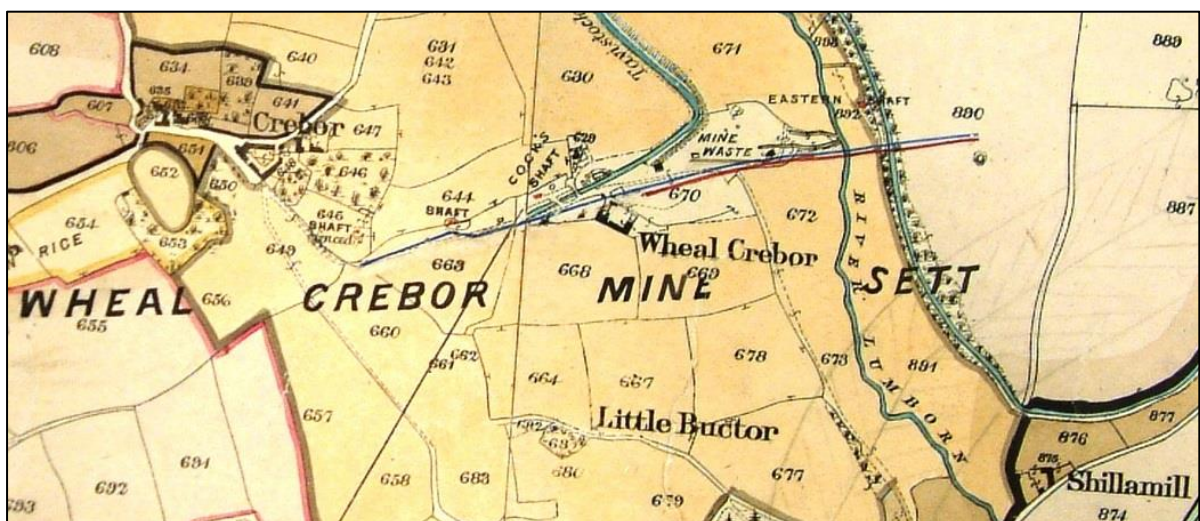
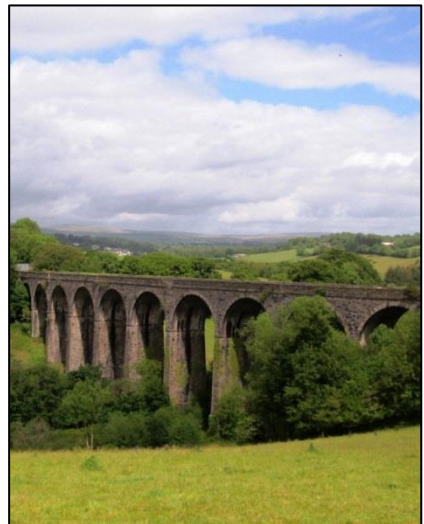
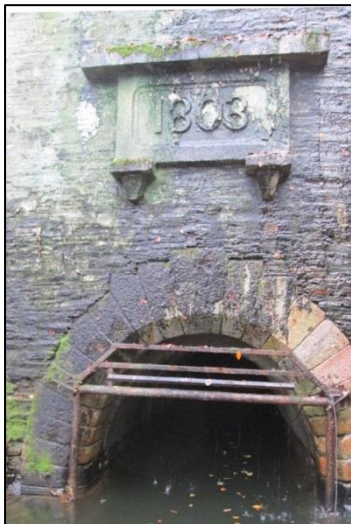




## Buctor Farm, Tavistock, Devon

### Archaeological Management Plan



**Cornwall Archaeological Unit**



# **Buctor Farm, Tavistock, Devon**

## **Archaeological Management Plan**

<b>Client</b>	<b>Mr D Hutchins</b>
<b>Report Number</b>	<b>2015R055</b>
<b>Date</b>	<b>October2015</b>
<b>Status</b>	<b>Final report</b>
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The views and recommendations expressed in this report are those of Cornwall Archaeological Unit and those of the other authors and organisations whose reports are summarised here. They are presented in good faith on the basis of professional judgement and on currently available information.

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## Cover illustration

*Front cover images of significant archaeological features within the Buctor landholding: the Tavistock Canal Tunnel eastern portal, the medieval Lumburn leat, the late 19<sup>th</sup> century Railway, and a Bedford Estates Map showing Wheal Crebor Mine (© CAU and Trustees of the Bedford Estates).*

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## **Abbreviations**

BRB	British Railways Board
CAU	Cornwall Archaeological Unit
CC	Cornwall Council
CRO	Cornwall Record Office
DHC	Devon Heritage Centre
EPS	European Protected Species
HBC	Historic Buildings Consultancy
HE	Historic England
HES	Historic Environment Service
HE	Historic Environment
HEP	Historic Environment Projects
HLS	Higher Level Stewardship
NGR	National Grid Reference
OS	Ordnance Survey
MDV	Monuments Devon
NE	Natural England
SMR	Sites and Monuments Record
SSSI	Site of Special Scientific Interest
SWW	South West Water
TVMHP	Tamar Valley Mines Heritage Project
WHS	World Heritage Site



# 1 Summary

This report outlines the historical development of the project area at Buctor Farm, Tavistock. It identifies archaeological remains and assesses their significance, provides management and maintenance recommendations for identified archaeological features within the landholding of Mr D Hutchins. It also guides potential conservation and safety works for the partially extant remains of Wheal Crebor Mine, the Tavistock Canal, the Lumburn Leat, and the late 19<sup>th</sup> century Pump House. The study area now part of a Natural England Higher Level Environmental Stewardship Agreement Scheme to preserve species-rich grassland in the Lumburn Valley.

The prime archaeological importance of this landscape lies in its 19th century industrial heritage, which has been recognised as being of international importance through the Cornwall and West Devon World Heritage Site (WHS) designation status of the Tavistock Canal. The canal runs into the tunnel at its eastern end, and emerges above Morwellham to the west. The main complex of archaeological features is within Wheal Crebor 19th century mine, which also includes the canal tunnel entrance (owned and managed by SWW). Other mining features include shafts, spoil tips, and the low remains of mine buildings. The eastern end of Wheal Crebor mine sett also survives close to the Tavistock Canal (on the northern side of the Lumburn Valley), which includes a mineshaft and the probable site of a large wheelpit.

However, the historical and archaeological interest is not just confined to industrial sites of the 19<sup>th</sup> century; the earthwork remains (particularly in Shillamill Woods) of the 15th century Lumburn Leat which supplied water to the Bere Alston Silver mines is of particular archaeological and historical significance, both locally and nationally. The holding also contains the rare example of an early 20th century estate water wheel powered pump house; its machinery still *in situ* and in recent use, which pumped water from the Shillamill valley up to a central reservoir to supply water to the surrounding farms, formerly in the Duke of Bedford's ownership. Lastly, the massive Bere Alston to Tavistock 19<sup>th</sup> century railway viaduct dominates the southern end of the Lumburn Valley.

This report describes, identifies and prioritises the archaeological, historical and building resource, together with the feasibility of positive archaeological and habitat management within its arable and woodland setting, with the potential for building conservation as part of short, medium and long-term objectives that reflect the individual sites' importance and significance within the World Heritage Site. In addition, it intends to ensure that the site's special qualities and importance are preserved and enhanced by any future woodland or rural management/stewardship proposals, and habitat conservation works



## 2 Introduction

### 2.1 Project background

Mr D Hutchins' holdings at Buctor Farm, West Devon (SX462 763) includes significant archaeological heritage assets: Wheal Crebor Mine, the Tavistock Canal (WHS), and the 15th century Lumburn Leat. The land has been entered into the Higher Level Stewardship scheme (No AG00568331), primarily to preserve species-rich grassland in the Lumburn Valley, and the presence of significant archaeological features. The agreement land is primarily agricultural and enclosed by boundaries which follow the medieval field pattern (Knight 2014). It also contains other features of great historical and archaeological significance, which have been identified by archaeological survey and research. The purpose of this project was to obtain up to date information about the historic landscape components and features and to provide an assessment of the management requirements, with specific prioritised recommendations.

Cornwall Archaeological Unit was commissioned in March 2015 by Mr D Hutchins, on behalf of Natural England as part of the Higher Level Scheme – Environmental Stewardship Agreement, to undertake an archaeological assessment and management survey of a defined area within the landholding of Mr Hutchins (see Fig 1), based on a brief supplied by NE (Simon Tame), and WSI by CAU (C Buck). This report will outline the mining history, identify archaeologically sensitive areas and set out management principles for any proposed habitat management and possible building conservation scheme.

It is anticipated that any future land, habitat and building conservation scheme may address the following:

- The management, protection and conservation of important archaeological remains and their settings.
- The management, protection, conservation and encouragement of an increase in the numbers of any significant ecological site asset (see separate Ecological report (CEC 2015), and a summary in Section 5.4).
- Identification and safeguarding of important ecological areas (by separately commissioned reports).
- Production of archaeological management recommendations to inform any proposed habitat management or potential building conservation schemes.
- Provision of potential low-key public amenity use where appropriate, incorporating limited access.
- The provision of general guidelines for the pro-active management of significant archaeological and ecological constraints within a working agricultural and woodland environment.

In view of the fact that this site is part of the Tavistock Canal component of the Cornwall and West Devon World Heritage Site mining landscape, particular attention has been paid to suggestions for the best mitigation of any ecological, landscape or potential building conservation works. This archaeological report will guide the site owner and Higher Level Scheme – Environmental Stewardship Agreement, on the effective prioritised conservation of the archaeological resource present within the Buctor Stewardship scheme, as well as providing guidance on mitigation of potential impacts.

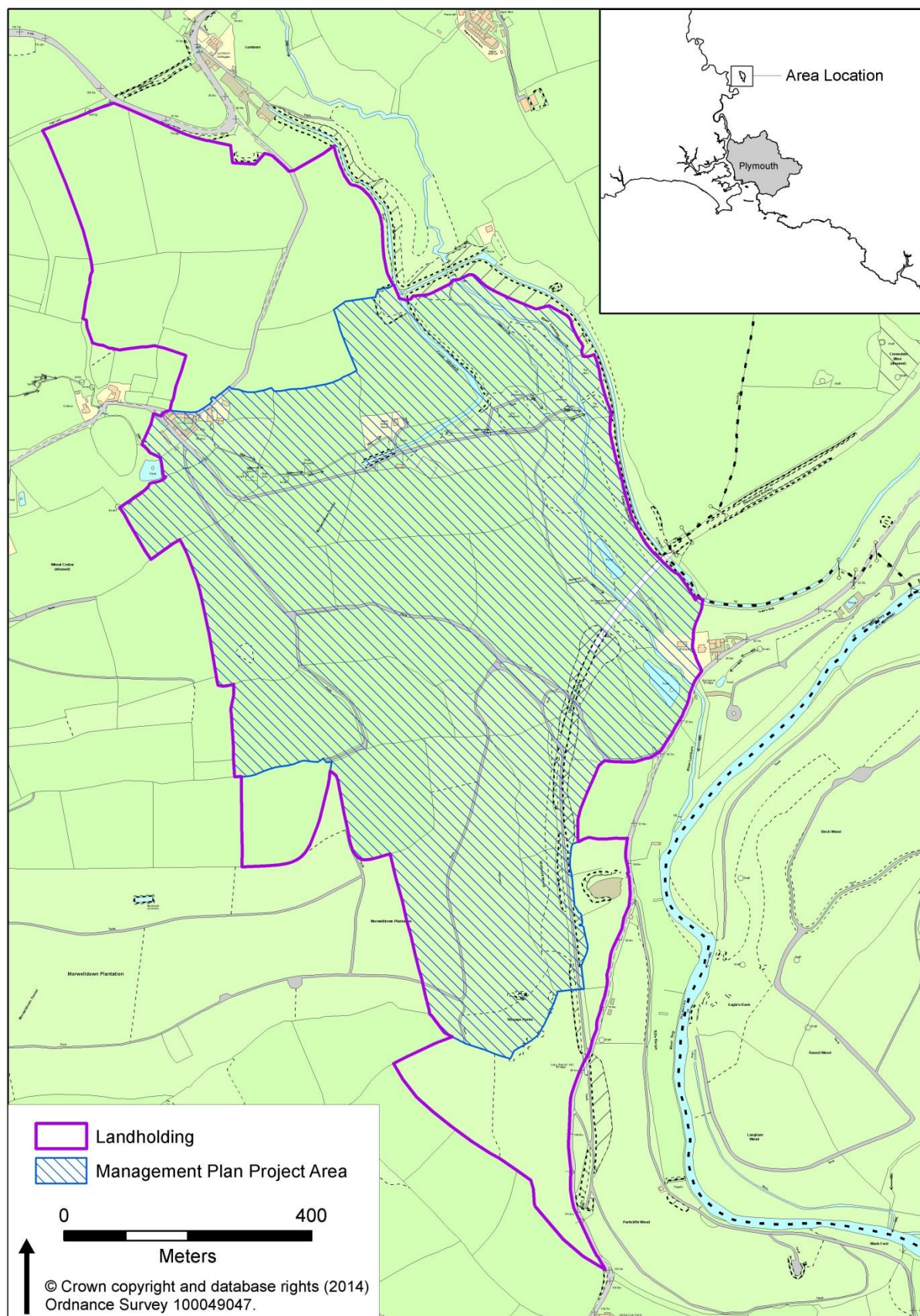


Figure 1 Location map and Buctor Farm landholding/management plan project area.

## 2.2 Aims

The main objectives of this report are to:

- Provide an understanding of the site's developmental and historic environment history through archive research and fieldwork survey.
- Carry out a descriptive archaeological assessment survey within Mr Hutchin's landholding (see Figure 1 for management plan study area); to identify archaeological remains, describe their condition and to investigate the potential for buried features.
- Propose appropriate priorities for possible conservation management recommendations to ensure that the site's special qualities and importance are preserved and enhanced by any landscape or ecological conservation proposals (minimising any adverse impact upon the archaeological resource).
- Identify all surviving visible features, describe their surface condition, make site management recommendations (with impact mitigation if appropriate), and investigate the potential for buried features. If possible, collate (and present) information on below ground mining related features and shallow mine workings.
- Bring to the attention of the landowner and the stewardship fund providers (NE), the site's significant assets to enable proactive management of these sites within a commercial working farm holding.
- Assess the significance and feasibility (taking into account environmental factors), of any building conservation scheme and provide an outline of the appropriate building conservation work for each site with recommendations for the appropriate level of analysis and building recording (with reference to standard HE survey levels). Identify and prioritise necessary consolidation works in terms of immediate, necessary and desirable objectives. The impacts of proposed works on features and their effect on the site's significance will also be described.
- Produce an ecological survey for European Protected Habitats and species within the study area; the results to be summarised and fully integrated into the management plan recommendations. Any perceived threats/issues arising from the survey, and the impact of any proposed conservation works or increased public access to be mitigated, as part of the management plan's recommendations.
- Identify the need for further archaeological recording (particularly for those sites requiring building conservation, for example, the Pump House), and possible site investigation.
- Ensure adequate liaison with other specialists who have experience of this site: for example, Robert Waterhouse and Tom Greeves.
- Guide future long-term management and maintenance of the sites, buildings, access routes and their interpretation to users.
- Assess the importance and significance of individual and grouped features in terms of local, regional, national or international historic landscape criteria, in conjunction with stated research questions for events, periods and processes.
- Provide a resource for DEFRA grant funding for possible building conservation works and any necessary statutory consents.
- Discuss the importance of the archaeological sites/landscape in conjunction with research questions for particular events, periods, processes and industries where appropriate (for example, the possibility for HLS funding for survey plans of the Pump House and guidance for possible restoration grants)
- Disseminate and publish the results in a medium that can be utilised by information boards, leaflets, booklets, WHS web site and related sites. This, in turn, will provide the site owner and NE with information to:
- Understand the development history of the project area within its local, regional and national context, and the nature, extent and quality of survival of historic and archaeological features within the project area.

- Take into account short and long-term management recommendations for the site and its components, including any requirement for further detailed evaluative survey, excavation or information gathering, statutory or other forms of planning designation protection.
- Take into account guidance for the effects of undertaking the provision of any potential increased public access, other necessary site safety/access works and how potential building consolidation can most appropriately be mitigated.

## **2.3 Methods**

### **2.3.1 Desk-based assessment**

During the desk-top assessment historical databases and archives were consulted in order to obtain information about the history of the study area and the structures and features that were known to have existed on it. The main sources located and consulted are summarised as follows (refer to Section 10.0). Primary historical documents, maps, plans and other published material held by statutory and non-statutory agencies (see Section 10.1):

- Historical documents, maps, plans and other published material held by Devon Records Office (see Section 10.1).
- Published histories of local industrial archaeology (incl. the former West Country Studies Library (Devon Heritage Centre (DHC) - see Section 10.2).
- Information on mining operations held by organisations such as the Tamar Journal of the Friends of Morwellham, Tavistock Museum, Trevithick Trust, etc.
- Local special interest groups (Tamar Industrial Archaeology Groups: Robert Waterhouse, Tom Greeves, etc).
- Statutory and other planning designations for the site.

Documentary research and fieldwork have been slanted towards the industrial development of the project area, with the majority of site management recommendations being applied to industrial sites. Nevertheless, sufficient background research has been undertaken to be able to summarise the pre-industrial history of the landscape within the project area (see Section 4.2.2).

### **2.3.2 Fieldwork**

Detailed maps for use in the field were produced from the Ordnance Survey Landline Digital Mapping and amalgamated with information derived from historic maps (including the 1st and 2nd edition 1:2500 Ordnance Survey maps), and other mapping and documentary sources from DHC).

These images were also used as part of the fieldwork map base during the field survey component of the project. Field recording was based on a mixture of photography (digital), and measured recording (as set out in the Brief, Section 12.1).

### **2.3.3 Post-fieldwork**

Following production of the archaeological assessment report, it is hoped that there will be a period of dialogue and consultation between Natural England (fund providers), Mr D Hutchins (landowner), Devon HE Countryside Advice (Steph Knight), and possibly the project archaeologist, to discuss the report management recommendations for long term significant feature/site preservation and the possibility of future long term building conservation projects.

## **3 Location and setting**

The nearest town to the study area is Tavistock, which is located 3 miles to the north. The site is located in West Devon District, approximately 15 miles north of Plymouth and 14 miles south-east of Launceston, on the western edge of Dartmoor. The general topography of the Buctor Farm landholding (centred SX 463723, as shown on Fig 1),

slopes from the west (the lower eastern slopes of the former Morwelldown), down to the River Lumburn Valley. Narrow strips of much older ancient woodland with some older trees and little evidence of coppicing, exist along the sides of the broadly north to south oriented River Tavy. The River Lumburn meets the River Tavy close to Shillamill, site of a former medieval corn mill (Site 16), and nearby a former Manganese Mill (Site 15).

Most of the Buctor Farm holding has, since later prehistoric clearance, had been used for pasture– its fields and hedges well maintained and used for centuries. However, the 19<sup>th</sup> century industrial ore extraction and transport sites have impacted the landscape along the mineral lodes extending from the Tamar Valley eastwards, and the course of the Tavistock Canal (Site 18). The setting of the other two landscape components; Shillamill Woods to the south along the Tavy Valley, and the marshy ground of the Lumburn Valley floor, reflects the geomorphological pressures caused by their formation.

This report focuses on (and brings to a higher prominence), the important historical heritage that can still be found a century after these 19<sup>th</sup> century impacts ended. The significance of these sites is demonstrated by the inclusion of many of them within the Cornwall and West Devon Mining Landscape World Heritage Site, some of them also Listed Grade II.

### **3.1 Landscape characterisation**

The landscape character of the study area consists of five different significant forms: the well-maintained fields for pasturage to the north, west and central section, the steep-sided character of Shillamill Woods and the nature and form of the Crebor/Buctor Farm settlements, the character of the Lumburn Valley intersected by the impact of the Wheal Crebor mine dumps, the canal and portal, its aqueduct and the railway viaduct construction (Figs 15 and 16).

The historic landscape context of the landholding was, prior to the mid-19<sup>th</sup> century, predominantly open downland (Morwelldown), fringing the arable/pasture of the valley. The B3257 runs along the ridge line of the Morwell 'plateau' from north to south – the project area being on the eastern side of that road. Figure 2, Donne's 1765 Map of Tavistock, shows the study area and the landscape character of the late medieval farming settlements (Creber (1166), (Great) Buc(k)tor (1414) and Little Buctor (of later date). Of much interest are the field hedge boundaries showing the gradual transition of the former smaller strip fields around each small farming hamlet, to larger fields – a natural progression to the present field form (compare: Figs 2 to 3 and Fig 14). The late 18<sup>th</sup> century relationship between the edges of Morwelldown and the enclosed field systems near the settlements is better demonstrated by reference to Figure 4, the 1784 Gardner Survey map, before the 1828 Enclosure Act of Parliament – which later saw the former downland fully enclosed. However, the impact from the 18<sup>th</sup> century onwards of copper openworks crossing Morwelldown from west to east no doubt resulted in scars, disrupting and impacting the former rural landscape.

The 1842 Tithe (index) map (Fig 6) shows the 'infields' (with orchards and meadows, etc), around each hamlet settlements, but omits the 'outfield' hedge boundaries, as shown on the earlier 1784 (Fig 4), and later 1848 map (Fig 7). The 1859 map (Fig 8) including Morwelldown, also shows these enlarged field boundaries, overlain by the mineral lodes crossing the landscape from east to west. However, until the 1880's some elements of the smaller 'infield' boundaries survived (see Fig 16).

It is not only hedge lines that contain elements of their earlier medieval origins – but the associated trackways and settlements themselves that hold clues to their origins. For example, there is a trackway that extends from Shillamill northwards into the outfield (see Fig 3 the 1765 map, Site 17), which still partially exists – a left-over perhaps to a much older trackway from the medieval (corn) mill in the valley bottom up to the crest of the fields towards Tavistock. The best surviving evidence of a medieval track within the study still is Buctor Lane (Site 13), an integral access route of the



medieval farming system. This served Little Buctor and Great Buctor; both late medieval farming settlements, neither of which survive. The later 19<sup>th</sup> century railway built a bridge over the lane as presumably access was still necessary – although by this date both settlements had ceased to exist. However, the track continues to make a strong contribution to historic character. The main landscape feature in the southern part of the study area is Shillamill Woods; its steeply sloping east facing Tavy Valley down to the road from Tavistock to Bere Alston, intersected and cut by the late 19<sup>th</sup> century Tavistock to Bere Alston Railway. The upper woodland is primarily Coniferous, a plantation probably planted in the 1960s (when the wood was purchased from the Earl of Bradford), no doubt destroying its varied character of different ancient woodland deciduous trees (compare Figs 4 and 13). Apart from the late nineteenth century railway line and impressive viaduct, the prime archaeological feature is the Lumburn Leat, a late fifteenth century linear excavation supplying mines near Bere Alston with water as a mechanised power source. A woodland hedge boundary has been built along its eastern side within Shillamill Woods; its form and condition very good compared to that within the open fields to the west.

The last map showing Little Buc(k)tor (with buildings) was in 1784 (Fig 4, Site 6), presumably an appended 18<sup>th</sup> century growth from Great Buctor (Site 5), although the site is labelled on the 1867 map (Fig 9). The earlier 1765 map shows the site with a small infield (meadow) and orchards (Fig 2), an example of late medieval agricultural expansion; impacting and changing the landscape character. Its founding settlement, Great Buctor (Site 5) is likely to have been an older settlement: The 1765 map (Fig 2) shows the farmhouse, the farm buildings with barn, a large yard and infields with orchards – a typical medieval layout. Over 90 years later the site is still extant (see Fig 9 – labelled but no buildings shown – probably due to conflict with the labelling of 'Wheal Crebor'). However, its demise by 1867 (Fig 9), may well be related to estate management rather than any other economic or demographic reason. At a similar time (early 1860s – D. Hutchins *pers comm*), Crebor Farm had its substantial triangular shaped courtyard farm buildings constructed. This would have been a substantial investment at the time – a move perhaps by the Duke of Bedford Estates who could afford the capital outlay to enable these expanding farms to focus on animal husbandry and milk production – a market that would have been in great demand locally given the number of new copper mines springing up in both the Tamar and Tavy valleys from the 1850s to the 1883s, attracting a workforce, and accommodation demand. The Listed farmhouse at Buctor (Site 2) is recorded as being of sixteenth century origin. It is currently being completely renovated, but is ineligible for management under HLS. The complex of farm buildings to the west (Site 3) is an interesting example of a Victorian planned (Bedford Estates) farmstead based on a triangular pattern with internal yard. It is relatively intact with many original features; a barn and horse engine house and other internal courtyard divisions, all of which is relatively rare in the same group value context, all of which increase the overall significance of this range of farm buildings.

The Lumburn Valley floor is characterised by marshy ground with hummocky grass, cut by leats running along the western side of the River Lumburn – primarily for the 18<sup>th</sup> century Shillamill Manganese Mill (Site 15), and the late 19<sup>th</sup> century Bedford Estates Pump House (Site 53). There is no doubt that the landscape character of the valley has been previously impacted by both the construction of the canal and the Wheal Crebor Mine in the early 19<sup>th</sup> century.

However, the two most significant landscape impacts to the valley occurred from the early 19<sup>th</sup> century; the construction of the Lumburn aqueduct (Site 18.1), rising approximately 20m above valley floor level to form the canal basin at the northern end of the landholding, and the later construction of the railway viaduct near the southern end. It is likely that the medieval landscape character of the valley in terms of form and morphology was partially created as a consequence of medieval streaming for alluvial tin up to the late 14<sup>th</sup> century (documented in the late 16<sup>th</sup> century: Greeves 2015 *pers comm*). Recent significant landscape impacts being the construction of the Bedford Estates water wheel powered Pump House (Site 53) and leat supply (Site 53.1 both still

surprisingly extant), in the late 19<sup>th</sup> century. In the 20<sup>th</sup> century, at the south end of the valley, Mr Hutchins has excavated two large ponds into the valley floor

The character of Wheal Crebor Mine (one of Devon's most productive copper mines in the early 19<sup>th</sup> century, and the probable site of an earlier openwork), is markedly different from that of the canal. The latter is probably little changed, while the former was dramatically altered. Rubble, trees and wire have replaced buildings, people, noise, waterwheels and flat rods. Even spoil mounds to the east appear to have been removed (during the early decades of the 20<sup>th</sup> century); many shafts were infilled and building stone robbed. However, there are small vestiges of its former glory; low yard walls, slumped shafts, revetment walls, an adit tunnel and a large flooded wheelpit.

Devon's Historic Environment Landscape Characterisation (HLC) project output has been consulted (see Fig 16 based on the OS 1884 OS map): A high percentage of the agricultural field project area is characterised as 'Medieval enclosures based on strip fields' and some outlying fields as 'Post-medieval enclosures'. Reference to Figs 13 (1883 OS map), and 16 shows the extent of the Morwelldown Plantation (compare Figs 4, 8 and 13 for site development), now gone and replaced by fields for pasturage, which includes the orchard around Buctor Farm. Although this area is outside the study area, it shows the wide expanse of woodland extending down into the Shillamill Wood, within the Tavy Valley. The Shillamill wooded area is characterised as 'Ancient Woodland', with fringes of 'Other woodland' to the east near the railway/road. This is a generic indicative description to reflect the area's predominant wooded character. The mining areas and canal are characterised as 'Mining' and 'Industrial complex'. The valley floor of the Lumburn Valley are characterised as 'Watermeadow'. This characterisation was at a county-wide level, and although it reasonably reflects the predominant character types of the study area, it is clear that, as a result of this detailed assessment, the historic character, as reflected in the historic processes that have taken place in the area, is quite complicated, and there is a complex mosaic of zones resulting from a wide range of past activities – elements of medieval field systems, former rough ground, management of ancient woodland, mine complexes and transport, water-meadow, etc. This could be mapped into a series of detailed zones or character areas that would inform a greater understanding of archaeological potential across the area, and guide future management recommendations.

## 4 Site history

### 4.1 Geology and lodes

The published geological map of the area (Geological Survey Sheet 337 (Tavistock), 1994) indicates that the area is underlain by the Kate Brook Slate of Upper Devonian geological age. The country rock is killas, which in the north-west, for nearly a mile east of the Tamar has suffered thermal metamorphism by the Gunnislake granite mass. There are several E-W elvan dykes, notably south of Gulworthy and in Morwelldown Plantation, closely associated with lodes. *'The lodes are mainly sulphide bearing and have yielded large amounts of copper and ores and pyrite. Some tin appears to be present throughout the area and has been produced in very small tonnages from 10 to 16 mines.... A considerable number of the mines have had a fair degree of success as producers of sulphide ores, and all known occurrences have been exhausted or are unworkable under present conditions'* (Dines and Phemister 1956, 664).

Wheal Crebor Mine Lodes:

*'The main lode trend is a little north of east and it is noteworthy that individual lode groups can be traced from one valley to the other (ie Tamar Valley to the Tavy Valley), the longest run of mines on one group being South Bedford (Wheal Luscombe Mine), West Crebor, Crebor and Crowndale which cover a length of over two miles. Mineralization however, is not continuous, the worked ore-bodies occurring only at scattered intervals'* (Dines and Phemister 1956, 663).

Figure 7 (Symons 1848 mining map detail), and Figure 8 (1859 area general lode map) shows three lodes within the Bedford United Mines (Ding Dong, and the two Liscombe Lodes), on the east side of the Tamar Valley (see Buck 2006), extending towards Wheal Crebor; one main copper lode is shown across the site of Wheal Crebor on both mine plans, with two smaller lodes to the north and south. *'Two adjacent lodes, Main and South coursing about E. 20° N. and underlying 30° N., appear to be the eastwards representatives of the group of lodes worked in South Bedford and Luscombe Mines. The chief workings in the Crebor section extend 150 fms. E. and 350 fms. W. of the river valley half a mile south of the River Lumburn'* (Dines and Phemister 1956, 671).

## 4.2 Historical background

### 4.2.1 Summary background: prehistoric/medieval history of the Tavy Valley

Devon's Sites and Monuments Record has no significant prehistoric sites within the Buctor project area. However, in the wider district Neolithic stone axes have been found at Tavistock, Bere Ferrers, and Buckland Monachorum. To the north at Heathfield (Beacon), between the parishes of Lamerton and Milton Abbot, an Early Bronze Age barrow cemetery has been located. Later Bronze Age finds include a socketed axe, found in Tavistock (location not specified) (MDV 30244) and a socketed axe (MDV 3830) found in or near Trendle Camp, an Iron Age enclosure north east of the town.

The Tavy Valley itself is likely to have been occupied in the prehistoric era, due to its, more fertile, lowland soils, and proximity to the river which may have been utilised as a means of transport, for trade and as a source for food (trout, salmon and lampreys). Later medieval and post-medieval farm settlements are likely to have hidden or destroyed much archaeological evidence for prehistoric occupation.

The place-name 'Tavistock' is Saxon in origin and is recorded in the Domesday Book as 'Tavestoc'. It is made up of 'Tavi' meaning the River Tavy and 'stock' meaning an offshoot or dependency settlement (Sturgess 2013). The later Abbey at Tavistock was founded in AD 974, probably at the instigation of the Saxon King Edgar (959-75), by Ordulf, Earl of Devon, who granted the manor of Tavistock to the Benedictine Order. The abbey (probably located on the site of the present abbey ruins) was dedicated to St Mary and St Rumon, and in 981, received its foundation charter from King Ethelred (979-1016). At this point approximately 18 square miles of adjacent land (the future parish of Tavistock) along with other scattered properties in Devon and Cornwall became the endowment of Tavistock Abbey (Alexander 1958). The former parish stretched between the River Tamar to the west and the River Burn and Tavy to the east (although an area to the east of the Tavy was included; the manor of Taviton), to the north it reached as far as Heathfield Downs and to the south as far as the Tamar at a point opposite Calstock which was located across the Tamar in Cornwall (Finberg 1951).

At the time of the Domesday survey of 1086 Tavistock Abbey was the richest religious house in Devon. The survey records the abbey as being in possession of a number of manors in Devon, Cornwall and Dorset with land in Tavistock manor for 40 ploughs. Domesday Book and medieval place-name evidence indicate a typical medieval farming landscape with settlements largely confined to the lower ground and the uplands left as open pasture. Medieval farming settlements are evidenced from documentary sources and from field evidence for strip-based field systems; they appear to have been small co-operative hamlets (of 3-6 farmsteads); Great and Little Buctor, and Creber being a good example of this, all within the study area. The study area included the medieval manor of Hurdwick, within the parish of Tavistock.

In 1539 the abbey was formally dissolved and its property granted by Henry VIII to John Russell who became lord of the borough. Russell was a close advisor of Henry VIII and Edward VI and was later elevated to the title of first Duke of Bedford in 1551. From 1539 continuing into the 20th century, Tavistock, and much of both the Tamar and Tavy Valleys were largely owned and controlled by the Russell's, whose family seat is Woburn Abbey, Bedfordshire. Landownership changes from the mid-20<sup>th</sup> century onwards have resulted in much smaller ownerships, although the Earl of Bradford to

this day still manages large areas of landscape. However, the character of the farming landscape (resulting from a process of adaption to utilise larger and more profitable farmsteads), now largely consists of single farms of a sizable acreage with large fields (but some with vestiges of their medieval origins).

Industrial activity in the Tavy Valley is by no means confined to the post-medieval period. Although tin appears to have been worked in the south west since the Bronze Age, the first surviving evidence dates to the medieval period. During the 12th century the alluvial gravels of Dartmoor and possibly both the Tamar and Tavy main and subsidiary valleys fulfilled the country's needs. Documentary evidence from the late 13th century to the early 14th century (and sporadically afterwards), attest to lead/silver mining in the Bere Alston and Lopwell districts, with later 16th century references to silver mining and refining in Calstock Parish, north of Kit Hill in the Tamar Valley (Buck 2011).

#### **4.2.2 Summary background: post-medieval history of the Tavy Valley area**

Within both the Tamar and Tavy Valleys, alluvial and shallow tin ore extraction proceeded sporadically until the mid/late 18th century. For example, to the west of the study area, the east-west oriented Luscombe Lodes (shown in Figure 7 (1848) and Figure 8 (1859), have been documented as producing tin in 1767 and 1768, with earlier 18<sup>th</sup> century tin working (openworks) in the Tamar Valley (John Goodridge *pers comm* 2005). When market interest for copper ore increased in the latter decades of the 18<sup>th</sup> century (fuelled no doubt by the rapidly expanding market of the Industrial Revolution), the copper mines of Wheal Friendship and Wheal Crowndale were started, and successfully operated for many years. These mines preceded the boom years of copper/tin production primarily from the mid-19th century (eg, for the nearby Tavy Valley: Crelake mine, West Wheal Crebor mine, East Wheal Crebor mine, New East Russell (Devon & Courtney mine), South Wheal Crebor mine, East Wheal Russell mine, William & Mary mine (Devon & Cornwall United), Virtuous Lady mine, West Down Mine, Little Duke mine, East Lady Bertha, Lady Bertha mine, Tavy Consols, South Lady Bertha, Wood mine, and Lopwell Mine- Wheal Maristow).

The ore lodes containing silver, lead, tin, and copper attracted thousands of miners from West Cornwall by the mid-19th century to East Cornwall (Caradon Mines) and the Tamar Valley (primarily Devon Great Consols - Buck 2002), as copper lodes ran out and ore prices fluctuated. Parts of the Tamar Valley (Gunnislake, Calstock, Tavistock, Bere Ferrers and Bere Alston), and their ore quays had become heavily industrialised by the 1860's, mainly due to mining and quarrying, together with their support industries and transport infrastructure. Settlement patterns were drastically altered to accommodate migrant labour (often from west/mid Cornwall). In Devon the Borough town of Tavistock and settlements of Bere Ferrers and Bere Alston were similarly affected by massive population expansion, with additional land being made available by the local gentry for housing at Tavistock and Bere Alston.

The River Tamar (and to a lesser extent the River Tavy), provided an easy and cheap routeway to supply the needs of this ever increasing population. Shipbuilding, lime-burning, the manufacture of fire-brick and furnace linings, quarrying, coal and timber import merchants, etc thrived. Tavistock, Calstock, Gunnislake, Morwellham and Bere Ferrers expanded throughout the early to mid-19th century as population and industrial centres, whilst large mines at Devon Great Consols, Bedford and Russell United, Gunnislake Clitters, Okeltor, Gawton and Wheal Crebor and numerous smaller concerns (especially in the Tavy Valley), provided (some) rich returns for their 'adventurers'. The years 1844 to 1870 saw the Tamar Valley become the richest copper-producing centre in England, with some of the highest grade ore ever to be treated in the country transported down the Tamar to the South Wales smelting works.

At the end of the copper boom years, arsenic was seen as an alternative ore to copper (by 1871 sales of refined arsenic contributed to 20% of Devon Great Consols receipts),



Figure 2 1765 map of the north part of the study area (DHC T1258M/E7).





Figure 3 1765 map of the south part of the study area, showing the site of the Shillamill Manganese Mill (Site 15) (DHC T1258M/E7).



Figure 4 1784-6  
Gardner map of the  
study area (Maps K.  
Top XI 80-80a. By  
permission of the  
British Library).

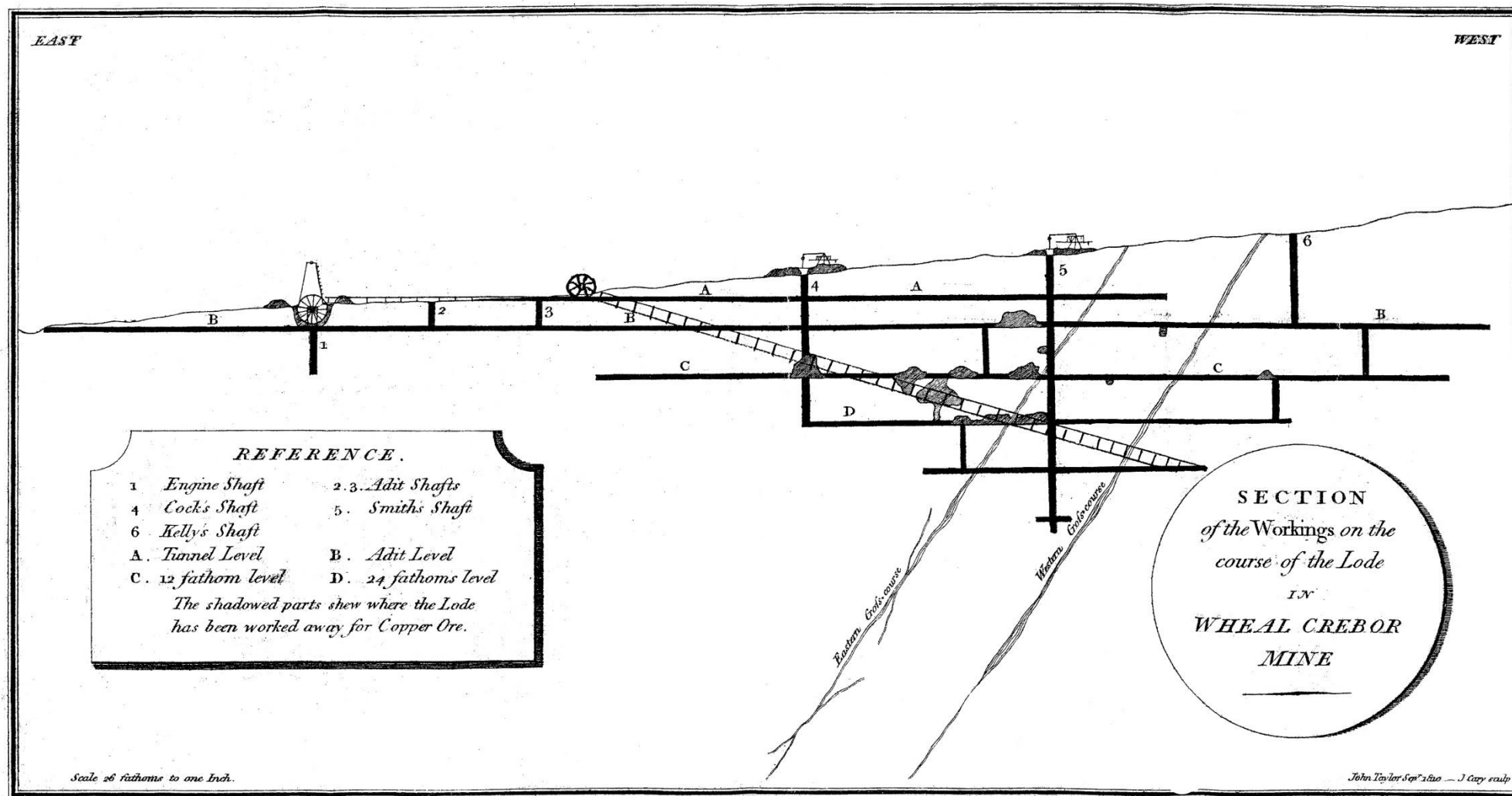


Figure 5 1810 Section of Wheal Crebor Mine by John Taylor and Son. The later incline plane and water wheel has been added by possibly Henry Brenton in 1812 (Site 26) (DHC T1258M/E100/171).



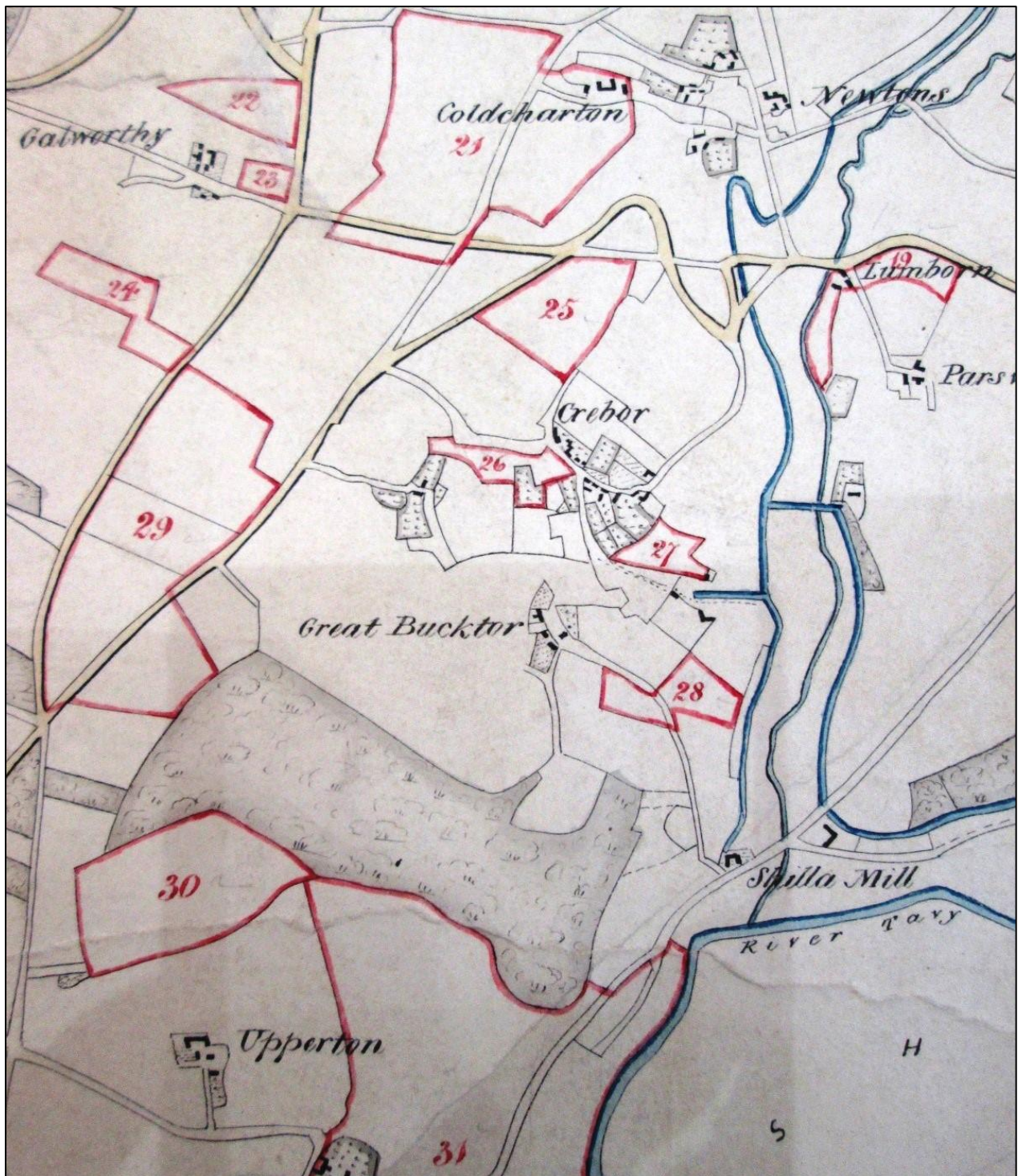


Figure 6 1842 Tithe Index map of the study area (DHC7/7/R Tavistock Parish Tithe map).

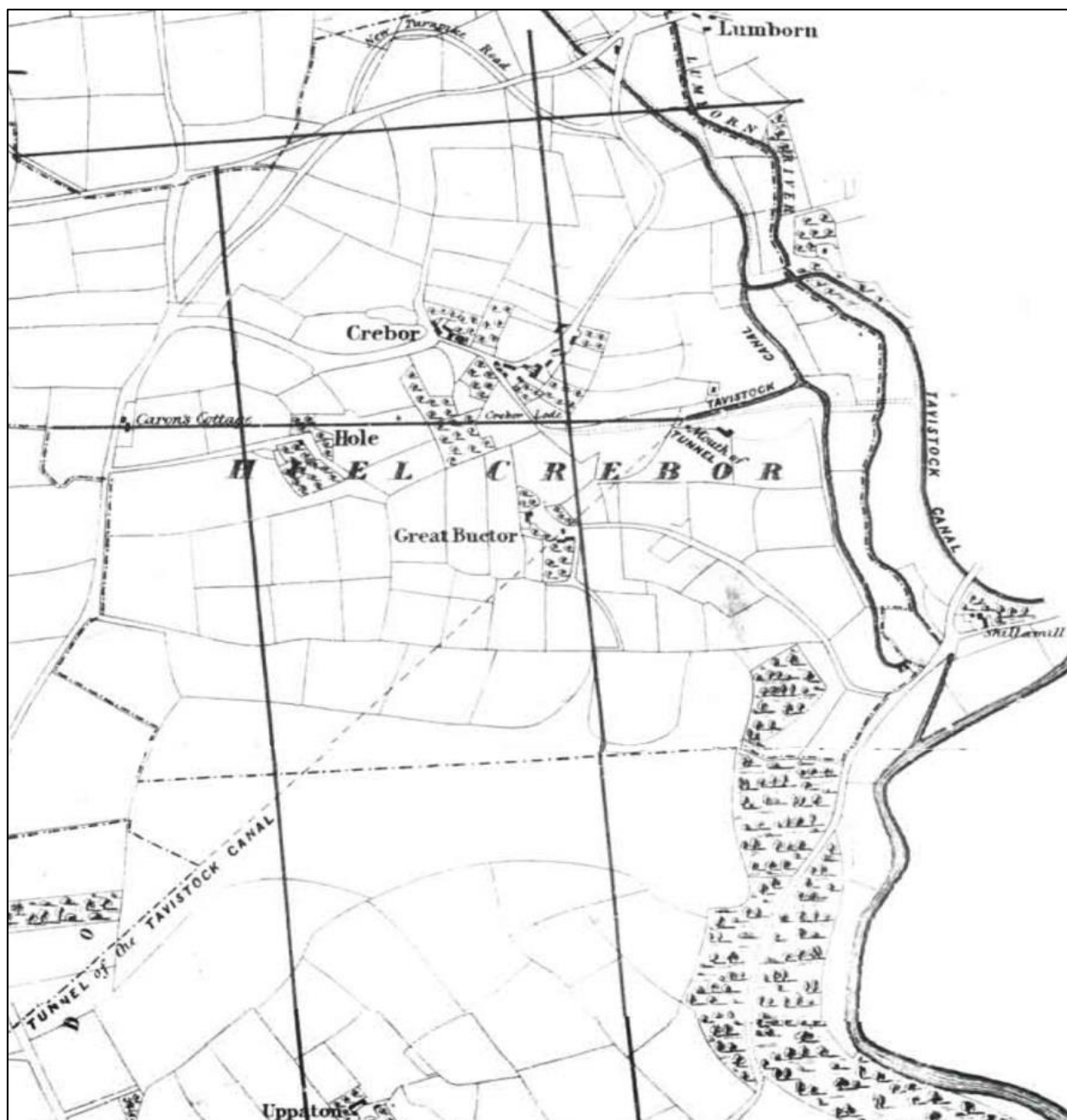


Figure 7 1848 Symons mine sett lodes map of the Tavistock District.





Figure 8 1859 lodes map of the area showing Wheal Crebor and mines/lodes to the west (DHC D1508/E/Tav).



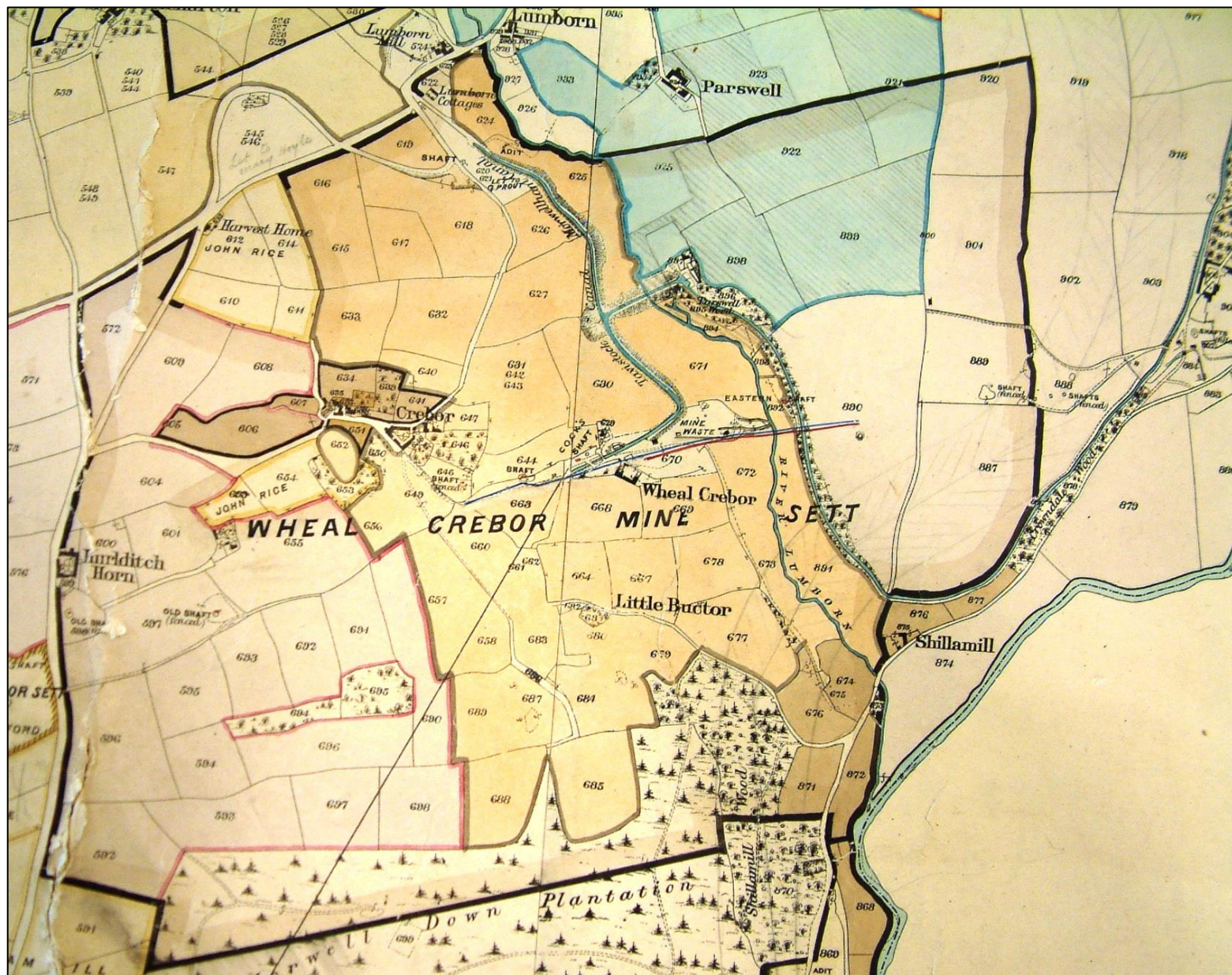


Figure 9 1867 Wheal Crebor mine sett shaft/ lodes map (DHC T1258M/E14b).

as the best copper lodes had been worked out and its market price had slipped to uneconomic extraction levels. The arsenic deposits in the Tamar and Tavy Valley mines (previously discarded but found within and adjacent to copper lodes), were among the richest and most extensive in the country. Arsenic was used in the world's chemical industries for the manufacture of glass, enamel and primarily insecticides (American cotton crop insecticide), other uses included constituents in paints, dyes and pigments, and was produced locally until 1925 when low market prices finally destroyed these last remnants of the Cornish/Devon mining industry.

Numerous small quays near villages along the River Tamar (Calstock and Morwellham), and Tavy (Bere Ferrers and Lopwell), testify to continual riverine trade from medieval times until the mid-18<sup>th</sup> century. These small localised sites were also used to meet market demand for agricultural lime from the late 18<sup>th</sup> century onwards (to neutralise acidic soils and re-claimed land). New lime kilns and quays were built in later years (especially along the Tamar Valley) to serve an increasing demand for finer building lime (mortar and lime-wash) to meet the demand for new houses. These were built until the late 19<sup>th</sup> century, creating in the Tamar Valley the highest concentration of these structures in Cornwall and Devon.

#### **4.2.3 Summary background of the study area (analysis)**

Documentary and place name evidence (Gover *et al* 1931), for Crebor (*Crevebere* 1166, *Crievebere* 1193, *Crauber* 1228, *Creweber* 1238 and *Creber* 1530) meaning 'Crow Wood', Buctor (*Buketor* 1414, *Bucketor* 1488, *Bukterwode* 1518-29 and *Buckatordowne* 1613) meaning 'Buck/he-goat/male deer', and Shillamill (*Shildemyll* 1488, *Shellamyll* 1606) are given. There is another date reference of 1545 from the Devon Monuments Record (MDV 21285), as a Corn Mill. These references are indicative of the continuity of period range of these settlements and underlining the agricultural character of the landscape within the study area: a medieval rural landscape of small farmsteads, the hedge form layout reminiscent of simple in-field/out-field farming techniques, as evidenced by early mapping (see Fig 2, Donn's 1765 map). However, this rural setting gave way to other significant events from at least the 16<sup>th</sup> century onwards, initially sporadic (for tin), and then more formalised, primarily from outcropping 18<sup>th</sup> century copper lodes criss-crossing from east to west across the study area; but the landscape impact of earlier 16<sup>th</sup> century tin working harder to define.

The flat valley bottom form of the Lumburn Valley and its river tributary means that it was a likely locale for medieval eluvial streamworking. Documentary and fieldwork research has been undertaken to relate early tin-working sites to specific sites in the landscape. Tom Greeves (PhD Thesis 1981), during research found a document at Devon Heritage Centre/L1258/2/66/1 (otherwise L/E2/66/1), dated 15 Sept 21 Eliz [1579], referring to two meadows called '*Lambert Meadows*' and one mill called 'a knake myll' within the parish of Tavistock and manor of Hurdwick. It is a lease from Francis Earl of Bedford to John Newton and John and Jonas his sons. '*Lambert Meadows*' had become '*Lumbourne meadowe*' by 30 Sept 1654 (L1258M/L/E2/66/2]. In addition, on the Tavistock tithe apportionment, part of Bucktor plot 540 is '*Lumbern Meadow*'. The term 'knack' mill (variously spelt) is quite commonly used of tin stamping (or 'knocking') mills. The meadow sites seem to be north-west of Shillamill and comprises two fields at SX 463720 and 464722, either side of the lane from Shillamill to Buctor (centred at Site 58). The Mill may have been sited close by, or perhaps fed by the Lumburn leat (Site 7) which may well have been (partially) re-used after its primary purpose in the late 15<sup>th</sup> century ceased. Alternatively, the mill may have been Shillamill, temporarily changed over from a corn mill (Site 16).

In later years, it may well be that the alignment of the Tavistock Canal into its portal, may have utilised an excavated openwork, possibly from the mid/late 18<sup>th</sup> century (extending from known lodes eastwards from the Tamar Valley (ie, Luscombe and Bedford United Lodes, see Fig 8). In fact Figure 2 (1765 map - out of the study area), labels a small site '*Old Mine workings*', indicative of 18<sup>th</sup> century exploitation of tin/copper lodes extending eastwards over Morwelldown to cross the Buctor landscape

down to the Lumburn Valley (Section 3.1). Robert Waterhouse (*pers comm*) has traced the remains of these lodes in places, especially in woodland areas across Morwelldown Plantation, south west of the study area. The author (Buck 2003) has also located and described the same L(i/u)scombe Lodes at their origins (west of the B3257), as part of a wide ranging assessment of what in later years became Bedford United Mine. In addition comment has already been made (Section 3.1) of the early documented origin of these workings dating from the mid eighteenth century (John Goodridge *pers comm*).

Donn's map of the study area (see Figs 2 and 3) is the first relatively detailed map that shows the form of the landscape prior to the 19th century enclosure of Luscombe Down to the west and Morwelldown south of Crebor and Hole/Hurlditch. Remnants of medieval strip fields can be seen to have spread out from the smaller infield systems and orchards adjacent to the three main settlements within the study area; Creber originating north west of the site now known as Buctor (Sites 1-3), Great Buctor (Site 5) and Little Buctor (Site 6). The access tracks are also quite visible – many of which are still extant (Sites 13 and 17). Interestingly the Shillamill Manganese mill (Site 15, Fig 3) is shown to good effect, with its leat supply from the north (further up the Lumburn Valley), Bodman (1998), also refers to this site in 1841 as being a Manganese Mill. Unfortunately, this map (DRO T1258ME6/E7, which still has its timber wall hanging supports), has been drawn over with early 19<sup>th</sup> century additions: for example the 1803 Tavistock Canal and mine buildings, and the later c1860s Crebor farm complex of buildings are also blacked out.

The Gardner Map of 1784/6 (Fig 4) is the first relatively detailed map to show the form of the late 18<sup>th</sup> century landscape prior to the 19<sup>th</sup> century enclosure of Luscombe and Morwelldown. The landscape character and interrelationships between the upper downland, the medieval strip-field remnants and enclosures, with the valleys of the Lumburn and Tavy are evidenced to good effect. There are no mining-related features shown on this map within the study area.

The first detailed mapped information relating to mining is shown on the Symons 1848 lodes and setts map (Fig 7). Primarily copper lodes are shown angling across the landscape (broadly east-west), with mainly north-south cross-courses also shown, often heaving the lodes. Crebor Lode is named as it crosses over the mine, with a cross course intersecting this (Georgina Lode) to the east of Crebor and the west of the tunnel portal. The latter is labelled, and the route of the tunnel shown as it crosses underneath Great Buctor farm settlement. The Tavistock Canal is shown and labelled, as is the Mill Hill section extending north out of the study area. Few shafts are shown but the Agent's House (Site 27) can be seen. Again field systems and access routes (Buctor Lane – Site 13) are present, with a small track (Site 8.1) extending south from Great Buctor uphill to a possible shaft and later quarry (Site 8). The leat to Shillamill manganese mill (Site 15.1) is also shown, with its leat feed from the canal (and possibly via the first water engine placed on the mine). However, the original Shillamill settlement (Site 16), has started to lose evidence of its adjacent fields on the east side of the river (running parallel to the Tavistock Canal, covering evidence of a possible leat – Site 16.1), which ran adjacent to a field boundary (see Fig 2, 1765 Donn's map), to supply the medieval corn mill. Figure 8, the 1859 plan which shows the lodes stretching from the Tamar to the Tavy Valley when compared to the earlier 1848 mapping (Fig 7) reveals an increase in mining activity.

The 1867 Bedford Estate map (Fig 9) shows the enclosure of Morwelldown with a wood plantation, and fields which have become bigger as 18<sup>th</sup> century hedge boundaries have been removed. Shafts are labelled (with their estate management status – those working are named), the main lode (extending east to Crowndale), and the sett boundary of the mine clearly labelled. The new triangular farm complex at Crebor with enclosed yard is shown for the first time (Site 3), and the observation that two smaller buildings previously sited north of Sites 1-2 have gone, as well as any sign of Great Buctor. It may well be the case that the Bedford Estate removed superfluous buildings



in the area to reuse masonry stone for the new build, with additional stone perhaps from Site 8, what appears to be a stone quarry.

The 1883 OS map (Fig 13), continues the theme of field enlargement, but little in the way of mine expansion, although the water wheel winder (Site 52) at Eastern (or New) Shaft (Site 50), is shown for the first time. The same map has been used as the base for the site inventory map (Fig 40), as it shows more Wheal Crebor Mine features in detail than any other (or abandoned mine plan). All of the significant mine buildings are shown (the wheelpit housing the main winding power (Site 29), the courtyard and ancillary mine buildings (Sites 31-34), the stables (Site 30), the dressing floor buildings (Site 37), the tramways (Sites 25, 39.1, 47 and possibly 51), the water wheel powered grinder (Site 39), the copper jigger/slime cisterns house (Site 41), and the spoil heaps (Sites 35, 47 and 49).

The later 1908 OS map presents the mine site in stark contrast – although a few (roofed) mine buildings are shown, the main wheelpit (Site 29), is presumably infilled with water, the courtyard complex of buildings are still extant, but the dressing floor buildings have gone and their related tramways. The main new addition to this map is the leat supply and erection of the Bedford Estates Pump House (Site 53), and its leat supply (Site 53.1). Comparisons of this map to 21<sup>st</sup> century mapping (Fig 1), shows little alteration – the landscape having finally taken its present form.

#### **4.2.4 Lumburn Leat**

*'The silver-lead mines of the Tamar Valley have probably been more profitably worked over a longer period than any other mines in England. They financed some of the martial enterprises of the Plantagenet kings... Their silver and lead have come from two strongly marked lodes coursing north and south through the Bere Alston peninsula ... two straight lines running parallel about three quarters of a mile apart... One little known link with the medieval mines is in Shillamill Wood, near Crowndale. Here are fragmentary remains of a leat running a little below the 400 ft. contour, tunnelled in places through rock cut by chisels before gunpowder was in use. A Tavistock Abbey document of 1461 refers to this leat which was about 20 miles long and probably brought water from the River Lumburn to those mines nearest the Tavy' (Booker, 1971, 54-55). Booker's comments appropriately summarise the background of the thirteenth century Bere Alston silver lead mines.*

Further recent research by Rippon, Claughton and Smart (2009), has further detailed survey and documentary research. The Lumburn Leat is an impressive linear earthwork which runs for 16 kilometres from Ogbear, west of Tavistock, down the Lumburn and Tavy valleys, around Morwelldown and across to Lockridge Hill. It was constructed between 1470 and 1480 in order to power suction lift pumps used to drain the mines, and in several places had to be tunnelled through bedrock, making it one of the most impressive feats of medieval engineering in Devon. Surviving stretches of leat form a continuous feature, gradually declining in elevation from source to end. A differential global positioning system allowed the probable line of the leat to be traced where it no longer survives as an earthwork (or adjacent to hedge boundaries), by revealing a distinct break of slope. Elsewhere its line is marked by field boundaries (Rippon, Claughton and Smart 2009, figs 4.3 and 5.3, 113 to 119). At the southern extreme of the landholding (Stonage Rocks SX 464 714), the leat has tunnelled through vertical rock outcrops – to similar effect as the 18<sup>th</sup> century Rubbytown leat in the Tamar Valley (Buck 2005, 22, fig 13).

#### **4.2.5 Tavistock Canal**

The canal has already been written in far more detail than is necessary for this report, notably by Hadfield (1967), Booker (1971), Hedges (1975), Woodcock (1995, 2005), and more recently by Robert Waterhouse (2012 forthcoming); a detailed book on the canal. The text below (excerpts from Buck 2013), is a summary history and construction account of the Tavistock Canal extracted from the above sources:

The medieval borough of Tavistock has always been closely linked to its port, Morwellham. That link was dramatically improved by the construction of the Tavistock Canal from 1803 to 1817. The main landscape features of this major construction throughout its full length can still be seen today, over two hundred years later; the wharves at Tavistock and Morwellham, the aqueduct over the River Lumburn, the 1.5 mile long tunnel under Morwelldown, and the remnants of the incline plane down to Morwellham.

**1796** The opening of Wheal Friendship Copper Mine, Mary Tavy, unintentionally led to the construction of this canal. The export of ore and import of coal and other materials needed to be cost effective – its transport costs by horse and cart must have been prohibitive. The young mine's engineer (in his twenties), John Taylor, had the idea of linking the Tavy and Tamar valleys, whilst using Morwellham to export the ore (via sea going ships); the nearest active port to Tavistock.

**1800** By the turn of the 19th century, the country had been at war with France for a few years. Demand for metallic ore was high.

**1802** Survey of the proposed canal route (presumably with the blessing of the Duke of Bedford) by John Taylor, the mining engineer of Wheal Friendship copper mine.

**1803** (March) Following the creation of a canal company funded by shares from the London Stock Exchange work began on the route in 1803, following the passing of an Act of Parliament. The canal was to be 16ft wide and 3ft deep, with a branch to the slate quarries at Millhill. It is likely that the first section of the canal route followed an earlier leat from the River Tavy to Crowndale Mine. Raising funds on the stock exchange gained stock interest from adventurers to exploit known lodes whilst tunnelling through the granite of Morwelldown, and for additional shares to be purchased by other mines and Tavistock businesses along its course, all recipients of the canal's cheaper transport costs. However, Hedges (1975) hints that Taylor's motivations for the project was not primarily to build the canal, rather the opportunity to exploit known lodes under Morwelldown; a mining speculation.

The provision of water via leats from the western end of the canal (top of the Morwellham incline) for other mines in the Tamar Valley as far north as Gunnislake to power water wheels was also planned. The original cost estimate for the canal was £40,000 (including testing for ore lodes), at £100 per share. The Duke of Bedford, who owned all the land along the canal's course, also purchased 1/8 of the shares and took dues for use of Morwellham Quay. He also agreed to a request to make a grant of a Mining Set: (for working all Lodes discovered in the Course of the Canal, Embankment, Tunnel and collateral branch for copper, tin and lead to the extent of 500 fathoms East and West of the canal for every Lode discovered), for the sum of 1/10 dues and a term of 42 years. The principal engineering features being the aqueduct over the River Lumburn, the 2,540 yard tunnel through Morwelldown, and the inclined plane west of the western end of the tunnel down to Morwellham – a fall of 237 ft, the greatest in southern England at that time.

**1803** (23rd August) Work began on the tunnel. Almost immediately copper was struck at the Tavistock end of the tunnel, and the lode developed to realise what later became Wheal Crebor (see Figure 3). Men were employed to work both concerns – the accounts separated. The Canal Committee managed both concerns until 1812 when a separate Committee was appointed after further copper ore discoveries in the tunnel under Morwelldown (Hadfield (1967, 128).

**1808** The waste rock and ground from the tunnel excavation was boated eastwards back to the tunnel entrance and used to infill and form the Lumburn Aqueduct over the valley, with a central spanning arch.

**1809** Work progressed slowly in the tunnel (by this date it was half finished), as the canal section from Tavistock to the tunnel was finished (i.e. this project's study area). This was built more permanently with stone sides (on edge) rather than puddle clay. The tunnel rock was granite, its depth 160 yards below the top of the hill. Pumping/ventilation/winding and access shafts (at least four – the main one being Bray

Shaft), had to be sunk from the top of Morwelldown to the underground canal. John Taylor designed the power source for the shaft workings by utilising flat rods (for lengths up to 1.5 miles) powered from a large 40' water wheel which was working by this date (Site 42). He also designed a ventilation fan for improving the air quality, for which the company was awarded the medal of the Society of Arts in 1809 (Hedges 1975).

**1810** The tunnel advanced at a rate of about 150 fathoms (six feet per fathom) per year until this year when three granitic dykes were cut, slowing the work rate to nearly a third that amount for two years. 30 to 40 workmen were continually employed, with a number of authors suggesting French prisoners of War used as 'navvies'. Figure 5 is a reproduction of the Wheal Crebor mine section drawing showing the shafts and levels made by John Taylor & Son. The later (1812) underground incline plane site is also shown on this drawing.

**1815** From this year there were shipments of manganese from mines around Brentor and Milton Abbot carried by the canal. These were the principal sources of manganese in the country at a time when it was used in the manufacture of glass. For example 13,335 tons were shipped to Plymouth in 1819. The ore was ground in a mill powered by the Morwellham water wheel (Booker 1976, 19), and exported in casks. Site 15, the Shillamill Manganese Mill, may well have processed (and exported) some this material via the canal, or perhaps from closer mines in the Tavy Valley.

**1816** (August) The Tunnel portals were originally cut from both ends simultaneously, initially to form a working area and to align both ends. These finally connected underground on the 21st August. Then the tunnel was enlarged (downwards and wider) throughout its length.

The demand for metallic ores to feed the Napoleonic war years (1793 – 1815) slumped after the soldiers returned, and markets waned. The canal committee, sensing further financial difficulties in September stated *'That the Tonnage will fall very short of the original estimate cannot be doubted; at the time when this was made the Mines in the neighbourhood were in their most flourishing condition, or rapidly advancing to it. Agriculture encouraged by high prices was improving everywhere, and the use of lime, so essential ... was very great and increasing. Slate quarries, then making large returns, were in full activity, and new ones opening. In all these sources of oecumenical mode of carriage, the greatest reverses have taken place, and at present a stagnation of enterprise and consequent inactivity prevails'* (Hadfield 1967, 130). However, the population of Tavistock had already increased from 1801 to 1821 by over 62%, reflecting the growth in the area, primarily a result of mining operations and related tertiary expansion.

**1817** The tunnel was finally completed early in the year, with the official opening ceremony held on 24th June. Thousands attended the event, with over 300 going in boats (with a band) through the tunnel – to be met (with obvious relief) by thousands more at the Morwellham side. All were then given a demonstration of the workings of the incline railway mechanism and tramway down to Morwellham (see Buck 2005 – Sites 58 to 64), powered by a large water wheel and the canal water – which was also recently completed. The boats (specially designed and built by the Tavistock foundries from 1811 to replace an earlier wooden design), were c30 feet long, 5 feet wide and towed along the slow moving open canal by horses. They were worked through the long tunnel by two men using iron bars against the rock face.

The canal had taken 13 years to build. Its final cost was £62,000, the excess over the authorised capital of £40,000 having been raised by calling £155 on each £100 share.

**1819** Although the economic outlook for the area was not good, the company decided to press ahead with the Millhill canal branch to the slate quarry. It was 2 miles long and cost £8000. It rose by 19.5ft to Millhill (from the western end of the Lumburn aqueduct – Site 19), with an inclined plane for the final section due to the scarcity of water (double tracked with two cradles counterbalanced with loaded boats going down pulling the empty ones up, with the help of three horses).



**1820s** The expected tolls for the canal were halved from their pre-construction estimates – due to the gloomy economic climate. Over the next three decades the canal carried between 15,000 to 20,000 tons per year, earning an annual profit of approximately £600.

**1831-2** A Cholera epidemic in the locality severely affected the workforce, the local economy and (temporarily), the canal's fortunes.

**1841** Great Western Railway completed.

**1844** Discovery of the main copper lode (40' wide) at Wheal Maria later Devon Great Consols – reversing the fortunes of Tavistock over the next 30 years, but reducing those of the canal. The Mill Hill Tramway was constructed this year (replacing the earlier section of the canal which had been closed after 1831), at a cost of £1,381 (Hadfield 1967, 132).

**1847** 20,132 tons were carried on the canal (Woodcock 1995, 23).

**1848-9** Another Cholera epidemic.

**1850** The goods carried on the canal were (tons): Sundries (7548), Limestone (3130), Copper ore (2,499), Slate (676), Granite (83) and Mundic (arsenic pyrites) (94). Tonnage carried fluctuated from year to year, reflecting the area's economic woes (or successes). In a bid to maintain revenue, at various times throughout this period, the company reduced tolls, or raised them again when economic conditions improved. But dividends, throughout the life of the canal were always modest, and profits turned out to be at a level 1/3 predicted at the outset.

**1851** In the 1851 census, there were 27 barge men working for their various employers regularly using the canal.

**1857** Shares that had changed hands at £100 in 1803 were now changing hands at £5.

**1859** Construction of the Devon Great Consols railway from the mine to Morwellham with a separate incline section down to the port finished this year. Also the South Devon & Tavistock Railway from Plymouth to Tavistock opened (later extended to Launceston) – in direct competition to the canal. Due to this competition, the company further reduced its tolls after the opening of the railway. However, in the same year it expended more capital on renewing the inclined plane mechanism, and investing funds on a steam mechanism to pull loaded barges through the tunnel against the water flow (it often took a couple of hours or more to undertake this manually!). This was not successful.

There is no doubt that the waning fortunes of the early 19<sup>th</sup> century Tavistock and Tavy copper mines were no competition for the resurgence of the mid-19<sup>th</sup> century Tamar Valley copper mines from the 1840s. Whilst the former utilised the Tavistock Canal as a transport medium during this period, so the latter formed its own railway equivalent, but both using Morwellham as their export destination. Given the rapidly changing transport infrastructure (and markets) across Devon and Cornwall at this formative period, the fortunes of this old transport route found wanting and uneconomic.

**1860** In the previous year, the canal tonnage was 17,455. In this year it fell to 13,500. From 1863 onwards there was a steady decline in the tonnage until, in the early 1870s it dwindled to nothing (Hedges 1975, 28).

**1862** A shareholder from Birmingham wrote to Mr Gill, representative of the Canal Company and said: *'I am afraid there is little hope of the canal rising in its fortunes with the railway for a rival. Here we have in several cases united the canal with the railway with advantage to both – you know best whether such an arrangement with the Tavistock canal would be advisable'* (Hedges 1975, 28).

**1866** In September, the canal committee recorded; *'That a very considerable reduction having taken place in the traffic and dues of the Tavistock Canal Company since the opening of the Tavistock and Launceston branch of the South Devon Railway it was resolved that His Grace the Duke of Bedford be applied to kindly assist the Tavistock Canal Company to compete with the Railway Company by reducing the Canal Dock dues at Morwellham'*. The Duke was evasive (Hadfield 1967, 134).

**1870** Only 783 tons were carried on the canal (Woodcock 1995, 24).

**1872** The economic situation became even direr; at a meeting on 2nd September the Duke offered to buy all the shares at £8 each, and to pay half the cost of an Act to transfer the canal to him. Within the month, the committee accepted his terms. Since the summer there had been no traffic on the canal. However, this was not a localised occurrence; the impact of the railways had dealt a death blow to innumerable canals all over the country.

**1873** In May the Act was passed and the Tavistock Canal and land returned to the Duke of Bedford for £3,200, there being no obligation on the Duke to maintain the canal. It is uncertain what use the canal had for the next twenty five years.

**1896** This perhaps was made clear in May of this year when the Tavistock Gazette reported that on Whit Monday the basin of the Tavistock Canal was to be cleaned out (it appears a regular activity on this day). *'The cleaning is wanted more now than when it was a hive of industry ... a resident noted ... A great deal of sewage was emptied into it, and the water does not run at a greater rate than half a mile an hour. I have seen dead dogs, cats and rats in the canal'* (Woodcock 2005, 26).

**1898** The Tavistock Canal was not included the Canal Returns.

**1923** F. Cloke and C.F. Barclay (Mining geologists) carefully assessed the lodes intersected by the tunnel in 1923 and in more detail this year during a tunnel assessment and clearance scheme (CRO AD58-26). They confirmed that the tunnel intersected eight or nine lodes and three cross-courses, but only two of these (East Russell and Georginia Lodes), had any stoping done on them within the canal tunnel. The only repairs necessary to the tunnel were to the Morwellham portal retaining wall.

**1933** RW Toll, the engineer to the 1933-4 canal works was responsible for all the cast concrete structures and construction of the Morwellham Power Station (Stewart 2005). After cleaning the canal bed (which must have been quite onerous!), and commissioning canal/tunnel condition survey reports from CF Barclay, the West Devon Electric Supply Company built a sluice gate near the west end of the tunnel portal, to convey water to a header pond to go down to hydro-electric turbines via large tubes at Morwellham Power Station, next to the River Tamar.

#### **Footnote:**

The canal has been maintained and managed by the owners of Morwellham Power Station since 1933. For some time this work has been undertaken by South West Water and British Waterways, the former now monitors and maintains the canal, carefully regulating the flow to utilise the instant generating capacity of the hydro-electric power station at times of peak demand (to provide a cost effective monetary return). It is poignant perhaps that the canal still exists today due to its economic usefulness – its *raison d'être* for its construction over two hundred years ago.

#### **4.2.6 Wheal Crebor Mine**

John Taylor, the celebrated land surveyor and civil engineer in 1799, aged 19, was offered the position of manager of Wheal Friendship (north of Tavistock), and Wheal Crowndale (south of Tavistock). His follow-on project, the Tavistock Canal, provided the means of importing (mine materials) and exporting (copper ore), from both these mines via firstly the Canal, through the Morwelldown Tunnel (approximately two miles) to Morwellham, via a water wheel powered incline (Buck 2005, 49, Site 64). An Act of Parliament empowering its construction was passed in 1803. The Tavistock Canal company had calculated that it would intersect known lodes (extending eastwards from the River Tamar) whilst excavating the tunnel, and so included a forty two year lease on mineral rights for five hundred fathoms to either side of the line of the tunnel, which was granted by the Duke of Bedford (Barton 1964, 92), and the Earl of Devon (at the Wheal Crebor end). The company was not disappointed.

**1803** *'This cost book company (Crebor Copper Mine: 1803 - 1834) was formed in accordance with a resolution passed at a meeting held in March 1803 to consider making a canal from Tavistock to Morwellham Quay... work started in the same year.*

Workings were almost entirely on Crebor and Georgina lodes, through the following shafts: Cocks (45 fms.), Smith's (100 fms.), Kelly's (135 fms.) and Rundle's (104 fms.)', (Justin Brookes Parochial Mines Index, Tavistock, Crebor Copper Mine, DHC SX622/Dev/Bro).

**1805** 'It was noticed in the Report of the Committee of Management made to the Proprietors last year, that Wheal Crowndale lode had been discovered at Creber in the limits of the Duke of Bedford's mineral set to the Proprietors of the canal: they have now to state that since that time a considerable expense has been incurred by following up the discovery with the proper modes of trial. An adit (Site 46) from the River Lumborne to a shaft sunk upon the course of the lode near the north end of the tunnel has been driven a considerable length. In February and March last about 20 tons of copper ore were sold; this produced, after paying the Duke of Bedford his dues of one-eighth, the sum of £98. 2s. 7d. To carry on this mine effectually, an engine will be required...' (Tavistock Canal: Report on the state of the mining part of the concern 1805, T1258M100/171).

**1806** 'As the water is not yet brought to the spot to work the engine, little could be done below adit... The adit is taken up in the valley as deep as the river would permit, and is driven mostly on the course of the lode up to and through a shaft called Cock's shaft (Site 24), near the tunnel end, and thence is driving west, and nearly communicates with another called Smith's shaft (Site 22), sunk in Lord Courtenay's land (Earl of Devon – see Fig 11), of which a sett has been taken for the Proprietors... It should be observed that there are three lodes here within short distances of each other. The shaft called Cock's shaft is sunk upon the north lode, and a level from it is driven some way east and west 12 fathoms under the adit. The adit level is upon the middle lode, and a south lode is cut in a cross drift: each of them have kindly appearance, and all have some copper ore in them, but the north lode is largest... The engine (water wheel powered – Sites 42 or 44) for sinking at Crebor is in a state for immediate erection, as soon as the open cutting can supply it with water; and an engine shaft is sinking to receive the pumps, and afford convenience for driving deeper levels to the lodes' (Tavistock Canal Reports *ibid*).

**1808** The Tavistock Canal reports for the mining concerns describes the progress of the Wheal Crebor sett: Engine Shaft (below the new water wheel 'engine') as sunk to the 12 fm. Level, Cocks to the 24 fm. Level, Smiths to the 12 fm. Level and Kelly's to adit (*ibid*).

**1809** It was reported that the costs had reached nearly £6000, copper ores sold totalled £271, with a 'Dressing' machine erected (possibly the grinder mill – Site 39) (*ibid*).

**1810** It was reported that the mine returned approximately 100 tons of 9% copper ore per quarter. A supplementary report on the mine was produced with a section of the workings on the course of the lode at this date by John Taylor (Fig 5). This shows the main shafts (Cocks and Smiths down to the 24 fm. Level (both with horse whims), the extent of ore bearing ground removed, the mine adit level, the winding engine waterwheel (with flat rods), and the two cross courses (*ibid*). This is a copy of the original section drawing with the later (1812) incline plane and wheel shown (by R. Waterhouse). This year also marked a turning point in its economic fortunes: over 195 tons of ore was produced, realising over £1300 – an overall loss of £894; the last year of losses until 1828 (Justin Brookes *ibid*).

**1811** Produced £19 profit (the first ever year), but during the following few years profits peaked to an average of £8000 for 1814/15, and a reduced profit margin to 1824. Output averaged 150 tons per quarter, increasing a year later to 155 tons a month (Hamilton Jenkin 2005, 35). For the next six years Crebor became one of the leading Devon copper mines.

**1812** Copper production realised approximately £500 per month, in effect subsidising some of the canal works. The concept of an incline plane (designed by John Taylor based on his earlier Wheal Friendship experience), is first mentioned in the company's

accounts; *'The Committee, convinced by the savings shown to have been made in this instance ... concurred in Mr Taylor's opinion, and requested him to take immediate steps for putting it into execution. This was done by sinking a suitably inclined shaft, and preparing a working model of the engine; which having satisfactorily exhibited the powers of the apparatus, the machine itself was executed under Mr Taylor's inspection, and put to work about a month before he left the management of the concern (resigning as engineer and resident manager of all south west positions – to establish a chemical works at Stratford in Essex – Burt, 1977, 21). The performance of the whole apparatus has fully justified the expectations formed of it, and the Ores are now regularly passed from the places where they are broken underground to the Dressing Floors, at a lower charge than is usually incurred in wheeling them from the workmen to the bottom of the shafts'* (Tavistock Canal: Report on the state of the mining part of the concern 1805, T1258M100/171). Figures 5 and 10, shows a plan and section of the mine (former undated) with the inclined plane. *'It was probably a plateway. As ores had to be raised rather than lowered, the plane (Site 26) had to be powered. It was worked by a 40 ft diameter water wheel at the incline's head (Site 26.1), with canal water acting as a leat... The incline went down 325 feet on a gradient of roughly 1 in 2'* (Bodman, 2012, 79). In addition, two more detailed reconstruction drawings by Robert Waterhouse have been reproduced in Appendix 12.6.

**1815** After this year production slowly declined year by year as Main lode (Figures 11 – mine plan and 12 – mine section) was worked out westwards.

**1816** The company's annual statement said that the ore was running out on Main Lode, and that the copper market price was low. Gill's Shaft (SX 45512 72061 – outside the study area near Morwelldowns, was started this year showing the mine extending underground to the western edge of its sett, and Rundle's Shaft started soon after (SX 45285 72059). *'..in 1816 (Wheal Crebor) had already been worked about 60 fms. Deep under the level of the tunnel, and had produced down to that time, between 8-9000 tons of copper ore... this mine produced nearly 4000 tons of ore in the year – it is now upwards of 80 fms deep'* (Moore, 1825, 324).

**1821** *'A fresh lease was granted in March 1821 for 21 years at 1/10 dues'* (Justin Brookes *ibid*). A new water wheel powered engine (using the same wheel erected in 1809) was erected (Site 29) this year, and remained working until the mine finally closed in 1903 (Robert Waterhouse *pers comm*). The wheel *'operated a line of flat rods 3,000 ft in length, extending up an incline to the top of the hill where by means of a 'T' bob it connected to the pumps in Rundle's Shaft, the most westerly on the property. Another wheel of (1)6 ft diameter (4 ft breast) similarly driven by the canal, drove a crusher'* (see Fig 10, Hamilton Jenkins *ibid*). The water wheel which powered the incline tramway (Site 26.1) was 30ft X 5ft (Barton 1964, 95). The westward extension of the mine to Gill's Shaft (max depth 66 fms) and Rundle's Shaft (12 fms.), was abandoned as no productive ore was found after five years of mining.

**1822** *'Wheal Crebor was very rich from about 1811 to 1819, when it became unproductive, but further discoveries have been lately made which promise to render it productive: it is about 80 fm deep...Wheal Crowndale, Wheal Crebor, East Liscombe (discovered about three years ago) and Wheal Tamar, are on the same lode which ranges as usual from east to west, and are included in a space of about 4 miles in length'* (Lysons 1822 6<sup>th</sup> Vol Magna Britannia, Devonshire). But the continued spiral downwards in production from Main Lode (see Figs 11 and 12) continued, as known ore from Smith's Shaft (Site 22) was removed. It is possible that development work started at New (Eastern) Shaft at this time, on the eastern side of the River Lumburn (extending the sett eastwards to its maximum).

**1827** The company's annual statement shows that for the first time the (declining) fortunes of the mining company are separated from the canal's accounts and shares.

**1828** The mine only produced 112 tons of copper ore (five years earlier it produced 1276 tons) (Burt et al, 2014, Wh Crebor statistics). *The mine was abandoned in 1828 as the adventurers were unable to find additional sums to work the site'* (Justin Brookes Parochial Mines Index, Tavistock, DHC SX622/Dev/Bro), and *'when the owner of*

*adjoining land to the west refused to grant an extension of the sett. By that time Cock's, Smith's, and Kelly's and Rundle's Shafts had been sunk to 45, 100, 135 and 104 fathoms from surface respectively, while sales of ore totalling 27,490 tons had realised £167,181'* (Hamilton Jenkin 2005, 35).

**1829** Wheal Crebor mine was stopped and parts auctioned/sold. The copper workings (like others in the area), were relatively shallow, and deposits under the tunnel exhausted. The general copper slump at this time made it difficult to sell the surface machinery – to recoup some of the company's losses.

**1835** *'In July 1835 it was proposed to relinquish the second lease in consideration of the granting of a third one for 21 years at 1/12 dues covering the original Wheal Crebor sett as well as Wheal Pixon which adjoined it to the east. The Crebor section of the new lease comprised Bucktor, Crebor and Hole estates, bounded by Waggon Lane on the west, Lumborn River on the east, and extending 200fms. North and 100 fms. South of Crebor Lode...The Crebor section remained unworked, however, and a separate company was formed to work Wheal Pixon'* (Justin Brookes, *ibid*).

**1842** The Tithe map (Fig 6) shows three settlements around Crebor, with related farm buildings, their adjacent paddocks and orchards. Great Bucktor farm settlement is shown with its related infields, although Little Bucktor, its smaller relation to the south east has gone, although its former tithe apportionment is shown in red outline (Parcel 28). The Tavistock Canal is shown in blue, not to be confused with either the River Lumburn or the leat feed from the Tavistock canal to the Shillamill Manganese Mill. The Mill Hill section and Lumburn 'aqueduct' parts of the canal can be seen, together with the mine buildings surrounding the Wheal Crebor Mine buildings.

**1844** In this year a new cost book company was formed (Crebor Mine/Crebor Consols Mining Company: 1844-1846), perhaps on the back of the renewed interest stimulated by the great discoveries of the large copper lode at Devon Great Consols, a short distance to the north-west. It was leased by the Duke of Bedford for 21 years from March 18<sup>th</sup> at 1/15 dues. In January of the following year it was planned to put in a waterwheel to enable the adventurers to get under the old workings (Justin Brookes, *ibid*). It is possible that (if this went ahead as planned), this is the first documentary reference to construction of a new waterwheel (Site 52) at New (or Eastern) Shaft (Site 50), as the mine's engine wheel (Site 29), would have had problems pumping via flat rods down the deepening shaft. In addition, the later 1848 Symons map (Fig 7), shows an access route up to (and beyond) New Shaft (over the River Lumburn).

**1846** A new adit was driven 15 fms below the old workings. Work in progress included the sinking of an incline (or rather underlie) shaft (presumably at New (Eastern) Shaft – Dines 1956, 672). But work was suspended after about £2000 had been expended – with little more forthcoming (Justin Brookes, *ibid*).

**1848** Symons map (Fig 7) shows the 'Huel Crebor' area, with the canal and mine features shown, lodes and cross-courses. At this date Great Buctor is still extant, but Little Buctor is not shown. The field boundaries are shown in more detail than the 1842 tithe (index) map (Fig 6).

**1850** Wheal Crebor Mine (1850 to 1860) was better organised and financed (presumably when mining prospects had come out of the previous slump). A new cost book company leased the mine from the Earl of Devon for 21 years from April at 1/15 dues, including an extension of the sett 220 fms. west of Rundle's Shaft. The properties and a 40' water wheel (8 ft breast) cost £325 (Justin Brookes, Wheal Crebor Mine *ibid*). Wheal Crebor was worked for the next fifty years; *'The mine lasted so long mainly because of the advantages of cheap transport (the direct connection with the quays of Morwellham saving it the cost of land carriage which had crippled other mines in the district), and power which it gained from being on the canal'* (Hamilton Jenkins *ibid*). DRO R224D (Abandoned mine plan) contains plans and sections of the mine (Fig 10).

**1851** The mine and machinery, including a 22" X 14" rotary steam engine (Compound cylinder Woolf engine - a rare design - Ken Brown *pers comm*, for hoisting, etc), boiler and pumps was offered for sale in London in April 1851 (not long after it was erected).



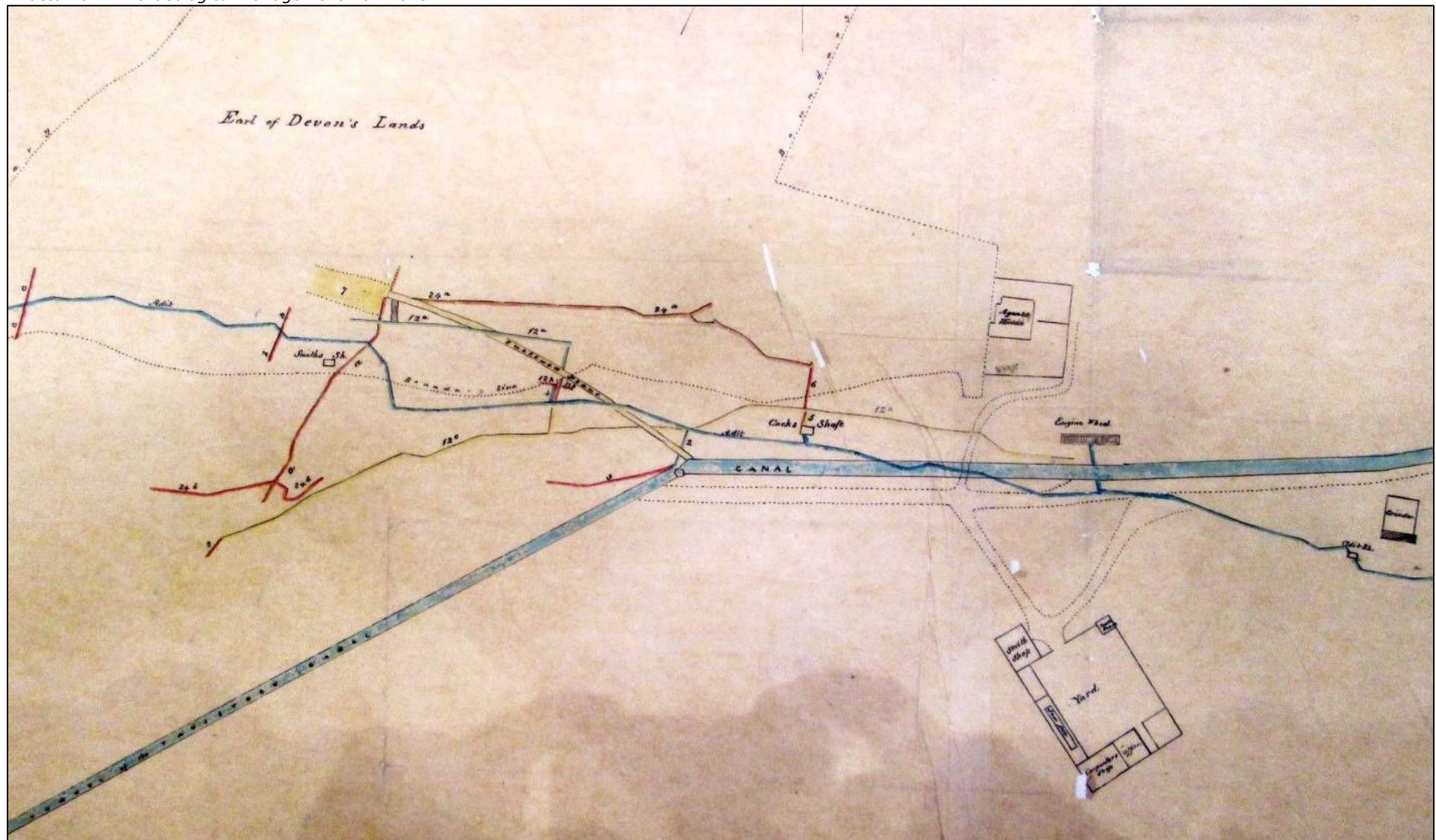


Figure 10 Undated plan of Wheal Crebor Mine (DHC R224D).



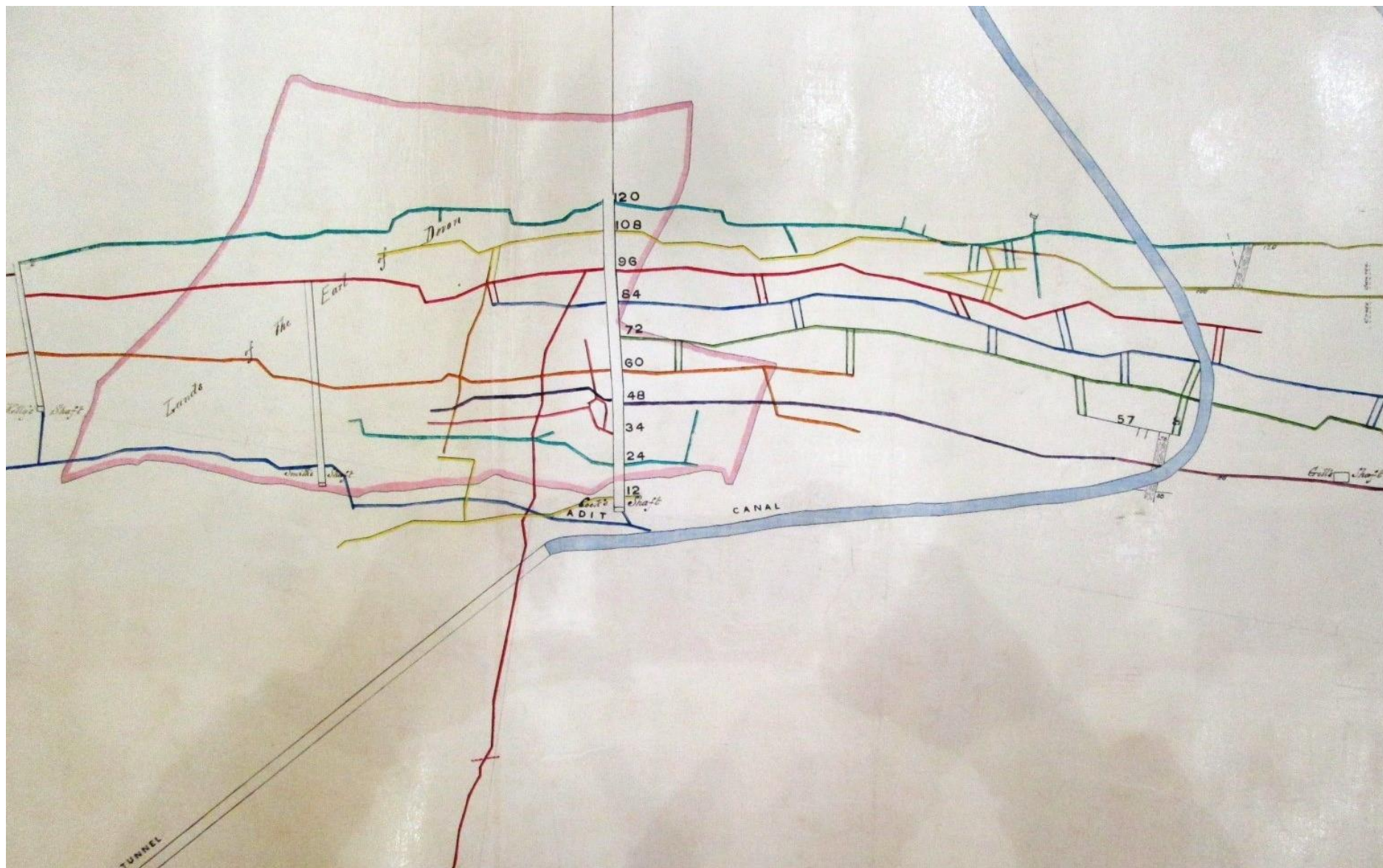


Figure 11 Undated underground plan of Wheal Crebor Mine (DHC 5124).

# Longitudinal Section of WHEAL CREBOR MINE ON MAIN LODE

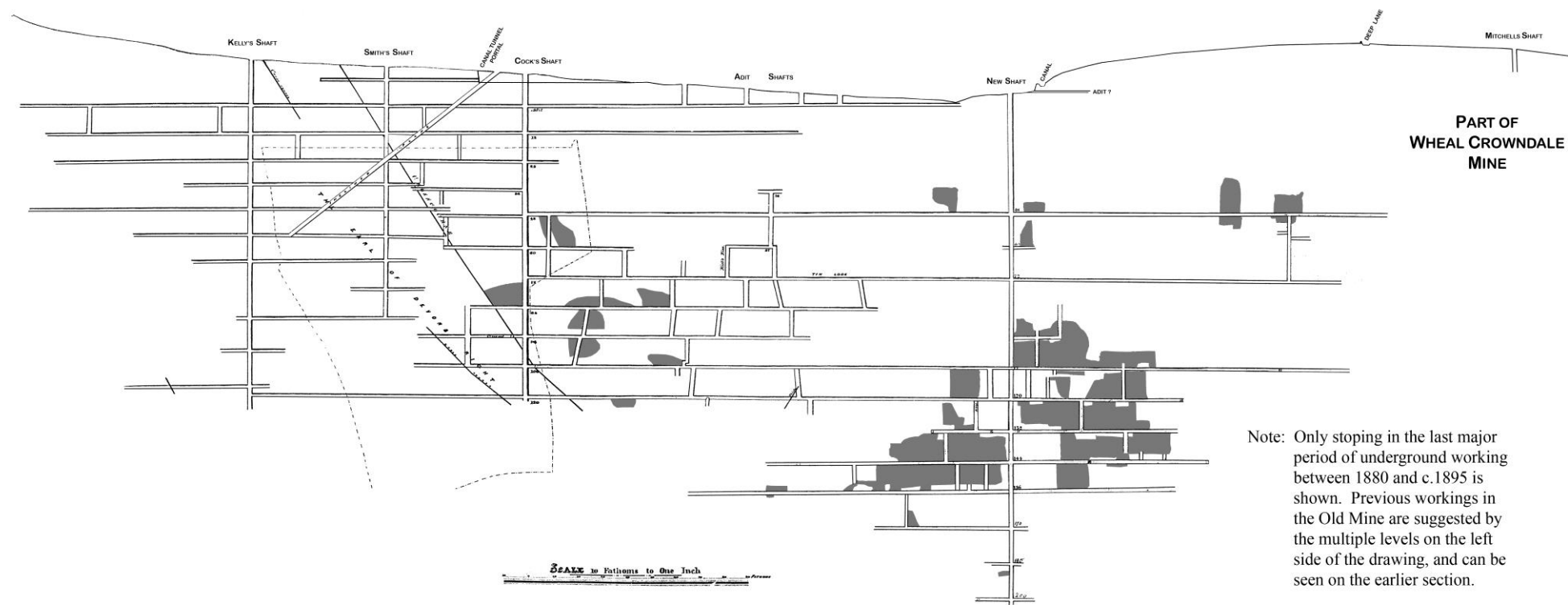


Figure 12 Sectional plan of Wheal Crebor (compiled by R Waterhouse from various abandoned mine sectional plans: R190G/5124/R224D).



32



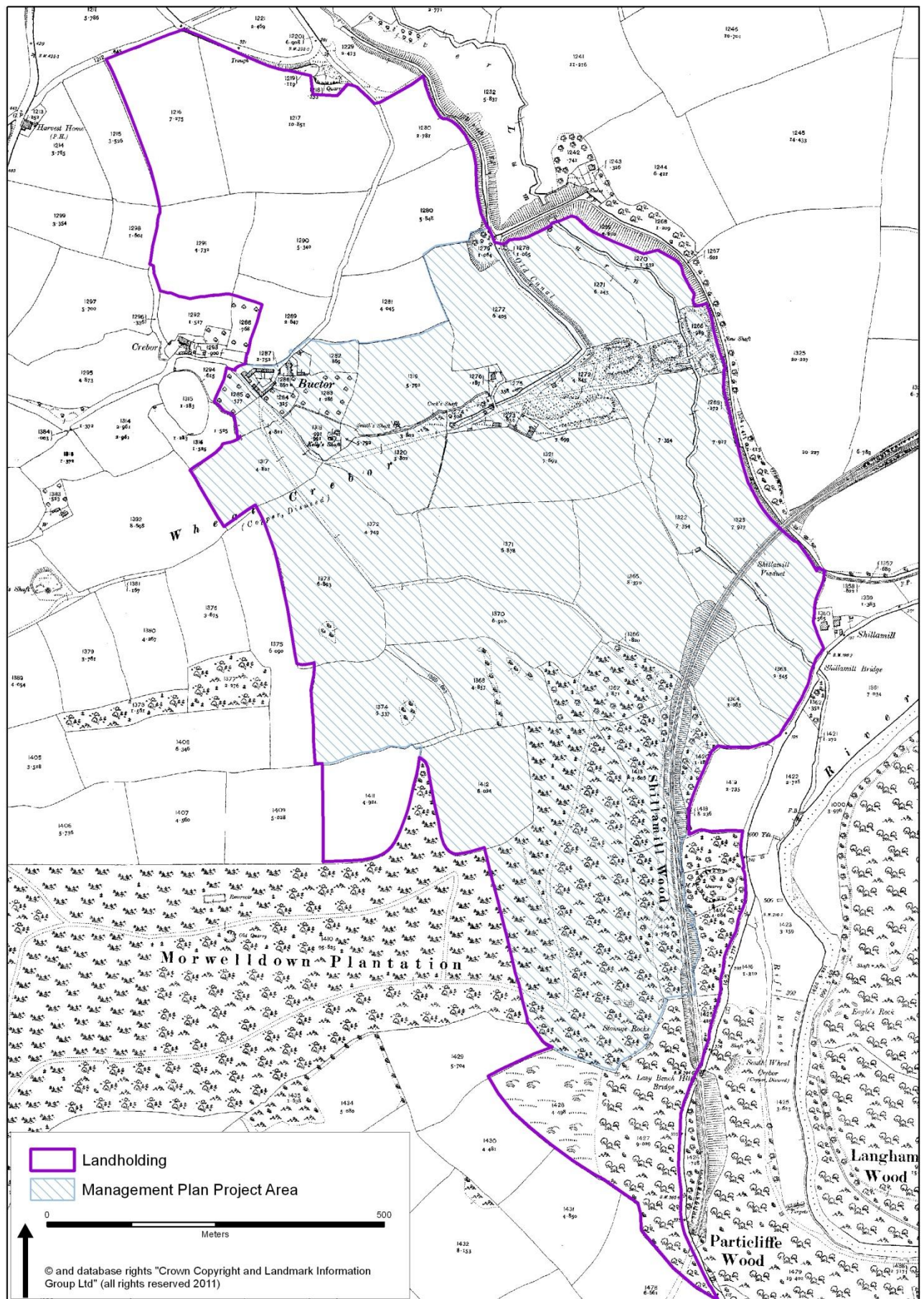


Figure 14 1908 OS map.





*Figure 15 1946 Aerial photograph of the study area (© Devon CC).*



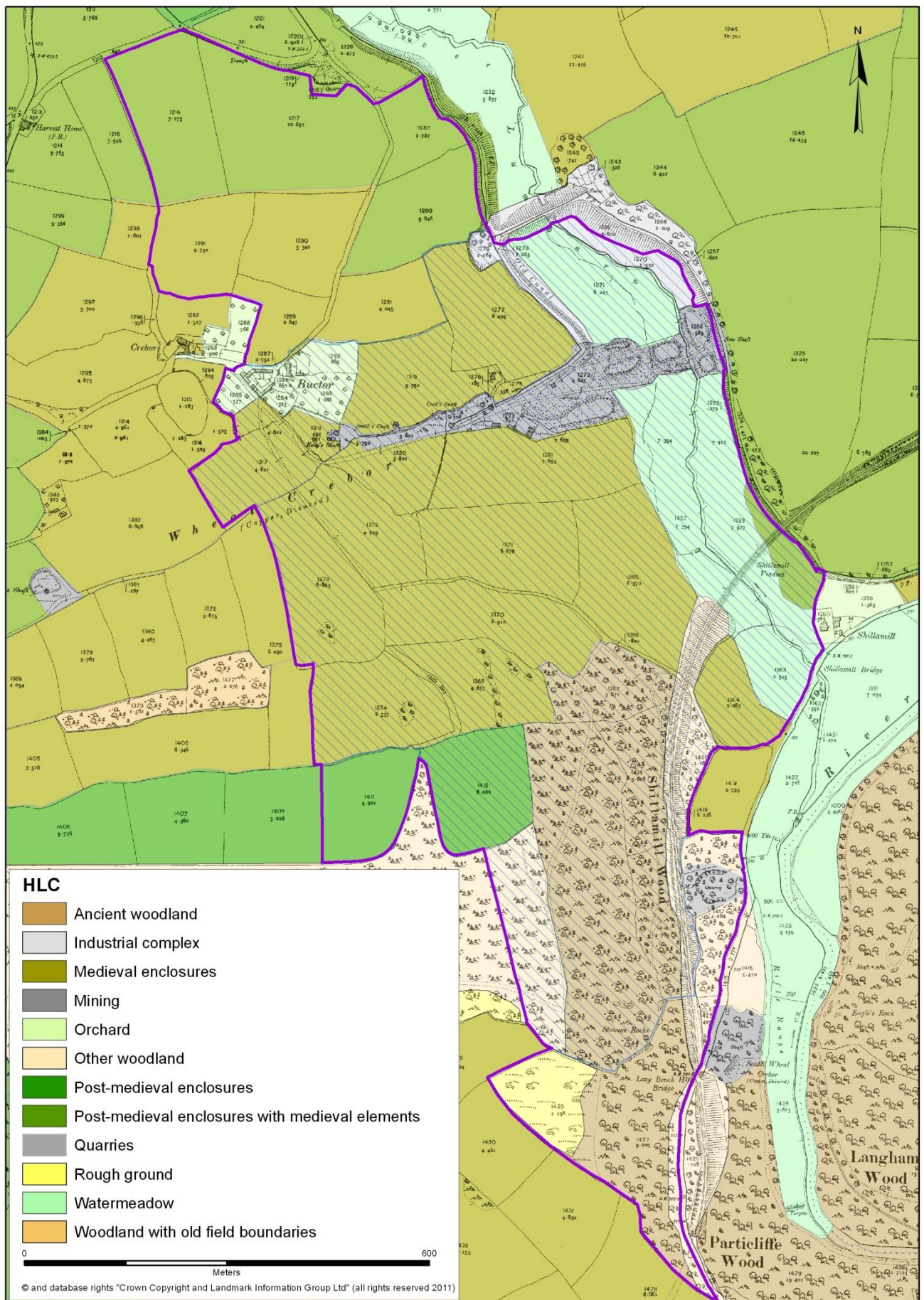


Figure 16 Historic Landscape Character Mapping (© Devon CC).



It is not known where this was erected but may have been at the western end of the sett (near Rundle's/Gill's Shafts (out of the study area). The engine was attempted to be sold at auction on 13/6/1857, which may post date the engine's sale. The mine property was sold for £1000 to a new company which was formed from 6000 shares. The output of the mine from 1821 to 1856 was in excess of 6000 tons of copper ore, realising over £19,000 (Justin Brookes, *ibid*).

**1855** There were 27 men and 10 boys working underground in November (Justin Brookes, *ibid*). But by 1858, sales of over £10,000 had only half met the outlay and the lease was transferred to another company.

**1858** Wheal Crebor Mining Company (1858 – 1893) was formed to work the mine. The mine was held at 1/15 dues from the Duke of Bedford under a 20 year lease from Christmas 1851. The (spare) steam engine was again put up for sale (presumably still languishing, unused, at the mine), together with its fly-wheel, boiler, pumps, etc (Justin Brookes, *ibid*).

**1862** The mine was 60 fms deep and employed 55 people (Justin Brookes, *ibid*). It appears that by this date the mine focussed on the eastern part of the sett close to (and beyond) the Lumburn river (and Tavistock Canal).

**1867** The Bedford Estates map of this year (Fig 9, T1258M E14B) outlines the Wheal Crebor mine sett, the agricultural and mining landscape with shafts and other features (leats and tramlines, etc), at surface. The extension of the present mining company eastwards can be seen by the sinking of Eastern Shaft (named New Shaft (Site 50) on the mine plans/sections: DRO MRO 5124), with the lode extending towards Wheal Crowndale.

**1868** Spargo (1868) described the mine as being 120 fms below adit (8 fms below ground level), and employed 44 people (36 men and boys, the remainder women). The same three water wheels described above were still operating, and in the 18 years of working calls amounted to about £15,000 and the present loss described as about £120 per month.

**1869** The Bedford Estates Steward (J Gilson) states: *'This company was formed in 1858 and has spent £15,900 in addition to its receipts from ores ... but has made no dividend. The mine is very economically worked and considerable trials have been made. It is worked and drained by three waterwheels. The ores are conveyed by the Tavistock Canal which runs through the sett to Morwellham. The mine water is partially cleansed by two depositing pits and more can be made should it be necessary. One shaft is described as being in use, and four abandoned.'* (DRO T1258M E14a-b).

**1873** The Duke of Bedford summoned the company's two lessees to Tavistock County Court on 1<sup>st</sup> January for £37 arrears of dues (although £792 had previously been paid since 1860). A correspondent for the Mining World Journal commented that this mine's shares had been subject to 'wild speculation' (Justin Brookes, *ibid*), which continued during the later 1870s (Justin Brookes, *ibid*) and early 1883s.

**1875** In the previous decade the mining company produced between 228 and 597 tons of mainly copper ore per annum, realising between £856 and £2,958 per annum (Burt *et al* 2014, CD stats). The Earl of Devon's mineral rights (see Fig 11), were transferred to the Bedford Estate (R Waterhouse *pers comm*). It is likely that by this date, all of the mineral wealth had already been mined.

**1876** A fresh lease was issued for 21 years with effect from March, dated September (Justin Brookes, *ibid*).

**1880** *'After a considerable outlay, said to be well over £60,000, the mine entered another productive period, producing over 8,500 tons of ore from 1884 to 1886. In the former year 141 were employed (65 underground; 76 at surface), and the mine was one of the very few in the West Country paying dividends from Copper... The total depth was then 200 fathoms and all ore was drawn to surface by a water wheel'* (Site 52; Barton 1964, 95).

**1885** The mine was still undertaking its pumping and winding from its large water wheels; all powered by water from the Tavistock Canal. But problems of flooding at the lower levels occurred when during canal cleaning, the water level was lowered and the water wheels had insufficient power to pump the lower levels of the mine (Barton *ibid*).

**1886** (copper) *'sales for the year ending June 30<sup>th</sup> 1886... Wheal Crebor in Tavistock sold 3,104 tons for £6494 (the third largest producer of copper in the south west). Out of 39 mines selling copper ores in this year, 20 sold less than a hundred tons each, most having only raised the ores as the 'by product' of tin mining'* (Devon Great Consols produced the most: 8,617 tons of low grade copper) (Rowe, 1993, 324).

**1887** For the first time, *'Watson Brothers reported in February that good stones of tin had been found at the 156 or bottom level ... where copper had ceased to exist, under the enormous deposit of arsenical mundic. In July the copper was reported to be gradually giving place to tin'* (Justin Brookes, *ibid*).

**1888** 129 people were employed, 52 on the surface, the rest underground. This figure fluctuated mainly downwards for the next few years. Arsenical pyrites had been increasingly produced from the eastern side of the sett since 1869, peaking from 1887 to 1890 (mostly over 2000 tons: nearly 3000 in 1889 – realising over £2390 in that year). However, also 1286 tons of copper was produced, valued at £4308 (Burt 2014 *ibid*).

**1889** In May, due to a combination of the fluctuating (downwards) fall in the price of copper (by £40 a ton), and the exhaustion of its copper lodes, the mine was faced with the prospect of closure. However, the mine manager, Moses Bawden resolved to lease the mine for 12 months at a royalty of 2s 6d in the £ on the gross produce, and the mine company's lease with the Duke was surrendered.

**1892** Copper returns diminished rapidly after 1889, with Moses Bawden focussing on arsenical pyrites, itself diminishing year by year until 1902 when only 294 tons were produced (Burt 2014 *ibid*). In May the holding mine company resolved to wind up the company, coppery mundic being the main product, the operating costs and labour charges being greater than the ore value. *'In July 1892 the mine was put up for auction as a going concern. Besides water wheels of 45' X 8' (main pumping engine via flat rods), 25' X 3' (New/Eastern Shaft winder), 30' X 4' 6" (incline plane wheel winder), and 12' x 1'6" (crusher/grinder mill) the equipment included six balance bobs, pitwork, rods, 300 fms. of single skip roads, 450 fms. of ladders, tram wagons, sheds, tools and jiggling machinery'* (Justin Brookes, *ibid*).

**1893** *'The liquidator noted that it was doubtful that the materials would realise enough to pay for drawing them to surface (estimated at £120) plus £140 which the Duke of Bedford had demanded for the cost of filling in wheelpits and fencing shafts, plus £54 for half a year's rent. He had accordingly accepted £140 for the mine from Moses Bawden, and this sum had been paid to the Duke of Bedford on the assignment of the lease to Mr Bawden'*. From 1860 to 1894 the mine had produced over 32,000 tons of copper ore valued at in excess of £106,000, and from 1872 to 1901 produced 24,820 tons of arsenical pyrites, with a small amount of tin stuff (Justin Brookes, *ibid*).

**1893-1900** Arsenical pyrites continued to be produced under the management of Moses Bawden. Nearly 10,000 tons were produced, valued at over £15,000. Employment reduced from 58 in 1893 to 12 in 1902 (Burt 2014 *ibid*).

**1901** The Bedford Estates Steward (Gilson Martin) states: *'Eleven men have been generally been employed on tribute, no explorations have been made. The men have ransacked the mine for copper ore and mundic between the 60 and 132 fathom levels both east and west of the Eastern Engine Shaft, I am sorry to say with unsatisfactory results on the whole, the quantity of mineral returned having been much less than last year and the prices paid for the produce have been much below those of 1900, so that the value of the returns made have shrunk from £1454 last year to £766 this year... I think most of the £688 named above has been a dead loss to Mr Bawden and his partner Mr Holman, if this is so an early stoppage of the mine may be expected for it*

*cannot be kept going by such returns as have been made this year' (DRO T1258M E14a-b).*

**1902** The mine was finally abandoned. Figure 11 (underground plan of the working levels - undated), and Figure 12 (a composite underground section of the final working levels from abandoned mine plans (courtesy of Robert Waterhouse), show the extent and depth of the workings over the previous century.

In the early decades of the 20<sup>th</sup> century, removal of most of the mine waste tips at Site 47 (to extract any metallic ores but primarily the arsenic pyrites content), occurred. The material was taken to an arsenic refining site (possibly Coombe Arsenic Works at Harrowbarrow, Cornwall– Robert Waterhouse *pers comm*), although other closer refining works (for example, as at Gawton or Devon Great Consols) cannot be discounted.

#### **4.2.7 Bere Alston to Tavistock Railway**

This section includes excerpts from a previous archaeological assessment survey of the railway line (Smith 2005):

The Great Western railway route from London (Paddington) to Plymouth is well known, but many people would be unaware that there was another, entirely separate main-line railway to Plymouth, which ran from Waterloo via Salisbury, Exeter and Okehampton to reach the city after travelling through Tavistock and the Bere peninsula.

In the mid-19<sup>th</sup> century the London and South Western Railway (LSWR) had long had ambitions for lines in Devon and Cornwall, going so far as to purchase the Bodmin and Wadebridge Railway in 1845, at a time when the South Western had not even reached Exeter. By 1876 the company had, by a process of gradual expansion westwards, reached Lydford via Crediton and Okehampton, and came to an agreement with the South Devon Railway to share its line via Tavistock and Yelverton to Plymouth. This last was a single-track broad-gauge branch, and a third rail had to be laid to accommodate the LSWR's standard-gauge trains. Through services began from London's Waterloo Station to Devonport, but while there was initial jubilation the limitations of the arrangement were soon evident, and by 1882 the LSWR was looking for an independent route into Plymouth (St John Thomas 1973, 122 -123).

*"As trade grew, relationships and working became more uneasy and clumsy; equally onerous was the South Devon's demand for a rent of 10 ½ pennies in every shilling of the South Western's gross receipts"* (Booker, 204).

A new company, the Plymouth, Devonport and South Western Junction Railway, was formed on August 25<sup>th</sup> 1883 by Act of Parliament to construct a line from a new central station in Plymouth via Devonport, St Budeaux, Bere Alston and Tavistock to join up with the existing London and South Western line at Lydford, a distance of some 22½ miles. The LSWR undertook to work the line, which had a board of directors including the Earl of Mount Edgcumbe, Lord St Levan and the Duke of Bedford, who between them provided almost all the land required for the new railway (Booker, 207). The first turf was cut on 29<sup>th</sup> March 1887 in Shillamill Wood. The cost, at £793,000, was high due to several major engineering works, including impressive viaducts at Tavistock, Shillamill and Ford, an eight-arched viaduct over the River Tavy and three long tunnels; at Shillamill, Ford and Devonport. The double-track line was built to main-line standards throughout. The work took three years, employing 2,000 navvies, twelve of whom died during the course of construction. The contractors were WT Relf and J Pethick, and 2 ½ million tons of earth were shifted. The Earl of Mount Edgcumbe built a mission hall at Bere Alston for the navvies, which survived until 1996 (John Snell *pers comm*).

A Board of Trade inspector visited the new railway on April 29<sup>th</sup> 1890 and the line was opened on June 2<sup>nd</sup>. Although independent, it was leased to the London and South Western Railway and operated by them, but never actually passed into their ownership, becoming instead part of the Southern Railway at the Grouping of 1923. On the day the

line opened a thousand people travelled by train from Plymouth to Tavistock. Even the inn at Bere Alston was overwhelmed by travellers (Booker 1971, 210).

*"Can we recapture the spirit of those railway celebrations of last century, when decorous old towns went almost wild with delight at the advent of the first train? Not easily! The coming of the railway meant for them the end of an age-long isolation, often stagnant, such as we know no longer in these islands save, perhaps, in the coming of the aeroplane to the Hebrides. But our grandparents and great grandparents, headed by mayor and mace-bearer, feted their first trains as the bringers of untold social improvement and unbounded commercial expansion. It was Progress, and they believed in Progress. The train rolled in from the East with the promise of a glorious dawn, and the Vicar invoked a blessing on it."* (Ellis 1950, 184).

The coming of the railway spelt great change for the Tamar Valley and the Bere Peninsula., as fast direct trains now gave the fruit growers of the area access to new markets. Coal and other essentials, which had hitherto been carried by barge to the ancient river quays, now came by rail to the smart new stations at Bere Alston and Bere Ferrers. The peninsula became a popular destination for day trips and school treats from Plymouth. Following the opening of the branch to Callington from Bere Alston in 1908, the economic impact on the Tamar Valley became even more profound, and such river traffic that had survived withered and died. The amount of freight handled at Tavistock station alone had reached 17,000 tons a year by 1907. The railway continued to prosper during the years after the Great War of 1914, and was perhaps at its busiest ever during World War Two, with evacuees from Plymouth and troop trains to swell the normal traffic. Despite being little known compared with the Great Western main line through South Devon, some railway historians fell under its spell, such as Hamilton Ellis:

*"Emergence of the train on Meldon Viaduct has a surprise quality for which one may seek far in railway travel, and surprises follow all the way to Plymouth, as with the first view down to Calstock, with its viaduct, from a noble curve on top of the ridge between Tavy and Tamar, as with the first view clear down to Saltash, and Brunel's bridge . . . Yes, it is a great line! Who, by daylight, would need to read in the train between Weybridge and St Budeaux?"* (Ellis 1950, 169).

The service provided on the line was a good one, with local trains between Plymouth and Tavistock serving all stations, and through trains from Plymouth to Exeter, Salisbury, and London (Waterloo), with one through train a day to Brighton. The journey from Bere Alston to Tavistock took around 12 minutes. From the early 1960s, however, this railway was progressively run-down in favour of the Western Region route from Paddington. The old South Devon Railway branch from Plymouth to Tavistock and Launceston closed at the end of 1962, which some observers thought might safeguard the future of the SR line, but Tavistock (North) lost its goods station in 1965 and the line between Okehampton and Bere Alston closed to passengers and all traffic on the 5<sup>th</sup> of May 1968. The year before, the noted railway author TWE Roche travelled both ways on the last through trains from Plymouth to Brighton:

3<sup>rd</sup> March 1967 – *"A Kelly College boy ran up to give us a wistful wave as we swept in above the roofs of Tavistock to the most crowded station we had yet seen – there must have been a hundred or more schoolchildren awaiting our arrival. We were a couple of minutes early, having come down from Okehampton in 26 minutes and we chatted as we stood poised on the viaduct above the Lilliputian gardens below. At 4.25 we were off again, along that incredibly beautiful stretch above the wooded windings of the Tavy, through Shillamill Tunnel and out on to the high land of Bere Alston's peninsula, Kit Hill and the Calstock Viaduct close to us on the right beyond the Tamar."* (Roche 1967, 67)

Since closure, the abandoned railway has gradually returned to nature. The station site at Tavistock has been redeveloped for the offices of WDBC and new housing. Part of the trackbed has sporadically been used for forestry operations, and since the 1990s the

section between the SR station at Tavistock and Crease Lane Bridge has been available to the public as a footpath and cycleway.

## 5 Archaeological/Ecological summary

### 5.1 Thematic outline of archaeological resource

This section gives a thematic outline of the archaeological resource within the land ownership project area, summarising information in the site inventory (Section 9.0) to provide a concise overview, cross referenced to the inventory by site number. Reference should also be made to Section 7.1 (site significance statement) and Section 9.3.1, summary management table of archaeological sites.

#### **Mining remains:**

- The **Lumburn Leat**, a 16km watercourse constructed in the late fifteenth century to power pumps at the Bere Ferrers Silver Mines, runs through this holding at approximately the 120m contour (Site 7). Although in parts the cutting has been levelled by agricultural processes, but well-defined earthwork remains are recorded within Shillamill Wood.
- **Medieval streamworks** are probable along the bottom and sides of the Lumburn Valley evidenced by landscape geomorphology and documentary evidence for a 16<sup>th</sup> century nearby 'knocking' (or Stamping Mill at Site 58).
- Possible mid-**18th century openwork** mine site at the same location as the Canal portal (Site 18.4) and Tavistock Cana route into the tunnel entrance, evidenced by documentary evidence of equivalent worked lodes along the same lode to the west, and mapped evidence (1765) of workings south west of Hole.
- **Wheal Crebor Mine** (1803 - 1886): This was one of the most productive copper mines in Devon during the early nineteenth century; the lode discovered during the construction of the canal tunnel: A compact mine site with a number of mine shafts (Sites 21, 22, 24, 44 and 50) and infilled waterwheel pits (Sites 26.1, 29, 39, 42 (or 44), and 52) following the east-west lode, and shallow adit shafts (Sites 38, 40, 42 and 43) to the edge of the River Lumburn. Low remains of mine buildings (Sites 31-34), except the stables and (office) buildings which are both extant (Sites 23 and 30). A later mine company (c 1820s and from 1845), extended eastwards to the west side of the River Lumburn (Sites 48 to 52), to exploit the eastern extent of the lode towards Crowndale Mine (see Figs 7-9).

#### **Tavistock Canal:**

- **The Tavistock Canal** (1803-1817) was built by John Taylor between 1803 and 1817, to connect the Tavistock mines copper outputs and trade to the Tamar at Morwellham, and then to the sea, with coal, lime and sand returned in the opposite direction. Its usefulness declined after the railway was built in 1859 and it was subsequently closed in the 1883s. The canal is now used as a source of water to power the Morwellham generator of the Central Electricity Board.
- **Bere Alston to Tavistock Railway:** The Waterloo to Plymouth Railway (via Salisbury, Exeter, Okehampton and Tavistock: built 1887-1890), operated by the London & South Western Railway cuts through the south eastern corner of the Buctor landholding, the Shillamill Viaduct (built 1889), its most impressive feature before the Shillamill tunnel.

#### **Other buildings:**

- The **Listed Grade II farmhouse** (Site 2) at Buctor is recorded as sixteenth century in origin, with good internal survival, (but ineligible for management under HLS), and currently undergoing complete restoration. The complex of farm buildings to the west appears to be an interesting example of an estate planned farmstead based on a triangular pattern and enclosed courtyard (c1860). It appears to survive intact,

with the horse engine house and internal courtyard divisions; relatively rare, which increases the significance of this range of buildings.

- The Bedford Estates water wheel powered pump house (c 1900s) is extant with its original twin pump *in situ* and iron water wheel.

**Key/well-preserved significant sites:**

- Significant extant sites include the Listed Building Farmhouse (Site 2), the triangular shaped Buctor Farm complex (Site 3), Wheal Crebor Stables (Site 30), the Tavistock Canal (Site 18), Morwell Tunnel Portal (Site 18.4), and the visible inclined shaft site adjacent to the portal (Site 26), with its related water wheel chamber (26.1). The Bedford Estates water wheel powered pump house (Site 53) is extant but needs short term structural remediation works.

## **5.2 Devon's Historic Environment Record Sites**

These sites within the study area have been identified from Devon's Historic Environment Record (MDV Number):

- Buctor Farmhouse (37341): Listed Building (Grade II: 1172158)
- Tavistock Canal North Portal (37342): Listed Building (Grade II: 1105729)
- Tavistock Canal Tunnel (4069): Listed Building (Grade II: 1105707)
- Bridge over Canal (37343): Listed Building (Grade II: 1305267)
- Shillamill Viaduct (51335/101081): Listed Building (Grade II: 1246222)
- Quarry (51337): Within landholding but out of plan study area
- Wheal Crebor Mine (3954)
- Tavistock Canal (4067/51333)
- Mill Hill Canal Branch (18721)
- Mill Hill Canal Horse Tramway (21606)
- Shillamill (Medieval Mill) (21285)
- Lumburn Leat (63055)
- Lumburn Leat rock cuttings (63073)
- Tavistock to Bere Alston Railway (72928)
- Shillamill Railway Tunnel and south portal (72999)
- Railway storage hut (73001)
- Lumburn Leat (63055)
- Railway Bridge over Buctor Lane (73012)
- Shillamill Canal Aqueduct (73904)
- Kelly's, Smith's and Cock's Shafts at Wheal Crebor (79918)
- Lower Adit Shafts at Wheal Crebor (79919)
- New (Eastern) Shaft at Wheal Crebor (79920)
- Tavistock Canal Air Shaft (79951)
- Possible mine shaft/quarry (79952)
- Possible mine shaft in woods (79953) Pits and surface working (79977)
- Pump House (106400)
- Pump House leat (106396)



### 5.3 Survey for European Protected Habitats and Species

This section gives a thematic outline of the ecological resource within the land ownership project area, summarising information from the ecological evaluation (CEC Report 2575, Section 3.0 and Appendix 2 – Survey notes/observations), to provide a concise overview. Relevant sites/issues/threats are cross referenced to the management plan site inventory description (Section 9.0). The presence of European Protected Species (EPS: Otters, Bats, Dormice and other species, for example, Greater Protected Newts), did not result in any positive sightings; however, the landholding has potential to support these species.

*Ecological survey summary:*

- **No habitats of European importance were recorded during the survey.**
- No Schedule 9 invasive species were recorded during the site visit.
- There is good habitat and features to support otters, bats and dormice, which are all European Protected Species.
- Otters are likely to be present along the river and river bank vegetation and other wetland features including leats, ponds, marshy grassland and woodlands alongside wetlands.
- There is potential for bats within buildings, bridges/viaducts, old mines and adits, canal tunnel, rock outcrops and mature trees.
- There is also good foraging habitat along the rivers, ponds and woodland edges. Hedges, especially those forming green lanes will also provide good foraging.
- The woodland and hedges with shrubs and trees provide suitable habitat for dormice.
- There is also evidence and potential for a number of non-European Protected.
- Species which have legal protection: Evidence of badgers was recorded and a roosting barn owl site identified.
- There is also good potential for numerous nesting birds and habitat for reptiles within un-shaded hedge banks and woodland /scrub edges and marshy grassland.

However, in terms of other protected and notable species; a possible badger sett was noted at Site 9, and a Barn Owl roosting site observed at the Pump House (Site 53). Management recommendations have already been provided by DCC (Steph Knight FEP dated 6/11/11), in terms of potential impacts to EPS through site management or possible conservation works (CEC Report 2015, Section 4.0 and Appendix 1: walkover survey target notes). In addition, Appendix 12.2 contains a precautionary method statement for small scale vegetation clearance impacting dormice, bats and the resulting impacts of tree felling and scrub clearance.

## 6 Designations

### 6.1 International

The Cornish Mining World Heritage Site (WHS) seeks to demonstrate the international importance of the developments within mining and allied technologies which took place within Cornwall and West Devon during the last half of the 18th century and into the 19th century, establishing beyond doubt the contribution of this region to the development of the modern, industrialised world.

The revised World Heritage Site Management Plan 2013-2018 (2013, 19), statement of Outstanding Universal Value and significance states that: *'The extensive Site comprises the most authentic and historically important components of the Cornwall and west Devon mining landscape dating principally from 1700-1914, the period during which the most significant industrial and social impacts occurred... The substantial remains within the Site are a prominent reminder of the contribution Cornwall and west Devon made to the Industrial Revolution in Britain and to the fundamental influence the area asserted on the development of mining globally'*. This demonstrates the far reaching

effects of the technological changes on the society, economy and landscape of the area, and identified a number of areas within Cornwall and West Devon where the results of these processes are still well-preserved.

The WHS areas, representative of the period of Cornish dominance of the mining world (c1700-1860), includes the project site within the Tamar Valley Mining District with Tavistock (Area 10); the Tavistock Canal is the primary World Heritage Site, linking Tavistock itself with the mines of the Tamar Valley.

The project area contributes to the mining Outstanding Universal Value categories of the overall Tamar Valley *'Area A10 is the most easterly and the second largest of the WHS Areas, this mining district A10 (i) lies in the Tamar Valley Area of Outstanding Natural Beauty and comprises both valley and upland settings for tin, copper, silver-lead and arsenic mining, ore-processing and smelting'*.

## 6.2 National

The entire project area is within the Tamar Valley Area of Outstanding Natural Beauty (AONB) – UID 1319.

There are no national ecological designated sites within the study area.

- Listed Buildings (Grade II):
- Buctor Farmhouse: Listed Building (Grade II: 1172158).
- Tavistock Canal North Portal: Listed Building (Grade II: 1105729).
- Tavistock Canal Tunnel: Listed Building (Grade II: 1105707).
- Bridge over Canal: Listed Building (Grade II: 1305267).
- Shillamill Viaduct: Listed Building (Grade II: 1246222).

# 7 Significance

## 7.1 Site significance

This section summarises the local, regional and national significance of the Buctor landholding area. It also examines the wider context of the study area in terms of the contextual relationship of the adjacent mid nineteenth century Tavy Mines to the south and the Tamar Mines to the west, all working the east/west copper lodes, and the relationship with earlier medieval alluvial tin mining along the sides of the Tamar/Tavy Valleys.

*'The historic features on this holding are of high significance, most of them associated with the World Heritage Site. Although some specific components of the WHS are believed to be in different ownership or management responsibility (such as the canal, tunnel and portal, Shillamill Viaduct, aqueduct and railway/canal bridges), others are part of this holding and can be considered a Historic Environment priority for management'* (Knight, DCC Archaeologist, 2014 Letter).

The study area is shown on Figure 1, and in detail on subsequent maps. The Buctor Farm landholding (centred SX462 763), contains a number of highly significant (primarily linear) industrial/transport archaeological features:

- The late 15th century Lumburn Leat (MDV 63055/63073, SX 45874 72003 to SX46431 71449, within landholding).
- The early 19th century Tavistock Canal (MDV 4067/51333/4069/37342/73904, SX 46664 72090 to SX46186 72587, within landholding).
- Wheal Crebor Mine (MDV 3954/79918/79919/79920, SX 4636 7231 centred),
- The railway line and Shillamill viaduct of the Tavistock to Bere Alston Railway (MDV 72928/72999/73001/73012, 1246222 SX 46464 71456 to SX46616 72169, within landholding), and a rare example of a small extant water wheel powered pumping house (SX 46476 72121).

- Some of the industrial sites are Grade II Listed and within/adjacent to the Cornwall and West Devon World Heritage Site.
- The main non-industrial/transport features of equal significance is the Listed farmhouse (101089, Site 2), and the triangular shaped farm complex (Site 3).

The landscape within the study area is a combination of agricultural pasturage, marshy wetlands along the Lumburn Valley floor, and woodland along the steep sides of the Tavy Valley, and is likely to have been for many centuries. However, the exception being the later mid-19<sup>th</sup> century planted enclosure of the Morwell Plantation (see Figs 4, 7-9, 13). Shillamill Woods and its steep slopes form a difficult topographical barrier for cultivation or pasturage. However, its ancient woodland character would have been severely impacted by its conversion to a conifer plantation in the 1960s (and also some important archaeological features), only a few remnant strips of its original mixed deciduous character now remains. Closer inspection may reveal some charcoal burning platforms, fragmentary sole evidence of an old woodland economic activity.

In the medieval and post-medieval period: *'The Duchy looked upon woods almost exclusively as a source of building material to be conserved and protected, and not as a source of revenue, although some income was received from the sale of dead and fallen trees which were especially numerous after high winds. In addition the woodlands provided small and occasional revenues from the sale of woodland pasture and pannage, from furze and ferns, wild honey and bird traps'* (Hatcher 1970, 185). This comment is as relevant to the Duke of Bedford Estates as any other large landowner. However, large conifer plantations have been planted during the last sixty years as tax incentives during government policies to increase woodland coverage. This policy of woodland preservation has changed to one of providing a sustainable financial income.

During massive exploitation of tin streaming from alluvial river beds from at least from the 11th century onwards, surface outcrops of tin would not have gone unnoticed. The reference of a nearby late 16<sup>th</sup> century 'knocking' (or 'knack') tin stamping mill is testament to the significance of the lower Lumburn Valley sections of the study area for tin workings. Through time, again through market demand, as alluvial mining had removed the surface tin, so mid-18th century (primarily copper) east-west lode back openworks continued across the landscape from the Tamar Valley (see Fig 8, 1859 lodes map and Figure 2, the 1765 map showing *'Old mine works'*). This was followed by 19th century technological steam advances and the identification of deep lodes and intensive underground development of mines through the sinking of shafts along and through the same lodes, combined with the progressive use of water or steam power for pumping and winding from the increasing depths.

Wheal Crebor Mine is a good example of the partial survival of a coherent early 19th century water powered mine complex and its range of related site components. These sites demonstrate a point in time when massive market demand for metallic ores to feed the industrial revolution (through the funding mechanism of a stock market), affected the agricultural landscape of a former scattered distribution of small farming settlements. Statutory Listing (Grade II) of the main site assets for the study area indicates the national significance of the industrial focus of the Tavistock Canal, Wheal Crebor Mine, and the railway. These significant mining related assets substantially contribute to the Outstanding Universal Value of the Tavistock Canal, linking the stannary town of Tavistock with the massive influence of the Tamar Valley as an export site and largest producer of Copper ore in Europe (Devon Great Consols).

The penultimate significant phase of landscape impact within the project area (and other parts of the Tavy Valley) is prior to the turn of the 19th century, when much improved transport facilities through the construction of the Waterloo to Plymouth Railway (via Salisbury, Exeter, Okehampton, Tavistock and Bere Alston), opened in 1890, operated by the London & South Western Railway, cut through the south eastern corner of the Buctor landholding. The Shillamill Viaduct (built 1889) is its most impressive feature, situated between Tavistock and the Shillamill tunnel. The railway

provided early season market demand and a speedy transport route for fruit and flower gardening entrepreneurs from the Tamar, and possibly the Tavy Valley as well. Given the demise of the canal nearly twenty years previously, this railway would have provided an alternative to road transport for industries that had London as its popular market destination.

In the context of other East Cornwall/West Devon and Tavy/Tamar Valley mining sites, the archaeological features within this study area are a significant and important asset: the relative continuity of metallic ore mining from the medieval period to the 20th century is demonstrated in these localities and accordingly all have been included in the Tamar Valley district (Area 10), as part of Cornwall's World Heritage Site. Conversely, the ecological significance of the study area is less so, although management recommendations will focus on improving the potential of its possible ecological assets.

## **7.2 General summary of significance**

Within the setting of the World Heritage Site, the Tavistock Canal - its waters still flowing, and Wheal Crebor Mine both retain significant and coherent remains of an early 19th century transport and mining enterprise. Although individually this smaller mine site has a medium significance when compared to other larger mine sites in the adjacent Tamar Valley, its contextual significance with the Tavistock Canal is high. Individual sites have been assigned low medium or high significance in the inventory. This is specific to the holding as a means of prioritising management action, but many sites are part of the significant mining industry associated with the WHS.

The steep sides of both the Tavy and Tamar Valleys, once the domain of mixed deciduous trees and ancient woodland, have, since the 20<sup>th</sup> century, been replanted with conifers, forever changing the area's significance and character. However, there are still a number of archaeological features that are well-preserved within this woodland setting – the Lumburn Leat being a good example.

# **8 Management Recommendations**

## **8.1 General recommendations**

The following management recommendations form a broad range of summary impact assessments, building conservation guidelines, site management and maintenance guidelines, WHS management policies, archaeological potential and recommendations for further archaeological interventions, all of which should be taken into account during the project implementation stage.

## **8.2 General impact assessment of potential building conservation works**

This report identifies and informs the client of the significant site assets and site constraints. If a separate capital works building conservation scheme is to be funded by NE and accepted by the landowner as part of increased public access to the Tavistock Canal and Wheal Crebor Mine, a separate provisional impact assessment report may need to be produced. This would contain an impact assessment for each site for which additional conservation works are proposed. This would inform the project developer and any other statutory (Defra), and non-statutory agencies (the Devon HET – Countryside Advice), of the impact of the site proposals on the identified site assets.

### **Future uses/threats/issues:**

- The remnant buildings of Wheal Crebor Mine and the Tavistock Canal are not proposed to be Scheduled by HE in the near future.
- The landowner has intimated that there are no plans to reuse or adapt any of the former sites or buildings described in this report.



- Appropriate vegetation/tree clearance and building conservation works would minimise further structural deterioration and preserve the sites for future generations.
- Site monitoring and supervision by the landowner would minimise possible accidental long-term damage to archaeological/ecological sites during contracted tree removal/thinning, etc.
- Pre-arranged public access through guided walks and educational school site visits should not result in an additional threat to any of the sites, given their low perceived frequency and guided (informed) nature of their visits. It is expected that vehicular access to any of the sites would be prohibited (except by the landowner and during any site works).
- Prior to the start of agreed conservation works, a site should be located for the contractor's vehicular access, site accommodation and a mortar mixing location.
- Consultation between any project developer and the relevant agencies should form a cohesive overall site project and conservation plan that not only conserves and protects the main significant site assets, but promotes these in a positive way to ensure safe, informative and pre-arranged educational public access.
- The current condition of the buildings and encroaching vegetation/trees are described in the Site Inventory (Section 9.2). However, if building conservation works are not soon carried out the structural deterioration of some buildings (Sites 21.1, 31-32.1, 33-34, 39.2 and 52-53), may well mean that they will collapse in the near future.

### **8.2.1 Guiding principles of potential building conservation works**

Appendix 12.4 reproduces a '*Mine landscape and buildings conservation philosophy*' which includes general building conservation specifications and an appropriate mitigation strategy to reduce the effect of any impacts. It is recommended that the following guiding principles for the Wheal Crebor and Bedford Pump House site buildings should be adhered to:

- The building conservation philosophy is based on respecting the character of each significant feature and its contextual relationship generally with other parts of this scheduled site. The long-term conservation and preservation of the built and standing archaeology should reflect its individuality, character and construction. The methodology of using traditional lime based mortar and timber structural components is intended to replicate its original construction technique; however, the end product is intended not to monumentalise the site but to conserve, protect and give the appearance of an old but safe structure. The building conservation text reproduced in the Appendix (12.4) is intended to describe in more detail the appropriate philosophy underlying building conservation works to enable safe public access and appropriate site interpretation.
- Contractors for the building conservation works should be experienced in the use of traditional materials and lime mortar techniques and specifications for use.
- An essential component of the mitigation strategy is the employment of an historic environment consultant who should ensure that Historic England (HE) principles of conservation practice are adhered to both in terms of the design of appropriate schemes, to ensure that consolidation works are carried out to acceptable HE standards, to ensure close liaison between statutory agencies, and to record any changes to the historic fabric. In addition it is important that the nature, extent and development of the site conservation works should be guided by the relevant short and long-term management plan policies (statutory, archaeological, conservation, ecological, mineralogical and WHS, etc), which are an important part of any mitigation strategy of the site (Section 12.4).

### **8.2.2 Site education/interpretation themes**

The provision of site interpretation via an appropriate medium is an important aspect of enabling the history and character of the area to be communicated. The following points represent key historical themes of the landscape:

#### *Medieval linear features in the landscape*

The course of the leat serving Shillamill medieval mill cannot be seen and evidence for the linear site of the late fifteenth century Lumburn Leat across present day agricultural land is also difficult to perceive – however, undulations in the landscape and how they relate to archaeological sub-surface remains may be evidenced by aerial photographic rectification and more recent advances in Lidar survey techniques.

#### *Post-medieval estate settlement features*

The layout and interpretation of the Crebor farm settlement buildings (Sites 1-3), provides an opportunity (particularly for educational site visits) for people (young and old), to see how changes in estate management farming policy can result in big changes to settlements (and the consequence on tenure and livelihood).

#### *Industrial archaeology*

- Changes in land use as alluvial valley streamworks operated from the medieval to the late medieval period, with the site of a late 16<sup>th</sup> century stamps mill documented within the study area (Section 4).
- Further changes in land use during the early 18<sup>th</sup> century as deeper tin/copper mineral lodes extended from the west of the study area (over Morwelldown prior to enclosure), and then exploited through gunnises (stockworks), adits, lode-back working and deeper shafts.
- More extensive industrialisation as operations were financed by a few (primarily 19th century) industrial entrepreneurs and mineral landowners.
- Advances in pumping, air ventilation and mechanical engineering technology from the early 19th century (engineered/utilised By John Taylor – Section 4.2.5).
- The decline of mines in the Tavy and Tamar Valley area before and closely after the turn of the 20th century as the copper and mundic lodes were exhausted and world market ore prices fell.
- The industrial character of relatively small, mainly water powered copper mines, reflects similar other Tavy (and Tamar) Valley mines. The key sites could be integrated into a scheme of limited public access (for example guided walks), are Wheal Crebor Mine and the Tavistock Canal Portal with inclined plane shaft and water wheel. The site could be accessed via the Tavistock Canal.

#### *The coming of the railways*

The arrival of the railway into Devon/Cornwall from the 1860s onwards had a massive negative effect on the local market economy, for road, river and canal. But from a Tamar and Tavy Valley perspective, it opened up flower and fruit markets to London and beyond – amplifying early summer market gardening produce to other parts of the country. Alternatively, from a landscape perspective, the Shillamill viaduct imposed a massive change to the visual topography of the lower Lumburn Valley.

#### *Site interpretation conflicts*

The approach to any proposed site management and conservation works to present and interpret these sites will need to take into account two potentially contradictory elements:

- Retaining the sense of an abandoned site, returning to 'nature' (reflecting the demise of the particular socio-economic context which led to its development), within its now rural/woodland context.

- Ensuring that appropriate sites, areas and views are sufficiently open (and conserved) to enable the complex overall and key contextual components within it to be safely accessible and understandable. The removal and management of obscuring trees and dense vegetation will be an important part of this philosophy, as long as ecological factors are not compromised. For example, at a certain location, the existing public access along the Tavistock Canal could be utilised as an informative sight line. The lower slopes could be cleared of vegetation and some small trees to view both the adjacent archaeological sites (52 and 52.1), and perhaps across the Lumburn Valley to Wheal Crebor.

Once specific public access routes both to/from and within the site are determined, site information could be produced and possibly the creation of historical informative web sites and related leaflets with detailed booklets could be part of an Interpretation Strategy.

### 8.3 WHS policies

The WHS policies given below are relevant excerpts relating to the proposed site development from the revised WHS Management Plan 2013-2018. These remain unchanged from the original management plan (2005 – 2010), but have been re-ordered to refer back to the four core areas of activity set out in the World Heritage Convention; these are **Protection, Conservation & Enhancement, Presentation** and **Transmit**. All four groups of policies generally relate to the Buctor landholding and its relationship to the World Heritage Site. However, the Conservation and Enhancement group (namely: Issue 7 Sustainable development, Issue 8 Conservation of key components, and Issue 9 Curation of archives & collections), is specifically relevant to the site both at present and for future development proposals. The following policies relate to the revised 2013-18 WHS Management Plan:

#### **Conservation and Enhancement**

##### ***Sustainable development***

*Policy C5: Landscape, nature conservation and Countryside management regimes should have regard for the authenticity and values of the site.*

##### ***Conservation and maintenance of key components***

*Policy C6: The conservation and continuing maintenance of the historic fabric of the site should be undertaken to the highest standards to ensure authenticity and integrity.*

*Policy C7: The historic character and distinctiveness of the Cornwall and West Devon mining landscape should be maintained.*

*Policy C8: Traditional materials and skills should be encouraged in the maintenance of the authentic historic fabric within the site.*

##### ***Presentation***

*Policy PN1: The partnership should promote access to the World Heritage Site that is sustainable to the environment and consistent to the values of the Site.*

*Policy PN3: Visitors should be encouraged to explore and learn about the physical, social and cultural aspects of the Cornwall and West Devon mining heritage.*

*Policy PN8: Enjoyment of the World Heritage Site should be available to all regardless of ability or income.*

##### ***Transmit***

*Policy T1: The values and significance of the World Heritage Site should be communicated to a wide range of educational audiences.*

## **8.4 Archaeological potential below ground**

Contingency funding should be made available as part of any proposed works to allow for an appropriate level of archaeological recording if shallow mining or other archaeological features are revealed during the course of any works programme. However, detailed consultations with the Devon County Council Historic Environment Archaeologist should take place at every stage of the project where below ground archaeological features are likely to be affected.

## **8.5 Further archaeological work**

- Vegetation and tree management clearance could be used to safeguard existing sites and to enhance surviving masonry or below-ground remains. It has already been recommended that this work be undertaken before any building consolidation works commence.
- Archaeological monitoring and recording may be needed during any geotechnical works (shaft plugging/fencing safety works, etc), in addition to archaeological recording and historic buildings consultancy.
- It is important to ensure that a dialogue is set up for the continued managed preservation of archaeological and potential ecological sites (perhaps utilising Environmental Stewardship Schemes).
- Thought should be given to the improvement of access through pre-arranged guided trips (at the discretion of the landowner): possibly through a limited number of guided walks and educational visits from schools; this is an important focus of the NE scheme (see Section 2.1). It is hoped that a guided circular walk would enable visitors to access the majority of the significant sites.
- The inclusion of all sites in published material (guidebooks/leaflets-histories/web sites, etc) is recommended. These should include detailed maps derived from research and surveys.
- The form of any future survey, excavation or analysis could be linked to a research agenda with the aim of answering key questions on aspects of historic mining and the associated industrial landscape.

### **8.5.1 Archaeological site consultancy**

A project brief for archaeological recording and consultancy should be developed with advice from a Devon County Council Historic Environment Archaeologist, if there will be known impacts to the historic environment resource (ie, for example building conservation works or tree/vegetation management). Provision should be made for a suitably qualified archaeologist to be present to record (and if necessary survey), archaeological features that may be affected by any works in line with the general and specific recommendations contained within this report.

### **8.5.2 Historic buildings/archaeological consultancy and recording**

There is a close relationship between the historic buildings consultancy and archaeological recording elements – essentially both are intricately tied together. It is generally more cost effective to combine both of the roles into a single work specification which could be undertaken simultaneously. For example, in the recent HLF Mineral Tramways, King Edward Mine HLF project, the Tamar Valley Mines Heritage Project and the East Cornwall Regeneration Project, the archaeological brief for this work was produced by the CC Senior Development Officer (Historic Environment) and approved by CC (WHS) Advice team, who combined both of these elements as a mechanism to ensure that the building conservation work is undertaken in a consistent style across the Devon and Cornwall WHS area and to ensure that site contractors strictly follow Historic England guidance for building conservation works.



- The project brief should describe in detail the nature and extent of the buildings consultancy, the standards of archaeological recording (to meet CAU and CIFA National Standards) and specify the archaeological recording report.
- Specifications for works should be agreed by the Devon County Council Historic Environment Archaeologist, and advised by a contracted experienced site archaeologist. These should follow the principles of good conservation practice set out in *A Guide to Conserving Historic Mine Buildings in Cornwall* (Sharpe, Johnson and Lewis 1996), Historic England's general principles and guidelines (Ashurst 1989, Bereton 1991), and appropriate WHS Management Plan policies.
- The consolidation of some structures is considered an urgent priority, if further collapse (and loss of the buildings), is to be avoided. A list of these sites can be seen in Section 9.3.2. Sites and structures should only be considered for consolidation/enhancement on the basis of their historical importance, significance and condition.

## 8.6 Statement of likely COSHH hazards

The mines within the Tamar and Tavy Valley areas are highly mineralised, and particularly in this area were amongst the 19th century's principal producers of copper and latterly arsenic. Residues from the mining activity have resulted in un-vegetated spoil tips (Site 47) and local soils which may be highly contaminated with arsenic (ranging from 120 to 52,600 µg/g), copper and tin.

In a relatively recent study at New Consols Mine, Lucket, Cornwall (the former slimes area at the bottom of the valley), testing levels of arsenic, lead and copper in the soil, surface water and mine waste, both copper and arsenic concentrations in the soil samples massively exceeded the ICRCL threshold triggers. In addition, the arsenic concentrations in surface water at the slimes site exceeded the WHO guidelines for drinking water. However, simultaneous exposure to the environment can also be from a number of other elements present in the mining waste at highly elevated levels, including zinc, antimony, molybdenum, tin, selenium and mercury. COSHH hazards within the study area may only be present close to former dressing floors; further testing is recommended if regular public access to these sites is to be encouraged.

### Note:

Although this report identifies some health and safety issues it is not intended as a health and safety assessment of the site or of individual features. CAU disclaims liability for Health and Safety issues arising from the use and management of the site.

# 9 Site inventory

## 9.1 General comments

- Refer to Figure 40 (Site Inventory map), to locate these sites within the project area.
- All identified structures and sites are located by a 10-figure grid reference (from OS map data). In most instances these relate to a point at the centre of the feature/structure. If the feature covers a large area, the NGR is an eight or six number grid reference. Linear features (canals, railways, leats, etc), are given NGR at either end where possible (within the landholding).
- Management recommendations for each site have taken into account a combination of the proximity of public access (and consequently the need for a higher safety factor), the short/long term preservation of archaeological features and ecological management recommendations.
- A descriptive site significance rating, Low (L), Medium (M) and High (H), has been applied to every site inventory entry and in Section 9.3.1, the summary

management table. The purpose of this is to help with the prioritisation of conservation works. The descriptive significance rating within the site includes the elements: feature condition, survival, complexity, context and rarity value. However, the final significance grading may also be skewed by a further comparative rating with other sites in the locality. Note that a Low significance rating does not imply that the site can or should be impacted or otherwise affected to any greater degree than a High significance site; and that all historic features on the holding need to be proactively and protectively managed.

- The site inventory includes cross references to the Devon site monument numbers, the Listed Building numbers, and to the contemporary Cornwall Environmental Consultants (CEC) Survey 2015 site numbers.
- If CEC recommendations for a specific site are made (rather than its potential), then these are replicated within the management recommendations.
- The archaeological site inventory within this management plan is not an exhaustive inventory of all archaeological features within the study area – only significant sites have been included that may have implications for site management under future Environmental Stewardship schemes.

Future management recommendations (whether or not conservation occurs), relate to reducing any increase of vegetation (particularly brambles, cotoneaster and possibly ivy). Removal of earth/grass/brambles, etc on top of walls should be undertaken once every five years – again to reduce cumulative build up. Patch repointing of weather sides and possibly wall tops may need to be undertaken after a decade (if works are undertaken). If these recommendations are not acted upon brambles, etc will grow out of the walls, making buildings unsightly and ultimately cause structural damage due to excessive root growth. Water ingress through deterioration of wall capping (due to neglect) would also cause structural deterioration at a lower level.

## 9.2 Site inventory

### Site 1 Buctor Bank barn SX 45887 72377 CEC 28

#### *Background*

This typical 19<sup>th</sup> century bank barn (the upslope bank now removed) appears to have been built between 1848 (Fig 7) and 1859 (Fig 8), and is shown on archive maps thereafter.

#### *Survey*

There was (remnants remain) cider pound/press apparatus within the building, and an extant apple crusher. Traditionally stone built with granite quoins, a half-hipped slate roof with the bank on the north side.

#### *Recommendations*

None – the building is privately owned by Mr Hutchins and is out of the Stewardship area. However, although it is not Listed as a national heritage asset, its significance is high. Therefore it is hoped that any scheme for conservation would be appropriate to its group value with the associated and adjacent Listed farmhouse (Site 2).

### Site 2 Buctor (Crebor) Farmhouse SX 45872 72389 MDV 37341/101089

#### **LBII 1172158 CEC 28**

#### *Background*

Crebor Farmhouse has been described as early 16<sup>th</sup> century with later 16<sup>th</sup> or early 17<sup>th</sup> century cross wing, and later additions and alterations of mid-19<sup>th</sup>/20<sup>th</sup> century. There is no doubt that this building has not survived its original medieval form, but has become truncated from its south end by (possibly) the 17<sup>th</sup> century, a later extension

now possibly forming the main body of the house. The earliest map of the settlement (1765 map in Fig 2) shows the same layout as at present. However, it may well be that this site was not the primary medieval site (its name place documented since 1193) of Creber – this may well have been to the west (the larger 'Creber' labelling shown on Fig 2). The site name 'Buctor' is first shown on the 1883 OS (Fig 13) map, possibly following the construction of the new yard and farm buildings in the 1860s. It is likely that the 1867 Bedford Estates map may have been based on earlier survey detail.

#### *Survey*

This building's listing description is not given. The site is privately owned by the landholder and is not part of the Higher Level Stewardship project. The building has Listed Building Consent for extensive rebuilding and consolidation works.

#### *Recommendation*

Not applicable.

### **Site 3 Buctor Farm buildings and yard SX c45828 72373 MDV 101089 CEC 28**

#### *Background*

The 1867 Bedford Estates map (Fig 9, T1258M E14B), confusingly labels Little Buctor (although it had not been labelled in the previous 1842 and 1848 maps), and Great Buctor is not shown for the first time. However, the new farm courtyard buildings at Buctor (labelled Crebor on the 1867 Bedford Estates Map), are shown for the first time. This suggests that the removal of Great Buctor Farm may be contemporary with the construction of these new farm buildings at Crebor (named Buctor after the 1883s), the masonry perhaps reused between 1848 (Fig 7), and 1867 (Fig 9). This may have occurred in the early 1860s (D Hutchins *pers comm*), perhaps a Bedford Estates strategic move to focus on centralising agricultural unitary farmsteads. The south west side of the yard was formed next to the new access track to Wheal Crebor Mine – the track created no doubt within the early years of the 1800s.

#### *Survey*

The buildings appear to be of single contemporary construction (granite and stone walls with slate roofs, although a detailed survey is necessary to confirm this. The buildings include two barns with stabling below, two milking parlours (with post WW2 milking equipment), horse stabling, a horse cart linhay with three openings, a large barn with a threshing machine and *in situ* horse-whim building. The yard is partially cobbled and also contains a large cattle byre building (used in the winter).

However, this site is privately owned by the landholder and is not part of the Higher Level Stewardship project.

#### *Recommendation*

Given the quality of these agricultural buildings and their associated group value with the nearby farmhouse, it is recommended that they are Listed as a monument of national interest. It is hoped that any scheme for conservation would be appropriate to its group value with the associated and adjacent Listed farmhouse (Site 2).

### **Site 4 Tavistock canal/tunnel shaft and horse-whim SX 45927 72002 MDV 79951 CEC 27**

#### *Background*

This shaft is neither labelled nor shown on any mine plan or map within this report. It is sunk on the tunnel alignment as both an air/ventilation shaft for the workers, and used

as a medium through which waste material could be brought to surface rather than taken back to the tunnel mouth – via a horse-whim.

#### *Survey*

The shaft opening is not visible at surface, but it is sited within the large mound, surmounted by trees. There are three elongated linear (tramway) tip lines forming the mound – approximately 4m height above downslope ground level, and approximately 1m above upslope ground level. The horse-whim would have been relatively near the shaft – but neither this site nor the shaft is visible (Fig 17).

#### *Significance*

Medium

This site area has a medium significance rating, given the lack of any other supporting archaeological site evidence.

#### *Recommendation*

Given the trampling of the ground at this site, animals may well use it for shelter or shade. Thought should be given to locating and fencing the shaft site and providing a shaft warning marker.

### **Site 5 Site of Great Buctor SX c45974 72065**

#### *Background*

This small settlement is shown in detail on Figure 2, the 1765 map, and existed up to 1859 (Fig 8). Name place evidence suggests it existed at least since 1414 – a small medieval farm holding. From approximately 1860, presumably either tenancy ended or a decision was taken to remove the smallholding entirely at a similar time as construction of the new farmyard buildings at Buctor, perhaps to make a larger more efficient farm landholding for the Bedford Estates.

#### *Survey*

There is no visible evidence whatsoever of this former farm site.

#### *Significance*

Low

#### *Recommendation*

Future management recommendations relate to minimising deep ploughing in the vicinity of this site – any future aerial (Lidar) or magnetometer surveys may well identify building foundations.

### **Site 6 Site of Little Buctor SX c46139 72066**

#### *Background*

Refer to the background comments given in Site 5. However, confusingly Little Buctor is shown on the 1867 mine plan (rather than Great Buctor). Both are gone by 1883 (Fig 13).

#### *Survey*

There is no visible evidence whatsoever of this former farm site.

#### *Significance*

Low



### *Recommendation*

Future management recommendations relate to minimising deep ploughing in the vicinity of this site – any future aerial (Lidar) or magnetometer surveys may well identify building foundations.

### **Site 7 Lumburn Leat SX 45874 72003 to 46431 71449 MDV 63055 CEC 24**

7.1 Leat sluice/feed SX 46334 71841 to SX 46393 71853

7.2 Stonage Rock tunnels SX 4643 7145 CEC 22

### *Background*

Refer to Section 4.2.4 for background information. Site 7.1, the leat sluice feed – may provide evidence that either sluices were used to limit flooding or over filling of the leat during wet times, or alternatively other feeds were taken off the leat to feed other mills (whether stamping or corn mills), for example in this case there was in this proximity a Knocking Mill (Site 58), or alternatively, Shillamill at the bottom of the valley. It is more likely that the leat was used for these other schemes after its primary use ended in the late 15<sup>th</sup> century. Tunnelling through the local rock outcrops in the Tavy Valley (Site 7.2) to continue the course of the leat has also occurred in later years in the Tamar Valley (Buck 2005, 22, Fig 13).

### *Survey*

Figure 40, the site inventory map shows the route of the Lumburn leat within the study area. Figure 15, the 1946 aerial photo of the study area shows that there is very little evidence of the leat as it crosses the landholding from east to west – until it enters Shillamill Wood. It is likely that the hedge line which marks part of its route across farmland, is formed on the lower side of the leats channel. In woodland the leat is approximately 0.7m wide, and its upslope bank 0.7 to 1.1m high, again often with a hedge-line surmounted on the downslope side (refer to Fig 18).

Site 7.1 the leat feed is approximately 1m wide across the base, and it takes a sharp turn before it reaches a small rock outcrop, to turn northwards. The Stonage Rock tunnels are described and photographed in detail (Claughton *et al* 2009, 119). Unfortunately access to the tunnels themselves (Site 7.2), were restricted due to dense vegetation – and their site on the edge of the limit of the study area.

### *Significance*

High

There are very few late 15<sup>th</sup> century leats surviving in the country – never mind across 16km of landscape forming the project area. The degree of preservation in the woodland is good – and should remain so in the future, subject to appropriate land management techniques.

### *Recommendations*

Section 12.3 summarises management recommendations for the long term preservation of archaeological features within woodland settings. Any future aerial (Lidar) or magnetometer surveys may well identify the course of the leat in its open field settings.

## **Site 8 Possible shaft/quarry SX 46043 71875 MDV 79952 CEC 25**

### **8.1 Track to quarry/shaft SX 46013 71982 to SX 46052 71829**

#### *Background*

This feature is not labelled as a shaft on any viewed map or plan, although the Devon Historic Environment Register (HER) sites this as a possible shaft based on evidence from Newman (2011, Site 9). Lack of detailed surveys until 1867 (Fig 9: shaft/lodes map), do not help to identify its function, however, all maps after that date show it as a small circular area of rough or wooded ground. Nevertheless, this site and that to the east (Site 9 – possible shaft), may be on the same mineral lode line, and may have its origins as a linear outcrop working (now obscured). To the south, within Morwelldown Plantation (Fig 13), there is evidence of further pits/earthworks and evidence of former (probably) 17/18<sup>th</sup> century workings. Alternatively, there are a number of small quarries distributed across the project area, usually the result of needing stone for the erection of buildings or perhaps for hedging. The 'holloway' track (Site 8.1) leading to this site appears to be quite old and has provided access to the upper (outfield) slopes (or previous downland), for Great and Little Buctor for centuries. However, the track effectively ends at the southern side of the feature – which may have only functioned as a stone quarry.

#### *Survey*

There is no evidence of any shaft or shaft subsidence. The main feature is a tree covered site with a rocky outcrop at surface. The deep access track has evidence of old hedging styles, which in places need slight repairs.

#### *Significance*

Medium

The medium significance for this site relates to the possibility of it siting an old shaft.

#### *Recommendations*

Given the trampling of the ground at this site, animals may well use it for shelter or shade. Thought should be given to locating and fencing a possible shaft and providing a shaft warning marker. The access track should be repaired where appropriate replicating adjacent hedging styles.

## **Site 9 Possible shaft SX 46202 71949 MDV 79953 CEC 26**

#### *Background*

Refer to background shaft comments given in Site 8.

#### *Survey*

There is no evidence of any shaft or shaft subsidence.

#### *Significance*

Medium

The medium significance for this site relates to the possibility of it siting an old shaft.

#### *Recommendations*

Thought should be given to locating and fencing a possible shaft and providing a shaft warning marker.



Figure 17  
Tavistock Tunnel  
Shaft (Site 4, MDV  
79951) (© CAU  
2015).

Figure 18 Lumburn Leat in Shillamill Woods  
(Site 7, MDV 63055) (© CAU 2015).



Figure 19 Tunnel  
under railway (Site  
10.1)

## **Site 10 South Wheal Crebor Mine SX 46452 71454**

10.1 Tunnel under railway SX 46454 71454 to 46475 71457 CEC 23

### *Background*

Whilst the low lying masonry remains of South Wheal Crebor (Newman 2011, Site 10), are outside the eastern side of the stewardship landholding, the leat tunnel is within the site ownership. The South Wheal Crebor Mine Sett plan (1867: DHC T1258 M/E/14b, and reproduced in Newman 2011, fig 6), labels an 'Adit' at the northern end of the core mine site – close to the eastern end of this feature. This tunnel feature appears to allow water from the steep western side of the Tavy Valley (Stonage Rocks) mine workings to either enter the River Tavy, or to be re-used within the mine itself as a power or dressing water source. Another alternative functional interpretation could be that the tunnel was a cattle/sheep 'creep'.

### *Survey*

The tunnel portal is fully extant. Figure 19 shows the feature from the west side. It is approximately 3m high and 1.9m wide, built of granite stone with arched portals and killas stone interior. The stone has been revetted on both north and south sides of each embankment cutting, on both sides of the disused railway line. A build-up mound of earth and leaf mould slightly restricts visual evidence of both openings, and helps to retain water build within the tunnel.

### *Significance*

#### *Medium*

The tunnel feature is within the landholding of Mr Hutchins. The feature is extant and in a relatively good condition.

### *Recommendation*

The site should be retained, with a minimal amount of disturbance to the masonry and adit mouths. Any future reuse of the railway line will need to clear out this feature. The CEC survey (2015, Site 23) stated: '*no obvious gaps for crevice bats. Low potential for use as a transitional or night roost by free-hanging bats*'.

## **Site 11 Tavistock to Bere Alston Railway SX 46464 71456 to SX 46616 72169 MDV 72928 CEC 19**

11.1 Permanent Way Hut SX 46431 71762 MDV 73001 CEC 21

11.2 Buctor Lane Bridge SX 46458 71927 MDV 73012 CEC 17

11.3 Shillamill Viaduct SX 46487 72006 to SX 46615 MDV 51335/101081

CEC 14 LBII 1246222

11.4 Shillamill Tunnel SX 45746 71110 MDV 72999

11.5 Lazy Bench Hill Bridge SX 46480 71350

### *Background*

Refer to Section 4.2.7 for the historical background. The railway is substantially intact, with only two bridges having been demolished between Bere Alston and Tavistock station. The remainder of the civil engineering works are in place and suitable for reuse. The line is a fine example of a late Victorian main-line railway, and one of the last examples to be built in the west of England. From an archaeological and historical perspective, there are good examples of railway overbridges and under bridges, embankments, cuttings, a tunnel and a viaduct, all of which have excellent individual and group value and which clearly demonstrate the technology of railway construction.



## Survey

The trackbed is overgrown in many places but is essentially unobstructed, with the original ballast stone in evidence. From Lazy Bench Hill Bridge (Site 11.5) to Buctor Lane Bridge (Site 11.2), the railway line continues north on a shelf cut into the hillside, initially with a high retaining wall on the east side of the formation, and then embankment. The route is clear of vegetation for the majority of the length, as it has been used for forestry access in recent times. Immediately south of Buctor Lane Bridge either the trackbed level has sunk or the ballast has been removed, causing a dip in the formation.

Site 11.1: The Permanent Way Hut (Fig 20) is constructed of standard pre-cast concrete and stands beside the west side of the line (looking north). It is very overgrown with trees and scrub, and is in poor condition. It appears to have suffered from vandalism, as most of the wall panels have gone and the roof is cracked and partly collapsed.

Site 11.2: Buctor Lane Bridge (Fig 21) sign states 'Distance from Waterloo – 215 miles, 65 chains'. A single-arch bridge carries the railway over a farm lane. The skew arch is of brick, with cut granite voussoirs, stone abutments, and rusticated masonry wing walls. The parapet is of rubble masonry with an iron handrail. The bridge appears to be in reasonable condition, with some ivy growing on the structure.

Site 11.3: Shillamill Viaduct (Fig 22) was not assessed in detail from its upper trackbed. The viaduct has been closed off from the railway at either end with concrete block walls and a locked steel door at the south, and so could not be inspected as part of this survey. Shillamill Viaduct has twelve 46 foot spans which carry the railway across the Lumburn River and the Tavistock canal. The viaduct was intended to have two additional arches at the south end, but these were replaced by an embankment to dispose of excess material from elsewhere on the line. From the top are excellent views of the Lumburn valley and the Tavistock Canal.

Site 11.4: Shillamill Tunnel and portal is adjacent to the southern tip of the property landholding of Mr Hutchins. This site has been included for contextual reasons. The tunnel portal is of roughly coursed rusticated ashlar masonry, with granite voussoirs to the arch. The first section of the tunnel is brick-lined. On the west side of the portal is a retaining wing wall against the cutting, with a false arch. The tunnel mouth is closed off with steel gates and fencing. The portal appears to be in good structural order.

*'Shillamill Tunnel is 603 yards (550 metres) long on a gradient of 1 in 98, and has a curve at either end, so there is no clear view from portal to portal. The tunnel is lined with brick immediately inside the entrances, and is then lined with stone on the arch, but the walls are unlined and left as rock-cut in many places; at intervals there are refuges built into the walls. There has been some more recent patching in places with brick, presumably where the masonry lining has failed. The ballast for the permanent way is still in place throughout the tunnel, as are the centre track drains which are accessed by concrete inspection boxes. Concrete cable ducting survives along one side, together with steel cable hooks on the tunnel wall. There is water penetration from above at intervals throughout the length, which has been attributed to unstable backfilled shafts in the 1995 structural report' (Smith 2005, 27).*

Site 11.5: Lazy Bench Hill Bridge is also adjacent to the south western tip of the property landholding of Mr Hutchins. This site has been included for contextual reasons. Lazy Bench Hill Bridge carries the railway over the public road. It has ashlar masonry abutments with three riveted iron girder spans supporting the line. Headroom over the highway is 14 feet 9 inches. The down side of the line is clear of vegetation, but the up side is blocked by trees and scrub. As far as can be seen, the main girders seem to be in good condition, but there is corrosion to the exposed steel deck.



*Figure 20 Permanent Way Hut (Site 11.1, MDV 73001) (© CAU 2015).*

*Figure 21 Buctor Lane Bridge (Site 11.2, MDV 73012) (© CAU 2015)*



*Figure 22 Shillamill Viaduct track (Site 11.3, MDV 51335) (© CAU 2015).*

### *Significance*

High

All sites have a High significance rating, given their degree of survival.

### *Recommendation*

All sites should be retained, with a minimal amount of disturbance, however it is recognised that there are plans to re-instate the railway line, which may impact upon structures and archaeological/historical features throughout its length (and within the study area), the Shillamill Viaduct being perhaps the greatest recipient.

## **Site 12 Quarry SX c46501 71622 MDV 51337**

### *Background*

There are number of small quarries distributed across the project area, usually the result of needing stone for the erection of buildings or perhaps for hedging stone. This quarry is within the landholding but out of the study area, and has been included solely for contextual reasons. It is first shown (unlabelled) on the 1867 and later maps (Fig 9). It probably functioned to provide building stone for the locality, possibly Tavistock.

### *Survey*

The site has not been surveyed and is out of the study area. The owner states it has been let to another person.

### *Significance*

N/A

### *Recommendations*

None.

## **Site 13 Buctor Lane SX 46591 71832 to SX 45997 72062 CEC 16**

### *Background*

Buctor Lane is shown on all historic mapping, and is likely to be contemporary with the origins of Great Buctor settlement (dating possibly from the early 15<sup>th</sup> century). The lane provided access to these settlements from the Tavistock road.

### *Survey*

Figure 23 shows the deep lane from the road to the former medieval settlements. A variety of stone infilling and repairs have been made over time. This site is still used for field access.

### *Significance*

Medium

The survival of this medieval track in such a good condition is surprising, and merits a medium significance rating.

### *Recommendation*

The access track should be repaired where appropriate replicating adjacent hedging styles.



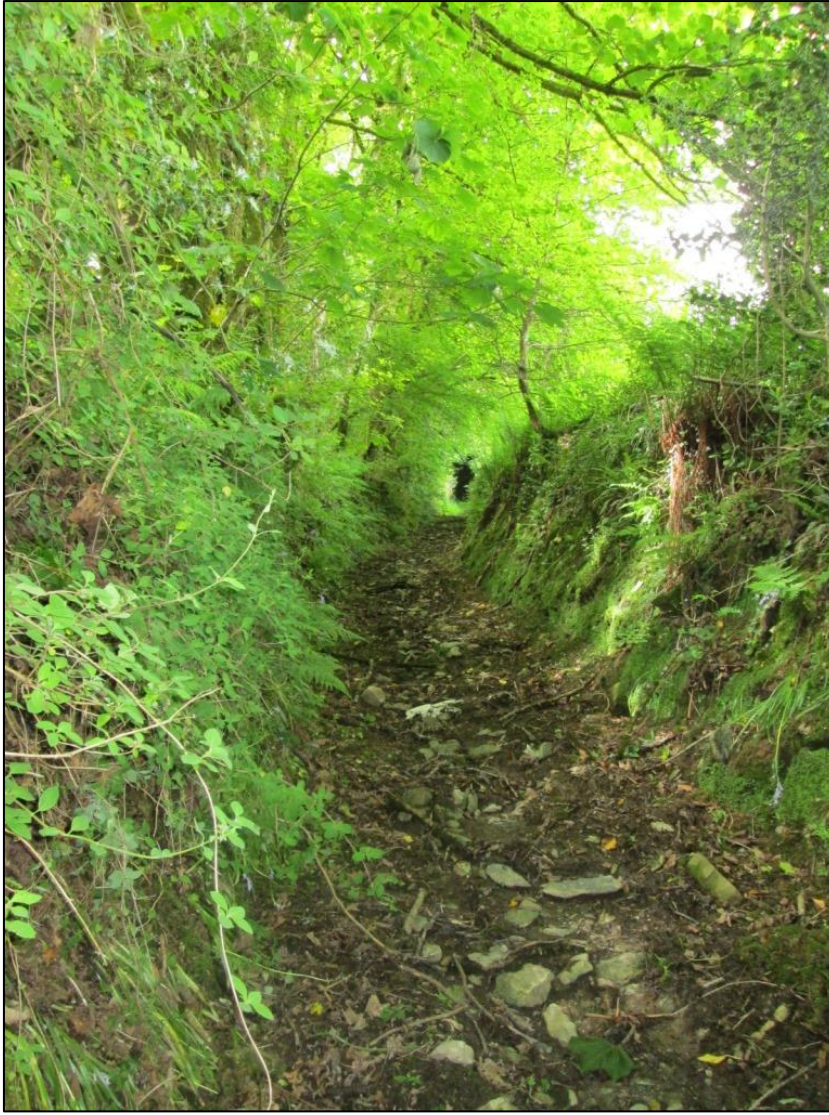


Figure 23 Buctor Lane (Site 13) (© CAU 2015).

#### **Site 14 Infilled costean openworkings/pits SX 46378 71962 MDV 79977**

##### *Background*

Refer to background shaft comments given in Site 8. The alignment of Sites 8, 9 and this site may represent lode outcrop works dating to the late medieval or post-medieval periods. Survey research by R Waterhouse (*pers comm*) has located similar sites to the south west in Morwelldown Plantation.

##### *Survey*

There is slight evidence of pits/hollows and disturbed ground within the vicinity.

##### *Significance*

Medium

The medium significance for this site relates to the possibility of it siting an old shaft/openworks.

##### *Recommendations*

Thought should be given to locating and fencing any possible shaft/ground subsidence and providing an appropriate shaft warning marker.



## **Site 15 Site of Shillamill Manganese Mill SX 46602 71891**

15.1 Leat supply to Mill SX 46351 72357 to SX 46602 71891

### *Background*

This site should not be confused with Shillamill (medieval) corn mill to the north (Site 16). Figure 3, the 1765 map shows the site in detail, as well as its leat supply. However, given the nature of the drawn feature it appears that this is another later addition to the map. The mill appears to post-date the 1803 Tavistock canal, and in fact its leat supply appears to have come from the canal (possibly via the primary site of the water engine water wheel; Site 42).

The documentary evidence (Section 4.2.5, 1815 date), mentions Manganese mine exports; *'From this year there were shipments of manganese from mines around Brentor and Milton Abbot carried by the canal. These were the principal sources of manganese in the country at a time when it was used in the manufacture of glass. For example 13,335 tons were shipped to Plymouth in 1819. The ore was ground in a mill powered by the Morwellham water wheel (Booker 1976, 19), and exported in casks. Site 15, the Shillamill Manganese Mill, may well have processed (and exported) some this material via the canal, or perhaps from closer mines in the Tavy Valley'*. The site is mentioned in the 1840s by Bodman (1981). R. Waterhouse (*pers comm*) states; *'This was described in a lease of 1841 from the Duke of Bedford to Jehu Hitchins, and a lease of 1842 from the Duke of Bedford and John Hitchins to Ebenezer Waugh Fernie, as having been built by Jehu Hitchins in 1840 to grind manganese ores from mines in Brentor Parish... An additional plan of the water supply shows it taken from the tailrace of a wheel which served the Wheal Crebor ore crusher, contradicting the Estate Map, the 1842 Tithe Map and Symons' 1848 map'*. The site is also shown on the 1842 (Fig 6) and 1848 (Fig 7), but the building is not shown on the 1859 (Fig 8) or later maps, although the leat is shown up to 1867 (Fig 9). It is quite possible that the Manganese mill at Morwellham (working from 1826; Patrick, 1989, 30), took away much of its trade via the Tavistock Canal.

### *Survey*

There is no evidence of the site at ground level. The landowner (D Hutchins *pers comm*) levelled the site and excavated a large pond nearby (Site 57). It may be possible that any site foundations are *in situ*, as part of the mill 'footprint' ground level has been artificially raised by approximately 1m – presumably from material excavated to form the adjacent pond. The original mill tail race running under the adjacent road and thence to the River Tavy is still *in situ*. The line of the original leat supply from the canal to the manganese mill is close to the western valley bottom hedge line – but visual evidence has now been lost, although parts may have been reused to site the later pump house leat (Site 53.1).

### *Significance*

Medium

### *Recommendation*

There may be foundation remains of the building under the build of material near the pond. It is recommended that no further excavation within or adjacent to the building's former site is undertaken.

## **Site 16 Shillamill Corn/tin mill SX 46665 72008 MDV 21285**

16.1 Leat supply to Mill SX 46650 72032 to SX 46488 72377

### *Background*

This site is out of the stewardship area – however, it has been included for historical context reasons. The mill place name has been documented since 1488 (Section 4.2.2),

again another 15<sup>th</sup> century date for settlement occupation of the Lumburn Valley. But it may well be that Shillamill has earlier 14<sup>th</sup> century origins. Figure 3, the 1765 map shows two sets of adjoined buildings, but no leat is visible. It may well be the case that the mill was no longer operating. However, it is likely that its leat would have run adjacent to a partly removed field boundary running halfway between the River Lumburn and the later Tavistock Canal; the leat would have run into the western end of the western rectangular building shown on Figure 3. The landowner, Mr Hutchins has mentioned that during excavation for an extension in this area building foundations were noticed.

It is quite feasible that the mill may have also functioned to power tin stamps when demand was greater than that of grinding flour. There are many instances where mills changed their configuration to suit the economic demands of the time. This may be the same site as the medieval (late 16<sup>th</sup> century) 'Knackin' Mill mentioned in documentary text (Tom Greeves *pers comm*; Section 4.2.3).

#### *Survey*

This site is out of the stewardship area.

#### *Recommendation*

Not applicable.

### **Site 17 Shillamill Track SX 46662 71978 to SX 46674 72102**

#### *Background*

The Shillamill track is shown on all historic mapping up to 1883 (Fig 13). The lane provided access to the outfields north of Shillamill, the main Tavistock to Gunnislake turnpike road (constructed in 1803), and then largely abandoned after the railway cut its course, and of course settlements towards Tavistock. By 1883 the track and aqueduct bridge had become a cattle creep.

#### *Survey*

Only a small section of this track (at the edge of a field above Shillamill) is now visible. Its past importance is testament to the Canal Company's need in 1803 to build an aqueduct bridge over the track (Site 18.1). It was subsequently rebuilt in iron in 1839.

#### *Significance*

Low

The hedge remnants of this feature merit a low significance rating.

#### *Recommendation*

The access track hedge (east side) should be repaired where appropriate replicating adjacent hedging styles.

### **Site 18 Tavistock Canal SX 46664 72090 to SX 46186 72587**

#### **MDV 4067/51333 CEC 1**

18.1 Bridge aqueduct SX 46664 72090 MDV 73904

18.2 Lock gates/turning area SX 46329 72627

18.3 Lumburn aqueduct SX 46294 72640 to SX 46186 72587

18.4 Tavistock Canal tunnel portal (LBII 1105707) SX 46120 72309 MDV 37342 CEC 3

## *Background*

Refer to Section 4.2.5 for the background history of the Tavistock Canal. The canal currently is owned and maintained by South West Water, to keep it free flowing and free of blockages, etc (Fig 24). Repair works to the canal's east side (and towpath) have been undertaken in the past, sometimes inappropriately using cement and concrete formwork. The 2009 repair work to both sides of the canal and re-surfacing parts of the towpath continued with the theme of patching damaged sections (as part of the Tamar Valley Mines Heritage Project – TVMHP, Buck 2013).

Site 18.1. The aqueduct bridge (Fig 25) carries the canal over an access lane to fields north of Shillamill Farm – this had been cut by construction of the canal in 1803. The iron plated trough structure seen today was built in 1839 by Gill & Co of Mount Foundry, Tavistock, replacing an earlier structure. As part of the Tamar Valley Mines Heritage Project structural survey on this building (2009), one of the four wrought iron lintels (over the towpath section on the south side of the canal), was replaced, and some re-pointing to the side and base walls undertaken (Buck 2013, 11).

Site 18.2. This site is outside the study area, but has been included for historical context reasons. The construction of the adjacent Canal cottage for operation of the lock gates, the lifting bridge and the visible remnants of the semi-circular trans-shipment basin (or turning/waiting area) is indicative that this part of the canal was quite busy (see Fig 9, the 1867 map). The latter (sited close to the lock gates) is now infilled, but the tops of some of its vertical timbers still visible. According to Waterhouse (forthcoming), the timber lifting bridge is of a Dutch design common on canals in the Welsh borders, and may not be contemporary with the canal's construction.

Site 18.3. This site is outside the study area, but has been included for historical context reasons. The necessity of keeping the water at the correct level was important for the tunnel – the lock gate possibly forming this function also for the Lumburn Aqueduct (SX 46311 72632 to SX 46184 72581), which also had spillways at either ends, and its single arch (see Fig 9). This is approximately 6m wide and 4.5m high – testament perhaps to the large amount of water that cascades down the valley during severe rain. The embankment was built between 1803 and 1808 – at an early stage shallow boats bringing rock from the tunnel excavation to build up the base across the valley. In addition, a quarry at either end of the aqueduct (at the west end Site 20, and the east end now siting the Lock keeper's and aqueduct manager's house), may well have helped to form the foundations of this large imposing feature. This waste-rock engineered design effectively re-using a large amount of material from the tunnel excavation – a cheaper expedient than depositing it elsewhere.

Site 18.4. It is likely the deep rock cut canal and portal supporting and façade masonry stonework was completed at an early stage during the canal excavation – probably in 1803. The later incline plane waterwheel (Site 26) is located close to the north side of the portal.

## *Survey*

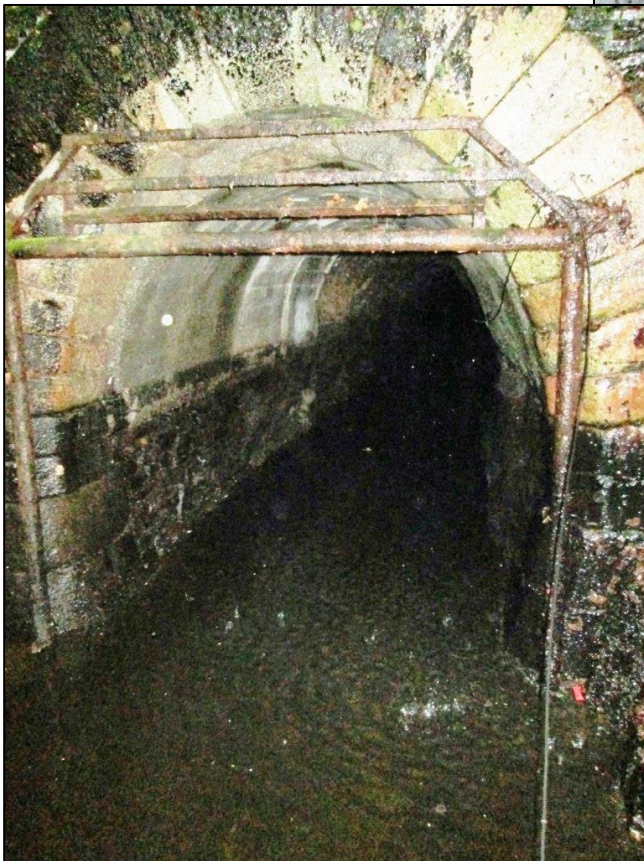
For much of its length the canal's west and north sides (see Fig 24), cuts into both of the Lumburn Valley's east and west sides – revealing bed-rock and forming the bed of the canal. Excess stone material from the rock cut was used to form the rounded profile edge of the east side of the canal – using slate/killas stones set on edge. The tow path was formed along this eastern/southern side. The canal is approximately 4m wide, 0.3m to 0.5m deep, with the east side approximately 0.6m to 0.8m deep from tow path surface to water level. Water slowly flows along the canal, through the tunnel and to the reservoir pond.

18.1: The bolted sections of the iron trough that carries the canal water over what is now a cattle creep (formerly a road track), extends to either side of the granite quoined masonry, supported by four wrought iron lintels (widening into the masonry sides) set



*Figure 24 Tavistock Canal (Site 18, MDV 51333) (© CAU 2015).*

*Figure 25 Tavistock Canal Bridge Aqueduct (Site 18.1, MDV 73904) (© CAU 2015).*



*Figure 26 Tavistock Canal Tunnel portal (Site 18.4, MDV 37342) (© CAU 2013).*



into the granite masonry (Fig 25). Three other similarly styled lintels provide the support for large slates under the tow path on the south side of the canal. The middle lintel however had rusted to the extent of being ineffectual, and was subsequently replaced with an equivalent (Buck 2013, 11). Unfortunately, the canal has been leaking for a number of years, which has caused the foundation masonry to drop – causing sagging to the entire structure – and causing stone to crack and mortar pointing to crack and dissolve.

18.2: The lock gate and lift bridge were previously restored by October 1998, funded by South West Water and British Waterways. However, one of the timber arms of the lift bridge had snapped and parts of the timber walkway rotted. In addition the lower parts of the swing lock gate has rotted where it is in contact with the canal water. All of these items were repaired and rotted timbers replaced to the same specification in 2009 (Buck 2013, 11).

18.3 This feature is not included in the stewardship landholding. The Lumburn aqueduct was not impacted nor repaired by the recent TVMHP conservation works. The aqueduct still conveys water, however it is not known how much is percolating down its centre. A detailed archaeological survey has been undertaken by R. Waterhouse.

18.4 The Morwelldown tunnel portal (see Fig 26), attempts to create an impressive façade with a granite portal stone and the date stone 1803 in raised letters incised in granite over the tunnel opening. The lintel is approximately 1.2 by 0.8m with two supporting stones. The ground level above the crown of the tunnel is approximately 3.2m high and 5.8m wide. Perhaps of more visual significance is the rock cut channel that has been excavated, approximately 90m long and 5.5m high at its portal end. This was originally faced with stone, but in places has collapsed. The tunnel opening is approximately 2.75 m high from water level to its crown and 1.8m wide at water level.

#### *Significance*

High

This site has a High significance rating, given its site history, its impact upon the landscape and its designation as being part of the Cornwall and West Devon World Heritage Site. The tunnel portal and tunnel itself are Listed Buildings (Grade II).

#### *Recommendation*

All sites should be retained after any obscuring vegetation clearance. If there is to a site interpretation strategy for this higher stewardship scheme, this could include the provision of an interpretation panel, for example near Site 52.1, (near the towpath and overlooking the site of the Wheal Crebor water wheel), a viewpoint perhaps towards Wheal Crebor mine across the Lumburn Valley. The provision of occasional guided tours around Wheal Crebor Mine could also visit this impressive feature.

### **Site 19 Tavistock Canal/Towpath (Millhill section) SX 46170 72584 to SX 45965 72881 MDV 18721/21606**

#### *Background*

This site is adjacent to the stewardship landholding, but is outside the study area. It has been included for historical context reasons. The additional Millhill branch was constructed in 1819 to serve the Millhill slate quarry to the north. It was 2 miles long, and cost £8000. It rose by 19.5ft to Millhill (from the western end of the Lumburn aqueduct – Site 18.3), with an inclined plane for the final section due to the scarcity of water (double tracked with two cradles counterbalanced; loaded boats going down pulling the empty ones up, with the help of three horses).

### Survey

The towpath is on the eastern side of the canal (near the aqueduct) and is used as a road track until the settlement of Lumburn is reached (see Fig 9, the 1867 map). The canal still exists but without any water, as an obscured, vegetation filled feature.

### Significance

Not applicable.

### Recommendation

Not applicable.

## **Site 20 Tavistock Canal Quarry SX 45927 72825**

### Background

This quarry (similar to its equivalent at Site 18.2; the lock keeper's house at the east end of the aqueduct, set in the former quarry), is likely to have been contemporary with and used to source the primary stone for the Lumburn Aqueduct from 1803 – and perhaps to source slate stone which when set on edge, lined the sides of the canal – particularly on the opposite side of the canal from the bedrock excavations.

### Survey

The quarry, cut back into the hillside, is overgrown with trees growing internally and on the sides of the vertical escarpment.

### Significance

Low

Given the general degradation of the site this would generally be of low significance.

### Recommendation

The site should be retained, however, the steep sides have the potential for collapse, and so it may be prudent for health and safety reasons to fence the opening on the west side of the canal.

## **Site 21 Kelly's Shaft SX 45935 72288 MDV 79918 CEC 5**

### 21.1 Angle-bob masonry and horse-whim site SX 45965 72881

### Background

It is suggested that this shaft is likely to date from the early days of the mine (1804, Fig 5). Dines and Phemister (1956, 672) states, '*Crebor Main Lode has been worked from four shafts west of the River Lumburn and one on the east. On the west are Kelly's ... vertical to the 12 fm. And on the underlie to the 120 fm. Level*'. The shaft can be viewed on plan in Figure 11, and in section on Figure 12. Figure 9 (1867 Bedford Estates Map), describes the shaft as '*Fenced*'. Given its pumping power source being the main flat rod (originally from the primary position of the water wheel at Site 42, to its secondary position at Site 29). The detailed site background is given in Section 4.2.6. The shaft is likely to have been disused for mineral extraction by the early 1820s.

The angle bob masonry mountings would have provided the structural means of siting an angle bob next to the shaft to transfer the horizontal movement of the flat rod to a vertical movement – to pump out the lower workings of the mine (to adit level) located at the east side of the shaft (Site 21.1). It is quite likely that a horse-whim was used at this site (ie, to help sink the shaft, raise pit-work, raise some ore and pump rod

maintenance, etc), perhaps sited on the shaft's south side, but there is no definite visual evidence of this.

#### *Survey*

The shaft (see Fig 27) is choked at surface (3.5m<sup>2</sup> and 2.5m below ground level), within a wide encircling dry stone hedge (0.7m high and wide). The flat rod slot route to the angle bob masonry is also visible east of the masonry. This measures 3m across its base and is 2m below ground level. The angle bob masonry sides are 2.2m high and 1.2m long, sited between the flat rod slot earthwork and the shaft. The balance bob mounting side walls (Site 21.1) are extant (0.85m internal width, 4m long and 0.6m high), and visible on the east side of the shaft, although the balance bob box to the rear (east end) has gone, presumably demolished when the protective hedge was built around the shaft.

#### *Significance*

Medium

This shaft has a contextual relationship with the adjacent mine. It therefore has a significance rating of Medium.

#### *Recommendation*

The mine and shaft site may well be viewed by members of the public who visit the site (especially those interested in industrial archaeology), and as part of pre-arranged guided tours. The shaft has evidence of movement within the fill, and the presence of cows perhaps does not help this scenario. It is recommended that the shaft site be fenced to restrict heavy animal access.

### **Site 22 Smith's Shaft and horse-whim SX 46028 72297 MDV 79918 CEC 2**

#### *Background*

It is suggested that this shaft is likely to date from the early days of the mine (1804, Fig 5). Dines (1956, 672) states, '*Crebor Main Lode has been worked from four shafts west of the River Lumburn and one on the east. On the west are Smiths ... 100 yards E. by N. of Kelly's on the underlie to the 88 fm. Level*'. The shaft can be viewed on plan in Figure 11, and in section in Figure 12. Given its pumping power source being the main flat rod (originally from the primary position of the water wheel at Site 42, to its secondary position at Site 29). The shaft is likely to have been disused for mineral extraction by the early 1820s.

It is quite likely that a horse-whim was used at this site (see Fig 5), perhaps sited on the shaft's west side, but there is no definite visual evidence of this.

#### *Survey*

The shaft (see Fig 28) is choked at surface, within a low encircling dry stone wall (0.5m high and 0.7m wide). The ground level within the shaft area is 2m below encircling ground level outside the wall. Unlike Kelly's Shaft (Site 21), there is no evidence of the angle bob masonry mountings.

#### *Significance*

Medium

This shaft has a contextual relationship with the adjacent mine. It therefore has a significance rating of Medium.

#### *Recommendation*

Refer to Site 21 recommendations.

## **Site 23 Mine building (Office) SX 46137 72295**

### *Background*

This building has been interpreted as a Mine Office/hut building, mainly on the basis of its layout of doorways, windows and a fireplace. The mine building is shown on the 1862 map (Fig 9) and the later 1883 OS map (Fig 13), and subsequent maps. It may well be that this small building was used for administration of materials coming into and out of the mine. This building is out of the stewardship area, and is under private ownership.

### *Survey*

The building's walls are extant to wall plate level, and are approximately 2m high internally - apart from the west wall which is not all visible. The east wall has a window set at its centre, with its original lintel visible. It is assumed the doorway was at its west side. The site (internally and externally) is very overgrown with brambles.

### *Recommendation*

Not applicable.

## **Site 24 Cock's Shaft SX 46133 72324 MDV 79918**

### 24.1 Capstan site SW 46146 72338

### *Background*

This shaft is likely to have been the first one dating from the early days of the mine (1804). Dines (1956, 672) states, '*Cock's vertical to the 12 fm. and on the underlie to the 120 fm. Level*'. The shaft can be viewed on plan in Figure 11, and in section in Figure 12. Figure 9 (1867 Bedford Estates Map), labels the shaft. Its pumping power source being the main flat rod (originally from the primary position of the water wheel at Site 42, to its secondary position at Site 29). This shaft is an important shaft for the mine working Main Lode, but is likely to have been disused for mineral extraction by the early 1820s.

There is no surface evidence of any angle bob masonry mountings (as at Kelly's Shaft), which would have provided the means of transferring the horizontal movement of the flat rod to a vertical movement. However, it is quite likely that a capstan (Site 24.1) was used at this site (ie, to help sink the shaft, raise pitwork, raise ore and pump rod maintenance, etc), sited on the shaft's north east side. Ore would have been raised up the shaft and then placed onto the tramway (Site 25), to go to the dressing floors for processing (over the canal, Crebor Wharf and across the road). This is shown on Figure 9 (1867 map), and in more detail on the OS 1883 map (Fig 13).

### *Survey*

The shaft (see Fig 29) is choked at surface (6m<sup>2</sup> and slumped 1.8m below ground level), and has no shaft protection. The north side of the collar wall is visible, but the remainder less so. The flat rod slot route over this shaft and then towards Smith's Shaft (Site 22) and Kelly's Shaft (Site 21) is visible 10.0m west of the shaft – the slot being 1.5m wide, and 0.5m deep below ground level to leaf mould.

### *Significance*

(Site 22) and Kelly's Shaft (Site 21) is visible 10m west of the shaft – the slot being 1.5m wide, and 0.5m deep below-ground level to leaf mould.

### Medium

This shaft has an important contextual relationship with the adjacent mine. It therefore has a significance rating of Medium.





*Figure 27 Kelly's Shaft  
(Site 21, MDV 79918)  
(© CAU 2015).*

*Figure 28 Smith's Shaft  
(Site 22, MDV 79918)  
(© CAU 2015).*



*Figure 29 Tavistock  
Canal (Site 24, MDV  
79918) (© CAU 2015).*



### *Recommendation*

The mine and shaft site may well be viewed by members of the public who visit the site (especially those interested in industrial archaeology), and as part of pre-arranged guided tours. The shaft has evidence of movement within the fill, and the presence of cows perhaps does not help this scenario. It is recommended that the shaft site be fenced to restrict heavy animal access.

## **Site 25 Tramway (Shaft to dressing floor) SX 46133 72324 to SX 46230 72325**

### *Background*

A tramway is shown on the 1883 OS map (Fig 13) extending from Cock's Shaft (Site 24) over the canal (presumably via a timber trestle), onto the adjacent road track through the mine and to the dressing floor buildings (Site 37).

### *Survey*

A small section of tramway is visible in the track which runs down parallel with the canal (Fig 30). The visible segment is 0.5m long and the tramway 0.66m wide. This is the only remnant of the feature shown in detail on Figure 13 (1884 OS map).

### *Significance*

Medium

This site has a medium significance rating, given the survival of such a small part.

### *Recommendation*

This site should be retained, with a minimal amount of disturbance.



*Figure 30 Tramway remnant in road (Site 25) (© CAU 2015).*

## **Site 26 Incline Plane SX 46120 72309**

### **26.1 Water wheel SX 46125 72310**

### *Background*

Constructed in 1812, this new engineering design to transport both ore and waste rock from Main Lode, via an inclined plane proved to be economically feasible – soon paying

for its construction (Section 4.2.5, 1812). Figure 10, an abandoned mine plan (R224D) shows the incline plane, whilst the 1810 Taylor's section plan (Fig 5), has been annotated to show this in section. It continued in use until Main Lode was exhausted of its mineral ore by the 1820s. A more detailed archaeological survey produced by R Waterhouse is reproduced in the Appendix (Interpretation Drawing 12.6.1), of the complex Canal portal, the incline plane and its adjacent underground 40ft water wheel (Site 26.1), and the Cock's Shaft tramway (Site 25). In addition a reconstruction sectional elevation drawing has also been produced (12.6.2).

#### Survey

The rock cut opening of the incline plane shaft is near the north east corner of the canal portal (Fig 31). From canal water level it narrows down to approximately 1.5m wide to 1.8m high at a depth of approximately 10m, and an angle of approximately 38° after which it is under water. The power source for the inclined plane, an adjacent water wheel, is obscured by tree branches placed on the north side of the modern steel access platform, and east side of the inclined shaft (see 12.6.2).

#### Significance

##### High

This site area has a high significance rating, given the historical, topographical and archaeological importance of this site.

#### Recommendation

This site should be retained, with a minimal amount of disturbance. Thought could be given to the erection of interpretation drawings to understand the working relationships of the visible archaeological features – as part of a guided tour experience. Examples of such interpretation drawings are reproduced in the Appendix (12.6.1 and 12.6.2).

### **Site 27 Agent's/Counthouse SX 46170 72375**

#### 27.1 Outside toilet SX 46164 72338

#### Background

This site is privately owned and is out of the stewardship area – however it is historically significant. The building is shown on the earliest surface plans of the mine (and has been annotated onto the 1765 map of the area - Fig 2). One must assume the building was constructed in the first few years of the mine operating. *'This may have been that occupied by Captain James Remfry during the early working of Wheal Crebor from 1803. It appears to have been constructed before 1811 (Canal Materials Valuation) when it was called the Comptery (Count) House and cost £150 to build. It continued to be the Captain's or Agent's House, as the first abandonment plan for Wheal Crebor, dated to circa 1828, it was shown as the 'Agent's House' (Fig 10), (R Waterhouse pers comm).* This Agent's/Counthouse building contains a plot of land to its south and faces the mine. In later years (c1820's) the secondary position of the 40ft water wheel powering the flat rods to the mine's shafts was sunk in the bottom of the garden. A small stone bridge was built over the canal (Site 28), to allow vehicular and pedestrian access to the house from the mine.

#### Survey

This building has not been surveyed, but appears to have a typical architectural design of its period – although it is likely to have had modifications to allow tributing and its use as a domestic house and mine office administration.

#### Recommendation

Not applicable.

### **Site 28 Footbridge SX 46174 72333 LBII (1305267) MDV 37343 CEC 4**

#### *Background*

It is assumed that the bridge is outside the stewardship area however, it has been included in this site inventory due to its site significance. The footbridge is shown on the 1765 map (Fig 2, as a later addition), and on later detailed maps (Figs 9 and 13). R. Waterhouse makes the following comments, 'A small stone bridge with a segmental arch, serving Wheal Crebor House. This seems to have been the first bridge to be built on the canal, in 1804. Part way through construction, its width was changed, a further 0.67m being added to the upstream side. The shallow three-centred arch and flared parapets make this a very attractive structure'.

#### *Survey*

The single span small bridge is built with a stone, granite and lime mortar arch (c3m wide), and is c4m long. The crown of the arch is c1.2m above canal level. There are intact stone parapet walls across the bridge (0.7m high).

#### *Recommendation*

Not applicable.

### **Site 29 Water wheel engine SX 46196 72350**

29.1 Balance bobs/pits SX 46185 72343

#### *Background*

This site is outside the stewardship area – but has been included for site significance reasons. The most detailed plan of this feature, the second (and final) position of the mine's main power source, can be seen in Figure 10 and in particular Figure 13. Section 4.2.6 (1821) describes this site in detail. The 40ft waterwheel provided a flat rod power source to pump out the mines shafts (even those at Gill's and Rundle's Shafts to the west), and in addition, to aid pumping within the tunnel works and exploratory lode development.

The balance bobs within their 'pits' are shown east of the water wheel pit (Site 29.1 on Fig 40), again these are infilled with no surface sign of their previous existence.

#### *Survey*

The site is flooded – and has the appearance of a pond.

#### *Recommendation*

Not applicable – the site is privately owned.

### **Site 30 Barn/stable SX 46179 72302 CEC 6**

30.1 Garden/grass SX 46158 72301

#### *Background*

This building is also outside the stewardship area (and owned by the landholder of Wheal Crebor House) – but has been included for site significance reasons. The date of the building appears to be between 1867 (Fig 9) and 1883 (Fig 13). Its function perhaps relates to the mine rather than the canal (to stable horses to transport ore from New Shaft (Site 50), to the 'grinder/crusher at Site 39), unless this material was taken via boats on the canal.

#### *Survey*

The building has not been surveyed internally, given its private ownership. It is open fronted at its east end (currently used as a car port). There are two windows at the



west end, facing perhaps a former yard/garden area (Site 30.1), presumably for horse manure disposal, etc). The west end of the building also has a small chimney in evidence – perhaps for heating during the winter. There is a blocked large opening with secondary infill of a doorway, facing the north side, with another blocked opening on the east side of another opening which has a later concrete lintel inserted.

*Recommendation*

Not applicable.

**Site 31 Smith's Shop SX 46199 72299**

*Background*

This building is labelled on the DHC Abandoned Mine Plan R224D (reproduced in Fig 10), as a 'Smith's Shop', and shown in Figure 13.

*Survey*

This rectangular building appears to be a remnant of a Smithy, although the forge area is not visible. A wall remnant at the south west corner is 0.6m high for a length of 1.2m – the rest of the building's walls have been robbed. A small water sump feature 0.6m by 0.5m, and c0.7m deep is located 9m north between the Stable (Site 30, and the Smithy); water coming out of a plastic pipe 1.5m to its south. This feature may be contemporary with the site, perhaps functioning as an underwater drain (for perhaps a stationary steam engine to power both the smithy and the saw pit).

*Significance*

Medium

Given the fragmentary survey evidence of this site, it has a medium significance rating.

*Recommendation*

It is recommended that these low mine yard features are conserved as part of a larger project of building conservation to the significant extant features of Wheal Crebor Mine. Clearance of over a century of fallen leaves and branches to the original floor surface (which may reveal mountings for machinery), would permit lime mortar repointing and re-bedding of the tops (and bases) of the remaining walls. This would dramatically aid public interpretation of the features. Future management recommendations relate to reducing any increase of vegetation growing out of the newly repointed walls (particularly brambles, and possibly ivy – if it cannot be annually managed), as well from the floor. If these recommendations are not acted upon weeds/brambles, etc will grow, making the yard area unsightly and ultimately causing structural damage due to excessive root growth.

**Site 32 Carpenter's Shop SX 46226 72287**

32.1 Saw Pit SX 46214 72291

*Background*

This building is labelled on the DHC Abandoned Mine Plan R224D (reproduced in Fig 10), as a 'Carpenter's Shop' and 'Saw Pit', and shown in outline in Figure 13.

*Survey*

A mound of rubble marks the former site of this building (0.8m above ground level). Its related Saw Pit has wall remnants at the south west corner to a maximum height of 2.4m for a length of 2.8m. In addition, another wall remnant is 1m high for a length of 2.5m – the rest of the building's walls have been robbed. There are two sections of rising main water pipe, each 2.4m long, one of which is standing (Fig 32). These may



Figure 31 Incline Shaft (Plane)  
(Site 26) (© CAU 2015).



Figure 32 Carpenter's Shop/Linhay  
(Site 32) (© CAU 2015).



Figure 33 Powder House (Site 34) (© CAU 2015).



have been vertical supports for an open fronted part of the yard; a building sited between the saw pit (Site 32.1) and the smith's shop (Site 31).

*Significance*

Medium

Given the fragmentary survey evidence of this site it has a medium significance rating.

*Recommendation*

Refer to recommendations given in Site 31.

**Site 33 Mine Offices SX 46234 72299**

*Background*

This building is labelled on the DHC Abandoned Mine Plan R224D (reproduced in Fig 10), as 'Mine Offices', and shown in outline in Figure 13.

*Survey*

There is very little surface evidence of these two buildings. However, leaf mould excavation and clearance of rubble may reveal wall foundations.

*Significance*

Medium

Given the fragmentary survey evidence of this site, it has a medium significance rating.

*Recommendation*

Refer to recommendations given in Site 31 (after ground/leaf clearance).

**Site 34 Powder House (Detonators?) SX 46215 72317**

*Background*

This building is labelled on the DHC Abandoned Mine Plan R224D (reproduced in Fig 10), as 'Powder House', and shown in outline in Figure 13. It may be the case that this building housed the detonators, whilst the explosive material was housed at Site 36.

*Survey*

This corner building has wall remnants at the north corner return of the building to a maximum height of 0.7m high for a length of 1m – the rest of the building's walls have been robbed (Fig 33).

*Significance*

Medium

Given the fragmentary survey evidence of this site, it has a medium significance rating.

*Recommendation*

Refer to recommendations given in Site 31.

**Site 35 Waste spoil heap SX c46302 72319 MDV 3954 CEC 7**

*Background*

The ore material was partially broken up underground and then brought to surface (either via the incline plane (Site 26), or via Cock's Shaft: Site 24), then transported via the tramway (Site 25) to either be further broken up into smaller pieces in the spalling buildings (Site 37), or the waste rock transported to the mine's waste heap via

a surface tramway. It may be the case that some of the canal tunnel excavated material is also at the base of the heap.

#### *Survey*

This site is quite similar to the mapped profile shown on Figures 13 and 14. At the east end of this feature the spoil tip is approximately 12m above ground level – at its western end it is approximately 1.6m above ground level – with remnants of a stone lined revetment. Surface tramways were moved at a number of locations to dump the spoil either side. The deeper sides may well have been revetted with timber to keep the dump within the confines of the agreed land (leased) for this function.

#### *Significance*

Low

Given the fragmentary survey evidence of this site, it has a low significance rating.

#### *Recommendation*

This site should be retained, with a minimal amount of disturbance. CEC (2015, 33, Site 7) refers to the site's potential for dormice and bats.

### **Site 36 Powder House (Explosives?) SX 46363 72317**

#### *Background*

This building is shown but not labelled on the 1883 OS map, however it may be the case that this building housed the explosives – for use underground, whilst the detonators may have been housed at Site 34. Health & Safety regulations in the mid-19<sup>th</sup> century even then were stipulated.

#### *Survey*

This building is not visible at ground level.

#### *Significance*

Low

Given the fragmentary survey evidence of this site, it has a low significance rating.

#### *Recommendation*

This site should be retained, with a minimal amount of disturbance.

### **Site 37 Site of dressing floors (Cobbing sheds) SX c46233 72332**

#### *Background*

The sites of the two or three dressing floor buildings (not all cobbing sheds), are nearly visible, although obscured by much surface rubble. These buildings would have been constructed of timber frames with probably timber planking and timber roof. One of the buildings may have housed a copper ore 'jigging house', as shown on Figure 13 (1883 OS map).

#### *Survey*

The tramline routes to and from these buildings are visible – remnants of the stone revetted spoil tip walls survive to a height of 1.4m (see Fig 34) – the track beds are approximately 1.5m wide.

#### *Significance*

Medium

Given the general degradation of the site this would generally be of medium significance.

*Recommendation*

These sites should be retained, with a minimal amount of disturbance to the ground as it may cause collapse of the stone revetment walls.

**Site 38 Adit Shaft SX 46244 72349**

*Background*

This adit shaft is shown in section on Figures 5 (No. 3), 12 and 13, and on plan in Figure 10. The shaft would only go down to the adit level.

*Survey*

The shaft site is not visible at surface.

*Significance*

Medium

This site area has a medium significance rating, given the lack of any other supporting archaeological site evidence.

*Recommendation*

Given the trampling of the ground at this site by cows, thought should be given to locating and fencing the shaft site and providing a shaft warning marker.

**Site 39 Site of Copper Grinder/Crusher House SX 46263 72361**

39.1 Site of tramway to Grinder House SX 46231 72333 to SX 46263 72361

39.2 Revetment wall SX 46265 72366 to 46293 72385

*Background*

Figure 10 (DHC R224D), shows and labels this site, whilst Figures 9 and 13 also show the site but it is not labelled. The 12' x 1'6" (crusher/grinder mill) was erected in 1809 (Section 4.2.6), to crush/grind the material coming from the dressing floor buildings (particularly the cobbing building – Site 37), to a much smaller size – part of the copper dressing process. The water wheel (fed by a spillway leat from the canal (or possibly the larger water wheel (Site 29) powered the crusher (resembling a 'mangle' but using twin steel lined rollers). The tramway (Site 39.1) was the transport medium to get the material from the dressing floor buildings to the grinder.

*Survey*

The building and tramway sites are not visible but the revetment stone wall (Site 39.2) is partially visible and extant as a 4.5m high retaining wall for a length of c5m.

*Significance*

Medium

This site area has a medium significance rating – this is the longest and biggest section of masonry remaining at this site.

*Recommendation*

The site should be retained, with a minimal amount of disturbance.



#### **Site 40 Adit Shaft SX 46288 72362**

##### *Background*

This adit shaft is shown in section on Figures 5 (No. 2), 12 and 13. The shaft would only go down to the adit level.

##### *Survey*

The shaft site is not visible at surface.

##### *Significance*

Medium

This site area has a medium significance rating, given the lack of any other supporting archaeological site evidence.

##### *Recommendation*

Given the trampling of the ground at this site by cows, thought should be given to locating and fencing the shaft site and providing a shaft warning marker.

#### **Site 41 Site of Slime cisterns SX 46309 72375**

##### *Background*

Figure 13 (1883 OS map) shows this site. The slime cisterns functioned to separate out waste slimes from copper slimes after dressing. However, there is a tramrail link to the last dressing floor buildings to the east (Site 45 – possible arsenic dressing buildings). A leat provided water to/from this site.

##### *Survey*

The two square cisterns/tanks are no longer visible, however, a small watercourse (spring) is visible nearby and there are remnants of slime mound deposits in the vicinity.

##### *Significance*

Low

##### *Recommendation*

The site footprint should be retained, with a minimal amount of disturbance.

#### **Site 42 Adit (Engine) Shaft SX 46344 72393 MDV 79919**

##### *Background*

This adit shaft is shown in section on Figures 5 (No. 1 Engine Shaft), 13 and DHC R224D – a section of the mine (undated). Only the first 1810 section (Fig 5) labels this primary site of the first water wheel (interpolated from Fig 5 as the primary evidence), with flat rods to power primarily pumping and perhaps some winding. Water would have been extracted from the canal (see Section 4.2.6: 1806), to power the water wheel. The shaft extended below adit level to extend down to the 12 fathom level – perhaps winding from that level in its early years.

##### *Survey*

The shaft/water wheel site is not visible at surface.

##### *Significance*

Medium

This site area has a medium significance rating, given the lack of any other supporting archaeological site evidence.

*Recommendation*

Given the trampling of the ground at this site by cows, thought should be given to locating and fencing the shaft/water wheel site and providing a shaft warning marker.

**Site 43 Adit Shaft SX 46356 72405 MDV 79919**

*Background*

This adit shaft is shown in section on Figures 12 and 13, and DHC abandoned mine plans for this mine. The shaft would only go down to the adit level.

*Survey*

The shaft site is not visible at surface.

*Significance*

Medium

This site area has a medium significance rating, given the lack of any other supporting archaeological site evidence.

*Recommendation*

Given the trampling of the ground at this site by cows, thought should be given to locating and fencing the shaft site and providing a shaft warning marker.

**Site 44 Gill's Shaft SX 46359 72422 MDV 79919**

*Background*

This shaft is shown in plan (unnamed) on Figures 9, 13, but named as 'Gill's Shaft' on Figure 11. It is likely that this shaft was sunk whilst working the lode east of the core of the mine (towards New/Eastern Shaft). This shaft would have provided the means of bringing ore to surface that had been recovered from the ground extending east to the River Lumburn. Ore beyond the river would have been extracted via New Shaft (Site 50).

*Survey*

The shaft site is not visible at surface, although a small copse of trees shown on the maps are still extant.

*Significance*

Medium

This site area has a medium significance rating, given the lack of any other supporting archaeological site evidence.

*Recommendation*

Thought should be given to locating and fencing the shaft site and providing a shaft warning marker.

**Site 45 Site of arsenic dressing buildings and tramway SX c46391 72374**

*Background*

The sites of at least two adjoined buildings are shown on Figures 9 and 13. Both appear to be related to dressing floor buildings, with a tramway extending from Site 41 (slime

cisterns). Undated mine plans do not show these buildings, however, they appear to be related to the development work that went on at New Shaft – and the association of arsenic with the copper ore. This should have been separated during dressing (usually by calcining in furnaces and condensing in flues/lambreths) – but there is no documentary indication this site ever had an arsenic treatment works – this would have been a good site for such a processing activity, given the documentary evidence for arsenic production in its last working phase.

#### *Survey*

There is no evidence of this site at ground level.

#### *Significance*

Low

#### *Recommendation*

This site should be retained, with a minimal amount of disturbance to the footprint of the original building.

### **Site 46 Adit portal SX 46413 72400 CEC 11**

#### *Background*

The end of the adit is shown on Figures 9 and 13 and some abandoned mine plans. 'Adit Level, which connects with West Crebor workings, passes Kelly's Shaft at a depth of 20 fms., Cock's at 13 fms., and opens into the west side of the valley 60 yds. S. W. of New East Shaft' (Dines and Phemister 1956, 672). The adit is shown in section in Figures 5 and 12.

#### *Survey*

The adit portal (Fig 35) is open, with ochreous water issuing. The opening is 0.55m wide, and 0.75m from the internal crown stone arch to water level (0.2m deep).

#### *Significance*

High

Given the quality of its masonry preservation, and the fact that the adit is still operational this would generally be of high significance.

#### *Recommendation*

The site should be retained, with a minimal amount of disturbance to the adit mouth. The tail race from the portal to the river should be kept clear of blockages.

### **Site 47 Waste spoil tip and site of tramline SX c46365 72389**

#### *Background*

The waste dressing floor material (from Site 37) was placed on a tramline to be deposited at this site, as detailed on Figure 13. This would have formed quite a large linear spoil tip as shown on Figure 14 (1908 OS map – previously cut by the late 1800's leat supply to the Morwell Pump House – Site 53.1).

#### *Survey*

This area has very little evidence of the former spoil tip. During the early decades of the 20<sup>th</sup> century – a programme of re-processing waste tips from mines in the Tamar and Tavy Valley occurred. Advances in ore dressing technology meant that additional ores (tin/copper/wolfram) could be extracted – but some tips (for example this one) focussed on arsenic extraction, the ore from New Eastern Shaft having an arsenic content (see Section 4.2.5, 1893 onwards).





*Figure 34 Site of dressing floors, tramlines (Site 37) (© CAU 2015).*

*Figure 35 Adit portal (Site 46) (© CAU 2015).*



*Figure 36 Site of New Shaft Winder and spillway from canal (Site 52) (© CAU 2015).*



*Significance*

Low

*Recommendation*

The site should not be disturbed – and is likely to contain high levels of metallic ore traces in the ground.

**Site 48 Site of timber bridge over River Lumburn SX 46465 72405 CEC 10**

*Background*

The date and nature of this crossing point is uncertain. Development work to the new Eastern Shaft may well have been in the 1820s (R Waterhouse *pers comm*), but a refocus of these workings from the 1870s to much deeper levels resulted. Presumably the bridge would have been of timber construction to cross the c3m to 5m wide river. The bridge is shown on Figure 13.

*Survey*

There is no evidence of any timber structures/features.

*Significance*

Low

*Recommendation*

This site should be retained, with no disturbance.

**Site 49 Waste spoil tip (New/Eastern Shaft) SX c46492 72394**

*Background*

The 1867 Bedford Estates plan (Fig 9), labels the shaft, but shows no waste tip. Both the documentary evidence and the mapping (compare Figs 9 and 13 – the 1883 OS map) show that intensive development work at New Shaft occurred in the 1870s – forming the existing mine spoil tip – which, given its inaccessibility probably retains its original form. It is likely that this tip was formed by the construction of a tramline (Site 51), above the shaft to take the waste rock from the shaft to the waste tip.

*Survey*

The large waste dump is extant, and fills up the ground between the (tram) trackway below the Tavistock Canal and the River Lumburn. The north side of the waste dump is bounded by high revetted stonework, which retains the spoil on one side and preserves the track access (via the bridge), on the other. The south side of the tip is bounded by a hedge. The site is overgrown with trees.

*Significance*

Low

*Recommendation*

This site should be retained.

**Site 50 New (Eastern) Shaft SX 46490 72430 MDV 79920**

*Background*

This shaft is likely to have been the last one cut at Wheal Crebor, although it may have been started in the 1820s, its main development was within the latter phase of the mine (Section 4.2.5, 1870s). Dines and Phemister (1956, 672) states, 'New East Shaft,

35 yds. from the river and 400 yds. E. by N. of Cock's is on the underlie to the 200 fm. Level'. The shaft can be viewed in Figure 9, and in section in Figure 12. Figure 9 (1867 Bedford Estates Map) also labels the site. The shaft would have had angle bob masonry on its north side set within a pit at the shaft edge, this being the deepest shaft on the mine (360m).

#### *Survey*

The shaft is choked at surface with stone with no shaft protection or collar wall. The flat rod route or angle bob pit is also not visible. However, the shaft position is marked by a brown/orange ochreous colour oozing from the ground over an area of 1m<sup>2</sup>. It is obvious that during heavy rain, the area is flooded by this liquid.

#### *Significance*

Medium

This shaft has an important contextual relationship with the adjacent mine. It therefore has a significance rating of Medium.

#### *Recommendation*

The mine and shaft site may well be viewed by members of the public who visit the site (especially those interested in industrial archaeology), and as part of pre-arranged guided tours. Although the shaft has no evidence of movement within the fill, it is recommended that the shaft site be fenced in case of collapse and to restrict animal access.

### **Site 51 Upper track/tramway SX 46497 72464 to SX 46510 72394**

#### *Background*

This feature is not shown on Figure 9, but may be shown on the 1883 OS map (Fig 13). Given the differing levels between the shaft site and the top of the adjacent spoil tip to the south – it appears likely that headgear erected over the shaft would have wound ore/waste rock brought up from the shaft. It may have been separated underground, with the obvious waste rock lifted up to an upper tramway running parallel to the alignment of the canal, and from there transported to the waste tip.

#### *Survey*

A flat track route 3.5 to 4m wide runs parallel to the canal from near Site 52.1 to Site 49.

#### *Significance*

Low

#### *Recommendation*

This site should be retained, with a minimal amount of disturbance.

### **Site 52 Water wheel winding engine SX 46480 72465**

52.1 Canal sluice/spillway SX 46490 72482

#### *Background*

The most detailed plan of this feature can be seen in Figure 13 (see Section 4.2.6, 1870s). Given the increasing depth of the shaft (as shown on DHC 5124) down to the 200 fathom level, the water wheel flat rods from Site 29 would not have been able to pump this shaft to adit level (the latter of which has not been found). Hence construction of the (winding) water wheel in the late 1870s (Site 52). The 40ft waterwheel provided a flat rod power source to pump out the mines shafts (even those

at Gill's and Rundle's Shafts to the west), and in addition, to aid pumping within the tunnel works and exploratory lode development. It is not known if the water wheel also powered a grinder/crusher – to save taking a large degree of waste material around the canal to the mine's main dressing floors. It is likely that the balance bobs within their 'pits' would have been relatively close to the winder – but these are infilled with no surface sign of their previous existence. A spoil tip on the west of this site is indicative of either the excavated ground to site the waterwheel, or waste rock after it has been through a crusher/grinder. The canal sluice/spillway (Site 52.1), supplied the required amount of water from the canal via a sluice set in the side of the canal to feed onto the water wheel.

#### *Survey*

Figure 36 shows the masonry remnants of this site. The footprint of the building as shown on the 1883 OS map can be seen within the dense vegetation, with some standing masonry walling – and its relationship to Site 52.1, the adjacent canal sluice/spillway, which can also be seen through the vegetation from the canal bank. A stone retaining wall is also visible retaining the canal bank. It is possible that the balance bob pit is in fact at the angle bob site adjacent to the shaft (Site 50), and not close to the winder.

Clearance of vegetation will reveal the remains of the granite spillway (Site 52.1 - 2.7m wide, c0.5m deep), cascading down to another spillway 2.5m lower, and from thence to the launder feeding the water wheel.

#### *Significance*

High

This site has a High significance rating, given the importance of the site, its contextual value to the nearby shaft and the visible extent of masonry remains.

#### *Recommendation*

Vegetation clearance will no doubt reveal the granite spillway/sluice, masonry walling, the site footprint and other historic features – to the benefit of members of the public walking the canal. In addition, some tree clearance may also present a view across the Lumburn Valley to Wheal Crebor. In addition, a site interpretation drawing of this feature could be displayed for public benefit, to understand the workings of this site – with a resume of the history of Wheal Crebor Mine. Appendix 12.6 includes interpretation drawings of this site (produced by R Waterhouse).

### **Site 53 Pump House SX 46476 72121 MDV 106400 CEC 13**

53.1 Pump House leat SX 46256 72611 to SX 46532 72086 MDV 106396 CEC 9

#### *Background*

In the late 1890s the Morwelldown Water Works Company was formed to supply water to a number of Bedford Estates farms, gravity fed from a central reservoir in the Morwelldown Plantation (SX 45757 71603) – this being seen a cheaper alternative than individually supplying 'mains' water to a number of farms. *'Two pump houses were built, supplying water to farms as far away as Orestocks in the south and Chipshop in the north'* (R Waterhouse pers comm).

The water supply was via a long leat starting at the base of the Lumburn canal aqueduct, via a weir. Although parts of the leat date from the inception of the Shillamill Manganese mill (Site 15 - c1840), its upper 250 metres and the weir date from the installation of this pump house (between 1884 and 1906). *'The weir is partly constructed of large recycled granite blocks and slabs, at least one of which is a doorpost from an early 17th century high status building. Its sluice was housed between well-constructed stone walls with triangular section granite cappings. The*

*sluice has gone, but a mesh filter to keep vegetable matter out of the leat survives in situ'* (R Waterhouse *pers comm*). The leat route (see Fig 40, site inventory), runs along the floor of the Lumburn Valley and intersects (cutting through) the former lower mine waste spoil tip (Site 47), before continuing along the valley floor (in places following the former 1840's Manganese Mill leat; Site 15). The leat enters the building on the west side via a small earth/stone aqueduct (Fig 37). The stone building, possibly originally with ridged slate roof, now with a galvanised corrugated steel roof (Fig 38), still contains a pair of water pumps either side of a 10ft water wheel (Fig 39), made by GH Harris of Wadebridge. Water was pumped up hill to the central reservoir in Morwelldown Plantation. The tail-race for the water leaves the building via a small tunnel set into its east side before re-joining the River Lumburn further down the valley.

It should be noted that (one side of) the pump was working up to two years ago (D. Hutchins *pers comm*). The building has a four paned window in each of the north and south elevations, with double doorway in the north elevation. The building has been built with brick edging for corners and all openings – a usual architectural detail of the period.

### *Survey*

Structurally, the south west corner of the building is falling away from its intended position. This structural movement is shown by movement (c0.3m) away from the west side of the vertical window frame, on the south side of the building. Unfortunately, this appears to have been a problem for some time – the leat is now by-passing the rusty iron water wheel and running along the outside of the south west corner of the building – softening the foundations and causing this section of wall to sink. Related structural movement is manifested in the side of the water inlet opening – on its south side, and the lintel. In addition a section of the west wall has collapsed.

Over a period of time timber has been used at a variety of locations to prop up the machinery – the main damage again having been caused by the wall movement – which has displaced the central steel beam socket on its south side which formerly supported the frame for the water wheel. The main front doors are partly unhinged, but the windows have original frames and timber shutters. The water wheel itself is quite rusty (Fig 39), as is the galvanised roof in places (Fig 37), but the building appears partly watertight. The leat is still working (approximately 1m wide and 0.3 to 0.5m deep), water slowly going down its course.

The ecological survey (CEC 2015, 26, Site 13) found '*Adult barn owl seen roosting above entrance doorway and accumulation of mixed-age pellets suggest this is a regularly used roosting site*'.

### *Significance*

#### High

It is highly likely that there are very few pump houses like this remaining in the south west – or even the country. As such it is a highly significant building – its importance amplified by its original pumping machinery.

### *Recommendations*

This building can now be seen to be structurally hazardous. It is recommended that this building is conserved as part of a project of limited structural building remediation and conservation. It is likely that the wall movement is too much to rectify, and that the wall may well need to be dismantled – the foundations stabilised, and the wall rebuilt. If this is beyond the remit of immediate funding, an alternative could be to slow down the wall movement by re-routing the leat away from the building (further to the south – allowing the wall section foundations to stabilise (as the foundations dry out). However, the seasonal winter rains are likely to soften the ground around the building as the water table in the valley floor rise, for at least four to six months per year. In the





*Figure 37 Pump House - west side (Site 53) (© CAU 2015).*

*Figure 38 Pump House north side (Site 53) (© CAU 2015).*



*Figure 39 Pump House - internal view from east (Site 53) (© CAU 2015).*

short term it is recommended that the building is closed to public access – both to preserve it's (over a century old) intact pump and water wheel – and also to minimise the possibility of collapse to the south west corner of the building onto visitors.

#### **Site 54 SWW Sluice Canal feed SX 46223 72352**

54.1 Sump (shaft?) SX 46229 72341

##### *Background*

The footnote of Section 4.2.4 describes the ownership and water management of the Tavistock Canal since 1933.

##### *Survey*

This feature is a mechanism to allow water (via a sluice gate and concrete revetment 1.5m wide in the south side of the canal), to enter a 'V' shaped concrete lined channel 6m long. This leads to a 11m long concrete block tunnel approximately 1.5m deep, 0.5m wide at its base – and from there to a deep tank (under the nearby track), or to divert to a long soakaway channel which runs down the mine on the north side of the main access track. The tank has water in it – and the mechanism appears to not have any blockages.

##### *Recommendation*

The site is presumably privately owned and outside the stewardship area.

#### **Site 55 SWW Iron ladder access to Canal portal SX 46123 72309**

##### *Background*

The footnote of Section 4.2.4 describes the ownership and water management of the Tavistock Canal since 1933.

##### *Survey*

A galvanised ladder and platform has been inserted into the north side of the canal portal – adjacent to the Incline Shaft and the top of its waterwheel (Site 26.1), to provide safe access to the canal tunnel, for maintenance. The date of this erection is not known.

##### *Recommendation*

The site is presumably privately owned and outside the stewardship area.

#### **Site 56 Man-made pond SX 46499 72173**

##### *Background*

Within the past decade the ground has been excavated with a machine digger to form a large pond.

##### *Survey*

The area of the pond is shown on modern OS mapping

##### *Recommendation*

Not applicable.

### **Site 57 Man-made pond SX 46597 71961 CEC 15**

#### *Background*

Within the past decade the ground has been excavated with a machine digger to form a large pond, which was subsequently stocked with fish. This excavation and ground creation may have impacted upon the site of the Shillamill Manganese Mill (Site 15).

#### *Survey*

The area of the pond is shown on modern OS mapping. It is not known if fish are still in the pond.

#### *Recommendation*

Not applicable.

### **Site 58 Site of medieval 'Knackin' Mill SX 46753 71367**

#### *Background*

Tom Greeves, through documentary research for medieval tinworks in this area discovered a late 16<sup>th</sup> century reference to a 'Knackin' (or Knocking/Stamping) Tin Mill (Section 4.2.2). Two fields were also mentioned in the relevant lease of which this site is centred.

#### *Survey*

The site of the mill is not definitely known, however it may be located close to the Lumburn Leat, parts of which may well have been kept open for local uses. However, it is not unlikely that Shillamill itself (Site 16), changed its function from a corn mill to a stamping mill – it is not far from this site, and changing functions of mills to meet local demands is well known.

#### *Recommendation*

Not applicable.

## **9.3 Site inventory summary**

This section of the report summarises the information and management recommendations presented in the Site Inventory (Section 9.0). The inventory table (Section 9.3.1) summarises all of the site recommendations for safety works and cross references these with National designations and Devon's Historic Environment Record. The second table (Section 9.3.2) prioritises consolidation works to masonry structures.

### **9.3.1 Summary management table of archaeological sites**

Cornwall Archaeological Unit favours low-key approaches to health and safety treatment of mine shafts and choked adits. This report has been provided to guide conservation works where they are deemed necessary and to advise the landowners of management of archaeological features and health and safety mitigation measures.

The significance ratings relate to a combination of factors including the quality and extent of the remains (both within the site and compared to adjacent sites), as well as the importance and understanding of the feature as part of a complex and how it contributes to the overall site character.



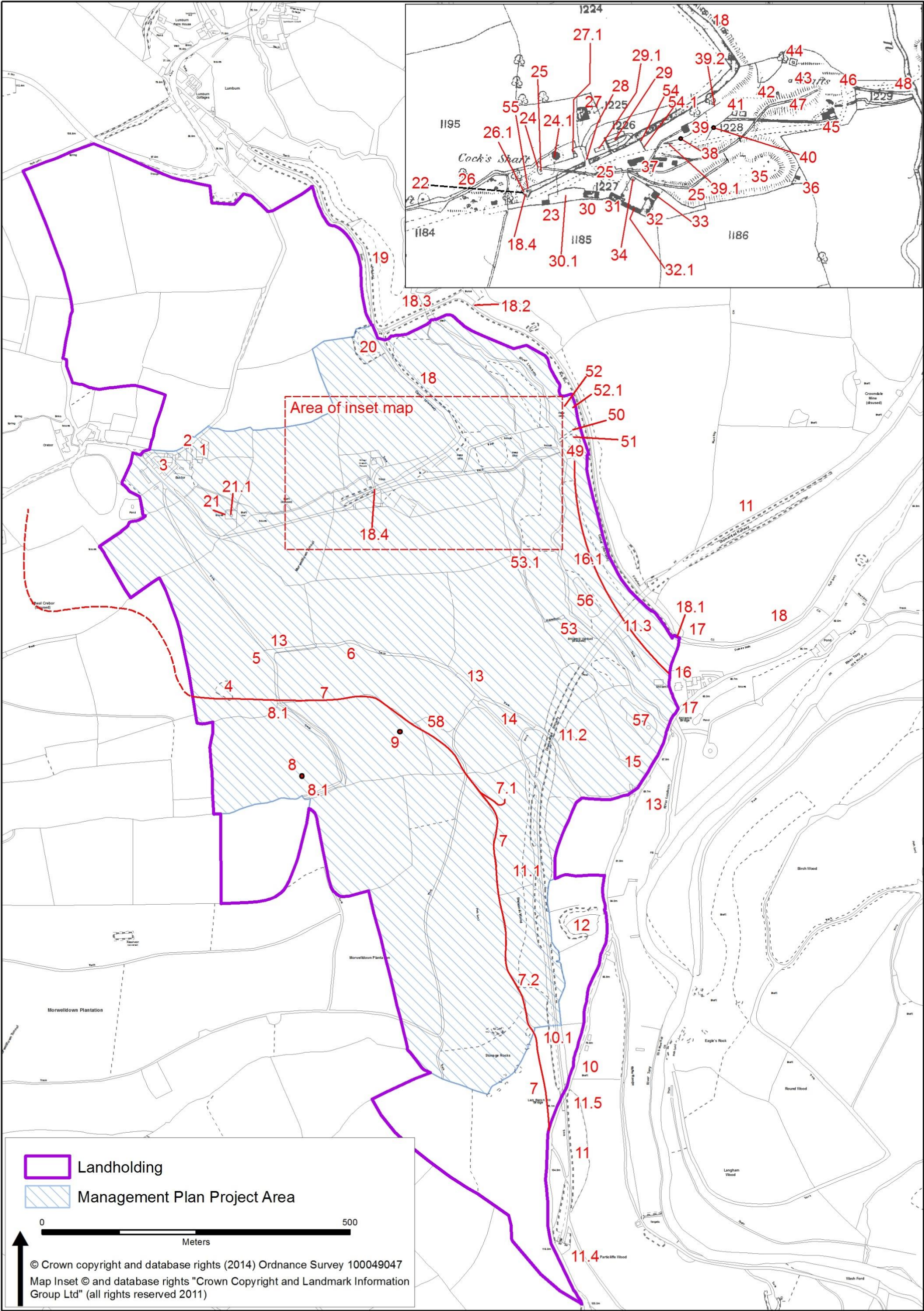


Figure 40 Site inventory map.



Site No.	Feature (Devon HER MDV)	NGR (SX)	Archaeological recommendations	S Rating
1	Buctor Bank Barn	45887 72377	Private ownership (out of HLS stewardship)	
2	<b>Buctor Farmhouse (LBII, 37341)</b>	45872 72389	Private ownership (out of HLS stewardship)	
3	Farm buildings and yard (101089)	c45828 72373	Private ownership (out of HLS stewardship)	
4	Tavistock Tunnel Shaft (79951) and Horse-whim	45927 72002	Locate and fence shaft. Horse-whim not visible.	M
5	Site of Great Buctor	c45974 72065	N/A (presumably previous ploughing already damaged site)	L
6	Site of Little Buctor	c46139 72066	N/A (presumably previous ploughing already damaged site)	L
7	Lumburn Leat (within study area) (63055)	45874 72003	Site to be retained in woods, undisturbed. Clear vegetation if necessary, remove conifers within leat. Restrict deep ploughing across route of leat. Manage site (refer Section 8.1.1)	H
7.1	Leat feed to Shillamill?	46431 71449		
7.2	Stonage Rock tunnels (63073)	46334 71841 46393 71853 4643 7145		
8	Possible shaft/quarry (79952)	46043 71875	Locate and fence shaft. Horse-whim not visible.	M
8.1	Track to stone quarry	46013 71982 46052 71829	Track is old Holloway to site and outfields with hedges.	
9	Possible shaft (79953)	46202 71949	Locate and fence possible shaft.	M
10	South Wheal Crebor Mine	46452 71454	Out of study area	M
10.1	Leat tunnel under railway	46454 71454 46475 71457	Keep tunnel open to drain and free of vegetation	
11	Tavistock to Bere Alston Railway (72928)	46464 71456	Track bed, bridges, etc owned by BRB (Railway may be reinstated)	H
11.1	Permanent Way Hut (73001)	46616 72169 46431 71762	Condition survey pending action	
11.2	Bridge over Buctor Lane (73012)	46458 71927	Vegetation clearance and condition survey	
11.3	<b>Shillamill Viaduct (LBII, 51335)</b>	46487 72006	Assessment and survey necessary	
11.4	Shillamill Tunnel (72999)	46615 72169 45746 71110	Out of study area but within landholding? (Vegetation clearance and condition survey)	
11.5	Lazy Bench Hill Bridge	46480 71350	Vegetation clearance/survey	
12	Quarry (51337)	c4650171622	Out of study area	
13	Buctor Lane	46591 71832 45997 72062	Maintain form of old hedges and re-use fallen stone debris	M
14	Infilled costean openworkings & pits (79977)	46378 71962	Locate and fence possible shafts.	M
15	Site of Shillamill Manganese Mill	46602 71891	Clear vegetation and consolidate for public interpretation	M
15.1	Leat supply to mill	46351 72357 46602 71891		
16	Shillamill (Corn/tin dressing/stamping) (21285)	46665 72008	Private ownership (out of HLS stewardship)	
16.1	Possible leat supply to mill	46650 72032 46488 72377	Minimise deep ploughing	

Site No.	Feature (Devon HER MDV)	NGR (SX)	Archaeological recommendations	S Rating
<b>17</b>	Shillamill Track	46662 71978 46674 72102	Site to be retained, undisturbed	L
<b>18</b>	Tavistock Canal (4067/51333)	46664 72090 46186 72587	Partly out of stewardship area.	H
18.1	Bridge aqueduct (73904)	46664 72090	Monitor water leakages affecting structure/access for farm	
18.2	Lock gates/turning area	46329 72627	Private ownership (out of HLS stewardship)	
18.3	Lumburn aqueduct	46294 72640 46186 72587	Private ownership (out of HLS stewardship)	
18.4	<b>Tavistock Canal tunnel portal (LBII, 37342)</b>	46120 72309	Private ownership (out of HLS stewardship)	
<b>19</b>	Tavistock Canal/towpath (Mill Hill section) (18721/21606)	46170 72584 45965 72881	Private ownership (out of HLS stewardship)	
<b>20</b>	(Canal) Quarry	45927 72825	Site to be retained, undisturbed but monitor trees on side of quarry	L
<b>21</b>	Kelly's Shaft (79918)/Horse-whim site	45935 72288 45939 72287	Assess hazard, fence if necessary (incl. collapsing angle-bob masonry)	M
21.1	Angle bob masonry			
<b>22</b>	Smith's Shaft (79918)/Horse-whim site	46028 72297	Assess hazard, fence if necessary	M
<b>23</b>	Mine building (Office?)	46137 72295	Private ownership (out of HLS stewardship)	
<b>24</b>	Cock's Shaft (79918)	46133 72324 46146 72338	Assess hazard, fence if necessary	M
24.1	Capstan		Site to be retained, undisturbed	
<b>25</b>	Tramway (Shaft to dressing floor)	46133 72324 46230 72325	Tramway remnant in track to be retained, undisturbed	M
<b>26</b>	Inclined Plane	46120 72309 46125 72310	Assess hazard, fence if necessary	H
26.1	Water wheel			
<b>27</b>	Agent's House	46170 72375 46164 72338	Private ownership (out of HLS stewardship)	
27.1	Outside toilet			
<b>28</b>	<b>Bridge (over canal) (LBII, 37343)</b>	46174 72333	Private ownership (out of HLS stewardship)	
<b>29</b>	Water wheel engine	46196 72350 46185 72343	Private ownership (out of HLS stewardship)	
29.1	Balance bobs/pits			
<b>30</b>	Barn/stable	46179 72302 c46158 72301	Private ownership (out of HLS stewardship)	
30.1	Garden/grass			
<b>31</b>	Smith's Shop	46199 72299	Clear vegetation, site to be retained, undisturbed	L
<b>32</b>	Carpenter's Shop	46226 72287 46214 72291	Clear vegetation, site to be retained, undisturbed	L
32.1	Saw Pit			
<b>33</b>	Mine Offices	46234 72299	Clear vegetation, site to be retained, undisturbed	L
<b>34</b>	Powder House (Detonators?)	46215 72317	Clear vegetation, site to be retained, undisturbed	L
<b>35</b>	Waste spoil heap (3954)	c46302 72319	Site to be retained, undisturbed	L
<b>36</b>	Site of Powder House (Explosives?)	46363 72317	Site to be retained, undisturbed	L
<b>37</b>	Site of Dressing floors (cobbing sheds)	c46233 72332	Site to be retained, undisturbed	M
<b>38</b>	Adit Shaft	46244 72349	Locate and fence possible shaft.	H
<b>39</b>	Site of Copper Grinder/Crusher House	46263 72361	Sites to be retained, undisturbed	M

Site No.	Feature (Devon HER MDV)	NGR (SX)	Archaeological recommendations	S Rating
39.1	and water wheel			
	Site of Tramway to	46231 72333		
	Grinder House	46263 72361		
39.2	Revetment Wall	46265 72366		
		46293 72385		
<b>40</b>	Adit Shaft	46288 72362	Locate and fence possible shaft.	M
<b>41</b>	Site of slime cisterns	46309 72375	Sites to be retained, undisturbed	L
<b>42</b>	Adit Shaft (Site of first water engine/water wheel) (79919)	46344 72393	Locate and fence possible shaft.	M
<b>43</b>	Adit Shaft (79919)	46356 72405	Locate and fence possible shaft.	M
<b>44</b>	Gill's Shaft (79919)	46359 72422	Locate and fence possible shaft.	M
<b>45</b>	Site of Arsenic dressing buildings? and tramway	46391 72374	Site to be retained, undisturbed	L
<b>46</b>	Adit Portal	46413 72400	Site to be retained, undisturbed	H
<b>47</b>	Waste spoil tip and site of tramline	c46365 72389	Remnants of site to be retained, undisturbed	L
<b>48</b>	Site of timber bridge over River Lumburn	46465 72405	Site to be retained, undisturbed	L
<b>49</b>	Waste spoil tip	c46492 72394	Site to be retained, undisturbed	L
<b>50</b>	New (Eastern) Shaft (79920) and angle bob pit	46490 72430	Locate and fence possible shaft.	M
<b>51</b>	Upper track/tramway	46497 72464 46510 72394	Site to be retained, undisturbed	L
<b>52</b>	Engine Water wheel, balance bob and possible grinder	46480 72465	Sites to be retained, undisturbed. Vegetation/tree management for masonry and viewing sites from canal	H
52.1	Canal sluice/spillway	46490 72482		
<b>53</b>	Pump House	46476 72121	Assess structural stability and Consolidate/fence. Divert leat from building. Recommend Listing.	H
53.1	Pump House Leat	46256 72611 46532 72086		
<b>54</b>	SWW Sluice Canal feed	46223 72352	Site to be retained, undisturbed	
54.1	Sump (Shaft)	46229 72341		
<b>55</b>	SWW Iron Ladder Access to Tav Canal portal	46123 72309	Site to be retained, undisturbed	
<b>56</b>	Man-made pond feature	c46499 72173	Site to be retained, undisturbed	
<b>57</b>	Man-made pond feature	c46597 71961	Site to be retained, undisturbed	
<b>58</b>	Site of medieval 'Knackin' Mill	c. 463 720	Site to be retained, undisturbed	

*Table Notes:*

- Significance (S) rating denotes the relative significance of Low, Medium or High, as described in the Site Inventory (Section 9.2). No significance ratings have been given to sites that are not within the stewardship areas, and those not owned by Mr Hutchins, the HLS Stewardship landowner.
- 'c' comment relates to approximate or centred NGR.
- NGR for linear features cross the study area (Lumburn Leat, mine leats and Railway), are given when they enter and leave the study area.
- Devon MDV (Monuments Devon) numbers are given where relevant for cross reference.

A few sites outside the study area but within/close to the HLS landholding have been included for historical context. Listed Building (Grade II) sites are bolded.

### 9.3.2 Masonry structures requiring treatment

A number of structures (not including shafts and adits), identified during the survey (within the HLS stewardship area) will require urgent attention (both large and small). There will be the necessity for archaeological recording, if full consolidation and repointing works are to be carried out. However, it is recognised that some of the (few) standing buildings on the mine may not merit full consolidation (given the pressure of funds for works elsewhere), although the proximity of possible occasional guided public access to some of these sites may determine the degree of consolidation that is undertaken.

- Limited works (shaded) means non-structural works, wall 'capping' and small areas of repointing where necessary for structural reasons to preserve the building. These sites do not necessitate a detailed building survey.
- Structural priority relates to an assessment of the long term structural competence of the feature and so prioritises works in the short/long term. 1 = urgent need for works (i.e. structural components failing), whilst 3 = less urgent needs for works.
- Visibility (public access) relates to proximity of features to existing permitted/adjacent public access. Public access is not related to designated routes – rather general public access throughout the project area.

Reference to the following table shows the relationship between the structural priorities of the significant, visible buildings, and the extent of recommended building conservation works. It can be seen that there is one structure (within the landownership and stewardship area), that urgently needs a conservation scheme (Scale 1). However, most sites that need limited conservation works are visible if guided walks as part of heritage site interpretation is permitted. It should be noted that a high percentage of all the building conservation sites are of Medium priority, and this also correlates with the site significance rating. Site 52 is highly visible from the adjacent publically accessible Tavistock Canal.

Site No.	Site name	Limited works (shaded)	Struct. Priority (1 – 3)	Visibility (public access)	Overall priority	S (Rating)
<b>21.1</b>	Kelly's Shaft angle bob masonry		3	M	<b>M</b>	<b>M</b>
<b>31</b>	Smith's Shop		3	M	<b>M</b>	<b>M</b>
<b>32</b> <b>32.1</b>	Carpenter's Shop Saw Pit		3	M	<b>M</b>	<b>M</b>
<b>33</b>	Mine Offices		3	M	<b>M</b>	<b>M</b>
<b>34</b>	Powder House (Detonators?)		3	M	<b>M</b>	<b>M</b>
<b>39.2</b>	Revetment wall		3	M	<b>M</b>	<b>M</b>
<b>52</b>	New Shaft water wheel winder		2	H	<b>M</b>	<b>H</b>
<b>53</b>	Pump House		1	H	<b>H</b>	<b>H</b>



## 10 References

### 10.1 Primary sources

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*Documents:* (DHC sub ref): Tavistock Hamlets Tithe Apportionment book; T1258M/E40 Apportionment book for 1765 map; Brookes (1986) Parochial Mines Index: Tavistock Hamlets Parish (Crebor Mine: SX 622/Dev/Bro); T1258m/E44a-b Reports on Mines & Quarries 1868-1901; D1508M/SS/Mining/3; T1258ME/100-171 Reports of the Tavistock Canal Committee Meetings.

*Maps/Plans:* DHC Parish Plans: Tithe Index Map 7/7/R and apportionment, T1258M/E7 and (c1765 Donn's Map): West Division and East Division maps, T1258M/E44 Plan of the Parish of Tavistock 1867; T1258M/E14b Plan of the Parish of Tavistock 1867; T1258M/E14a Plan of the Parish of Tavistock 1867; T1258M/E6 Tavistock Parish (Middle Division); D1508/E/Tavi/Maps/2 Geological Map of the Tavistock Districts 1859; T1258m/E11 Plan of the Parish of Tavistock 1867 (3 chains : 1 inch).

*DHC Abandoned Mine Plans:* R190G Plan/Section of Crebor New Mine; R224D Plans and Sections of Wheal Crebor; 5124 Plans and Sections of Wheal Crebor.

#### Cornwall Council:

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### 10.3 Websites

<http://www.imagesofengland.org.uk/Historic> England's online database of Listed Buildings

<http://www.cornish-mining.org.uk> The Cornwall and West Devon Mining Landscape World Heritage Site website

## 11 Project archive

The CAU project numbers are **146483** (Buctor Archaeological Management Plan)

The project's documentary, digital, photographic and drawn archive is maintained by Cornwall Archaeological Unit, Cornwall Council, Fal Building, County Hall, Treyew Road, Truro, TR1 3AY. A project file containing site records and notes, project correspondence and administration (File No. 146483).

1. This report is held in digital form at CAU CC as: G:\Historic Environment (Documents)\Projects\Sites\Devon\Buctor Arch Man Plan 146483\Buctor Man Plan Report 2015R055
2. Digital photographs: R:\Historic Environment (Images)\Sites Devon\Buctor Farm 146483 (No Black/White photos taken)
3. Electronic drawings: G:\TWE\Waste & Env\Strat Waste & Land\Historic Environment\Projects\Sites\Devon\Buctor Arch Man plan 146483\GIS Mapping
4. Historic England/ADS OASIS online reference: cornwall2-223650.

## 12 Appendix

### 12.1 Project brief

#### **Brief for archaeological survey and production of a Management Plan of archaeological/ecological features within the landholding of Mr Hutchins, Buctor Farm, Devon (SX 462 763)**

**Higher Level Stewardship Application No: AG00568331**

#### **Introduction**

Mr D Hutchins' holdings at Buctor Farm, West Devon includes significant archaeological heritage assets: Wheal Crebor Mine, the Tavistock Canal (WHS), and the 15<sup>th</sup> century Lumburn Leat. The land has been entered into the Higher Level Stewardship scheme primarily to target species-rich grassland in the Lumburn Valley combined with significant archaeological features. It has also been recognised that the agreement land, although primarily agricultural (based on a pattern of medieval field enclosures), is also of great historical and archaeological significance, although the full nature, extent and condition of sites is currently unknown. The purpose of this project is to obtain up to date information about the historic landscape and features on the holding and provide an assessment of their management requirements, with specific prioritised recommendations.

The prime importance of this landscape lies in its 19<sup>th</sup> century industrial heritage, which has been recognised as being of international importance through the Cornwall and West Devon World Heritage Site (WHS) designation status of the Tavistock Canal that runs into the tunnel at its eastern end, and runs under the southern landholding to emerge above Morwellham to the west. The main complex of features is centred around Wheal Crebor 19<sup>th</sup> century Mine, which also includes the canal tunnel entrance (owned and managed by SWW). Other mining features include shafts, spoil tips, and the low remains of mine buildings. The eastern end of Wheal Crebor mine sett also survives close to the Tavistock Canal (on the northern side of the Lumburn Valley), which includes a mineshaft and the probable site of a large wheelpit. Also, apparently the remains of a rivetted iron barge were seen near the canal here in the 60s/70s – so some parts may survive.

Streamworking, further mining remains (small structures, spoil heaps, shafts, adits, leats etc), and historic woodland management features (charcoal platforms, saw-pits) may all be expected to be found throughout the areas of woodland and valleys within the landholding and are no less important than the more substantial later complexes of features outlined above.

The historical and archaeological interest is not just confined to industrial remains however; the earthwork remains (particularly in Shillamill Woods) of the 15<sup>th</sup> century Lumburn Leat which supplied water to the Bere Alston Silver mines is of particular archaeological and historical significance, both locally and nationally. The holding also contains the rare example of an early 20<sup>th</sup> century estate water wheel powered pump house; its machinery still in-situ, and in recent use, which pumped water from the Shillamill valley up to a central reservoir to supply water to the surrounding farms, formerly in the Duke of Bedford's ownership.

### **Historic environment designations within the holding:**

#### *World Heritage Site*

The Tavistock Canal is within the Cornwall and West Devon Mining Landscape World Heritage Site (Area A10i Tamar Valley), and links Tavistock to the Tamar Valley.

#### *Listed Buildings (Grade II)*

- Buctor Farmhouse
- Tavistock Canal tunnel portal
- Crebor House bridge (over the canal)
- Shillamill railway viaduct

The site is also within the Tamar Valley AONB. There are no ecological designations of County importance. The Devon County Historic Environment Record (HER) records 24 historic features within the land holding, and many more immediately adjacent to it. One discreet area forms the basis of the management plan assessment (see location map, showing the extent of the area to be assessed).

### **Outline brief**

A professional archaeologist or archaeological organisation should on behalf of the applicants prepare a Written Scheme of Investigation (WSI) for an archaeological assessment of the project area (as shown on the accompanying map) including the potential for further archaeological recording, conservation of any built structures/earthworks, management and presentation with regard to the Higher Level Stewardship scheme.

A suitably qualified ecologist should be employed to survey the project area for the presence of any European Protected species – and the results to be summarised and fully integrated into the management plan recommendations.

### **Guidance for tenders**

The successful contractor will be expected to oversee the provision of all appropriate work to ensure a successful outcome. This includes all health and safety related services and insurance (to include public liability and professional indemnity).

Provision of this guidance is for the benefit of the HLS agreement holder (Mr D Hutchins), to help ensure relevant tenders which fulfil HLS scheme requirements are received. **Any contract however would be between the agreement holder and**



**the contractors.** All day to day agreements, health and safety requirements etc, are matters between these parties. In addition, close liaison will be required with Mr D Hutchins, the landowner, to relate the past and proposed future management if sites are to be conserved.

Liaison will also be needed with the Natural England officer involved in the Higher Level Stewardship agreement (Simon Tame), in order to inform understanding of the context of the study, with Steph Knight of Devon's Historic Environment Service, and Ainsley Cocks of Cornwall Council with regard to the Tavistock Canal's World Heritage Site status.

The Tender will be evaluated on the following criteria (not set out in order of importance):

- Price
- Capability and Quality (including the ability to meet the deadlines indicated)
- Previous relevant experience of writing Conservation Management Plans.
- Demonstrable experience of managing historic structure restoration projects
- Given the nature of the site, relevant experience of industrial archaeological and ground archaeological survey within the Tamar/Tavy area.

Natural England is not obliged to accept any tender or to accept the lowest tender. Please note that Natural England cannot accept 'contingency' amounts.

The WSI should be submitted to and agreed in writing by Natural England before the work is commissioned and carried out.

*The professional archaeologist/archaeological organisation is advised to visit the site before completing their quote as there may be implications for accurately costing the project. Contact the landowner for access in this instance.*

### **Aims and objectives**

- to investigate, describe and understand the archaeological and historic environment resource within the study area through historical and archaeological desk top and fieldwork methods and to understand the relative importance of the surviving archaeological features within the context of the wider historic landscape of the project area
- to outline the current and future management and maintenance requirements of the sites identified within the project area
- to assess the feasibility of site conservation and provide an outline of the work required taking identified environmental factors into consideration
- to discuss the importance of the archaeological sites/landscape in conjunction with research questions for particular events, periods, processes and industries where appropriate (for example the possibility for HLS funding for survey plans of the Pump House and guidance for possible restoration grants)
- to assess the impact on the archaeological features posed by site management works to be undertaken as part of the HLS scheme

In particular, the assessment should:

- Draw upon all available historical resources to undertake the desktop stage to research and compile the background history of the site, including records at the Devon Record Office, and any local archives (Plymouth Record Office and the West Country Studies Library).
- Identify all surviving features and their specific management requirements
- Carry out a condition survey of the surviving structures
- Ensure adequate liaison with other specialists who have experience of this site: Robert Waterhouse and Tom Greaves

- Identify future management requirements and management priorities.
- Identify the need for further archaeological recording, investigation and survey (for example of the pump house)
- Identify opportunities for educational access and interpretation
- The presence of any European Protected Species should also be identified and evaluated (it is expected that this work will be subcontracted to an appropriately qualified ecologist).
- Use should be made of information gathered as part of the FEP survey.
- Use of full, up-to-date HER information

## **Methodology**

### **Management plan production**

**1. Site Description and Location** – to include a site plan to an appropriate scale. This section should also comment where appropriate on the contribution identified features/buildings make to the local landscape character.

**2. Site and Building Context** A brief summary of the historical development of the area, including reference to appropriate OS and other historic mapping, utilizing map regression arising from historical research at district or County level. Description of the current use of the area and proposed future uses, threats and issues. This should include information on any pending or agreed planning consents for the area and liaison with appropriate statutory bodies.

**3. Analysis and Recording** Undertake a site survey of the archaeological features, looking at (where appropriate) their form, use of materials and methods of construction, past function, style of architecture and changes/adaptations over time and the reasons for the changes. This should be cross-referenced with information gathered in 2 above. An inventory of the sites should be appropriately illustrated with photographs (as a separate inventory), which cross references to the Devon Historic Environment Service HER numbering, and an appropriately compiled assessment survey plan.

**4. Identify the location of European Protected wildlife habitats and species** within the project area either seasonally or throughout the year and to consider their requirements, and the legal obligations under relevant wildlife legislation, when managing or consolidating the features.

**5. Undertake a condition survey** of the archaeological and historic features and comment on the feasibility of management, highlighting good points as well as looking at defects and **recommending the remedies required**. The survey should prioritize work areas into 'immediate (1-2 years), necessary (2- 5years) and desirable (5-10 years)'.

**6. Produce a statement of significance and a statement of guiding principles** for the future restoration and continuing management of the historic and archaeological features.

**7. Identify management and maintenance needs on a continuing basis**

The recommended forms of sustainable feature management for the study area as a whole should be suggested which could be deliverable within the HLS scheme. Guidelines for any best practice woodland/tree management to ensure the historic environment is adequately protected, interpreted and accessible, should also be produced. Other forms of individual feature management works should be identified where necessary (for example if appropriate, selective archaeological landscape fencing or perhaps masonry conservation works to the Pump House).

Impact assessments of potential conflicts or mutual benefits of HLS landscape management should also be produced for archaeological feature maintenance, increased public access and the potential for appropriate building consolidation works.

**8. Produce a summary outlining and illustrating the history of the site** and the main visible features which could be suitable for potential 'virtual' access to be available on the web for possible future grant aided projects, or alternatively hosted on Devon County Council historic environment webpages in the interim.

### **Management Plan report production**

A report should be produced and contain the following:

- Non-technical summary
- Background to the project
- Methodology
- Landscape setting and character
- Site designations
- Historic context: Pre-industrial/industrial
- Description of sites including relevant location plans
- Results of ecological survey
- Results of condition survey
- Site significance and summary statement
- Site inventory including specific management requirements where appropriate
- Reproduction of at least one photograph of each significant feature illustrating its condition and archaeological details (the pump house will need interior and exterior illustrated images including fixtures and fittings).
- Detailed management requirements and suggested prioritisation of works
- Scope for further archaeological works
- Bibliography
- Archive

Copies of historic maps, historic photographs etc should be incorporated into the report where relevant

### **Site meetings**

**Pre works meeting** – an initial on-site meeting to agree the expected scope of works and timetable, and look at particular points of detail on the ground as appropriate.

Hold a **review meeting** following report publication to discuss points on the ground with the key partners, including a discussion of the suggested priorities. Agree the key consolidation works to be delivered as part of any site conservation stage and any recommendations of further survey/consultancy that may be required to deliver these works.

### **Deposition**

One hard copy and one digital copy of the completed report should be sent to the Natural England Historic Environment Advisor at Bristol, and two copies to the NE Project Officer (Simon Tame) at Bovey Tracey.

One copy should be sent to the landowner (Mr D Hutchins), including a PDF copy.

On completion of the report, in addition to copies required by Natural England, one hard copy of the report shall be supplied to the Devon Historic Environment Team (HET) on the understanding that one of these copies will be deposited for public

reference in the HER, and a digital copy. In addition to the hard copies of the report, one copy shall be provided to the HET in digital format - in a format to be agreed in advance with the HET - on the understanding that it may in future be made available to researchers via a web-based version of the Historic Environment Record.

The archaeological consultant shall complete an online OASIS (Online AccesS to the Index of archaeological investigationS) form in respect of the archaeological work. This will include a digital version of the report. The report will also include the OASIS ID number.

## ARCHIVING

Completion of the project is dependent on the compilation of an ordered and integrated project archive by the archaeological contractor in accordance with this Brief and with Management of Research Projects in the Historic Environment (MoRPHE - <http://www.englishheritage.org.uk/publications/morphe-project-managers-guide/>).

The archive must also be transferred for long-term curation to a recognised, accredited or trusted repository. An archive is defined as *'all records and materials recovered during an archaeological project and identified for long term preservation, including artefacts, ecofacts and other environmental remains, waste products, scientific samples and also written and visual documentation in paper, film and digital form'* (ARCHES forthcoming).

It is anticipated that the archive will consist of three elements:

- 1) a copy of the report
- 2) maps and plans showing the location of sites, constraint areas and photographs
- 3) copies of the photographs not presented in the site report.

The HET would normally expect deposition of the site archive to be completed within six months of completion of the fieldwork element of the project.

Should the survey yield any artefactual material worthy of deposition with the collecting museum, the archaeological contractors should contact the collecting museum as soon as such material finds are recovered to obtain an accession or reference number and agree future conditions for deposition with the museum. Items in the material archive must be cleaned (or otherwise treated) ordered, recorded, packed and boxed in accordance with the deposition standards of the relevant museum. It is advised that early consultation with the museum will facilitate transfer of the material archive.

The relevant collection museum in Devon (Plymouth City Museum & Art Gallery) requires that the digital archive (consisting of born-digital and digital copies of relevant written and drawn data produced during fieldwork), must be transferred into the care of a Trusted Digital Repository instead of with the museum (see 'Deposition of the digital archive' – below) and generally not with the museum.

If ownership of all or any of the finds is to remain with the landowner, provision and agreement must be made for the time-limited retention of the material and its full analysis and recording, by appropriate specialists.

### *Deposition of the digital archive*

The digital archive will consist of:

- (i) a copy of the final report
- (ii) maps and plans showing the location of sites, constraint areas and photographs (iii) digital images, along with associated meta-data of the site that are not presented in the report.

The digital archive must be deposited with a Trusted Digital Repository and thus made publicly accessible, in accordance with the National Planning Policy Framework (2011).



It is understood that the only suitable repository for digital archaeological archive is the Archaeology Data Service (ADS). Digital archive must be compiled in accordance with the standards and requirements of the ADS, which may be accessed through the ADS website:

<http://archaeologydataservice.ac.uk/advice/guidelinesForDepositors>.

Guidance on selection for the archive is also provided:

<http://archaeologydataservice.ac.uk/advice/selectionGuidance>

It is expected that a licence to copyright for documentary material, in both physical and digital forms, will be given to the receiving repository.

### **Dissemination & Publication**

Contingency should be considered for publishing the results of the work in an appropriate archaeological journal, following discussion with Natural England, providing there are adequate funds available and the results are significant enough to warrant publication. Production of a published summary should be separately costed in the tender.

### **Monitoring**

Variations in the project design should be submitted in writing to the NE Project Officer before such changes are implemented (this potentially affects grant aid). A draft copy of the report should be supplied to Natural England and the Devon County Archaeologist (HER) for comment prior to finalising publication.

### **Timetable**

Tenders are to be submitted by end of February 2015, and the draft report should be completed and submitted by the end of May 2015, with the final report by the end of June 2015.

### **Personnel**

Each aspect of the work should be carried out by suitably experienced and qualified professionals with specialist expertise in their area of competence. The names and titles of the Project Manager and all staff should be listed with a précis of their relevant and recent experience.

It would be preferable for the professional organisation to be a Registered Archaeological Organisation with the Institute of Field Archaeologist and the Project Manager and key personnel should be individual members of the IFA. All consultants are expected to have professional indemnity insurance appropriate to the work involved in this project.

It is recommended that there should be an initial on-site meeting between the Natural England Project Officer (Simon Tame), the Devon County Archaeologist (Steph Knight), the landowner (Mr Hutchins), and the project archaeologist.

**Key contact for this assessment and the address for the submitted tenders (labelled Buctor HLS Man Plan), will be through Simon Tame, Natural England Project Officer:**

**Simon Tame**  
Natural England  
Yarner Wood

Bovey Tracey  
Devon  
TQ13 9LJ  
Tel: 01626 832330 direct dial 01626 831585  
**Simon.tame@naturalengland.org.uk**

**Landholder**

Mr D Hutchins  
Buctor Farm  
Gulworthy  
Tavistock  
West Devon  
PL19 8HZ

Tel: 07867 972789

**This brief has been processed by Simon Tame, Steph Knight and Mr D Hutchins.**

**Date: 18th December 2014**

**References**

Work shall be carried out in accordance with:

*Understanding Historic Buildings* A guide to good recording practice. HE publication 2006 (can be found at the following link:

[http://www.english-](http://www.english-heritage.org.uk/upload/pdf/Understanding_Historic_Buildings_1.pdf)

[heritage.org.uk/upload/pdf/Understanding\\_Historic\\_Buildings\\_1.pdf\)](http://www.english-heritage.org.uk/upload/pdf/Understanding_Historic_Buildings_1.pdf)

*Understanding the Archaeology of Landscapes*: A guide to good recording practice. HE publication 1997 (can be found at the following link:

[http://www.english-heritage.org.uk/upload/pdf/Understanding the Archaeology of Landscapes 1.pdf\)](http://www.english-heritage.org.uk/upload/pdf/Understanding_the_Archaeology_of_Landscapes_1.pdf)

## 12.2 CEC (2015): Generic method statements

### **Appendix 2: Precautionary Method Statement for Small-scale Vegetation Clearance-Dormice & Bats. (CEC, Rep No. 2575, 2015, Appendix 2)**

#### **Please note the following:**

1. The methodology below only applies to small scale removal of individual/small groups of trees, or small areas of scrub, which would not normally be expected to require a licence (Natural England & Forestry Commission, 2007) It is considered that if the precautions have been properly followed, a prosecution (in the event of damage, harm or disturbance to dormice) is unlikely to be considered to be 'in the public interest';
2. For more significant clearances (refer to table in Section 4 for further details) an ecologist should be consulted to advise of any further survey / licensing requirements necessary for legal compliance;
3. Only the bare minimum amount of trees / shrubs should be removed to allow the historic feature management objectives to be met, without compromising the overall integrity of the surrounding habitats e.g. where historic features are located within a woodland, clear-felling should be avoided and clearances should instead seek to create glades, maintaining continuous canopy connections in the retained habitats around the perimeter of the feature and avoiding canopy isolation of trees / shrubs;
4. Tree surgery (to remove dead or dangerous limbs) is preferable to felling mature trees;
5. In the event of a bat, dormouse or any other protected species being discovered (or suspected) during clearance operations, works in that location must cease immediately and a suitably qualified ecologist should be contacted for advice to ensure legal compliance and the welfare of animals is not compromised.

#### **Tree felling surgery**

1. Tree felling surgery should be conducted in September/October to avoid most sensitive periods for dormice, and bats, whilst also avoiding any conflicts with bird nesting;
2. Mature trees should be section-felled. Trees that have a diameter (at 1.5m) of 300mm or less are normally regarded as being unsuitable for bats and do not require section felling.
3. Where possible any features offering potential to support roosting bats (woodpecker holes, splits and slits; rot holes; loose bark; broken branches and dense ivy) should be inspected immediately prior to felling. Care should be taken not to cut through any cracks, holes or hollows that cannot be exhaustively checked for the presence of bats and cuts should be made at least 50cm from the potential roost feature.
4. If limbs or large branches require felling consideration should be given to cracks which may close (crushing any bats inside) once the weight of the limb has been removed. If the crack cannot be thoroughly inspected the crack should be wedged open prior to removal of the limb/branch;
5. Felled tree sections to be sensitively lowered to the ground (with ropes as required) to minimise risk of damaging dormice nests on the ground and damage to retained habitats. Felled limbs / sections should be allowed a rest period of at least 24 hours on the ground to allow any bats present to disperse of their own accord;
6. Avoid unnecessary disturbance of the ground e.g. vehicles should not be tracked across retained habitats and tree roots should be left in situ and treated if necessary;
7. Avoid surface scarification or brash burning within suitable dormouse habitat.
8. Arisings can be left as log / brash piles in areas of undisturbed retained habitat or removed, as required.

### **Scrub clearance**

1. To be conducted from November to early March to coincide with dormouse hibernation period and avoid the main bird nesting season;
2. Scrub clearance should be carried out using hand-held tools (e.g. brush-cutters, chainsaws etc.);
3. Scrub roots not to be grubbed up or disturbed, with scrub control through stump treatment only;
4. Avoid unnecessary disturbance of the ground e.g. vehicles should not be tracked across retained / cleared habitats;
5. Avoid surface scarification or brash burning within suitable dormouse habitat; and
6. Arisings can be chipped, removed from site or left (undisturbed) in retained habitats as brash piles/windrows.

## **12.3 Forestry management and maintenance requirements**

(summarised from Hooley (1999), Smallacombe Downs: an HE management plan report)

This text provides general guidelines to enable short and long term conservation of the archaeological resource of Shillamill Wood alongside any ongoing or future exploitation of timber by the landowner or contractors.

The management principles are applicable across the entire site wherever archaeological remains have been identified within this report (or are currently known or subsequently discovered). It should be noted that management of specific archaeological site types can vary in extent and frequency. However there is a need for a number of short-term principles and practical measures to minimise archaeological damage in any current forestry cycle, leading to longer term management objectives. It is recommended that a more detailed archaeological management plan is produced to provide long term protection of any archaeological resource. It is preferable if this is combined with other site constraints (ie ecological etc), to produce an overall management plan with related site plans showing the variety of site significances and different phasing of works. This can then inform and guide the landowner and site contractors.

*'...the nature, disposition and intensity of archaeological damage (including both degradation and destruction of archaeological remains) varies considerably through the forestry cycle. The greatest risks and incidents of damage are focussed into relatively short periods during the decades of the overall cycle: these most damaging episodes occur during ground preparation where ploughing is employed, during clear-felling and during brash clearance. More gradual insidious damage of varied intensity occurs through the decades of tree growth' (Hooley 1999, section II, 3).*

Guidance is given by the Forest Authority; *'no new planting should occur in areas identified for archaeological conservation'* (Forestry Authority 1995, 4, Guideline 1).

Archaeologically sensitive areas are defined as those shown as archaeological features on the site inventory map (Fig 40). It is preferable if the short and long-term management of archaeologically sensitive features is undertaken in a systematic and phased approach – based on an agreed Management Plan framework for a number of years in advance.

### **Short term conservation of surviving archaeological remains:**

- Standing timber within archaeologically significant and sensitive areas (as defined within this report), should be felled by hand where appropriate (leaving the root ball in situ to ensure that the archaeological feature is not affected), and the stump treated (if broadleaved).
- There should be a presumption against infilling features (i.e. leats/reservoir ponds etc.) within archaeologically sensitive areas.

- It may be necessary, (after archaeologically sensitive areas have been cleared of cut branches and trees), to construct a permanent boundary (perhaps by a fence) to restrict access, especially if there are Health & Safety issues.
- The methodology (and route) of removing cut trees should be agreed with an Historic Environment archaeologist and the landowner (to avoid damaging archaeological features).
- Prior to the clearance of trees and brash (and any subsequent boundary fencing), the archaeologically sensitive areas defined above must not be used for creation of timber storage/loading bays, forestry roads, drainage ditches or the passage of vehicles, which should be along pre-designated routes.
- The landowner and the County Archaeologist should liaise to ensure appropriate and sufficient timing of actions by both parties necessary to implement the principles of this short-term management plan (and to ensure that forestry workers are briefed on the general principles).

#### **Long term conservation of surviving archaeological remains:**

- The areas of surviving archaeologically significant features (including the full extent of all designated monuments), are recommended to be taken out of the existing forestry cycle, and remain unplanted in future forestry cycles. Resulting vegetation growth on significant archaeological features should be managed (annually/bi-annually).
- Areas to be taken out of the forestry cycle to include a 3.0m wide protective margin beyond the outermost limits of the archaeological feature (or defined by an archaeologist recommended by the County Archaeologist).
- The archaeologically sensitive and significant areas defined above must not be used for creation of timber storage/loading bays, forestry roads, drainage ditches or the passage of vehicles (which should be along designated routes).
- The archaeologically sensitive areas must not have trees felled into them from beyond their boundaries.
- Timber extraction routes and new access track creation must not cross or impinge upon archaeologically sensitive areas except where specifically permitted in the detailed management plan.
- Wind thrown or wind-felled trees which fall within archaeologically sensitive areas should be removed under archaeological supervision.
- The landowner and the Historic Environment archaeologist should maintain liaison to ensure appropriate and sufficient timing of actions by both parties necessary to implement the principles of this long-term management plan (and to ensure that forestry workers are briefed on the general principles).

## **12.4 Mine landscape and buildings conservation philosophy**

### **Conservation philosophy**

A site's importance may relate to its historic heritage, its ecological or mineralogical heritage, or more usually, to a combination of two or more of these factors. Statutory designations (Scheduled Monuments, Listed Buildings, SSSI, RIGS, SAC etc) and non-statutory designations (World Heritage Site), may well affect or constrain the scope of a proposed scheme and detailed consultation with relevant statutory agencies will need to take place both prior to and during the scheme with a marked emphasis on a continual dialogue with consultants, focussing on the preservation of the historic character of the mining landscape and buildings.



Conservation work usually involves more than just the consolidation of a building or structure. The work carried out must respect its character and should take into account future access and interpretation, as well as the integrity of its surroundings. It is particularly important that all of these aspects are considered from the outset to avoid situations where consolidation or safety works compromise future plans for the site. Thus the process of professional dialogue and assessments needs to be co-ordinated often by County Council Historic Environment (Planning Advice Agencies), broadly following the pattern of Assessment, Evaluation (excavation or Impact Assessment), and Mitigation (the results of an agreed Mitigation Strategy). The assistance and close liaison of a Historic Buildings Consultant is very important before, during and after works have finished to ensure communication protocol with the respective statutory agencies and to ensure that the works are undertaken to the required standard.

The proposals should be specified in the schedule of works and specifications (through consultation with the appropriate statutory and non-statutory bodies), that result in the conservation, protection and enhancement of the historical authenticity, biodiversity and mineralogical heritage potential of the site. Therefore disturbance to a site should be kept to the minimum required to achieve the aims of the schedule of works and impact assessment mitigation strategy (all of which should have been designed in close consultation with appropriate statutory agencies i.e. HE, NE, CCC (HE Advice), etc). Thus the site should be (as far as possible), left in an enhanced or similar condition to that when work started.

### **Building Conservation**

The conservation of a structure is likely to include a combination of one or more of the following approaches: Stabilisation, Partial or full Reconstruction, Selective or full Demolition and adaptive Re-use. Schedules of work should incorporate some flexibility of approach and be tailored to specific site conditions and problems. The particular options selected are likely to be influenced as much by immediate objectives (e.g. stopgap measures to prevent further deterioration) as long term aims intended to serve for many decades, but should always take into consideration the intended long-term use of both the structures and the sites within which they stand.

The preferred conservation approach is based on retaining the essential appearance of a structure, whilst tackling the effects of time, weather and previous destructive interventions, with the aim of undertaking the minimum of work necessary to produce a stabilised ruin in the medium term. This may involve limited demolition and reconstruction, and, in rare cases, the addition of aids to long-term stability - underpinnings to foundations, hidden reinforcing and stitching, though it is preferable to avoid such solutions unless no other options exist. Preventing the ingress of water to wall heads not designed to be exposed to the elements is almost always likely to be required; lintels and other structural timbers should be carefully examined, and where necessary, replaced. Such interventions should be kept to a minimum in order to maintain the integrity of the structure, however and all wall capping and masonry reconstruction should be to profiles existing at the commencement of the works.

Wherever possible, conservation approaches should be based on carrying out repairs rather than rebuilding, other options being resorted to only where absolutely necessary. Reducing the ingress of water is the main pre-requisite of building conservation, and this will usually result in re-pointing and wall capping. Other structural remediation works are likely to necessitate operations such as masonry removal and re-setting, masonry replacement, re-installation of lintels and other structural timber or stonework, pointing and weatherproofing of areas of exposed wall cores and wall heads, installation of strengthening features such as hidden steel rods or 'beams', treatment of chemical hazards, removal or control of vegetation, clearance of rubble or rubbish, installation of lightning conductors and perhaps reinstatement or replacement of roof structures and coverings. Archaeological excavation may also be necessary, in particular of floor deposits within buildings.

### **Specifications**

- Traditional building materials (e.g: similar brick or stone, Oak/Douglas Fir timber lintels) should be used when consolidating historic buildings. Where material is to be site won, advice must be taken from the archaeologist and ecologist on the project team to ensure that the sites where this is to take place are appropriate.
- Traditional lime mortar mixes (NHL 3.5 for walls and NHL 5 for wall capping and exposed sites) should generally be used (specifications can be supplied by HES/HE), using locally sourced aggregates to match the original mortar composition. Mortar test panels should be made to permit the selection of appropriate aggregate mixes/colour and finish before the pointing work is undertaken.
- Cement and modern materials should be used very rarely and only when the need for their use can be demonstrated.

For public access and interpretation, additional works are likely to be required, including hazard treatment, safety barriers or hazard warnings, site access arrangements – paths, parking, perhaps steps or ramps to enable public access, including arrangements for those with restricted mobility. There may also be a need to restrict access to the structure, or to parts of it, using railings or other barriers. Signs or interpretative features may also be installed.

Whatever approach is taken, the need for flexibility, sensitivity and above all, authenticity must be recognised from the outset, and, where possible incorporated into the design brief. It should also be remembered that many of the surviving former industrial buildings in Cornwall are Listed Buildings or Scheduled Monuments, or are likely to become so in the near future, and that a vast majority lie within Cornwall and West Devon's World Heritage Site. Work to such buildings will almost certainly need specific and detailed written consent from local or national agencies. Any existing consents, permissions and approvals should always be checked, and attached conditions strictly adhered to.

### **Mitigation strategy**

The project briefs for the site assessments and any follow on evaluation or impact assessments should be specified by the appropriate statutory or non-statutory authorities.

As part of the mitigation strategy (described in the Impact Assessment and archaeological recording report), Historic Building Consultants should be utilised to ensure that Historic England principles of conservation practice are adhered to both in terms of the design of appropriate schemes, to ensure that consolidation works are carried out to acceptable (HE) standards and to ensure close liaison between statutory agencies and the project works.

In addition it is important that the nature, extent and development of the site conservation works should be guided by the relevant short and long term management plan policies (statutory, archaeological, conservation, ecological, mineralogical and WHS etc), which are an important part of any mitigation strategy of the site. These will then inform and guide subsequent practical site management actions, to facilitate the long term conservation and preservation of these archaeological features and sites.

## 12.5 Glossary of mining terms

**ADIT** A level tunnel (usually driven into a hillside) in order to give access to a mine, and used for drainage or the hauling of broken ore. Deeper adits did not necessarily connect to surface, and were used to carry water back from distant workings to a pumping shaft.

**ANGLE BOB** A simple lever-based device using which the direction of a reciprocal motion (of pump rods, flat rods) could be changed (for example from horizontal to vertical).

**ASSAY HOUSE** The mine laboratory, where samples or ore were analysed for their mineral content.

**BAL or BALL** From Cornish "Pal" a shovel, and hence "a digging" = a mine. Generally applied to earlier mines. See also **WHEAL**.

**BALANCE BOB** A large counterweighted lever attached to the shaft pump rods and used to offset their weight and thus reduce the work of a pumping engine to lifting water alone. A surface balance bob would be mounted adjacent to the shaft on a pair of plinths or on a masonry support at ground level (balance bob mounting), the attached counterweight - a large box filled with scrap iron or rocks - working in an adjacent stone-lined pit. Other balance bobs would be installed in chambers cut into the rock adjacent to the shaft wall as needed to counterbalance the weight of the pump rods, especially on a deep shaft..

**BAL-MAID** A woman or girl employed at surface on a mine, generally in the dressing of ore.

**BEAM-ENGINE** A type of steam-engine much favoured in Cornwall for use in pumping, winding, and providing the power to crush ores preparatory to dressing on Cornish mines. The power from a large cylinder set vertically in an engine-house was transferred via a massive rocking beam or bob to the pumps in the shaft outside. For winding and crushing, the bob was instead attached to a flywheel and crank on a **LOADING** next to the **BOB-WALL** (or in the case of all indoor engines, the side wall). In most cases, the engine house formed an integral part of the framing of the engine.

**BEDSTONE** The granite slab which formed the foundation for the cylinder of a Cornish Engine.

**BLOWING-HOUSE** An early form of tin smelting furnace, small in scale and using charcoal as a fuel.

**BOILER HOUSE** A generally lightly-built structure attached to an engine house, and designed to contain the horizontal boilers for a steam engine; the associated chimney stack may be attached to this structure, or built into one corner of the engine house.

**BRATTICING** Timber partition work in a mine, for instance the **LAGGING BOARDS** which lined the upper section of a shaft where it ran through soft ground.

**BUCKING** The breaking down of copper ore on an anvil to about 10mm in diameter by bal-maids using small hammers, after which the ore was separated from the waste by hand. This process followed cobbing, in which it had been broken down to about 25mm in diameter, the waste again being hand removed. These processes, through which the majority of the highest quality copper ore was recovered, took place within roofed structures called bucking houses.

**BUDDLE** A device for concentrating tin ore. In the mid-19th century these most usually took the form of a circular pit with rotating brushes; the tin from the stamps was fed into the centre or side of the pit and was graded by gravity, concentrating the heavy ore near the inlet point. These were often mechanically worked. Earlier buddles were trapezoidal in shape, and manually operated. A variation used in tailings works to treat sands and slimes was the **ROUND FRAME**: a free-standing, all wooden, mechanically-actuated buddle, whilst a further variation was the dumb buddle or dumb pit, which was not mechanically operated.

**CALCINER** A furnace and heating chamber in which ores were roasted to drive off impurities such as sulphur and arsenic. These were also known as Burning Houses, later patterns being of **REVERBERATORY** design. The Brunton pattern calciner, introduced in the mid-19th century, was mechanically powered, and operated on a

continuous basis, unlike earlier designs. Other patterns of calciner were also devised, the majority named after their designers (e.g. Oxland, Hocking and Loam).

**CAPSTAN** A manually or steam-operated winding drum, usually installed on a mine to raise pitwork from the shaft for maintenance or repair.

**CATARACT PIT** (or cock pit) A sub-floor area within the foundation levels of an Engine house between the Cylinder Plat and the Bob Wall, containing the regulating apparatus, and giving access to cylinder hold-down bolts.

**CILL** The base of a window or other wall opening.

**COFFIN** or **GOFFEN** The narrow excavation resulting from stoping on a lode being carried to or from surface on part or all of a lode. See also **GUNNIS**, **STOPE**, **OPENWORK**.

**CONDENSER** The cast-iron cylinder set in a tank of cold water immediately in front of the bob wall of an engine house in which the exhaust steam was condensed, creating a vacuum which greatly increased the efficiency of a steam engine. For a pumping engine this equipment was often contained within a pair of masonry walls projecting from the bob wall towards the shaft.

**COST BOOK COMPANY** A company of unlimited liability into which shareholders either paid 'calls' for further finance or shared any profits. Mines kept a 'cost book' to record expenses/costs/dues/earnings. This system was replaced by the end of the 19th century by limited liability companies.

**COUNT HOUSE** Properly **ACCOUNT HOUSE**, but generally shortened. The mine office, sometimes incorporating accommodation.

**CULVERT** A small tunnel constructed to carry a channel of water.

**CYLINDER OPENING** The often large, arched opening in the rear wall of an engine through which the steam cylinder was brought into an engine house during the erection of the engine. This opening was generally subsequently closed off with a timber partition and usually incorporated the principal doorway into the engine house.

**CYLINDER PLAT** The massive masonry base on which the cylinder of a Cornish Engine was bolted down (see also **BEDSTONE**).

**DRESSING** The concentration of the tin (copper or other ores) contained in the rock excavated from the stopes of a mine. Carried out on **DRESSING FLOORS**.

**DRESSING FLOORS** An (often extensive) area at surface on a mine where the various processes of concentration of ore took place - these consisted of crushing or stamping to attain a uniform size range, sizing (particularly on later mines), separation of waste rock, concentration (generally mechanically and hydraulically on tin mines, manually on copper mines), the removal of contaminant minerals (by calcination, flotation, magnetic separation), and finally drying and bagging for transportation to the smelter. Tin floors in particular were generally laid out down a slope to reduce mechanical or manual handling between stages in the process.

**DRIVE** (alternatively lode drive or heading). A tunnel excavated on the line of a lode as the first stage of the development of a **STOPE**.

**DRY** or **CHANGE HOUSE** (earlier **MOOR HOUSE**) The building within which miners changed their clothes before and after going underground. Some were heated by steam pipes connected to the engine boilers. Where there were large numbers of women or children employed on a mine, there might be two dries - one for men, the other for women and children. The pithead baths or showers found in collieries were rarely found in Cornwall.

**DUMP** or **BURROW** (alternatively spoil dump, spoil tip). A pile of waste material, usually from a mine or quarry. May contain primary waste (where this could not be disposed of underground) or waste from various stages in the dressing process. **TAILINGS LAGOONS** stored the extensive slimes from the final stages in the process; in earlier mines these were flushed over cliffs or allowed to wash away in streams or rivers.

**EDUCTION PIPE** The large diameter pipe through which exhaust steam was drawn into the condenser set outside the bob wall.

**ENGINE HOUSE** A building designed to contain steam, gas, oil or electric engines on a mine or other works. When forming part of the framework of a beam engine, these were particularly strongly constructed.

**FATHOMS** Measurement of horizontal or vertical distance at surface or underground (1 fathom is the equivalent of 6 feet)

**FINGER DUMP** A linear dump of waste material from a mine or quarry, flat-topped to allow material to be barrowed or trammed along it, and often equipped with a temporary tramway track.

**FLAT RODS** Reciprocating (or very occasionally rotative) iron rods used to transfer power from a steam-engine or water-wheel to a remote location.

**FLUE** A masonry-constructed tunnel or conduit connecting a furnace to a chimney stack

**FRUE VANNER** A mechanically-driven, laterally vibrated, inclined rotating belt on which fine tin-containing material in suspension in water was treated by relative density.

**GIRDER** The massive timber beam set across an engine house just below top floor level to which the parallel motion was attached and on which the spring beams sat.

**GOSSAN** The upper part of a mineral vein as it breaks surface. The natural weathering of the rock will decompose the metallic sulphides, characteristically leaving a porous rusty Quartz.

**GUNNIS** A narrow linear excavation left where a lode has been worked, most commonly used when open to surface. See **COFFEN**

**HANG A TACKLE** A temporary headframe construction with a winding mechanism to aid in the sinking of a shaft on a lode or to access a lode

**HEAD or CROP** The richest part of material in a buddle - nearest its feed point.

**HEADFRAME** The tall construction set over a winding shaft which carried the sheave wheels over which the winding ropes ran. Headframes usually contained ore bins or ore chutes to allow the broken rock in the skips or kibbles to be tipped into trams at surface.

**HORIZONTAL ENGINE** A steam engine where the cylinder(s) are set on a horizontal bed and the piston rods are attached via a cross-head to a crank and flywheel.

**HORSE WHIM** Similar to a capstan, but in this case power supplied by a horse walking around a circular platform (**PLAT**) was applied to an overhead winding drum; frequently used for winding from small shafts on Cornish mines, especially during exploratory work and shaft sinking. The smaller under-gear whims found in some 19th century farms were little used on mines.

**JIG** A large mechanically or hand-operated sieve set in a tank of water using which ore could be separated by waste. Sometimes constructed in groups within jiggling houses.

**KIBBLE** A large, strongly-constructed, egg-shaped, iron container used for ore and rock haulage in earlier shafts. Superseded by **SKIPS**.

**LAGGING BOARDS** The timber planks lining the upper part of a shaft, or where it ran through soft ground.

**LAUNDER** A wooden or steel trough used to carry water or other liquids; often used to feed water or finely-divided material in suspension around a dressing floor.

**LABYRINTH** (colloquially "lambreth") A series of interconnected masonry-constructed chambers set adjacent to one another on whose walls the arsenic vapourised in a calciner or arsenic furnace was condensed out. The gas followed a zig-zag path through such groups of chambers, and one end of each chamber would be closed off with a door using which the condensed arsenic could be collected.

**LEAT** An artificial water-course, built to carry a supply of water to a mine.

**LINTEL** The horizontal timber or stone support above an opening in a wall or structure.

**LOADING** The masonry platform in front of an engine-house (or elsewhere on a mine) on which machinery such as cranks, flywheels or winding drums were mounted and on which the reciprocal motion of the sweep rod attached to the beam was turned into a rotative motion.

**LOBBY** The excavated cutting running up to an adit portal.

**LODE** A linear area of mineralization underground. In other parts of Britain a **VEIN**, or **SEAM**. Generally vertical or near-vertical, and often extending for considerable distances along its strike.

**LODE-BACK PIT** A shallow shaft dug from surface into shoad or the upper part (backs) of a lode, from which ore could be extracted from shallow stopes to the depth of the



water table or just below. Waste material was generally dumped adjacent to the shaft mouth.

**MAGAZINE** Small strongly built store containing explosives (gunpowder or dynamite); often circular, sometimes with additional enclosing walls to contain the blast of an accidental explosion.

**MELLIOR STONE** The granite bearing stone in which the upright shaft of a HORSE WHIM ran.

**MIDDLES** The material in a buddle found between the crop and the tailings, this generally containing enough ore to warrant its re-treatment.

**OPENWORK** or **BEAM**. A mineral extraction site open to the surface, and similar to a quarry but usually distinguished by its elongated shape, and steep sides. Generally applied to features broader in extent than a GUNNIS OR COFFIN. A variety is a STOCKWORKS, where an area of ground containing a large number of small parallel lodes was removed wholesale.

**OVERBURDEN** The topsoil and subsoil removed in the process of opening or extending a quarry, streamworks or mine.

**PELTON WHEEL** A small enclosed water turbine, working at high pressure and rotational speeds. In use from the later 19th century.

**PITWORK** The term used to describe the pump rods, rising main, shaft guides (buntons) etc. within a shaft.

**PORTAL** The entrance to an adit beyond its LOBBY. Often timbered or stone vaulted.

**PROSPECTING PIT/FOSSICKING PIT OR COSTEANING PIT** A small pit dug in search of minerals, and almost always found in linear groups, often arranged cross-contour, or at right angles to the projected strike of known lodes or deposits of shoad. A **COSTEANING TRENCH** is a linear excavation cut for prospecting purposes.

**RAG FRAME** or **RACK FRAME** An inclined table-like surface on which very fine slimes in slurry form were treated to recover their tin. Large mines would have hundreds of such frames arranged in groups.

**REVERBERATORY KILN** A design of furnace in which there was indirect contact between the heat from a hearth and ore to be roasted, usually by incorporating a baffle flue.

**ROTATIVE ENGINE** A beam engine in which the reciprocating motion of the beam was converted to rotary motion via a sweep rod, crank, and flywheel.

**SETT** The legal boundary within which a mine could extract minerals.

**SETT** One of a series of stone supports for a tramway, performing the same function as sleepers.

**SETT** One of the components of timber framing of an adit where it ran through loose ground; also the timber framing of a shaft to which the shaft guides and LAGGING BOARDS were attached.

**SHAFT** A vertical or near-vertical tunnel sunk to give access to the extractive areas of a mine.

**SHAKING TABLE** A slightly inclined, mechanically vibrated table on which fine tin (as sands or slimes) in suspension in water was concentrated by relative density.

**SHEARS** or **shear legs**. A tall timber frame carrying a pulley or sheave wheel erected in front of an engine house over a shaft and used for the installation and maintenance of PITWORK.

**SHOAD** or **SHODE** Ore weathered from the load and moved (in geological time) downslope under the force of gravity. Material reaching a river valley would be to some degree concentrated before redeposition in horizontal beds. These beds of detrital material (placer deposits) were exploited in streamworks.

**SKIP** A (generally elongated) iron or steel container equipped with small wheels or brackets running on the shaft guides (buntons) and used for rock and ore haulage in later mines.

**SOLLAR** A timber platform in a shaft, stope or underground working (often between a series of ladders).

**SPRING BEAMS** The pair of longitudinal timbers extending from the rear of an engine house parallel to and on either side of the BEAM at top floor level. These served to arrest any unwanted excess indoor motion of the beam via catches set onto its rear and

were extended out from the front of the house to form the foundation for the bob-plat (the timber platform from which the bearings on the outdoor section of the beam could be serviced).

**STACK** A chimney on an industrial site, used to carry away smoke or fumes from boilers, furnaces and calciners. Often situated at the end of a Flue.

**STAMPS** A mechanical device for crushing ore-bearing rock to a fine sand. Heavy vertically-mounted beams (or later iron rods) carrying cast or forged iron heads were sequentially lifted and dropped onto the prepared ore beneath them by a series of cams mounted on a rotating drum; this usually being driven by a water-wheel or rotative steam engine.

**STOPE** Excavated area produced during the extraction of ore-bearing rock. Often narrow, deep and elongated, reflecting the former position of the lode. Where open to the surface, these form GUNNISES or COFFENS.

**STREAMWORKS** An area worked for detrital (redeposited) tin deposits by shallow excavation. Often characterised by linear dumps, river diversion, and evidence for leats. Some streamworks (dryworks) exploited deposits of shoad in now dry valleys and on hillsides, where concentrations of this material were economically workable. Leats and reservoirs were necessary to work these sites, and are characteristic of them.

**STRIPS** (settling strips) Elongated shallow tanks in which the primary settlement and subsequent separation of tin ore from waste took place after it had been stamped.

**SWEEP ROD** The elongated iron rod which connected the beam of a Cornish engine to a crank and fly wheel.

**TAILINGS** The waste sand and slime from a mine dressing floor, not containing workable quantities of mineral.

**TAILRACE** The channel along which water flows after having passed over or under a water-wheel and is then generally returned to the water course.

**TRIBUTE** A system of payment (by percentage of value of ore broken) whereby groups of miners contracted to work at previously-agreed rates.

**TUTWORK** A system of payment ("by results") in which groups of miners bid against one another for contracts to work sections of the mine for a percentage of the value of the ore raised from that area.

**VANNER** A person employed on the surface of a mine to check or assess the tin content at each stage of the refining process. The VANNING SHOVEL was used to test the relative concentration of ore in a sample of finely crushed ore or partially dressed ore.

**WATER-WHEEL** Wheel fitted with buckets or paddles around its periphery, and driven by the weight or force of a stream of water directed onto them.

**WHEAL** also **WHELE**, **WHILE**, **HUEL**. A mine.

**WHEELPIT** A structure built to house a water-wheel, often excavated and stone-lined, but sometimes free-standing.

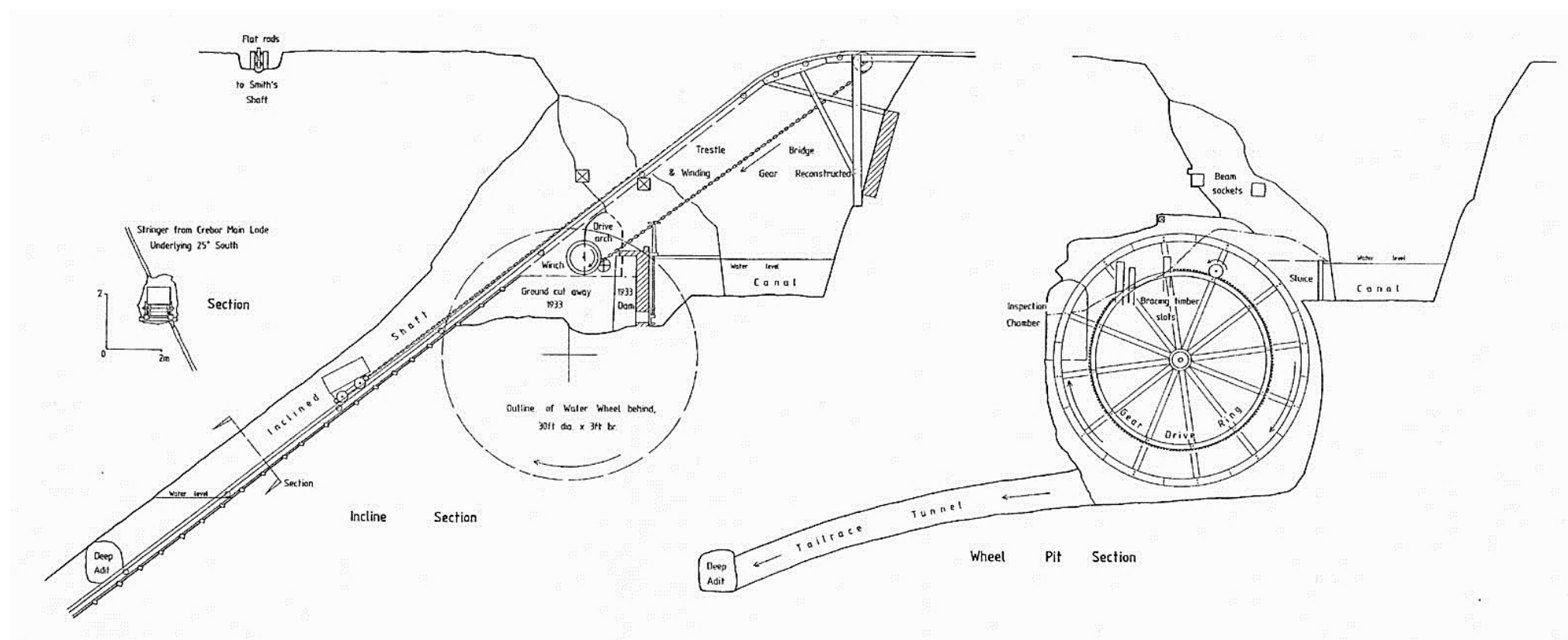
**WHIM PLAT** The level and usually circular platform on which a horse-whim was sited.

**WHIM** The winding gear used for hauling from a shaft; consists of a power source and a winding drum. See Horse-Whim.

**WIND BORE** The cast-iron strainer attached to the bottom lift of pumps

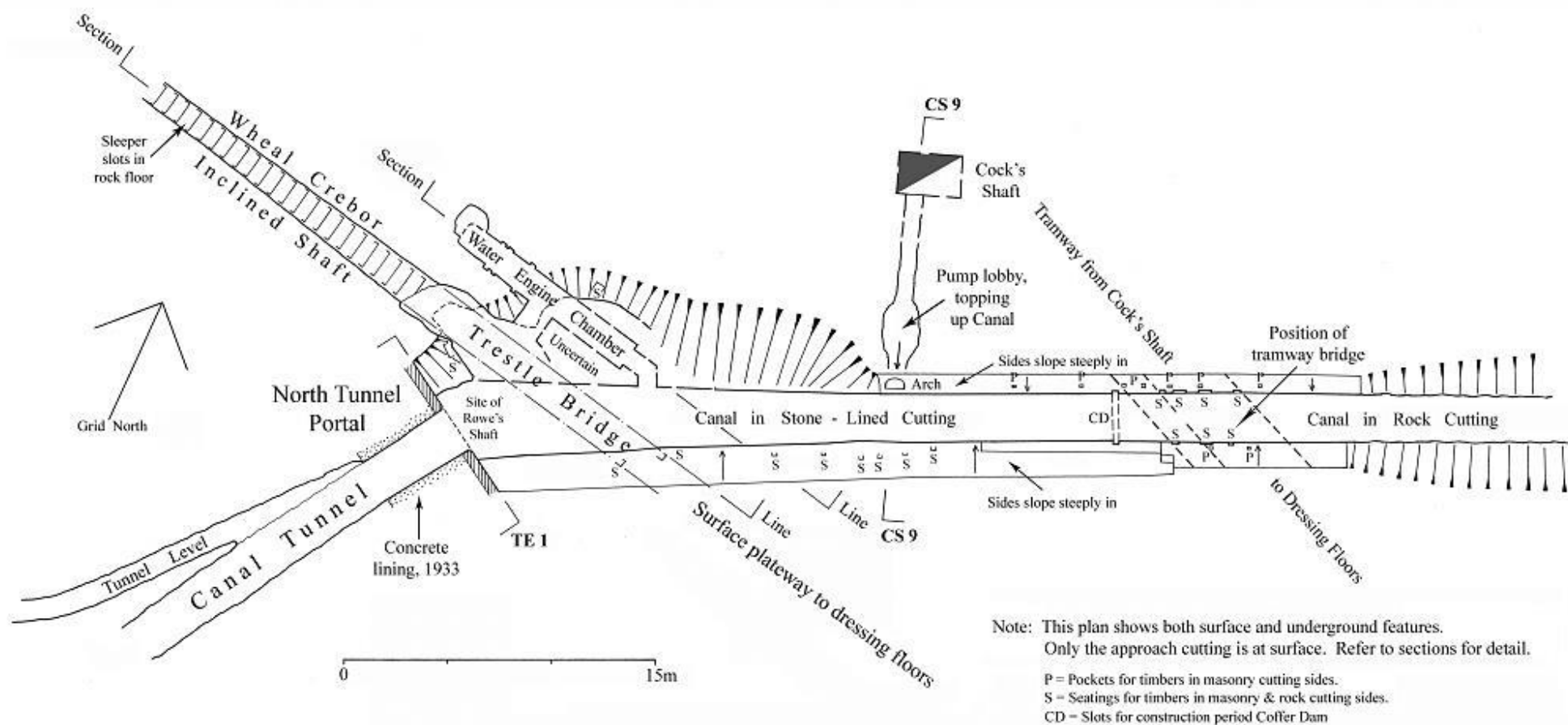
## 12.6 Interpretation drawings (© R Waterhouse)

### 12.6.1 Incline plane and water wheel (sectional elevation)



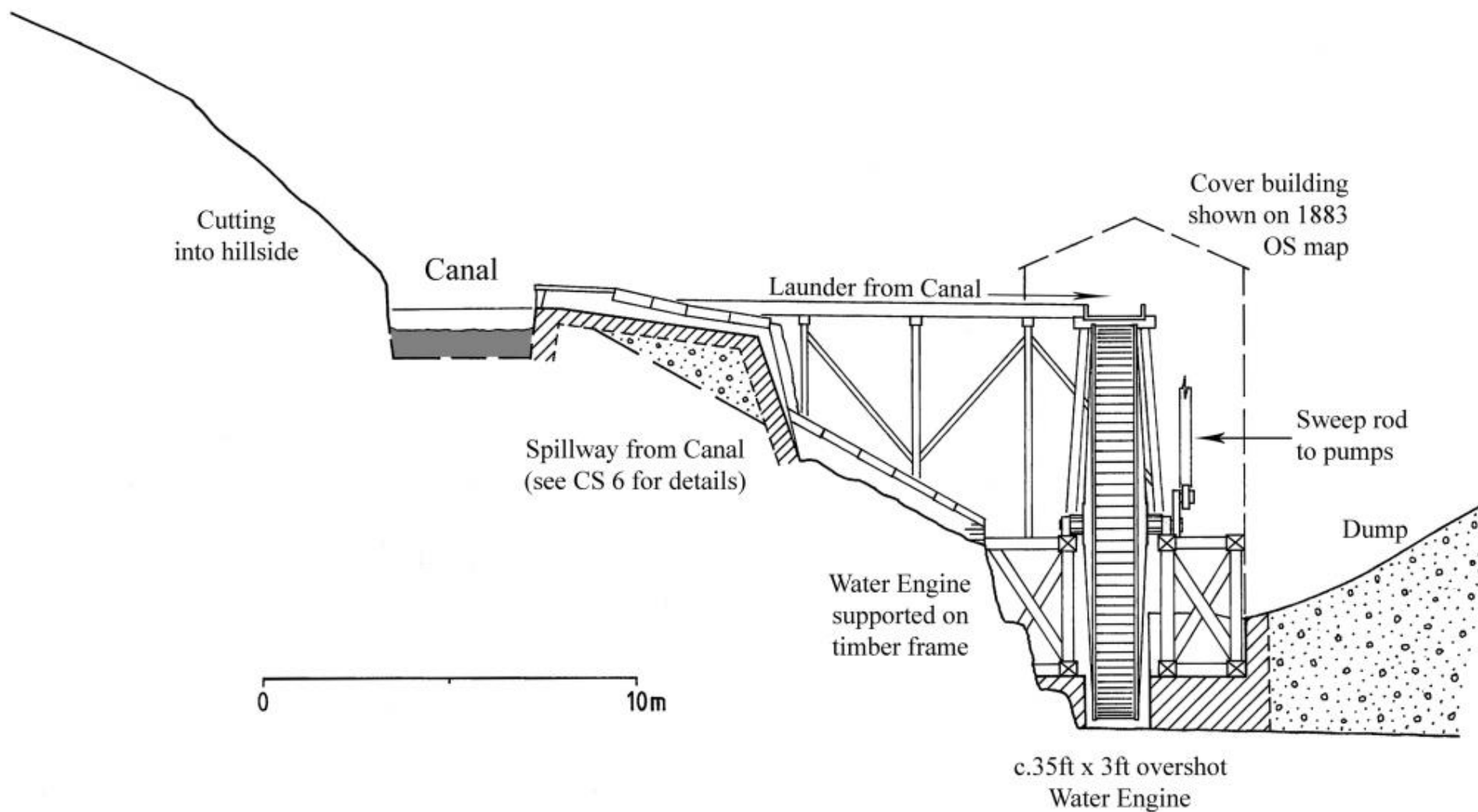
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## 12.6.2 Incline Plane/Tavistock Canal (surface and underground features)



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### 12.6.3 New Shaft winding waterwheel engine (reconstruction)



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