

The Swannery, Hartland, Devon.

Stephen Hobbs.

Field investigation

March 2009.



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Stephen Hobbs.

Lanhern,

Natcott Lane,

Hartland,

Devon.

EX39 6DQ

01237 441450

Email:

hartonarchives@gmail.com

A Report for
The Hartland Society
Exploring Archaeology project

By
Stephen Hobbs

March 2009

Acknowledgements

Thanks are due to Sir Hugh and Lady Angela Stucley for giving permission to conduct geophysical surveys and landscape studies across their estate and to the tenant farmers Mr. and Mrs. Colin Davey.

Thanks also go to all those who volunteered and offered assistance in the many aspects of the fuller research programme. In particular Dr Penny Cunningham and members of the XArch Project for their enthusiasm, North Devon Archaeological Society members; Derry Bryant, Mary Houldsworth, Bob Shrigley and Liz Hobbs, Rod Landman, Brian Warmington who were regular participants.

The views and recommendations expressed in this report are those of the projects team and are presented in good faith on the basis of professional judgement and on information currently available.

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Cover illustration

St. Catherine's Tor and the Tor Marsh Valley (Photograph by Robyn Wilson)

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1 Summary

The report describes a landscape recognition project undertaken by members of The Hartland Society, North Devon Archaeological Society and community volunteers, assisted by the XArch project based at The University of Exeter. This report, in two sections, deals with a hedge bank survey, and a boundary and topographical survey using GPS survey methods and off set tape survey techniques to enlighten on the area surrounding the St. Catherine's Tor, ½ Km south of Hartland Quay.

The hedge bank survey was undertaken to judge viability of recording such features and to produce a template for a full survey of the hedges within the Hartland Abbey Barton Farm estate. The base for this is the suggestion that the Barton Farm was the subject of a reordering of its field systems possibly in the 16th or 17th century. A further comparison could then be made with other such estates within the local area to ascertain if a differential is apparent. Participation in the survey by the local community was encouraged in order to extend an interest in the locality by its inhabitants.

The GPS survey centred on an area below St. Catherine's Tor where it was alleged a Swannery existed. Extant banking of the small stream and what appears to be a large earth coffer dam adding to the suggestion. By undertaking a systematic sampling of the features present it was hoped to show the viability of a more comprehensive GPS survey; at the same time to provide data which would indicate the suitability of the extant features for retaining water. Community participation was encouraged and the provision of training facilities by XArch enabled the preliminary survey.

The two landscape surveys were complimented by research on the two deerparks (report in preparation) and the carriage drives of the Hartland Abbey Estate (University of Plymouth/NDC dissertation, unpublished). The involvement of community participants has proven beneficial to both the projects and the community as it has stimulated interest in the historic environment of the parish by its community.

2 Introduction

2.1 Site Location

The site is approximately half a kilometre south of Hartland Quay. This area is in the immediate vicinity of the Hamlet of Stoke and Hartland Abbey. The area under study runs from the 'middle' car park at Hartland Quay in the north as far as the northern end of the cliff top at Spekes Beach in the south.

2.2 Historical and archaeological background:

The Devon H.E.R. has an entry to suggest that all or part of the river meadows lying below St Catherine's Tor was at one time a Swannery which may have been associated with the Abbot at Hartland Abbey (1169-1539). The evidence for this suggestion comes from a sequence of sources. Primarily an entry in the Dean Milles parochial survey of 1762, completed on behalf of Hartland parish by John Velly of Galsham Farm, and has an entry "*Catherine Tor - under which is a marsh in ye abbot's time a swan pool.*" This entry is picked up by William Heard in his MSS Remembrances of Old Hartland (North Devon Athenaeum /H.A.R 900) and then by Richard Pearse-Chope (Transaction of the Devonshire Association /66 (1934)73). The statement is then often repeated in a variety of documents and has drifted into fact. Close inspection of the Dean Milles document would reveal that John Velly was often less than correct in the responses he gave to the standard questionnaire and allowed conjecture to be entered.

There are no known documentary archive materials extant for Hartland Abbey of the period up to the Dissolution, a small number of transitional documents exist within the present archive which is evidences of land transfer and ownership. Entries exist within Exeter Cathedral archive for a small number of communications with the Abbey. In either source there is no evidence to suggest that the Abbot had or had use of a 'Swan Pool'. An alternative is that any Swan Pool could have been part of the Manorial Estate belonging to the Dinham family (c1100 – 1501), but no mention is contained within their document archive (Arundel collection Cornwall Record Office AR/). Explicit works by Fox & Padel¹ and Hannes Kleineke² on these records have no mention of the Dinhams using or producing Swan as a household item. Kleineke has detailed inventories of household consumption for capons, gannets a wide variety of salt and fresh water fish, meats and eggs but no mention of swan or indeed game bird such as duck. Therefore there is no factual documentary reference to a Swan Pool in Hartland or more particularly in the vicinity of St. Catherine's Tor.

2.3 Geography/Geology

The study area is part of a sea dissected river valley system and therefore, of geological interest. The Spekes River, originally running north along the valley system, discharged into an ocean or larger river system at a point west of Smoothlands (Blagdon Valley). Erosion has divided the valley into isolated sections devoid of any river presence.

The study area contains three promontories that are remnant sections of the original valley. The northern promontory, Screda Point, is dry and shows no evidence of the line

¹ Cornish Lands of the Arundells of Lanherne, DCRS, 1998

² The Dinham Family in the Later Middle Ages, Unpublished thesis, University of Holloway, 1998

of a stream. The second, above Childspit Beach, contains evidence of a dry river bed running parallel to the present cliff line (Figure 3). The depth of the erosion of this dry bed would indicate that it had been a stream for a considerable time and had discharged into the sea at its northern end at a now lost waterfall.

Subsequent erosion has cut the stream at a position 150 metres east, where it now discharges over a substantial waterfall onto Childspit Beach. Inspection of the cliff face erosion shows only light evidence of the position of the original stream course. This promontory could also be the source where early people were able to extract the substantial stone slabs from the cliff face for use as monoliths once common in the immediate area³.

The third promontory in this area is formed by the sub-circular tor known as St. Catherine's. This tor is regarded as the site of an early chapel attached to the Hartland church. Erosion has reduced the summit by some forty feet within the last century (Compare photographs of the periods, Cann Picture Archive & Hartland Digital Archive⁴). Evidence of a building is described by Pearse-Chope (1940) in relation to a variety of artefacts recovered from the summit in the early 20th Century and now displayed in the museum within Stoke church at Hartland. William Heard in his M.S.S. also mentions a family picnic when he climbed the tor and returned with a number of tiles which were discarded into a hedge bank when the family showed little interest in a child's find.

The valley system is accessed by a track from Hartland Quay as far as the valley earthworks (now part of the South West Coastal Path), this track was created in the late 19th Century to provide a route for hunting parties. The route is shown as a 'footpath' on the 1891 OS map (see photograph of hunting party in the Cann Picture Archive). A second track runs into the valley south of Big Sheepless field this is shown as a track on the 1891 OS map

3 Hedge Survey

The study area contains a number of hedges and banks that, although not unusual within the Abbey and Barton Estate, their recording and classifying would be beneficial for future comparisons. Two surveys have been undertaken (1) in the immediate vicinity of St. Catherine's Tor and (2) surrounding an area known as the Warren, immediately east of Hartland Quay.

3.1 Method

The method of classification and identification was based on a system developed in association with the 'Historic Environment Research Strategy for Exmoor' (Objective 8.i) and used by The North Devon Archaeological Society (Holworthy Farm, Parracombe). Hedge characteristics are recorded on a *pro forma* based on one used by the Cornwall Archaeological Unit in 1998 and adapted to the local circumstances (Gillard 2002). The Rural Development Service Technical Advice Note 32, 2006, where relevant, was used in the Classification/description of hedges/banks (See Figure 5 for hedge locations)

³ Chope, Book of Hartland, 1940: and R. Wilson unpublished research, University of Plymouth 2007

⁴ Both archives held by Hartland Digital Archive and a small selection at North Devon Records Office

Measuring hedge width at base, width at top and height gives the dimensions of a cross section which is essentially a trapezium. The area of a trapezium is base (B) plus top (T) divided by 2 to give an average; times the average of the heights (H1, H2) (both sides of the hedge) (Figure 4). The resulting figure gives not only the area of cross section, but, when multiplied by 1, gives the cubic volume per metre. Applying this formula to all the boundaries recorded, the resulting figures are rounded up or down to the nearest whole number, producing the basis of a simple numerical classification: Classes 1,2,3,4,5,6,7 based on volume (Table 1 & Figure 5).

3.2 Hedge descriptions

3.2.1 Hedge H1 (Figure 7)

This hedge runs parallel to a small stream and is a substantial construction; it is formed as a dropped bank Corn Ditch in style with the stock coping facing north against the stream. The bank is stone faced on both sides with an earth/turf cap, the infill is packed earth. On the south face, a build up of earth is in situ which could be part of the original construction or may be hill wash or collapse of the cap. Due to erosion, the bank terminates on the west at the cliff top; the eastern end has been reduced by the formation of the track-way and work on the modern reservoir, consequently, it is almost non-existent. It is possible that it formerly continued to join the hedge H8.

3.2.2 Hedge H2 (Figures 8-15)

This is the large bank that dissects the valley north/south at the base of St Catherine's Tor and the subject of the enclosure bank forming the 'Swan Pool'. In its present appearance, it is as a stone faced wall on both sides with a stone coping on the north-west face in the form of a corn ditch. The fill is of compacted earth/clay layers (Figures 14 & 15) which is now exposed at the southern face where a cattle shelter was inserted into the bank (Figure 13). The top of the hedge is 1.1m high and in the form of a domed earth cap now turfed (Figure 11). The western end of the bank abutted the stream but was reduced due to erosion to the extent whereby c.3m was cut back to form an access gateway. Originally a stile was in situ at this point and the stream/enclosure had evidence of a restricting feature such as a weir. The 'new' end has been stone faced to form a circular final and thus corresponds with other such gateways on the greater Barton Estate.

Within the Hartland Abbey document archive are a series of letters from the Hunting Committee (Gorvin Hunt). One such letter describes how the recent heavy flooding had washed away the hound kennels and buildings in the Hunting Marsh. It recommends that to avoid such an incident in the future then a substantial bank should be constructed across the valley. The measurements contained in the letter match the dimensions of Hedge H2 and should be possibly considered as one and the same. If this 'new' bank is excluded then the lower embanking (Figure 9) on the north of H2 can be seen as the original water retention banks associated with the similar banks in the valley.

The north-east end of hedge H2 adjoins H3, but may have originally continued into the incline of the natural hillside thus forming a possible coffer dam. On the west of H2 is a

series of small earth embankments (Figure 9) running parallel to the main hedge, which could be seen as a double bank and ditch system or could be the relict feature of an earlier hedge construction whereby the west face was banked to form a more traditional corn ditch appearance (Figure 6). In relation to the above mentioned Hunting Committee letter, it would seem a peculiarity that this small embankment survived the building of the larger hedge, as, if the smaller unit was part of a previous water impounding system this would be made redundant by the new hedge and therefore, the small bank could be robber material for the new bank. If a section through the smaller bank and a comparative study of the base of the larger bank were made it could be discovered if they are of the same initial build period. One would expect any downstream embankment of any water impound to be made substantially stronger than the upstream banks.

3.2.3 Hedge H3

This hedge forms the north boundary of the enclosure and runs parallel with the general hillside below Big Sheepless field. It is double stone faced with compacted earth fill and earth/turf top. The unusual feature is that the hedge has a stone overhanging coping on both faces which would seem to be a contradictory feature as it would effectively exclude stock from either direction. The gradient of the adjoining hillside is such that an animal could, with relative ease jump, the gap onto the hedge (Figure 12).

3.2.4 Hedge H4

As traditional Devon earth bank it forms a break between the St Catherine's enclosures and the Kernstone Valley at Wester Wood the valley floor is wet marshland (Figure 16). A small stream runs against this hedge on the south eastern face discharging into the Wargery Water stream outside of the impounding banking of the valley.

3.2.5 Hedge H5

Forms the boundary between the St Catherine's enclosures and Kernstone Cliff Field; it is a dry stone construction with light earth jointing and a turf cap, and runs south until the Spekes Beach cliff face. Two similar hedges exist on the Stoke Barton Estate both being on the Warren field. These two hedges have evidence of the reuse of materials from a substantial building and in particular the stone stile is made entirely of decorative stone.

It would be expected that if the area had been flooded for a period then a layer of water born sediment, sands and detritus would be evident. There is no similar evidence of sediment layers in the river banks to support controlled flooding; this may be due to the enclosure of such water within the secondary stage embankment on the valley sides (Figure 17).

3.2.6 Hedge H6/H7

These banks form the boundary between the base of St Catherine's Tor and the valley. H6 forms a distinctive feature of the valley side and forms a bank and ditch system which could at one time been an access track which may have ran in a zigzag to the summit of the Tor (Figures 18-23). There is no evidence of any stone face or any coping stone. H6 on the north effectively stops where the two meadow enclosures meet at the stream, the bank being absorbed back into the natural slope of the Tor. On the south, H6 is absorbed back into the slope of the Tor. A deteriorated small earth bank runs parallel to the cliff face on the south and is similar in size and construction to other such banks edging the stream. Hedge H7 is the re-emerging H6 at a position west of the

coffer dam (H2) and is stone faced on the north, but unlike H6, has no significant track or ditch against the hillside. There is some evidence of stone faced embankment remaining on the east bank of the stream against St Catherine's Tor, although the longer stretches appear to have been lost by water erosion.

3.2.7 Further hedge systems on the Warren

Three easily determinable styles of hedge are apparent on the Warren. The large earth bank either partially supported on or faced with stone, traditional Devon hedge of compacted earth and dry stone walls.

The two sections of dry stone wall are recorded on the Tithe Map (1846) in both locations as is the dry stone wall at St. Catherine's. The two areas vary in the size and composition of the stones used with those on the Warren being of a larger dimension. These walls are also of a greater breadth than the St Catherine's dry stone wall. The stone stile in situ on the Warren that accompanies hedge W4-W6 contains elements that have come from a lost building of some status. The age of the stile is unknown although in construction it matches others found in the boundary of the medieval deerpark. Local tradition has it that the series of stiles running from Hartland Quay through to the east end of the church yard at Stoke were in place to allow local access to the Quay without having to pay the toll charge on the improved road (c.1760). No documentary evidence has arisen to support this although an amount of correspondence does exist in the Hartland Abbey Archive in regard to the usage and service dues of tenants on the estate in regard to access to the road.

The area known as the garden adjacent to Sheeplace field and surrounded by hedge W16 shows evidence of domestic use. The hedge in its southern run is in the style of a corn ditch although its height is less than may be expected. This hedge translates into a more substantial section W17-W18 stone faced with compacted earth core and corn ditch capping. The east face of this hedge shows evidence of a lost building. All hedges are in the process of degradation and the extant features will be lost without maintenance and animal control. Where cattle or sheep have broken the banking evidence can be seen of pottery and bottles dating from the 18th century to modern. The deeper within the breadth of the hedge to earlier the samples.

3.3 Discussion

The hedge and banks within the area form an interesting mix; the traditional earth bank is evident as is a simple stone wall boundary. The double facet corn ditch raises some question on its purpose; although the Stoke Barton Estate contains a considerable number of standard corn ditches which can be seen as indicative of the control of animals most probably associated with a sporting estate. When the result of this small hedge survey is included within similar research of the greater estate, it may be that there are indications of a general improvement of the estate circa the 18th Century. Certainly there is evidence of further substantial hedge structures on the south of the estate that would place them in a classification of 9 or above, which is well above the estate average, some of these have been reduced in width by mechanical means in the 1950s, but evidence of their original size exists at the junctions with adjoining hedges.

Data within the survey of both areas indicates that hedges in category 1 are evenly distributed across both areas. Category 2 hedges are slightly more in evidence on the Warren. Category 3, 4, 5 & 9 hedges are all predominantly on the Warren. This result indicates that the hedges on the Warren being of greater dimensions and built at greater

labour costs could be earlier than the lower category hedges. This cannot be taken as conclusive on such a small sample of the estate hedges and with no comparator outside the estate taken. It does however give an indication of the potential of this type of survey work. As these hedges are all in the extreme coastal area vegetation is minimal and no recording of species has been undertaken.

With regard to the hedges and embankments in the St. Catherine's valley comparison taken from GPS readings would show any correlation between levels of the larger banks within the valley and if they are at a consistent level at which water could have been retained by them. If this is shown, then water to a depth of 1.6m would exist over a substantial area of land. The stream through the valley would appear to have been subject to embankment and a number of small linear earth banks are extant on the stream edge. These could also have performed a retaining aspect for any water in the formation of the early 'Swan pool' (Figures 22-23).

4 GPS Survey, Summer (2008)

4.1 Aims

- (1) To allow volunteers to gain experience in the use of GPS survey equipment.
- (2) To produce an initial mapping diagram to allow evaluation of the valley meadows.

4.2 Method

Grid reference points were recorded with a Leica GPS system 500 and Total Station TCR1205. The perimeter of the valley meadows was recorded at approximately 2m intervals. Two traverse lines of the north meadow running SW–NE and one line the length of the same meadow running N–S were taken at approximately 0.5m intervals. In the south meadow, a small area in the south-east corner was traversed in a W–E direction to take account of earthworks of a visible feature. Within the south meadow, other possible earthworks exist of a similar nature, but are less well defined visually.

The data points were first processed in Leica Geo Office program (Figure 25) and then downloaded into Copan Lite from Underhill Geomatics Ltd. This software gives a visual display of all the plot points and reassigns a point number to each recorded data log (944 in total). It is possible to then draw off a tabular table of the Northings, Eastings and Elevation data and produce a diagram of the survey points (Figure 24). There is no facility in this Freeware programme to produce diagrams in the third dimension.

Comparison with the produced display and satellite imagery has shown that within reason and acceptable for our purposes the GPS data co-locates with all perimeter markers.

4.3 Analysis

The traverse runs had the potential to show the gradients of the meadows and if the levels of the earthworks across the site were possibly able to retain water to any depth.

An elementary schematic (Figure 26 & 29) has been produced by entering the elevation readings associated with each run, taken from the data entered this into a spreadsheet. This has allowed a visual representation of the terrain, but is inaccurate in as far as the spacing between each recording is neither consistent nor easily measurable. Therefore the visual representations are either contracted or expanded as the spreadsheet only assigns a reading per data point.

However the diagrams do show that the terrain does rise and fall. What is particularly noticeable is Section-1 (Figure 27) that shows the existing river level, the retaining bank and the meadow floor, and from this illustration we can see that it would be capable of retaining a substantial amount of water.

4.3.1 Section-1 (Figure 27) shows the existing river level, the retaining bank on the left (S-W) and the meadow floor, which from this illustration would be capable of retaining a substantial amount of water. It is considered the depression shown at data point 51 is an anomaly in the data extraction.

4.3.2 Section 2 (Figure 28) shows the traverse of the length of the north meadow (220M), starting from the large earth bank and running towards the track way in the SE

corner of the meadow. The ground in the SE rises sharply and the walker has aimed for the highest point. It would have been beneficial if a similar run was made taking recordings only on the lower areas in which a water pool would have been practical.

Similarly the two recordings over the feature in the south meadow (sections D & E below) suffer from the lack of scaling using the spreadsheet. They do however show that a feature exists (Figure 29).

It may be possible to re-plot this data by hand on a graph sheet if the spaces between GPS recording can be sufficiently discovered. This would then allow a more accurate portrayal of the scale of the earthworks within the terrain. It is not proposed to undertake this as the exercise was to show feasibility of the study method for discovering if a water retaining pool could exist in this location and this has been achieved.

Unfortunately it has not been possible to recover all the data from the GPS system in a useable format. The areas shaded Blue in Figure 26 show the lost data although Figure 25 taken from the GeoOffice software shows the data exists but is being masked.

5 Investigation

5.5 Discussion

It has been shown that the Tor valley system does contain a series of earthworks sufficient to be considered as a water retaining pool. It is also possible that there is a two stage development in construction of the pool, possibly the early 12th Century pool with a rebuild in the 18th Century.

Although the documentary evidence does not confirm the use of the Swannery, the evidence on the ground could be suggestive of supporting some form of water impounding and control. The large bank across the valley is a formidable barrier and would be capable of retaining a large volume of water although it is doubtful if the height of water was anywhere close to the capacity at first indicated by the size of the barrier. This gives support to the Hunting Committee letter.

It would seem probable that the secondary banks on the edge of the stream represent the extent of the water retained, thus a depth of no more than 600mm at its western (deepest) end plus an allowance for sedimentary build up. To operate as a pool within the secondary banks it would need an access point with weir or sluice gates for the water from the stream to become impounded at a point close to Wester Woods. If such a control was static by use of simple overflow weirs or with the use of sluice gates is not known or identifiable. On the estate there are further examples of water control primarily for the use of the mills all of which use a first stage overflow weir, with storage ponds and finally a sluice at the mill wheel for control. However a mechanism existed in the river system at Cuckoo wood which was a hand controlled sluice allowing water to enter an open leat supplying an ornamental cascade.

From the layout of the secondary banks (Figure 16 & 22) it would appear that water from the side stream running down from Big Sheepless and Quarry Fields supplied a steady source of water. A form of sluice may have operated on the main stream at a

point below Kernstone Cliff Field, therefore, providing additional water if and when needed.

The water could be impounded to a depth of approx 600mm against the stream running to 0mm on the north meadow edge thus forming the marsh as described by John Velly in his response to Dean Milles.

To control the water level a weir would have been sited on the north-west corner of the pool adjacent to the coffer dam (H2). The evidence for this structure is within living memory, along with an inserted stone step stile in H2 at this point. There are two large dressed stones in the stream bed which evidently formed part of the weir (pers. comm. D. Cook & S. Littlejohn)

The secondary banking on the south of the stream may have acted in reverse and prevented water ingress into the second valley enclosure. However the banking on the southern cliff edge is complimentary to the southern river embankment and could have contained an early second pool. The evidence for further smaller enclosures within the south meadow is strong. If these were smaller holding tanks or for other agricultural purposes is unknown at this stage.

No attempt has been made to address the existence of a chapel or beacon on St Catherine's Tor and as the top has eroded to such an extent that any artefact or sub-surface evidence will have been lost. The remaining track and the embankment at the base indicate that a need was felt for access to the summit and some form of division from the remaining landscape. If this was for an early religious purpose or possibly as an enclosure of a piece of land for use as an extension of the existing Warren, both could be accepted as reasonable explanations.

6 Conclusion

Within the landscape there exists enough evidence to be able to suggest that the physical means were present to enable water to be impounded, that a suitable source of water was available and that further improvements to the area had taken place at a later date. These improvements and the size of the coffer dam (H2) are such that they visually create a false impression of the relict Swan Pool as being up to two metres in depth on its northern end. This would be unsustainable geographically due to the presence of the cliff face on the south or the height of the secondary banking. Therefore any pool would have been of a shallow nature extending across the enclosure into the marshland below Wester Woods, the reason why a pool was located in this valley at such a distance from the religious house is unknown as the geographic circumstances exist within the Abbey valley for numerous such features. If indeed the benefit of the Swan pool was for the Abbot then it would enlighten on further aspects of the property associated with their landholding. Further investigation of the reputed fish weir and pond in Smoothlands valley on the north of Blegbury Farm, Hartland and the provenance of the fish pond adjacent to the present Abbey building may add to our knowledge.

7 Recommendations

This report represents an initial stage of an archaeological investigation, presents the analysis of the results and provides a record that can be used to target further assessment and analysis.

At the conclusion of this report the following tasks have been achieved:

- This report forms part of the archive outlining the results of a hedge survey and a GPS topographical survey

To continue with the research it is recommend that the following forms of investigation are conducted:

- To understand the composition of the sub-soil layers, a small number of core samples should be taken from both enclosures.
- Systematic field walking of the immediate surrounding area.
- To provide a complete survey of the area by GPS, a recording grid of 1m x 0.25m points should be laid out across the two meadows. The subsequent data would allow a full three dimensional illustration of the area.
- A further option would be to investigate if this area has been covered by the Lidar imaging and if this has produced further information.

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Figure 1: Location of site at Hartland, Devon (OS Web site 2007)

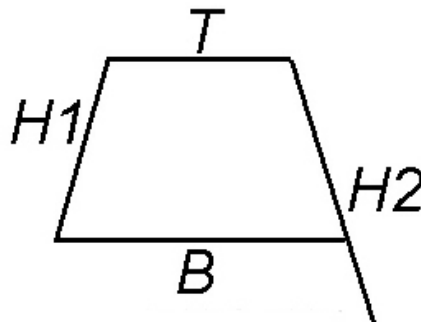


Figure 2: Location of St Catherine's Tor/Swannery site, Devon (OS Web site 2007)



Figure 3: Dry River Bed at Childspit Beach, looking north (50cm marked rods)

$$v^3 = ((H1+H2)/2) \times ((B+T)/2) \times 1 \text{ or length}$$



$$v3 = ((H1+H2)/2) \times ((B+T)/2) \times 1 \text{ or length}$$

Figure 4: Formulae used to calculate the area of a cross-section of a hedge bank

ID	H1	H2	Top	Base	Volume	Class	Description
H1	1.76	1	0.86	1.7	1.93	2	Corn ditch stone faced earth top and fill
H2	1.66	2.5	7.8	8.52	16.97	17	Large earthworks (corn ditch), stone face, earth fill earth cap
H3	1.6	1.3	0.9	3.18	2.96	3	Double faced corn ditch, stone faced earth cap and fill
H4	1.2	1.1	1.6	2.3	2.24	2	Earth bank
H5	1.3	1.2	0.6	1	1.00	1	Stone hedge, earth top
H6	1.4	0.68	0.75	1.2	1.01	1	Freestanding hillside bank all earth
H7	1.6	0	0.7	1.1	0.72	1	Embedded hillside bank, stone face
H8	1.1	0.7	1.5	2.2	1.67	2	Stone faced, earth cap and fill
W1	4.0	7.0	2.15	1.3	9.49	9	Earth with stone base layer and walling
W2	2.1	1.4	2.4	1.27	3.21	3	Stone faced both sides, packed earth core
W3	1.5	1.5	2.65	1.35	3.00	3	Earth bank, stone base walling to 1m high, End of wall rounded to form gate opening
W4	2.0	1.4	3.0	1.8	4.08	4	Earth bank, stone base walling to 1m high, End of wall rounded to form gate opening [gate opening now filled in with dry stone wall
W5	1.4	1.3	0.9	0.75	1.11	1	Dry stone wall
W6	0.95	0.95	0.93	0.85	0.85	1	Measured at the gate opening, dry stone wall
W7	1.5	1.5	4.0	2.9	5.18	5	Stone base to height of 0.8m, packed earth bank on top.
W8	1.0	1.2	2.4	1.6	2.20	2	Stone base to height of 0.8m, packed earth bank on top.
W9	1.5	1.4	4.0	2.9	5.00	5	Stone base to height of 0.8m, packed earth bank on top. Rounded end at gate.
W10	1.3	1.3	1.8	1.1	1.89	2	Stone faced packed earth core
W11	1.5	1.75	2.8	1.45	3.45	3	Stone faced on north side, earth faced on south side
W12	1.2	1.2	1.1	0.7	4.86	5	Dry stone wall
W13	1.0	1.1	1.25	0.7	1.02	1	Dry stone wall, rounded end at gate opening
W14	1.8	1.6	2.9	1.9	4.08	4	Large stoned face packed with earth core
W15	1.5	1.5	2.2	1.5	2.78	3	Stone back and sides for 3m from gate opening then packed earth bank. Rounded end at gate opening (some 16 th century bricks in walling)
W16	0.8	0.8	2.0	1.2	1.28	1	Stone faced on east side, sloped earth bank on west side. Corn ditch top.
W17	1.1	0.75	2.9	2.3	2.41	2	Stone faced both sides packed earth core. Corn ditch top.
W18	1.5	1.2	2.35	1.64	2.69	3	Stone faced both sides packed earth core. Corn ditch top.

Table 1: Hedge size and classification

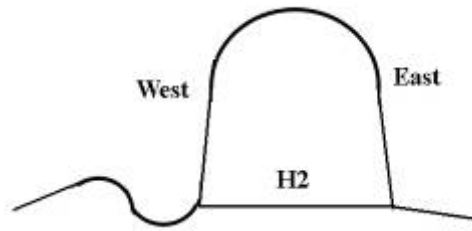


Figure 6: Diagram of possible bank and ditch system at H2



Figure 7: Hedge H1 viewed from the north



Figure 8: H2 viewed from north west



Figure 9: H2 looking north east



Figure 10: H2 showing depth of the earth/turf cap



Figure 11: H2 showing the width of the bank looking south west



Figure 12: H2 north west corner of H2/3



Figure 13: H2 Inserted cattle shelter on south east face



Figure 14: H2 showing the compacted earth infill layers (west)



Figure 15: H2 showing the compacted earth infill layers (east)



Figure 16: H4 from the north west



Figure 17: Erosion of bank on the valley stream looking south



Figure 18: H6 looking north



Figure 19: H6 looking north



Figure 20: H6 looking north



Figure 21: St Catherine's Tor from the east showing path to summit



Figure 22: Earth bank parallel to stream forming two enclosures within the valley



Figure 23: Earth bank against the west edge of 'Swan Pool' enclosure



Figure 24: The initial 'New' data logging output (Copan)



Figure 25: Recovered GPS data plot (Geo Office)



Figure 26. Drawn mapping from new data extraction, showing traverse section runs (red) and lost data areas (blue)

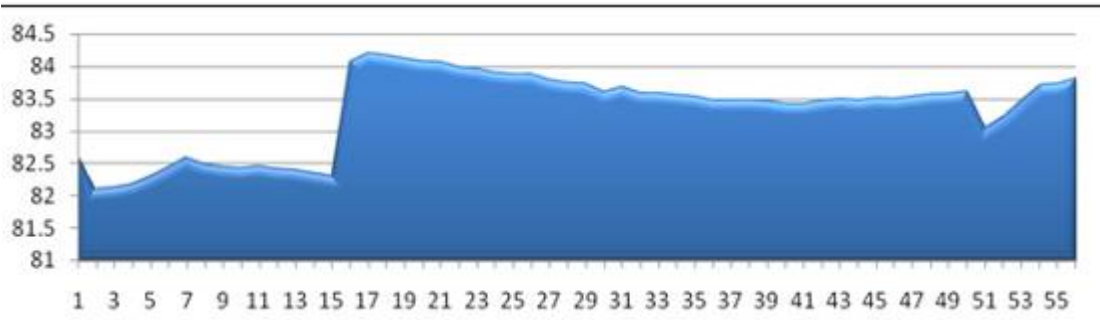


Figure 27: Section 1 (section A below) length of traverse is 60m

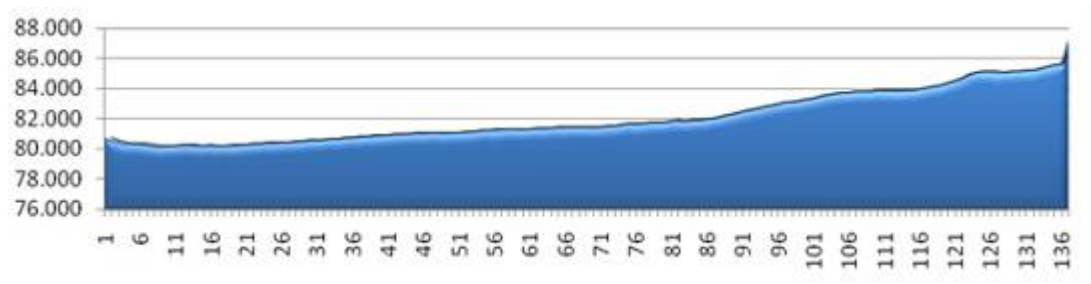


Figure 28: Section 2 (section C below) length of traverse 220m

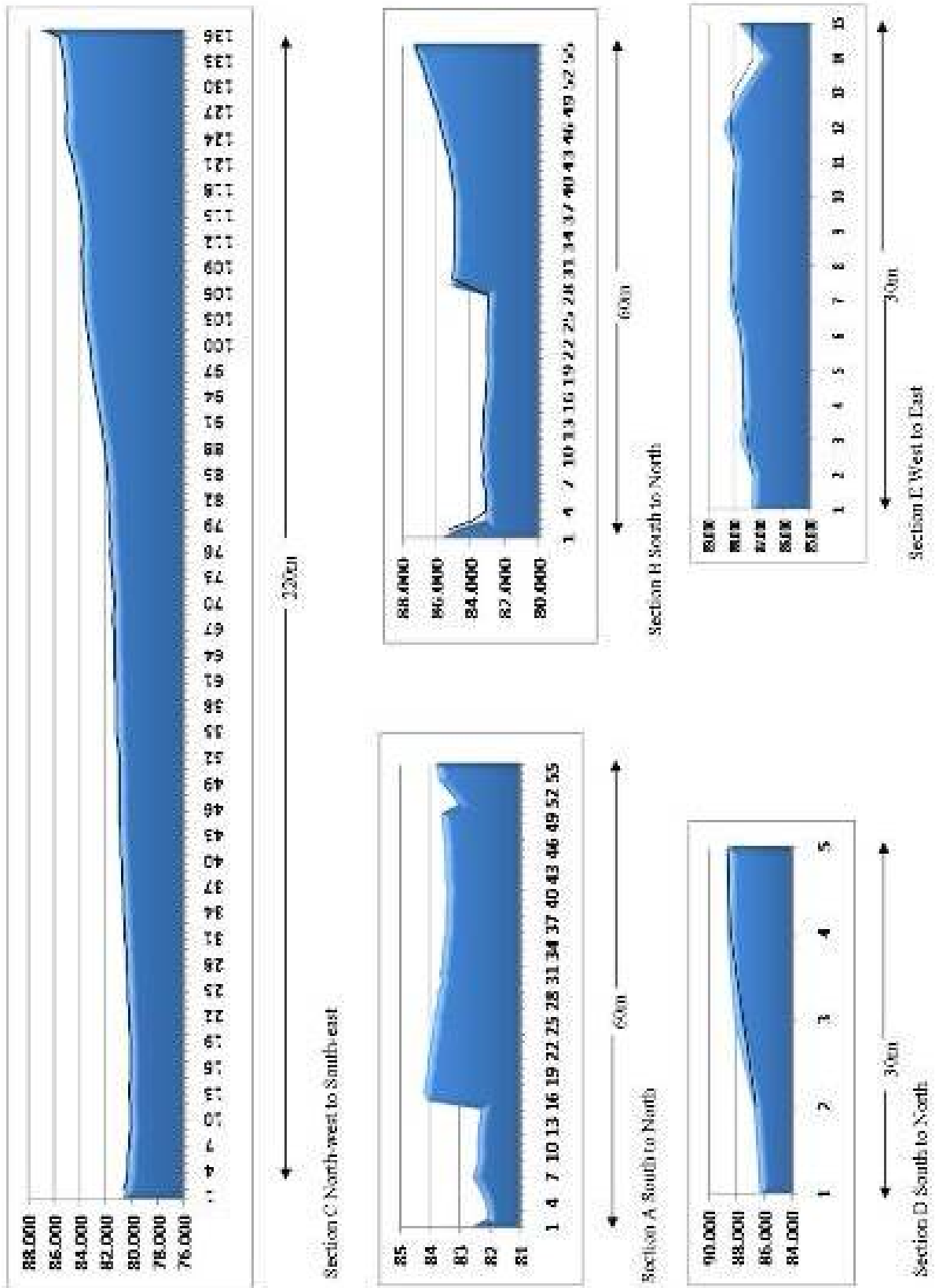
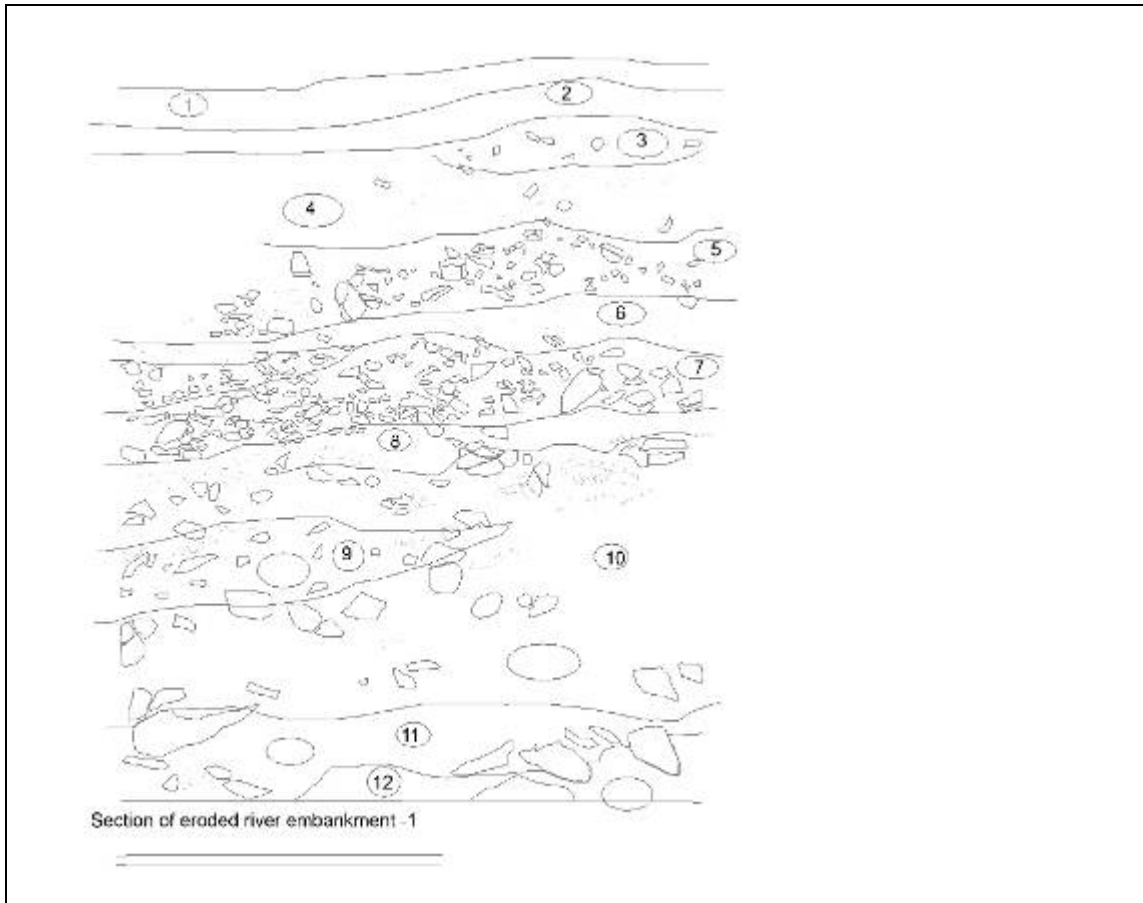


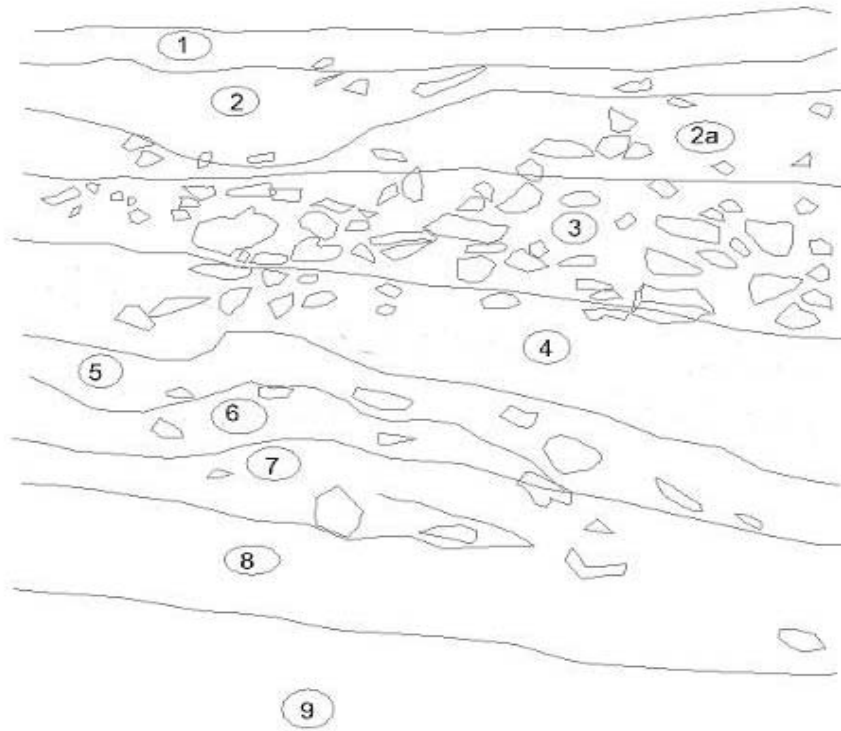
Figure 29: Section created by data entry into a spreadsheet (not to scale)



Layer	Description	
1	Existing grass land turf	
2	Existing top soil depth of approx. 90mm	
3	Small lens of topsoil and water washed stones	
4	Sub soil, some water washed stone also normal field stone	
5	Layer of mainly water washed stone with 25% gravels	
6	Compacted original top soil	
7	Sub soil heavy with field stone, small lens of clay with stone content	
8	Small lens of clay with gravel and small stone	
9	Lens of gravel and small stone 40/60%	
10	Heavy sub soils with field stone (over 20mm) some gravels 10%	
11	Heavy red clays with some stone (over 200mm)	
12	Present water levels, on heavy clay bed with stone and elements of bed rock	

This section of the embankment has been exposed by the river eroding the retaining banks. It is a typical section of such banking along the length of this river section. This particular section has been used to illustrate the core (2) of the raised bank. Height of section is 1.02m from water level

Figure 30: Schematic section of embankment -1



Section of eroded river embankment -2

Layer	Description	
1	Existing grass land turf	
2	Existing top soil depth of approx. 90mm with a deeper section containing increased small stone 10%	
2a	A mix of top soil and water washed stone (10%) with some gravels (25%)	
3	Heavy layer of sub soil with extensive stone content (65%) (between 150-300mm)	
4	Sub soil with clay content some small stones (less than 150mm) gravel content (40%)	
5	Compacted red clays little stone or gravels	
6	Lens of clay with small stones and gravels (60%)	
7	Lens of clay with small stones (150mm)	
8	Red clay little stone present	
9	Water level on red clay	

This section of the embankment has been exposed by the river eroding the retaining banks. It is a typical section of such banking along the length of this river section. This particular section has been used to illustrate a linear section of the banking where over 60% of the depth of such banking has been lost.

Figure 31: Schematic section of embankment -2

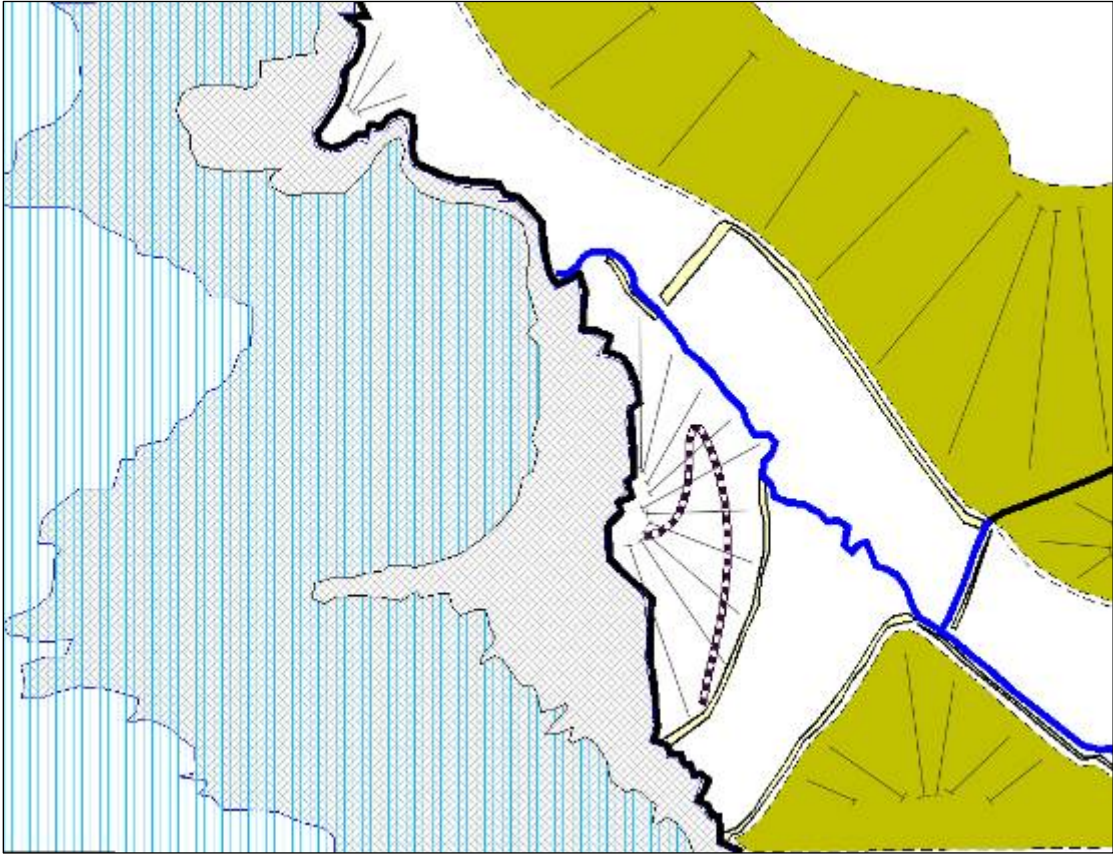


Figure 32: Schematic of the area (north top)

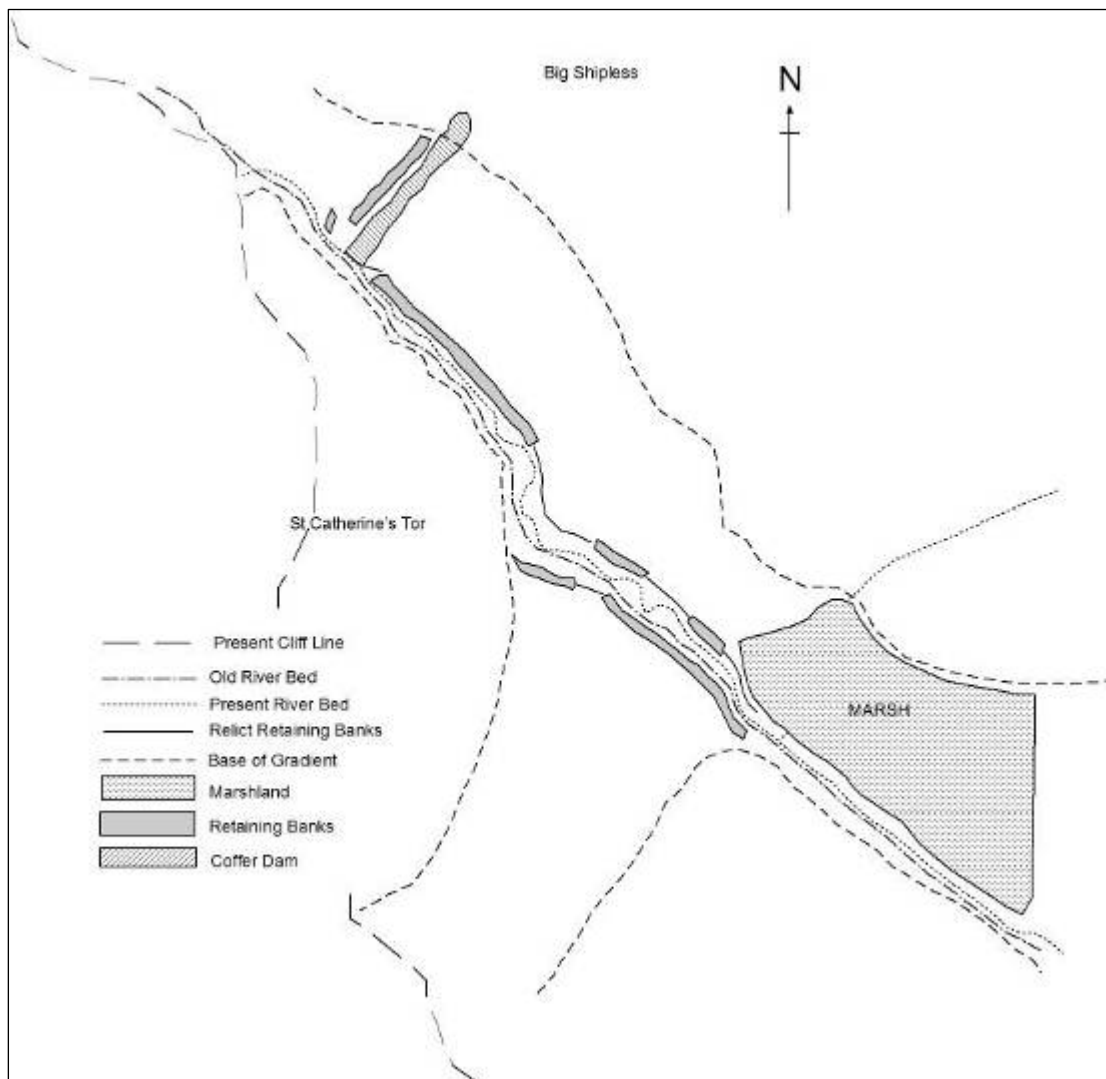


Figure 33: Layout of the Swan Pool area showing retaining banks