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Sarsen Stone Quarrying in Southern England: An Introduction.

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On 23 November 1973, Collin Bowen FSA wrote a memo to some of his colleagues complaining that English Farms Ltd had removed sarsen stones from an area of the Marlborough Downs (Wiltshire, UK), using dynamite. The land owner had cleared an acre of ground to the north of Old Totterdown (Fig.1), mapped by the Ordnance Survey as 'Boulders' since the nineteenth century. Bowen bemoaned the lost opportunity to examine the sarsens for archaeological and geological research: and this in the landscape thought by many to be the source for Stonehenge's trilithons and lintelled stone circle, as well as local prehistoric megalithic monuments. This was not the first time that sarsen stones in an area of sarsen-built features had been destroyed using explosives, and neither would it be the last.

This chapter asks what sarsen quarrying looks like, and provides a preliminary review of the main ways that the stone has been extracted in the past. Historical sarsen quarrying has not been addressed archaeologically in any detail, the prehistoric even less (Gillings and Pollard 2016, 2), yet geological memoirs, archives, and field evidence offer sources to investigate this ancient industry. For the prehistorian, a problem at the heart of the question is that people have continued to take sarsen for building material in those areas where it was exploited in prehistory. The former extent of the quarry and the effects of its more recent exploitation are unquantified (Gillings and Pollard 2016, 4-5). Furthermore, sarsen stone procurement is difficult to address using techniques that have been applied to sourcing material like Stonehenge's bluestones, for example; although geochemical studies may be successful (Nash *et al*. 2013; Ullyott and Nash 2006). Scientific approaches to prehistoric sarsen procurement must, therefore, be accompanied by a robust understanding of the later history of the sarsen quarry.

Recently, evidence suggesting that it can be possible to identify prehistoric sarsen extraction signatures has been compiled by Gillings and Pollard (2016), directing archaeological expectations at least for the later Neolithic. But the episode at Old Totterdown serves to illustrate the importance of investigating the sarsen quarry in which earlier stone procurement is situated. Following a brief description of sarsen stone, I introduce four examples of

quarrying all of which have left their mark on the landscape, and consider their place in the sarsen quarry today.

SARSEN STONE

Sarsen is a silcrete found in central-southern and eastern England, formed by the accumulation of silica in near-surface Tertiary sediments. The silica, likely carried in groundwater, cemented quartz sands into indurated masses. Following periods of erosion which removed uncemented material, and later movement under periglacial conditions, the remaining cobbles and boulders can now be found both exposed on the surface in sarsen spreads (for example, at Knighton Bushes Plantation, Oxfordshire) and buried in superficial deposits (such as the clay-with-flints south of Eynsford, Kent). The silica content is usually greater than 95% (Prestwich 1854; Dewey *et al*. 1924; Ullyott *et al*. 2004; Nash and Ullyott 2007; Ullyott and Nash 2016).

Archaeologists tend to divide sarsen into two categories based on macromorphological characteristics (Fig.2). The hard, grey sandstone boulders familiar from the settings at Avebury and Stonehenge are known as saccharoid sarsen because the freshly-broken surface looks like sugar-loaf. The second type, quartzitic sarsen, is formed of finer sediments and commonly found as smaller cobbles and pebbles, browner in colour. Sarsens can display considerable internal heterogeneity, transitioning from strongly to poorly silicified zones and from clean sand to pebbly areas in a single boulder (Summerfield and Goudie 1980; Geddes 2000). Sarsen is notoriously difficult to shape into useful building material, a property I will return to below.

Silcretes are not mapped by the British Geological Survey (BGS), although they have been described in BGS *Memoirs* (for example Osborne White 1907; 1912). The stone's availability can only be gauged by combining these older reports with historical Ordnance Survey mapping, and by fieldwork. Currently the most comprehensive depiction of British silcrete distribution is in Ullyott *et al*. (2004, 1511), compiled from five sources as varied as a sketch map by HC Brentnall (1946) and the results of the 1970s *Sarsen Stones in Wessex* survey (Bowen and Smith 1977). The distribution emphasises sarsen's dispersed nature and highlights its presence beyond Wiltshire's more familiar Marlborough Downs.

DIGGING SARSEN

The presence on chalklands of "the hollows that occasionally puzzle excavators" (Society of Antiquaries 1975) was one of the problems taxing members of the *Sarsen Stones in Wessex* project. In sarsen-rich areas, how could the archaeologist interpret what may be natural features but could be anthropogenic, without a better understanding of the archaeological signatures of sarsen extraction? The issue is brought into stark contrast in an area such as the northern arm of Clatford Bottom (Wiltshire) where Devil's Den long barrow was built: and the Dukes of Marlborough cleared sarsens both for agricultural purposes and to supply ornamental gardens on the White Knights estate (Berkshire) (Colt Hoare 1819; Soames 1987). Sarsens have been used in megalithic architecture from Dorset to Kent, but it is only very recently that progress has been made into characterising prehistoric sarsen extraction, in Wiltshire.

In an important first step, Mark Gillings and Josh Pollard (2016) have collated possible sarsen extraction features in the environs of Avebury. Focusing on hollows excavated at the West Kennet Avenue and the West Kennet palisade enclosures, they draw attention to consistent morphological characteristics and dating evidence to identify two large, shallow, cut features as the locations of sarsens that prehistoric monument builders removed from the ground. Both pits were large enough to have held substantial sarsens. Beside the Avenue, the edge of pit F.12 within the excavation trench included a line of stakeholes at the base, implying the leverage necessary to remove a large stone from the ground. Like the nearby pit F.3, which included a "discrete deposit" (2016, 11) of late Neolithic/early Bronze Age freshly worked flint, F.12 also included worked flints in its fill.

Later Neolithic sherds and animal bone were found in the fills of similarly-shaped and -sized features within the palisade enclosures. Excavated more than 30 years ago, and including features seen in a *c.*2m wide pipe-line trench, the evidence is arguably less well documented than Gillings and Pollard's 2013-15 excavations: but they argue against these being tree-throws, marl-pits, or chalk pits filled with rubbish. They propose that the material in the fills had been deposited in acts of reciprocity in return for the taken sarsens (2016, 8-15). These tentative beginnings suggest what prehistoric sarsen extraction pits may look like.

Sarsen has been cleared from fields and taken for building material at different times, but the stone's use since the seventeenth century in particular has had a major impact on landscapes where it is found. At Oxfordshire's Ashdown House (*c.*1662), for example, sarsen is an integral part of the designed landscape. The *c.*7km long rubble sarsen parkland wall and ha-ha enclose the *c.*140ha grounds (Historic England 1984), whilst sarsens lying in a natural spread to the east of the house, in line with its main aspect, were moved to clear the eastern axial avenue view to the eyecatcher on Weathercock Hill (Fig.3).

Similar uses have continued into more recent times. In 1923, sarsens were taken from a spread at East Kennett to Maiden Bradley for the Duke of Somerset's grave-setting (Goddard 1926). Sarsens dug from a location in the Kennet Valley form the façade of the modern All Cannings Long Barrow, built in 2014 (Daw pers. comm. 29 October 2016). In addition, farmers have continued to clear inconvenient sarsens. Sometimes these events were recorded. In a field adjacent to Hangmanstone Lane, Welford Woods (Berkshire), workmen uncovered a *c.*4m long sarsen that was impeding ploughing. They failed to break up the stone, so they tried to lever it out. A pit was dug to one side and the stone tilted over into it. This exposed three more adjacent sarsens in the clay overlying the chalk, one of which was more than 3m long and 3m wide (Adams 1870, 106).

It remains difficult to contrast examples like these with possible prehistoric extraction sites described by Gillings and Pollard (2016). The newsworthy parts of these and similar stories are related, such as the stones' intended uses or their resistance to hand-work, but rarely the mundanities of the resulting pits or scars; the Welford Woods story is an exception, but still lacks detail. Nevertheless, they remind the archaeologist that people have continued to take sarsens and to be aware of the possibilities in the archaeological record.

THE BUCKINGHAMSHIRE SARSEN INDUSTRY

Thick clay-with-flints deposits overlie the chalk of the southern Chiltern Hills escarpment in south Buckinghamshire (Sherlock 1922; Sherlock and Noble 1922). Silcretes in these deposits are accessible over a wide area from south-east Oxfordshire into Hertfordshire, but the sarsens are especially numerous in Hughenden, in the environs of Naphill, Walter's Ash, Denner Hill, and Kiln Common (Morley Davies and Baines 1953). Hughenden parish is characterised by dispersed settlement and life in the 1800s was predominantly agricultural

(Ellis and Jamison 1925, 57), but for some time sarsens had been dug from the superficial deposits by specialist cutters providing stone for building and street furniture. The products were advertised under locality names as Wycombe Stone and Denner Hill Stone (Burtonwood 1995).

The origins of the business, both in terms of the development of the necessary knowledge and skills and the building up of the trade, are presently unknown, but a brief survey of listed buildings in the locality shows that some dating to the early nineteenth century incorporate cut (that is, not rubble) sarsen. Examples include the Church of St John the Evangelist at Lacey Hill, built between 1822 and 1825 to a design by Chadley (Historic England 1955); the rear wing extension of Denner Hill Farmhouse, *c.*1800 (Historic England 1974); and the barns dated 1803 and 1804 to the west of Denner Hill Farmhouse, with coursed sarsen walls (Historic England 1985).

The quarrymen located sarsens closest to the surface by probing the ground with rods (Fig.4). Having exposed the first boulder, they split it by cutting lines of wedge pits to take metal wedges feathered with pieces of hoop iron, hammering the wedges with 28lb sledges (Burtonwood 1995, 3). The quarrymen continued digging to expose yet more buried sarsens; the ensuing pits within what were likely solution features could be up to 17m deep. As the workings deepened the sarsen cutters used simple timber scaffolding for access. Primary reduction continued *in situ*, with an A-frame and human-powered winch to haul the pieces to the surface. Here the cutters carried out secondary reduction and finishing using tracing hammers and chisels to make setts, kerbs, and building stones. The quarrymen's contracts required that they fill in exhausted pits, although they took advantage of the brickearth to run adjacent brick kilns (Spicer 1905, 39-40; Sherlock and Noble 1912, 201; Morley Davies and Baines 1953, Plate 1; Crook and Free 2011, 21).

This is the only example of deep-digging for sarsen. The trade is poorly documented other than these descriptions in the historical geological literature and occasional archive photographs. These show that, when active, the industry characteristically included the deep quarry pits, great quantities of waste material, and associated ancillary trades.

THE WILTSHIRE SARSEN INDUSTRY

The greatest impact on Wiltshire's sarsen fields was made from the mid-nineteenth century by a small number of quarrymen who moved from Buckinghamshire. Enos Free (aged 25) and his brother Edward (aged 17) arrived in 1847 and, at about the same time, Joseph Cartwright and Walter Bristow. They came from Hughenden (Crook and Free 2011; King 1968) and brought with them their tools, skills, and habits from the Chiltern Hills. Wiltshire's industry was at its height in the 1890s, supplying setts and kerbs as streets were being newly built or upgraded and prepared for new tram services in developing urban areas (King 1968, 87-8). The cutting technique has been described by Douglas Free (1948, 1950), grandson of Edward. His information is amplified by Noel King (1968), who was able to draw on the memories of Kennet Valley residents. These ethnohistorical accounts can be engaged with the archaeological evidence.

Selecting suitable sarsens was itself a skill. Free (1950, 338) alludes to some of the specialist knowledge developed by the sarsen cutters and their understanding of the stone's likely behaviour. The cutter would first knap a small piece from the edge of a sarsen to check its quality, before digging a gully around the chosen boulder. The gully would enable the ensuing hammering forces to pass fully through the rock and allow splits propagated by wedges to run true (King 1968, 90).

As in Hughenden, wedge-pits were cut out, enlarged using a series of peckers, and finished with punches. The quarryman hammered the row of wedges using a 14lb sledge until the stone split (Fig.5). Secondary reduction was completed with a slicing chisel and tracing hammer. A sharp chisel was used to complete the cutting (King 1968, 90-2). Finally, the pecking hammer, a type of mason's axe, was used to dress the cut pieces as required; examples of highly finished sarsen blocks can be seen in the Victorian church at East Kennet, for example.

Many of the boulders remaining today in the sarsen spreads are those abandoned after primary reduction revealed faults in the stone. This archaeological record speaks to the breadth of the dispersed quarry, with abandoned cut sarsens scattered across the upper Kennet Valley in an area *c.*100km². In addition, the gully feature described by Donald Free was observed around a cut sarsen on Overton Down excavated in 1975, and the un-weathered chalk platform where the sarsen had rested contrasting with the weathered chalk beyond the gully (Bowen and Smith 1977, 193). This characteristic cut feature may not always be

present along with the abundant debris; for example, no such gully appears in the excavation drawings of the cut Overton Down *polissoir* (Fowler 1963). This emphasises the need for a more detailed archaeological understanding of the industry to improve on King's spare record of the cutters' taskscapes (1968, 92-3), and the importance of questioning the documentary accounts with the archaeological record.

EXPLOSIVES

Personal experience indicates how surprised people can be to learn that sarsen stones have been extracted using explosives, despite this being a common quarry technique. Yet variability in the position of sarsens relative to their underlying superficial and bedrock deposits, combined with the intractability of the hard stone and the variety of products required, led to the use of explosives in certain circumstances. This chemical assistance, one of the few innovations in mining and quarrying technology (Samuel 1977, 38), is recorded in use on sarsens before 1754 in Wiltshire (King 1968, 85) and by 1806 in Berkshire (Lysons and Lysons 1806, 192).

Blasting was an acceptable technique for creating rubble, in particular for road-stone. It was the method adopted in 1920 by Thacker and Johnson in West Woods, Lockeridge (Wiltshire). At that time the London-Bath Road (the present-day A4) was being upgraded. The two men gained a road-stone contract and installed stone-crushing machinery in Hursley Bottom, using charges to blast sarsen boulders lying in the valley. The broken stone pieces were passed through the plant, producing metalling. The business cleared a large area in the Olympic Agricultural Company's woodland (King 1968, 86-7). The archaeological remains of this industry are well-preserved in Forestry Commission compartments G and N (Amadio 2011, 38-42 and 70-3). These include cart ruts and ramped causeways built up out of compartment G to the main metalled track; a large concrete block interpreted as the base for the stone crushing plant or a loading platform; a store cut into the hillside interpreted as a magazine or fuse store; and extensive areas of pitted and disturbed ground where sarsen boulders were dug around and extracted.

The process of setting charges on sarsen boulders is unrecorded, but in wood compartment N the quarry pits are distinct features (Fig.6). Where sarsens occasionally remain in pits, it appears that the boulders had been dug around before the charges were set. This may indicate

that the plaster shot method was used. The charge is packed on the top of the stone with clay and some four ounces of explosive applied for every foot thickness of rock (Mike Williams, pers. comm. 27 February 2017). Clearing soil enables the force to pass through each stone, splitting it into more manageable pieces. The area of quarrying in compartment G, to the west side of the main track and closest to the surviving industrial structures, is more confused. Here, the ground is softer underfoot with much more flint and sarsen rubble visible despite the leaf litter, but still with many quarry pits, including some remaining sarsens.

It transpired that this road material was not fit for purpose and the partners went bankrupt. There are, however, numerous other examples of sarsen blasting. Second World War American Army units based in Wiltshire practiced setting charges by blowing up sarsens in West Woods (King 1968, 87). The Territorial Army cleared sarsens around Lotmead Farm, Swindon, in the 1950s (David Sabin pers. comm. 2 December 2016). A sarsen marking the Kingston Russell/Longbredy boundary (Dorset) was destroyed with explosives during the Second World War[i], whilst sometime before 1975 a farmer tried and failed to use explosives to break up a large sarsen in Martyr Worthy (Hampshire)[ii]. A further failed attempt to blast a large roadside sarsen was reported in Bere Regis (Dorset) in April 1975[iii]. The last three sarsens of a once larger group in a field at Day House Farm, Coate (Swindon), still standing in 1893, had been destroyed using explosives by 1968[iv]. These boulders had been adjacent to prehistoric stone settings in Coate and Broome Manor.

These latter examples draw attention to the necessity for archaeologists to be alive to the varied approaches that land owners and farmers have taken towards sarsens on their property. The importance of ethnohistorical and oral history sources to draw attention to these activities is cast into sharp relief, given the difficulty of characterising the archaeological record which remains unexplored. But despite the destructive reputation of explosives, both powder and plastic could be used in controlled ways and in West Woods there is considerable potential for understanding the difference between these archaeological signatures and different sarsen extraction methods in other periods.

DISCUSSION

Unlike many of the stone types used in the Neolithic, people have continued to use sarsen. This has depleted the quarry, removing material that otherwise would have played a role in

provenancing studies to understand prehistoric sarsen procurement. A more detailed and nuanced understanding of the various quarrying techniques that have been used in overlapping areas is required, to inform research into prehistoric sarsen extraction in archaeological and geological terms. Both extensive and *ad hoc* sarsen clearance, usually for agricultural improvement, are the hardest to approach. Reports of clearance from sarsen spreads become more common as travellers and antiquarians interested themselves in the countryside, such as de Luc (1811) and Colt Hoare (1819). However, they do not include information about how the substantial boulders were dealt with and what the ground looked like as a result. It may be possible to locate and investigate sarsen extraction of specific dated events, such as the clearance of Ashdown House's eastern avenue, but reports of sarsen digging tend to be imprecisely located, or in areas since well-ploughed. In the face of this uncertainty, further examples like those discussed by Gillings and Pollard, excavated and documented to modern standards, are required to augment evidence for prehistoric sarsen extraction.

For example, the flint assemblage excavated by Peter Fowler (2000) at the Overton Down *polissoir* may be susceptible to re-interpretation. Fowler suggested that the *polissoir* had once stood upright in an adjacent socket hole (regrettably only partially-investigated), implying that the sarsen had been raised from its natural recumbent position (2000, 66-8). That should have left a sarsen hollow, or perhaps the hollow was re-used for the stone socket. As in West Kennet Avenue pit F.3 mentioned above, excavated flints were predominantly late Neolithic, apart from two heavily patinated leaf arrowheads, and included a flake from a polished flint axe head (Everton 1970s; Johnston 1995). A close reading of the excavation archive is clearly warranted in the context of Gillings and Pollard's findings.

The Buckinghamshire sarsen industry is important to underpin an understanding of Wiltshire's later quarry. Nevertheless, the relevance of deep digging to prehistoric sarsen extraction might reasonably be questioned. As Neolithic flint mines show, however, deep digging was not an unknown quarrying technique. The possibility of prehistoric quarrying of sarsens from superficial deposits trapped in solution features has been proposed for both the Salisbury Plain and for Avebury (Field 2005, 91; Bowden *et al*. 2015, 41). Analogies for a prehistoric *chaîne opératoire*, and also specific considerations regarding deep excavations by hand, offered by the Buckinghamshire industry, are therefore valuable.

Both cutting and blasting sarsens involved clearing soil away from the boulders for the very different forces to work, but these techniques resulted in different surface remains. In compartment G of West Woods, for example, considerable quantities of shattered stone cover the cratered ground where ancillary specialist quarry features remain *in situ*. Although cutting sarsen also left quarry pits and debris, these hollows tend to be shallower and the waste material includes characteristic features such as wedge pit scars and abandoned part-cut stones. The sarsen cutters operated across the full extent of Wiltshire's sarsen quarry, but were breaking down boulders to make a suite of specific products. The signatures of these quarrying activities should differ markedly from the extraction pits of whole sarsens used to build, say, the chambers of West Wood's Barrow Copse long barrow.

CONCLUSION

This has been an introductory review, necessarily brief as both a work-in-progress and a starting point to research into a little-studied industry. Yet it shows, I hope, that there is considerable potential to improve knowledge and understanding of sarsen stone quarrying. A dialogue between different types of evidence is important, including between both new and archived archaeological data. It is exciting to think that it may be possible to identify prehistoric quarry pits, whilst always bearing in mind the *duree* of sarsen extraction. A multi-scalar approach is possible, from an overview that treats the whole sarsen distribution as the potential quarry, to detailed analysis of specific quarrying events. Prehistoric sarsen use, so long the Cinderella to exotic stone from more distant locations, can be better understood in the context of the assemblage that is the sarsen quarry.

ENDNOTES

[i] Society of Antiquaries of London, Wessex Sarsen Stone Survey, MS953/2/1/LGB2
[ii] Society of Antiquaries of London, Wessex Sarsen Stone Survey, MS953/3/2/1/Ih2
[iii] Society of Antiquaries of London, Wessex Sarsen Stone Survey, MS953/2/1/BRG3
[iv] Society of Antiquaries of London, Wessex Sarsen Stone Survey, MS953/4/1/SU18

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BIBLIOGRAPHY

Adams, J. 1870. Sarsens. *Transactions of the Newbury District Field Club,* 1**,** 104-109.

Amadio, L. 2011. *West Woods, Wiltshire: An Archaeological Survey*. Wiltshire Archaeological and Natural History Society Report. Devizes: Wiltshire Archaeological and Natural History Society.

Bowden, M., Soutar, S., Field, D. & Barber, M. 2015. *The Stonehenge Landscape. Analysing the Stonehenge World Heritage Site,* Swindon, Historic England.

Bowen, H. C. n.d. Sarsens. Notes. Historic England Archive SAO03 (unpublished archive collection).

Bowen, H. C. & Smith, I. F. 1977. Sarsen Stones in Wessex: the society's first investigations in the Evolution of the Landscape Project. *The Antiquaries Journal,* 57**,** 185-196.

Brentnall, H. C. 1946. Sarsens. *Wiltshire Archaeological and Natural History Magazine,* 51**,** 419-439.

Burtonwood, G. 1995. *Denner Hill Stone*. Halton: Buckinghamshire County Museum Archaeological Service.

Colt Hoare, R. 1819. *The Ancient History of Wiltshire.* London: Lackington, Hughes, Harding, Mavor, and Jones.

Crook, M. L. & Free, I. E. T. 2011. *Grey Wethers. The Free family in Marlborough and the Upper Kennet Valley c.1847-1998.* Privately published.

Daw, T. 29 October 2016. *The All Cannings Long Barrow.* Personal communciation to Whitaker, K.

De Luc, J. A. 1811. *Geological Travels. III. Travels in England.* London, F.C. and J. Rivington.

Dewey, H., Bromehead, C. E. N., Chatwin, C. P. & Dines, H. G. 1924. *The Geology of the Country around Dartford. Explanation of Sheet 271.* London: His Majesty's Stationery Office.

Ellis, G. A. & Jamison, C. 1925. Hughenden. In Page, W. (ed.) *The Victoria County History of the County of Buckingham,* 57-62. London: The St Catherine Press.

Everton, A. 1970s. *Fyfod Working Paper 31. Full Text of Flint Reports*. Archaeology Data Service.

Field, D. 2005. Some observations on perception, consolidation and change in a land of stones. In Brown, G., Field, D. & Mcomish, D. (eds.) *The Avebury Landscape.*

Aspects of the field archaeology of the Marlborough Downs, 87-94. Oxford: Oxbow Books.

Fowler, P. J. 1963. *ODII: polissoir: excavation plan and sections*. Archaeology Data Service.

Fowler, P. J. 2000. *Landscape Plotted and Pieced. Landscape History and Local Archaeology in Fyfield and Overton, Wiltshire.* London: The Society of Antiquaries of London.

Free, D. W. 1948. Sarsen stones and their origin. *Wiltshire Archaeological and Natural History Magazine,* 52**,** 338-344.

Free, D. W. 1950. *Marlborough and District: An Original Peep Into the Past.* Marlborough.

Geddes, I. 2000. *Hidden Depths. Wiltshire's Geology and Landscapes.* Trowbridge, Ex Libris Press.

Gillings, M. & Pollard, J. 2016. Making Megaliths: Shifting and Unstable Stones in the Neolithic of the Avebury Landscape. *Cambridge Archaeological Journal,* 26**,** 1-23.

Goddard, E. H. 1926. Modern use of sarsens as tombstones. *Wiltshire Archaeological and Natural History Magazine,* 43**,** 335.

Historic England 1955. *Church of St John the Evangelist* [Online]. Historic England. Available: https://www.historicengland.org.uk/listing/the-list/list-entry/1125865 [Accessed 1 May 2017].

Historic England 1974. *Denner Hill Farmhouse* [Online]. Historic England. Available: https://www.historicengland.org.uk/listing/the-list/list-entry/1160234 [Accessed 1 May 2017].

Historic England 1984. *Ashdown House* [Online]. Historic England. Available: https://www.historicengland.org.uk/listing/the-list/list-entry/1000502 [Accessed 30 April 2017].

Historic England 1985. *Pair of Barns Adjoining to West of Denner Hill Farmhouse* [Online]. Historic England. Available: https://www.historicengland.org.uk/listing/the-list/list-entry/1332051 [Accessed 1 May 2017].

Johnston, R. 1995. *Fyfod Working Paper 31a. Summary and Interpretation of Flint Reports*. Archaeology Data Service.

King, N. E. 1968. The Kennet Valley Sarsen Industry. *Wiltshire Archaeological and Natural History Magazine,* 63**,** 83-93.

Lysons, D. & Lysons, S. 1806. *Magna Britannia; Being a Concise Topographical Account of the Several Counties of Great Britain. Berkshire.* London: Cadell and Davies.

Morley Davies, A. & Baines, A. H. J. 1953. A preliminary survey of the sarsen and puddingstone blocks of the Chilterns. *Proceedings of the Geologists' Association,* 64**,** 1-9.

Nash, D. J., Coulson, S., Staurset, S., Ullyot, J. S., Babutsi, M., Hopkinson, L. & Smith, M. P. 2013. Provenancing of silcrete raw materials indicates long-distance transport to Tsodilo Hills, Botswana, during the Middle Stone Age. *Journal of Human Evolution,* 64**,** 280-8.

Nash, D. J. & Ullyott, J. S. 2007. Silcrete. In Nash, D. J. & Mclaren, S. J. (eds.) *Geochemical Sediments and Landscapes,* 95-143. Oxford: Blackwell Publishing.

Osborne White, H. J. 1907. *The Geology of the Country around Hungerford and Newbury: explanation of Sheet 267.* London: His Majesty's Stationery Office.

Osborne White, H. J. 1912. *The Geology of the country around Winchester and Stockbridge: explanation of Sheet 299.* London: His Majesty's Stationery Office.

Prestwich, J. 1854. On the Structure of the Strata between the London Clay and the Chalk in the London and Hampshire Tertiary Systems. Part II: the Woolwich and Reading Series. *Quarterly Journal of the Geological Society,* 10**,** 75-138.

Sabin, D. 2 December 2016. *Discussion concerning sarsen stone in north Wiltshire.* Personal communicaiton to Whitaker, K.

Samuel, R. 1977. Mineral Workers. In Samuel, R. (ed.) *Miners, Quarrymen and Saltworkers.* London: Routledge and Keegan Paul.

Sherlock, R. L. 1922. *The Geology of the Country around Aylesbury and Hemel Hempstead: explanation of Sheet 238.* London: His Majesty's Stationery Office.

Sherlock, R. L. & Noble, A. H. 1912. On the Glacial Origin of the Clay-with-Flints of Buckinghamshire and on a former course of the Thames. *Quarterly Journal of the Geological Society,* 68**,** 199-208.

Sherlock, R. L. & Noble, A. H. 1922. *The Geology of the Country around Beaconsfield: explanation of Sheet 255.* London: His Majesty's Stationery Office.

Soames, M. 1987. *The Profligate Duke. George Spencer-Churchill, fifth Duke of Marlborough, and his Duchess.* London, Collins.

Society Of Antiquaries Of London 1975. *Sarsen Symposium. Evolution of the Landscape Project: News Sheet No. 2* (10 May 1975). Society of Antiquaries of London MS953 (unpublished archive collection).

Spicer, E. C. 1905. Sarsen-Stones in a Claypit. *Quarterly Journal of the Geological Society,* 61**,** 39-41.

Summerfield, M. A. & Goudie, A. S. 1980. The sarsens of southern England: their palaeoenvironmental interpretation with reference to other silcretes. In Jones, D. K. C. (ed.) *The Shaping of Southern England,* 71-100. London: Academic Press.

Ullyott, J. S. & Nash, D. J. 2006. Micromorphology and geochemistry of groundwater silcretes in the eastern South Downs, UK. *Sedimentology,* 53**,** 387-412.

Ullyott, J. S. & Nash, D. J. 2016. Distinguishing pedogenic and non-pedogenic silcretes in the landscape and geological record. *Proceedings of the Geologists' Association,* 127**,** 311-19.

Ullyott, J. S., Nash, D. J., Whiteman, C. A. & Mortimore, R. N. 2004. Distribution, petrology and mode of development of silcretes (sarsens and puddingstones) on the eastern South Downs, UK. *Earth Surface Processes and Landforms,* 29**,** 1509-1539.

Williams, M. 27 February 2017. *Breaking Rocks.* Personal communicaiton to Whitaker, K.

FIGURES

Figure 1 Location map. Southern England including the chalk outcrop with, inset, places in north Wiltshire named in the text.

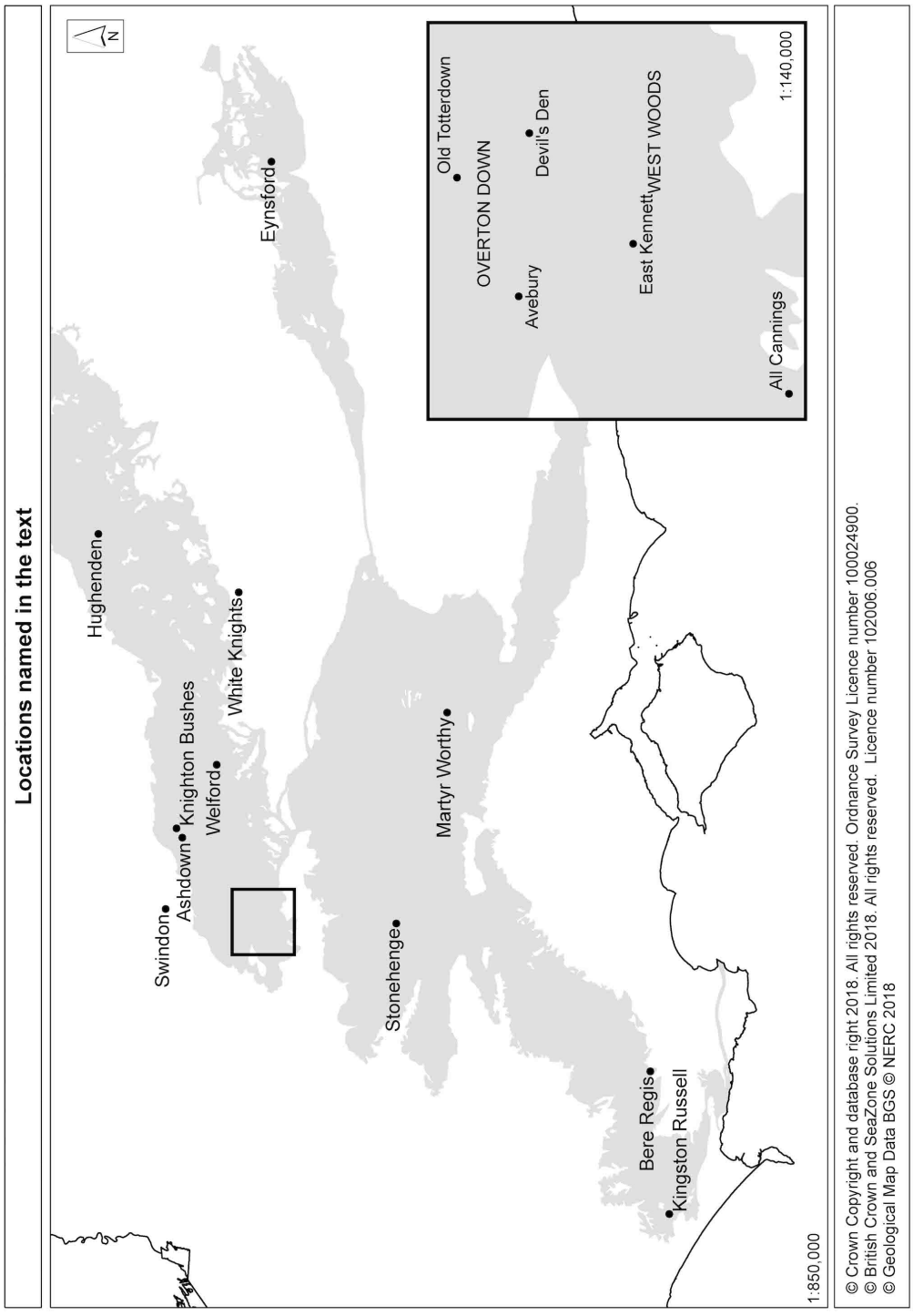

Figure 2 The churchyard wall, Fyfield (Wiltshire), constructed from cut blocks of saccharoid sarsen, capped with quartzitic sarsen nodules (© author).

Figure 3 Ashdown Park's eastern avenue was cleared of sarsens, whilst the boulders remain scattered in the semi-wooded area and in the sarsen spread between the ha-ha and the road (© author).

Figure 4 Sarsen quarrying at Denner Hill, Buckinghamshire, *c.*1907 (© Buckinghamshire County Council, HG33).

Figure 5 A cut and abandoned sarsen, Hursley Bottom, West Woods (Wiltshire) (© author).

Figure 6 Sarsen extraction pits in the area of West Woods (Wiltshire), cleared with explosives during the 1920s (© author).