A HISTORY OF CALAMINE EXTRACTION
ON MENDIP

TO WHAT EXTENT HAS THE MINING HERITAGE OF SHIPHAM BEEN LOST

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ABSTRACT

Somerset calamine extraction began at Worle Hill in 1556 and reached Mendip by 1600. The early industry was monopolised by the Society of the Mineral and Battery Works. However, it failed to establish a successful brass industry in England and calamine extraction on Mendip expanded during the 17th century, to meet overseas needs. The Mines Royal Act of 1689 ended State monopoly and triggered a boom in calamine mining on Mendip, to supply the successful brass works established at Bristol. Shipham and Rowberrow, the main centres of calamine mining, expanded rapidly during the 18th century. Elsewhere on Mendip, calamine was raised at many localities, often in association with lead. The industry went into rapid decline during the 19th century, as deposits became exhausted and cheap zinc was available from abroad. Mining centres such as Rowberrow and Shipham suffered great hardship and went into decline. Calamine extraction ceased on Mendip by the end of the 19th century.

The mining created a unique landscape in the Parish of Shipham. It is proposed that 4000 pits were dug to raise the ore from at least 12km of mineralised veins. Most were surface pits, which created three types of “gruffy ground” with differing intensities of working. Much of the mining ground around Shipham has been levelled in the past 50 years. Two surviving patches are under threat of continued tipping and are considered to be highly vulnerable. Analysis of spoil heaps to the southeast of Shipham indicates that they lie above underground workings, with proposed galleries of length 20 to 30 metres.

Sites for the cleaning and sorting of the ore have yet to be identified and will never be located if the surviving gruffy ground is lost. Sixteen open mines survive in the Parish of Shipham, mostly small workings in poor states of deterioration.

Shipham retains a unique layout originating from its expansion during the mining boom, whereas Rowberrow contains many deserted cottages following its decline. The industrial landscape of Shipham is in need of further protection, as many questions remain unanswered concerning the processing and sorting of the ore.

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1. **INTRODUCTION**

1.1 **Project Background**

Mendip had a well-documented lead industry that spanned from before the Romans until the early 20th century. However, between the 16th and 19th century, extraction of the less well-known calamine was at least of equal importance. Calamine (zinc carbonate) was used as a raw material in the production of brass – an industry whose early development occurred in Bristol. It is hoped that this study will highlight the importance of calamine extraction on Mendip as well as revealing some of the finer details of how it was mined.

1.2 **Aims**

This study will aim to achieve the following outcomes:

i) Production of a detailed history of the development and decline of the calamine industry on Mendip.

ii) Assessment of the full extent of extraction by locating all known areas of production.

iii) Identification of surviving evidence within the modern parishes of Shipham (which includes the former parish of Rowberrow) and to interpret mining methods of the time.

iv) Estimation of the total number of pits and length of worked galleries within the modern parish of Shipham.

v) Assessment of the vulnerability of the surviving mining heritage of Rowberrow and Shipham.

1.3 **Methodology**

1.3.1 **Data Collection**

The sources of documentary evidence consulted are widespread, so as to build up a broad range of historical, cartographic and archaeological data. The following repositories were used:

i) Somerset Records Office, Taunton (SRO)

ii) Somerset Local Studies Library, Taunton (SLSL)

iii) North Somerset Museum Service, Weston-super-Mare (NSMS)

iv) North Somerset Local Studies Library, Weston-super-Mare (NSLSL)

v) Somerset Sites and Monuments Record, Taunton (SMR)

vi) National Monuments Record Centre, Swindon (NMR)

vii) University of Bristol Libraries (UBL)
viii) Bristol Records Office (BRO)

**Primary Sources**

Primary sources consulted include:

i) Ordnance Survey maps
ii) Geology maps produced by the British Geological Survey
iii) County maps from 15th century onwards
iv) Tithe maps and apportionment
v) Estate maps
vi) Accounts for calamine/lead mines
vii) Census details

**Secondary Sources**

Secondary sources consulted include:

i) Books, journals and reports
ii) Various contemporary diaries of travellers and industrial spies

**Further Sources**

Aerial photographs, both vertical and oblique, have been consulted and included in the report.

1.3.2 Preparation of Data

It has been possible to include much of the cartographic data and aerial photographs by scanning from reproductions of the originals. This has enabled annotation to be superimposed on to the diagrams by using suitable software.

Where this has not been possible, the original document has been traced to produce a copy for inclusion.

In the case of the tithe maps, microfiche prints have been pasted together to give copies of a rough quality.

1.3.3 Earthwork Survey and Field Observations

Features within the pitted “gruffy ground” near Shipham have been surveyed. Spoil heaps have been mapped by taking taped offsets from a baseline tied in to the National Grid. The heights of the mounds have been measured using a plumb-line in order to be able to produce rough sections across some of the features. This will enable the volume of material in the spoil heaps to be calculated.
1.3.4 Interpretation of Aerial Photographs

Areas of heavily pitted ground will be closely scrutinised in order to count the number of pits per hectare visible on the aerial photographs. Different intensities of mining will be clearly identifiable.

1.4 Location and Topography

1.4.1 Mendip

Mendip rises proudly above Somerset to form an area of high ground that reaches a maximum of 325m A.O.D. on Blackdown. A significant part is designated an Area of Outstanding Natural Beauty (Figure 1).

![Map of Mendip](image)

(1:125000 OS Somerset Navigator, 2002)

Figure 1 The Western Region of Mendip

The western margins consist of a series of steep sided hills that emerge from the low-lying Somerset Levels. From Blackdown it is possible to overlook a line of hills at Crook Peak, Sandford, Banwell, Bleadon and Brean as they stretch towards the Bristol Channel. The steepness of the slopes has resulted in limited access in the western area, with relatively few roads crossing.
The main area of plateau lies to the east of the A38 and stretches away to the southeast at heights generally between 200m and 270m A.O.D. Predominantly composed of carbonate rocks there is very little surface water present on Mendip and steep sided valleys carry away the River Axe, Yeo and Chew. Features typical of limestone areas are common, such as gorges, swallow holes and caves. The eastern margins of Mendip gradually decrease in height towards Frome, which is often given as the eastern gateway.

The southern boundary is characterised by a line of settlements along the A371, located along the spring line.

To the north, the land falls away to lower ground that now contains Chew Valley and Blagdon Lakes. A line of villages also stretches along the A368, which has resulted in the main area of high ground almost completely ringed by settlements.

Farming is now the main occupation on Mendip, with tourism also important. Mining, which once employed hundreds of people, ceased during the last century. Quarrying, however, still employs a small quantity of men.

In this study, areas such as Worlebury, Wrington and Broadfield Down have been included, although strictly speaking they lie outside the boundary of Mendip. However, they are part of the same geological feature and have important roles to play in the development of calamine mining on Mendip.

1.4.2 Shipham and Rowberrow

The parishes of Shipham and Rowberrow were the main centres of calamine mining and have been chosen for more detailed study. Figure 2 shows the location of the two villages, which are overlooked by Dolebury Hillfort to the west of Blackdown and lie west of the main area of mining on Mendip.

Both villages have easy access to the A38 and therefore to Bristol. The underlying geology determines that there is little surface water with the only stream along Rowberrow Bottom.

Shipham is situated at approximately 150m A.O.D. on ground that slopes down to the northwest. To the southeast is a ridge of higher ground called Cuck Hill.

Rowberrow is just to the northeast of Shipham and is now much the smaller of the two. It too lies on ground that slopes away to the northwest and also very steeply to the east into Rowberrow Bottom.

Today, they are quiet rural villages. It seems difficult to imagine 200 years ago when they were busy mining centres.
1.5 Geology

1.5.1 Introduction

The mining past of Mendip is a consequence of the region's geological history. In order to understand the distribution of the mining areas and problems associated with the workings it is important that the geology is described in some detail.

1.5.2 Background Geology

The Mendip region contains a wide variety of rock types and features that have been exploited by humans for over 2000 years. The general geology of the region is shown on Figure 3.
The oldest rocks found are volcanic and of Silurian age (420 million years), outcropping east of Shepton Mallet. The main areas of higher ground are generally formed of Carboniferous Limestones with lobes of Triassic Dolomitic Conglomerate emerging from the margins and merging laterally into the Triassic mudstones of the Keuper Marl (Figure 4).
Structurally, Mendip consists of four periclines (asymmetric folds) that run roughly east-west. The northern limit of each fold is the steepest, and erosion has revealed Devonian sandstones in the cones of each pericline. The uplift associated with the folding during Permo-Triassic times was accompanied by a great deal of erosion to produce the scree deposits and alluvial fans that form the Dolomitic Conglomerate (Kellaway & Welch, 1993).

During folding, a series of faults and joints also formed, which controlled the distribution of the various zones of mineralisation.

1.5.3 **Nature of the mineralisation**

The mineral deposits of Mendip are found in the west and central areas in an area called the Central Mendip Lead-Zinc Orefield (Green, 1958). Upward-moving mineralising solutions travelled along existing fissures, such as faults and joints, which became infilled to form veins which narrowed with depth (Green, 1958). Most workings in the Central Mendip Orefield tended to be less than 30m deep.

Alabaster (1982) states that veins 30-60cm thick appear to have been the norm in the Central Mendip Orefield. Because the mineralised fluids came in discrete bursts, individual veins will show distinct layering. Only small parts of a vein will contain ore, the rest called ‘gangue’ is waste (Figure 5).
According to Alabaster (1982), the proportion of ore to gangue varies considerably and gives four situations of ore type for galena:

i) nodules  
ii) thin layers at the wall of the vein  
iii) thin strings and bands within the gangue, parallel to the sides of the vein  
iv) ‘ore shoots’ – rich pockets of ore which locally fill the width of the vein.

Therefore, the miners would have to follow the vein in the hope of hitting the richer deposits. On Mendip, a number of minerals have been worked for ore, with calamine (zinc carbonate) and galena (lead sulphide) the most important. One estimate is that 202,000 tonnes of galena have been obtained from Mendip in total (Green, 1958). The figures are not known for calamine. Figure 6 indicates the location of galena and calamine bearing veins in the parishes of Shiphamp and Rowberrow.
It is wrong to think of calamine mines and galena mines as separate entities. Veins can carry more than one ore type and many of the miners would have worked both galena and calamine from the same mine. In the Rowberrow/Shipham area both minerals were often found together whereas at Priddy/Charterhouse there was very little calamine with the galena.

Calamine is found on Mendip in a variety of forms:

i) compact, stalactitic encrustations on other vein minerals and within cavities in the vein

ii) “dry- bone ore” – concentrations within the vein, or as thin veins, veinlets and strings with a structure looking like old bone.

iii) as pseudomorphs, where it has replaced calcite crystals.
In its pure state calamine is colourless, but has been stained by various oxides on Mendip to give black, brown, red and yellow forms (Alabaster, 1982).

1.5.4 **Geometry of the Veins – Summary**

i) Ores are found in veins that tend to be 30-60cm thick and become thinner with depth, especially below 30m.

ii) The veins are linear, tabular and sub-vertical but are not constant in thickness.

iii) In the Central Mendip Orefield veins tend to trend east-southeast to west-northwest.

iv) The ore is not evenly distributed within the vein and can disappear and re-appear.

v) Both galena and calamine can be found in the same vein.

vi) In the Rowberrow/Shipham mining area the mineralisation is more concentrated in the Dolomitic Conglomerate, due to its higher porosity.

vii) Elsewhere, mineralisation is also found in the Carboniferous Limestone.
2. **HISTORICAL BACKGROUND**

2.1 **Calamine Extraction – an Historical Account**

2.1.1 **Introduction**

Lead mining was long established by the time calamine extraction was taking place on Mendip. It is therefore worthwhile to briefly describe the laws and customs that applied to lead mining in the 16th and 17th centuries. Mendip was under the jurisdiction of its own set of laws and customs that were applicable to lead only until 1773 when calamine, manganese and ochre were also included (Knight, 1915, 143). It is reasonable to assume that before 1773 calamine extraction operated under the same laws, especially when one considers that lead was also being raised with the calamine in many instances.

Gough (1967) describes the constitution of the lead mines in great detail and only the briefest summary is presented here in order to provide some insight into some of the laws/customs that would have almost certainly applied to the earliest miners of calamine in the late 16th century.

Mendip was divided into four regions, called liberties, each of which had a site called a minery where processing, smelting and collection of royalties occurred. There were four ‘Lord Royals of Mendip’ entitled to collect one tenth of all ore mined on the commons, and even more on land outside the commons.

Each liberty operated under the same general set of laws, with slight variations in each district. The officers in charge of collecting the royalties (called the lot-lead) were the lead-reeves. A mineral court existed in each liberty to uphold the laws and settle disputes.

Figure 7 is a copy of an old map of Mendip that shows the position of the four mineries Priddy, Chewton, West and Harptree possibly in the late 16th century.
The ten common laws are printed in full in Gough (1967), but attention is drawn here to items 1 and 3, which concern obtaining a license and staking a claim. This version is from the margins of the Chewton map, held at the Waldegrave Estate Office and is of unknown date:

1. **FIRST** That if any man whatsoever hee be that doth intend to venter his life to bee a workman in the mynedery Occupacon hee must first of all require Lycence of the Lord of the Soyle where he doth purpose to work or in his absence of his offer as Lead Reve or Bailye and the Lord nother his Bayliffe or officer can deny him.

2. **ITEM** That every man that doth begin his pitt or Groove shall have his hacks throw two wages after the Rake; And note that hee that doth throwe the hack must stand in his said Groove to the girdle or wast And then noe man shall or may worke within the compasse of his said hacks throw. (Gough, 1967,70)

The groove, or gruff is the name for the pits and mine workings on Mendip and ‘rake’ is the vein of ore. These items of law mean that first you had to obtain a licence to dig and then define the area you are entitled to mine by throwing your hack (small pick) in both directions along the line of the vein, while waist deep in the pit. Jack McQueen-Foord, writing in “Shipham, Rowberrow and Star – A Local History”, (1986) explains how there was a recognised way of throwing and a special “law
"hack" used when staking a claim. The pitch was finalised by setting up a course of timber on the ground and a pair of stillions, which are the wooden uprights for a windlass.

The method of obtaining a licence, staking a claim and paying a share to the Lord of the Manor also applied to extraction of calamine.

In summary, when calamine extraction began on Mendip in the late 16th century it was in a region of a well-established prosperous lead industry governed by its own special laws and customs.

2.1.2 Early Beginnings of the Calamine Industry

There have been various studies that have documented the early stages of the calamine industry in Britain. They all tend to give similar accounts being based on relatively few original documents. The best descriptions of events at the onset of the industry are found in *The English Brass and Copper Industries to 1800* written by Henry Hamilton in 1926 (revised in 1967), *The Mines of Mendip* written by Gough in 1930 (second edition, 1967) and *Bristol Brass: The History of the Industry* by Joan Day (1973). Gough and Day both draw on the work of Hamilton. The key stages that led to the establishment of calamine mining are described here, with particular attention paid to the location of early workings in Somerset.

2.1.3 An Elizabethan Monopoly

There was no brass industry in England until the reign of Elizabeth I. To be dependant on importing brass and copper from the continent was potentially a strategic weakness that could affect the vitally important wool industry and weapon manufacture. Hamilton (1967, 7) points out that the production of brass wire for making wool-cards was every bit as important as the need to produce cannon.

The English Government desired to have a brass industry of its own and looked to the continent for the expertise to set one up. During the 16th century the German metal industry was far in advance of that in Britain. In 1561 German merchants were approached resulting in the establishment of a company, backed by German and English Investors, to search for copper and other metals (Day, 1973, 16). This company eventually became called the Mines Royal Company. A second company (virtually a sister company) was established in order to make brass. The Society of the Mineral and Battery Works had many of the same shareholders as the Mines Royal and was also a joint German/English enterprise. These two companies, that received a Royal Charter in 1565, enjoyed far-reaching privileges that effectively gave them a monopoly in England (Hamilton, 1967).

The Mineral and Battery Works set out to find calamine, which was to be combined with copper to produce brass. Sir William Humfrey, chief assayer of the Mint, assisted by Christopher Schutz
(manager of a zinc mining company in Saxony) were granted sole rights to search for, mine calamine and set up brass and battery works. The Mineral and Battery Works were a joint enterprise with German entrepreneurs hoping for good profits by virtue of their expertise and experience in producing brass. Battery works were used in Germany to produce brass sheets using hammers powered by water wheels. The Germans also had methods of drawing out wire using waterpower. At the time in England metal sheets and wire had to be produced by hand. The metal industry in England was to receive a rigorous phase of modernisation (Hamilton, 1967). Gough quotes several separate contemporary sources that identify Worle as an early site of calamine extraction. These include Humfrey and Schutz taking out a lease to work and mine for calamine discovered on Worle Hill in 1566. The site of these early workings may still be visible today, as there are patches of gruffy ground on Worlebury Hill.

Humfrey and Schutz set up a brass works at Tintern to produce iron and brass wire. However, although they successfully produced iron wire, experiments to produce good quality brass ended in failure and in 1569 they gave up the lease (Hamilton 1967).

There seems to have been a lull in activity until 1582, when the Mineral and Battery Works, leased its privileges of mining calamine and producing brass wire and battery. Four partners, including John Brode, finally signed an agreement in 1587 and battery works were constructed at Istleworth, near London (Gough, 1967,209).

Norden (1593,41) describes:

“Thistleworth or Istleworth……a place scyntuate vpon the Thamis, not far from whence, betweene it and Worton, is a copper and brass mill, where it is wrought out of the oare, melted and forged. The oar, or earth, whereof it is contrived, is brought out of Sommerset Shire from Mendip hils, the most from Worley Hill mainie artificiall deuices there are to be noted in the performance of the worke”.

The extent of the industry at the end of the 16th century was expanding under John Brode’s supervision and workings opened up on Broadfield Down, near Wrington. The Wells Chapter Acts of 12th October 1598 also mention:

“the mines, grooves and pits of Calamynt stone now being or to be made upon the commons of smaledowne and other commons and waste grounds within the manors of Winscombe and Shipham”.

The locations of known calamine mines at the end of the 16th century are shown on Figure 8.
By now the industry was well established in England and almost entirely in the hands of the Mines Royal and the Mineral and Battery Works. However, the monopoly of these two companies was to come to an end during the following century.

2.1.4 Stagnation During the 17th Century

The century began with the Mineral and Battery Works having its privileges re-confirmed by James I’s Government. However, by the time of the Civil War the fortunes of the company had declined with increasing amounts of imported brass and copper and a certain amount of disarray in the country (Hamilton, 1967)

Although brass production went into decline after the Restoration, Gough (1967) describes how calamine mines in Nottinghamshire, Gloucestershire and Somerset were kept busy for overseas markets. A petition presented to Parliament in 1665 indicates that the calamine industry was well established in Western Mendip. Concerned at the fate of several towns the petition states:

"the complaint of the severall townes in Somersetshire that do live upon it viz. Renton, Rubery, Shipham, Winchcomb, Barrington etc show that it is of great concernment for their imployment and lively-hood" (Pettus, 1667).

Gough (1967,219) also quotes from manuscripts of 1681 stating that calamine was being raised on hills above Banwell and Hutton. With English brass and copper production in the doldrums, the extent of calamine production late in the 17th century shows a surprising increase in the number of
mines. Including sites at Worle, Broadfield and Brockley, the extent of the calamine industry had grown (Figure 9).

![Figure 9](image)

Figure 9  Location of Calamine Mines in late 17th Century Somerset

With home manufacture of brass being inadequate, illegal works began cropping up. At Bristol in 1629, William Bisse and John Berry were ordered to demolish their brass works at Cheddar and Stapleton (Day, 1967,23). They eventually obtained a lease.

In 1662 John Tripp was summoned for mining and exporting calamine without a licence. He pleaded ignorance and was allowed to continue, provided he paid a share to the Crown (Gough, 1967,213). Although the location of Tripp’s mines are unknown, it is possible that they were in or near Shiphamp since the Tripps are listed as a mining family in Shiphamp in 1723 (Stiles, 1983,7).

The privileged companies of the Mines Royal and the Mineral Battery Works combined during the 1660s, but by then were in a state of deterioration. Towards the end of the century legislation was passed that effectively ended the monopoly of the privileged companies. The Mines Royal Act of 1689 meant that the Crown was no longer able to exert control over mines producing base metals such as lead and copper. This had the immediate effect of opening up metal industries for private enterprise and the brass industry was to enjoy a period of growth during the start of next century.

2.1.5 Boom Time

The establishment of the Bristol Brass Wire Company in 1702 at Baptist Mills, as well as factories in Birmingham and elsewhere, gave an important market for Mendip calamine. It was during the
middle part of the 18th century that was probably the peak of the calamine industry on Mendip. There was a rush of people into places such as Rowberrow and Shiphm keen to make their fortune. The nature of mining calamine on Mendip was similar to that of lead, with lots of independent miners who would pay their royalties (or freeshare) to the mineral owning Lord of the Manor. Miners had to apply to the Lord of the Manor for a licence to stake a claim to dig on the common grounds or waste of the Manor. McQueen-Foord (1986,6) highlights records of the Shiphm Manorial Court for 15th May 1789, which involves four cases of illicit building and inclosing gardens on the waste of the Manor. This erratic building of plots was to give Shiphm a unique plan as will be shown later.

The extent of the calamine industry spread as the success of the Bristol Company grew. Bristol was well placed with local calamine, supplies of copper from Cornwall and decent power supplies on the Avon and Frome. A successful port, Bristol gave the opportunity for export of brass goods especially with the rapidly growing African and Plantation trade (Gough, 1967).

Calamine extraction received a further boost when William Champion obtained a patent for making metallic zinc from the ore. He broke away from the Bristol Brass Company and set up the Warmley Company in 1746.

Calamine mines are known to have existed in many places on Mendip during the 18th century boom time. Billingsley (1798,85) mentions work at Compton Martin, East Harptree and Binegar. De La Beche (1839) quotes recently worked calamine from Worle and Bleadon Hill and accounts held at the Somerset Record Office confirm that it was mined at Chewton (SRO/DD/WG/Box14). A Modern Map of Somerset (1766) by Ellis shows calamine workings to the south and east of Priddy. There were even workings started on Durdham Down in Bristol in 1712 (Gough, 1967,171). Figure 10 shows the likely extent of calamine extraction that occurred during the 18th and possibly early 19th century.

The impact on Rowberrow and Shiphm, which were the main centres of the industry, can be shown by population changes. Census data shows that the population of Rowberrow and Shiphm rose from 680 in 1791 to 1083 in 1831.
Shipham miners were setting up by encroaching on the common, and in Rowberrow, most settled along Rowberrow Bottom. The rise in the number of miners is confirmed from various production records for the Manor of Shipham between 1724 and 1761 (Stiles, 1983). In Shipham, the number of named miners in the records (probably lead and calamine) was 20 in 1724, 29 in 1750 and 44 in 1760.

### 2.1.6 Years of Decline

Several events led to the death of the calamine industry on Mendip. James Emerson patented a new method of making brass in 1781 by directly combining zinc and copper. A higher quality brass was produced and this method gradually superseded the older method of combining calamine and copper. The reduction of high duty tax on imported zinc in 1825 meant that it could be obtained cheaply from abroad (Gough, 1967,232). Having been artificially protected, Mendip calamine could not compete with free trade and demand was down due to changes in the method of producing brass. Calamine found near the surface had virtually been exhausted and the industry went into rapid decline. As early as 1830 there were concerns for the welfare of the miners of Shipham and Rowberrow, when a meeting was chaired by the Bishop of Bath and Wells to set up a committee to help. It was reported in the Bristol Mirror of 27/11/1830 and included the following:

“*The population, about 300, has hitherto been principally supported by the raising of calamine, which is so reduced in value by the introduction of foreign metal and other courses,*
Knight (1915,141) describes how mining had ceased in Rowberrow and Shipham by 1853. The decline had almost certainly begun in many places early in the 19th century. Accounts for the Manor of East Harptree numbers 16 calamine miners in 1797, dropping to one in 1801. The drop in the number working calamine corresponded with an increase of those working ochre (SRO DD/WG/Box14).

There was a final attempt to maintain the industry with sporadic mining activities by the Cornish in Rowberrow and Shipham during the 1850s and 1860s (Schmitz, 1976,81). The final attempts were probably four deeper shafts sunk in the early 1870s by a man called Rickard from Redruth. Gough (1967,231) also describes various sporadic leases for mining calamine at East Harptree as late as the 1880s.

In summary, Somerset’s calamine industry went into a very rapid decline from the 1820s until effectively ending in the 1850s, with a couple of later failed attempts. The result of this brought hardship on areas like Rowberrow/Shipham/Star that were dependent on the calamine and were predominantly surrounded by ground spoilt for agriculture. Population data from the census is shown on Figure 11.

Figure 11  Population of Rowberrow, Shipham, Winscombe and Puxton 1801-1911
The decline in population between 1841 and 1911 reflects how the two parishes could no longer support as many people. It can be seen from Figure 11 that the falls in population for Rowberrow and Shipham are very significant. Between 1831 and 1911 Rowberrow fell from 392 to just 78 whereas Shipham fell from 707 to 359. In 1911 the population of Rowberrow was less than 20% of 1831 and Shipham about 50%. This contrasts greatly with Puxton, a small non-mining settlement and with Winscombe which showed a much smaller percentage fall in population. Although calamine was mined at Winscombe, the scale of any surviving industry in the early 19th century was very small in comparison to Rowberrow and Shipham.

The net result was abandonment of properties more so than in Shipham as the villages shrunk in size. Evidence of this will be looked at later.

2.2 Mining Techniques Through Time

2.2.1 Introduction

Various eye-witness accounts and descriptions exist that give an insight into how the calamine was worked and processed. The sources vary from descriptions made in the 17th century, mining account books in the 19th century and writers from the early 20th century. It is hoped that a detailed picture will be formed that will enable us to interpret the evidence that survived in the field today.

First-hand Accounts of Calamine Mines and Mining Techniques

Pre-19th Century

Mr Giles Pooley produced a most detailed account of calamine extraction near Wrington in October 1684. The methods described continued in use throughout the history of Mendip calamine extraction, perhaps with the exception of the very latest phase of workings. The description given by Pooley (1684) was used by many later writers to produce their own version.

Pooley starts his account:

“As to the finding out the Calamine, which I think the first thing to inform you of, the Groovers tell me there is no certainty at all, but that it is a meer Lottery”.

Groovers is the Mendip term for miner and Pooley goes on to describe that the calamine cannot be located through changes in the vegetation or the like. He notes that the workings are always on hills.

To locate veins the miners dug trenches down to the bedrock across the expected line of the vein.

The veins:

“run between the Rocks, generally wider than those of Lead-Ore, unless they are inclosed in very hard Cliffs, and then they are as narrow as the Veins of Lead” (Pooley, 1684).
Later writers describe the importance of the divining rod for locating ores (Billingsley, 1794).

A description of the underground workings tells us:

“they use the same way and Instruments they do in Lead Mines: and sometimes they light upon a good quantity of Lead” (Pooley, 1684).

He explains that the ore is generally raised in small pieces but occasionally needs to be broken underground before winding it up in buckets.

The tools of the miners would have been picks, lamps, wedges and after 1680, gunpowder. The badge for the Mineral and Battery Works (1568), shows this (Figure 12).

Pooley describes that after being raised, the ore is carried off and washed by turning it in running water in an enclosure made of boards or turf. The more earthy parts are carried off. On Mendip this process of cleansing is called buddling. Then:

“having raked up the bigger parts of both Lead and the Calamine, they afterwards put the smaller parts, that they may lose none of their Ore, into Sieves made of strong Wire at the bottom.” Then “they often dip and shake up and down in a great Tub of Water, by which shaking of the Sieves, the parts of the Lead which is mixt amongst the Calamine sink or pitch down to the bottom of the Sieve” (Pooley, 1684).

This method is called jigging and would separate the lead, calamine and calcite due to their differing densities. This would allow each to be taken off one layer at a time.

(Rees, 1968)

Figure 12  Arms of the Society of the Mineral and Battery Works, 1568
The scene can be imagined by studying Figures 13 and 14, that show buddling and jigging in German mines during the mid-16\(^{th}\) century.

Figure 13  Buddling in a 16\(^{th}\) century German Mine as shown by Agricola (1556)

Figure 14  Jigging in a German Mine as shown by Agricola (1556)
Then according to Pooley:

*they are forc’d to spread it upon a Board, and so pick out with their hands the trash and stones that remain*” (Figure 15).

![Figure 15 Picking the ore in a 16th century German Mine (Agricola 1556)](image)

It is interesting that Agricola shows women picking the trash from the ore and this may have been the case on Mendip, as Gough (1967) reports that the Reverend Skinner witnessed this in 1820. Once cleansed, the calamine requires reducing to zinc oxide by firing in an oven in a similar process by which limestone is converted to lime. According to Pooley (1684) it is much bigger than a bakers oven and:

“*they cast in their Coals into a Hearth made on one side of the Oven, which is divided from the Oven it self by a Hem or Partition made open at the top, whereby the Flame of the Fire passeth over, and so heats and bakes the Calamine.*”

This process is called calcination and would have been carried out prior to the ore being transported as it is now reduced in weight. Rakes would have been used to turn the ore which was heated for four or five hours.

Henric Kalmeter, a Swedish industrial spy describes the process at Shipham 40 years after Pooley’s account:

“When it is completely cleaned from all lead ore it is crushed under large stones which roll on their edges and are drawn by a horse, after which it is put in a furnace to be burned. The furnace is built in the same way as a reverberatory furnace, so that the flames from the fire,
which is made of fern or peat which grow in the marshes, can play over the calamine, which lies four or five inches deep on the bottom, the chimney drawing the flames up at the end of the furnace away from the end where the fire is” (Kalmeter, 1725,58).

(Rees, 1968)

Figure 16  Example of a reverberatory furnace

It is interesting to note that Kalmeter records an extra step in the processing using stone wheels to crush the ore prior to calcinations in the oven. There are later accounts of ovens in Rowberrow that produced fumes that prevented trees from growing (Collinson, 1791,599) and the base of a chimney from a calamine oven survives in Shipham today. Knight states that there four calamine ovens in Shipham. Their locations is not known at present but was apparently well known in 1915 (Knight, 1915, 134.

After calcinations:

“ they beat it to a Powder with long Iron Hammers like Mallets, upon a thick Plank, picking out what Stones they find amongst it; so that at last the Calamine is reduced to Dust : From the Oven it is conveyed in Sacks to some Port, where being bought by the Merchants, it is carried beyond – sea, commonly I think to Holland” (Pooley, 1684).

Kalmeter (1725,59) states that:

“the shafts are worked by the country people on their own account and they pay a certain fee to the owner of the ground. They sell the raw calamine to the representative which the Bristol Copper and Brass Company keeps here, and who calcines it as well as as that he digs up on his
own lands. He arranges things so that little or none of this calamine is shipped overseas, as happened in former times.”

This confirms that while the brass industry was in the doldrums, Mendip calamine was sold abroad until a market returned in the U.K.

Kalmeter (1725) describes how the shafts in Shipham are all timbered, and with some three to six fathoms deep and some ten to fifteen fathoms. A later account by Maton in 1797 gives a little more detail of the underground workings:

“The common mode of descending is by a rope tied around the thighs, and it is wonderful with what rapidity the miners let themselves down only by sliding their hands along this rope when dropped to the bottom. Their buckets which are brought up by a windlass, hold about a gallon” (Maton, 1797,133).

Agricola shows a similar arrangement in Figures 17 and 18.

![Figure 17 Descending Shallow Mine Shafts, Germany (Agricola, 1556)](image-url)
Figure 18 seems to show that the windlass is built on to a roundish flat surface. Many of the pits to the south of Shipham show a similar form.

The ore was worked from small underground galleries using picks where it was friable enough. Waste material was left underground, in many cases to backfill worked out galleries. After 1680 it was possible for gunpowder to be used and a description of a visit underground by Maton gives some idea of the conditions:

“I was in one gallery of such length and so confined that amidst the fumes of gunpowder (used for splitting the rock), the breath of three or four people huddled together, and the oily effluvia of the candles, I had nearly sunk with suffocation before I had remained in it a quarter of an hour” (Maton, 1797,133).

Early accounts of the depths of the mines seem to fall into the range of 1 yard to 30 fathoms, which is roughly 1 to 60m (Billingsley, 1794). Billingsley talks of four or five hundred miners in Rowberrow, Shipham and Winscombe in 1794. This figure seems high, but Collinson (1791,600) gives 380 inhabitants in Shipham in 1791

“almost all of them miners.” He describes “upwards of one hundred of these mines now working, many of which are in the street, in the yards and some in the very houses.”

This fact is confirmed by Maton (1797,127) who states of Shipham
“it is inhabited entirely by miners, who have hollowed out of the ground under the very foundations of the houses. At the particular hours of the day when their labour ceases, they may be seen crawling out of the ground exactly like rabbits from their burrows.”

A newspaper report in the Bristol Mercury of March 3\textsuperscript{rd}, 1817 gave news of a robbery “committed by a combination of villains at Shipham, Somersetshire, who broken open Mr Spencer’s barn and carried off 14 tons of lapis calaminaris.”

This gives us a final part of the mining process, i.e. the calamine was stored in barns.

The primitive methods described so far were in use throughout the whole period of calamine extraction on Mendip. There were clearly a large number of workings, which according to Knight (1915,132) were of two distinct types: long shallow trenches and more regular shafts.

The author Francis Knight lived on mining ground in a house named Wintrath, near Winterhead to the west of Shipham. Several of Knight’s books contain details of the remains of workings in Shipham, Rowberrow and Winterhead between 1904 and 1915. Describing the garden of their bungalow, Knight talks of beds of sand/gravel that are the remains of the breaking up and washing the ore (Knight, 1904). Also described are the rotten remains of a wooden aqueduct and of a possible calamine roasting oven. It is difficult to know when these features date from, but it is likely to be from the latter stages of the industry.

2.3 Later Techniques

There was limited use of steam engines on some of the later, deeper mine shafts. Old locomotive engines were used to turn the winding drum and two are described at Rowberrow. One was on the ground and known as Beach and the other was near the eastern edge of Daffodil Valley (Knight, 1915,184).

An engine also existed in Shipham, located in the middle of the village on the deepest of the Shipham mines (Knight, 1915,141). The exact locations of all three will be considered later on.

According to Knight (1915), the long trenches of pits and the deeper shafts were being worked at the same time. McQueen-Foord (1986) explains that the long lines of small pits, that used to be far more visible than today are the result of 19\textsuperscript{th} century miners. He describes how 40-60 foot shafts were dug down to the ore, worked along the vein for about 30 feet and then another shaft would be sunk. This allows the miners to leave their waste by back-filling galleries and reduces the distance underground to the shaft. Chris Richards has probably spent more time than anybody exploring and mapping some of the underground workings at Shipham. His descriptions confirm this arrangement (Richards, 2003, pers comm.).
2.4 Summary of Calamine Mining Methods

i) Miners obtained a licence from the landowner and then staked a claim.

ii) Miners worked independently paying 1/10 or more to the landowner.

iii) Initial workings were small pits with narrow galleries that followed the ore.

iv) Simple tools were used such as picks, shovels, buckets windlass and gunpowder.

v) Mines could be very close and were found in streets, houses and yards.

vi) Miners in Shipham incroached on the common and built houses over their claims.

vii) The ore was cleaned by buddling and jigging using water and then it was crushed.

viii) The ore was roasted in calamine ovens, probably supervised by agents from the companies buying the ore.

ix) The ore was stored in barns, prior to being sold or transported in sacks via horse and cart.
3. CARTOGRAPHIC AND ARCHAEOLOGICAL SOURCES

3.1 Cartographic Data

3.1.1 Introduction

A wide range of maps have been consulted that date back to the 16th century. However, it soon becomes apparent that very little direct evidence of calamine mining is recorded on maps. It is hoped to show how the development and decline of Shipham/Rowberrow between 1600 and 1900 was totally linked with the health of the calamine mining. Maps that contain areas of significance are included in the following section.

3.2 Map Regression

3.2.1 Early Maps

The Map of Mendip showing the mineries is of unknown date, but may originate in the 15th century. Saxton’s Map of Somersetshire (1575) shows the mineries near Priddy as well as the parish churches at Shipham and Rowberrow (Figure 19).

Figure 19  Saxton’s Map of Somersetshire, 1575
Morden’s map of Somersetshire (1695) contains no mention of calamine, but again shows the mineries near Priddy (Figure 20).

![Figure 20: Somersetshire by R. Morden, 1695](image)

The earliest map with a reference to calamine dates back to 1725 and is a geological section produced by John Strachey (Figure 21).

![Figure 21: Sections of a Coal Country in Somersetshire (Strachey, 1725)](image)

(Kellaway and Welch, 1993)

It shows lead mines on Broadfield Down, but also shows lapis calaminaris associated with it.
Ellis’ Modern Plan of Somersetshire (1766) shows lead mines at Broadwell Down (Broadfield), but also lapis calaminaris near Shipham and Priddy (Figure 22).

Although there appears to be some artistic licence in the placing of the calamine mines on Figure 22, it indicates that the mines had sufficient importance in 1766 to warrant putting on the map.

**3.2.2 1792 Map of Shipham by W. White**

Local surveyor William White produced a detailed map of the manors of Shipham and Winscombe in 1792. Figure 23 shows a copy that was traced from the original held at Somerset Record Office.

It can be seen how the village of Shipham has developed the distinctive shape it has today. The old medieval part of the village is centred around the church and manor house and the newer part of the village has been built on the common where people have staked their claims (Neale, 1986).
Francis Neale describes a rush of cases in the 1780s and 1790s involving illicit building on the memorial common and waste. The survey book (File DD/CC11556, SRO) that accompanied the map records 14 properties in Shipham Pitts listed as “Incroachments” and the rough area of these is shown on Figure 23. The areas of enclosed ground to the east and south of Shipham are recorded as shanty town plots on the Somerset SMR. These probably represent the plots of land worked by the miners to grow produce, rather like allotments today. It is interesting to note that in the central part of Shipham Pitts the clumps of houses do not seem to have streets yet, although the layout is clear to see.
3.2.3 Tithe Maps of 1841

The tithe maps were produced during a period of change for the calamine miners. By 1831 Rowberrow and Shipham had reached their maximum size in terms of population, but by then mining was already in decline. Produced in 1841, the tithe maps give a “snapshot” view of the two parishes prior to the drastic depopulation of the next 70 years. The census of 1841 names 45 lead/calamine miners in Rowberrow and 48 in Shipham. At the time, the population of Rowberrow was 369 (190 men) living in 74 houses and in Shipham it was 707 (364 men) living in 163 houses.

Very little direct evidence of calamine mining is given on the tithe maps. There is no mention of any workings in the apportionment, which is strange since limekilns are listed. In the following sections evidence will be drawn from the tithe maps of Shipham and Rowberrow to give more of an insight into how these two settlements developed.

3.2.4 Shipham

A rough copy of the tithe map for Shipham is shown on Figure 24. Some annotation has been added to explain some of the features shown.

It is immediately noticeable that the basic layout of Shipham is a result of the initial sites of illicit building shown on White’s map of 1792. This has given it the cellular appearance that was to remain largely unchanged until the 1950s.

The apportionment confirms that many of the occupants of Shipham owned their own property by 1841, and that a range of occupations existed in the community such as blacksmiths, carpenters, school, chapels, poor house and public houses.

Only two occupants are named as miners – George Day and John Stock, although Solomon Pitman, John Seymour and others are listed as working the plots of ground called the Miners Piece. This was land owned by the Dean and Chapter of Wells that was set aside for the miners to use. This probably reflects the general poverty within Shipham as the mining was by now in rapid decline. Several of the so-called “shanty town plots” are listed as gardens, with many not even present on the apportionment. There are many garden plots, which was still the case in 1915 according to Knight.
Figure 24  Copy of the Tithe Map for the Parish of Shipham, 1841
Many properties are listed with barns/sheds/outbuildings and whether these represent the “barns” used to store ore is difficult to prove. The fact that cottages with tiny plots of ground have a barn implies that some are almost certainly associated with mining use. The positions of these are shown on Figure 24.

Several hovels are listed, which together with the presence of a “Poor House” give further indication of poverty.

The only sites of water listed are Horsepool Ground (plot 84), near the church and Pool Ground (plot 349), which is to the west of Star and out of the mining area. Perhaps the most tantalising field names are Wash Pound Piece and Bathes, to the south of the church and on the line of the stream fed by springs further up the hill. This spring and three wells close by represent the only sources of water for the washing the ore. It is certainly possible that Wash Pound Piece may have been used for that purpose. It is more likely linked with the farming past of Shipham.

The mention of ruins in some plots indicates the abandonment of properties, but one in particular draws attention. Plots 155/156 are listed as an orchard with ruins and a garden with ruins. These are in the vicinity of the remains of the calamine oven that survive today.

3.2.5 Rowberrow

A copy of the tithe map for the Parish of Rowberrow is shown on Figure 25. Key features have again been added to aid interpretation.

The layout of Rowberrow differs from Shipham because the housing was generally concentrated along Rowberrow Bottom and not over the top of the mines. Compared to today, it is immediately noticeable how many properties formerly existed alongside the stream. As with Shipham, there are a large number of small garden plots that the mining families would have tended to grow produce.

The number of barns mentioned on the apportionment is very low and there seems to be far less support occupations such as blacksmiths. The barn in plot 33, adjacent to the A38 at Star is on the site of known mines discovered by the water board in the 1980s (Hendy and Prewer, 2002). It may therefore represent a calamine storage barn.
Figure 25  Tithe Map for the Parish of Rowberrow, 1841
The only sources of water are the stream along Rowberrow Bottom and the pond next to the Swan Inn, although there are two fields called Wellmeads which may have had wells nearer to the mining areas.

3.2.6 **Ordnance Survey, 1886**

The 1886 editions of the Ordnance Survey, mapped at a scale of 25 inches to the mile are shown reduced on Figures 26 and 27.
Important observations from these maps are listed below:

i) Large areas of gruffy ground are shown indistinguishable from other pasture.

ii) Shafts have been shown in both the Rowberrow and Shipham runs and are likely to date from the later phases of mining, but are disused by 1886.

iii) Many buildings have disappeared since the tithe map or are just shells, particularly along Rowberrow Bottom and Back Lane, Rowberrow. In Shipham the disappearance of structures is less marked, and mainly concentrated in the south of the village.

iv) The garden plots are shown as if they are still in use in 1886 in both villages.
v) The wells and springs that are the source of water for Shipham, are clearly shown. The maps show that the impact of population loss was more marked in Rowberrow (which had halved from 1841 to 1881) than Shipham, where it had dropped by 40%.

3.2.7 **Ordnance Survey 1902/3 revised in 1932**

There are a number of observations that can be made from this edition mapped at 6 inches to the mile. Figure 28 shows that Rowberrow Bottom and Back Lane had become almost totally deserted.

Figure 28  Ordnance Survey Map of 1932, mapped at 6 inches to the mile

Very few properties are occupied and the garden plots are no longer in use. Just to the west of Shipham another old mine shaft is located near to Wintrath – the house that author Francis Knight owned. Knight’s description of wooden aqueducts and deposits of sand/gravel from the washing of ore probably relate to this mine (Knight, 1915). In general, there was little change to Rowberrow and
Shipham during the first half of the 20\textsuperscript{th} century. The population reached a low of 437 in 1911 for both parishes, and had only risen to 572 by 1951.

Post-war development has had a dramatic influence, especially on Shipham. The current O.S. map is shown on Figure 29 and reveals how much building has occurred in Shipham whereas Rowberrow has largely remained unchanged since the 1930s.

![Figure 29 1:10000 OS Map of Shipham area, 2002](image)

The corresponding rise in population is equally dramatic as the decline during the 19\textsuperscript{th} century (Figure 30).
3.3 **Archaeological Background**

There is very little primary archaeological research relating to the calamine industry. During the 1970s, caving groups did a great deal of work locating and surveying several of the old mines. Chris Richards was heavily involved in this work and produced a number of descriptive accounts. These will be looked at in the next chapter.

The Sites and Monuments Record (SMR) for Shipham and Rowberrow lists 80 entries. These are shown on the two maps in Appendix I, together with the full record for entries relevant to calamine mining.

3.3.1 **Prehistoric to Medieval Period**

This an area that has had human occupation from the Palaeolithic onwards (Rowberrow Cavern, SMR 10767). There are a number of barrows or possible barrows indicating a Bronze Age presence (SMR 10763,10771,10772,10773) and of course the hillfort at Dolebury indicates a strong presence during the Iron Age. To the north of Star is found a Romano-British villa, with further evidence in
Rowberrow Cavern. Fragments of a 9th century Saxon cross were found at St Michael’s Church, Rowberrow (SMR 10762).

The churches of St Michael and St Leonard have graveyards in use since medieval times (SMR 10778,10779) and there are a number of medieval buildings, trackways and boundary stones. Rowberrow and Shipham were effectively two small medieval villages centred on the church and Manor, prior to the influx of miners from the 16th century onwards.

3.3.2 Entries Concerning Calamine Mining

This is a summary of the entries on the SMR that relate to calamine extraction. Fuller descriptions are found in Appendix I.

<table>
<thead>
<tr>
<th>SMR</th>
<th>Summary of Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10765</td>
<td>Entrance to Singing River Mine with 3000 feet of galleries</td>
</tr>
<tr>
<td>10780</td>
<td>Cobbled road east of Lippiat Lane, likely to carry traffic from mining operations</td>
</tr>
<tr>
<td>10781</td>
<td>Old mining shaft, north of Shipham</td>
</tr>
<tr>
<td>10783</td>
<td>Surface workings north of Shipham</td>
</tr>
<tr>
<td>10793</td>
<td>Surface workings southeast of Shipham. Western part is dominated by discrete shafts with rings of upcast, eastern area is dominated by more dense shallow pits</td>
</tr>
<tr>
<td>10794</td>
<td>Calamine processing oven at ST 4439 5739</td>
</tr>
<tr>
<td>11448</td>
<td>Village of Shipham. Description of cellular plan</td>
</tr>
<tr>
<td>11583</td>
<td>Shanty town plots south of Shipham</td>
</tr>
<tr>
<td>11935</td>
<td>Deserted village along Back Lane and Rowberrow Bottom. Includes 11543-11551, 11553-11561, 11538-11539, 11531-11535, and 11936 which are abandoned buildings. Also includes 11541, 11937 and 11563 which are areas of small field plots</td>
</tr>
<tr>
<td>12706</td>
<td>Mine shaft sunk as a trial in 1870 to the west of Shipham</td>
</tr>
<tr>
<td>12707</td>
<td>Mine shaft near Star Inn</td>
</tr>
<tr>
<td>11584</td>
<td>Shanty town plots east of Shipham</td>
</tr>
</tbody>
</table>
The main areas of calamine workings are identified on the SMR without distinguishing features that have disappeared due to tipping or levelling. It can be seen that a great deal has been recorded with regards to the deserted settlement along Rowberrow Bottom with the deserted buildings, sheds, garden plots trackways that made up this part of the village, all listed.

The parts of the calamine industry not well accounted for includes the methods of storing and processing the ore. There are also many open shafts that are not included in the SMR.
4. AERIAL PHOTOGRAPH INTERPRETATION

4.1 1946 RAF Coverage

The modern parish of Shipham has good coverage by aerial photographs that really show how much change has occurred since 1946. With so much of the gruffy ground now levelled, aerial photographs give a unique view of the former extent of the mining. It has been possible to classify different types of gruffy ground and also to calculate an estimate of the number of pits from the RAF prints of 1946 (Figure 31).

It is apparent from Figure 31 that there are different intensities of pitting in the gruffy ground. The areas of highest intensity have an average of 285 pits/hectare, based on counting the number of pits in the four areas shown. The total area of high intensity mining is estimated at 14 Ha, calculated by superimposing a grid over the photograph. This gives an estimate for the total number of pits in the Shipham/Rowberrow runs of 3990. Most of these would be surface workings but a great deal would have underground galleries too.

To the southeast of Shipham an area is characterised by a lower intensity of pits, with 18/Ha. These are in the area where a deposit of marl overlies the ore-bearing Dolomitic Conglomerate. Therefore the miners had to dig through marl to reach the ore underground. These pits have very regular circular cones of spoil, and almost certainly all have underground workings.

The separation of shafts in this area is about 20m. This corresponds with views that they would sink a new shaft to reduce the distance one would travel underground (Richards, pers. comm.). The spread of shafts to the south of Glovers Field is shown on Figure 32.
Figure 31  Aerial Photograph of Shipham, 1946

(RAF/CPE/UK/1869/4Dec1946/Frames4276,4277)
Where individual vein has greater separation, pits were dug in ribbons separated by areas of unworked ground. The number of pits along these veins averages 22 per 100m.

The total length of surface ore veins shown on the 1:25000 geological map is 11.9km. This of course only depicts the main veins, so the true length of potential workings is far greater. Twenty-two pits per 100m over 11.9km would give 2618 in total. This therefore represents a second minimum estimate for the number of pits dug in the Shipham/Rowberrow runs of ore.

4.2 **Ordnance Survey Photographs, 1971**

By 1971, large areas of gruffy ground had been tipped on and levelled (Figure 33). The 1970s were a period of housing development in Shipham, including over the former mine workings.
Figure 33  The extent of lost gruffy ground by 1971

Many of the pockets of land not built on in 1946, became developed during the 1950s and 1960s. In the Shipham Pitts area these are highly likely to be above underground workings.
4.3 **Ordnance Survey Photographs, 1989**

By 1989 almost all of the gruffy ground near Shipham had been levelled (Figure 34).

![Image of Ordnance Survey Photographs, 1989]

(0S/89071/8 April 1989/Frames 229/306)

Figure 34 Surviving gruffy ground, 1989

There are now only three areas of gruffy ground surviving in the Shipham area and these are presently under threat due to tipping.

It is evident how much new building has filled in the gaps that were still present in 1946.
4.4 Summary

i) Almost all of the gruffy ground has been levelled since 1946, and continues to disappear today.

ii) Estimates for the total number of pits dug in the Rowberrow/Shipham ore runs ranges from 2618 to 3990. It is not know how many of these have underground galleries.

iii) Three categories of gruffy ground can be recognised:

Class A: Very intensively worked, with surface and underground workings numbering up to 300/Ha.

Class B: Less intensively worked, with distinct shafts separated by approximately 20-30m.

Class C: Ribbons of pits 5m apart along individual veins that are separated by areas of unworked ground.
5. FIELD OBSERVATIONS AND SURVEYS

This section will concentrate on the nature of surviving features in the modern parish of Shipham. Remaining gruffy ground will be looked at in detail, as well as some evidence of the deserted settlement along Rowberrow Bottom. The nature of underground workings will be assessed by using studies by the Axbridge Caving Group and Archaeological Society who explored the area extensively in the 1970s.

5.1 Surviving Gruffy Ground and Shafts

5.1.1 North of Daffodil Valley, and near Star

This is the only patch of gruffy ground that survives north of Shipham, in what was the extensive Rowberrow run of workings. Most of the ground has been levelled by tipping. This has resulted in numerous bottles from the 1950s and 1960s protruding from the soil. Plates 1 and 2 give an indication of the hummocky nature of the ground which is somewhat hidden by brambles. Localities referred to are shown on Figure 35.

Plate 1 Gruffy ground north of Daffodil Valley, near Star
Figure 35  Locations of Mine Shafts near Star

Plate 2  Gruffy ground north of Daffodil Valley, near Star
This small patch of intensely pitted ground contained several open shafts that lead to underground workings. These shafts are in a variety of states of deterioration that pose a risk to members of the public. The largest, Star Shaft, was uncovered in 2002 when a tractor nearly went down it. It is now fenced off and has a significant platform of spoil adjacent to it (Plate 3).

![Plate 3 Entrance to Star Shaft](image)

A survey of the workings is shown on Figure 36.

![Figure 36 Section of the workings at Star Mineshaft](image)

(Hendy and Prewer, 2002)
Other shafts nearby include Holly Fissure (Plates 4 and 5), Boulder Shaft (Plate 6), Star Mine 1 (Plate 7 and a choked shaft near Holly Fissure (Plate 8). Details of these shafts is presented in Appendix II.

Plate 4   Entrance to Holly Fissure

Plate 5   Looking into Holly Fissure
Plate 6  The blocked entrance of Boulder Shaft

Plate 7  Star Mine 1
Plate 8  A choked shaft near Holly Fissure

Figure 35 shows the locations of the other known shafts in this area. It is compiled using descriptions by Axbridge Caving Group (Richards, 1972) and recent work by Hendy and Prewer (2002). Surveys of some of the underground workings near Star are redrawn on Figure 37.
With the exception of the Star Mineshaft, which has a larger scale and almost certainly dates to the final stages of mining, most of the other mines have certain characteristics. Richards (1971a) identifies a “Shipham type” shaft that is circular, 0.75m in diameter and only changes shape when ore bearing rock has been reached. He records 2cm shot holes in some mines e.g. Crocus Hole. Figure 37 shows that the mines worked more than one level and that a great deal of spoil was left underground. Many of the shafts are lined with dry stone walling from the surface for a short depth; a method called ginging in other parts of the country.

Once the miners reached ore the shaft would open out into a “rift” and follow the mineralisation along narrow galleries. With some shafts or rifts only 60cm across, it is highly likely that many
remain to be discovered. It is unknown how many have been buried by the levelling that has occurred in the past 50 years. Plate 9 shows how well the gruffy ground has been levelled, north of Shipham.

Plate 9   Former gruffy ground, now levelled to the east of New Road

5.1.2  **South and East of Shipham**

The most extensive surviving gruffy ground is to the south and southeast of Shipham. Locations referred to are shown on Figure 38.
Figure 38  Features South of Shipham

The gruffy ground here is divided into two distinct types; very hummocky ground, intensely pitted (Plate 10) and an area with distinct separate shafts with circular spoil heaps (Plate 11).
The gruffy ground here is under risk as it is currently being tipped on (Plate 12).

Open shafts known to cavers are shown on Figure 38. Holly Bush Shaft and August Pit are of the usual “Shipham type” with circular shafts 0.75m across and both workings have routes blocked by rubble (Richards, 1972). The largest known workings are those of the Singing River Mine, with over 1000m of galleries (Figure 39)
This mine is different than many of the others in the area because it has much larger galleries. This may be the result of greater width of veins but also because it was probably a sponsored undertaking (Richards 1971) and money was spent to make the removal of ore easier. Most of the other mines in the area were individual concerns where the miners usually only removed a few inches of rock either side of the vein to give room to work (Richards, 1971). This would create the narrow rifts and galleries that are present in most of the mines.

Numerous choked galleries indicate that the workings may extend further. This is the case with almost of all of the mines that have been explored and it is therefore impossible to assess the true extent of most workings.

Associated with this mine is possibly the only surviving calamine oven in Britain (SMR 10794) which is shown on Figure 40 as it was before it collapsed in 1980, leaving a 1m stump.
The area to the east of Singing River Mine is characterised by distinct rings of spoil that are generally level at the top (Plate 13).

Figure 41 shows the result of a taped survey of two typically sized spoil heaps, the locations of which are shown on Figure 32.
Figure 41  Survey of spoil heaps A and B as shown on Figure 32

It is possible to calculate an estimate for the volume of material in these spoil heaps using: \( \text{Vol} = \text{area} \times \pi \times d \), where \( d \) = diameter at the top of the spoil heap.

**Calculations:**

Spoil heap A  \[ \text{vol} = 3.04 \times \pi \times 6.1 \]
\[ = 58.3 \text{m}^3 \]

Spoil heap B  \[ \text{vol} = 2.76 \times \pi \times 5.5 \]
\[ = 47.7 \text{m}^3 \]

If we consider a typical “Shipham type” shaft of diameter 0.75m and that the nearest mines have entrance shafts of the following depths:

August Pit = 6m
Holly Bush Shaft = 6m
Singing River Mine = 12m
It is possible to calculate an estimate for the minimum length of gallery underground to give the volume of spoil present:

i)  cross –sectional area of typical Shipham shaft  \[ = \pi r^2 \]
    \[ = \pi 0.375 \times 0.375 \]
    \[ = 0.44 \text{m}^2 \]

![Diagram of circular cross-section with radius 0.7m]

ii) volume of 6m shaft  \[ = 0.44 \times 6 \]
    \[ = 2.65 \text{m}^3 \]

![Diagram of cylinder with height 6m and radius 0.7m]

iii) consider a typical gallery 1m wide, 2m high with area 2m²

![Diagram of rectangular prism with dimensions 1m x 2m x length l]

therefore volume of material removed = 2m² x length \( l \)

\[ = 2l \text{m}^3 \]

iv) potential gallery lengths :

volume of spoil = volume of shaft + volume of galleries

spoil heap A,  \[ \text{volume} 58.3 \text{m}^3 = 2.65 = 2l \]

therefore \( 2l = 55.65 \)

therefore \( l = 27.8 \text{m} \)
Observations

There is sufficient material in the typically sized spoil heaps to mine to a depth of 6m with horizontal galleries between 20 and 30m in length. When one considers that in reality large amount of spoil were left underground, it is possible that the figures could be much higher.

The level topped nature of these spoil heaps could indicate that some form of boarding was placed over the top, with a windlass central over the shaft, as shown in Figure 19. It is extremely probable that these large separate spoil heaps are former mine shafts whereas much of the more intensely pitted ground probably represents surface pits.

There were no obvious sites where the ore may have been buddled and jigged prior to roasting. The close proximity of the calamine oven implies that the ore would have been cleaned and separated somewhere in this vicinity. It is possible that water was carried in aqueducts from the springs to the west of Cuck Hill.

5.2 Deserted settlement along Rowberrow Bottom

Rowberrow was once large enough to have its own parish. However, population loss associated with the decline of calamine mining resulted in the abandonment of many properties. Writing in 1915, Knight observes of Rowberrow

“Even during the last half-century many cottages have been demolished. And the size and character of the long-disused school building, built, as may be seen from the tablet on its front in 1855, and now converted into a dwelling house” (Knight, 1915,174).

He also describes a Baptist School and Chapel laying in ruins in School Lane, as well as a poor house in Rowberrow Valley. The locations of ruins from the deserted part of Rowberrow are very well documented on the SMR and only a few examples will be shown in this section.
The large areas of garden plots shown on the tithe maps are all now overgrown by woods, and most of the properties have very little surviving masonry.

The nature of some of the ruins that survive are shown on Plates 14-18. The SMR location can be found on the maps in Appendix I.

Plate 14  Ruined cottage in Rowberrow Bottom (SMR 11551)

Plate 15  Small ruined building, 5m x 3.5m in size (SMR 11561)
Plate 16  Walls of a cottage surviving in a back garden along Back Lane (SMR 11549)

Plate 17  Walls of cottages cut into the slope along Back Lane (SMR 11545/11546)
Plate 18  Dry stone walled entranceway to former cottage (SMR 11545/11546)

The few examples shown are among those that are the most visible. Numerous plots are so overgrown during July and August that a winter visit would be necessary to view most of the structures. Many of the former cottages have left little evidence today, and what there is, has been reclaimed by nature.
6. CONCLUSIONS AND DISCUSSION

6.1 Phases of development

Based on historical evidence researched for this dissertation, it is possible to break down the history of calamine mining on Mendip into the following phases:

Phase 1. Establishment of a new industry, 1560-1600
The formation of the Society of the Mineral and Battery Works in 1565 was soon followed by the discovery of calamine at Worle Hill, one year later. This marks the starting point of calamine extraction in Somerset. The industry was soon to expand as more calamine was discovered at Broadfield Down, Wrington, Winscombe and Shipham. The area was already mined for lead and so early miners would have used exactly the same methods. In fact many workings, especially near Shipham, would produce lead and zinc from the same vein.

Phase 2. Expansion of calamine production on Mendip, against a backdrop of a failed English brass industry, 1600-1700
Overseas markets lead to an expansion in the number of calamine workings in Somerset and Mendip including Worle Hill, Hutton, Banwell, Winscombe, Shipham, Rowberrow, Burrington, Wrington, Brockley and Broadfield Down. Brass production in England was in disarray during the 17\textsuperscript{th} century, with the Government backed Society of the Mineral and Battery Works having failed to establish a successful industry.

Phase 3. Period of rapid growth, 1700-1820
The passing of the Mines Royal Act of 1689 meant the Government could no longer control the brass industry. This opened up the industry to private enterprise and triggered a rapid growth of calamine mining. This had great impact on settlements such as Rowberrow and Shipham, which then expanded rapidly. On Mendip there were now local markets for calamine with the establishment of successful brass works in Bristol from 1702 onwards. Supplies also went to Birmingham.

Phase 4. Decline and death of the calamine industry, 1820-1870
A combination of factors led to a rapid decline in the fortunes of calamine mining. Taxes on imported zinc were reduced in 1825 and most of the easily obtained calamine had been mined out. Large scale production of calamine on Mendip effectively ceased by the 1850s leaving settlements such as Shipham and Rowberrow in great poverty, with many people abandoning their houses. Rowberrow today, is therefore much reduced from the boom time of the calamine industry.
6.2 **Surviving evidence in Rowberrow and Shipham**

6.2.1 **Gruffy Ground**

The ore belt that lies either side of Shipham was once extensively pitted. However, over the past forty years most of this ‘gruffy ground’ as it is called, has been levelled.

It has been possible to gather details of 16 known open mines in the parish of Shipham. Most of these are very small operations accessed through narrow shafts. It is known that in Shipham, early miners illegally built on the common over the entrances to their mines. It is therefore an impossible task to assess the full extent of underground galleries.

Calculations from geological maps indicate that there are at least 11.9km of zinc bearing mineral veins in the Shipham area. It is possible that a great deal of this length of vein could have been worked underground.

Through close scrutiny of post-war RAF aerial photographs, it has been possible to calculate that at least 2600 to 4000 pits have been dug to raise calamine in the Shipham and Rowberrow mineral runs. Most of these would have been surface pits, but many would have also been worked underground.

Three classes of gruffy ground are proposed:

- **Class A:** very intensively worked with 300 pits/Ha of mostly surface workings.
- **Class B:** less intensively worked, with shafts every 20 to 30m apart, surrounded by distinct rings of spoil.
- **Class C:** ribbons of pits separated by unworked ground.

Through survey of several annular rungs of spoil in the area of Class B gruffy ground to the southeast of Shipham, it was possible to make the following calculations:

- **i)** Volume of material was 50 to 60m³ per spoil heap.
- **ii)** This could have come from a 20-30m length of underground gallery 1m wide, 2m high.

It is therefore almost certain that the rings of spoil in the Class B gruffy ground all surround shafts to underground workings as shown by the high volume of material in them. This is further backed up by the level tops to the spoil heaps, which may have had a boarded structure built on to support a windlass.
6.2.2 Vulnerability of surviving features

The rapid disappearance of Shipham’s gruffy ground in recent years highlights the vulnerability of the few remaining areas. There is a real danger that this most visible reminder of Shipham and Rowberrows’ past will disappear without some form of protection. Vast areas of the gruffy ground have disappeared and decision needs to be made soon whether protection is afforded to the surviving patches. Levelling continues today and it is possible that all the gruffy ground could disappear within a short period of time.

The remains of the calamine oven in Shipham is now much deteriorated and would certainly benefit from further protection as it is the only evidence of processing calamine that survives on Mendip and probably in Britain.

Early accounts describe washing and separating the ore in turfed/boarded enclosures. Such features have left no obvious evidence in the landscape and is an area recommended for future research. If the remaining gruffy ground is lost, any chance to locate the sites for buddling, jigging or roasting of the ore will be lost forever.

The large number of deserted cottages along Rowberrow Bottom, indicate the level of decline in the Rowberrow/Shipham area once mining had ceased.

Shipham has a unique layout that is a result of its early expansion as a mining village and this has remained preserved in the street plan and street names of today.

6.3 Recommendations for future research

The unanswered questions concerning mining of calamine in the Shipham area, all concern the processing of the ore prior to it being bagged up and sold.

Early accounts (Pooley 1684, Kalmeter 1725) describe the use of running water to cleanse the ore. In Shipham the only sources of water are the wells and springs on Winterhead Hill, to the south of the village. This would either necessitate construction of aqueducts and storage pools or large amounts of water being carried by hand in order to clean the ore nearer to where it is being raised.

Similarly, Rowberrow has a source of water along Rowberrow Bottom. Did the miners carry the ore they had raised in the Rowberrow run down to Rowberrow Bottom in order to clean and process it? Collinson (1791,599) describes that very little wood survives near the village of Rowberrow because of the burning of calamine. The location of the calamine ovens responsible for this, are unknown.
For both Rowberrow and Shipham we know where the mines and pits were, yet we don’t really know exactly where they cleansed and sorted the ore – a process that would surely have left layered deposits as described by Knight (1904.21). Identification of gravels resulting from washing the ore would help lead to the answer. A detailed soil survey could provide valuable information to solve this unanswered question. So far, the only soil analysis has been to assess cadmium levels which caused unwarranted scares and bad publicity.
7. GLOSSARY OF MINING TERMS

Barn shed where the calamine was stored.
Buddling method of separating soil from the ore using channels of running water.
Calcination method of heating calamine (ZnCO₃) to reduce it to zinc oxide (ZnO).
Calamine zinc carbonate – used in manufacture of brass by reducing to zinc oxide and combining with copper.
Freeshare payment to landowner for ore raised - often 10%.
Gallery underground working.
Ginging dry stone walling used to line shafts part of the way from the surface.
Hack small pick.
Jigging method of separating the calcite, calamine and lead by dipping sieves into tubs of water.
Lapis calaminaris latin name for calamine.
Liberty ancient mining district on Mendip.
Rake vein being worked for ore.
Reeve officer in charge of collecting mining royalties.
Rift where the vein has been mined out leaving a passage with irregular walls of rock.
Runs areas where the minerals have been worked e.g. Rowberrow run and Shipham run.
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Aerial Photographs Viewed

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APPENDIX - Open calamine mine shafts in the Parish of Shipham

1. Ham Mine 1. NGR 4399 5852
   Small mine with upper and lower galleries that run under the small lane east of the Star Inn. Entrance is in the garden of the cottage called Laneside (Hendy and Prewer, 2002).

2. Ham Mine 2. NGR 4398 5850
   Small mine that runs northeast to southeast and with an entrance in a paddock 22m south southwest of Ham Mine 1 (Hendy and Prewer, 2002).

3. Star Shaft. NGR 4401 5828
   Large rectangular shaft (2.4 x 1.8m) that descends 28m into workings that run 30m south before dropping 20m down a shaft to a lower set of workings extending north and south. Length worked in more than 100m (Hendy and Prewer, 2002).

4. August Pit. NGR 4476 5729
   20 foot deep shaft with blocked routes leading away. Small circular shaft leads into an east-west rift two feet across (Richards, 1972).

5. Crocus Hole NGR 4394 5820
   Mainly worked for lead, this small mine has a length of 30m and depth of 10m (Richards, 1972).

6. Daffodil Mine. NGR 4425 5795
   Mine of length 80m, depth 15m with two shafts 6m apart (Richards, 1972).

7. Holly Bush Shaft. NGR 4469 5733
   Mine with a new cover constructed to the shaft in summer 2003. This is a 6m deep shaft of the usual “Shipham” type at the top and choked at the bottom (Richards, 1972).

8. Holly Fissure. NGR 4403 5820
   Small mine choked with rubbish (Richards, 1972).

9. Ivy Fissure. NGR 4401 5822
   Small mine choked with rubbish (Richards, 1972).

10. Rowberrow Beach Shaft. NGR 4450 5870 (approx.)
    Small, square lined shaft only 2.5m deep. Now lost under land reclamation (Richards, 1972).

11. Rubbishy Rift. NGR 4430 5794
    Small rift, 3m long and 2.5m deep. Blocked with rubbish (Richards, 1972).

12. Singing River Mine. NGR 4447 5736
    Largest explored mine on Mendip with 1000m of worked galleries extending ESE to WSW at depths of about 11m. Galleries are larger than most of the other Shipham mines and there are many blocked shafts and choked galleries (Richards, 1972).

13. Tin Can Alley. NGR 4427 5799
    Small rift dropping 1.5m into a rubbish-filled chamber (Richards, 1972).

14. Star Mine One. NGR 4492 5820
    Narrow workings of length 24m extend from 10m shaft (Richards, 1972).

15. Star Mine Two. NGR 4407 5823
    10m length of galleries entranced by small hole, 3m deep (Richards, 1972).

16. Boulder Shaft. NGR 4408 5827
    Hidden by three boulders, a 0.7m diameter shaft drops away 5.6m and then slopes away to the NNW (Hendy and Prewer, 2002).