Feeding Roman Silchester: Querns and Millstones in and around Roman Towns

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SUPPLEMENTARY MATERIAL

ONLINE APPENDIX 1. DESCRIPTIONS OF STONE TYPES USED FOR QUERNS IN SILCHESTER AND THE TOWN'S 20 KM HINTERLAND ZONE

A total of 15 lithologies were used to make querns and millstones in the north Hampshire/south Berkshire region around Silchester in the Roman period. Of these, four can be considered to have been major suppliers of querns to the region. These are Lodsworth Greensand (from the south), Mayen Lava (from the east), Millstone Grit (from the north) and Old Red Sandstone (from the west). There are a further five lithologies for which the source areas are known and a number of other stone types for which the area of origin can only be more broadly established. A summary of what we currently know about these querns, where they were made and what the stone type looks like is given below.

Lodsworth stone (Fig 1a)

Lodsworth stone is a rock from the Hythe Beds of the Lower Greensand. The main quarry used to produce querns is located in the parish of Lodsworth about 57km to the south of Silchester. The quarries were located just to the west of Stane Street, the main Roman road connecting London to Chichester in the south coast. It is a medium-grained greenish or brownish-grey glauconitic sandstone, typically silicified and with characteristic dark cherty swirls which range from dark grey to black. It is usually easy identified in hand specimen because of these cherty swirls, but as their distribution is not uniform throughout the rock, the swirls may not be visible on the smaller samples, making identification of these fragments difficult.

Lodsworth stone was used to manufacture querns from the Neolithic period, but production appears to have been sporadic until the introduction of the rotary quern during the middle Iron Age.[1] The number of querns being produced and the distance over which they were distributed increased thereafter with querns found across most of the southern parts of Roman Britain. An end date for production is unknown, but the evidence thus far has pointed to a predominantly early Roman use.[2]

Mayen lava (Fig 1b)

Most Roman lava querns in Britain appear to be from Mayen in Germany but Volvic lava from the Auvergne region of France was also used in small quantities, for example for the Pompeian millstones found at Princes Street, London and Corfe Mullen in Dorset.[3] In addition, it is possible that some lava querns in the UK were actually manufactured elsewhere, perhaps from rocks at Orvieto in Italy or in Austria, where younger volcanic rocks were used for Roman mills.[4]

With the latest geochemical analysis, it is now possible to allocate querns to a precise lava flow in the volcanic Eifel region around Mayen in Germany[5] but analysis for other sources is not as advanced. For the purpose of this report, an assumption has been made that all the lava querns are from Mayen, but future research may well demonstrate otherwise.

Mayen lava is a grey vesicular rock. It is fine-grained with small vesicles (cavities) but it often contains small clinopyroxene phenocrysts and less often, larger sanidine phenocrysts as well as felsic xenolith inclusions. Technically it is a tephritic phonolite (not a true basalt). The fine-grained matrix is mainly composed of nepheline, sanidine, clinopyroxene crystals, plagioclase and opaque ores with minor grains of leucite and apatite.[6]

Rotary querns of lava are found across Roman Britain as far west as Devon in the south. There are often concentrations on sites with military origins or connections and in the south of England, the large assemblage of querns from 1 Poultry in London indicates that London was probably the likely point to which querns were imported and from which they were subsequently distributed, although not specifically the site at 1 Poultry.[7]

[1] Shaffrey and Roe 2011, 309.
[2] Peacock 1987, 73; Shaffrey and Roe 2011, 316.
[3] Peacock 1980; Williams Thorpe and Thorpe 1988; Williams and Peacock 2011, 117.
[4] Gluhak and Hoffmeister 2011, 1616; Williams and Peacock 2011, 119.
[5] Gluhak and Hoffmeister 2011, 1617.
[6] Reniere et al 2016, 408.
[7] Williams and Peacock undated; Hill and Rowsome 2011, 351.

Old Red Sandstone (Fig 2a)

The Old Red Sandstone is a rock of varied petrology with major production areas in the Mendips, the Bristol area and in the Wye Valley /Forest of Dean.[8] The best known variety is the Quartz Conglomerate of the Upper beds. This is a typically greyish-red, medium-grained quartz cemented sandstone containing frequent pebbles, predominantly quartz, many of which are tinged pink. There are also pebbles of various rock fragments, and jasper is a particularly distinctive, if rare inclusion in the Quartz Conglomerate from the Forest of Dean. The coarser, less pebbly varieties of the Quartz Conglomerate are not dissimilar to Millstone Grit and the two are often confused by non-geologists.

The most likely source area for many querns provenanced to the Forest of Dean area is around Penallt, where extensive production of millstones occurred during the medieval and post-medieval periods. Such activity is likely to have destroyed evidence of earlier quarrying but during the post-medieval period there were at least five extraction areas.[9]

The Upper Old Red Sandstone also outcrops widely in the Bristol area at Portishead and between Wraxall and Abbots Leigh and querns were certainly made of Old Red Sandstone from one or more outcrops there.[10] The rock from this area tends to be less pebbly than that from the Forest of Dean area and can have a calcite cement. Further outcrops of the Old Red Sandstone occur in the Mendips, particularly around Beacon Hill. Here the Old Red Sandstone lacks the exotic pebbles and pink quartz of the Forest of Dean exposures and tends to be an overall pinker/redder colour. Querns positively identified as having been manufactured in the Mendips were distributed over a smaller geographical area than those from the Bristol/ Portishead and Forest of Dean areas. However, unless the rock used for a quern has particularly distinctive petrographic characteristics, it is often not possible to be certain precisely where the Old Red Sandstone was quarried. Overall, querns of Old Red Sandstone have been found across most of the Roman south except Devon and Cornwall.[11]

Millstone Grit (Fig 2b)

In the north of England, Millstone Grit (Namurian Sandstone) was widely used during the Iron Age to make beehive querns.[12] There is no evidence for its use for querns further south than Oxfordshire before the Roman period but flat forms were being commonly discarded in southern England by at least the late first and early second century.[13]

Rotary querns of Millstone Grit have a widespread distribution across the south, but the significance of this stone as a supplier of querns appears to have decreased rapidly south of the River Thames so that its use in Roman settlements along the south coast is minor. A recent survey of Iron Age and Roman querns in Devon demonstrates that querns of Millstone Grit were not used there at all (Shaffrey in prep) and it is likely that this is true of Cornwall too.

In the archaeological literature, querns are typically broadly classified as being of 'Millstone Grit'. However, it is a hugely varied rock that outcrops across a wide geographical area, mainly in Derbyshire and Yorkshire. It has proved difficult to provenance it to specific exposures, but several quarries have been identified. A significant quarry existed at Wharncliffe in south Yorkshire, for example, where over 2000 querns were identified in a survey following a heath fire.[14] However, the rock exploited here (locally named the Wharncliffe Rock) is actually from the Coal Measures sandstone. It is notable for containing very little feldspar[15] and it is therefore unlikely to be the source of most of the Millstone Grit querns in southern England, which are typically highly feldspathic.

It is more likely that the sources for the Millstone Grit querns of southern England were quarried further south. One possibility is a quern quarry located at Rivelin on the outskirts of Sheffield.[16] Here querns were made from the Rivelin Grit, known elsewhere as the Chatsworth Grit. It is a medium-

[8] Shaffrey 2006.
[9] Tucker 1972, 231
[10] Barford 1984, 15; Ingle 1984; Shaffrey 2006.
[11] Shaffrey in prep.
[12] Heslop 2008.
[13] eg Shaffrey 2011, 364.
[14] Pearson and Oswald 2000.
[15] Elizabeth Wright pers comm.
[16] Wright 1988; Newman 2016, 29.

grained sandstone with occasional pebbles.[17] Querns from here may well have been exported some distance, and a thin section of the Blackfriars quern was found to be indistinguishable from samples of Rivelin Grit.[18] Although a field survey at Rivelin found many traces of the manufacture of beehive querns, it is not yet clear whether the flat disc types of querns and millstones found in southern England were also produced there during the Roman period.[19]

In the southern Pennines, the rocks of the Millstone Grit are mainly medium-grained, highly feldspathic and non-fossiliferous.[20] Recently, a quern quarry in the Ashover Grit at Blackbrook in Derbyshire has been investigated.[21] The Millstone Grit at Blackbrook is typically a poorly-sorted, medium to coarse-grained but well-cemented pinkish buff through grey to brown sandstone, with fresh pink feldspar and with occasional pebbles up to 20 mm in size.[22] This could well be one of the sources for some southern querns, as could the Kinderscout Grit in the eastern Pennines, which is described as a coarse, gritty, and highly feldspathic sandstone.[23] It is clear that more work is needed on the petrography of Millstone Grit querns.

Oxfordshire Grits

Querns are thought to have been made from the Lower Greensand in at least two localities in Oxfordshire: Cole's Pits to the south of Faringdon, first recorded by Crawford (1953, 102) and in the area around Culham, each some 35km to the north of Silchester. Culham has been identified as a source of querns based on comparison with field samples and this should be considered more broadly as a source area, rather than as a known quarry.

The Lower Greensand is mostly too soft to make querns but there are harder beds and doggers that would have been suitable. Both Cole's Pits (also known as Faringdon Greensand) and Culham provide gritty sandstones containing coarse quartz sand and frequent small smooth quartz and lydite pebbles with a polished appearance[24] in a typically orangish matrix. However, the rock from Culham is more ferruginous than that from Cole's Pits and the latter contains large shell fragments and sometimes brown or black polished fish or reptile teeth.[25] On larger samples it is relatively straightforward to distinguish the two based on the presence of shells but to complicate matters, rock from the Corallian Lower Calcareous grit is very similar in appearance containing "many small, polished pebbles of dark brown and black lydite and vein quartz".[26] It thus seems possible that the three rocks have been confused at times in the archaeological literature, since one would need numerous field specimens for comparison and many of the original exposures are now completely removed. For the purposes of this analysis, the three rocks are discussed together, with references to specific types where relevant but it should be borne in mind that there may be doubt over some of the identifications.

As can be expected for a rock with relatively limited exposures, the querns did not travel particularly far from their place of manufacture with use focusing on modern-day Oxfordshire, Berkshire and north Hampshire.[27]

Potterne Rock

Potterne Rock is a hard bed within the Upper Greensand. It is a fine-grained calcite cemented glauconitic sandstone with sparse feldspar and bioclastic fragments.[28] Hard doggers of Potterne Rock occur in the Devizes and Potterne areas of Wiltshire and although a quarry is yet to be identified, a late

[17] Ingle 1989, 43.
[18] Marsden 1994; Elizabeth Wright pers comm.
[19] Wright 1988, 69.
[20] Ingle 1989, 42.
[21] Palfreyman and Ebbins 2007 and 2018.
[22] Palfreyman and Ebbins 2018.
[23] Ingle 1989, 42.
[24] Arkell 1947, 157.
[25] See previous note
[26] Arkell 1947, 78
[27] Shaffrey and Roe in prep
[28] Woods et al 2008, 239.

Iron Age rotary quern from Shipton Bellinger in Hampshire proved a close match to samples from these areas.[29]

No querns of Potterne Rock have been identified at Silchester, but until Williams suggested it in 2003, it is unlikely to have been considered as a possible source for querns in the region, and it is difficult to identify it by eye. A rotary quern and a probable millstone from the Whitehall Brick and Tile Works, Arborfield are of Potterne Rock[30] and it seems likely that with detailed analysis, further querns of Potterne Rock will be identified.

Other Greensands

Querns were also made from the Greensand at Pen Pits in Somerset but this does not appear to have been transported further east than the mill at Fullerton and none of these have been recorded at Silchester. However, other types of Greensand querns were also in use at Silchester but not yet identified to a source. Whilst it is possible to identify some types of Greensand in use in the Silchester area by eye (e.g. Lodsworth Stone, Faringdon Greensand), and others microscopically (e.g. Potterne Rock), it has not yet been possible to distinguish all types of Greensand and these are generally grouped as Greensand (or occasionally as Upper or Lower Greensand). Nonetheless, there is a clear emphasis on the use of these querns south of the River Thames.

Much of the Greensand of southern England is too soft to have been used for querns, so that although on a geological map it would appear as though there are vast exposures of it, only a relatively small number of areas produced rocks hard enough to manufacture querns. In the Wessex area, hard enough rocks have been identified (aside from the quarries at Pen Pits and Lodsworth) only at Urchfont, Potterne, Stoke Wake and Ansty.[31] As with the Potterne Rock and Oxfordshire grits, these are usually in the form of hard doggers within the softer main beds.[32]

PERIPHERAL AND MINOR SUPPLIERS

Alderney Sandstone

A single quern from Silchester has been identified as being of Alderney sandstone.[33] This is a coarse-grained, pale-pink feldspathic gritstone, which weathers to dark grey and contains large quartz granules and salmon coloured feldspar. In thin section it is seen to contain abundant sericite cement.

Querns were being made on Alderney from the Iron Age onwards, as evidenced by the discovery of blanks of Alderney sandstone querns on Longis Beach.[34] Movement between Britain and the Channel Islands / continental Europe is evidenced (in terms of stone) by the finding of stones, assumed to be ballast, from the Channel Islands and Brittany (including Alderney sandstone) at Fishbourne Palace's harbour.[35] However, only a limited comparison has thus far been carried out between querns in the UK and samples of Alderney sandstone from Alderney island. Alderney sandstone also outcrops on other Channel Islands and in northern France, and it is possible that the quern originates in one of the other source areas.

Alderney sandstone is increasingly being recognised as a quern material, with recent Roman finds on the Isle of Wight, in Sussex and in London and it may be possible to establish more about these querns in time.[36]

[29] Shaffrey 2019.
[30] Williams 2003, 60.
[31] Cutler 2012, 279.
[32] Shaffrey 2019.
[33] Allen 2013.
[34] Watts 2003.
[35] Cunliffe 1971, 2–3.
[36] Allen 2013; Kevin Hayward pers comm, pers obs.

Hertfordshire Puddingstone

Hertfordshire Puddingstone is a flint-pebble conglomerate (a silcrete) that has its main exposures in Hertfordshire. The pebbles are well rounded and variable in size but usually measure about 20mm in diameter and "are grey-white, yellow, orange, red or black in colour and often have a black 'rind'".[37]

It is a very hard siliceous rock and so far, over 700 examples have been recorded, mainly in eastern England/east Anglia but extending into northern Kent.[38] There are occasional instances west of London and south of the Thames.[39] Two examples of Hertfordshire Puddingstone querns have been recorded at Silchester but they are the only examples from Hampshire.

Worms Heath Puddingstone

Worms Heath puddingstone is a distinctive, very hard, dark red or purplish iron cemented flint conglomerate (ferricrete). The flint pebbles are well-rounded and grey, brown or white in colour, measuring up to 50 mm in diameter. Querns do not appear to have been made in any great number in this puddingstone. Worms Heath is located near Warlingham in Surrey, some 75 km from Silchester. Its use for quern manufacture was first suggested by Crawford[40] but not well supported by evidence at the time. It was recently re-identified as a source of a small number of querns, mainly in Bedfordshire, Essex, Hampshire, Kent, Norfolk and Suffolk,[41] although the unusual concentration of examples in northern Kent may have been produced at a much more local source near Cobham, now entirely removed.[42]

Only two fragments of Worms Heath Puddingstone querns have been recovered from Silchester while the ferruginous puddingstone querns from Nuffield and Marnel Park, Basingstoke, are also highly likely to be from Worms Heath.[43] Querns of this type will have had a long working life and so are difficult to date accurately but are probably largely very late Iron Age or early Roman in date.

French Puddingstone

French Puddingstone is superficially similar to the well-known Hertfordshire Puddingstone but can be differentiated from it by the presence of fossils and by smaller, darker flints.[44] Morphologically the querns are also different so that the French examples usually have handle sockets that perforate the eye and lower stones that are fully perforated for the spindle with straighter sloped edges compared to the rounded ones of the Hertfordshire Puddingstone.[45]

Because French Puddingstone querns have only recently been identified in Roman Britain following extensive research by Chris Green and David Peacock, the distribution area is not yet clearly established. However, Green has determined their presence in most of the southern and eastern counties of Hampshire, West Sussex, Kent, Hertfordshire, Bedfordshire, Cambridgeshire, Essex, and probably south Suffolk.[46] He has also identified two examples from Silchester.

Bargate Stone

Bargate stone is a honey coloured sandstone that occurs as hard calcareous doggers within the Bargate member of the Sandgate Formation in the Greensand ridge of south-eastern England. It is particularly well exposed in Surrey, around Goldalming, with further doggers around Dorking. In thin section, Bargate Stone is seen to be a typically poorly-sorted sandstone or limestone containing mainly rounded, medium to coarse-grained monocrystalline quartz and bioclastic debris, glauconite, and rounded phosphatized grains, along with rare feldspar and rock fragments.[47]

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[37] Green 2011, 125.
[38] Green 2011, 123.
[39] Roe 2010.
[40] 1953
[41] Green and Peacock 2012.
[42] Shaffrey 2011.
[43] Start 1982; Hayward 2009, 39.
[44] Green 2017, 167.
[45] Green 2017, 167–9.
[46] Ibid.
[47] Lott and Cameron 2005.

Before the discovery of the quarry at Lodsworth, querns of Lodsworth stone were often misidentified as Bargate stone.[48] As a result, it is difficult to ascertain to what extent Bargate stone was utilised for the production of querns. However, querns of Bargate stone have been recorded by the author at three sites in Surrey and they have been identified in the literature at a further six sites in Surrey and one in Kent.[49]

Two fragments of Bargate stone were identified amongst the assemblage of querns from Silchester. Both have only been tentatively identified as querns based on the survival of likely pecked faces. Given the otherwise entirely local distribution of rotary querns of Bargate stone, it might be wise to view these fragments with caution, but not discount them altogether.

Carstone/ferruginous sandstone

Carstone is a brown, ferruginous, well-sorted coarse-grained sandstone, beds of which occur within the Lower Greensand of southern England. It is typically orange-brown or purple-brown in colour. Carstone was not widely used for the production of querns and its use seems to have been primarily for saddle querns. Rotary querns of it were made, however, and in southern England they have been found in very small numbers in Roman contexts, primarily in Kent and on the Isle of Wight. Querns have been found in the wider study area at Neatham, and in Silchester's hinterland at Arborfield and Basingstoke[50] but none have been recorded from Silchester itself.

Sarsen

Sarsen is a fine-grained siliceous Tertiary sandstone with sub-rounded 'sugar like' quartz grains. It occurs as boulders across southern England but especially in the Wessex Downs. Sarsen is usually grey to pale brown in colour, but creamier when weathered[51] and it is well suited to life as a quern because it is hard and of even grain size. Rotary querns of sarsen appear to have been less commonly made than saddle querns, but they do occur in small numbers in the same geographical area as their earlier counterparts. The earliest rotary querns of sarsen have been recovered from mid-late Iron Age contexts[52] but they also occur on Roman sites and production seems likely to have continued into the Roman period, albeit in small numbers.

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[48] eg Rawnsley 1925, 241-2; Clark and Nichols 1960, 68.
[49] Sanderson 2004, 339, none verified by the author.
[50] Timby 1986, 136; Williams 2003, 60; Anderson 1992, 79.
[51] King 2015.
[52] e.g. Hayward 2012, 126.

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ONLINE APPENDIX 2. LIST OF ALL SITES IN SILCHESTER'S 20 KM HINTERLAND ZONE WITH QUERNS AND/OR MILLSTONES

Site	**Reference**	**NGR**
Aldermaston Wharf	Cowell, R. W., Fulford, M. G. and Lobb, S. 1978: 'Excavation of Prehistoric and Roman settlement at Aldermaston Wharf 1976-77', *Berkshire Archaeological Journal* 69, 1-37	SU 6050 6810
Aldermaston, Raghill Farm	Beach, S., Manning, A., Trevarthen, M. 2008: Raghill Farm, Aldermaston, West Berkshire: initial statement of results, Wessex Archaeology Report 58253.02	SU 6127 6465
Aldworth, Enwick Shaw Pit (Newbury Pipeline)	Shaffrey, R. 2006: 'Worked Stone' in J. Timby, D. Stansbie, A. Norton and K. Welsh. Excavations along the Newbury Reinforcement Pipeline: Iron Age-Roman activity and a Neolithic pit group, Oxoniensia LXX, 26-274	SU 5488 7968
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Newbury, Municipal Buildings (Town Hall)	HER: https://www.heritagegateway.org.uk/Gateway/Results_Single.aspx?uid=MWB9904&resourceID=1030	SU 4710 6710
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Reading, Cockney Hill	Reading Museum	SU 6700 7500
Reading, Manor Farm	Reading Museum and HER: https://www.heritagegateway.org.uk/Gateway/Results_Single.aspx?uid=MRD3887&resourceID=1028	SU 7120 7070
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Swallowfield	Reading Museum and Peake, H. 1931: *The Archaeology of Berkshire*, 233	SU 7300 6400
Swallowfield, Riseley Farm	Lobb, S.J. and Morris, E.L. 1993: 'Investgations of Bronze Age and Iron Age features at Risely Farm, Swallowfield', *Berks Arch Journ* 74, 37-69	SU 7300 6380
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Tilehurst, Pincent's Farm	Reading Museum Acc: 1940.50	c SU 6500 7100
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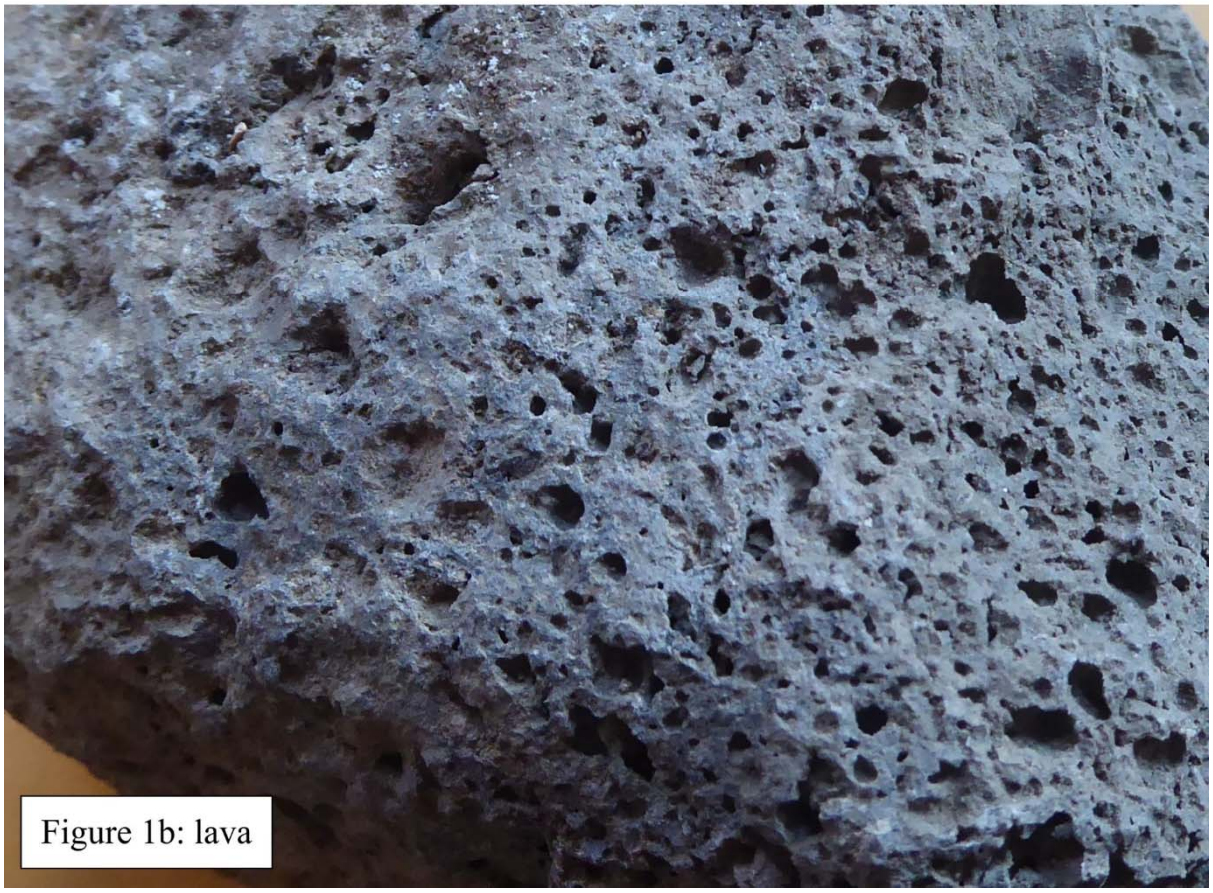
Wokingham, Matthewsgreen Farm, Twyford Road	Ford, S. 2015: Matthewsgreen Farm, Twyford Road, Wokingham, Berkshire. An Archaeological Evaluation, Thames Valley Archaeological Services report	SU 8047 7015



ONLINE FIGURE 1. Close-up photographs of Lodsworth stone and Mayen lava.

ONLINE FIGURE 2. Close-up photographs of Millstone Grit and Old Red Sandstone.