

GEOARCHAEOLOGY OF PUDDINGSTONE IN HERTFORDSHIRE AND DORSET



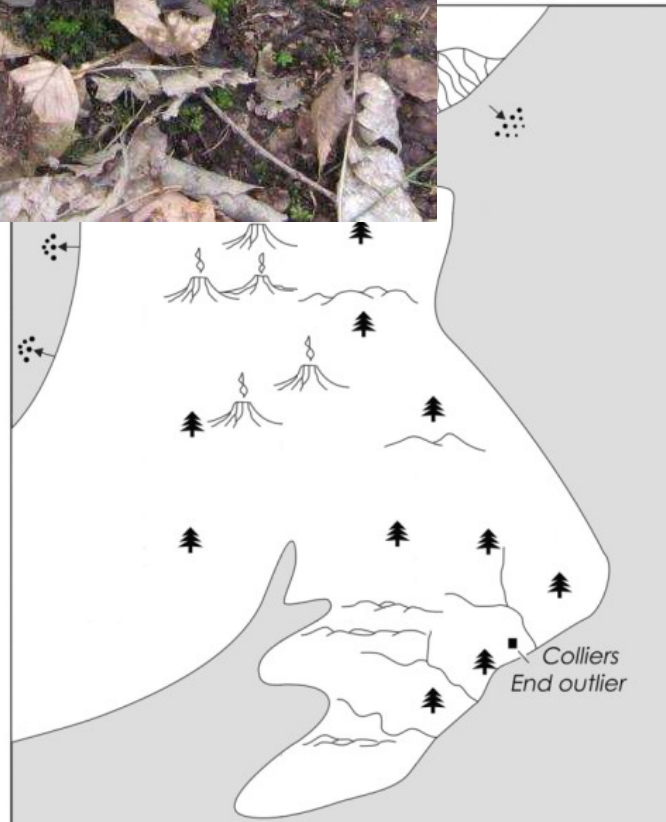
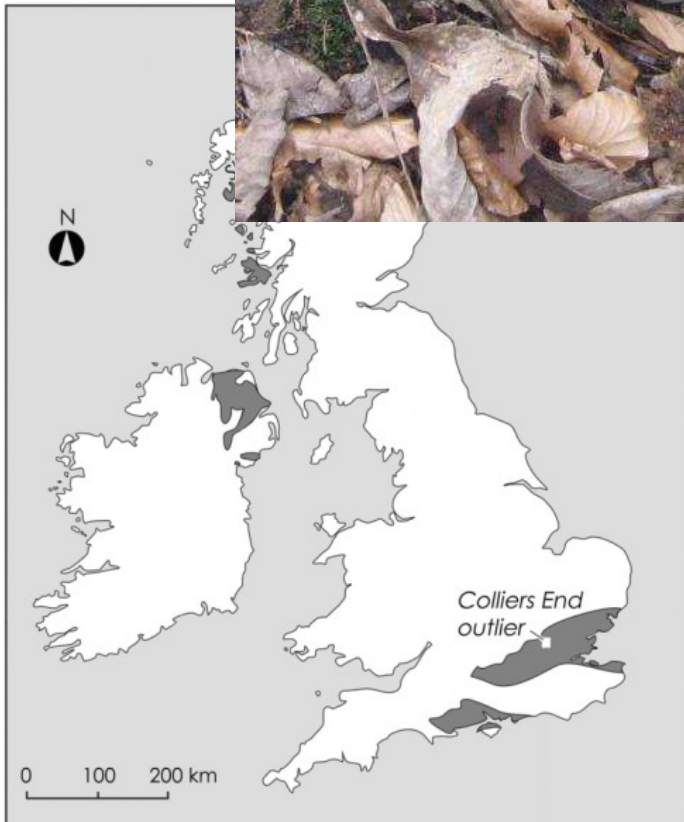
A GEOARCHAEOLOGICAL STUDY OF A ROMANO-BRITISH QUARRY

Mervyn Jones



WHAT IS PUDDINGSTONE?

- Silcrete concretions
- Pebble beach around the London basin silicified to form Puddingstone
- Sarsen in the sub-soil of the chalk uplands and used to build Stonehenge
- Sediments cemented by silica in very hot humid conditions 56 mya





IN SITU HPS

- Very rare!
- Assisted by Mr Brock
- In the face of a Chalk Pit
- Beneath pebbly sarsen and yellow sands



Side



Bottom



Side



Top

Scale=50cm



LITHOLOGY

- “Chris” the concretion
- Too small to make a quern blank
- Left at surface of pit
- Rubified exterior
- Cut and polished for microscopic analysis
- Stratification within the conglomerate
- Matrix of sarsen



LITHOLOGY

- Its been through a lot
- Rubification
- Shattering and recementing



LITHOLOGY

- Associated with pebbly sarsen
- Immediately overlying the HPS
- Suggests pebble bank overlain by sand before lithification
- Source of matrix



GEOARCHAEOLOGY – WASSAT?

- What can Geology and geomorphology contribute to Archaeological investigation?
- My rockery - every piece broken off a concretion by a Roman slave;
- For the production of querns.



WHERE IS THE BOUNDARY?

- HPS collection from a 2mx2Mx0.6m trench
- Boundary between Archaeology and Geology;
- Literally &
- Metaphorically



A GEOARCHAEOLOGICAL STUDY OF A ROMANO-BRITISH PUDDINGSTONE QUARRY

- Great Gaddesden, Hertfordshire
- Outliers of the Chilterns
- Above the valley of the River Gade
- Gaddesden Estate – seat of the Halsey family since the 1530s



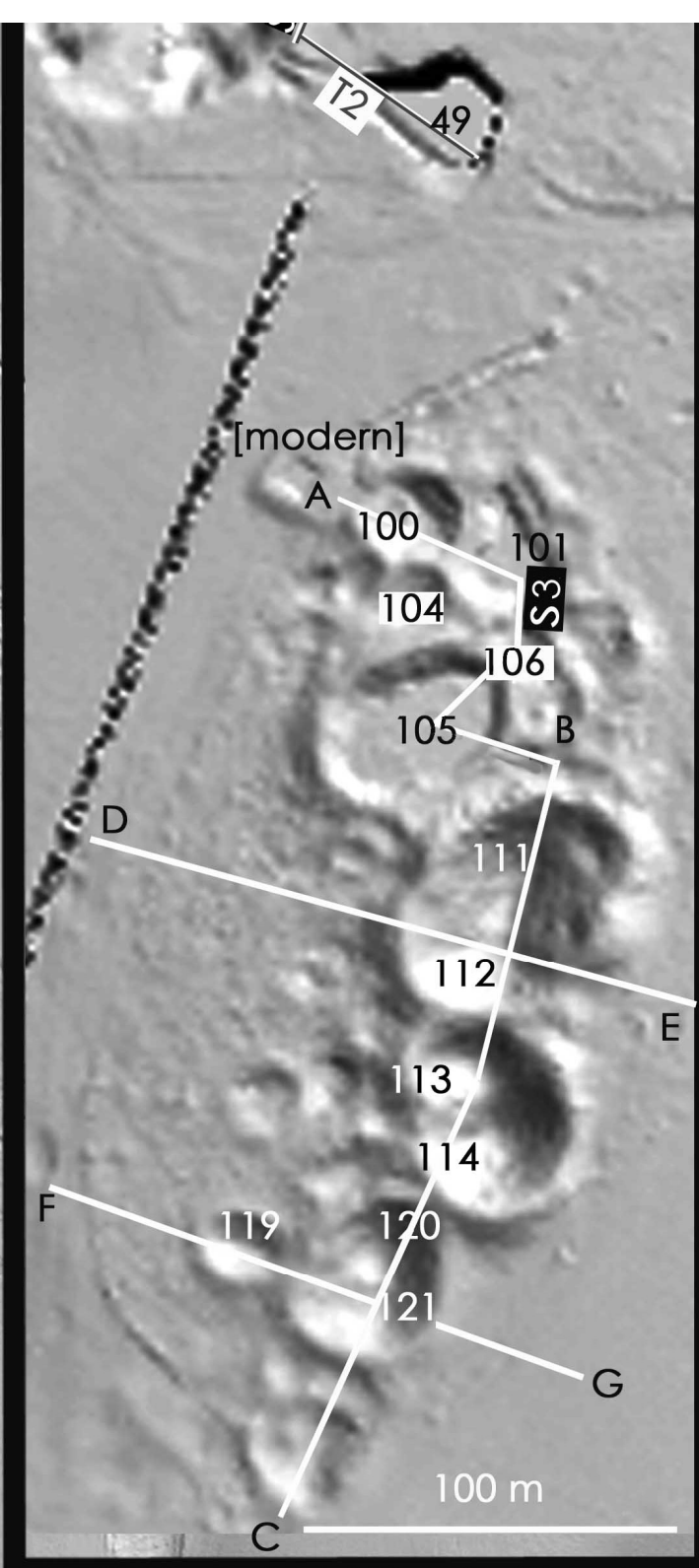
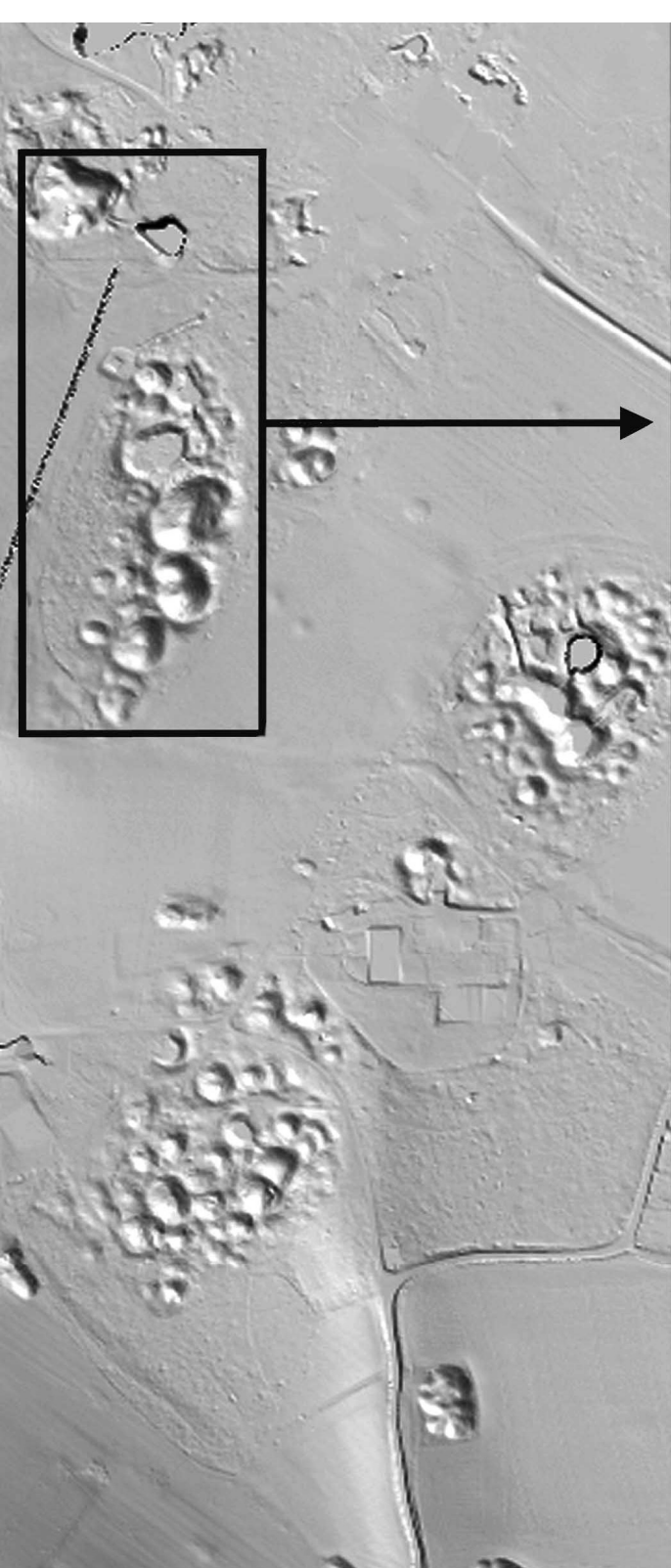
WHY LOOK HERE?

- 2014 GA Seminar on Puddingstones and silcretes
- Special PGA Vol127 July 2016
- Gade River bed
- Great Gaddesden Church
- Mr Halsey's vegetable garden
- Oops!



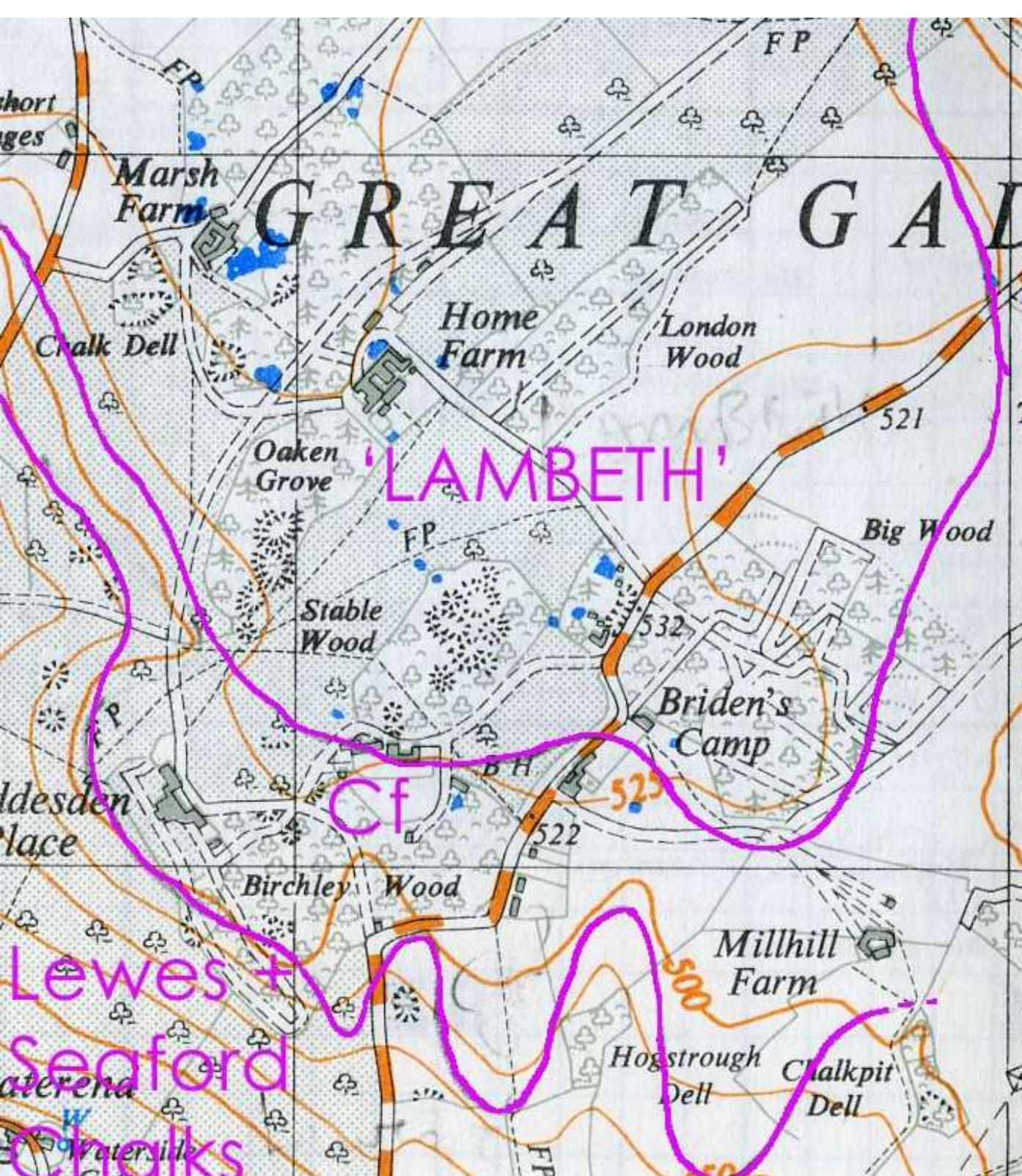
METHODOLOGY

- Lidar Survey
- Historical research
- Field Survey
- Geophysical survey
- Trenching
- Coring
- Sedimentological analysis
- Metrical analysis of debitage
- Dating



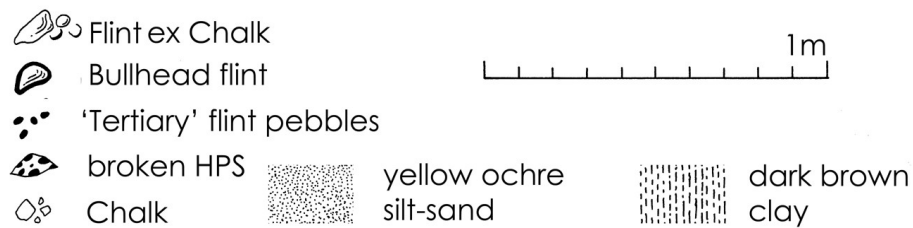
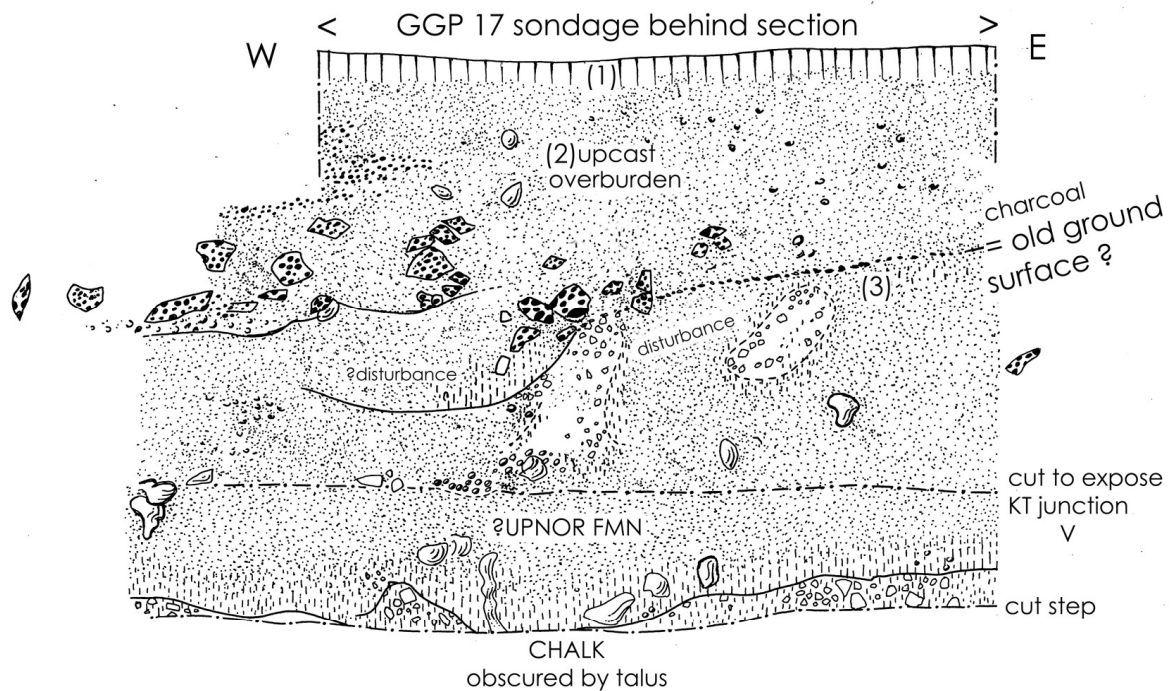
**75,000M2 OF
DISTURBED
GROUND,
40,000 M³ OF
UPCAST**

- Pits
- Upcast rims



GEOLOGY

- Tertiary outlier – mostly Eocene
- Feather edge - sands and gravels of (?) Paleocene Upnor formation
- Puddingstone horizon
- Unconformably overlying chalk
- Dells = chalk pits
- But full of sand, brickearth and Puddingstone



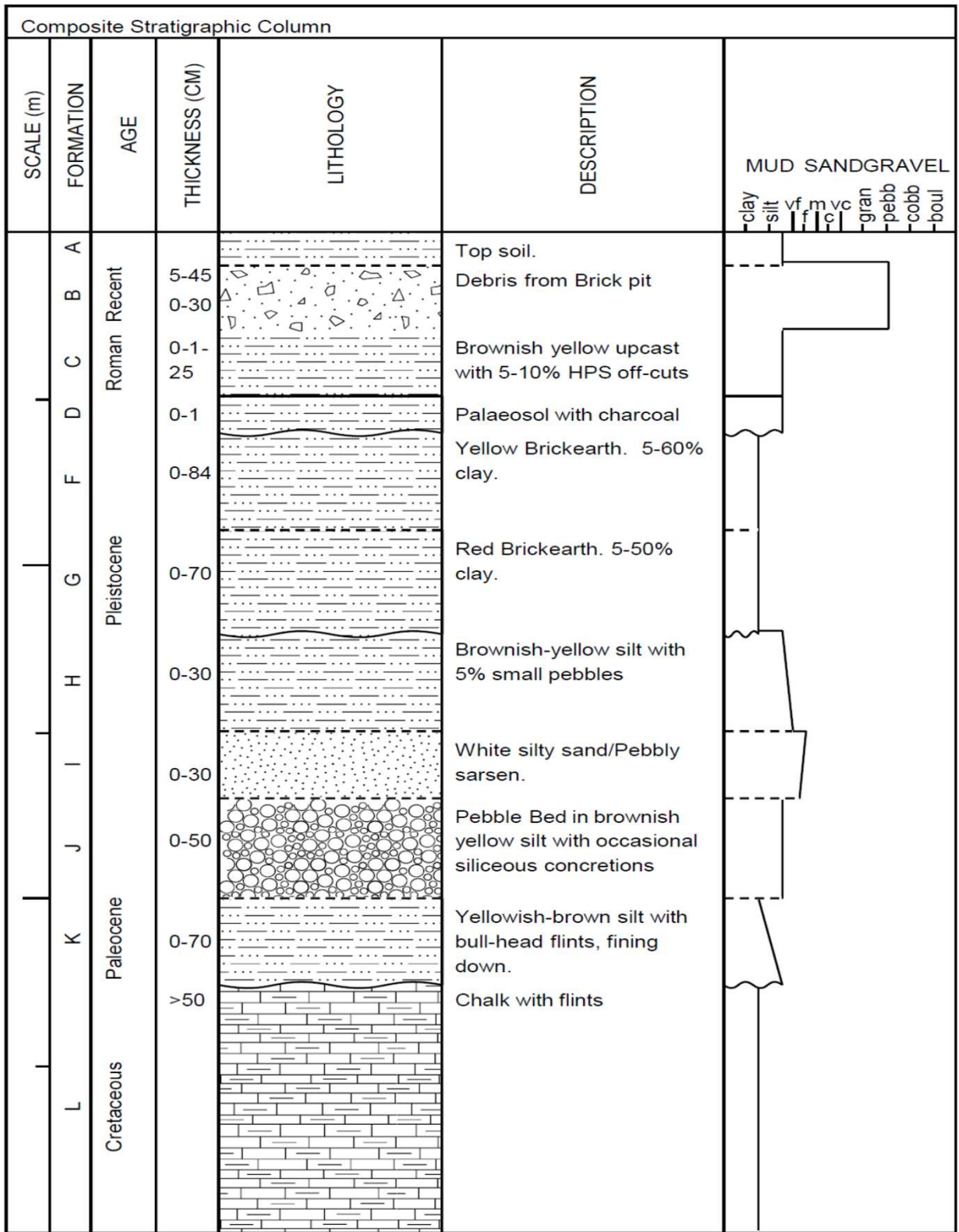
STRATIGRAPHY

- Pieced together
- Sampling quarry face
- Stratigraphy
- Palaeosurface
- Sedimentology
- Laser granulometry



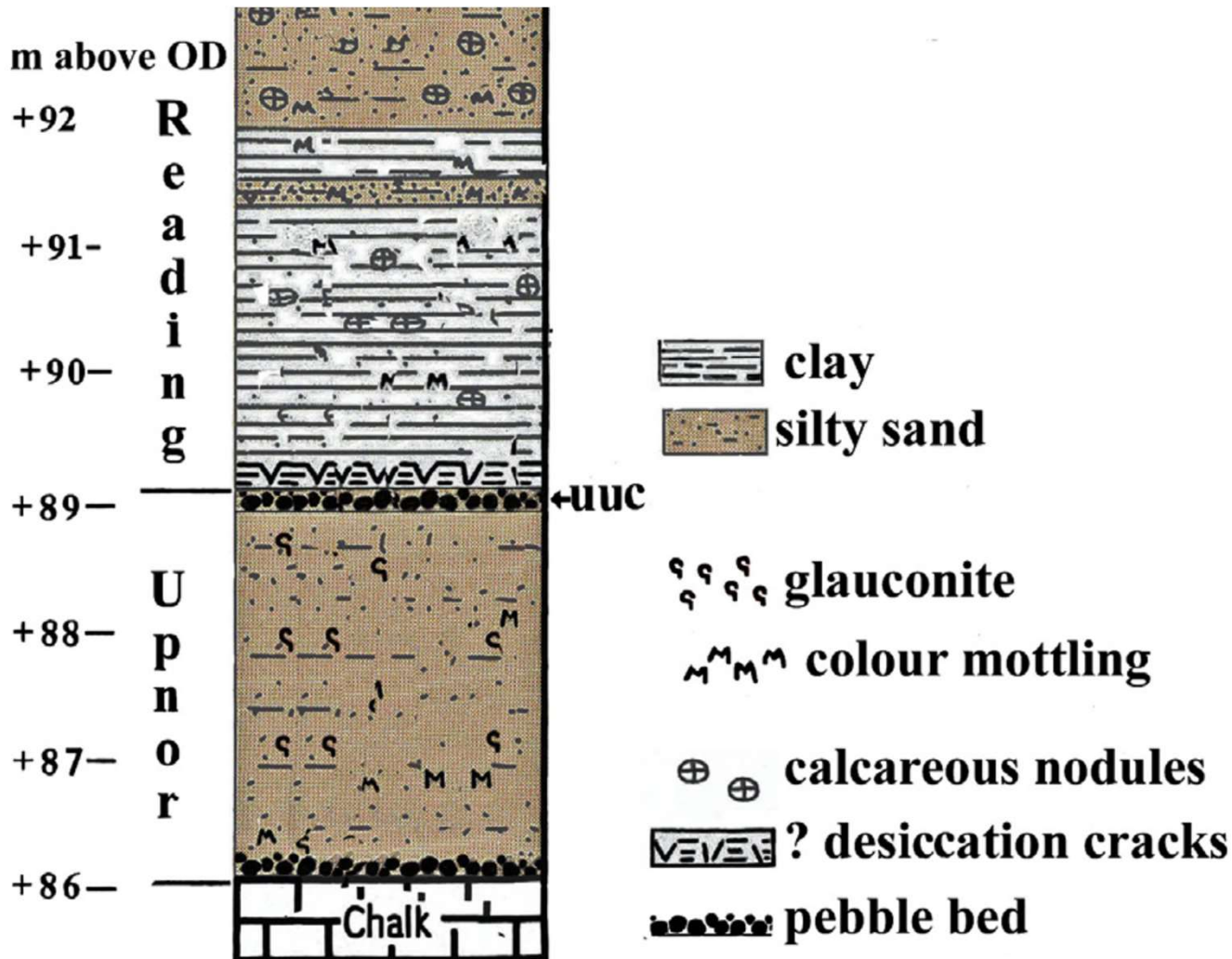
ARCHAEOLOGY

- Coring in transects
- Stratigraphy
- Sedimentology
- Laser granulometry



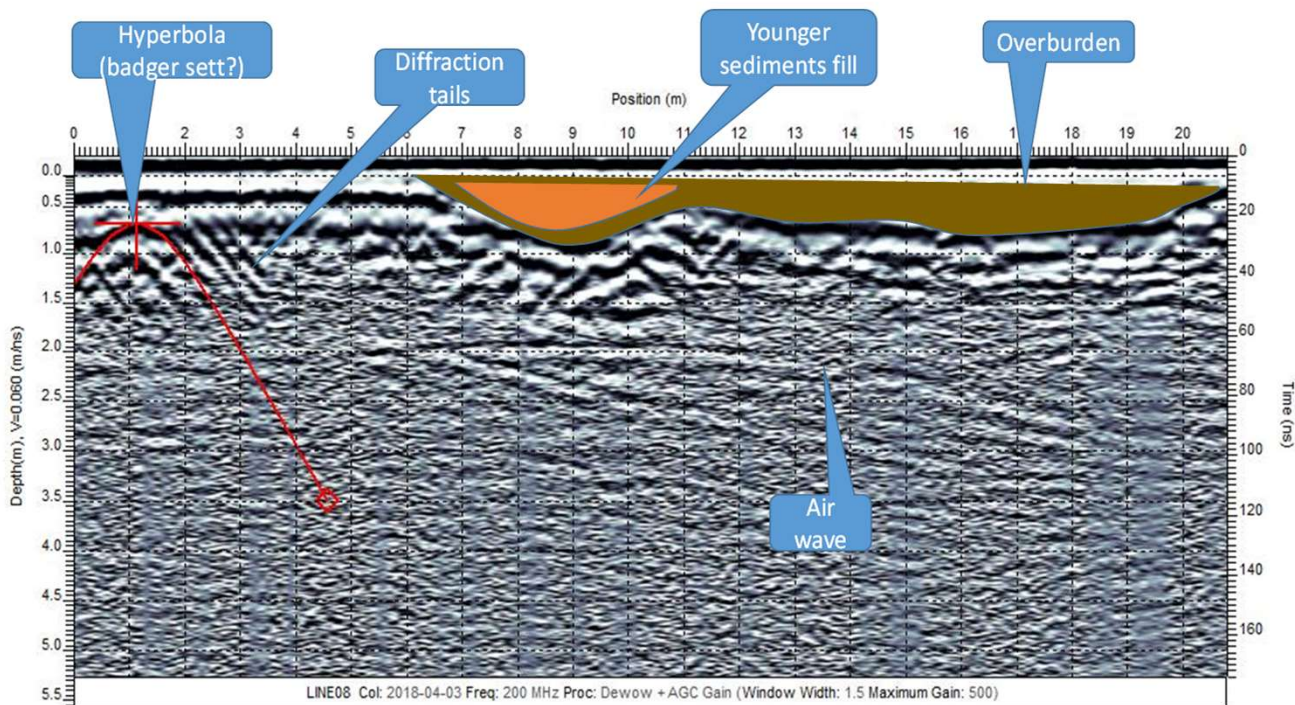
STRATIGRAPHY

- Indicative stratigraphic column
- 2m of silty sand and conglomerates between chalk and either Eocene Reading beds or Pleistocene brickearths



STRATIGRAPHY

- Lower part of Dowsett's Farm borehole log adapted from Hopson et al. (1996) (Tubb 2016, 321).
- Note the glauconite, characteristic of marine deposits



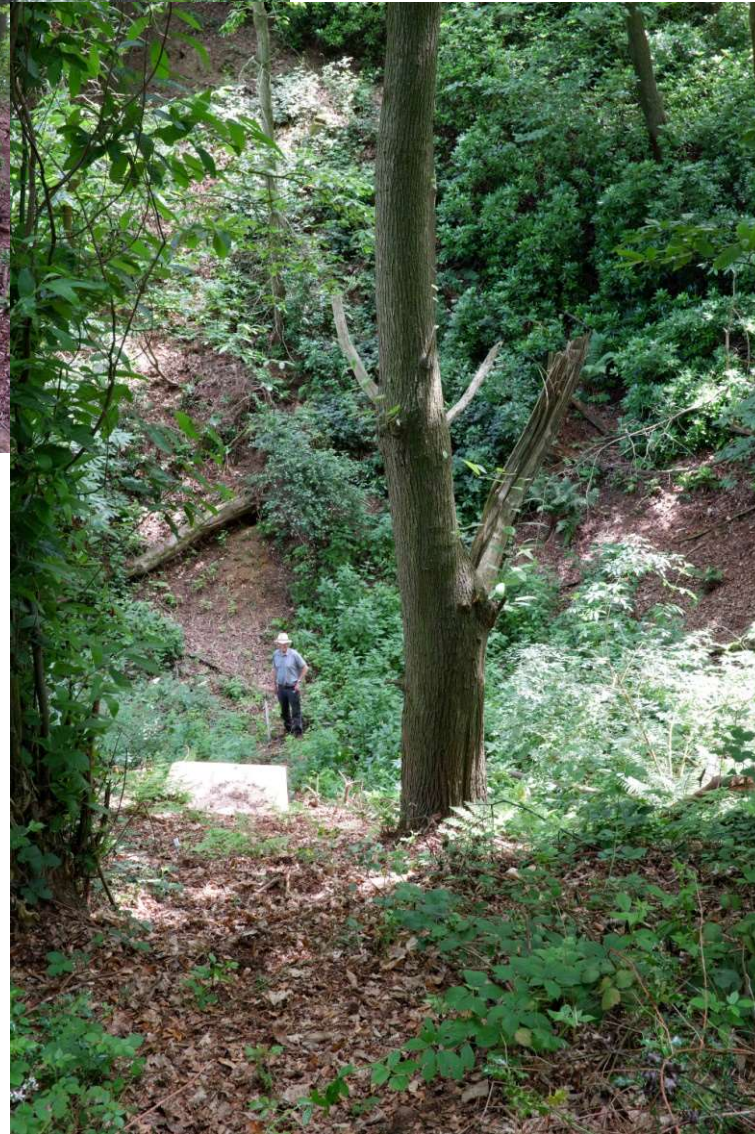
GEOPHYSICS

- Note the successive humanly produced horizons
- Upcast
- Brickmaking debris



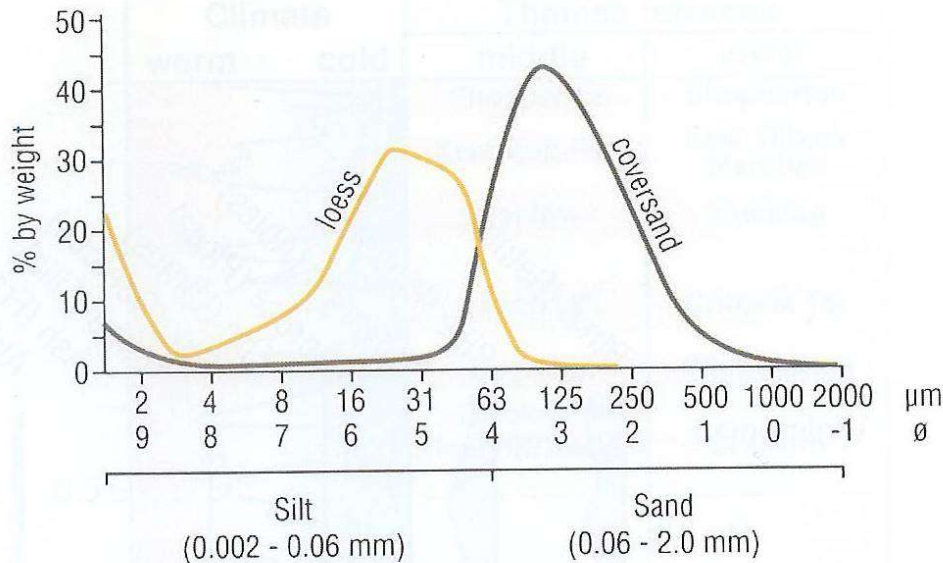
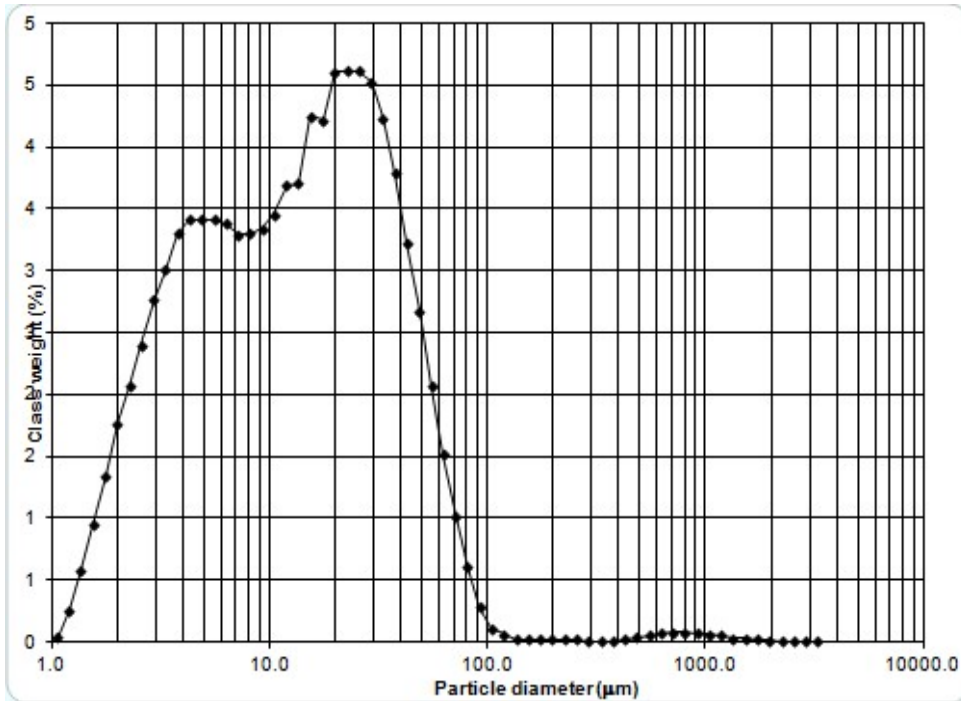
GEOMORPHOLOGY

- Enigmatic
- 50 dry pits in area of study
- With high rims
- 8 filled with water and/or sediment
- Hypotheses:
- Glaciofluvial solution features (dolines)
- Or linear channel eroded in Chalk
- Humanly excavated



GEOMORPHOLOGY

- They are big – 40mX20m
- The banks may be the biggest Roman earthworks in Hertfordshire



DOLINE FILLS

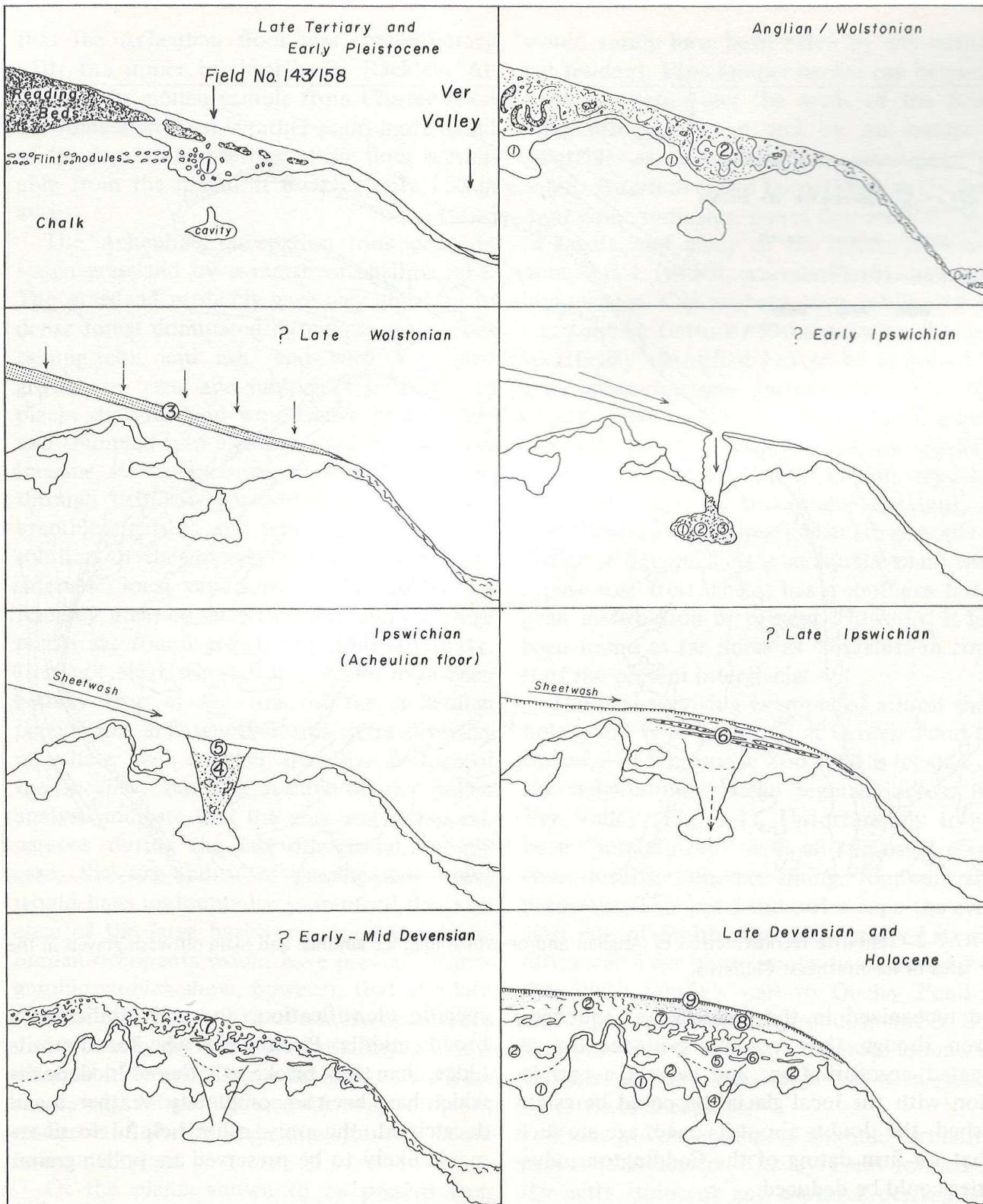
- Coring sides of dry dolines –
- 2m of silty clay
- Likely illuvial clays
- Coring filled doline –
- Particle distribution compared with
- Catt 2010, 123
- Likely loess from the Wolstonian



Ice sheet

GEOMORPHOLOGY

- Edge of the Anglian Ice Sheet
- Intense periglacial activity
- And the first humans



GEOMORPHOLOGY

- Tentative reconstruction of the development of late Tertiary and Pleistocene deposits on the northeast Chilterns (Catt 1978, 141).
- Gelifluction and Solifluction filled dolines and valleys
- Pingos in the Gade
- Human activity

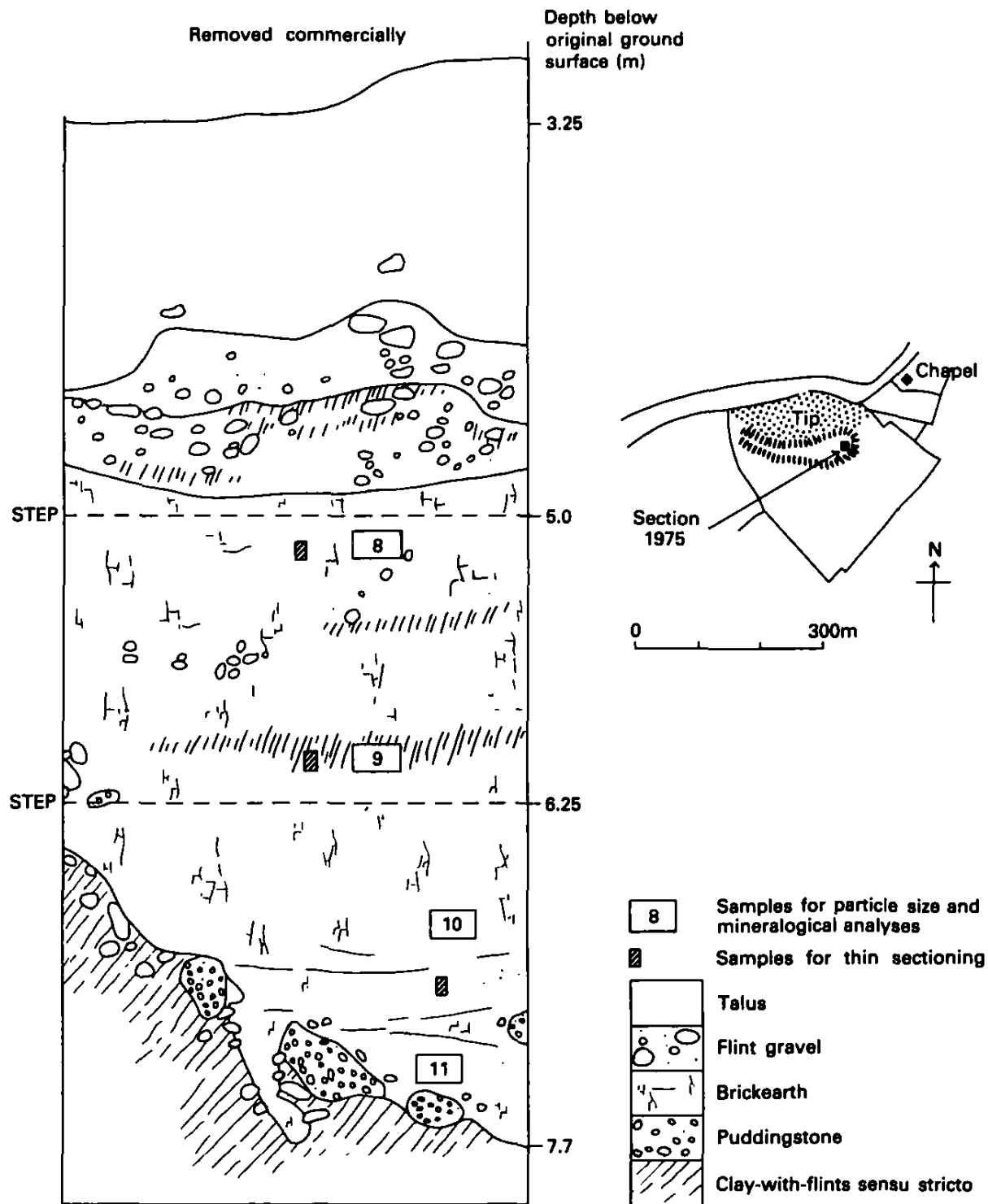


Sarsens in Clay-with-flints, Walter's Ash

From an old photograph by courtesy of Messrs. T. Bristow and Bros.

GEOMORPHOLOGY

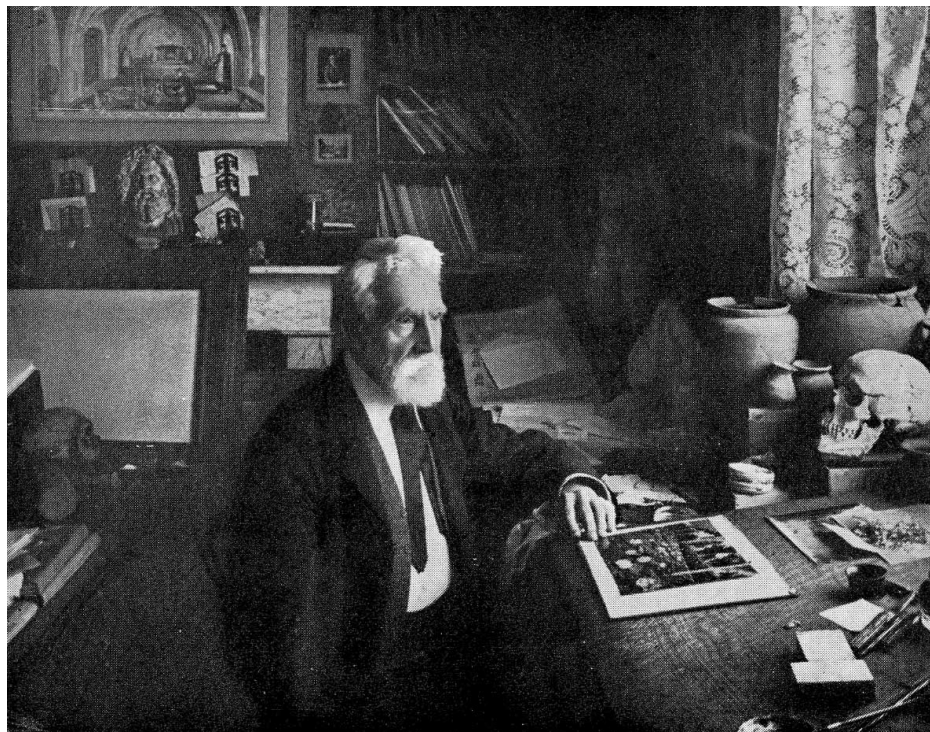
- Historical evidence
- Chiltern sarsen quarries
- Doline fills



GEOMORPHOLOGY

- Gaddesden Row 1Km North
- Doline repeatedly excavated
- Full of brickearth – loess and cover sand
- Flints and Puddingstone
- Fill of Wolstonian Age?
- MIS7 Aveley Interglacial 243kya

Fig. 3: Section at Butterfield's Pit, Gaddesden Row in 1975, showing location of analysed samples 8-11 (based on drawings by I. I. Wymer)



Worthington George Smith in his study.



FIG. 37.

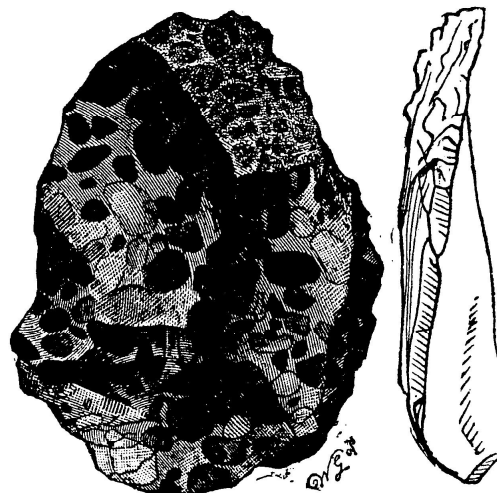
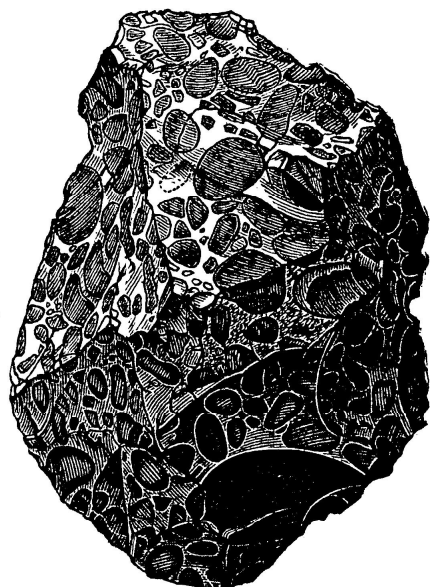
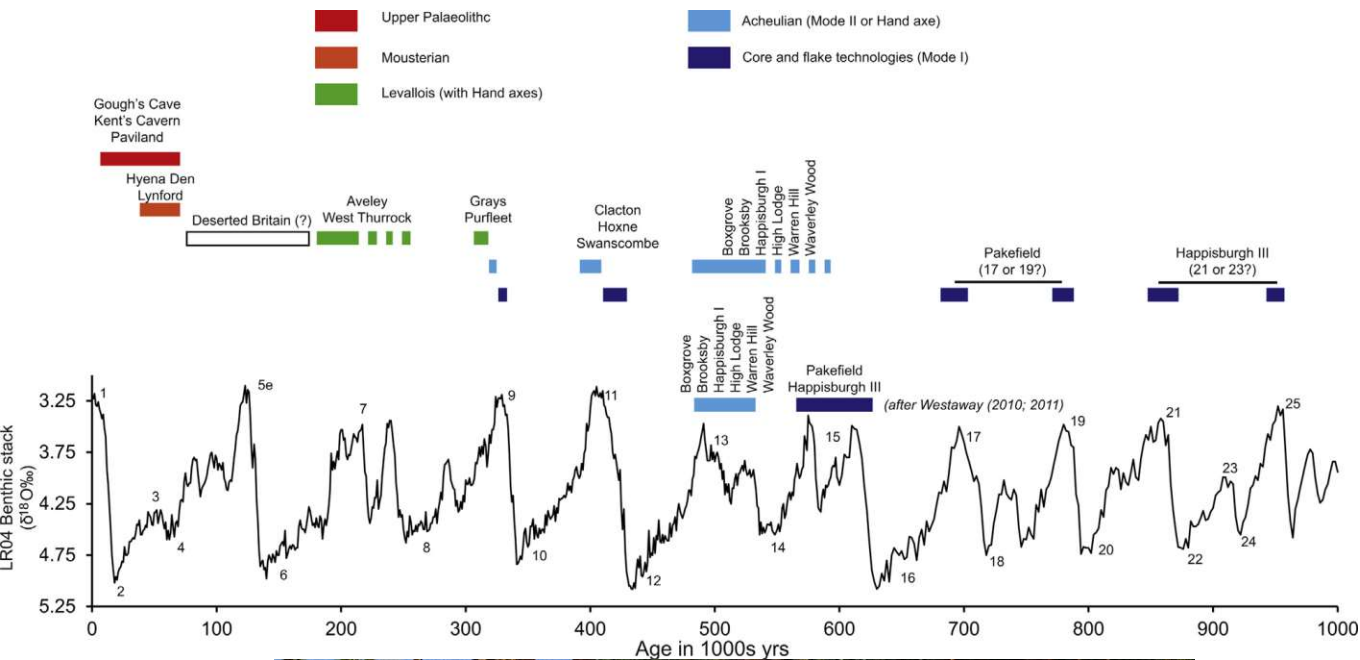


FIG. 38.

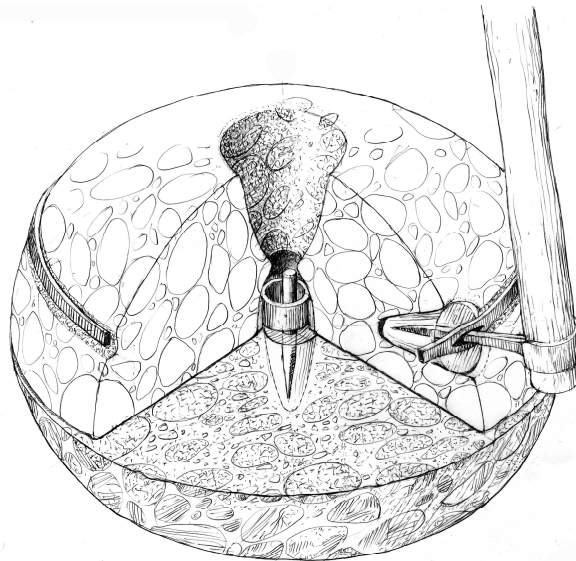
ARCHAEOLOGY

- Literature Review
- Gaddesden Row Palaeolithic site
- Worthington Smith
- Flint spreads and bi-face hand axes around the doline
- Less convincing evidence of use of Puddingstone – an alternative explanation?



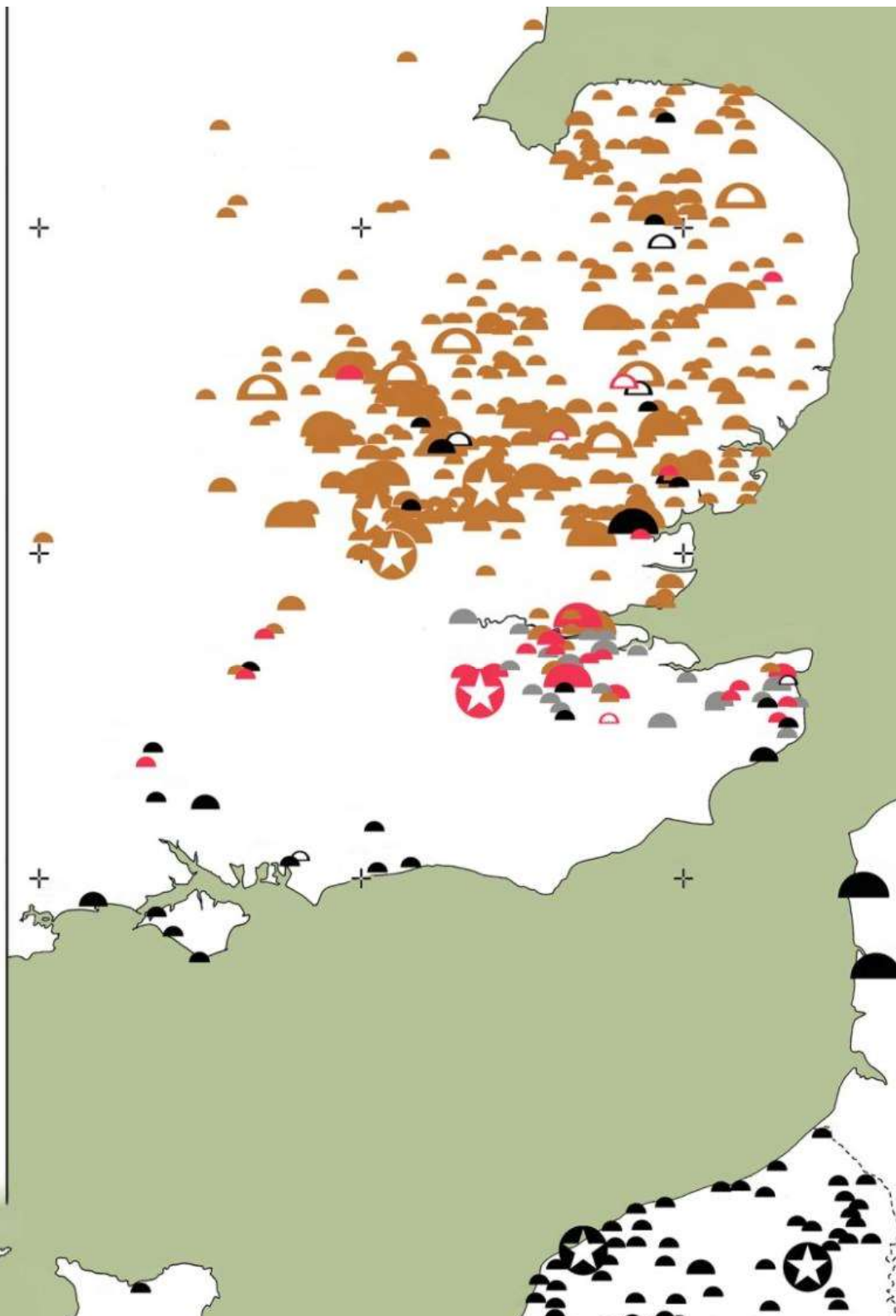
GEOMORPHOLOGY

- Fill of Wolstonian Age?
- MIS7 Aveley Interglacial 243kya
- Levallois hand axes
- Neanderthal camp in Hertfordshire
- Could we find another one?



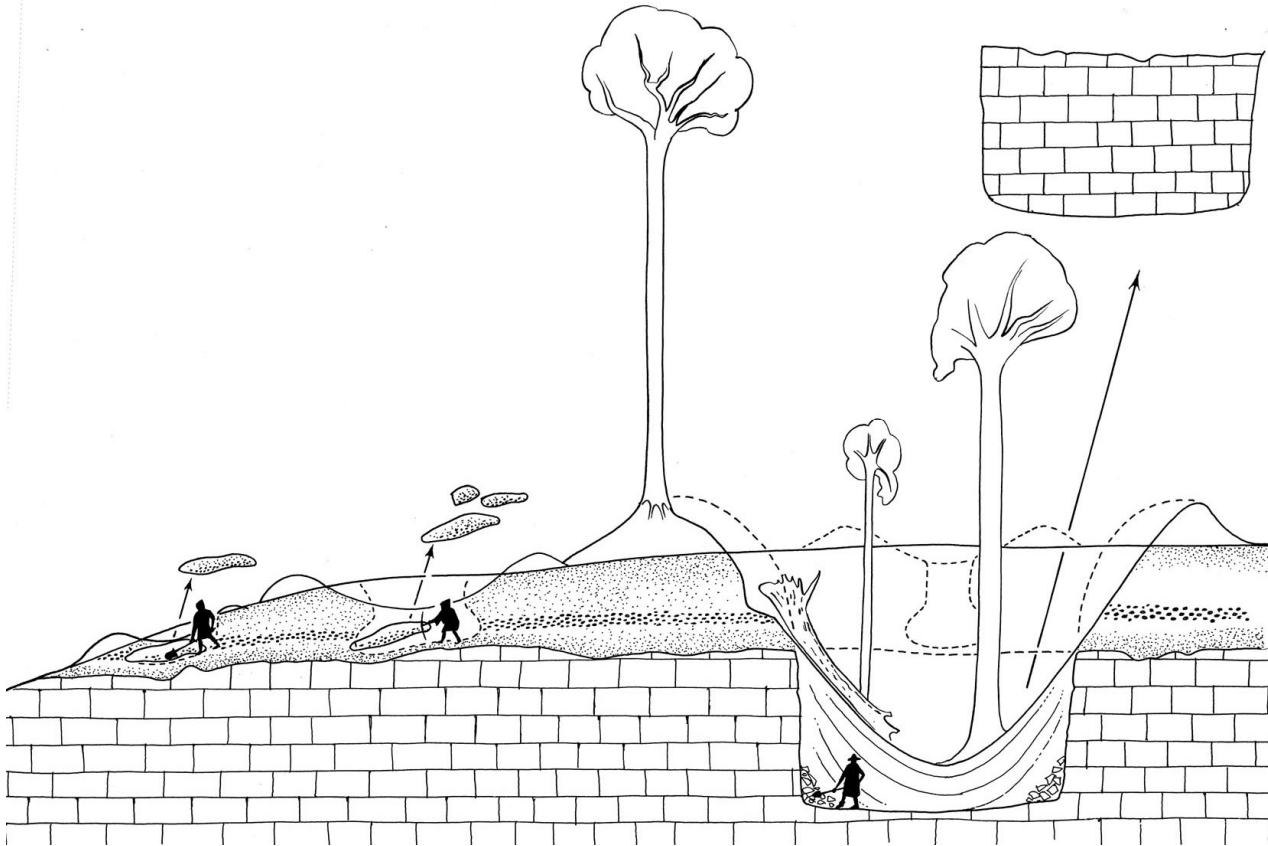
ARCHAEOLOGY

- Cultural uses
- Breeder Stones
- Buildings
- **Querns**
- Used to prepare flour for bread
- Every home must have one!



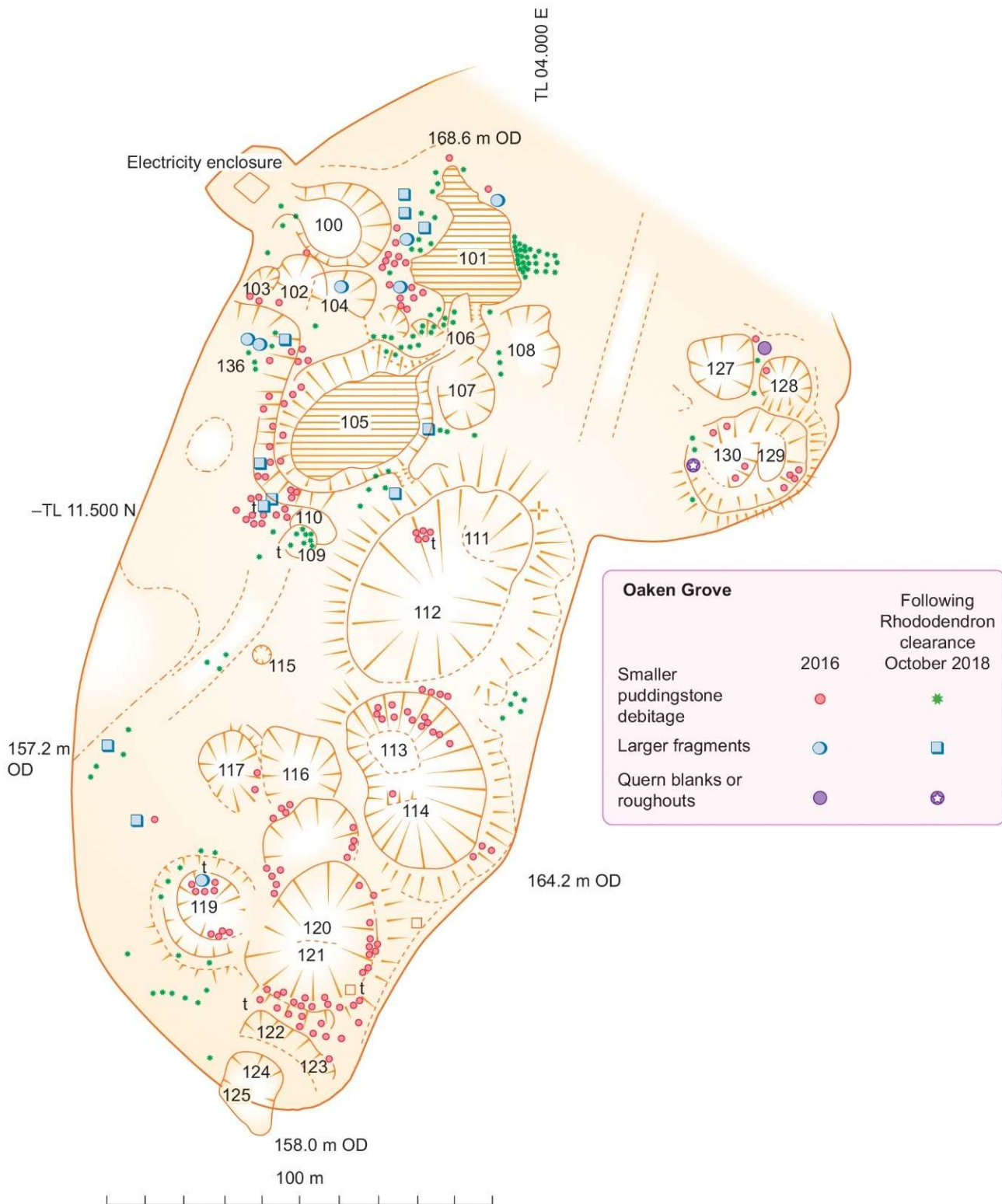
DISTRIBUTION OF QUERNS

- Regularly turn up in excavations of Roman sites
- 750 catalogued examples
- Major trade good in Brittania
- Supplanted by millstones c 150AD
- Source unknown – until now



ARCHAEOLOGY

- Roman quarries are very rare
- Often over-deepened eg by Victorians for chalk and brickearth
- Opportunity to explore: -
- Scale and intensity?
- Quarrying techniques employed?



ARCHAEOLOGY

- Field Survey
- Debitage spreads
- Abandoned blocks
- Quern rough



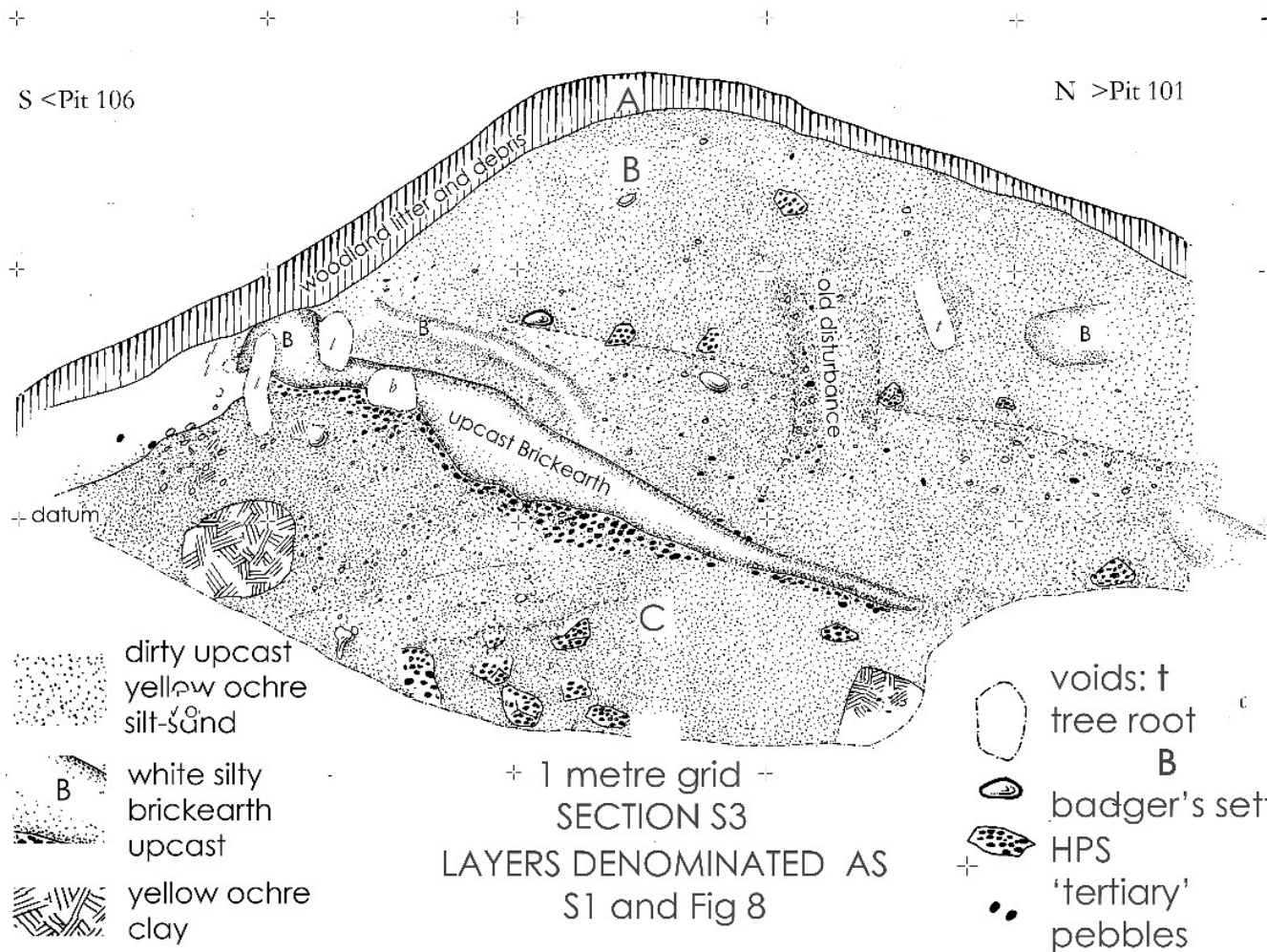
ARCHAEOLOGY

- Huge quantities of debitage
- Only one quern rough found at edge of Pit 127



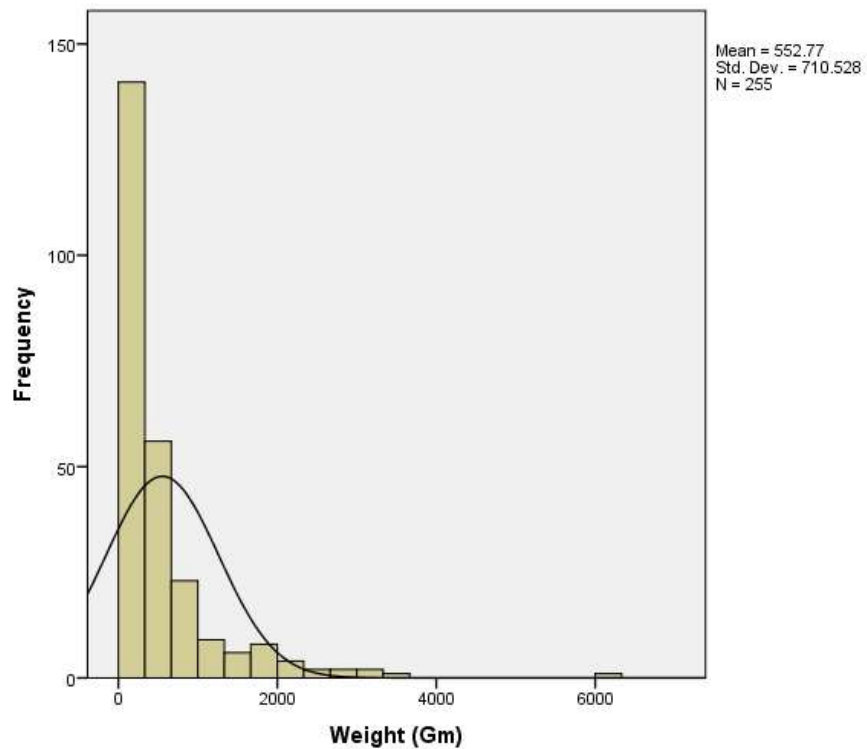
ARCHAEOLOGY

- Trenching through upcast



ARCHAEOLOGY

- Section through upcast bank in Oaken Grove
- Multiple phases of quarrying
- Initially, excavating near surface concretions
- Then digging out dolines



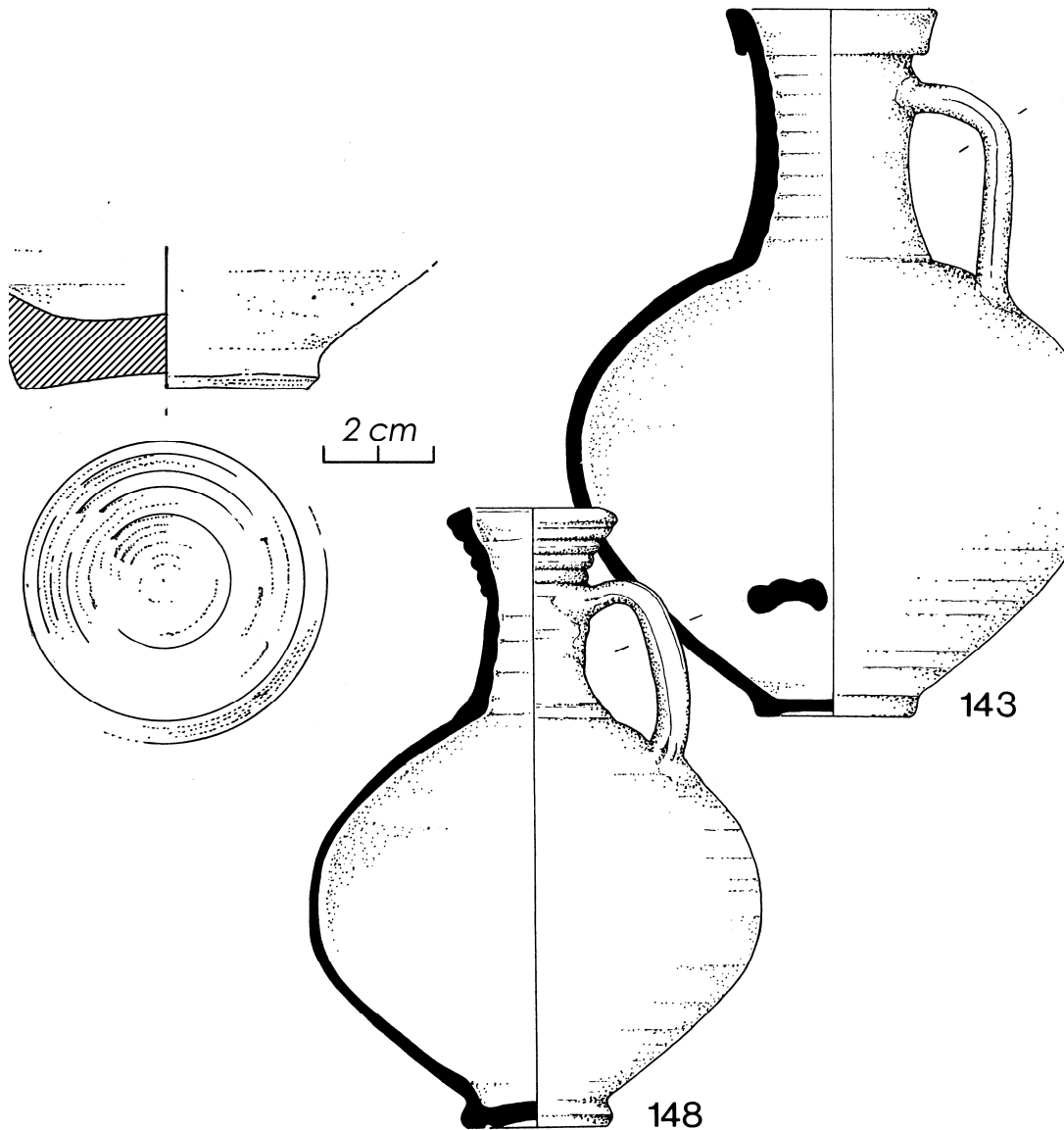
ARCHAEOLOGY

- Quarrying was accompanied by first stage shaping of blanks prior to manufacture of querns offsite.
- Debitage from removal of cortex
- Distribution of weights of HPS debitage, with normal distribution for comparison



ARCHAEOLOGY

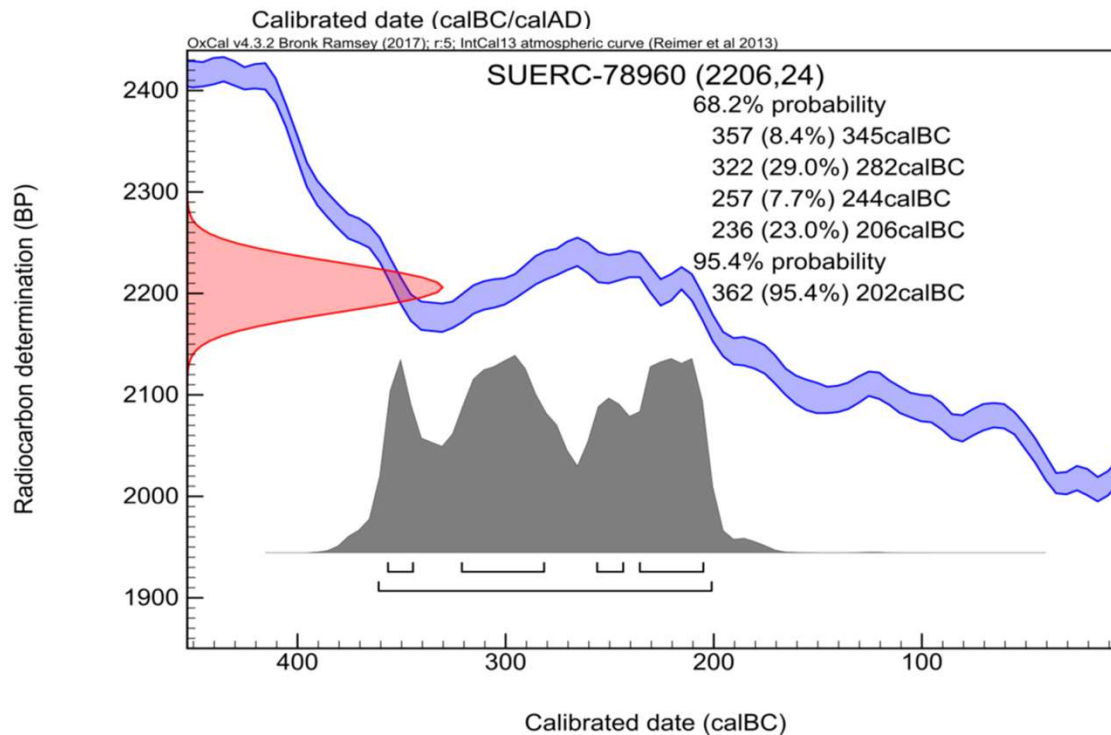
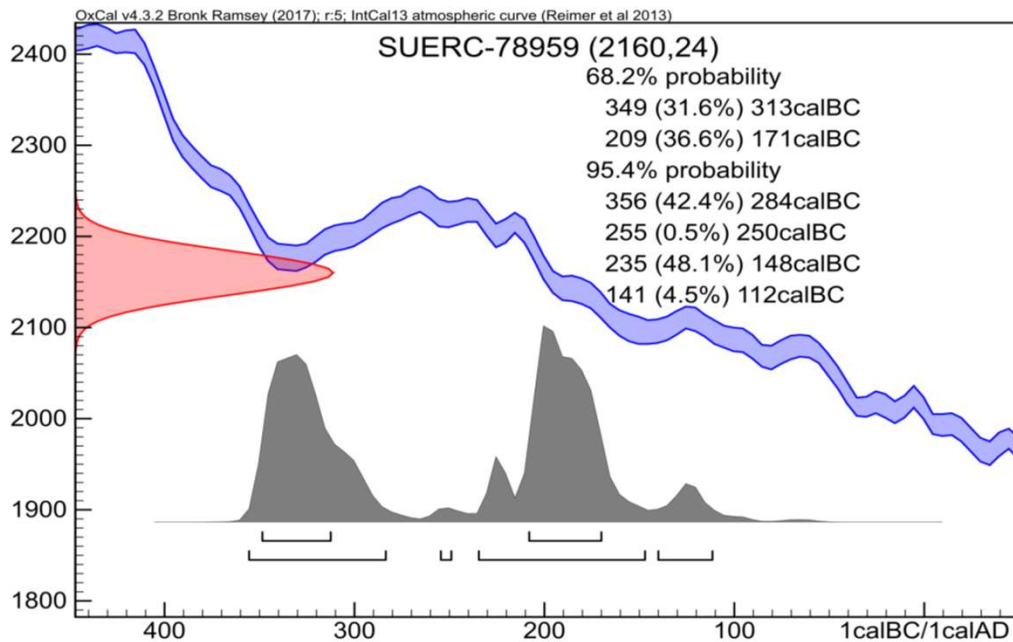
- Roughed –out blocks
- Identifiable wedge marks
- Blanks for creating querns



CHRONOLOGY

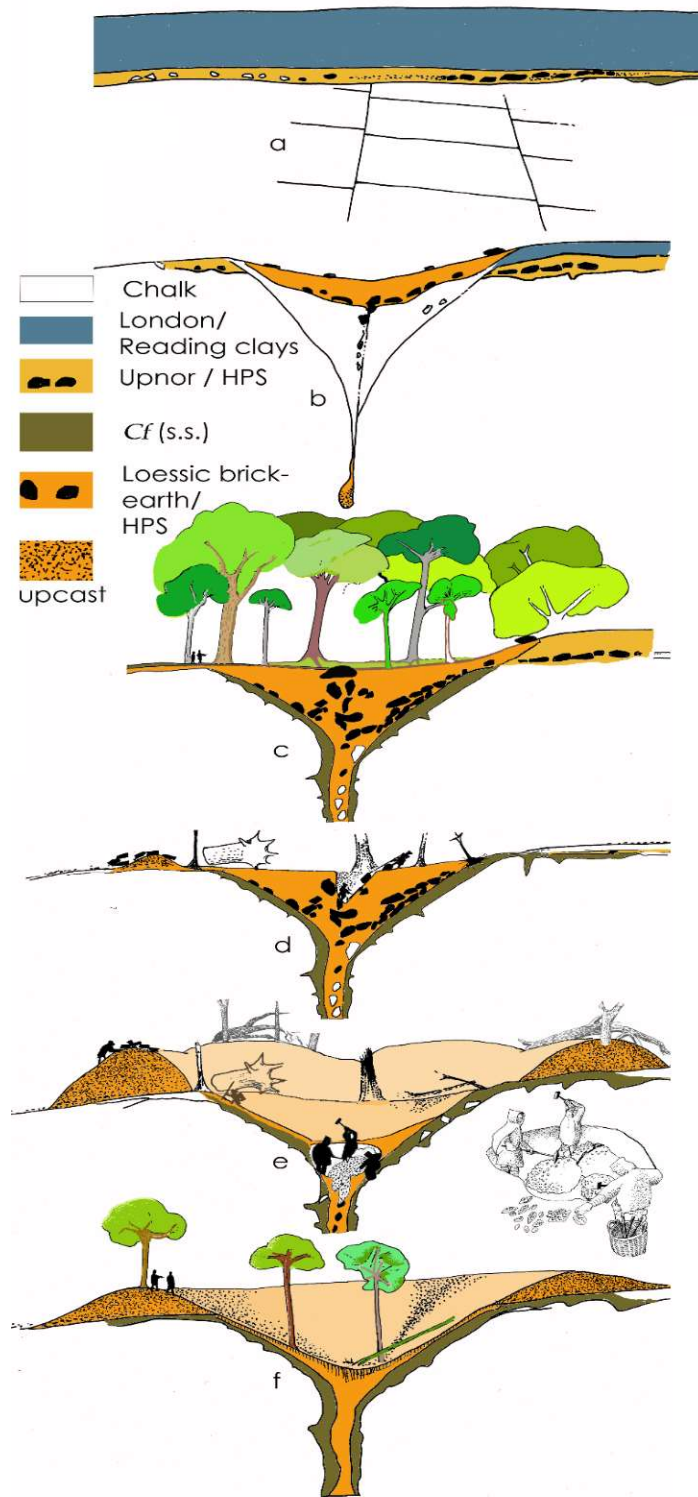
- Ceramic found in upcast material was Roman
- Verulamium White Ware, produced in quantity from AD50 to cAD180.

Radiocarbon determination (BP)



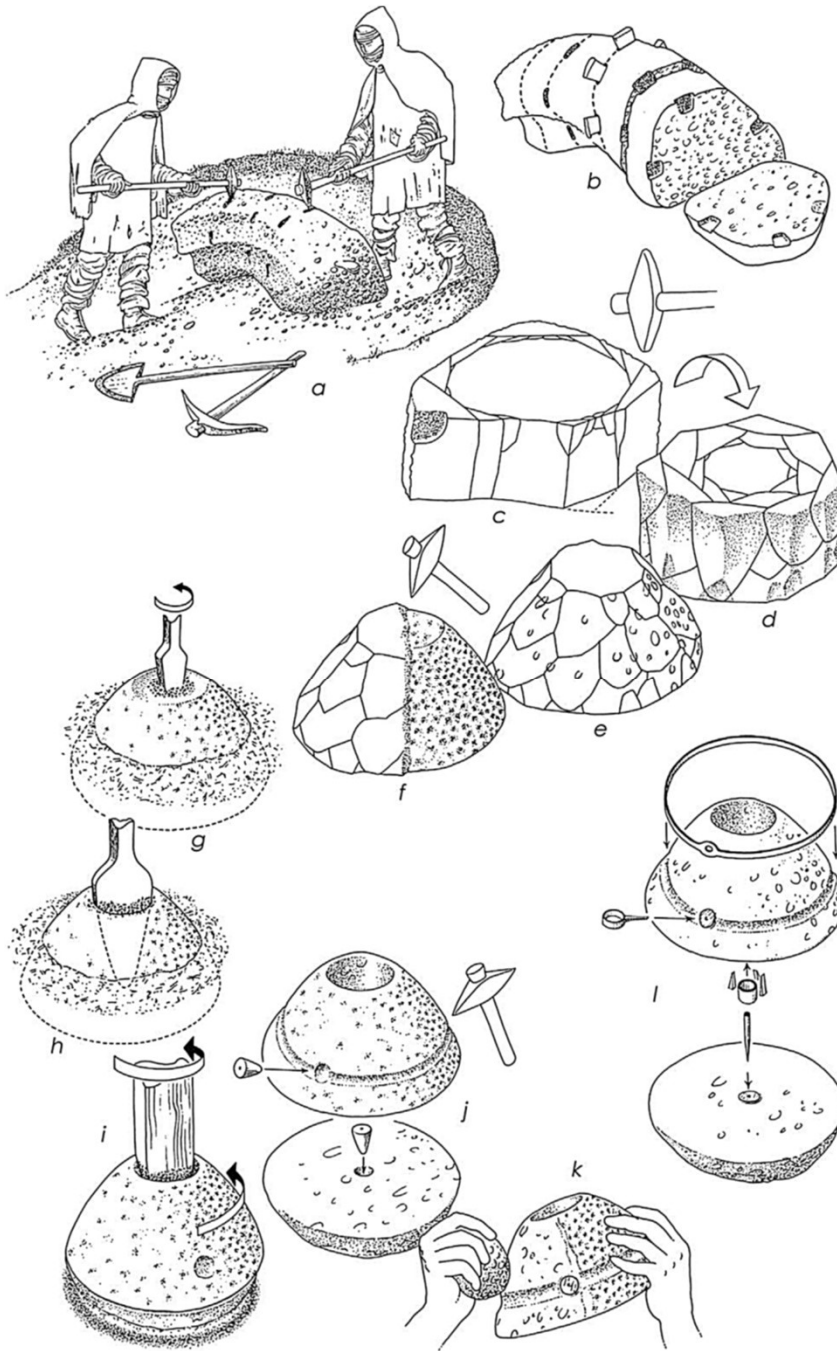
CHRONOLOGY

- ¹⁴C Dating of charcoal layer – identified as Quercus sp.
- Base of upcast early Roman
- Probably wholesale clearance of 250 year old oaks



AD 40 - TODAY

- Roman colonists and Gaulish specialists cleared the site by felling and burning the tree cover.
- Extracted HPS
- Cut blanks
- 2,500 blanks extracted
- Gang of 6 with support from blackmiths and carters could have ³⁹ excavated the upcast



OFF-SITE FINISHING

- The chaîne opératoire of the Roman Hertfordshire Puddingstone quern industry (Green 2016, 355, after Peacock, 2013)



WHERE NEXT?

- Provenancing Puddingstone querns via trace elements
- Like Sarsens and Bluestones at Stonehenge
- Finding and studying other sites
- Experimental archaeology of quern making



PUDDINGSTONE IN DORSET

- Eocene sands cap the chalk at Bronkham Hill and Hardy Monument
- Associated with dolines and sink holes at the “feather edge” of the Tertiary
- And barrow cemetery



PUDDINGSTONE IN DORSET

- Concretions formed from Eocene pebble bed
- Moved by glaciofluvial action
- Valley of the Stones
- Portesham



GEOARCHAEOLOGY IN DORSET

- Latest find
- Polissoir in the Valley of the Stones



GEOARCHAEOLOGY IN DORSET

- Standing stones – they are not Sarsen!
- EG Kingston Russell stone circle
- No evidence of querns
- Use in architecture?



Mervyn Jones – mervyn@joneswaters.co.uk

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