

Les métaux précieux en Méditerranée médiévale

Exploitations, transformations, circulations

sous la direction de
Nicolas Minvielle Larousse, Marie-Christine Bailly-Maître et Giovanna Bianchi



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Actes du colloque International d'Aix-en-Provence des 6, 7 et 8 octobre 2016 édités par :
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2019

PRESSES UNIVERSITAIRES DE PROVENCE

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View from the other side of the Channel

England's mining response to the silver crisis in the 15th century

Peter Cloughton

Résumé

Londres possédait l'un des rares ateliers monétaires de l'Europe du Nord qui continue à fonctionner durant la crise de l'argent du milieu du XV^e siècle. Cela était dû en partie à la production accrue des mines à *Bere Ferrers* dans le sud-ouest du Devon. Les mines avaient été exploitées directement par la Couronne anglaise de la fin du XIII^e siècle jusqu'au milieu du XIV^e siècle et l'arrivée de la Peste Noire.

Ensuite, l'ensemble des mines a été loué à des entrepreneurs, mais comme la raréfaction de l'argent s'est accrue, les mines de *Bere Ferrers* ont été subdivisées entre cinq, voire plus d'individus ou groupes d'individus prenant de courtes sections de la veine productive avec une section réservée à la Couronne. Le maintien de la production en profondeur a toutefois été limité par le drainage manuel à une période de déclin démographique. Dans le troisième quart du XV^e siècle, le problème du drainage a été surmonté par l'introduction d'un système innovant de pompage actionné par l'eau, bien que cela n'ait pas permis une augmentation de la production.

Abstract

London was one of the few mints in northern Europe which continued to operate through the bullion crisis of the mid 15th century. This was due in part to the increased output from mines at Bere Ferrers in south-west Devon. The mines had been worked directly by the English Crown from the late 13th through to the mid-14th century, and the advent of the Black Death.

Thereafter the mines were leased as a whole to entrepreneurial interests but as the scarcity of silver deepened the mines at Bere Ferrers were sub-divided, with five or more individuals, or groups of individuals, taking short sections of the productive vein, with one section reserved to the Crown. Maintaining production at depth was however limited by the reliance on manual labour for drainage at a period of demographic decline. In the third quarter of the 15th century the drainage problem was overcome by the introduction of innovative water-powered pumping, albeit in a manner which did not result in increased production.

Introduction

Over the course of the fifteenth century northern Europe reached the nadir in its population levels as renewed outbreaks of plague following on the Black Death of the previous century took their toll. By the middle of the century many of the mining fields which had provided the silver for the increased commercialisation of the European economies had reached the limits of their productive capacity. Added to which was the steady drain of silver towards the Arab world of the eastern Mediterranean with gold returning in the opposite direction. The combination of these last two factors led to a severe bullion crisis in the mid-fifteenth century with a dearth of the small silver coins required to facilitate everyday transactions. At the same time there is evidence that the supply of credit had shrunk to a similar extent and it has been suggested that, for England, the « monetary factors contributed to the depression of aggregate demand in the mid-fifteenth century »¹.

That the mint in London continued to operate was down to a combination of the strength of English exports and increased production from the Crown silver mines at Bere Ferrers in the south-west of Devon. The Bere Ferrers mines (**fig. 1**) had been worked by the English Crown from the late 13th century until the advent of the Black Death in 1349, after which they were leased on a Crown grant to entrepreneurial interests. By the fifteenth century they were already being worked below the level of the available drainage adits, using manual haulage of water to surface. Production records from the early part of the 14th century onwards are however fragmentary. Only isolated annual returns have survived, but by the early 1440s production was evident albeit at a modest level. In 1441 the recorded level was 2440 ounces², falling to just less than 300 ounces in 1447, but the scarcity of bullion will have concentrated effort and by 1448 production was well over 8000 ounces per annum, and rising to over 9000 ounces in the following three years and 5475 ounces in the half year to 25 March 1452. During the late 1440s the mines were held by the Earl of Suffolk. With his fall from favour, and subsequent murder, silver mining became briefly enmeshed in the web of intrigue which preceded a period of civil conflict in England, the Wars of the Roses. The returns from the Devon mines during Suffolk's tenure were evidently called into question and investigations put in train to establish if silver had left the country illegally³. In 1449 Suffolk was licensed to export

500 fother⁴ of lead, the product of the Devon mines: This suggests a much reduced yield of silver, perhaps 40 ounces per ton of metallic lead compared with circa 125 ounces per ton in the 14th century; either that or some silver production was concealed⁵.

After the death of Suffolk the mines were granted to Adrian Sprynker, described as “clerk, born in Duchelande”, i.e. Germany, and recited the details of a scheme whereby the royalties to the Crown would be increased and the mines at Bere Ferrers returned to full operations by subdividing the workings⁶. This was the first example we have of changes to the operation of the mines which can be seen as measures to address the demands of the bullion crisis.

1. Subdivision of the mines

During his tenure Sprynker entered into agreements, confirmed by letters patent, with five individuals and partnerships allowing them to work sections of the Bere Ferrers mines for a period of twelve years (see **fig. 3** below), retaining one section to be worked on behalf of the Crown. This radical change in leasing policy, moving from grants based on entire counties to short sections of the lode, in some cases less than a kilometre in length, had the advantage of increasing capital investment in the search for new deeper deposits. Again, mercantile interests are in evidence, particularly continental interests: Falron and Nicholo from Venice, Deloreto from Genoa, and Ram from Utrecht⁷. Falron surrendered his lease after only a few years, having spent over £250 on drainage without profit⁸.

The other lessees had moderate success, although subdivision of the mines was not continued beyond the term of the leases. Whilst subdivided, the remaining mines in Devon and Cornwall, including the shafts retained by the Crown, were farmed out to members of the royal household at £110 per annum. Subdivision of the mines lasted at the most nine years and appears have been of only short term benefit to the Crown. It was not repeated and the mines were returned to the control of an overall lessee or lessees. Despite an earlier petition of Parliament that silver mining be opened up to all comers, the system of leasing reverted to a county basis⁹.

1 Hatcher 1996, 244.

2 The ‘ounce’ of silver at this period was the 12th part of an ‘exchange or Tower pound (*pondus cambii*)’, that is 29.17g.

3 British Library, Add Ms. 24513, f. 95-96; The National Archives, Public Record Office, Exchequer Accounts, E101/265/10 and 11; Cal. Pat. R. Henry VI, vol. 5, 533.

4 The weight of the ‘fodder’ could vary with time and place of origin but in this case it would be the London fodder of 2184lbs (990,65kg).

5 Cal. Pat. R. Henry VI, vol. 5, 215.

6 Cal. Pat. R. Henry VI, vol. 6, 110-111.

7 Cal. Pat. R. Henry VI, vol. 5, 467-68, 569, 571; vol. 6, 47, 110, 142.

8 The National Archives, Public Record Office, *Exchequer Accounts* E101/265/18.

9 Rotuli Parliamentorum, vol. 5, 272.

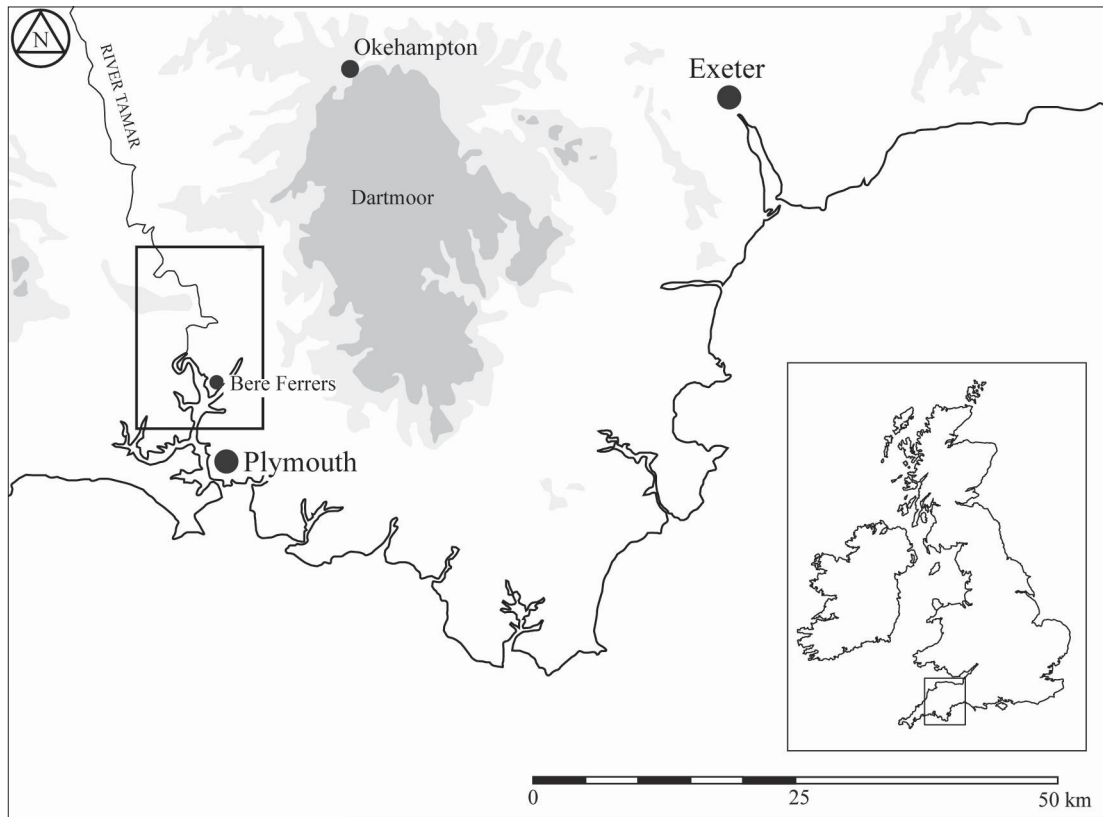


Fig. 1 - Bere Ferrers – location. (Bere Ferrers Project)

Archaeological evidence for the subdivision of the workings is tentative at best. There are features in the area of Cleave Wood, at the southern end of the line of workings, in the area identified as ‘Tonnewell’ in 1451 and 1452 (see **fig. 3**), which might be attributed to that period of working. Investigation in 2006-08 identified shallow shafts which are interpreted as initial working of a section of the deposit where the silver values at surface did not justify bulk extraction by an open worked trench¹⁰.

The high cost of drainage at Bere Ferrers had been evident in the 1450s, cited by Falron (above) as the prime reason for the failure to make a profit. With few deep valleys cutting the mineral deposits, which ran from river (sea) level in the south to around 90 metres above that level in the north, there was limited opportunity for drainage adits and the time/cost penalties of driving ever longer adits would be excessive leading to increased dependency on manual water haulage. Never the less, continued production into the early 1460s is suggested by the expenditure on drainage and the export of lead from the south coast ports but no figures for silver output survive¹¹.

2. The introduction of mechanised pumping

By 1460 the cost of water haulage in one section of the mines, over an 18 week period, appears to have reached £120¹². Costs which would have left very little margin for profit. It was under these conditions that the various factors, scarcity of silver bearing ores, increased working depths, and the scarcity and increased cost of labour, combined to stimulate the mechanisation of drainage.

It was Sir John Fogge, lessee of the mines from 1471, who took the initiative to introduce water powered pumping but it was not until 1480 that the pumps were in place and working. The pumps themselves were suction lift devices (**fig. 4**), first attested in Italy in 1425¹³, working in a shaft on Lockridge Hill at the northern end of the mines active in the medieval period. The total lift was 20 fathoms (36 metres) in nine sections bored from suitable trees purchased locally in

¹⁰ Rippon, Cloughton, Smart 2009, 75-77.

¹¹ Wiltshire Record Office, 366/1; Blanchard 1995, 302.

¹² Wiltshire Record Office 366/1.

¹³ Hollister-Short 1993.

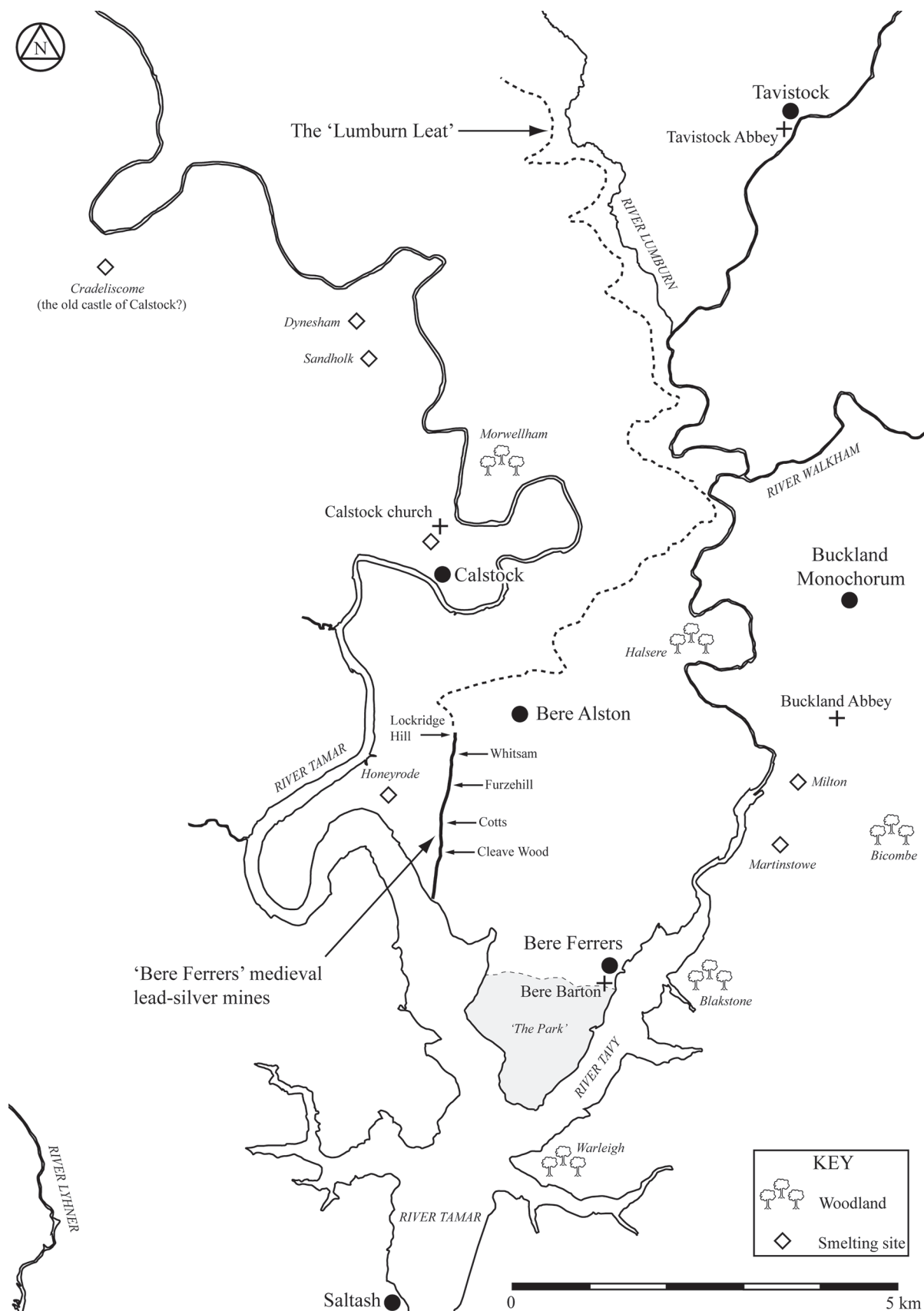


Fig. 2 - Bere Ferrers – location of the mines and associated features. (Bere Ferrers Project)

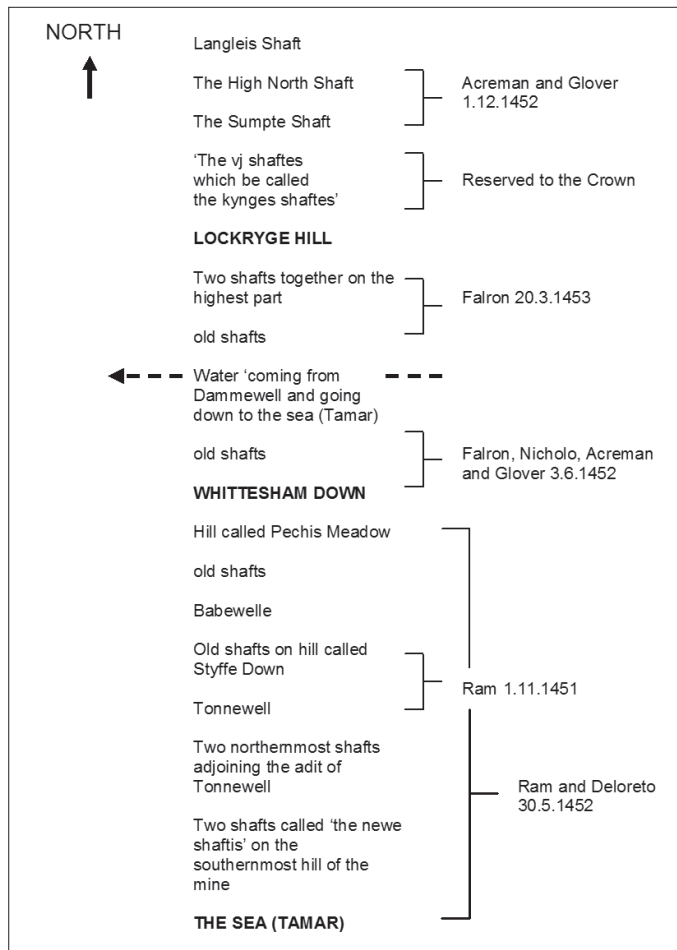


Fig. 3 - Bere Ferrers – the subdivision of the mines in the early 1450s (based on Cal. Pat. R., Hen. VI, vol. 5, pp. 467-68, 569, 571; vol. 6, pp. 47, 110 and 142).

SUCTION-LIFT PUMP SHOWN ON UPWARD OR LIFT STROKE

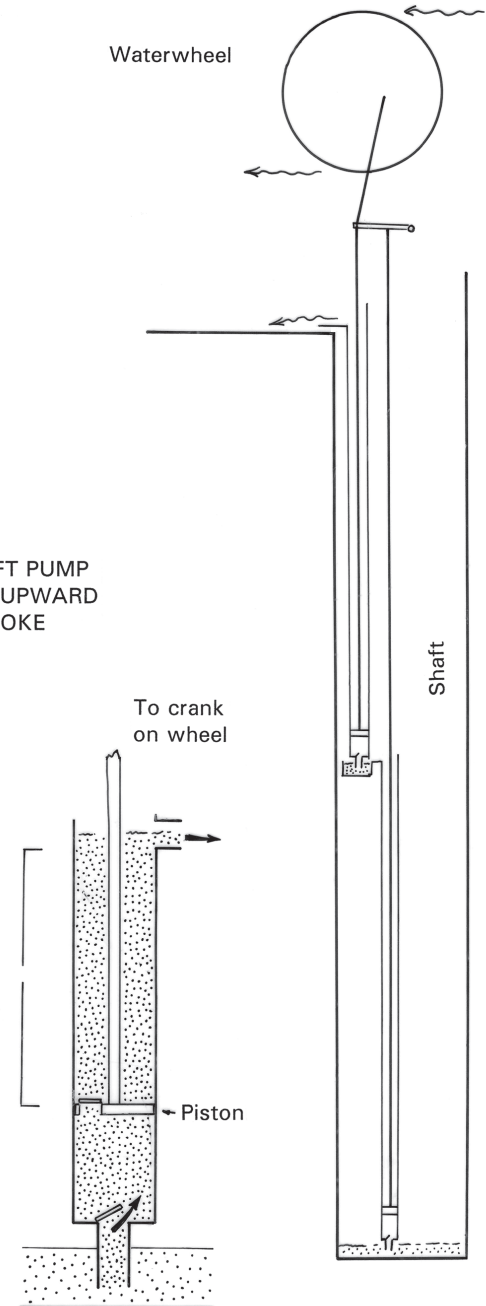


Fig. 4 - Suction lift pumps – details of operation.

Plympton Wood¹⁴. Power for those pumps was provided by a water-wheel of unknown dimensions and, without the power transmission systems which were available a hundred years later, this had to be mounted directly over the pumps in the shaft. Bringing water to that wheel was a major undertaking and required a leat 16 km in length, drawing on a tributary of the River Lumburn to the west of Tavistock (see **fig. 2** above). The earthworks of that leat (identified as the « Lumburn Leat » in **fig. 2** above) provide remarkable field evidence for the introduction of mechanised pumping.

3. The field evidence

The source of the leat is a western tributary of the River Lumburn. At Ogbear Farm the abstraction point at NGR

¹⁴ The National Archives, Public Record Office, *Exchequer Accounts*, E101/266/25; see Rippon, Claughton, Smart 2009, 110-114, for more details.

SX 44347510¹⁵, on the stream-bed north-north-west of the farmhouse, is visible although that stream-bed is currently dry. The substantial footbridge further downstream indicates a substantial water flow was expected in the past but post-medieval mining to the west has significantly lowered the water table in this area. A short section of leat leaves the abstraction point, running south-west to a point at SX 444.750., between the farmhouse and the stream, where the earthworks of a storage pond are visible. Continuation of the leat can then be seen as a slight ledge running across the field to the east, just above the 120 metre contour, before being lost in the road hedge at SX 44777485. Beyond the road, the present surface of which is well below leat level, it is not visible in the field corner but can be clearly identified in Ogbear Wood.

In the wood, once clear of the boundary hedge, are the well-defined earthworks of a leat 1.5 metres wide at its base, 2 metres wide at the rim and averaging around 0.5 metres deep. The well preserved nature of the earthworks and the remains of what appears to be a sluice gate on the bank about 180 metres into the wood, suggests that this section has been used for water storage in the relatively recent past. However, the leat is respected by an ancient hedge-bank on the downslope side close to the sluice. The earthworks can be traced south following the 120 metre contour to an unidentified quarry west of Millhill, which is probably of mid-20th century date as it is not marked on the 2nd edition OS mapping. Here the leat is cut by the quarry excavation and partially filled by an associated incline.

Beyond the quarry the leat is readily identified although disturbed by further quarrying and overlain with spoil from ancient (stone?) pits at about SX 45157449. Immediately south of this point the earthworks are lost where disturbed by allotment gardens associated with the cottages at Millhill. The line of the leat is marked by a distinct ledge in the top of the gardens visible south of the northern boundary and about 20 metres east of the western boundary. This ledge is joined by an old track to form the western boundary about 40 to 50 metres further south. Once this leaves the south-western corner of the gardens it is lost in the landscaping around the cottage at Artiscombe Leigh.

South of the lane from Three Oaks to Middle Lumburn Bridge and north-west of the house at Artiscombe Farm there is a section of hedge on the expected alignment of the leat. Here a distinct ledge on the downslope side of the hedgebank appears to have carried the leat towards the small stream and slight earthwork evidence for a storage pond at SX 44787403. In relatively recent times the direction of flow in the leat

had been reversed to feed a storage pond cut into the line of the leat but at a slightly lower level. A sluice from this pond controlled water to a launder running to a waterwheel (still in situ) in the farm buildings¹⁶.

Firm visible evidence of the leat between Artiscombe and Shillamill Wood is fragmentary. There are, however, a number of indicators which can be identified with the line of the leat. On the prominent hillside west of Newton Wood the hedge-bank, from NGR SX 45577392 to SX 45807377, closely follows the 120 metre contour. Where that contour crosses the lane 170 metres west of Newton there is a clear discontinuity in both hedge banks and immediately south-east of Colcharton a hedge-bank again closely follows the 120 metre contour for around 220 metres. Such alignment of hedge-banks is a feature found at intervals along the whole 16 kilometres of the leat. Where it occurs those hedges are invariable out of character with the normal field alignment in that area.

Apart from a short earthwork ledge in the field immediately north of Buctor, it is in the northern part of Shillamill Wood (see **fig. 5**) that the earthworks of the leat can again be clearly identified. The line of the leat immediately north of the wood is occupied by a hedge-bank. Once inside the wood, at SX 46237193, the well-defined earthworks with a later stone built bank on the downslope side can be followed south to rock outcrops, immediately east of Stonage Rocks at about SX 46427151. Here a series of cuttings with three tunnels have been made in the rock face. All are hand cut without the aid of explosives, sweeping pick marks being clearly visible in the walls. The tunnels being up to 13 metres long from 0.84 to 0.92 metres wide and 1.4 metres high (**fig. 6**).

In driving the cuttings and tunnels best use was made of faults in the rock. This is in evidence at the northern end of the tunnels where a fault forms the eastern wall. The weakness of the fault line appears to have been exploited by fire-setting to commence the initial drive, leaving a characteristic concave face to the rock above the entrance. Pick marks on the wall rock suggest that working was completed, if not initiated, from both ends.

For the 150 metres between the tunnels and the Shillamill to Orestocks road the line of the leat is a well-defined ledge, up to 3 metres wide, in the steep wooded hillside (**fig. 7**). South-east of the road, and the disused railway tunnel entrance, the line can be traced as a ledge below the hedge-bank. It is briefly lost in cultivated ground before being identified in Ramsham Wood where it has in part been obliterated by quarrying. Leaving the wood at SX 46717082 it is again lost in cultivated ground but appears as a hedge alignment 320 metres south-east of Hartshole Farm.

¹⁵ The map references are those for the British National Grid and can be located using Ordnance Survey Explorer (1:25,000) Map 108, Lower Tamar Valley & Plymouth.

¹⁶ Ordnance Survey, sheets Devon CV:6 and 7, surveyed 1883.

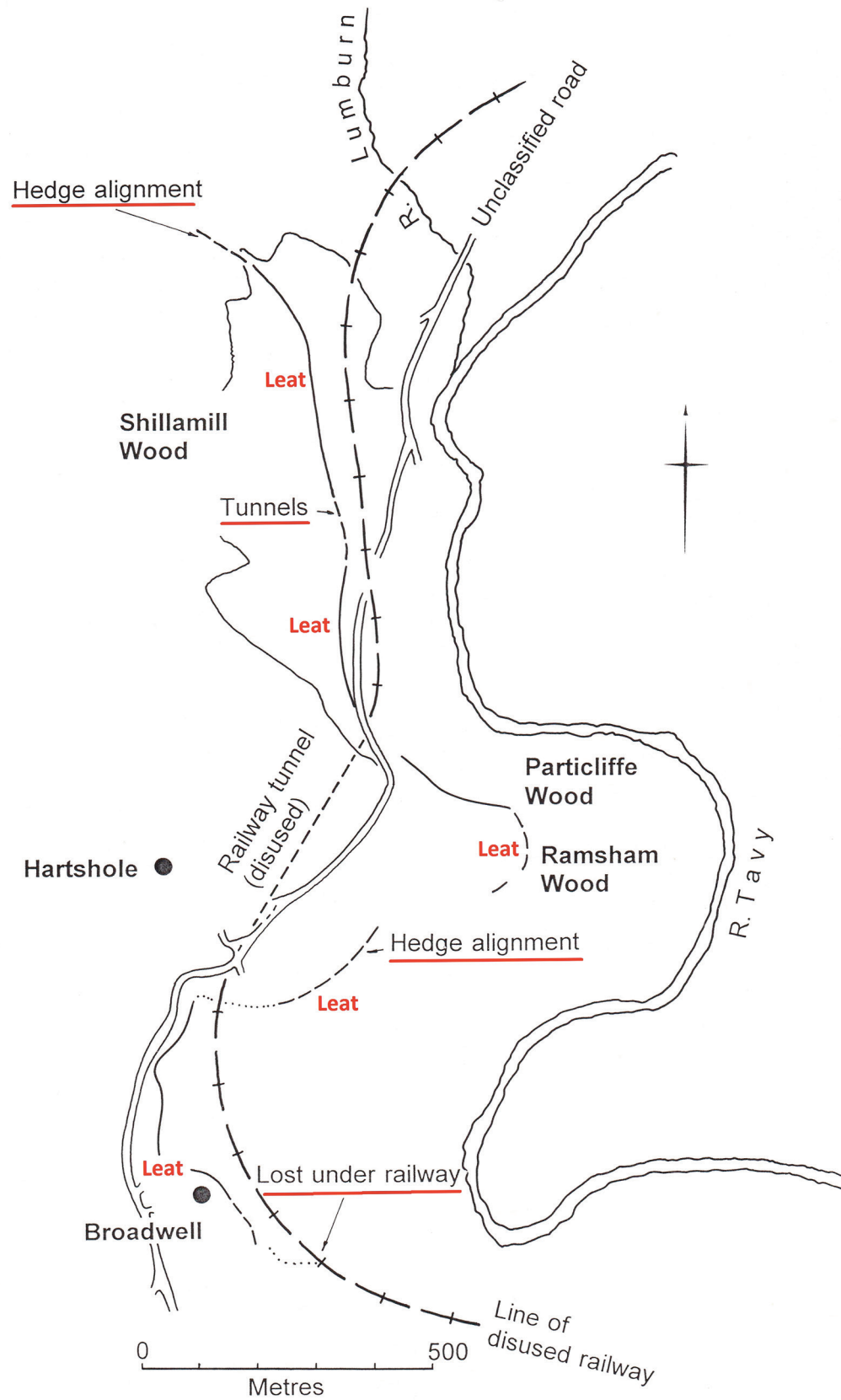


Fig. 5 - The leat - detail, Shillamill to Broadwell.



Fig. 6 - The leat – southern tunnel in Shillamill Wood.



Fig. 7 - The leat – earthworks in woodland.

At SX 46167057, immediately west of the southern end of the old railway tunnel, the line of the leat can be identified as a distinct ledge in the field on the downslope side of the road. Again following the contour southwards to the corner of the wood at SX 46097036. From where it forms the western boundary of the wood for 80 metres south before being lost in the old lane. On the north-east side of the farm buildings at Broadwell the leat appears as a shallow ditch running south-east. Continuing from SX 46197026 for 120 metres as a ledge on the downslope side of the hedge-bank as far as the lane. There is no sign of it beyond the lane and it is then lost under the railway. However in Broadwell Wood there is a track running east on the downslope side of the railway cutting which may be following the line of the leat.

At the northern end of Blackmoorham Wood 120 metres south of the bridge carrying the lane from Orestocks over the railway, at about SX 47026965, the leat can be seen as a rock cutting emerging from the material forming the railway embankment. A few yards east of the embankment the leat enters a tunnel bringing it south through the spur called Raven's Rock. However, judging by the shelf possibly cut into that rock it may have been originally intended to bring the line of the leat around the eastern end of the spur.

The leat tunnel is larger than those in Shillamill Wood, being up to 1.9 metres high and 1 metre wide. It takes a dogleg course, first south-east then turning south before resuming a more south-easterly course to emerge south of the spur. The rocks are slates, softer than in Shillamill Wood and, where advantage has been taken of fault lines to aid in driving the tunnel, the rock on the footwall side of the fault has been taken away giving it an irregular cross-section.

Just inside the northern entrance of the tunnel in Blackmoorham Wood there is a vertical slot cut in the western wall. The opposite, eastern, wall of the tunnel has collapsed at this point so no corresponding slot can be seen in that wall. This slot was probably for a sluice board.

There are further cuttings about 100 metres south of Raven's Rock. One, roughly cut, ends on the rock face with only a narrow ledge as its obvious continuation. To the west of this, on a parallel course, is a deeper cutting which connects with the course of the leat south towards and through the Little Duke Mine site.

At Little Duke the western end of the open-working, on the lode above shallow adit, cuts into the leat and there is a shallow shaft immediately east of the leat, divided from it by a low boundary hedge. Beyond the mine the leat continues as a well-defined earthwork following the 115 metre contour round to the south-west. It is lost under the railway embankment for much of the next half kilometre, reappears

as a field boundary 150 metres south-east of Hocklake Farm, before being lost again as it crosses the shallow valley running down to the Tavy. Beyond, in the woods, the leat appears as a slight earthwork. Leaving the wood at SX 46616886 there is no visible sign of its line in the cultivated ground to the south-west, towards Higher Gawton.

The leat at this point is just below the 114.3 metre (375 foot) contour and is well placed to cross the saddle in the ridge to the Tamar side. Unfortunately those constructing the railway had the same idea and all traces of the leat are lost until it reappears as a hedge-bank alignment north-east of Rumleigh Lodge. Cultivation has removed most of the evidence for the leat between here and the mines. Only in the area of Wheal Jenny are the leat earthworks to be seen. South-west of Philleigh Farm old hedgebanks which originally followed the line of the leat can be seen as frost marks on particularly cold mornings¹⁷. A ledge, with a line of trees along its downslope side, in the uncultivated ground east and west of Wheal Jenny marks the line of the leat. It is cut into by the workings at SX 450673. Continuation beyond the uncultivated ground is as a hedge alignment with a broad ledge on its downslope side. That continues for 50 metres beyond the Wheal Jenny bungalow and is then lost in cultivated ground.

A further length of hedge alignment commences 290 metres south-east of Bere Alston railway station running south of west for 300 metres to the road. The continuation of the hedge alignment has been removed but its route can still be seen in the field, between there and the road to Collin's Bridge, turning south towards Goldstreet. At this point the leat is at about 110 metres above river level with the mine site only 4 to 500 metres to the south on gently sloping ground. All visible trace of the final route into the mine has been lost under cultivation and the construction of the railway.

In 2006-2008 the Bere Ferrers Project, University of Exeter, surveyed the full route of the leat, confirming that it is one continuous feature¹⁸. The decline in elevation over a substantial part of its course between Artiscombe and Wheal Jenny is a little over 18 metres, an overall gradient of 1:1800. It was designed to pass over the spur of high ground separating the Tavy from the Tamar catchment and provides the only feasible option for carrying water to the wheel operating the pumps at the northern end of the mines. Coming, as it did, some hundred years before similar leats were used to carry water from Dartmoor into Plymouth, it was a remarkable feat of engineering and comparable with similar work linked to the drainage of mines in Central Europe.

17 Mr Hugh Harrison, occupier of Philleigh Farm, pers. comm.

18 Rippon, Cloughton, Smart 2009, 110-119.

Concluding summary

The introduction of mechanised pumping overcame the problems of drainage at a period of high labour costs and a scarcity of bullion but the recorded silver returns were disappointing, a mere 1883 ounces in 1480-8119. In reality, confirmed by post-medieval working, the pattern of mineralisation meant that the silver bearing deposits inclined ever deeper southwards in the vein and were subsequently worked below river level at the southern end of the mines. The subdivision of the mines in the early 1450s had stimulated production and encouraged exploration of the deposits in an area to the south of the sections which had been worked with considerable success in the late 13th / early 14th century, but the deeper deposits were beyond the available techniques of the time. It was not until the introduction of steam-powered pumps in the late 18th century that deep working of those deposits was possible, and that was thwarted in 1856 when water from the bed of the river broke into the workings of the mine at South Tamar Consols.

For England respite from the bullion crisis did not come from increased domestic silver production but from the opening up of new mines and the deep working of existing mines in Central Europe, drawing silver into its economy through a vibrant export trade. New silver deposits were discovered and worked, at Combe Martin in North Devon and in mid-Wales, but they came later. It was in Central Europe that the techniques tried at Bere Ferrers, particular the mechanisation of pumping, played their part in breaking the 15th century bullion crisis.

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Les métaux précieux en Méditerranée médiévale

Exploitations, transformations, circulations

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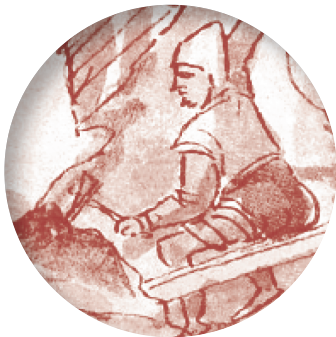


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Das Schwazer Bergbuch, 1556

Cet ouvrage rassemble les actes d'un colloque international tenu à la Maison méditerranéenne des sciences de l'homme d'Aix-en-Provence les 6, 7 et 8 octobre 2016. Organisée par le Laboratoire d'Archéologie Médiévale et Moderne en Méditerranée (CNRS, Aix-Marseille Université) et par le Dipartimento di Scienze Storiche e dei Beni Culturali de l'Università di Siena, cette rencontre a réuni près de cinquante spécialistes du Moyen Âge – archéologues, historiens, géochimistes – autour des métaux précieux en Méditerranée.

Ce livre entend examiner un long processus qui s'étend de l'extraction des minerais jusqu'à la diffusion des métaux, en articulant les techniques aux sociétés et aux pouvoirs. Le panorama des principaux lieux de la production, ici présenté sous forme de synthèses régionales, côtoie des études qui suivent les différentes phases de ce processus, de façon à confronter les sources, les approches et à faciliter les comparaisons. L'enquête se focalise enfin sur les circulations des métaux, en mettant en évidence les problèmes de sources et de méthodes que cela induit, tout en proposant des relectures historiographiques fondées sur les résultats de travaux récents.

Pour la première fois, la Méditerranée médiévale fournit le cadre géographique d'une réflexion collective consacrée aux productions et circulations des métaux précieux. Au-delà du simple bilan de connaissances, ce livre entend finalement proposer quelques jalons pour une histoire comparée et connectée : l'approfondissement, puis la confrontation d'enquêtes monographiques et régionales offrent dans cette optique de fécondes perspectives pour les années à venir.

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