THE CLWYD-POWYS ARCHAEOLOGICAL TRUST

Llanymynech Heritage Area

ARCHAEOLOGICAL SURVEY

CPAT Report No 618

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ARCHAEOLOGICAL SURVEY

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Report for Oswestry Borough Council

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1 INTRODUCTION

1.1 In December 2003 the Clwyd-Powys Archaeological Trust (CPAT) was commissioned by Mrs Harriet Devlin of Oswestry Borough Council, to undertake an archaeological survey of the Llanymynech Heritage Area in connection with proposals for the Llanymynech Heritage Area Development Project. A brief for the survey was produced by the Historic Environment Officer in Shropshire County Council.

1.2 The Llanymynech Heritage Area lies on the northern side of the village, extending from the canal to the main road from Oswestry to Welshpool (Fig. 1). The survey area also included the area of the Llanymynech Rocks Wildlife Reserve at the foot of Llanymynech Hill, together with the line of two tramway inclines connecting the quarry with the canal and railway.

1.3 The site as a whole is of national importance with regards to its industrial archaeological heritage, as well as the major prehistoric hillfort atop Llanymynech Hill and the course of Offa's Dyke around its western margins. The hillfort is protected as a scheduled ancient monument and several elements of the industrial complex have been afforded listed building status. These include an exceptionally well-preserved Hoffman-type lime kiln and chimney, as well as two conventional draw kilns.

1.4 A number of archaeological and historical assessments have been undertaken within the area which, with one exception (Archenfield 2001), were re-examined during the present study. A list of sources is provided in Section 9. Although each study appears to have included some element of field investigation, one of the main aims of the present survey was to undertake the first detailed ground survey of the site.

2 METHODOLOGY

2.1 The survey comprised two main elements, a desk-based study and a programme of field survey. The former involved the examination of all readily available primary and secondary documentary, cartographic and aerial photographic sources at the following repositories: the Regional Sites and Monuments Records (SMR), CPAT, Welshpool and Shropshire County Council, Shrewsbury; the National Monuments Record (NMR), Royal Commission on Ancient and Historical Monuments in Wales (RCAHMW), Aberystwyth; the National Monuments Record (NMR), English Heritage, Swindon; the National Library of Wales (NLW), Aberystwyth; Powys County Archives (PCA), Llandrindod Wells; Denbighshire County Record Office (DCRO), Ruthin; and Staffordshire County Record Office (SCRO), Stafford. Additional information was provided from an examination of numerous maps and documents relating to the canal collected during the 1980s under the supervision of Graham Deamer and deposited at the Powysland Museum, Welshpool.

2.2 For the purpose of the field survey the study area was divided into two sections. The upper section, comprising the Wildlife Trust Reserve, was subject to a rapid survey in accordance with the requirements of a Level 1 Survey, as defined by the Royal Commission on Historical Monuments in England (RCHME 1999). This provided a non-analytical record of all archaeological sites identified, including the location, a basic description and, where appropriate, a sketch with dimensions. Sites were classified according to their perceived significance and a record was made of any potential management issues. Field notes were entered into a Geographical Information System (GIS) using Mapinfo 6, and later converted to Arcview format. Field sketches were deposited in the site archive.

2.3 The main Heritage Area was subject to a detailed survey in accordance with the requirements of a Level 3 Survey, as defined by the Royal Commission on Historical Monuments in England (RCHME 1999). In addition to the level of recording noted above, this included a detailed and analytical record based on an accurately located, measured survey of the area. The Level 3 survey comprised a total station survey, undertaken using a Wild TC500 EDM in conjunction with Penmap survey software. Due to considerations regarding access, health and safety and vegetation, the total station survey did not include the two inclines which were surveyed using a combination of conventional surveying techniques, such as tape and offset,

in relation to known fixed points from the total station survey and Ordnance Survey mapping, with distances measured using a hand-held laser tape measure (Leica Disto). The Level 3 survey resulted in the production of a series of ground plans of the entire area, including all archaeological features and earthworks, with levels related to Ordnance Datum.

2.4 Post-survey processing employed AutoCAD13 to position the survey data against the Ordnance Survey National Grid, achieved as a best fit against plotted boundaries. The survey data were then imported into a GIS format and are presented in the report both as digitally produced illustrations and as a more traditional hachured plan, drawn by hand from the survey data.

2.5 A digital photographic record was made of each feature within the survey area. The digital images are presented on a CD enclosed within the report, which also contains the photographic catalogue in database (dbf) and rich text format (rtf).

Fig. 1 Survey area

3 HISTORICAL BACKGROUND

3.1 The general area around Llanymynech is one of considerable historical importance, containing a number of monuments of national significance ranging in date from prehistory to the early 20th century.

Prehistory

3.2 Llanymynech Hill is occupied by an impressive Iron Age, or possibly Late Bronze Age hillfort, the ramparts enclosing an area of 57ha, making it one of the largest in Britain. Archaeological investigation on the hillfort has so far been rather limited. In 1981 a section through the ramparts was recorded during construction work, which revealed the stone rampart and ditch of the inner defences, together with metalworking debris in the interior of the rampart dating from the 4th century BC to the 1st century AD (Musson 1981; Musson and Northover 1989, 20). A number of small-scale archaeological evaluations within the hillfort in recent years have revealed further evidence of occupation and metalworking, including part of an Iron Age roundhouse beneath the 13th green of the Golf Club which occupies much of the hillfort (Owen 1999).

3.3 The area to the west of Llanymynech also contains a number of other prehistoric sites, including the remains of several Bronze Age burial mounds and evidence for prehistoric land divisions, known as pit alignments.

Roman

3.4 The area has a long history of copper and lead mining dating back to at least the Roman period, and a hoard of 33 coins dating between 30 BC and 161 AD was found in a cave known as the Ogof, on top of Llanymynech Hill. It has even been suggested that the hillfort may have been the location for the last stand of Caractacus against the Romans in AD 49 (Jones and Mattingly 1990, 66-67).

3.5 The general area also includes a number of Iron Age, or Romano British defended enclosures or farmsteads, including a multiple-ditched enclosure just to the south of the canal (SJ 2698821103).

Medieval

3.6 It has been argued that the western defences of the hillfort were adopted as part of Offa's Dyke, the 8th century linear earthwork which defined the boundary of the kingdom of Mercia. The precise course of the dyke through Llanymynech village is unknown although further to the south, around Four Crosses, it survives as an impressive earthwork.

Post-Medieval

3.7 Prior to the construction of the canal the area between Llanymynech village and Llanymynech Hill appears to have been largely agricultural, with small irregular fields and small areas of woodland. Traces of ridge and furrow cultivation, of medieval or post-medieval date, survive in fields to the south and east of the main Heritage Area. The Hill itself was unenclosed common land. This is the situation depicted by a map of the Bridgeman Estate in 1766 (Bradford Estate Papers) which indicates that the turnpike road between Oswestry and Welshpool, dating from around 1763, adopted a rather more sinuous route than the present road, with a side road leading into the village further to the east (see below).

Industrial era (18th-20th centuries)

Ellesmere Canal

3.8 The waterway now known as the Montgomery Canal was built in stages between 1794 and 1821, and runs from the Shropshire Union Canal at Frankton Locks to Newtown in Montgomeryshire. The canal, which reached Llanymynech by 1786 at the latest, originally consisted of four distinct schemes which have only been linked together in name under modern ownership. Three of the schemes were specifically constructed to carry and distribute lime for agricultural purposes from the Llanymynech Quarries (Hughes 1983, 9). By 1840-41 there were 92 limekilns along a 26 mile stretch of the canal and a peak carriage of 56,501 tons of limestone per annum was achieved (Williams 1989, 28).

3.9 In addition to limestone, the canal was also used to transport lead from the Tanat Valley mines of Cwm Orog, Craig y Mwyn and South Llangynog, as well as slate from the Llangynog area, which had previously used a river port on the Vyrnwy at Carreghofa.

3.10 The canal wharf at Llanymynech developed in association with the tramway system (see below). Originally, limestone would have been transported from the quarries to the canal by horse and cart, presumably being loaded onto boats moored along the northern side of the canal, close to the turnpike road, or a side road to the east. By 1806 the first tramway was constructed, associated with a small triangular canal wharf, with a second, larger wharf, lying to the east of the road. A third, longer wharf was added further to the west sometime between 1813 and 1858.

3.11 The Cambrian Railway's Llanfyllin Branch was opened in 1863, and although at first the canal suffered little from railway competition (Morriss 1991) the railway eventually took much of the lime trade from the canal. The wharf was probably disused by around 1900, although quarrying and lime burning continued until 1914 (Hughes 1983, 157-8).

Tramways and Inclines

3.12 Following the opening of the Ellesmere Canal a system of tramways and inclines was developed to transport limestone from the quarry faces on Llanymynech Hill to the canal, where the rock was manually crushed before transportation. The earliest mention of a tramway is in December 1799 when a Mr Smith of Madely wished to lease land from the Chirk Castle Estate, suggesting that the quarry construct a railroad to the bank of the canal at an estimated cost of £100 (NLW, Chirk Castle 8528-8573). The first tramway to be constructed, however, was proposed in December 1804 and completed by June 1806. It was built by Arthur Davies, Robert Cartwright and Richard Jebb, who at this time leased quarries from the Chirk Castle Estate and a Mr West (NLW, Chirk Castle 6050 and 6061). It carried limestone from the quarry workings on land belonging to the Chirk Castle Estate to what was at that time the only wharf on the canal. A drum house is shown at the top of the incline, which carried a double track with a cross-over at the bottom where the lines joined a single track to cross the Welshpool to Oswestry Turnpike road, below which was a small passing bay. The single track continued, possibly following the line of the side road noted above, to the canal wharf where it divided, with a branch running to each side of the wharf.

3.13 A second tramway was proposed by Thomas Yates in 1807, leading from land belonging to Lord Bradford to the canal, and is shown on a plan of that date (Fig. 2; NLW Chirk Castle 6046). Although this was not constructed as proposed, it is probable that something was in place by 1810 when Yates started paying rent to the Bradford Estate (see below). One of the inclines was shown on an early version of the Ordnance Survey map in 1837 and this was to become the main transport route which, with later modifications, remained in operation until the closure of the quarry in 1914.

3.14 Cartographic sources for the early 1860s (eg Fig. 3) indicate that by this time the earliest tramway had been abandoned below the incline, a new connecting track having been constructed to join the two tramways immediately west of the road, with a double line running beneath the road to a complicated cross-over, to the south of which the western line ran in a curve before heading to the western canal wharf. The course of the curve can still be traced in fields to the west of the Heritage Area. A building is depicted to the north of the canal wharves which is described as 'House Stable Offices and yard, with a narrow strip to the south recorded as 'Garden'. The building would appear to be in approximately the same position as that presently known as the stables, although the shape of the 1860s structure suggests that this is not the surviving building. The records of the Porthywaen and Llanymynech Lime and Limestone Works include a note that new stables were constructed to replace those burnt down soon after the formation of the company, around 1869 (R Hughes pers. comm.)

3.15 The tramway system during the later 19th century and early 20th century is well-illustrated by the Ordnance Survey 1:2,500 mapping. The first edition (Fig. 4), surveyed in 1874, shows two tramway systems leading from the quarries to the canal. The western tramway system has a series of lines within the quarry workings leading to a brake house at the top of a single-track incline with a short passing loop. The eastern tramway system has what must be an incline, although without a brake house, leading south from the quarry face, with a siding joining from nearby limekilns. A series of lines lead south-west from the eastern workings and limekilns to join the incline above the mid-point. As in 1863, both systems join near the road crossing, with a weighing station beyond. To the south the tramway continues as a double track which diverges to service both canal wharves, as well as joining the mainline railway, which opened in 1863. The second edition (Fig. 5), revised in 1900, shows that by this time the tramway

system serving the western quarry workings had been abandoned, while the eastern system had been much altered to include a double-track incline with brake house, with a new series of feeder tramways along the quarry face. At the southern end, the construction of the conventional lime kilns and their replacement by the Hoffman-type kiln (see below) had led to significant changes with a system of tramways and mainline railway sidings serving the later kiln.

3.16 A short *in situ* section of tramway recognised during the present survey indicates that a 2ft gauge was employed.

Railways

3.17 In 1845 the Shrewsbury Oswestry and Chester Junction Railway was formed with the intention of constructing a line from the Shrewsbury to Chester railway at Gobowen, through Oswestry to Llanymynech. The line was only completed as far as Oswestry, in December 1848, by which time the company had been amalgamated with the North Wales Mineral Railway to form the Shrewsbury and Chester Railway, itself later absorbed into the Great Western Railway in 1854. Meanwhile, the London and North Western Railway had acquired the Montgomeryshire Canal Company and its tramroads and backed a scheme proposed by the Shropshire Union Railway and Canal Company to convert the canal into a railway. In 1855 the Oswestry and Newtown Railway was incorporated, with the line completed to Pool Quay by 1860 and to Newtown the following year (Wren 1968, 30-33).

3.18 The proposed route for the Llanfyllin Branch of the Cambrian Railway was surveyed in 1860, the resulting plan and schedule providing useful information regarding the existing layout of the canal, tramways and other structures at Llanymynech. Unfortunately, the quality of the plan precludes reproduction within this report. The line was constructed by Mr Savin and his brother-in-law, Mr Ward, and opened on 10 April 1863. A stipulation of the Act of Parliament allowing the construction was that the line was not to interfere with existing tramways by crossing them on the level and thus necessitated two bridges to carry the railway over them (Christiansen & Miller 1967, 29). At Llanymynech, a north-end bay platform catered for the Llanfyllin trains which, in order to surmount the canal, used the long 'Rock Siding' to a shunting neck, reversing on or off the branch. After several false starts and changes in company, a railway was eventually constructed from Shrewsbury to Llanymynech, and on through Llanyblodwel to the limestone quarries at Nantmawr. The single-track line, which bypassed the Cambrian line, was known as the Potteries, Shrewsbury and North Wales Railway, and was opened in August 1866 (Wren 1968, 34). Through traffic on the Rock Siding ended in January 1896, although it continued to serve the limekilns until their closure in 1914. After this the siding was used to store redundant wagons until the track was removed in 1939, the Llanfyllin Branch line itself finally closing in 1965 (Baughan 1991, 182-3; Cozens 1959).

Quarrying and limestone

3.19 The natural limestone outcrop has been exploited as a source of building stone for centuries. However, it was the use of lime as an agricultural fertiliser and in building mortar which led to large-scale quarrying during the 19th and 20th centuries.

3.20 Limestone is a form of calcium carbonate ($CaCO_3$) which, when heated to between 900 and 1100^0C is converted to calcium oxide (CaO), or 'quicklime', by driving off carbon dioxide (CO_2), in a process known as 'calcining'. Quicklime produces an exo-thermic reaction with water, forming calcium hydroxide ($Ca(OH)_2$), known as 'slaked' or 'hydrated' lime. This will react slowly with the carbon dioxide and water in the atmosphere to revert eventually to calcium carbonate. It is this latter property which allows lime to be used as a cement, the quicklime being slaked with excess water to form a lime putty which, when mixed with sand, forms a pliable mortar which slowly sets hard. Although the use of lime in buildings was an important output for the lime industry, the main market was for agricultural lime, primarily used to reduce the acidity of the soil. An additional benefit was that lime also breaks down heavy clay soils, aiding drainage and assisting cultivation. Quicklime need to be slaked in order to produce a powder suitable for spreading, and this was usually undertaken in the fields by dumping it in heaps which were left to slake naturally. By the end of the 19th century burnt lime was being ground and sprinkled with water to form hydrated lime which was then dried and bagged for sale (Williams 1989, 8-11).

3.21 Quarrying of the exposed limestone face on the southern side of Llanymynech Hill developed under a series of leases from the Chirk Castle and the Bridgeman Estates (later to be termed

the Bradford Estate when Bridgeman became Lord Bradford). The former held land on the western side of the hill, while the latter owned the eastern side. It would appear that the earlier workings were largely associated with the Chirk Castle lands and relatively large-scale operations were certainly under way by the mid-18th century. The earliest tramway is associated with these workings and it is possible that the coming of the canal provided the impetus for large-scale quarrying to develop on the Bradford Estate. Bridgeman's rent accounts for 1766 - the first ones that are currently available - have a long list of disbursements, totalling more than £190, relating to what was termed the 'lime account', which suggests that the Estate was actively involved in extracting and working limestone and paying piece rates to local workmen. However, there are no comparable entries in subsequent ledgers, suggesting that the account had been closed and that the Estate had ceded its direct interests in limestone extraction to others.

3.22 The nature of the quarry workings may well have been influenced by the boundary between the Chirk and Bradford estates, which could account for the large promontory of un-quarried rock which divides the main workings. On the Chirk Castle lands, the method of working seems to have been by clearing benches and then removing rock from these until the floor of the quarry was reached at a depth of *c.* 50m, forming a large horseshoe-shaped quarry *c.* 270 by 150m in extent. Further to the east, a linear quarry face appears to have been worked in a similar manner, the main workings extending for 250m, with a rock face up to 30m high. Between 1863 and 1914 the rock face was cut back approximately 30m. Within the western quarry is an area of deeper working which appears to represent the latest phase of quarrying, associated with a tunnel cut through the promontory.

3.23 The limestone from the quarries was either burnt in kilns for use as a fertiliser or in lime mortar, or used in its raw state as a flux in the smelting of iron ore. During the Industrial Revolution the main centres of iron production in the West Midlands were at Coalbrookdale, Shropshire, and in South Staffordshire. The opening of the Ellesmere Canal, and particularly the connection to Birmingham with the opening of the Birmingham and Liverpool Junction Canal in 1935, greatly increased the market for Llanymynech limestone.

3.24 As the canal extended further, reaching Newtown in 1821, numerous limekilns developed at the wharves along its route. Although some of the limestone was burnt in kilns close to the quarry workings, the volatile nature of quicklime made its transport by water too hazardous and so much of the quarried limestone was crushed and transported to the various canalside kilns before being burnt.

3.25 Records for the carriage of limestone to the canalside kilns south of Llanymynech are preserved within the Montgomeryshire Canal Report Books held in the National Archives in Kew:

Lime kilns	Limestone (tons)		Lime-coal (tons)	
	1828	**1832**	**1828**	**1832**
Vyrnwy Aqueduct			113	138
Cloptons Wharf	1865	1688	742	688
Mardu	773	2599	291	1021
Bank Lock		251		100
Varchoel	691	1401	192	303
(Pool) Quay				7
Buttington	2478	1937	548	640
(Welsh)Pool	2296	1655	902	670
Belan	5065	3843	1394	940
Brithdir	879	2335	259	714
Rectory	2439	2340	739	819
Berriew	2530	2121	734	665
Efel fach	2808	1421	563	583
Redgate	2093	3541	611	985
Garthmill	2630	6956	993	2250

3.26 Details regarding the ownership and operation of the limestone quarries and kilns is rather confused, although a series of leases from the Earl of Bradford and the Estate of Ruthin Castle shed some light on the matter. During the early 19th century the quarries were

evidently operated by two separate companies, each with a lease from one of the two estates. In 1798 Frederick West, of Ruthin Castle, married Maria Myddleton, co-heiress of the Chirk Castle Estate, who in 1819 was allotted a portion of the estate by the Court of Chancery, which may have included Llanymynech. Certainly by 1827 the lands formerly held by Chirk Castle Estate were owned and leased out by West, and by 1851 they had passed into the ownership of their son, Frederick Richard West (Ruthin Castle Estate lease). A leasing agreement of 1878 between the Right Honourable Orlando George Charles, Earl of Bradford, and William Cornwallis West, of Ruthin Castle seems to have formalised an arrangement dating from 1873 whereby West was granted a 99 year lease allowing him to transport lime from his quarries across land belonging to the Bradford Estate to the canal and railway.

3.27 The Chirk Castle quarries were initially run by Messrs Davies, Cartwright and Jebb, while Thomas Yates worked the rock on the Bradford Estate. Yates was paying rent to the Bradford Estate from 1810 to *c.*1830, while Davies, Cartwright and Jebb appear in the Bradford rental books after 1815, but were involved with Chirk Castle at least ten years earlier (see 3.12). Ten years later they were then superseded, or taken over by, Exuperius Pickering and Co, who continued to operate for about twenty years. In 1827 Pickering leased limestone quarries from Frederick West for 31 years and Pickering and Co were themselves replaced (or re-established) as the Carreghofa Lime Rock Co in 1844/45. Records from the Bradford Estate show that in 1835 Pickering and Co paid a rent of £15 5s for two railways and a stable, one of the former presumably being that run previously by Thomas Yates. In 1851 a seven-year lease of limestone quarries was granted by F R West and M West to Mr T E Ward of the Lodge, Chirk, while quarries on the Bradford Estate appear to have been operated by Mr Baugh. At the same time it would appear that quarries were also leased to Longueville, Longueville and Williams, who themselves granted a further lease two years later to Joseph Needham and then in 1856 Longueville and Williams leased workings to Messrs Benjamin Manning and John Dicks. It would appear that Longueville and Williams were the Trustees of F M West and in 1863 they granted a lease to Thomas Savin, who was then described as a railway contractor, while by 1869 a further lease describes him as a limeburner.

3.28 In 1860 quarrying on the Bradford Estate was carried out under lease by the Carreghofa Lime Rock Company, with Walter Eddy as Secretary (Plan of Llanfyllin Railway 1860). From the 1860s some of the quarries in the Llanymynech area seem to have had close links with the railways, being owned by Mr R S France in 1862, the secretary of the Mid Wales Railway (Baughan 1991, 27), and by Thomas Savin and Company, who was heavily involved with the Cambrian Railway and responsible for the Llanfyllin Branch opening in 1863. At this time it would seem that Savin acquired the leases from both estates for quarrying at Llanymynech. Although Savin was declared bankrupt in 1868, his involvement in Llanymynech continued, with the company changing its name to The Porthywaen and Llanymynech Lime and Limestone Works, based at Cambrian Buildings, Oswestry. A statement of accounts to the company directors in August 1871 reports that a large number of limekilns along the canal at Newtown, operated by the North and South Wales Coal and Lime Company, had closed down and the construction of a number of kilns at Llanymynech was therefore considered as a 'permanent and independent outlet for limestone'. In the late 19th century the company again changed its name to become the Porthywaen Lime Company Ltd of Llynclys, with Captain Nicholson as director. The company was still operating in 1928 when they acquired the Old Sun Inn at Llanymynech, which lay in the eastern angle formed by the canal and the main road to Oswestry, near the present entrance to the Heritage Area.

3.29 Quarrying was not the only activity on Llanymynech Hill during the 19th century as it appears that lead and copper mining was still active, albeit on a small scale. In 1837 a 21 year lease was granted by the Hon. F West for mines and minerals to Messrs William Smith and James Williams. Two years later there was a deed of settlement between West and the Carreghofa Roman Copper and Lead Mining Company, principally Frederick William Smith, Edward Williams and Richard York.

Limekilns

3.30 The use of lime as a fertiliser may date back to the medieval period and lime putty mortars were used by the Romans and more extensively from the Norman Conquest. It is not known when the burning of limestone commenced at Llanymynech, although the earliest reference is a map of Chirk Castle Estate in 1753 which depicts what appear to be three banks of triple kilns within the area of the quarry workings. The site of the kilns is not known, although they are likely to lie beneath extensive late 19th-century spoil tips. In 1754 the Reverend Richard

Pococke noted 'a great number of lime kilns' at Llanymynech, whilst travelling from Oswestry to Welshpool.

3.31 Although the raw limestone was clearly in abundant supply at Llanymynech, what made the area of particular significance was the relative proximity of coal from the Oswestry, Chirk and Ruabon coalfield. The southern end of the coalfield, between Trefonen and Morda, is only 6km from Llanymynech. The kilns at Llanymynech date from the main period of activity towards the end of the 19th century. By the end of the 19th century the use of lime in the construction industry was in decline with increased competition from Portland cement, which was both stronger and more water resistant, and this was undoubtedly a major factor in the eventual closure of the lime works in 1914.

3.32 The surviving kilns fall into two groups, one close to the quarry and the other near the canal and railway. The former group comprises three banks of kilns and associated structures to the south-east of the Wildlife Reserve, which are all variations of continuous draw kilns. They are depicted by the Ordnance Survey in 1874, along with a related tramway system, but had evidently fallen out of use by 1900.

3.33 A structure located on the canal wharf may originally have been a kiln and has a raised tramway leading to it. Its later use, however, was as a tally hut. The largest kilns at Llanymynech were constructed following the opening of the railway in 1863 and comprise two continuous draw kilns with single draw-holes and the later Hoffman Kiln, dating from around 1899.

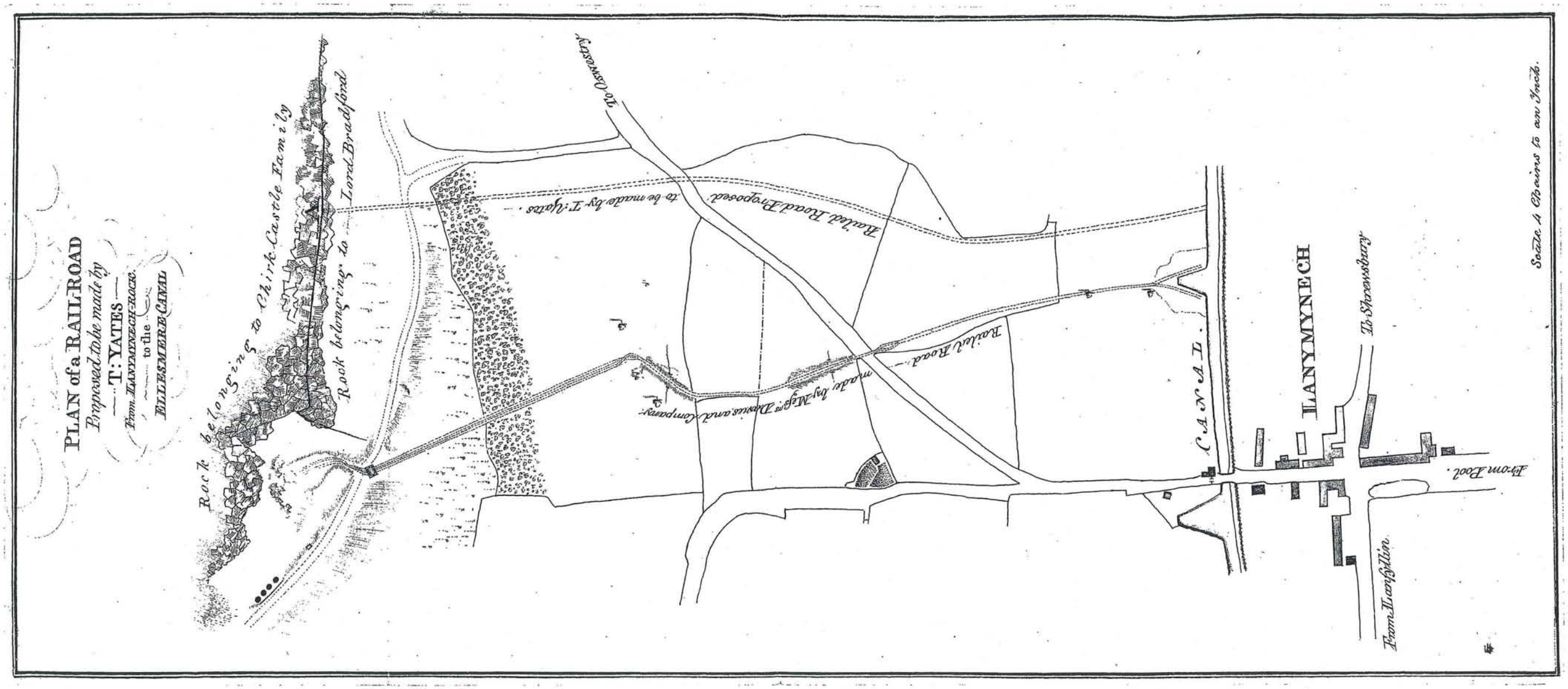

Fig. 2 1807 plan of a railroad proposed from Llanymynech Rock to the Ellesmere Canal (NLW Chirk Castle v6046)

Fig. 3 Tracing of a map of Lord Bradford's Estate in Llanymynech, Llandisilio and Kinnerley, 1863

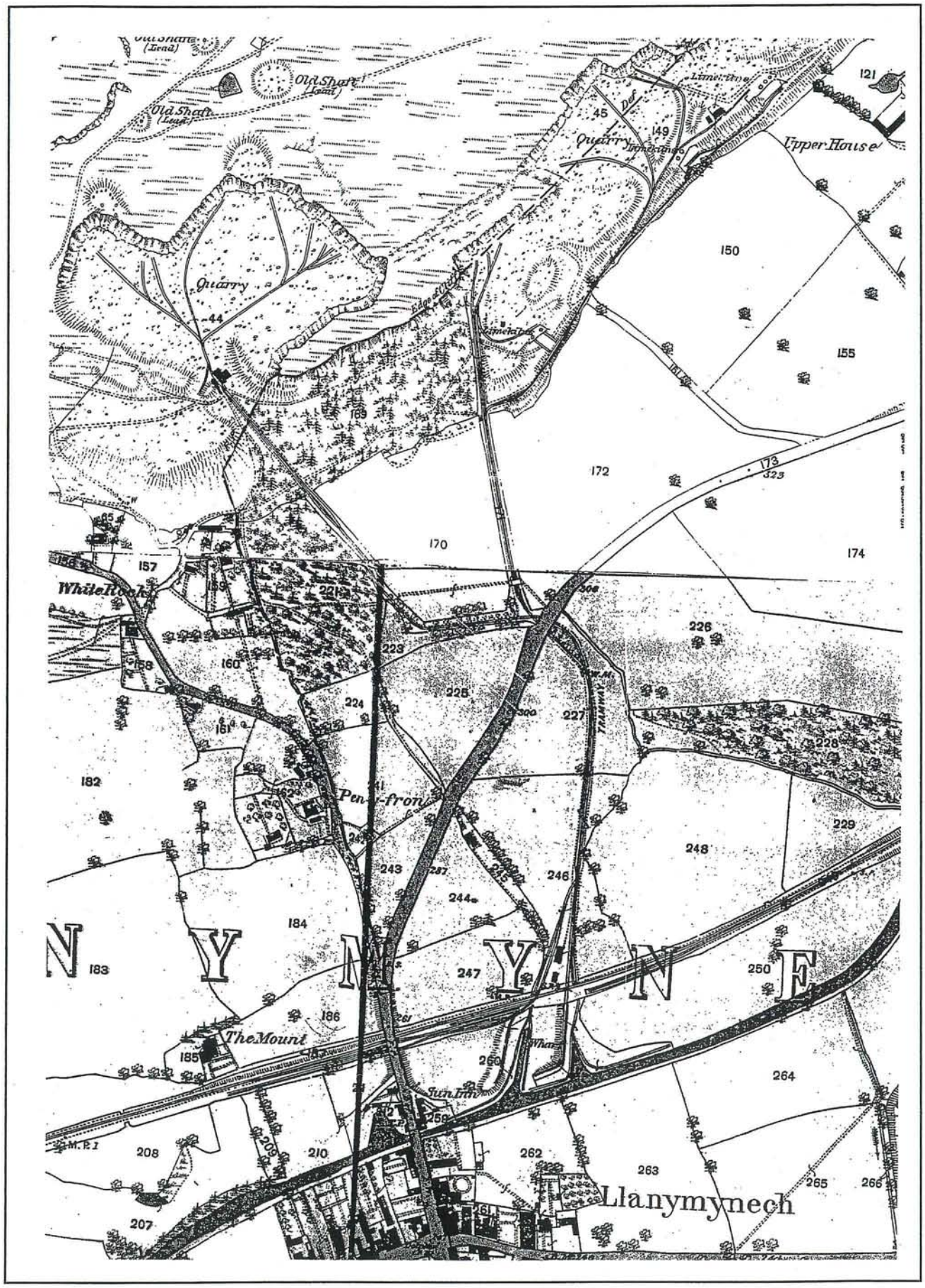

Fig. 4 Ordnance Survey 1st edition 1:2,500, surveyed 1874

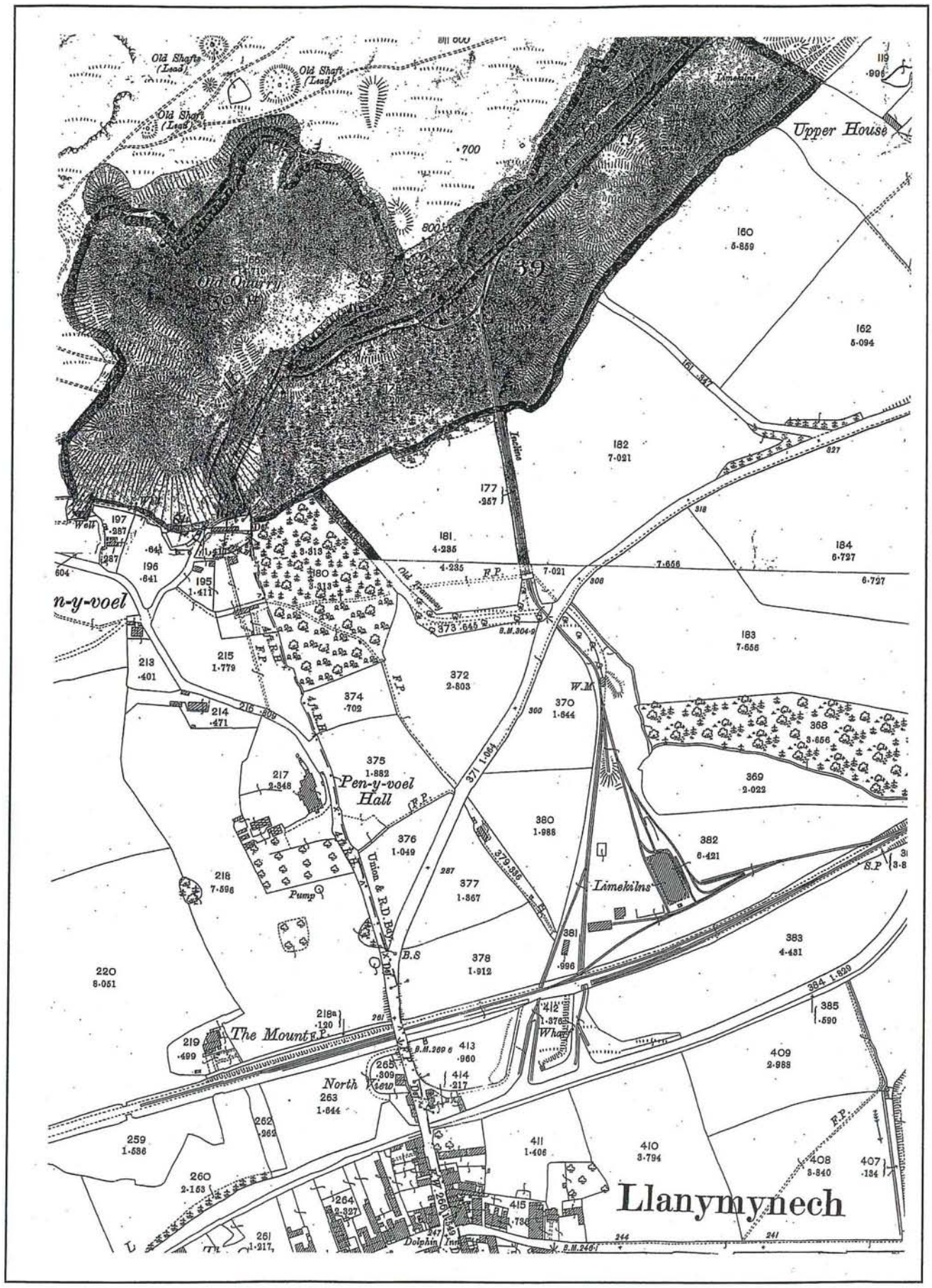

Fig. 5 Ordnance Survey 2nd edition 1:2,500, 1901

4 HISTORIC LANDSCAPE

4.1 The historic landscape within which the Heritage Area lies has already been the subject of a study in connection with proposals to restore the Montgomeryshire Canal (Jones 2003; Fig. 6). This identified a number of distinctive areas, known as 'character areas', through which the canal passes, one of which encompassed the area surrounding Llanymynech. This area was further subdivided into a number of 'aspect areas' (AA), each of which has its own individual landscape character. The following details have been drawn from that source, which also includes a full description of the methodology employed.

4.2 The area defined around Llanymynech is characterised by the mining and industrial processing settlements of Llanymynech and Pant, and agricultural and recreational areas associated with the distinctive limestone upland block of Llanymynech Hill. The area was drawn to include the following aspect areas: the nucleated settlement of medieval origin at Llanymynech (AA 71); the post-medieval settlement at Pant (AA 74); an area of former limestone quarries, cottages, encroachments and small straight-sided fields (AA 75); the golf course occupying the plateau of the hill (AA 76); and an area of past and present processing and manufacturing industry (AA 72). The later prehistoric hillfort which crowns the summit of the hill is one of the largest in the country and, although it may represent a tribal centre which once housed a large population, there have even been suggestions that it may also have been built to protect the sources of copper ore which lie within its interior. There is evidence to suggest that these ores were being mined and used for the manufacture of bronze weapons and implements from the later Bronze Age onwards and there is a cave known as the Ogof inside the hillfort which probably represents a Roman mine. It has been suggested that the hillfort may have been the site of the last stand of the Celtic chieftain Caractacus against the Roman army, in a decisive battle in the Roman conquest of Britain described by the historian Tacitus. The location of the battle is unknown, however, and other sites in the upper Severn valley for which claims have been made include the Breiddin hillfort and the hill now occupied by Dolforwyn Castle.

4.3 It is uncertain when the earliest stone quarries were opened, although it has been suggested that quarrying and lime production may have started in the Roman period, Llanymynech Hill being the closest source of building lime to the large Roman city at Wroxeter, further downstream on the Severn, and it is possible that a quarrying settlement existed at Llanymynech at that time.

4.4 In the later 8th century Offa's Dyke, marking the western boundary of the Anglo-Saxon kingdom of Mercia, was built across the area, encompassing the hill and incorporating the western defences of the prehistoric hillfort.

4.5 A church settlement had become established at Llanymynech, near the crossing of the River Vyrnwy, by the medieval period but rapid growth of this nucleated settlement and of Pant on the western flanks of the hill came with the expansion of the quarrying industry in the post-medieval period, especially following the improvements to the turnpike roads. Lime production for building and agricultural purposes was undertaken on a large scale during the 18th and 19th centuries, the raw material being first transported by road and river and subsequently by canal and railway. The industry declined and virtually disappeared during the later 19th century.

The main historical and archaeological interests within the character area are as follows:

- the later prehistoric hillfort, one of the possible sites of Caractacus's last stand against the Roman army
- evidence of prehistoric and Roman copper mining and processing
- the course of Offa's Dyke
- deposits associated with medieval nucleated settlement at Llanymynech
- industrial sites and structures associated with the limestone and lime industries
- significant elements of transport history associated with the canal and railways

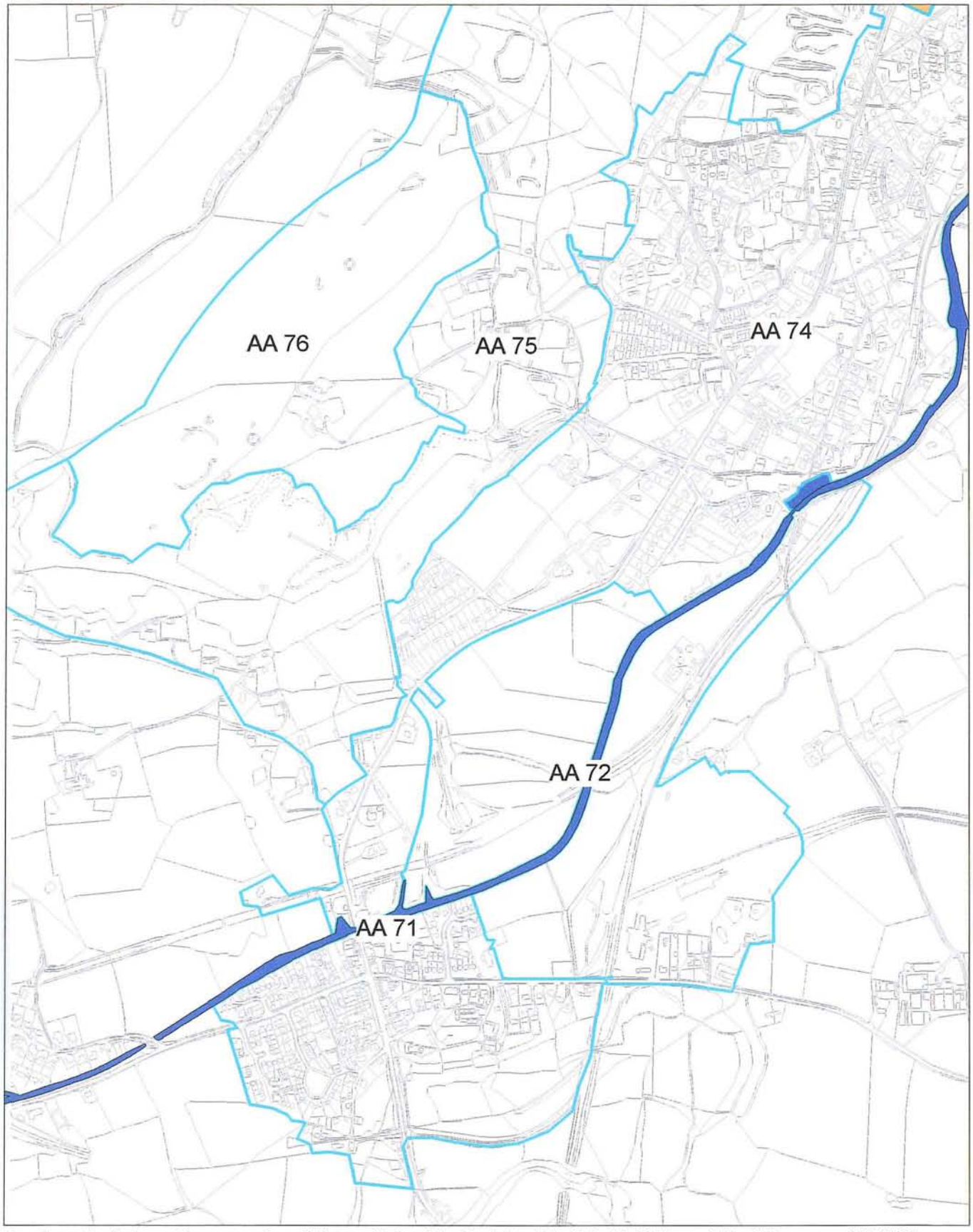

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Fig. 6 Historic Landscape: Llanymynech Character Area (after Jones 2003)

5 MEASURED SURVEY

5.1 The detailed measured survey of the Heritage Area was undertaken over a period of 20 days during January and February 2004, recording over 4300 points, digitally surveyed using total station surveying. The survey of the two inclines was completed over a three-day period in February 2004, using more conventional tape and offset surveying. The detailed nature of both surveys enabled a thorough investigation of the area, resulting in the identification of several new structures and other features. The survey has also allowed a better understanding of the relationship between features to an extent which, as a result of the topography and vegetation, has not previously been possible.

5.2 The earthworks and structures within the Heritage Area presented a considerable challenge for the survey, due to their often impressive height and the dense vegetation cover. In particular, the tramway embankments for charging the draw kilns and the Hoffman kiln created significant obstacles which are some of the most impressive features of the site. It is, however, the lime kilns which are the most important structures, not only for their industrial archaeological interest, but also as major features in the landscape. The site is dominated by the Hoffman kiln and chimney which, having been cleared of vegetation, could be surveyed in some detail. The survey of the two draw kilns, however, was generally limited to recording a ground plan as a security fence prevented access to the upper part of the kilns. Rectified aerial photography has been used to add detail for the top of the kilns, although clearly with less accuracy that the total station survey.

5.3 The survey has enabled a better understanding of the topography and the way in which the natural contours have been modified to accommodate the inclines, tramways and other structures. The earthwork survey of the inclines (Fig. 7) has demonstrated the way in which a constant gradient has been maintained by the construction of embankments and cuttings. The western incline falls by around 70m over a distance of 270m, while the eastern inclines falls 50m over a distance of 255m. The upper sections of both inclines operated on a gradient of approximately 20^0, gradually levelling out towards the base to an angle of $12\text{-}14^0$. The earthworks of other related features, such as trackways, have only been recorded immediately adjacent to the inclines, although in most cases they extend further, beyond the survey area. The bed of the western incline retains a number of limestone sleeper-blocks which were used as plate fixings for the tramway rails, as well as some with grooves incised by the haulage cables, and the position of each has been recorded. There are, however, certain to be further such blocks which are presently not visible.

5.4 Below the inclines, the gradient of the tramways has also been maintained by constructing cuttings at the southern end, although in part this may be due to later modifications associated with the construction of the railway. The large tramway embankments serving the draw kilns and the Hoffman kiln are another obvious topographical modification. What is less apparent, however, is the way in which a large levelled platform has been created for the kilns. The substantial stone wall along the south side of the kilns acts as a revetment, behind which the ground level has been raised by up to 2.1m.

5.5 During the post-survey processing of the results it became apparent that although the overall boundaries of the survey correlated well with the boundaries published by the Ordnance Survey, the detail and position of structures within the area showed considerable variation. At its greatest, a variation of around 5m was noted between the Ordnance Survey and the actual position of features as recorded by the total station survey.

5.6 The results from the measured surveys have been used to produce a series of conventional drawn plans (Figs 7-9), as well as computer-generated images (Figs 10-11). In addition, the digital data have been provided to the client in GIS (Arcview) format, including a level of interpretation (see Fig. 12).

Fig. 7 Measured survey of the inclines

Fig. 8 Measured survey of Heritage Area (north)

Fig. 9 Measured survey of Heritage Area (south)

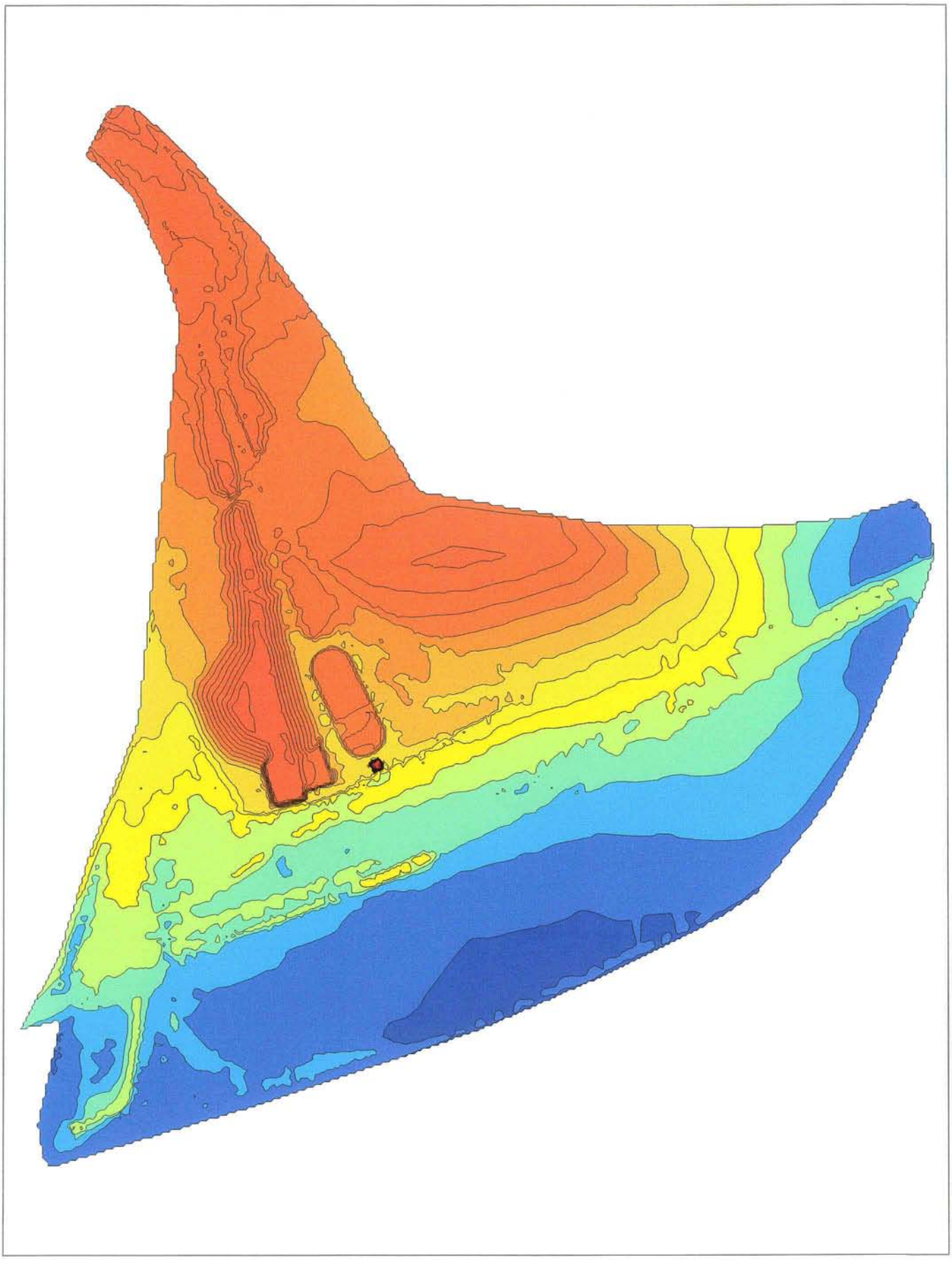

Fig. 10 Digital contour model at 1.0m intervals, scale 1:200

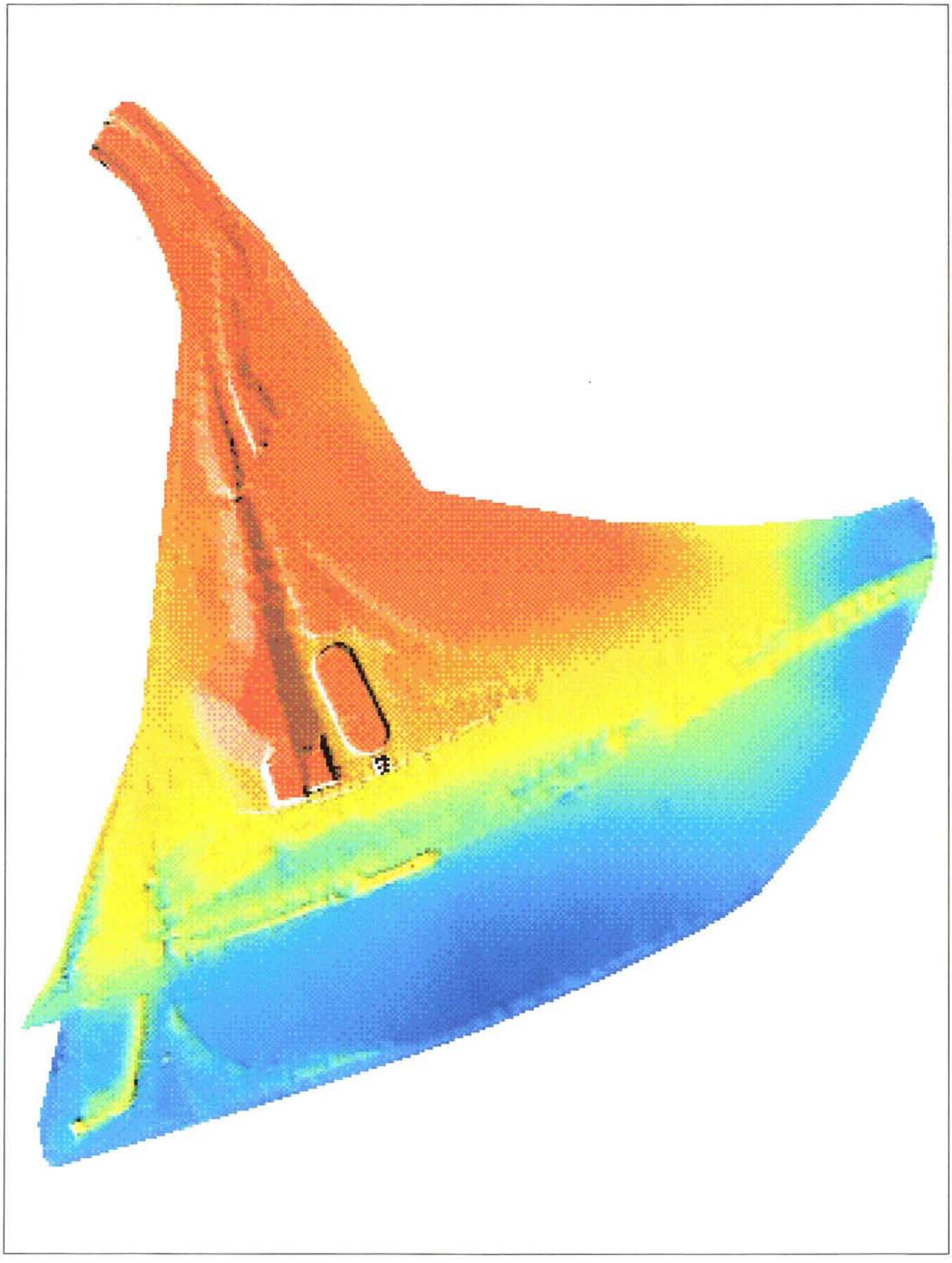

Fig. 11 Digital relief shade model, scale 1:200

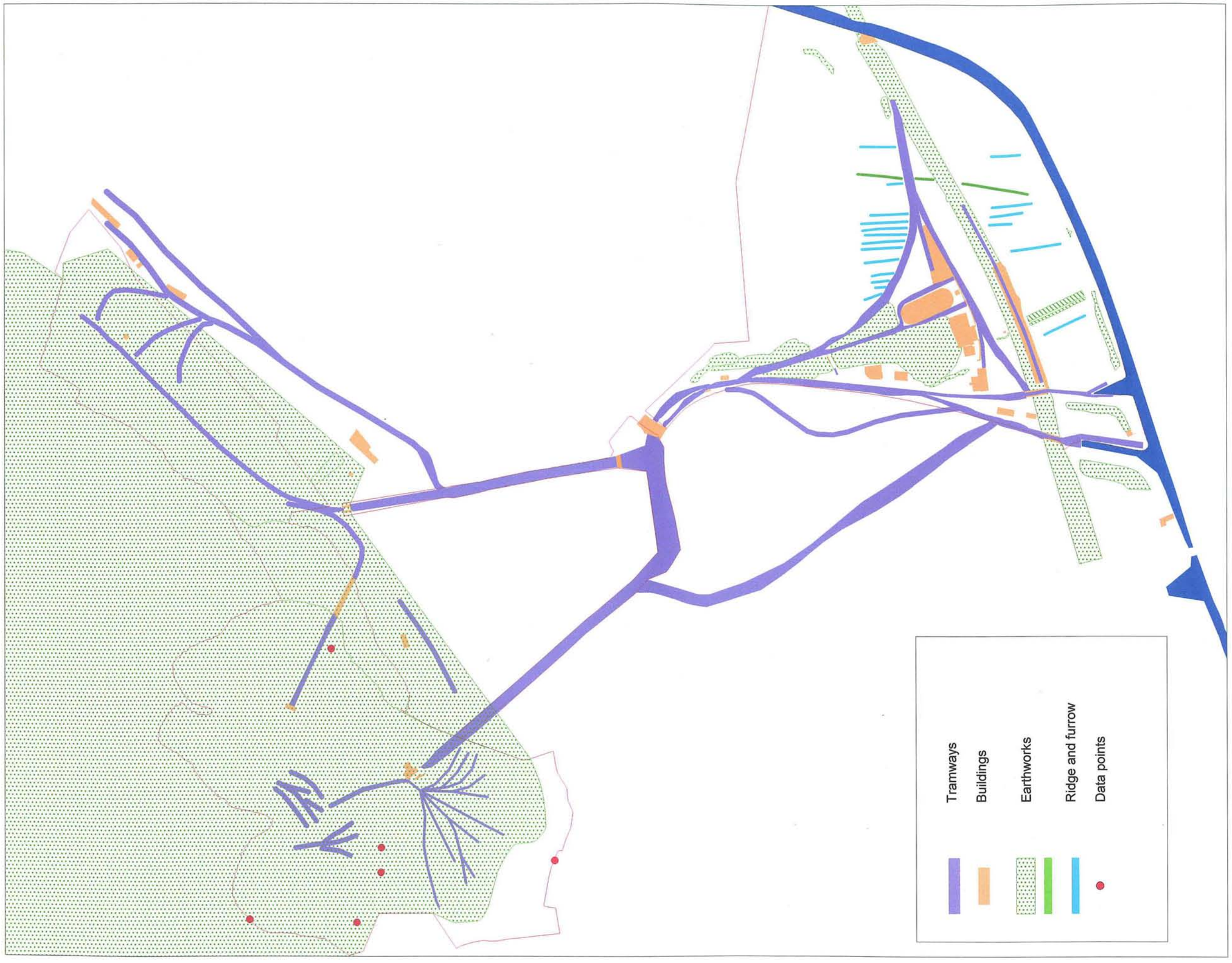

Fig. 12 GIS Model: polygonal and point data

6 ARCHAEOLOGY

6.1 Each feature identified during the survey, either as an extant earthwork or structure, or as a documentary reference, has been allocated a unique site number to which data have been attached in the GIS model, using a standard set of data fields. Information on each site including, where appropriate, management recommendations, is presented below and on Figs 13-14.

6.2 The archaeological sites are classified according to their perceived significance. The categories, with the exception of Category E, are based on those given in the Department of Environment, Transport and Regions' *Design Manual for Roads and Bridges* Volume 11 Section 3 Part 2 (1993).

6.2.1 *Category A* sites are those believed by CPAT Contracts to be of primary significance, either potentially of national importance or already designated by Cadw: Welsh Historic Monuments or English Heritage as being of scheduled ancient monument or listed building status.

6.2.2 *Category B* sites are those of regional importance. These sites are not of sufficient importance to justify scheduling or listing, but are nevertheless important in aiding the understanding and interpretation of the archaeology of the region.

6.2.3 *Category C* sites are those of local importance. These sites are of lesser importance, but are nevertheless useful in aiding the understanding and interpretation of the archaeology of the local area.

6.2.4 *Category D* sites are either those of minor importance or those which are so badly damaged that too little now remains to justify their inclusion in a higher grade.

6.2.5 *Category E* sites are those which have been identified, but whose importance cannot be assessed from fieldwork and desk-top study alone.

6.3 Wildlife Reserve and Inclines

6.3.1 The Reserve occupies a major part of the former limestone quarries at Llanymynech and is nationally important for its limestone grassland flora and fauna. Llanymynech Rocks is a Reserve which straddles the border and is managed jointly by Montgomeryshire Wildlife Trust and Shropshire Wildlife Trust. The present study also included an area to the south of the Reserve which contains three groups of limekilns and part of the tramway system.

Archaeological summary

6.3.2 Although the main archaeological features within the Reserve relate to the quarrying and mining activities of 18th, 19th and 20th-century date, the hilltop above is occupied by a nationally important prehistoric hillfort (Site 68), the western defences of which were later adopted by Offa's Dyke (Site 69). Its course may have run through the Reserve. The quarry workings are clearly the dominant feature and it is their abandonment and subsequent floral and faunal re-colonisation which have led to the creation of the Wildlife Reserve. The method of working seems to have been by clearing benches and then removing rock from these until the floor of the quarry was reached at a depth of *c.* 50m. The western quarry area (Site 1) developed on land belonging to the Chirk Castle Estate and was worked from at least the mid-18th century until the early 20th century. Within this quarry is an area of deeper working (Site 17) which appears to represent the latest phase of quarrying. There is no surface evidence for the series of lime kilns (Sites 10 and 71) depicted on the maps of 1753 and 1807, although they may well survive buried beneath later spoil.

6.3.3 Other sites recorded in the western area include a small blast shelter or store (Site 16), a mining adit (Site 15) cut into the cliff face of Asterley Rocks, and a well (Site 3) depicted on the Ordnance Survey 2nd edition 1:2,500 map of 1901, although not identified during the field visit; it may therefore lie just outside the Reserve.

6.3.4 The eastern quarry workings (Site 91) developed on land belonging to the Bradford Estate and form an impressive linear rock face around 250m in length. The two main areas of quarrying are separated by a promontory of rock which may have been left unworked as it formed the boundary between the two estates.

6.3.5 Stone was removed from the quarries by a series of tramways and inclines which led to the canal, and later the railway, some distance to the south-east. The development of this transport system has already been described in sections 3.12 to 3.16. The main surviving elements consist of three stone-built drum houses (Sites 4, 6 and 40) associated with three separate inclines (Sites 8, 9 and 19). The lower part of the earliest tramway (Site 21) lies outside the survey area. Various tramlines are visible on the quarry floor and there are a set of well-preserved tip lines to the south-west of the drum house (Site 4).

6.3.6 A number of quarry related features lies outside the Reserve to the south-east, including the line of the tramway system (Site 61) depicted by the Ordnance Survey in 1874, three banks of lime kilns (Sites 52, 59 and 60) and a number of other buildings and structures (Sites 57-8, 62-3).

Management recommendations

6.3.7 The majority of the Reserve lies within the Scheduled Ancient Monument of Llanymynech Hillfort (SAM Mg 30) which gives statutory protection for the area, placing strict controls on any development or ground disturbance. This area lies on the Welsh side of the border and any works within it should be subject to Scheduled Monument Consent (SMC) following an application to Cadw: Welsh Historic Monuments. Consultation should be undertaken prior to any proposed ground disturbance or structural works, with consultees including the following, as appropriate: Cadw: Welsh Historic Monuments; English Heritage; the Historic Environment Officer, Shropshire County Council; and the Principal Curatorial Officer, Clwyd-Powys Archaeological Trust.

6.3.8 The entire Reserve area is potentially archaeologically sensitive with the hillfort, the line of Offa's Dyke running along the top of the cliff to the north-west, and the quarry and mine workings constituting one large archaeological site within which the Reserve is located. The remains of the three drum houses (Sites 4, 6 and 40) are in need of remedial action to remove the vegetation and reconsolidate the surviving structures. Once the vegetation has been cleared a detailed measured and photographic survey should be undertaken for the structures, to include any associated features which may be revealed. Limited excavation of spoil within and around the structures might provide significant evidence as well as aiding visitor interpretation. Since two of the drum houses lie within the Scheduled Area, Cadw: Welsh Historic Monuments should be consulted before any work is undertaken. The two main inclines (Sites 8 and 19) should be cleared of scrub vegetation to aid public access and interpretation.

6.3.9 Both of the inclines have the potential for significant buried remains and provision should be made for an appropriate archaeological response associated with any ground disturbance.

6.3.10 The Reserve has considerable potential for future visitor access and interpretation, although the safety of the area will always be a primary consideration and appropriate warnings or fencing of some areas must be considered. The history of the hillfort and Offa's Dyke, together with the mining and quarrying offers a wide range of information which could be presented on display boards.

6.3.11 Site-specific management recommendations are provided below.

Gazetteer of archaeological sites

Site	Name	Type	Period	Form	Category	Grid ref
1	Llanymynech Quarry I	Quarry	Post Medieval	Earthwork	B	SJ2650021700
2	Llanymynech Mines	Mine (lead/copper)	Multiperiod	Earthwork	B	SJ2640022000
3	Llanymynech Rocks Well I	Well	Post Medieval	Document	E	SJ2639021540
4	Llanymynech Quarry Drum house I	Drum house	19th Century	Building	B	SJ2646021650
6	Llanymynech Quarry Drum house II	Drum house	20th Century	Building	B	SJ2651021750
7	Llanymynech Quarry Tunnel	Tunnel	19th Century	Structure	B	SJ2659021710
8	Llanymynech Quarry Incline I	Inclined plane	19th Century	Structure	B	SJ2648021630
9	Llanymynech Quarry Incline II	Inclined plane	19th Century	Structure	B	SJ2662021700
10	Llanymynech Quarry limekilns	Lime kiln	Post Medieval	Document	E	SJ2640021680
14	Llanymynech quarry embankment	Revetment	19th Century	Structure	C	SJ26572165
15	Llanymynech Quarry adit II	Adit	Post Medieval	Earthwork	B	SJ2634021790
16	Llanymynech quarry shelter/magazine	Shelter	19th Century	Structure	C	SJ2656021720
17	Llanymynech Quarry III	Quarry	19th Century	Earthwork	B	SJ2657021730
19	Llanymynech incline III	Inclined plane	19th Century	Earthwork	B	SJ2676721420
20	Llanymynech quarry tramway I	Tramway	19th Century	Earthwork	B	SJ2676421852
40	Llanymynech Quarry Drum house III	Drum house	19th Century	Structure	B	SJ2667521705
51	Llanymynech incline footbridge	Bridge	19th Century	Structure	E	SJ2671321490
52	Llanymynech quarry limekiln II	Lime kiln	19th Century	Structure	B	SJ2672821697
54	Llanymynech quarry building I	Building	19th Century	Document	E	SJ2681221885
57	Llanymynech quarry building II	Building	19th Century	Structure	D	SJ2670121704
58	Llanymynech quarry loading ramp	Embankment	19th Century	Document	C	SJ2671321714
59	Llanymynech quarry limekiln III	Lime kiln	19th Century	Structure	A	SJ2684621845
60	Llanymynech quarry limekiln I	Lime kiln	19th Century	Structure	A	SJ2691421904
61	Llanymynech quarry tramway II	Tramway	19th Century	Document	B	SJ2679321762
62	Llanymynech quarry limekiln building I	Building	19th Century	Structure	C	SJ2687021874
63	Llanymynech quarry limekiln building II	Building	19th Century	Structure	C	SJ2687821881
65	Llanymynech quarry tramway III	Tramway	19th Century	Document	B	SJ2644821684
68	Llanymynech Hillfort multiple	Hillfort	Iron Age	Earthwork	A	SJ2649922149
69	Offa's Dyke	Linear earthwork	Saxon	Earthwork	A	SJ2600021930
71	Llanymynech Quarry Limekilns	Lime kiln	Post Medieval	Document	E	SJ2634021700

72	Llanymynech Quarry building	Building	Post Medieval	Document	E	SJ2638021680
91	Llanymynech Quarry II	Quarry	19th Century	Earthwork	B	SJ2675021850
92	Llanymynech tramway III	Tramway	19th Century	Earthwork	E	SJ2668021450
98	Llanymynech quarry tramway IV	Tramway	19th Century	Earthwork	C	SJ26572166

Site 1 Llanymynech Quarry I
The main area of quarrying at Llanymynech is situated on the south side of Llanymynech Hill. Its age is uncertain but it was certainly active between the 18th and early 20th centuries. Limekilns were in existence along the lower edge of the quarry by at least 1753, although the main period of working followed the opening of the Ellesmere Canal in 1796. An area of deeper working (Site 17) may be the latest phase of quarrying.

Management - The quarry lies within the scheduled area of Llanymynech Hillfort (Mg030) and advice should therefore be sought from Cadw: Welsh Historic Monuments, possibly including an application for scheduled monument consent, before any ground disturbance works are undertaken.

Site 2 Llanymynech Mines
The exploitation of lead and copper at Llanymynech may date from the Roman period, or possibly earlier. At least 10 shafts were formerly visible before landscaping, together with a large number of shallow pits and shaft-mounds. The main workings include the Pit Series, Winze Series and the Ogof workings. The Winze Series at SJ 26502236 consists of a long adit at SJ 26582225 leading to a winze and levels while the Pit Series consists of two parallel levels which continue northwards as a line of shallow pits on the surface, still visible at SJ 26472222, which appear to connect with the Winze Series workings. In the face of the large southern quarry are three levels one of which terminates abruptly while the others continue north and connect with three shafts in the Carreghwfa workings at SJ 26502186. There is a connecting quarry tunnel between the two main quarries. Another adit runs west from the base of a quarry on the eastern side of the hill but does not continue for any great distance (SJ 26932219). Lead and/or copper processing probably took place on the hilltop as evidenced by the former existence of processing spoil heaps prior to landscaping for the golf course. Excavations in 1981, just inside the eastern multivallate defences at SJ 26892214, revealed evidence of metalworking hearths relating to the reworking of smelted local copper ores. This activity has been dated to the second and/or first centuries BC by radiocarbon dating (Musson and Northover 1989).

Management - The quarry lies within the scheduled area of Llanymynech Hillfort (Mg030) and advice should therefore be sought from Cadw: Welsh Historic Monuments, including an application for scheduled monument consent, before any ground disturbance works are undertaken.

Site 3 Llanymynech Rocks Well I
A well is marked on the OS 2nd edition, revised in 1900, but it was not located during the survey.
Management - None

Site 4 Llanymynech Quarry Drum house I
The drum house, which is depicted on the OS 2nd edition map, has an associated outbuilding on its north-east side, and is situated at the head of an incline (Site 8). The drum house is stone-built, and consists of two parallel walls aligned north-west to south-east, 2.8m apart and 7.2m long which stand to a height of 3.5m. No lateral timbers survive in situ, although slots for timbers are evident within the south-east wall. The south-east part of the structure is trapezoidal, built against a bank of spoil, its northern wall is 1.2m long and its southern wall 2.7m long. To the south-east of this are the remains of a retaining wall, but spoil and rubble banked up on the south side obscures this. The north-east part of the drum house measures 3.7m wide by 7.2m long, and has an internal slot measuring 4.18m by 0.83m, with an access portal on the south-east side, possibly to house the brake-banding mechanism. A building has been added to the north-east side, measuring 7.3 by 5.5m. This is divided into two rooms, measuring 3.2 and 3m across. Another structure has been added to the north-west, measuring 6m long x 4.2m wide, with an entrance in the north-west wall. All the structures are ivy clad, and other vegetation impedes access and visibility.

Management - The drum house lies within the scheduled area of Llanymynech Hillfort (Mg030) and advice should therefore be sought from Cadw: Welsh Historic Monuments, possibly including an

application for scheduled monument consent, before any works are undertaken which may affect the structure or its environs. The vegetation should be removed from the structure and a detailed drawn and photographic record made prior to reconsolidation.

Site 6 Llanymynech Quarry Drum house II

Drum house with an associated outbuilding on its south-western side, at the head of an incline (Site 9) leading to a tunnel in the rock face. The drum house is stone-built, and consists of two parallel walls standing 3.1m apart, each 5.5m long and *c.* 1.8m thick, with a maximum surviving height of 3.1m at the south-east corner. Two lateral timbers survive in situ. The north-western timber is circular in cross-section and 0.27m in diameter, whilst the south-eastern timber is square in section measuring 0.3m wide. Between these two timbers are two other square-sectioned beams, 0.3m wide, both still in situ, which appear to form a pivot-socket for the drum head. To the north-western side of the structure lie the remains of a brake-band. Other ironwork lies to the south-east of the structure.

The stone walls of an unroofed outbuilding, 5m long by 2.5m wide, are 0.7m thick and stand to a height of 1.0m. Its entrance is on the south-east side, and its interior is rubble-filled. The structures are clad in ivy and many ash saplings have taken hold.

Management - The vegetation should be removed from the structure and a detailed drawn and photographic record made prior to reconsolidation.

Site 7 Llanymynech Quarry Tunnel

The tunnel, which is depicted on the OS 2nd edition map, revised in 1900, is *c.* 50m long, oriented west-south-west to east-north-east, and was cut through the rock face to connect an area of later quarry working with the main incline (Site 9). A tramway led through the tunnel from the base of an incline within the quarry to a drum house at the head of the main incline. The eastern mouth of the tunnel is 7.25m wide and 6.2m high, but where it opens into the upper quarry the tunnel is 5.9m wide and 7.5m high, and there is considerable variation in the dimensions along the length of the tunnel. Just to the west of its opening into the upper quarry are the remains of a tramline with a sleeper in situ. Within the tunnel is a trial cut on the north-east wall, *c.* 8m long x 1.5m wide. The tunnel is unsafe and has been fenced-off, although this is no longer effective.

Management - The tunnel lies within the scheduled area of Llanymynech Hillfort (Mg030) and advice should therefore be sought from Cadw: Welsh Historic Monuments, including an application for scheduled monument consent, before any works are undertaken which may affect the structure or its environs.

Site 8 Llanymynech Quarry Incline I

The first tramway to be constructed at Llanymynech was proposed in December 1804 and completed by June 1806. The tramway was built by Arthur Davies, Robert Cartwright and Richard Jebb, who at this time leased quarries from the Chirk Castle Estate and a Mr West (NLW, Chirk Castle 6050 and 6061). It carried limestone from the quarry workings on land belonging to the Chirk Castle Estate to what was at that time the only wharf on the canal. The drum house still survives at the top of the incline. The incline carried a double track with a cross-over at the bottom where the lines joined a single track to cross the Welshpool to Oswestry Turnpike road, below which was a small passing bay. The single track continued, possibly following the line of a side road (depicted on the 1807 map of Chirk Castle Estate), to the canal wharf where it divided, with a branch running either side of the wharf.

The incline is depicted on an 1807 map of Chirk Castle Estates, and the later Tithe map, OS Surveyors' drawing & 1:2500 1st edition map. It is heavily vegetated at its upper end. There are marks from a haulage cable visible on rocks adjacent to the drum house (Site 4) at the head of the incline.

Management - The incline is in a stable condition and requires no remedial action, with the exception of controlling the growth of saplings to allow access along its length. Numerous stone blocks line the route, incorporating both sleeper-blocks and stones bearing cable marks and these should be retained in situ. Care should be taken when undertaking groundworks as buried remains may be present.

Site 9 Llanymynech Quarry Incline II

The Incline was constructed sometime after 1900. The upper section is rock cut near the drum house (Site 6). It runs through the tunnel (Site 7) where there is an in situ rail.

Management - The incline lies within the scheduled area of Llanymynech Hillfort (Mg030) and advice should therefore be sought from Cadw: Welsh Historic Monuments, including an application for scheduled monument consent, before any works are undertaken which may affect the structure or its environs.

Site 10 Llanymynech Quarry limekilns
Three banks of triple lime kilns are shown on a map of 1753 (Chirk Castle Estate). Limekilns are also shown in approximately the same position on a map of 1807. There is now no visible trace, although they could be buried beneath later spoil.

Management - None

Site 14 Llanymynech quarry embankment
Limestone rubble embankment, 4m wide by 9.6m long with a stone revetment up to 1.9m high. It is situated on the southern side of the lower quarry edge, and just south-east of the tunnel. Its function is uncertain, though it may possibly be associated with tramways.

Management - Removal of vegetation.

Site 15 Llanymynech Quarry adit II
Trial adit in the quarry face. It extends for 30m, with a dog-leg to the north-east from the entrance passage which runs north-west. No minerals are evident though there is some copper colouring to the clay bands in the limestone.

Management - The adit lies within the scheduled area of Llanymynech Hillfort (Mg030) and is an integral feature of the mining remains which should be preserved.

Site 16 Llanymynech quarry shelter/magazine
Blast shelter or magazine built into the south face of the main quarry west of the tunnel. It consists of a 3m long alcove with a stone wall on the north side with remains of a doorway. There are slate fragments at the top of the wall to deflect water. Dimensions are 3 x 2 x 2.5m high.

Management - The structure lies within the scheduled area of Llanymynech Hillfort (Mg030; Sa013) and advice should therefore be sought from Cadw: Welsh Historic Monuments, possibly including an application for scheduled monument consent, before any ground disturbance works are undertaken. The structure should be preserved in situ.

Site 17 Llanymynech Quarry III
An area of deeper working within the main quarry which appears to represent the last phase of working.

Management - The quarry lies within the scheduled area of Llanymynech Hillfort (Mg030) and advice should therefore be sought from Cadw: Welsh Historic Monuments, including an application for scheduled monument consent, before any ground disturbance works are undertaken.

Site 19 Llanymynech incline III
In 1807 Thomas Yates proposed a second tramway at Llanymynech to run from land belonging to Lord Bradford to the canal, and this is shown on a plan of that date (NLW Chirk Castle 6046). Although this was not constructed as proposed, a tramway and incline were built along much the same route, having certainly been completed by 1837, when the incline is shown on an early Ordnance Survey map. This was to become the main transport route which, with later modifications, remained in operation until the closure of the quarry in 1914.The incline is depicted in various phases from 1863 to 1900, presumably remaining in use until quarry closure in 1914.

Management - The incline is presently blocked by rubbish and vegetation, both of which should be cleared to allow clear access. Care should be taken when undertaking groundworks as buried remains may be present.

Site 20 Llanymynech quarry tramway
A dendritic tramway connecting the quarry complex with the canal wharves below (Sites 28 & 29). The tramway was developed sometime between 1874 and 1900 to serve the extensive linear quarry face along the south-east side of Llanymynech Hill. It was constructed in association with the incline

and drum house at its south-west end. The line of the tramway is largely that now followed by a public footpath.

Management - The tramway lies within the scheduled area of Llanymynech Hillfort (Mg030) and advice should therefore be sought from Cadw: Welsh Historic Monuments, including an application for scheduled monument consent, before any works are undertaken. Buried remains may survive which could be affected by alterations to the footpath that follows the line of the tramway.

Site 40 Llanymynech Quarry Drum house III
Drum house with an associated outbuilding on its east side, situated at the head of a tramway incline (Site 19), at the base of a south-facing quarry face. It was constructed sometime between 1874 and 1900. It appears to have been operated remotely, so that the operator stood at the top of the incline, with a clear view down, the braking mechanism being connected to a lever by a series of rods running in a culvert alongside the tracks.

The drum house is stone-built, and consists of two parallel walls 2.2m apart, 6m long and 1.79 and 1.9m thick which stand to a height of 3.75m.Two lateral timbers remain in situ, both square in section, measuring 0.26m wide, with many iron fittings surviving, including the remains of a brake band on the northern timber. Running from the south side of the eastern wall to the head of the incline is a culvert constructed from stone, 11.95m long by 0.65m wide, which is cut into the ground surface, and within this are the remains of iron-banded brake/gearing mechanism, associated with the mechanics of the drum house.

The stone walls of the unroofed outbuilding, 6m long by 2.5m wide, are 0.7m thick and stand to a height of 1.15m. Its entrance is on the north side. The interior is generally clear of rubble. On the exterior south-east corner of the building is the remains of an extended wall or buttress. The whole of the drum house structure is currently clad in ivy.

Management - The vegetation should be removed from the structure and a detailed drawn and photographic record made prior to reconsolidation.

Site 51 Llanymynech incline footbridge
A bridge over the incline is depicted on the OS 2nd edition map revised in 1900. The incline is now blocked at this point by a ramp revetted by concrete blocks, within which elements of the original structure may survive.

Management - Limited clearance should be undertaken on the northern side to determine the potential for survival of the original structure.

Site 52 Llanymynech quarry limekiln II
Double limekiln of uncoursed limestone rubble. Depicted on the OS 1st edition 1874. An embankment to the north is presumably associated with charging the kiln.

Management - None.

Site 54 Llanymynech quarry building I
A small building is depicted on the OS 2nd edition map surveyed in 1900. There is now no visible trace. Its site lies to the south of, and below, an embankment which carried the main quarry tramway.

Management - None.

Site 57 Llanymynech quarry building II
A small building is depicted on the OS 1st edition map 1874. Rough, low walling survives.

Management - None.

Site 58 Llanymynech quarry loading ramp
Structure depicted on the OS 1st edition map. Embankment with stone revetment at south-east end, possibly a charging ramp for limekilns to the south-east.

Management - None.

Site 59 Llanymynech quarry limekiln III
Triple limekilns of uncoursed limestone rubble, depicted on the OS 1st edition map.

Management - A listed building, but outside study area.

Site 60 Llanymynech quarry limekiln I
Triple limekiln of roughly coursed and dressed limestone rubble, depicted on the OS 1st edition map.

Management - A listed building, but outside study area.

Site 61 Llanymynech quarry tramway II
Tramway system depicted on the OS 1st edition, linking quarry workings and limekilns with the main incline to the south-west.

Management - None.

Site 62 Llanymynech quarry limekiln building I
Building depicted on the OS 1st edition map.

Management - None.

Site 63 Llanymynech quarry limekiln building II
Building depicted on the OS 1st edition map.

Management - None.

Site 65 Llanymynech quarry tramway III
Tramway system is depicted on the OS 1st edition map, linking the main western quarry workings with an incline. The tramway would have developed as quarrying progressed, also carrying spoil to tips west of the drum house.

Management - The tramway lies within the scheduled area of Llanymynech Hillfort (Mg030) and advice should therefore be sought from Cadw: Welsh Historic Monuments, including an application for scheduled monument consent, before any ground disturbance works are undertaken.

Site 68 Llanymynech Hillfort
Llanymynech Hill is occupied by an impressive Iron Age, or possibly Late Bronze Age hillfort, the ramparts enclosing an area of 57ha, making it one of the largest in Britain. Archaeological investigation on the hillfort has so far been rather limited. In 1981 a section through the ramparts was recorded during construction work, which revealed the stone rampart and ditch of the inner defences, together with metalworking debris in the interior of the rampart dating to the 4th century BC to the 1st century AD (Musson 1981; Musson and Northover 1989, 20). A number of small-scale archaeological evaluations within the hillfort in recent years have revealed further evidence of occupation and metalworking, including part of an Iron Age roundhouse beneath the 13th green of the Golf Club which occupies much of the hillfort (Owen 1999).

Management - Llanymynech Hillfort is protected as a scheduled ancient monument (Mg030; Sa013) and advice should therefore be sought from Cadw: Welsh Historic Monuments, possibly including an application for scheduled monument consent, before any ground disturbance works are undertaken.

Site 69 Offa's Dyke
It has been suggested that the western defences of the hillfort may have been adopted as part of Offa's Dyke, the 8th century linear earthwork which defined the boundary of the kingdom of Mercia. The precise course of the dyke through Llanymynech is unknown although further to the south, around Four Crosses, it survives as an impressive earthwork.

Management - Offa's Dyke follows the western defences of Llanymynech Hillfort, lying within the scheduled area (Mg030). No earthwork remains are known within the study area, although buried remains could be present.

Site 71 Llanymynech Quarry Limekilns
Bank of four limekilns is depicted on an 1807 map of Chirk Castle Estate (NLW 6046). There is no surviving trace, although it may possibly be buried beneath later spoil.

Management - None.

Site 72 Llanymynech Quarry building
A small, roughly square structure is depicted on an 1807 map of Chirk Castle Estate NLW 6046. There is no surviving trace, although it may possibly be buried beneath later spoil.

Management - None.

Site 91 Llanymynech Quarry II
Area of linear quarrying along south-east side of the hill, on land belonging to the Bradford estate. Cartographic sources show that the quarry face was cut back *c.* 30m during the 19th century. An extensive tramway system developed along with the quarry workings to carry limestone to the canal and later railway below. The remains of a tramway wagon lie partly buried close to the footpath which follows the line of the late 19th-century tramway.

Management - The quarry lies within the scheduled area of Llanymynech Hillfort (Mg030) and advice should therefore be sought from Cadw: Welsh Historic Monuments, including an application for scheduled monument consent, before any ground disturbance works are undertaken.

Site 92 Llanymynech tramway III
Tramway connecting the base of the 1806 incline with a later incline to the east after the abandonment of the original tramway. Depicted on maps of 1863 and 1874, but abandoned by 1900.

Management - Buried structural remains may survive and could be affect by any works associated with the road bridge. Groundworks should be undertaken under archaeological supervision.

Site 98 Llanymynech quarry tramway IV
Linear hollow, probably representing the line of a tramway. Surviving section lies to south of footpath, which at the east end probably follows its course.

Management - Buried remains may survive which could be disturbed by any groundworks.

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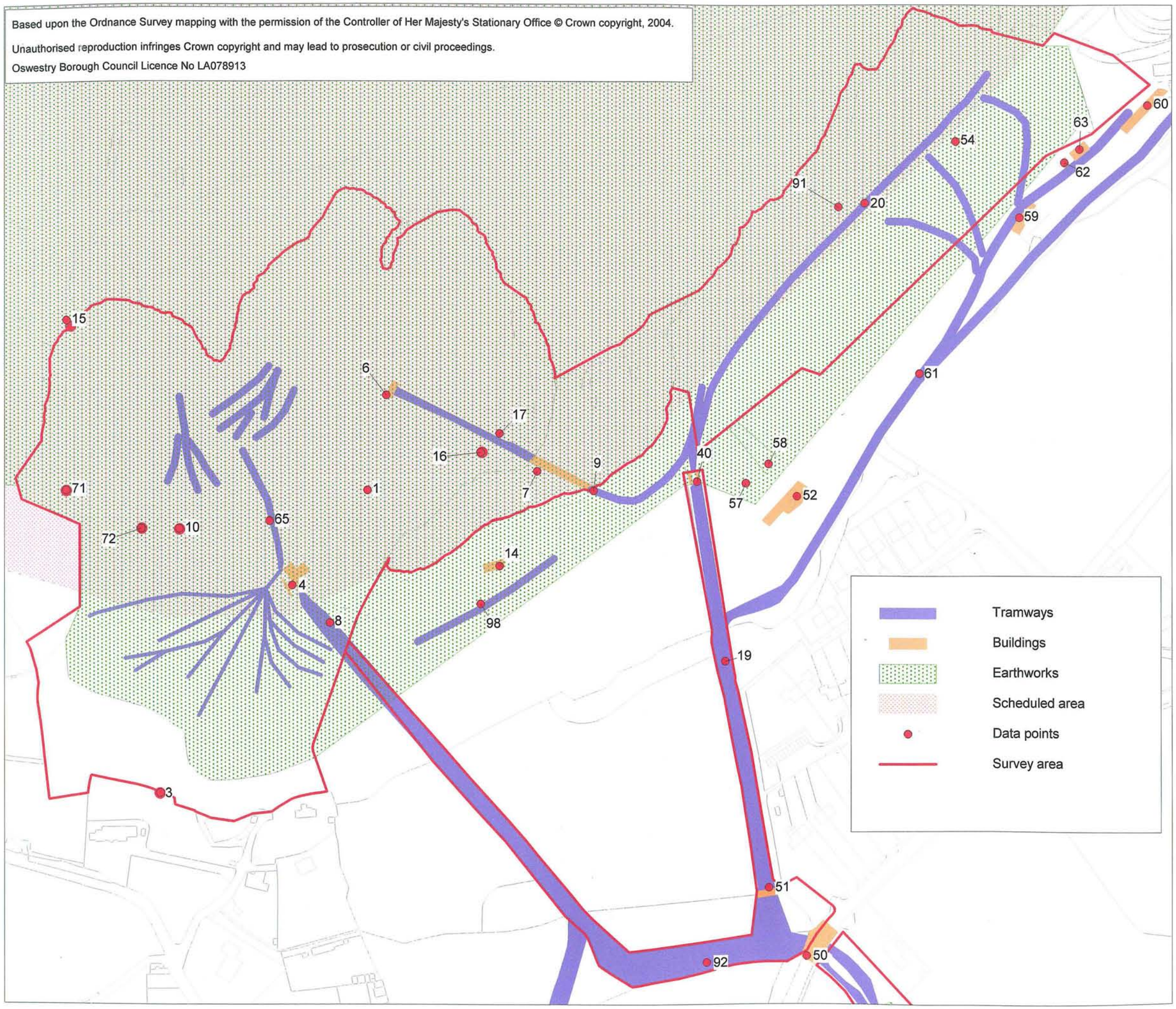

Fig. 13 Archaeology of the Wildlife Reserve and Inclines, 1:2,000

6.4 Heritage Area

6.4.1 The main Heritage Area, lying between the canal and the Oswestry to Welshpool road, contains a complex of structures and earthworks associated with the transport and processing of limestone from the quarries above.

Archaeological summary

6.4.2 The various structures and earthworks are dominated by the impressive limekilns, comprising two draw kilns (Sites 23 and 24) and the later Hoffman Kiln and chimney (Sites 22 and 18). These represent the latest period of activity at Llanymynech, following the opening of the railway in 1863 until the closure of the limeworks in 1914. The railway, its sidings and the tramway system which developed to serve the kilns are all important elements of the site as a whole. Earlier activity was focused on the Ellesmere Canal (Site 70), along which two wharves (Sites 28 and 29) were developed to serve the trade in limestone, each with its own system of tramways.

6.4.3 The Heritage Area also contains features relating to the pre-industrial history of the area, with two fields bearing faint traces of ridge and furrow (Sites 66 and 67).

Management Recommendations

6.4.4 Consultation should be undertaken prior to any proposed ground disturbance or structural works, with consultees including the following, as appropriate: Cadw: Welsh Historic Monuments; English Heritage; the Historic Environment Officer, Shropshire County Council; and the Principal Curatorial Officer, Clwyd-Powys Archaeological Trust.

6.4.5 The entire area is one of considerable regional significance, relating to its industrial archaeological heritage. Within the area, a number of the structures have been afforded statutory protection as listed buildings: the Hoffman kiln and chimney, and the two limekilns to the west. Any works to these structures would require Listed Building Consent. The two draw kilns appear to be in relatively good condition having already been afforded some reconsolidation. The Hoffman kiln is also largely in good condition, although part of the interior is now supported with a timber framework. The floor of the kiln is covered with a thick layer of manure which should be removed under archaeological supervision to reveal the original surface. Some tree clearance in the area to the west of the kilns would allow better visual access and greater visitor appreciation. Detailed building recording should be considered for all three kilns in the form of elevations, plans and sections.

6.4.6 The tramway system is now largely overgrown and remedial clearance should be considered in a number of areas. The tramway north of the Hoffman kiln (Site 47) should be cleared of debris and fallen trees along its entire length. Safety considerations may restrict public access to the main charging embankment for the draw kiln (Site 34), although the clearance of saplings should be considered along the top of the embankment, adjacent to the kiln. At present, the drainage of water is a particular problem along two tramways (Sites 47 and 93) and alternatives should be considered to allow greater visitor access.

6.4.7 Each of the tramways has the potential for significant buried remains and provision should be made for an appropriate archaeological response associated with any ground disturbance.

6.4.8 The area of the canal wharves is particularly overgrown and significant clearance of vegetation will be required to allow visitor access and aid the presentation and interpretation of the site. The reconsolidation of the stone revetment along the two wharf embankments (Sites 31 and 79) should be considered, both with regard to safety and presentation.

6.4.9 The wharf area has the potential for significant buried remains relating to the canal and tramways and provision should be made for an appropriate archaeological response associated with any ground disturbance.

6.4.10 Site-specific management recommendations are provided below.

Site No	Name	Type	Period	Form	Category	Grid ref.
11	Llanymynech railway earthwork platform	Platform	19th Century	Earthwork	C	SJ2700021270
12	Llanymynech old field boundary	Field boundary	Post Medieval	Earthwork	C	SJ2693521200
13	Llanymynech limeworks office	Building	19th Century	Document	E	SJ2675021175
14	Llanymynech quarry embankment	Revetment	19th Century	Structure	C	SJ26572166
18	Llanymynech Hoffman kiln chimney	Chimney	19th Century	Structure	A	SJ2684821212
21	Llanymynech old tramway	Tramway	19th Century	Document	C	SJ2672721211
22	Llanymynech Hoffman kiln	Lime kiln	19th Century	Structure	A	SJ2683621236
23	Llanymynech limekiln I	Lime kiln	19th Century	Structure	A	SJ2681621201
24	Llanymynech limekiln II	Lime kiln	19th Century	Structure	A	SJ2682821204
25	Llanymynech wharf building	Building	19th Century	Structure	B	SJ2673621073
26	Llanymynech kilns stable	Stable	19th Century	Building	B	SJ2675221172
27	Llanymynech tramway tally hut	Tally hut	19th Century	Structure	C	SJ2678021401
28	Llanymynech Canal Wharf I	Canal wharf	19th Century	Structure	B	SJ2672421087
29	Llanymynech Canal Wharf II	Canal wharf	19th Century	Structure	B	SJ2677121081
30	Llanymynech Canal Wharf tramway I	Tramway	19th Century	Document	E	SJ2675721089
31	Llanymynech Canal Wharf tramway embankment	Tramway embankment	19th Century	Earthwork	B	SJ2675521083
32	Cambrian Railway Llanfyllin Branch	Railway	19th Century	Structure	C	SJ2670421129
33	Llanymynech Rock Siding	Railway siding	19th Century	Earthwork	C	SJ2687521218
34	Llanymynech limekiln embankment	Tramway embankment	19th Century	Earthwork	B	SJ2680021280
35	Llanymynech Hoffman Kiln tramway embankment	Tramway embankment	19th Century	Earthwork	B	SJ2682221268
36	Llanymynech limekilns building I	Building	19th Century	Structure	E	SJ2678121191
37	Llanymynech limekilns hoist	Building	19th Century	Structure	C	SJ2680121201
38	Llanymynech limekilns building III	Building	19th Century	Structure	E	SJ2678121258
39	Llanymynech limekilns tramway	Tramway	19th Century	Document	E	SJ2680921227
41	Llanymynech wharf railway siding	Railway siding	19th Century	Document	C	SJ2681921159
42	Llanymynech wharf railway siding embankment	Embankment	19th Century	Structure	C	SJ2680721150
43	Llanymynech tramway bridge I	Tramway bridge	19th Century	Document	B	SJ2679321315
44	Llanymynech railway bridge II	Railway bridge	19th Century	Structure	B	SJ2673321137
45	Llanymynech railway bridge III	Railway bridge	19th Century	Structure	B	SJ2676821148
46	Llanymynech embankment	Embankment	19th Century	Structure	B	SJ2679121373
47	Llanymynech Hoffman Kiln tramway I	Tramway	19th Century	Document	B	SJ2681421275
48	Llanymynech Hoffman Kiln tramway II	Tramway	19th Century	Document	E	SJ2681921276

49	Llanymynech Hoffman Kiln tramway III	Tramway	19th Century	Document	E	SJ2684321256
50	Llanymynech incline road bridge	Road bridge	19th Century	Structure	B	SJ2673321453
53	Llanymynech track ?	Trackway ?	Post Medieval	Cropmark	E	SJ2704021320
55	Llanymynech tramway building	Building	19th Century	Document	E	SJ2674821152
56	Llanymynech incline building	Building	19th Century	Document	E	SJ2676921414
66	Llanymynech ridge and furrow I	Ridge and furrow	Post Medieval	Earthwork	C	SJ2690021270
67	Llanymynech ridge and furrow II	Ridge and furrow	Post Medieval	Earthwork	C	SJ2682021120
70	Montgomery Canal	Canal	Post Medieval	Structure	B	SJ2685221092
73	Llanymynech limeworks drain I	Drain	19th Century	Structure	C	SJ2681121176
74	Llanymynech limeworks drain II	Drain	19th Century	Earthwork	C	SJ2678221213
75	Llanymynech limeworks stone crusher	Stone crushing plant	19th Century	Structure	B	SJ2677421198
76	Llanymynech limeworks building	Building	19th Century	Structure	B	SJ2678521280
77	Llanymynech railway platform	Railway platform	19th Century	Structure	C	SJ2681021158
78	Llanymynech canal tramway embankment I	Tramway embankment	19th Century	Structure	B	SJ2670921084
79	Llanymynech canal tramway embankment II	Tramway embankment	19th Century	Structure	B	SJ2682021090
80	Llanymynech Hoffman Kiln railway platform	Railway platform	19th Century	Structure	B	SJ2687721230
81	Llanymynech Hoffman Kiln tramway	Railway siding	20th Century	Earthwork	B	SJ2684821268
82	Llanymynech tramway embankment	Embankment	19th Century	Structure	B	SJ2679421404
83	Llanymynech tramway I	Tramway	19th Century	Earthwork	B	SJ2673721321
84	Llanymynech canalside buildings	Building	19th Century	Document	E	SJ2684521109
85	Llanymynech railway structure	Structure	19th Century	Structure	D	SJ2681621173
86	Llanymynech Llanfyllin Railway bridge	Railway bridge	19th Century	Structure	B	SJ2706721293
87	Llanymynech track	Trackway	Post Medieval	Earthwork	C	SJ2704021320
88	Llanymynech kilns revetment wall	Wall	19th Century	Structure	B	SJ2684021205
89	Llanymynech kilns railway siding	Railway siding	19th Century	Structure	C	SJ2688021235
90	Llanymynech tramway II	Tramway	19th Century	Structure	C	SJ2678521310
93	Llanymynech tramway IV	Tramway	19th Century	Earthwork	B	SJ2675021190
94	Llanymynech tramway V	Tramway	19th Century	Earthwork	B	SJ2676521170
95	Llanymynech tramway VI	Tramway	19th Century	Earthwork	E	SJ2677021300
96	Llanymynech coal wharf building	Building	19th Century	Building	B	SJ2666521045
97	Llanymynech culvert	Culvert	19th Century	Structure	C	SJ2689721120

Site 11 Llanymynech railway earthwork platform
Earthwork platform, possibly for a building, alongside the junction of the Llanfyllin branch line and Rock Siding.

Management - Preservation in situ

Site 12 Llanymynech old field boundary
Former field boundary, now surviving as a slight earthwork.

Management - Preservation in situ

Site 13 Llanymynech limeworks office
A building which predates the existing stables is described on a map of 1860 as 'house, office, stables and yard'.

Management - Buried remains may survive. Any groundworks should be undertaken under archaeological supervision

Site 14 Llanymynech quarry embankment
Limestone rubble embankment, 4m wide x 9.6m long with stone revetment up to 1.9m high. It is situated on the southern side of the lower quarry edge, and just south-east of the tunnel. Of uncertain function but possibly associated with tramways

Management - Removal of vegetation.

Site 18 Llanymynech Hoffman kiln chimney
Hoffman kiln chimney built in or around 1899 in red brick (English Garden wall bond) and held together by iron ties. The chimney is square in section, measuring 3.44 by 3.48m at the base and slightly tapering towards the top, with a slightly chamfered plinth and moulded capping. A round-arched stoke hole on the north side of the plinth links the chimney with the Hoffman Kiln to the north. The square brick chimney stands on a plinth 3.7m across, and rises to a height of around 42.5m.

Management - The chimney is a listed building and consent should be obtained prior to undertaking any works affecting the structure.

Site 21 Llanymynech old tramway
The first tramway to be constructed at Llanymynech was proposed in December 1804 and completed by June 1806. The tramway was built by Arthur Davies, Robert Cartwright and Richard Jebb, who at this time leased quarries from the Chirk Castle Estate and a Mr West (NLW, Chirk Castle v/6050 and 6061). It carried limestone from the quarry workings on land belonging to the Chirk Castle Estate to what was at that time the only wharf on the canal. The drum house still survives at the top of the incline, which carried a double track with a cross-over at the bottom where the lines joined a single track to cross the Welshpool to Oswestry Turnpike road, below which was a small passing bay. The single track continued, possibly following the line of the side road noted above, to the canal wharf where it divided, with a branch running either side of the wharf. The lower part of the tramway was abandoned below the incline by 1863.

Management - None.

Site 22 Llanymynech Hoffman kiln
The Hoffman kiln is exceptionally well preserved and is of particular importance, not least because it retains its chimney. The kiln is constructed of brick with battered walls, measuring 44.8m by 17.5m overall externally, with a height of around 3.4m. There is some disagreement regarding the date of construction, although this seems to have been generally accepted as being around 1899. Certainly, the kiln was not recorded by the Ordnance Survey in 1874, but was in existence by 1900, and continued in use until 1914.

The Llanymynech kiln had 14 chambers which were stacked with limestone transported by tramways which ran along both sides of the kiln. The coal was brought onto the roof of the kiln by a tramway on an embankment to the north, with a bridge over the ground level limestone-carrying tramway passing around the north end of the kiln. The whole structure was covered with a corrugated iron roof, the iron stanchions for which are still visible along the base of the kiln walls.

Management - The kiln is a listed building and consent should be obtained prior to undertaking any works affecting the structure. The interior should be cleared of overburden under archaeological supervision and the structure reconsolidated as necessary to allow safe and easy access. Detailed building recording should be undertaken in association with any works.

Site 23 Llanymynech limekiln I
A massive continuous single draw kiln of dressed limestone with a single pot and brick-arched draw hole. The kiln measures 14.6m wide (east - west) by 16.8m at the base, and stands 8.5m above the revetment wall.

Management - The kiln is a listed building and consent should be obtained prior to undertaking any works affecting the structure. Vegetation should be cleared from the structure and its environs to improve its appearance and visibility. Detailed building recording should be undertaken in association with any works.

Site 24 Llanymynech limekiln II
Massive continuous draw kiln constructed in dressed limestone with single pot and draw hole. It measures 11.5m wide (east - west) by 15.5m (north - south) at base and is *c.* 6m high.

Management - The kiln is a listed building and consent should be obtained prior to undertaking any works affecting the structure. Vegetation should be cleared from the structure and its environs to improve its appearance and visibility. Detailed building recording should be undertaken in association with any works.

Site 25 Llanymynech wharf building
Building measuring 4.9 by 4.6m and 2.6m high, possibly originally a limekiln fed by a tramway on an embankment, and later used as a tally hut on the canal wharf.

Management - Vegetation should be cleared from the structure and its environs to improve its appearance and visibility. Detailed building recording should be undertaken in association with any works.

Site 26 Llanymynech kilns stable
The building known as the stable block appears to have been constructed around 1870. A postcard, dated 1915, shows the southern end to have been open-fronted, although this section has since been demolished. It has been suggested that this was not originally built as a stable, but may have been associated with the used of horses, perhaps as a farrier's and feed store (Graham Barrow Research and Consulting *et al.* 2002, 8). The building, which measures 3.8 x 5.3m, is stone-built with yellow brick-lined openings and quoins. Its east elevation has a central doorway with matching windows on either side and four ventilation slots. Its north end has an opening into a loft with three brick ventilation grids.

Management - The structure has already been reconsolidated although vegetation should be cleared from the structure and its environs to improve its appearance and visibility. Detailed building recording should be undertaken in association with any works.

Site 27 Llanymynech tramway tally hut
Brick-built tally hut at the base of the inclines, which is currently in very poor condition, with the gable walls supported by timber bracing.

Management - The structure is in a poor state and is likely to be beyond repair. Vegetation should be cleared from the structure to allow adequate building recording to be undertaken before the structure is made safe.

Site 28 Llanymynech Canal Wharf I
The wharf is depicted on a Chirk Castle Estate map of 1806, and was constructed in association with a tramway. The wharf is triangular in shape and measures 16m wide at its entrance and 30m long. Its original stone revetment survives along much of its length although it is often obscured by vegetation.

Management - The vegetation, including immature trees, should be removed and the stone revetment repaired.

Site 29 Llanymynech Canal Wharf II
This wharf was constructed sometime between 1806 and 1833 in association with the tramways. The wharf is elongated and measures 5m wide and 58m long, with a splayed entrance. Its original stone revetment survives along much of its length although it is often obscured by vegetation.

Management - The vegetation, including immature trees, should be removed and the stone revetment repaired.

Site 30 Llanymynech Canal Wharf tramway I
Tramway constructed on an embankment leading to a stone structure, possibly originally a limekiln, on the canal wharf.

Management - Buried remains may be preserved on the embankment and any groundworks should be undertaken under archaeological supervision.

Site 31 Llanymynech Canal Wharf tramway embankment
Stone-revetted tramway embankment *c.* 2.3m high and 3m wide at the top.

Management - Buried remains may be preserved on the embankment and any groundworks should be undertaken under archaeological supervision. The vegetation and at least some of the tree cover should be cleared and the revetment wall reconsolidated.

Site 32 Cambrian Railway Llanfyllin Branch
The Llanfyllin Branch of the Cambrian Railways was constructed by Mr Savin and his brother-in-law, Mr Ward, and opened on 10 April 1863. A stipulation of the Act of Parliament allowing the construction was that the line was not to interfere with existing tramways by crossing them on the level which thus necessitated two bridges to carry the railway over them (Christiansen & Miller 1967, 29). At Llanymynech, a north-end bay platform catered for the Llanfyllin trains which, in order to surmount the canal, used the long 'Rock Siding' to a shunting neck, reversing on or off the branch. After several false starts and changes in company, a railway was eventually constructed from Shrewsbury to Llanymynech, and on through Llanyblodwel to the limestone quarries at Nantmawr. The single-track line, which by-passed the Cambrian line, was known as the Potteries, Shrewsbury and North Wales Railway, and was opened in August 1866 (Wren 1968, 34). Through traffic on the Rock Siding ended in January 1896, although it continued to serve the limekilns until their closure in 1914. After this the siding was used to store redundant wagons until the track was removed in 1939. The Llanfyllin Branch line itself finally closed in 1965 (Baughan 1991, 182-3; Cozens 1959).

Management - The line of the railway should be cleared of scrub vegetation.

Site 33 Llanymynech Rock Siding
Railway siding constructed to serve the large draw kilns and the Hoffman kiln, linking them to the Llanfyllin Railway. The line of the siding can now only be traced as an earthwork.

Management - The line of the siding should be cleared of scrub vegetation.

Site 34 Llanymynech limekiln embankment
A massive earth and stone embankment forming a charging ramp for the west lime kiln. The embankment rises from ground level at the north end to 11m high at the kiln. Its base is partially revetted in stone.

Management - Although the embankment is heavily overgrown no clearance work is proposed.

Site 35 Llanymynech Hoffman Kiln tramway embankment
The stone-revetted embankment, extending for *c.* 60m, was constructed for a tramway to carry coal onto the top of the Hoffman kiln via a timber bridge.

Management - The stone revetment should be reconsolidated after the removal of debris. Buried remains of the tramway may be preserved which could be affected by any groundworks within the area.

Site 36 Llanymynech limekilns building I
A structure is depicted on the OS 2nd edition map, revised in 1900, with a railway siding leading into it from the east. Its position suggests that this may be a different structure to the possible crusher (Site 75), remains of which are visible immediately to north.

Management - Buried structural remains may be preserved. Any groundworks within the area should be undertaken under archaeological supervision.

Site 37 Llanymynech limekilns hoist
A building *c.* 9 by 8m is depicted on the OS 2nd edition map, revised in 1900, on the west side of the larger draw kiln. A postcard dated 1915 show this to be a hoist, presumably for raising coal. Part of the structure survives on a level platform alongside the kiln.

Management - Vegetation should be cleared from the structure and its environs.

Site 38 Llanymynech limekilns building III
A structure is depicted on the OS 2nd edition map, revised in 1900, although no trace of a structure is now apparent in this location. The recorded location is to the south of the surviving remains of another structure (Site 75).

Management - Buried structural remains may be preserved. Any groundworks within the area should be undertaken under archaeological supervision.

Site 39 Llanymynech limekilns tramway
A tramway constructed on a massive embankment to carry limestone and possibly coal for charging the large draw kilns to the south. No surface remains of the tramway itself are now visible.

Management - Buried structural remains may be preserved. Any groundworks within the area should be undertaken under archaeological supervision.

Site 41 Llanymynech wharf railway siding
A railway siding, 2.6m wide, running between a stone revetted embankment to the south and the railway platform to the north. It is depicted on the OS 2nd edition map, revised in 1900.

Management - The vegetation should be cleared from within the siding.

Site 42 Llanymynech wharf railway siding embankment
A stone-revetted embankment, *c.* 3.2m wide x 1.5m high, along the south side of the siding. It is depicted on the OS 2nd edition map revised in 1900.

Management - The embankment is heavily overgrown in places and the revetment walls have partly collapsed. The west section should be reconsolidated in association with the adjoining tramway bridge abutments.

Site 43 Llanymynech tramway bridge I
The abutments survive for a bridge through the substantial embankment which carried a tramway to the large draw kilns. The stone-built abutments are *c.* 5.8m wide, 0.9m thick and 4m high. A short section of the tramway is visible in situ in the bank of the stream on the west side of the bridge, suggesting that a tramway ran under the bridge, although its line is not recorded.

Management - The vegetation and debris should be cleared and the structure reconsolidated. Buried structural remains of the tramway may survive between and adjacent to the abutments and any groundworks should be undertaken under archaeological supervision.

Site 44 Llanymynech railway bridge II
A bridge constructed to carry the Llanfyllin Railway over the western tramway, which at this point runs in a cutting. The stone abutments survive, 3m apart, for a bridge 7.8m wide and *c.* 1.5m high.

Management - The vegetation and debris should be cleared and the structure reconsolidated. Buried structural remains of the tramway may survive and any groundworks should be undertaken under archaeological supervision.

Site 45 Llanymynech railway bridge III
A bridge constructed to carry the Llanfyllin Railway over the eastern tramway, which at this point runs in a cutting. The stone abutments survive, 3m apart, for two adjacent bridges: the southernmost carried the railway, with abutments 6.6m long and *c.* 1.5m high; the northernmost carried the Rock Siding with abutments 7.4m long and *c.* 1.5m high.

Management - The vegetation and debris should be cleared and the structure reconsolidated. Buried structural remains of the tramway may survive and any groundworks should be undertaken under archaeological supervision.

Site 46 Llanymynech embankment
A stone-revetted embankment, possibly for a siding associated with the tally hut.

Management - The vegetation should be cleared and the revetment wall reconsolidated. Buried structural remains of the tramway may survive and any groundworks should be undertaken under archaeological supervision.

Site 47 Llanymynech Hoffman Kiln tramway I
A tramway constructed to carry limestone from the incline for loading into the Hoffman kiln. It is depicted on the OS 2nd edition, revised in 1900. No visible remains survive although the route is partly blocked by vegetation and rubbish.

Management - The vegetation and debris should be cleared. Buried structural remains of the tramway may survive and any groundworks should be undertaken under archaeological supervision.

Site 48 Llanymynech Hoffman Kiln tramway II
A tramway constructed on an embankment to carry coal onto the top of the Hoffman kiln via a timber bridge. It is depicted on the OS 2nd edition map revised in 1900, but no visible remains survive.

Management - Buried remains of the tramway may be preserved which could be affected by any groundworks within the area.

Site 49 Llanymynech Hoffman Kiln tramway III
Tramway sidings to east of the Hoffman kiln, leading to stone-revetted platform area above Rock Siding. These are depicted on the OS 2nd edition map revised in 1900.

Management - Buried remains of the tramways may survive which could be affected by any groundworks.

Site 50 Llanymynech incline road bridge
A bridge constructed in 1858 to carry the turnpike road over the tramways, and now carries the main Oswestry to Welshpool road. The bridge has two arches, one for each of the two tramways, which diverge from west to east. The bridge is stone-built and in good condition, although the northern arch is partly blocked.

Management - Vegetation and debris should be removed and the northern arch cleared. Buried remains of the tramways may survive and any ground disturbance should be undertaken under archaeological supervision. A programme of building recording should be undertaken in association with any works.

Site 53 Llanymynech track ?
A possible track has been identified from aerial photography as a linear cropmark *c.*5m wide. It is not discernible as an earthwork, although there is a ditch visible following its western side.
Management - Buried remains may survive. Any groundworks should be undertaken under archaeological supervision.

Site 55 Llanymynech tramway building
A building depicted on the OS 1st edition map.

Management - Buried remains may survive. Any groundworks should be undertaken under archaeological supervision.

Site 56 Llanymynech incline building
A building depicted on the OS 1st edition map, possibly an early tally hut. No visible remains are now evident.

Management - Buried remains may survive. Any groundworks should be undertaken under archaeological supervision.

Site 66 Llanymynech ridge and furrow I
Ridge and furrow first identified from aerial photographs but surviving as faint earthworks.

Management - Earthworks survive in pasture field and should be preserved in situ.

Site 67 Llanymynech ridge and furrow II
Ridge and furrow first identified from aerial photographs but surviving as faint earthworks.

Management - Slight earthworks remain. No further recording proposed.

Site 70 Montgomery Canal
The waterway now known as the Montgomery Canal was built in stages between 1794 and 1821, and runs from the Shropshire Union Canal at Frankton Locks to Newtown. The canal, then known as the Ellesmere Canal, had reached Llanymynech by at least 1786. It was constructed to carry and distribute lime for agricultural purposes from the Llanymynech Quarries (Hughes 1983, 9). The Cambrian Railway Llanfyllin Branch opened in 1863, taking much of the lime trade from the canal, the wharf probably being disused by around 1900, although quarrying and lime burning continued until 1914 (Hughes 1983, 157-8).

Management - The canal is a structure of regional if not national importance. Its restoration should take this into account, allowing for the preservation of original structures and appropriate recording as work progresses.

Site 73 Llanymynech limeworks drain I
A drain leading from a stone/brick outlet to a culvert beneath the railway.

Management - Preservation in situ.

Site 74 Llanymynech limeworks drain II
A probable drain leading along the base of the embankment to a culvert at the south end.

Management - Preservation in situ.

Site 75 Llanymynech limeworks stone crusher
Brick-floored building measuring *c.* 12 by 7m with concrete machine bases and a small wheel pit. It is possibly a late 19th-century stone crusher.

Management - The extent of the surviving remains should be investigated through appropriate clearance and excavation, leading to reconsolidation and further structural recording.

Site 76 Llanymynech limeworks building
Stone and concrete foundations for a building on a platform which measures *c.* 13.5 by 11.8m. It comprises raised plinths 0.6m wide set on a platform.

Management - Preservation in situ and control of vegetation.

Site 77 Llanymynech railway platform
Railway platform, *c.* 3m wide, between the main branch line and a siding.

Management - Clearance of scrub vegetation.

Site 78 Llanymynech canal tramway embankment I
Tramway embankment along the west side of the western canal wharf. It is depicted on the OS 1st edition map 1874.

Management - The structure lies within the British Waterways compound but is an integral part of the Heritage Area and should be preserved in situ.

Site 79 Llanymynech canal tramway embankment II
Stone-revetted embankment for a canalside tramway associated with a probable wharf alongside the canal.

Management - Clearance of vegetation and preservation of structure in situ. Buried structural; remains associated with tramways may survive.

Site 80 Llanymynech Hoffman kiln railway platform
Railway platform for the Hoffman kiln sidings. The levelled area has been raised above the natural ground level with the construction of a substantial stone revetment wall along the south side and further revetment along the north side, forming the edge to a railway siding at a lower level.

Management - The platform should be cleared of vegetation. No reconsolidation is proposed.

Site 81 Llanymynech Hoffman kiln tramway
Tramway or railway siding, surviving as an earthwork hollow-way *c.* 5m across, possibly for the import of coal to fuel the Hoffman kiln.

Management - The earthwork is stable and requires no further action.

Site 82 Llanymynech tramway embankment
Stone-revetted embankment measuring *c.* 20 by 7m, possibly for a siding associated with the tally hut.

Management - Clearance of vegetation and reconsolidation of stone revetment. Buried remains may survive for the tramway and any groundworks on the embankment should be undertaken under archaeological supervision.

Site 83 Llanymynech tramway I
The line of a tramway is depicted on a map of 1863. The northern half survives as an earthwork in the field to the west of the Heritage Area.

Management - The surviving earthwork lies outside the Heritage Age but is an integral part of the site and should, if possible, be retained.

Site 84 Llanymynech canalside buildings
Two small buildings are shown on a map of 1863, but there are no obvious surface remains. Aerial photographic evidence suggests a possible track leading to them from the north.

Management - Buried structural remains may survive. Any groundworks should be undertaken under archaeological supervision.

Site 85 Llanymynech railway structure
Small brick-built foundation measuring *c.* 2 by 1.4m, for a structure probably associated with the railway.

Management - Preservation in situ.

Site 86 Llanymynech Llanfyllin Railway bridge
Railway bridge carrying the Llanfyllin Railway over the canal. The bridge has been removed, but the stone abutments survive.

Management - Preservation in situ.

Site 87 Llanymynech track
A possible track survives as an earthwork, slightly terraced into the natural slope. A number of shallow pools between the track and the canal appear to be recent.

Management - Preservation in situ.

Site 88 Llanymynech kilns revetment wall
A stone wall *c.* 2.1m high forms a revetment along the north side of the railway siding. Behind the revetment is a levelled area containing two massive draw kilns and the Hoffman kiln. A flight of steps leads up the wall from the sidings level.

Management - Western section of wall has already been reconsolidated. The eastern section should also be cleared of vegetation and reconsolidated.

Site 89 Llanymynech kilns railway siding
Railway siding leading off Rock Siding to the north side of a raised platform area east of the Hoffman kiln.

Management - Clearance of vegetation within area of siding.

Site 90 Llanymynech tramway II
Short length of apparently in situ tramway immediately west of the bridge through the large tramway embankment leading to the draw kilns.

Management - Visible remains suggest more extensive buried remains. Any groundworks within this area should be undertaken under archaeological supervision.

Site 93 Llanymynech tramway IV
Tramway running in a cutting to the west of the stables, leading beneath the railway to the west canal wharf.

Management - Vegetation should be cleared from within the tramway cutting. Buried structural remains may survive and any groundworks should be undertaken under archaeological supervision.

Site 94 Llanymynech tramway V
Tramway running in a cutting to the east of the stables, leading beneath the railway to the east canal wharf.

Management - Vegetation should be cleared from within the tramway cutting. Buried structural remains may survive and any groundworks should be undertaken under archaeological supervision.

Site 95 Llanymynech tramway VI
The main tramway route from the road bridge at the base of the inclines to north of the stables. This line is now largely followed by a footpath.

Management - Buried structural remains may survive and any groundworks should be undertaken under archaeological supervision.

Site 96 Llanymynech coal wharf building
Building associated with the coal yard wharf and stable.

Management - Building lies outside Heritage Area but forms an integral part of the overall site. Any reconsolidation work should be undertaken in association with appropriate building recording.

Site 97 Llanymynech culvert
Stone culvert leading towards or below the canal.

Management - Preservation in situ

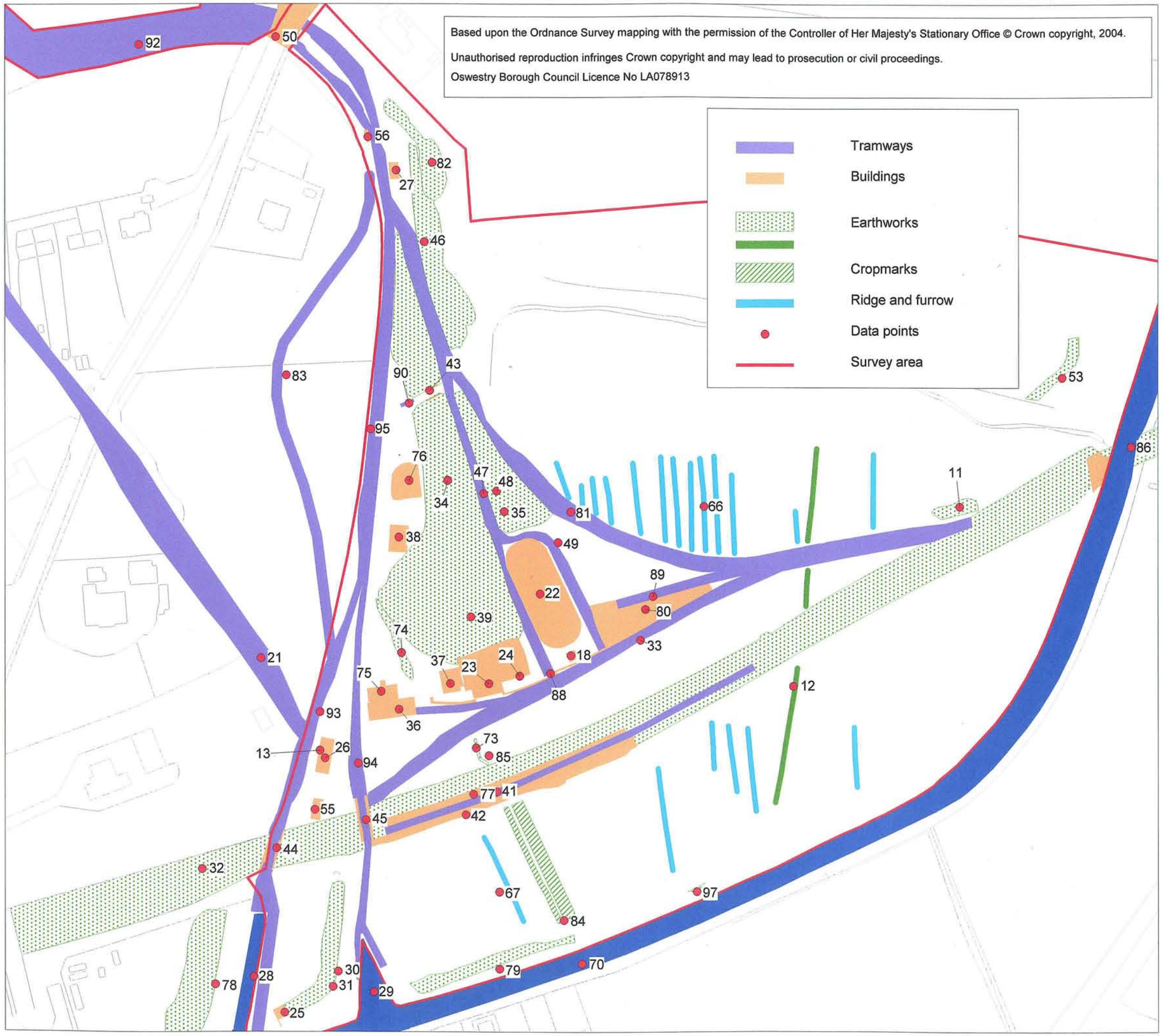

Fig. 14 Archaeology of the Heritage Area, 1:1,500

7 INTERPRETATION AND PHASING (1796 to present)

7.1 The development of the lime industry is most clearly illustrated by the various cartographic sources and these have been used to produce an illustration of the phasing, based on the evidence from mapping in 1807, 1863, 1874 and 1900 (Fig. 15).

1796 to 1863 (pre-railway era)

7.2 Prior to the opening of the Ellesmere Canal in 1796 the quarrying and burning of limestone, although an important industry, was undertaken on a relatively small scale. The new markets which could be supplied by the canal led to a rapid expansion of the lime industry at Llanymynech. The main problem faced by the quarry operators was the transportation of limestone from the quarry to the canal 80m below and 700m distant. Initially, transport was provided by horse and cart although this situation was clearly unable to cope with the increased demand for limestone. As a result, a tramway and incline was constructed in 1806 to carry limestone from the western quarry workings to a new wharf on the canal. The incline had a double track with a drum house at the top and a cross-over at the bottom where the lines joined a single track tramway leading to the canal wharf where it divided, with a branch running either side of the wharf.

7.3 There appear to have been limekilns within the quarry from at least 1753 and although kilns are shown there in 1806 it is unlikely that the lime would have been transported by canal due to its volatile nature. Instead, quicklime would probably still have been transported by horse and cart with only limestone taken by canal.

7.4 A second tramway was constructed further to the east between 1807 and 1837. This was to become the main transport route which, with later modifications, remained in operation until the closure of the quarry in 1914.

7.5 Each of the inclines had a drum house (also known as a brake house or Gin wheel) at the top which controlled the decent of laden wagons. A system of tramways developed within the quarry to transport quarried stone to the head of the inclines and also to remove spoil to the tipping area. These internal tramways would have been subject to frequent modifications as the quarry face receded and new areas were worked, the sections of track being easily lifted and re-laid as and where necessary.

7.6 The tramways carried wagons to the head of the inclines and from the bottom to the canal. The inclines at Llanymynech are of a type known as self-acting balance or gravity inclines, whereby the decent of a full wagon raised an empty one to the top. A drum house at the top contained a large drum which rotated on an axle supported by the structure's substantial stone walls. A single haulage cable ran the length of the incline, being wound around the drum at the top. A loaded wagon was attached to the cable at the top end and an empty wagon at the bottom. The decent of the laden wagon under gravity thus raised the empty wagon to the top. The speed of decent was controlled by a braking mechanism, comprising a broad metal band around the drum which, through the action of levers, was tightened to produce a braking effect. The easternmost drum house appears to have been operated remotely, so that the operator stood at the top of the incline, with a clear view down, the braking mechanism being connected to a lever by a series of rods running in a culvert alongside the tracks.

7.7 The quarried limestone would have been unloaded from the tramways onto the canal wharf, where it was stockpiled and broken by hand. A remarkable photograph survives showing one of the foremen, John Roberts, breaking limestone alongside the western wharf, with tramways visible on either side of the canal wharf (Fig. 16).

1863 to 1899

7.8 The opening of the Cambrian Railway's Llanfyllin Branch in 1863 had a dramatic affect on the lime industry at Llanymynech. Although the canal continued to be used for transporting limestone, the railway afforded a much faster means of transport, with links to a much wider network, thus introducing new potential markets. In particular, it allowed a much safer means of transporting quicklime. The tramway system which had developed to serve the canal was largely retained and modified to utilise the new means of transport. By 1863 the earliest

tramway had been abandoned below the incline, with a new connecting track being constructed to join the two tramways immediately west of the road, and a double line running beneath the road to a cross-over. To the south the western line ran in a curve before heading to the western canal wharf, while an eastern line took a more direct route to the eastern wharf. A building is shown in the position of the presumed stables, the depicted shape of which suggests that this was a different structure to that which survives. Indeed, records indicate that a new stable block was constructed around 1870 to replace one destroyed by fire.

7.9 By 1874, although presumably rather earlier, the western tramway had been augmented by the addition of a siding along the south side of the main railway, while further tramways had been constructed to serve the canal wharves. At the quarry workings the western tramway system remained in use, although the incline appears to have been down-graded to a single track with a passing loop. The eastern tramway system has what must be an incline, although without a brake house, leading south from the quarry face, with a siding joining from nearby limekilns. A series of lines lead south-west from the eastern workings and limekilns to join the incline above the mid-point. As in 1863, both systems join near the road crossing, with a weighing station beyond.

7.10 The two large kilns to the west of the Hoffman kiln are both draw kilns, designed to be run in a continuous operation. Company reports suggest that the construction of new kilns was planned in 1871, although cartographic evidence implies that they were built in association with the railway after 1874 and abandoned by 1900. A detailed survey of the upper part of the kilns was not possible owing to safety fencing restricting access. Both kilns are constructed of roughly dressed limestone blocks, the smaller eastern kiln seeming to be the earlier of the two, measuring *c.* 11.5m east-west by 15.5m north-south and up to 6m high, with a single central pot. The western kiln also has a single central pot, approximately 2.7m across, the kiln measuring *c.* 14.6m by 16.8m at ground level, rising to 8.5m above the stone revetment wall following the north side of the Rock Siding. A coal hoist was located on a platform on the western side of the kiln, fragments of which can still be identified. The supports for a small cabin on top of the kiln can still be seen projecting from the front wall, and both this and the hoist can be clearly seen on a postcard of 1915 (Fig. 17). The front of the kiln was protected by a canopy and projecting corbels below the draw hole suggest a raised floor for unloading the lime directly into railway wagons.

7.11 Both kilns appear to be straightforward single-draw kilns which would have been loaded from the top with alternating layers of coal and limestone. The charging ramp for the earlier is not now evident, having been subsumed within the bank of the much larger ramp for the later kiln.

7.12 A brick-floored building to the west of the kilns has a series of concrete machine bases within it, and this may be the site of a crusher for stone. If so, it may have been constructed in association with the larger kiln, utilising the hoist to raise the limestone to the charging platform.

1899 to 1914

7.13 The last major development at Llanymynech was the construction of the Hoffman kiln sometime around 1900. The Ordnance Survey second edition map (Fig. 5), revised in 1900, shows the kiln along with significant changes to the transport system, including additional tramways and main line railway sidings serving the kiln. At the quarry, the western workings and the associated tramway system had been abandoned, while the eastern system was altered to include a double-track incline, with a new series of feeder tramways along the quarry face.

The Hoffman kiln

7.14 The Hoffman kiln is exceptionally well preserved and is of particular importance as it retains its chimney and is also unusually constructed in brick, rather than limestone. The kiln is constructed of brick with battered walls, measuring 44.8m by 17.5m overall externally, with a height of around 3.4m. The square brick chimney (3.44 by 3.48m at the base) stands on a plinth 3.7m across, and rises to a height of around 42.5m. There is some disagreement regarding the date of construction, although this seems to have been generally accepted as being around 1899. Certainly, the kiln was not recorded by the Ordnance Survey in 1874, but was in existence by 1900, and continued in use until 1914.

7.15 This design of kiln was developed in Germany by Friedrich Hoffman, who first patented the design in 1857 for the firing of bricks. The earliest Hoffman kilns were circular, later developing into larger, elliptical or rectangular structures. An English patent was taken out by Humphrey Chamberlain in 1868, with the first kiln built in Nottingham in that year. The design was later modified for the burning of lime and a number of such kilns were constructed in the late 19th century, including the well-preserved example at Langcliffe near Settle in North Yorkshire, as well as two kilns at Minera, near Wrexham. The larger examples, such as Langcliffe, had a central chimney, rather than a separate structure as at Llanymynech. The kiln at Langcliffe, which operated continuously between 1873 and 1931, is also well-preserved, although without its chimney, and is considerably larger than Llanymynech, measuring 128m in length, with 22 chambers (Trueman 1992). It has been suggested that smaller kilns, such as Llanymynech, were considerably less efficient than those with more chambers and a greater overall length, and this may be one reason why such kilns tended to have a relatively short working life (Johnson 2002, 127).

7.16 The significance of the Hoffman kiln is that it allowed for more extensive continuous operation, with the kiln comprising a continuous tunnel which was divided into a series of chambers separated by temporary dampers, which in the case of Langcliffe consisted of steel doors, sealed with fire-clay (Trueman 1992, 140). The Llanymynech kiln had 14 chambers, such that at any one time one would be empty, one was being filled, five were pre-heating, two were firing, four were cooling, and one was being emptied. The main entrance to the chambers, known as a wicket, was sealed with bricks during firing, the inner side becoming vitrified with use. When not in use the bricks were stacked close by and a number of these stacks remain at the foot of the embankment to the west of the kiln. Other vitrified bricks may be found built into the revetment for some of the embankments north of the kiln, suggesting that these were constructed after the Hoffman kiln. Alongside the main entrances each chamber has a semi-circular air intake at ground level, with a corresponding flue beneath the floor which connects to a central flue along the length of the kiln, leading to the chimney. Each intake has above it a row of bricks projecting from the external wall.

7.17 Limestone was brought to the kiln on tramways which ran at ground level on either side of the kiln. To fire the kiln the limestone was carefully stacked in each chamber in succession, with vertical shafts or 'pillars' being left immediately beneath a series of 'feed holes' in the arched tunnel roof. Small piece of coal were fed through these holes to be burned in the hot air passing through the tunnel. The combustion gases circulated from one chamber to the next until they were drawn into the central flue leading to the chimney. Once the lime in one chamber was sufficiently burned, the flue was closed and coal was fed into the next chamber, which had its flue opened, and thus the fire moved around the kiln. The coal was brought onto the roof of the kiln by a tramway on an embankment to the north, with a bridge over the ground level limestone-carrying tramway passing around the north end of the kiln. The whole structure was covered with corrugated iron roof (see Fig. 17), the iron stanchions for which are still visible along the base of the kiln walls.

7.18 A series of four trial trenches were excavated on the roof of the kiln in 1993 to determine the extent and nature of any necessary repairs. The trenches investigated and recorded a number of the 'feed holes', the overall results revealing that the roof was generally in good condition (Hannaford 1993).

1914 to the present day

7.19 Following the closure of the lime works in 1914 the site appears to have been largely abandoned. The Hoffman kiln served as a cowshed for a number of years, while the railway was used to store redundant wagons, until the tracks were finally removed in 1939. Although all of the machinery was removed from the site the various structures were left more or less intact. It would appear that the tramway rails, and possibly other iron structures, were sold and removed as scrap metal, possibly as late as the 1960s.

7.20 More recently the area of the quarry workings, which had extensive regeneration of the flora and fauna, became a wildlife reserve, while the southern area was designated as the Llanymynech Heritage Area.

Fig. 15 The development of the tramway system, 1807 to 1900

Fig. 16 Photograph of John Roberts, foreman, breaking stones on the western canal wharf. Undated, but probably late 19th century.

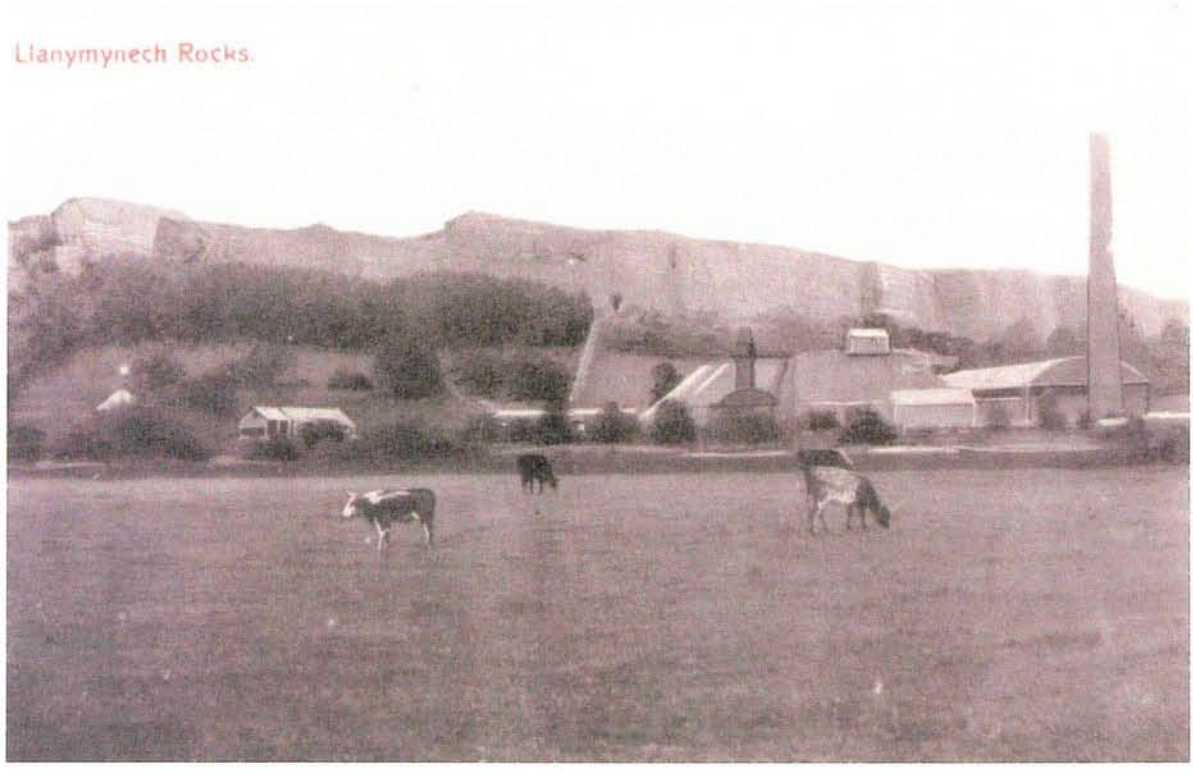

Fig. 17 Postcard of Llanymynech Rocks, dated 1915.

8 CONCLUSIONS

8.1 The survey of the limeworks at Llanymynech has enabled a greater appreciation of the site, allowing each element within the Heritage Area to be accurately planned for the first time, while the extensive documentary research has shed new light on the development of the quarries and limeworks at Llanymynech, allowing a better understanding of the overall phasing.

8.2 The extensive structural and earthwork remains at Llanymynech form a complex of national importance, due largely to the state of preservation and the inter-relationship between the main elements. An investigation of Llanymynech tells not only the history of the site itself, but also provides a unique example of the rise and fall of the lime industry in Britain as a whole, as well as illustrating the technological advances of the lime industry during the 19th century. The limestone outcrop has been exploited for centuries, but it was not until the so called 'Agrarian Revolution' of the later 18th century that the quarrying and burning of limestone saw any great expansion. It was the demand for Llanymynech lime as an agricultural fertiliser that led to the construction of the Ellesmere (later Montgomery) Canal, which reached Llanymynech in 1796, and the new markets which the waterway opened provided the impetus for dramatic expansion. The system of tramways and inclines which developed to distribute the limestone appear to have been constantly adapted to meet the changing needs of the industry. This is particularly true following the opening of the Llanfyllin Railway in 1863 which, like the canal before it, provided important new markets, leading ultimately to the construction of the large kilns along the north side of the railway. By the end of the 19th century the boom period was on the wane, due to a nation-wide decline in the demand for lime with the development of alternative fertilisers and building materials. The construction of the Hoffman kiln appears to have been a last-ditch, if ultimately unsuccessful, attempt to reverse the decline in fortunes.

8.3 Of the 20 lime-burning Hoffman kilns so far identified in England and Wales, only three survive to any great extent, the others being at Langcliffe and Minera. Llanymynech, however, has the distinction of being the only kiln to retain its chimney, and is also the only surviving brick-built Hoffman limekiln (Johnson 2003).

8.4 The quarrying and burning of limestone at Llanymynech was not restricted to the survey area alone and the surviving remains should be seen within the wider context of an industry which encompassed the hill, with numerous other quarries and limekilns, notably to the north around Porthywaen and Whitehaven. That said, however, the industrial remains within the survey area certainly represent the best preserved of elements of the industry.

8.5 The significance of Llanymynech should not, however, be viewed only in relation to the lime industry. The area has a rich historical and archaeological heritage and was clearly of great significance during later prehistory, as demonstrated by the impressive remains of the hillfort on Llanymynech Hill which has been suggested as the possible site of Caractacus's last defence against the invading Roman legions. The western defences of the hillfort were later adopted as part of Offa's Dyke, the 8th century earthwork forming the western boundary of the kingdom of Mercia.

8.6 The remains at Llanymynech have much to offer the visitor and the proposed reopening of both the canal and railway are of key importance to the future of the site. Although some remedial works have been undertaken in more recent years considerable reconsolidation and vegetation clearance are still required to ensure the preservation of the remains and allow improved access and understanding for members of the public.

8.7 The potential of the site should not, however, be seen purely in terms of a visitor attraction. It is first and foremost an archaeological site of national significance and any development proposals must consider the impact on this important resource. The recent survey has highlighted the potential for further buried remains to be preserved within the area, particularly in relation to the various tramways, but also in the wider context of archaeological remains from any period, and an appropriate archaeological response should be considered in association with any works. Although a detailed ground survey has now been completed within the Heritage Area, the standing structures have not been subject to such a thorough investigation and detailed building recording, in association with vegetation clearance, would not only provide a complete record but also an aid to their interpretation and management.

8.8 The significance and potential of Llanymynech has, therefore, been clearly demonstrated. The realisation of this potential and the preservation of the archaeological resource for future generations will require further investment and investigation, and it is to be hoped that the present study has laid a cornerstone from which the future of the site can be secured.

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10 REFERENCES

Published sources

Baughan, P E, 1991. *A Regional History of the Railways of Great Britain. Volume 11, North and Mid Wales, second edition.* Nairn: David St John Thomas Publisher.

Christiansen, R, & Miller, R W, 1967. *The Cambrian Railways. Volume 1: 1852-1888.* Newton Abbot: David and Charles.

Cozens, L, 1959. *The Llanfyllin Railway*. London.

Hughes, S, 1983. *The Archaeology of the Montgomeryshire Canal, second edition.* Aberystwyth: Royal Commission on Ancient and Historical Monuments in Wales.

Johnson, D, 2002. Friedrich Edouard Hoffman and the Invention of Continuous Kiln Technology: the archaeology of the Hoffman kiln and 19th-century industrial development (part 1), *Industrial Archaeology Review* 24.2, 119-132.

Johnson, D, 2003. Friedrich Edouard Hoffman and the Invention of Continuous Kiln Technology: the archaeology of the Hoffman kiln and 19th-century industrial development (part 2), *Industrial Archaeology Review* 24.2, 15-29.

Jones, G D B, & Mattingly, D, 1990. *An Atlas of Roman Britain.* Oxford: Basil Blackwell Ltd.

Morriss, R, 1991. *Canals of Shropshire.* Shropshire Books.

Musson, C R, 1981. Llanymynech Hillfort, *Archaeology in Wales* 21, 31.

Musson, C R, & Northover, J P, 1989. Llanymynech Hillfort, Powys and Shropshire: observations on construction work, 1981, *Montgomeryshire Collections* 77, 15-26.

Pearce, A J 1992. *The Mines of Llanymynech Hill.* Revision of original edition by DR Adams, 1970. Shropshire Caving and Mining Club.

RCHME, 1999. *Recording Archaeological Field Monuments: a Descriptive Specification.*

Trinder, B, 1996. *The Industrial Archaeology of Shropshire.* Chichester: Phillimore and Co. Ltd.

Trueman, M R G, 1992. The Langcliffe Quarry and Limeworks. *Industrial Archaeology Review* 14.2, *126-144.*

Williams, R, 1989. *Limekilns and Limeburning.* Shire Album 236. Aylesbury: Shire Publications Ltd.

Wren, W J, 1968. *The Tanat Valley, its railways and industrial archaeology.* Newton Abbot: David and Charles.

Unpublished sources

Archenfield, 2001. Unidentified report.

Deamer, G, 1995. *Llanymynech Heritage Park.*

Graham Barrow Research and Consulting, Marketing Planning Associates, Donald Insall Associates, & AAA Archaeological Advisors, 2002. *Llanymynech Heritage Area Development Study*

Hannaford, H R, 1993. *The Archaeological Excavation of Test Pits at the Hoffman Kiln, Llanymynech, Shropshire.* Archaeology Unit, Shropshire County Council, Report No, 38.

Hughes, L, & Gould, C, 1993. *Llanymynech Village Appraisal.*

Jones, N W, 2003. *Montgomery Canal Conservation Management Strategy: Landscape Archaeology Assessment.* CPAT Report No. 550.

Jones, N W, & Owen, W J, 2001. *Montgomeryshire Wildlife Trust Reserves: Archaeological Baseline Survey.* CPAT Report No. 394.1.

McLoed, M, Stratton, M, & Trinder, B, 1987. *Llanymynech Hill: An Archaeological and Historical Evaluation.* Ironbridge Institute Research Paper No. 18.

Murray, T, 1995. *Llanymynech Heritage Park: A Study.*
Owen, W G, 1999. *13th Green, Llanymynech Golf Club, Powys: archaeological assessment.* CPAT Report No. 336.
Reid, M L, 1998. *Llanymynech Rocks Nature Reserve: An Archaeological Management Plan.*
Rural Resources, 2003. *Limestone Lives*
Walters, M, 1994. *Powys Metal Mines Survey 1993.* CPAT Report No. 89.

Cartographic and documentary sources

Map and survey of Llanymonach rock in the township of Carreghova in the parish of [eligible] and county of Denbigh. Surveyed and mapped by the order of Thomas Slaughter Esq., Mr Richardson and Mr Goldsmith by their humble servant Edward Matthews, 1753 (NLW Chirk Castle v/7390).
Plan of estates at Llanymynech and Llwyntidmon belonging to Sir Henry Bridgeman, 1766 (SCRO temp no. D1287/M/703)
Map of estate at Caeghofa, Llanymynech and Llwyntidmon, undated (SCRO temp no. D1287/M/332)
Plan of a Railroad proposed to be made by T Yates from Llanymynech Rock to the Ellesmere Canal, 1807 (NLW Chirk Castle v/6046).
Valuation of lands including Llanymynech, 1797 (SCRO temp no. D1287 Knockin Add H/35)
Survey and valuation of estates including Llanymynech, 1809 (SCRO temp no. D1287 Knockin Add H/46)
Particular of the Llanymynech and Llwyntidmon estates, 1810 (SCRO temp no. D1287 Knockin Add H/49)
Map of allotments in Crickheath, Llwyntidmon and Trepenal, 1813. (SCRO temp no. D1287/M704)
Lease of limestone quarry, Hon. Frederick West to Messrs E Pickering, 1827, for 31 years (CROR DD/RC/294)
Articles and co-partnership between F West, Miss C L West and Exuperius Pickering the elder and the younger, 1827 (CROR DD/RC/295)
1837 Lease of mines and minerals under Llanymynech Hill for 21 years. Hon. Frederick West to Messrs Smith and Williams. Plan included (CROR DD/RC/296)
Ordnance Survey Old Series, Sheet 74 SE, published 1837
Tithe Survey for Llanymynech (Llwyntidman & Treprenal) Parish, 1838 (SRRC 4259/T/1-2, S)
Deed of settlement of the Carreghofa Roman Copper and Lead Mining Company (CROR DD/RC/297)
1851 Lease of limestone quarries situated in the parish of Llanymynech, county of Denbighshire, for 7 years. R West Esq and M West Esq to Mr T E Ward of the Lodge, Chirk (CROR DD/RC/298)
1853 lease by Messrs Longueville and Williams to Joseph Needham (CROR DD/RC/299)
1856 lease by Messrs Longueville and Williams to Benjamin Manning and John Dicks. Plan included (CROR DD/RC/300)
Llanfyllin Railway plan and book of reference, 1860 (NLW Mont CC 26)
Map of Lord Bradford's estate in Llanymynech, Llandisilio and Kinnerley, 1863, (SCRO temp no. D1287/M706)
1863 lease by the Trustees of F M West to Thomas Savin, plan included (CROR DD/RC/301)
Plan of part of Bradford estate at Llanymynech to be let from 1864 (SCRO temp no. D1287/M2243)
1869 lease by the Trustees of F M West to Thomas Savin, plan included (CROR DD/RC/301)
Terrier of Knockin estate, 1870 (SCRO temp no. D1287 Knockin Add E/406)
Ordnance Survey 1:2500 1st edition Montgomery 11.1 (surveyed 1874, published 1882)
Ordnance Survey 1:2500 2nd edition Montgomery 11.1 (surveyed 1874, revised 1900, published 1901)
Ordnance Survey 1:2500 1st edition Montgomery 11.5 (surveyed 1874 in, published 1882)
Plan of Llanymynech Hill, 1896, (SCRO temp no. D1287/M2361)
Plan of goods branch of railway through Llanymynech, 1896 (SCRO temp no. D1287/M2371)
Ordnance Survey 1:2500 2nd edition Montgomery 11.5 (surveyed 1874 in Shropshire, 1885 in Montgomeryshire, revised 1900, published 1901)

Vertical aerial photographs
RAF 1947: CPE/UK/2010/2311-2312
RAF 1953: 58/1135/0016
RAF 1961: 543/1475/59

Oblique aerial photographs
CPAT 1984: 84-C-0001

CPAT 1985: 85-05-0027 and 28
CPAT 1990: 90-MB391 and 392
CPAT 1990: 90-MB-767 to 770
CPAT 1992: 92-C-1048 to 1051
CPAT 1992: 92-MB-743
CPAT 1992: 92-MC1-12 and 13
CPAT 1993: 93-01-0011 and 12
CPAT 2003: 03-C-400-403 and 789-801

APPENDIX 1
GLOSSARY OF TERMS

Term	Definition
18th Century	AD 1700-1799
19th Century	AD 1800-1899
20th Century	AD 1900-1999
adit	tunnel driven horizontally for access to and/or drainage of underground workings
Bronze Age	c. 2400 BC - 700 BC
canal	artificial waterway intended for transport
Dark Age	AD 410-1080
drum house	structure containing winding drum for an incline. Also known as brake house
embankment	artificial bank of earth and stone
find	one or more artefacts
footbridge	structure crossing a river/road/railway etc not intended for vehicular use
hillfort	defended hilltop settlement of late Bronze Age and Iron Age
Hoffman kiln	continuous rotary limekiln developed during late 19th century
hoist	mechanism for raising objects from one level to another
incline	track or tramway on a gradient for transportation of ore/stone
Iron Age	c. 700 BC - AD 43
level	tunnel driven into hillside, generally along a vein, to extract ore
lime kiln	structure designed for burning lime, usually with coal, to produce quicklime
Medieval	AD 1080-1536
mine	underground excavation for extraction of minerals/coal/stone
Neolithic	c. 4300 BC - 2400 BC
palaeoenvironmental	potential for preserved organic remains, usually under waterlogged conditions
post-medieval	AD 1536-1799
prehistoric	pre AD 43
quarry	surface working for stone/gravel/sand etc
Roman	period of Roman occupation, in Britain between 64 AD and around 420 AD
revetment	stone or brick retaining wall built to support base of an embankment, for example
stone crusher	mechanism for breaking rocks into smaller pieces
tally hut	building associated with recording the weight or quantity of transported goods
total station survey	digital ground survey
tramway	narrow-gauge railway usually with horse drawn trucks
tunnel	artificial underground passage
weir	man-made dam to control flow of river
well	shaft or depression for collection of water
wharf	area alongside waterway for loading and unloading of cargo
winze	mining shaft sunk to connect working levels, not exposed to the surface

APPENDIX 2

SITE ARCHIVE

Drawn archive
A1 drawn plan of the survey area
A1 drawn plan of the inclines
A1 drawn plan of the Heritage Area (north)
A1 drawn plan of the Heritage Area (south)

Digital archive
The following files exist in three formats, as Mapinfo and Arcview GIS tables and DXF files:

1147poly	polygonal data
1807map	digital mapping from 1807 map of Chirk Castle Estate
1863map	digital mapping from a tracing of 1863 map of Bradford Estate
1874map	digital mapping from 1st edition Ordnance Survey 1:2,500
1900map	digital mapping from 2nd edition Ordnance Survey 1:2,500
area	survey area
1147surv	earthwork survey
1mcont	1m contour data
05mcont	0.5m contour data

The following file exist in three formats, as a database (dbf), and Mapinfo and Arcview GIS tables:

1147smr	point data

The following digitally generated images exist as Mapinfo and files and bitmaps (bmp):

1147modl	digital relief shade model
1147modl-contour	digital contour model

Photographic archive
243 digital photographs, CPAT film no. 1603
photographic catalogue: 1147photo.dbf, photonum.rtf and photsite.rtf

Level 1 survey
5 dimensioned sketches