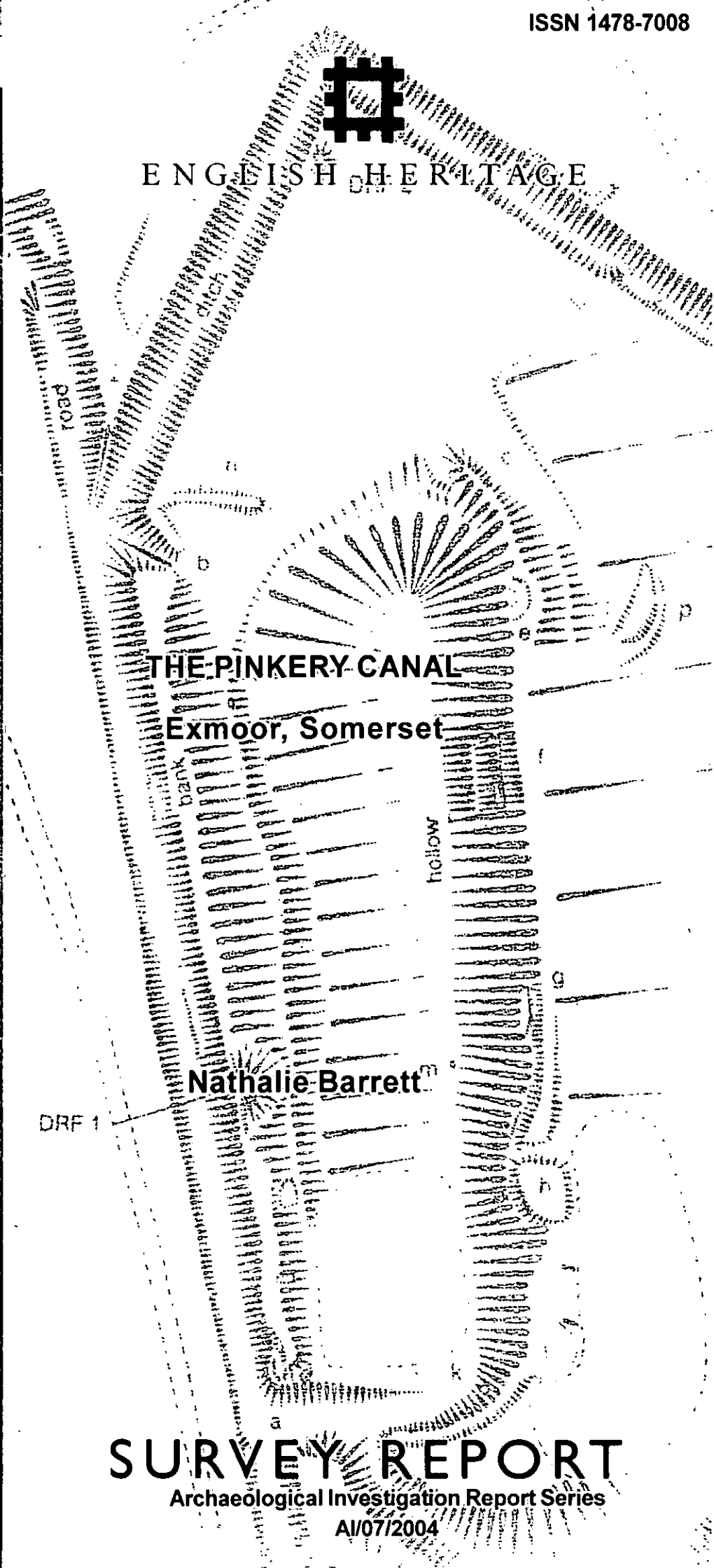




ENGLISH HERITAGE



THE PINKERY CANAL
Exmoor, Somerset

Nathalie Barrett^m

SURVEY REPORT

Archaeological Investigation Report Series

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THE CANAL AT PINKERY: Looking west (above); looking east (below)



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Summary

The Pinkery Canal lies at the heart of the former Royal Forest of Exmoor. It is an integral part of the 19th century landscape created by the reclamation efforts of the Knight family. The results of the first full archaeological survey of this 9km linear feature are discussed in this report, together with possible interpretations of its use. A full description of the feature and its historical context are followed by an analysis of its construction. Agricultural improvements of the period, including water management, and the use of water power are considered. A possible connection with the proposed Porlock railway is assessed. Finally, the conclusion is drawn that while this embanked ditch is most likely to have been intended as a leat to provide water power for an unfinished scheme, the possibility that it may actually have been intended to provide water transport should not be discounted. Contrary to all previous debate it is not inconceivable that it could be, as its name suggests, a canal.

Introduction

The Pinkery 'Canal', and its relationship to Pinkworthy Pond, has long been the subject of discussion and bemusement. It is an impressive earthwork, covering a distance of nearly 9 km at the heart of Exmoor Forest [Figs 1 and 6]. It dates from the era when dramatic change was brought to the old Royal Forest by its new private owners, the Knight family from Wolverley in Worcestershire. They, and their cousins from Downton Castle, Ludlow, had made their wealth from iron-mining and had interests in both the 'picturesque' garden landscaping movement and in vegetation studies and land improvement. After John Knight's purchase in 1818, a period of 'reclamation' of the moor began, famously recounted in C.S. Orwin's work, published in 1929.

By the 1850s this enigmatic feature had not only been abandoned, but cut through by and even re-used as new field boundaries. Never completed and leaving no obvious clues, this large-scale effort of construction and engineering has remained a mystery. Interpretations have considered its use as a source of water power relating to a proposed railway or to the mining industry. It has also been viewed as a series of leats for drainage. Only a small amount of fieldwork had been undertaken prior to this full survey.

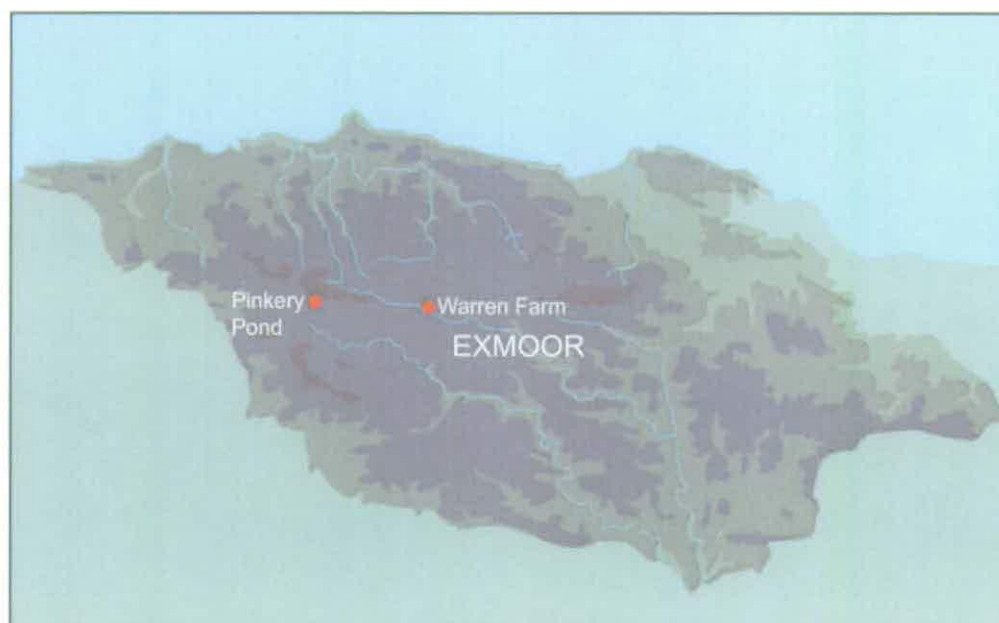


Figure 1
Location map

Exmoor National Park Authority (ENPA) have recently restored the sawmill in Simonsbath and this will become a focal point for visitors to the area. This study was proposed by R. Wilson-North, ENPA archaeologist, as part of this scheme, in order to enhance understanding of the impact on the area by the Knight family in the 19th century. The aim is to add a new dimension to the discussion by concentrating on the archaeology, with the first full field survey of the whole course of the canal. A critical aspect to aid analysis of its possible function was considered to be the taking of levels over the full distance at regular intervals. A Global Positioning System (GPS) survey provided a relatively fast, yet accurate, method

of plotting the entire feature, recording levels and drawing profiles. The information gathered on its survival and condition will also be of benefit for management purposes.

This report details all the survey results, describes aerial photograph and documentary evidence and reviews work published thus far. It provides a full description of form and condition of the Pinkery 'Canal'. It aims to place the Pinkery 'Canal' in its landscape and historical context and offer new thoughts regarding its purpose. It is not intended to be fully conclusive and should offer the opportunity for further study.

The Pinkery 'Canal' will be referred to as the canal within this report. Original material has been referred to and secondary sources often quoted verbatim to reduce the risk of misinterpretation.

2 Landscape Context

2.1 Location, Geology, Landscape Setting

The Pinkery Canal is situated on the south-facing slope of the central ridge which runs east-west across Exmoor [Fig 2]. It runs from below Pinkworthy Pond at NGR SS 721 419, along the 435m contour above Simonsbath to NGR SS 793 402 opposite Warren Farm. The land above is the moorland plateau with blanket bog, known as The Chains, with a height of 460 to 487m (Maltby 1995, 33). The River Barle rises there and is soon dammed by Pinkworthy Pond. The River Exe also rises above the canal further east at Exe Head. Several streams have cut small valleys (known as combes) into the slope.



Figure 2
Aerial view
looking West
along the Canal
(© Crown
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15606/16)

The northern part of the Forest is on Hangman Grits Sandstone (Middle Devonian period) which has a boundary with the Ilfracombe Slates (Middle to Upper Devonian period) along the Exe valley. The lower part of the Chains and the Simonsbath area are of slaty rocks of both Ilfracombe and Morte (Upper Devonian) Slates (Edwards 2000, 70). Pinkworthy Pond was cut into Ilfracombe slates which can be seen on its northern edge (ibid, 75). Peat formation began on the Chains some time around the mid-3rd millennium BC (Straker & Crabtree 1995, 45).

The acid soil supports grasses, rushes and mainly purple moor-grass (*molinia caerulea*) with patches of sphagnum mosses in boggy areas (Straker & Crabtree

1995, 46). There is no heather, unusually for moorland, but Orwin (1997, 60) explains: 'It is an ecological fact that grass-heath tends to arise, in substitution for heather-heath, when heather-heath is used as fairly intensive grazing land.' Indeed the predominant land use of this area has been, and still is, pasture for sheep.

Some areas crossed by the canal are marshy and difficult walking ground. The land is boggy due to a thin clay-iron pan just below the surface. This is covered with a shallow layer of peat, saturated with water for most of the year as it cannot drain through the pan (Orwin 1997, 61). Exmoor Forest land is of two types: 'wet', as above, or 'dry' with natural

drainage- a brown loam covering a yellow subsoil of degraded clay-slate rock, which could be fertile land with the addition of lime (Orwin 1997, 61). Lime was added as part of the later land improvements which will be described in this study.

The aerial photograph of The Chains [Fig 3] shows not only the canal's location and relation to Pinkworthy Pond, but two other features of the high moors: extensive efforts at surface drainage and peat-cutting. Both these factors will have affected the land below, though the miles of drains do not appear to have been able to cope (Orwin 1997, 58). Exmoor has a damp climate with high average rainfall (2000mm +).



Figure 3
Aerial photograph
of Pinkworthy
Pond and the
Canal (© Crown
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3149, 11/4/47)

2.2 Landscape History

The canal is at the heart of the ancient Royal Forest but there is little activity recorded in this part of Exmoor until the post-medieval period. Chains Barrow [SS 7345 4190] is on the top of the plateau above the canal [visible at the top of Fig 3], one of at least three hundred and seventy such Bronze Age monuments on Exmoor (Riley & Wilson-North 2001, 32). Several barrows are used as boundary markers of the extent of the Forest (Grinsell 1970, 103). Later peat-cutting [also visible on Fig 3] may have removed signs of other early prehistoric activity. The name 'Blackpits Gate' at the centre of the survey area is a reminder of this peat cutting (Allen 1978, 41), also evidenced by the number of ponds filling cuttings around Exe head. A hilltop site at Birchcleave, yet to be investigated, overlooking the River Barle at Simonsbath may be an Iron Age settlement [SS 780 392]. The hillfort of Cow Castle is further down the river to the southeast [SS 7945 3735] and Shoulsbury is to the southwest [SS 7055 3909] near Challacombe (Riley & Wilson-North 2001, 59-61). Mining has recently been shown to have started by the later Iron Age and Roman periods: there is a smelting site at Sherracombe Ford [SS 7200 3665] (Riley & Wilson-North 2001, 80) and there is evidence of openworks near Comham Ford [SS 7499 3840] (Jones 1997, 15).

While there is no known evidence of early medieval activity, legend has it that Simonsbath acquired its name from a forest outlaw named Simon, who was converted to Christianity by a wandering Cornish saint. After his baptism in the Barle he was told to take a regular bath at that spot to remind himself of his new faith (Allen 1978, 31). Pinkworthy's name is probably of Saxon origin: from '*pinca*' a chaffinch and '*worthy*' a small farm or enclosure (Allen 1978, 30). The earliest known perambulation of the Royal Forest (document stating the bounds) dates to 1219, though the area was probably used for hunting before being first defined as a territory (Grinsell 1970, 128). The moor was regularly 'perambulated' and a detailed account of all these can be found in MacDermot's *History of the Forest of Exmoor* (1973). The Porlock to Simonsbath road is known as 'Prayway' at its highest point: this means a pass or valley along which sheep or cattle were driven by the Forest Regarders in the periodical round-up of stock in the Royal Forest (Allen 1978, 41). Many tracks and pack-horse ways crossed the Moor: these can be seen on aerial photographs [NMR 67/76/150]. Some of these could date from the 15th century, when iron ore was carried for smelting to the wooded combes where charcoal was produced (Jones 1997, 16).

Simonsbath is first mentioned by John Leland in his *Itinerary* of 1540-2. His description of his journey across Exmoor is as follows:

From Exford to Simonsbath bridge a 4. miles, al by forest, baren and morisch ground, where ys store and breeding of yong catelle, but little or no come or habitation...From Simonsbath bridge I rode up an high morisch hylle, and so passing by 2. miles in lyke ground, the soyle began to be sumwhat fruteful, and the hills to be full of enclosures, ontlylle I cam a 3, miles farther to a poore village caullid Brayforde (Grinsell 1970, 150).

A survey of Exmoor Chase of 1651 was drawn up for the sale of land belonging to the late Charles I as part of the post Civil War disposal of Royal property (Grinsell 1970, 128). Twenty thousand acres were purchased by James Boevey and John Smith in 1652. James Boevey built the first house in the Forest at Simonsbath in 1654 (Orwin 1997, 247). In 1660 the land was restored to the monarchy but Boevey had purchased the lease and tithes and was thus able to remain (Burton 1994, 15). He held it until his death in 1696. There are eight pillow mounds at Warren Farm, which may date to the 17th century (Riley & Wilson-North 2001, 133). A 1675 copy of '*The map of Exmore*' shows the forest as a barren area surrounded by the commons of parishes such as Exford and Withypool [SCRO 1]. Payment was made for pasturing and a pound was built at Simonsbath (MacDermot 1973, 324-329).

The Forest lease was variously held and hunting and grazing were administered by the foresters. Again, full details are listed in MacDermot (1973). Sir Thomas Acland of Holnicote took the lease in 1767 and became Warden of the Forest and Master of the Staghounds (Burton 1994, 18). The lease was continued by Sir Thomas Dyke Acland until 1814 when his son was unable to renew it (Burton 1994, 21). The wars against France had led parliament to assess all Crown property for increased production and self-sufficiency. Exmoor was assessed for its potential to provide wood for the Navy but was deemed unsuitable (Burton 1994, 22). Instead, the Forest was divided into allotments by the Inclosure Commissioners. Their '*Exmoor Perambulation*' describes the boundary of the Forest [SCRO 2] and the area was mapped by them in 1818 [SCRO 3]. [Fig 4 shows the Inclosure Commissioners' final map of 1819.] The maps show the Crown Allotments as No.40, The Chains including Pinkery and Driver, No.32 Exe Plain and No.33, Ashcombe to Honeymead and the enclosure and house at Simonsbath. Two 'public carriage roads' cross the land later carved by the canal: No.6, the 'Lynton Road' across Dure Down (no longer exists) and No.7, the 'Brendon Road' at Prayway (the B3223 today). The Challacombe Road is also marked (the B3358 today) as well as a bridleway, No.11, which is still visible as an earthwork near Driver Farm but is not visible on the ground where it should have met the canal. Neither pond nor canal appears on this map, providing a *terminus post quem* for these features.

A decision was made to sell rather than exploit the Crown Allotments. A deed records the

'Particulars of a Freehold Farm belonging to his Majesty and of the Allotments (Tithe free) made to his Majesty on the Inclosure of Exmoor Forest – to be sold by public Tender on 23rd July 1818 - The farm called Simon's Bath Farm (108) acres (inclosed) and Allotment of Waste land (10,262 acres)' [SCRO 4].

A Memorandum of Sale was attached on the above date to 'John Knight of Portland Place, Middlesex for £50.122' and so began an age of dramatic change for the old Forest.

The Knight family had dominated the iron making region of the Midlands since the 18th century (Trinder 1982, 26). John's cousin, Richard Payne Knight of Downton Castle, Herefordshire was also known as a landscape theorist and proponent of the Picturesque movement in gardens (Stamper 1996, 58), while his brother Thomas Andrew Knight was famed for his research into vegetable physiology and plant breeding (Stamper 1996, 75).



Figure 4 1819 Exmoor Inclosure Map (SCRO Q/Rde/140), reproduced with permission of the Somerset Archive and Record Service

John Knight counted on inheriting the Downton family fortune through male lineage. His own branch of the family were ironmasters at Wolverley, Worcestershire. John Knight was also involved in arable farming and cattle breeding and had succeeded in reclaiming local heathland (Orwin 1997, 35).

Much of John Knight's work, and that of his son Frederic Winn Knight will be discussed throughout this report. This has been detailed in Orwin (1997), Burton (1989) and Riley & Wilson-North (2001). A short summary at this point will set down a framework for this period.

Soon after the purchase, a 48km enclosure wall was built to fence in the tithe allotments [these were examined on 2nd June 1820, SCRO 5]. John Knight moved to Boevey's house in Simonsbath in 1827 (MacDermot 1973, 36). He began the construction of a great house, but this was never completed. He improved the roads, and by 1842 he had built Cornham and Honeymead farms and eighteen cottages (Orwin 1997, 74). The other fifteen farms were established in the late 1840s and 1850s (MacDermot 1973, 436). John Knight had bought the mineral rights from the Crown for £762, though no mining was recorded until copper mining began at Wheal Eliza [SS 7847 3812] in 1846 (Jones 1997, 26).

In 1840, John suffered a financial blow when he lost a court-case to claim the succession to the Downton Knights' fortune, when lineage passed to their female descendants. On 2nd June 1841 John Knight wrote to his wife Jane Elizabeth that he had passed the management of the moor to Frederic [SCRO 5]. Mrs Knight appears to have mostly stayed away from Exmoor for reasons of ill-health and she died in Italy on 18th July 1841 [Letter from Frascati, 19th July 1841, SCRO 5]. John spent most of his time thereafter in Rome, where he died in January 1850 [letter of 26th January 1850, SCRO 5]. He remained interested in his property: when Frederic returned to Wolverley to become Member of Parliament, John wrote:

'Frederic is now quite a Worcestershire man. I should never have bought the Moor, had I not thought that I could establish my family there – In which I appear to have failed, nevertheless it must turn out a most valuable estate and not a failure in that respect' [letter of 30th December 1841, SCRO 5].

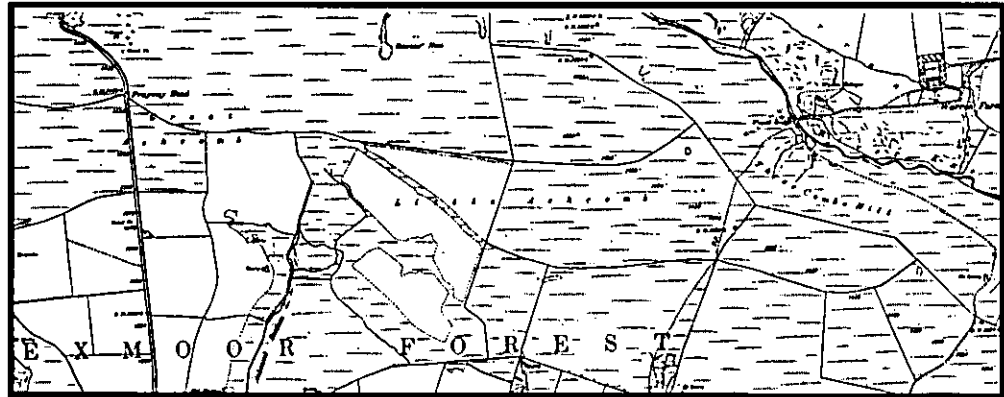
In fact, though Frederic appointed a manager, he was very much involved in running the Forest. He had a different vision to his father and set about establishing farms and investigating further mineral exploitation. Much planning went into a railway to connect Exmoor Forest with the coast at Porlock Weir [NMR SS 84 SW 44], though this project was never completed.

Only six years later the Forest was a different place: the parish of Exmoor was formed due to the growth in inhabitants between 1845 and 1852 from the new farms and the mining operations (MacDermot 1973, 439). By 1859 most mining had ceased due to disappointing results, though a little carried on into the 20th century (Riley & Wilson-North 2001, 148). Frederic died on 3rd May 1897, though he had already sold the reversion of the estate, after

the death of his son, to Earl Fortescue on 10th April 1886 for £193,060, subject to his life interest (Orwin 1997,141).

Many of the boundaries which re-use the canal are shown on the 1st edition (1881) OS maps (Somerset XLIV NE and XLV NW). Pinkworthy Pond is also mapped at this time (Somerset XXXII SE). The canal does not appear as a feature on these maps, except in one field on Little Ashcombe where it is depicted as a marshy channel [Fig 5]. Small enclosed fields surround the farmsteads, while the canal forms part of the boundaries of much larger areas, some of which were sub-divided later in the 19th century.

Figure 5
Detail from the first edition Ordnance Survey map, showing the Canal as a marshy feature (Reproduced from the 1881 Ordnance Survey map, Somerset sheet XIV)



The period of great change was over. The later history of the tenanted farms is covered in detail by Orwin (1997) and Burton (1989). Exmoor Forest saw some military activity during World War II as an infantry and artillery training area (Riley & Wilson-North 2001, 167-9). Eleven of the seventeen Knight farms are still in use, though Pinkery is now an Outdoor Centre. The National Park (created 1954) bought much of the Fortescue Estate in 1969 and 1991, including much of the Pinkery Canal (and the pond). The fields it lies in today are used for sheep farming.

2.3 Previous Work

As stated previously, the most famous study is that of the economic historian C.S. Orwin, 'The Reclamation of Exmoor', first published in 1929 and now in its third edition with revisions and contributions by R. Sellick and V. Bonham-Carter (Orwin 1997). Orwin based some of his work on an article written in the Journal of the Royal Agricultural Society: 'Exmoor Reclamation' by S. Sidney (1878, Vol.114, 72-97). Orwin came to the conclusion that the purpose of the pond and canal were to provide irrigation (1997, 57). Another important work is 'The History of the Forest of Exmoor' by E.T. MacDermot (1973) which reproduces and comments on many documentary sources. No mention is made of the canal in the text, but he suggests that the pond was intended as a water supply for farming (1973, 437).

A recent contributor in this field is the local historian, Roger Burton, with 'The Heritage of Exmoor'(1989) and a detailed study of social history in 'Simonsbath: The Inside Story of an Exmoor Village' (1994). The pond and canal were also considered by Dr.R.F. Youell of Leeds University, during his work on the mineral deposits of Exmoor (published 1974). There has been some debate on the subject of the pond and canal between these authors

in the Exmoor Review. Youell (1974, 102) thought the most likely solution to the mystery was that 'the pond would have provided all the water necessary, led by the canal direct to the top of the inclines down to Simonsbath'. In 1985, Burton agreed with him (1985, 72): 'as the leat from Pinkery Pond can be traced to within a few yards of the top station, there can be no doubt that its purpose was to supply the water power needed at this end' [Fig 16 illustrates the route of the railway]. In 1989 however, Burton announced 'new evidence': he had previously believed (as Youell) that the canal ended at Limecombe. He then noted the full course as it is described in this report, across Ashcombe to beyond the plantation opposite Warren Farm (1989, 64). He concluded that 'Pinkworthy Pond and canal, and a similar canal off the River Exe, were constructed to provide water power to work steep inclines at both ends of a proposed railway from Porlock Weir to Simonsbath, to bring in vast quantities of cheaper limerock from South Wales to speed up the reclamation work' (Burton 1994, 22).

The Porlock railway is discussed by R. Madge in *'Railways round Exmoor'* (1988). The work of R. Sellick on the West Somerset Mineral Railway and the Brendon mines provides useful comparisons of a more successful enterprise (1970). M. Jones (1997) has studied the local mining history of both the Brendons and Exmoor.

A section was dug across part of the canal as part of a paleoenvironmental study by K. Crabtree and E. Maltby (1975). Its potential was recently reassessed by Maltby, who regards the canal as 'an environmentally significant feature' which can enable 'valid spatially separate comparisons to be made between reclaimed, unreclaimed and reverted soil conditions' (1995, 39).

'Archaeological Assessments for Management Purposes' were written by R. McDonnell for the ENPA on the Pinkworthy Estate, Simonsbath and Warren Farm, which cover the areas crossed by the canal. These included fieldwork and notes and plans (including part of the canal) are available as appendices to these (McDonnell, 1998). Apart from this and, previously, Grinsell's more general work *'Archaeology of Exmoor'* (1970), very little research had been done on the archaeological remains of Exmoor as a whole. This situation was remedied by the work of the Royal Commission for the Historical Monuments of England (RCHME) between 1993 and 1999. Large amounts of archaeological field survey were conducted, culminating in the publication of *'The Field Archaeology of Exmoor'* by H. Riley and R. Wilson-North (2001). A brief survey of some of the Pinkery Canal was conducted by I. Sainsbury as part of this work (NMR SS 74 SW 64), concluding that the canal was in fact a series of short drainage leats.

The only other survey was a Hydrological Analysis of Pinkworthy Pond conducted by the Babbie Group for ENPA, due to the possible registration of the pond under the provisions of the Reservoir Act 1976. The survey also considered the canal and concluded that it would have been possible for it to connect with the pond and achieve sufficient water levels to fill and create a flow. It was calculated that there would be insufficient flow to power a railway incline, and that the water provision was probably for a quarry at SS 274 395 at Bale Water

(Underwood 1997,3). The report states that the canal stops at Tangs Bottom and that it has been confused with field boundaries further east. It is suggested that a better place for a reservoir for the proposed railway would have been at Exe Head (Underwood 1997,5).

3 Description of Form and Condition of the Pinkery Canal

3.1 An Overview

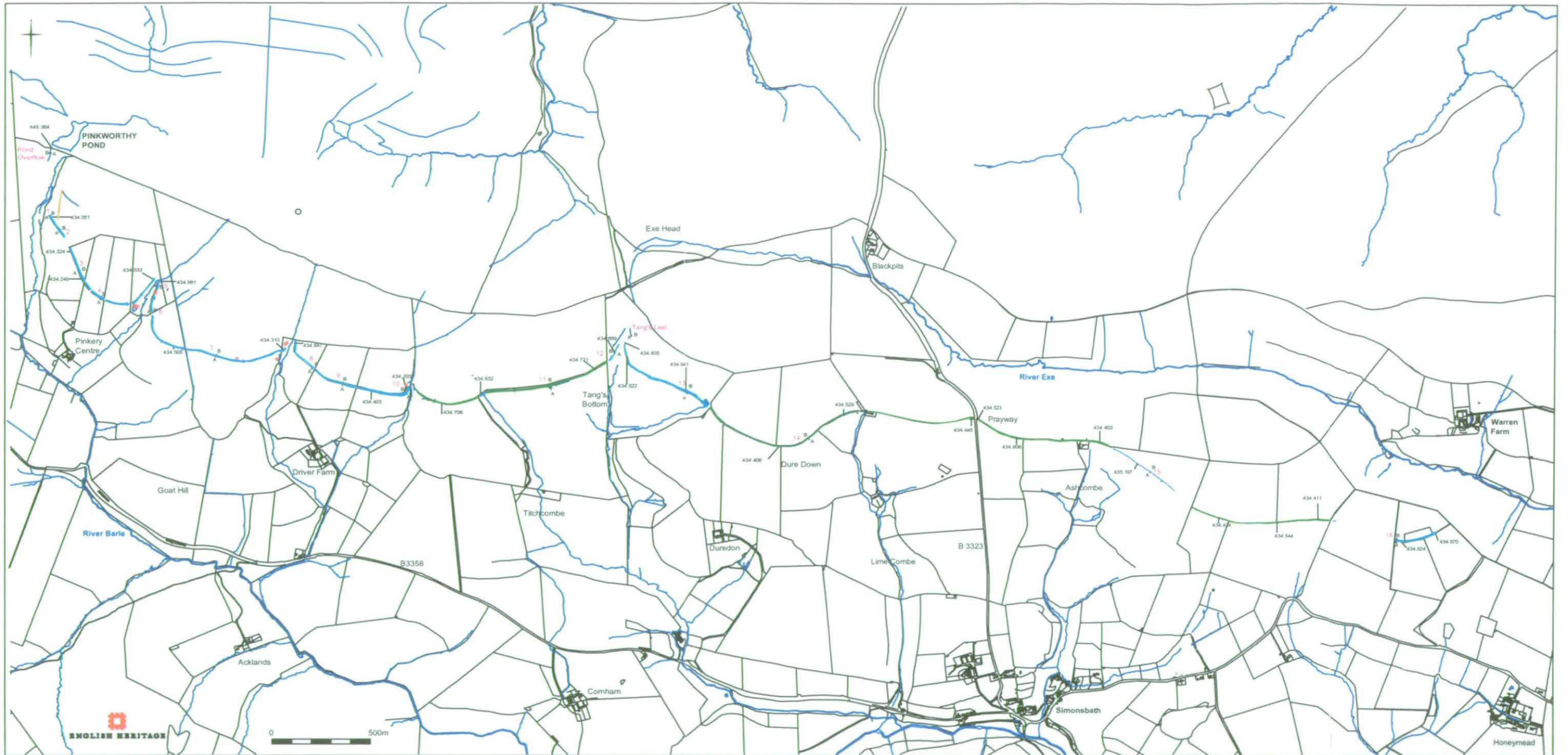
The Pinkery 'Canal' is essentially a linear ditch, on the south-facing slope of the Chains. It runs for c.9 km following closely the 435m contour line from near Pinkworthy Pond to (and through) the plantation at the top of Three Combe Hill, opposite Warren Farm [Fig 6]. It is 2.5 – 3m wide, averaging c. 2m deep with a width of c. 1.5m at the base. It is flanked by banks either side: the southern (downslope) bank is c. 2m wide and 1m high with a broad, flattish top; the northern bank is c. 1m wide and 0.5m high with a more rounded appearance. The earthworks survive to varying degrees: survival is generally better in the western part, across Pinkery and Driver land [Fig 1]. It is almost unrecognisable in some of the eastern part, though aerial photographs have shown this deterioration to be quite recent (detailed below).

The feature has been cut by many enclosure banks and for much of its course has been re-used as a field boundary with the hedge-bank being built on one of its banks. Farm tracks, bridleways and footpaths cut across it, sometimes dividing it into small segments. Some of these sections have then been fenced in. The B3223 crosses it by Prayway Head. Streams have cut and even washed away some sections. Various factors have affected its morphology. These include erosion of the banks and infill of the ditch in the wetter sections. Ploughing of the banks has changed the form of one or other bank and, in three places, ploughed the feature out, although slight earthworks remain and the course is clear from aerial photographs. Quarrying for stone has cut into certain sections. Additional ditches have been cut alongside the canal and the upcast has increased the height of banks. At least one section has been regularly cleared out, with the silt adding to the bank height.

The canal meets several streams, and approaches combes. It either stops or narrows as it bends into these combes. The eye is deceived when looking at the channel's path into the combes: it appears to drop down. Levels taken along the course have, however, shown that there is no more than a 0.5m change in height at any point along the length and this is caused by infill of the ditch rather than deliberate engineering. Some of the ditch holds water and most of the ditch is marked by a line of rushes. The banks are covered in grass, and purple moor grass and moss in the wetter areas, and are formed of various sized slate fragments and loamy brown soil. There are no evident spoil heaps or pits from the construction of the feature, although there are pits caused by later quarrying.

A full description follows, divided into sections for ease of reading and beginning at the west end with Pinkworthy Pond. The description includes all evidence surveyed and noted, including features other than the canal relating to water management and quarrying. Figure 7 shows profiles taken across the canal at various points in order to illustrate change of form. Heights are expressed as m OD.

ARCHAEOLOGICAL SURVEY OF THE PINKERY CANAL, EXMOOR



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KEY:			
—	Canal	■	Quarry
—	Ploughed out Canal	■	Bank
—	Re-used Canal	⊥	Profiles, Fig 7

Figure 6 Plan of the Pinkery Canal, 1:10 000 scale (reduced)

PROFILES ACROSS THE PINKERY CANAL

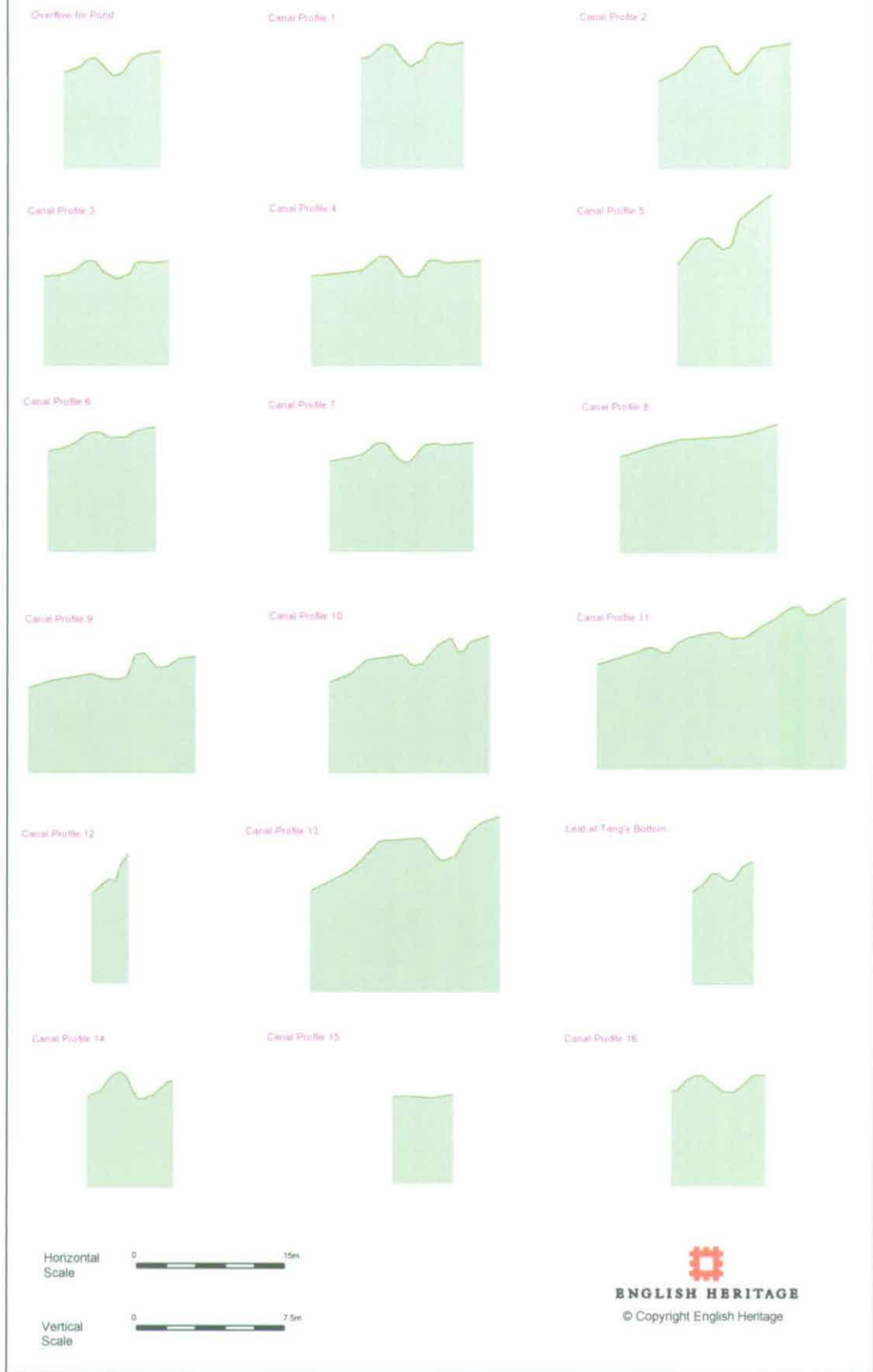


Figure 7 Profiles across the Pinkery Canal



Figure 8 Pinkworthy Pond (top) and Dam (below)



3.2 Pinkworthy Pond and the Canal course across Pinkery and Driver (NGR SS 721 418 to SS 740 410)

The pond itself was not surveyed as it is depicted on OS maps and was not strictly in the remit of this project. It will however be considered in the discussion in view of its potential relationship with the canal. Briefly, it is a large reservoir formed by the construction of a huge dam [Fig 8] which retains the headwaters of the River Barle. The water currently flows out of a rock-cut tunnel. There are no signs of sluices or methods of stopping or controlling the flow to fill the pond. It is possible that the tunnel was cut in 1913 during the search for a missing person and to keep the water level low to prevent the need for draining again. If the water level ever attained the full height of the dam then the volume of water in the pond would have been considerable. The total pond area would have been seven acres; it is currently about half full (Allen 1978, 28).

Heights were taken across the top of the dam, showing it to run fairly level at 445m. An additional feature was surveyed, which appears to be an overflow for the pond at 445.217m, NGR SS 722 422. It is a ditch cut into the valley side with a bank on the downslope, eastern, side [Fig 7]. It runs a short distance southwards, down the valley, from the top of the dam. This provides a run-off at some distance from the dam, thereby preventing the danger of excess water undermining the construction. Several paths are cut into the valley sides and a leat runs off near the valley bottom towards Pinkery Farm (now the Outdoor Centre).

A linear feature was investigated as it ran over an area between the pond and canal. Considering its morphology and position, it would appear to be an eroded field boundary, parallel with those extant [Fig 6].



Figure 9
The canal at
Pinkery, cut
by a hedge-
bank

The first section of canal that is encountered is some 350m from the pond, at NGR SS 721 419 [Fig 7, Profile 1]. It appears to have a definite end - deliberately constructed as such, rather than having been eroded or ploughed away. This section is marked on maps as a field boundary but has not been planted or otherwise altered. The level at this point is 434.674m. There is a considerable run-off of water down the slope in this area. The canal has been breached by this water in places, although the lower (southern) bank is still visible. Occasionally, the upper (northern) bank no longer has the appearance of a bank due to the amount of sediment deposited behind it [Fig 7, Profiles 2 and 3]. In the drier areas, there are breaches made by tractor tracks. An additional channel has been cut at an angle to the canal, which may have been a more recent effort to help drain a very wet part of this area. A section of the canal was removed by the construction of a field boundary – a stone and earth bank planted with beech trees [Fig 9]. This is a pattern repeated along much of the course of the canal.

The next section at NGR SS 724 415 was surveyed fully in order to produce an earthwork plan at 1:500 [Figure 10]. The canal is cut by more walls and several farm tracks before reaching the first combe. Its condition is generally stable along this stretch as the ground is not so damp [Fig 7, Profile 4]. Where a wall cuts the actual line of the canal, a hole is left in the construction of it near the base to allow any water still being channelled to flow through (NGR SS 725 414).

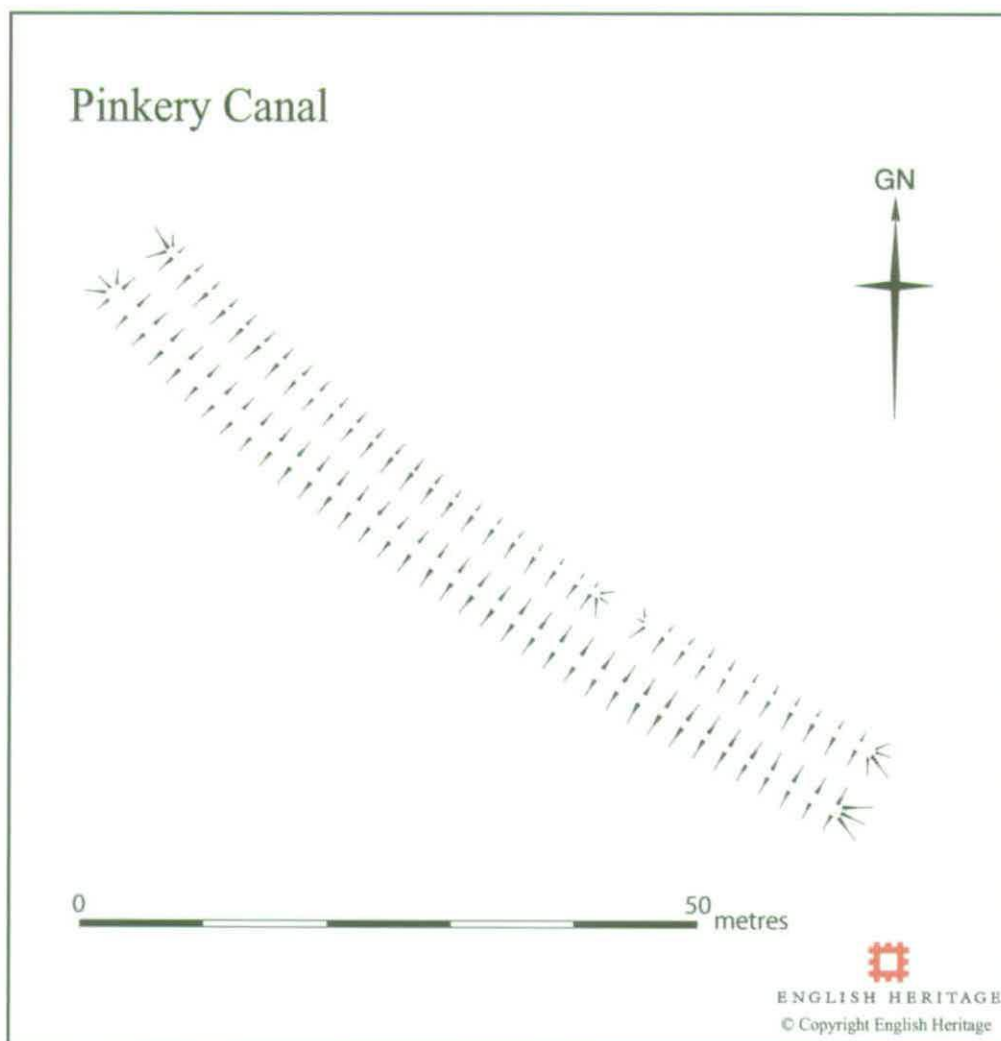


Figure 10
Earthwork plan
of a truncated
section of the
Canal, 1:500

The canal turns to the northeast as it enters the combe, just after being cut by a gateway. There is a quarry on the valley side and either a channel, or more likely, a path heading south from next to the canal around the quarry to the valley side.

The canal changes width at this point [Fig 7, Profile 5]. In fact, the canal seems to stop then a narrower version of it heads to the back of the combe, tapering and finally running out (NGR SS 727 415). It remains level around the bend. It starts again on the other side of the combe (still level at 434.795m) but loses its form, almost levelled by the boggy ground. Its course is still apparent from the line of rushes in the ditch and parts of the banks are still visible (NGR SS 727 414) [Fig 7, Profile 6]. At intervals, it appears to have been washed away completely.

Shortly, it resumes its usual appearance (NGR SS 727 413) and is again cut by an enclosure bank which has a fast-flowing stream alongside it – this does not run into the canal at present as a section of it has been removed by the bank construction. The banks of the canal are particularly steep within this field, which appears due to the clearing out of the ditch (434.275m). Rushes are growing in clumps on the top of the banks, which does not occur elsewhere: the extra height must be due to the ditch fill being thrown onto the banks (NGR SS 729 412) [Fig 7, Profile 7]. An additional bank to the north has the appearance of a Second World War feature (NGR SS 729 412) [Fig 6].

The canal then returns to a well-preserved form until it is again cut by a bank and a small stream before the next combe at NGR SS 734 412. Another quarry is situated to the south. The canal turns to the northeast again into the combe, but is there disturbed by another quarry (cut down to 434.310m) and can be seen no further on this side of the gully. On the other side it is back to the usual level (434.847m) and heads back round into Driver Gully field, but as it straightens, it is ploughed out (NGR SS 735 411). It is still visible as a slight earthwork [Fig 7, Profile 8].

It is only ploughed out in this field: over the wall it runs across the next field. In the following field, 'Foxy Pieces', a second ditch has been dug behind the upper ditch. The upcast of this has been thrown onto the upper bank, increasing its height and width [Fig 7, Profiles 9 and 10]. The lower bank is also of different appearance along this section: it is wider and flatter than usual, which appears to have caused by ploughing.

3.3 Tang's Bottom to Three Combe Hill, across Prayway and Ashcombe (NGR SS 750 410 to NGR SS 793 402)

The border with Astrop Estate land is marked by another gully and quarry (NGR SS 740 410). The levels are 434.613m on the west side and 434.519m on the east. Up to this point the canal is easily recognisable as a feature (Fig 11). From this point however, the upper bank has been re-used as a hedge-bank. The ditch is quite wide and marshy; the south bank is low and wide and occasionally missing – washed away in another boggy area and cut by streams. A ditch appears deliberately cut, heading southwest, to drain this excess water. The canal is cut by a bridleway and another bank.

Figure 11
The canal at the border of the Astrop Estate: good survival on Driver land; a quarry in the coombe side being surveyed in the foreground



A second ditch is again cut on the upslope side of the canal above Bale Water. The trees on the top of the hedge bank have grown very large along this section (NGR SS 744 409 to SS 748 410). The ditch becomes very uneven and silted up; there are many breaks through the lower bank by small streams. In addition to the second ditch to the north of the canal, there is a third channel running parallel to the south [Fig 7, Profile 11]. This whole area, on either side of Tang's Bottom is particularly wet (NGR SS 748 410 to SS 755 408).

Tang's Bottom is much wider, deeper and steeper than the other combes so to remain level the canal has to go much further back into the head of the combe [Figs 6 and 12]. As the canal narrows it is cut into the rock and becomes much narrower [Fig 7, Profile 12], with a short outer bank which falls steeply down the combe edge. The combe sides are very boggy and so is the head of the combe (NGR SS 751 412). A leat runs parallel with the canal for a short section [Figs 6 and 7], visible on aerial photographs for a longer distance (NMR 3151, 11/4/47). The level on the west side of the combe is 434.906m and 434.835m on the east. The next section has again been washed away and silted up: the remains of banks can be followed along the route. In some places there is quite good survival, in others many breaches by either water or farm tracks. Then the bank sides appear quite eroded and the ditch quite wide with a deep water and marsh fill [Fig 7, Profile 13].

The canal disappears into a large quarry at the next small combe (NGR SS 755 408). The level on the west side is 434.641m and 434.523m on the east. After this, the bank is built up to the south with occasional trees planted on top. This area is divided into many small sections by wide farm access tracks. The canal sections are each fenced in. The upper bank is disturbed by the fence line and the lower bank is re-used as the hedge bank; the ditch remains recognisable and level with the rest of the course [Fig 7, Profile 14]. The ditch has more build up of mud washed down the field within it. There is a wide break at the



Figure 12 The Canal at Tang's Bottom: a) looking in, b) looking out





Figure 13 The canal at Prayway: virtually unrecognisable



Figure 14 The distinctive kink in the hedge-bank at Ashcombe, where the canal route crosses the ploughed-out field.

sheep dip above Limecombe (NGR 763 408). The next section to the road is virtually unrecognisable (NGR 764 408 to 769 407) [Fig 13]. Aerial photographs confirm that this was a section of the canal. On aerial photograph NMR 3077, taken 13/5/46, it survives well up to its interruption by the sheep dip.

There is a wide gap cut by the B3223 at Prayway Head. Across the road the condition is slightly better, the south bank is still the hedge bank and the north bank is often flattened. The ditch has rushes growing in it and there is more of a bank. The course continues across Ashcombe, cut by farm tracks, a bridleway and footpath; the level here is 434.457m. There is a distinctive kink in the field boundary at NGR SS 776 786: at this point the hedge bank is no longer imposed on the feature but carries straight on [Figs 6 and 14]. The course of the canal is hard to spot; a level was taken at 435.197m where it is filled with ploughsoil. As it heads across the field it is almost totally ploughed out, though occasional remnants of banks and a slight hollow are discernible (NGR SS 775 405) [Fig 7, Profile 15]. In an aerial photograph taken 13/5/46 (NMR 3075), it is clearly defined to the kink in the bank. The ploughed out section was visible after heavy snow on 7/3/79 (NMR SS 7740/6/157).



Figure 15
Aerial
photograph of
the Canal
opposite
Warren Farm
(© NMR 4156,
11/4/47)

The form then returns to a flattened north bank and hedge bank on the south bank for two fields before it is again ploughed out. Aerial photographs NMR 3073-4 of 13/5/46 show the canal still surviving in the ploughed out field. In the two previous fields, though the hedge-banks are clearly seen on the canal's lower bank, the ditch and upper bank appear much less disturbed than at present; the level is still 434.596m. This has occurred more recently with the erection of a fence causing slumping of the upper bank into the ditch in places. This time in the ploughed-out field there is no trace of the canal's survival except for a very slight depression at one point in the west end of the field at NGR SS 789 403. It was still in existence on 11/4/47 and there was no plantation (NMR 4156) [Fig 15]. By 14/4/74 it has been ploughed out (NMR 023/74/259-263) and is seen under cultivation on 25/6/76 (NMR 48/76/131).



Figure 16a
*The Canal at
Three Combe
Hill: fairly good
survival*

A final section survives in fairly good condition (NGR SS 792 402 to SS 793 402) and its form is returns to that of the Pinkery end although the banks are slightly more eroded; the level at the base is 434.510m [Fig 7, Profile 16 and Fig 16a]. The canal then continues into the plantation on Three Combe Hill, where it survives right through, cut by fences and pipes carrying cables to masts within the plantation [Fig 16b]. This plantation has appeared by the aerial sortie of 27/6/53 (NMR CAP 8120/56). The canal finally terminates in this field at NGR SS 793 402; the level is 434.870m. The bank ends appear to have been ploughed over- they are not so well defined as at the western end. On a photograph of 13/5/46 (NMR 3073), the canal can be seen before the trees were planted and it terminates at the same point. A slight mark caused by water run-off is visible. Aerial photographs of the area to the east of this point (NMR 3128-9, 8/11/52; 67/76/158, 4/8/76; 3072,13/5/46) confirm that the canal goes no further.



Figure 16b The Canal at Three Combe Hill: Surviving under the plantation, cut by a modern pipe

4 Discussion

4.1 Construction and Design

The only reference to a possible date for the building of the canal, which has been used in previous discussions, is from a letter at Kidderminster Library which speaks of the construction of a 'water carriageway' on Goat Hill in 1833 (Crabtree & Maltby 1975, 38). The canal, however, does not run across Goat Hill, which on all maps is shown as the land south of Driver Farm alongside the Challacombe Road. In addition, there is a complex system of leats on Goat Hill surveyed and reported by McDonnell (1998). It is difficult to say with any certainty to what feature the document refers. No conclusive documentary evidence relating to either pond or canal was discovered during the research into this project.

What is certain is that neither the pond nor the canal appear on the 1802 OS sketches or the 1818 or 1819 inclosure maps. The canal is cut by beech hedge-banks which date to the development of the farms from the late 1840s. Duredon was built in 1846, Driver in 1847, while Pinkery and Titchcombe were only designated as future holdings in that year (Orwin 1997, 81). These boundaries would only have been constructed as required by the tenants rather than in advance (Orwin 1997, 93). The canal can only be securely dated to some time in the period between 1820 and the 1840s, though it seems likely that its construction dates to the early stages of John Knight's improvements. Burton (1994, 25) proposes a more definite date: 'the early stages of John Knight's reclamation, which entailed the use of a considerable labour force, reached its peak in the mid to late 1820s with the import of 200 Irish labourers to work on the construction of Pinkery Pond and the canal and railway system'. No documentary reference however is given, and no supporting evidence has been able to confirm or add to this information during this present study.

The 1818 and 1819 maps by the Inclosure Commissioners (referred to above and in Fig 4) show the area of the Royal Allotment to be enclosed, just prior to John Knight's purchase. The only apparent extant features are the roads and the Simonsbath enclosure, and the pond or canal are not shown. It is not possible to see the Duredon road or the No 11 bridleway and these were probably cut by the canal construction as they had gone or were going out of use. (No.11 bridleway can still be seen across Driver land as earthworks forming a hollow-way in Oxen Park Field). However the road known as the Lynton road was already in existence when the canal was built and its relationship with the canal at Prayway is uncertain. The road was described as a forty foot wide public carriage road. This would probably have been no more than a track prior to the Knights amelioration, used for the movement of animals. The construction of the pound at Simonsbath suggests the continued use for this purpose as well as other traffic. This poses an unanswerable problem regarding the relationship of the canal and the road: did the canal cut across this road? Was it to be bridged by the road? The construction of the beech hedge-banks have removed any physical relationship between the features.

A consideration of the form and location of the canal can help to answer some questions but also poses many others. The canal is not just a ditch with a bank formed by the upcast from the construction of this ditch. There is a second bank – though smaller it is a definite bank [Fig 7 shows sections across the feature, illustrating this]. This suggests that the canal would not appear to have been designed to collect surface water running off the slopes from the Chains. A large amount of water does however flow down from the Chains. Several streams could have flowed into the canal to top up the water level at various points along the course. It is difficult to assess if there was any deliberate channelling of these streams into the course of the canal as the water has eroded away any possible traces of evidence. Neither is there any apparent evidence of a system of channels to drain any water out of the canal down to the land below. Leat systems will be discussed in a later section. Several leats were encountered during the survey but none appeared to have any direct connection with the canal.

The canal is linear but it is only straight in sections: for most of its course it gently curves to follow the contour and turns into the combes [Fig 6 shows its overall form]. The relationship of the canal with these combes is the most perplexing aspect of the feature. It raises a number of questions which will be returned to during the discussion below. The canal turns into them but is narrower: was it heading round the back of the combes or could the canal have bridged them? Was the canal designed to be connected as one long feature or was it intended to be a series of short sections?

If the canal was not in fact a single feature but a series of drainage leats, then there would seem to be no real purpose to connect it to Pinkworthy Pond. The pond however is a contemporary feature and it is hard to imagine that each was not built with the other in mind. The proximity of these two large-scale projects is seen in both Fig 2 and 3. An analysis of the pond and its possible connection to the canal was not possible as part of this study but was the subject of a survey by the Babbie Group, as referred to in the previous work section. They calculated that the canal could have been filled from the pond and a flow created to the canal's end, judged by them to be at Tangs Bottom. The results of the present survey have shown that the canal continues for over twice that distance [Fig 6]. The flow achieved over that greater distance could have been considerable, even though the course was fairly level. The canal would have remained full and flowing, even if only gently. The Babbie survey appears to have used the current level of the pond (437.4 – 438.8m, Underwood 1997, 3) as the maximum height of fill for its calculations. The height of the dam construction and the overflow at the top would however suggest a height of c. 445m. This total increased volume of the pond may have created even more of a potential flow in the canal.

Something that is apparent when the full length of the canal is considered [Fig 6], is the difference between the eastern and western sections of its course. The western section encounters many combes and deliberately turns into them whereas the eastern section is straighter and positioned high above Limecombe and Ashcombe. In the eastern section, the canal could not be located at a higher contour as it is almost at the highest point. In the west, if it had been located any higher it would have encountered even more difficult, marshy

ground. Therefore, in order to run over the full distance it covers, it had to be located at that contour, though seemingly not ideal in view of the need to cross the combes in the western part. Similarly there is an east/west difference in survival and later use. For much of its eastern part it has been reused as a boundary. In fact, as the Babbie survey illustrated, many people do not realise the full extent of the canal and have confused it with original field boundaries rather than a feature re-used in this way. In the only two fields where it does not serve this purpose, the land has been ploughed out (since 1947). It survives in its original form close to and through the plantation opposite Warren Farm [Fig 15]. It has survived much better in the west and does not fit the field pattern as it does in the east. Holes in the base of walls cutting the path of the canal in the west suggest it retained water at the time of the boundary constructions. It has only been ploughed out in one field of the western section. There does not appear to be any difference in later land use between the east and west sections.

As the last paragraphs have demonstrated, most of the problems in interpreting the canal relate to its relationship with other features, particularly to the combes. Why does the canal turn into the heads of the combes instead of draining straight down the valley side? How would the sections have connected? Would they have bridged the combes or would the canal have gone back round the head? There is a definite change of shape of the feature as it either narrows into the combes or even stops short just before them. The narrow sections into the combes are still level, although this is deceptive on the ground as they appear to almost run uphill. On Dartmoor, the Reddaford Leat which served Mary Tavy mines and still serves the power station gives the 'uncanny impression of running uphill' (Harris 1986, 198). As they are level, they would not appear ideal to act either as overflows or as top-up points. There is no evidence of sluices, dams or aqueducts but there is much heavy rainfall in this area. The great storm of 15th August 1952, which devastated Lynmouth, caused landslips along valley slopes on many parts of the Challacombe to Simonsbath area (Edwards 2000, 73). It is possible that the canal may have suffered from some damage in the combes from the weather, which might mask some evidence.

It is also possible that there was never any evidence. It is logical that the connections would have been left till last: the heavy groundwork of construction of the route would be done by the labourers after the levels were laid out by surveyors; the more complicated connections would then be dealt with by the engineers. For financial and logistical reasons these would be left till last, but they were never called in as the project budget overall collapsed. This would not only explain the lack of evidence in the combes and across the Lynton road but also the lack of connection to Pinkworthy Pond. The Porlock-Simonsbath railway project, which was never completed either, was constructed in similar fashion: the course was laid out and much of the track-bed was built up by labourers, but the rails and engineering did not materialise as the project was abandoned.

Orwin (1997, 57) relates a tradition that the canal and pond were not connected as they worked to the wrong levels. He suggests that a difficulty may actually have been that the dam was not strong to hold the pond water if filled to its highest level. It is true that a

problem when building a cross-valley dam was the need to withstand winter streams, particularly in this wet upland. In order to enable surplus to pass, overflows and sluices had to be incorporated into the dam structure. It is these points which often lead to failure of the project (Crossley 1990, 142). There is an overflow at the top of the dam, indicated on the overall plan [Figs 6 and 7]. The current exit for the water is rock cut and keeps the level down to a much lower point than the height of the dam. It is not certain if this an original feature which could have been blocked to fill the reservoir or if, as has been proposed, this relates to either of the two pond-draining episodes: in 1880 after the suicide of a farmer or 1913 in the search for a missing person (Allen 1978, 30).

The suggestion that the surveying was incorrect seems unlikely. The results of the present GPS survey have shown that John Knight's surveyors managed to accurately lay down a course over 9 km across wet ground and round combs. Their achievement cannot be denied. Orwin says (1997, 56) that John Knight supervised all his works himself. His surveyor was Thomas Timmins, who stayed at White Rose Cottage (Burton 1994, 30). It is likely that more documentary evidence existed, which may have been lost or destroyed, and unfortunately not been uncovered to date. John Knight certainly planned and began to execute an enormous scheme. The hard labour would have been the cheapest part of the project. It is possible to envisage friends or potential investors being given a tour of the estate and impressed by miles of earthworks being dug by large gangs of labourers. The funds never materialised and the costly engineering was never commenced.

Most authors agree that it was abandoned before completion, except the RCHME survey which concluded it was a series of short drainage leats [NMR SS 74 SW 64]. Burton (1985, 72) saw it as 'painfully obvious' that John Knight was 'overhasty' in the construction of the pond and 'leat'. Orwin says (1997, 57) that the best suggestion is that 'Pinkery Pond and the canal were constructed to provide irrigation water for the long stretch of land from Pinkery Farm to Honeyhead, but that its peaty nature made it unsuitable for this purpose and led to the abandonment the project.' Many of the problems discussed in this section will now be returned to as the various possible interpretations of the canal's use and purpose are considered.



Figure 17
Difficulties in surveying on boggy ground

4.2 Improving the Land

Upland moors which passed into private ownership in the 18th /19th centuries were a 'real challenge for improvers' (Williamson 2002, 126). How does the canal relate to the 'reclamation' of the moor? The canal stretches from above Pinkery to above Honeymead: a large proportion of Knight land. As seen above, Orwin favoured the suggestion that the pond and canal were to irrigate this long stretch of land (1997, 57). McDermot (1973, 437) does not mention the canal but says that 'Although Pinkery Pond was often said to have been made to form a reserve of water power for the use of the mines, these were of a later period and it is most probable that it was intended to provide a water supply for farming.'

Another form of land improvement could be the management of excess water from the Chains - to dry out the land below by draining water into the combes. The canal was described as impressive by its scale, but 'merely a large drainage channel' (Riley & Wilson-North 2001, 139). 'Water was the great enemy of the farmer in the West' – affecting not only yields of arable land but pasture land which became infested with rushes and reeds and other 'rank' vegetation (Williamson 2002, 120). Surface drains were extensively used in upland areas, often spaced at intervals of 20 to 30 metres (Williamson 2002, 121). The surface drains visible on aerial photographs within the study area [Fig 3] seem to fit within field boundaries. The leases for the new farms included a Memo to encourage the tenant to lay out systems for drainage [SCRO 6]. Drainage would probably not therefore have been done until each farm was established. The discussion above concerning the design of the canal and its connection to the pond also suggests that drainage was not the purpose of the project.

We are told John Knight began 'demesne farming' early on and, although he continued to take sheep for summer pasture, 'farming on a large-scale was his object' (Orwin 1997, 59). It is not known exactly how much was brought into cultivation under John Knight. He tried to farm a 'four-course system', common in his native Worcestershire, of barley, wheat, turnips and sheep (Orwin 1997, 63). Does the optimistically named 'Cornham' suggest the starting point for this venture? Similarly, 'Honeymead' might suggest good grazing land. These two earliest farms were the only ones developed under John Knight rather than Frederic Knight and they are both situated to the south of the Challacombe Road, the wrong side to the canal. They could have held more land initially but there is no mention of any decrease in size when let out. There is no evidence that John Knight ever considered creating tenanted farms. His plan was 'to organise a great agricultural enterprise under his own direction' (Orwin 1997, 71). There appears to be no intent to set out other farms: no farms or enclosures date to the time of the canal-only the pond is contemporary, and the enclosed land at Simonsbath. It is difficult to see how the pond and canal could have benefited the farming of the time as a supply of water. The canal does not extend, either directly or indirectly, to any farms.

The suggested option of irrigation does not seem to fit with the story as related so far but as it was raised as an interpretation by Orwin it should be considered here. Youell said 'Irrigation would hardly have been needed on the heights of Exmoor' (1974, 102). However,

many post-medieval farmsteads on Exmoor have systems of leats, both to carry water to the farm and to irrigate lower meadows (Riley & Wilson-North, 128). Extensive examples are at the deserted Knight farms of Tom's Hill and Larkbarrow, outside this study area, detailed in an English Heritage Archaeological Investigation Report by E. Jamieson. Catchwork systems brought in water by a contour leat then overflowed into a gutter system lower down the slope, then again to a lower part of the hillside. 'A major weapon in the struggle to create good agricultural land and nutritious grazing out of the hilly terrain and the acid, peaty soil was the extensive use of catchwork meadows' (Bettey 1999, 192). Sluices would be opened to allow water to flow along leat and into feeders across fields. These would be flooded to deposit silt and nourish, then drained to prevent grass rot (Wade-Martins 1995, 67). Duredon has a contour leat system visible on aerial photographs (73109/987-8, 29/4/73). They can be seen following down the combe to the farm. The system on Goat Hill at Driver has already been mentioned, seen on an aerial photograph (NMR DAP6686/14, 10/1/89). Leats are visible too on aerial photographs, at Cornham Farm, south of the Challacombe Road (NMR 67/76/152 4/8/76). Frederic's later tenant and agent at Emmett's Grange, Robert Smith was an authority on irrigation and water power. He wrote '*Bringing Moorland into Cultivation*' for the Journal of the Royal Agricultural Society in 1856 (Vol. 17, 356-362). In 1851 Smith said that new meadows were being laid out on every farm (Bettey 1999, 193). Historically this is too late and the archaeological evidence shows there are no obvious gutter systems linked to the canal. In addition, the size of the canal is substantially larger than any other leat in the area.

Could the canal have developed as part of the agricultural improvements, as a result of the need for liming? It will be seen later that it could have been intended to carry lime to the more inaccessible farmland. 'Soil acidity was a serious problem. High levels of precipitation ensured rapid loss of lime, while poor drainage encouraged the formation of acid peat' (Williamson 2002, 121). The improvement of acidic soil was very important in the Southwest generally; many limekilns were constructed and lime imported from South Wales (Wade-Martins 1995, 79). The Ilfracombe Slates contain discontinuous beds of limestone, especially around Combe Martin, which had eighteen kilns: it is said that lime was carried from here by horse and cart to the Forest for the Knights' reclamation (Edwards 2000, 41). No lime was available in the Forest area itself; the closest source was nearby at Newland quarry (SS 824 385) (Riley & Wilson-North 2001, 156). It was common for farm leases to include stipulations for the regular application of lime (Williamson 2002, 124) and this was the case for Knight leases. We are told that John Knight hoped that deep ploughing and liming would make the soil suitable to farm the area as one huge arable plot (Wade-Martins 1995, 122). Areas that would be suitable for cultivation after liming were subdivided into fifty-acre fields (Burton 1994, 22). One of the fields above Driver farm is known as 'hundred acres'. The need for lime seems to connect all possible interpretations and will be returned to below.

John Knight's attempts to plough as he would have done in the Midlands, in spite of the high elevation and rainfall (Orwin 1997, 72), were too optimistic. The climate proved to make his task impossible. A change of farming methods was required in order to succeed. The estate was divided by Frederic Knight into mixed livestock farms. Farmsteads were built,

characteristically backed by a shelterbelt of beech and surrounded by fields enclosed with beech-topped stone walls (Wade-Martins 1995, 122), still visible at the deserted Larkbarrow farm. By 1880 Frederic Knight boasted in a letter [to Mr Little, SCRO 7] 'there has been no part of the United Kingdom in which, during the last fifty years, the agricultural labourer has had a better opportunity of emerging from the ranks into a higher position'. The Knight story is unique on Exmoor but close by on Dartmoor there are similar examples of attempts to convert the barren moorland in agriculturally fertile area. Thomas Tyrwhitt improved land by draining and ploughing. In 1846 a Mr Fowler was reported to have successfully grown good crops, but even he gave up after a while and laid the land to grass (Harris 1986, 152).

4.3 Harnessing Water Power

Is it possible that the canal was dug with the intention of providing water power for mining or other industrial purposes? Reservoirs and leats form part of the mining landscape of Dartmoor, Cornwall and Worcestershire. This was a time of skilled and ingenious uses of water power. Ambitious schemes were accomplished in Cornwall in this period by J.T. Austen who cut a 3 mile water course to power machinery at one of his mines (Trinder 1982, 118). He also built a railway line from the china clay district to Newquay, including a major viaduct which still exists across the Luxylan valley (Trinder 1982, 146).

Leats for the provision of water power often ran over considerable distances. The Vitifer mine leat on Dartmoor, built in 1830, was 7 miles long, following the contours from the East dart river and supplemented along the way by water from the North Teign (Harris 1986, 198). They could also be quite wide: a leat from Burrator Reservoir on Dartmoor for domestic water supply to Plymouth was 6ft wide and 2ft deep (Harris 1986, 136).

If there was not enough flow to work a wheel then a pond could be constructed to provide a head of water. There is an example of this on Exmoor at Great Bradley. An earthen dam (220yds long and 20ft high) was built across the head of a combe, making a pond of over 5½ acres. This was channelled down a leat for a mile to the farm, where it worked a wheel as well as providing a water supply (D.W. Warren, in Allen 1978, 16). Many Exmoor farms had wheels, often used for threshing, with the 'intriguing' exception of the Knight farms (D.W. Warren, in Allen 1978, 18). The sawmill at Simonsbath (SCRO 5) was powered by a leat from the Barle.

The suggestion that the pond was intended as a water supply for mining seemed improbable to Orwin (1997, 57): 'the only iron ore known to exist in his time was never worked, and it occurs lower down the river, where power would have been available at much less expense'. Is it a problem that the dating is later? It is not really known how much prospecting actually went on in John Knight's time. Just because none is recorded as actually starting in his time, could it be connected with any future plan for mining? If the canal is to be seen as a leat carrying water from the reservoir to the place where the power is needed, then the end of the canal at Three Combe Hill would be the intended end of the supply. There does not appear to have been any plans for mining at this point. Neither is there any other industry in evidence which would have benefited from the power supply. Some purpose for the flow of water must be found.

Orwin (1997) does not consider the option of any relationship with the Porlock - Simonsbath railway. The 'hybrid' or 'composite' railway evolved in the first three decades of the century, but carried on past the 1830s. These would typically be planned like a canal with level summit sections and inclined planes to carry the traffic, often mineral wagons, to them (Trinder 1982, 145). There is a theory that water power was used to power an incline; this was proposed by Burton and referred to earlier. Was the canal, as has been suggested, a way to power the incline needed to get goods up to the railway? Inclined planes were often operated by water – this will be discussed in the next section. They were usually vertical lift shafts with counter-balanced tanks, fed by water. If cargo was to ascend then the descending tank filled with water would lift the cargo. Inclined planes did not necessarily need water power though – they could be worked by stationary engines and horses used for haulage along straight sections (Trinder 1982, 149).

An agreement, dated 18th July 1860, between George William Blathwayt of Dryram Park, Glocs and Frederic Winn Knight of Wolverley House, Worcs [SCRO 8] includes the following clauses:

1) to grant lease of George Blathwayt's land 'of such land....as may be required for the construction of a double line of a Locomotive Narrow Gauge Railway from the property of the said Frederic Knight on the Forest of Exmoor to the Harbour of Porlock; 13) to use land at the ends of each incline plane 'for the convenient working of such incline planes and the deposit of the ore or other materials conveyed thereon'; 16) to have 'full use for the purposes of the Railway of such springs of water on (Porlock) Common....as may be necessary for the service of the line and the Engines and Machinery thereon with liberty to make such Waterleads Wheels Rams Tanks and Ponds as may be required for such purposes'; 32) to take land up to half an acre alongside the line to erect limekilns.

This agreement shows that water power was planned for the railway but can this be transposed back to the time of the construction of the canal? Would water power also be used for the section of railway in the canal area?

The previous discussion referred to in the introduction between Burton and Youell has centred around letters to Charles Bailey of Nynhead (agent to Colonel Blathwayt) from Mr Knight [SCRO 8]. In a letter of 28 November 1826 it is said that Mr Knight requires land 'for a railroad and space at the weir for wharfs warehouses houses and limekilns'. He also requires the 'power of diverting several streams of water at pleasure for..supplying engines and filling the dock so as to raise vessels for unloading them..and spaces on several parts of Porlock Common for Reservoirs and Leads for supplying the planes with water'. Again on 23rd June 1829 he asks for a reply to his proposals.

A map of the '*Exmoor ironstone deposit*' (Fig 18) shows the proposed railway and a tramway to pits and Workings from Simonsbath to Hangley Cleave. This shows an incline station at Prayway, east of Lime Combe and West of the road. The canal would meet this but why is it not shown on this map? This map was added to by Youell in his research [SCRO 9]. He

has added Pinkworthy Pond and the canal, thus making it look like it connects neatly with the railway. This does not give us the whole picture however as the canal is shown stopping above Duredon. As described already aerial photographs and fieldwork have shown it continue to Three Combe Hill. There are no signs of any deliberate break in the construction of the canal at an appropriate spot on Limecombe. The full length of the canal does not sit so neatly with the power for the incline scenario, unless it were to be by Exe Cleave at Warren Farm. Burton observed that 'the water from Pinkery Pond would have tumbled swiftly down the steep hillside to join the River Exe below... There can be only one reason for this otherwise pointless exercise, and that is that John Knight intended to construct an incline there to bring his railway across the river, thus avoiding the wet and boggy ground at Blackpitts and Exe Head' (1989, 64). The valley sides at Warren Farm are very steep, requiring an almost vertical incline or lift to climb. Is it possible to imagine that the canal, level and not sloping to this point, could provide sufficient power for such an incline? The large head of water at Pinkworthy Pond together with the flow created by the full length of the canal would provide a considerable supply. There would be no need for a slope all along the canal once an initial flow was created from the pond.

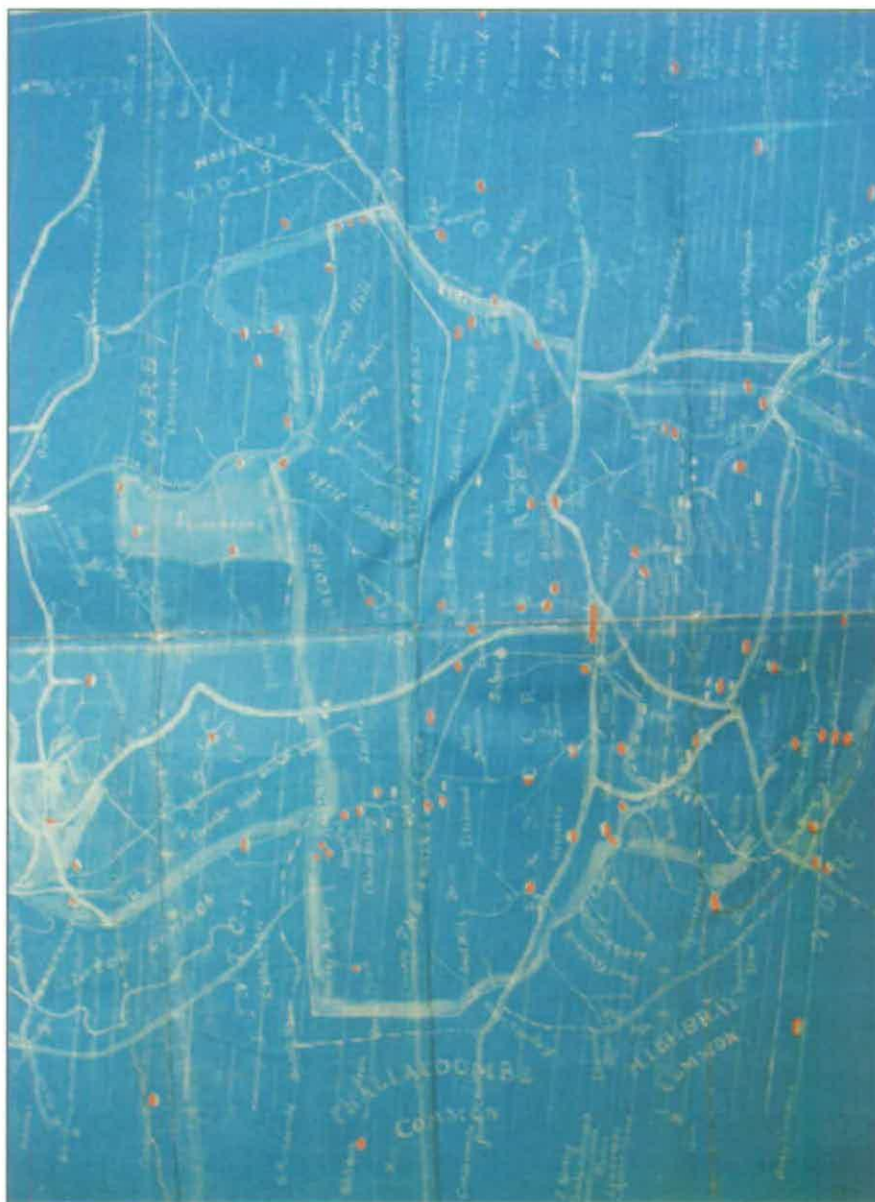


Figure 18
 Map of 'Exmoor
 Ironstone
 Deposit'
 (SCRO DD/X/
 YL), reproduced
 with permission
 of the Somerset
 Archive and
 Record Service

If there was to be an incline at Warren Farm how would it have worked at the end of the canal? Perhaps it could have operated as the Lynton Cliff Railway still does today: a large tank in the base of each compartment is filled with water at the top of the cliff. At the bottom the water is unloaded from the car. The descending car is thus heavier than the ascending car with an empty tank. Another possible method would be operation by a water-wheel, fed by a leat; a very large contour leat in this instance.

Burton also notes another problem (1989: 65), that it would be necessary to operate another incline on the opposite side of the valley. He says that there is another canal on the north side of the valley, along the 1400ft contour (426.72m), which joins the River Exe near its source thereby obtaining the water supply necessary to operate the other incline. Burton notes that this second canal carries on, past the point where the incline would be, to discharge water into Rams Combe. He also questions why another waterway comes off this canal, running eastwards towards Larkbarrow (Burton 1989,63). A full investigation of these matters is beyond the scope of this project but these two extra 'waterways' can be seen from the roadside at Prayway Head [Fig 19] and have been examined on aerial photographs (NMR 3155 and 3159, 11/4/47). They are quite clearly ditches formed by the construction of hedge-banks, no doubt serving a dual purpose by draining away excess surface water. Burton observed that the 'waterway' heading towards Larkbarrow ends close to the bed of the unfinished railway – on the same level-and that they appear to be converging. He explains that this canal was heading to Porlock Common to fill the 'reservoirs and leats' mentioned in the railway negotiations above (1989,65). The flow of water from Exe Head would have to be considerable indeed to power an incline and fill a reservoir, but the Babbie group suggested Exe Head as a good location to site a reservoir. The problem with this theory is that there does not seem to be any archaeological evidence to prove it.



Figure 19
*View east along
the Exe valley,
from Blackpits to
Warren Farm*

4.4 A 'Canal'?

The first comment usually made about the feature is that it is a misnomer. 'As a canal it had no obvious use' (Youell 1974, 102). Orwin considered that it was built during an age of great activity in canal construction and yet found it 'difficult to believe that John Knight had serious thoughts of providing transport from the comparatively insignificant source' (1997, 57). This was reiterated by Burton (1989, 62): 'Although usually referred to as a canal there is nothing to show that it was to be used to convey either canal barges or boat traffic. All the evidence points to it being solely constructed to carry vast quantities of water to work the inclines of a proposed railway.'

It has not been possible to find, during this study, when the feature was first called by the name canal. Canals of the period were not all for wide barges transporting 50- 80 tons of goods, nor did they all carry large numbers of vessels which had to pass each other at bays and locks. There were also canals built for tub-boats which were about 20 feet long by 6 ft and could carry 5 or 6 tons. They were iron or wooden tanks which were chained together and pulled by one or two horses (Hadfield 1968, 121). In 1674, Earl Gower formed a company to develop coal and iron deposits on his Shropshire land and to build a small-sized narrow boat canal. He was a pioneer and established industrialists followed suit, seeing the advantage in cheap and efficient movement of heavy goods. Private canal branches or tramroads were built to connect their properties to main line canals. A two mile long canal was built at Ketley to join ironworks to the Shropshire Canal in 1788 (Hadfield 1968, 147). This is both the time and area known by the Knights. Would the best preserved sections of the Pinkery Canal have been wide enough for a tub-boat? They would: narrow tub-boats measure 1.4m (Hadfield 1968, 121) and the canal measures 2m in its best-preserved sections. Only the narrowest boats could operate in the space available, and only by travelling one-way. There are a number of examples of such boats operating on a one-way system.

'Water was valuable in Britain when the canals were built, owing to its extensive use for industrial power. Because of this, and the scarcity of capital, waterways had to be constructed as small as the estimated traffic would warrant. Hence our legacy of undersized canals, too limited in capacity for modern needs, and yet not all of the same dimensions' (Hadfield 1968, 55). The earliest canal with inclined plane in Britain was in County Tyrone, the Coalisland Canal, completed 1778, for boats 4'6" (1.4m) wide and 10' (3.05m) long. The gradient of the planes, however was too steep for successful counter-balance and the project had to be abandoned in 1787 as impracticable (Harris & Ellis 1972, 177). The Shropshire Canal (1792) carried tub-boats on cradles down three vertical planes measuring 120', 126' and 207' (36.6, 38.4 and 63.1m). 'The innovation of the boat-carrying inclined planes of the Shropshire Canal was of much interest to visitors, who came from near and far to view the system in operation' (Harris & Ellis 1972, 179).

Many parallels can be drawn with the story of the Bude Canal. Poor moorland was treated by the addition of calcium-carbonate-rich sand from Bude Bay (Harris & Ellis 1972, 13). A tub boat canal was first proposed in 1774 to carry not only sand but coal and agricultural products (Harris & Ellis 1972, 14). In 1785 Edmund Leach wrote '*A Treatise of Universal*

Inland Navigation', advocating the use of inclined planes rather than locks. He designed a plan for the Bude Canal to include these: sluices at the end of the canal would let water out to power a water wheel. Boats would move on rollers into vehicles with a cistern which would contain water for use as counter-balance. Ballast water would discharge as the vehicle descended. The power was therefore part wheel part counter-balance (Harris & Ellis 1972, 19).

In 1796 Robert Fulton wrote '*A Treatise of the Improvement of Canal Navigation*' in which he advocated using small canals and small boats. He planned five water-wheel planes for the Bude Canal with a system similar to that proposed by Leach except that he could also add water to the boat if the load was not heavy enough. In addition, he proposed an alternative 'bucket in the well' scheme for the Hobbacott incline which raised boats (with wheels on to save loading into vehicles) up 225' (69m) (Harris & Ellis 1972, 181). Work on the canal finally began in 1817. This could have influenced John Knight, who may have considered such a scheme for his newly-acquired property. The railway plans discussed in the previous section might have formed just a part of much grander plans. There is an additional link between the Bude Canal and Exmoor: Sir Thomas Acland, who lost Exmoor Forest to John Knight, was involved with the project at Bude.

There are two goods canals on Dartmoor: the Stover Canal carrying granite from Haytor with a tramway connection; the Tavistock Canal for carrying ores from the mines at Mary Tavy to the Tamar River (Harris 1986, 177). There is another small canal near Plymouth: the Cann Quarry Canal, 6ft wide, was constructed to join a navigable mill leat. It opened in 1829 but was superseded by a tramway for transport in 1835 although it continued as a leat (NMR SX 55 NW 36). The Torrington Canal in Devon operated from 1817 to 1871 and included an aqueduct and inclined plane (NMR SS 42 SE 12).

Having seen that there are parallel schemes, similarities in construction can be compared. Is the fact that the canal follows the contour a problem with a canal theory? Early canals were in fact more likely to be contour canals, until technological advances in inclined planes and locks meant the course could run straighter. The main consideration would be that it would have to be level: the contour on which it is located was chosen for a particular reason. Engineers and their surveyors would work out the route, doing their own levelling (Hadfield 1960, 52). The engineer would start by pegging out the line with the plan being to move as little soil as possible for the shortest distance and to balance the cutting and embankment so that there would be no pits from which soil was dug, or banks of excess spoil at the end (Hadfield 1968, 59). This is indeed the case with the careful construction of the Pinkery Canal that is still obvious today.

Early canals were not usually built by a single contractor: the engineer would let a number of small contracts for cutting sections of canal each a few miles long, with a separate price for digging and for puddling and lining. Separate contracts would usually be given for bridges and buildings (Hadfield 1968, 57). There is no apparent evidence of lining in the canal, but

if the cutting was made through clay or other watertight soil, no lining or puddling would be needed.

Most canals had specially designed tow paths for animals or teams of men to pull the boats (Hadfield 1968, 124). Could the wider south bank have been planned as a towpath or would a gravelled path have been added to one side? Would a boat-house or stables for the horses be visible? Once again, the project was abandoned too early for these to have been added.

The other main consideration would be water supply: canals need a lot of water. If a reservoir was needed this would also need planning to locate in the best position, both not to take water needed elsewhere and so that water could enter the summit of the canal (Hadfield 1968, 52). Reservoirs were commonly built by constructing cross-valley dams (Crossley 1990, 142). Pinkworthy Pond seems well planned in this respect. Its location downstream of the pond would provide the initial flow downslope to fill it.

Water could also be topped up at intervals by directly taking in small streams, or by making small canals or feeders and excess water could be taken out into the nearest streams. Planks or stop-gates could be fitted to enable isolation of sections of the canal (Hadfield 1968, 67). Perhaps this offers another possibility for the shape and location of the canal at the combes. It reinforces the idea that connection to the pond and across the combes would be last. It would be no good having water flowing through till all the whole route was finished and connected: it would be a hindrance to ongoing works. Combes could be crossed with a small masonry or brick or iron aqueduct, narrowing the channel if necessary (Hadfield 1968, 60). Could the point at which it stops opposite Warren Farm have even been considered as a place to build a bridge, aqueduct or viaduct across the Exe valley? Or was there instead to be an incline at that point as mentioned in the previous section?

Could the Pinkery Canal therefore be a canal, intended to ease transport of goods across this long section of difficult moorland or a method of transporting goods to or from the railway? What would it have carried? Could it have been for the carriage of lime, wheat and barley, slate or potentially, ironstone? The Montgomeryshire Canal ran through an area being agriculturally improved and carried limestone and coal for the limekilns westwards and returned with building materials (Hadfield 1968, 146). Large quantities of lime were indeed needed on Exmoor, as has been discussed earlier.

By 1830, canals were commonly connected to railways and improved roads to provide 'an efficient and interlinked system' (Hadfield 1968, 154). Was Youell right in saying: 'the canal and the railway formed part of the same plan (1974, 102)? The likelihood that the canal was intended to aid in the transport of goods across the Forest deserves to be examined. In view of the damp climate and boggy ground, it may have seemed reasonable to create a communications network that did not consist only of tracks and roads. The construction, form and levels of the feature seem to fit with the possibility it is a canal. It is suggested that, rather than dismissing it outright, some more thought should go into this option.

4.5 A Designed Landscape?

Would its use have been purely agricultural or industrial? Could it be an aesthetic feature? A letter from Frederic Knight to Lady Headly from Wolverley, 20th January 1851 reads:

'When my father entrusted me with the management of the Forest, it was merely a large plaything – I have endeavoured, with his approbation, to put it into the state of ordinary landed property- I have built, for him, seventeen farmhouses and buildings with near double the number of cottages, and made many miles of road and fence with plantations, nursery, etc – I have given it my most anxious attention and if my undertaking has not met with the success it deserves it is partly the fault of the property, partly of the bad tenants I had the misfortune to get, and partly the fault of the times' [SCRO 5].

It could be inferred from this that, until Frederic took control in 1841, the area did not have the appearance of 'ordinary landed property'. The 'plaything' comment is interesting – does he mean his playing at arable farming or at an industrial scheme or even that the area was used for leisure. Could the pond and canal be seen in this light?

Was the canal a feature of a 'designed landscape'? A truly holistic study should consider every eventuality; an aesthetic consideration deserves to be made. Another feature of the post-medieval landscape is the landscaping of parks and gardens. Land was provided with features that were not purely functional. This was a period when owning property meant more than just making money from it. The Downton Knight family background was not only in mining, but in gardens and horticulture. Thomas' daughter and her husband designed new pleasure grounds at Acton Scott Hall (Stamper 1996, 75). Would contact with this branch of the family have had any influence on John Knight? Orwin says that the Knights also contributed to 'artistic life' (1997, 35).

John Knight designed a large house though it was never completed. He may have built the 'Victorian' Ice House in the garden (Burton 1994, 27). The function of the Simonsbath Tower/ 'Round House' has been another subject for debate in the Exmoor Review, even linked to the canal in an article by Peck reviewed by Burton (1994, 30). The Deer Park is another landscape feature that has been discussed: 'No large landed estate in John Knight's day was considered complete without its deer park, which was desirable not only for the sport and venison it provided, but also on account of its aesthetic appeal' (Burton 1994, 28). What other parkland features might one expect to find?

The Simonsbath designed landscape has not yet been assessed. Studies have concentrated on farming and industry. If John Knight, already wealthy, thought he was going to inherit a fortune, he may have indulged in some unnecessary pleasures rather than expending all his energy on purely money-making schemes. Could he not have devoted some time to surrounding himself in a landscape which contained all the finer features of country property-ownership? It might seem extreme to suggest that the pond was actually a duck decoy or fishing lake. Or that the canal was for pleasure: carrying ladies for views of the Forest and

a picnic by the Pond. It seems remiss to exclude the consideration of these possibilities on the grounds that, today, we simply cannot imagine this to be correct.

5 Conclusion

'The improvement of estates remained for many a fascination and a moral duty which transcended simple economic consideration' (Williamson 2002, 151). The construction of the Pinkery Canal occurred within an era of economic and technological changes; a time of the adoption of new sources of power, mechanical innovations, revolutions in industry, transport and agriculture. The canal is not the only obsolete monument of its period. Many large-scale opportunistic projects were short-lived if ever completed. This major feat of planning and engineering proved to be an optimistic investment. The artificial channel was dug out by pick and shovel labour and was an impressive achievement, requiring the commissioning of experts and the employment of a large workforce.

It is unfortunate that no physical or documentary evidence has yet been seen which could shed some light on this puzzle. Contracts and payrolls might describe the tasks to which they relate; personal letters might detail these achievements. It is possible that evidence exists which could complement the archaeological remains and lead to a better understanding of this significant feature of the Exmoor landscape. A glimpse of the person behind this scheme is offered in a letter from John Knight to his wife, on 28th August 1826: 'I am full of my plans as usual; perhaps when you return you will find too many of them executed' [SCRO 5]. The Knight family would no doubt have published their success story in a journal of the time if it had gone to plan, thus depriving us of this enigma.

The purpose of this survey was to analyse the canal with the archaeological evidence as a priority. This was done with no pre-conceived ideas about its purpose, in order to gain an unbiased view of its place within the landscape. Levels were taken at approximately 30m intervals all along the course: these showed a variation of no more than 60cm. The purpose of this was to determine whether there was a particular direction of flow, either along the full length or in individual sections.

It can be concluded that the canal was intended to be a continuous feature, connected to Pinkworthy Pond. It can also be said that its primary purpose is neither drainage nor irrigation. Its appearance is of a contour leat, albeit large. If designed to produce water-power, its aim is not apparent: the end of the canal opposite Warren Farm offers no answers. It may be however be correct to link the canal in some way to the railway – they are both projects of similar time and scale located close together. The possibility that the 'canal' is a canal, though previously dismissed, deserves consideration. The feature follows the 435m contour closely and was designed to carry water; to conclude definitely whether it is a contour leat or a contour canal is asking too much of the archaeological remains. Its purpose may have been power or transport, or even a combination of both. It may have been a contour leat which served the additional function of goods canal, possibly intended to join the railway by means of a counter-balance incline with water ballast. Considering the era in which this constructional event occurred and the scale of the project, a simple explanation seems unlikely.

The whole area offers much opportunity for further research in a number of fields. The dam and pond are worthy of additional analysis; fresh documentary research relating to the Knight family, beyond the scope of this project, might prove rewarding. The Pinkery Canal is a monument characteristic of the efforts, attempts and achievements of the most prolific part of the history of Exmoor Forest, and merits recognition as such.

6 Survey and Research Methodology

A walkover survey and photographic survey were conducted after an initial assessment of secondary material. The feature was then recorded along its full length using Trimble 4700 series Global Positioning System equipment (GPS). Where extant, the outside bottom of each bank was recorded to show the full width of the canal. Where that bank was eroded or otherwise unclear, the inside top of the ditch was recorded. Points for levels were taken at regular intervals the full length of the course and 30 profiles were taken to show changes in shape. In addition, features which were close to or connected to the feature such as quarries and leats were recorded.

The GPS base-stations' co-ordinates were calculated in Trimble Geomatic Office (TGO) software using five Ordnance Survey (OS) active stations. The survey was located to the OS National Grid using TGO's OSTN02 transformation. The controllers were set to the following parameters: horizontal 10mm, vertical 15mm. The survey was plotted using ACAD 2000.

A full plan at 1:10000 scale showing profiles and levels was produced for the ENPA. Copies of this are available from the NMRC, Swindon. A walkover to check and annotate the plan was conducted. A small area was surveyed in detail to produce a hachured plan of the earthworks at 1:500 scale. Over 500 aerial photographs were viewed and visits made to the Somerset Record Office to view primary material.



Figure 20
GPS survey in
progress

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- Fig 4- Q\Rde/140- 'A map of Exmoor Forest', Inclosure Awards, 1819.
- Fig 18 DD/X/YL/1 - 'Exmoor Ironstone Deposit', undated map, c.1850-55, showing proposed railway and tramway to pits or workings. (An attempt was made to contact the depositor without success regarding reproduction.)


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