental (three times greater than the Lowland Cornwall average). The high percentage of the HLC Type Ornamental reflects the location of the extensive Boconnoc estate in the northernmost part of the area (Fig 57)

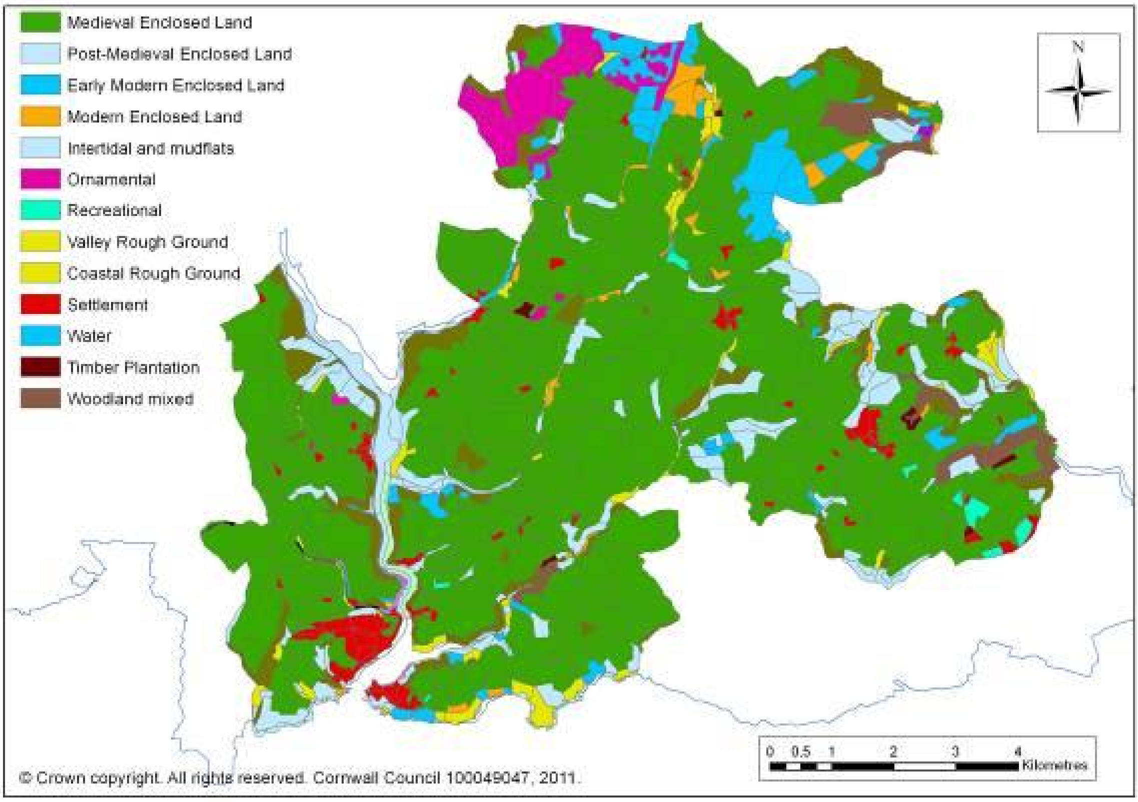

Fig 58. The Pelynt study area showing the refined HLC 2011 time-slice.

In the refined HLC undertaken during this project reclassification of the enclosed land types has resulted in the proportions of each type differing significantly from those in the 1994 HLC (Fig 58). The most significant changes concern the interpretation of Post-Medieval Enclosed Land. In the 1994 HLC 23.69 sq km is classed as this Type whereas in the 2011 HLC the figure is only 6.38 sq km. The difference is 17.31 sq km, of which 4.1 sq km was re-interpreted as Modern or Early Modern Enclosed Land and 13.2 sq km as Medieval Enclosed Land.

Analysis of the various HLC time-slices for the Pelynt study areas show that, as in the other areas, the extent of Rough Ground has diminished through time (Fig 59). However it should be noted that even in the late medieval time slice there is considerably less Rough Ground in Pelynt than the other study areas – only 9% of the area was covered by Rough Ground types. There is Coastal Rough Ground along much of the coastline, but extensive areas of Upland Rough Ground only occur in the far north of the study area.

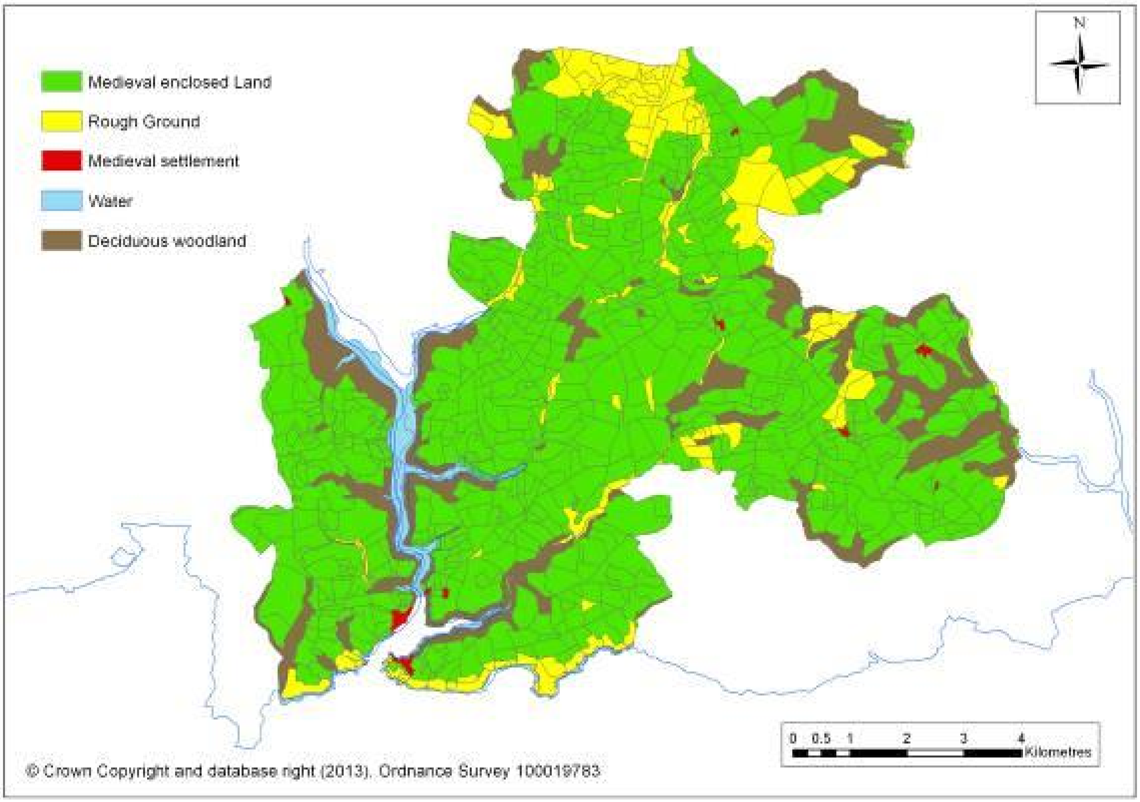

Fig 59. The Pelynt study area showing the late medieval time-slice HLC.

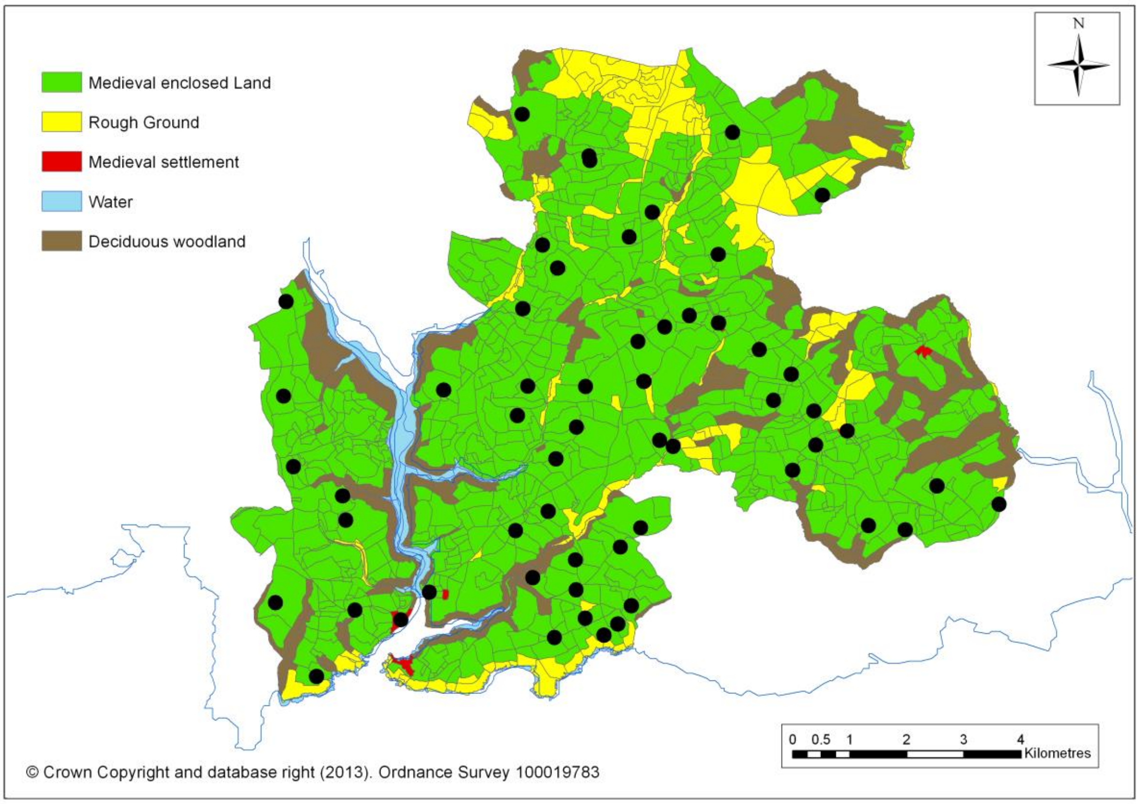

Fig 60. Distribution of early medieval settlements in the Pelynt study area. Background formed by the late medieval time-slice HLC.

Mapping of settlements with early place-name elements against the late medieval time-slice (Fig 60) indicates the potential settlement pattern in the early medieval period and this is as expected: of the 57 settlements, 51 are located in areas of enclosed land and the other six are captured within settlement HLC Types. None are located in the Rough Ground areas in the north.

5.2 Prehistoric and Romano-British archaeology in the Pelynt study area

The Lowland Cornwall cropmark visibility model, which indicates those areas where cropmarks are most likely to form and are most likely to be visible, classes 59% of the Pelynt study area as falling within its high visibility zone (Fig 61). The low visibility zone is considerably larger than that of the Probus study area but smaller than that in Penwith, covering 20%, and the medium probability zone covers 21% (very similar to both Probus and Penwith). The high visibility zone in Pelynt is smaller than that in Penwith (64%) and considerably smaller than that in Probus (73%). Although in places Denbigh2 soils overlie slate, siltstone and sandstone, a combination which is classed in the high visibility zone, the combination of bedrock geology and soils over other parts of the study area fall into the medium or low visibility zones. Added to this is the fact that the aerial reconnaissance history over the study area indicates that some parts have been flown only a medium number of times whilst other parts have been rarely flown.

A total of 83 monument sites in the project dataset are located within this study area (Fig 62), which equates to a site density of 0.9 sites/km sq. Of these 59 (71%) are captured in the high visibility zone of the model, 17 (20%) in the medium zone, and 7 (9%) in the low probability zone, so overall the visibility model works well when applied to the Pelynt study area.

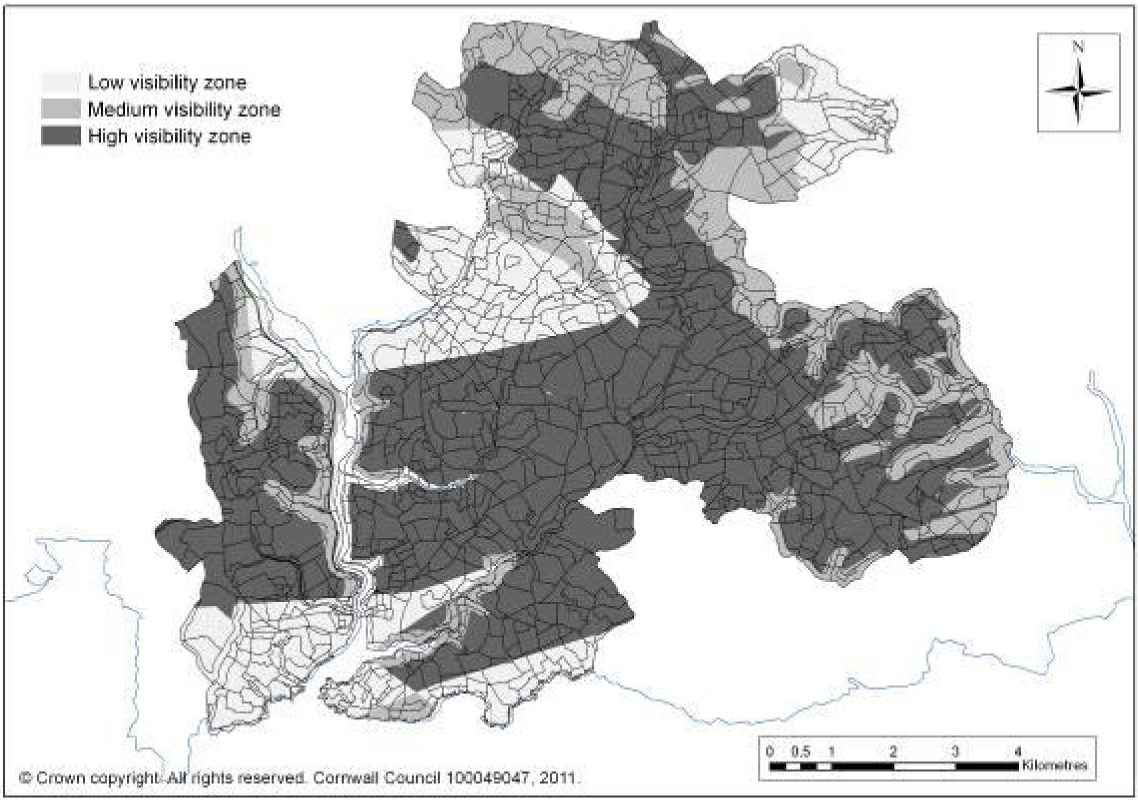

Fig 61. The Lowland Cornwall cropmark visibility model for the Pelynt study area.

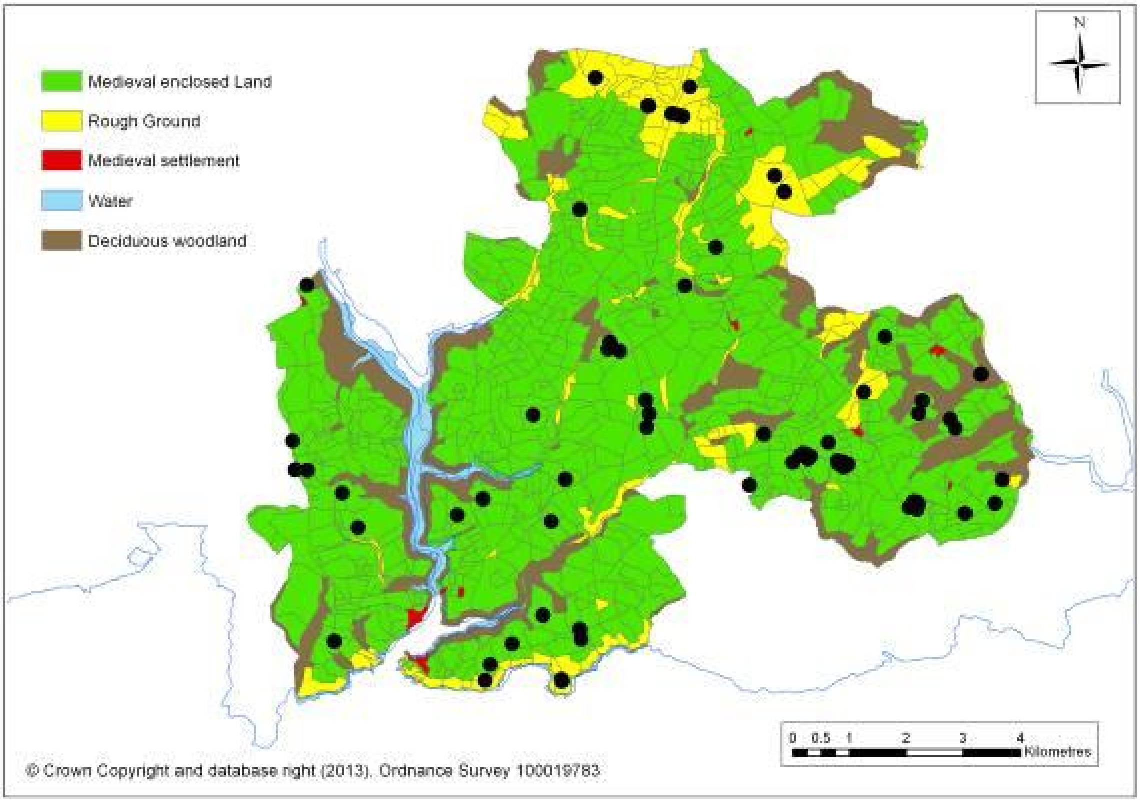

Fig 62. The distribution of all prehistoric/RB monument sites in the Pelynt study area. Background formed by the late medieval time-slice HLC.

Of the 83 sites five are recorded as 'site of' – formerly known sites which have since been destroyed. Of the remainder, 38 are recorded as having surviving earthworks, 26 are visible as cropmarks and 14 are recorded from documentary sources (however, one of these – the cliff castle at St Catherine's Point, PRN 176991, does actually have earthwork remains). A much higher percentage of sites in the Pelynt study area have earthwork remains than in either Probus or Penwith. Whilst the percentage of cropmark sites is similar to that in Penwith it is much lower than in Probus and the percentage of sites recorded from documentary sources is the same as in Probus but considerably lower than in Penwith. Unlike either Probus or Penwith, settlement related features do not make up the majority of sites recorded, but instead barrows are the most numerous monuments. A breakdown of site types is set out in table 67 below.

Site type	Number	Percentage
Round	11	13.5%
Enclosure	11	13.5%
Barrow	50	60%
Field system	2	2.5%
Field boundary	0	0
Hillfort	7	8.5%
Cliff castle	1	1%
Round house	1	1%
Total	**83**	

Table 67. *Breakdown of prehistoric/RB site types recorded from the Pelynt study area*

Overall site density in the Pelynt study area is roughly half that in Probus and less than half that in Penwith. Accordingly the only sites recorded in numbers comparable with Probus or Penwith are barrows (there are actually more barrows recorded here than from Penwith) and hillforts. All other site types are much scarcer – for instance only 11 rounds compared to 84 in Probus and 73 in Penwith.

5.2.1 Enclosures

In contrast to Probus and Penwith, where enclosures are plentiful, there are only 22 enclosures in the Lowland Cornwall dataset for the Pelynt study area. Of these eight were recorded as high validity enclosures, the remaining 14 having a low validity score. Six of the low validity enclosures are listed in the HER as recorded from documentary sources and have no visible surviving remains, and a seventh, although listed in the HER as a cropmark on aerial photographs, was not mapped during Cornwall's NMP.

Five of the high validity enclosures and eight of the low validity examples are recorded as cropmarks. The remaining three high validity enclosures all have earthwork remains and the six low validity enclosures are recorded from documentary sources. In percentage terms 59% of the enclosures are recorded as cropmarks and 14% as earthworks. Compared with Probus and Penwith, the percentage of cropmark enclosures is much lower than in Probus but higher than in Penwith: the percentage of earthwork enclosures is similar to Probus but slightly less than in Penwith. The percentage of documentary records for enclosures is closer to Probus than to Penwith.

The distribution of enclosures in the Pelynt study area is shown in Fig 63 below. The enclosures are generally dispersed throughout most of the study area, although there are extensive areas where none are recorded. All the enclosures are located within the HLC Type Medieval Enclosed Land of the late medieval time-slice HLC apart from one which is in Upland Rough Ground (undivided). This enclosure (PRN 25126), situated some 300m from the hillfort on Bury Down, was recorded from antiquarian sources but no traces now survive above ground, nor is it visible as a cropmark.

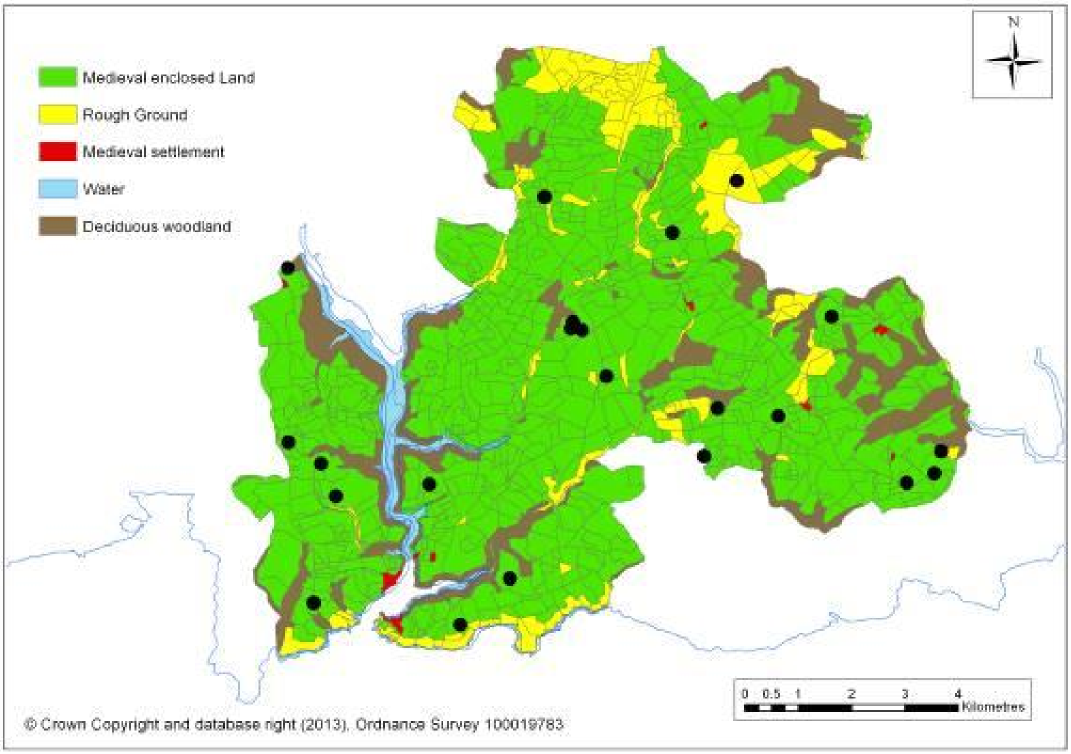

Fig 63. The distribution of enclosures in the Pelynt study area. Background formed by the late medieval time-slice HLC..

5.2.1.1 Topographic location of the enclosures

Like the enclosures in the Probus and Penwith study areas a significant majority of those in the Pelynt area are located on slopes. However, the percentage of enclosures on slopes (64%) is smaller than in Probus or Penwith (where the figures are 78% and 71% respectively). Of the high validity enclosures, five are located on slopes, and there are single instances of an enclosure on a cliff top, a hill top and a ridge. Nine of the low validity enclosures are sited on slopes, one on a ridge and four on hill tops. Overall the percentage of hill top enclosures in Pelynt is considerably higher than in either Probus or Penwith, but the varying sizes of the three samples ought preclude any firm conclusions being drawn from this apparent difference.

The enclosures are for the most part located predominantly between the 76m and 140m contours. This is true of both the high and low validity enclosures (all the high validity enclosures and 71% of low validity enclosures are located at this height). One low validity enclosure is on higher ground and three are sited in lower lying ground.

Height (m)	High validity enclosures	Low validity enclosures	All enclosures
0-40	0	1	**1**
41-75	0	2	**2**
76-105	4	5	**9**
106-140	4	5	**9**
141+	0	1	**1**
Total	**8**	**14**	**22**

Table 68. Pelynt study area: Enclosures – altitude.

There appears to be no particularly favoured aspect for the enclosures, although there is an avoidance of northerly aspects (table 69). When the high validity enclosures are considered in isolation, there might be a slight preference for southerly and easterly aspects, but overall the enclosures fit into the general lie of the land.

Location	High validity enclosures	Low validity enclosures	All enclosures
Western (W, NW, SW)	2	5	**7**
Eastern (E, NE, SE)	3	3	**6**
Northern (N, NE, NW)	1	1	**2**
Southern (S, SE, SW)	4	3	**7**
All aspects	2	4	**6**

Table 69. Pelynt study area: Enclosures – broad aspect.

A total of 57 early medieval settlements are identified through place-name evidence in the Pelynt study area. When their location in the landscape is compared with that of the enclosures a similar pattern emerges to that noted in both the Probus and Penwith study areas, namely that the early medieval settlements tend to be sited in lower lying terrain than the enclosures (Table 70).

Similarly there is a marked preference for settlement locations on sloping ground: 55 of the settlements are sited on slopes, one is on a cliff top and the other on a plateau. Among the early medieval settlements there is a preference for southerly aspects (32 settlements), particularly slopes facing southeast, and a marked avoidance of northerly aspects (only 13 settlements).

Height	EM settlements	% settlements	% enclosures
0-40m	5	9%	4.5%
41-75	19	33%	9.1%
76-105	14	25%	40.9%
106-140	18	31%	40.9%
141+	1	2%	4.5%
Total	57		

Table 70. Comparison of height OD between prehistoric/RB enclosures and early medieval settlements in the Pelynt study area

5.2.1.2 Size and form of the enclosures

Reliable measures of size could be made for 14 of the enclosures (seven of the high validity enclosures and seven of the low validity enclosures). The size of the enclosed area could not be measured for the six enclosures identified from documentary evidence with no visible remains and an incomplete enclosure recorded from aerial photographs (PRN 26707; Coombe Farm).

Of the seven high validity enclosures two are curvilinear in form, three are rectilinear and two are mixed (with straight and curving sides). All the low validity enclosures are curvilinear in shape. In other words nine out of the 14 enclosures (64%) are of curvilinear from. This is a much higher percentage than in either the Probus or Penwith study areas. However it should be noted that, quite apart from the limited size of the Pelynt sample, this figure is heavily influenced by the form of the low validity enclosures; when the high validity enclosures are considered in isolation there is a more even mixture of enclosure forms.

Overall 12 (86%) of the 14 measurable enclosures cover less than 0.5ha in area, with eight (57%) enclosing an area smaller than 0.25ha. This size range closely resembles that in the Probus study area (88% enclosing less than 0.5ha and 60% enclosing less than 0.25ha). Four of the low validity enclosures and one high validity enclosure cover less than 0.1ha in area (36% of all the measurable enclosures, which is similar to the corresponding percentage in the Penwith study area). One high validity enclosure covers between 0.5 and 1ha, and one of the low validity enclosures covers an area greater than 1ha.

Unlike the Probus and Penwith study areas, where a larger proportion of earthwork enclosures fall into the larger size bands than do the cropmark enclosures, in the Pelynt study area all the earthwork enclosures cover less than 0.5ha, whereas cropmark enclosures are represented in all five size bands (table 71).

Size	Earthworks	Cropmarks	All enclosures
<0.1ha	1	4	**5 (36%)**
0.1-0.25ha	1	2	**3 (21%)**
0.25-0.5ha	1	3	**4 (29%)**
0.5-1ha		1	**1 (7%)**
>1ha		1	**1 (7%)**
Total	**3**	**11**	**14**

Table 71. Pelynt study area: Enclosures –size of earthwork and cropmark enclosures.

Curvilinear enclosures

Two of the high validity enclosures and all seven of the low validity enclosures are classed as curvilinear. All of these have sufficiently extensive visible remains to allow a closer definition of their form (Table 72).

Form	High validity enclosures	Low validity enclosures	Total
Circular		1	**1**
Sub-circular	1	1	**2**
Oval	1	3	**4**
Regular			
Irregular			
C-shaped		2	**2**
Total	**2**	**7**	**9**

Table 72. Pelynt study area: Enclosures – form of curvilinear enclosures.

It is clear that whilst truly circular enclosures are less common and regular and irregular shaped enclosures are not represented, oval forms are the most commonly occurring shapes.

Rectilinear enclosures

Three of the high validity enclosures are classed as rectilinear. All three are four-sided; two are sub-square and the other sub-rectangular.

5.2.1.3 Form of the enclosing circuits

The construction of the enclosing circuit of 15 of the Pelynt enclosures could be identified. Eight of the enclosures appear to be bounded by a ditch only, four by a ditch and bank and three by a bank only.

Form	High validity enclosures	Low validity enclosures	All enclosures
Ditch	4	4	**8(53%)**
Bank		3	**3 (20%)**
Ditch and bank	4		**4 (27%)**
Total	**8**	**7**	**15**

Table 73. Pelynt study area: Enclosures – form of enclosing circuit.

Although the percentage of enclosures bounded by both ditch and bank is very similar to that in the Penwith study area the high number of enclosures bounded only by a ditch means that the character of the Pelynt enclosures corresponds more closely to that of the Probus enclosures.

5.2.1.4 Complexity

A higher percentage (27%) of enclosures in the Pelynt study area can be classed as complex than in either the Probus or Penwith study areas. However, given the small sample of enclosures in Pelynt, this only amounts to six individual sites. Of these, two have an appended enclosure or annex, three are double-ditched (multivallate with close-spaced ditches) and one is multivallate with wide-spaced ditches (in which the outer circuit encloses at least twice the area of the inner).

Two of the double-ditched enclosures are oval in shape; in scale, however, the two are quite different. The first, PRN 57412 at Barcelona, Pelynt, is sited on a hill top and encloses an area of 0.81ha. The second, PRN 10117 is an earthwork enclosure at Kilminorth, Pelynt, sited on a northeast facing slope and enclosing an area of 0.1ha.

The third double-ditched enclosure, PRN 57688 sited close to a cliff top to the east of Polruan, Lanteglos by Fowey, is sub-rectangular in shape and encloses an area of 0.37ha.

The enclosure with wide-spaced ditches, PRN25133 on a south facing slope at Carwen, Lanreath comprises an oval shaped inner enclosure covering 0.13ha and a polygonal outer enclosure formed of straight and curving sides enclosing 0.54ha.

One enclosure with an annex is the site known as Bake Rings, near Bake Farm, Pelynt PRN 37198. This enclosure is situated on a ridge between the 135 and 140m contours. The 'parent' enclosure is formed by both straight and curving sides (mixed) and encloses an area of just under 0.2ha. The annex, which is appended to the enclosure's eastern side, is polygonal with at least five sides and covers an area of at least 0.75ha. The annex may have a complex entrance in its southeast side. The shape of the present day field boundary to the southwest of the enclosure suggests that there are further associated features (possibly a second appended enclosure) in the vicinity.

The second enclosure with annex is a sub-square enclosure at Penventinue, Fowey (Fig 67). This is an unusual enclosure for Lowland Cornwall: it measures roughly 60m x 60m and has a rectilinear annex, measuring 45m x 30m, attached to its southwest side. Both the parent enclosure and the annex have internal 'partitions', there are corresponding entrances in the southwest side of the annex and the parent enclosure and a possible second entrance to the parent enclosure in its southeast side. There is a visible remnant of an associated field system to the south (and possibly to the north of the enclosure).

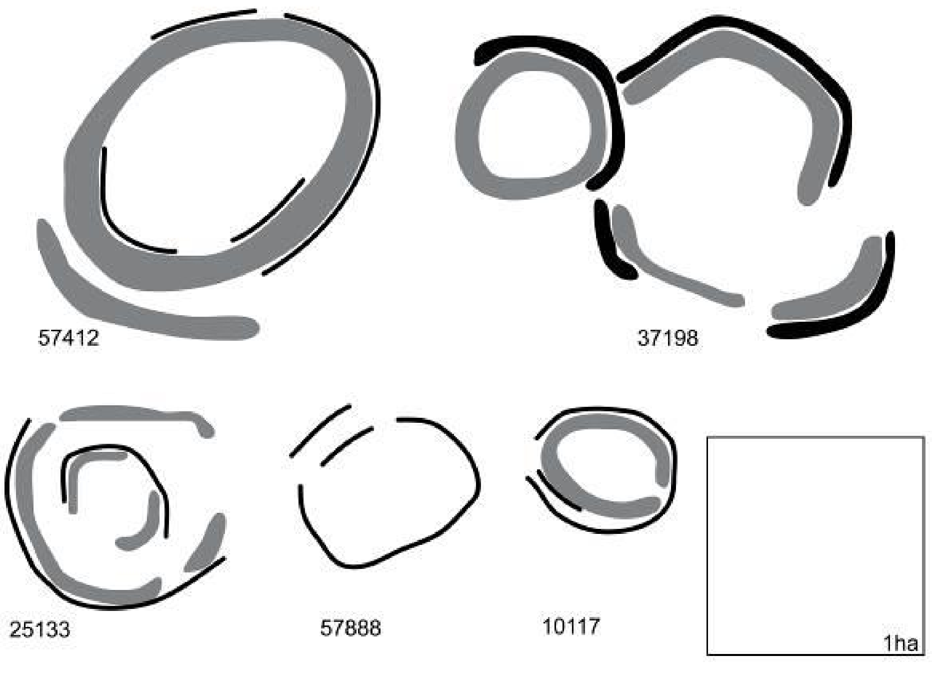

Fig 64. Complex enclosures in the Pelynt study area.

5.2.1.5 Summary

Fifty nine percent of the Pelynt study area falls into the high visibility zone of the Lowland Cornwall visibility model, which is less than the Penwith study area and significantly less than Probus. This is despite there being quite extensive areas of bedrock and soil types conducive to cropmark formation: the main reason for this smaller zone of high probability seems to be the fact that some parts of the area have been rarely flown. However, 74% of the area is captured in the high probability zone of the enclosures/1994 HLC probability model. This is a similar percentage to the Penwith study area and only slightly lower than the Probus study area.

Despite this, only 22 enclosures are recorded from this study area – less than any of the other three and, to put it into perspective, more than six times fewer than in the Probus study area. The density of enclosures is only 0.25 per km sq, or one enclosure per 4km sq. Areas of rough ground or former rough ground are avoided - all but one of the enclosures are located in land enclosed in the medieval period or earlier.

The majority of enclosures are recorded as cropmarks, with three recorded as extant monuments and six from documentary sources.

Although a significant majority of the enclosures are sited on sloping ground, the percentage of the Pelynt enclosures located on hill tops is considerably higher than in either Probus or Penwith. They tend to occupy ground between the 76 and 140m contours and although there appears to be an avoidance of northerly facing aspects there is no obviously favoured aspect. As in Probus and Penwith early medieval settlements are found in similar areas to the enclosures but tend to favour lower-lying terrain.

As elsewhere a large majority of the Pelynt enclosures (86%) cover less than 0.5ha and more than half enclose an area smaller than 0.25ha. Unlike the Probus study area, there is no obvious tendency for earthwork enclosures to fall into the larger size brackets; in fact the largest enclosures here are recorded as cropmarks.

Where the shape of enclosures can be defined there are three times as many curvilinear enclosures as there are rectilinear, and oval forms are the most frequent. Rectilinear forms are either sub-square or sub-rectangular. More than half the enclosures appear to be bounded by a ditch only, whilst similar numbers of enclosures are bounded by a bank only or by a ditch and bank.

Although the majority of enclosures are univallate in form there is a larger proportion of complex enclosures in Pelynt than in Probus or Penwith - two with an appended annex, three with double ditches and one multivallate enclosure.

5.2.2 Unenclosed settlements

Only one round house is recorded in the Lowland Cornwall dataset for the Pelynt study area and that is contained within the Castle Dore hillfort. Therefore there are no recorded unenclosed settlements in the study area.

5.2.3 Field systems

There are only two field systems of definite prehistoric/RB date in the Lowland Cornwall dataset for the Pelynt study area, both of which were assigned a Morph validity score of 3 or higher. In addition a further two field systems and six field boundaries of uncertain date are recorded: it is possible that some or all of these are prehistoric in origin. All of these also were ascribed a high validity score in Morph.

All of the fields, both the undated examples and those of prehistoric/RB date, are plough-levelled and were recorded as cropmarks in the database. One of the prehistoric/RB field systems appears to be associated with an enclosure but the other does not. Of the undated fields four are close to enclosures and could therefore be associated, whilst the other four are not.

The distribution of the fields does, however, resemble that of the enclosures in that they are located in broadly the same parts of the study area and all are within land classed as enclosed land in the late medieval time-slice HLC (Fig 65 and compare with Fig 63).

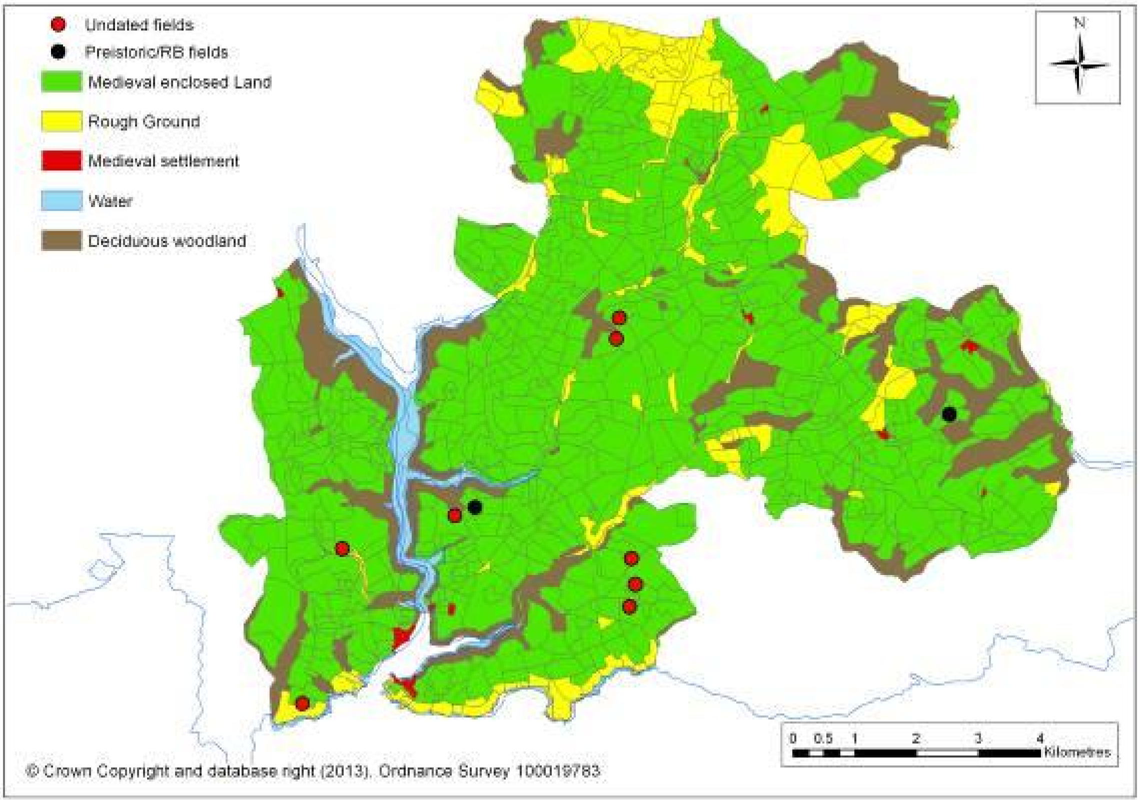

Fig 65. Pelynt study area: distribution of field systems and field boundaries

5.2.3.1 Topographic location of the field systems

All the field systems are located on sloping ground apart from one of the undated examples, which is sited on a ridge. Predominantly the fields occupy land between the 75 and 105m contours, although two are in rather lower lying areas and two are on higher ground (table 74).

Height (m)	Prehistoric/RB fields	Undated fields	All fields
0-40	0	0	**0**
41-75	0	2	**2**
76-105	1	5	**6**
106-140	1	1	**2**
141+	0	0	**0**
Total	**2**	**8**	**10**

Table 74. Pelynt study area: field systems – altitude.

As pointed out in discussions of the topographical location of field systems in previous sections, these figures are somewhat generalised because some field boundaries are relatively long and traverse a number of contours. For instance the highest field boundary in the study area stretches from the 115m contour to the 145m contour but is classed in table 83 as falling within the 106-140m contours.

One of two prehistoric/RB field systems faces northwest and the other northeast. Looking at all the field systems together the favoured aspects appear to be westerly and northerly (table 75); in fact of the undated fields, two face due north and two due west.

Location	Prehistoric/RB fields	Undated fields	All fields
Western (W, NW, SW)	1	4	**5**
Eastern (E, NE, SE)	1	1	**2**
Northern (N, NE, NW)	1	3	**4**
Southern (S, SE, SW)	0	2	**2**
All aspects	0	0	**0**

Table 75. Pelynt study area: field systems – broad aspect.

5.2.3.2 Size and form of the fields

As in the Probus study area all the fields recorded in Pelynt are visible only as cropmarks and, even more so than in Probus, the survival appears to be very fragmentary. Measurements of width are possible in all of the undated fields and for one of the prehistoric/RB fields but measurement of length was only possible in two of the undated fields and one of the prehistoric/RB fields, meaning that statements about field size in terms of area could only be made for the three examples where length measurements were possible.

The measurable field assigned a prehistoric or Romano-British date is at Colquite, Lanteglos by Fowey (PRN 57693). Here the fragmentary remains of a large rectilinear field were mapped during Cornwall's NMP. The field measures 167m x 126m, giving an area of more than 2ha. It is possible, however, that the visible remains represent the major boundaries only, and that there may have been internal boundary divisions. Certainly the two undated fields whose area is measurable, at Carneggan, Lanteglos by Fowey (PRN 57497) and at Penventinue, Fowey (PRN 57692), are considerable smaller – that at Carneggan measures 44m x 24m, with an area of 1,056sq m, and that at Penventinue is 70m x 50m with an area of 3,500sq m.

The prehistoric or Romano-British field system near Hall Rings (PRN 57424) is too fragmentary to allow reliable measurements. The remaining six undated field systems have measurable widths ranging from 33m to 58m. Overall the average width of the undated fields is 43m and the average length 47m, giving an average area of 2,278sq m. This compares with the average area of the Probus fields of 6,779sq m and of the Penwith fields of 1,594sq m.

In terms of shape of the field boundaries the two prehistoric/RB fields are defined by boundaries with both straight and curving elements. Five of the undated fields are rectilinear in form whilst three include both straight and curving elements.

In terms of construction, all the field systems recorded in the Pelynt study are defined by ditched boundaries, with no banks visible.

5.2.4 The settlement and farming pattern

Twenty one prehistoric settlement polygons were created for the Pelynt study area. In addition a further 16 polygons were drawn around features or groups of features of uncertain date but which are potentially prehistoric in origin. These included four single enclosures, six single enclosures with associated field boundaries, and six field systems or groups of field boundaries. In total, then, 37 settlement polygons were created for the Pelynt study area (Fig 66).

From Fig 66 it is clear that there appears to be only limited access to extensive areas of rough ground other than in the far northeast and along the coast.

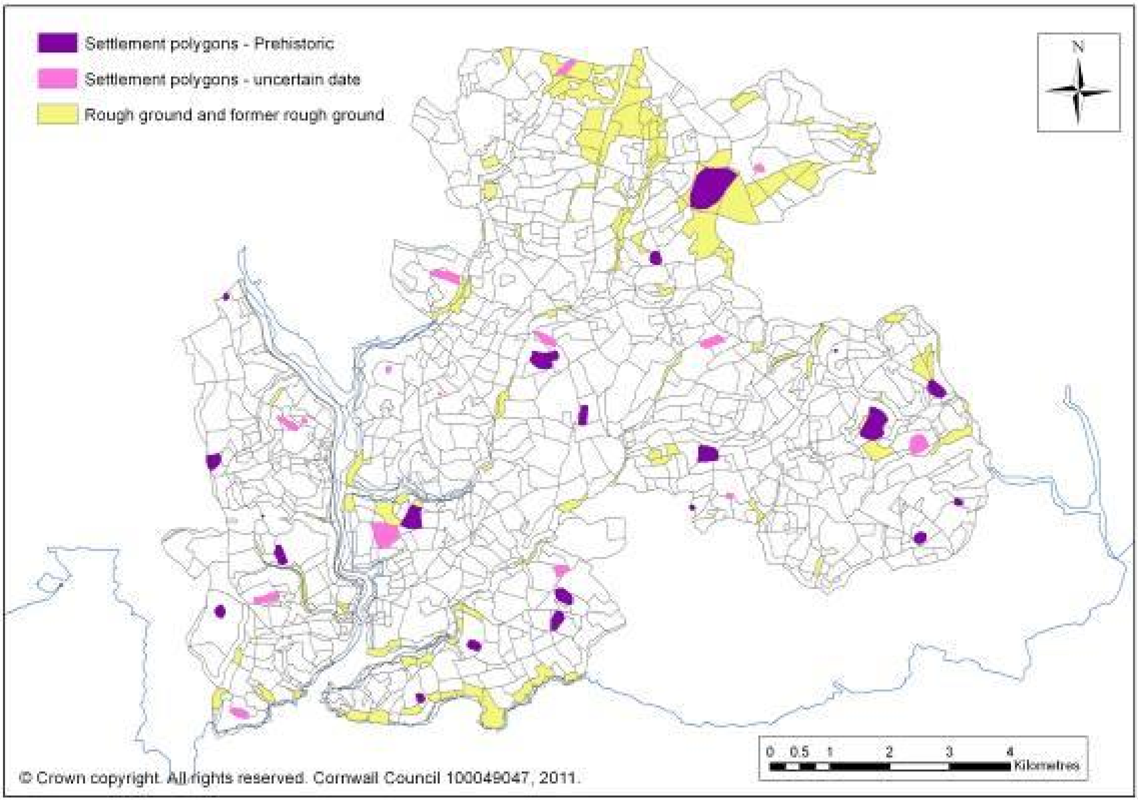

Fig 66. Pelynt study area: distribution of settlement polygons and rough ground (including former rough ground).

The polygons range in size from 0.15ha (an enclosure at Wooda, St Veep, PRN 57731) to 36.4ha (Bury Down hillfort, Lanreath). The average size of the polygons is 5.5ha. Twelve of the areas are larger than this, with the potential enclosure and field system at Lescrow (5.7ha) nearest in size to the average.

Size range of polygons (ha)	No. of polygons
<1.0	6
1.1 - 5.0	17
5.1 - 10	9
10.1 - 20	4
20.1 - 50	1
>50	0
Total	37

Table 76. Pelynt study area: size range of the settlement polygons.

The archaeological components vary from polygon to polygon. The commonest features are the enclosures: 25 polygons contain at least one enclosure. Twelve polygons contain a single enclosure with no visible associated features and a further 12 contain a single enclosure with associated field boundaries and/or other associated features such as ditches, pits and trackways. Only one polygon contains more than a single enclosure and this is accompanied by associated filed boundaries. Eight polygons contain only field systems or groups of field boundaries. A summary of the components making up each polygon is set out in table 77 below.

Components	No. of polygons
Single enclosure	12
Single enclosure and field boundaries	9
Single enclosure field boundaries and pits	1
Single enclosure and field system	2
Enclosures and field boundaries	1
Hillfort	2
Hillfort, outworks and trackway	1
Hillfort, outworks and field boundaries	1
Field system	2
Field system and trackways	1
Field boundaries	4
Field boundaries and pits	1
Total	**37**

Table 77. Pelynt study area: features contained in the settlement polygons.

The settlement polygon at Penventinue (Fig 67) is of average size for the Pelynt study area, covering 4.9ha. It does, however, contain a very unusual site, not only for Pelynt but for the entire Lowland Cornwall area.

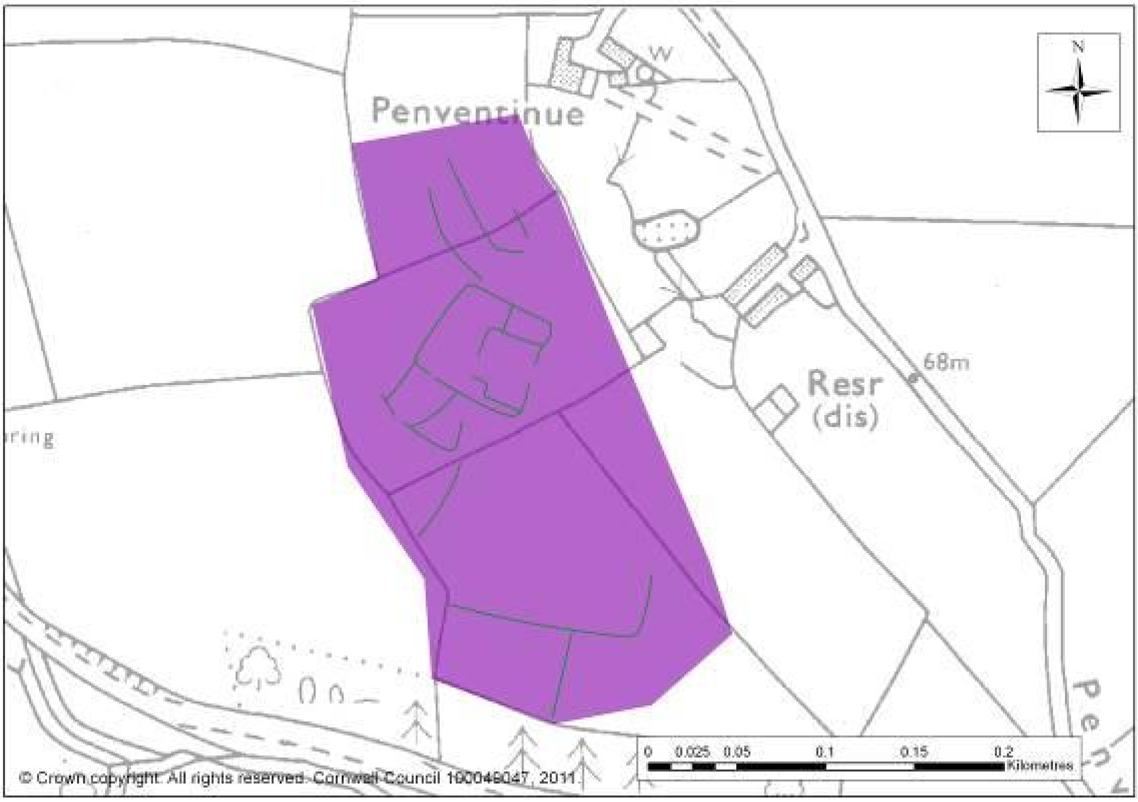

Fig 67. Prehistoric settlement polygon at Penventinue, Fowey.

This has been interpreted as a possible Romano-British settlement (PRN 57691). It consists of a sub-square single-ditched enclosure covering 0.34ha, with internal partitions and an appended enclosure on its south western side. The main enclosure has a southeast-facing entrance and the appended enclosure has an entrance facing southwest. Also contained in the polygon are the fragmentary remains of an associated field system. All these features are visible as cropmark ditches.

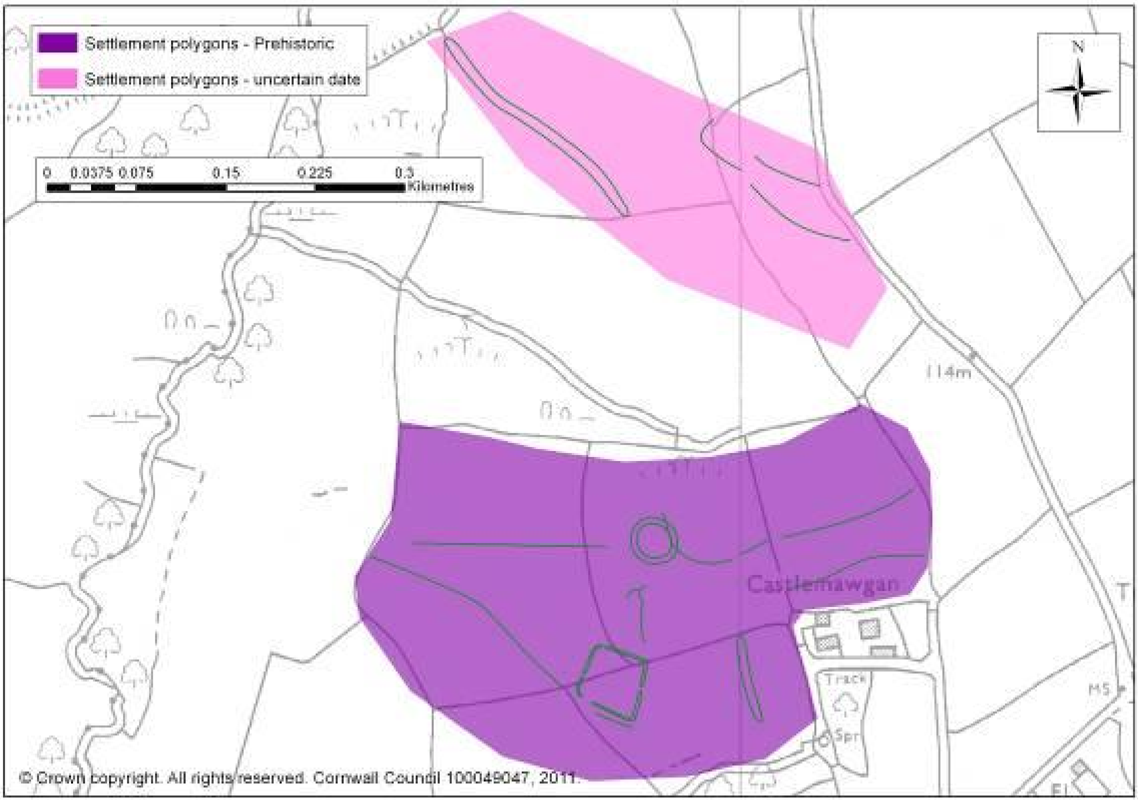

Fig 68. Prehistoric and uncertain date settlement polygons at Castlemawgan, Lanreath.

At Castlemawgan, Lanreath, one of the larger settlement polygons in the Pelynt study area, covering 10.8ha, contains two enclosures and a series of linear ditches, all visible as cropmarks. The rectilinear enclosure is bounded by a single ditch which encloses 0.2ha. There are a number of interruptions to the enclosing circuit, one of which may be a southeast-facing entrance. The enclosure is situated on a southwest-facing slope between the 85m and 90m contours.

The second enclosure, 80m to the north, was allocated a low validity score during Cornwall's NMP and it is unusual in that it is highly circular. Very few, if any, truly circular settlement enclosure have been recorded in Cornwall so it is more likely that this is a plough-levelled barrow, albeit a large one, being 28m in diameter.

The linear ditch running northwest to southeast is on the same alignment as the existing field pattern. This is Medieval Enclosed Land consisting of former cropping units which have been sub-divided and then amalgamated so it is probably a medieval field boundary. The linear features running east – west through the centre of the polygon are more likely to be prehistoric but their function is uncertain.

5.2.5 Barrows

There are 50 barrow sites in the dataset for the Pelynt study area. Of these, 23 were assigned a validity score of 3 or more; these are referred to below as high validity barrows. The remaining 27 are referred to as low validity barrows. Of these, five were mapped during Cornwall's NMP but were assigned low validity ratings. None of the other 22 were visible on aerial photographs and were not mapped during the NMP and therefore have no validity score. Five of these were recorded from documentary evidence and five are listed in the HER as 'site of': none of these barrows have visible remains. The remaining 12 are recorded variously as either extant or cropmark features. Three extant low validity barrows are located in modern plantations and this explains why they were not recorded during NMP. This leaves nine low validity barrows which presumably were not considered sufficiently convincing features to warrant NMP mapping.

5.2.5.1 Evidence for the barrows

A majority of the barrows have extant above ground remains. This is particularly the case with the high validity barrows, 83% of which are recorded as extant features.

Evidence	High validity barrows	Low validity barrows	All barrows
Cropmark	4	7	**11(22%)**
Extant	19	10	**29(58%)**
Documentary	0	5	**5(10%)**
Site of	0	5	**5(10%)**
Total	**23**	**27**	**50**

Table 78. Pelynt study area: barrows – types of evidence.

5.2.5.2 Distribution of the barrows

The barrows are located throughout the southern and northern parts of the study area with few in the central area (Fig 69). In particular there are concentrations of barrows on the higher ground in the southeast and northeast. To an extent this reflects the evidence for the barrows, with many of the high validity barrows in the southeast having above ground extant remains, as opposed to those in the west, a large proportion of which are identified from documentary sources, are listed as 'site of', or are only visible as cropmarks (Fig 70).

Another feature of the distribution is the presence of a number of clusters in the southeast and northeast which can be regarded as 'cemeteries'. In the southeast is a tightly defined group of five extant barrows with an extant outlier 160m to the west. At Wilton Farm, 500m to the southeast of here, is a very tightly defined group of 10 extant barrows, all in the same field. Just over a kilometre to the southeast at Ashen Cross, Pelynt, is a group of five barrows (four extant and one cropmark) in a roughly linear arrangement with three outliers (two 'site of' and one cropmark). Again this group lies within a single field. In the northern part of the study area, at Buckabarrow Downs, Lanreath, is a linear cemetery consisting of four extant barrows. At Clowne Plantation, 430m to the northwest, are two adjacent extant barrows which are on the same linear alignment and 540m to the northwest is a single extant barrow. Overall there are five groups which can be considered as cemeteries, a further two sites where there are two barrows in close proximity. Elsewhere 29 barrows are recorded in isolation.

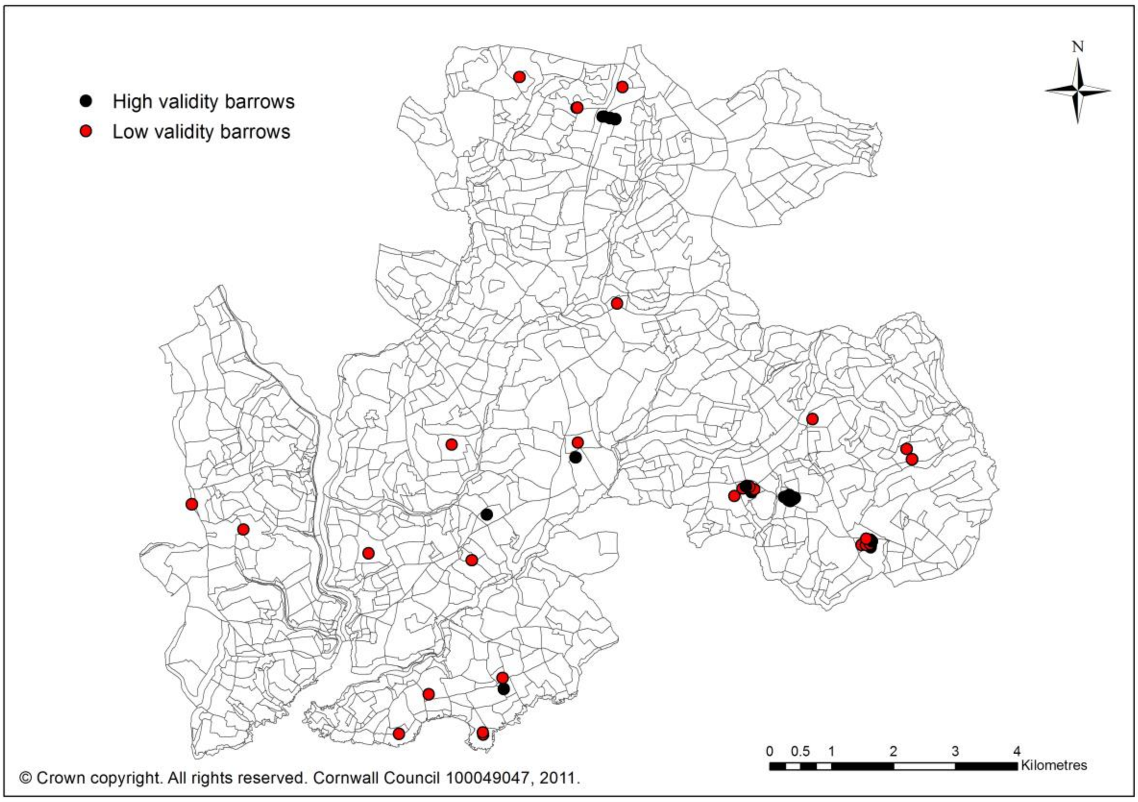

Fig 69. Pelynt study area: distribution of high validity and low validity barrows

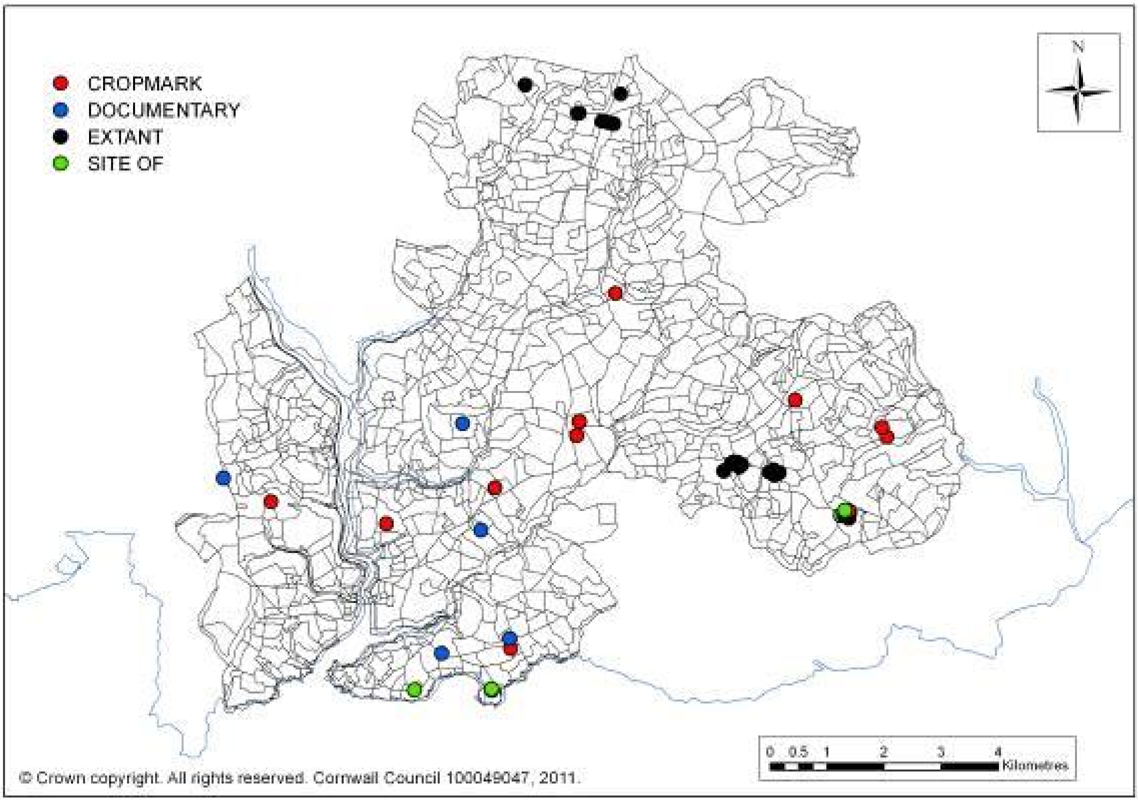

Fig 70. Pelynt study area: evidence for barrows

5.2.5.3 Topographic location of the barrows

As in the Penwith study area the majority of Pelynt barrows are situated on sloping ground, but a fair number are also located on ridges and hill tops.

Location	Barrows	Low validity barrows	All barrows
Cliff top	0	1	**1 (2%)**
Hill top	1	8	**9 (18%)**
Plateau	1	0	**1 (2%)**
Promontory	0	3	**3 (6%)**
Ridge	6	10	**16 (32%)**
Slope	15	5	**20 (40%)**
Total	**23**	**27**	**50**

Table 79. Pelynt study area: barrows – location in the landscape.

The barrows are found predominantly between the 75 and 140m contours, but particularly between the 105 and 140m contours. Some high validity barrows are located on higher ground but none have been recorded on land below the 75m contour

Height (m)	High validity barrows	Low validity barrows	All barrows
0-40	0	1	**1**
41-75	0	2	**2**
76-105	3	7	**10**
106-140	16	12	**28**
141+	4	5	**9**
Total	**23**	**27**	**50**

Table 80. Pelynt study area: barrows – altitude.

When considering the topographical aspect of the barrows, there are clear differences between the location of the high and low validity barrows. Although only 35% of high validity barrows face all aspects, this is the most favoured location of the low validity barrows. And whilst the most favoured position for the high validity barrows is northwest, no low validity barrows are recorded from northwest-facing sites. Nonetheless it is fair to say that most barrows in the Pelynt study are found in sites that face all aspects or those that face northwest.

Location	High validity barrows	Low validity barrows	All barrows
All aspects	8	15	**23 (46%)**
E	0	0	**0**
N	0	4	**4 (8%)**
NE	1	0	**1 (2%)**
NW	11	0	**11 (22%)**
S	0	3	**3 (6%)**
SE	0	4	**4 (8%)**
SW	0	1	**1 (2%)**
W	3	0	**3 (6%)**
Total	**23**	**27**	**50**

Table 81. Pelynt study area: barrows – specific aspect.

When taking into account the broad aspect faced by the barrows northerly, westerly and all aspects are the favoured sites, particularly for the high validity barrows (table 82).

Broad aspect	High validity barrows	Low validity barrows	All barrows
Western (W, NW, SW)	14	4	18
Eastern (E, NE, SE)	1	4	5
Northern (N, NE, NW)	12	4	16
Southern (S, SE, SW)	0	5	5
All aspects	8	15	23

Table 82. Pelynt study area: barrows – broad topographical aspect.

5.2.5.4 Size and form of the barrows

Dimensions of the barrows were measurable for all the high validity barrows and for five of those with low validity. Three of the latter were oval in shape: the first at Trezare, Fowey, PRN 57689, visible as a cropmark ditch measuring 30m x 25m; at Pelynt PRN 57404, a cropmark mound measuring 20m x 14m; and at Little Larnick, Pelynt, PRN 57426, a cropmark mound measuring 27m x 18m. Otherwise all the barrows are round barrows whose diameters range from 10m to 31m and with an average diameter of 18m, which is slightly more than the barrows in the Probus and Penwith study areas. The majority of the barrows fall within the 11-20m diameter size range (table 83).

Diameter (m^2)	High validity barrows	Low validity barrows	All barrows
5-10	0	1	**1**
11-15	6	0	**6**
16-20	12	0	**12**
21-25	3	0	**3**
26-30	2	0	**2**
31-35	0	1	**1**
Total	**23**	**2**	**25**

Table 83. Pelynt study area: barrows – measurable diameters.

The great majority of the round barrows are visible as mounds (whether upstanding or plough levelled); four have a mound and ditch and two are recorded as ring ditches table 83).

Form of remains	High validity barrows	Low validity barrows	All barrows
Mound	18	1	**19**
Ditch	1	1	**2**
Mound and ditch	4	0	**4**
Total	**23**	**2**	**25**

Table 84. Pelynt study area: barrows – form of remains.

6 Poundstock

6.1 Character of the Poundstock study area

The Poundstock study area is located in the north-eastern corner of Cornwall. It comprises the ecclesiastical parishes of Jacobstowe , Marhamchurch, Poundstock and Whitstone (Fig 71). Originally it was planned to include Week St Mary parish in this study area but digitised Tithe map data was unavailable so this parish was omitted. As a result the study area encompasses a less contiguous block of landscape than the other three and is the smallest, covering an area of 65.574 sq km.

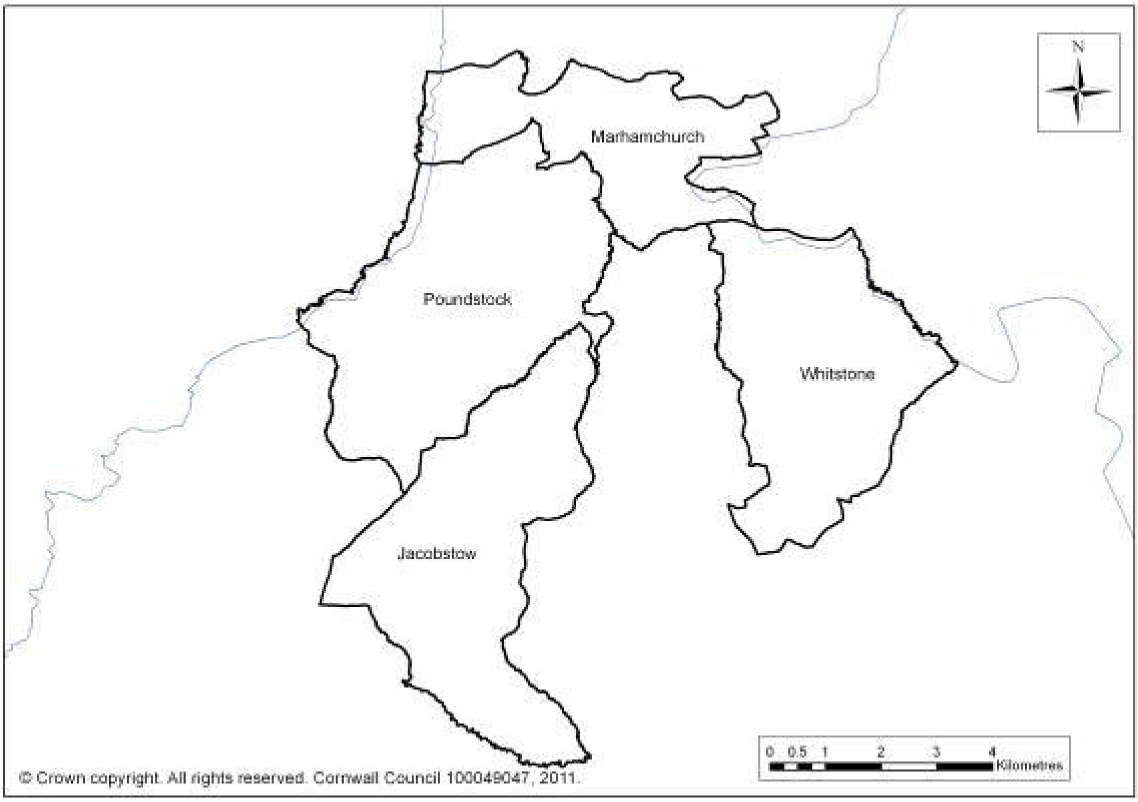

Fig 71. The Poundstock study area showing ecclesiastical parishes.

The eastern parish boundaries of both Marhamchurch and Whitstone form part of the boundary with Devon which is defined by the River Tamar. The western boundary of Jacobstowe follows the River Ottery as it runs southeast – northwest. The parish of Marhamchurch is dissected by the River Neet, which also forms part of the eastern parish boundary of Poundstock. Poundstock is also cut by the Wanson Water and Millook Water as they flow from higher ground to the coast.

The study area includes approximately five kilometres of coastline around Widemouth Bay. Much of this coast is relatively low-lying (below the 50m contour), apart from in the south around Millook, where the land quickly rises to the 120m contour.

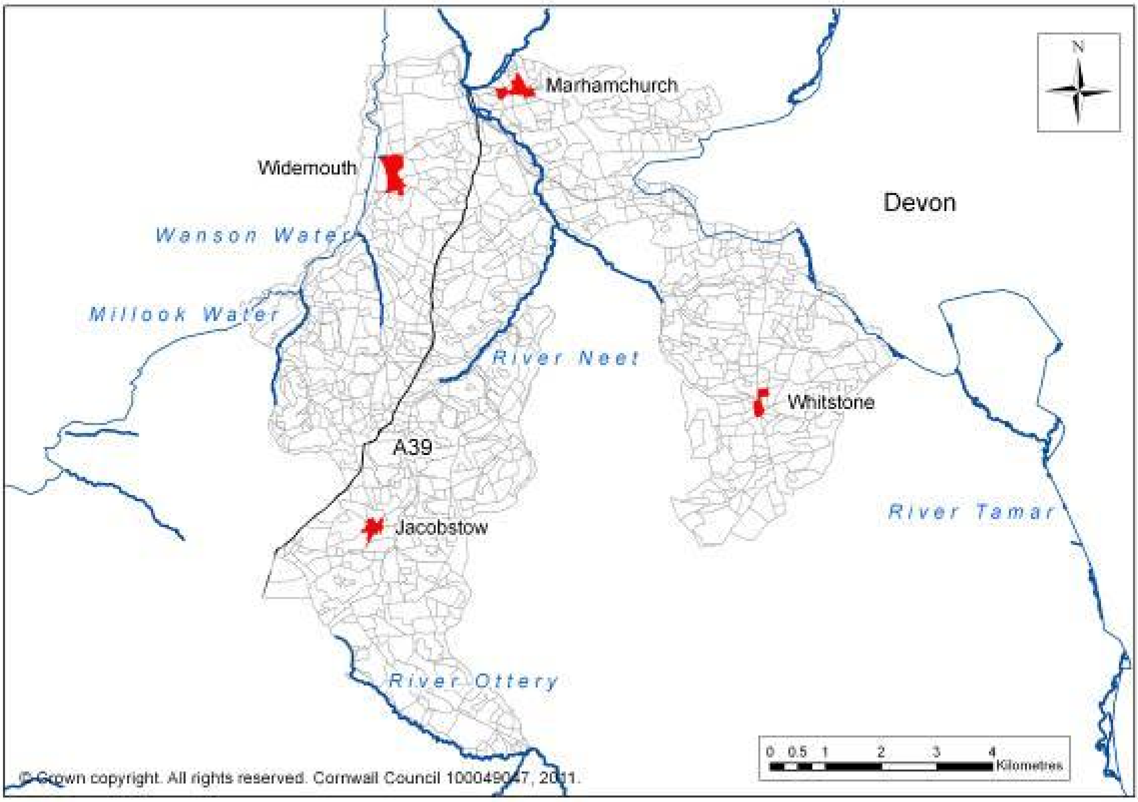

Fig 72. The Poundstock study area showing major settlements, rivers and lines of communication.

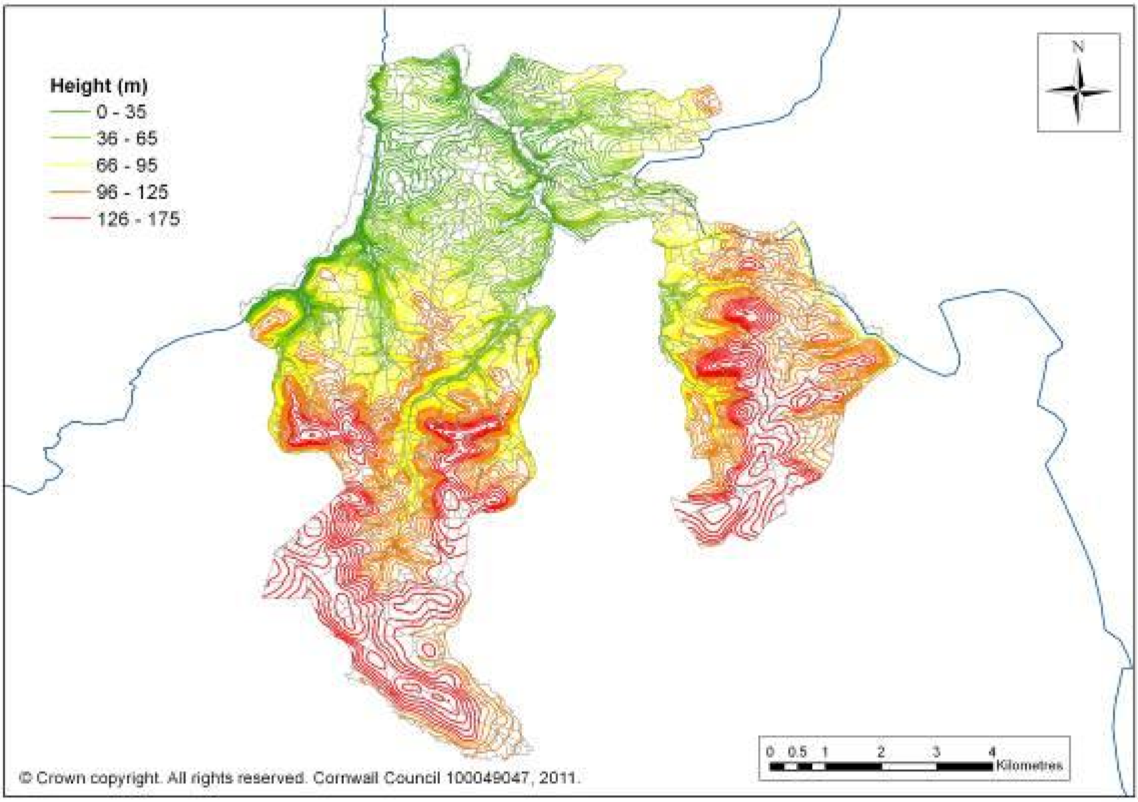

Fig 73. The topography of the Poundstock study area.

Although the Neet valley is steep-sided, much of Marhamchurch is relatively low-lying. Only in the far east of the parish does the landfall rise above the 70m contour. The northernmost portion of Poundstock parish is similarly low-lying but in the south the land rises and continues to do so into Jacobstowe parish, most of which lies above the 70m contour. The southern part of Jacobstowe is characterised by a long and prominent ridge running northwest – southeast to Langdon Hill on the 145m contour. Whitstone is also hilly, being formed by an undulating plateau which drops away steeply to the valleys of the Tamar in the east and a tributary of the Neet in the west. The western part of the plateau is characterised by a north-south line of rounded hills which reach the 160m contour at Whitstone itself.

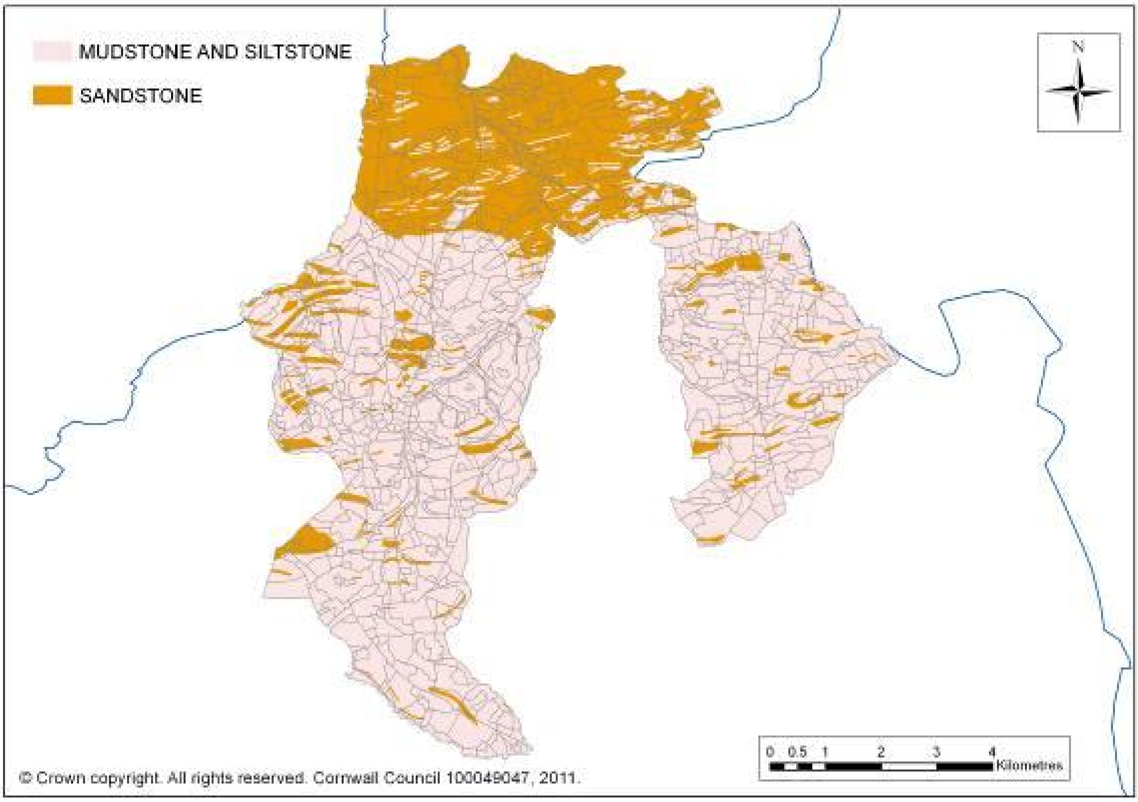

Fig 74. The Poundstock study area: simplified bedrock geology.

The underlying bedrock geology is represented by only two rock types (Fig 74). Carboniferous mudstone and siltstone of the Crackington formation underlies most of the southern part of the study area, whilst the northern third is underlain by sandstone of the Bude formation. This rock also appears as lenses further south.

The predominant soils are the deep clays of the Halstow series and seasonally wet deep clays of the Hallsworth1 series interspersed with smaller patches of Hallsworth2. The former is located in the central part of the study area, the latter mainly in the south (Fig 75). There are some fine loams – the Denbigh1 series in central areas and the Neath series mainly overlying the sandstone in the north.

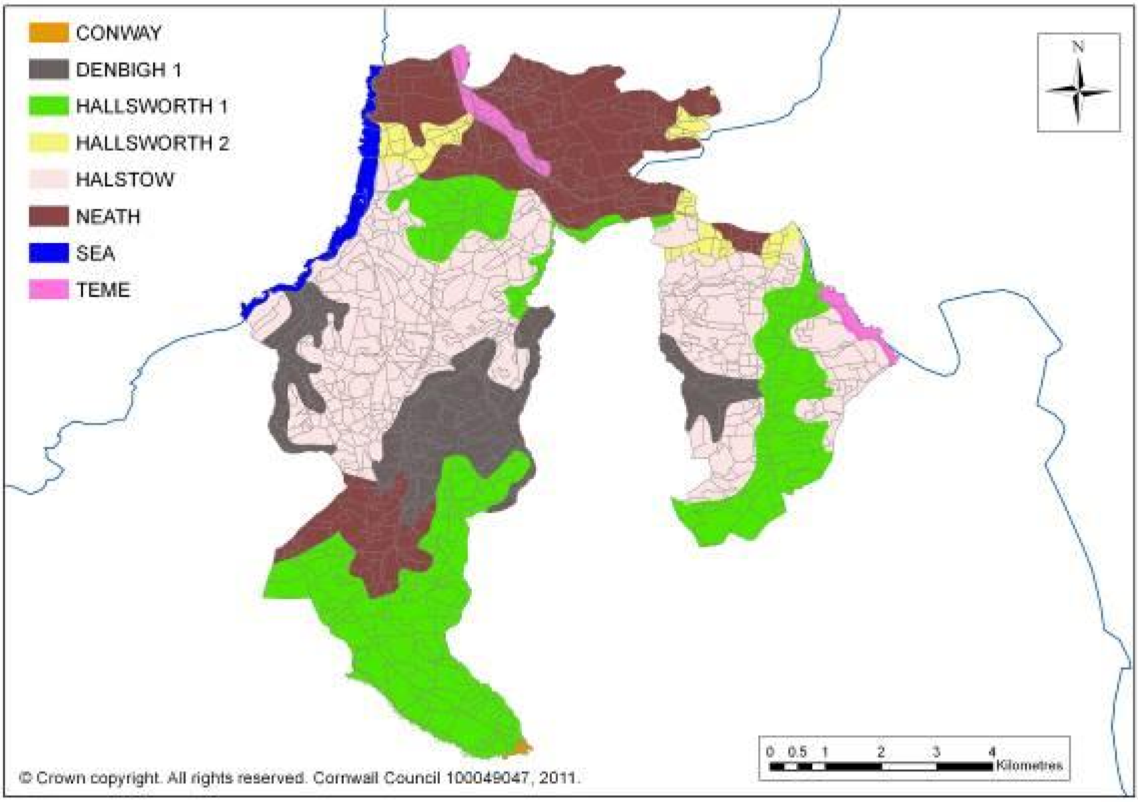

Fig 75. Soil types in the Poundstock study area.

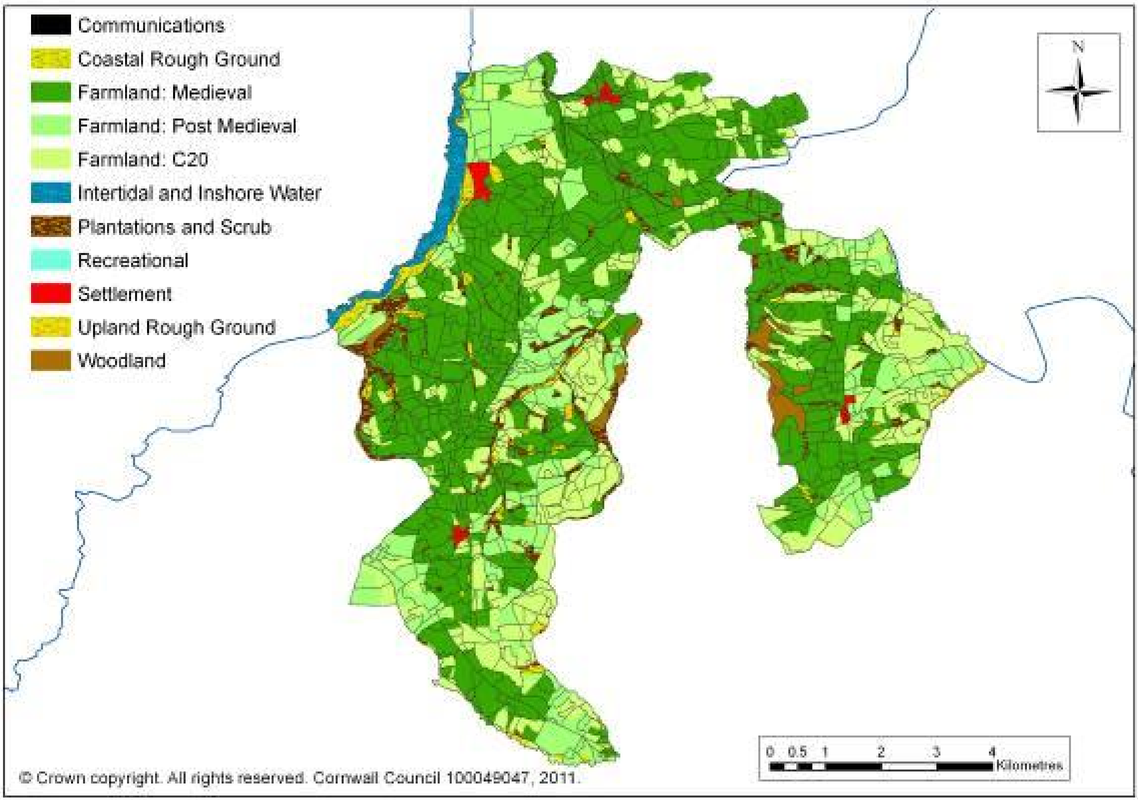

Fig 76. The 1994 HLC for the Poundstock study area.

During the 1994 HLC 87% of the Poundstock study area was classed as enclosed farmland (Fig 76). This is a more than in any of the other study areas. Whilst the proportion of the study area covered by the HLC Type Farmland: Medieval is similar to that for Lowland Cornwall generally, the percentage of Farmland: Post medieval is greater (20% as opposed to 16) and the extent of Farmland: C20 also covers a larger proportion of land than the Lowland Cornwall average (14% as opposed to 11). There is twice the woodland coverage than in Lowland Cornwall as a whole, but only half as much cover of Upland Rough Ground.

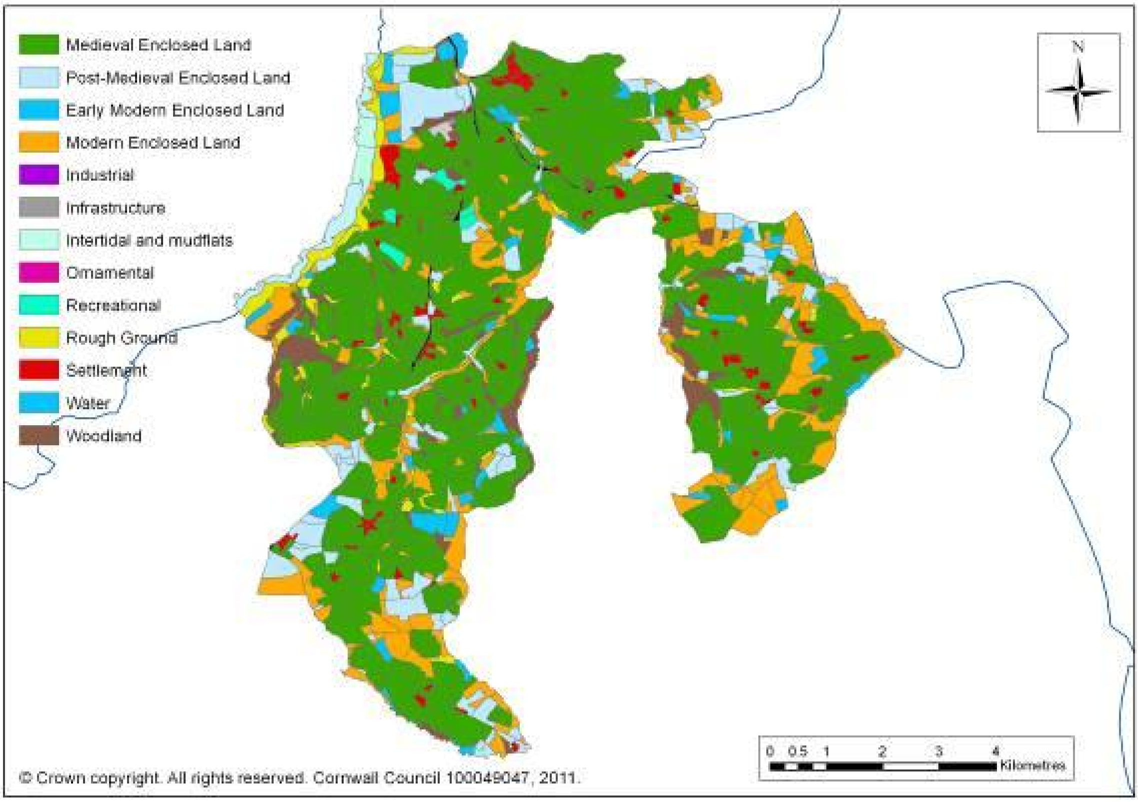

Fig 77. The Poundstock study area showing the refined HLC 2011 time-slice.

There are some differences between the 1994 HLC and the refined 2011 HLC time-slice. The biggest difference is that 11% less of the area is interpreted as Post-Medieval Enclosed Land. Roughly 3.5% has been re-interpreted as Modern or Early Modern Enclosed and 7.5% as Medieval Enclosed Land. As a result, in the 2011 time-slice 60% of the area is made up of land classed as Medieval Enclosed (Fig 77).

In late medieval time-slice of the refined HLC 65% of the area was classed as enclosed land and 29% was rough ground; 4% of the area was wooded (Fig 78). In the 2011 time-slice rough ground takes up only 2% of the area. As elsewhere the loss of rough ground is a result of post medieval, early modern and modern enclosure.

Mapping of settlements with early place-name elements against the late medieval time-slice (Fig 79) indicates the potential settlement pattern in the early medieval period and this is as expected: of the 23 settlements, 20 are located in areas of enclosed land and the other three are captured within settlement HLC Types. None are located in the rough ground areas.

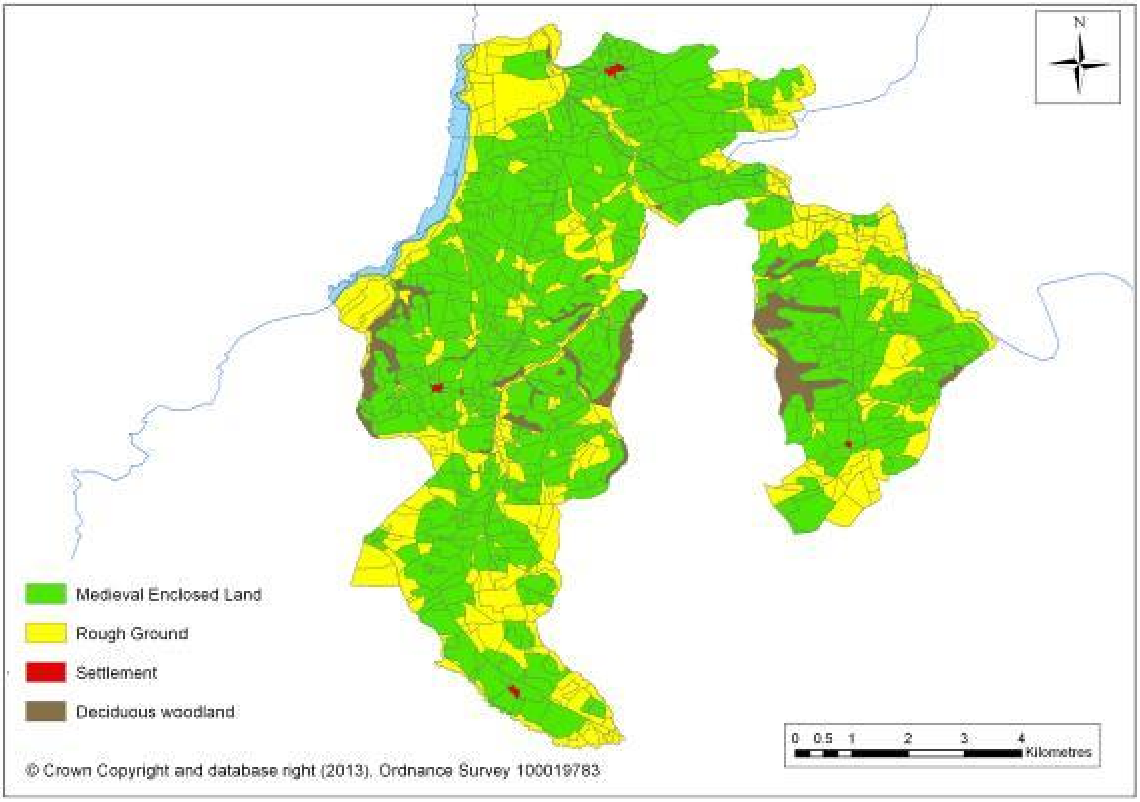

Fig 78. The Poundstock study area showing the late medieval time-slice HLC.

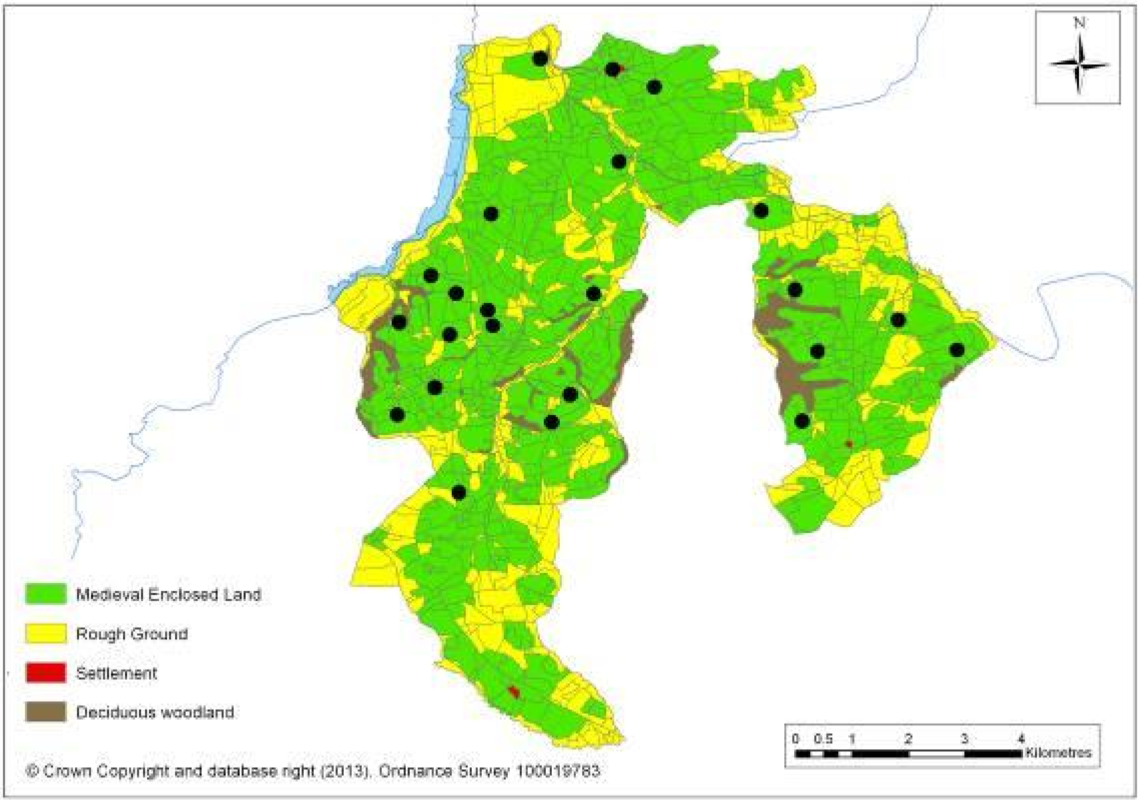

Fig 79. Distribution of early medieval settlements in the Poundstock study area. Background formed by the late medieval time-slice HLC.

6.2 Prehistoric and Romano-British archaeology in the Poundstock study area

The Lowland Cornwall cropmark visibility model, which indicates those areas where cropmarks are most likely to form and are most likely to be visible, classes 45% of the Poundstock study area as falling within its high visibility zone (Fig 80). The low visibility zone is similar in extent to that of the Pelynt study area, covering 19%, but the medium probability zone is much larger than in any of the other study areas, covering 46% of the area. It is clear from this that the combinations of bedrock geology and soils in the Poundstock study area are not particularly conducive to cropmark formation, allied to the fact that some parts of the area have never been flown. The high visibility zone is much smaller than that in any other study area so that, in theory at least, we should expect fewer sites in this area than in the others.

A total of 87 monument sites in the project dataset are located within this study area (Fig 81). Although this figure is significantly lower than either the Probus or Penwith study areas, it is only one less than Pelynt. It equates to a site density of 1.3 sites/km sq, which is actually higher than the Pelynt site density. Of the sites 38 (44%) are captured in the high visibility zone of the model, 31 (36%) in the medium zone, and 18 (20%) in the low probability zone. Overall the cropmark visibility model does not work well when applied to the Poundstock study area: less than half the sites are captured in the high probability zone. In fact this represents a by chance distribution (44% of the sites in a zone covering 45% of the study area).

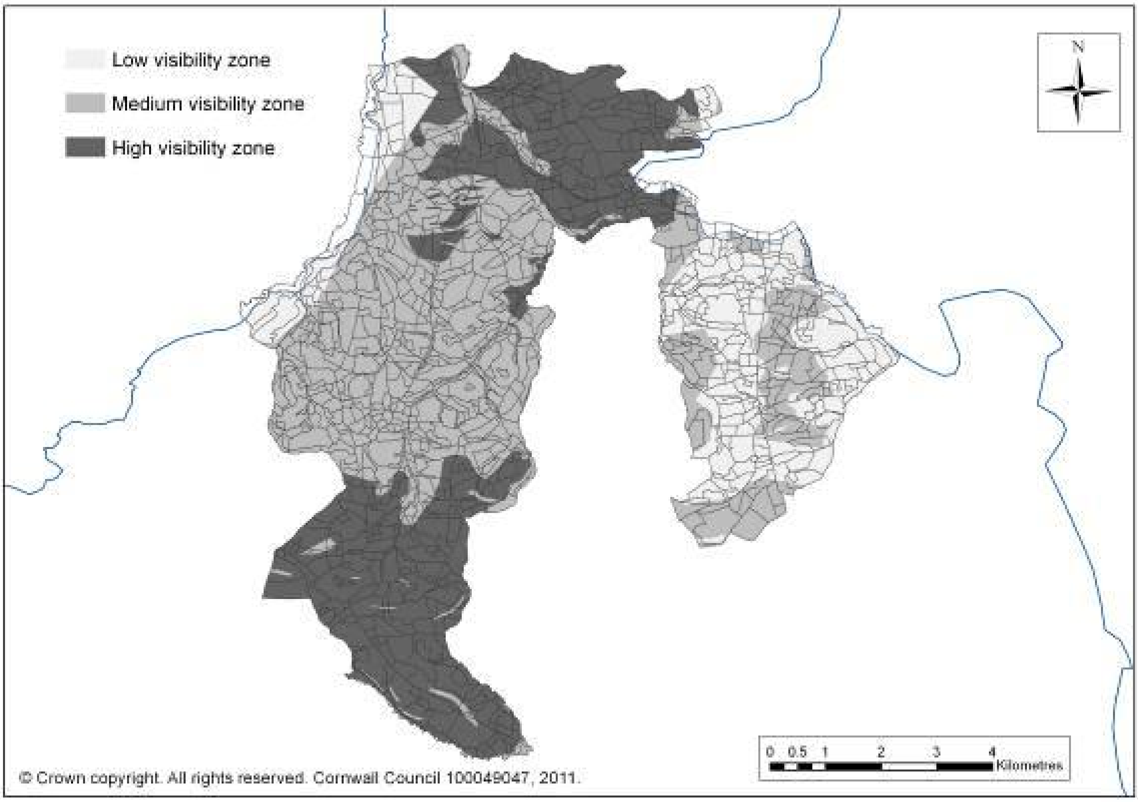

Fig 80. The Lowland Cornwall visibility model for the Poundstock study area.

Of the 87 sites two are recorded as 'site of' – formerly known sites which have since been destroyed. Of the remainder, 33 are recorded as having surviving earthworks, 41 are visible as cropmarks and 11 are recorded from documentary sources. The proportion of sites with earthwork remains is broadly similar to that in Pelynt but considerably higher than in either Probus or Penwith. Whilst the percentage of cropmark sites is greater than that in Pelynt or Penwith it is much lower than in Probus and the percentage of sites recorded from documentary sources is roughly similar to Probus and Pelynt but considerably lower than Penwith.

As in Pelynt, settlement related features do not make up the majority, but instead barrows are the most numerous monuments. A breakdown of site types is set out in table 85 below.

Site type	Number	Percentage
Round	19	21.8%
Enclosure	14	16.1%
Barrow	49	56.3%
Field system	2	2.3%
Field boundary	2	2.3%
Hillfort	1	1.1%
Total	**87**	

Table 85. *Breakdown of prehistoric/RB site types recorded from the Poundstock study area*

Although the site density in Poundstock is greater than in Pelynt, there are far fewer sites than in Probus or Penwith. For instance there are only 19 rounds compared to 84 in Probus and 73 in Penwith, and only four field systems or field boundaries. There are no records for round houses or cliff castles.

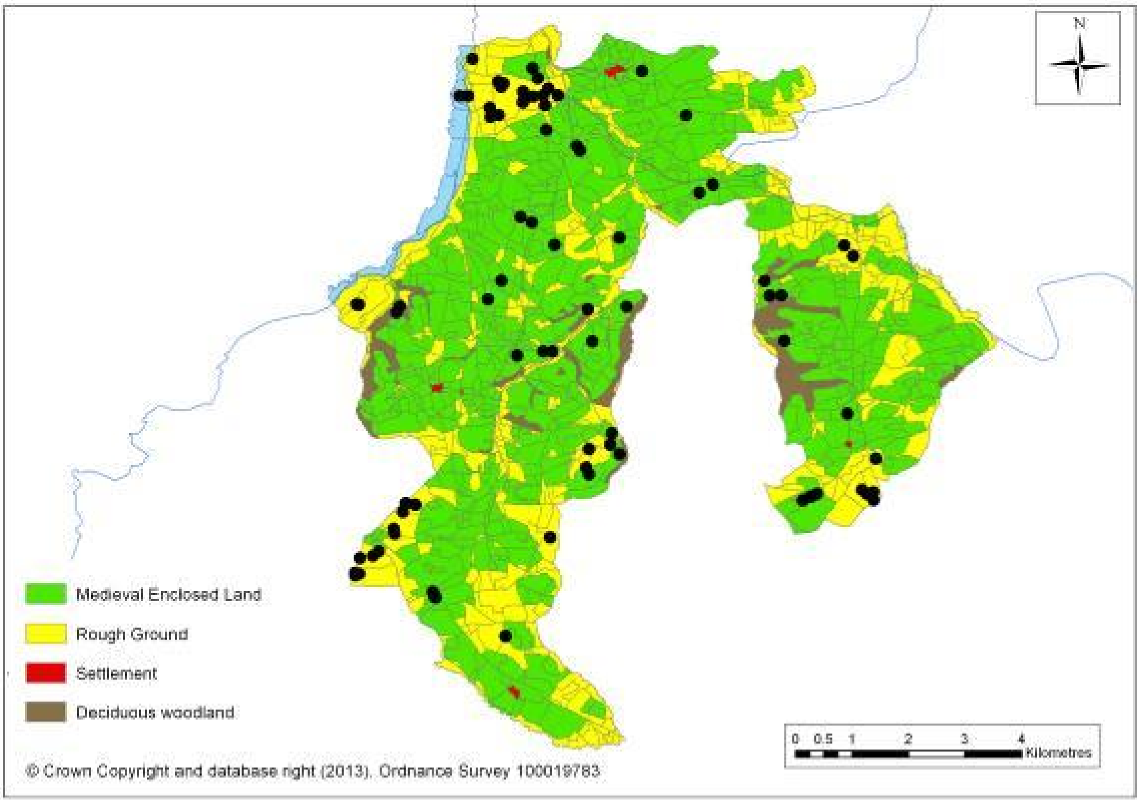

Fig 81. Distribution of prehistoric/RB monument sites in the Poundstock study area. Background formed by the late medieval time-slice HLC.

6.2.1 Enclosures

There are 33 enclosures in the Lowland Cornwall dataset for the Poundstock study area. Twenty four were mapped and recorded during Cornwall's NMP and of these, 17 were assigned a validity score of 3 or above and are referred to below as 'high validity' enclosures. The remaining seven enclosures mapped during Cornwall's NMP were assigned low validity scores. Nine of the enclosures were not mapped by the NMP and do not have a validity rating. These, together with those assigned low validity scores are referred to below as 'low validity' enclosures.

Of the nine unmapped enclosures, five are listed in the HER as sourced from documentary references and therefore have no visible surviving remains. The remaining four are listed as extant (either these were not visible on aerial photographs or the NMP interpreters did not regard them as convincing as enclosures). The other low validity enclosures are all recorded as cropmarks.

6.2.1.1 Evidence for the enclosures

The evidence for the enclosures is summarised in Table 86 below.

Evidence	High validity enclosures	Low validity enclosures	Total
Cropmark	13 (77%)	7 (44%)	**20 (61%)**
Extant	3 (18%)	4 (25%)	**7 (21%)**
Documentary	1 (6%)	5 (31%)	**6 (18%)**
Geophysical	0	0	**0**
Site of	0	0	**0**
Total	**17**	**16**	**33**

Table 86. Evidence for all 33 enclosures in the Poundstock study area (percentages are rounded up or down for clarity).

There are roughly three times as many enclosures recorded as cropmarks than are recorded as extant or as sourced from documentary references. The proportion of cropmark enclosures is broadly similar that in the Pelynt study area (where the figure was 57%), but when the high validity enclosures are considered in isolation the proportion of those recorded as cropmarks is comparable with that in the Probus study area (77% compared with 81%).

6.2.1.2 Distribution of enclosures

To some extent the enclosures are distributed around the edges of the study area, with fewer in the 'interior'. Due to the relatively low numbers of sites, the enclosures appear to be sparsely spread with several extensive areas devoid of sites, particularly in the eastern part of the area. There is one notable cluster of enclosures near Trehausa in the easternmost part of Jacobstowe parish and just to the west of Ashbury hillfort (PRN 2051) which is just outside the study area.

When their distribution is compared with the late medieval time-slice HLC it is clear that most of the enclosures are located in areas of enclosed land (Fig 82). In fact 24 (73%) are sited in enclosed land, eight (33%) are in rough ground and one is in woodland. This is quite different from the location of early medieval settlements, of which none are sited in rough ground. The distribution of the enclosures against the late medieval time-slice HLC is similar to that in the Penwith study area, where 21% of enclosures were sited in rough ground, but different from both Probus and Pelynt where only 5% of enclosures were located in land classed as rough ground.

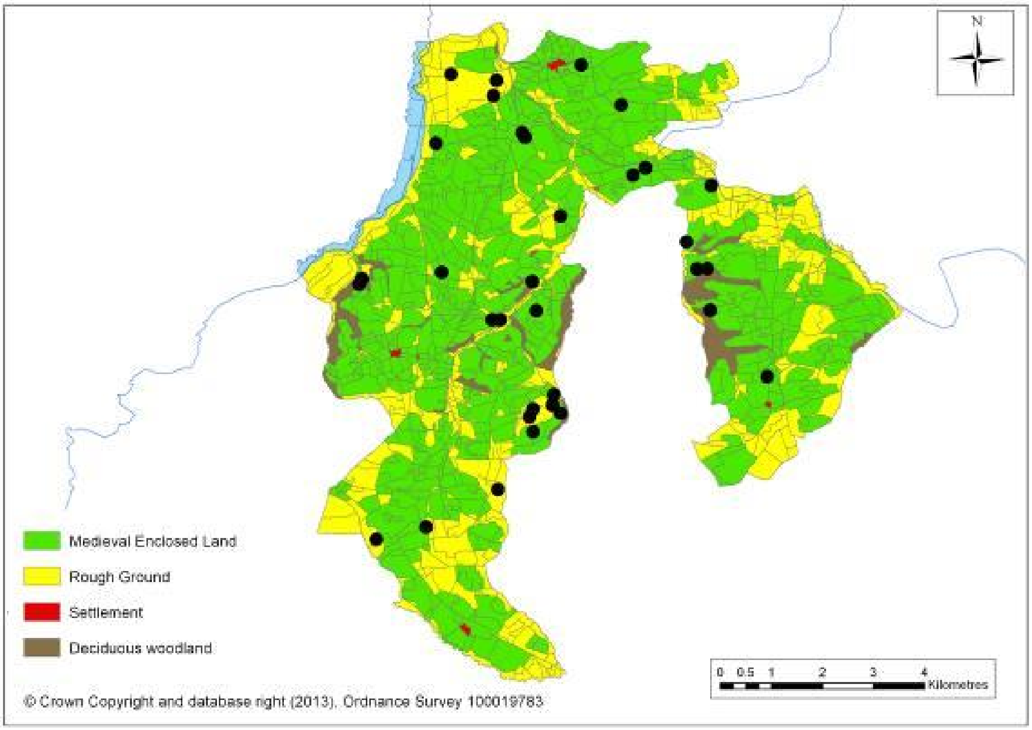

Fig 82. Distribution of enclosures in the Poundstock study area. Background formed by the late medieval time-slice HLC.

6.2.1.3 Topographic location of the enclosures

The enclosures are situated in a range of locations in the landscape, but predominantly on sloping ground (Table 87 below). In this respect the siting of enclosures in the Poundstock study area is very similar to that in Probus and Penwith, where the percentages of enclosures located on slopes was 78% and 71% respectively.

Location	High validity enclosures	Low validity enclosures	All enclosures
Cliff top			
Hill top	1		**1 (3%)**
Plateau	1	1	**2 (6%)**
Promontory	2	1	**3 (9%)**
Ridge	2	2	**4 (12%)**
Slope	11	12	**23 (70%)**
Total	**17**	**16**	**33**

Table 87. *Poundstock study area: Enclosures* – location in the landscape.

The great majority (70%) of the enclosures are sited below the 96m contour and the most favoured slopes lie between the 36 and 95m contours (Table 88). In this respect the enclosures in the Poundstock study area follow the same pattern as those in the other three study areas in that the lower and higher ground tends to be avoided. Having said that, it is notable that a higher percentage of the Poundstock enclosures are located in the highest ground here than in the other areas; 15% as opposed to 9% in Penwith, 5% in Pelynt and less than 1% in Probus.

Height (m)	High validity enclosures	Low validity enclosures	All enclosures
0-35	3		**3**
36-65	4	6	**10**
66-95	6	4	**10**
96-125	3	2	**5**
126+	1	4	**5**
Total	**17**	**16**	**33**

Table 88. Topographic location of the enclosures

The favoured aspect for the siting of the enclosures appears to be predominantly in north facing locations (Table 89).

Location	High validity enclosures	Low validity enclosures	All enclosures
All aspects	4	3	**7 (21%)**
E		5	**5 (14%)**
N	6	4	**10 (30%)**
NE	1		**1 (3%)**
NW	2	1	**3 (9%)**
S		1	**1 (3%)**
SE	1		**1 (3%)**
SW	1		**1 (3%)**
W	2	2	**4 (12%)**
Total	**17**	**16**	**33**

Table 89. Topographical aspect of the enclosures

This is clear when the enclosures are grouped together according to their broad aspect (Table 90) and equally clear is an obvious avoidance of locations with a southerly aspect. Interestingly the siting of enclosures in both the Penwith and Pelynt study areas clearly avoided northerly aspects in contrast to Poundstock. Whilst there was no obviously favoured aspect in the Pelynt study area, westerly aspects were favoured in Probus and southerly and eastern aspect in Penwith. It appears that no general rule can be applied to the siting of enclosures with regard to aspect and that they tend to fit into the general lie of the land, regardless of which direction they face.

Location	High validity enclosures	Low validity enclosures	All enclosures
Western (W, NW, SW)	5	3	8
Eastern (E, NE, SE)	2	5	7
Northern (N, NE, NW)	9	5	14
Southern (S, SE, SW)	2	1	3
All aspects	4	3	7

Table 90. Poundstock study area: Enclosures – broad aspect.

In Poundstock, then, as in the other three study areas, the majority of the enclosures are situated on sloping ground away from the high and low ground. They fit into the general lie of the land, which in this area means that most are north-facing. More enclosures in Poundstock are on hill tops, ridges and other locations open to all aspects than are sited in locations with a southerly aspect.

As in the other three study areas early medieval settlements, of which 23 are recorded from the Poundstock study area, tend to favour slopes for location even more than the prehistoric/RB enclosures. Seventeen of the 23 settlements (74%) are located on slopes; two are on ridges, two on hill tops and two on plateaux. Favoured aspects, however, are somewhat different from those of the enclosures (Table 91), with the early medieval settlements favouring sites with an eastern aspect.

Location	Enclosures	Early medieval settlements
Western (W, NW, SW)	8	4
Eastern (E, NE, SE)	7	11
Northern (N, NE, NW)	14	6
Southern (S, SE, SW)	3	4
All aspects	7	5

Table 91. Poundstock study area: comparison of broad aspect of enclosures and early medieval settlements

There are also differences in the siting of early medieval settlements with regard to height OD. (Table 92).

Height	Early medieval settlements	% settlements	% enclosures
0-35m	0	0%	7%
36 -65m	5	22%	37%
66-95m	9	39%	30%
96-125m	3	13%	15%
126m+	6	26%	11%
Total	23		

Table 92. Comparison of height OD between prehistoric/RB enclosures and early medieval settlements in the Poundstock study area

In the Poundstock study area it appears that the early medieval settlements generally are sited in higher ground than the enclosures: 44% of the enclosures are located below the 66m contour as opposed to only 22% of early medieval settlements; conversely 39% of early medieval settlements are sited above the 95m contour as opposed to 26% of enclosures. This is the opposite of the other three study areas, where the early medieval settlements tend to favour lower lying situations than the enclosures.

6.2.1.4 Size and form of the enclosures

The size of area enclosed could only be reliably measured for 18 enclosures identified in the Poundstock study area. These include 11 of the high validity enclosures and seven of the low validity enclosures. The remaining 15 include six documentary sites, four enclosures listed in the HER as extant but which were not mapped during Cornwall's NMP (one of these, at Froxton, Whitstone, is located in a coniferous plantation) and five only partially visible as cropmarks.

High validity enclosures				
Size	**Curvilinear**	**Mixed**	**Rectilinear**	**Total**
<0.1ha	2	0	1	**3**
0.1-0.25ha	1	1	3	**5**
0.25-0.5ha				**0**
0.5-1ha	2		1	**3**
>1ha				**0**
Total	**5**	**1**	**5**	**11**

Table 93. Poundstock study area: Enclosures – size and form of high validity enclosures.

Low validity enclosures				
Size	**Curvilinear**	**Mixed**	**Rectilinear**	**Total**
<0.1ha	2			**2**
0.1-0.25ha	3		1	**4**
0.25-0.5ha				**0**
0.5-1ha	1			**1**
>1ha				**0**
Total	**6**	**0**	**1**	**7**

Table 94. Poundstock study area: Enclosures – size and form of the low validity enclosures.

All enclosures				
Size	**Curvilinear**	**Mixed**	**Rectilinear**	**Total**
<0.1ha	4		1	**5 (28%)**
0.1-0.25ha	4	1	4	**9 (50%)**
0.25-0.5ha				**0**
0.5-1ha	3		1	**4 (22%)**
>1ha				**0**
Total	**11**	**1**	**6**	**18**

Table 95. Poundstock study area: Enclosures – size and form of all visible enclosures.

As is the case in the other three study areas, the enclosures predominantly cover less than 0.5ha (78% of the enclosures fall into this category, including 73% of the high validity enclosures). In fact the great majority of the Poundstock enclosures cover less than 0.25ha (none of the measurable enclosures fall into the 0.25 – 0.5ha bracket). No sites enclosing more than 1ha are recorded from the study area.

It is not possible to identify any correlation between form of remains and size of the enclosures. This is because only one of the measurable enclosures has surviving earthwork remains; all the rest are recorded as cropmarks.

Almost two thirds of the measurable enclosures are curvilinear in form, six are rectilinear and one is formed by both straight and curving sides. As in the other study areas the rectilinear forms tend towards the smaller end of the scale (five of the six enclose less than 0.25ha, whereas three curvilinear enclosures are larger than this).

Curvilinear enclosures

Of the 18 enclosures where shape is identifiable, five of the high validity enclosures and six of the low validity enclosures are classed as curvilinear. The most frequent form is sub-circular, but all forms other than truly circular are present.

Form	High validity enclosures	Low validity enclosures	Total
Circular			**0**
Sub-circular	2	3	**5**
Oval	1	1	**2**
Regular	1		**1**
Irregular	1		**1**
C-shaped		2	**2**
Total	**5**	**6**	**11**

Table 96. Poundstock study area: Enclosures – form of curvilinear enclosures.

Rectilinear enclosures

Of the six measurable rectilinear enclosures, four high validity enclosures are four-sided and one high validity enclosure and one low validity enclosure are five-sided polygons. Of the four-sided enclosures three are sub-square in shape.

6.2.1.5 Form of the enclosing circuits

The form of construction of the enclosing circuits could be identified in 24 of the Poundstock enclosures. The majority are apparently enclosed by ditch alone, a slightly lower percentage are enclosed by a bank alone, whilst a minority are enclosed by ditch and bank.

Form	High validity enclosures	Low validity enclosures	Total
Ditch	8	4	**12 (50%)**
Bank	6	3	**9 (38%)**
Ditch and bank	3		**3(12%)**
Total	**17**	**7**	**24**

Table 97. Poundstock study area: Enclosures – form of enclosing circuit.

6.2.1.6 Complexity

As is the case with the other three study areas the great majority of the enclosures are simple univallate in form – these make up 81% of all enclosures in the study area. Five enclosures can be classed as ‘complex’. Of these, three are univallate enclosures with appended enclosures or annexes, and two are double-ditched. There are no multivallate enclosures with wide-spaced ditches in the Poundstock study area.

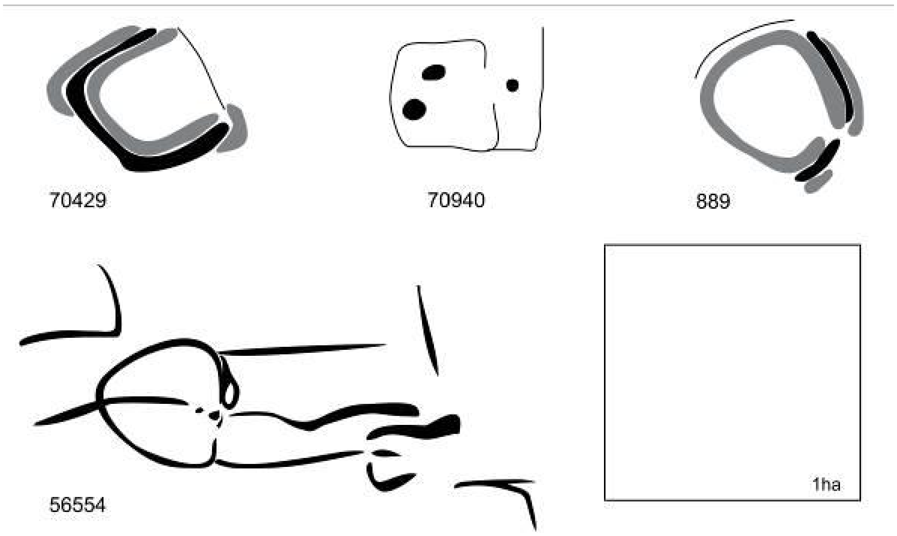

Fig 83. Complex enclosures in the Poundstock study area.

6.2.1.7 Summary

Only 45% of the Poundstock study area falls into the high visibility zone of the Lowland Cornwall visibility model, which is a significantly smaller proportion than the other three areas. This suggests that fewer enclosures can be expected from this study area. However, 73% of the area is captured in the high probability zone of the enclosures 1994 HLC probability model and, in fact, 33 enclosures in total are recorded – far fewer than in Probus and Penwith but more than Pelynt. Site density is roughly one enclosure per 2 km sq.

A good majority of enclosures (61%) are recorded as cropmark features, with roughly equal proportions of extant sites and those recorded from documentary sources.

Seventy percent of the enclosures are sited on sloping ground with 21% on ridges or promontories. Most commonly the enclosures occupy ground between the 36 and 95m contours and especially on slopes with a northerly aspect (north, northwest or northeast).

As with the other three study areas, the great majority of enclosures cover less than 0.25ha in area, but unusually, a relatively high proportion enclose an area of between 0.5 and 1ha. Almost twice as many enclosures in Poundstock are curvilinear as are rectilinear and only one has a mixture of straight and curving sides.

Where their construction can be analysed, half of the enclosures appear to be bounded by a ditch only, 38% by a bank only and 12% by a bank and ditch.

More than 80% of the enclosures are univallate in form. Three have appended annexes and two are double-ditched: there are no multivallate enclosures with wide-spaced ditches.

6.2.2 Unenclosed settlements

There are no unenclosed round house settlements recorded in the Lowland Cornwall dataset for the Poundstock study area.

6.2.3 Field systems

Two records of field boundaries and two records of field systems were included in the project dataset for the Poundstock study area. All were assigned a validity score in Morph of 3 or higher and they have all been interpreted as prehistoric in date. Three of the field systems were recorded as cropmarks; the fourth had surviving above ground remains.

6.2.3.1 Distribution of the field systems

The fields are widely scattered but are for the most part located close to the edges of the study area (Fig 84). Three are situated in enclosed land in the late medieval time-slice HLC and the fourth is in Valley Rough Ground. All four are in close proximity to enclosures and so may be associated.

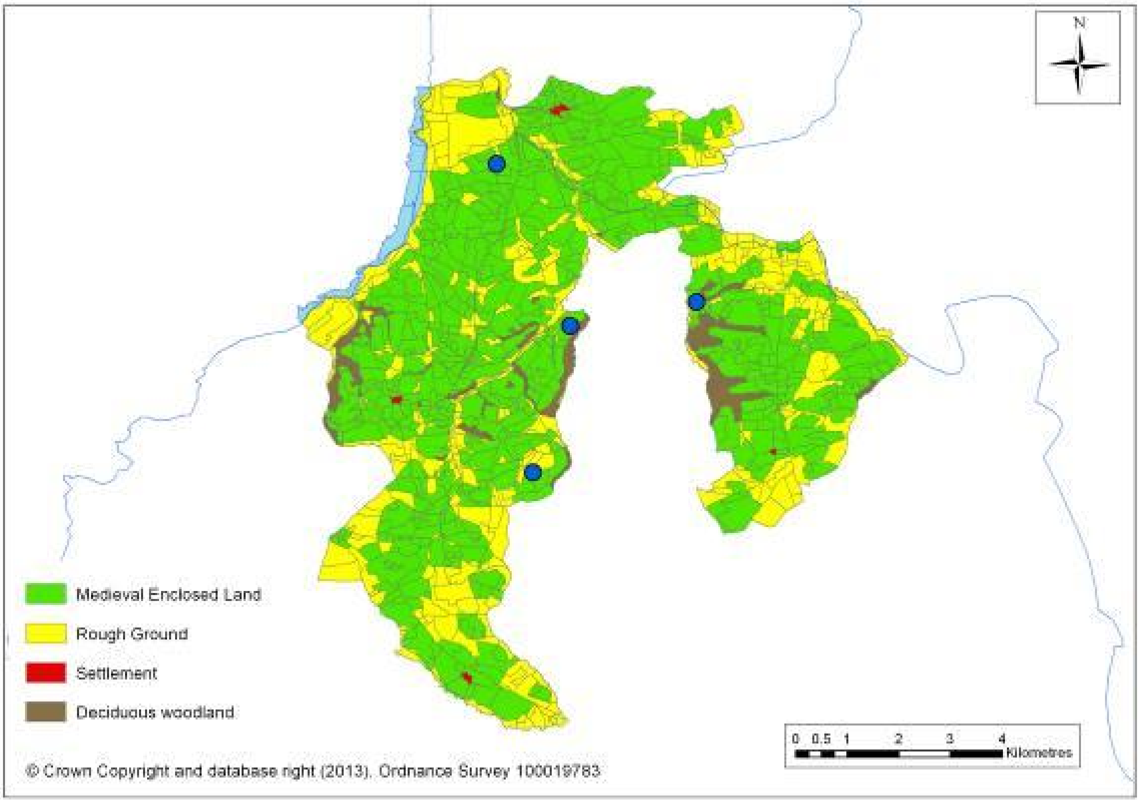

Fig 84. Distribution of field systems and field boundaries in the Poundstock study area. Background formed by the late medieval time-slice HLC.

6.2.3.2 Topographic location of the field systems

All the fields are located on sloping ground but covering a range of altitudes. One lies between the 30 and 40m contours; one between the 50 and 60m contours; one between 55 and 80m and the fourth between the 110 and 135m contours. All are situated on land with a northerly aspect (three face due north; the fourth faces various aspects, but primarily northwest).

6.2.3.3 Size and form of the fields

Of the four field systems, three are only partially visible. As a result these appear to be fragmentary and incomplete. The average length and breadth of the fields can only be reliably measured for one of the sites - just to the northwest of Sudcott (PRN 56512) where an average field measures approximately 113m by 30m, with an area of 3,390sq m. Given the very small sample it is uncertain whether this represents a true average field size for prehistoric field systems in the Poundstock study area: it is smaller than the fields recorded from Probus but larger than those in Penwith and Pelynt. All the fields are rectilinear in form and all their boundaries were recorded as ditches.

6.2.4 The settlement and farming pattern

Sixteen polygons were created for prehistoric settlement clusters in the Poundstock study area. In addition a further six polygons were drawn around sites or groups of sites recorded in the HER as being of uncertain date but which could potentially be prehistoric in origin. These undated sites were all single enclosures, one accompanied by associated pits. In total, then, there are 22 settlement polygons in the Poundstock study area (Fig 85).

Whilst the polygons indicate the extent of settlement it is clear that there was an ample supply of rough ground in both eastern and western parts of the study area as well as along the coast.

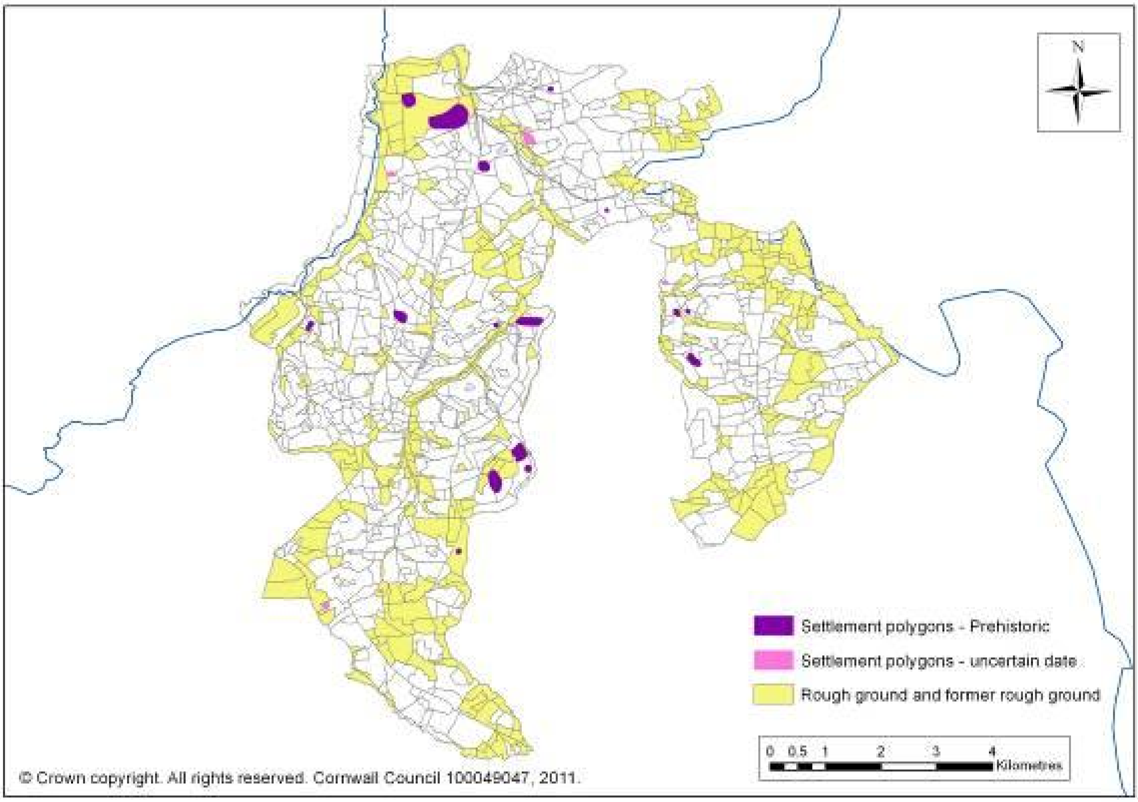

Fig 85. The Poundstock study area: distribution of prehistoric and uncertain date settlement polygons and rough ground (including former rough ground).

The polygons range in size from 0.5ha (an enclosure at Titson Farm, PRN 70450) to 22.2ha (enclosures and settlement near Widemouth Bridge). The average size of the polygons is 3.4ha and only eight are larger than this.

Size range of polygons (ha)	No. of polygons
<1.0	8
1.1 - 5.0	9
5.1 - 10	4
10.1 - 20	0
20.1 - 50	1
>50	0
Total	22

Table 98. Poundstock study area: size range of the settlement polygons

The archaeological components vary from polygon to polygon. The dominant features are the enclosures, and this is more marked than in the other three study areas: all 22 polygons contain at least one enclosure. Eleven polygons contain a single enclosure with no visible associated features and a further six contain a single enclosure with associated field boundaries and/or other features such as ditches, pits and trackways. Only five polygons contain more than one enclosure, of which three are accompanied by associated features. A summary of the components making up each polygon is set out in table 99 below.

Components	No. of polygons
Single enclosure	11
Single enclosure and field boundaries	4
Single enclosure and field system	1
Single enclosure and pits	1
More than one enclosure	2
Enclosures and field boundaries	1
Enclosures, field boundaries and pits	1
Enclosures and field system	1
Total	**22**

Table 99. Poundstock study area: features contained in the settlement polygons.

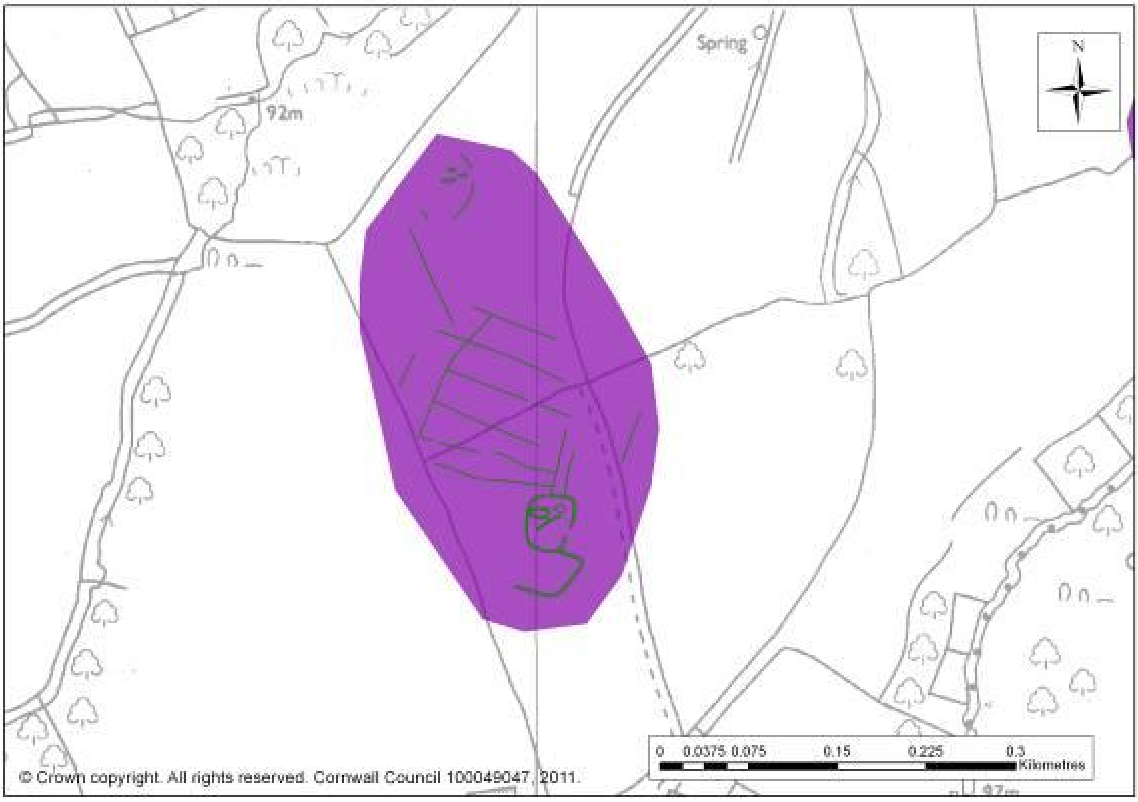

Fig 86. The Poundstock study area: settlement polygon at Sudcott, Jacobstowe e.

The settlement enclosure at Sudcott, Jacobstowe e covers 7.5ha and contains two enclosures and field system. In the south is a single-ditched cropmark enclosure with possible entrances facing southeast and north. The enclosure contains internal features comprising a pit or hollow, a linear ditch and a possible oval house, suggesting a Romano-British date. The enclosure is on a north-facing slope between the 130m and 140m contours and covers 0.14ha. A second enclosure, likely to be larger, is appended to its south side, but this enclosure appears to be not completely visible. At the northern end of the polygon is a third possible enclosure. It appears to be curvilinear but is highly fragmentary.

In the centre of the polygon is a very regular rectilinear field system visible as cropmark ditches. It is unusual for lowland Cornwall in that it appears to be more or less complete, whereas the norm is for lowland Cornwall field systems to be fragmentary and incomplete. The southern part of the system is situated in Medieval Enclosed Land (former cropping units which have been sub-divided, amalgamated and later re-arranged) and the fact that it is on a different alignment to the medieval-derived field pattern does suggest it is of prehistoric or Romano-British date. The field system covers 1.4ha and the field dimensions are typically 113m x 30m and 3,390m sq in area.

6.2.5 Barrows

The dataset contains records for 49 barrows in the Poundstock study area, of which 26 were ascribed a validity rating of 3 or more – these are referred to below as high validity barrows – the other 23 are referred to as low validity barrows. Of the low validity barrows, six were mapped during Cornwall's NMP, but with low validity scores. The remaining 17 barrows were not mapped during the NMP and therefore do not have a validity rating. Four of these are recorded from documentary references and one is listed in the HER as 'site of': none of these barrows has visible surviving remains, hence they were not mapped. This leaves 12 unmapped barrows of which ten are listed in the HER as extant features and two as cropmark sites. Presumably no convincing evidence for these barrows was visible on aerial photographs during NMP mapping (even though one of them, PRN 486 at Millook Common, Poundstock, is marked on the OS base map).

6.2.5.1 Evidence for the barrows

The majority of the barrows have upstanding extant remains, although a significant number are recorded as cropmarks (table 100).

Evidence	High validity barrows	Low validity barrows	All barrows
Cropmark	10	8	**18 (37%)**
Extant	15	10	**25 (51%)**
Documentary	0	4	**4 (8%)**
Site of	1	1	**2 (4%)**
Total	**26**	**23**	**49**

Table 100. Poundstock study area: barrows – types of evidence.

6.2.5.2 Distribution of the barrows

There are three main foci for the distribution of the high validity barrows: in the northern part of the study area between Widemouth and Helebridge, in the southwest around Wainhouse Corner (these are part of a larger barrow cemetery that extends westwards beyond the study area), and in the far southeast beyond Nethercott (Fig 87). In two of these areas – in the north and southwest – there are also concentrations of low validity barrows and low validity barrows are also recorded from the central part of the study area, from which high validity barrows are absent.

The extant barrows are, for the most part, found in the northern and south western concentrations, whilst the south eastern concentration consists of a majority of plough levelled barrows visible as cropmarks. The barrows identified from documentary evidence are confined to the central part of the study area (Fig 88).

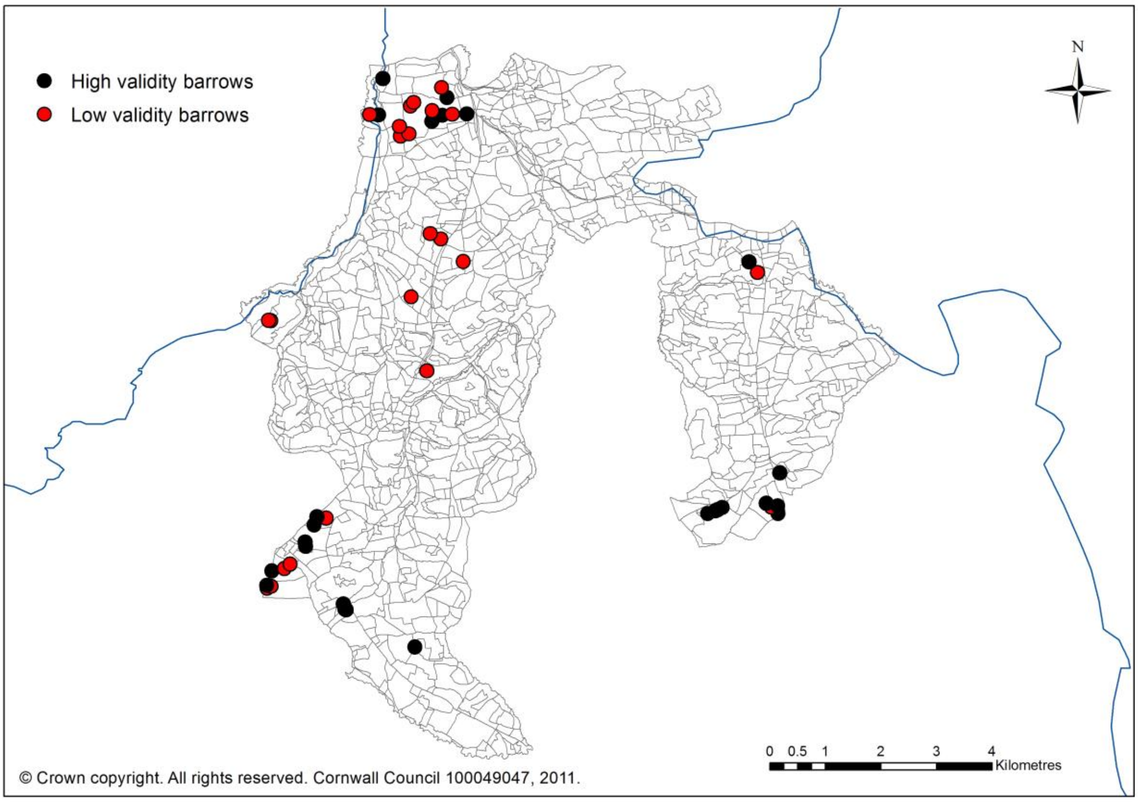

Fig 87. Poundstock study area: distribution of high validity and low validity barrows

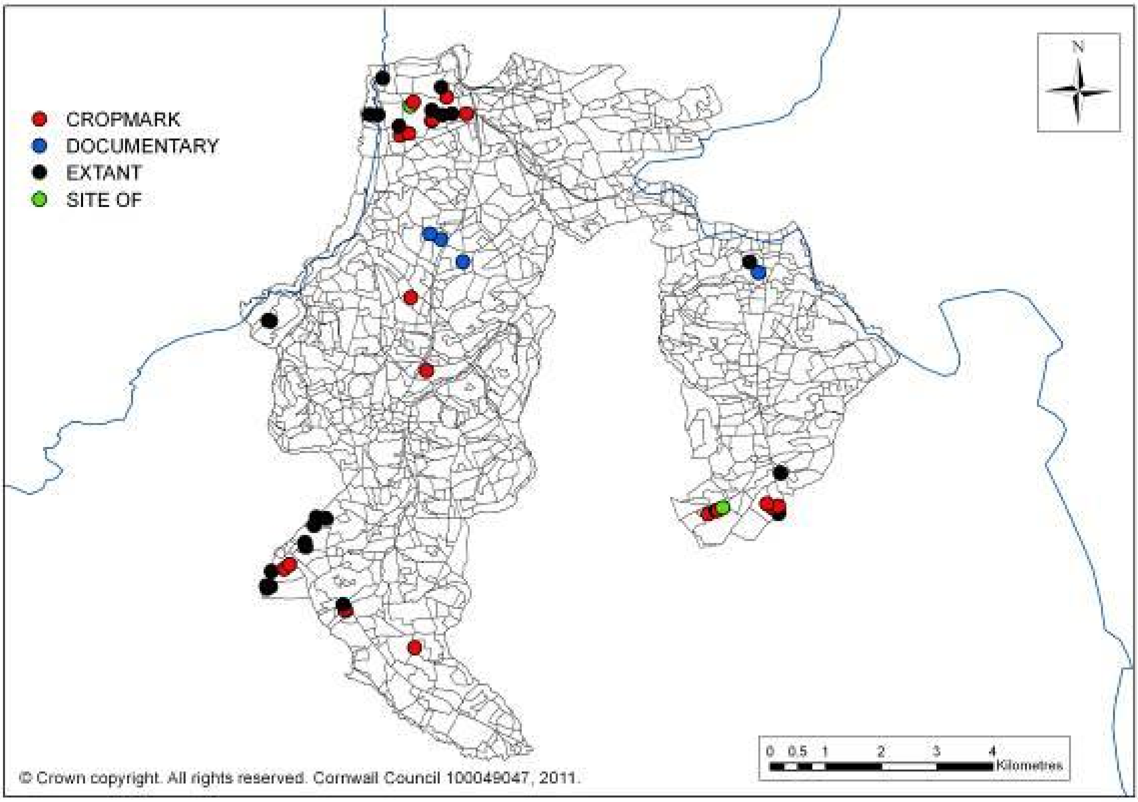

Fig 88. Poundstock study area: evidence for the barrows

To a large extent the distribution of barrows in the Poundstock study area is characterised by quite extensive cemeteries. In the southwest, to the south of Wainhouse Corner, Jacobstowe , is a loosely defined group of four extant and two cropmark barrows. These form part of a larger cemetery, with a further six barrows a few metres to the west in the neighbouring parish of St Gennys, which falls outside the study area. Some 420m north of this group lies another dispersed cemetery consisting of five extant barrows including the largest in the study area (PRN 496.01) which comprises a mound 42m in diameter. Again an additional barrow forming part of this group lies within St Gennys parish. A little over 1km to the southeast at Headon Cross is Headon barrow (PRN 740) which forms part of a group of three.

In the north, between Widemouth and Whalesborough, Marhamchurch, there is an extensive dispersed group of eight extant, seven cropmark and one 'site of' barrows, some of which are of low validity, set in land below the 70m contour reaching back from the sea.

There are two cemeteries in the southeast. The first, at Foxhole, Whitstone, consists of four barrows (two cropmarks, one extant and one 'site of') arranged in a linear alignment. Roughly 800m to the east, at Wilsworthy Cross is another linear cemetery consisting of two cropmark and one extant barrows – a fourth barrow forming this cemetery lies outside the study area in the neighbouring parish of North Tamerton. There are a number of outlying barrows here, including a cropmark barrow 100m away, an extant barrow 600m to the north at Dilland, and two more in the parish of North Tamerton. Overall there are six groups which can be considered cemeteries; elsewhere 12 barrows occur in isolation.

The majority of high validity barrows are sited on hill tops whereas low validity barrows are more likely to be situated on sloping ground (table 101)

Location	High validity barrows	Low validity barrows	All barrows
Hill top	13	4	**17 (35%)**
Cliff top	2	1	**3 (7%)**
Plateau	2	2	**4 (9%)**
Promontory	0	0	**0**
Ridge	2	3	**5 (10%)**
Slope	7	13	**20 (41%)**
Total	**26**	**23**	**49**

Table 101. Poundstock study area: barrows – location in the landscape.

There are also differences in the location of the high and low validity barrows when contour data is analysed (table 102). Almost three quarters of the high validity barrows are situated between the 126 and 175m contours (on the high ground in the southwest and southeast) whereas the majority of low validity barrows are sited below the 65m contour.

Height (m)	High validity barrows	Low validity barrows	All barrows
0-35	2	4	**6**
36-65	5	8	**13**
66-95	0	0	**0**
96-125	0	5	**5**
126-175	19	6	**25**
Total	**26**	**23**	**49**

Table 102. Poundstock study area: barrows – altitude.

When aspect in the landscape is considered there are again differences between the high validity and low validity barrows. The majority of high validity barrows are sited on hill tops whilst the low validity barrows are on slopes facing a wide variety of aspects (table 103)

Location	High validity barrows	Low validity barrows	All barrows
All aspects	16	4	**20 (41%)**
E	2	4	**6 (12%)**
N	0	4	**4 (8%)**
NE	0	1	**1 (2%)**
NW	2	3	**5 (10%)**
S	2	4	**6 (12%)**
SE	1	2	**3 (6%)**
SW	0	0	**0**
W	3	1	**4 (8%)**
Total	**26**	**23**	**49**

Table 103. Poundstock study area: barrows – specific aspect.

Location	High validity barrows	Low validity barrows	All barrows
Western (W, NW, SW)	5	4	**9**
Eastern (E, NE, SE)	3	7	**10**
Northern (N, NE, NW)	2	8	**10**
Southern (S, SE, SW)	3	6	**9**
All aspects	16	4	**20**

Table 104. Poundstock study area: barrows – broad aspect.

Despite these differences it is clear, when analysing the broad aspects of the barrows' position in the landscape, that the majority are in locations facing all aspects and that beyond that there is no particularly favoured aspect.

6.2.5.3 Size and form of the barrows

Dimensions were measurable for all the high validity barrows and for six low validity barrows. Two high validity barrows were oval in shape: PRN 56694 at Higher Langdon, Jacobstowe , consisting of a cropmark mound measuring 33m x 22m, and PRN 897 at Foxhole, Whitstone, consisting of an oval ring ditch 27m x 19m. All the other sites are round barrows with diameters ranging from 8m to 42m, with an average diameter of 20m, which is higher than the other three study areas. The majority have diameters ranging from 11m to 25m. A summary of the barrow diameters is set out in table 105.

Diameter (m^2)	High validity barrows	Low validity barrows	All barrows
5-10	3	0	**3**
11-15	4	1	**5**
16-20	5	4	**9**
21-25	7	0	**7**
26-30	3	1	**4**
31-35	1	0	**1**

Diameter (m^2)	High validity barrows	Low validity barrows	All barrows
36-40	0	0	**0**
41-45	1	0	**1**
Total	**24**	**6**	**30**

Table 105. Poundstock study area: barrows – measurable diameters.

The great majority of the round barrows are visible as mounds (whether upstanding or plough levelled); four have a mound and ditch and nine are recorded as ring ditches (table 106).

Form of remains	High validity barrows	Low validity barrows	All barrows
Mound	16	3	**19**
Ditch	8	1	**9**
Mound and ditch	2	2	**4**
Total	**26**	**6**	**32**

Table 106. Poundstock study area: barrows – form of remains.

7 Summary and discussion

7.1 Enclosures

There are 305 records for enclosures in the Lowland Cornwall dataset, making it the most numerous site type in the project area. Overall 152 of the enclosures have a high validity score and 153 are classed as low validity. The enclosures are not at all evenly distributed and there are significant differences in the number of enclosures from study area to study area. Almost half of the enclosures are within the Probus study area whilst in the Pelynt and Poundstock study areas the enclosures are outnumbered by records for barrows. To some extent the low number of enclosures (33) in the Poundstock study area may reflect the fact that only 45% of the area falls into the high visibility zone of the Lowland Cornwall visibility model, as opposed to 60% for the four study areas as a whole. In other words the geology and soils here are not conducive to cropmark formation and there has been little aerial reconnaissance. By contrast 73% of the Probus study area lies in the high visibility zone and 145 enclosures are recorded. The lowest number of enclosures (22) is recorded from the Pelynt study area despite the fact that 59% of the area is within the high visibility zone and several reconnaissance flights have been made over it. The apparent lack of enclosures may be because of the area’s natural topography, dominated as it is by incised valleys and long ridges of high ground.

The majority of the enclosures (58%) are recorded as cropmarks, but again the percentage varies from area to area: for instance 69% of the Probus enclosures but only 42% of those in Penwith are cropmarks. There are also differences between the form of remains between the high validity and low validity enclosures. Over the four study areas 79% of the high validity enclosures are recorded as cropmarks (the percentages in each study area are very similar apart from Pelynt, where only 63% of high validity enclosures are recorded as cropmarks). By contrast only 37% of the low validity enclosures are cropmarks. To some extent this is because most cropmark enclosures were mapped as part of Cornwall’s NMP and therefore have been assigned a validity rating, whereas a high proportion of the low validity enclosures are recorded from documentary evidence, have no visible remains and have therefore a validity score of zero. In total almost a quarter of the enclosures are recorded from documentary evidence and are classed as ‘low validity’. There is a particular concentration of these in the Penwith study area (37 in total – 36% of the Penwith enclosures), perhaps reflecting the high level of early antiquarian work carried out here.

Across all four study areas only 17% of the enclosures have above ground extant remains.

The form of construction can be determined for 196 of the enclosures. More than half appear to be enclosed by a ditch alone, 27% by a bank alone and 20% by bank and ditch. However, there is a tendency in Cornwall for ditches to produce cropmarks more readily and more clearly than banks, so it might be the case that some of the ditched enclosures do have an accompanying bank not visible as a cropmark. A good example of this is Penhale Round, Fraddon. Penhale Round was first identified from aerial photographs, on which it appears as a double-ditched oval enclosure with no trace of a bank. However, excavation of the site revealed a substantial, stone-revetted enclosing bank (Nowakowski 1998). Nonetheless it should not be automatically assumed that all ditched enclosures will be bounded by a bank as well as a ditch; the open-ended enclosure at Tremough, Penryn (Gossip and Jones 2007) serves as an example of a simple, ditched enclosure with no trace of a bank.

The Probus study area has the highest percentage of ditched enclosures (68%). By contrast only 27% of the Penwith enclosures are bounded by a ditch alone. Here the majority are enclosed by a bank. This is true also of the form of construction of field boundaries in Penwith (see section 7.2). Penwith is the only study area where a substantial part is underlain by granite. This naturally leads to a higher amount of rock at surface and therefore a correspondingly higher proportion of features originally built using stone, which could explain this contrast with the other three study areas.

More than 70% of the enclosures are located on hill slopes, with only 10% on hill tops and similar percentage on ridges. The remaining 10% are on plateaux, promontories or cliff tops. Similarly the enclosures are situated predominantly on the middle ground in terms of topography. Across the Lowland Cornwall project area heights OD range from sea level to 220m at Fraddon, St Enoder, on the fringe of the Hensbarrow uplands. Half of the enclosures are located on land lying between the 70m and 105m contours, with only eight located below the 35m contour and 10 above the 145m contour. There are slight differences between the location of the high validity enclosures and those with a low validity rating: 34% of the low validity enclosures are situated on land above the 105m contour as opposed to only 22% of the high validity enclosures.

There appears to be no pattern with regard to favoured aspects in the landscape, rather the siting of enclosures seems to follow the general lie of the land. So the majority of the Probus area enclosures face westerly aspects (west, southwest or northwest), with very few facing all aspects. In the Penwith study area a majority of enclosures are facing southerly or easterly aspects, with very few facing west; there is no obvious preferred aspect for the Pelynt enclosures other than an avoidance of northerly aspects, whilst the majority of the Poundstock enclosures are facing northerly aspects, with very few facing south.

For the Probus, Penwith and Pelynt study areas this contrasts with the location of early medieval settlements. Invariably the majority of these are situated in lower-lying land than the enclosures with a marked preference for southerly aspects. In the Poundstock study area, however, the majority of early medieval settlements are located in higher ground than the enclosures and on land facing easterly aspects.

The size of the enclosed area could be measured in 187 of the enclosures (61% of the total number of enclosures). Of these only 10% covered an area greater than 0.5ha and only three enclosed an area greater than 1ha (excluding the outer enclosed area of multivallate enclosures). Almost 70% of the enclosures do not exceed 0.25ha in area and as many as one third cover an area smaller than 0.01ha. These proportions are similar for both the high validity enclosures and those with a low validity rating. There are some slight differences between the four study areas, the most notable being that the enclosures in Penwith are generally smaller than elsewhere – almost half the enclosures here are smaller than 0.01ha and none encloses an area greater than 0.5ha.

The shape of these 187 enclosures could also be defined, and slightly more than half (55%) were classed as curvilinear in form, with a roughly equal division of the others between rectilinear and mixed (23% and 22% respectively). There were some differences between the high validity enclosures and those with low validity, most notably that the percentage of low validity enclosures classed as curvilinear was much higher than that of the high validity enclosures (75% as opposed to 46%).

Among the curvilinear enclosures the most prevalent shape is oval – almost a third of curvilinear enclosures. Just under a quarter were defined as sub-circular and a similar number as C-shaped. However, it should be noted that of the 18 enclosures classed as C-shaped, 11 had low validity ratings. There were equal numbers of enclosures defined as regular and irregular. Only two enclosures were classed as circular, both with a low validity score. These findings were broadly consistent across all study areas with oval enclosures the most frequent, apart from in Poundstock, where sub-circular and C-shaped types were most numerous.

Almost two thirds of the rectilinear enclosures are four-sided but the actual proportion of four-sided enclosures may be higher than this. Twelve enclosures were classed as three-sided but it is possible that some, or all, of these are incomplete or not completely visible and may actually have four or more sides. Fifteen percent of the rectilinear enclosures are polygonal with five sides and one enclosure is six-sided. Of the four-sided enclosures the majority were classed as polygonal in shape but there were a significant number of sub-square types, especially in the Penwith study area. Between them the polygonal and sub-square types account for 82% of the four-sided enclosures, with rectangular and sub-rectangular making up the remainder. One feature of the rectilinear enclosures is that they seem to be towards the smaller end of the size range: this is clearest in the Probus study area and to a lesser degree in Penwith.

The vast majority of the enclosures are simple univallate types but 13% of the total sample can be described as more complex. These are enclosures that either have more than one enclosing ditch and/or bank and those which have a secondary appended enclosure or ‘annex’. The largest group are double-ditched enclosures – i.e. those with two or more close-spaced ditches and/or banks – of which there are 15. These are probably best considered as variants on the more frequent univallate enclosures in that enclose a single, defined space but with two ditches rather than one. They differ significantly from the 12 multivallate enclosures with wide-spaced ditches, where the outer enclosure covers at least twice the area of the inner enclosure, creating an extensive intervallate space. And there are 12 enclosures with annexes. A high proportion of the complex enclosures are recorded as cropmarks – 78% as opposed to 58% for all enclosures, but also a higher proportion has surviving earthwork remains – 23% against 17% of all enclosures. The double-ditched enclosures are more likely to be rectilinear or mixed than curvilinear, tend to be larger than the average univallate enclosures and also are more likely to be located on ridges. By contrast the multivallate enclosures are more likely to be curvilinear in form and the majority are located on hill slopes.

Enclosed settlements from the Iron Age and Romano-British period in Cornwall have traditionally been called ‘rounds’. In the most recent review of rounds Quinnell proposed a refined definition of the term ‘round’ – “a permanent settlement with substantially built houses whose inhabitants merited the distinction of a formal bound or enclosure, which may have held significance for their status beyond its provision of protection or defence” (Quinnell 2004, 213). One difficulty with the need for a refined terminology for Cornish enclosures is that the term ‘round’ is embedded in the literature and in archaeological vernacular. A sample of the Lowland Cornwall univallate enclosures is shown in Fig 89. Although some, such as enclosure 22262, are rectilinear in form, and although enclosure 21088 is double-ditched, Cornish archaeologists would have no difficulty in classing these enclosures as typical rounds.

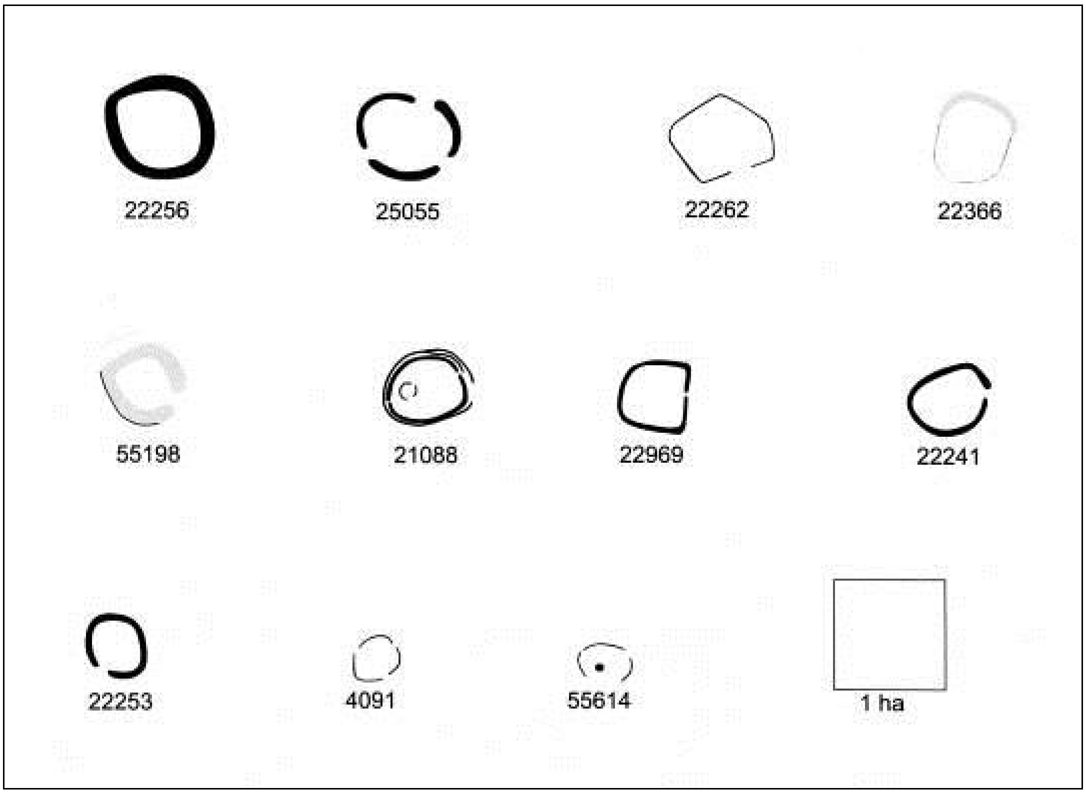

Fig 89 A sample of typical enclosures from Lowland Cornwall. Ditches are shown as black lines; banks in grey. North is towards the top.

However, only a small proportion of the enclosures have visible entrances or possible entrances and only 10 have internal features, such as houses. This would seem to exclude them from being interpreted as settlements, but where enclosures are visible as cropmarks entrances do not always show and internal features such as round houses are far less substantial structures than enclosure ditches and are rarely visible on aerial photographs in Cornwall. Bearing this in mind it seems likely that further investigation (e.g. geophysical survey or small scale excavation) of the enclosures would identify entrances and internal settlement features.

The need for an updated terminology is underlined by excavations in Devon where fieldwork has shown that some small enclosures date to the Bronze Age or medieval periods (Fitzpatrick *et al* 1999, Griffith and Quinnell 1999) This is likely to be the case also in Cornwall. Recent work in the county has shown that small enclosures at Killigrew, St Erme (Cole and Nowakowski forthcoming) and possibly Little Quoit Farm, St Columb Major (Lawson-Jones and Kirkham 2009-2011), were not settlements but dedicated metalworking sites.

A considerable number of the Lowland Cornwall enclosures differ in form from the traditionally accepted definitions of a round. For instance, a third of the enclosures can be classed as very small in that their circuits enclose less than 0.1ha. It is possible that some are not settlements: the majority are located adjacent to larger enclosures or within complexes of enclosures, field systems and other settlement-related features and probably fulfilled some ancillary function, such as livestock pens. Some, however, occur apparently in isolation and these might reasonably be interpreted as settlements. One possible model for these small enclosures is that at Tremough, Penryn (Gossip and Jones 2007). This consisted of a small open-ended curvilinear enclosure which contained a single oval building dating to the Romano-British period. Another possible analogy is the Romano-British settlement at Porth Godrevy, although the nature of the enclosure there is ill-defined (Fowler 1962).

At the other end of the scale the enclosures that exceed 1ha in area are clearly unusual. There are four good examples in the Probus study area. One, the rectilinear enclosure at Carvossa, Probus (ID 23028) which encloses 2.25ha, is double indexed in the HER as a hillfort/enclosure and is included in the Lowland Cornwall dataset because, unlike the classic Cornish hillforts, it continued in use into the Roman period and appeared to increase in affluence during the later 1st and 2nd centuries AD (Quinnell 2004, 216). The other three enclosures are all in the parish of Ladock; at Trobus (ID 55203) enclosing 2ha, Trebeigh (ID72272) enclosing 1.27ha, and Trendeal (ID 55220) enclosing 1.88ha. The enclosure at Tregonning, St Newlyn East (ID 55673) which encloses 0.98ha might also be included in this group of large enclosures.

In terms of their size these enclosures are comparable to the extant hillforts in the study area. These are Trewinnion, St Enoder (ID 22250) which encloses 1.14ha, Golden, Probus (ID 23027) enclosing 3.47ha and Cargoll, St Newlyn East (ID 25050) which encloses 0.46ha (Fig 90). This latter site illustrates the general inconsistencies in the accepted classification of Cornish enclosures because it seems too small to be considered a true hillfort. Its interpretation as such appears to rest mainly on its survival as a substantial earthwork. It occupies a relatively prominent position at the head of a steep northeast facing slope but the other hillforts, Trewinnion, on a hill top, and Golden, on a promontory, are situated in far more imposing locations. As well as the five enclosures discussed above, 13 enclosures in the Probus study area are larger than the Cargoll hillfort and some are much larger, such as the earthwork enclosure at Parkengear, Probus (ID 22537) which encloses 0.88ha – almost twice the size of the Cargoll 'hillfort'.

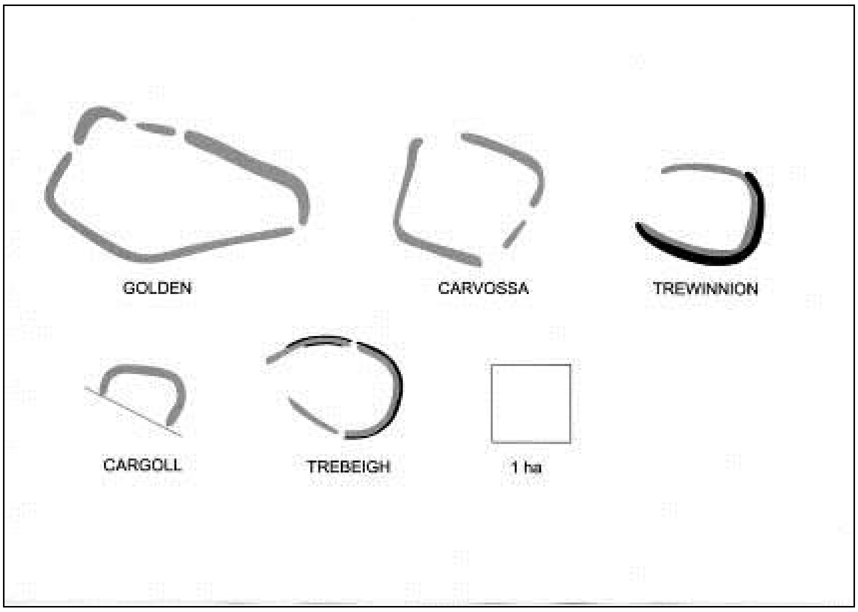

Fig 90. Hillforts in the Probus study area, including the possible fort at Trebeigh. North is towards the top.

If the interpretation of Cargoll as a hillfort can be questioned then the large enclosure at Trebeigh can reasonably be considered as a potential hillfort. It is an oval univallate enclosure, slightly larger than the Trewinnion hillfort and, although only visible as a cropmark, it is bounded by a substantial bank. It is located on a prominent hill top at the head of the Tresillian River where it forks to the north of Gunnamanning.

It is unlikely that the other large enclosures are hillforts (Fig 91). The Trendeal enclosure lies only one kilometre to the north of Trebeigh and although it straddles a prominent ridge, its enclosing bank, which is visible as a cropmark, appears to be relatively slight. The enclosures at Trobus and Tregonning are both located on sloping ground below hill tops and the Trobus enclosure lies only 355m from the hillfort documented at Nansough. These three enclosures are similar in that their circuits are all incomplete, they are all cut by field hedges, they are rectilinear in form (although the Trendeal and Tregonning enclosures could alternatively be regarded as mixed) and they are likely to be five- or more sided (Trobus might be six-sided and Tregonning may have three straight sides and one curving side or five sides with curving corners in the northeast).

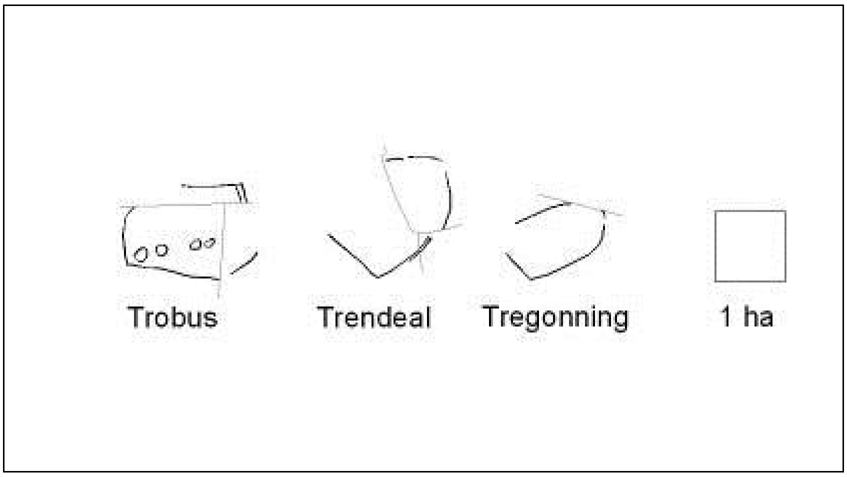

Fig 91. Large enclosures in the Probus study area. Modern field hedges are shown in grey. North is towards the top.

Multivallate enclosures are of particular interest because, whether they represent two phases of enclosure or were originally designed with more than one circuit, they are very different from the typical univallate and double-ditched enclosures. The outer circuits are in many cases much larger than the predominant small enclosures, some enclosing more than 1ha. Little investigation of multivallate enclosures has been carried out in Cornwall but at both Trevisker, St Eval (ApSimon and Greenfield 1972) and at Reawla, Gwinear (Appleton-Fox 1992) the inner enclosing ditch was infilled before the outer enclosure was constructed. There is currently no evidence for the opposite – the contraction of enclosures. Increase in status or in local or regional significance may be factors behind the expansion of multivallate enclosures. Population growth is another possible factor, as are changing or added functions. More research is needed into the reasons for such radical rebuilding and also into why large annexes were sometimes added to otherwise typical univallate enclosures.

Apart from the annexed enclosures, the multivallate enclosures, the very small enclosures and the large enclosures a number of other examples of unusual enclosures are recorded from Lowland Cornwall, particularly from the Probus study area. There is no common factor marking out these enclosures as 'different', but rather each is unique for its own reasons. A sample of these enclosures is shown in Fig 92. Enclosures 25041 and 22303 are noteworthy for their sharp angled corners (compare with the far more typical curving corners of enclosures 22262 and 22969 in Fig 89). Enclosure 25041 is also unusual for its high degree of rectiliniarity. Enclosures 55616 and 55617 in Fig 92 are similar in that both have smaller enclosures and other features appended to their circuits. The series of three enclosures appended to 55616, in particular, appear to have been carefully built on to its southeast side, giving the whole complex a distinctly accreted feel. The layout of enclosures 25060 and 25059 is unusual: there are suggestions of a relationship between the two although this is difficult to define; both are distinctly rectilinear and enclosure 25059 could possibly be a field or pound accessed by a ditched droveway. Enclosure 55652 combines a number of elements; it is small, double-ditched and has a small oval enclosure appended. None of these enclosures can reasonably be described as a round in the simple sense of the term.

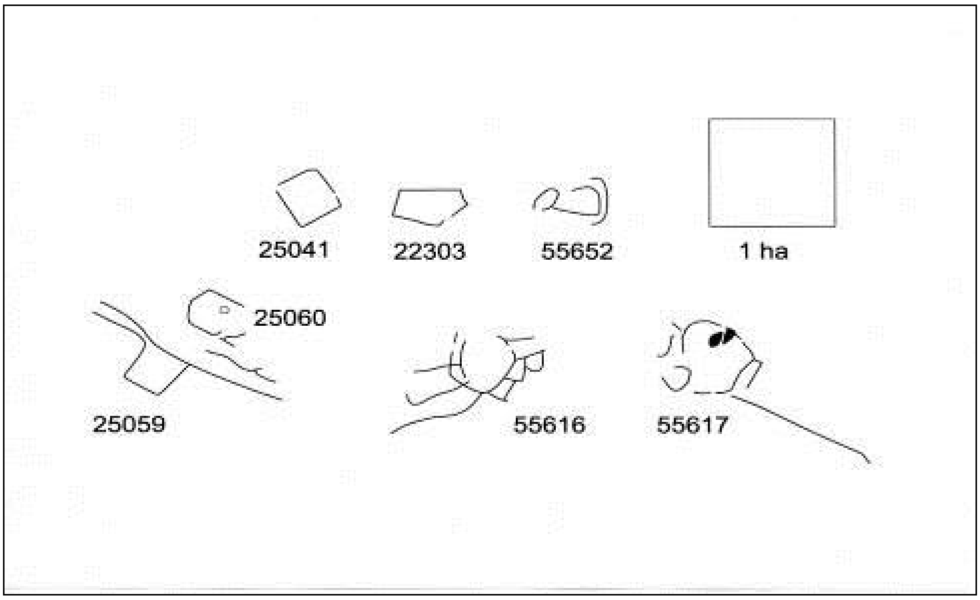

Fig 92 A sample of unusual enclosures in the Probus study area. North is towards the top.

'Open ended enclosures' might represent another enclosure type not previously discussed in the literature. These are enclosures whose circuit is not complete but leaves one side of the enclosure open. In some cases this includes three-sided rectilinear enclosures but the majority are C-shaped curvilinear enclosures (Fig 93).

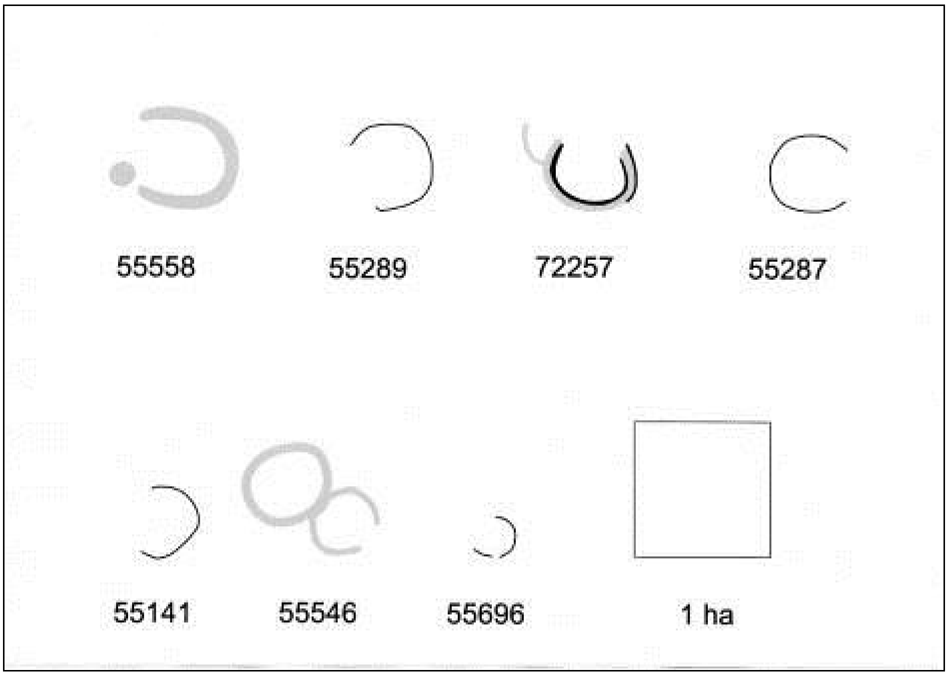

Fig 93 A sample of C-shaped open-ended enclosures. Black lines represent ditches; grey lines banks. North is towards the top

It is easy to assume that in many cases a complete circuit does exist but is not completely visible as a cropmark. In some cases this may be true but the possibility of some enclosures being deliberately designed as open-ended should not automatically be discounted.

7.2 Fields

Across the four study areas there are records for 66 prehistoric or Romano-British field systems or field boundaries – significantly fewer records than there are for enclosures or barrows. In addition there are 32 records for undated field systems or boundaries which could potentially be prehistoric or Romano-British in origin. Within Lowland Cornwall the distribution of the fields is uneven: 26 prehistoric/Romano-British and 24 undated fields are in the Probus study area; 34 prehistoric/Romano-British fields are in Penwith; two prehistoric/Romano-British and eight undated fields are in Pelynt and four prehistoric/Romano-British fields are in Poundstock. All but five of the prehistoric/Romano-British field systems/boundaries have a high validity rating and the same is true for all the undated field components.

Two thirds of the prehistoric/Romano-British fields are recorded as cropmarks as are all the undated fields. However, the distribution of extant field systems is not at all even and those with surviving above-ground remains are largely confined to the Penwith study area. Here there are 18 extant field systems, whereas there are only three in Probus, one in Poundstock and none in Pelynt. The extant fields in Probus are at Trenithan Bennett and were recorded from RAF aerial photographs from 1946. The boundaries are not visible on more recent aerial photography so it seems likely that these are now plough-levelled. The most likely reason for the better survival of field systems in Penwith is that outlined for the high number of enclosures bounded by a bank (section 7.1); namely a higher proportion of features originally built using stone, which was more readily available here than elsewhere.

Like the enclosures the field systems are predominantly on hill slopes. This is the case both for the prehistoric/Romano-British fields, 59 (89%) of which are located on slopes, and for the undated fields of which 27 (84%) are on slopes. Small numbers of field systems occupy cliff tops, hill tops and ridges. One is located on a promontory and one is spread over various topographical locations. Similarly the fields are mostly situated in the middle ground, with more than half of the prehistoric/Romano-British and undated fields lying between the 70m and 105m contours. This is an almost exact replica of the location of the enclosures which is to be expected, given that 42 (64%) of the prehistoric/Romano-British fields are in close proximity to enclosures and are thus likely to be associated. This is less clear for the undated fields, only 40% of which are in proximity to enclosures. And there are differences in the topographical location of dated and undated fields, with more of the latter in land above the 100m contour.

There are also differences between the favoured aspects for the prehistoric/Romano-British and undated fields. The dated fields are mostly facing southerly (30) or easterly aspects (25), whilst most undated fields face northerly (14), westerly (10) or southerly aspects (10).

The field shape is predominantly rectilinear - 73% of prehistoric/Romano-British and 66% of undated fields. Fields defined by a combination of straight and curving boundaries are the second most commonly occurring forms. Only three prehistoric/Romano-British and one undated field system were classed as curvilinear.

There are regional differences when the construction of the prehistoric/Romano-British field boundaries is considered. Almost 90% of the Penwith fields are recorded as either extant or cropmark banks (including stony banks) whilst only four of those in the Probus study area are recorded as banks and none from either Pelynt or Poundstock. The great majority of boundaries in these study areas are formed by ditches, with only 5 recorded as comprising ditch and bank. The form of the undated field boundaries is similar to this, with 29 formed by a ditch, two by a bank and one by ditch and bank. However, it should be borne in mind that Cornish hedges – substantial structures consisting of wide stone and earth banks – when removed leave a highly distinctive double-ditched cropmark with often no hint of a central bank. So it may well be that the prehistoric field boundaries appearing as ditched cropmarks may well have had accompanying banks.

Generally speaking the field systems recorded in Lowland Cornwall are incomplete and fragmentary in nature. So much so that it was difficult to obtain measurements for typical field size in any of the study areas. The most coherent systems were recorded from the Penwith study area, but even here measurements could only be made in 13 instances. Here the average dimensions for the fields were 45m x 32m, with an average area of 0.16ha. The fields in Pelynt appear to be somewhat larger than this, at 47m x 43 and covering 0.23ha. By contrast the fields in Poundstock averaged 113m x 64 (0.34ha) and those in Probus 109m x 64m (0.67ha).

The apparent fragmentary nature of the field systems over much of Lowland Cornwall suggests that we are not seeing their complete extent and that only the major boundaries produce clear cropmarks and that sub-dividing boundaries are not visible.

In upland areas of Cornwall a series of key reorganisations of the farming system undertaken on a wide scale in response to changing pressures on land and resources has been identified (Herring 2008). The earliest definable patterns, from the middle Bronze Age, can be traced on Bodmin Moor, where towards the fringes of the Moor unenclosed round house settlements are set within curvilinear accreted field systems. A major reorganisation around the mid second millennium involved the laying out of extensive coaxial field systems with round houses scattered within them. These have been recorded from coastal rough ground on the Lizard Peninsula and in West Penwith as well as on Bodmin Moor. Reorganisation in the late Bronze Age/early Iron Age saw the abandonment of coaxial fields and the development of dense grids of brick-shaped fields. This model is clearest in West Penwith and to a lesser extent in other parts of west Cornwall and the Lizard Peninsula. One could expect that similar changes took place in lowland areas but the fragmentary nature of the evidence makes this difficult to recognise. Certainly no curvilinear accreted systems, like those on Bodmin Moor, have been identified in Lowland Cornwall. In parts of the Probus study area there are hints at coaxial systems but these systems are not extensive enough to be able to confirm this. In Penwith the occurrence of smaller fields than elsewhere suggests that the characteristic brick-shaped fields surviving in the West Penwith uplands did, in fact, extend into lowland areas, but again the evidence from Lowland Cornwall is not conclusive enough to say this with any real assurance.

7.3 The settlement and farming landscape

A notable feature of the enclosures in Lowland Cornwall is that their distribution is not even throughout the landscape. Some are lying in apparent isolation, in other cases two or more enclosures are situated in close proximity and in places there are relatively dense concentrations of enclosures and associated features. The distribution of enclosures, other settlement features and field systems was mapped using polygons in each of the study areas. In total 186 settlement polygons were created for features dated as Bronze Age, Iron Age, Prehistoric or Romano-British, and a further 55 polygons were created for undated features considered to be potentially of prehistoric date.

The number of polygons varies considerably between each study area, ranging from 22 in Poundstock to 109 in Probus. The average size of the polygons is 5.3ha and again the average polygon size varies from area to area, from 3.4ha in Poundstock to 8.4ha in Probus (the average in Pelynt is 5.5 – close to the overall average). The vast majority (83%) are 10ha or less in size and 44% cover between 1ha and 5ha. There are differences between the study areas, most notably in Probus, where there are 25 polygons greater than 10ha, as opposed to 10 in Penwith, five in Pelynt and only one in Poundstock. There are no polygons greater than 20ha in Penwith, one each in Pelynt and Poundstock and 10 in Probus.

The most frequently occurring site types within the polygons are the enclosures: 149 (80%) of the dated polygons and 188 (78%) of all the polygons contain at least one enclosure. In total 77 polygons contain a single enclosure with no other features and a further 50 contain a single enclosure with associated field system, field boundaries, ditches or pits. In other words 68% of the enclosures occur singly with no other enclosures in close proximity. However, this figure varies considerably from area to area – 96% of the enclosures in Pelynt occur singly, 77% of those in Poundstock, 73% in Penwith but only 54% of those in the Probus study area.

Sixteen of the polygons contain more than one enclosure in close proximity but no other associated features. Thirty six contain more than one enclosure and associated field boundaries or field systems. Forty polygons contain field systems or field boundaries only, with no associated enclosures or other settlement features, and half of these are within the Penwith study area.

7.4 Barrows

In total 229 barrows are recorded in the Lowland Cornwall study areas. However, only 96 were assigned a high validity rating, the remaining 133 having a score of 2 or less. The majority of these (65) are recorded in the HER either from documentary evidence or as 'site of' and because they have no visible remains were not assigned a validity rating. Ten barrows recorded in the HER as cropmarks and 36 as extant sites were not mapped during Cornwall's NMP (presumably the remains were not convincing in the view of the photo interpreters) and a further 22 were mapped but were awarded a low rating. One of the issues over interpretation of barrows in the metalliferous mining districts is the difficulty in distinguishing between a plough-levelled barrow mound and a plough-levelled spoil heap and many cropmark mounds were interpreted as either/or. This issue affected parts of both the Probus and Penwith study areas. The most populous study area is Probus, with 84 barrows, whilst the other three contain similar numbers, ranging from 46 to 50. Poundstock is the only study area in which high validity barrows outnumber the low validity examples (26:23) whereas by contrast only 28% of the Penwith barrows have a high validity score.

The great majority of the high validity barrows have above ground earthwork remains and only 26% are recorded as cropmarks. Of the low validity barrows 40% are recorded from documentary evidence, 33% as extant monuments and 18% as cropmarks. Overall almost half the barrows are extant earthworks with roughly equal proportions of cropmark and documentary examples.

The majority of barrows occupy land between the 70m and 145m contours, and this is the case both for the high validity and low validity barrows (69% and 68% respectively). However, there is a distinct trend for the high validity barrows to be sited on higher ground then those with low validity scores: 65% of high validity barrows occupy land above the 105m and contour as opposed to 40% of low validity barrows.

The favoured location in the landscape for the barrows is on hill slopes, with 42% of all barrows sited here. Considerable numbers are located on ridges and hill tops (25% and 21% respectively). The location of high validity barrows and those with low validity scores are roughly similar, the biggest differences being that 31% of high validity barrows are situated on ridges as opposed to only 20% of low validity barrows and that a higher proportion of low validity barrows are located on hill slopes. There are also differences between the study areas: more than half the barrows in the Penwith study areas are located on slopes – a higher proportion than anywhere else, and 50% of high validity barrows in Poundstock are on hill tops – again a much higher percentage than the other study areas.

Given the high numbers of barrows located on hill tops and ridges it is not surprising that almost twice as many face all aspects as any other. Ninety seven barrows face all aspects whilst between 45 and 50 face southerly, westerly, northerly or easterly aspects. When only the high validity barrows are considered, just over half are facing all aspects. However, the proportions vary from area to area: in Probus 56% face all aspects and in Poundstock the figure is 55%, but in Penwith and Pelynt only 22% face all aspects. In Penwith the favoured aspect is easterly and in Pelynt it is westerly and northerly. In all study areas the favoured aspect of the low validity barrows is all aspects.

Seven of the barrows are oval in shape but the remainder are all circular and described variously as round barrows or bowl barrows. The diameters of these were measurable in 91 of the high validity barrows and 19 of those with low validity. The predominant size range is between 11m and 20m (the case with two thirds of the high validity barrows and 73% of low validity barrows) and 82% of the barrows are between 11m and 25m in diameter. Four barrows measure more than 30m in diameter and nine are less than 10m.

The barrows are recorded predominantly as mounds, whether extant or plough-levelled – 72% are mounds, 26% are visible as ring ditch cropmarks and the remaining 2% have an identifiable mound and enclosing ditch.

In Penwith the barrows are loosely distributed throughout the study area but elsewhere there are notable foci where there are clusters of barrows. In Probus there is a dense cluster on and around the high ground at Newlyn Downs, in Pelynt there are clusters in the southeast and north, and in Poundstock there are three major concentrations, in the southwest, southeast and north. In places two barrows are situated in close proximity to each other and there are 19 groups of three or more barrows which can be regarded as cemeteries. Elsewhere 116 barrows are located singly, apparently in isolation. The distribution pattern in Penwith differs from the other three study areas in that there is only one cemetery – around the Merry Maidens stone circle in St Buryan – and this is a scattered group of six barrows. In the Probus study area there are seven cemeteries around Newlyn Downs, in Pelynt there are five and in Poundstock six. In eight of the cemeteries the barrows are arranged in a distinctly linear alignment, 11 cemeteries are tightly defined, with the barrows in a cluster, and the remaining one can be described as loosely defined or 'dispersed'.

8 The predictive models

8.1 Methodology

The methodology used for model construction was the same as for the HLC models. This is outlined fully in Volume 1, section 7.2 and is summarised here.

The Kj parameter was the calculation applied to measure the relative importance of each HLC Type and Sub-Type in measuring site probability. The Kj parameter is defined as: $\sqrt{(PS \times (PS-PA)/PW)}$. PS = the proportion of sites captured within each HLC Type and Sub-Type, PA = the proportion of the study area taken up by each HLC Type and PW is the proportion of the area that does not include sites. Because the predictive models for Lowland Cornwall used point data for sites rather than areas (polygons) the PW factor can be ignored (see Verhagen and Berger 2007).

The performance of the models is gauged using a number of gain measures. Foremost among these is Kvamme's Gain: Gain = 1-(PA/PS). An important point about Kvamme's Gain is that because PA/PS can never = 0, Kvamme's Gain cannot reach the maximum 1: there is therefore always a maximum gain dependent on the model itself. A simpler measure is Relative Gain: PS-PA, resulting in theoretical values ranging from 1 to -1 (Wansleeben and Verhart 1992).

The ratio of proportion of sites (PS) to proportion of area (PA) is a straightforward way to measure importance. This formula, PS/PA, is known as the Indicative Value and it can be used internally to compare the performance of each probability zone against that of the others. An even simpler measure of site density is S/A – a calculation of the number of sites per square kilometre.

The concepts of accuracy and precision are important in terms of predictive modelling. Accuracy is a measure of correct prediction – are most of the sites captured in the high probability zone? Precision is a measure of how far the model has limited the high probability zone to as small an area as possible.

9 Models based on early medieval land use

9.1 Background

As the first stage in the process of refining the Lowland Cornwall HLC, St Newlyn East (in the Probus study area) was chosen as a pilot parish to trial the proposed methodology. It was selected due its well-defined divisions in topography and landscape, varied settlement and industrial history, and the high number of late prehistoric sites recorded there.

Additional context to HLC refinement was provided by a separate supporting Historic Settlement dataset. Its basis was the HES transcription of the Institute of Cornish Studies (ICS) Place-name Index (Historic Environment Service nd). The Historic Settlement supporting layer was the first dataset to be analysed for the pilot parish. This was useful as it provided a framework of background information which ensured the HLC refinement was undertaken from a better informed understanding of the landscape.

Analysis of the Historic Settlement dataset showed that St Newlyn East has the usual Cornish pattern of regularly dispersed hamlets. Thirty one settlements have medieval documentation, of which 16 have the habitative place-name elements in *tre/tref* - 'farming estate' - indicative of settlement of early medieval origin (Padel 1985, 225). The remaining 15 have 'topographical' names which refer to features in their immediate landscape and which are often still identifiable today. For example, in a parish where river systems control the topography, it is no surprise to find that there are four names which contain the element *nans* - 'valley': Nancemeer, Nancolleth and Nanhellen and Lanteague.

It has been suggested that topographical place-names like these may reflect an expansion of settlement from the early medieval core which is indicated by names in *tre* (Preston-Jones and Rose 1986, 143-4). That certainly seems to be the case in Newlyn East: all bar three of the places with a name in *tre* are located in the northern part of the parish, on generally lower ground and sloping valley sides (Fig 94). By contrast, the majority of the places with topographical names are in the central part of the parish, on the fringes of the higher ground to the south. The average height of the *tre*-settlements is 57 metres above sea level; that of the topographical settlements is 68 metres. This contrast in the settlements' locations seems to confirm the more marginal nature of those with topographical names. This suggests that these could reflect a later medieval extension of settlement onto the higher parts of the landscape.

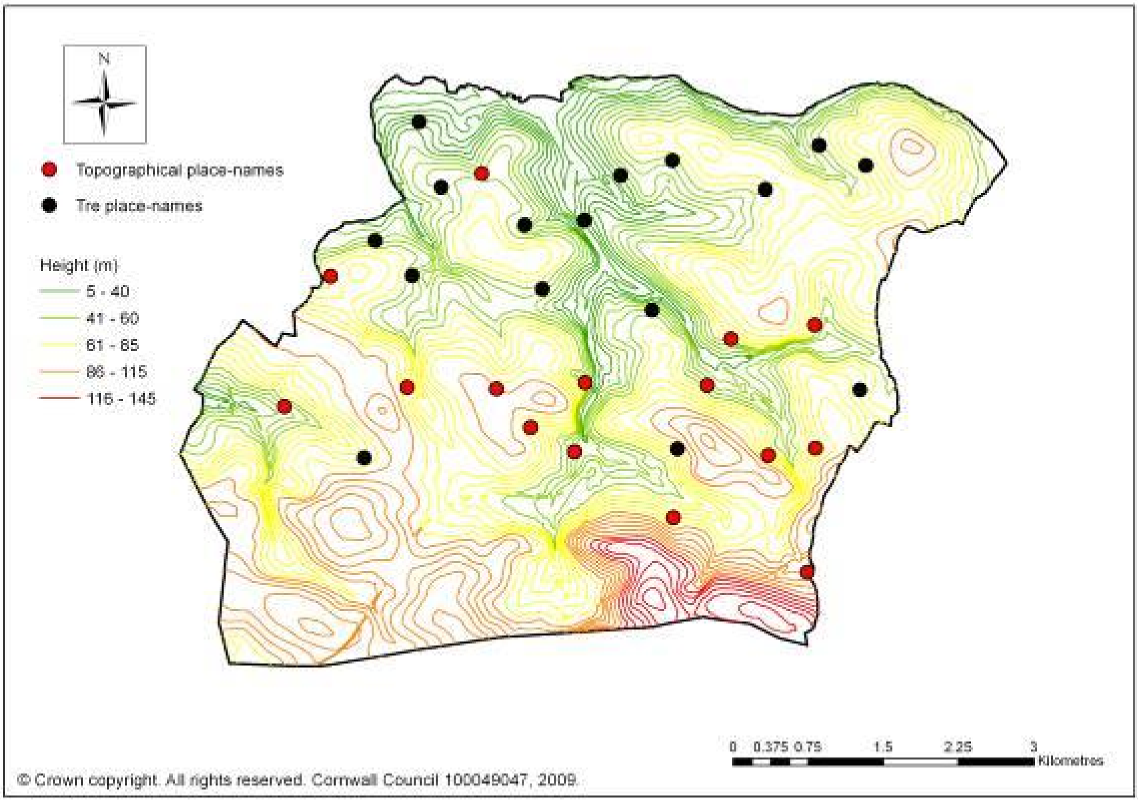

Fig 94. The contrasting distribution in St Newlyn East parish of medieval settlements with tre- and topographical place-names

Three main zones can be defined in the pattern of settlement in the parish. The first (zone 1), in the north, contains almost all of the potentially early-medieval settlement. The second (zone 2), in a broadly east-west band through the centre of the parish, contains for the most part those settlements which are likely to represent an extension of settlement from the early medieval 'core' in the later medieval period. Finally, in the southern part of the parish is the higher ground which would have been used for open rough grazing in the past and where, for the most part, enclosure has occurred only recently. Some of it is still unenclosed rough ground.

Following the model proposed by Rose and Preston-Jones, zone 1 – the core settlement zone - would be seen as the area where continuity in settlement and farming is most likely to have existed from prehistoric through to medieval times. The second is likely to be a 'tidal' zone, in which settlement and farming have come and gone in the past, as economic need or other circumstances dictated. In the third zone, settlement would not normally be expected, although other activities will have taken place which may have had an impact; this can be seen as the marginal zone. In St Newlyn East, the existence of high ground in the southern part of the parish, which gave 'space' for such fluctuation (the tides) may help explain why it is possible to discern such obvious zones in the settlement distribution.

According to this model, zone 2 may have seen an extension of settlement in the late prehistoric/early historic period, then a retraction of settlement, followed by colonisation again, sometimes in slightly different locations and potentially under different circumstances, in the later medieval period.

Alternatively the main area of settlement in the Iron Age and Romano-British periods may have been zone 2, and changing circumstances in the early medieval period led to a colonisation of the slightly lower ground on which the *trefs* are now located. Given that the later prehistoric enclosures appear to be located on higher ground than early medieval settlements in the Probus study area (section 3.2.1.2), this latter scenario may be more apt.

As a result of analysis of the early medieval settlement pattern in the pilot parish a 'Landuse' attribute was added to the HLC database. The aim of this was to attempt to better define the core, tidal and marginal zones and to then build models for prehistoric settlement within each zone. To do this, decisions had to be made as to how to define the extent of farmland associated with each settlement. On Bodmin Moor, a number of deserted medieval settlements with near-complete survival of their contemporary fields have been recorded (Herring and Rose 2001). One of the best surviving example is Brown Willy, which had 270 hectares of enclosed land, of which 53 hectares were cultivated (*ibid,* 43). However, Brown Willy cannot act as a realistic guide: if all 16 *Tre-* settlements had 270ha of enclosed land, the area of enclosed land would amount to 4,320ha and St Newlyn East parish only comprises 3,390ha in total. Of course a viable farming hamlet on Bodmin Moor, with its comparatively impoverished soils, would have required a much greater land holding than a comparable hamlet in the more fertile lowlands of St Newlyn East.

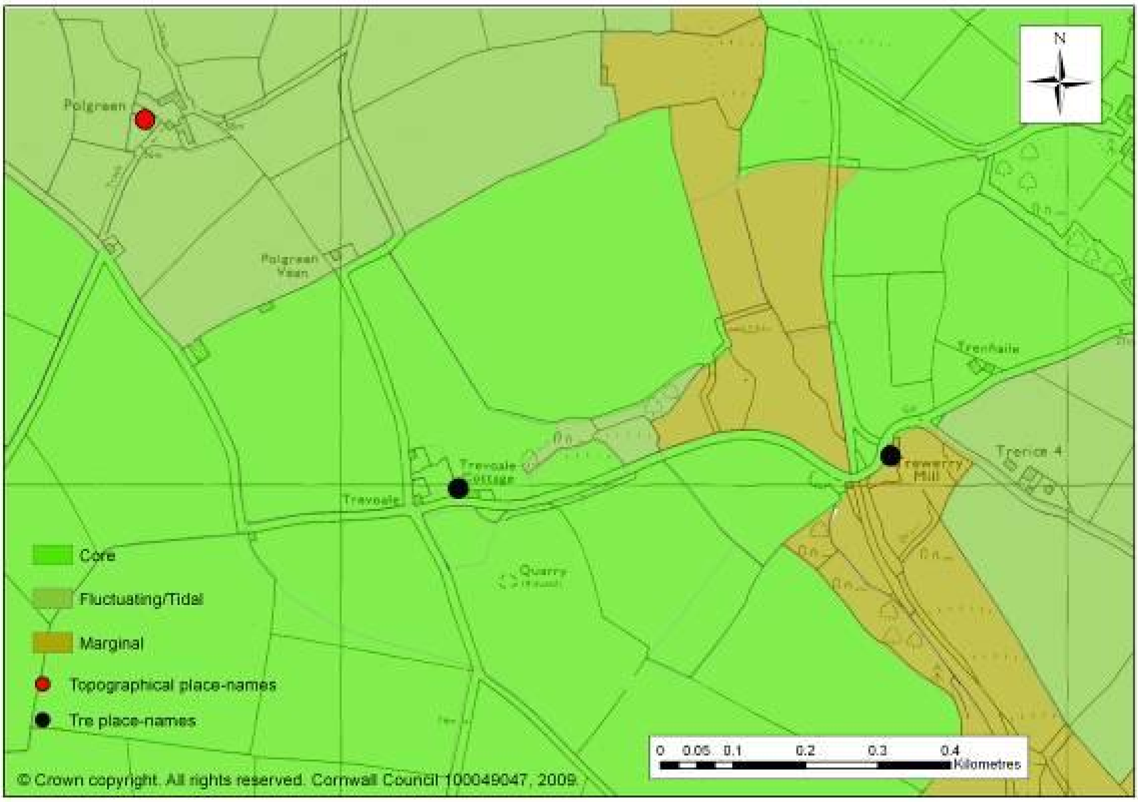

Fig 95. Extract of Landuse mapping in St Newlyn East parish showing how the extent of farmland associated with each settlement was defined.

This serves to illustrate the difficulty of establishing the extent to which any group of fields were associated with a given settlement. In most cases the extent was established by subjective judgement influenced by topography (altitude, severity of slope, and aspect) and the way in which the landscape was divided (dominant boundaries). A small number of the 1840 Tithe maps recorded tenement boundaries and these were used to delineate the areas of enclosed land surrounding a particular settlement.

In the event for the parish of St Newlyn East the average extent of 'core' land per early medieval settlement, as defined during the project, is 74ha. An illustration of how the extent of land associated with each holding was defined is shown in Fig 95.

9.2 Models for enclosures based on early medieval land use

Notwithstanding the difficulties of reliably defining the extent of land relating to each settlement, the Landuse attribute was used to model prehistoric and Romano-British settlement patterns.

9.2.1 Probus study area

9.2.1.1 St Newlyn East

The distribution of enclosures against Landuse was analysed by recording the numbers of high validity enclosures and low validity enclosures captured in each Landuse type. The results for St Newlyn East parish are set out in table 107 below.

Landuse	High validity enclosures	Low validity enclosures	Total	%
Core	11	5	**16**	**53%**
Tidal	6	7	**13**	**43%**
Marginal	0	1	**1**	**3%**
Total	**17**	**13**	**30**	

Table 107. Distribution of enclosures in St Newlyn East parish against Landuse

Overall the definition of marginal land is clearly accurately defined, with only one enclosure recorded in this Landuse type - (PRN 32055 at Shepherds farm). There are questions around the validity of this feature – it is recorded as a cropmark in the HER but was not mapped during the NMP, meaning that the NMP interpreter did not recognise a convincing cropmark at this location. Otherwise there does seem to be a preference for the area defined as the core settlement zone, especially considering that 65% of the high validity enclosures are located here.

To measure the importance of each zone in terms of predictive power the Indicative Value (IV) for each was calculated using the formula IV=PS/PA (where PS= proportion of sites captured in the zone and PA= proportion of the parish taken up by each zone). The areas covered by each Landuse zone in St Newlyn East are broadly similar: Core=35%, Tidal=32% and Marginal=33%. The Indicative Values for each Landuse zone are as below

Landuse	High validity enclosures	Low validity enclosures	All enclosures
Core	1.9	1.1	**1.5**
Tidal	1.1	1.7	**1.3**
Marginal		0.2	**0.1**

Table 108. Indicative Values for each Landuse type in St Newlyn East

By calculating the ratio of the Indicative Values we can arrive at a relative definition of the likelihood of encountering enclosures in each of the zones. For example the IV for all enclosures in the Core zone is 1.5, whilst in the Marginal zone it is 0.1: 1.5/0.1=15.

Therefore one is 15 times more likely to encounter an enclosure in the Core zone than in the Marginal zone. One is only slightly more likely to encounter an enclosure in the Core zone than in the Tidal zone. However, one is almost twice as likely to encounter a high validity enclosure in the Core zone than in the Tidal area (1.7 times more likely).

9.2.1.2 Remainder of the Probus study area

There is a more marked tendency for enclosures to be located in the Core settlement zone in the parish of St Enoder than in St Newlyn East. Indicative Values for each zone are: Core=2.1, Tidal=0.8 and Marginal=0.3. In other words one is more than two and a half times more likely to encounter an enclosure in the Core zone than in the Tidal zone and seven times more likely than in the Marginal zone.

In the parish of Probus the Indicative Values for the Core and Tidal zones are 1.1 and 1.0 respectively. This means that the likelihood of encountering an enclosure is virtually the same for each zone. The Indicative Value for the Marginal zone is 0.4.

In Ladock parish the situation is quite different. More enclosures are located in the Marginal zone than in the Core, and more than three times as many are located in the Tidal zone than in the Core. Indicative Values are: Core=0.8, Tidal=1.8 and Marginal=0.5. So one is more than twice as likely to encounter an enclosure in the Tidal zone than in the Core.

The Tidal zone is also the most favoured zone for settlement in the parish of St Erme. The Indicative Values are: Core=0.7, Tidal=1.5 and Marginal=0.9.

Considering the Probus study area as a whole, the three Landuse zones cover roughly equal areas in extent. The proportion of the area taken up by each is: Core=34%, Tidal=36% and Marginal=30%. The number of enclosures recorded from each Landuse type is set out in table 109 below.

Landuse	High validity enclosures	Low validity enclosures	All enclosures	%
Core	42	25	**67**	**46%**
Tidal	34	29	**63**	**44%**
Marginal	7	8	**15**	**10%**
Total	**83**	**62**	**145**	

Table 109 Distribution of enclosures in the Probus study area against Landuse

It can be seen from this that the number of enclosures recorded from the Core and Tidal zones is broadly similar. Indicative Values for each zone are shown in table 110 below.

Landuse	High validity enclosures	Low validity enclosures	All enclosures
Core	1.5	1.2	**1.4**
Tidal	1.1	1.3	**1.2**
Marginal	0.3	0.4	**0.3**

Table 110. Indicative Values for enclosures in the Probus study area against Landuse

Interestingly the statistics for high validity enclosures produce Indicative Values slightly more in favour of the Core zone than the figures for all enclosures (Core=1.5 and Tidal=1.1 as opposed to 1.4 and 1.2). The figures for low validity enclosures offer a contrast, with the Tidal zone producing the highest Indicative Value. Closer analysis of the 37 low validity enclosures captured within the Tidal and Marginal zones failed to identify any particular pattern to explain this apparent discrepancy. Eighteen of the enclosures were not mapped during Cornwall's NMP, one was ascribed a validity rating of 1 (meaning there is significant doubt as to its interpretation) and 18 were ascribed a rating of 2 (some doubt as to their interpretation). Twenty three enclosures (62%)

were recorded as cropmarks, 10 (27%) from documentary sources, and four (11%) as extant monuments. These proportions are very similar to those of the low validity sample as a whole (section 3.2.1.1) – cropmarks=53%, documentary=32% and extant=12%. The enclosures which were mapped during the NMP include multivallate examples as well as some with external features and cover a typical size and shape range.

Considering the performance of this model as a whole, there is very little difference between the PA and PS values for the Core and Tidal zones. When Kvammes Gain measures are applied, the Core zone has a value of 0.262 and the Core and Tidal zones combined produce a gain measure of 0.217. Whilst this indicates that the Core zone can be seen as the high probability zone, the fact that only 46% of enclosures are located there does not represent a very accurate model. If the Core and Tidal zones are taken together as the high probability zone the model is more accurate, with 90% of enclosures captured within it, but less precise, as indicated by the lower Kvammes Gain.

In conclusion, when using Landuse as the variable a two-zone model is produced, with a clearly defined low probability zone but with virtually no difference between the Core and Tidal areas.

9.2.2 Penwith study area

In the Penwith study area the most extensive Landuse zone is Marginal (which includes coastal HLC Types such as Rocky foreshore, Beach and Inshore water). The percentage of the area taken up by the three zones is: Core=31%, Tidal=31% and Marginal=38%.

The number of enclosures recorded from each zone is shown in table 111 below.

Landuse	High validity enclosures	Low validity enclosures	All enclosures	%
Core	21	16	**37**	**35%**
Tidal	17	29	**46**	**44%**
Marginal	6	16	**22**	**21%**
Total	**44**	**61**	**105**	

Table 111 Distribution of enclosures in the Penwith study area against Landuse

The Indicative Values for each Landuse type are contained in table 112 below.

Landuse	High validity enclosures	Low validity enclosures	All enclosures
Core	1.5	0.8	**1.1**
Tidal	1.2	1.5	**1.4**
Marginal	0.4	0.7	**0.6**

Table 112. Indicative Values for enclosures in the Penwith study area against Landuse

Although the statistics for high validity enclosures are similar to those in the Probus study area (48% of high validity enclosures captured in the Core zone compared with 47% in Probus) the figures for all enclosures are at variance, with more enclosures recorded from the Tidal zone than the Core. Clearly the figures for low validity enclosures are influencing the model, with the ratio of Indicative Values suggesting that the chances of encountering a low validity enclosure in the Tidal zone are almost twice as high as encountering one in the Core zone. It is also clear that more enclosures are recorded from the Marginal zone than were expected from the model. This is especially true for low validity enclosures – equal numbers of these are recorded from the Core and Marginal zones, and the Indicative Values are virtually identical (0.8 and 0.7).

Analysis of the low validity enclosures in the Marginal zone shows that 13 of the 16 sites were not mapped during the NMP. Eight are recorded from documentary sources and have no visible traces, three are listed in the HER as being 'site of', and one is a vague cropmark. This leaves four recorded as extant monuments: two of these were not mapped during the NMP (one is sited in woodland) and two were ascribed a validity of 2 (signifying some doubt as to their interpretation).

The low validity enclosures in the Tidal zone include 23 which were not mapped during the NMP and six with an ascribed validity of 2. Of the latter, five were recorded as indistinct cropmarks and one as an extant monument. Of those not mapped, one is a listed in the HER as a cropmark, five are listed as extant monuments and 17 are recorded from documentary sources. It might be questioned whether it is valid to include enclosures recorded from documentary sources in the model. On the other hand 11 of the 16 low validity enclosures captured in the Core zone are identified from documentary sources so it is probably safest to conclude that in the Penwith study area, the Tidal zone is the favoured Landuse zone for the siting of prehistoric enclosures.

Regarding the gain measures produced by this model, if the Tidal zone is taken as the high probability zone the Kvammes Gain is 0.285 but this zone is not accurate, capturing only 44% of the enclosures. When the Tidal and Core areas are read as the high probability zone the model is more accurate, with 79% of enclosures captured, but lacks precision, with a Kvammes Gain of 0.210. As with the Probus study area the Landuse layer is producing a two zone model.

9.2.3 Pelynt study area

The most extensive Landuse type in the Pelynt study area is the Tidal zone, which covers 43% of the area. The Marginal zone covers 30% and the Core zone accounts for the remaining 27% of the study area.

The number of enclosures recorded from each zone is as follows:

Landuse	High validity enclosures	Low validity enclosures	All enclosures	%
Core	4	5	9	**41%**
Tidal	4	7	11	**50%**
Marginal	0	2	2	**9%**
Total	**8**	**14**	**22**	

Table 113 Distribution of enclosures in the Pelynt study area against Landuse

The Indicative Values for each Landuse type are contained in table 114 below.

Landuse	High validity enclosures	Low validity enclosures	All enclosures
Core	1.8	1.3	**1.5**
Tidal	1.2	1.2	**1.2**
Marginal	0	0.5	**0.3**

Table 114. Indicative Values for enclosures in the Pelynt study area against Landuse

As with the Penwith study area more enclosures are recorded from the Tidal zone than from the Core settlement area, and similarly it is the low validity enclosures that are influencing the model. However, in this study area the Indicative Value for the Core zone is higher than that of the Tidal – this is because the Tidal zone is considerably greater in extent than the Core zone. So the chances of encountering an enclosure in the Core zone is slightly higher than in the Tidal zone and five times greater than in the Marginal zone.

Of the low validity enclosures, six are recorded from documentary sources and eight as cropmarks. Of the latter, six are ascribed a validity rating of 2 whilst the remaining two were not mapped during Cornwall's NMP.

Looking at the model as a whole it bears similarity with that for the Probus study area in that the marginal zone is clearly identified as the low probability zone. Kvammes Gain measures show that the Core area is more precisely defined than that in Probus, with a gain of 0.329. However it is not very accurate, capturing only 41% of the enclosures. The Core and Tidal zones combined capture 91% of the enclosures but because they cover 70% of the study area they produce a lower Kvammes Gain – 0.230, so again this is essentially a two zone model.

9.2.4 Poundstock study area

The model for enclosures against Landuse zone in the Poundstock study area differs significantly from the models produced by the other three study areas. This is in part because the Core zone only covers 16% of the area, as opposed to 39% taken up by the Marginal zone and 45% by the Tidal zone.

The number of enclosures recorded from each zone is as below:

Landuse	High validity enclosures	Low validity enclosures	All enclosures	% of enclosures
Core	3	1	4	**12%**
Tidal	5	11	16	**49%**
Marginal	9	4	13	**39%**
Total	**17**	**16**	**33**	

Table 115 Distribution of enclosures in the Poundstock study area against Landuse

The Indicative Values for each Landuse type are contained in table 116 below.

Landuse	High validity enclosures	Low validity enclosures	All enclosures
Core	1.1	0.4	**0.8**
Tidal	0.6	1.5	**1.1**
Marginal	1.4	0.6	**1.0**

Table 116. Indicative Values for enclosures in the Poundstock study area against Landuse

The main difference is the large percentage of enclosures located in the Marginal zone, particularly when the high validity enclosures are considered in isolation. In fact the Indicative Values for high validity enclosures are Core=1.1, Tidal=0.6 and Marginal=1.4.

As with the other study areas a majority of enclosures in the Tidal zone are ascribed a low validity rating.

Despite there being fewer enclosures in the Core zone than any other, the Indicative Values for all enclosures are broadly similar (a range of 0.8 – 1.1).

When modelled using the Kj parameter technique the Marginal zone is rated highest, and of all four models produces the most accurate result (although not especially accurate), with 53% of the enclosures captured. This zone produces a Kvammes Gain of 0.266. However the model as a whole suggests a by chance distribution of enclosures within the three zones, with the Tidal zone capturing 49% of enclosures in 46% of the area, the Marginal zone capturing 39% in 39% of the area and the Core zone capturing 12% in 16% of the area.

9.2.5 All study areas

For the four study areas as a whole the most extensive Landuse zone is Tidal, covering 38% of the total area; the Marginal zone covers 33% and the Core zone is the smallest, covering 29% of the area. Obviously when modelling the four study areas together the results from Probus and Penwith will have the greatest influence because many more enclosures are recorded from there than from Pelynt and Poundstock. It is no surprise, therefore, that the Core and Tidal zones are ranked highest in the model. The number of enclosures from each of the three zones is shown in table 133 below and the resulting Indicative Values in table 117.

Landuse	High validity enclosures	Low validity enclosures	All enclosures	% of enclosures
Core	70	47	117	**38**
Tidal	60	76	136	**45**
Marginal	22	30	52	**17**
Total	**152**	**153**	**305**	

Table 117 Distribution of enclosures in the four study areas against Landuse

The Indicative Values for each Landuse type are contained in table 118 below.

Landuse	High validity enclosures	Low validity enclosures	All enclosures
Core	1.6	1.1	**1.3**
Tidal	1.0	1.3	**1.2**
Marginal	0.4	0.6	**0.5**

Table 118 Indicative Values for enclosures in the four study areas against Landuse

When modelled using the Kj parameter technique the Core zone is ranked highest, but the model is not accurate; only 38% of the enclosures are captured in the Core zone. This zone produces a Kvammes Gain of 0.237. When it is combined with the Tidal zone 83% of enclosures are captured in 67% of the total study area but a low Kvammes Gain of 0.198 is achieved.

9.2.6 Model Validation

None of the models based on the Landuse attribute can be described as convincing. In the Probus, Penwith and Pelynt study areas the resulting models really only have two zones, with Core and Tidal areas being very similar, and the enclosures appear to have a by chance distribution in Poundstock. This is confirmed when the models are tested against each other. The technique for validating the models involves creating a model based on a combination of three study areas and then applying this to the fourth study area to test for accuracy.

Pelynt, Penwith and Poundstock

Taking first a model for the Pelynt, Penwith and Poundstock study areas combined. The Tidal zone was ranked highest in this model, followed by the Core zone. Forty six percent of the enclosures were captured in the Tidal zone, so the model is not very accurate. Nor is it precise as it achieves a low Kvammes Gain of only 0.140.

Based on the extent of each zone and the number of enclosures captured in each, the number of enclosures per square kilometre can be calculated. In the case the Pelynt, Penwith and Poundstock model these figures are outlined in table 119 below.

Landuse	Area (km^2)	Enclosures	Enclosures/km^2
Tidal	97.166	73	0.75
Core	63.961	50	0.78
Marginal	87.428	37	0.42
Total	**248.555**	**154**	

Table 119. Number of enclosures per square kilometre in each zone of the Pelynt, Penwith and Poundstock study areas

The figures for enclosures per square kilometre are then applied to the Probus study area to arrive at hypothetical figures for the number of enclosures to be expected in each Landuse zone. From these hypothetical figures, notional PS (proportion of sites) values can be calculated for each of the Landuse zones (table 120).

Landuse	Area (km^2)	Enclosures/km^2	Hypothetical enclosures	Predicted PS
Tidal	49.133	0.75	36.85	0.41
Core	46.184	0.78	36.02	0.40
Marginal	40.178	0.42	16.87	0.19
Total	**135.495**		**89.74**	

Table 120. The predicted percentage of enclosures to be captured in each Landuse zone in the Probus study area

So based on the number of enclosures captured in each Landuse zone in the Pelynt, Penwith and Poundstock study areas, this hypothetical model suggests that one might expect 89.74 enclosures from the Probus study area and that 41% of these will be captured in the Tidal zone, 40% in the Core zone with the remaining 19% located in the Marginal zone.

In reality 145 prehistoric or Romano-British enclosures are recorded from the Probus study area. Using the predicted PS values in table 136 above, numbers of enclosures can be predicted for each zone. These can then be compared with the actual figures for each zone to test the reliability of the model. The result of this test is set out in table 121.

Landuse	Actual enclosures	Predicted PS	Predicted enclosures	Actual PS
Tidal	63	0.41	59	0.43
Core	67	0.40	58	0.46
Marginal	15	0.19	28	0.10
Total	**145**		**145**	

Table 121. Comparison of the predicted and actual PS values and predicted and actual numbers of enclosures in the Probus study area based on the Pelynt, Penwith and Poundstock model

The predicted figures are in fact fairly close to the actual numbers of enclosures and the actual PS values for the Core zone; less so for the Tidal zone. The test confirms that the Marginal zone in Probus is the low probability zone but there is a 9% variance between the predicted and actual PS values for this zone in favour of the Core and Tidal zones.

When this test was repeated based on high validity enclosures only, there was a 10% variance between predicted and actual values for the Marginal zone in favour of the Tidal zone: the number of enclosures in the Core zone was very close to that predicted.

Probus, Pelynt and Poundstock

The model for a combination of the Probus, Pelynt and Poundstock study areas ranked the Core zone highest. The model is not very accurate, with only 40% of the enclosures captured in this zone, but because the Core zone only covers 28% of the three study areas the model is more precise than those considered above, producing a Kvammes Gain measure of 0.303.

The numbers of enclosures per square kilometre for this model are:

Landuse	Area (km^2)	Enclosures	Enclosures/km^2
Core	80.943	80	0.99
Tidal	116.887	90	0.77
Marginal	92.382	30	0.32
Total	**290.212**	**200**	

Table 122. Number of enclosures per square kilometre in each zone of the Probus, Pelynt and Poundstock study areas

The figures calculated for hypothetical numbers of enclosures and predicted PS values for the Penwith study area are set out below.

Landuse	Area (km^2)	Enclosures/km^2	Hypothetical enclosures	Predicted PS
Core	29.202	0.99	28.91	0.46
Tidal	29.412	0.77	22.65	0.36
Marginal	35.224	0.32	11.27	0.18
Total	**93.838**		**62.83**	

Table 123. The predicted percentage of enclosures to be captured in each Landuse zone in the Penwith study area

The actual figures are shown in table 124 below.

Landuse	Actual enclosures	Predicted PS	Predicted enclosures	Actual PS
Core	37	0.46	48	0.35
Tidal	46	0.36	38	0.44
Marginal	22	0.18	19	0.21
Total	**105**		**105**	

Table 124. Comparison of the predicted and actual PS values and predicted and actual numbers of enclosures in the Penwith study area based on the Probus, Pelynt and Poundstock model

This model does not fit the Penwith study area very closely. There is a variance of 11% for the Core zone with fewer enclosures than expected captured in this zone. Three percent more enclosures than predicted are located in the Marginal zone and 8% more in the Tidal zone. When the same procedure is carried out based on the numbers of high validity enclosures only, the Tidal zone captures 8% more enclosures than predicted at the expense of both the Core and Marginal zones.

Probus, Penwith and Poundstock

The model for a combination of the Probus, Penwith and Poundstock study areas ranked the Core zone highest. The model is not very accurate, with only 39% of the enclosures captured in this zone. Nor is it very precise, producing a Kvammes Gain of 0.248.

Landuse	Area (km^2)	Enclosures	Enclosures/km^2
Core	85.682	108	1.26
Tidal	108.337	125	1.15
Marginal	100.876	50	0.50
Total	**294.895**	**283**	

Table 125. Number of enclosures per square kilometre in each zone of the Probus, Penwith and Poundstock study areas

The figures calculated for hypothetical numbers of enclosures and predicted PS values for the Pelynt study area are set out below.

Landuse	Area (km^2)	Enclosures/km^2	Hypothetical enclosures	Predicted PS
Core	24.463	1.26	30.82	0.35
Tidal	37.962	1.15	43.66	0.50
Marginal	26.730	0.50	13.37	0.15
Total	**89.155**		**87.85**	

Table 126. The predicted percentage of enclosures to be captured in each Landuse zone in the Pelynt study area

The actual figures are shown in table 127 below.

Landuse	Actual enclosures	Predicted PS	Predicted enclosures	Actual PS
Core	9	0.36	8	0.41
Tidal	11	0.50	11	0.50
Marginal	2	0.15	3	0.09
Total	**22**		**22**	

Table 127. Comparison of the predicted and actual PS values and predicted and actual numbers of enclosures in the Pelynt study area based on the Probus, Penwith and Poundstock model

Clearly the model based on the Probus, Penwith and Poundstock study areas applies quite accurately to Pelynt. There is only a 6% variance between the predicted and actual values for the Marginal zone in favour of the Core zone. The values for the Tidal zone are as predicted by this model.

When the same procedure is applied based on numbers of high validity enclosures there is a 13% variance for the Marginal zone (where no enclosures were recorded). The Core zone scored 7% better than predicted, and the Tidal zone scored 6% better than predicted.

Probus, Pelynt and Penwith

The model for a combination of the Probus, Pelynt and Penwith study areas ranked the Core zone highest. The model is not very accurate, with only 42% of the enclosures captured in this zone, nor is it very precise, producing a Kvammes Gain measure of 0.245.

The numbers of enclosures per square kilometre for this model are:

Landuse	Area (km^2)	Enclosures	Enclosures/km^2
Core	99.849	113	1.13
Tidal	116.496	120	1.03
Marginal	102.134	39	0.38
Total	**318.479**	**272**	

Table 128. Number of enclosures per square kilometre in each zone of the Probus, Pelynt and Penwith study areas

The figures calculated for hypothetical numbers of enclosures and predicted PS values for the Poundstock study area are set out below.

Landuse	Area (km^2)	Enclosures/km^2	Hypothetical enclosures	Predicted PS
Core	10.296	1.13	11.65	0.22
Tidal	29.803	1.03	30.70	0.59
Marginal	25.472	0.38	9.73	0.19
Total	**65.571**		**52.08**	

Table 129. The predicted percentage of enclosures to be captured in each Landuse zone in the Poundstock study area

The actual figures are shown in table 130 below.

Landuse	Actual enclosures	Predicted PS	Predicted enclosures	Actual PS
Core	4	0.22	7	0.12
Tidal	16	0.59	20	0.49
Marginal	13	0.19	6	0.39
Total	**33**		**33**	

Table 130. Comparison of the predicted and actual PS values and predicted and actual numbers of enclosures in the Poundstock study area based on the Probus, Pelynt and Penwith model

This model performs worse than any of the others outlined above, with the Marginal zone capturing 20% more enclosures than predicted at the expense of the other two zones. When the procedure is carried out based on a model for high validity enclosures only the performance is even weaker, with the Marginal zone capturing 40% more enclosures than predicted, mainly at the expense of the Tidal zone.

9.2.7 Discussion

The application of these models suggests that over the four study areas as a whole the Landuse zone Marginal is the low probability zone, where the fewest number of enclosures are located. However, there is very little distinction between the Core and Tidal zones in terms of probability of enclosures being encountered, so in essence the Landuse attribute produces a two-zone model, with high and low probability zones only. Although this model is accurate, capturing 83% of the enclosures in the Core and Tidal zones, it lacks precision, producing a low Kvammes Gain of 0.198.

There are differences in the Landuse models between the four study areas. The models for Probus and Pelynt are similar in that the Core zone in each produces slightly higher Indicative Values than the Tidal zone (i.e. there is a slightly greater probability of encountering enclosures in the Core zone) and that the Marginal zone is clearly the zone of least probability. In Penwith the Tidal zone produces a slightly higher Indicative Value, and again the Marginal zone is the area of least probability, although more enclosures than expected were captured in this zone. The most significantly different model was that for the Poundstock study area. Here the model indicates a by chance distribution with very similar Indicative Values for each Landuse zone ranging from 0.8 to 1.1. Furthermore, in Poundstock the Marginal zone has a greater probability than the Core zone and when the Marginal and Tidal zones are combined they form the high probability zone, capturing 71% of the enclosures.

These differences are highlighted when the models for each study area are tested in turn using the combined models for the other three study areas as test data. Using a model for the Penwith, Pelynt and Poundstock study areas to predict where the enclosures can be expected in Probus the model fits quite well, with both Core and Tidal zones capturing slightly more enclosures than predicted and the Marginal zone consequently confirmed as the low probability zone. The same is true for the Pelynt study area when a model for Probus, Penwith and Poundstock is applied. However, when a model for Probus, Pelynt and Poundstock is applied to the Penwith study area 11% fewer enclosures than predicted are captured in the Core Zone, with both the Tidal and Marginal zones capturing more enclosures than predicted. When the Poundstock study area is tested with data from Probus, Penwith and Pelynt, the Marginal zone captures 20% more enclosures than predicted at the expense of both Tidal and Core zones. There are not only regional differences, but, as shown in the Probus study area, there are differences at a parish level, most notably in St Erme, where the Indicative Value for the Marginal zone is higher than that for the Core zone.

There are also differences between the results for high validity enclosures and those with low validity scores. These are illustrated by comparison of the Indicative Values for the Core zones of each study area in table 131 below.

Study area	High validity enclosures	Low validity enclosures	All enclosures
Probus	1.5	1.2	1.4
Penwith	1.5	0.8	1.1
Pelynt	1.8	1.3	1.5
Poundstock	1.1	0.4	0.8
All areas	1.6	1.1	1.3

Table 131. Indicative Values for the Core zone of Landuse models for each study area

In each case the Indicative Values for the Core zone are higher when only the high validity enclosures are considered. In particular the Indicative Value for low validity enclosures in Poundstock is just over one third that for the high validity enclosures and in Penwith the Indicative Value for low validity enclosures is just over half that for the high validity enclosures. Almost one third of all the low validity enclosures are recorded from documentary evidence. In many cases the evidence is based on place-name elements, which have been used here to define the Core zone, so it is perhaps surprising to find so many enclosures recorded from documentary evidence in the Tidal and, especially, in the Marginal zones.

Ultimately it should be acknowledged that the method used to establish the extent of each Landuse zone was to a degree based on subjective judgement and that if a more reliable and accurate method could be found to define the zones these models could be refined.

9.3 Models for settlement polygons based on early medieval land use

9.3.1 Probus study area

By joining the settlement polygons with the Lowland Cornwall HLC shapefiles for each study area it was possible to establish what proportion of the settlement polygons fall within each of the Landuse attributes. Of all the study areas Probus contains the largest number of settlement polygons, 109 in total, and together they cover an area of just over 914ha. Of the 109 polygons 93 contain features interpreted as prehistoric or Romano-British and 16 contain undated features of potential prehistoric or Romano-British date. Models were created for all the polygons and the prehistoric/Romano-British polygons only.

	Landuse	Area (km2)	Settlements (ha)	PA	PS	Kvammes	IV
1	Core	46.184	456.39	0.341	0.499	0.317	1.46
2	Tidal	49.133	380.196	0.363	0.416	0.231	1.15
3	Marginal	40.178	77.652	0.297	0.085	0.000	0.29
Total		135.495	914.238				

Table 132. Distribution of settlement polygons in the Probus study area against Landuse. All polygons. (IV = Indicative Value).

As was the case with the enclosures in Probus, although the Core zone is ranked highest in the model it only captures 50% of the settlement area, so as a high probability zone it is not vey accurate. The result shows that this is in effect a two-zone model, with the Core and Tidal areas forming the high probability zone, capturing 91% of the settlement area in 70% of the study area. The Marginal areas form a well-defined low probability zone, covering 30% of the study area but only capturing 8.5% of the settlements.

	Landuse	Area (km2)	Settlements (ha)	PA	PS	Kvammes	IV
1	Core	46.184	436.45	0.341	0.517	0.341	1.52
2	Tidal	49.133	341.066	0.363	0.404	0.236	1.11
3	Marginal	40.178	66.774	0.297	0.079	0.000	0.27
Total		135.495	844.29				

Table 133. Distribution of settlement polygons in the Probus study area against Landuse. Prehistoric and Romano-British polygons.

When only the prehistoric or Romano-British settlement polygons are included the resulting model is quite similar. The main difference is that the Core area captures slightly more of the settlement area than in the all polygons model, at the expense of both Tidal and Marginal zones.

9.3.2 Penwith study area

There are a total of 73 settlement polygons in the Penwith study area together covering 290.5ha. Of these 56 contain prehistoric or Romano-British features and 17 contain undated features of potential prehistoric/Romano-British date.

	Landuse	Area (km2)	Settlements (ha)	PA	PS	Kvammes	IV
1	Marginal	35.224	148.721	0.375	0.512	0.267	1.36
2	Core	29.202	71.921	0.311	0.248	0.096	0.80
3	Tidal	29.412	69.914	0.313	0.241	0.000	0.77
Total		93.838	290.556				

Table 134. Distribution of settlement polygons in the Penwith study area against Landuse. All polygons.

In Penwith the Marginal areas are forming the high probability zone (although not very accurately, capturing only 51% of the settlement area). The Tidal and Core zones are performing almost identically, capturing between 24 and 25% of the settlements. This is a quite surprising result, given that the Marginal areas were clearly the low probability zone in the Landuse/enclosures model. And when only the prehistoric/Romano-British polygons are included the Marginal areas are still ranked highest (now only capturing 44% of the settlements). In this model (table 135) the Tidal and Core areas are producing a by chance result – 55% of the settlements captured in 58.6% of the study area. In fact the Indicative Values for this model indicate that the chance of encountering settlement polygons is broadly similar for all three Landuse zones, with a range of 0.87 to 1.18.

	Landuse	Area (km2)	Settlements (ha)	PA	PS	Kvammes	IV
1	Marginal	35.224	93.042	0.375	0.444	0.154	1.18
2	Tidal	29.412	59.92	0.313	0.286	0.056	0.91
3	Core	29.202	56.64	0.311	0.270	0.000	0.87
Total		93.838	209.602				

Table 135. Distribution of settlement polygons in the Penwith study area against Landuse. Prehistoric/Romano-British polygons.

Almost half of the Penwith settlement polygons contain field boundaries or field systems, including the 10 largest polygons. Analysis of the polygons in the Marginal zone shows that the great majority contain field systems or field boundaries and that although parts of some of the polygons are within Core or Tidal zones, the field boundaries run into Rough Ground or former Rough Ground which has been classed as Marginal.

9.3.3 Pelynt study area

There are a total of 37 settlement polygons in the Pelynt study area together covering 205.5ha. Of these 21 contain prehistoric or Romano-British features and 16 contain undated features of potential prehistoric/Romano-British date.

	Landuse	Area (km2)	Settlements (ha)	PA	PS	Kvammes	IV
1	Tidal	37.962	119.616	0.426	0.582	0.269	1.37
2	Marginal	26.73	48.531	0.300	0.236	0.113	0.79
3	Core	24.463	37.316	0.274	0.182	0.000	0.66
Total		89.155	205.463				

Table 136. Distribution of settlement polygons in the Pelynt study area against Landuse. All polygons.

The Tidal areas are ranked highest in this model although they do not form a very accurate high probability zone, capturing only 58% of the polygons. A more accurate high probability zone would include the Marginal areas as well as Tidal. This would capture 82% of the polygons, but because it would cover more than 72% of the study area it would not be very precise, with a Kvammes gain of only 0.113.

This is an unexpected result because when the Landuse attribute was used to model the Pelynt enclosures the Core areas were ranked highest. Nor is the ranking altered when only the prehistoric or Romano-British settlement polygons are included (table 137). In fact the settlement area captured in the Marginal zone is higher in this model, at the expense of the Tidal zone – the performance of the Core zone remains the same.

	Landuse	Area (km2)	Settlements (ha)	PA	PS	Kvammes	IV
1	Tidal	37.962	67.839	0.426	0.502	0.151	1.18
2	Marginal	26.73	42.679	0.300	0.316	0.112	1.05
3	Core	24.463	24.667	0.274	0.182	0.000	0.67
Total		89.155	135.185				

Table 137. Distribution of settlement polygons in the Pelynt study area against Landuse. Prehistoric or Romano-British settlement polygons.

Analysis of the polygons in the Marginal zone revealed that the largest polygon in the study area – the hillfort and associated earthworks at Bury Down, Lanreath – lies within this zone. Hillforts were not included in the model building stages of the Lowland Cornwall project because when the Chi squared process was carried out it suggested their distribution was not statistically significant and could be simply by chance. They were included in the settlement polygons, however, being important features in the landscape. If the complex of features at Bury Down is excluded from this model are rather less surprising result is obtained (table 138).

	Landuse	Area (km2)	Settlements (ha)	PA	PS	Kvammes	IV
1	Tidal	37.962	119.616	0.426	0.708	0.398	1.66
2	Core	24.463	37.316	0.274	0.221	0.246	0.80
3	Marginal	26.73	12.084	0.300	0.071	0.000	0.24
Total		89.155	169.016				

Table 138. Distribution of settlement polygons in the Pelynt study area against Landuse. All settlement polygons minus Bury Down hillfort complex.

The Tidal areas are clearly forming the high probability zone, capturing 71% of the enclosures and producing a reasonable Kvammes Gain of 0.398. The Marginal areas clearly form the low probability zone.

9.3.4 Poundstock study area

There are a total of 22 settlement polygons in the Pelynt study area, together covering 77ha. This is the smallest number of polygons and the smallest area covered out of all four study areas. Of these, 16 contain prehistoric or Romano-British features and six contain undated features of potential prehistoric/Romano-British date.

	Landuse	Area (km2)	Settlements (ha)	PA	PS	Kvammes	IV
1	Marginal	25.472	42.614	0.388	0.555	0.300	1.4
2	Core	10.296	9.346	0.157	0.122	0.194	0.8
3	Tidal	29.803	24.855	0.455	0.324	0.000	0.7
Total		65.571	76.815				

Table 139. Distribution of settlement polygons in the Poundstock study area against Landuse. All settlement polygons.

This result is somewhat unexpected, bearing in mind that when the enclosures were modelled against the Landuse attribute the Tidal zone captured the majority of the enclosures and produced the highest Indicative Value of all three zones. Here it the worst performing zone. However it was noted that the enclosures model suggested there was a virtually by chance distribution pattern, so perhaps not too much should be read into that model. In the settlement polygons model the Marginal zone clearly captures most of the settlement area and the Indicative Value for this zone is twice that of the Tidal zone. Although the Tidal zone captures more polygons than the Core zone, the small area covered by the latter means that it produces a slightly higher Indicative Value than the Tidal zone. When only the prehistoric or Romano-British polygons are included the result is similar, indeed a little clearer (table 140).

	Landuse	Area (km2)	Settlements (ha)	PA	PS	Kvammes	IV
1	Marginal	25.472	41.871	0.388	0.617	0.370	1.6
2	Core	10.296	8.836	0.157	0.130	0.269	0.8
3	Tidal	29.803	17.204	0.455	0.253	0.000	0.6
Total		65.571	67.911				

Table 140. Distribution of settlement polygons in the Poundstock study area against Landuse. Prehistoric or Romano-British polygons.

9.3.5 All study areas

Across the four study areas there are a total of 241 settlement polygons together covering 1,487ha. Of these 186 contain prehistoric or Romano-British features and 55 contain undated features of potential prehistoric/Romano-British date. The total area covered by the prehistoric/Romano-British polygons is 1,226.5ha, and the undated polygons 260.6ha.

	Landuse	Area (km2)	Settlements (ha)	PA	PS	Kvammes	IV
1	Core	110.145	574.973	0.287	0.387	0.258	1.3
2	Tidal	146.299	594.581	0.381	0.400	0.151	1.0
3	Marginal	127.606	317.518	0.332	0.214	0.000	0.6
Total		384.05	1487.072				

Table 141. Distribution of settlement polygons in all Lowland Cornwall study areas against Landuse. All polygons.

Although the largest settlement area is captured in the Tidal zone, the Core zone is ranked higher because it covers a considerably smaller area than does the Tidal zone. This higher ranking is slight, however, with the Indicative Values of the two zones 1.3 and 1.0 respectively. In other words this is effectively a two-zone model with the high probability zone formed by the Core and Tidal areas, and with the Marginal areas forming the low probability zone. Thus the high probability zone captures almost 79% of the settlement area so it is accurate. It is not, however, very precise, covering almost 67% of the study area and producing a low Kvammes gain of 0.151. The Indicative Value for the Core and Tidal zones combined is 1.2, which is twice that of the Marginal zone.

	Landuse	Area (km2)	Settlements (ha)	PA	PS	Kvammes	IV
1	Core	110.145	526.593	0.287	0.429	0.332	1.5
2	Tidal	146.299	455.521	0.381	0.371	0.166	1.0
3	Marginal	127.606	244.366	0.332	0.199	0.000	0.6
Total		384.05	1226.48				

Table 142. Distribution of settlement polygons in all Lowland Cornwall study areas against Landuse. Prehistoric or Romano-British polygons.

A very similar result was achieved when only the prehistoric or Romano-British polygons were modelled. The only difference is that the Core zone captures more of the settlement area at the expense of both Tidal and Marginal areas. However, this is also a two-zone model, with the Core and Tidal zones combined having an Indicative Value twice that of the Marginal zone.

9.3.6 Discussion

The models for settlement polygons against Landuse classes cannot be described as satisfactory. Taking all four study areas together the Core Landuse zone is ranked highest with the Tidal zone a close second and the Marginal zone forming a clear low probability zone. However, this outcome is very heavily influenced by the Probus study area where, for instance, the settlement area captured in the Core zone is six times greater than that captured in the Marginal zone. Indeed it is greater than the entire settlement area captured in the Marginal zone over all four study areas.

This pattern is clearly not replicated across the four study areas. The Core zone is ranked highest in the Probus study area but not in any of the others, and in the Pelynt study area it is ranked third. In fact the only two study areas in which the three Landuse zones are ranked the same are Penwith and Poundstock, in both of which the Marginal zone is ranked highest. The lack of consistency between the study areas is summarised in the table below.

Study area	Rank 1	Rank 2	Rank 3
Probus	Core	Tidal	Marginal
Penwith	Marginal	Core	Tidal
Pelynt	Tidal	Marginal	Core
Poundstock	Marginal	Core	Tidal

Table 143. Comparison of the results of the settlement polygon against Landuse models for the four Lowland Cornwall study areas.

This lack of consistency means there is little point in testing the models because it is obvious that, for instance, a combined model for the Penwith, Pelynt and Poundstock study areas is not going to fit well with the pattern in Probus.

There are a number of reasons that could explain why there is such inconsistency. First is the different size of the study areas leading to bias (with Probus having a great influence on the overall pattern). Secondly, the differing sizes of the individual polygons – for instance, removing the polygon at Bury Down from the equation completely altered the ranking order in the Pelynt study area. In this regard it is worth recognising that the polygon at Trenithan Bennett in Probus covers 109.6ha, which is a larger area than, for example, the 77ha which is the total area covered by all the settlement polygons in the Poundstock study area. Thirdly there are the difficulties, alluded to in section 9.1, of accurately establishing the extent to which a group of fields were associated with a given settlement.

The extent of land classed as Core varies widely between the study areas – in Probus the Core zone covers 50% of the study area, in Penwith 31%, in Pelynt 27% and in Poundstock only 16%. This may also be a factor, although the use of Indicative Values as a measure ought to provide a balance for this type of discrepancy. Finally a probable weakness of the settlement polygons is the method used to create them. They were drawn using subjective judgement and also there was an element of postulating the likely extent of groups of features. In other words, the boundaries of the polygons were not defined tightly around the visible archaeology, but made allowance for the possibility that additional features do (or did) exist which are not visible either above ground or as cropmarks. An example is shown in Fig 96: here a group of field boundaries is visible and the assumption has been made that these boundaries are the fragmentary remains of a more extensive field system and the polygon has been defined accordingly. It should also be noted that the polygon outline has been drawn with no reference to the present day landscape. In this sense the polygon outlines could be said to be rather crude and it perhaps might have been more appropriate to have drawn them in the same way as the refined HLC polygons, i.e. using the field boundaries marked on OS mapping as the polygon boundaries.

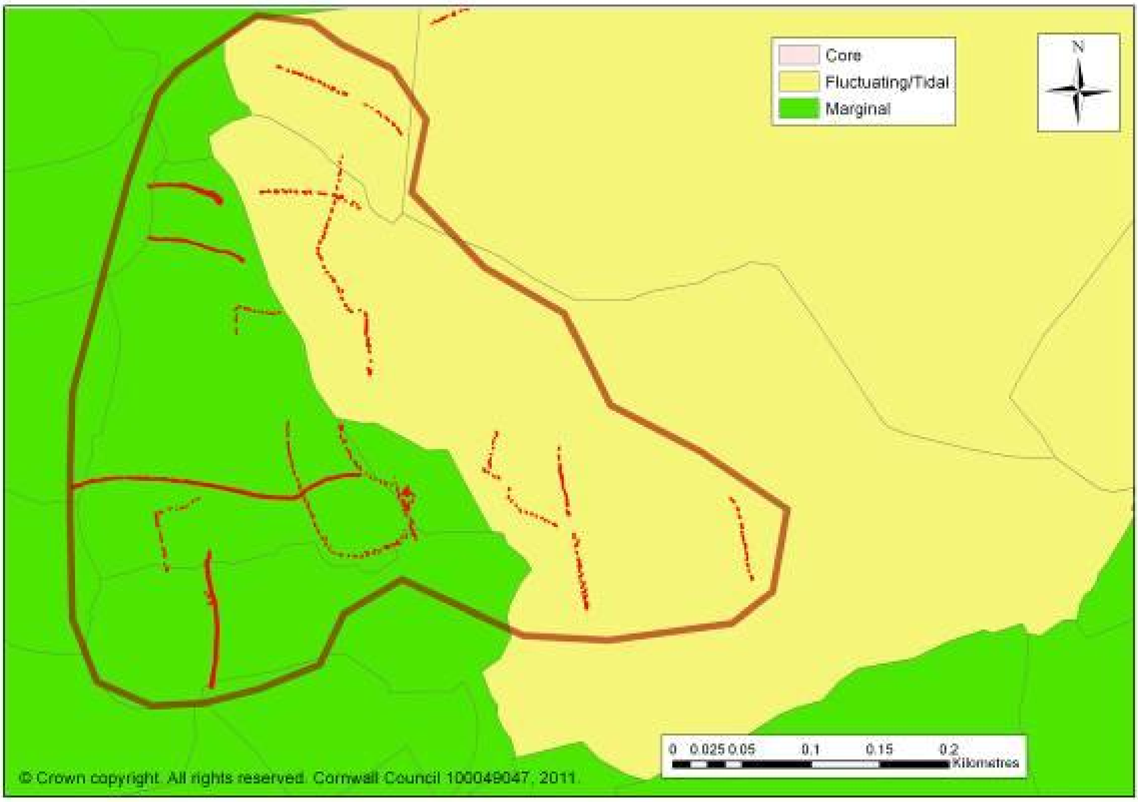

Fig 96. GIS mapping extract from the Penwith study area showing the relationship between visible archaeological features and the polygon boundary.

9.4 Models for barrows based on early medieval land use

9.4.1 Probus study area

In the Probus study area the three Landuse zones cover roughly equal areas in extent. The proportion of the area taken up by each is: Core=34%, Tidal=36% and Marginal=30%. In total 84 barrows are recorded from the study area, although only 35 of these have a high validity score. The number of barrows recorded from each Landuse type is set out in table 144 below.

Landuse	High validity barrows	Low validity barrows	All barrows	%
Marginal	28	20	**48**	**57%**
Core	4	20	**24**	**29%**
Tidal	3	9	**12**	**14%**
Total	**35**	**49**	**84**	

Table 144 Distribution of barrows in the Probus study area against Landuse

Clearly the majority of the barrows are recorded from the Marginal zone, although as the high probability zone of a predictive model this is not very accurate, capturing only 57% of the barrows. There are significant differences between the distribution of high validity barrows and those with a low validity score, with 80% of high validity barrows located in the Marginal zone as opposed to only 41% of low validity barrows. Conversely 41% of low validity barrows are located in the Core zone (the same figure as for the Marginal zone) compared with only 11% of high validity barrows. Indicative Values for each zone are shown in table 145 below.

Landuse	High validity barrows	Low validity barrows	All barrows

Marginal	2.7	1.36	**1.93**
Core	0.34	1.2	**0.84**
Tidal	0.24	0.5	**0.39**

Table 145. Indicative Values for barrows in the Probus study area against Landuse

The Indicative Values show that one is more than twice as likely to encounter a barrow in the Marginal zone than in the Core zone and roughly five times more likely than in the Tidal zone. As far as the high validity barrows are concerned one is eight times or more likely to encounter a barrow in the Marginal zone than either of the other two. The chances of encountering a low validity barrow are roughly similar for the Marginal and Core zones. Overall the model indicates that the Marginal areas form the high probability zone and the Tidal areas a well-defined low probability zone.

9.4.2 Penwith study area

In the Penwith study area the most extensive Landuse zone is Marginal (which includes coastal HLC Types such as Rocky foreshore, Beach and Inshore water). The percentage of the area taken up by the three zones is: Core=31%, Tidal=31% and Marginal=38%.

In total 46 barrows are recorded from the study area, although only 13 of these have a high validity score. The number of barrows recorded from each Landuse type is set out in table 146 below.

Landuse	High validity barrows	Low validity barrows	All barrows	%
Marginal	6	11	**17**	**37%**
Core	5	10	**15**	**33%**
Tidal	2	12	**14**	**30%**
Total	**13**	**33**	**46**	

Table 146 Distribution of barrows in the Penwith study area against Landuse

As can be seen from this the barrows are fairly evenly distributed among the three Landuse zones. This is even more apparent when the Indicative Values are analysed.

Landuse	High validity barrows	Low validity barrows	All barrows
Core	1.24	0.97	**1.05**
Marginal	1.23	0.89	**0.98**
Tidal	0.49	1.16	**0.97**

Table 147. Indicative Values for barrows in the Penwith study area against Landuse

For all barrows the Indicative Values have a tight range of between 0.97 and 1.05. This suggests a by chance distribution with roughly equal probability of encountering a barrow in any of the three Landuse zones. There are, however, differences between the location of the high validity and low validity barrows. The former are 2.5 times more likely to be encountered in the Core and Marginal zones than in the Tidal, whereas the low validity barrows are a little more likely to be encountered in the Tidal zone.

Of the low validity barrows, only two were mapped during Cornwall's NMP: the others all were assigned a validity score of zero. These include seven recorded as extant earthworks, two as 'site of' and the remaining 22 from documentary sources.

9.4.3 Pelynt study area

The most extensive Landuse type in the Pelynt study area is the Tidal zone, which covers 43% of the area. The Marginal zone covers 30% and the Core zone accounts for the remaining 27%. In total 50 barrows were recorded from the study area, of which 22 were assigned a high validity rating. Their distribution through the three Landuse zones is set out in table 148.

Landuse	High validity barrows	Low validity barrows	All barrows	%
Core	8	11	**19**	**38%**
Tidal	10	9	**19**	**38%**
Marginal	4	8	**12**	**24%**
Total	**22**	**28**	**50**	

Table 148. Distribution of barrows in the Pelynt study area against Landuse

Overall the barrows are equally distributed in the Core and Tidal zones with fewer in the Marginal zone. In fact, when numbers of barrows per Landuse zone are considered this could be seen as a two-zone model with the Core and Tidal zones as the high probability zone, capturing 76% of the barrows. However, when the extent of area covered by each zone is taken into account the outcome is slightly different, as shown by the Indicative Values (table 149).

Landuse	High validity barrows	Low validity barrows	All barrows
Core	1.33	1.43	**1.38**
Tidal	1.07	0.75	**0.89**
Marginal	0.61	0.95	**0.80**

Table 149. Indicative Values for barrows in the Pelynt study area against Landuse

This shows that overall the Core areas form the high probability zone (albeit not a very accurate one), with the Tidal and Marginal areas producing quite similar Indicative Values. The chance of encountering a barrow is 0.5 times more likely in the Core zone than the Tidal and slightly more again than in the Marginal zone.

There are differences in the distribution of the high validity barrows and those with low validity scores. Although the chance of encountering a high validity barrow in the Tidal zone is 0.75 times greater than in the Marginal zone, there is more chance of encountering a low validity barrow in the Marginal zone than in the Tidal.

9.4.4 Poundstock study area

In the Poundstock study area the Core zone only covers 16% of the area, as opposed to 39% taken up by the Marginal zone and 45% by the Tidal zone. This in part explains why only two barrows are recorded from the Core zone. In total 49 barrows are recorded from the study area, with the great majority located in the marginal zone (table 150).

Landuse	High validity barrows	Low validity barrows	All barrows	%
Marginal	18	17	**35**	**71%**
Tidal	7	5	**12**	**25%**
Core	1	1	**2**	**4%**
Total	**26**	**23**	**49**	

Table 150. Distribution of barrows in the Poundstock study area against Landuse

Clearly the Marginal areas are forming the high probability zone of this model, capturing more than three times as many barrows as the Tidal areas. The Core Landuse areas make up the low probability zone, capturing only 4% of the barrows in 16% of the study area. This pattern is consistent for high validity barrows and those with low validity ratings.

Landuse	High validity barrows	Low validity barrows	All barrows
Marginal	1.78	1.9	**1.84**
Tidal	0.59	0.48	**0.54**
Core	0.24	0.28	**0.26**

Table 151. Indicative Values for barrows in the Poundstock study area against Landuse

Indicative Values show that the chances of encountering a barrow in the Marginal zone are three and a half times greater than in the Tidal zone and seven times greater than in the Core zone.

9.4.5 All study areas

For the four study areas as a whole the most extensive Landuse zone is Tidal, covering 38% of the total area; the Marginal zone covers 33% and the Core zone is the smallest, covering 29% of the area. In total 229 barrows are recorded from the Lowland Cornwall study areas, a clear majority of which have been assigned a low validity score. The distribution of the barrows within the three Landuse zones is shown in table 152.

Landuse	High validity barrows	Low validity barrows	All barrows	%
Marginal	56	56	**112**	**49%**
Core	18	42	**60**	**26%**
Tidal	22	35	**57**	**25%**
Total	**96**	**133**	**229**	

Table 152. Distribution of barrows in the four study areas against Landuse

The Marginal Landuse zone clearly forms the high probability zone of this model but it is not very accurate, only capturing 49% of the barrows. The Core and Tidal zones capture similar numbers of barrows, but the Core zone is ranked second in the model because it covers a smaller area than the Tidal zone. This is illustrated by the Indicative Values for each Landuse zone (table 153).

Landuse	High validity barrows	Low validity barrows	All barrows
Marginal	1.76	1.27	**1.47**
Core	0.65	1.10	**0.91**
Tidal	0.60	0.69	**0.65**

Table 153. Indicative Values for barrows in the four study areas against Landuse

Overall this suggests that one is 0.6 times more likely to encounter a barrow in the Marginal zone than in the Core and more than twice as likely than in the Tidal zone. However, there are differences between the high validity barrows and those with a low validity rating. Whereas one is more than twice as likely to encounter a high validity barrow in the Marginal zone than in the Core the chances of encountering a low validity barrow in either of these two zones are roughly equal.

9.4.6 Discussion

Overall it appears that the Marginal Landuse zone forms the high probability zone for this model, although it only captures 49% of the barrows so cannot be described as very accurate. Nor is the Marginal zone the highest ranked in all four study areas. In fact the rankings of the three Landuse zones are different in each of the study areas (table 154).

Study area	Rank 1	Rank 2	Rank 3
Probus	Marginal	Core	Tidal
Penwith	Core	Marginal	Tidal
Pelynt	Core	Tidal	Marginal
Poundstock	Marginal	Tidal	Core

Table 154. Comparison of the results of the barrows against Landuse models for the four Lowland Cornwall study areas.

To some extent the outcome of the model for all barrows is skewed by the different size of the study areas and the number of barrows in each. For instance there are 84 barrows in the Probus study area but only 50 or less in the other three. In Probus 48 of the barrows are located in the Marginal zone – this is more than the total number of barrows in the Penwith study area.

Another factor is the large number of barrows in prominent locations on high ground, particularly around Newlyn Downs in the Probus study area and various locations in the Poundstock study area. Such locations are predominantly classed as the Marginal Landuse type, which explains why in the Probus and Poundstock study areas the Marginal zone equates to the high probability zone. In fact it can be suggested that the barrows fall into two categories: those in prominent locations which mainly fall within the Marginal zone, and those on lower lying land which have no obvious pattern in terms of Landuse zones. This is clearest in the Penwith study area, where there is effectively a by chance distribution, with the barrows fairly evenly distributed through the three Landuse zones. It is also the case in the Pelynt study area, where there are equal numbers of barrows in the Core and Tidal zones and where the Marginal areas form the low probability zone.

One striking aspect of the barrow dataset is the high proportion of low validity sites, which outnumber the high validity barrows by more than a third. Poundstock is the only study area in which there are more high validity barrows than those with low validity. At the other end of the scale there are more than twice as many low validity than high validity barrows in the Penwith study area. There are some differences in the distribution of high validity and low validity barrows. In the Probus study area there are equal numbers of low validity barrows captured in the Marginal and Core zones, whereas there are seven times more high validity barrows in the Marginal zone than there are low validity barrows. In the Penwith study area the highest number of low validity barrows is captured in the Tidal zone yet this zone captures the lowest number of high validity barrows.

10 Models based on Lowland Cornwall HLC: Probus enclosures

Full details of the Lowland Cornwall HLC Types and Sub-Types and time-slices referred to in this and following sections are contained in Lowland Cornwall Volume 3 and are briefly summarised here.

Historic Landscape Characterisation is hierarchical. At the top of the Lowland Cornwall HLC sits a 'Broad Type' with increasing levels of complexity beneath it. Broad Type is sub-divided to form a more specific 'HLC Type'; and within 'Enclosed Land' this can be further sub-divided to a detailed 'Sub-Type' level, defined by a complex set of attribute values. An example from the Lowland Cornwall project:

Broad Type: Enclosed Land (simple set of attribute values)

HLC Type: Medieval Enclosed Land (moderately complex set of attribute values)

Sub-Type: MD derived from Cropping Units (complex set of attribute values)

As well as defining the historic character of the present day landscape, the Lowland Cornwall HLC included four 'time-slices' defining the previous character of the landscape. The availability of digital 1880 OS and 1840 Tithe maps enabled the full completion of HLC fields for these two time-slices. This, it was envisaged, would enable a clearer, statistic-based understanding of landscape change over the past 170 years. The mapping confirmed the value of the 1880 and 1840 time-slices as they enabled a complex picture of the sequential nature of landscape and HLC change to be drawn. Where understood, two further 'interpretive time-slices' beyond 1840, corresponding with the 'late medieval' and 'late prehistoric' periods were also added.

10.1 The 1994 HLC model

Much of the Probus study area is classed in the 1994 HLC as either Farmland Medieval or Farmland C20. In other words a large part falls within the high probability zone of the 1994 HLC model for enclosures (Lowland Cornwall Volume 1, section 8.2). As a result when the 1994 HLC model is applied to the Probus study area its performance is good in terms of accuracy but weak in terms of precision. Although 87% of the Probus enclosures are captured in the high probability zone a very low Kvammes Gain of 0.112 is achieved because the high probability zone covers 77% of the area (Fig 97).

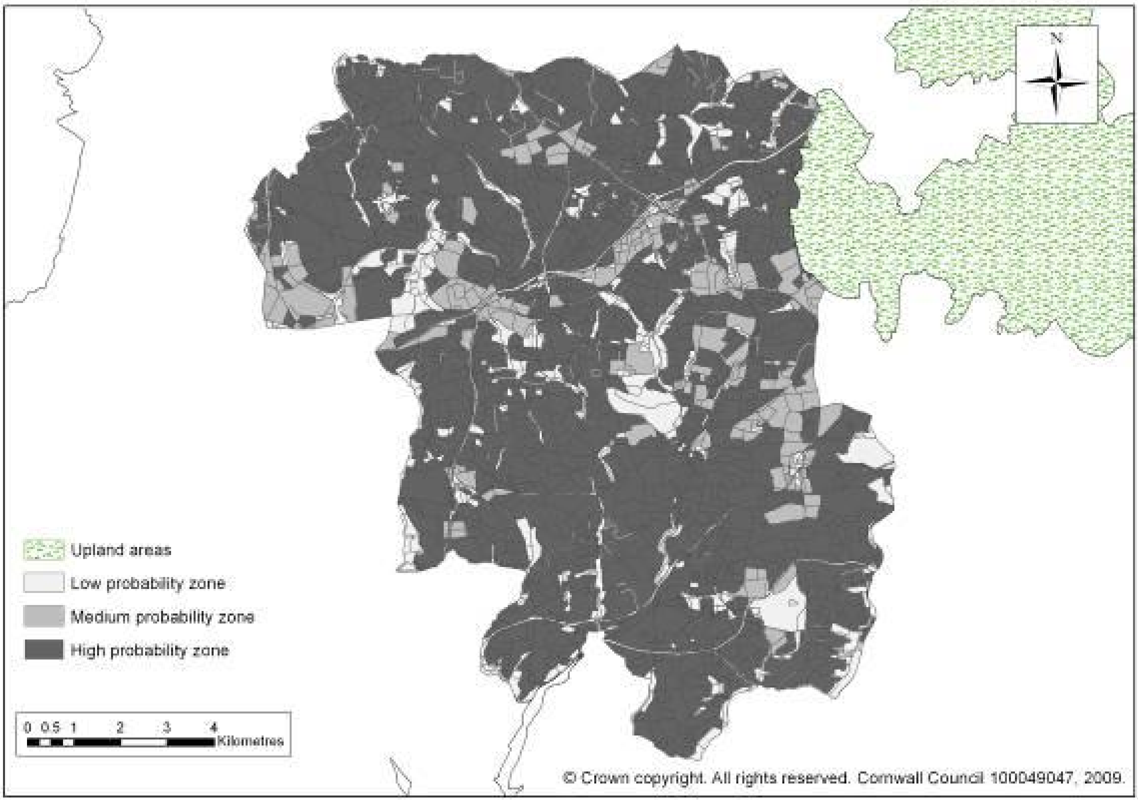

Fig 97. Map of the Probus study area showing the 1994 HLC enclosures model

10.2 The Lowland Cornwall HLC models

A principal aim of HLC refinement in this project was to create a finer grained characterisation which could be used to produce more precise models than the 1994 version. Each time-slice of the Lowland Cornwall HLC does in fact produce more precise models than the 1994 HLC.

10.2.1 HLC Types

When models are based on HLC Type to give a broad overview, Medieval Enclosed Land is in each case the highest ranked Type. Each time-slice produces a higher Kvammes Gain measure than the 1994 HLC model (table 155).

HLC Time-slice	PA	PS	Kvammes Gain
2011	0.663	0.876	0.243
1880	0.688	0.890	0.227
1840	0.694	0.890	0.220
Medieval	0.708	0.897	0.210

Table 155. PA, PS and Kvammes Gain values of the high probability zone for each of the four time-slices in the Probus study area. All enclosures.

When only the high validity enclosures are considered a slightly more precise result is achieved, as indicated by higher gain measures (table 156).

HLC Time-slice	PA	PS	Kvammes Gain
2011	0.663	0.904	0.266
1880	0.688	0.904	0.239
1840	0.694	0.904	0.232
Medieval	0.708	0.904	0.216

Table 156. PA, PS and Kvammes Gain values of the high probability zone for each of the four time-slices in the Probus study area. High validity enclosures only.

The fact that the Kvammes Gain measures are highest in the more recent time-slices reflects the shrinkage in Medieval Enclosed Land as this has been altered through time. Whereas in the medieval time-slice some 96 km^2 of the area was classified as Medieval Enclosed Land, by the time of the 2011 time-slice this area had shrunk to $90km^2$.

10.2.2 HLC Sub-Types 2011 time-slice

Although the Lowland Cornwall HLC Types produce more precise models than the 1994 HLC, the Kvammes Gain measures remain somewhat low. More precise models can be produced using the HLC Sub-Types as attributes. Table 157 below shows how each Sub-Type is ranked based on the 2011 time-slice.

	HLC Sub-Types	Enclosures	PA	PS	Kj cum	Rel gain
1	MD Altered field patterns (Amalgamated)	79	0.33	0.54	0.345	0.218
2	MD derived from Cropping Units	28	0.17	0.19	0.425	0.245
3	MD Altered field patterns (Re-arranged)	12	0.09	0.08	0.440	0.236
4	MD Altered field patterns (Sub-Divided)	8	0.07	0.06	0.437	0.218
5	PM Intakes	3	0.02	0.02	0.440	0.216
6	Emod Altered field patterns (Re-arranged)	2	0.01	0.01	0.450	0.223
7	Emod Altered field patterns (Amalgamated)	3	0.05	0.02	0.428	0.196
8	Village	2	0.02	0.01	0.429	0.195
9	Campsite, chalet park etc.	1	0.00	0.01	0.437	0.200
10	Emod New Farms (>5ha)	1	0.00	0.01	0.444	0.206
11	PM Altered field patterns (Re-arranged)	1	0.01	0.01	0.447	0.207
12	Major roads	1	0.01	0.01	0.447	0.206
13	Parkland	1	0.01	0.01	0.447	0.204
14	Emod Altered field patterns (Sub-Divided)	1	0.01	0.01	0.445	0.201
15	Woodland mixed	1	0.01	0.01	0.441	0.196
16	Emod Intakes	1	0.02	0.01	0.425	0.181
17	Other	0	0.18	0.00	0.000	0.000
	Total	**145**				

Table 157. The model for Probus prehistoric and Romano-British enclosures based on the 2011 time-slice HLC Sub-Types

The cumulative Kj parameter values (Kj cum) continue to rise through the three highest ranked Sub-Types, reaching a peak of 0.440 before falling to 0.437 when the Sub-Type MD Altered field patterns (Sub-Divided) is included in the model. If the cumulative Kj values are used to define the cut-off point between high and medium probability zones then the three highest ranked Sub-Types would form the high probability zone of the model. In this case the high probability zone would capture 82% in 58% of the study area, giving a Kvammes Gain of 0.288.

However, the Relative Gain measures (Rel gain) begin to decrease at the third highest ranked Sub-Type (MD Altered field patterns (Re-arranged)). If the two highest ranked Sub-Types – MD Altered field patterns (Amalgamated) and MD derived from Cropping Units – are defined as the high probability zone, then 73% of the enclosures are captured within it and it covers 50% of the study area. This zone produces a Kvammes Gain measure of 0.380. This is a more satisfactory model, being more precise whilst retaining more than 70% accuracy, so in this instance the cut-off point between high and medium probability zones is better defined by Relative Gain measures than the Kj values. The medium probability zone is formed by the four next highest ranked Sub-Types:

MD Altered field patterns (Re-arranged)
MD Altered field patterns (Sub-Divided)
PM Intakes
Emod Altered field patterns (Re-arranged)

When the next highest ranked Sub-Type is added to the model both the Relative Gain and Kj values drop from 0.223 and 0.450 respectively, thereby defining the cut-off point between medium and low probability zones. In this model the medium probability zones captures 17% of the enclosures in 19% of the study area, and the low probability zone captures only 10% of enclosures in 31% of the study area. This model therefore works well.

When an equivalent model considering only the high validity enclosures is built the same two HLC Sub-Types form the high probability zone and it achieves identical Kvammes Gains to the model based on all enclosures.

In table 157 above it may be noted that one enclosure is recorded from the Sub-Type Campsite, chalet park etc. and another from the Type Major roads. In the first case the previous time-slices are the Sub-Types MD Altered fields (Sub-Divided); MD Altered fields (Sub-Divided); MD derived from Cropping Units. For the enclosure recorded from Major roads the previous time-slices are the Sub-Types MD Altered fields (Amalgamated); MD Altered fields (Sub-Divided); MD derived from Cropping Units. This illustrates how the various time-slices can explain why some of the enclosures are recorded from unlikely sounding HLC Types in the 2011 time-slice.

10.2.3 HLC Sub-Types 1880 time-slice

The 1880 time-slice produces a weaker model and there are difficulties in defining a satisfactory cut-off point between the high and medium probability zones.

	HLC Sub-Types	Enclosures	PA	PS	Kj cum	Rel gain
1	MD derived from Cropping Units	69	0.34	0.48	0.257	0.138
2	MD Altered field patterns (Amalgamated)	22	0.10	0.15	0.342	0.187
3	MD Altered field patterns (Sub-Divided)	24	0.16	0.17	0.395	0.197
4	MD Altered field patterns (Re-arranged)	12	0.06	0.08	0.438	0.220
5	Emod Intakes	6	0.05	0.04	0.443	0.214

Table 158. The five highest ranked HLC Sub-Types for Probus prehistoric and Romano-British enclosures model based on the 1880 time-slice HLC Sub-Types

The Relative Gain values increase through the four highest ranked Sub-Types before falling from 0.220 to 0.214 when the Sub-Type Emod Intakes is included, although the cumulative Kj value continues to increase.

Like the 2011 time-slice model a better performance can be achieved if the cut-off point is defined using the Relative Gain values rather than the Kj measures.

If the four highest ranked Sub-Types are taken as forming the high probability zone then 88% of the enclosures are captured in 66% of the study area, producing a modest Kvammes Gain of 0.251.

The next highest ranked Sub-Types are Emod Intakes and PM Intakes. These two Sub-Types can be defined as the medium probability zone. In this case the medium probability zone captures roughly 7% of the enclosures in 8% of the study area; the low probability zone, consisting of all other Sub-Types, captures 5% of the enclosures in 26% of the area. The weakness of the model lies in the relative lack of accuracy of the high probability zone (only capturing 63% of the enclosures).

When an equivalent model considering only the high validity enclosures is built, the high probability zone is formed by the Sub-Types MD derived from Cropping Units and MD Altered field patterns (Sub-Divided). This zone captures 76% of the enclosures; it covers 49% of the study area and achieves a Kvammes Gain of 0.350, which is significantly higher than that achieved by the model based on all enclosures.

10.2.4 HLC Sub-Types 1840 time-slice

The model based on the 1840 time-slice is also weaker than that based on the 2011 time-slice.

	HLC Sub-Types	Enclosures	PA	PS	Kj cum	Rel gain
1	MD derived from Cropping Units	76	0.38	0.52	0.278	0.147
2	MD Altered field patterns (Sub-Divided)	31	0.20	0.21	0.342	0.158
3	MD Altered field patterns (Re-arranged)	14	0.06	0.10	0.404	0.195
4	Emod Intakes	6	0.04	0.04	0.410	0.192
5	MD Altered field patterns (Amalgamated)	3	0.01	0.02	0.427	0.203
6	PM Intakes	5	0.06	0.03	0.402	0.173

Table 159. The six highest ranked HLC Sub-Types for Probus enclosures model based on the 1840 time-slice HLC Sub-Types

Again there is a conflict between the Kj and Relative Gain values, with the Kj values increasing through the five highest ranked Sub-Types before dropping from 0.427 to 0.402 when the Sub-Type PM Intakes is included in the model, whilst the Relative Gains increase through the three highest ranked Sub-Types before falling.

If the cut-off point for the high probability zone is defined using the Kj parameter it would capture 90% of the enclosures in 70% of the study area and produce a Kvammes Gain of 0.203.

A more satisfactory definition of the high probability zone is achieved by basing the cut-off point on the Relative Gain values. The high probability zone comprises the HLC Sub-Types MD derived from Cropping Units, MD Altered field patterns (Sub-Divided) and MD Altered field patterns (Re-arranged). Together these Sub-Types capture 83% of enclosures in 64% of the study area and produce a Kvammes Gain of 0.234.

The medium probability zone of this model is formed by the Sub-Types Emod intakes and MD Altered field patterns (Amalgamated). This zone is notably small in extent, covering just 5% of the study area, and it captures 6% of the enclosures.

The low probability zone captures 10% of the enclosures, which is more than the medium probability zone, but it covers 31% of the project area.

When an equivalent model considering only the high validity enclosures is built the Sub-Type MD derived from Cropping Units captures 69% of the enclosures within 38% of the study area, giving a Kvammes Gain measure of 0.451. Alternatively the Sub-

Type MD Altered field patterns (Sub-Divided) could also be included in the high probability zone. This results in a high probability zone covering 58% of the study area which captures 83% of the enclosures, but the Kvammes Gain falls to 0.303. In either scenario, however, the Kvammes Gain is higher than that achieved by the model based on all enclosures.

10.2.5 HLC Sub-Types medieval time-slice

The model based on the medieval time-slice is simple in that the high probability zone is formed entirely by the HLC Sub-Type MD derived from Cropping Units. This captures 84% of the enclosures and covers 63% of the study area.

The medium probability zone comprises the HLC Type Upland Rough Ground (Undivided) and the Sub-Type MD derived from Strip Fields (Enclosed): this captures 11% of the enclosures within 21% of the study area.

The low probability zone is made up of the remaining Sub-Types, capturing 5% of the enclosures within 16% of the study area. The Kvammes Gain achieved by the high probability zone of this model is 0.249.

For the high validity enclosures the high probability zone is the same, but it captures 90% of the enclosures and produces a rather higher Kvammes Gain measure of 0.301.

10.2.6 Conclusions

In the Probus study area when using the HLC Sub-Types as the variables in model building there are issues about how best to define the cut-off points between high and medium probability zones. In order to optimise the precision of the models it proved more satisfactory to use the Relative Gain values as guidance, although the Kj parameter values must be used to order the Sub-Types according to rank.

The HLC Sub-Types do produce more precise models, but when considering all the enclosures only in the 2011 time slice is the model significantly more precise (table 160). The models are also less accurate than those based on HLC Types (but all high probability zones capture more than 70% of the enclosures).

	HLC Types				**HLC Sub-Types**		
Time-slice	**PA**	**PS**	**Kvammes Gain**		**PA**	**PS**	**Kvammes Gain**
2011	0.66	0.88	0.243		0.50	0.73	0.380
1880	0.69	0.89	0.227		0.66	0.88	0.251
1840	0.69	0.89	0.220		0.64	0.83	0.234
Medieval	0.71	0.90	0.210		0.63	0.84	0.249

Table 160. Comparison of the performance of models based on HLC Types and Sub-Types for each time-slice in the Probus study area. All enclosures.

When only the high validity enclosures are considered, the Sub-Types produce considerably more precise models than the HLC Types (table 161), but again there is a reduction in accuracy.

	HLC Types				**HLC Sub-Types**		
Time-slice	**PA**	**PS**	**Kvammes Gain**		**PA**	**PS**	**Kvammes Gain**
2011	0.66	0.90	0.266		0.50	0.73	0.380
1880	0.69	0.90	0.239		0.49	0.76	0.350
1840	0.69	0.90	0.232		0.58	0.83	0.303
Medieval	0.71	0.90	0.216		0.63	0.90	0.301

Table 161. Comparison of the performance of models based on HLC Types and Sub-Types for each time-slice in the Probus study area. High validity enclosures only.

In all four time-slices the high probability zones are made up exclusively of Medieval Enclosed Land Sub-Types, whether all the enclosures are modelled or only the high validity enclosures. There are slight differences in the make-up of the high probability zones of the models from time-slice to time-slice. This is largely because of changes to field patterns through time. For instance the highest ranked Sub-Type in the 2011 time-slice model is MD Altered field patterns (Amalgamated) whilst the Sub-Type MD Altered field patterns (Sub-Divided) is ranked fourth. By contrast in the 1840 time-slice MD Altered field patterns (Sub-Divided) is ranked second and MD Altered field patterns (Amalgamated) is only ranked fifth, behind Emod Intakes. At the time of the 1840 time-slice, MD Altered field patterns (Amalgamated) covered a mere 1% of the study area whereas MD Altered field patterns (Sub-Divided) covered 20%. By 2011 MD Altered field patterns (Amalgamated) covered 33% and the area taken up by MD Altered field patterns (Sub-Divided) had dwindled to 7%.

10.2.7 HLC Sub-Types all time-slices

The fact that the make-up of the high probability zones varies from time-slice to time-slice begs the question of how to produce overall models which take account of all the time-slices. To achieve these models the time-slices for each HLC polygon were used in combination. For example, in the Probus study area the Sub-Types in the combination of time-slices which capture the highest number of enclosures are:

Time-slice	HLC Sub-Type
2011	MD Altered fields (Amalgamated)
1880	MD derived from Cropping Units
1840	MD derived from Cropping Units
Medieval	MD derived from Cropping Units

HLC polygons with this combination of Sub-Types capture 39 enclosures, which is 27% of the total number of enclosures and they cover 12% of the study area. If this were to be seen as the high probability zone of a model the Kvammes Gain measure is 0.561. However, to be of use the model would need to be more accurate but 'regressive' models of this design clearly have the potential to be relatively precise.

Obviously, given the number of HLC Types and Sub-Types there will be numerous combinations through the four time-slices (and more in the Penwith study area, where there are five time-slices), so constructing these models requires a complex set of GIS queries. The starting point for construction of this type of regressive model was the acknowledgement that Medieval Enclosed Land, in broad terms, forms the high probability zone. Therefore only those polygons classified as Medieval Enclosed Land during at least one time-slice were considered when defining the high probability zone. This covers 69% of the study area, captures 89% of the enclosures and produces a Kvammes Gain of 0.220.

However, within this high probability zone some combinations capture considerable numbers of enclosures, others capture only a single enclosure and some capture none. Thus it is possible to refine the high probability zone by identifying those combinations of Sub-Types where there is a very high likelihood of encountering enclosures – in essence a very high probability zone.

To do this the various combinations of Sub-Types were ranked according to their Kj values and the cut off point for the very high probability zone was identified as the point where the previously increasing cumulative Kj and/or Relative Gain values began to decline. The combinations of Sub-Types forming the very high probability zone of this model are listed in table 179 and the cut-off point occurs when the cumulative Kj value falls from 0.516 to 0.508 and the Relative Gain drops from 0.324 to 0.309. This zone covers 67.3 square kilometres which equates to roughly 50% of the study area, and it captures 119 enclosures – 82% of the total. This achieves a Kvammes Gain of 0.387.

Below this are a number of combinations of Medieval Enclosed Land Sub-Types, each capturing a single enclosure (two enclosures in one case). These and Medieval Enclosed Land Sub-Types in which no enclosures are recorded make up the remainder of the high probability zone. The exception to this was land that at some point in its history had undergone significant change. This includes Medieval Enclosed Land that in one or more time-slices was defined as industrial (because mining had taken place here), or in the 2011 time-slice was classed as major roads or some other type representing below ground disturbance (including timber plantation). Land that had undergone this sort of destructive alteration was classed in the low probability zone because is unlikely that any enclosures will be found at these locations in the future.

Land classed as farmstead, hamlet, village or town in the recent time-slices but which had been classed as Medieval Enclosed Land in at least one previous time-slice were placed in the high probability zone. In some cases some polygons classed as Medieval Enclosed Land in the earlier time-slices had since ceased to be actively farmed and had reverted to Rough Ground. These polygons also were placed in the high probability zone of the model.

All other Sub-Type combinations form the low probability zone.

Overall the performance of the model is shown in table 162 below and a map showing the model is presented in Fig 98.

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain
Very High	68.209	119	0.503	0.821	0.387
High*	93.974	129	0.694	0.890	0.220
Low	41.521	16	0.306	0.110	-1.777

Table 162. Regressive model for all enclosures in the Probus study area. * includes very high probability zone.

Analysis of the 16 enclosures falling in the low probability zone shows that one (at Trewaters, St Erme; PRN 32053) is in land classed as Major roads but which in previous time-slices was Medieval Enclosed Land, one (Trenowth, Probus; PRN 20933) is in Woodland in all time-slices and a third (St Erme; PRN 25252) is in land classed as Village in the 2011 time-slice and Hamlet in all previous time-slices. Thirteen enclosures are located in land classed as Early Modern Enclosed Land taken in from Upland Rough Ground or in Post-Medieval Enclosed Land taken in from Upland or Valley Rough Ground. Four of these 13 are within fields whose dominant boundary form in the 1840 time-slice was recorded as sinuous. Fields with these characteristics are typically located on the edge of existing medieval field systems and have been interpreted as remnants of earlier, medieval use but in a temporary or less intensive arrangement, such as areas of temporary outfield cultivation (Lowland Cornwall Volume 3, section 4.2.6). These four enclosures are therefore likely to be on the periphery of Medieval Enclosed Land. In fact two are in land on the very border of the very high probability zone, one is within 100m of the very high probability zone and the fourth is within 60m of the high probability zone.

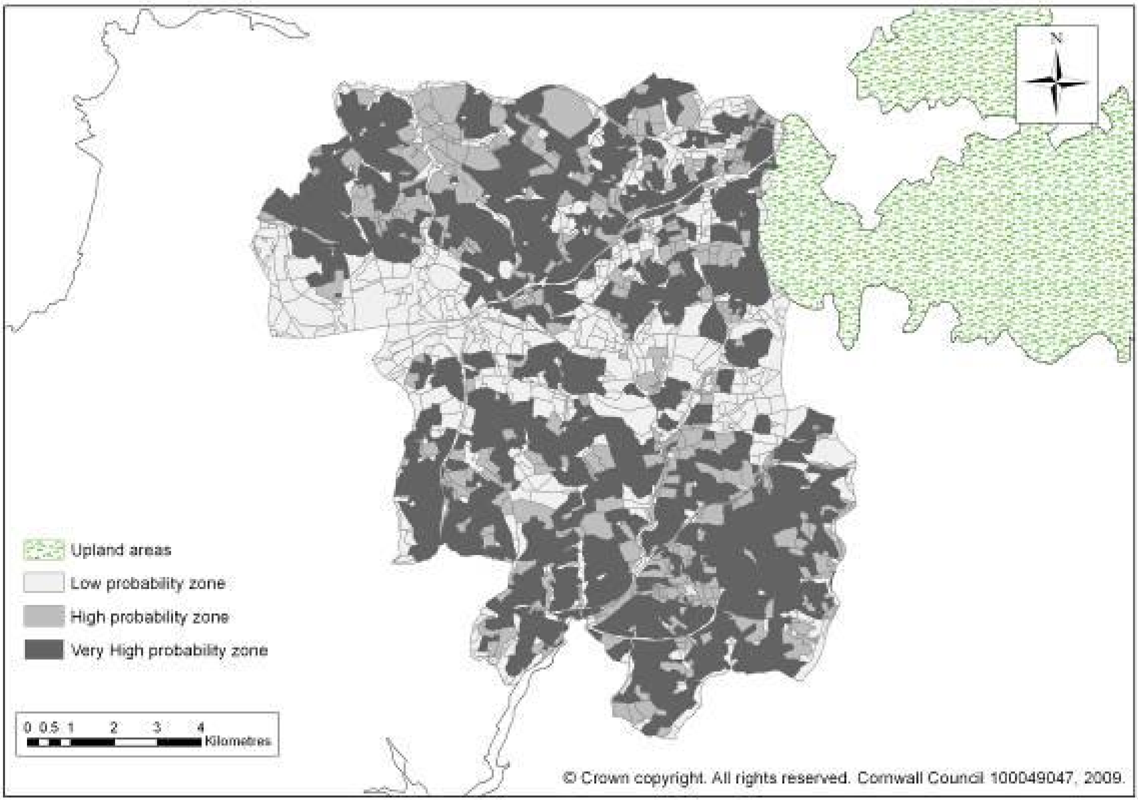

Fig 98. Map showing the regressive model for prehistoric and Romano-British enclosures in the Probus study area.

When this model was run against the high validity enclosures only, a slightly better result was obtained. The very high probability zone captured 84% of the high validity enclosures compared with 82% for all enclosures. Overall 90% of the high validity enclosures were captured in the high probability zone and 10% in the low probability zone. The Kvammes Gain achieved by the very high probability zone is 0.403 and by the high probability zone overall 0.229.

10.2.8 Discussion

The results of applying these models in the Probus study area demonstrate that the Lowland Cornwall HLC Types can be used to produce more precise models than the 1994 HLC Types.

The HLC Type Medieval Enclosed Land is clearly forming the high probability zone for prehistoric and Romano-British enclosures and this is the case in all four time-slices.

The HLC Sub-Types produce more precise models than the HLC Types. Against this is the fact that the Sub-Type models are not as accurate but nonetheless they achieve acceptable levels of accuracy (between 73 and 88% of enclosures captured over the four time-slices) and produce higher Kvammes Gain measures than those attained by the HLC Types. That said, it is the case that the Kvammes Gain measures achieved by the Sub-Types models are relatively modest – only the 2011 time-slice achieved a Kvammes Gain higher than 0.3.

When models were built using the distribution of only the high validity enclosures somewhat higher Kvammes Gains were achieved than for the models based on all enclosures. The Sub-Types forming the high probability zones for all time-slices except that for 1880 were ranked in the same order in both sets of models. The 1880 high probability zone model for all enclosures consisted of MD derived from Cropping Units and MD Altered field patterns (Amalgamated) in that order, with MD Altered field patterns (Sub-Divided) ranked third. In the corresponding model based only on high validity rounds the order of second and third ranked Sub-Types was reversed.

The most precise and accurate results are achieved by using combinations of Sub-Types from all time-slices as attributes to build a regressive model. This enables the high probability zone to be refined and part of it to be identified as a very high probability zone. This model suggests that the Sub-Types MD Altered field patterns (Amalgamated) and MD derived from Cropping Units are the most important in terms of predicting the location of enclosures. The highest numbers of enclosures are located in land classed as MD derived from Cropping Units in all three previous time-slices but which has undergone twentieth century alteration and is classed as MD Altered field patterns (Amalgamated) in the 2011 time-slice. Land containing the second highest number of enclosures is classed as MD derived from Cropping Units throughout all four time-slices.

Of the 15 combinations of Sub-Types making up the very high probability zone in the regressive model, nine are classed as MD Altered field patterns (Amalgamated) in the 2011 time-slice. Amalgamation – the removal of field boundaries and resulting enlargement of field size – seems to be a key factor in the location, or at least the detection, of enclosures in the Probus study area. Although MD Altered field patterns (Amalgamated) is a recent HLC land class (this Sub-Type only made up 1.3% of Medieval Enclosed Land in the 1840 time-slice and 15% in the 1880 time-slice) it should be borne in mind that the grouping of medieval strip fields into cropping units is a form of 'amalgamation' in itself.

This raises the question of whether the enlargement of fields, thereby enabling them to be brought under modern arable cultivation more profitably, simply means there is more likelihood of detecting below ground archaeology, especially given that almost three quarters of the Probus enclosures are recorded as cropmarks. Alternatively it may be that the fields were amalgamated because they have always been the best quality farmland and it follows that this is precisely where prehistoric and Romano-British settlements are most likely to have been established.

In this regard it is pertinent to note that 16 of the 22 enclosures recorded as extant earthworks in the Probus study area are captured in the very high probability zone of the regressive model. This equates to almost 73% of the earthwork enclosures, which suggests that the very high probability zone does not merely indicate those fields in which cropmarks are most likely to be recorded but may represent the favoured areas for settlement and farming.

Sub-Type	SubType1	SubType2	SubType3	Sites	Area	PA	PS	KJ	R gain
MD Altered field patterns (Amalgamated)	MD derived from Cropping Units	MD derived from Cropping Units	MD derived from Cropping Units	39	15.99	0.12	0.27	0.20	0.151
MD derived from Cropping Units	MD derived from Cropping Units	MD derived from Cropping Units	MD derived from Cropping Units	27	21.85	0.16	0.19	0.28	0.176
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	12	9.61	0.07	0.08	0.32	0.188
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	8	4.97	0.04	0.06	0.35	0.206
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	4	1.11	0.01	0.03	0.37	0.226
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	5	3.75	0.03	0.03	0.39	0.232
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	4	2.70	0.02	0.03	0.40	0.240
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD peripheral fields	MD peripheral fields	3	0.58	0.00	0.02	0.42	0.257
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD derived from Cropping Units	3	0.71	0.01	0.02	0.44	0.272
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	MD derived from Cropping Units	3	1.15	0.01	0.02	0.46	0.284
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	3	1.80	0.01	0.02	0.47	0.292
MD Altered field patterns (Re-arranged)	MD derived from Strip Fields (Enclosed)	MD derived from Strip Fields (Enclosed)	MD derived from Strip Fields (Enclosed)	2	0.37	0.00	0.01	0.49	0.303
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	2	0.67	0.00	0.01	0.50	0.311
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Strip Fields (Enclosed)	2	0.76	0.01	0.01	0.51	0.320
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	2	1.27	0.01	0.01	0.52	0.324
Very High probability zone total				**119**	**67.29**	**0.50**	**0.81**		
MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	MD derived from Cropping Units	MD derived from Cropping Units	2	3.94	0.03	0.01	0.51	0.309
MD derived from Cropping Units	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	MD derived from Cropping Units	1	0.09	0.00	0.01	0.51	0.315
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Strip Fields (Enclosed)	1	0.10	0.00	0.01	0.52	0.321
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	MD derived from Cropping Units	1	0.21	0.00	0.01	0.53	0.327
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Amalgamated)	MD derived from Cropping Units	MD derived from Cropping Units	1	0.21	0.00	0.01	0.53	0.332
MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	1	0.24	0.00	0.01	0.54	0.337
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	MD derived from Cropping Units	1	0.29	0.00	0.01	0.55	0.342
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	1	1.11	0.01	0.01	0.55	0.341
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD derived from Cropping Units	MD derived from Cropping Units	1	2.34	0.02	0.01	0.54	0.330
Remainder of the high probability zone total				**10**	**8.53**	**0.06**	**0.09**		
Low probability zone total			Other	**16**	**59.68**	**0.44**	**0.11**	0	0
			Grand total	**145**	**135.50**				

Table 163. Probus study area. Combinations of HLC Sub-Types through four time-slices making up the very high probability zone of the enclosures model

11 Models based on Lowland Cornwall HLC: Penwith enclosures

11.1 The 1994 HLC model

Much of the Penwith study area is classed in the 1994 HLC as Farmland Prehistoric, Farmland Medieval or Farmland C20. In other words a large part falls within the high probability zone of the 1994 HLC model for enclosures (Lowland Cornwall Volume 1, section 8.2). As a result when the 1994 HLC model is applied to the study area its performance is good in terms of accuracy but poor in terms of precision. Although 79% of the enclosures are captured in the high probability zone a low Kvammes Gain of 0.165 is achieved because the high probability zone covers as much as 66% of the area (Fig 99).

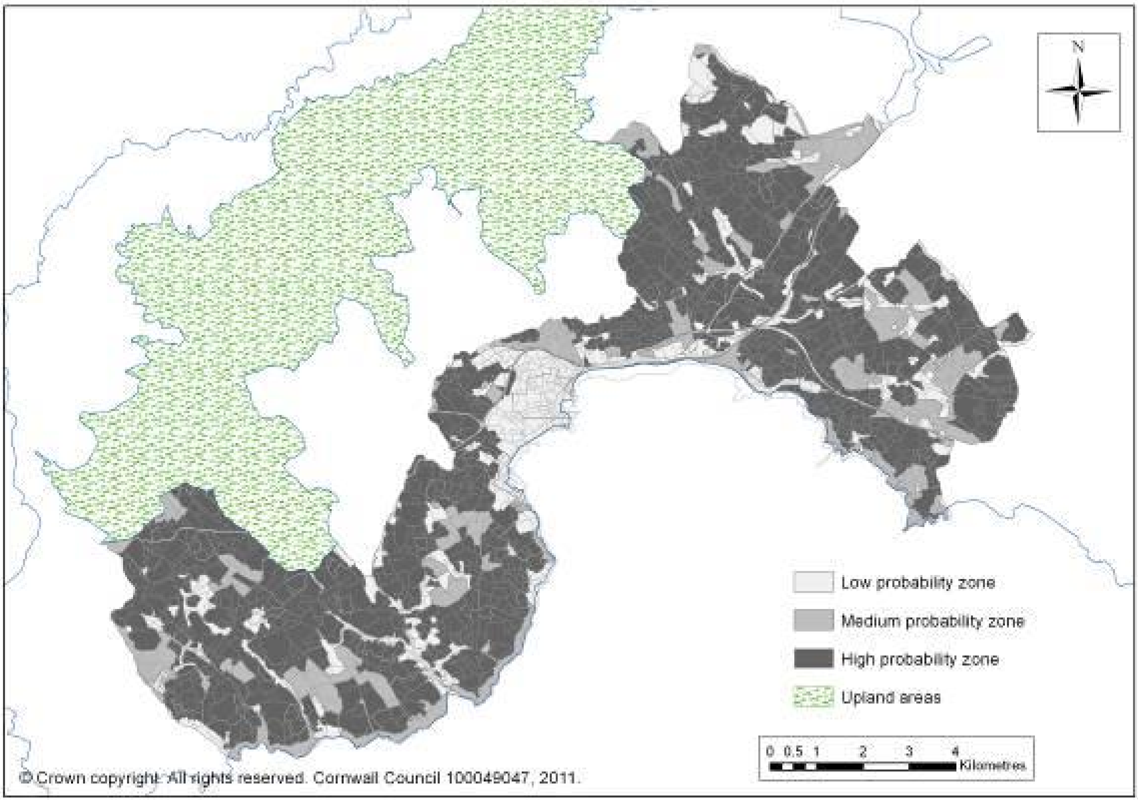

Fig 99. Map of the Penwith study area showing the 1994 HLC enclosures model

11.2 The Lowland Cornwall HLC models

11.2.1 HLC Types

The 2011, 1880 and 1840 time-slices of the Lowland Cornwall HLC produce more precise models than the 1994 HLC when models are based on HLC Type to give a broad overview. Medieval Enclosed Land is in each of these time-slices the highest ranked Type and Prehistoric Enclosed Land is ranked second. The same is true of the medieval time-slice, but in this time-slice model the Lowland Cornwall HLC Types produce a lower Kvammes Gain measure than the 1994 HLC model because a smaller proportion of the enclosures were captured in a similar sized area. For each time-slice Medieval Enclosed Land and/or Prehistoric Enclosed Land achieved the following results for the all enclosures dataset.

HLC Time-slice	PA	PS	Kvammes Gain
2011	0.592	0.762	0.223
1880	0.622	0.771	0.194
1840	0.638	0.790	0.192
Medieval	0.664	0.762	0.128

Table 164. PA, PS and Kvammes Gain values of the high probability zone for four of the time-slices in the Penwith study area. All enclosures.

When an equivalent model is built considering the high validity enclosures only, the rankings of each HLC Type are the same as above but the models are more precise, as indicated by higher gain measures (table 165).

HLC Time-slice	PA	PS	Kvammes Gain
2011	0.592	0.886	0.332
1880	0.622	0.886	0.298
1840	0.638	0.886	0.280
Medieval	0.664	0.864	0.258

Table 165. PA, PS and Kvammes Gain values of the high probability zone for four of the time-slices in the Penwith study area. High validity enclosures only.

11.2.2 HLC Sub-Types 2011 time-slice

For all except the medieval time-slice, more precise models can be produced using the HLC Sub-Types as variables. The highest Kvammes Gain for all enclosures, 0.376, is achieved by the 2011 time-slice (table 166).

	HLC Sub-Types	Enclosures	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Amalgamated)	45	0.283	0.429	0.250	0.146
2	PX Altered field patterns (Amalgamated)	17	0.053	0.162	0.388	0.255
3	MD Altered field patterns (Sub-Divided)	10	0.085	0.095	0.426	0.265
4	Mod Intakes	8	0.057	0.076	0.465	0.283
5	Deciduous woodland	3	0.014	0.029	0.485	0.298
6	MD Altered field patterns (Re-arranged)	6	0.113	0.057	0.453	0.242
7	Town	3	0.049	0.029	0.441	0.222
8	MD derived from Cropping Units	2	0.032	0.019	0.432	0.209
9	Mod New Farms (>5ha)	1	0.001	0.010	0.443	0.217
10	Farmstead	1	0.002	0.010	0.453	0.225
11	Emod Intakes	1	0.006	0.010	0.460	0.229
12	Emod Altered field patterns (Sub-Divided)	1	0.008	0.010	0.463	0.230
13	Hamlet	1	0.009	0.010	0.466	0.230
14	Valley Rough Ground (undivided)	1	0.011	0.010	0.467	0.229
15	Upland Rough Ground (divided)	1	0.014	0.010	0.465	0.225
16	Coastal Rough Ground (divided)	1	0.015	0.010	0.461	0.219
17	Valley Rough Ground (divided)	1	0.025	0.010	0.448	0.204
18	Emod Altered field patterns (Amalgamated)	1	0.035	0.010	0.421	0.179

19	PM Altered field patterns (Amalgamated)	1	0.044	0.010	0.380	0.144
20	Other	0	0.144	0	0	
	Total	105				

Table 166. The model for Penwith enclosures based on the 2011 time-slice HLC Sub-Types.

In this model the high probability zone is made up of the five highest ranked Sub-Types. Up to this point the cumulative Kj measures increase from 0.250 to 0.485, after which they fall to 0.453, thereby marking the cut-off point between the high and medium probability zones. Although the high probability zone includes two Medieval Enclosed Land Sub-Types and one Prehistoric Enclosed Land Sub-Type, it also contains Modern Intakes and Deciduous woodland. The high probability zone of this model captures 79% of the enclosures in 49% of the study area so is accurate and reasonably precise.

There are difficulties in defining the medium probability zone for this model because both Kj and Relative Gain values continue to fall until the ninth highest-ranked Sub-Type after which they both increase up to the thirteenth ranked Sub-Type. It is probably best, then, to define the medium probability zone as comprising those Sub-Types ranked sixth to thirteenth. This zone covers 22% of the study area and captures 15% of the enclosures. It produces a Kvammes gain of -0.44.

The low probability zone is formed by all other Sub-Types. It captures only 6% of the enclosures and covers 29% of the study area.

When an equivalent model considering only the high validity enclosures is built, the high probability zone is formed by the same four highest-ranked Sub-Types but with third and fourth-ranked positions reversed.

1	MD Altered field patterns (Amalgamated)
2	PX Altered field patterns (Amalgamated)
3	Mod Intakes
4	MD Altered field patterns (Sub-Divided)

These capture 86% of the enclosures and cover 43% of the study area, giving a Kvammes Gain measure of 0.501.

11.2.3 HLC Sub-Types 1880 time-slice

The 1880 time-slice model based on HLC Sub-Types produces an accurate but less precise model than the 2011 time-slice.

	HLC Sub-Types	Enclosures	PA	PS	Kj	Rel gain
1	PX Altered field patterns (Amalgamated)	16	0.057	0.152	0.121	0.096
2	MD Altered field patterns (Amalgamated)	21	0.180	0.200	0.202	0.116
3	MD Altered field patterns (Sub-Divided)	20	0.175	0.190	0.267	0.131
4	MD derived from Cropping Units	11	0.091	0.105	0.306	0.145
5	MD Altered field patterns (Re-arranged)	10	0.086	0.095	0.338	0.154
6	Upland Rough Ground (divided)	8	0.057	0.076	0.377	0.173
7	Valley Rough Ground (divided)	6	0.056	0.057	0.391	0.174
8	MD derived from Strip Fields (Enclosed)	2	0.013	0.019	0.402	0.180
9	Emod Intakes	2	0.023	0.019	0.402	0.177
10	Farmstead	1	0.000	0.010	0.414	0.186
11	Hamlet	1	0.004	0.010	0.423	0.192

12	PX Altered field patterns (Sub-Divided)	1	0.007	0.010	0.427	0.194
13	Upland Rough Ground (undivided)	1	0.009	0.010	0.430	0.194
14	Town	1	0.010	0.010	0.432	0.194
15	Coastal Rough Ground (divided)	1	0.013	0.010	0.430	0.191
16	Orchard	1	0.015	0.010	0.426	0.185
17	Emod New Smallholdings (<5ha)	1	0.019	0.010	0.417	0.176
18	PM Altered field patterns (Amalgamated)	1	0.027	0.010	0.398	0.158
19	Other	0	0.158	0.000	0.000	0.000
	Total	**105**				

Table 167. The model for Penwith enclosures based on the 1880 time-slice HLC Sub-Types.

There are difficulties in defining the cut-off point between the high and medium probability zones of this model because the cumulative Kj values continue to increase up to the fourteenth highest-ranked Sub-Type (Town). The high probability zone of this model is very accurate, capturing 96% of enclosures but not very precise as it covers 77% of the study area. However, the Relative Gain measures begin to decrease at the eighth highest-ranked Sub-Type (MD derived from Strip Fields (Enclosed)). If the eight highest-ranked Sub-Types are taken as forming the high probability zone then 89.5% of the enclosures are captured in 71.5% of the study area. Both models produce a Kvammes Gain of 0.202 so neither can be said to be very precise.

If the eight highest-ranked Sub-Types are accepted as forming the high probability zone the medium probability zone is probably best defined as comprising those Sub-Types ranked nine to 14. This zone captures 7% of the enclosures but covers only 5% of the study area. The low probability zone, formed by all other Sub-Types captures 4% of the enclosures and covers 23% of the study area.

When an equivalent model considering only the high validity enclosures is built, the high probability zone consists of the following five Sub-Types.

1	PX Altered field patterns (Amalgamated)
2	MD Altered field patterns (Amalgamated)
3	MD derived from Cropping Units
4	MD Altered field patterns (Re-arranged)
5	MD derived from Strip Fields (Enclosed)

This zone captures 82% of the enclosures in 42.6% of the study area and it achieves a Kvammes Gain measure of 0.479. These five Sub-Types were all included in the high probability zone of the all enclosures model, albeit with some differences in ranked positions. The main difference between this model and that for all enclosures is that Valley and Upland Rough Ground Types are not part of its high probability zone.

11.2.4 HLC Sub-Types 1840 time-slice

Again the 1840 time-slice produces an accurate model but one which lacks much precision.

	HLC Sub-Types	Enclosures	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Sub-Divided)	34	0.284	0.324	0.114	0.040
2	PX Altered field patterns (Amalgamated)	10	0.048	0.095	0.191	0.087
3	MD Altered field patterns (Re-arranged)	13	0.113	0.124	0.230	0.098
4	MD derived from Cropping Units	15	0.139	0.143	0.264	0.101
5	Upland Rough Ground (divided)	9	0.057	0.086	0.317	0.131
6	PX Altered field patterns (Sub-Divided)	4	0.015	0.038	0.353	0.154
7	PX field patterns	3	0.006	0.029	0.384	0.176
8	Valley Rough Ground (divided)	5	0.065	0.048	0.374	0.158
9	Emod Intakes	3	0.018	0.029	0.393	0.169
10	Hamlet	2	0.003	0.019	0.415	0.184
11	MD derived from Strip Fields (Enclosed)	2	0.019	0.019	0.419	0.185
12	MD peripheral fields	1	0.006	0.010	0.426	0.189
13	PX Altered field patterns (Re-arranged)	1	0.007	0.010	0.431	0.191
14	Coastal Rough Ground (divided)	1	0.012	0.010	0.429	0.188
15	Emod New Smallholdings (<5ha)	1	0.029	0.010	0.409	0.169
16	PM Intakes	1	0.066	0.010	0.335	0.112
17	Other	0	0.112	0.000	0.000	0.000
	Total	**105**				

Table 168. The model for Penwith enclosures based on the 1840 time-slice HLC Sub-Types.

Clearly the high probability zone of this model is formed by the seven highest-ranked Sub-Types because both Kj and Relative Gain measures begin to decrease when Valley Rough Ground (divided) (the eighth highest-ranked Sub-Type) is added to the model. These seven Sub-Types capture 84% of enclosures in 66% of the study area and produce a Kvammes Gain of 0.210.

The medium probability zone is formed by those Sub-Types ranked eight to 13: this zone captures 13% of the enclosures in 12% of the study area. The low probability zone is formed by all other Sub-Types and captures 3% of the enclosures in 22% of the study area. When considering the performance of all three probability zones this model can be said to work well, despite the lack of precision in the high probability zone.

When an equivalent model considering only the high validity enclosures is built the following seven Sub-Types are forming the high probability zone.

1	PX Altered field patterns (Amalgamated)	2
2	PX Altered field patterns (Sub-Divided)	6
3	PX field patterns	7
4	MD Altered field patterns (Sub-Divided)	1
5	MD derived from Strip Fields (Enclosed)	11
6	MD derived from Cropping Units	4
7	PX Altered field patterns (Re-arranged)	13

These Sub-Types capture 79.5% of the enclosures in 52% of the study area and achieve a Kvammes Gain measure of 0.348. There are significant differences between the make-up of this high probability zone and that of the all enclosures model, as shown in the right hand column of the table above. This lists the ranked position of each Sub-Type in the all enclosures model. The main differences are that Upland Rough Ground is not ranked in the high probability zone of this model and that the Sub-Types MD derived from Strip Fields (Enclosed) and PX Altered field patterns (Re-arranged) are: these were ranked in the medium probability zone of the all enclosures model.

11.2.5 HLC Sub-Types medieval time-slice

The medieval time-slice produces the least precise model of any.

	HLC Sub-Types	Enclosures	PA	PS	Kj	Rel gain
1	MD derived from Cropping Units	56	0.492	0.533	0.149	0.042
2	PX field patterns	13	0.061	0.124	0.262	0.104
3	Upland Rough Ground (undivided)	15	0.157	0.143	0.268	0.090
4	MD derived from Strip Fields (Enclosed)	8	0.074	0.076	0.284	0.092
5	Hamlet	2	0.003	0.019	0.311	0.108
6	Coastal Rough Ground (undivided)	3	0.037	0.029	0.303	0.099
7	PX Altered field patterns (Amalgamated)	2	0.014	0.019	0.313	0.104
8	Valley Rough Ground (undivided)	5	0.106	0.048	0.212	0.045
9	MD peripheral fields	1	0.023	0.010	0.179	0.032
10	Other	0	0.032	0.000	0.000	0.000
	Total	**105**				

Table 169. The model for Penwith enclosures based on the medieval time-slice HLC Sub-Types.

Kj measures indicate that the cut-off point between high and medium probability zones occurs when the sixth highest-ranked Sub-Type (Coastal Rough Ground (undivided)) is included. These Sub-Types capture 89.5% of enclosures in 79% of the study area: so the model is very accurate but not precise, with a low Kvammes Gain of 0.121.

A slightly more precise (though less accurate) performance is achieved by using the Relative Gain measures to define the high probability zone. In this scenario the two highest-ranked Sub-Types, MD derived from Cropping Units and PX field patterns, form the high probability zone. This model captures 66% of enclosures in 55% of the study area and produces a Kvammes Gain of 0.158.

When an equivalent model considering only the high validity enclosures is built, the high probability zone consists of the following four Sub-Types.

1	PX field patterns
2	MD derived from Cropping Units
3	MD derived from Strip Fields (Enclosed)
4	PX Altered field patterns (Amalgamated)

These capture 86.4% of the enclosures and cover 64% of the study area, giving a Kvammes Gain measure of 0.258. Again there are no Rough Ground Types in the high probability zone of this model by contrast with the all enclosures model. A further difference is that PX Altered field patterns (Amalgamated) is ranked in the medium probability zone of the all enclosures model.

11.2.6 Conclusions

For all time-slices apart from the medieval time-slice, models based on HLC Sub-Types produce more precise models than those based on HLC Types, and the 2011 Sub-Type model is considerably more precise than the HLC Types model. The Sub-Type models are also more accurate. However, the models cannot be described as significantly more precise – apart from the 2011 time-slice model, none produce a Kvammes Gain greater than 0.3, and the medieval time-slice model is less precise than the 1994 HLC model.

	HLC Types				HLC Sub-Types		
Time-slice	**PA**	**PS**	**Kvammes Gain**		**PA**	**PS**	**Kvammes Gain**
2011	0.592	0.762	0.223		0.493	0.790	0.376
1880	0.622	0.771	0.194		0.646	0.819	0.211
1840	0.638	0.790	0.192		0.662	0.838	0.210
Medieval	0.664	0.762	0.128		0.787	0.895	0.121

Table 170. Comparison of the performance of the high probability zones of models based on HLC Types and Sub-Types for each time-slice in the Penwith study area. All prehistoric and Romano-British enclosures.

	HLC Types				HLC Sub-Types		
Time-slice	**PA**	**PS**	**Kvammes Gain**		**PA**	**PS**	**Kvammes Gain**
2011	0.592	0.886	0.332		0.431	0.864	0.501
1880	0.622	0.886	0.298		0.426	0.818	0.479
1840	0.638	0.886	0.231		0.519	0.795	0.348
Medieval	0.664	0.864	0.232		0.641	0.864	0.258

Table 171. Comparison of the performance of the high probability zones of models based on HLC Types and Sub-Types for each time-slice in the Penwith study area. High validity enclosures only.

When models considering only the high validity enclosures are built, the HLC Sub-Types produce significantly more precise high probability zones, although overall they are slightly less accurate than the models using HLC Types as their variables.

Although the high probability zones of the models for all the time-slices are made up predominantly of Medieval and Prehistoric Enclosed Land Sub-Types they also include Rough Ground and former Rough Ground Types and Sub-Types. This is especially the case for the medieval time-slice model.

There are differences between the all enclosures models and those for high validity enclosures. In particular the high probability zones of the high validity enclosure models for all but the 2011 time-slice are formed exclusively by Medieval and Prehistoric Enclosed Land Sub-Types. These differences are clearest in the 1840 time-slice, in which the Sub-Types are ranked very differently from the equivalent all enclosures model.

11.2.7 HLC Sub-Types all time-slices

When all time-slices are considered in combination a much more precise model can be achieved. This model was created in a similar way as that described for the Probus study area (section 10.2.7), with most polygons classed as Medieval or Prehistoric Enclosed Land in at least one time-slice being included in the High Probability zone. The exception to this were polygons which in some time-slices were classed as Major roads, Railways, Reservoirs, Timber plantation, Industrial or Infrastructure. The high probability zone of this model captured 81% of enclosures in 66% of the study area so is very accurate but not precise, producing a low Kvammes Gain of 0.187.

The very high probability zone captures 73% of the enclosures in 38% of the study area, so is reasonably accurate and precise, with a Kvammes Gain of 0.483. The Sub-Types forming the very high probability zone are set out in table 173, the overall performance of the model is shown in table 172 and a map showing the probability zones is presented in Fig 100.

When this model was run against the high validity enclosures only, 91% of the enclosures were captured in the overall high probability zone, producing a Kvammes Gain of 0.276, and 79.5% of the enclosures were captured in the very high probability zone which achieved a Kvammes Gain of 0.523.

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain
Very High	35.569	77	0.379	0.733	0.483
High*	61.774	85	0.658	0.810	0.187
Low	32.064	20	0.342	0.190	-0.794

Table 172. Results of the regressive model for all enclosures in the Penwith study area.* includes the very high probability zone.

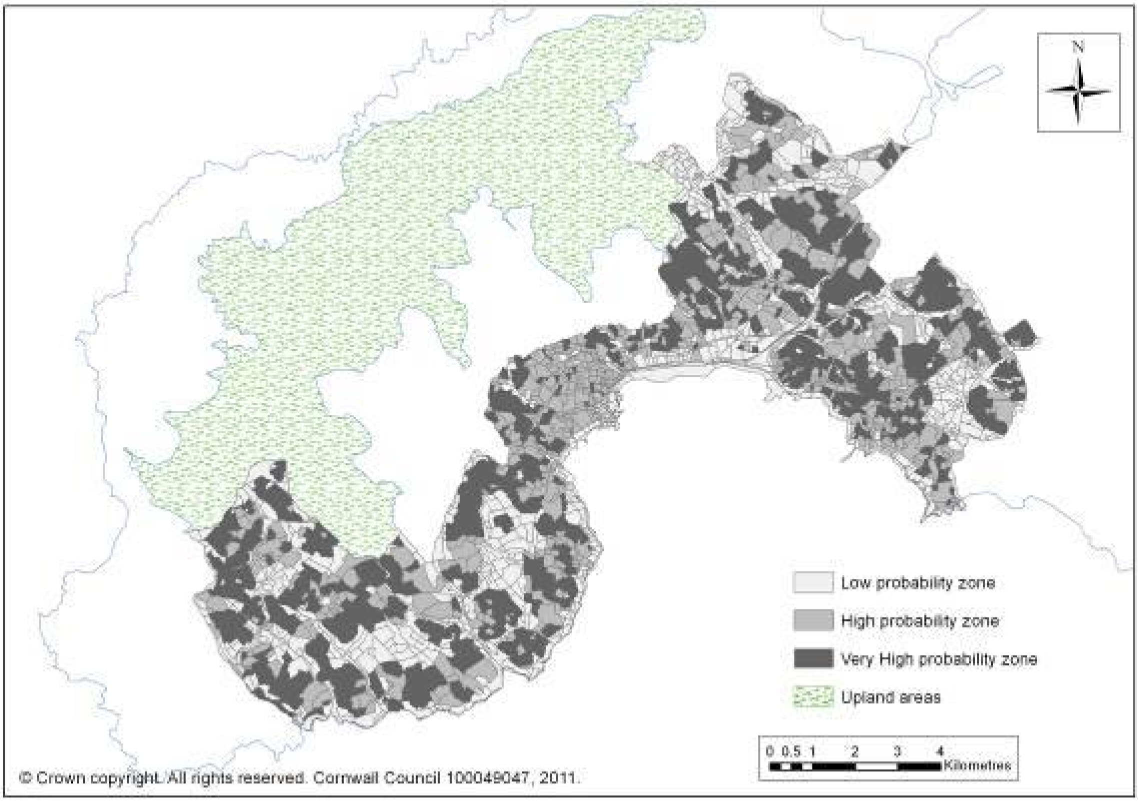

Fig 100. Map showing the regressive model for prehistoric and Romano-British enclosures in the Penwith study area.

11.2.8 Discussion

Overall when the Lowland Cornwall HLC is used to create models for all enclosures in the Penwith study area the Sub-Types produce models which are very accurate but not very precise, although the 2011, 1880 and 1840 models are more precise than the 1994 HLC model. The Lowland Cornwall HLC Types produce models which are broadly similar to the 1994 model.

The high probability zones of the models in all time-slices were made up predominantly of Medieval and Prehistoric Enclosed Land Sub-Types, although in some time-slice models Rough Ground and former Rough Ground Types were also included. However, this was not the case with the high validity enclosure models, whose high probability zones were all formed exclusively by Medieval and Prehistoric Enclosed Land Sub-Types. The high validity enclosure models were also considerably more precise than the all enclosures models and roughly the same in terms of accuracy.

In fact a significant feature of the enclosure dataset for the Penwith study area is the high ratio of low validity enclosures: 58% were awarded a validity rating of 2 or less. In particular 41 enclosures are recorded in the HER as either identified from documentary sources or as former sites which have since been destroyed. When only the high validity enclosures were considered better performing models, some with high probability zones with different make-ups than the all enclosures models, were produced.

Of the 44 high validity enclosures, only five are in land not classed as Prehistoric or Medieval Enclosed Land. Three are located in Modern Intakes (which was formerly Rough Ground). One is located in Post Medieval Enclosed Land which was formerly Upland Rough Ground. The fifth enclosure, PRN 53395 at Castallack Carn, is in land classed as Valley Rough Ground (divided) in the 2011 time-slice, but which was classed as Prehistoric Enclosed Land in the Prehistoric time-slice. In other words only 9% of the high validity enclosures are located in land not classed as Medieval or Prehistoric Enclosed in at least one time-slice.

By contrast 20 out of the 61 low validity enclosures (almost a third) are located in land not classed as Medieval or Prehistoric Enclosed in the 2011 time-slice. Three have a validity rating of 2, and the other 17 are rated zero (in other words no remains were visible during the NMP mapping project). Other than three enclosures recorded from Penzance (in what was formerly Medieval Enclosed Land), one from the HLC Type Farmstead and one from ‘Hamlet’, all these enclosures were situated in what was formerly Rough Ground of one type or another. Of these, 14 are recorded from documentary sources. This level of variance, and the fact that there are differences in the make-up of the high probability zones of the all enclosures and high validity enclosures models, does suggest that the interpretation of some low validity enclosures could be questioned, particularly those recorded from documentary references.

The regressive model, combining all five time-slices, produced a more precise model whose very high probability zone captured 73% of the enclosures. As in the case of the Probus study area, amalgamated field Sub-Types are the most important in terms of predicting the location of enclosures: in the 2011 time slice 18 out of the 31 Sub-Type combinations making up the high probability zone are amalgamated Sub-Types, although in the case of Penwith these include Prehistoric Altered as well as Medieval Altered field patterns. In fact 48% of the enclosures captured in the very high probability zone are in land classed as cropping units in the medieval time-slice and amalgamated fields in the 2011 time-slice: 14% are in land classed as prehistoric amalgamated fields in the 2011 time-slice. In other words two thirds of the very high probability enclosures are in fields which have been amalgamated during the twentieth century or earlier.

2011	1880	1840	Medieval	Enclosures	Area (km2)	PA	PS	Cum Kj	Rel Gain
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	14	6.927	0.074	0.133	0.089	0.060
MD Altered field patterns (Amalgamated)	MD derived from Cropping Units	MD derived from Cropping Units	MD derived from Cropping Units	7	2.727	0.029	0.067	0.139	0.097
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	9	5.317	0.057	0.086	0.190	0.126
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	Upland Rough Ground (undivided)	3	0.113	0.001	0.029	0.220	0.154
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX field patterns	PX field patterns	3	0.161	0.002	0.029	0.249	0.180
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX Altered field patterns (Sub-Divided)	PX field patterns	3	0.168	0.002	0.029	0.277	0.207
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX field patterns	4	2.335	0.025	0.038	0.300	0.220
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	4	2.453	0.026	0.038	0.322	0.232
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	MD derived from Cropping Units	2	0.78	0.008	0.019	0.337	0.243
MD Altered field patterns (Amalgamated)	MD derived from Strip Fields (Enclosed)	MD derived from Strip Fields (Enclosed)	MD derived from Strip Fields (Enclosed)	2	0.884	0.009	0.019	0.350	0.253
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	2	0.94	0.010	0.019	0.363	0.262
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Strip Fields (Enclosed)	2	1.12	0.012	0.019	0.375	0.269
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	3	2.27	0.024	0.029	0.388	0.273
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	2	1.281	0.014	0.019	0.399	0.279
Mod Intakes	Upland Rough Ground (divided)	Upland Rough Ground (divided)	Upland Rough Ground (undivided)	1	0.016	0.000	0.010	0.409	0.288
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD peripheral fields	MD peripheral fields	1	0.033	0.000	0.010	0.419	0.297
Town	Town	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	1	0.038	0.000	0.010	0.429	0.306
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX Altered field patterns (Re-arranged)	PX Altered field patterns (Amalgamated)	1	0.063	0.001	0.010	0.438	0.315
MD Altered field patterns (Amalgamated)	Valley Rough Ground (divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	1	0.07	0.001	0.010	0.448	0.324
Town	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD derived from Strip Fields (Enclosed)	1	0.102	0.001	0.010	0.457	0.332
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Sub-Divided)	PX Altered field patterns (Amalgamated)	PX field patterns	1	0.122	0.001	0.010	0.466	0.341
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Amalgamated)	MD derived from Cropping Units	MD derived from Cropping Units	1	0.151	0.002	0.010	0.475	0.348
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Strip Fields (Enclosed)	1	0.225	0.002	0.010	0.483	0.356
Town	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Strip Fields (Enclosed)	1	0.287	0.003	0.010	0.491	0.362
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	1	0.321	0.003	0.010	0.499	0.368
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Strip Fields (Enclosed)	1	0.405	0.004	0.010	0.506	0.373
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX Altered field patterns (Sub-Divided)	PX Altered field patterns (Amalgamated)	1	0.442	0.005	0.010	0.513	0.378
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	1	0.555	0.006	0.010	0.519	0.382
MD Altered field patterns (Re-arranged)	PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX field patterns	1	0.755	0.008	0.010	0.523	0.383
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	1	0.876	0.009	0.010	0.527	0.383
MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	MD derived from Cropping Units	MD derived from Cropping Units	1	0.91	0.010	0.010	0.530	0.383
Very High probability zone total				**77**					

Table 173. Penwith study area. Combinations of HLC Sub-Types through five time-slices forming the very high probability zone of the enclosures model.

12 Models based on Lowland Cornwall HLC: Pelynt enclosures

12.1 The 1994 HLC model

Much of the Pelynt study area is classed in the 1994 HLC as Farmland Medieval or Farmland C20. In other words a large part falls within the high probability zone of the 1994 HLC model for enclosures (Lowland Cornwall Volume 1, section 8.2). Consequently when the 1994 HLC model is applied to the study area its performance is good in terms of accuracy but weak in terms of precision. So although 95% of the Pelynt enclosures are captured in the high probability zone a modest Kvammes Gain of 0.221 is achieved because the high probability zone covers 74% of the area (Fig 101).

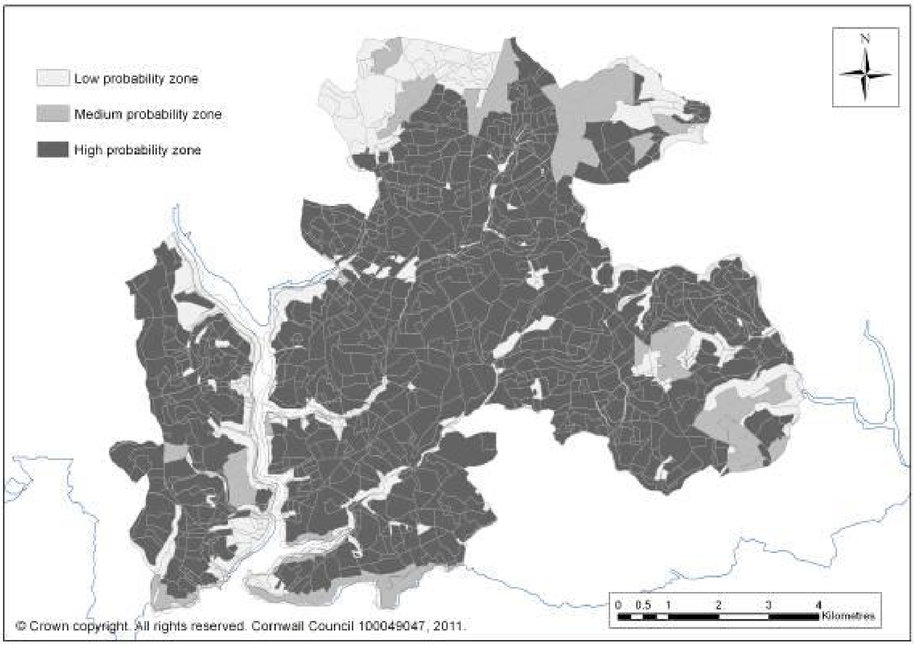

Fig 101. Map of the Pelynt study area showing the 1994 HLC enclosures model

12.2 The Lowland Cornwall HLC models

By comparison each time-slice of the Lowland Cornwall HLC produces more precise models.

12.2.1 HLC Types

When models are based on HLC Type to give a broad overview, Medieval Enclosed Land is in each case the highest ranked Type and each time-slice produces a higher Kvammes Gain measure than the 1994 HLC model, albeit only slightly higher (table 174).

HLC Time-slice	PA	PS	Kvammes Gain
2011	0.678	0.91	0.254
1880	0.703	0.96	0.264
1840	0.705	0.96	0.261
Medieval	0.725	0.96	0.241

Table 174. PA, PS and Kvammes Gain values of the high probability zone for each of the four time-slices in the Pelynt study area. All prehistoric and Romano-British enclosures.

When an equivalent model considering only the high validity enclosures is built all the enclosures (eight in total) are located within Medieval Enclosed Land, resulting in more precise models as indicated by higher gain measures set out in the table below.

HLC Time-slice	PA	PS	Kvammes Gain
2011	0.678	1.0	0.322
1880	0.703	1.0	0.297
1840	0.705	1.0	0.295
Medieval	0.725	1.0	0.275

Table 175. PA, PS and Kvammes Gain values of the high probability zone for each of the four time-slices in the Pelynt study area. High validity enclosures only.

The fact that the Kvammes Gain measures are highest in the more recent time-slices reflects the shrinkage in Medieval Enclosed Land as this has been altered through time. Whereas in the medieval time-slice some 65 km^2 of the area was classified as Medieval Enclosed Land, by the time of the present (2011) time-slice this area had shrunk to $60km^2$.

12.2.2 HLC Sub-Types 2011 time-slice

More precise models can be produced using the HLC Sub-Types rather than Types as variables. Table 176 below shows how each Sub-Type is ranked based on the 2011 time-slice.

	HLC Sub-Types	Enclosures	PA	PS	Kj cum	Rel gain
1	MD Altered field patterns (Amalgamated)	15	0.372	0.682	0.459	0.309
2	Farmstead	1	0.003	0.045	0.506	0.351
3	Emod Altered field patterns (Amalgamated)	1	0.020	0.045	0.539	0.376
4	MD Altered field patterns (Sub-Divided)	2	0.086	0.091	0.574	0.381
5	MD derived from Cropping Units	1	0.038	0.045	0.594	0.388
6	MD Altered field patterns (Re-arranged)	2	0.177	0.091	0.550	0.302
7	Other	0	0.302	0	0	0
	Total	**22**				

Table 176. The model for Pelynt enclosures based on the 2011 time-slice HLC Sub-Types

Both cumulative Kj parameter and Relative Gain measures continue to increase until the fifth highest ranked Sub-Type, thereby clearly defining the cut-off point between high and medium probability zones. The high probability zone captures 91% of the enclosures in 52% of the study area and achieves a Kvammes Gain of 0.427.

The medium probability zone can be defined as the next highest ranked Sub-Type, MD Altered field patterns (Re-arranged). This covers almost 18% of the study area but only captures 9% of the enclosures. The low probability zone is formed by all other Sub-Types, covers 30% of the study area and contains no enclosures.

When an equivalent model considering only the eight high validity enclosures is built the high probability zone is formed by the following three Sub-Types (in the order in which they are ranked).

MD Altered field patterns (Amalgamated)
MD Altered field patterns (Sub-Divided)
MD derived from Cropping Units

All the enclosures are captured in this combination of Sub-Types, which covers 49.7% of the study area, meaning that the model achieves a Kvammes Gain of 0.503. Essentially the high validity enclosures produce a two-zone sites/no sites model.

12.2.3 HLC Sub-Types 1880 time-slice

The enclosure captured in the HLC Type Farmstead in the 2011 time-slice is located in Medieval Enclosed Land in the 1880 and earlier time-slices. As a result these time-slices produce slightly less precise but more accurate models.

	HLC Sub-Types	Enclosures	PA	PS	Kj cum	Rel gain
1	MD Altered field patterns (Sub-Divided)	9	0.234	0.409	0.267	0.175
2	MD Altered field patterns (Amalgamated)	8	0.222	0.364	0.494	0.316
3	MD derived from Cropping Units	3	0.123	0.136	0.547	0.330
4	Emod Intakes	1	0.040	0.045	0.566	0.335
5	MD Altered field patterns (Re-arranged)	1	0.105	0.045	0.526	0.276
6	Other	0	0.276	0.000	0.000	0.000
	Total	**22**				

Table 177. The model for Pelynt enclosures based on the 1880 time-slice HLC Sub-Types

The Kj and Relative Gain values indicate that the high probability zone is formed by the four highest ranked Sub-Types. This zone captures 95.5% of the enclosures and covers 62% of the study area. This is very accurate and reasonable precise, with a Kvammes Gain of 0.351. The medium probability zone, formed by MD Altered field patterns (Re-arranged), covers 10.5% of the study area but only captures 4.5% of the enclosures. The low probability zone, formed by all other Sub-Types, covers 27.6% of the study area and has no enclosures.

As in the 2011 time-slice, when only the high validity enclosures are considered a two zone sites/no sites model is produced. The zone with sites is formed by the following Sub-Types and produces a Kvammes Gain of 0.420:

MD Altered field patterns (Sub-Divided)
MD derived from Cropping Units
MD Altered field patterns (Amalgamated)

12.2.4 HLC Sub-Types 1840 time-slice

A slightly weaker model is produced by the 1840 time-slice.

	HLC Sub-Types	Enclosures	PA	PS	Kj cum	Rel gain
1	MD Altered field patterns (Sub-Divided)	13	0.368	0.591	0.363	0.223
2	MD derived from Cropping Units	5	0.161	0.227	0.486	0.289
3	MD Altered field patterns (Amalgamated)	1	0.011	0.045	0.528	0.323
4	MD peripheral fields	1	0.018	0.045	0.564	0.350
5	Upland Rough Ground (undivided)	1	0.021	0.045	0.598	0.375
6	MD Altered field patterns (Re-arranged)	1	0.133	0.045	0.536	0.287
7	Other	0	0.287	0	0	0
	Total	**22**				

Table 178. The model for Pelynt enclosures based on the 1840 time-slice HLC Sub-Types

Kj measures and Relative Gains indicated the high probability zone consists of the five highest ranked Sub-Types. These cover 58% of the study area and capture 95.5% of the enclosures, producing a Kvammes Gain of 0.393. The medium probability zone is formed by MD Altered field patterns (Re-arranged), covering 13.3% of the area but only capturing 4.5% of the enclosures. The low probability zone is made up of all other Sub-Types, contains no enclosures and covers almost 29% of the study area.

When only the high validity enclosures are considered the following three Sub-Types form the high probability zone (in the order they are ranked):

MD derived from Cropping Units
MD Altered field patterns (Sub-Divided)
MD peripheral fields

This combination of Sub-Types captures all the enclosures in 55% of the study area and produces a Kvammes Gain of 0.452. So again this is a sites/no sites model.

12.2.5 HLC Sub-Types medieval time-slice

The medieval time-slice produces a significantly weaker model than the others.

	HLC Sub-Types	Enclosures	PA	PS	Kj cum	Rel gain
1	MD derived from Cropping Units	19	0.610	0.864	0.468	0.253
2	MD peripheral fields	1	0.040	0.045	0.485	0.259
3	Upland Rough Ground (undivided)	1	0.066	0.045	0.477	0.238
4	MD derived from Strip Fields (Enclosed)	1	0.075	0.045	0.457	0.209
7	Other	0	0.209	0	0	0
	Total	**22**				

Table 179. The model for Pelynt enclosures based on the medieval time-slice HLC Sub-Types

The high probability zone is formed by the Sub-Types MD derived from Cropping Units and MD peripheral fields. These capture 91% of the enclosures, but because these two Sub-Types cover 65% of the study area the Kvammes Gain is only 0.285.

The medium probability zone is formed by the Sub-Types ranked 3 and 4. Together these make up 40% of the study area and capture 9% of the enclosures. The low probability zone is made up of all other Sub-Types; it covers almost 21% of the study area and has no enclosures.

The weakness of the model in comparison with those for the other time-slices is twofold. Firstly it is less precise, with a significantly lower Kvammes Gain measure, and secondly the poor performance of the medium probability zone which covers a large area but captures a disproportionately low percentage of the enclosures. In fact it is performing virtually as a two-zone model with high and low probability zones.

When only the high validity enclosures are considered the high probability zone is formed by MD derived from Cropping Units (7 enclosures) and MD peripheral fields (1 enclosure). Together these Sub-Types cover 65% of the study area and capture all the enclosures, thereby producing a two zone sites/no sites model. The high probability zone achieves a Kvammes Gain of 0.350.

12.2.6 Conclusions

In the Pelynt study area HLC Sub-Types produce more precise models than HLC Types, and for the 2011, 1880 and 1840 time-slices the models are considerably more precise. Apart from the medieval time-slice the Sub-Type models are also of a similar level of accuracy as those based on HLC Types (table 180).

	HLC Types				**HLC Sub-Types**		
Time-slice	**PA**	**PS**	**Kvammes Gain**		**PA**	**PS**	**Kvammes Gain**
2011	0.678	0.909	0.254		0.521	0.909	0.427
1880	0.703	0.955	0.264		0.619	0.955	0.351
1840	0.705	0.955	0.261		0.580	0.955	0.393
Medieval	0.725	0.955	0.241		0.650	0.909	0.285

Table 180. Comparison of the performance of models based on HLC Types and Sub-Types for each time-slice in the Pelynt study area. All prehistoric and Romano-British enclosures.

When only the high validity enclosures are considered, the Sub-Types produce considerably more precise models than the HLC Types over all four time-slices (table 181).

	HLC Types				**HLC Sub-Types**		
Time-slice	**PA**	**PS**	**Kvammes Gain**		**PA**	**PS**	**Kvammes Gain**
2011	0.678	1.0	0.322		0.497	1.0	0.503
1880	0.703	1.0	0.297		0.580	1.0	0.420
1840	0.705	1.0	0.295		0.548	1.0	0.452
Medieval	0.725	1.0	0.275		0.650	1.0	0.350

Table 181. Comparison of the performance of models based on HLC Types and Sub-Types for each time-slice in the Pelynt study area. High validity enclosures only.

12.2.7 HLC Sub-Types all time-slices

When the time-slices for each HLC polygon are used in combination a more precise model is achievable. If the Kj values are used to define the cut-off point then all combinations of Sub-Types in which enclosures are recorded would form the very high probability zone, producing a two zone sites/no sites model. A more satisfactory model was achieved by defining the cut-off point for the very high probability zone as the point where the previously increasing cumulative Relative Gain values began to decline. The combinations of Sub-Types forming the very high probability zone of this model are listed in table 183 and the cut-off point occurs when the cumulative Relative Gain drops from 0.615 to 0.610. This zone covers 26.029 square kilometres which equates to 29% of the study area, and it captures 20 enclosures – 91% of the total. This achieves a Kvammes Gain of 0.679.

The Sub-Types in the combination of time-slices which capture the highest number of enclosures are:

Time-slice	HLC Sub-Type
2011	MD Altered fields (Amalgamated)
1880	MD Altered fields (Sub-Divided)
1840	MD Altered fields (Sub-Divided)
Medieval	MD derived from Cropping Units

HLC polygons with this combination of Sub-Types over time capture 36% of the enclosures within 9% of the study area and attain a Kvammes Gain measure of 0.750.

Below this is a combination of time-slices classed as MD Altered fields (Amalgamated) in the 2011 time-slice and MD derived from Cropping Units in all previous time-slices. This combination covers 5% of the study area and captures one enclosure (4.5% of the total number of enclosures). This combination forms the remainder of the high probability zone of the model along with other combinations of Medieval Enclosed Land from which no enclosures are recorded. Overall the high probability zone captures 95.5% of the enclosures in 72% of the study area, giving a Kvammes Gain of 0.247. The performance of the model is shown in table 199 below and a detailed breakdown of the very high probability zone in table 183.

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain
Very High	26.029	20	0.292	0.909	0.679
High*	64.120	1	0.719	0.955	0.247
Low	25.035	1	0.281	0.045	-5.178

Table 182. Regressive model for prehistoric and Romano-British enclosures in the Pelynt study area. *includes very high probability zone.

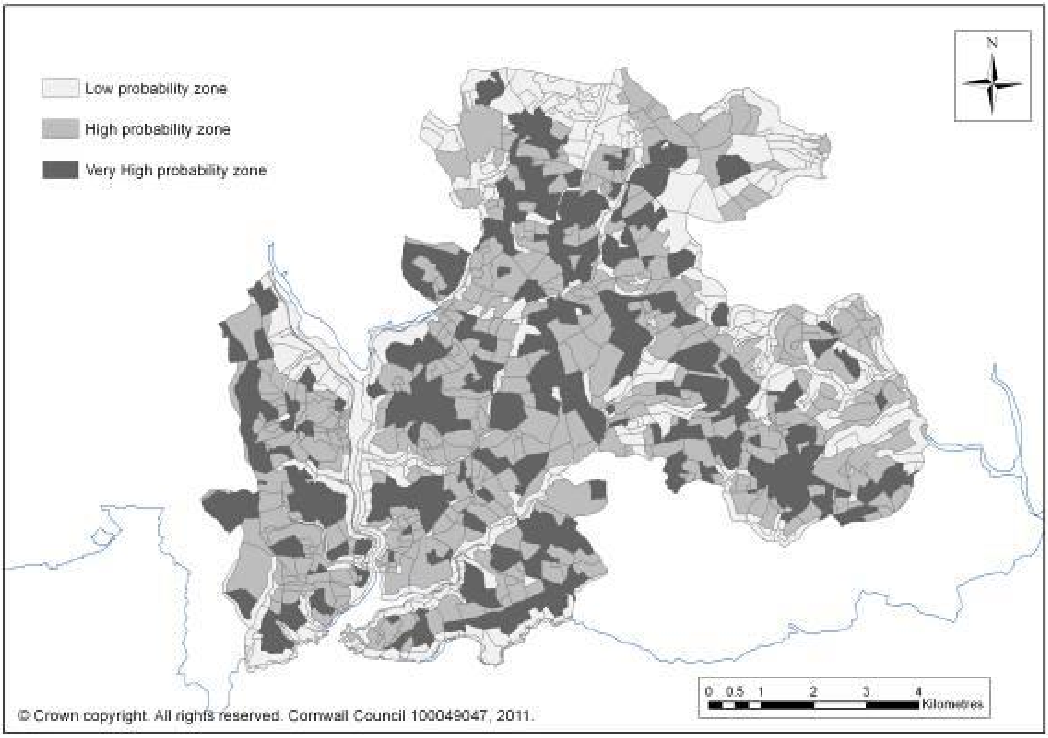

Fig 102. Map showing the regressive model for prehistoric and Romano-British enclosures in the Pelynt study area

When this model was run against the high validity enclosures only, a slightly better result was obtained, with all eight high validity enclosures captured within the very high probability zone and a Kvammes Gain of 0.708.

12.2.8 Discussion

There are fewer enclosures recorded from Pelynt than any of the other study areas and the small size of the sample means that the results are likely to be statistically the least meaningful. The size of the sample also probably explains why the high validity enclosures produce sites/no sites models and why the models for all enclosures can largely be seen as two-zone models with high and low probability zones.

Nonetheless some broad conclusions can be drawn. Firstly, these figures show that the Lowland Cornwall HLC Types can be used to produce more precise models than the 1994 HLC Types, and that in all four time-slices the highest-ranked HLC Type is Medieval Enclosed Land.

The HLC Sub-Types produce more precise models than the HLC Types without any great loss of accuracy. In all time-slices more than 90% of the enclosures were captured in the high probability zones and higher Kvammes Gain measures were achieved than are attainable by the HLC Types. The most precise model was that based on combinations of Sub-Types over all four time-slices, whose very high probability zone produced a Kvammes Gain of 0.679.

There are some slight differences between the models produced by including all enclosures and those in which only the high validity enclosures are included. This is particularly the case in the 1840 time-slice in which the three highest-ranked Sub-Types in the all enclosures model are:

MD Altered field patterns (Sub-Divided)
MD derived from Cropping Units
MD Altered field patterns (Amalgamated)

But in the high validity enclosures model are:

MD derived from Cropping Units
MD Altered field patterns (Sub-Divided)
MD peripheral fields

The biggest difference, however, is the inclusion of the Sub-Types Farmstead and Emod Altered field patterns (Amalgamated) in the high probability zone of the 2011 time-slice in the all enclosures model. A single enclosure is located in each of these Sub-Types and both are recorded from documentary evidence alone (PRN 25197.1 and 25196). There is no difficulty in accepting that prehistoric or Romano-British settlement enclosures may lie beneath farms with early Cornish place-names, as has previously been postulated (e.g. Johnson1998; Rose and Preston-Jones 1995). In this case the farmstead in question, at Cardwen, Pelynt, does have a Cornish place-name, *Ker*, meaning 'fort' (Padel 1985), and in the three previous time-slices this site is in land classed as Medieval Enclosed Land. However, the record of the enclosure (PRN 25196) located in Early Modern Enclosed Land is less convincing. It lies 230m southeast of Bury Down hillfort in land taken in from Upland Rough Ground (undivided) but no trace of it was identified during Cornwall's NMP survey. The reference (Lysons 1814) describes a 'very small camp 800ft to the southeast of Bury Down fort of an irregular triangular form, called Little-bury'. However, in 1972 the OS surveyor could find no trace of this enclosure so there is some doubt about its existence.

This raises the question of whether the models built using only the high validity enclosures are more reliable than those based on all enclosures and also questions the veracity of documentary records. More detailed analysis of the documentary records than was possible during the Lowland Cornwall project might better identify those which are reliable and those which might legitimately be questioned.

Nonetheless there are broad patterns in the location of the enclosures. As in the Probus and Penwith study areas the Sub-Type MD Altered field patterns (Amalgamated) dominates the high probability zone of the more recent time-slices: in the very high probability zone of the regressive model 2011 time-slice it is present in five of the 11 highest ranked Sub-Type combinations and in six in the 1880 time-slice. The next most populous Sub-Type is MD Altered field patterns (Sub-Divided), especially in the 1840 time-slice. In the medieval time-slice MD derived from Cropping Units is the dominant Sub-Type.

To a large extent this reflects changes in land use over time. In the Pelynt study area at the end of the medieval period as much as 83% of Medieval Enclosed Land was derived from cropping units. By 1840 almost half of these fields had been sub-divided. Since 1840 the extent of fields derived from cropping units has shrunk dramatically as a result of amalgamation and a large portion of the sub-divided fields have also undergone amalgamation.

Sub-Type	SubType1	SubType2	SubType3	Sites	Area	PA	PS	KJ	R gain
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	8	8.103	0.091	0.364	0.315	0.273
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	3	7.004	0.079	0.136	0.407	0.331
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD derived from Strip Fields (Enclosed)	1	0.068	0.001	0.045	0.452	0.375
Farmstead	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	1	0.174	0.002	0.045	0.497	0.419
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD peripheral fields	MD peripheral fields	1	0.428	0.005	0.045	0.541	0.459
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Amalgamated)	MD derived from Cropping Units	MD derived from Cropping Units	1	0.538	0.006	0.045	0.583	0.499
MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	MD derived from Cropping Units	MD derived from Cropping Units	1	0.999	0.011	0.045	0.623	0.533
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	1	1.240	0.014	0.045	0.661	0.565
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD derived from Cropping Units	MD derived from Cropping Units	1	1.260	0.014	0.045	0.698	0.596
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	1	2.828	0.032	0.045	0.726	0.610
MD derived from Cropping Units	MD derived from Cropping Units	MD derived from Cropping Units	MD derived from Cropping Units	1	3.387	0.038	0.045	0.749	0.617
Very High probability zone total				**20**	**26.029**	**0.293**	**0.905**		

Table 183. Pelynt study area. Combinations of HLC Sub-Types through four time-slices forming the very high probability zone of the enclosures model.

13 Models based on Lowland Cornwall HLC: Poundstock enclosures

13.1 The 1994 HLC model

As is the case with the other three study areas, the 1994 HLC Types Farmland Medieval and Farmland C20 are very extensive, covering 73% of the Poundstock study area. These HLC Types form the high probability zone of the 1994 HLC enclosures model. Not surprisingly, therefore, that 21 of the 33 enclosures recorded from the Poundstock study area are captured in this zone. However, this is only 64% of the enclosures and, because the zone covers 73% of the study area, the high probability zone produces a negative gain measure (a Kvammes Gain of -0.147 and a Relative Gain of -0.094). In fact it is the medium probability zone of this model that is ranked highest when applied to this study area, as set out in table 184.

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain
Medium	11.164	9	0.174	0.273	0.360
High	46.707	21	0.730	0.636	-0.147
Low	6.110	3	0.095	0.091	-0.050
Total	**63.981**	**33**			

Table 184. 1994 HLC model for enclosures applied to the Poundstock study area.

When the model is run against the high validity enclosures only, its performance is even worse. Although 11 out of the 18 enclosures (65%) are captured in the high probability zone this zone is actually ranked third out of the three zones (the low probability zone captures 12% of the enclosures in 10% of the study area and therefore is ranked second). The extent of the three probability zones of this model are shown in Fig 103

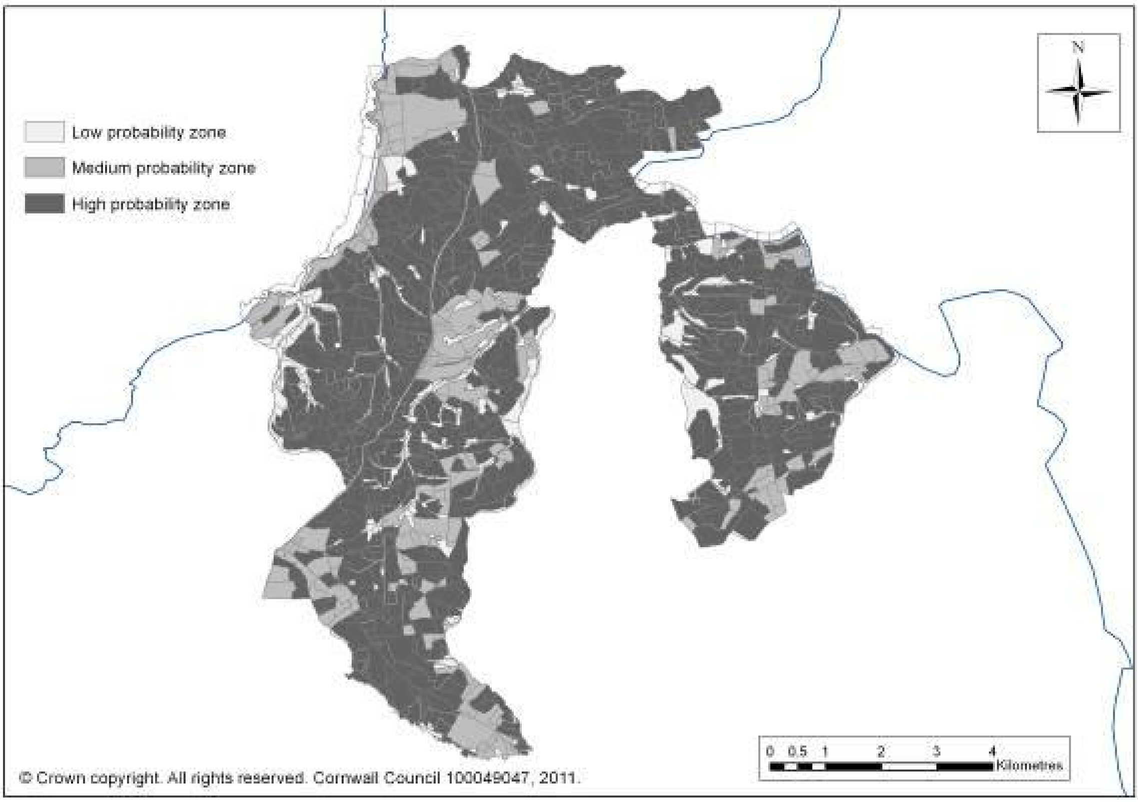

Fig 103. Map of the Poundstock study area showing the 1994 HLC enclosures model

Clearly the 1994 HLC model for enclosures does not apply well to the Poundstock study area. The zone with the greatest Kvammes Gain measure (the medium probability zone) only captures 27% of the enclosures; the high probability zone produces a negative gain measure and the low probability zone performs essentially as a by chance distribution (9.1% of enclosures in 9.5% of the study area). All the enclosures captured in the medium probability zone of this model are located in land classed in the 1994 HLC as Farmland Post medieval.

13.2 The Lowland Cornwall HLC models

13.2.1 HLC Types

When HLC Types are used as the basis for modelling they produce a better result than the 1994 HLC, albeit with a notable lack of precision. For each time-slice Medieval Enclosed Land is the highest ranked HLC Type but the Kvammes Gains produced are very low, as shown in the table below.

HLC Time-slice	PA	PS	Kvammes Gain
2011	0.604	0.727	0.170
1880	0.610	0.667	0.085
1840	0.634	0.667	0.050
Medieval	0.645	0.727	0.113

Table 185. Performance of the Lowland Cornwall HLC model for enclosures based on HLC Types in the Poundstock study area.

As is the case for the other study areas, the extent of Medieval Enclosed Land has shrunk through time – in Poundstock by 4%. An apparent inconsistency in these figures is the fact that whilst almost 73% of the enclosures are recorded from Medieval Enclosed Land in the 2011 and medieval time-slices, this percentage falls to 66.7 in the 1880 and 1840 time-slices. The reason for this discrepancy is that some areas that were once enclosed and farmed reverted to rough ground before being re-used as farmland by the time of the 2011 time-slice. The land use history of these areas is set out in the table below.

HLC time-slice	HLC Type or Sub-Type
2011	MD Altered field patterns (Re-arranged)
1880	Upland Rough Ground (divided)
1840	Upland Rough Ground (divided)
Medieval	MD derived from Cropping Units

Table 186. Land use history of areas once farmed but reverted to Rough Ground in the 1840 and 1880 time-slices in the Poundstock study areas.

When an equivalent model considering only the high validity enclosures is built, the results are less clear cut. For the 1840 time-slice Post-Medieval Enclosed Land is ranked highest. However, it only captures 23.5% of the enclosures (but produces a Kvammes Gain of 0.563), so is not accurate. The high probability zone for this time-slice is therefore made up of Post-Medieval and Medieval Enclosed Land. This combination captures 88% of the enclosures but, because it covers 74% of the study area, produces a low Kvammes Gain of 0.166. For the other three time-slices Medieval Enclosed Land is ranked highest, but with even lower gain measures, as set out in the table below.

HLC Time-slice	PA	PS	Kvammes Gain
2011	0.604	0.647	0.067
1880	0.610	0.647	0.058
1840	0.736	0.882	0.166
Medieval	0.645	0.706	0.086

Table 187. Performance of the Lowland Cornwall HLC model for high validity enclosures based on HLC Types in the Poundstock study area.

In fact, to a large extent these results suggest a by chance distribution with the PS values barely exceeding the PA values (in the 1840 time-slice, for instance, the PA and PS values for Medieval Enclosed Land are 0.634 and 0.647 respectively).

To summarise, the results for Poundstock are less satisfactory than the other three study areas. The models have little precision and are less accurate, with less than 73% of enclosures captured in the high probability zones of three of the time-slices.

13.2.2 HLC Sub-Types 2011 time-slice

Although the Lowland Cornwall HLC Types produce a more satisfactory model than the 1994 HLC, the Kvammes Gain measures are very low, indicating a lack of precision. More precise models can be created by using the HLC Sub-Types as variables (table 188).

	HLC Sub-Types	Enclosures	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Sub-Divided)	5	0.051	0.152	0.123	0.100
2	MD Altered field patterns (Re-arranged)	7	0.151	0.212	0.242	0.161
3	PM Altered field patterns (Amalgamated)	5	0.054	0.152	0.365	0.259
4	Deciduous woodland	2	0.039	0.061	0.402	0.281
5	MD Altered field patterns (Amalgamated)	8	0.369	0.242	0.356	0.154
6	MD peripheral fields	1	0.002	0.030	0.394	0.183
7	Hamlet	1	0.007	0.030	0.426	0.206
8	Emod Intakes	1	0.008	0.030	0.456	0.229
9	Village	1	0.011	0.030	0.483	0.249
10	Emod Altered field patterns (Amalgamated)	1	0.016	0.030	0.505	0.263
11	Mod Intakes	1	0.137	0.030	0.396	0.157
12	Other	0	0.157	0.000	0.000	
	Total	**33**				

Table 188. The model for Poundstock enclosures based on the 2011 time-slice HLC Sub-Types

The cut off point for the high probability zone of this model is defined as the point when the cumulative Kj values fall from 0.402 (Deciduous woodland) to 0.356 (MD Altered field patterns (Amalgamated). The cumulative Kj values then increase until the tenth-ranked Sub-Type, when they fall from 0.505 to 0.396 (Mod Intakes). The HLC Sub-Types causing the Kj values to increase all form the medium probability zone whilst Mod Intakes and 'Other' types form the low probability zone. The high probability zone is not very accurate, capturing only 57.6% of the enclosures but is fairly precise, with a Kvammes Gain of 0.488.

When an equivalent model considering only the high validity enclosures is built, the high probability zone is formed by the following Sub-Types.

1	MD Altered field patterns (Sub-Divided)
2	PM Altered field patterns (Amalgamated)
3	MD Altered field patterns (Re-arranged)
4	MD peripheral fields
5	Emod Intakes
6	Deciduous woodland

The high probability zone of this model covers 30% of the study area, captures 76.5% of the enclosures and produces a Kvammes Gain of 0.460, so can be said to be both accurate and precise.

13.2.3 HLC Sub-Types 1880 time-slice

There are difficulties defining the cut-off point for the high probability zone for the 1880 time-slice model. If the cumulative Kj parameters were to be used to indicate this, the result would be a two-zone sites/no sites model. Therefore it is more satisfactory to base the cut-off point on the Relative Gain measures which increase from the highest-ranked to the fourth highest-ranked Sub-Type before falling from 0.198 to 0.166.

The resultant model produces a slightly more accurate but less precise result than the 2011 time-slice, with 64% of enclosures captured in the high probability zone which covers 44% of the study area, and achieves a Kvammes Gain of 0.310. In this time-slice the high probability zone is formed by MD Altered field patterns (Amalgamated), MD peripheral fields, MD Altered field patterns (Sub-Divided) and Upland Rough Ground (divided).

	HLC Sub-Types	Enclosures	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Amalgamated)	10	0.205	0.303	0.173	0.098
2	MD peripheral fields	3	0.012	0.091	0.265	0.178
3	MD Altered field patterns (Sub-Divided)	5	0.152	0.152	0.311	0.178
4	Upland Rough Ground (divided)	3	0.071	0.091	0.355	0.198
5	MD Altered field patterns (Re-arranged)	4	0.153	0.121	0.355	0.166
6	Emod Intakes	2	0.036	0.061	0.395	0.191
7	PM Altered field patterns (Amalgamated)	2	0.037	0.061	0.433	0.214
8	PM Intakes	2	0.049	0.061	0.460	0.226
9	Valley Rough Ground (undivided)	1	0.007	0.030	0.491	0.249
10	Deciduous woodland	1	0.021	0.030	0.508	0.258
11	Other	0	0.258	0.000	0.000	0.000
	Total					

Table 189. The model for the Poundstock enclosures based on the 1880 time-slice HLC Sub-Types

The medium probability zone comprises the Sub-Types ranked 5–10. This zone covers 56% of the study area but only captures 36% of the enclosures. No enclosures are recorded from the low probability zone, which is formed by all other Sub-Types and covers 17% of the study area. The main weakness of this model is the large size of the medium probability zone – in more than half the study area there is neither a high nor low probability of enclosures being present.

When an equivalent model considering only the high validity enclosures is built there are two options for the cut-off point between the high and medium probability zones. The Relative Gain measures increase up to the fifth-ranked Sub-Type (Emod Intakes). This gives a high probability zone consisting of the following Sub-Types, capturing 65%

of the enclosures in 25% of the study area and producing a Kvammes Gain of 0.621. So whilst this is precise it is not especially accurate.

1	MD peripheral fields
2	MD Altered field patterns (Re-arranged)
3	PM Altered field patterns (Amalgamated)
4	Valley Rough Ground (undivided)
5	Emod Intakes

However, the Kj measures continue to increase up to the sixth highest-ranked Sub-Type (MD Altered field patterns (Amalgamated)). If this Sub-Type is included in the high probability zone then 82% of the enclosures are captured in this zone, it covers 45% of the study area and produces a Kvammes Gain of 0.454. This is probably a more satisfactory model – whilst not so precise it is considerably more accurate.

13.2.4 HLC Sub-Types 1840 time-slice

The model based on the 1840 time-slice is less satisfactory. If precision is favoured over accuracy then the high probability zone is formed by the three highest-ranked Sub-Types, MD peripheral fields, MD Altered field patterns (Re-arranged) and PM intakes. After this the Relative Gain measures drop from 0.207 to 0.193. However the Kj values continue to increase up to the eighth-ranked Sub-Type, Deciduous woodland.

The high probability zone based on Relative Gain values produces a Kvammes Gain measure of 0.401 but only captures 51.5% of the enclosures. The high probability zone based on the Kj parameter captures 97% of the enclosures in 67.5% of the study area giving a Kvammes Gain of 0.303. In effect this is a two-zone model, with the low probability zone covering 32.5% of the study area and capturing only one enclosure.

	HLC Sub-Types	Enclosures	PA	PS	Kj	Rel gain
1	MD peripheral fields	4	0.020	0.121	0.111	0.101
2	MD Altered field patterns (Re-arranged)	8	0.195	0.242	0.232	0.148
3	PM Intakes	5	0.093	0.152	0.326	0.207
4	MD Altered field patterns (Sub-Divided)	8	0.256	0.242	0.382	0.193
5	Upland Rough Ground (divided)	3	0.065	0.091	0.431	0.219
6	MD Altered field patterns (Amalgamated)	2	0.013	0.061	0.492	0.266
7	Upland Rough Ground (undivided)	1	0.013	0.030	0.516	0.284
8	Deciduous woodland	1	0.020	0.030	0.534	0.294
9	Valley Rough Ground (divided)	1	0.094	0.030	0.480	0.231
10	Other	0	0.231	0.000	0.000	0.000
	Total	**33**				

Table 190. The model for Poundstock enclosures based on the 1840 time-slice HLC Sub-Types

When an equivalent model considering only the high validity enclosures is built, a high probability zone formed of the following five Sub-Types is produced.

1	MD peripheral fields
2	PM Intakes
3	MD Altered field patterns (Re-arranged)
4	Upland Rough Ground (undivided)
5	MD Altered field patterns (Amalgamated)

These Sub-Types capture 82% of the enclosures in 33% of the study area and achieve a Kvammes Gain measure of 0.594.

13.2.5 HLC Sub-Types medieval time-slice

The model based on the medieval time-slice is notably weaker than the others. In this model the high probability zone comprises the Sub-Types MD peripheral fields, MD derived from Cropping Units and Coastal Rough Ground (undivided). This zone captures 70% of the enclosures in 53% of the study area but only produces a Kvammes Gain of 0.233.

When an equivalent model considering only the high validity enclosures is built, the high probability zone is formed by the same three Sub-Types, but in a different order.

1	MD peripheral fields
2	Coastal Rough Ground (undivided)
3	MD derived from Cropping Units

This zone covers 53% of the study area, captures 82% of the high validity enclosures and produces a Kvammes Gain of 0.351.

13.2.6 Conclusions

For the Poundstock study area models based on the HLC Types are not very satisfactory, being only reasonably accurate (the high probability zones in three of the time-slices capture less than 73% of the enclosures) and having little precision. In fact the 1880 and 1840 time-slices produce models displaying a virtually by chance distribution. Models based on the Sub-Types produce reasonable Kvammes Gain measures so are certainly much more precise but they are (with the exception of the 1840 time-slice) less accurate: the 2011 time-slice, for instance, captures fewer than 60% of the enclosures.

	HLC Types				**HLC Sub-Types**		
Time-slice	**PA**	**PS**	**Kvammes Gain**		**PA**	**PS**	**Kvammes Gain**
2011	0.604	0.727	0.170		0.295	0.576	0.488
1880	0.610	0.667	0.085		0.439	0.636	0.310
1840	0.634	0.667	0.050		0.675	0.970	0.303
Medieval	0.645	0.727	0.113		0.534	0.697	0.233

Table 191. Comparison of the performance of the high probability zones of models based on HLC Types and Sub-Types for each time-slice in the Poundstock study area. All enclosures.

Equivalent models considering only the high validity enclosures produce mixed results. Those based on HLC Types are in the main not very accurate and certainly not precise; those based on Sub-Types are both accurate and precise.

	HLC Types				**HLC Sub-Types**		
Time-slice	**PA**	**PS**	**Kvammes Gain**		**PA**	**PS**	**Kvammes Gain**
2011	0.604	0.647	0.067		0.304	0.765	0.602
1880	0.610	0.647	0.058		0.450	0.824	0.454
1840	0.736	0.882	0.166		0.334	0.824	0.594
Medieval	0.645	0.706	0.086		0.534	0.824	0.351

Table 192. Comparison of the performance of the high probability zones of models based on HLC Types and Sub-Types for each time-slice in the Poundstock study area. High validity enclosures only.

However, there are difficulties with the Sub-Type models, most notably that the Sub-Types forming the high probability zones vary considerably between time-slices. This inconsistency is summarised below (table 193).

2011 time-slice.		**1880 time-slice.**
MD Altered field patterns (Sub-Divided)		MD Altered field patterns (Amalgamated)
MD Altered field patterns (Re-arranged)		MD peripheral fields
PM Altered field patterns (Amalgamated)		MD Altered field patterns (Sub-Divided)
Deciduous woodland		Upland Rough Ground (divided)

1840 time-slice.		**Medieval time-slice.**
MD peripheral fields		MD peripheral fields
MD Altered field patterns (Re-arranged)		Coastal Rough Ground (undivided)
PM Intakes		MD derived from Cropping Units
MD Altered field patterns (Sub-Divided)		
Upland Rough Ground (divided)		
MD Altered field patterns (Amalgamated)		
Upland Rough Ground (undivided)		
Deciduous woodland		

Table 193. Sub-Types forming the high probability zones for each time slice model for enclosures in the Poundstock study area.

These inconsistencies probably reflect a more complex pattern of land use history in Poundstock compared with the other study areas. For instance one of the enclosures is located in land that underwent the following development.

Time-slice	**HLC Type or Sub-Type**
2011	Deciduous woodland
1880	Valley Rough Ground (undivided)
1840	PM Intakes
Medieval	Coastal Rough Ground (undivided)

There are also significant differences between the models based on all enclosures and those based on high validity enclosures only. Comparison of the 1880 time-slice models illustrates an example of this (table 194).

1880 time-slice. All enclosures		**1880 time-slice. High validity enclosures**
MD Altered field patterns (Amalgamated)		MD peripheral fields
MD peripheral fields		MD Altered field patterns (Re-arranged)
MD Altered field patterns (Sub-Divided)		PM Altered field patterns (Amalgamated)
Upland Rough Ground (divided)		Valley Rough Ground (undivided)
		Emod Intakes

Table 194. Comparison between the Sub-Types forming the high probability zones of the 1880 time-slice models for all enclosures and high validity enclosures only in the Poundstock study area.

13.2.7 HLC Sub-Types all time-slices

The most precise (and reasonably accurate) model was achieved by considering combinations of all the time-slices. This model was created in the same way as that described for the Probus study area (section 10.2.7). Although the identification of Medieval Enclosed Land as the broad level high probability zone is less clear cut in Poundstock than any of the other study areas, it is the case that in each of the four time-slices this HLC Type captures roughly 70% of the enclosures. Therefore it seems reasonable to include only Medieval Enclosed Land in the high probability zone of the regressive model.

The high probability zone captures 73% of the enclosures in 63% of the study area, so is reasonably accurate but not precise, with a Kvammes Gain of only 0.128. However the very high probability zone captures almost 70% of the enclosures in only 25% of the study area and achieves a Kvammes Gain of 0.635, so it is both reasonably accurate and much more precise. The Sub-Types forming the very high probability zone are set out in table 196, the overall performance of the model is shown in table 195 and a map showing the probability zones is presented in Fig 104.

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain
Very High	16.666	23	0.254	0.697	0.635
High*	41.558	1	0.634	0.727	0.128
Low	24.006	9	0.366	0.273	-0.343

Table 195. Results of the regressive model for prehistoric and Romano-British enclosures in the Poundstock study area.* includes the very high probability zone.

When the 17 high validity enclosures only are set against the model 70.6% of the enclosures are captured in the high probability zone so this is slightly more accurate. On the other hand because the high probability zone covers 63% of the study area this represents a virtually by chance distribution. However the 70.6% of enclosures are all captured in the very high probability zone so this zone is accurate and precise, achieving a Kvammes Gain of 0.640.

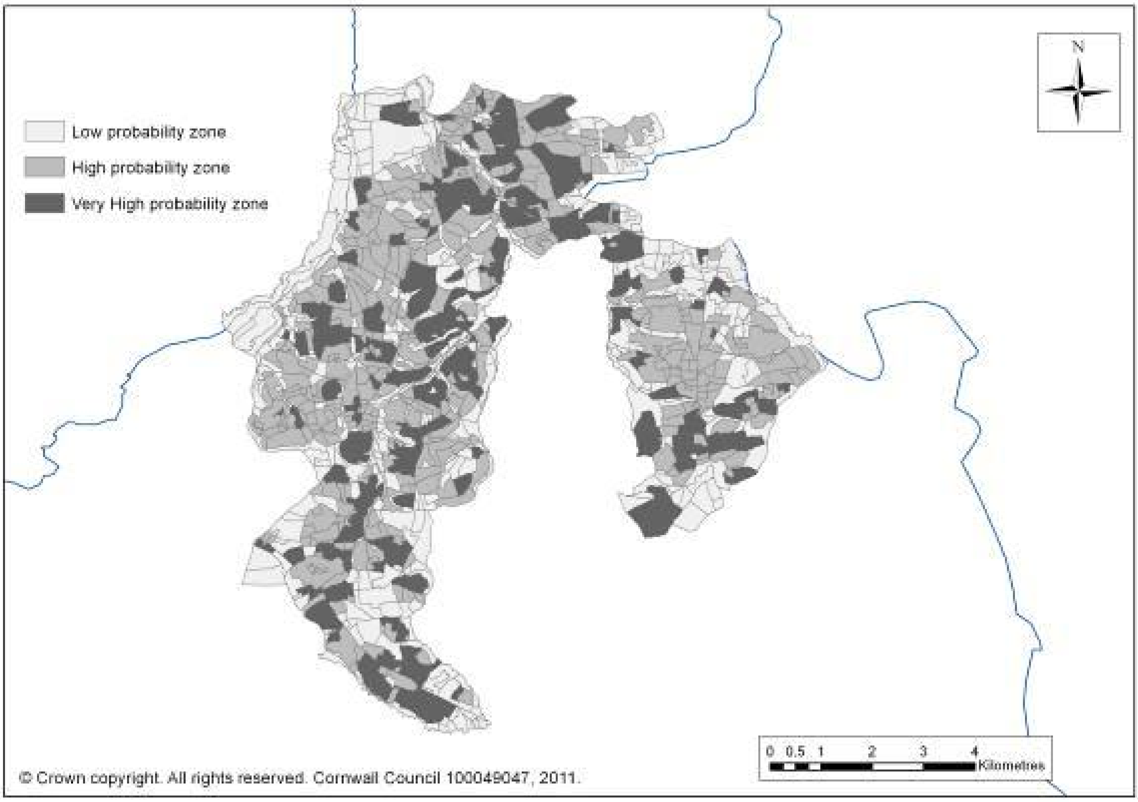

Fig 104. Map showing the regressive model for prehistoric and Romano-British enclosures in the Poundstock study area.

13.2.8 Discussion

In the Poundstock study area the 1994 HLC model fails to predict those areas where the largest numbers of enclosures can be found and the Lowland Cornwall HLC Types models, whilst suggesting that Medieval Enclosed Land represents the high probability zone, lacks any real precision and, in fact, for some time-slices can be interpreted as indicating a by chance distribution.

The HLC Sub-Types produce precise and reasonably accurate models but there are significant inconsistencies between the Sub-Types making up the high probability zones of each time-slice; so much so that the sequence from time-slice to time-slice could be described as erratic.

There are also significant differences between the make-up of the high probability zones of the models based on all enclosures and those based on only the high validity enclosures. The most notable example of this is in the 1880 time-slice.

Although the HLC Type Medieval Enclosed Land captures the highest number of enclosures and can therefore be seen on a broad level as the high probability zone this definition is less clear-cut than in the other study areas. In fact in the model based on only the high validity enclosures for the 1840 time-slice the highest-ranked Type is Post-Medieval Enclosed Land. In the models based on Sub-Types various non-Medieval Enclosed Land Sub-Types appear in the high probability zones. It should also be noted that although the very high probability zone of the regressive model achieves a reasonable degree of accuracy and good precision, when mapped (Fig 104) it forms a fragmented and incoherent landscape.

One difference between the make-up of the very high probability zone of this model and those for the other three study areas is that it is not formed predominantly by amalgamated fields. For instance, in the 2011 time-slice the Sub-Type MD Altered field patterns (Amalgamated) is included in only six out of the 18 combinations, whilst the Sub-Type MD Altered field patterns (Sub-divided) is included in seven.

Sub-Type	SubType1	SubType2	SubType3	Sites	Area	PA	PS	KJ	R gain
MD Altered field patterns (Sub-Divided)	MD peripheral fields	MD peripheral fields	MD peripheral fields	2	0.02	0.000	0.061	0.060	0.060
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD derived from Cropping Units	2	0.161	0.002	0.061	0.120	0.118
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	3	4.084	0.062	0.091	0.177	0.147
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	2	1.543	0.024	0.061	0.224	0.184
MD Altered field patterns (Re-arranged)	Upland Rough Ground (divided)	Upland Rough Ground (divided)	MD peripheral fields	1	0.058	0.001	0.030	0.254	0.214
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD peripheral fields	1	0.106	0.002	0.030	0.284	0.242
Village	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	1	0.133	0.002	0.030	0.314	0.271
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD peripheral fields	MD peripheral fields	1	0.137	0.002	0.030	0.343	0.299
MD peripheral fields	MD peripheral fields	MD peripheral fields	MD peripheral fields	1	0.138	0.002	0.030	0.372	0.327
MD Altered field patterns (Re-arranged)	Upland Rough Ground (divided)	Upland Rough Ground (divided)	MD derived from Cropping Units	1	0.26	0.004	0.030	0.401	0.353
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	1	0.351	0.005	0.030	0.428	0.378
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD derived from Strip Fields (Enclosed)	1	0.439	0.007	0.030	0.455	0.402
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	1	0.864	0.013	0.030	0.478	0.419
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD derived from Strip Fields (Enclosed)	1	1.299	0.020	0.030	0.497	0.429
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	1	1.366	0.021	0.030	0.516	0.439
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Strip Fields (Enclosed)	1	1.809	0.028	0.030	0.530	0.442
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	1	1.944	0.030	0.030	0.543	0.442
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Strip Fields (Enclosed)	1	1.954	0.030	0.030	0.556	0.443
Very High probability zone total				**23**	**16.666**				

Table 196. Combinations of HLC Sub-Types making up the very high probability zone of the enclosures model for the Poundstock study area.

14 Testing the enclosures models

14.1 Model for all Lowland Cornwall enclosures

Inevitably in the future previously unrecorded enclosures will be discovered, and the veracity of the models presented here can be tested independently by analysis of the proportion of those new enclosures located in each of the probability zones. In the absence of this new information the models can be tested internally using data within the Lowland Cornwall dataset. The simplest means of testing is to create a model for all the Lowland Cornwall enclosures and then apply this model to each of the study areas to measure the extent to which its performance in terms of accuracy and precision varies between each.

A regressive model was created based on the various combinations of HLC Sub-Types over the four time-slices. The combinations were ranked using Kj measures but the cut-off point for the very high probability zone was defined as that at which the Relative Gain values began to decline (cumulative Kj values continued to increase beyond that point). The very high probability zone is formed by 49 combinations of Sub-Types as set out in table 203. The performance of the model is summarised in table 197. The overall high probability zone is very accurate, capturing almost 85% of the enclosures and it achieves a reasonable level of precision, with a Kvammes gain of 0.321. The very high probability zone is more precise, with a Kvammes gain of 0.465, and captures 74% of the enclosures. The low probability zone coves 42% of the project area but because it only captures 15% of the enclosures it produces a negative Kvammes gain.

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain
Very High	152.836	227	0.398	0.744	0.465
High*	221.315	259	0.576	0.849	0.321
Low	162.735	46	0.424	0.151	-1.810

Table 197. Results of the regressive model for all prehistoric and Romano-British enclosures in the Lowland Cornwall study areas.* includes the very high probability zone.

When this model is applied to only the high validity enclosures it achieves a more accurate and more precise performance, as set out in table 198.

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain
Very High	152.836	123	0.398	0.809	0.509
High*	221.315	135	0.576	0.888	0.352
Low	162.735	17	0.424	0.112	-2.785

Table 198. Results of the regressive model for all high validity prehistoric and Romano-British enclosures in the Lowland Cornwall study areas.* includes the very high probability zone.

More than 80% of the high validity enclosures are captured in the very high probability zone and almost 89% in the overall high probability zone, whilst there are only 11% of the enclosures in the low probability zone.

14.1.1 Probus study area

This model was then applied to each of the study areas in turn, starting with Probus. Whilst the model is more accurate when applied to the Probus study area than to all four study areas together, it is not as precise because the very high probability zone covers 48.5% of the study area (as opposed to 39.8% of all study areas) and the overall high probability zone covers 69%. Nonetheless this model can be said to fit the Probus study area well (table 199).

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain
Very High	65.657	117	0.485	0.807	0.399
High*	93.874	129	0.693	0.890	0.221
Low	41.621	16	0.307	0.110	-1.784

Table 199. Results of applying the regressive model for all enclosures in the Lowland Cornwall study areas to the Probus study area.* includes the very high probability zone.

When the model was run against the high validity enclosures only, a slightly better fit was achieved, with the very high probability zone capturing 87% of the enclosures and producing a Kvammes gain of 0.441.

14.1.2 Penwith study area

The model does not work as well in the Penwith study area (table 200). Although the overall high probability zone is accurate, capturing 81% of the enclosures it is not very precise, covering 66% of the study area and producing a low Kvammes gain. Conversely the very high probability zone is precisely defined, covering less than 35% of the study area and achieving a reasonable Kvammes gain measure of 0.484, but not especially accurate because it captures less than 70% of the enclosures

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain
Very High	32.713	71	0.349	0.676	0.484
High*	62.018	85	0.661	0.810	0.184
Low	31.82	20	0.339	0.190	-0.780

Table 200. Results of applying the regressive model for all enclosures in the Lowland Cornwall study areas to the Penwith study area.* includes the very high probability zone.

When the model was run against the high validity enclosures only, a significantly better fit was achieved, with the very high probability zone capturing 77% of the enclosures and producing a Kvammes gain of 0.549. Only 9% of the enclosures were captured in the low probability zone.

14.1.3 Pelynt study area

The model performs better applied to the Pelynt study area than any of the other three. The very high probability zone is very accurate and also precisely defined, covering less than 40% of the study area and producing a Kvammes gain of 0.533. The model also clearly identifies the low probability zone: this captures only a single enclosure and produces a highly negative Kvammes gain measure.

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain
Very High	34.045	18	0.382	0.818	0.533
High*	64.125	21	0.719	0.955	0.246
Low	25.03	1	0.281	0.045	-5.176

Table 201. Results of applying the regressive model for all enclosures in the Lowland Cornwall study areas to the Pelynt study area.* includes the very high probability zone.

When the model was run against the high validity enclosures only, the very high probability zone captured only 75% of the enclosures and produced a lower Kvammes gain of 0.491. However, no enclosures were recorded from the low probability zone.

14.1.4 Poundstock study area

The model does not fit the Poundstock study area as well as it does the other three. The very high probability zone captures less than 64% of the enclosures, so it is the least accurate and the overall high probability zone is the only one out of the four study areas to capture less than 80% of the enclosures. Nor does the model define the low probability zone particularly well; this captures 27% of the enclosures – a much higher proportion than any other study area. Nonetheless the model is relatively precise, with the very high probability zone producing a Kvammes gain of 0.496.

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain
Very High	21.067	21	0.321	0.636	0.496
High*	41.898	24	0.638	0.727	0.123
Low	23.756	9	0.362	0.273	-0.327

Table 202. Results of applying the regressive model for all enclosures in the Lowland Cornwall study areas to the Poundstock study area.* includes the very high probability zone.

When the model was run against the high validity enclosures only, the very high probability zone captured 65% of the enclosures and produced a Kvammes gain of 0.504, so its performance was slightly better than when all the enclosures were included in the test. However, a higher proportion of enclosures (29%) were recorded from the low probability zone.

2011	1880	1840	Medieval	Prehistoric	Enclosures	Area (km2)
MD Altered field patterns (Amalgamated)	MD derived from Cropping Units	MD derived from Cropping Units	MD derived from Cropping Units		47	24.68
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units		32	27.112
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units		26	21.613
MD derived from Cropping Units	MD derived from Cropping Units	MD derived from Cropping Units	MD derived from Cropping Units		30	30.225
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units		7	4.369
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD peripheral fields	MD peripheral fields		5	1.238
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX field patterns		5	2.335
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units		5	3.579
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units		8	8.413
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	Upland Rough Ground (undivided)		3	0.113
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX Altered field patterns (Sub-Divided)	PX field patterns		3	0.168
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD derived from Cropping Units		3	1.308
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	MD derived from Cropping Units		3	1.308
MD Altered field patterns (Sub-Divided)	MD peripheral fields	MD peripheral fields	MD peripheral fields		2	0.11
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD derived from Cropping Units		2	0.257
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Strip Fields (Enclosed)		3	2.458
MD Altered field patterns (Re-arranged)	MD derived from Strip Fields (Enclosed)	MD derived from Strip Fields (Enclosed)	MD derived from Strip Fields (Enclosed)		2	0.614
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	MD derived from Cropping Units		3	2.523
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Amalgamated)	MD derived from Cropping Units	MD derived from Cropping Units		2	1.595
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units		7	8.619
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX field patterns	PX field patterns		3	0.161
Mod Intakes	Upland Rough Ground (divided)	Upland Rough Ground (divided)	Upland Rough Ground (undivided)	PX field patterns	1	0.016
Town	Town	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units		1	0.038
Campsite, chalet park etc	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units		1	0.086
Hamlet	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Strip Fields (Enclosed)		1	0.088
MD Altered field patterns (Amalgamated)	Valley Rough Ground (divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units		1	0.089
MD derived from Cropping Units	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	MD derived from Cropping Units		1	0.092
Town	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD derived from Strip Fields (Enclosed)		1	0.102
Valley Rough Ground (divided)	Valley Rough Ground (divided)	Valley Rough Ground (divided)	Valley Rough Ground (undivided)	PX field patterns	1	0.106
MD Altered field patterns (Re-arranged)	Upland Rough Ground (divided)	Upland Rough Ground (divided)	MD peripheral fields		1	0.119
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Sub-Divided)	PX Altered field patterns (Amalgamated)	PX field patterns		1	0.122
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX Altered field patterns (Re-arranged)	PX Altered field patterns (Amalgamated)	PX field patterns	1	0.153
Farmstead	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units		1	0.481
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD peripheral fields	MD peripheral fields		1	0.16
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD peripheral fields		1	0.231
MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units		1	0.235
MD Altered field patterns (Re-arranged)	Upland Rough Ground (divided)	Upland Rough Ground (divided)	MD derived from Cropping Units		1	0.276
Town	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)	MD derived from Strip Fields (Enclosed)		1	0.287
Village	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units		1	0.314
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Amalgamated)	MD derived from Cropping Units	MD derived from Cropping Units		1	0.358
MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Sub-Divided)	MD derived from Strip Fields (Enclosed)		1	0.434
PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX Altered field patterns (Sub-Divided)	PX Altered field patterns (Amalgamated)	PX field patterns	1	0.442
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)	MD derived from Strip Fields (Enclosed)		1	0.443
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD derived from Strip Fields (Enclosed)		1	0.638
PX Altered field patterns (Re-arranged)	PX Altered field patterns (Amalgamated)	PX Altered field patterns (Amalgamated)	PX field patterns		1	0.652

MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units	MD derived from Cropping Units		1	0.869
MD peripheral fields	MD peripheral fields	MD peripheral fields	MD peripheral fields		1	0.896
MD Altered field patterns (Re-arranged)	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Re-arranged)	MD derived from Cropping Units		1	1.091
MD Altered field patterns (Amalgamated)	MD Altered field patterns (Re-arranged)	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units		1	1.22

Table 203. Combinations of HLC Sub-Types through five time-slices forming the very high probability zone of the enclosures model for the four Lowland Cornwall study areas.

14.2 Models using partial data

14.2.1 Methodology and the Probus study area

More thorough testing of the models presented here was achieved by holding back some of the dataset. This was done by creating models using data from three of the study areas and then applying this model to the fourth area. To explain how this was done the Probus study area is used here as an example.

The starting point was the model for all enclosures. This was renamed in Excel and then amended to remove the Probus data. The highest ranked Sub-Type time-slice combination in the all enclosures model contained the following Sub-Types.

Time-slice	HLC Sub-Type
2011	MD Altered field patterns (Amalgamated)
1880	MD derived from Cropping Units
1840	MD derived from Cropping Units
Medieval	MD derived from Cropping Units

This combination captured 47 enclosures and covered 24.68 km sq. In the Probus study area this combination of Sub-Types covered 15.985 km sq and captured 39 enclosures. Therefore in the Penwith/Pelynt/Poundstock model this combination was listed as capturing eight enclosures and covering 8.695 km sq.

This process was repeated for all Sub-Type combinations in which enclosures were captured in the Probus study area. Once this was completed the various Sub-Type combinations were re-ranked using Kj parameter measures. This model was then applied in GIS to the Penwith, Pelynt and Poundstock study areas and achieved the following performance.

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain
Very High	72.927	106	0.293	0.663	0.557
High*	168.041	130	0.676	0.813	0.168
Low	80.514	30	0.324	0.188	-0.728

Table 204. Results of the regressive model for enclosures in the Penwith, Pelynt and Poundstock study areas.* includes the very high probability zone.

As can be seen the very high probability zone is precisely predicted, achieving a Kvammes Gain of 0.557, but is not terribly accurate as it only captures 66% of the enclosures. The overall high probability zone is accurately predicted, but is not very precise and the low probability zone is accurately predicted.

The number of enclosures per km sq in each of the probability zones was then calculated as follows:

Probability zone	Area (km2)	Enclosures	Enclosures/km2
Very High	72.927	106	1.45
High*	168.041	130	0.77
Low	80.514	30	0.37

Table 205. Number of enclosures per km sq in each zone of the Penwith/Pelynt Poundstock enclosures model.

The amended model was then applied in GIS to the Probus study area. The area in Probus taken up by each of the probability zones was multiplied by the number of enclosures per km sq in the amended model to arrive at a projected number of enclosures expected to be captured in each probability zone in the Probus study area. The calculations were as follows:

Probability zone	Area (km2)	Enclosures/km2	Projected enclosures	Predicted PS
Very High	39.085	1.45	56.67	0.661
High*	93.874	0.77	70.37	0.820
Low	41.621	0.37	15.40	0.180
Total	135.495		85.77	

Table 206. Notional projected number of enclosures and the predicted Proportion of Sites expected for each probability zone of the model applied to the Probus study area.

The projected total number of enclosures for the Probus study area was 85.77 and from this figure a PS value (proportion of sites) could be calculated for each of the probability zones, as set out in the table above. In reality there are 145 enclosures in the Probus dataset, but by using the projected PS values, predictions of how many enclosures could be expected from each probability zone could be made, as follows:

Probability zone	Predicted PS	Predicted enclosures
Very High	0.661	96
High*	0.820	119
Low	0.180	26
Total		145

Table 207. Predicted number of enclosures for each probability zone of the model applied to the Probus study area.

When the model was applied to the Probus study area the actual PS values and number of enclosures captured in each probability zone were rather different:

Probability zone	Actual PS	Actual enclosures
Very High	0.517	75
High*	0.890	129
Low	0.110	16

Table 208. The actual outcome of applying the model to the Probus study area.

Clearly the Penwith, Pelynt and Poundstock model accurately identifies the overall high probability zone of the Probus study area as well as the low probability zone. However, there are significantly fewer enclosures captured in the very high probability zone than predicted - only 52% as opposed to the 66% predicted. When the test was applied considering only the high validity enclosures a similar outcome was reached (table 209).

Probability zone	Area km2	Enclosures /km2	Projected enclosures	Predicted PS	Actual enclosures	Actual PS	Predicted enclosures
V High	39.085	0.69	26.97	0.718	42	0.506	60
High*	93.874	0.36	33	0.878	75	0.904	73
Low	41.621	0.11	4.58	0.122	8	0.096	10
Total	174.58		37.58		83		83

Table 209. Results of applying the test model to the high validity Probus enclosures only.

Again the overall high probability zone is accurately predicted as is the low probability zone. However, only slightly more than 50% of the enclosures were captured in the very high probability zone. In neither case is the very high probability zone accurately predicted.

14.2.2 Penwith study area

The model for the Probus, Pelynt and Poundstock study areas achieved the following performance:

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain	Enclosures/km2
Very High	112.364	152	0.387	0.760	0.491	1.35
High*	199.897	174	0.689	0.870	0.208	0.87
Low	90.315	26	0.311	0.130	-1.394	0.29

Table 210. Results of the regressive model for enclosures in the Probus, Pelynt and Poundstock study areas.* includes the very high probability zone.

The model works well, capturing 76% of the enclosures in the very high probability zone, 87% of the enclosures in the overall high probability zone and predicting the low probability zone accurately. The very high probability zone is also quite precisely defined, producing a Kvammes Gain of 0.491.

Predictions based on number of enclosures per km sq and the actual numbers of enclosures in each probability zone are set out below.

Probability zone	Area km2	Enclosures /km2	Projected enclosures	Predicted PS	Actual enclosures	Actual PS	Predicted enclosures
V High	23.979	1.35	32.37	0.633	41	0.390	67
High*	62.081	0.87	41.90	0.820	85	0.810	86
Low	31.757	0.29	9.21	0.180	20	0.190	19

Table 211. Predicted and actual outcomes of applying the Probus/Pelynt/Poundstock enclosures model to the Penwith study area.

As in the Probus study area test, the Probus, Pelynt and Poundstock model applied to the Penwith study area identifies accurately the overall high probability zone as well as the low probability zone (both perform almost exactly as predicted). Similarly the actual number of enclosures in the very high probability zone is significantly less than predicted. However, in the case of Penwith there is an obvious explanation for this. Prehistoric Enclosed Land Sub-Types are not recorded from the Probus, Pelynt or Poundstock study areas but they form part of the very high probability zone in the Penwith study area. In the Probus, Pelynt and Poundstock model these Sub-Types therefore are not included in the very high probability zone but do form part of the overall high probability zone. In total there are 19 enclosures recorded in prehistoric Enclosed Land Sub-Types in the Penwith study area. If these were included in the very high probability zone in this test then this zone would capture 60 enclosures rather than the 41 listed in table 228, giving a PS value of 0.571 – reasonably close to the predicted PS of 0.633.

When the model is applied considering only the high validity enclosures a similar outcome was obtained (table 212). In this case 43% of the high validity enclosures were captured in the very high probability zone as opposed to the 69% predicted. However, 14 high validity enclosures are located within Prehistoric Enclosed Land Sub-Types and if these are placed in the high probability zone this zone would capture 75% of the high validity enclosures – 6% more than predicted.

Probability zone	Area km2	Enclosures /km2	Projected enclosures	Predicted PS	Actual enclosures	Actual PS	Predicted enclosures
V High	23.979	0.77	18.46	0.691	19	0.432	30
High*	62.081	0.48	22.27	0.834	40	0.909	37
Low	31.757	0.14	4.45	0.166	4	0.091	7
Total	93.838		26.72		44		44

Table 212. Predicted and actual outcomes of applying the Probus/Pelynt/Poundstock enclosures model to the Penwith study area for high validity enclosures only.

14.2.3 Pelynt study area

The model for the Probus, Penwith and Poundstock study areas achieved the following result:

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain	Enclosures/km2
Very High	118.755	209	0.403	0.739	0.455	1.76
High*	197.79	238	0.671	0.841	0.202	1.20
Low	97.105	45	0.329	0.159	-1.071	0.46

Table 213. Results of the regressive model for prehistoric and Romano-British enclosures in the Probus, Penwith and Poundstock study areas.* includes the very high probability zone.

This model performs well, capturing 74% of the enclosures in the very high probability zone, 84% in the overall high probability zone and accurately predicting the low probability zone. The very high probability zone is reasonably precisely defined, achieving a Kvammes Gain of 0.455.

Predictions based on number of enclosures per km sq, and the actual number of enclosures in each study area, are set out below.

Probability zone	Area km2	Enclosures /km2	Notional enclosures	Predicted PS	Actual enclosures	Actual PS	Predicted enclosures
V High	33.803	1.76	59.49	0.724	16	0.727	16
High*	64.125	1.20	76.95	0.936	21	0.955	19
Low	25.03	0.46	11.51	0.140	1	0.045	3

Table 214. Predicted and actual outcomes of applying the Probus/Penwith/Poundstock enclosures model to the Pelynt study area.

The Probus, Penwith and Poundstock model fits the Pelynt study area very closely, with the actual number of enclosures in the very high probability zone exactly as predicted. The overall high probability zone performs rather better than predicted at the expense of the low probability zone. When the model is applied to the high validity enclosures only, a similarly good fit is achieved (table 215).

Probability zone	Area km2	Enclosures /km2	Notional enclosures	Predicted PS	Actual enclosures	Actual PS	Predicted enclosures
V High	33.803	0.99	33.46	0.724	6	0.75	6
High*	64.125	0.64	37.41	0.936	8	0.25	7
Low	25.03	0.18	4.51	0.140	0	0	1
Total	89.155		41.91		8		

Table 215. Predicted and actual outcomes of applying the Probus/Penwith/Poundstock enclosures model to the Pelynt study area for high validity enclosures only.

14.2.4 The Poundstock study area

The model for the Probus, Penwith and Pelynt study areas achieved the following result:

Probability zone	Area (km2)	Enclosures	PA	PS	Kvammes Gain	Enclosures/km2
Very High	130.830	206	0.411	0.757	0.458	1.57
High*	220.017	235	0.691	0.864	0.200	1.07
Low	98.469	37	0.309	0.136	-1.273	0.38

Table 216. Results of the regressive model for enclosures in the Probus, Penwith and Pelynt study areas.* includes the very high probability zone.

Again the model performs well, capturing 76% of the enclosures in the very high probability zone and 86% in the overall high probability zone.

Predictions based on number of enclosures per km sq, and the actual number of enclosures in each study area, are set out below.

Probability zone	Area km2	Enclosures /km2	Notional enclosures	Predicted PS	Actual enclosures	Actual PS	Predicted enclosures
V High	19.752	1.57	31.01	0.655	11	0.333	22
High*	41.898	1.07	38.32	0.810	24	0.727	27
Low	23.666	0.38	8.99	0.190	9	0.273	6

Table 217. Predicted and actual outcomes of applying the Probus/Penwith/Pelynt enclosures model to the Poundstock study area.

Clearly the Probus, Penwith and Pelynt model does not fit the Poundstock study area at all well: only half as many enclosures as predicted are captured in the very high probability zone and the low probability zone performs better than predicted. Even so the overall high probability zone is reasonably accurate. When the model is tested against only the high validity enclosures the result is even worse, with only 29% of the enclosures captured in the very high probability zone as opposed to the 75.5% predicted. Nor does the overall high probability zone perform especially well, capturing 70.6% of enclosures instead of the 87.4% predicted (table 218).

Probability zone	Area km2	Enclosures /km2	Notional enclosures	Predicted PS	Actual enclosures	Actual PS	Predicted enclosures
V High	19.752	0.86	16.99	0.755	5	0.294	13
High*	41.898	0.56	19.64	0.874	12	0.706	15
Low	23.666	0.12	2.84	0.126	5	0.294	2
Total	65.564		19.64		17		17

Table 218. Predicted and actual outcomes of applying the Probus/Penwith/Pelynt enclosures model to the Poundstock study area for high validity enclosures only.

14.2.5 Test areas 1 and 2

The overall high probability zone of the test models was accurately predicted in all four study areas. However, whilst the very high probability zones fitted the Pelynt study area very well and also the Penwith study area if the Prehistoric Enclosed Land Sub-Types are included in the very high probability zone, the same cannot be said for the Probus and Poundstock study areas. To some extent this may be because of variations in the historic landscape character through the four study areas. For example, as already mentioned, the highest ranked Sub-Type time-slice combination in the all enclosures model contained the following Sub-Types.

Time-slice	HLC Sub-Type
2011	MD Altered field patterns (Amalgamated)
1880	MD derived from Cropping Units
1840	MD derived from Cropping Units
Medieval	MD derived from Cropping Units

This combination captured 47 enclosures and covered 24.68 km sq. But in the Probus study area this combination covered 15.985 km sq and captured 39 enclosures. This means that the Probus study area contains 65% of the total extent of this Sub-Type combination and 85% of the total number of enclosures captured within it. In Probus there are on average 1.9 enclosures per square kilometre in this Sub-Type combination but throughout the other three study areas there are only 0.9 enclosures per square kilometre. In fact, although this combination forms part of the very high probability zone in Probus and Penwith it is not included in the very high probability zones in the Pelynt or Poundstock study areas. Another example of the uneven spread of Sub-Type combinations is that in which the Sub-Type throughout all time-slices is MD derived from Cropping Units. The Probus study area contains 72% of the total extent of this combination and it is ranked second in the very high probability zone of the Probus model. However, this combination is not in the very high probability zones of the Penwith or Poundstock models.

To test the models in a way that as far as possible neutralises the effects of these regional variations, two test areas of roughly equal size were created by taking a number of parishes from each study area and grouping them together. Obviously the extent of each test area had to be limited by the Poundstock study area, which is the smallest of the four, covering 65.6km sq. This meant that each of the test areas would be made up of land covering slightly more than 30km sq from each study area. The make-up of the two areas is set out below.

Test area 1		
Study area	**Parish**	**Area (km2)**
Probus	Probus	33.005
Total area. Probus		*33.005*
Penwith	Madron	6.492
	St Buryan	26.641
Total area. Penwith		*33.133*
Pelynt	Pelynt	18.931
	St Veep	12.968
Total area. Pelynt		*31.899*
Poundstock	Jacobstowe e	18.094
	Whitstone	15.897
Total area. Poundstock		*33.991*
Total area. Test area 1		**132.028**

Table 219. Parishes making up test area 1.

Test area 2		
Study area	**Parish**	**Area (km2)**
Probus	St Newlyn East	33.899
Total area. Probus		*33.899*
Penwith	Lelant	6.365
	Paul	14.202
	St Hilary	11.862
Total area. Penwith		*32.429*
Pelynt	Lanreath	20.095
	Lanteglos by Fowey	13.804
Total area. Pelynt		*33.899*
Poundstock	Marhamchurch	11.375
	Poundstock	20.208
Total area. Poundstock		*31.583*
Total area. Test area 1		**131.80**

Table 220. Parishes making up test area 2.

Models based on combinations of Sub-Types through all time-slices were made for each test area and were then applied in turn to the other test area. The results of the tests are set out below, firstly applying the Test area 1 model to Test area 2.

Probability zone	Area km2	Enclosures /km2	Notional enclosures	Predicted PS	Actual enclosures	Actual PS	Predicted enclosures
V High	34.601	1.82	63	0.625	33	0.375	55
High*	88.419	0.98	87	0.759	81	0.920	67
Low	43.421	0.56	24	0.241	7	0.080	21
Total	131.84		101		88		88

Table 221. Predicted and actual outcomes of applying the Test area 1 enclosures model to Test area 2. All enclosures. *High probability zone includes the very high probability zone.

Probability zone	Area km2	Enclosures /km2	Notional enclosures	Predicted PS	Actual enclosures	Actual PS	Predicted enclosures
V High	34.601	1.04	36	0.726	17	0.378	33
High*	88.419	0.55	44	0.877	42	0.933	39
Low	43.421	0.14	6	0.123	3	0.067	6
Total	131.84		50		45		45

Table 222. Predicted and actual outcomes of applying the Test area 1 enclosures model to Test area 2. High validity enclosures only. *High probability zone includes the very high probability zone.

Clearly the Test area 1 model fails to predict the enclosure distribution in Test area 2 with any accuracy. Firstly, looking at the outcome for all enclosures, the area 1 model predicts that there will be 101 enclosures in area 2, whereas there are only 88. Secondly, there are only a third as many enclosures in the low probability zone than were predicted (although this could be taken as an accurate definition of the low probability zone). Most importantly the model predicts that the area 2 very high probability zone will contain 62.5% of the enclosures but it actually only contains 37.5%. The result is even worse when only the high validity enclosures are included: in this test the very high probability zone only contains half the predicted number of enclosures.

The results of applying the Test area 2 model to Test area 1 are shown below.

Probability zone	**Area km2**	**Enclosures /km2**	**Notional enclosures**	**Predicted PS**	**Actual enclosures**	**Actual PS**	**Predicted enclosures**
V High	54.873	1.48	81	0.90	64	0.561	103
High*	96.023	0.90	84	0.936	94	0.825	107
Low	36.006	0.16	6	0.064	20	0.175	7
Total	132.029		90		114		114

Table 223. Predicted and actual outcomes of applying the Test area 2 enclosures model to Test area 1. All enclosures. *High probability zone includes the very high probability zone.

Probability zone	**Area km2**	**Enclosures /km2**	**Notional enclosures**	**Predicted PS**	**Actual enclosures**	**Actual PS**	**Predicted enclosures**
V High	54.873	0.741	42	0.901	43	0.741	52
High*	96.023	0.914	44	0.951	53	0.914	55
Low	36.006	0.086	3	0.054	5	0.086	3
Total	132.029		47		58		58

Table 224. Predicted and actual outcomes of applying the Test area 2 enclosures model to Test area 1. High validity enclosures only. *High probability zone includes the very high probability zone.

When all enclosures are included the result for the very high probability zone is similar to the test result for area 2, with roughly only 60% of the predicted number of enclosures actually captured in the zone. However, the overall outcome of this test is worse than for area 2 because there are almost three times as many enclosures in the low probability zone than were predicted. When the test is applied to the area 1 high validity enclosures the most satisfactory result of any of the four tests is achieved. The actual number of enclosures captured in the overall high probability zone is very close to that predicted, and 74% of the high validity enclosures are captured in the very high probability zone (although this is 16% fewer than predicted).

14.2.6 Discussion

Generally speaking the all enclosures model fits each study area reasonably well: very well in the case of Pelynt. The worst fit is Poundstock where less than 64% of the enclosures are captured in the very high probability zone, and where the low probability zone captures 27% - significantly more than any of the other study areas. In Probus and Pelynt the low probability zone is particularly well predicted by this model. Interestingly when only the high validity enclosures are considered the model performs better in each study area and significantly better in Penwith.

When the models are tested using partial data the results are less clear. When models for three study areas are applied to the fourth area only in Pelynt was a close fit achieved. However, the Probus, Pelynt and Poundstock model could be said to fit Penwith very well if allowance is made for the absence of the HLC Type Prehistoric Enclosed Land in those three study areas. Poundstock again produced the least satisfactory result, with only half the predicted number of enclosures captured in the very high probability zone. In fact in all the study areas except Pelynt fewer enclosures than predicted were captured in the very high probability zones. The most striking feature of the test results is the accurate prediction of the overall high probability zone in each case: even in Poundstock the actual number captured was not too far from the predicted number (72.7% as opposed to 81%).

It is clear that the overall high probability zone, made up of Medieval Enclosed Land and Prehistoric Enclosed Land, can be predicted more or less accurately across all four study areas but this is not the case with the finer-grained very high probability zones. As discussed at the beginning of section 14.2.5, this is probably because of regional variations from study area to study area. However, when two test models were made by taking randomly chosen parishes to form roughly equal-sized areas in an attempt to counteract these variations the results were actually even less satisfactory. So it would appear that the fine-grained models cannot be reliably used as predictive tools on a countywide basis because of regional differences in the distribution of HLC Sub-Types and, possibly, in the distribution pattern of the enclosures (for example the occurrence of clusters of enclosures).

15 Models based on Lowland Cornwall HLC. Settlement polygons

15.1 Probus study area

Models were created for the settlement polygons in exactly the same way as for enclosures, using Kj parameters to rank each HLC Sub-Type in order of predictive importance, and using a combination of cumulative Kj values and Relative Gain measures to define the cut-off points between the high, medium and low probability zones. In order to save time models were only made for the 2011, 1880 and 1840 time-slices using only the HLC Sub-Types as variables.

15.1.1 2011 time-slice

The Sub-Types making up the high probability zone of the model are ranked as follows:

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Amalgamated)	422.339	0.327	0.462	0.250	0.135
2	MD derived from Cropping Units	186.434	0.166	0.204	0.339	0.173
3	MD Altered field patterns (Re-arranged)	104.443	0.091	0.114	0.391	0.196
4	MD Altered field patterns (Sub-Divided)	89.442	0.073	0.098	0.440	0.220
	Total	**802.658**	**0.657**	**0.878**		

Table 225. Probus study area 2011 time-slice: all settlement polygons. HLC Sub-Types making up the high probability zone.

There are 109 settlement polygons in the Probus study area and they cover a total area of 914.24ha. The high probability zone of the model captures almost 88% of this area (PS = proportion of sites) and the Sub-Types themselves cover almost 66% of the study area. Thus the model is very accurate but is not very precise, producing a Kvammes Gain of 0.251.

MD Altered field patterns (Amalgamated) is the highest ranked Sub-Type by some distance, capturing almost half of the settlement polygon area. This Sub-Type plus MD derived from Cropping Units capture 73% of the settlement polygon area and they cover roughly 50% of the study area. The highest ranked Sub-Types are similar to those in the enclosures model for Probus – in fact the four highest ranking Sub-Types in both models are identical.

Sixteen of the settlement polygons contain features which were recorded as being of uncertain date but which were potentially prehistoric, as well as 93 containing features interpreted as prehistoric or Romano-British. In total these 93 polygons cover an area of 844.29ha. When a model was built using only the prehistoric/RB polygons the following result was obtained:

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Amalgamated)	410.932	0.327	0.487	0.279	0.160
2	MD derived from Cropping Units	167.654	0.166	0.199	0.363	0.192
3	MD Altered field patterns (Re-arranged)	95.708	0.091	0.113	0.414	0.214
4	MD Altered field patterns (Sub-Divided)	75.634	0.073	0.090	0.452	0.231
	Total	**749.928**	**0.657**	**0.889**		

Table 226. Probus study area 2011 time-slice: prehistoric and Romano-British settlement polygons. HLC Sub-Types making up the high probability zone.

The high probability zone of this model is formed by the same four highest ranked Sub-Types (and in the same order) as the model for all settlement polygons and the proportion of the settlement polygon area they capture is also very similar in both models. This model is slightly more precise than that for all settlement polygons, achieving a Kvammes Gain of 0.260.

15.1.2 1880 time-slice

When the Kj parameters are used to define the cut-off point for the 1880 time-slice model the high probability zone is formed by the same four Sub-Types as in the 2011 model, but in a different order (table 227).

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	MD derived from Cropping Units	491.352	0.337	0.537	0.328	0.200
2	MD Altered field patterns (Re-arranged)	82.320	0.060	0.090	0.380	0.230
3	MD Altered field patterns (Sub-Divided)	120.812	0.156	0.132	0.396	0.207
4	MD Altered field patterns (Amalgamated)	97.803	0.103	0.107	0.414	0.234
	Total	**792.287**	**0.656**	**0.866**		

Table 227. Probus study area 1880 time-slice: all settlement polygons. HLC Sub-Types making up the high probability zone.

These four Sub-Types capture 87% of the settlement polygon area in 66% of the study area and produce a Kvammes Gain 0f of 0.243. The Sub-Type MD derived from Cropping Units is the most important, capturing more than half of the settlement polygon area.

However, the Relative Gain values begin to decrease after the second highest-ranked Sub-Type. If only the two highest-ranked Sub-Types are taken as forming the high probability zone, this captures 63% of the settlement area, covers 40% of the project area and produces a Kvammes Gain of 0.367.

When only the prehistoric and Romano-British settlement polygons are considered, in the resulting model the four highest ranked Sub-Types are the same as in the model for all settlement polygons (but not in the same order) and are joined by the Sub-Type MD derived from Strip Fields (Enclosed) (table 228).

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	MD derived from Cropping Units	462.382	0.337	0.548	0.339	0.210
2	MD Altered field patterns (Sub-Divided)	117.102	0.156	0.139	0.364	0.193
3	MD Altered field patterns (Amalgamated)	90.830	0.103	0.108	0.396	0.198
4	MD Altered field patterns (Re-arranged)	68.732	0.060	0.081	0.438	0.219
5	MD derived from Strip Fields (Enclosed)	27.625	0.026	0.033	0.453	0.226
	Total	**766.671**	**0.682**	**0.909**		

Table 228. Probus study area 1880 time-slice: prehistoric and Romano-British settlement polygons. HLC Sub-Types making up the high probability zone.

These Sub-Types capture 91% of the settlement area, so the model is very accurate, but they cover 68% of the project area so the model is not especially precise, producing a Kvammes Gain of 0.249.

15.1.3 1840 time-slice

In the 1840 time-slice model the highest-ranked Sub-Type is MD derived from Cropping Units, which captures almost 58% of the settlement area. The Relative Gain values indicate that the high probability zone of the model should be formed exclusively by this Sub-Type: the values fall from 0.199 to 0.181 and remain at this figure for the second and third highest-ranked Sub-Types. However the Kj parameters continue to rise up to the fifth highest-ranked Sub-Type (table 229). These five Sub-Types form a high probability zone capturing almost 89% of the settlement area within 68% of the study area. So this model is very accurate but not very precise, producing a Kvammes Gain of 0.236.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	MD derived from Cropping Units	526.614	0.377	0.576	0.339	0.199
2	MD Altered field patterns (Sub-Divided)	168.487	0.203	0.184	0.371	0.181
3	MD Altered field patterns (Re-arranged)	54.304	0.059	0.059	0.385	0.181
4	MD derived from Strip Fields (Enclosed)	38.207	0.029	0.042	0.408	0.193
5	MD Altered field patterns (Amalgamated)	23.327	0.009	0.026	0.431	0.209
	Total	**810.939**	**0.677**	**0.887**		

Table 229. Probus study area 1840 time-slice: all settlement polygons. HLC Sub-Types making up the high probability zone.

When a model is produced using only the prehistoric and Romano-British settlement polygons the high probability zone is formed of exactly the same Sub-Types as the all polygons model, and they are ranked in the same order. The model is very accurate, capturing 90% of the settlement area, but is not very precise, covering 68% of the study area and producing a Kvammes Gain of 0.245 (table 230).

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	MD derived from Cropping Units	495.8940	0.377	0.587	0.352	0.211
2	MD Altered field patterns (Sub-Divided)	158.7079	0.203	0.188	0.390	0.196
3	MD Altered field patterns (Re-arranged)	50.2224	0.059	0.059	0.404	0.196
4	MD derived from Strip Fields (Enclosed)	38.2074	0.029	0.045	0.432	0.212
5	MD Altered field patterns (Amalgamated)	14.6658	0.009	0.017	0.444	0.220
	Total	**757.6975**	**0.677**	**0.896**		

Table 230 Probus study area 1840 time-slice: prehistoric/RB settlement polygons. HLC Sub-Types making up the high probability zone.

15.1.4 Discussion

In all the models the high probability zones are formed exclusively by Medieval Enclosed Land Sub-Types. And the models are very similar for all settlement polygons and for those where only the prehistoric and Romano-British settlement polygons are included. All the models can be considered to be very accurate, capturing between 87% and 91% of the settlement area: the models for prehistoric and Romano-British polygons are marginally more accurate than those for all the polygons. However, the high probability zones are only reasonably precise, with Kvammes Gain measures ranging from 0.236 to 0.260. The higher Kvammes Gains were achieved by the 1840 time-slice model so overall the earlier time slices produce more accurate and precise high probability zones.

Further analysis shows that the high probability zones are, in all but the 2011 time-slice, dominated by the Sub-Type MD derived from Cropping Units. So, for instance, this Sub-Type makes up more than 50% of the high probability zone in the 1880 time-slice and almost 60% in the 1840 time-slice. In the 2011 time-slice model the dominant Sub-Type is MD Altered field patterns (Amalgamated), with MD derived from Cropping Units ranked second. Between them these two Sub-Types capture roughly 66% of the settlement area. In this respect the settlement polygon models closely resemble the enclosures model for the Probus study area, in which amalgamated fields (whether represented by twentieth century enlargement of groups of small fields, or late medieval amalgamation of groups of strip fields) made up the bulk of the high probability zones. And the same question can be asked of the settlement polygon models – prehistoric settlement features are recorded from these Sub-Types because amalgamated fields are more likely to be under cereal cultivation and are therefore more likely to contain visible cropmarks, or alternatively the fields were amalgamated in the twentieth century to facilitate arable agriculture because they contain the most fertile land and this is the reason why prehistoric settlement and farming activity occurred in those locations.

15.2 Penwith study area

15.2.1 2011 time-slice

In the Penwith study area 73 settlement polygons were created covering a total area of 290.55ha. The high probability zone of the 2011 time-slice model was made up of the following Sub-Types:

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	PX Altered field patterns (Amalgamated)	45.124	0.053	0.155	0.126	0.103
2	Mod Intakes	41.347	0.057	0.142	0.236	0.187
3	Upland Rough Ground (divided)	21.126	0.014	0.073	0.302	0.246
4	Valley Rough Ground (divided)	20.232	0.025	0.070	0.358	0.291
5	MD Altered field patterns (Amalgamated)	59.911	0.283	0.206	0.372	0.215
6	PX Altered field patterns (Re-arranged)	14.095	0.012	0.049	0.418	0.251
7	Upland Rough Ground (undivided)	9.461	0.008	0.033	0.448	0.276
	Total	**211.296**	**0.452**	**0.728**		

Table 231. Penwith study area 2011 time-slice: all settlement polygons. HLC Sub-Types making up the high probability zone.

It should be noted that the Relative Gain measures increase through to the fourth ranked Sub-Type before falling from 0.291 to 0.215, whilst the cumulative Kj values continue to increase as far as the seventh highest-ranked. If the fourth to seventh ranked Sub-Types were excluded from the high probability zone, as the Relative Gains suggest they should, this zone would only capture 44% of the settlement polygons. Therefore in this instance it seems better to use the Kj measures to define the cut-off point between high and medium probability zones.

This high probability zone is accurate and reasonably precise, capturing 73% of the settlement area in 45% of the study area and achieving a Kvammes Gain of 0.379. The zone contains a variety of Sub-Types, with Rough Ground and Mod Intakes in addition to Medieval and Prehistoric Enclosed Land. The Sub-Type MD Altered field patterns (Amalgamated) contains the largest portion of the settlement polygons area but because it covers 28% of the study area (as opposed to, for instance the 5.7% covered by Mod Intakes) it is only ranked fifth in the model.

The 73 settlement polygons include 17 which contain features recorded as being of uncertain date but which are potentially prehistoric or Romano-British. The remaining 56 contain features interpreted as prehistoric or Romano-British. When a model was made including only these 56 polygons, the results were as follows:

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	PX Altered field patterns (Amalgamated)	34.788	0.053	0.166	0.137	0.113
2	Mod Intakes	32.784	0.057	0.156	0.261	0.212
3	Upland Rough Ground (divided)	17.260	0.014	0.082	0.337	0.281
4	MD Altered field patterns (Amalgamated)	50.088	0.283	0.239	0.390	0.237
5	Valley Rough Ground (divided)	14.922	0.025	0.071	0.450	0.283
6	PX Altered field patterns (Re-arranged)	8.466	0.012	0.040	0.485	0.312
	Total	**158.308**	**0.444**	**0.754**		

Table 232. Penwith study area 2011 time-slice: prehistoric/RB settlement polygons. HLC Sub-Types making up the high probability zone.

Once again the Kj values have been used to define the cut-off point for the high probability zone because otherwise the zone would capture only 40.5% of the settlement polygons area. The make-up of the high probability zone is very similar to that of the all settlement polygons model, with a variety of Sub-Types, including Rough Ground, Prehistoric, Medieval and Modern Enclosed Land.

The model is accurate, capturing 75% of the settlement area within 44% of the study area, producing a Kvammes Gain of 0.413.

15.2.2 1880 time-slice

The high probability zone of the 1880 time-slice model is somewhat different to that of the 2011 time-slice, with Upland Rough Ground (divided) ranked highest (table 233). This is because the 41.347ha of Mod Intakes, ranked second in the 2011 model, was Upland Rough Ground prior to the twentieth century. The Kj parameters were used to define the cut-off point of the zone even though the Relative Gain measures start to fall after the third ranked Sub-Type. Had the Relative Gain measures been used instead only 46% of the polygon area would have been captured in the zone. As it is the high probability zone captures 59% of the polygons, so it is not very accurate. The zone covers 40% of the study area and achieves a Kvammes Gain of 0.409.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	Upland Rough Ground (divided)	67.839	0.057	0.233	0.203	0.176
2	PX Altered field patterns (Amalgamated)	39.049	0.057	0.134	0.306	0.254
3	Valley Rough Ground (divided)	27.805	0.056	0.096	0.369	0.294
4	MD Altered field patterns (Amalgamated)	37.084	0.180	0.128	0.378	0.242
	Total	**171.777**	**0.35**	**0.591**		

Table 233. Penwith study area 1880 time-slice: all settlement polygons. HLC Sub-Types making up the high probability zone.

When the model is built using only the 56 settlement polygons interpreted as prehistoric or Romano-British in date the result is broadly similar, with the same four Sub-Types in the all settlements model being the four highest-ranked in the this. Again there is a combination of Prehistoric Enclosed Land, Medieval Enclosed Land and Rough Ground Sub-Types.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	Upland Rough Ground (divided)	40.582	0.057	0.194	0.162	0.136
2	PX Altered field patterns (Amalgamated)	36.733	0.057	0.175	0.307	0.255
3	MD Altered field patterns (Amalgamated)	33.791	0.180	0.161	0.354	0.236
4	Valley Rough Ground (divided)	19.495	0.056	0.093	0.413	0.273
5	MD Altered field patterns (Sub-Divided)	27.127	0.175	0.129	0.414	0.228
	Total	**157.728**	**0.525**	**0.752**		

Table 234. Penwith study area 1880 time-slice: prehistoric/RB settlement polygons. HLC Sub-Types making up the high probability zone.

The Kj parameters were used to define the cut-off point of the high probability zone even though the Relative Gain measures begin to fall after the second highest-ranked Sub-Type. Had the Relative Gain measures been used, only 37% of the polygons would have been captured in the high probability zone. By using the Kj parameters, 75% of the polygons are captured and a Kvammes Gain of 0.303 is achieved.

15.2.3 1840 time-slice

The high probability zone of the 1840 time-slice model is formed by seven Sub-Types. As in the 1880 time-slice model Upland Rough Ground (divided) is the highest ranked. Once again it is more satisfactory to use the Kj parameters to define the cut-off point for the high probability zone even though the Relative Gain measures start to fall after the fourth highest ranked Sub-Type. If the Relative Gain measures were used the zone would only capture 42% of the polygons so would lack accuracy. Using the Kj parameters 71% of the polygons are captured and a Kvammes Gain of 0.316 is achieved (table 235).

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	Upland Rough Ground (divided)	45.069	0.057	0.155	0.124	0.099
2	PX Altered field patterns (Amalgamated)	33.227	0.048	0.114	0.211	0.165
3	Valley Rough Ground (divided)	27.506	0.065	0.095	0.266	0.194
4	Upland Rough Ground (undivided)	16.594	0.011	0.057	0.318	0.240
5	MD Altered field patterns (Sub-Divided)	61.393	0.284	0.211	0.325	0.167
6	PX field patterns	12.327	0.006	0.042	0.358	0.276
7	PX Altered field patterns (Sub-Divided)	10.448	0.015	0.036	0.385	0.297
	Total	**206.564**	**0.486**	**0.71**		

Table 235. Penwith study area 1840 time-slice: all settlement polygons. HLC Sub-Types making up the high probability zone.

When only the polygons interpreted as prehistoric or Romano-British are considered the model's high probability zone is broadly similar to that of the all polygons model: the majority of the Sub-Types are included in both (albeit not in the same order of rank) and there is the usual mixture of Prehistoric Enclosed Land, Rough Ground and Medieval Enclosed Land Sub-Types (table 236). The most notable difference is the inclusion of Extractive, metalliferous in the high probability zone of the 1840 time-slice model. Again the Kj parameters have been used to define the cut-off point for the high probability zone, which captures 73.5% of the polygons in 48% of the study area and produces a Kvammes Gain of 0.343.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	Upland Rough Ground (divided)	29.203	0.057	0.139	0.107	0.083
2	PX Altered field patterns (Amalgamated)	23.363	0.048	0.111	0.191	0.146
3	Upland Rough Ground (undivided)	15.127	0.011	0.072	0.259	0.207
4	MD Altered field patterns (Sub-Divided)	51.260	0.284	0.245	0.308	0.168
5	Valley Rough Ground (divided)	19.205	0.065	0.092	0.358	0.194
6	PX Altered field patterns (Sub-Divided)	9.947	0.015	0.047	0.400	0.226
7	Extractive, metalliferous	6.180	0.003	0.029	0.431	0.253
	Total	**154.285**	**0.483**	**0.735**		

Table 236. Penwith study area 1840 time-slice: prehistoric and Romano-British settlement polygons. HLC Sub-Types making up the high probability zone.

15.2.4 Discussion

There were difficulties in defining the cut-off point between the high and medium probability zones in all of the models. In all cases the Kj parameter values continue to increase after the Relative Gain measures begin to decrease. Because of this the Kj parameters were used to define the cut-off points and in doing so the resulting models favour accuracy over precision – had the Relative Gain values been used the high probability zones of all the models would have captured less than 50% of the settlement polygons.

With the exception of the 1880 time-slice model for all settlement polygons all the models are accurate, capturing between 71% and 75% of the settlement polygons, and all are reasonably precise, producing Kvammes Gain measures ranging from 0.303 to 0.413. The all polygons 1880 time-slice model differs from the others in terms of accuracy, capturing only 59% of the polygons, and only the four highest-ranked Sub-Types are included in its high probability zone whereas the high probability zones of the other time-slice models contain between five and seven Sub-Types. Similarly the high probability zone only covers 35% of the study area whereas the high probability zones of the other models cover between 44.4% and 52.5%. If the fifth highest-ranked Sub-Type (MD Altered field patterns (Sub-Divided)) were included in this high probability zone its performance would be more in keeping with the other models. However, both the Relative Gain and Kj parameter values decrease after the fourth highest-ranked Sub-Type, thereby precluding its inclusion.

In all cases the high probability zones of the models are formed by Medieval Enclosed Land Sub-Types, Prehistoric Enclosed Land Sub-Types and by Rough Ground (or, in the 2011 time-slice, by Rough Ground and Modern intakes from former Rough Ground). In all but the 1880 time-slice model the proportion of the settlement polygon area forming the high probability Sub-Types is broadly consistent throughout all the time-slices. The high probability Rough Ground and former Rough Ground Types capture between 29% and 32% of the settlement polygons and the high probability Medieval and Prehistoric Enclosed Land Sub-Types capture between 40% and 46.5%. These figures are in contrast to those of the enclosures models. In their high probability zones Medieval and Prehistoric Enclosed Land Sub-Types capture between 68.6 and 75.2% of the enclosures, while Rough Ground and former Rough Ground Sub-Types capture only between 7.6 and 8.6%.

The fact that Medieval Enclosed Land Sub-Types do not feature more extensively in any of the high probability zones is somewhat surprising given that Medieval Enclosed Land was the highest ranked HLC Type in the enclosures model for all time-slices. Equally surprising is the proportion of the settlement polygon area captured in Rough Ground Types, as noted above. The two most likely reasons for this are firstly that compared with the other study areas there are relatively extensive field systems in Penwith and some of these are located in land which has reverted to Rough Ground, and secondly the method used for defining the polygons themselves. As already pointed out in section 9.3.6 the boundaries of the polygons were not defined tightly around the visible archaeology, but made allowance for the possibility that additional features do (or did) exist which are not visible either above ground or as cropmarks (Fig 96). As a result some of the polygons extend over a wide range of Sub-Types in which no archaeological features are actually visible.

On a more general level, there are few differences between the make-up of the high probability zones in the models for all settlement polygons and those for the prehistoric and Romano-British polygons only. And the models are broadly similar through all the time-slices, so they can said to be consistent in both regards.

15.3 Pelynt study area

15.3.1 2011 time-slice

A total of 37 settlement polygons were created in the Pelynt study area and in total they cover an area of 205.46ha. The high probability zone of the 2011 time-slice model is made up of the following HLC Sub-Types:

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Amalgamated)	96.509	0.372	0.470	0.214	0.097
2	Emod Altered field patterns (Sub-Divided)	40.838	0.011	0.199	0.437	0.285
3	MD Altered field patterns (Sub-Divided)	21.343	0.086	0.104	0.533	0.336
4	MD derived from Cropping Units	14.749	0.038	0.072	0.486	0.319
	Total	**173.439**	**0.507**	**0.845**		

Table 237. Pelynt study area 2011 time-slice: all settlement polygons. HLC Sub-Types making up the high probability zone.

The high probability zone of the model is made up of three Medieval Enclosed Land Sub-Types and one Early Modern Enclosed Land Sub-Type. The model is accurate, capturing 84.5% of the polygon area and is reasonably precise, covering 51% of the study area and producing a Kvammes Gain of 0.399.

Of the 37 polygons, 16 contained features of uncertain but potentially prehistoric date. The remaining 21 contain features interpreted as prehistoric or Romano-British. When a model was built using only these polygons the following result was obtained:

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	Emod Altered field patterns (Sub-Divided)	36.426	0.011	0.269	0.264	0.259
2	MD Altered field patterns (Amalgamated)	53.256	0.372	0.394	0.431	0.280
3	MD Altered field patterns (Sub-Divided)	14.859	0.086	0.110	0.485	0.304
	Total	**104.541**	**0.469**	**0.773**		

Table 238. Pelynt study area 2011 time-slice: prehistoric and Romano-British settlement polygons. HLC Sub-Types making up the high probability zone.

In this model the high probability zone captures 77% of the polygon area within 47% of the study area so is accurate and relatively precise, producing a Kvammes Gain of 0.393. The zone is made up of Early Modern and Medieval Enclosed Land Sub-Types, and Early Modern Enclosed Land is ranked highest. This is somewhat surprising given that the high probability zones of the models for enclosures in the Pelynt study area were made up almost exclusively of Medieval Enclosed Land Sub-Types. As has been pointed out in section 9.3.3 the largest settlement polygon in the study area contains the hillfort and associated features on Bury Down and this polygon consequently has a dominant influence on this model, as it did for the Landuse model. If the Bury Down polygon is removed from the models the makeup of the high probability zones are quite different (table 239).

Rank	All polygons	Prehistoric/RB polygons
1	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)
2	MD derived from Cropping Units	MD Altered field patterns (Sub-Divided)
3	MD Altered field patterns (Sub-Divided)	

Table 239. HLC Sub-Types making up the high probability zones of the 2011 time-slice settlement models when the Bury Down polygon is removed.

The high probability zones are now formed exclusively by Medieval Enclosed Land Sub-Types. The high probability zone of the all polygons model captures 90.5% of the polygons in 50% of the study area, producing a Kvammes Gain of 0.451. The high probability zone of the prehistoric polygons model captures 89% of the polygons and covers 46% of the study area, producing a Kvammes Gain of 0.486. So both models are accurate and quite precise.

15.3.2 1880 time-slice

Like the 2011 time-slice model the high probability zone of the 1880 time-slice model contains Medieval Enclosed Land Sub-Types and Early Modern Enclosed Land Sub-Types. It captures almost 65% of the polygons and covers 38.5% of the study area, producing a Kvammes Gain of 0.427, so is more precise but considerably less accurate than the 2011 model.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Amalgamated)	69.149	0.222	0.337	0.196	0.114
2	Emod Intakes	36.949	0.040	0.180	0.363	0.255
3	MD derived from Cropping Units	27.109	0.123	0.132	0.413	0.264
	Total	**133.207**	**0.385**	**0.649**		

Table 240. Pelynt study area 1880 time-slice: all settlement polygons. HLC Sub-Types making up the high probability zone.

When only the prehistoric and Romano-British settlement polygons are used to build the model it contains three Medieval Enclosed Land Sub-Types with the Sub-Type MD derived from Cropping Units replaced by MD Altered field patterns (Re-arranged) and MD peripheral fields. But the main difference is that the highest ranked is an Early Modern Enclosed Sub-Type (table 241). This high probability zone captures almost 76% of the polygon area and covers only 38% of the study area so is accurate and precise, with a Kvammes Gain of 0.5.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	Emod Intakes	36.921	0.040	0.273	0.253	0.234
2	MD Altered field patterns (Amalgamated)	42.555	0.222	0.315	0.438	0.326
3	MD Altered field patterns (Re-arranged)	15.332	0.105	0.113	0.535	0.378
4	MD peripheral fields	7.503	0.012	0.056	0.487	0.369
	Total	**102.311**	**0.379**	**0.757**		

Table 241. Pelynt study area 1880 time-slice: prehistoric and Romano-British settlement polygons. HLC Sub-Types making up the high probability zone.

When the Bury Down polygon is removed from the model the high probability zones of the models for all settlement polygons and for only the prehistoric and Romano-British polygons are made up exclusively of Medieval Enclosed Land Sub-Types (table 242).

Rank	All polygons	Prehistoric/RB polygons
1	MD Altered field patterns (Amalgamated)	MD Altered field patterns (Amalgamated)
2	MD Altered field patterns (Sub-Divided)	MD derived from Cropping Units
3	MD derived from Cropping Units	

Table 242. HLC Sub-Types making up the high probability zones of the 1880 time-slice settlement models when the Bury Down polygon is removed.

Both models are accurate and reasonably precise. The all polygons model high probability zone captures 90% of the polygon area within 58% of the study area, producing a Kvammes Gain of 0.354, whilst that of the prehistoric polygons model captures 70% of the polygon area in 34.5% of the study area, with a Kvammes Gain of 0.504.

15.3.3 1840 time-slice

The high probability zone of the 1840 model is somewhat different, containing three Medieval Enclosed Land Sub-Types. The land classed as Early Modern Intakes in the 1880 time-slice was Upland Rough Ground (undivided) in 1840 and this Type is ranked second (table 243). The high probability zone is very accurate, capturing 87% of the polygon area and reasonably accurate, covering 57% of the study area, producing a Kvammes Gain of 0.348.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Sub-Divided)	95.306	0.368	0.464	0.210	0.095
2	Upland Rough Ground (undivided)	36.447	0.021	0.177	0.402	0.252
3	MD derived from Cropping Units	34.766	0.161	0.169	0.515	0.304
4	MD peripheral fields	12.641	0.018	0.062	0.455	0.295
	Total	**179.16**	**0.568**	**0.872**		

Table 243. Pelynt study area 1840 time-slice: all settlement polygons. HLC Sub-Types making up the high probability zone.

When only those polygons interpreted as being prehistoric or Romano-British are included the same four Sub-Types make up the high probability zone, but ranked in a different order, with Upland Rough Ground (undivided) being ranked highest. The model's performance is very similar to that of the all polygons model, with a slightly higher accuracy and a Kvammes Gain of 0.350.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	Upland Rough Ground (undivided)	36.447	0.021	0.270	0.259	0.249
2	MD Altered field patterns (Sub-Divided)	49.742	0.368	0.368	0.398	0.249
3	MD peripheral fields	12.641	0.018	0.094	0.486	0.324
4	MD derived from Cropping Units	19.450	0.161	0.144	0.518	0.307
	Total	**118.28**	**0.568**	**0.876**		

Table 244. Pelynt study area 1840 time-slice: prehistoric and Romano-British settlement polygons. HLC Sub-Types making up the high probability zone.

When the Bury Down polygon is removed from the model the high probability zone of the all settlement polygons model is made up of four Medieval Enclosed Land Sub-Types plus Emod New Farms (>5ha). The high probability zone of the prehistoric/Romano-British model is formed exclusively of three Medieval Enclosed Land Sub-Types (table 245).

Rank	All polygons	Prehistoric/RB polygons
1	MD Altered field patterns (Sub-Divided)	MD Altered field patterns (Sub-Divided)
2	MD derived from Cropping Units	MD derived from Cropping Units
3	MD peripheral fields	MD peripheral fields
4	Emod New Farms (>5ha)	
5	MD Altered field patterns (Amalgamated)	

Table 245. HLC Sub-Types making up the high probability zones of the 1840 time-slice settlement models when the Bury Down polygon is removed.

15.3.4 Discussion

Broadly speaking the models for all settlement polygons are consistent across all three time-slices. The high probability zones are made up of between three and four HLC Sub-Types, consisting of two or three Medieval Enclosed Land Sub-Types and one Early Modern Enclosed Land Sub-Type which was formerly Upland Rough Ground (undivided). The highest-ranked Sub-Types in each case are forms of Medieval Enclosed Land and they reflect the characteristic change in land use over time, with MD Altered field patterns (Sub-Divided) ranked highest in the 1840 time-slice and MD Altered field patterns (Amalgamated) ranked highest in the 1880 and 2011 time-slices.

A slightly different pattern is evident when only those settlement polygons interpreted as certainly prehistoric or Romano-British in date are modelled. Although the high probability zones are formed by a similar combination of two to three Medieval Enclosed Land Sub-Types and one Early Modern Enclosed Land/Upland Rough Ground Sub-Type, in each of these models the Early Modern Enclosed Land/Upland Rough Ground Sub-Type is ranked highest. A second difference is that the Sub-Type MD peripheral fields is included in the high probability zones of the 1880 and 1840 models, whereas this is not the case in the models for all settlement polygons.

The high probability zones of the models for enclosures in the Pelynt study area are all clearly dominated by Medieval Enclosed Land Sub-Types. So the inclusion of Early Modern Enclosed Land and Upland Rough Ground in the high probability zones of the settlement polygon models is perhaps surprising. As pointed out above this is largely due to the extensive area covered by the Bury Down polygon. In fact this is the largest polygon in the study area, covering 36.4ha. As can be seen from the tables above this is the total extent of Upland Rough Ground captured in the high probability zone of the 1840 model, and for the great majority of Early Modern Enclosed Land in the 1880 and 2011 models.

Chi-Squared testing during stage 1 of the Lowland Cornwall project indicated that the distribution of hillforts within the HLC zones is not statistically significant and follows a by chance pattern. In other words there is an equal chance of encountering a hillfort in Rough Ground, Medieval Enclosed Land, Early Modern Enclosed Land or any other HLC Type. Therefore it can be argued that the inclusion of the Bury Down polygon is skewing the models. Excluding this polygon produces models whose high probability zones are made up predominantly, exclusively in the 2011 and 1880 time-slices, of Medieval Enclosed Land Sub-Types.

Regardless of this issue it can be said that the models are all accurate, with the high probability zones capturing between 65% and 87% of the settlement polygon area, and reasonably precise, achieving Kvammes Gains ranging from 0.348 to 0.5.

15.4 Poundstock study area

15.4.1 2011 time-slice

A total of 22 settlement polygons were created for the Poundstock study area and they cover an area of 76.82ha – by some margin the smallest area of any of the four study areas. The high probability zone of the 2011 time-slice model is made up of the following HLC Types and Sub-Types.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	PM Altered field patterns (Amalgamated)	27.925	0.054	0.364	0.336	0.310
2	MD Altered field patterns (Sub-Divided)	9.054	0.051	0.118	0.426	0.376
3	MD Altered field patterns (Amalgamated)	20.098	0.369	0.262	0.525	0.322
	Total	**57.077**	**0.474**	**0.744**		

Table 246. Poundstock study area 2011 time-slice: all settlement polygons. HLC Sub-Types making up the high probability zone.

The zone contains two Medieval Enclosed Land Sub-Types but the highest-ranked is a Post-Medieval Enclosed Land Sub-Type, which captures more than a third of the total polygon area within only 5% of the study area. The model is accurate, with its high probability zone capturing 74% of the polygon area and relatively precise, with a Kvammes Gain of 0.362.

Of the 22 polygons, six contain features of uncertain but potentially prehistoric date. The remaining 16 contain features interpreted as prehistoric or Romano-British. When a model was built using only these 16 polygons the following result was obtained.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	PM Altered field patterns (Amalgamated)	27.925	0.054	0.411	0.383	0.357
2	MD Altered field patterns (Sub-Divided)	9.054	0.051	0.133	0.489	0.439
	Total	**36.979**	**0.105**	**0.544**		

Table 247. Poundstock study area 2011 time-slice: prehistoric and Romano-British settlement polygons. HLC Sub-Types making up the high probability zone.

The high probability zone includes the same two highest-ranked Sub-Types as the all polygons model. The Sub-Type MD Altered field patterns (Amalgamated) is again ranked third but both the Kj parameters and the Relative Gain measures indicate that it falls outside the high probability zone. As a result the model is not very accurate, capturing 54% of the polygon area, but is very precise, covering only 10.5% of the study area and achieving a Kvammes Gain of 0.807.

15.4.2 1880 time-slice

The make-up of the high probability zone of the 1880 time-slice model is quite different. Although the Sub-Type PM Altered field patterns (Amalgamated) is again ranked highest the zone also contains Valley Rough Ground (undivided) and PM Intakes. Also the Sub-Type MD Altered field patterns (Sub-Divided), which was ranked second in the 2011 time-slice is ranked ninth in this model. Nor is this model as accurate as the 2011 time-slice model, capturing 71% of the settlement area as opposed to 74%. It is, however, more precise, producing a Kvammes Gain of 0.466.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	PM Altered field patterns (Amalgamated)	24.182	0.037	0.315	0.295	0.277
2	MD Altered field patterns (Amalgamated)	18.809	0.205	0.245	0.422	0.318
3	Valley Rough Ground (undivided)	3.339	0.007	0.043	0.462	0.354
4	PM Intakes	3.785	0.049	0.049	0.481	0.354
5	MD derived from Cropping Units	4.477	0.082	0.058	0.485	0.331
	Total	**54.592**	**0.38**	**0.71**		

Table 248. Poundstock study area 1880 time-slice: all settlement polygons. HLC Sub-Types making up the high probability zone.

When only the 16 prehistoric or Romano-British settlement polygons are included the high probability zone is made up of the same five highest-ranked Sub-Types in the same order with the Sub-Type MD peripheral fields also included. The model is slightly more accurate than that for all settlement polygons, capturing 75% of the polygon area, and also slightly more precise, with a Kvammes Gain of 0.479.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	PM Altered field patterns (Amalgamated)	24.182	0.037	0.356	0.337	0.319
2	MD Altered field patterns (Amalgamated)	13.236	0.205	0.195	0.413	0.309
3	Valley Rough Ground (undivided)	3.339	0.007	0.049	0.459	0.351
4	PM Intakes	3.641	0.049	0.054	0.482	0.356
5	MD derived from Cropping Units	4.477	0.082	0.066	0.495	0.340
6	MD peripheral fields	2.116	0.012	0.031	0.519	0.359
	Total	**50.991**	**0.392**	**0.751**		

Table 249. Poundstock study area 1880 time-slice: prehistoric and Romano-British settlement polygons. HLC Sub-Types making up the high probability zone.

15.4.3 1840 time-slice

The 1840 time-slice model differs somewhat in that PM Intakes is ranked highest, Valley Rough Ground is not included in the high probability zone and nor is MD derived from Cropping Units. Also the Sub-Type MD Altered field patterns (Re-arranged) is ranked second whereas it was not included in the high probability zone of the 1880 model. The Kj parameters were used to define the high probability zone, despite the fact that the Relative Gain values begin to decrease after the highest ranked Sub-Type. Had the Relative Gains been used to define the cut-off point, the high probability zone would have captured only 40% of the polygon area. By using the Kj parameters to define the cut-off point the result is a high probability zone that captures 69% of the polygon area within 32% of the study area and with a Kvammes Gain of 0.537.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	PM Intakes	31.208	0.093	0.406	0.357	0.313
2	MD Altered field patterns (Re-arranged)	13.078	0.195	0.170	0.408	0.288
3	MD peripheral fields	5.642	0.020	0.073	0.471	0.341
4	MD Altered field patterns (Amalgamated)	3.435	0.013	0.045	0.509	0.373
	Total	**53.363**	**0.321**	**0.694**		

Table 250. Poundstock study area 1840 time-slice: all settlement polygons. HLC Sub-Types making up the high probability zone.

When only the 16 prehistoric/Romano-British polygons are included the high probability zone is formed by only two Sub-Types. This model lacks accuracy – only capturing 54% of the polygon area in its high probability zone, but is very precise, achieving a Kvammes Gain of 0.790.

	HLC Sub-Types	Settlement (ha)	PA	PS	Kj	Rel gain
1	PM Intakes	31.064	0.093	0.457	0.408	0.364
2	MD peripheral fields	5.642	0.020	0.083	0.480	0.427
	Total	**36.706**	**0.113**	**0.54**		

Table 251. Poundstock study area 1840 time-slice: prehistoric and Romano-British settlement polygons. HLC Sub-Types making up the high probability zone.

15.4.4 Discussion

The highest-ranked Sub-Types in all the models for the Poundstock study area are Post-Medieval Intakes in 1840 whose fields had become amalgamated and enlarged by 1880 and 2011. These Sub-Types capture between 31.5% (the all polygons 1880 time-slice model) and 46% (the prehistoric polygons 1840 model) of the settlement polygon area, but they only cover between 4% and 9% of the study area.

In the high probability zones of the 2011 and 1840 all polygons models the Post-Medieval Sub-Type is accompanied by two or three Medieval Enclosed Land Sub-Types. In the prehistoric polygon models for these time-slices the Post-Medieval Sub-Type is accompanied by only one Medieval Enclosed Land Sub-Type and these models are not as accurate.

The 1880 time-slice models seem to be something of an anomaly, with Valley Rough Ground ranked in the high probability zones of both the all polygons and the prehistoric polygons models, even though this HLC Type is not included in the high probability zones of the other time-slice models.

As in the Pelynt study area the models are heavily influenced by the largest settlement polygon in the study area. In this case the polygon is situated on the coastal plateau to the immediate west of the village of Marhamchurch. This polygon measures 22.24ha in extent, 18.56ha of which is PM Altered field patterns (Amalgamated) in the 2011 and 1880 time-slices and PM Intakes in the 1840 time-slice. The total extent of the settlement polygons captured in PM Altered field patterns (Amalgamated) in the 2011 time-slice is 27.925ha and in the 1880 time-slice is 24.182, so this single polygon accounts for 66% of the 2011 total and 76% of the 1880 total. In the 1840 time-slice this polygon accounts for 59% of the total polygon area captured in the Sub-Type PM Intakes.

Overall the high probability zones of the all polygons models are accurate and reasonably precise, capturing between 69% and 74% of the polygons, with Kvammes Gains ranging from 0.362 to 0.537. The prehistoric polygon models are less accurate but more precise, capturing between 54% and 75% of the polygon area, with Kvammes Gains of between 0.479 and 0.807.

15.5 Testing the models

In order to test the settlement polygon models the first step was to produce a model for the polygons in all four study areas combined. This was based on the 2011 time-slice and the Sub-Types making up the high and medium probability zones of this are set out in table 252 below.

	HLC Sub-Types	**Settlement (ha)**	**PA**	**PS**	**Kj**	**Rel gain**
	High probability zone					
1	MD derived from Cropping Units	228.021	0.080	0.153	0.106	0.073
2	MD Altered field patterns (Amalgamated)	505.162	0.334	0.340	0.197	0.079
3	MD Altered field patterns (Sub-Divided)	206.000	0.076	0.139	0.299	0.142
4	Upland Rough Ground (undivided)	45.907	0.005	0.031	0.333	0.168
	Total	**985.09**	**0.495**	**0.663**		

	Medium probability zone					
5	MD Altered field patterns (Re-arranged)	144.952	0.127	0.097	0.324	0.138
6	PX Altered field patterns (Amalgamated)	45.124	0.013	0.030	0.351	0.156
7	PM Altered field patterns (Amalgamated)	48.321	0.038	0.032	0.352	0.150
8	Emod Altered field patterns (Amalgamated)	38.480	0.033	0.026	0.349	0.144
9	Upland Rough Ground (divided)	21.126	0.004	0.014	0.364	0.154
	Total	**298.003**	**0.215**	**0.199**		

Table 252. The high and medium probability zones of the model for all settlement polygons in the Lowland Cornwall project area.

The model performs reasonably well in terms of accuracy, with the high probability zone capturing 66% of the polygon area within 49.5% of the project area and producing a Kvammes Gain of 0.253. The medium probability zone captures 20% of the polygons in 21.5% of the project area and the low probability zones captures 14% of the polygons in 29% of the project area, so is well-defined.

This model was then applied to each of the study areas in turn with the following results:

Probus study area					
Probability zone	**Settlement area (ha)**	**Area (km2)**	**PA**	**PS**	**Kvammes Gain**
High	701.713	78.022	0.576	0.767	0.249
Medium	142.054	22.883	0.169	0.155	-0.090
Low	70.471	34.590	0.255	0.077	-2.312
Total	**914.238**	**135.495**			
Penwith study area					
Probability zone	**Settlement area (ha)**	**Area (km2)**	**PA**	**PS**	**Kvammes Gain**
High	88.313	38.345	0.411	0.304	-0.351
Medium	106.481	24.22	0.259	0.366	0.292
Low	95.762	30.818	0.330	0.330	-0.001
Total	**290.556**	**93.383**			
Pelynt study area					
Probability zone	**Settlement area (ha)**	**Area (km2)**	**PA**	**PS**	**Kvammes Gain**
High	132.601	44.29	0.497	0.645	0.230
Medium	20.019	20.672	0.232	0.097	-1.380
Low	52.843	24.193	0.271	0.257	-0.055
Total	**205.463**	**89.155**			

Poundstock study area					
Probability zone	**Settlement area (ha)**	**Area (km2)**	**PA**	**PS**	**Kvammes Gain**
High	29.226	29.498	0.450	0.380	-0.183
Medium	37.473	14.525	0.222	0.488	0.546
Low	10.116	21.541	0.329	0.132	-1.495
Total	**76.815**	**65.564**			

Table 253. Results of applying the Lowland Cornwall all settlement polygons model to each study area.

It is clear from this that the results are mixed. The best outcome was achieved in the Probus study area, in which the high probability zone captures almost 77% of the polygon area, the medium probability zone captures 15.5% and the low probability zone only 8%. Because the high probability zone covers more than 57% of the study area the model is not especially precise, with a Kvammes Gain of 0.249.

The high probability zone performs reasonably well when applied to the Pelynt study area, capturing 64.5% of the polygon area, but here the low probability zone captures almost three times as much of the polygon area as the medium probability zone.

The model does not fit either the Penwith or Poundstock study areas at all well. In both cases the medium probability zone captures more of the polygon area than the high probability zone and in the Penwith study area the high probability zone captures the least amount of the polygon area.

The results suggest that there are differences in the combinations of Sub-Types forming the high probability zones between the four study areas, particularly Penwith and Poundstock, which are notably different from Probus and Pelynt. However, it should also be borne in mind that the area covered by the settlement polygons varies significantly from study area to study area. So, for instance the polygon area in Poundstock (76.815ha) is more than three times smaller than that in Penwith (290.556ha), whilst the polygon area in Probus (914.238ha) is almost 12 times larger than that in Poundstock. In fact the polygon area in Probus is almost twice that of the other three study areas combined. Such discrepancy in the extents of the polygons is bound to influence the overall model. The fact that the polygon area is so large in the Probus study area means that overall model is skewed in its favour, which is doubtless why the model fits Probus so well.

16 Models based on Lowland Cornwall HLC. Barrows

16.1 Probus study area

Eighty four barrows are recorded in the Probus study area, of which 35 were allocated a validity score of 3 or more during Cornwall's NMP project. These are referred to below as high validity barrows. Models were made for all barrows and high validity barrows only for each of the four time-slices.

16.1.1 1994 HLC model

The 1994 HLC model for barrows (Lowland Cornwall Volume 1, section 8.4) does not fit the Probus study area entirely satisfactorily. The high probability zone of the model, made up of recently Enclosed Land Types, Rough Ground and Farmland Prehistoric, covers only 25% of the study area but captures only 47.6% of the barrows. So whilst it is reasonably precise, producing a Kvammes Gain of 0.473, it is not very accurate. In fact more barrows are captured in the medium probability zone, which comprises the HLC Types Farmland Medieval, Rough Ground/industrial and Recreational. Because this zone is very extensive, covering 66% of the study area it produces a negative Kvammes Gain. In other words the medium probability zone, where the likelihood of encountering a barrow is neither high nor low, covers two thirds of the study area, and there are fewer than half the barrows in the high probability zone.

16.1.2 Lowland Cornwall HLC model: 2011 time-slice

When a model was made for all barrows using the Lowland Cornwall HLC Types as variables the result was also not totally satisfactory. The high probability zone of the model was formed of the following four HLC Types.

1 Modern Enclosed Land

2 Post-Medieval Enclosed Land

3 Early Modern Enclosed Land

4 Woodland mixed

These HLC Types capture 46 barrows, which is only 55% of the total number, so the model cannot be said to be very accurate. Furthermore, of these four Types, Modern Enclosed Land captures the highest number of barrows, but this is only 18. Medieval Enclosed Land, which forms the medium probability zone, captures 35 barrows – almost twice as many.

A better model was made by using HLC Sub-Types as the variables. The Sub-Types making up the high probability zone of the 2011 time-slice model for all barrows is shown in table 254.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	Mod Intakes	18	0.034	0.214	0.197	0.181
2	MD derived from Cropping Units	17	0.166	0.202	0.301	0.217
3	PM Altered field patterns (Amalgamated)	8	0.030	0.095	0.380	0.282
4	Woodland mixed	6	0.011	0.071	0.447	0.342
5	Emod Altered field patterns (Amalgamated)	7	0.047	0.083	0.503	0.379
	Total	**56**	**0.288**	**0.665**		

Table 254. Probus study area 2011 time-slice: all barrows. HLC Sub-Types making up the high probability zone.

The high probability zone of this model captures 66.5% of the barrows so is more accurate. It is also precise, covering only 29% of the study area and achieving a Kvammes Gain of 0.568. The zone is made up predominantly of recent Enclosed Land Sub-Types, with MD derived from Cropping Units being the only Medieval Enclosed Land Sub-Type (this is, however ranked second in the model).

When only the 35 high validity barrows were considered both HLC Types and Sub-Types produced accurate and precise models. HLC Types used as variables resulted in a high probability zone that captured 80% of the barrows in 20% of the study area and achieved a Kvammes Gain of 0.753. It was formed by the following four HLC Types.

1 Modern Enclosed Land

2 Post-Medieval Enclosed Land

3 Woodland mixed

4 Early Modern Enclosed Land

Again Medieval Enclosed Land formed the medium probability zone of this model but in this case only captured seven barrows whereas the two highest ranked Types each captured nine.

The high probability zone of the model using Sub-Types as variables contained four Sub-Types shown in table 255.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	Mod Intakes	9	0.034	0.257	0.240	0.223
2	PM Altered field patterns (Amalgamated)	8	0.030	0.229	0.453	0.422
3	Woodland mixed	5	0.011	0.143	0.590	0.554
4	Emod Altered field patterns (Amalgamated)	3	0.047	0.086	0.651	0.593
	Total	**25**	**0.122**	**0.715**		

Table 255. Probus study area 2011 time-slice: high validity barrows. HLC Sub-Types making up the high probability zone.

The high probability zone is accurate, capturing 71.5% of the barrows and only covers 12% of the study area so is very precise, producing a Kvammes Gain of 0.830. Again it is dominated by recent Enclosed Land Sub-Types, with no Medieval Enclosed Land Sub-Types included.

16.1.3 Lowland Cornwall HLC model: 1880 time-slice

The model for all barrows in the 1880 time-slice based on HLC Types as variables is similar to that for the 2011 time-slice. The high probability zone contains three of the same Types as that of the 2011 time-slice, although in this case the highest ranked Type is Upland Rough Ground (undivided). It seems likely that the Modern Enclosed Land in the 2011 time-slice was taken out of this Upland Rough Ground. The order of rank is as follows:

1 Upland Rough Ground (undivided)

2 Post-Medieval Enclosed Land

3 Woodland mixed

4 Early Modern Enclosed Land

There are, however, similar difficulties with this model. The high probability zone only captures 52.5% of the barrows so is not very accurate. And again Medieval Enclosed Land forms the medium probability zone but captures 35 barrows – more than twice as many as the 17 captured by Upland Rough Ground (undivided).

A better model is produced by the HLC Sub-Types, whose high probability zone is formed by the following Sub-Types.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	Upland Rough Ground (undivided)	17	0.019	0.202	0.193	0.184
2	MD derived from Cropping Units	27	0.337	0.321	0.296	0.168
3	PM Intakes	9	0.040	0.107	0.385	0.234
4	Woodland mixed	6	0.012	0.071	0.454	0.294
5	Emod Altered field patterns (Sub-Divided)	5	0.023	0.060	0.502	0.330
6	PM Altered field patterns (Sub-Divided)	3	0.008	0.036	0.535	0.358
7	Emod Altered field patterns (Amalgamated)	2	0.008	0.024	0.555	0.375
8	Upland Rough Ground (divided)	2	0.012	0.024	0.572	0.387

	Total	**71**	**0.459**	**0.845**		

Table 256. Probus study area 1880 time-slice: all barrows. HLC Sub-Types making up the high probability zone.

There were difficulties in defining the cut-off point of the high probability zone of this model. It can be seen from table 256 that the Relative Gain values begin to decrease after the highest-ranked Sub-Type, Upland Rough Ground (undivided), whereas the Kj parameter values continue to rise. If the Relative Gain values were used to define the high probability zone, it would only capture 20% of the barrows so would not be at all accurate (although it would be precise, with a Kvammes Gain of 0.907). By using the Kj parameters to define the cut-off point, the resulting high probability zone captures almost 85% of the barrows so is much more accurate. It is not, on the other hand, as precise, producing a Kvammes Gain of 0.458.

When only the 35 high validity barrows are considered the HLC Types produce a model whose high probability zone is both accurate and precise, capturing 80% of the barrows in 23% of the study area, achieving a Kvammes Gain of 0.712. It is formed of the following Types:

1 Upland Rough Ground (undivided)

2 Post-Medieval Enclosed Land

3 Woodland mixed

4 Early Modern Enclosed Land

5 Valley Rough Ground (divided)

When the high validity barrows model is made using the Sub-Types as variables the high probability zone is made up of three Sub-Types: Upland Rough Ground (undivided), PM Intakes and Woodland mixed. MD derived from Cropping Units, which is ranked second in the all barrows model, is only ranked fifth. The high probability zone of this model captures only 60% of the barrows so is not notably accurate, but it is very precise, covering only 7% of the project area and achieving a Kvammes Gain of 0.881.

16.1.4 Lowland Cornwall HLC model: 1840 time-slice

The 1840 time-slice model for all barrows based on HLC Types is very similar to that of the 1880 model, with the high probability zone dominated by recent Enclosed Land Types and Rough Ground. It has similar drawbacks in that the high probability zone only captures 55% of the barrows and so is not very accurate. And the highest ranked Type, Upland Rough Ground (undivided), captures 18 barrows whilst Medieval Enclosed Land captures 35, but is only ranked in the medium probability zone.

When the model is made using Sub-Types as variables there are difficulties in defining the cut-off point of the high probability zone. As in the 1880 model the Kj parameters have been used to define the cut-off point even though the Relative Gain values decrease after the second-highest-ranked Sub-Type before starting to increase again, otherwise the high probability zone would capture less than 40% of the barrows. By using the Kj parameters the third ranked Sub-Type, MD derived from Cropping Units, is included in the high probability zone which it otherwise would not have been, along with the fourth to sixth-ranked Sub-Types. The make-up of the high probability zone is shown in table 257.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	Upland Rough Ground (undivided)	18	0.033	0.214	0.197	0.182
2	PM Intakes	12	0.065	0.143	0.305	0.260
3	MD derived from Cropping Units	27	0.377	0.321	0.373	0.205
4	Upland Rough Ground (divided)	8	0.024	0.095	0.387	0.331
5	Emod Intakes	7	0.045	0.083	0.445	0.370
6	MD derived from Strip Fields (Enclosed)	3	0.029	0.036	0.464	0.376
	Total	**75**	**0.573**	**0.892**		

Table 257. Probus study area 1840 time-slice: all barrows. HLC Sub-Types making up the high probability zone.

The drawback of including MD derived from Cropping Units in the high probability zone is that, whilst the model is very accurate, capturing more than 89% of the barrows this is at the expense of precision, the Kvammes Gain being 0.359.

When only the 35 high validity barrows are included the models based on HLC Types and Sub-Types produce high probability zones dominated by recent Enclosed Land and Rough Ground Types. Both produce similar statistical results, capturing 74%-80% of the barrows in between 17 and 23% of the study area and achieve Kvammes Gains of 0.711 (HLC Types) and 0.777 (Sub-Types). The make-up of the high probability zone of the Sub-Types model is shown in table 258.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	PM Intakes	9	0.065	0.257	0.223	0.193
2	Upland Rough Ground (undivided)	8	0.033	0.229	0.435	0.389
3	Upland Rough Ground (divided)	5	0.024	0.143	0.565	0.507
4	Emod Intakes	4	0.045	0.114	0.655	0.577
	Total	**26**	**0.167**	**0.743**		

Table 258. Probus study area 1840 time-slice: high validity barrows. HLC Sub-Types making up the high probability zone.

16.1.5 Lowland Cornwall HLC model: Medieval time-slice

Models for all barrows based on the medieval time-slice do not produce very satisfactory models. When HLC Types are used as variables the high probability zone is formed by the Type Upland Rough Ground (undivided). This, however, only captures 55% of the barrows, so is not particularly accurate: on the other hand it is precise, covering only 16% of the study area and achieving a Kvammes Gain of 0.714. The medium probability zone is formed by Medieval Enclosed Land, which captures 43% of the barrows but covers 63% of the study area so produces a negative Kvammes Gain.

When the model uses HLC Sub-Types as variables the result is very similar, with Upland Rough Ground (undivided) forming the high probability zone and the medium probability zone formed by MD derived from Cropping Units. In terms of accuracy the model is the same as that based on HLC Types.

When only the 35 high validity barrows are considered the resulting model performs much better. The high probability zone is formed by the HLC Types Upland Rough Ground (undivided) and Valley Rough Ground (undivided). This captures 80% of the barrows in 24% of the study area and produces a Kvammes Gain of 0.697.

16.1.6 Discussion

When the 1994 HLC model for barrows is applied to the Probus study area the results are not very satisfactory. The neutral, medium probability zone covers two thirds of the study area and captures more barrows than the high probability zone.

Better results were achieved by the Lowland Cornwall HLC models overall, but nor were these entirely satisfactory when all the barrows were modelled using HLC Types as variables. The high probability zones in all four time-slices captured fewer than 60% of the barrows so they lack accuracy. A further drawback of these models is that the Type Medieval Enclosed Land, which forms the medium probability zone of all time-slice models, captured 42% of the barrows – significantly more than any of the individual Types making up the high probability zones. The models are, however, consistent in that the high probability zones are made up of Rough Ground and more recently Enclosed Land Types. At its simplest this pattern is best seen in the medieval time-slice model, in which the high probability zone is formed entirely by Upland Rough Ground and the medium probability zone by Medieval Enclosed Land. Between them these two Types capture 98% of the barrows.

Generally speaking the models made using Sub-Types as variables perform better: certainly they are significantly more accurate, apart from the medieval time-slice model, capturing between 66.5% and 89.2% of the barrows. However there are difficulties in defining the high probability zone cut-off point in both the 1880 and 1840 models. These difficulties centre around the Sub-Type MD derived from Cropping Units, which captures almost a third of the barrows but which takes up a similar proportion of the study area (33.7% in 1880 and 37.7% in 1840). On its own this Sub-Type captures more barrows than any other, but because it is so extensive it actually produces a negative Kvammes Gain. By not including it in the high probability zones (and the Relative Gain measures suggest it should not be included) the models would not be accurate, but by including it (as the Kj parameter values suggest it should) the models attain a high degree of accuracy but at the expense of precision. In both cases it was decided to include the Sub-Type because the reduction in precision was far less than the loss of accuracy which would result from its omission.

When only the 35 high validity barrows are modelled the results are much more clear cut. The principal difference between these models and those for all barrows is that their high probability zones are made up exclusively of Rough Ground or recently Enclosed Land Types and Sub-Types, with no Medieval Enclosed Land Sub-Types. In all cases Medieval Enclosed Land is forming the medium probability zone. And they perform consistently better than the models for all barrows. Regardless of whether the models are based on HLC Types or Sub-Types, the high probability zones of the models for all but the 1880 time-slice capture between 71.5% and 80% of the barrows so are more accurate, and are precise or very precise: the areas they cover range from 7% to 24% of the study area and they achieve Kvammes Gains ranging from 0.711 to 0.881.

There does therefore appear to be a link between low validity barrows and Medieval Enclosed Land. Of the 49 low validity barrows, 32 are located in Medieval Enclosed Land – that is 65%, whilst for the high validity barrows the corresponding figure is only 20%. Further analysis of the low validity barrows shows that the form of those recorded from Medieval Enclosed Land is as follows:

Cropmark	7
Documentary	19
Extant	5
Site of	1

The striking figure is the 19 barrows recorded from documentary references. In total the Probus barrow dataset includes 22 documentary records for barrows so this represents 86% of these. Similarly there are eight low validity barrows recorded as cropmarks, 87.5% of which are in Medieval Enclosed Land. By contrast only 33% of the 15 low validity barrows with extant remains are located in this Type, along with a single high validity extant barrow.

The main point arising from this is that one could question the reliability of the low validity records, especially those barrows recorded from documentary sources, and further research is needed to make a considered assessment of their veracity.

Overall the models point to Rough Ground and recently Enclosed Land Types being where barrows are most likely to be encountered, especially when only the high validity barrows are modelled. In particular the majority of the extant barrows are located in Rough Ground or recently Enclosed Land Types – many, for instance, in the central ridge of high ground at Newlyn Downs. However, these models are to an extent retrodictive: they indicate the places where barrows have been recorded. It seems unlikely that many extant barrows remain to be discovered in the Probus study area; more likely that more with below ground remains will be revealed by aerial photography, geophysical survey or intrusive interventions. In total 14 of the Probus barrows are recorded as cropmarks and of these, 12 are located in Medieval Enclosed Land (five with high validity scores). These locations include areas of intense prehistoric settlement, such as Trenithan Bennett. So the models suggest that previously unrecorded barrows will most likely be found in Post-Medieval, Early Modern and Modern Enclosed Land but to an extent also in Medieval Enclosed Land.

16.2 Penwith study area

A total of 46 barrows were recorded from the Penwith study area, of which only 13 were assigned a validity rating of 3 or more. These are referred to below as high validity barrows. Models were made for all barrows and high validity barrows for the 2011, 1880, 1840 and medieval time-slices.

16.2.1 1994 HLC barrows model

When the 1994 HLC barrows model was applied to the Penwith study area 89% of the barrows were captured within its high probability zone. So the model fits very well in terms of accuracy, largely because much of the western part of the study area was characterised as Farmland Prehistoric in the 1994 HLC. In fact the high probability zone of the model covers 74.5% of the study area. This means that the model is not precise, producing a low Kvammes Gain of 0.164.

16.2.2 Lowland Cornwall HLC model: 2011 time-slice

The model for the 2011 time-slice based on HLC Types is not very satisfactory. The high probability zone is formed by the following Types:

1 Modern Enclosed Land

2 Prehistoric Enclosed Land

3 Medieval Enclosed Land

4 Post-Medieval Enclosed Land

5 Village

6 Town

7 Upland Rough Ground (undivided)

8 Upland Rough Ground (divided)

9 Deciduous woodland

Together these Types capture all but one of the barrows, thereby effectively producing a two-zone barrows/no barrows model. Although it is accurate it lacks precision because it covers 82.55 of the study area and achieves a low Kvammes Gain of 0.157.

The main problem, however, is that there is no coherent pattern to the make-up of the zone, with barrows likely to be encountered in any of the HLC Types.

In terms of performance a better result is achieved by using HLC Sub-Types as variables. Those forming the high probability zone of the model are shown in table 259.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Amalgamated)	15	0.283	0.326	0.119	0.043
2	Mod Intakes	6	0.057	0.130	0.230	0.116
3	PX Altered field patterns (Re-arranged)	4	0.012	0.087	0.322	0.191
4	PM Altered field patterns (Amalgamated)	4	0.044	0.087	0.384	0.234
5	Village	2	0.024	0.043	0.413	0.254
	Total	**31**	**0.42**	**0.673**		

Table 259. Penwith study area 2011 time-slice: all barrows. HLC Sub-Types making up the high probability zone.

This is reasonably accurate, with the high probability zone capturing 67% of the barrows, and reasonably precise, covering 42% of the study area and achieving a Kvammes Gain of 0.376. However, when analysing the Types and Sub-Types making up the high probability zone it is evident that again there is no real pattern, there being a mixture of Modern Enclosed Land, Medieval and Prehistoric Enclosed Land Sub-Types and Village. In fact, the highest-ranked is a Medieval Enclosed Land Sub-Type, which seems to contradict the model based on Types, in which Medieval Enclosed Land was ranked third.

When only the 13 high validity barrows are considered, the model based on HLC Types produces a two-zone model. The high probability zone is formed of Post-Medieval Enclosed Land, Modern Enclosed Land, Medieval Enclosed Land and Prehistoric Enclosed Land (ranked in that order). Although it captures all of the barrows so is highly accurate, it covers 72% of the study area so is not very precise, achieving a Kvammes Gain of 0.284. When the model for high validity barrows is based on HLC Sub-Types the high probability zone is formed of the Sub-Types set out in table 260.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	PM Altered field patterns (Amalgamated)	4	0.044	0.308	0.285	0.264
2	MD Altered field patterns (Amalgamated)	5	0.283	0.385	0.503	0.366
3	Mod Intakes	2	0.057	0.154	0.625	0.462
4	PX Altered field patterns (Re-arranged)	1	0.012	0.077	0.697	0.527
5	PX Altered field patterns (Amalgamated)	1	0.053	0.077	0.742	0.551
	Total	**13**	**0.449**	**1.00**		

Table 260. Penwith study area 2011 time-slice: high validity barrows. HLC Sub-Types making up the high probability zone.

This is a two-zone model, with a zone with barrows and a zone with no barrows. It covers 45% of the study area and achieves a Kvammes Gain of 0.551. Again the zone is formed by a mixture of Medieval Enclosed Land, Prehistoric Enclosed Land and more recently Enclosed Land Sub-Types.

16.2.3 Lowland Cornwall HLC model: 1880 time-slice

When the model for all barrows is based on HLC Types for the 1880 time-slice the high probability zone is formed of the following four Types:

1 Upland Rough Ground (divided)

2 Medieval Enclosed Land

3 Post-Medieval Enclosed Land

4 Prehistoric Enclosed Land

This zone captures 43 barrows, which is 93.5%, so the model is very accurate. However, it covers 75% of the study area and so is not very precise, achieving a low Kvammes Gain of 0.193. Again the zone is formed by a wide mixture of Types.

When the model is based on HLC Sub-Types there are difficulties in defining the cut-off point between the high and medium probability zones. The Relative Gain values start to decrease after the second-ranked Sub-Type, suggesting that this is the cut-off point. However, in this case the high probability zone would capture only 35% of the barrows. By contrast the KJ measures continue to rise up until the sixth-ranked Sub-Type, producing a more satisfactory model. The six highest-ranked Sub-Types are shown in table 261.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	Upland Rough Ground (divided)	9	0.057	0.196	0.165	0.138
2	MD Altered field patterns (Re-arranged)	7	0.086	0.152	0.267	0.205
3	MD Altered field patterns (Amalgamated)	8	0.180	0.174	0.322	0.199
4	PM Intakes	3	0.031	0.065	0.370	0.233
5	PX Altered field patterns (Amalgamated)	3	0.057	0.065	0.397	0.241
6	PM Altered field patterns (Amalgamated)	2	0.027	0.043	0.424	0.258
	Total	**32**	**0.438**	**0.695**		

Table 261. Penwith study area 1880 time-slice: all barrows. HLC Sub-Types making up the high probability zone.

These six Sub-Types capture 69.5% of the barrows, so the model is reasonably accurate. They cover almost 44% of the study area so the model is also reasonably precise, producing a Kvammes Gain of 0.371. Again there is the same issue as in the 2011 models – namely that there is no clear pattern to the range of Sub-Types making up the high probability zone, there being a mixture of Medieval, Prehistoric and more recently Enclosed Land, as well as Rough Ground, which is ranked highest.

When only the high validity barrows are modelled using HLC Types as variables the high probability zone is formed by Post-Medieval Enclosed Land and Upland Rough Ground (divided) only. Whilst these two Types cover a meagre 13% of the project area they only capture 46% of the barrows – so although the model is very precise, with a Kvammes Gain of 0.719, it can hardly said to be accurate.

When the high validity barrows are modelled using HLC Sub-Types as variables the high probability zone is formed by the Sub-Types shown in table 262.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	PM Altered field patterns (Amalgamated)	2	0.027	0.154	0.140	0.127
2	PM Intakes	2	0.031	0.154	0.277	0.249
3	Upland Rough Ground (divided)	2	0.057	0.154	0.400	0.346
4	MD derived from Cropping Units	2	0.091	0.154	0.501	0.408
5	PX Altered field patterns (Sub-Divided)	1	0.007	0.077	0.575	0.478
6	PX Altered field patterns (Amalgamated)	1	0.057	0.077	0.619	0.498
	Total	**10**	**0.27**	**0.77**		

Table 262. Penwith study area 1880 time-slice: high validity barrows. HLC Sub-Types making up the high probability zone.

This model greatly improves on accuracy, capturing 77% of the barrows, while retaining a good degree of precision, producing a Kvammes Gain of 0.648. Once again, however, there is a mixture of Sub-Types in the high probability zone, with no real distinct pattern.

16.2.4 Lowland Cornwall HLC model: 1840 time-slice

When HLC Types are used as the variables they produce a two-zone, barrow/no barrow model. Although this is obviously very accurate, the high probability zone covers 83.6% of the study area so is not precise, with a low Kvammes Gain of 0.164. The main weakness of the model, however, is that the barrows zone is made up of Rough Ground Types, Prehistoric, Medieval and more recently Enclosed Land with no coherent pattern.

When the model is made using HLC Sub-Types as variables there are again problems with defining the cut-off point between high and medium probability zones. The Relative Gain measures begin to decrease at the third highest-ranked Sub-Type. If this is taken as the cut-off point then the high probability zone would capture only 35% of the barrows. A better result is obtained by using the Kj measures to define the cut-off point. The resulting high probability zone is formed of the five Sub-Types shown in table 263.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	Upland Rough Ground (divided)	9	0.057	0.196	0.165	0.139
2	MD Altered field patterns (Re-arranged)	7	0.113	0.152	0.249	0.179
3	MD Altered field patterns (Sub-Divided)	11	0.284	0.239	0.280	0.134
4	PM Intakes	4	0.061	0.087	0.328	0.159
5	PX Altered field patterns (Amalgamated)	3	0.048	0.065	0.361	0.176
	Total	**34**	**0.563**	**0.739**		

Table 263. Penwith study area 1840 time-slice: all barrows. HLC Sub-Types making up the high probability zone.

Although this model is accurate, capturing 74% of the barrows, it is not very precise, covering 56% of the study area and producing a Kvammes Gain of 0.239. And again the high probability zone is made up of a combination of Medieval, Prehistoric and more recently Enclosed Land Sub-Types as well as Rough Ground, with no real predictive pattern.

When only the 13 high validity barrows are considered the model based on HLC Types is exactly the same as that for the 1880 time-slice, with the high probability zone made up of Post-Medieval Enclosed Land and Upland Rough Ground (divided), and with the same statistical results.

When the model is based on Sub-Types a more satisfactory result is achieved, the high probability zone being made up of the Sub-Types shown in table 264.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	PM Intakes	4	0.031	0.308	0.292	0.276
2	PX Altered field patterns (Amalgamated)	2	0.057	0.154	0.415	0.373
3	Upland Rough Ground (divided)	2	0.057	0.154	0.538	0.470
4	MD derived from Cropping Units	2	0.091	0.154	0.640	0.532
	Total	**10**	**0.236**	**0.77**		

Table 264. Penwith study area 1840 time-slice: high validity barrows. HLC Sub-Types making up the high probability zone.

The high probability zone captures 77% of the barrows, so is accurate, and it only covers 23.6% of the study area, so is precise, producing a Kvammes Gain of 0.692. It does, however, consist of the usual mixture of Enclosed Land of all periods as well as Rough Ground.

16.2.5 Lowland Cornwall HLC model: Medieval time-slice

There are difficulties with the medieval time-slice models for all barrows, regardless of whether they are based on HLC Types or Sub-Types. When based on Types the result is a two-zone, barrow/no barrow model where the zone containing all the barrows is formed of the following Types:

1 Upland Rough Ground (undivided)

2 Medieval Enclosed Land

3 Prehistoric Enclosed Land

Although this zone is obviously accurate, it is not very precise, covering 78% of the study area and producing a modest Kvammes Gain of 0.216.

The outcome is little different when the models are based on Sub-Types. The three Sub-Types forming the high probability zone are as follows:

1 Upland Rough Ground (undivided)

2 MD derived from Cropping Units

3 PX field patterns

These three Sub-Types capture 96% of the barrows, so the model is accurate, but they cover 71% of the study area so it is not precise, producing a modest Kvammes Gain of 0.257.

Similar results were obtained when only the high validity barrows were considered, whether based on HLC Types or Sub-Types. In each case a barrow/no barrow model resulted with the barrow zone formed by the same Sub-Types as the all barrows model and in the same order of rank.

Although this zone captures all the barrows it covers 71% of the study area so is not very precise producing a Kvammes Gain of 0.290.

16.2.6 Discussion

When the 1994 HLC model is applied to the Penwith study area the results are somewhat mixed. Although the model performs very well with regard to accuracy, capturing 89% of the barrows, it lacks precision.

The Lowland Cornwall HLC Types produce models which are more accurate – in fact the 1840 and medieval time-slices produce two-zone models in which all the barrows are captured in the high probability zone. However, these models display a similar lack of precision, with Kvammes Gains ranging from 0.157 to 0.216.

The Lowland Cornwall models are less useful than the 1994 HLC model from a predictive point of view. Whereas the high probability zone of the 1994 model comprised Rough Ground, Recently Enclosed Land and Prehistoric Enclosed Land, that of the Lowland Cornwall models also includes Medieval Enclosed Land. In other words the models suggest there is a more or less equal chance of encountering a barrow in any of these Types. This is best illustrated in the medieval time-slice, in which the high probability zone is formed of Upland Rough Ground, Medieval Enclosed Land and Prehistoric Enclosed Land, which together cover 78% of the study area.

When only the high validity barrows are modelled there is a similar outcome for the 2011 and medieval time-slices, with the high probability zones formed of Medieval and Prehistoric Enclosed Land along with Rough Ground or former Rough Ground. By contrast the 1880 and 1840 time-slices produce much more precisely defined high probability zones made up of Upland Rough Ground (divided) and Post-Medieval Enclosed Land. Unfortunately these two models are not very accurate, both capturing only 46% of the barrows.

The Lowland Cornwall Sub-Types produce better models in terms of performance. Their high probability zones capture between 67% and 96% of the barrows over the four time-slices, so are accurate or very accurate, and they produce Kvammes Gains ranging from 0.239 to 0.376, so are more precise. However, like the HLC Types models they lack any real predictive capability. Their high probability zones are made up of Enclosed Land of all periods and Rough Ground (except for that of the 2011 time-slice, which does not include Rough Ground). A typical example is the 1880 time-slice model, whose high probability zone is formed of Upland Rough Ground and Post-Medieval, Medieval and Prehistoric Enclosed Land Sub-Types. The same is the case when only the high validity barrows are modelled: the high probability zones are formed of a similar broad range of Sub-Types.

The inclusion of such a range of Types and Sub-Types in the high probability zones of the models can partly be explained by the way the landscape was interpreted during the Lowland Cornwall characterisation. One significant difference between the 1994 and Lowland Cornwall HLC is that in 1994 more than 40% of the study area was classed as Farmland Prehistoric, but much of this was reinterpreted during Lowland Cornwall as Medieval Enclosed Land (Lowland Cornwall Volume 3), so that only 7.5% of the study area is now classed as Prehistoric Enclosed Land (the equivalent of Farmland Prehistoric). Farmland Prehistoric is a major component of the high probability zone of the 1994 HLC barrows model and as a result of the reinterpretation many barrows formerly captured in Prehistoric Enclosed Land are now located within Medieval Enclosed Land. Had this land not been reinterpreted it is probable that Medieval Enclosed Land would not have been ranked in the high probability zones of the Lowland Cornwall models.

There were difficulties in defining the cut-off points for the high probability zones of the 1880 and 1840 time-slice models. In both cases the Relative Gain values decreased at the third-ranked Sub-Type whilst the Kj values continued to increase up to the sixth and fifth highest-ranked Sub-Type respectively. If the Relative Gain values were used to define the high probability zones then in both models these zones would only capture 35% of the barrows. Therefore the Kj values were used to define the zone in order to produce a more accurate result. In both models the Relative Gain values began to increase again from the fourth highest-ranked Sub-Type, which seemed to justify this decision. In both models the third-ranked Sub-Types were forms of Medieval Enclosed Land and their PA values (proportion of area covered) exceeded their PS values (proportion of sites captured), which explains why they produced low Relative Gain values. However, each Sub-Type captured relatively high numbers of barrows (MD Altered field patterns (Sub-Divided) in the 1840 time-slice captured more barrows than any other Sub-Type), for which the Kj parameters made an allowance.

This illustrates the wider issue with the Penwith models as a whole. More barrows are located in Medieval Enclosed Land than any other HLC Type, but because this Type covers such an extensive area, one is more likely to encounter a barrow in Rough Ground or recently Enclosed Land Types. For example in the medieval time-slice 17 barrows are located in Upland Rough Ground (undivided), giving a mean distribution of 1.15 barrows per km sq: 24 barrows are located in Medieval Enclosed Land, but because this covers 53 square kilometres the mean distribution is 0.45 barrows per km sq. Because Medieval Enclosed Land Sub-Types are included in the high probability zones of the Penwith models along with Rough Ground and recently Enclosed Land Sub-Types the models are consequently inconclusive and have little predictive capability.

16.3 Pelynt study area

A total of 50 barrows were recorded from the Pelynt study area, of which 22 were assigned a validity rating of 3 or more during Cornwall's NMP. These are referred to below as high validity barrows. Models were made for all barrows and high validity barrows for each of the four time-slices.

16.3.1 1994 HLC barrows model

When the 1994 HLC model for barrows was applied to the Pelynt study area the result was far from satisfactory. Only 27% of the barrows were captured in the high probability zone, whereas 65% were captured in the medium probability zone. In part this is due to the fact that the medium probability zone covers 64.5% of the study area as opposed to the high probability zone's 26.5%. Despite this the model clearly does not work well. In fact when the proportion of sites within each probability zone is compared with the proportion of the study area they occupy, there is clearly a by chance distribution of barrows within the high and medium zones, with the proportion of sites within each zone the same as the proportion of the study area taken up by those zones.

16.3.2 Lowland Cornwall HLC model: 2011 time-slice

When the model for all barrows in the 2011 time-slice was made using HLC Types as variables the high probability zone was made up of the following four Types:

1 Medieval Enclosed Land

2 Modern Enclosed Land

3 Plantation

4 Coastal Rough Ground (divided)

These four Types captured 98% of the barrows so the high probability zone is very accurate, but, as it covers 71% of the study area, is not very precise, producing a Kvammes gain of 0.276. A better result was obtained when the model was made using Sub-Types as the variables. The Sub-Types forming the high probability of this model is shown in table 265.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Amalgamated)	32	0.372	0.640	0.414	0.268
2	Mod Intakes	5	0.013	0.100	0.512	0.355
3	Plantation	4	0.016	0.080	0.586	0.418
4	MD Altered field patterns (Sub-Divided)	4	0.086	0.080	0.609	0.412
5	Coastal Rough Ground (divided)	2	0.002	0.040	0.650	0.450
	Total	**47**	**0.489**	**0.94**		

Table 265. Pelynt study area 2011 time-slice: all barrows. HLC Sub-Types making up the high probability zone.

The high probability zone of this model captures 94% of the barrows, covers 49% of the study area and achieves a Kvammes Gain of 0.479, so is both accurate and quite precise. Although the high probability zone is formed of a mixture of Medieval Enclosed Land, Rough Ground, Plantation and more recently Enclosed Land, the most important Sub-Type is MD Altered field patterns (Amalgamated) which on its own captures 64% of the barrows in 37% of the study area and produces a Kvammes Gain of 0.418.

When only the high validity barrows were modelled the importance of this Sub-Type was even more apparent. The high probability zone of this model is made up of only three Sub-Types, which are shown in table 266.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Amalgamated)	18	0.372	0.818	0.604	0.446
2	Mod Intakes	2	0.013	0.091	0.690	0.524
3	Plantation	1	0.016	0.045	0.727	0.553
	Total	**21**	**0.401**	**0.954**		

Table 266. Pelynt study area 2011 time-slice: high validity barrows. HLC Sub-Types making up the high probability zone.

These three Sub-Types capture 95% of the barrows in 40% of the study area so the model is very accurate and precise, producing a Kvammes Gain of 0.579. But the Sub-Type MD Altered field patterns (Amalgamated) actually captures 82% of the barrows in 37% of the study area, producing a Kvammes Gain of 0.545, so could be considered to form the high probability zone on its own.

When the model for high validity barrows is based on HLC Types the outcome is less satisfactory. The result is a two-zone, barrows/no barrows model with the barrow zone covering 71% of the study area and producing a Kvammes Gain of 0.292.

16.3.3 Lowland Cornwall HLC model: 1880 time-slice

When all the barrows were modelled using HLC Types as variables for the 1880 time-slice the high probability zone was formed by the following five Types:

1 Medieval Enclosed Land

2 Upland Rough Ground (divided)

3 Plantation

4 Coastal Rough Ground (divided)

5 Coastal Rough Ground (undivided)

Between them these five Types capture 98% of the barrows so the model is very accurate, but these Types cover 73% of the study area, so it is not very precise, producing a Kvammes Gain of 0.257. In fact it is virtually a two-zone model because it captures all but one of the 50 barrows, that one being located in Post-Medieval Enclosed Land. A notable weakness of the model is the fact that the highest-ranked Type, Medieval Enclosed Land, captures 76% of the barrows but covers just over 70% of the study area which represents a virtually by chance distribution.

A better result was obtained by basing the model on Sub-Types. The make-up of the high probability zone for this model is shown in table 267.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Re-arranged)	18	0.105	0.360	0.303	0.255
2	MD Altered field patterns (Sub-Divided)	13	0.234	0.260	0.418	0.281
3	Upland Rough Ground (divided)	4	0.006	0.080	0.499	0.355
4	Plantation	4	0.016	0.080	0.572	0.419
	Total	**39**	**0.361**	**0.78**		

Table 267. Pelynt study area 1880 time-slice: all barrows. HLC Sub-Types making up the high probability zone.

The high probability zone is accurate, capturing 78% of the barrows, and is precise, covering 36% of the study area and producing a Kvammes Gain of 0.538. Essentially the zone is formed of Medieval Enclosed Land and Rough Ground, with the Medieval Enclosed Land Sub-Types being ranked highest. Further analysis of the high probability zone shows that the Sub-Type MD Altered field patterns (Re-arranged) is indeed a very likely location for barrows, with a PS value more than three times its PA value, the same is not true for the second-ranked Sub-Type, MD Altered field patterns (Sub-Divided). This Sub-Type captures 26% of the barrows in more than 23% of the study area which is virtually a by chance distribution.

When only the 22 high validity barrows are modelled using HLC Types as variables the result is a two-zone, barrows/no barrows model with the barrows zone formed of the Types Medieval Enclosed Land, Upland Rough Ground (divided) and Plantation (ranked in that order). Although this captures all the barrows, so is extremely accurate it is not very precise because the barrows zone covers more than 72% of the study area (Medieval Enclosed Land alone covers 70% of the study area), and it produces a modest Kvammes Gain of 0.276.

When the model uses Sub-Types as variables a better result is achieved. If the Kj parameter values are used to define the high probability zone it is formed of four Sub-Types (table 268) but retains a high degree of accuracy, capturing 95.5% of the barrows. And because this zone only covers 36% of the study area the model is precise, achieving a Kvammes gain of 0.622. Alternatively the Relative Gain values could be used to define the high probability zone. In this case the zone would be formed by the highest-ranked Sub-Type only. Whilst this would be a very precise model, with a Kvammes Gain of 0.836, it would not be as accurate, capturing 63.6% of the barrows.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Re-arranged)	14	0.105	0.636	0.582	0.532
2	MD Altered field patterns (Sub-Divided)	4	0.234	0.182	0.626	0.479
3	Upland Rough Ground (divided)	2	0.006	0.091	0.670	0.617
4	Plantation	1	0.016	0.045	0.707	0.646
	Total	**17**	**0.127**	**0.772**		

Table 268. Pelynt study area 1880 time-slice: high validity barrows. HLC Sub-Types making up the high probability zone.

16.3.4 Lowland Cornwall HLC model: 1840 time-slice

When all the barrows were modelled using HLC Types as variables for the 1840 time-slice the high probability zone was formed by almost exactly the same five Types as that in the 1880 model:

1 Medieval Enclosed Land

2 Upland Rough Ground (undivided)

3 Plantation

4 Coastal Rough Ground (divided)

5 Coastal Rough Ground (undivided)

The only difference being that in the 1880 model the second highest-ranked Type is Upland Rough Ground (divided) rather than (undivided).

The performance of the high probability zone is exactly the same as the 1880 model, capturing 98% of the barrows within 73% of the study area, and producing a Kvammes Gain of 0.257. Like the 1880 model it is virtually a two-zone model, capturing all but one of the 50 barrows, that one being located in Post-Medieval Enclosed Land. As in the 1880 model the PA and PS values produced by Medieval Enclosed Land represent a virtually by chance distribution.

When the model is based on Sub-Types the high probability zone, using the Kj parameters to define it, is formed by five Sub-Types (table 269).

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	MD Altered field patterns (Re-arranged)	18	0.133	0.360	0.286	0.227
2	MD Altered field patterns (Sub-Divided)	18	0.368	0.360	0.397	0.219
3	Plantation	4	0.011	0.080	0.480	0.288
4	Upland Rough Ground (undivided)	4	0.021	0.080	0.553	0.347
5	Coastal Rough Ground (divided)	2	0.006	0.040	0.592	0.381
	Total	**46**	**0.539**	**0.92**		

Table 269. Pelynt study area 1840 time-slice: all barrows. HLC Sub-Types making up the high probability zone.

This model is very accurate, capturing 92% of the barrows. It covers just over half of the study area so is reasonably precise, producing a Kvammes Gain of 0.414. However, the Relative Gain values fall when the second highest-ranked Sub-Type is added to the model, indicating that the high probability zone should consist of the highest-ranked Sub-Type only. This would, however, only capture 36% of the barrows. It should be noted that the second highest-ranked Sub-Type, MD Altered field patterns (Sub-

Divided), is displaying a by chance distribution with a PA value of 0.368 and a PS value of 0.360.

When only the high validity barrows are considered the results are very similar to the 1880 time-slice. The only difference when the model uses HLC Types as variables is that the second highest-ranked Type is Upland Rough Ground (undivided) rather than (divided). And the model produces exactly the same results in terms of barrows captured, area covered and Kvammes Gain.

However, when the model is based on Sub-Types the outcome is quite different, with the high probability zone formed exclusively by the Sub-Type MD Altered field patterns (Re-arranged). This captures 64% of the barrows within 13% of the study area and achieves a Kvammes Gain of 0.791, so whilst very precise it is only reasonably accurate.

16.3.5 Lowland Cornwall HLC model: Medieval time-slice

When the medieval time-slice model for all barrows is based on HLC Types a two-zone model results, with the barrows zone formed of the Types Medieval Enclosed Land, Upland Rough Ground (undivided) and Coastal Rough Ground (undivided). The zone covers 80% of the study area so, although completely accurate, lacks precision, producing a Kvammes Gain of 0.196.

When the model uses Sub-Types as variables a similar two-zone model is produced. The high probability zone is formed of the following Sub-Types:

1 MD derived from Cropping Units

2 Upland Rough Ground (undivided)

3 MD derived from Strip Fields (Enclosed)

4 Coastal Rough Ground (undivided)

These four Sub-Types capture all the barrows in 76.5% of the study area so, although completely accurate is not very precise, producing a Kvammes Gain of 0.235.

When only the 22 high validity barrows are considered the high probability zone is formed of MD derived from Cropping Units (which captures 18 barrows) and Upland Rough Ground (undivided) (which captures 3). In total this zone captures 95.5% of the barrows in 68% of the study area, so is very accurate but not so precise, producing a Kvammes Gain of 0.291.

16.3.6 Discussion

The 1994 HLC barrows model does not fit the Pelynt study area very well at all. More than twice as many barrows are captured in the medium probability zone than in the high probability zone, and there is a by chance distribution of barrows in both high and medium probability zones. In part this is due to the very small extent of Rough Ground and former Rough Ground, which form a major component of the model’s high probability zone: these types cover only 15% of the study area.

The Lowland Cornwall HLC produces better performing models. When all the barrows are modelled using HLC Types as variables, the resulting high probability zones are very accurate, so much so that the 2011, 1880 and 1840 time-slices produce virtually two-zone, barrows/no barrows models, with only a single barrow not captured in the high probability zone. And the medieval time-slice does produce a barrows/no barrows model, with all the barrows captured in the high probability zone. However, because in each time-slice the high probability zones cover an extensive area, ranging from 71% to 76.5% of the study area, the models are not very precise, with Kvammes Gain measures ranging from 0.235 to 0.276. In fact for the 1840 and 1880 time-slices the highest-ranked Type, Medieval Enclosed Land, displays a virtually by chance distribution with similar PA and PS values.

In all four models the highest-ranked HLC Type is Medieval Enclosed Land and when the barrows are modelled using Sub-Types as variables the predominance of Medieval Enclosed Land is very clear. Taken individually Medieval Enclosed Land Sub-Types capture between 62% (1880 time-slice) and 76% (medieval time-slice) of all barrows in each of the four time-slices. All these models, bar that for the 1840 time-slice are all very accurate capturing between 78% and 100% of the barrows, and apart from the medieval time-slice, they are more precise than those based on HLC Types, with Kvammes Gains ranging from 0.414 to 0.538. Like the HLC Types model, the medieval time-slice Sub-Types produce a two-zone model.

Analysis of the Medieval Enclosed Land Sub-Types ranked in the high probability zones of the models suggests that they broadly reflect the pattern of change through time typical of the four study areas as a whole (Lowland Cornwall volume 3). That is, MD derived from Cropping Units in the medieval time-slice, MD Altered field patterns (Sub-Divided) in the 1880 time-slice, and MD Altered field patterns (Amalgamated) in the 2011 time-slice. In addition the Sub-Type MD Altered field patterns (Re-arranged) is ranked highest in both the 1840 and 1880 time-slices. Of these four, while both MD Altered field patterns (Amalgamated) and MD Altered field patterns (Re-arranged) are strong predictors, this is not the case with MD Altered field patterns (Sub-Divided) and, to a lesser extent, MD derived from Cropping Units. In fact in the 1840 time-slice model MD Altered field patterns (Sub-Divided) is displaying a by chance distribution.

When only the high validity barrows were modelled the results were broadly similar to those produced by the models for all barrows in that Medieval Enclosed Land Sub-Types are ranked highest throughout.

16.4 Poundstock study area

In total 49 barrows are recorded from the Poundstock study area, of which 26 were assigned a validity score of 3 or more during Cornwall's NMP. These are referred to below as high validity barrows. Models were made for all barrows and the high validity barrows only for all four HLC time-slices.

16.4.1 1994 HLC model

When the 1994 HLC model for barrows is applied to the Poundstock study area it fits very well, with the high probability zone capturing 71% of the barrows, the medium probability zone capturing 29% and the low probability zone being free of barrows. One weakness of the model is the very small size of the low probability zone (covering only 5% of the study area), with the result that the neutral, medium probability zone is relatively extensive, covering almost half of the study area.

16.4.2 Lowland Cornwall HLC model: 2011 time-slice

When the Lowland Cornwall HLC Types were used as variables for the 2011 time-slice model the high probability zone was formed by the following Types:

1 Post-Medieval Enclosed Land

2 Modern Enclosed Land

3 Early Modern Enclosed Land

4 Coastal Rough Ground (divided)

Together these four Types capture 67% of the barrows in 28% of the study area and achieve a Kvammes Gain of 0.590, so the model is both accurate and precise.

However, when the model is made using HLC Sub-Types as variables there are difficulties in defining the cut-off point between high and medium probability zones. The Relative Gain values begin to decrease after the two highest-ranked Sub-Types, both of which are forms of Post-Medieval Enclosed Land (table 270). The high probability zone formed by these two Sub-Types covers only 7% of the study area so is very precise, with a Kvammes Gain of 0.8. However, it only captures 35% of the barrows so is not at all accurate.

On the other hand the Kj parameter values continue to increase up to the eleventh highest-ranked Sub-Type. These 11 Sub-Types capture 98% of the barrows, thereby producing a virtually two zone model which is very accurate but not as precise, with the high probability zone covering 63% of the study area and achieving a Kvammes Gain of 0.359.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	PM Altered field patterns (Amalgamated)	13	0.054	0.265	0.237	0.211
2	PM Altered field patterns (Sub-Divided)	4	0.016	0.082	0.310	0.277
3	MD Altered field patterns (Amalgamated)	14	0.369	0.286	0.350	0.194
4	Mod Intakes	6	0.137	0.122	0.369	0.180
5	Mod New Farms (>5ha)	2	0.003	0.041	0.416	0.217
6	Emod Intakes	2	0.008	0.041	0.458	0.250
7	Coastal Rough Ground (divided)	2	0.008	0.041	0.499	0.283
8	Emod Altered field patterns (Amalgamated)	2	0.016	0.041	0.532	0.308
9	Coastal Rough Ground (undivided)	1	0.001	0.020	0.555	0.328
10	Emod Altered field patterns (Sub-Divided)	1	0.004	0.020	0.575	0.344
11	PM Intakes	1	0.013	0.020	0.587	0.351
	Total	**48**	**0.629**	**0.979**		

Table 270. Poundstock study area 2011 time-slice: all barrows. HLC Sub-Types making up the high probability zone.

When only the high validity barrows are modelled using HLC Types as variables the high probability zone is made up of the following three Types:

1 Post-Medieval Enclosed Land

2 Early Modern Enclosed Land

3 Coastal Rough Ground (undivided)

Together these three Types capture 54% of the barrows, so the model is not very accurate, but as they cover only 13% of the study area it is very precise, producing a Kvammes Gain of 0.760.

When the model uses HLC Sub-Types as variables it performs similarly to the all barrows model (table 271). The Relative Gain measures begin to decrease after the second highest-ranked Sub-Type whilst the Kj parameters continue to increase up to the ninth highest-ranked. If these nine Sub-Types are taken as forming the high probability zone then the performance is very accurate (capturing 92% of the barrows) and reasonable precise, with a Kvammes Gain of 0.472. The two highest-ranked Sub-Types capture only 35% of the barrows so do not form an accurate high probability zone.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	PM Altered field patterns (Amalgamated)	6	0.054	0.231	0.202	0.177
2	PM Altered field patterns (Sub-Divided)	3	0.016	0.115	0.309	0.277
3	MD Altered field patterns (Amalgamated)	8	0.369	0.308	0.375	0.215
4	Emod Intakes	2	0.008	0.077	0.456	0.284
5	Coastal Rough Ground (undivided)	1	0.001	0.038	0.498	0.322
6	Mod New Farms (>5ha)	1	0.003	0.038	0.537	0.357
7	Coastal Rough Ground (divided)	1	0.008	0.038	0.573	0.388
8	PM Intakes	1	0.013	0.038	0.604	0.413
9	Emod Altered field patterns (Amalgamated)	1	0.016	0.038	0.634	0.435
	Total	**24**	**0.488**	**0.921**		

Table 271. Poundstock study area 2011 time-slice: high validity barrows. HLC Sub-Types making up the high probability zone.

In both the all barrows and high validity barrows models the Sub-Types making up the high probability zones are very similar, being predominantly forms of Post-Medieval, Early Modern or Modern Enclosed Land, but with MD Altered field patterns (Amalgamated) being ranked third in both, and capturing more barrows than any other Sub-Type. However, in both models this Sub-Type's PA value is greater than its PS value (e.g. in the all barrows model its PA value is 0.369 and its PS value 0.286), indicating that it is not a strong predictor.

16.4.3 Lowland Cornwall HLC model: 1880 time-slice

The 1880 time-slice model for all barrows based on HLC Types is both accurate and precise, with its high probability zone capturing 67% of the barrows in 22% of the study area and producing a Kvammes Gain of 0.673. The zone is formed by the following four Types:

1 Post-Medieval Enclosed Land

2 Coastal Rough Ground (divided)

3 Early Modern Enclosed Land

4 Upland Rough Ground (divided)

When the model uses Sub-Types as variables the high probability zone is more accurate but less precise. The make-up of the high probability zone is shown in table 272.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	PM Altered field patterns (Amalgamated)	9	0.037	0.184	0.164	0.146
2	PM Intakes	8	0.049	0.163	0.301	0.261
3	MD Altered field patterns (Amalgamated)	10	0.205	0.204	0.379	0.260
4	Coastal Rough Ground (divided)	5	0.015	0.102	0.477	0.348
5	Emod Intakes	5	0.036	0.102	0.559	0.414
6	Upland Rough Ground (divided)	5	0.071	0.102	0.617	0.445
7	Coastal Rough Ground (undivided)	1	0.005	0.020	0.636	0.460
8	PM Altered field patterns (Sub-Divided)	1	0.006	0.020	0.653	0.475
	Total	**44**	**0.424**	**0.897**		

Table 272. Poundstock study area 1880 time-slice: all barrows. HLC Sub-Types making up the high probability zone.

The zone captures 90% of the barrows within 42% of the study area, producing a Kvammes Gain of 0.529. As well as Rough Ground and more recently Enclosed Land Sub-Types the zone also includes the Medieval Enclosed Land Sub-Type MD Altered field patterns (Amalgamated). In this instance the PA and PS values produced by MD Altered field patterns (Amalgamated) are virtually identical, indicating a by chance distribution.

When only the high validity barrows are modelled using HLC Types as variables the high probability zone is made up of the same four Types as the all barrows model but they are ranked differently:

1 Post-Medieval Enclosed Land

2 Early Modern Enclosed Land

3 Upland Rough Ground (divided)

4 Coastal Rough Ground (undivided)

Together these Types capture 61.5% of the barrows in 21% of the study area and produce a Kvammes Gain of 0.658, so the model is more precise than accurate.

When the high validity barrows model is made using Sub-Types as variables the high probability zone is made up of the following five Sub-Types.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	PM Intakes	6	0.049	0.231	0.205	0.182
2	PM Altered field patterns (Amalgamated)	4	0.037	0.154	0.339	0.298
3	MD Altered field patterns (Amalgamated)	6	0.205	0.231	0.447	0.325
4	Emod Intakes	3	0.036	0.115	0.543	0.404
5	Upland Rough Ground (divided)	2	0.071	0.077	0.575	0.410
	Total	**21**	**0.398**	**0.808**		

Table 273. Poundstock study area 1880 time-slice: high validity barrows. HLC Sub-Types making up the high probability zone.

The three highest-ranked Sub-Types are the same as those in the all barrows model. The main difference between the two models is that Coastal Rough Ground Types are not included in the high probability zone of the high validity barrows model whereas they are in that for all barrows. The high probability zone of this model captures 81% of the barrows in 40% of the study area so it is very accurate, but not as precise as the model based on HLC Types, producing a Kvammes Gain of 0.507.

16.4.4 Lowland Cornwall HLC model: 1840 time-slice

When an 1840 time-slice model is made for all barrows using HLC Type as the variable, the high probability zone is formed of the following four Types:

1 Post-Medieval Enclosed Land

2 Upland Rough Ground (divided)

3 Coastal Rough Ground (divided)

4 Coastal Rough Ground (undivided)

These Types capture 65% of the barrows in 19% of the study area and produce a Kvammes gain of 0.703 so the model is reasonably accurate and very precise.

When Sub-Types are used as the variables the resulting model is somewhat problematic in terms of accuracy (table 274).

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	PM Intakes	18	0.093	0.367	0.317	0.274
2	Upland Rough Ground (divided)	7	0.065	0.143	0.424	0.352
3	Coastal Rough Ground (divided)	4	0.011	0.082	0.500	0.423
	Total	**29**	**0.169**	**0.592**		

Table 274. Poundstock study area 1840 time-slice: all barrows. HLC Sub-Types making up the high probability zone.

Only 59% of the barrows are captured in the high probability zone, so it is not very accurate. It is, however, precise, achieving a Kvammes Gain of 0.714.

When only the high validity barrows are modelled using HLC Types as the variables the same four Types form the high probability zone as in the all barrows model (and ranked in the same order), but the model is not as accurate or precise – the high probability zone captures 61.5% of the barrows in 19% of the study area and achieves a Kvammes Gain of 0.684.

When Sub-Types are used as the variables the model is a good deal more accurate, with 85% of the barrows captured in the high probability zone. This model achieves a Kvammes Gain of 0.483. The make-up of the high probability zone is quite different from that of the all barrows model. It contains five Sub-Types rather than three and the third-ranked Sub-Type is a form of Medieval Enclosed Land.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
1	PM Intakes	10	0.093	0.385	0.335	0.292
2	Upland Rough Ground (divided)	4	0.065	0.154	0.452	0.380
3	MD Altered field patterns (Sub-Divided)	6	0.256	0.231	0.522	0.355
4	Coastal Rough Ground (divided)	1	0.011	0.038	0.556	0.382
5	Upland Rough Ground (undivided)	1	0.013	0.038	0.588	0.408
	Total	**22**	**0.438**	**0.846**		

Table 275. Poundstock study area 1840 time-slice: high validity barrows. HLC Sub-Types making up the high probability zone.

16.4.5 Lowland Cornwall HLC model: Medieval time-slice

When all the barrows are modelled using HLC Types as the variable the high probability zone is formed of the Types Coastal Rough Ground (undivided) and Upland Rough Ground (undivided), in that order. These two Types capture 69% of the barrows within 18% of the study area so the model is reasonably accurate and very precise, achieving a Kvammes Gain of 0.741. The medium probability zone is formed of Medieval Enclosed Land.

When Sub-Types are used as the variable the high probability zone is made up of Coastal Rough Ground (undivided), Upland Rough Ground (undivided) and MD derived from Strip Fields (Enclosed). This model is more accurate, capturing 86% of the barrows in its high probability zone, but somewhat less precise, covering 34% of the study area and producing a Kvammes Gain of 0.608.

When only the high validity barrows are modelled the models are exactly the same as those for all barrows in terms of the Types and Sub-Types making up the high probability zones. They are slightly different in term of gain measures: the high probability zone of the HLC Type model captures 65% of the barrows in 18% of the study area, with a Kvammes Gain of 0.726; the Sub-Types model captures 92% of the barrows in 34% of the study area and produces a Kvammes Gain of 0.636.

16.4.6 Discussion

The 1994 HLC model for barrows fits the Poundstock study area very well in terms of accuracy and is reasonably precise, with a Kvammes Gain of 0.381. When HLC Types are used as variables the Lowland Cornwall HLC produces models which are, apart from that for the 2011 high validity barrows, rather more accurate and considerably more precise, capturing between 61.5% and 69% of the barrows within between 13% and 28% of the study area and achieving Kvammes Gains ranging from 0.590 to 0.760. The high probability zones of the 2011, 1880 and 1840 time-slice models are formed by Rough Ground and more recently Enclosed Land Types (former Rough Ground) and that of the medieval time-slice exclusively by Rough Ground Types, with Medieval Enclosed Land forming the medium probability zone in all the models.

However, the models made using HLC Sub-Types as variables are less clear cut. There are difficulties defining the cut-off point of the high probability zones of the 2011 and 1880 time-slice models. The Sub-Type MD Altered field patterns (Amalgamated) captures more barrows than any other and is ranked third in each. However, because its PA value is greater than its PS value the Relative Gain measures indicate that it should not be included in the high probability zones, which in that case would be formed solely by two Post-Medieval Enclosed Land Sub-Types. These zones would capture less than 40% of the barrows so would not be accurate. Therefore the Kj parameters were used to define the high probability zones, which were, as a result, both accurate and reasonably precise, capturing between 90 to 98% of the barrows and producing Kvammes Gains of 0.359 and 0.529.

All the other Sub-Types making up the high probability zones of these two models are either Rough Ground or former Rough Ground Sub-Types, so this is a very clear pattern. And this pattern is even more pronounced in the 1840 time-slice model, whose high probability zone is formed by Post-Medieval Intakes and two Rough Ground Types only. This model, however, is not as accurate, capturing only 59% of the barrows. The medieval time-slice model has a high probability zone containing Coastal Rough Ground, Upland Rough Ground and MD derived from Strip Fields (Enclosed).

There are some differences in the make-up of the high probability zones of the models across the four time-slices but in the main these reflect changes to field patterns through time. For instance in the 1880 time-slice model the Sub-Type PM Intakes captures eight barrows and is ranked second in the model, but in the 2011 time-slice model it only captures one barrow and is ranked tenth. In the 2011 model four of the barrows previously captured by this Sub-Type are captured by the Sub-Type PM Altered field patterns (Amalgamated) and three by Type PM Altered field patterns (Sub-Divided).

Similarly there are mostly only slight differences between the models for all barrows and those for only the high validity barrows. These typically consist of slightly different orders in which the Sub-Types are ranked. The most notable variance is in the 1840 time-slice models, with the Sub-Type MD Altered field patterns (Sub-Divided) included in the high validity barrows model but not in that for all the barrows.

16.5 Testing the models

In order to test the models the first step was to produce a model for the barrows in all four study areas combined, based on the 2011 time-slice. The Sub-Types making up the high and medium probability zones of this are set out in table 276 below.

	HLC Sub-Types	Barrows	PA	PS	Kj	Rel gain
	High probability zone					
1	Mod Intakes	35	0.052	0.153	0.124	0.101
2	MD Altered field patterns (Amalgamated)	76	0.334	0.332	0.219	0.099
3	PM Altered field patterns (Amalgamated)	25	0.038	0.109	0.318	0.170
4	MD derived from Cropping Units	18	0.080	0.079	0.336	0.168
5	PM Altered field patterns (Sub-Divided)	8	0.008	0.035	0.372	0.195
6	Emod Altered field patterns (Amalgamated)	9	0.033	0.039	0.388	0.202
7	Woodland mixed	6	0.009	0.026	0.411	0.219
8	Emod Intakes	5	0.013	0.022	0.426	0.228
9	PX Altered field patterns (Re-arranged)	4	0.003	0.017	0.444	0.242
10	Plantation	4	0.005	0.017	0.460	0.255
11	Coastal Rough Ground (divided)	4	0.006	0.017	0.475	0.267
	Total	**194**	**0.581**	**0.846**		
	Medium probability zone					
12	MD Altered field patterns (Sub-Divided)	8	0.076	0.035	0.447	0.226
13	Upland Rough Ground (undivided)	3	0.005	0.013	0.458	0.234
14	PM Intakes	3	0.016	0.013	0.459	0.232
15	Mod New Farms (>5ha)	2	0.001	0.009	0.469	0.240
16	PX Altered field patterns (Amalgamated)	2	0.013	0.009	0.467	0.235
17	Town	2	0.014	0.009	0.464	0.230
	Total	**20**	**0.125**	**0.088**		

Table 276. The high and medium probability zones of the 2011 time-slice model for all barrows in the Lowland Cornwall project area.

The model performs very well in terms of accuracy and is reasonably precise, with the high probability zone capturing almost 85% of the barrows within 58% of the project area and producing a Kvammes Gain of 0.315. The medium probability zone captures 9% of the barrows in 12.5% of the project area and the low probability zones captures a little over 6% of the barrows in 29% of the project area, so is well-defined. The model is considerably more accurate than that based on the 1994 HLC, in which the high probability zone captured only 61% of the barrows. However, the 1994 model was more precise, achieving a Kvammes Gain of 0.397.

This model was then applied to each of the study areas in turn with the following results:

Probus study area					
Probability zone	**Barrows**	**Area (km2)**	**PA**	**PS**	**Kvammes Gain**
High	76	86.991	0.642	0.971	0.290
Medium	5	14.207	0.105	0.000	-0.762
Low	3	34.297	0.253	0.029	-6.087
Total	**84**	**135.495**			
Penwith study area					
Probability zone	**Barrows**	**Area (km2)**	**PA**	**PS**	**Kvammes Gain**
High	30	46.483	0.498	0.652	0.237
Medium	9	19.076	0.204	0.196	-0.044
Low	7	27.824	0.298	0.152	-0.958
Total	**46**	**93.383**			
Pelynt study area					
Probability zone	**Barrows**	**Area (km2)**	**PA**	**PS**	**Kvammes Gain**
High	43	47.837	0.537	0.860	0.376
Medium	4	9.78	0.110	0.080	-0.371
Low	3	31.534	0.354	0.060	-4.895
Total	**50**	**89.151**			
Poundstock study area					
Probability zone	**Barrows**	**Area (km2)**	**PA**	**PS**	**Kvammes Gain**
High	43	41.884	0.639	0.878	0.272
Medium	3	4.497	0.069	0.061	-0.120
Low	3	19.183	0.293	0.061	-3.779
Total	**49**	**65.564**			

Table 277. Results of applying the Lowland Cornwall all barrows model to each study area (2011 time-slice).

Clearly the model fits the study areas well; very well in the case of Probus, Pelynt and Poundstock, capturing more than 85% of the barrows in each. In Penwith, although the model does not perform as well, it still captures 65% of the barrows so is reasonably accurate. Also in all the study areas the medium probability zone performs better than the low probability zone, as shown by the Kvammes Gain measures. The model is not, however, particularly precise, with Kvammes Gains ranging from 0.237 to 0.376.

When only the high validity barrows are considered the model for the most part performs slightly better, with between 85% and 97% of the barrows captured in the high probability zone and Kvammes Gains ranging from 0.245 (Poundstock) to 0.461

(Penwith). The most notable difference is that 92% of the high validity barrows in the Penwith study area are captured in the high probability zone as opposed to only 65% of all barrows.

17 Summary and discussion

17.1 The enclosure models

The principal Types forming the high probability zone of the 1994 HLC model for enclosures in Lowland Cornwall were Farmland Medieval, Farmland Prehistoric and Farmland C20. Between them these Types captured 79% of the enclosures in 66% of the project area, producing a Kvammes Gain of 0.172. So whilst the model is accurate it lacks precision.

When this model was applied to the four study areas it was in the main accurate: in Penwith it performed similarly to its county-wide performance, capturing 79% of the enclosures, and in both Probus and Pelynt it was more accurate, capturing 87% and 95% of enclosures respectively. In terms of precision in Pelynt the model performed better than it did county-wide, producing a Kvammes Gain of 0.221, but in Probus and Penwith it was less precise, producing Kvammes gains of 0.112 and 0.165. However, the model did not perform well in the Poundstock study area. The high probability zone only captured 64% of the enclosures and produced a negative Kvammes Gain, and the medium probability zone was actually ranked highest when Kj parameters were applied.

It is fair to say that in each of the four study areas the Lowland Cornwall HLC Types produced better performing models. In both Probus and Pelynt the high probability zones were more accurate across the four time-slices, capturing between 88% and 96% of the enclosures, and also more precise with Kvammes Gains ranging from 0.210 to 0.261. In the Penwith study area the models were of similar accuracy to the 1994 model, the 2011, 1880 and 1840 time-slice models were more precise, but that for the medieval time-slice was less so. In Poundstock, although the models performed better than the 1994 model, capturing between 67%and 73% of enclosures in their high probability zones and producing positive Kvammes Gains, these gains were low, ranging from 0.050 to 0.170. In fact for the 1880 and 1840 time-slices the models in Poundstock suggested an almost by chance enclosure distribution: for instance in the 1840 time-slice the high probability zone captured 67% of the enclosures in 63% of the study area.

In all four study areas the highest-ranked HLC Type was Medieval Enclosed Land, and in Penwith Prehistoric Enclosed Land was ranked second. The predominance of Medieval Enclosed Land in the high probability zones was underlined when the models were made with Sub-Types as the variables. Some of the high probability zones were made up exclusively of Medieval Enclosed Land Sub-Types and in all cases Medieval Enclosed Land Sub-Types dominated the high probability zones. An additional feature of the 2011 time-slice models across the study areas was that the highest-ranked Sub-Type was MD Altered field patterns (Amalgamated). The only exception was in the Poundstock study area, and here the predominance of Medieval Enclosed Land was less clear than the other three study areas. For instance the highest-ranked HLC Type in the Poundstock 1840 time-slice model was Post Medieval Enclosed Land and the high probability zones of the Sub-Type models for all time-slices include Rough Ground or former Rough Ground Sub-Types as well as Medieval Enclosed Land.

For the most part the models based on HLC Sub-Types produce more precise models than those based on Types, albeit with a slight decrease in accuracy. Broadly speaking the combinations of Sub-Types making up the high probability zones are consistent throughout the time-slices, allowing for changes in field patterns through time (for instance fields classified as sub-divided in the 1840 time-slice being replaced by amalgamated fields in the 2011 time-slice). Again the exception to this general trend is Poundstock, where there are significant differences between the high probability zones from time-slice to time-slice.

Also in the Poundstock study area there are significant differences between the make-up of the high probability zones of the all enclosures models and those for high validity enclosures only. The most obvious case is in the 1880 time-slice where only one of the four Sub-Types in the high probability zone of the all enclosures model is included in that of the high validity enclosures model. However, variance between the all enclosures and high validity enclosures models is most notable in the Penwith study area where some Rough Ground and former Rough Ground Sub-Types are included in the high probability zones of some of the all enclosures models, but not in the high validity enclosure models. Here just over 10% of the high validity enclosures are located in land not classed as Medieval or Prehistoric Enclosed, whereas the corresponding figure for the low validity enclosures is 33%. This suggests that the interpretation of some of the low validity enclosures might be questioned, particularly those recorded from documentary sources.

Although the Lowland Cornwall HLC produces more precise models for enclosures than the 1994 HLC, particularly when the models are made with Sub-Types as variables, the increase in precision is not very great. In an attempt to create more precise models the combinations of Sub-Types across all four time-slices (five in the case of Penwith) were modelled as variables. The result was a series of complex models which were essentially two-zoned, with high and low probability zones, but with a far smaller very high probability zone. The very high probability zones of these models achieve good levels of accuracy and precision. However, although there are similarities between the very high probability zones for all four study areas, there are also differences. For instance in Poundstock the predominant Sub-Type in the very high probability zone is MD Altered field patterns (Sub-Divided), whilst in the other three study areas the predominant Sub-Type is MD Altered field patterns (Amalgamated).

These differences doubtless explain why, when testing was carried out using partial data, in most cases the very high probability zones captured fewer enclosures than predicted. Even when roughly equal-sized areas from all four study areas were created, in an attempt to neutralise differences in size and HLC make-up between the study areas, and then tested against each other, the results were the same.

Conversely what the tests did show for the most part was that the overall high probability zones of these models did very accurately predict the number of enclosures captured. The conclusion to be drawn from this is that regional differences in HLC, topographical character and enclosure distribution mean it is not possible to successfully apply the fine-grained very high probability zone from one study area to the others, but that the high-level Lowland Cornwall high probability zone can be. This does demonstrate a correlation between Medieval and Prehistoric Enclosed Land and the location of the enclosures.

17.2 The settlement polygon models

The make-up of the high probability zones of the settlement polygon models is not consistent across the project area but differs from study area to study area. In Probus the high probability zones of all the models are formed exclusively by Medieval Enclosed Land Sub-Types; in Penwith the high probability zones are formed by Medieval and Prehistoric Enclosed Land Sub-Types and by Rough Ground or former Rough Ground; in Pelynt Medieval Enclosed Land and Rough Ground/former Rough Ground; in Poundstock Post-Medieval Enclosed Land and Medieval Enclosed Land Sub-Types. In both Probus and Pelynt the highest-ranked Sub-Types are forms of Medieval Enclosed Land; in Penwith the highest-ranked in the 2011 time-slice is a Prehistoric Enclosed Land Sub-Type, but in the other time-slices the highest-ranked is Upland Rough Ground (divided); in Poundstock the highest-ranked in all the models are Post-Medieval Sub-Types.

These differences are reflected in the results of testing the individual study areas using a model based on the complete dataset. The only study area in which this model fits well is Probus, and this to an extent is because the settlement polygons from the

Probus study area make up as much as 45% of the complete dataset and will therefore have a proportionately greater influence then the other study areas. At the other end of the scale, because the settlement polygon area in the Poundstock study area is so small, the Poundstock model is more vulnerable to being skewed by a single large polygon. This could in fact be the case because the largest polygon in the study area, to the west of Marhamchurch, captures between 59 and 76% (varying through the time-slices) of the Post-Medieval Sub-Types which are ranked highest in the model.

In the Pelynt study area there is an even clearer case of a single polygon influencing the model. The historic landscape character of this polygon, at Bury Down, is former Upland Rough Ground which was taken in during the Early Modern period and it forms almost 20% of the total area covered by the settlement polygons in Pelynt. Otherwise all the Sub-Types making up the high probability zones of the Pelynt models are forms of Medieval Enclosed Land.

In the Penwith study area there is no such instance of one individual polygon having such a strong influence on the model. Here there is a distinct three-way distribution of the HLC Types making up the high probability zones of the models, with Rough Ground Types forming between 43 and 56% of the zones, Medieval Enclosed Land Sub-Types making up between 22 and 30%, and Prehistoric Enclosed Land Sub-Types making up between 23 and 28%. The predominance of Rough Ground Types in the Penwith models is a result of relatively large field systems extending into them.

In two thirds of the models there were contradictory indicators of how best to define the cut-off points between the high and medium probability zones, with the Kj parameters continuing to increase after the Relative Gain values began to fall. This was the case with all six of the Penwith models and with four models in each of the other study areas. In every instance the Kj parameters were used to define the cut-off points because otherwise the high probability zones would be significantly less accurate, in most cases capturing less than 50% of the settlement polygon area. In every instance the Sub-Type causing the Relative Gain values to fall was a form of Medieval Enclosed Land (in most cases MD Altered field patterns (Sub-Divided)) and in each case the PA values for those Sub-Types was larger than their PS value. In other words the proportion of the study area covered by that Sub-Type was larger than the proportion of sites it captured. The Kj parameters, which favour accuracy over precision, included these Sub-Types in the high probability zones because in each case they captured a large part of the settlement polygon area. For instance, in the Penwith study area 2011 model, the Relative Gain values fell when the Sub-Type MD Altered field patterns (Amalgamated) was included in the model. However, this Sub-Type captured more of the settlement polygon area than any other. Inevitably the inclusion of these Sub-Types resulted in weaker models in terms of precision, but, with the exception of the Poundstock models, all were accurate to very accurate.

Generally speaking there are only slight differences, if any, between the make-up of the high probability zones of the all polygon models and those for only the prehistoric and Romano-British polygons. Also in most cases the make-up of the high probability zones within each study area are consistent through all three time-slices. The only notable exception is the 1880 time-slice in the Poundstock study area, in which Valley Rough Ground is included in the high probability zone, but not in that of the 2011 or 1840 time-slices.

Given that within each study area the models are for the most part accurate and consistent through the three time-slices, it is reasonable to suggest that they do offer a true reflection of those HLC Types and Sub-Types in which the settlement polygon features are most likely to be found. However, the make-up of the high probability zones is different in each study area and these differences are reflected in the poor test results, especially in Pelynt and Poundstock. It can be argued that in these two study areas the models are skewed by individual large polygons which go against the overall trend. The safest conclusion, however, is that there is no clear pattern for the settlement polygons across the Lowland Cornwall project area.

17.3 The barrow models

The principal Types forming the high probability zone of the high level 1994 HLC model for barrows in Lowland Cornwall were Recently Enclosed Land Types (Farmland Post Medieval and Farmland C20), Rough Ground and Farmland Prehistoric. Between them these Types captured 61% of the barrows within 37% of the study area and produced a Kvammes Gain of 0.397. So this model is reasonably accurate and precise. The weakness of the model is the large size of the medium probability zone, made up principally of Farmland: Medieval. This zone covers more than half of the Lowland Cornwall study area and also captures 32% of the barrows – twice as many as any other HLC Type.

When this model was applied to the four study areas the results were very mixed. The model performed well in the Poundstock study area, being accurate and reasonably precise, but whilst its high probability zone captured 89% of the barrows in the Penwith study area, here it lacked precision. In both the Probus and Pelynt study areas the medium probability zone captured more barrows than the high probability zone – twice as many in the case of Pelynt.

There are some mitigating factors to account for these inconsistent results. For instance the area taken up by Rough Ground and Recently Enclosed Land in the Pelynt study area is very small; hence the low number of barrows captured by the high probability zone. And large parts of the Penwith study area contained land classed in the 1994 HLC as Farmland Prehistoric; hence the lack of precision (even though mush of this land has been reinterpreted as Medieval Enclosed Land). But overall the results illustrate that when applying a high level county-wide model to specific local areas, in some it performs as expected; in others less so or not at all.

Generally speaking the Lowland Cornwall HLC models based on HLC Types perform better than the 1994 HLC model. All are more accurate: for instance in the Probus study area, although the high probability zones of all four time-slice models capture less than 60% of the barrows this is better than the 47.6% captured by the high probability zone of the 1994 model. And in both the Pelynt and Penwith study areas some of the time-slices produce two-zone, barrows/no barrows models which are obviously extremely accurate. In terms of precision the performance of the models is mixed: in Poundstock Kvammes Gains range from 0.590 to 0.760 from time-slice to time-slice compared with the 0.473 achieved by the 1994 model, and in Probus the gains are almost as high. However the Lowland Cornwall models for Penwith and Pelynt are less precise than the 1994 model.

In both Probus and Poundstock the high probability zones of the models are formed by the HLC Types one might expect given the make-up of the 1994 high probability zone. That is, the zones are dominated by Recently Enclosed Land and Rough Ground Types. This is clearest in the Poundstock study area, where, for example, the medieval time-slice model has a high probability zone made up exclusively of Rough Ground Types. By contrast in the Pelynt study area the high probability zones for all four time-slices are formed of Medieval Enclosed Land, and in the Penwith study area there is no clear pattern with the high probability zones containing a range of Types. For instance the high probability zone of the medieval time-slice model is made up of Rough Ground, Prehistoric Enclosed Land and Medieval Enclosed Land.

There are factors to account for some of these difficulties. The small extent of Rough Ground and Recently Enclosed Land in Pelynt is mentioned above and this might explain why Medieval Enclosed Land is consistently the highest-ranked Type in all four time-slices. In Penwith much of the land classed as Farmland Prehistoric in the 1994 HLC has been reinterpreted as Medieval Enclosed Land in the Lowland Cornwall HLC. This is not to suggest that it was misidentified during the 1994 HLC: rather it has been interpreted now as land that was enclosed in prehistoric times but has undergone such extensive alteration in the medieval period that it has lost most or all of its prehistoric character. So much of the Medieval Enclosed Land can be seen as altered Prehistoric Enclosed Land.

When the models are made using HLC Sub-Types as variables the results are in the main more accurate than the models made with HLC Types and most are more precise. Again in all except Pelynt the high probability zones are dominated by Recently Enclosed Land and Rough Ground Sub-Types. However, this is less clear than in the models based on Types. In Penwith the high probability zones for some time-slices contain Medieval Enclosed Land Sub-Types and the overall impression of the Penwith models is that there is no real pattern to the make-up of the high probability zones, their containing a mixture of Rough Ground, Recently Enclosed, Medieval Enclosed and Prehistoric Enclosed Land Sub-Types. In the Probus study area there are questions of whether to include Medieval Enclosed Land Sub-Types in the high probability zones of the 1880 and 1840 time-slice models – they were included, in order to favour accuracy over precision. Even in the Poundstock study area, where the predominance of Recently Enclosed Land and Rough Ground in the high probability zones was clearest, when the models are based on Sub-Types the 1880 and 2011 high probability zones contain Medieval Enclosed Land Sub-Types.

When only the high validity barrows are modelled the results generally are similar or very similar to the models for all barrows. They also tend to be more accurate and precise, although in the Poundstock study area most are slightly less accurate. On the whole they also indicate more clearly that Rough Ground and Recently Enclosed Land Types and Sub-Types are the areas of high probability. For instance in the Probus study area the high probability zones do not contain any Medieval Enclosed Land Sub-Types. In fact Probus is the only study area where the models for high validity barrows are notably different from those for all barrows. The main cause of the difference appears to be the large number of low validity barrows, especially those recorded from documentary evidence, which are located in Medieval Enclosed Land and further work might include research on the veracity of these records. This difference is not apparent in the other three study areas. In fact in the Pelynt study area there are equal numbers of high validity and low validity barrows located in Medieval Enclosed Land, and in Poundstock there are more high validity barrows than those with a low validity.

Overall the models, especially those based on HLC Types, do indicate that Recently Enclosed Land, Prehistoric Enclosed Land and Rough Ground are the Types where barrows are most likely to be located, but this is by no means definitive. There are also substantial numbers of barrows in Medieval Enclosed Land and in some parts of the county there are more barrows in Medieval Enclosed Land than any other HLC Type, so the models are to an extent inconclusive. It seems likely that the majority of barrows awaiting future discovery have no detectable above-ground remains and will be found in ploughed land. So in terms of predicting where they might be found, Prehistoric Enclosed Land, Recently Enclosed Land and Medieval Enclosed Land are the most likely areas.

This is borne out by the model for all the Lowland Cornwall barrows, which is very accurate but not especially precise, but does fit each study relatively well. The high probability zone of this model is made up of a combination of Modern, Early modern, Post-Medieval, Medieval and Prehistoric Enclosed Land Sub-Types as well as Coastal Rough Ground.

17.4 HLC and predictive modelling

For many years the Historic Environment Service at Cornwall Council has included consideration of HLC in the archaeological advice provided to planners. Generally this advice has been that there is high potential for archaeological remains to exist in locations classed as Anciently Enclosed Land (this comprises the HLC Types Farmland Medieval and Farmland Prehistoric), even if no sites are recorded in the HER at those locations. As a result a considerable number of previously unrecorded prehistoric settlement features have been revealed by geophysical survey and evaluation trenching at such locations. So clearly HLC has been, and continues to be, an effective predictive tool in Cornwall.

Anciently Enclosed Land, and in particular the Type Farmland Medieval, covers a large proportion of the county. One of the principal aims of the Lowland Cornwall project, apart from providing a statistical examination of the correlation between Anciently Enclosed Land and prehistoric settlement, was to deepen the existing HLC in order to see whether some parts of Anciently Enclosed Land have higher potential for prehistoric settlement than others.

In this respect the project has only been partially successful. Predictive models were made for prehistoric and Romano-British enclosures (on the assumption that these are evidence of settlement), Bronze Age barrows and settlement polygons. The latter were polygons created in GIS around single enclosures or groups of settlement and farming features.

The models for Bronze Age barrows clearly have little predictive power: in most cases they suggest that barrows are likely to be found in land classed as rough ground or land enclosed in any of the modern, early modern, post medieval, medieval or prehistoric periods. Nor were the settlement polygon models very successful. There were significant differences from study area to study area in the combinations of HLC Types and Sub-Types making up the high probability zones of these models.

The models for enclosures did confirm that Medieval and Prehistoric Enclosed Land are the land classes where the enclosures are most likely to be found. However, attempts to enhance the precision of the models, by using combinations of HLC Sub-Types from all four time-slices as variables, were only partially successful. In the main, regional variations meant that the Sub-Types forming the very high probability zone differed from one study area to another, in some cases quite considerably. On the other hand, the overall high probability zones of these models captured consistently high numbers of enclosures across all four study areas. So it is reasonable to suggest that although the finer grained very high probability level cannot be reliably applied on a county-wide basis, the high probability zone can be.

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19 Project archive

The CAU project number is **2009028**

The project's documentary, photographic and drawn archive is housed at the offices of Cornwall Archaeological Unit, Cornwall Council, Fal Building, New County Hall, Treyew Road, Truro, TR1 3AY. The contents of this archive are as listed below:

1. A project file containing project correspondence and administration.
2. A digital file containing Excel tables, draft documents and notes held in the directory G:\TWE\Projects\Sites_L\ Lowland_Cornwall
3. GIS shapefiles and accompanying metadata are held in the directory: L:\Historic Environment (Data)\HE_Projects\Sites_L\Lowland_Cornwall_2009028\Final report