

TOTON UNEARTHED, TOTON, NOTTINGHAMSHIRE

Report on an archaeological evaluation on the site of Toton Mill, Manor
Farm Recreation Ground, August to September 2014

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Summary

- Trent & Peak Archaeology was commissioned by the Friends of Toton Fields to complete an archaeological evaluation at the site of Toton Manor Farm Recreation Ground in Nottinghamshire, centred on SK350 487, as part of the Heritage Lottery-funded community archaeology project *Toton Unearthed*.
- The site is situated on deposits of alluvial riverine clays overlying river terrace gravels and the waterstones of the Mercia Mudstone Formation.
- Previous work at the site involved Lidar survey, geophysical (geomagnetic) survey, laser scan topographic survey, and walkover and hand topographic survey. This was done through a community venture with the help of local volunteers during April and May 2014. It followed the methodology detailed in a WSI (April 2014) approved by the NCC archaeological leader Ursilla Spence.
- Following a successful grant application this program of archaeological works was implemented under the professional leadership of TPA to complement the archival and survey work already undertaken, with the key goals of locating and investigating the Manor House.
- The excavation took place between 18th August 2014 and Friday 19th September 2014. The methodology used was set out in a Written Scheme of Investigation previously approved by Ursilla Spence, Archaeology Leader for Nottinghamshire County Council.
- The excavation identified three main phases of construction at the site. Possible evidence of a medieval mill once having stood on the site was recorded in the form of stone foundations and a posthole and beam slot. In situ timbers of uncertain function recovered from the mill pond were also dated to the 13th century AD. The scale and manner of the 18th century mill was recorded as were features evidencing expansion and technological advancements during the 19th Century.

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1 INTRODUCTION

Toton is recorded as having had two mills as far back as the Domesday Book in the 11th century. The area of interest is now situated within parkland that forms the Toton Manor Farm recreation ground and is managed by Broxtowe Borough Council. No standing remains of the site are visible above ground, however some members of the community can recall an associated pond, large pieces of masonry and millstones located on the site prior to the area being cleared infilled and landscaped in the 1950's. Following on from an historical research volume entitled 'Toton Revealed' by Gill Morral & Rex Wyatt, the formation of a group known as the 'Friends of Toton Fields' sought to answer more questions of both the mill and nearby manorial site.

2 PROJECT BACKGROUND

2.1 Research context and previous work

Toton Manor was a medieval township located along the River Erewash. The settlement may have Anglo-Saxon origins, but certainly by the time Domesday was written in 1086 a Manor House and two associated water mills were in existence. Documents from the 16th century record that the Stanhope family bought Toton manor.

In 2012, amateur historians Gill Morral and Rex Wyatt produced a volume entitled Toton Revealed, which brought together memories and photographs of Toton from the last century alongside documentary historical research stretching further back. Following on from this the 'Friends of Toton Fields' sought to answer more questions about both the Manorial site and the nearby Mill site.

In June 2013 the Friends of Toton Fields learned of a planned play area to be situated on a potential site of one of the ancient water mills. Through the Connected Communities scheme funded by the Arts and Humanities Research Council, they were able to commission a geophysical survey of the area, which was conducted by the University of Nottingham in partnership with Trent & Peak Archaeology. Both magnetometry and resistivity methods were employed to reveal reasonably clear anomalies, particularly in the resistance data. High-resistance anomalies in the north-east of the area were interpreted as sub-surface structural remains of a mill building, while low-resistance anomalies were interpreted as the northernmost extent of the in-filled millpond (see Paul Johnson 2013 Toton Manor Farm, Toton, Broxtowe, Nottingham; Geophysical Survey Report). As a result of this work, Broxtowe Borough Council agreed to move the location of the proposed play area to the south-west.

The Friends of Toton Fields then prepared an application to the Heritage Lottery Fund for the current project *Toton Unearthed*. The project's main *foci* being the medieval and post-medieval Manor House and the mill and water management systems.

This report sets out the results of an archaeological evaluation involving the excavation of three areas measuring approximately 16m x 16m (Area 08), 20 x 1.8 (Area 09) and 6m x 3m (Area 10). A further north - south aligned sondage, 6m x 1.8m was also excavated to establish the position of the mill pond (Area 11). This site was targeted using the previous survey work and test-pits and aimed to identify the location and form of the medieval and post-medieval Mill complex. This had been identified as one of five objectives set out for the *Toton Unearthed Project*. Excavation was undertaken by three professional archaeologists and a team of volunteers. All works were carried out using the methodology set out in a Written Scheme of Investigation for the site approved by Ursilla Spence, Archaeology Leader for Nottinghamshire County Council (Trent and Peak 2014).

2.2 Potential remains

Local knowledge, map regression and topographic anomalies gave a good indication for one of the mill site locations (Figure 1). Geophysical and topographic surveys provided information regarding form and orientation and were used to inform the positioning of the trenches on the site (Trent and Peak 2014).



3 SITE TOPOGRAPHY AND GEOLOGY

Centred at SK5013 3436, the site lay within Toton Manor Recreation ground toward the western corner adjacent to a basketball court. The underlying bedrock is comprised of Gunthorpe Member Mudstone and the superficial deposits consist of Hemington Member-silt and gravels.

4 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

4.1 Water Mills

The first water mills were introduced to Britain in the first century BC. There were more than 6,000 in the country by the time of the Domesday Book and the number peaked around the turn of the 19th century with more than 20,000 in operation. By the end of the 19th century many had closed down and flour was instead ground at port based steam powered mills (Jesmond Dene Old Mill Website 2015).

Watermills use a flow of water to turn a large wheel (Figure 5). Power generated by this wheel is transmitted via a shaft to the pit wheel which is generally partly below the level of the mill floor. The momentum is then turned at 90 degrees through bevel gears to turn a vertical shaft. This power was then often transferred through a further cog to turn the millstone which would grind the corn. Very few medieval mills have been explored archaeologically.

4.2 Local Background

Toton derives its name from the tun, or farmstead of Torolf (Mellors 1920) In the Domesday book it is called Tovetune, and Tolvestune, and in the following centuries Toueton, Towton, etc. The manor of Tovetune, comprising 3 carucates (? 360 acres) of land assessed, belonged to Aldene, the Saxon, but in or after 1066 it was taken from him, and given to William Peverel, the lord of Nottingham Castle. There was a church, two mills, doubtless on the Erewash, and a little plantation of willows. The value before, and after, the Conquest was 60/- (Mellors, 2014).

In 1212 the ownership of Toton was forfeited to the Crown and was run by Henry de Grey who was in the king's service abroad. This was passed on to John de Grey and following his death in 1271-2 the manor was recorded as having a new dovehouse worth nothing.

4.3 Toton Mill

Two mills are known to have functioned at Toton from the time of the Domesday Book. Following the death of Lord John de Grey a survey of the Toton Manor recorded two mills at the site, worth £4 and by 1308 "There is a water mill, worth yearly 30/-" (Mellors, 1920). The second mill appears to have gone out of use by at this time.

The small settlement of Toton is first shown on Chapman's map of 1774. The Manor is visible to the north of the road between Nottingham and Long Eaton but there is no depiction of the mills. However, at this time the manor is documented as having two mills and was valued at 60 shillings, as it had been in 1066 (Thoroton and Throsby 1792-96). The road depicted on the 1774 map is the main road between Tamworth and Nottingham; an important road which became the main turnpike road.



Plate 1: Extract from Sir John Borlase Warren's map of 1789; mill outlined in red

The earliest definite depiction of Toton Mill is on Sir John Borlase Warren's map of 1789 (Plate 1). This shows a single sub rectangular building. None of the buildings depicted are labelled. The depiction of the mill appears to be a stylised sketch rather than an accurate depiction.

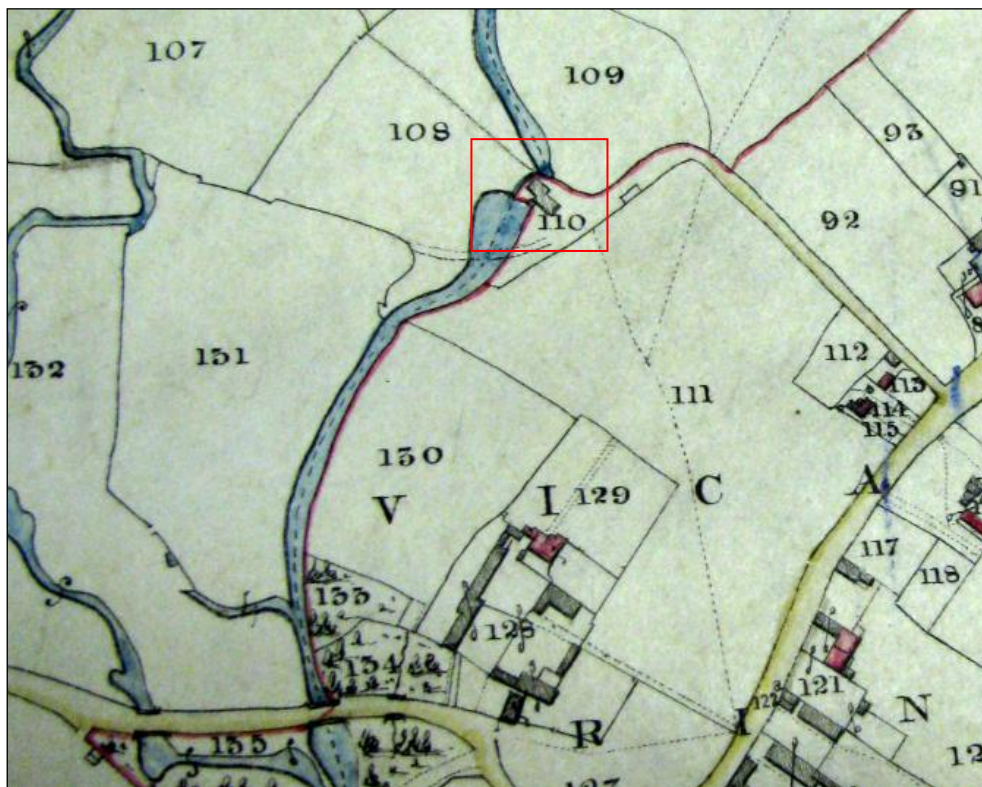


Plate 2: Extract from The Tithe Map of 1847; mill outlined in red

The Tithe Map of 1847 (Plate 2) shows the mill, which appears to be made up of two conjoined rectangular buildings. The general layout of the area has changed little since the maps from the 1780's. The building is not labelled and so its function at this stage is unclear.

The Ordnance Survey map of 1884 (not depicted) shows the mill is similarly laid out to the 1847 Tithe map but is labelled "Flour Mill. Disused" suggesting the mill is no longer functioning. By the time of the 1900/1 OS Map (Plate 3) the former mill was being used as a soap works. The general layout of the mill remains the same, but a small square room to the southeast extent is added.

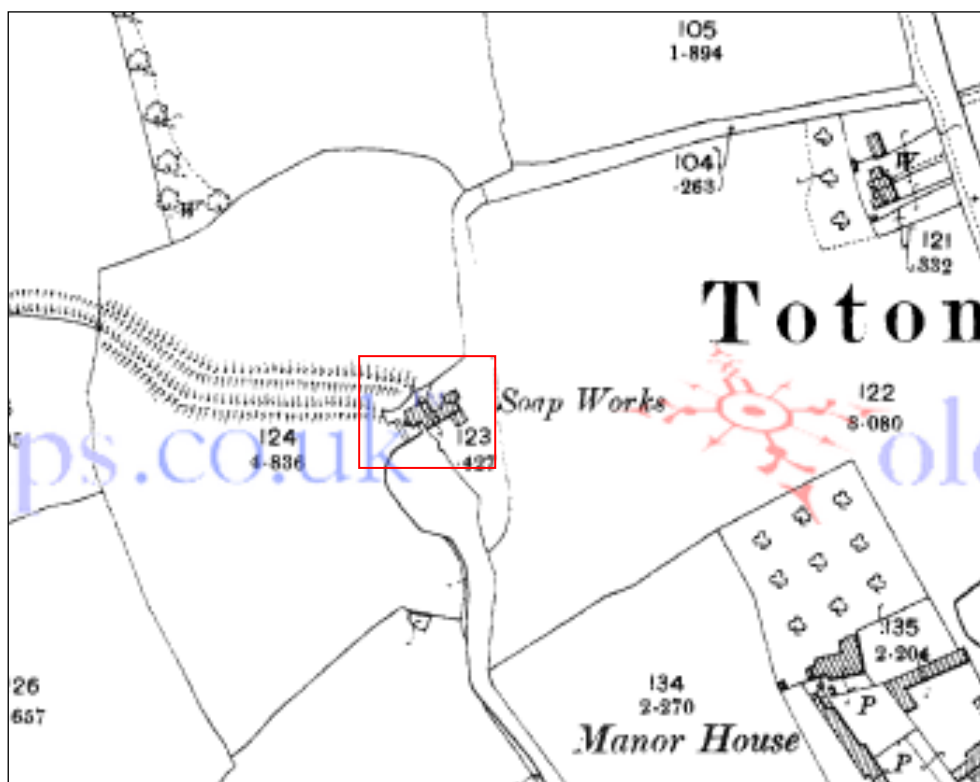


Plate 3: Extract from Ordnance Survey Map of 1901; mill outlined in red

By the time of the 1914 Ordnance Survey Map the mill has been demolished although head and tail races are still depicted. As on the 1901 map the head race is depicted as a pair of raised banks rather than a ditch.

Cartographic evidence shows the tail race to the south of the mill was infilled during the 1950's while the headrace to the north was still visible as an earthwork into the 1980's.

5 METHODOLOGY

All work was carried out in accordance with a Written Scheme of Investigation written by Gareth Davies and approved by Ursilla Spence, Archaeology Leader for Nottinghamshire County Council (Trent and Peak, 2014). It also met the requirements and standards set out in Management of Research Projects in the Historic Environment Project Planning Note 3: Archaeological Excavation (MoRPHE PPN3) (English Heritage 2008), and the requirements and standards set by the Chartered Institute for Archaeologists (CIfA) in their Standard and Guidance for archaeological field evaluation (IfA 1994; revised 2008) Standard and Guidance for the collection, documentation, conservation and research of archaeological material (IfA 2001; Revised 2008); Code of Conduct (IfA 1985; revised to 2008) and Standard and Guidance for the creation, compilation, transfer and deposition of archaeological archives (IfA, 2009).

General and Specific Aims

The general aim of the trial trenching was to gather sufficient information to establish the presence/absence, extent, condition, depth, character, quality and date of any archaeological remains in order to establish the impact of the development on the archaeological resource.

More specific aims and objectives were as follows:

- To identify, investigate and record any such archaeological remains to the extent possible;
- To clarify the date, character and extent of those sites and geophysical anomalies identified within the footprint of the proposed development;
- To determine (so far as possible) the stratigraphic sequence and dating of the deposits or features identified;
- To establish any eco-factual and environmental potential of archaeological deposits and features; and to provide recommendations for mitigation measures.

Area Excavation

Initially a large open area of 15m x 15m was excavated (Area 08) which was extended with a trench measuring 20m by 1.8m (Area 09) to the north west. Area 10 was later opened to the south of Area 09, west of Area 08. Area 11 was excavated within Area 08 to recover information about the pond. The original trench plan set out in the Written Scheme of Investigation was altered slightly to incorporate these further areas.

Surveying and setting out

The locations of all areas of excavation were accurately set out, surveyed as excavated and tied in to the Ordnance Survey (OS) National Grid and Ordnance datum. This was undertaken using a GPS, Leica CS15/GS15 RTK Differential GNSS. TPA holds full co-ordinate data which can be supplied as DXF/DWG files if necessary.

Mechanical excavation

Topsoil was removed using a wheeled mechanical excavator fitted with a toothless ditching bucket. All such mechanical excavation was undertaken under the direct and continuous supervision of Trent & Peak Archaeology. Mechanical excavation ceased at the first archaeologically significant horizon or when the absence of any such horizon was adequately demonstrated. Topsoil and subsoil was segregated in separate spoil heaps. Spoil from the excavation of archaeological features was stored on the subsoil heap. After the completion of archaeological excavation the material was replaced in reverse order of removal and the soil was graded to a smooth, even profile, free from local mounds and depressions.

Hand Excavation

All fieldwork was carried out in accordance with the code of conduct of The Chartered Institute for Archaeologists. The depth and complexity of archaeological features and deposits across the whole site was evaluated by hand excavation. The stratigraphy of each trench was fully recorded with at least one long section of each trench. More sections were drawn to properly record the deposits, and sufficient excavation was undertaken to ensure that all contexts shown on each section drawing can be related to a trench plan.

Recording

All excavated contexts were fully recorded on TPA written context records giving details of location, composition, shape, dimensions, relationships, finds, samples, cross-references to other elements of the record and other relevant contexts, etc.

All features were recorded on at least one plan (normally at 1:20 scale) and at least one section drawing (normally at 1:10 scale). A complete post-excavation plan and long section

of each trench was prepared. All drawings included co-ordinate data and spot-heights related to the Ordnance Survey Datum and accurate to two decimal places.

All excavated features and deposits shall be recorded photographically using both colour and black and white negative film, in a 35mm or medium format. Additional illustrative photographs were taken using digital photography (four Megapixels). All black and white record photographs were taken using silver based film only, being suitable for long-term storage (Brown 2007, 13).

All finds were recorded by context; and individually significant finds were also individually labelled with a TPA three-letter code (e.g. AAA) and recorded three-dimensionally. All artefacts recovered were retained and removed from site for conservation (if necessary) and specialist examination/analysis (see Section 6). All recording, cleaning, storage and conservation of finds has been carried-out in accordance with the Institute for Archaeologist's Standard and Guidance for the collection, documentation, conservation and research of archaeological materials (2001, revised 2008).

No human remains were recovered during the evaluation.

Palaeoenvironmental Sampling

All environmental archaeology was undertaken in accordance with the principles set out in *Environmental Archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation* (Campbell, Moffett and Straker 2011) and with reference to the *Association for Environmental Archaeology's Working Paper No. 2, Environmental Archaeology and Archaeological Evaluation* (1995).

Soil samples comprising at least 40 litres per context or 100% of smaller contexts were taken for the recovery of charred plant remains, small bones and finds shall be taken from appropriate contexts. These comprised basal/primary fills of at least 50% of all cut archaeological features and at least 25% of all other anthropogenic soil deposits, including all deposits containing any visible charcoal or other carbonised material and all deposits considered to be of particular interest on the basis of artefactual content or other characteristics.

Samples suitable for dendrochronological dating were taken from one of the posts recovered from the edge of the mill pond.

Site Archive

Archive consolidation was undertaken immediately following the conclusion of fieldwork. The site record was checked, cross-referenced and indexed.

All retained finds were marked and packaged as necessary.

All retained finds have been assessed and recorded by suitably qualified and experienced TPA staff. Initial artefact dating has been integrated into the site narrative.

Following further mitigation, the archive shall be assembled in accordance with the guidelines set out in Appendix 1, P1 of MoRPHE PPN3 (English Heritage 2008). In addition to the site records, artefacts, ecofacts and other sample residues, the archive shall contain:

- site matrices where appropriate;
- a summary report synthesising the context records;
- a summary of the artefact record; and
- a summary of any other records or materials recovered.
- The integrity of the primary field records shall be preserved and the Contractor shall create security copies in digital, fiche or microfilm format of all primary field records.

6 RESULTS

The results of the excavation are set out here in chronological order.

6.1 Medieval

Possible Medieval activity was identified in Areas 08 and 10 in the form of rough stone foundations as well as a posthole and possible beam slot. In Area 10 the foundations (0525) were identified below made ground on top of which sat 18th century foundations (0520). Posthole [0529] was rectangular and located within the south of this stone foundation (Plate 5). A possible beam slot was identified below the foundations orientated north west - south east. Further possible medieval foundations were identified to the east and south east which were of similar unworked stone (0605) and seemed to be orientated north west – south east, running through the unexcavated section between Area 08 and Area 10. No artefacts were recovered to accurately date these features.

6.2 Early-Mid 18th Century

This phase of the site was the most substantial recorded and combined the end of a headrace at the north of the site leading into a wheel pit within the footprint of the mill building. The cog pit/pit wheel pit was located to the east of the water wheel pit. The main outline of the mill was represented by large cut stone foundations. These are thought to date to the early-mid 18th century but may be the foundations of an earlier building that has been reused or be made up of stone from another building that has been recycled.

Stone walls (0310/0308) were orientated north west – south east (Figure 5). They are thought to represent the southern wall of the mill. They were separated by a gap of approximately 5m which is presumed to represent an entrance to the mill (Plate 6). Wall (0308) turned at its west end to run for approximately 3m to the north, orientated north west – south east (Plate 7).

To the north west of wall (0308) a further cut stone foundation (0427) was observed which had the remnants of mid 18th century (R Sheppard, pers. com) brick foundation (0301) above it (Plate 8). The brick work forms an insubstantial foundation/wall base over what is a very substantial stone foundation. Constructed from white limestone this stone foundation was nicely faced on its southern side mirroring outer wall (0308) to the south east. Excavation of a sondage part way along (0427) revealed it was 0.8m deep (Plate 9). Given the location of this wall it is thought to form part of the structure associated with supporting the axle tree, which would have been located to the north and which would have required load bearing walls (Plate 10).

Abutting (0301/0427) at its east end a further stone wall foundation (0300), constructed out of white limestone was observed orientated north west – south east (Plate 11). This had the remnants of a floor level on its south west side and a large area of 18th century brick floor (0303) on its north east side, which remained intact to a good standard (Plate 12). This floor led to what must have been a doorway at the back of the mill, at the eastern end of (0308) which was indicated by wooden threshold (0313).

On the eastern side of brick floor (0303) and integrated within it, was a sunken trough feature (0610) approximately 0.7m x 2.5m in length. It was divided into two sections by a small curved brick wall (0430) (Plate 13). At its eastern end was a cast iron pipe (which is likely to have functioned as an overflow outlet pipe taking material out toward the tail race end of the mill (observed 0453). Excavation of this feature revealed that the bricks on the interior of this trough had been subjected to intense heat; furthermore the fill of this feature consisted of several large fragments of firebrick often used in environments requiring intense heat such as a furnace, kiln or hearth. It is unclear at present what this feature may represent. It may have been used to dry grain or the mill may have had a secondary purpose such as acting as a distillery.



Adjacent to trough [0610] on its southern edge was a linear brick feature orientated north east – south west which combined (0306/0307). This feature does not appear to be a wall having no evidence for bonding and it is too narrow to be a floor or walkway but it appears to be related to trough (0610).

Running north from the west end of 0301/0427 a substantial faced stone wall (0508) was noted continuing through from Area 08 into Area 09 ending 0.2m from the northern extent of the excavation areas. The water wheel pit was located to the west of this wall with the wheel/cog pit to the east.

Inner walls (0363/0364/520) formed the remainder of the structure housing the wheel/cog pit (Plate 14 and 15) an area in which an internal wheel turned by the water wheel and the upright shaft for the cog mechanisms would have stood. This was orientated in an east - west direction, wall (0363) of the structure was robust being three bricks in width (0.45m) 2m (visible) and 0.5m in depth (Plate 16 and 17). This was abutted by (0364) which was a further substantial block of masonry measuring 0.65m x 1.5m (visible) x 0.5m. This wall formed the eastern inside edge of the wheel/cog pit which measured 3m x 0.65m x 0.5m. It had a brick floor (0446).

The water wheel pit was located to the west of the wheel/cog pit structure. It was defined on either side by large stone blocks. On the north east side this was (0365) which measured 0.2m x 6m (visible) x 0.4m and (0366/0367) on the south west side which measured 0.26m x 0.5m (visible) x 0.6m (Plates 18 and 19). Situated between these parallel stone walls, the base of the wheel pit was visible and surviving in good condition (Plate 20). From the northern edge of Area 09 this area would have been fed water via the dam head race inlet end of the water wheel pit, a finely made brick floor angled at 45° could be observed entering the water wheel pit area (0496) (Plates 21). The bricks have been identified as the same early to mid 18th type in keeping with the majority of this mill. This construction is almost certainly designed in this way to create maximum downward velocity forcing the water to hit the wheel at its optimum speed; this early 18th century wheel may have been an 'undershot' wheel as was common at the time.

Located on the western side of the water wheel pit wall (0368), a number of roughly hewn large stones (0369) were noted abutting and clearly supporting the water wheel pit wall in Area 9; this would have provided extra support on this exterior side which was not connected or supported by the main mill structure. Furthermore it is likely this stone revetment would originally have been covered with an earthen bank (Figure 3).

The water wheel pit floor abruptly ended at a low wall (0527) orientated north east – south west which divided the wheel pit from the tail race. The floor level dropped into the tail race by 1m to the south of this wall (Figure 7). The tail race had a fine flagstone floor (0607) surviving in good condition, The inner wall of the tail race exit (0556) was constructed at an angle of approximately 80 degrees (Plates 22 and 23). This would have been mirrored on the opposing side and would have allowed the water from the water wheel pit to flow through this area with greater speed

Abutting (0369), a brick wall structure constructed with mid 18th brickwork and orientated roughly east - west was observed; this appeared to have an opening which had subsequently been patched up at a later date using a large stone doorway threshold measuring 1m in length (0579). The purpose of these alterations is unknown however the feature itself is likely to represent an overflow sluice running from the side of the dam (Plates 24 and 25).

Excavation of a sondage in this area (Figure 6) showed that fine waterborne gravels had been deposited up against this wall consistent with the flow and settling of gravels along the periphery of the dam. Unusually these gravels had been cemented together presumably via a process of mineralisation caused by an iron rich water source. The iron may have been from industrial contamination of the river or perhaps by the presence of iron components and mechanisms in the water next to the mill which may have led to iron particles leaching into the water over time (Plates 26 and 27).

At the far western end of Area 09, part of a substantial stone block (0372) could be observed, the size and type of stone was similar to those observed in the water wheel pit structure; unfortunately with only a tantalising glimpse of this feature it is difficult to ascertain what it relates to, however given the location, it probably will form part of a sluice gate structure, which may or may not be contemporary with (0370).

Further hand excavation in Area 10 demonstrated that much of the south west interior of the mill was densely packed with coarse angular stone (0531). The stones varied between 50mm-150mm in diameter. These stones continued on the east side of the baulk within Area 08 as (0433) and appeared to have a distinct edge forming somewhat of a north east – south west linear alignment (Figure 3). It is possible these may represent hard-core material on which an 18th century floor was constructed, however the possibility of it relating to some other earlier feature cannot be eliminated.

6.3 Early 19th Century Features

To the south of the junction of stone foundations (0300) and (0427) mortar foundation (0344) was identified on which early 19th century brick surface (0340) had been laid. This is thought to represent early 19th century renovations to the mill.

6.4 Later 19th Century Features

In the later 19th century the building was expanded substantially. This may relate to the building being converted into a soap factory. Extra rooms were added at the east of the building and the design of the mill itself was altered to work more efficiently.

At the north end of the water wheel pit a large metal plate (0606) was noted resting on the brick surface now crushed by the debris above (Plate 28). This feature may represent the water wheel being modernised from the original 'Undershot' to the 'Poncelet' wheel type. The undershot wheel used a vertical blade in front of the wheel which slowed down the water before it passed through. The Poncelet design used an angled metal blade to funnel the water course resulting in the pressure of the water passing through the wheel being greater (Figure 4).

Further modifications appear to have been made to the water wheel pit, probably later in the 19th century. Firstly the 18th century brick floor (0496) and metal plate (0606) were buried with debris over which a crude single brick wide east – west orientated footing was constructed. This is thought to have been to raise the level of the channel. A trough construction may have sat upon this to feed the water to the wheel via a 'breastshot' feed. This may have been supported by rendered wall (0418).

Located directly at the foot of (0496) and attached to the interior of the stone wall (0367) a bracket for holding a sluice gate was observed and the remnants of a further bracket were noted on the opposing side (Plate 29). This would have controlled water entering the water wheel pit from the dam above. This was abutted by a low mortar lined wall (0418) spanning the wheel pit east-west which had an angled stone plinth set against it. This plinth which also had downward grooves cut into it mirrored the angle of the wheel at its base and would allow the flow of water to run smoothly off the wheel in to the pit. Abutting these features is the floor of the water wheel pit which is made of machine engineered bricks (0528) datable to the later half of the 19th century suggesting further modifications in this area towards the end of the mills life (Plates 30 and 31).

A crude brick box drain (0315) oriented north west – south east was noted leading from the outer back wall into the pond area which had the remains of a ceramic pipe laid on top, this was perhaps a later replacement after the former became blocked. This was laid over the top of considerable deposits of 19th century debris and is most probably a feature which relates to the later part of the 19th century.

Located outside the main wall of the mill and adjacent to the back entrance was a brick lined well (0318); this measured approximately 1m x 1m, the bricks were laid in a Flemish style (with absent headers) and was constructed out of bricks attributable to the late 19th century (Plate 32). This was noted cutting through 19th century made ground and it was half sectioned to a depth of 1m which did not reach the bottom of the well. Down to this depth the well had one fill of loose black clinker ash, a deposit that covered much of the site and presumably was part of the demolition sequence and or landfill/landscaping of the site. The location of this feature was within the footprint of a single brick construction (made up of 0377, 0378 and 0318) which appeared to be the base of an unsubstantial lean to building (Plate 33). The bricks used in the construction of the lean to building were different to those used in the construction of the well and so although the two are broadly contemporary (late 19th century) they may not have been built at the same time.

Abutting the main outer wall (0310) on its southern side, two areas of mortar were noted orientated north east - south west (0323/0358) and one orientated north west – south east (0327) (Plates 34-35). These areas of mortar had occasional brick prints suggesting they acted as the base of a floor.

This floor is likely to relate to brick foundations located further to the south east in Area 08 which appear to represent a mid 19th century addition to the mill (R Sheppard, pers com) (Plates 36-37). Wall (0329) has a distinct curve at its south east corner indicating some architectural thought was given to its construction. This may indicate this area was an office or an area of the mill that dealt with the public. Wall (0328) to the west was made of bricks 0.5m long.

6.5 The Mill Pond

South of the main outer walls of the mill was an area traditionally referred to as the 'mill pond' which was still surviving to some extent until the 1950's when it was backfilled as part of the landscaping undertaken in this area at this time. A large pond was noted on maps as being in this area from at least 1847 (Plate 2). The 1847 Tithe map also shows this mill being fed by a high banked leat coming in from the north west. The leat is still visible as an earthwork. Generally, water would flow through a mill and out through a tail race taking the water back out to the river. This millpond is on the wrong end of the mill for this which may suggest the pond is a relic of a secondary (or earlier) mill that it once fed. A system may have been in place whereby the water that passed through the first mill ran into a second mill pond that fed the second mill, then running off down the leat to the river. Toton is recorded as having two mills during the medieval period and this set out may relate to this period.

The top fill of the pond contained a lot of mid 20th century landfill material evidencing its infilling in the 1950's. It was also evident that in areas closest to the mill wall the pond had undergone an earlier infill event as indicated by a large spread of 19th century material appearing to fill the pond right up to the 18th century outer wall. It was decided to hand excavate a trench (Area 11) leading from the mill wall out into the former pond area to obtain a stratigraphic sequence which to inform us on the size of the pond as well as giving a date for the construction of the outer wall and a date for the digging of the pond (Figure 7).

Within the pond were a number of successive distinctive layers of material, largely deposited during the 19th century. At a depth of 0.6m a firm clean light brown clay was observed abutting the mill wall, this gently sloped south from the wall to the pond area and was noted continuing 1.5m from the mill wall where it met the edge of the pond. At this boundary large rocks (0608) were observed concentrated in a 0.5m area running parallel with the wall and edge of the pond, becoming more apparent as the area was excavated (Plate 38). Iron pipe (0610) orientated in a north east – south west direction was also noted at this depth. This is thought to be a continuation of pipe (0453) which was recorded within brick trough (0606).

At approximately 1m in depth the fill became more alluvial with a large quantity of branches (Plate 39) present as well as slip wares dating to the mid 18th century.

Further excavation revealed two large upright oak stake piles (0614 and 0615), also noted was a horizontal timber with a mortise (0616) (Plate 40). Excavation of these timbers revealed them to be very substantial with (0614) measuring 2m in length. Samples of the timbers were sent for dendrochronological dating. The dating revealed that the timbers had been cut between 1210 and 1231 AD (Arnold and Howard, Section 7.3). The alignment of this structure suggests a possible medieval timber revetment for the pond related to stones (0608). Excavation continued to the south of these stakes until the base of the pond was found at approximately 1.2m below ground level. Samples of primary fill (0604), which represents the silting up of the pond, were sent for Environmental Remains Analysis (Carson and Miller, Section 7.2). The date of these deposits is unclear. CBM and glass were recovered from (0604) but this may represent later material being introduced to this soft deposit when it has been disturbed. The samples of (0604) were found to contain a range of plant remains from plants typically found in scrub woodland and wetland. Remains of trees and bushes from mixed scrub woodland were also recorded in significant numbers as were a number of well preserved small branches which appeared to have been worked, some cut at one end and others at both ends. Arnold and Howard suggest that this may represent debitage from wattling, associated with the two large Medieval stakes, used to support the pond edges. Nine fig seeds (*Ficus carica*) were also recovered from this sample, these may have been introduced through human faeces while a hemp (*Cannabis sativa*) seed may have been introduced during retting (rotting) of stems for fibre. These seeds and environmental remains may all have been washed into the pond from further up stream.

A prominent feature in this area was the presence of a brick box drain (0557) on a north to south alignment (Plate 41), this was constructed using late 19th bricks and may have served as a replacement after the former channel had become blocked.

7 ARTEFACTS AND ECOFACTS

7.1 The artefacts recovered from the site are fully catalogued in Appendix 2, including ceramics spot dates. However, instead of a section containing traditional specialist artefact reports the intention is to fully catalogue photographically all artefacts (and also provide a short date and interpretation) as an online catalogue accessible at <http://totonunearthed.org.uk/>. This will develop during 2015-16 as a FOTF project and readers are advised to check this website to monitor the status of this work.

Some information in the Environmental Remains report pertains to samples from the excavation at the site of Toton Manor and this information has been retained here. This site was located approximately 150m to the south east of the mill. One of the ditches [0126] contained medieval pottery and the information recovered from the sample helps give an idea of the wider environment at this time.

7.2 *Environmental Remains* by Sharon Carson and Jennifer Miller

Samples from the two ditch features at the manor farm house site revealed variable levels of preservation with evidence of intermittent waterlogging within one ditch fill (0127) that may have been used for the purposes of drainage, land division and delineation of areas for different purposes, and carbonised remains within the other ditch fill (0171). Land management and agricultural practices were observed in the form of arable/ruderal plant remains and carbonised cereals, with occasional commonly associated crop weeds.

The basal fill of the mill pond included input from arable /ruderal, wetland and scrub woodland plant remains and possibly worked roundwood branches that may be the remnants of a wattle structure associated with the oak timbers discovered during excavation. Evidence of imported fruits and cultivation of originally imported taxa were recovered in the form of fig seeds and hemp, indicative of consumption practices, agriculture, industry and economy.

Introduction

A range of samples recovered from Toton Manor Farm Recreation Ground during excavation were submitted for specialist processing and analysis. It was anticipated this would contribute towards the interpretation of the site and provide evidence for the nature and land use of the occupied area over time.

The origins of Toton Manor are thought to date to the 11th century. Excavation of the manor farm house area revealed ditches, remains of structures and artefacts ranging in date from the 13th to the 20th century. Two of these ditch features (one of which dates to the 13th-14th century) were sampled for further investigation and analysis. Two mills are known to have functioned at Toton from the time of the Domesday Book. South of the main outer walls of the mill was an area traditionally referred to as the 'mill pond' which was still surviving to some extent until the 1950's when it was backfilled as part of the landscaping undertaken in this area at this time (Parker & Winfer 2015). It was anticipated that analysis of the basal fill of the pond might provide palaeoenvironmental evidence related to the use of the pond and mill.

Methodology

Standard (Non-Waterlogged) Bulk Sample Processing

Bulk samples were received within 10 litre plastic tubs, sealed to exclude light and air. They were floted for the recovery of environmental evidence and artefacts using standard methods and a bespoke adapted Siraf flotation system including a pumped recycled water system with four settling tanks. Samples were disaggregated by agitating in water over a 500µm diameter mesh supported over a flotation drum. Light, primarily organic materials that floated as wash-over (flots) were retained on 500µm and 1mm calibrated mesh diameter Endicot sieves whilst other materials larger than 500µm that did not float remained on the mesh as the retent.

Wet retents were spread out on plastic trays and examined visually before being tagged and dried. The flot material was wrapped in blue acid-free paper, tagged and recorded before

being air dried on trays in a warm drying room. Once dried, the retents were sieved using 4mm and 2mm Endicot sieves and sorted using magnified illuminated lamps for all categories of artefacts and ecofacts. A magnet was employed to locate magnetised stone and metals.

Sorting of flots was undertaken using a Nikon 93756 binocular microscope with associated Schott KL-1500 LCD cold light source. Sorted materials were bagged and labelled for submission to specialists and weighed (where relevant) using an Ohaus CS200 digital scale calibrated to 0.01g. Sorted residues were also weighed on a digital scale, bagged and stored pending decision for disposal.

Waterlogged Sample Processing

Botanical material within contexts deemed to be waterlogged after the flotation process were retained wet in plastic bags or tubs to await analysis. The dried retent and the wet organic flot materials were sorted separately, using a Nikon 93756 binocular microscope with independent Schott KL-1500 LCD cold light source. Using this methodology, any charcoal, carbonised seeds and bone would be dried whilst waterlogged fragile organic material is sorted within water and retained wet pending full analysis. The matrix composition was described according to Hubbard & Clapham's abundance scale (1992). Inorganic artefacts including pot, CBM and mortar-like sediment concretions were bagged and labelled for submission to specialists. Where relevant, materials were weighed using an Ohaus CS200 digital scale calibrated to 0.01g.

Botanical Material Identification

For non-waterlogged samples processed by standard flotation, carbonised botanical material from each sorted retent was added to the corresponding flot before being sorted through a 500µm, 1mm and 4mm mesh diameter sieve. Depending upon volume present, 100% of the charcoal >4mm fragment size, or a representative sample thereof, was identified as completely as preservation would allow. Charcoal >2mm fragment size was scanned, and if necessary and feasible a selection was identified to ensure the identified material provided an accurate representation of the species composition for each sample analysed. The total volume of charcoal present was recorded. Carbonised cereals, seeds and other macroplant remains within non-waterlogged samples were 100% identified as specifically as preservation would allow using a Nikon 93756 binocular microscope at variable magnifications of between X8 - X40 with associated Schott cold light source.

For waterlogged samples, macroscopic identification of non-carbonised and carbonised plant materials and invertebrates was achieved using a Nikon 93756 binocular microscope with independent Schott light source at variable magnifications of between X4 – X45. Charcoal and wood internal anatomy was confirmed at X40 magnification using reflected light and a Brunel SP80 metallurgical microscope. Following identification, waterlogged fragile organic materials were stored in water with a preservative mixture of 200ml glycerine, 400ml ethanol and 6ml formalin in accordance with standard methodology.

Charcoal identification was undertaken with reference to Schweingruber (1990). Confirmation of cereal morphology was achieved with reference to Jacomet (1987), whilst seed identification was confirmed by comparison with images within Beijerinck (1947) and Cappers (2006) and the Dickson botanical reference collection. Bud identification was achieved with reference to Tomlinson (1985). Plant nomenclature follows Stace (1997) except cereals, which conform to Zohary & Hopf (2000).

Faunal Remains Identification

The faunal remains were examined in laboratory conditions and recorded with guidance from Dobney et al. (1999) and O'Connor (2008). Only very small bone scraps (smaller than 10mm) were present, all recorded as unidentifiable, tallied and weighed in each case.

Results

Results are discussed below by focus area and phase wherever such information was available. Tables 1 and 2 show the results obtained from the samples and methods of processing; Table 1 provides data from sorting of the flots, full analysis and identification of botanical remains and Table 2 gives results of the retent sorting for artefacts and other biological remains.

Manor Farm House

Two samples from two ditch features related to the manor farm house area were analysed. One of the most notable features relating to this phase was a substantial ditch, the cut [0126] of which measured 3m wide at the surface and 1.7m deep. The primary fill (0127) was a firm mid orange/grey silty loam clay that produced many fragments of brown/green glazed ridge tiles dating to the 13th-16th century and several shards of green glazed pottery dating to the 13-14th century. The dimensions and location of the ditch suggest that it could have been a substantial enclosure or boundary ditch (Parker & Winfer 2015).

Phase 1: 13th-14th Century

(0127) <unknown> primary fill of ditch [0126]

The sample was processed by standard flotation methods as during excavation the context was not deemed to be waterlogged. However, the flot material produced was noted to contain waterlogged plant remains and subsequently was retained wet for analysis. The retent material was dried and sorted. A small number of indeterminate calcined bone fragments, small charcoal fragments, carbonised but poorly preserved cereal grains and one small sherd of pottery were recovered, alluding to a degree of domestic waste. Although present, charcoal fragments were limited and included only two taxa; oak (*Quercus*) and hazel (*Corylus*). The carbonised cereals were very fragmented and abraded and included two oats (*Avena sp*), two grains of probable rye (*cf Secale cereale*), three probable wheats (*cf Triticum sp*) and a number of indeterminate cereal fragments. Such waste material may have derived from deposition of domestic hearth rake out material, with the inclusion of cereals suggesting loss during the parching stage of processing prior to storage. A quantity of possible pieces of slag and other magnetic material were also recovered which were likely to have derived from the deposition of waste material from industrial processes conducted within the vicinity of the ditch.

The waterlogged plant remains indicate the wet nature of the ditch environs at the time of the accumulation of the fill. The botanical assemblage indicates that the deposit may have accumulated gradually, with the ditch possibly remaining open and water filled for some time as implied by seeds of true aquatic taxa such as water-plantain (*Alisma plantago-aquatica*), and possible fringed water-lily (*cf Nymphoides*). Wet ditch/marshland taxa including seeds of common club-rush (*Schoenoplectus lacustris*), gypsywort (*Lycopus europaeus*), tawny sedge (*Carex hostiana*), yellow sedge (*Carex viridula*) and an abundance of celery-leaved buttercup (*Ranunculus sceleratus*) further support the archaeological interpretation of this feature as a functioning water-filled drainage ditch, within which gradual sediment accumulation resulted in the loss of true aquatic flora and natural succession by wetland communities over time.

A number of the waterlogged plant macrofossil remains recorded were of species that are typical arable or ruderal indicators, the most abundant of such being henbane (*Hyoscyamus niger*). Ruderal plants are pioneers of disturbed or waste ground and typically include many crop weeds. Collectively, henbane (*Hyoscyamus niger*), fat hen (*Chenopodium album*) and common poppy (*Papaver rhoeas*) may all be weeds of medieval cereal cultivation. Others, including stinging nettle (*Urtica dioica*), creeping and creeping/bulbous buttercups (*Ranunculus repens/bulbosus*), thistles (*Cirsium/Carduus*) and other related species found are suggestive of field margins and disturbed ruderal ground. Other species, such as those derived from the pink family (Caryophyllaceae), redshank (*Persicaria maculosa*) and docks (*Rumex sp*) are also encountered as arable / ruderal weeds, and are frequently encountered adjacent to or within cultivation. Collectively, this combination of weedy taxa is strongly indicative of the ditch having been in close proximity to arable cultivation, possibly forming

part of the field boundary. This supports the archaeological interpretation proposed during excavation.

Occasional ehippia (winter or 'dry-season' eggs) of water flea (*Daphnia pulex*) were recovered from the ditch fill. They are produced in response to drying out and suggest that standing water levels probably fluctuated as sediment accumulated within the ditch, becoming possibly only seasonally wet and eventually drying sufficiently to provide new exposed ground for the ruderal assemblage to colonise.

Woodland indicators including a number of elder or red-berried elder (*Sambucus nigra/racemosa*) seeds, and seeds of silver/downy birch (*Betula pendula/pubescens*), possible hawthorn (*cf Cratageous sp*) and blackberry (*Rubus fruticosus ss*) imply scrub woodland at the margins of enriched soil in close proximity to the ditch. The numerous thin woody twigs within the sample were too young and poorly preserved to be identified but imply either overhanging woody vegetation or intentional deposition of young twig material for any purpose.

Unprovenanced

One sample was submitted from the fill of a shallow ditch/gully related to the manor farm house area.

(0171) <0165> fill of ditch/gully [unknown]

Few artefacts and ecofacts were recovered from fill 0171, but occasional indeterminate calcined bone fragments, pottery and CBM imply a component of domestic hearth waste within the assemblage. A number of magnetic fragments and possible metal/slag were also recovered which may have derived from local industrial processes or regeneration of the manor buildings.

The carbonised plant assemblages within this ditch/gully fill revealed evidence of cereal crop processing, including poorly preserved carbonised cereal grains identified as possible wheat. The grains were recovered with occasional commonly associated crop weeds including fat hen (*Chenopodium album*), probable common vetch (*Vicia cf sativa*) and seeds of possible vetch/pea (*Vicia/Lathyrus*). Such remains are often recorded from archaeological contexts representing cereal processing waste and are accidentally carbonised within the hearth during parching or gleaning.

The charcoal assemblage was diverse although of low volume, and is likely to have derived from mixed deciduous local woodland. Taxa recorded included birch (*Betula*), ash (*Fraxinus*), poplar/willow (*Populus/Salix*), possible cherry type (*cf Prunoideae*) and oak (*Quercus*). Together with the small number of carbonised cereals found, these remains may be residual domestic hearth waste. Also within the charcoal assemblage were fragments of possible heather family (*cf Ericaceae*) stems. Heather family stems within a hearth assemblage are frequently indicators of cereal parching, with heathland turf or heather family fuel used to bank down the fire to help minimise accidental conflagration of drying grains (Dickson 1998).

Mill Pond

South of the main outer walls of the mill was an area traditionally referred to as the 'mill pond' which was still surviving to some extent until the 1950s when it was backfilled as part of the landscaping undertaken in this area at this time. The pond contained a number of successive distinctive layers of material, largely deposited during the 19th century. At approximately 1m depth the fills became more alluvial with a large quantity of branches present and two large upright oak stake piles that were substantially within fill 0604. The alignment of this structure suggests a possible medieval timber revetment of the pond (Parker & Winfer 2015). The samples recovered from the basal fill and above basal fill were processed separately but are discussed together.

(0604) <unknown> basal fill and above basal fill of pond

The basal fill of the pond is likely to reflect the natural sediment accumulations of water laid silts prior to the subsequent infilling events. The deposit may also include some material from subsequent fills that have become mixed after settling as it included fragments of building material detritus including quantities of CBM, worked stone and glass. Magnetic and



especially metallic material were also recorded. These may have derived from the overlying iron pan formation which was recorded as having formed above the sediment but given the other anthropogenic materials present, are more likely to have derived from industrial processes or structural regeneration. No botanical remains were recovered from the very basal fill other than a limited number of minute charcoal flecks, although the above basal material of context 0604 was highly organic.

The majority of the plant remains in the above basal material derived from scrub woodland taxa with input from wetland and arable/ruderal weeds. Seeds from wetland taxa recovered included water-pepper (*Persicaria hydropiper*), possible celery-leaved buttercup, clustered dock (*Rumex conglomeratus*) northern dock (*Rumex longifolius*) and common club-rush. Arable / ruderal indicators support the interpretation of the pond being set within open ground close to cultivation.

Woodland indicator taxa were prolific within the above basal fill of context 0604. The assemblage included seeds, buds and wood of taxa including alder, birch, possible beech (*cf Fagus*), apple type (Maloideae), willow and elder. Additionally, prickles, thorns and spines, many still attached to twigs, of blackthorn (*Prunus spinosa*), hawthorn, rose (*Rosa sp*) and blackberry type were recorded in significant numbers. Collectively, this implies the presence of mixed scrub woodland within the vicinity of the pond.

Many substantial and well preserved small branches and large twigs were recovered from the above basal material from deposit 0604, many of which had been cut to an angled point. Several had more than one such cut, in different orientations, indicating that they were woodworking waste. Such finds may represent deposition of clearance material from this scrub woodland environment. However, this material may also be debitage from wattle work associated with the construction or use of the pond, as oak timbers were also recovered from this deposit during excavation.

Nine seeds of fig (*Ficus carica*) were recorded from the basal fill of the mill pond. These are likely to indicate that human cess material has been deposited within the pond. One seed of hemp (*Cannabis sativa*) was also recorded. This may reflect casual loss during retting (rotting) of stems for fibre.

Toton 4478181 Table 1	Propagule	Context	0127	0171	0604 (basal)	0604 (above basal)
Waterlogged samples analysis		Sample	?	0165	?	?
		Feature	13-14C ditch	ditch/gully	mill pond	mill pond
Matrix Composition (1-5 abundance)		Volume examined				
Wood & twigs			++++	-	-	+++++
Bark			++	-	-	+++
Moss			-	-	-	+
Dicot leaf			-	-	-	++
Seeds (w/l)			++++	-	-	++++
Seeds (carb)			-	++	-	-
Cereals (carb)			++	++	-	-
Charcoal			++	++	+	-
Cinder			-	+++	+	-
Bone			-	-	-	-
Roots			+	+++	++	+
Invertebrates			++	+	-	++
Invertebrate eggs			++	-	-	++
Charcoal >4mm			<<5ml	5ml	0ml	0ml

Charcoal <4mm			<<5ml	5ml	<<5ml	0ml
% Charcoal ID >4mm			100	100	0	0
Charcoal/Cereal AMS option Y / N				Y		Y
Charcoal		Common Name				
<i>Alnus</i>						
<i>Betula</i>		birch	-	1 (0.19g)	-	-
<i>Corylus</i>		hazel	3 (0.02g)	-	-	-
cf Ericaceae		cf heather family	-	5 (0.20g)	-	-
<i>Fraxinus</i>		ash	-	3 (0.05g)	-	-
Maloideae		apple family	-	-	-	-
<i>Populus/Salix</i>		poplar/willow	-	2 (0.01g)	-	-
Prunoideae		cherry family	-	-	-	-
cf Prunoideae		cf cherry family	-	2 (0.07g)	-	-
<i>Quercus</i>		oak	3 (0.04g)	1 (0.3g)	-	-
Cereals (carb)		Common Name				
<i>Avena sp</i>	seed	oat	2	-	-	-
cf <i>Secale cereale</i>	seed	cf rye	2	-	-	-
cf <i>Triticum sp</i>	seed	cf wheat	3	4	-	-
Cerealium indet	seed	cereal	12	16	-	-
Other Macros (carb)		Common Name				
Arable/ruderal (waste ground)						
<i>Chenopodium album</i>	seed	fat hen	-	2	-	-
<i>Vicia cf sativa</i>	seed	common vetch	-	3	-	-
cf <i>Vicia/Lathyrus sp</i>	seed	vetch/pea	-	4	-	-
Macros (W/L)		Common Name				
Woodland/scrub						
<i>Alnus</i>	seed	alder	-	-	-	1
<i>Alnus fgmt</i>	false cone	alder	-	-	-	3
cf <i>Alnus</i>	bud	alder	-	-	-	2
<i>Betula pendula/pubescens</i> NFI	seed	silver/downy birch	2	-	-	-
cf <i>Betula sp</i>	bud	cf birch	-	-	-	1
<i>Crataegus monogyna</i>	spine	hawthorn	-	-	-	++
cf <i>Crataegus spfgmt</i>	seed	cf hawthorn	1	-	-	-
cf <i>Fagus</i>	bud	beech	-	-	-	2
Maloideae roundwood	twig	apple type	-	-	-	+

>2yo						
<i>Populus/Salix</i> roundwood >4yo	twig	poplar/wil- low	-	-	-	+
<i>Prunus spinosa</i>	thorn	blackthorn	-	-	-	+++
Prunoideae roundwood >4yo	twig	cherry type	-	-	-	+++
<i>Rosa</i> sp	prickle	rose	-	-	-	+++
<i>Rubus fruticosus</i> ss	seed	blackberry	3	-	-	3
<i>Rubus fruticosus</i> sl	prickle	blackberry type	-	-	-	++
<i>Rubus fruticosus</i> sl	seed	blackberry type	1	-	-	2
<i>cf Salix</i> sp	bud	cf willow	-	-	-	3
<i>Sambucus</i> <i>nigra/racemosa</i>	seed	elder/red- berried elder	27	-	-	1
Buds indet	bud		-	-	-	4
Gall	leaf gall		-	-	-	2
Twigs 1-2yo NFI	twig		+++		-	+++
Arable/ Ruderal (waste ground)						
<i>Anagallis arvensis</i>	seed	scarlet pimpernel	1	-	-	-
<i>Chenopodium album</i>	seed	fat hen	1	-	-	3
<i>Cirsium/ Carduus</i> sp	seed	thistles	-	-	-	6
<i>Galeopsis tetrahit</i> sl	seed	hemp- nettle	-	-	-	1
<i>Hyoscyamus niger</i>	seed	henbane	33	-	-	1
<i>Lamium</i> sp	seed	dead nettle	2	-	-	-
<i>Papaver rhoeas</i>	seed	common poppy	2	-	-	-
<i>Persicaria maculosa</i>	seed	redshank	1	-	-	-
<i>Persicaria cf maculosa</i> fgmt	seed	cf redshank	-	-	-	-
Poaceae (large) NFI	seed	large seeded grass	2	-	-	-
Poaceae (small) NFI	seed	small seeded grass	-	-	-	2
<i>Polygonum aviculare</i>	seed	knotgrass	-	-	-	-
<i>Polygonum / Persicaria</i> sp fgmt	seed	knotgrass/ knotweed	-	-	-	-
<i>Ranunculus</i> <i>repens/bulbosus</i>	seed	creeping/ bulbous buttercup	1	-	-	7
<i>Stellaria media</i> (incl fgmt)	seed	chickweed	3	-	-	2
<i>Urtica dioica</i>	seed	stinging nettle	7	-	-	16
Rough/ Open grassland						

<i>Carex divulsa</i>	seed	grey sedge	2	-	-	-
<i>cf Genista tinctoria</i> NFI	seed	cf dyer's greenweed	1	-	-	-
<i>Plantago major</i>	seed	greater plantain	1	-	-	9
Wetland:						
marsh/fen/mire						
<i>Lycopus europaeus</i>	seed	gypsywort	2	-	-	-
<i>Carex hostiana</i>	seed	tawny sedge	2	-	-	-
<i>Carex viridula</i> sl	seed	yellow sedge	1	-	-	-
<i>Persicaria hydropiper</i>	seed	water-pepper	-	-	-	1
<i>Ranunculus sceleratus</i>	seed	celery-leaved buttercup	28	-	-	-
<i>cf Ranunculus sceleratus</i> fgmt	seed	cf celery-leaved buttercup	8	-	-	3
<i>Rumex conglomeratus</i>	tepal	clustered dock	-	-	-	2
<i>Rumex longifolius</i>	tepal	northern dock	-	-	-	3
<i>Schoenoplectus lacustris</i>	seed	common club-rush	8	-	-	2
Aquatic:						
lakes/ponds/rivers						
<i>Alisma plantago-aquatica</i>	seed	water-plantain	12	-	-	-
<i>cf Alisma plantago-aquatica</i>	seed	cf water-plantain	3	-	-	-
<i>cf Nymphoides</i> type	seed	cf fringed water-lily	11	-	-	-
<i>Potamogeton perfoliatus</i>	seed	perfoliate pondweed	-	-	-	1
Imported/Cultivated						
<i>Cannabis sativa</i>	seed	hemp	-	-	-	1
<i>Ficus carica</i>	seed	common fig	-	-	-	9
Habitat not defined						
<i>Carex</i> sp fgmt	seed	docks	-	-	-	2
Caryophyllaceae	seed	pink family	37	-	-	-
Lamiaceae	seed	dead-nettle family	2	-	-	-
<i>cf Polygonaceae</i> fgmts NFI	seed	knotweed	-	-	-	4
<i>Potentilla</i> sp	seed	cinquefoils	1	-	-	-
<i>Ranunculus</i> sp fgmt	seed	buttercups	-	-	-	6
<i>Rumex</i> sp	seed	dock	23	-	-	6

<i>cf Rumex</i> sp	seed	cf dock	8	-	-	-
tussock forming moss fgmt	moss	moss	-	-	-	1
Invertebrates						
<i>Daphnia pulex</i> ephippia	resting egg	water flea	9	-	-	
Beetle fgmts	exoskeleton			-	-	
Egg cases	egg			-	-	
Other						
Fish otolith	bone			1	-	

Toton 4478181 Table 2			Sample info (volumes in L)					Constituents weights (g)								
Context	Sample	Type	total tubs	tubs processed	sample vol	retents processed	Retent vol	Charcoal	Bone	Pottery	CBM	magnetic material	industrial waste	worked stone (flint)	Glass	Plant material
0127	?	BS	5	5	25	5	3.2	0.03	0.29	1.65		2.51	15.58			
0171	0165	BS	2	2	15	2	2	0.55	0.65	5.83	1.61	4.91				
0604 basal	?	BS	2	2	10	2	8.5			0.45	75.62	2.30	34.72	22.14	0.74	
0604 above basal	?	BS	1	1	0.5	1	2				2.5					++ +

Discussion

The artefact assemblage recovered from all of the samples was relatively limited and restricted primarily to fragments of CBM, pottery, metal and magnetic material, glass and worked stone (flint). Artefacts and ecofacts including calcined bone, pottery, charcoal and carbonised cereal grains, as recovered from the manor farm ditch fills (0171 & 0127), usually have domestic connotations and are likely to have derived from the deposition of hearth waste material. Carbonised botanical remains were somewhat sparse within the samples, with only one context (0171) producing a moderate number of charcoal fragments and carbonised cereals and typically associated crop weeds to lend any interpretative value related to such remains. Pottery was recovered from all of the samples, but was slightly more abundant within the manor farm ditch fills.

Although recorded in relatively small quantities, CBM fragments especially appeared to be more prolific within the top of basal fill (0604) of the mill pond. This basal pond fill also contained shards of glass and worked stone (flint). Together these artefacts may reflect changes caused by structural demolition and regeneration of buildings within the area, or related to the mill pond structure itself.

Whilst carbonised organic materials relate to incidents involving fire and are frequently relatable directly to human activities, fragile waterlogged materials often reveal additional evidence of indirect association with people and specific activities, such as weeds of

anthropogenic soils or post abandonment events. Considerable numbers of waterlogged seeds and other plant macrofossil remains were recorded from the waterlogged fills from both the manor farm house ditch feature [0126] and the basal fill of the mill pond. The large 13th-14th century ditch was interpreted initially as a substantial boundary ditch. While this is more than likely substantiated, the presence of wetland and aquatic plant taxa indicate that this was a wet and waterlogged environment. It is possible that the ditch provided two important functions; those of boundary delineation but also of drainage. The primary fill (0127) of ditch 0126 also contained occasional carbonised plant remains in the form of charcoal fragments and cereals, with other typically domestic components including small indeterminate calcined bone fragments and pottery, alluding to the deposition of possible hearth waste material within the ditch.

The basal fill (0604) of the mill pond contained an abundance of scrub woodland indicators in the form of waterlogged seeds, leaf fragments, thorns, prickles & spines and roundwood branches and twigs, many of which appeared to be worked and cut to a point. These remains may have derived from the clearance of scrub woodland surrounding the pond during periods of use and activity to maintain the surrounding area, or conversely may have derived from the remnants of a structure related to the construction of the pond. At this depth, the fills became more alluvial and contained a large quantity of branches and two large upright oak stake piles which were substantially within the basal fill (0604). Dendrochronological dating of the stakes suggests a possible timber revetment from the 13th century. The worked roundwood branches and twigs may be the remnants of such a structure constructed with wattle panelling supported with the oak timber uprights.

The pond fill also contained imported plants including seeds of hemp and fig seeds. Previously hemp was cultivated both as a medicinal herb as it is a useful drug plant, and also as a source of hemp fibre to produce rope and cloth (Mabey 1997; Stuart 1989). It was grown as an annual crop on rich soils and retted in much the same way as flax to produce fibres. Unless resin is also found within archaeological contexts, finds of seeds are unlikely to indicate whether it was grown for fibre, oil or medicine (Dickson & Dickson 2000), although cultivation for fibre especially was well established by medieval times, with the seed by product being used for oil and fodder.

Henbane was recovered from the waterlogged ditch fill (0127) and mill pond (0604) and also has notable medicinal implications; originally it may have had originated as a physic garden escape. However, henbane is also a prolific weed of enriched soils and waste ground that is also extremely robust. Consequently, it is very likely to be present as such. Figs are likely to have been imported as dried fruits for consumption, implying sufficient wealth within the community to purchase such luxury items. Figs also have medicinal qualities and have been widely used for their laxative qualities (Stuart 1989). Figs do not set seed naturally within the British Isles (Dickson & Dickson 2000) but were a prolific import as dried fruit by the medieval period and would have been available at most markets.

7.3 *Dendrochronology* by Alison Arnold and Robert Howard

Sampling

Analysis by dendrochronology was undertaken on samples from two timbers found during archaeological excavation at the site of a former watermill at Toton in Nottinghamshire (TOT-M02 (DBO), and TOT-M01 (DBP)), in an attempt to obtain accurate and reliable dates. It was hoped that tree-ring analysis would provide some dating for the structure, there being no other certain evidence for its period of use or its potential sequential development.

Sliced samples were thus taken from the two submitted timbers. Having been buried for some time the timbers were waterlogged, and the sliced samples were initially frozen for a short period to harden them. Once sufficiently solid the slices were reduced in size to narrow-width, cross-sectional, radii. The radii were then allowed to air dry naturally for three weeks before being prepared for measuring by sanding and polishing to clearly reveal the annual tree-ring growth (Plate 42). The two samples were given the Nottingham Tree-ring Laboratory code

TOT-M (for Toton Mill), and were numbered 01 and 02, as well as being denoted by their Trent and Peak excavation code (respectively DBP and DBO). Details of the samples are given in Table 3, including the site code of the timber sampled, the total number of rings each sample has, and how many of these, if any, are sapwood rings. The individual date span of each dated sample is also given.

Table 3: Details of tree-ring samples from Toton Mill, Toton Manor Farm Recreation Ground, Nottinghamshire

Sample number	Sample location/identifier code	Total rings	Sapwood rings*	First measured ring date (AD)	Heart/sap boundary	Last ring date	Estimated felling date range**
TOT-M01	DPB	101	h/s	1116	1216	1216	1231–56
TOT-M02	DBO	136	h/s	1060	1195	1195	1210–35
*h/s = heartwood/sapwood boundary, i.e., only the sapwood rings are missing							
**Felling date range based on a minimum of 15 sapwood rings and a maximum of 40 sapwood rings							

Tree-ring dating

Tree-ring dating relies on a few simple, but quite fundamental, principles. Firstly, as is commonly known, trees (particularly oak trees, the timber most commonly used in building construction until the introduction of pine from the late eighteenth century onwards) grow by adding one, and only one, growth-ring to their circumference each, and every, year. Each new annual growth-ring is added to the outside of the previous year's growth just below the bark. The width of this annual growth-ring is largely, though not exclusively, determined by the weather conditions during the growth period (roughly March–September). In general, good conditions produce wider rings and poor conditions produce narrower rings. Thus, over the lifetime of a tree, the annual growth-rings display a climatically influenced pattern. Furthermore, and importantly, all trees growing in the same area at the same time will be influenced by the same growing conditions and the annual growth-rings of all of them will respond in a similar, though not identical, way.

Secondly, because the weather over a certain number of consecutive years is unique, so too is the growth-ring pattern of the tree. The pattern of a shorter period of growth, 20 or 30 consecutive years, might conceivably be repeated two or even three times in the last one thousand years, and is considered less reliable. A short pattern might also be repeated at different time periods in different parts of the country because of differences in regional micro-climates. It is less likely, however, that such problems would occur with the pattern of a longer period of growth, that is, anything in excess of 45 years or so. In essence, a short period of growth, anything less than 45 rings, is not reliable, and the longer the period of time under comparison the better.

Tree-ring dating relies on obtaining the growth pattern of trees from sample timbers of unknown date by measuring the width of the annual growth-rings. This is done to a tolerance of 1/100 of a millimeter. The growth patterns of these samples of unknown date are then

compared with a series of reference patterns or chronologies, the date of each ring of which is known. When the growth-ring sequence of a sample 'cross-matches' repeatedly at the same date span against a series of different reference chronologies the sample can be said to be dated. The degree of cross-matching, that is the measure of similarity between sample and reference, is denoted by a 't-value'; the higher the value the greater the similarity. The greater the similarity the greater is the probability that the patterns of samples and references have been produced by growing under the same conditions *at the same time*. The statistically accepted fully reliable minimum t-value is 3.5.

However, rather than attempt to date each sample individually it is usual to first compare all the samples with one another, whether they be from a single archaeological structure, single archaeological site or phase, from a seemingly non-integral structure, or from a standing building. This comparative process is undertaken in an attempt to cross-match each sample with all the others from the same archaeological structure/phase, or building. It should be pointed out that this is not done by simply comparing the 'raw' ring-width data of the samples (the 'raw' growth pattern), but rather by calculating a moving five-year average for each individual consecutive ring (requiring the first two and the last two rings of each sample to be 'lost'), and then turning this average into a ratio relative to the next average. It is thus that a series of 'normalised' patterns are compared with each other.

When samples from the same phase do cross-match with each other they are combined at their matching positions to form what is known as a 'site chronology'. As with any set of data, this has the effect of reducing the anomalies of any one individual (brought about in the case of tree-rings by some non-climatic influence) and enhances the overall climatic signal of the group of samples. As stated above, it is the climate that gives the growth pattern its distinctive pattern. The greater the number of samples in a site chronology the greater is the climatic signal of the group and the weaker is the non-climatic input of any one individual.

Furthermore, combining samples in this way to make a site chronology usually has the effect of increasing the time-span that is under comparison. As also mentioned above, the longer the period of growth under consideration, the greater the certainty of the cross-match. Any site chronology with less than about 55 rings is generally too short for reliable dating. However, this process of combining individual samples is not always possible, particularly with archaeological sites, where non-integral structures may contain timbers of different dates. In such instances, each sample may be compared individually with the full corpus of reference data in an attempt to date them as 'singletons'. Although this approach is usually less successful than dating combined groups where the data of the samples is replicated, it can be done.

Having obtained the date span of the individual samples the felling date of the tree or trees represented may be calculated. Where a sample retains complete sapwood, that is, it has the last or outermost ring produced by the tree before it was cut, the last measured ring date is the felling date of the tree.

Where the sapwood is not complete it is necessary to estimate the likely felling date of the tree. Such an estimate can be made with a high degree of reliability because oak trees generally have between 15 to 40 sapwood rings. For example, if a sample with, say, 12 sapwood rings has a last sapwood ring date of 1400 (and therefore a heartwood/sapwood boundary ring date of 1388), it is 95% certain that the tree represented was felled sometime between 1403 (1400+3 sapwood rings (12+3=15)) and 1428 (1400+28 sapwood rings (12+28=40)).

Analysis

Thus, once sufficiently prepared, the widths of the annual growth rings of the two samples were measured, the data of these measurements then being initially compared with each other as described in the notes above. This comparative process indicated that although there was some cross-matching between the two samples at one particular position (when the first ring of sample TOT-M01 (DBP) is at +56 years relative to the first ring of sample TOT-M02 (DBO)), this was not at a significantly high level.

Because of this, the two samples were then compared individually to the full corpus of reference data, this indicating cross-matches and dates for both of them; sample TOT-M01 (DBP) cross-matching significantly well and repeatedly with a large number of reference chronologies when its 101 rings span the years 1116–1216, while sample TOT-M02 (DBO) cross-matches significantly well and repeatedly with a large number of reference chronologies when its 136 rings span the years 1060–1195. It will be seen that the first ring date of each sample corresponds to the relative position of the low level cross-matching between the two samples seen in the initial analysis (ie, +56 rings).

Because of the satisfactory dating of the two individual samples, and because of their corresponding, though low-level, cross-matching, the samples were combined at their indicated offset positions to form a single site chronology, TOTMSQ01, this have a combined overall length of 157 rings (Fig 3). Site chronology TOTMSQ01 was then compared with the full corpus of reference data, this indicating a cross-match spanning the years 1060–1216. The evidence for this dating is given in the t-values of Table 4.

Table 4: Results of the cross-matching of site chronology TOTMSQ01 and the reference chronologies when the first ring date is 1060 and the last ring date is 1216		
Reference chronology	t-value	
England, London master chronology	6.2	(Tyers and Groves 1999 unpubl)
Angel Choir, Lincoln Cathedral	6.0	(Laxton and Litton 1988)
Manor House, West Bromwich	5.9	(Arnold <i>et al</i> 2009)
Manor House, Medbourne, Leicestershire	5.7	(Howard <i>et al</i> 1999)
London Fleet Valley chronology	5.7	(Tyers and Hibbard 1993)
Bede House, Lyddington, Rutland	5.6	(Arnold and Howard forthcoming)
Holy Trinity Church, Wistanstow, Hampshire	5.6	(Miles 1998)
LON-S01M master chronology	5.5	(Morgan 1977)

Interpretation

Neither of the dated samples retains complete sapwood (the last ring produced by a tree before felling), and it is thus not possible to reliably determine the precise felling date of either of the trees represented. The two samples do, though, retain the heartwood/sapwood boundary, this meaning that although each sample has lost its sapwood rings, it is *only* the sapwood rings that have been lost. This situation allows an estimated date range within which it is highly likely that the trees were felled.

Allowing for a likely minimum of 15 sapwood rings and a likely maximum of 40 sapwood rings (the usual 95% confidence interval), and given that the heartwood/sapwood boundary on sample TOT-M02 (DBO) is dated to 1195, it is likely that the tree represented was felled at some point between 1210 at the earliest and 1235 at the latest.

Likewise, allowing for the same sapwood estimates as above, 15–40 rings, and given that the heartwood/sapwood boundary on sample TOT-M01 (DBO) is dated to 1216, it is likely that the tree represented by this sample was felled at some point between 1231 at the earliest and 1256 at the latest.

Conclusion

Tree-ring dating has thus produced dates for both of the samples analysed in this programme, this indicating that both timbers date from the early- to mid-thirteenth century. It is most likely that the timbers were felled at slightly different times, though there is a slight possibility that they were felled together in the period 1231–35 (where their estimated felling date ranges overlap). As such, these timbers represent an unusually early survival, and may relate to the mill referred to in the survey of 1308.

8 DISCUSSION AND CONCLUSION

8.1 Discussion

There is evidence for a possible medieval mill at the site. Dry stone foundations/wall remains were recorded surviving below material on which the 18th century mill was built. A posthole was observed within these remains as well as a possible beam slot. The nature of these features is still unclear as this excavation has focused on recording the 18th century remains. Dendrochronological analysis has shown the two large stakes recovered from the edge of the pond were from trees felled between 1210 and 1231 AD. The two stakes may have formed part of a wattle revetment built along the edge of the pond. The pond may have sat between this mill and a further mill to the south although this was not identified by the geophysical survey.

In the early to mid 18th century a new mill was built on the site. This comprised a water wheel pit within the footprint of the mill, fed by the head race to the north, with wheel pit/cog pit to the east and a possible barn to the east of this. A possible kiln was also excavated. The extent of the mill building was not defined to the west as a tree is growing in this area. An undated stone foundation around these 18th century features is presumed to date to this period although it may be an earlier foundation reused for the construction of this mill or be of stone that has been recycled from elsewhere.

Evidence of early 19th century renovation was identified with part of a floor and the underlying cement recorded.

The later 19th century saw further modifications to the mill with a large extension to the south east and a well and a lean to shelter to the south. The water wheel pit appears to have been resurfaced and the mechanics behind the generation of power evolved. The wheel appears to have gone from being an undershot design to a Poncelet and finally a breast shot mechanism.

Excavation of the mill pond revealed phases of infilling in both the 19th century and the mid 20th century. Samples from the silted primary fill of the pond contained plant remains from wetland and mixed scrub woodland as well as fig seeds and a single hemp seed. The mixed nature of this silt deposits means that the date at which these plant remains were deposited is unclear, although they obviously pre-date the 19th century infilling of the pond.

8.2 Conclusion

The excavation has revealed evidence of a medieval mill once having stood on the site. It has identified the scale and layout of the 18th century mill and shown how it evolved, expanding and incorporating advancements in technology during the 19th Century.

Whilst we may speculate about the various inner workings of this Mill, we can say with some degree of certainty that we have tantalising evidence for a mill on this very site prior to the 18th century, and that during the 18th century this mill in keeping with so many other industries during the industrial revolution was a powerhouse of activity increasing its output with evermore efficient modifications. In the end, these technological advancements would inevitably lead to its downfall and, with the introduction of steam powered engines, the days of solely using waterpower was at an end. Unsuccessful bids to transform the mill firstly to a bonemeal factory and then to a soapworks were doomed to fail. Its demise was sealed with its demolition during the early 20th century which left only a pond and a few solitary stones to indicate that there ever was such a hive of activity on this spot. Children would play on this now barren land and now some years later, it is those very people and a wealth of enthusiastic and dedicated volunteers that have finally bought Toton Mill back to life.

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1884 Ordnance Survey map, scale 1:2,500

1847 Tithe map

1835 map from Sanderson's Twenty Miles around Mansfield

1789 map of Toton Manor, Sir John Borlase Warren

1782 map of Toton Manor, Sir John Borlase Warren

1774 Map of Nottinghamshire, John Chapman

Appendix 1 Context Register

Context	Category	Description
0300	Feature	Stone walls SE-NW, area 08
0301	Feature	Brick wall NE-SW, area 08
0302	Feature	Brick wall SE-NW keyed to 0301, area 08
0303	Feature	Handmade brick floor NE-SW, area 08
0304	Feature	Handmade brick floor SE-NW, area 08
0305	Feature	Same as 0304 -3 bricks, area 08
0306	Feature	1 course brick wall NE-SW, area 08
0307	Feature	Brick floor below 0306, area 08
0308	Feature	Stone wall NE-SW
0309	Feature	Stone wall NE-SW same as 0308
0310	Feature	Stone wall NE-SW same as 0308/9, area 08
0311	Feature	Brick surface/wall, area 08
0312	Feature	2 course width brick wall, area 08
0313	Feature	Wooden threshold, area 08
0314	Feature	Ceramic tubular drain laid over redundant earlier brick box drain, area 08
0315	Feature	Brick 19thc box drain, area 08
0316	Feature	3 bricks together, area 08
0317	Fill	Fill of 19thc well, area 08
0318	Feature	Brick well, area 08
0319	Layer	Topsoil, area 08
0320	Layer	Mixed compact orange brown demolition layer, area 08
0321	Layer	Mid-dark grey/brown friable silty demolition layer, area 08
0322	Layer	Compacted black/grey clinker ash, area 08
0323	Feature	Lime mortar foundation, area 08
0324	Void	-
0325	Void	-
0326	Feature	Lime mortar bedding for possible brick floor, area 08
0327	Feature	Lime mortar bedding for possible brick floor, area 08
0328	Feature	E-W 19 th c brick wall, area 08
0329	Feature	NE-SW 19 th c brick wall, area 08
0330	Feature	E-W 19 th c brick wall, area 08
0331	Feature	E-W 19 th c brick wall, area 08
0332	Feature	Square brick foundation abutting 0331/0329, area 08
0333	Feature	Stone packing abutting 0329, brick wall, area 08
0334	Feature	Isolated stone work, area 08

0335	Feature	Mill pond edge cut, area 08
0336	Layer	Firm mid yellowish brown clay layer, area 08
0337	Layer	Firm mid brown clay layer, possibly surface, area 08
0338	Layer	Pond fill, area 08
0339	Feature	Stone packing between 0300 & 0303, area 08
0340	Feature	Group of bricks overlying 0301, area 08
0341	Feature	Bricks abutting 0308, area 08
0342	Layer	Firm 5yr 4/6 clay silt, frequent rounded pebbles, abuts 0323, area 08
0343	Layer	Firm 10yr 3/4 10yr 2/2, mixed mortar, pebbles, charcoal, dump deposits, area 08
0344	Layer	Mortar foundation/bedding between 0300, 0301, 0302, area 08
0345	Surface layer	Compacted cobble surface, area 08
0346	Layer	Firm light brown (2.5yr 3/3 clay/silt, area 08
0347	Layer	Cobble surface? Rough laid possible dump to consolidate soft ground, area 08
0348	Layer	Friable mid grey brown (10yr 4/2) sandy clay silt subsoil, area 09
0349	Layer	Friable mid brown (10yr 4/3) silty clay subsoil, area 09
0350	Layer	Friable grey brown (10yr 3/2) silty sand demolition layer, area 08
0351	Fill	Mortar fill of foundation cut (10yr 8/2) area 08
0352	Cut	Foundation cut for 0329 area 08
0353	Cut	Same as 0352 area 08
0354	Fill	Same as 0351 area 08
0355	Layer	Firm mid brown (10yr 4/6) sandy clay
0356	Layer	Friable (7.5yr 3/4) grey brown pebble layer
0357	Layer	Early 19 th c made ground, friable 10yr 4/4 silty sand frequent pebbles/brick frags area 08
0358	Layer	Demolition layer, loose 7.5yr 5/4 sandy silt area 08
0359	Feature	Wall foundation/brick surface? Square brick set feature area 08
0360	Layer	Compacted surface, mixed deposit 7.5 4/4, frequent frags of brick area 08
0361	Layer	Surface 0357 area 08
0362	Feature	Possible collapsed wall,

		aligned NW-SE area 09
0363	Feature	Brick wall aligned NW-SE area 09
0364	Feature	Brick feature 'L' shaped in plan area 09
0365	Feature	Stone block relating to wheelhouse mechanism area 09
0366	Feature	Stone block relating to wheelhouse mechanism area 09
0367	Void	-
0368	Feature	Brick wall NE-SW aligned area 09
0369	Feature	Stone wall/revetment aligned NW-SE area 09
0370	Feature	Brick wall N-S aligned area 09
0371	Feature	Brick wall E-W aligned area 09
0372	Feature	Large stone block, possibly related to sluice gate for leat area 09
0373	Feature	Brick structure adjoined to 0372 area 09
0374	Layer	Firm brownish yellow clay layer (10yr 6/8) possible re-deposited natural area 08
0375	Cut	Pit cut area 08
0376	Fill	Fill of 0375, Firm 10YR 4/2 dark greyish brown clay area 08
0377	Feature	Short length of wall area 08
0378	Feature	Short length of wall area 08
0379	Layer	Firm yellowish brown clay (10yr 5/6 area 08
0380	Layer	Made ground south of 0308 area 08
0381	Layer	Compact mid brown clay loam area 09
0382	Fill	Loose black grey clinker ash within d shaped trough area 08
0383	Layer	Demolition layer, loose reddish yellow sandy silt 5yr 6/6 area 09
0384	Layer	Firm mid brown clay loam 7.5yr 5/3 layer area 08
0385	Fill	Demolition layer, loose sandy silt, frequent mortar, brick pebbles area 09
0386	Feature	Brickwork within well structure 0318 area 08
0387	Fill	Fill of 'D' shaped trough, Friable mid yellow red sandy clay 10yr 3/3 area 08
0388	Fill	Basal fill of trough firm mid yellow clay, 10yr 7/6 area 08
0389	Layer	Loose black clinker layer area 08

0390	Layer	Friable dark brown grey clayey loam 7.5yr 4/1 area 08
0391	Layer	Demolition/levelling layer, loose black clinker ash 1% brick frags area 08
0392	Layer	Demolition material consisting of tile frags, friable 7.5yr 6/3 light brown sandy clay loam area 08
0393	Layer	Firm light grey brown clay loam 7.5yr 5/1 area 08
0394	Layer	Pale yellow mortar associated with 0329 area 08
0395	Layer	Friable strong brown clay loam layer 7.5yr 5/4 area 08
0396	Layer	Dark brown silty loam layer, friable 7.5yr 3/2, 20% rounded pebbles area 08
0397	Layer	Friable light brown clay loam layer 10yr 5/3, 1% charcoal, 1% sub angular stone area 08
0398	Layer	Demolition/levelling layer, loose clinker ash area 08
0399	Layer	Secondary fill of pit 0376, Friable 7.5yr 4/2 brown gritty loam, 70% burnt bone, charcoal. area 08
0400	Layer	Demolition layer mixed with re-deposited natural. Friable yellowish red gritty clay loam, 15% sub rounded stones, brick frags, charcoal flecks area 08
0401	Layer	Alluvial deposit surrounding pond, firm 7.5yr 4/1 dark grey clay, 5% charcoal flex. area 08
0402	Layer	Friable light yellowish brown clay loam layer, 10yr 6/4, 1% charcoal. area 08
0403	Layer	Firm blue grey clay layer, 1 5/1 area 08
0404	Layer	Tarmac/hardcore dump layer area 08
0405	Layer	Clinker/sandy lenses area 08
0406	Layer	Alluvial deposit around mill pond, 10yr 4/3 area 08
0407	Layer	Loose reddish yellow sand & gravel layers 7.5yr 6/8 area 08
0408	Layer	Compacted brownish yellow sandy loam gravels, 10yr 6/8 area 08
0409	Layer	Mortar/ brick frag deposit associated with 0329 area 08
0410	Layer	Potential compacted pebble surface area 08
0411	Layer	Potential compacted pebble surface area 08
0412	Layer	Firm yellowish brown clay

		loam layer 10yr 5/6 5% stones/charcoal area 08
0413	Layer	Firm mid brown sand clay area 09
0414	Cut	Circular cut of well area 08
0415	Fill	Fill of outer well cut, loose yellowish brown loam 10YR 5/4 area 08
0416	Fill	Demolition layer , loose mid brown sandy silt layer 10yr 4/3 area 09
0417	Fill	Demolition/levelling layer of wheel-pit area, loose sandy silt, 10yr 4/6 area 09
0418	Feature	Brick structure within wheel pit rendered with mortar area 09
0419	Feature	Linear brick structure within wheel-pit area 09
0420	Feature	Metal fitting that probably housed sluice gate area 09
0421	Cut	Foundation cut of 0301 area 08
0422	Fill	Fill of foundation cut 0421, firm light yellowish brown clay loam, 10yr 6/4 area 08
0423	Fill	Fill of foundation cut 0421, loose white mortar, 5yr 8/1 area 08
0424	Layer	Wooden sill/step, very degraded overlying 0418 area 09
0425	Layer	Firm grey clay at base of wheelpit 10yr 3/2 area 09
0426	Feature	Brick step within at the head water control hatch end of wheel pit Area 09
0427	Feature	Stone foundations of 0301 area 08
0428	Feature	NE-SW brick wall lower foundation of 0304 area 08
0429	Feature	N-S wall area 08
0430	Feature	Semi circular brick feature area 08
0431	Feature	Remnants of slate damp proof between brick layers area 08
0432	Feature	Brick floor abutting 0300/0301
0433	Feature	Demolition rubble layer below 0359 area 08
0434	Feature	Brick step area 08
0435	Feature	Brick plinth similar to 0359 area 08
0436	Feature	Two bricks abutting 0309 area 08
0437	Feature	3x angled bricks sloping toward trough feature 0430 area 08
0438	Feature	Continuation of 0429 area 08
0439	Feature	Brick course above 0438 area 08

0440	Layer	Friable reddish brown clay loam below 0434 area 08
0441	Layer	Friable greyish brown layer layer below 0440 area 08
0442	Feature	Compacted mixed clay/mortar surface area 08
0443	Feature	Brickwork abutting 0303 area 08
0444	Layer	Mid brown clay below 0361 area 08
0445	Feature	NW-SE linear wall area 08
0446	Surface layer	Brick floor surface area 09
0447	Fill	Demolition infill, firm dark greyish brown clayey silt, moderate angular pebbles/brick frags area 09
0448	Feature	Brick plinth, Area 08
0449	Feature	Continuation of 0307, Area 08
0450	Feature	Solitary stone possibly related to 0316/0378, Area 08
0451	Feature	Cast iron outlet pipe running underneath 0438 to the millpond area 08
0452	Layer	Demolition layer area 08
0453	Feature	Cast iron pipe (at millpond end) same as 0451 area 11
0454	Feature	Stone spread within pond cut area 11
0455	Feature	Trench cut of pipe 0453 area 11
0456	Fill	Fill of 0455, friable mixed yellow clay black ash/clinker area 11
0457	Cut	Foundation cut of 0308 area 11
0458	Fill	Firm mid brown clay fill of 0457 area 11
0459	Fill	Friable mid brown loam fill of 0457 area 11
0460	Layer	Firm clay loam abutting 0457 area 11
0461	Layer	Firm light brown clay NE end of area 09
0462	Fill	Pond infill, soft silty sand, 2.5yr 4/8 area 08
0463	Fill	Tree bole infill NW facing section area 08
0464	Cut	Tree bole cut NW facing section area 08
0465	Layer	Friable dark grey sandy silt layer, 7.5 yr 4/1 area 08
0466	Fill	Pond infill layer, friable mixed silty sand, clinker, angular pebbles. 2.5yr 4/1 2.5yr 6/6 area 08
0467	Fill	Pond infill layer, friable dark grey silty sand, 7.5yr 4/1 area 08
0468	Fill	Pond infill layer, firm dark

		greyish brown silty clay, 10yr 3/2 area 08
0469	Layer	Friable dark grey silty sand layer, 10yr 4/1 (pond fill) area 08
0470	Fill	Friable greyish brown sandy silt 10yr 5/2 (pond fill) area 08
0471	Layer	Firm strong brown clay, occasional concrete/brick frags, 7.5yr 5/6 area 08
0472	Fill	Friable sandy silt 7.5yr 7/3 (pondfill) area 08
0473	Fill	Friable sandy silt 2.5yr 6/6 (pond fill) area 08
0474	Fill	Friable sandy silt 10yr 3/4 (pond fill) area 08
0475	Fill	Friable sandy silt 10yr 3/2 (pond fill area 08
0476	Layer	Friable greyish brown sandy silt layer, 10yr 5/2 area 08
0477	Layer	Light yellow concreted gritty clay deposit area 11
0478	Layer	Friable mid brown sandy loam associated with 0427 & SE section area 08
0479	Layer	Compact mid grey clay loam stony layer, SE facing section, 30% rounded pebbles, SE section area 08
0480	Layer	Friable light grey sandy loam demolition layer 30% brick & mortar frags, SE section area 08
0481	Layer	Friable light yellow clay loam layer, SE section area 08
0482	Layer	Friable mid yellow brown re-deposited natural clay, SE section area 08
0483	Layer	Friable mid yellow/pink clayey loam demolition layer, SE section area 08
0484	Layer	Loose mid greyish black ash, SE section area 08
0485	Layer	Friable grey clay silt layer 7.5yr 5.1 NE facing section area 10
0486	Layer	Compacted pebble area 08
0487	Layer	Friable light yellowish brown silty clay, 7.5yr 5/1 area 08
0488	Feature	Brick structure area 10
0489	Feature	Brick structure area 10
0490	Feature	Brick structure area 10
0491	Feature	Brick structure area 10
0492	Layer	Friable dark brown loam layer
0493	Layer	Topsoil
0494	Layer	Subsoil noted in NW facing section area 09, firm 10yr 4/6 dark yellowish brown silty clay
0495	Layer	Subsoil noted in SE facing

		section are 09
0496	Surface	Brick floor area 09
0497	Surface	Stone flag surface area 09 associated with water control outside wheel pit
0498	Surface	Brick floor, possibly re-laid at later date in 19 th c when wheelhousing converted
0499	Fill	Construction backfill, friable silty clay, moderate angular stone/brick frags
0500	Cut	Construction cut of wall 0363 area 09
0501	Layer	Firm light brown silty clay 2.5yr 5/4
0502	Layer	Cobble dump area 11
0503	Layer	Firm grey stony clay layer
0504	Layer	Firm mixed cobble, mortar layer SW end area 09
0505	Layer	Demolition layer
0506	Layer	Demolition layer
0507	Fill	Loose ash/clinker infill of well 0386
0508	Fill	Main outer stone wall of mill structure area 10
0509	Feature	Stone associated with 0509 area 10
0510	Feature	Brick structure associated with area 10
0511	Feature	Brick structure associated with area 10
0512	Feature	Brick structure associated with area 10
0513	Feature	White mortar covering brick structure area 10
0514		Brick structure (wheel pit side) area 10
0515	Layer	Firm brown clay layer area 10
0516	Layer	Firm yellow brown clay, 5% plaster frags 10yr 4/4 area 10
0517	Layer	Rubble/cobble layer sondage 3 area 09
0518	Fill	Infill taken from square hole in side wall stonework of wheel pit
0519	Layer	Concreted orange /grey grit layer in sondage 3 area 09
0520	Layer	Brick step area 10
0521	Layer	Brick floor area 10
0522	Layer	Single brick course area 10
0523	Layer	Stone foundation of 0514
0524	Layer	Mid brown clay loam area 10
0525	Layer	Stonework associated with 0529
0526	Layer	Fill of post area 10
0527	Layer	Brick mortared wall area 10
0528	Layer	Brick floor area 10
0529	Layer	Cut of post hole area 10
0530	Layer	Mortar above 0308 area 10

0531	Layer	Stone rubble surface area 10
0532	Layer	Friable mid grey ash layer in NE facing section area 08
0533	Layer	Friable light brown loam above 0528
0534	Layer	Firm mid grey clay with abundance of fallen tree debris area 11
0535	Layer	Concreted grey grit below 0519 sondage 3 area 09
0536	Layer	Loose mid grey-black clinker ash loam
0537	Layer	Friable mid grey silty clay layer 10yr 6/1 brownish yellow mottles area 08 NE facing section
0538	Layer	Friable mid brown silty clay layer 7.5yr 4/3, 10% brick frags, 1% charcoal
0539	Layer	Firm light yellowish brown clay layer 10yr 6/4 area 09
0540	Layer	Firm light reddish brown clay 5yr 6/3 10% brick stone frags
0541	Cut	Foundation cut for wall 0427, 0422 area 08
0542	Fill	Fill of foundation cut, firm 10yr 5/4 firm yellowish brown clay area 08
0543	Layer	Firm yellowish brown clay layer 10yr 5/8, 10% stone frags area 08
0544	Layer	Firm pale brown gritty clay, 10% plaster, 5% angular stones
0545	Fill	Fill of 0546, firm mid brown gritty clay, 10yr 5/3 40% angular stones
0546	Feature	Flat based compacted foundation
0547	Cut	Foundation cut of 0427
0548	Fill	Same as 0542
0549	Layer	Firm dark yellowish brown clay layer 10yr 4/4
0550	Layer	Mixed plaster loam layer below 0349 area 09
0551	Layer	Fill of 0552, firm mid reddish brown clay area 09
0552	Layer	Cut of sondage 4 area 9
0553	Layer	Loose strong brown silty loam 7.5yr 4/6, heavy root action NE facing section area 10
0554	Layer	Loose mid brown silt clay 7.5yr 4/2 heavy root action, NE facing section area 10
0555	Layer	Firm grey blue clay area 10
0556	Feature	Flagstones adjacent to 0308
0557	Feature	19 th c brick box drain area 11
0558	Layer	Friable mid brown silty clay layer 7.5yr 4/2 20% plaster,

		stone frags (demolition) NW facing section area 09
0559	Layer	Firm mid brown clay layer 7.5yr 5/4) NW facing section area 09
0560	Fill	Fill of 0561, friable mid brown silty clay, 7.5yr 4/2 40% brick, plaster frags) NW facing section area 09
0561	Cut	Straight edged foundation cut of 0364) NW facing section area 09
0562	Layer	Loose reddish yellow sand with 60% degraded brick plaster demolition rubble,) NW facing section area 09
0563	Fill	Fill of 0564, mid brown sandy silt 10% brick/plaster fragments,) NW facing section area 09
0564	Cut	Foundation cut of 0365, NW facing section area 09
0565	Layer	Loose grey gritty sand 7.5yr 5/1 10% plaster demolition lenses 10% brick tile frags,) NW facing section area 09
0566	Layer	Firm dark greyish brown silty clay demolition layer 10yr 4/2, 1% charcoal, plaster, brick frags,) NW facing section area 09
0567	Layer	Friable grey silty clay 10yr 5/1 with large plaster frags,) NW facing section area 09
0568	Fill	Friable mid brown silty clay layer 10yr 4/3, large plaster frags.) NW facing section area 09
0569	Layer	Firm brown clay layer 7.5yr 5/4 with strong mottles 5/8 area 09
0570	Layer	Firm 7.5yr 5/2 brown clay 10% charcoal flex,) NW facing section area 09
0571	Cut	Foundation cut for 0573 NW facing section area 09
0572	Fill	Firm greyish brown silty clay, 10% brick frags, large plaster frags,) NW facing section area 09
0573	Feature	Brickwork abutting 0576,) NW facing section area 09
0574	Fill	Fill of 0573, 0577, friable 10yr 4/3 brown clay, 20% large brick frags, rounded pebbles,) NW facing section area 09
0575	Fill	Friable 10yr 4/3 brown clay, 20% large brick frags, rounded pebbles,) NW facing

		section area 09
0576	Feature	Large stone wall below 0370, NW facing section area 09
0577	Feature	Brickwork below 0579
0578	Feature	Brickwork between 0576, 0579
0579	Feature	Stonework abutting 0578 above 0577, re-used stone doorway threshold. area 09
0580	Feature	Brickwork abutting 0579 area 09
0581	Feature	Stone deposit above 0579, area 09
0582	Cut	Opposing edge of 0571, area 09
0583	Cut	Cut of pit, same as 0552, area 09
0584	Fill	Same as 0551, area 09
0585	Layer	Firm light mid brown clay sand layer, 20% tile, brick and plaster frags, area 09
0586	Layer	Firm mid brown grey silty clay, 10% large bricks, stones, plaster, area 09
0587	Layer	Concreted grey/green small angular grit stones , sondage 3, area 09
0588	Layer	Firm bright orange sand , lower strat of sondage 3
0589	Layer	Flagstone slab, (re-deposited) area 09 sondage 3
0590	Fill	Firm mid brown clay, area 09, sondage 3
0591	Cut	Foundation cut of wall 0577, sondage 3, area 9
0592	Not used	-
0593	Not used	-
0594	Not used	-
0595	Not used	-
0596	Not used	-
0597	Not used	-
0598	Not used	-
0599	Not used	-
0600	Fill	Box drain 0557 cut fill, Firm did orange brown sandy clay, 20% brick, tile, plaster frags late 19 th c, area 11
0601	Cut	Cut of box drain 0557, area 11
0602	Fill	Firm light yellow brown silty clay layer forming part of pond infill, area 11
0603	Fill	Friable light orange iron pan sand , area 09
0604	Layer	Firm brownish grey alluvial clay, 20% sub rounded pebbles
0605	Feature	Possible medieval rubble wall, sondage 1 area 08
0606	Iron plate	Area 09, below 0417, possibly

		a plate relating to a 'Poncelet' style of water feed
0607	Stone floor	Stone floor of tail race
0608	Stone revetment	Stone revetment with wooden stakes (0614) and (0615)
0609	Void	Void
0610	Group number	Group number for 0428/0449/0429
0611	Group number	Group number for 0328/0329/0354
0612	Group number	Group number for 0377/0378/0318
0613	Feature	Internal wall of tail race
0614	Feature	Large oak stake
0615	Feature	Small oak stake
0616	Feature	Oak mortised horizontal timber

Appendix 2 Finds Register

Context: 0314

Context No.	Material	Object Type	Count
0314	Ceramic	Drain pipe fragments	4

Context (0314) was a ceramic tubular drain laid over redundant earlier brick box drain in area 08.

Context: 0317

Context No.	Material	Object Type	Count
0317	Glass	Shard	7
0317	Pottery	Sherds	27
0317	Slag	Fragment	2
0317	Slate	Roof Tile Fragment	2

Context (0317) was a fill of 19th century well [0318].

Context: 0320

Context No.	Material	Object Type	Count
0320	Bone	Bone	7
0320	Carbon	Fragment	2
0320	Glass	Shard	40
0320	Metal	Nail	9
0320	Metal	Fragment	9
0320	Lead	Window piece	1
0320	Pottery	Sherd	60
0320	Shell	Fragment	1
0320	Slag	Fragment	6
0320	Slate	Fragment	13
0320	Ceramic	Tile fragment	1

Context (0320) was a mixed compact orange brown demolition layer.

Context: 0321

Context No.	Material	Object Type	Count
0321	Glass	Shard	1
0321	Metal	Fragment	2
0321	Pottery	Sherd	7

Context (0321) was a mid-dark grey/brown friable silty demolition layer

Context: 0322

Context No.	Material	Object Type	Count
0322	Brick	Fragment	1
0322	Clay	Pipe Stem	2
0322	Charcoal	Fragment	1
0322	Clay	Marble?	1
0322	Coal	Fragment	1
0322	Glass	Shard	9
0322	Metal	Fragment	4
0322	Mortar	Fragment	2
0322	Mother of Pearl	Stud top?	1
0322	Metal	Nail	1
0322	Pottery	Sherd	20
0322	Slag	Fragment	13
0322	Slate	Fragment	1
0322	Ceramic	Tile fragment	8

Context (0322) was a compacted black/grey clinker ash.

Context: 0336

Context No.	Material	Object Type	Count
0336	Glass	Shard	1
0336	Metal	Token	1
0336	Pottery	Sherd	3
0336	Stone	Polished Stone	1

Context (0336) was a firm mid yellowish brown clay layer.

Context: 0337

Context No.	Material	Object Type	Count
0337	Coal	Fragment	3
0337	Mortar	Fragment	1
0337	Pottery	Sherd	4
0337	Slate	Fragment	2

Context [0126] was a firm mid brown clay layer, possibly surface.

Context: 0342

Context No.	Material	Object Type	Count
0342	Bone	Fragment	3
0342	Brick	Fragment	1
0342	Metal	Fragment	5
0342	Pottery	Sherd	7
0342	Ceramic	Fragment	1
0342	Slag	Fragment	2

Context (0342) was a firm clay silt layer with frequent rounded pebbles.

Context: 0343

Context No.	Material	Object Type	Count
0343	Ceramic	Tile	23
0343	Pottery	Sherd	1

Context [0343] was a mixed mortar, pebbles and charcoal, dump deposits.

Context: 0345

Context No.	Material	Object Type	Count
0345	Clay	Pipe Fragment	1
0345	Glass	Shard	1
0345	Metal	Fragment	1
0345	Pottery	Sherd	1

Context (0345) was a compact cobbled surface.

Context: 0346

Context No.	Material	Object Type	Count
0346	Bone	Fragment	1
0346	Brick	Fragment	4
0346	Clinker	Fragment	3
0346	Metal	Fragment	3
0346	Clay	Pipe fragment	3
0346	Pottery	Sherd	85
0346	Slag	Fragment	2
0346	Slate	Fragment	4
0346	Ceramic	Tile fragment	1

Context (0346) was a firm light brown clay/silt deposit.

Context: 0348

Context No.	Material	Object Type	Count
0348	Bone	Fragment	7
0348	Clay	Pipe Stem	1
0348	Concrete	Fragment	1
0348	Glass	Shard	26
0348	Metal	Fragment	35
0348	Mortar	Fragment	4
0348	Pottery	Sherd	37
0348	Slate	Fragment	1
0348	Stone	Tile	2
0348	Ceramic	Tile Fragment	2

Context (0348) was a friable mid grey brown sandy clay silt subsoil.

Context: 0349

Context No.	Material	Object Type	Count
0349	Glass	Shard	2

Context (0349) was a friable mid brown silty clay subsoil.

Context: 0350

Context No.	Material	Object Type	Count
0350	Bone	Fragment	2
0350	Ceramic	Pipe fragment	1
0350	Glass	Shard	4
0350	Metal	Fragment	2
0350	Pottery	Sherd	45
0350	Shell	Fragment	10
0350	Slate	Fragment	3
0350	Stone	Stone	2
0350	Ceramic	Tile fragment	2

Context (0350) was a friable grey brown silty sand demolition layer.

Context: 0355

Context No.	Material	Object Type	Count
0355	Glass	Shard	8
0355	Metal	Fragment	3
0355	Pottery	Sherd	1
0355	Ceramic	Tile fragment	5

Context (0355) was a layer of firm mid brown sandy clay

Context: 0356

Context No.	Material	Object Type	Count
0356	Clay	Pipe stem	1
0356	Metal	Button	1
0356	Pottery	Sherd	3
0356	Ceramic	Tile Fragment	17

Context (0356) was a grey brown pebble layer.

Context: 0357

Context No.	Material	Object Type	Count
0357	Metal	Nail	1
0357	Pottery	Sherd	24
0357	Slag	Fragment	5

Context (0357) early 19th c made ground.

Context: 0358

Context No.	Material	Object Type	Count
0358	Glass	Shard	1
0358	Plastic	Button	1

Context (0358) was a demolition layer comprising loose sandy silt.

Context: 0360

Context No.	Material	Object Type	Count
0360	Bone	Fragment	3
0360	Clay	Pipe stem	1
0360	Glass	Shard	7
0360	Metal	Nail	3
0360	Mortar	Fragment	4
0360	Pottery	Sherd	12
0360	Stone	Stone	1

Context (0360) was a compacted surface, made up of mixed deposits, frequent frags of brick area.

Context: 0361

Context No.	Material	Object Type	Count
0361	Bone	Brick	24
0361	Brick	Fragment	6
0361	Clay	Tile	5
0361	Coal	Mortar	2
0361	Flint	Fragment	2
0361	Glass	Shard	16
0361	Metal	Fragment	17
0361	Mortar	Fragment	1
0361	Plaster	Fragment	2
0361	Pottery	Sherd	59
0361	Shell	Fragment	2
0361	Slag	Fragment	2
0361	Slate	Fragment	6
0361	Stone	Fragment	1
0361	Ceramic	Roof tile	4

Context (0361) was the same as surface (0357).

Context: 0374

Context No.	Material	Object Type	Count
0374	Bone	Fragment	2
0374	Glass	Shard	1
0374	Metal	Fragment	2
0374	Clay	Pipe fragment	4
0374	Pottery	Sherd	17
0374	Slate	Fragment	2
0374	Unknown	Unknown	1

Context (0374) was a firm brownish yellow clay layer, possibly re-deposited natural.

Context: 0376

Context No.	Material	Object Type	Count
0376	Bone	Fragment	4
0376	Glass	Shard	1
0376	Pottery	Sherd	1
0376	Slag	Fragment	4

Context (0376) was the dark greyish brown clay fill of pit [0375].

Context: 0381

Context No.	Material	Object Type	Count
0381	Pottery	Sherd	1

Context (0381) was a layer of compact mid brown clay loam.

Context: 0382

Context No.	Material	Object Type	Count
0382	Bone	Fragment	4
0382	Metal	Nail	1
0382	Slag	Fragment	7
0382	Slate	Fragment	2
0382	Stone	Fragment	2

Context (0382) was a loose black grey clinker ash within d shaped trough [0430].

Context: 0383

Context No.	Material	Object Type	Count
0383	Bone	Fragment	35
0383	Brick	Fragment	21
0383	Coal	Fragment	1
0383	Charcoal	Fragment	6
0383	Clay	Fragment	1
0383	Clinker	Fragment	4
0383	Concrete	Fragment	1
0383	Flint	Fragment	1
0383	Glass	Shard	26
0383	Metal	Fragment	23
0383	Mortar	Fragment	30
0383	Plaster	Fragment	1
0383	Pottery	Sherd	18
0383	Pumice	Fragment	1
0383	Shell	Fragment	5
0383	Slag	Fragment	8
0383	Slate	Fragment	17
0383	Stone	Fragment	19
0383	Ceramic	Tile fragment	39
0383	Wood	Fragment	1

Context (0383) was a demolition layer comprising loose reddish yellow sandy silt.

Context: 0384

Context No.	Material	Object Type	Count
0384	Clay	Pipe fragment	9
0384	Glass	Shard	2
0384	Metal	Fragment	3
0384	Mortar	Fragment	1
0384	Pottery	Sherd	88
0384	Shell	Fragment	4
0384	Slag	Fragment	1
0384	Ceramic	Tile fragment	2

Context (0384) was a layer of firm mid brown clay loam

Context: 0385

Context No.	Material	Object Type	Count
0385	Bone	Fragment	1
0385	Metal	Fragment	4
0385	Slate	Fragment	1
0385	Ceramic	Tile fragment	2

Context (0385) was a demolition layer made up of loose sandy silt, frequent mortar, brick and pebbles.

Context: 0386

Context No.	Material	Object Type	Count
0386	Brick	Fragment	13
0386	Glass	Shard	2
0386	Metal	Nails	4
0386	Mortar	Fragment	19
0386	Slate	Fragment	1

Context (0386) was brickwork within well structure 0318.

Context: 0412

Context No.	Material	Object Type	Count
0412	Bone	Fragment	1
0412	Brick	Fragment	2
0412	Clay	Pipe fragment	2
0412	Flint	Fragment	1
0412	Glass	Shard	11
0412	Metal	Fragment	9
0412	Pottery	Sherd	55
0412	Slag	Fragment	4
0412	Stone	Fragment	2
0412	Ceramic	Tile fragment	1

Context (0412) was a firm yellowish brown clay loam layer.

Context: 0413

Context No.	Material	Object Type	Count
0413	Brick	Fragment	1
0413	Pottery	Sherd	11
0413	Ceramic	Tile fragment	2

Context (0413) was a layer of firm mid brown sand clay.

Context: 0415

Context No.	Material	Object Type	Count
0415	Metal	Nail	1
0415	Pottery	Sherd	9

Context (0415) was the fill of outer well cut [0414], loose yellowish brown loam.

Context: 0416

Context No.	Material	Object Type	Count
0416	Bone	Fragment	3
0416	Glass	Shard	5
0416	Mortar	Fragment	1
0416	Pottery	Sherd	1
0416	Stone	Fragment	1

Context (0416) was a demolition layer comprising loose mid brown sandy silt.

Context: 0417

Context No.	Material	Object Type	Count
0417	Metal	Fragment	3
0417	Pottery	Sherd	1
0417	Slate	Fragment	1
0417	Stone	Fragment	2
0417	Ceramic	Tile fragment	9
0417	Wood	Fragment	1

Context (0417) was a demolition/levelling layer of wheel-pit area made up of loose sandy silt.

Context: 0420

Context No.	Material	Object Type	Count
0420	Metal	Fragment	8

Context (0420) was a metal fitting that probably housed sluice gate.

Context: 0441

Context No.	Material	Object Type	Count
0441	Glass	Shard	4
0441	Metal	Fragment	4
0441	Pottery	Sherd	24
0441	Slate	Fragment	2
0441	Ceramic	Tile fragment	1

Context (0441) was a friable greyish brown layer.

Context: 0446

Context No.	Material	Object Type	Count
0446	Bone	Fragment	3
0446	Glass	Shard	6
0446	Metal	Fragment	5
0446	Pottery	Sherd	2
0446	Stone	Fragment	3
0446	Ceramic	Tile fragment	1

Context (0446) was a brick floor surface.

Context: 0447

Context No.	Material	Object Type	Count
0447	Brick	Fragment	3
0447	Pottery	Sherd	7
0447	Slate	Fragment	1
0447	Ceramic	Tile fragment	5

Context (0447) was a demolition infill, made up of firm dark greyish brown clayey silt with moderate angular pebbles/brick fragments.

Context: 0461

Context No.	Material	Object Type	Count
0461	Clay	Pipe fragment	2
0461	Mortar	Fragment	1
0461	Stone	Fragment	1

Context (0461) was a layer of firm light brown clay.

Context: 0477

Context No.	Material	Object Type	Count
0477	Bone	Fragment	1
0477	Glass	Shard	1
0477	Pottery	Sherd	28

Context (0477) was a light yellow concreted gritty clay deposit.

Context: 0485

Context No.	Material	Object Type	Count
0485	Brick	Fragment	1
0485	Clay	Pipe fragment	2
0485	Glass	Shard	14
0485	Metal	Fragment	20
0485	Plastic	Fragment	4
0485	Pottery	Sherd	41
0485	Ceramic	Tile fragment	3

Context (0485) was a layer of friable grey clay silt.

Context: 0487

Context No.	Material	Object Type	Count
0487	Metal	Fragment	4
0487	Glass	Shard	2
0487	Pottery	Sherd	3
0487	Ceramic	Tile fragment	1

Context (0487) was a layer of light yellowish brown silty clay.

Context: 0491

Context No.	Material	Object Type	Count
0491	Brick	Fragment	2

Context (0491) was a brick structure.

Context: 0492

Context No.	Material	Object Type	Count
0492	Glass	Shard	1
0492	Pottery	Sherd	1

Context (0492) was a layer of friable dark brown loam.

Context: 0502

Context No.	Material	Object Type	Count
0502	Bone	Fragment	1
0502	Brick	Fragment	3
0502	Glass	Shard	1
0502	Metal	Nail	1
0502	Pottery	Sherd	12
0502	Shell	Fragment	3
0502	Slag	Fragment	1
0502	Stone	Fragment	3
0502	Ceramic	Tile fragment	5

Context (0502) was an area of dumped cobbles.

Context: 0503

Context No.	Material	Object Type	Count
0503	Bone	Fragment	1
0503	Clay	Pipe fragment	4
0503	Glass	Shard	5
0503	Metal	Fragment	8
0503	Mortar	Fragment	2
0503	Plaster	Fragment	1
0503	Pottery	Sherd	102
0503	Slag	Fragment	1
0503	Slate	Fragment	1
0503	Stone	Fragment	2
0503	Ceramic	Tile fragment	5

Context (0503) was a firm grey stony clay layer

Context: 0504

Context No.	Material	Object Type	Count
0504	Bone	Fragment	1
0504	Brick	Fragment	2
0504	Glass	Shard	35
0504	Metal	Fragment	7
0504	Mortar	Fragment	3
0504	Pottery	Sherd	6
0504	Slag	Fragment	3
0504	Ceramic	Tile fragment	1
0504	Wood	Fragment	1

Context (0504) was a firm mixed cobble and mortar layer.

Context: 0508

Context No.	Material	Object Type	Count
0508	Glass	Shard	4

Context (0508) the main outer stone wall of mill structure.

Context: 0515

Context No.	Material	Object Type	Count
0515	Glass	Shard	1
0515	Pottery	Sherd	3
0515	Shell	Fragment	2
0515	Stone	Chip	1
0515	Ceramic	Tile fragment	1

Context (0515) was a firm brown clay layer.

Context: 0516

Context No.	Material	Object Type	Count
0516	Bone	Fragment	7
0516	Brick	Fragment	1
0516	Glass	Shard	1
0516	Metal	Fragment	2
0516	Stone	Fragment	2
0516	Ceramic	Tile fragment	1

Context (0516) was a layer of firm yellow brown clay.

Context: 0517

Context No.	Material	Object Type	Count
0517	Brick	Fragment	1
0517	Glass	Shard	64
0517	Metal	Fragment	3
0517	Pottery	Sherd	3
0517	Slate	Fragment	13
0517	Ceramic	Tile fragment	2
0517	Unknown	Unknown	4
0517	Metal/wood	Knife handle	1

Context (0517) was a layer of rubble and cobbles.

Context: 0534

Context No.	Material	Object Type	Count
0534	Clay	Pipe fragment	1
0534	Pottery	Sherd	6

Context (0534) was a firm mid grey clay with an abundance of fallen tree debris.

Context: 0536

Context No.	Material	Object Type	Count
0536	Glass	Shard	3
0536	Metal	Fragment	3
0536	Pottery	Sherd	1
0536	Rubber	Strap	1

Context (0536) was a layer of loose mid grey-black clinker ash loam.

Context: 0553

Context No.	Material	Object Type	Count
0553	Bone	Fragment	2
0553	Brick	Fragment	2
0553	Glass	Shard	3
0553	Metal	Bolts	4
0553	Pottery	Sherd	1
0553	Slag	Fragment	6

Context (0553) was a deposit of loose strong brown silty loam.

Context: 0555

Context No.	Material	Object Type	Count
0555	Pottery	Sherd	4

Context (0555) was a layer of firm grey blue clay.

Context: Unstratified

Context No.	Material	Object Type	Count
Unstratified	Bone	Fragment	27
Unstratified	Clay	Pipe fragment	6
Unstratified	Coal	Fragment	1
Unstratified	Glass	Shard	67
Unstratified	Metal	Fragment	28
Unstratified	Mortar	Fragment	2
Unstratified	Pottery	Sherd	87
Unstratified	Shell	Fragment	1
Unstratified	Slate	Fragment	67
Unstratified	Stone	Fragment	7
Unstratified	Tarmac	Fragment	1
Unstratified	Ceramic	Tile fragment	5
Unstratified	Unknown	Unknown	1

The context from which these artefacts were recovered is not recorded.



Plate 4: View of Area 08 looking west



Plate 5: Area 08, posthole [0529] within foundation (0525) looking north east



Plate 6: Area 08 Outer wall (0310) looking north east



Plate 7: Area 10 Wall (0308) looking north



Plate 8: Area 08, stone foundation (0427) and brickwork (0301) looking north east



Plate 9: Area 8 section of (0427) looking north west



Plate 10: Junction Areas 08, 09 and 10 showing (0427) in foreground looking south west



Plate 11: Area 8 stone wall (0300) abutting wall (0427) looking north west



Plate 12: Area 8, brick floor (0303) and wooden threshold (0313) looking north



Plate 13: Area 08 trough (0610) with curved wall (0430) looking south west



Plate 14: Area 09 pit wheel/cog pit floor (0446) (wrongly numbered) looking south west



Plate 15: Area 9 and 10 wall (0520) and wheel/cog pit to left looking south east

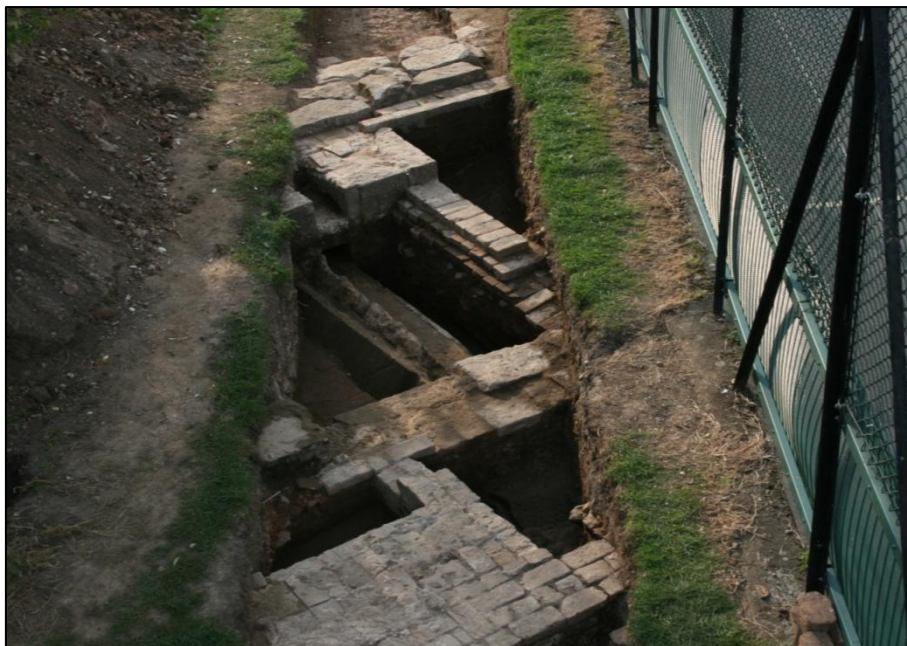


Plate 16: Area 09 east end, overview showing wheel/cog and water wheel pit looking west



Plate 17: Areas 09 and 10 wheelhouse structure looking east



Plate 18: Area 09 Substantial stone blocks (0366) showing slot for a wooden beam looking south west



Plate 19: Area 9 stonework (0365) with drainage hole looking north east



Plate 20: Area 10 water wheel-pit wall (0508) and brick floor (0528) with wheel/cog pit and internal wall divisions looking south east



Plate 21: Area 09 brick floor (0496) looking north west



Plate 22: Area 10 showing tail race wall (0308) with the water wheel pit floor (0607) looking north west



Plate 23: Area 10 tail race wall (0308) and flagstone floor (0607) looking north east

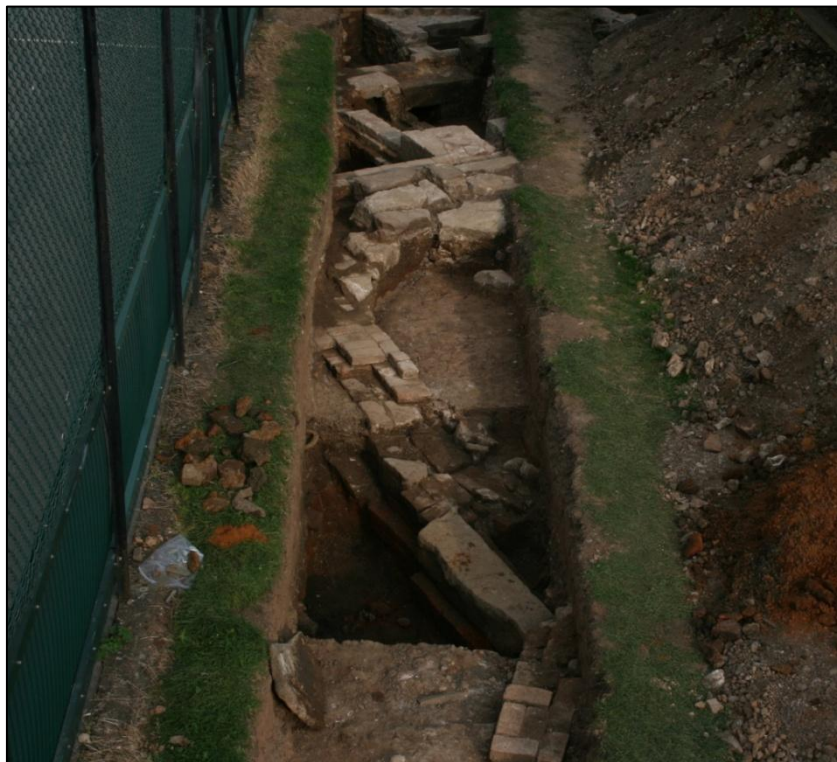


Plate 24: Area 09 west end showing leat looking east



Plate 25: Area 09, (0579) repairing (577) and (0578) looking south east



Plate 26: Area 09 wall threshold (0579) and walls (0577) and (0578) looking north east



Plate 27: Area 09 west end showing iron effected gravels looking west



Plate 28: Area 9 feed channel (0496) showing Poncelet phase related plate (0606) looking north east



Plate 29: Area 09 section of channel [0418] looking west



Plate 30: Area 09 engineered brick floor (0528) and angled stone back plinth and supporting rendered wall (0418) looking south west



Plate 31: Area 09 water wheel pit brick floor (0498) looking south



Plate 32: Area 08 section of well (0318) looking south west



Plate 33: Area 8 late 19th century structure looking north east.



Plate 34: Area 08 late 19th century extension to well looking north west



Plate 35: Area 08 mortar floor bedding (0327) looking north



Plate 36: Area 08 late 19th century extension looking north



Plate 37: Area 08 curved wall of (0329) looking north west



Plate 38: Area 11 outer wall 0306, revetment (0608) and iron pipe (0610) looking north west



Plate 39: Area 11 fills of pond (0603) and (0555) with stone revetment (0608) and box drain (0557) looking north west



Plate 40: Area 11 oak stake piles (0614) and (0615) with mortised beam (0616) and stone revetment (0608) looking north



Plate 41: Area 11 box drain (0557) looking north west



Plate 42: View of the sample radii



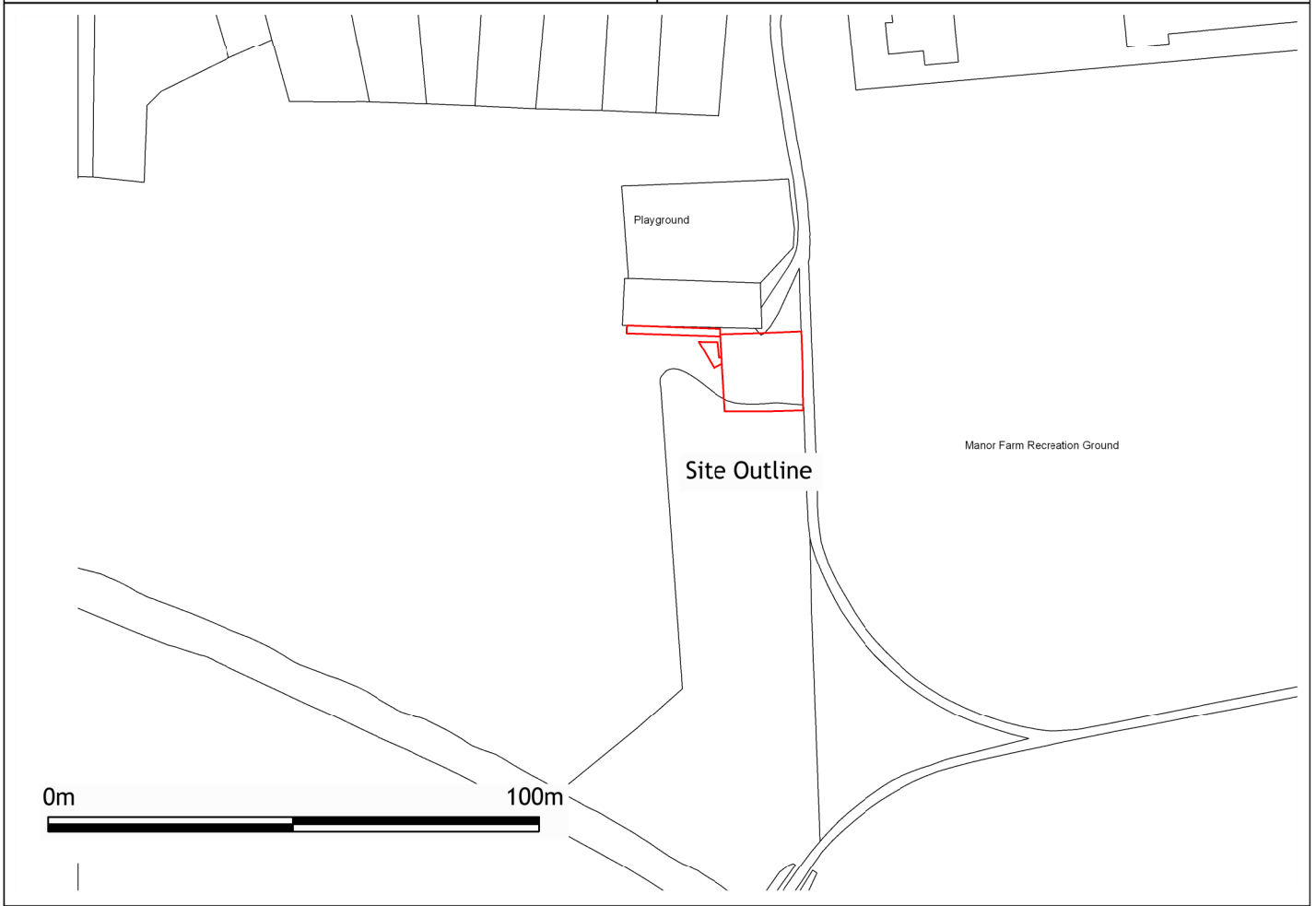
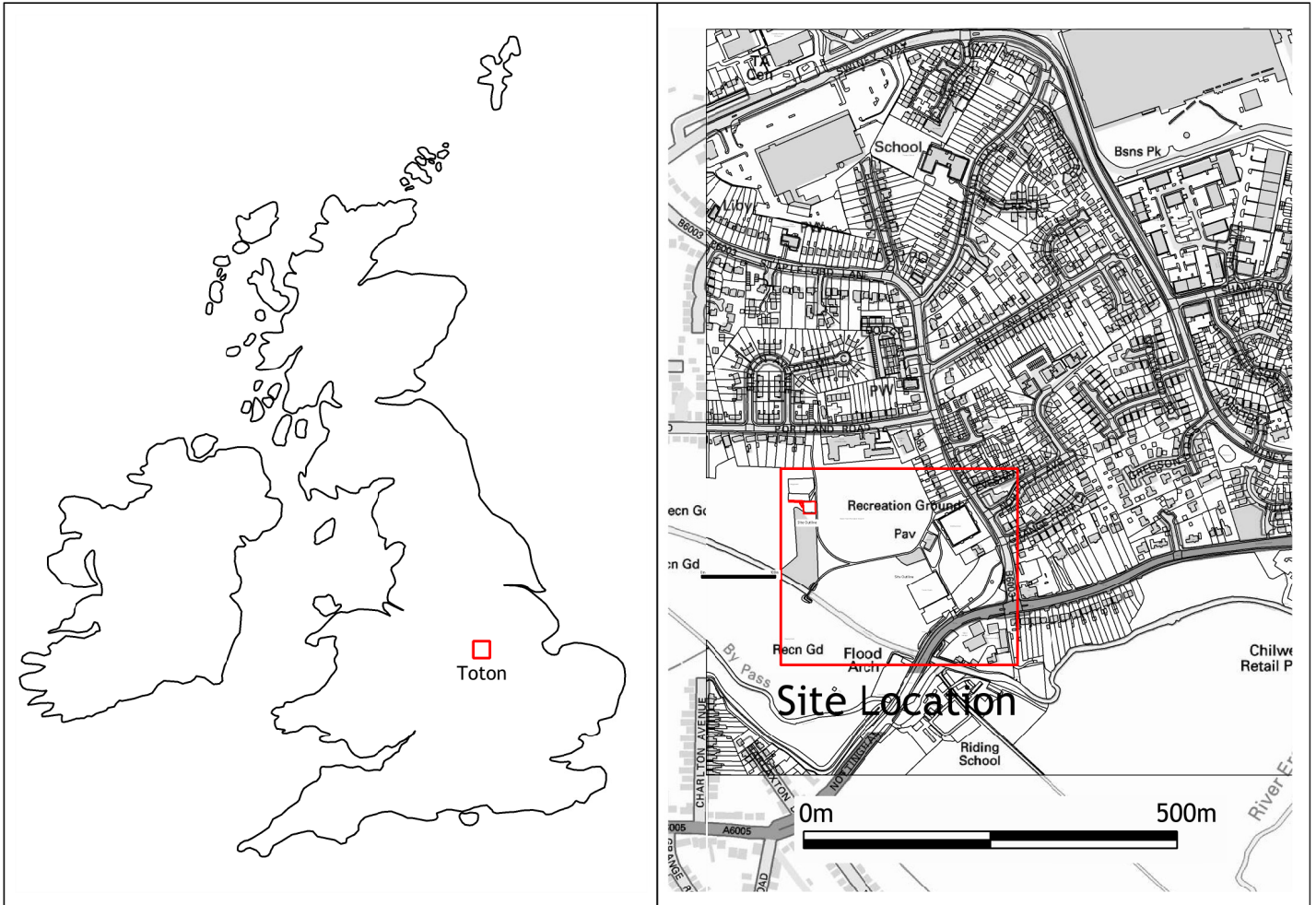
Plate 43: Timber pile DBO. Note the tool marks at the top of the timber.

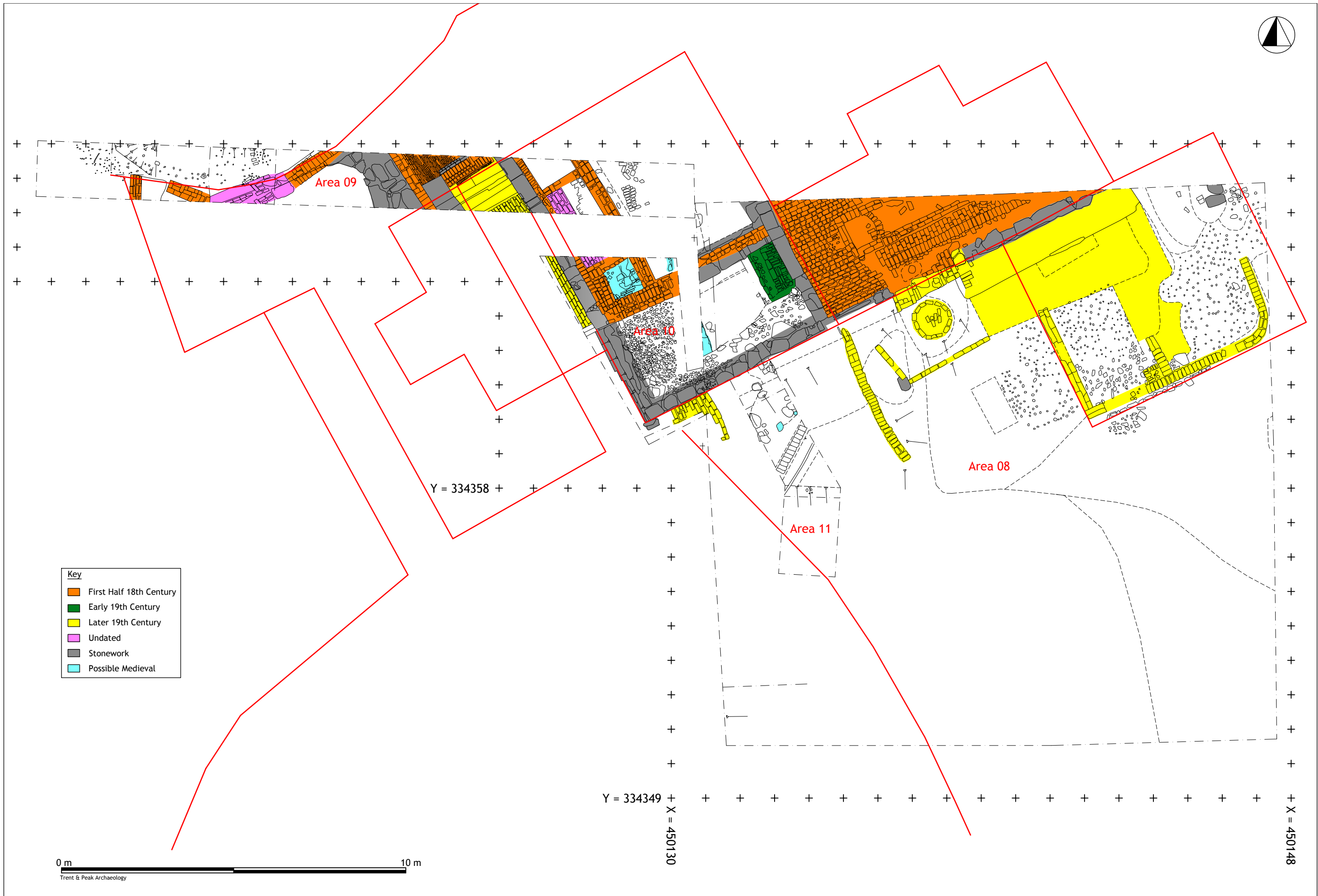


Plate 44: Detail of the tool marks at the top of timber pile DBO.



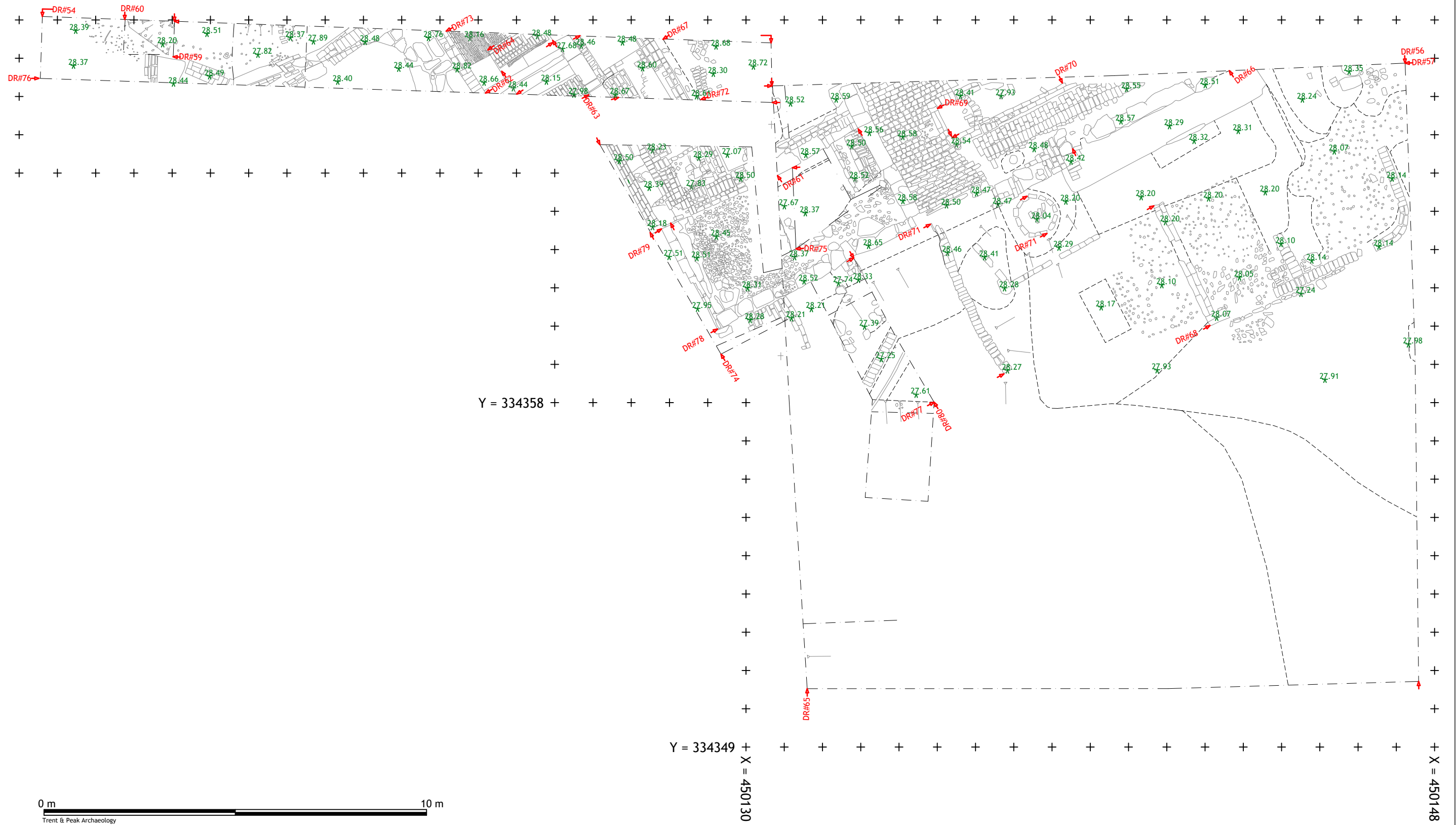
Plate 45: Timber pile DBP.

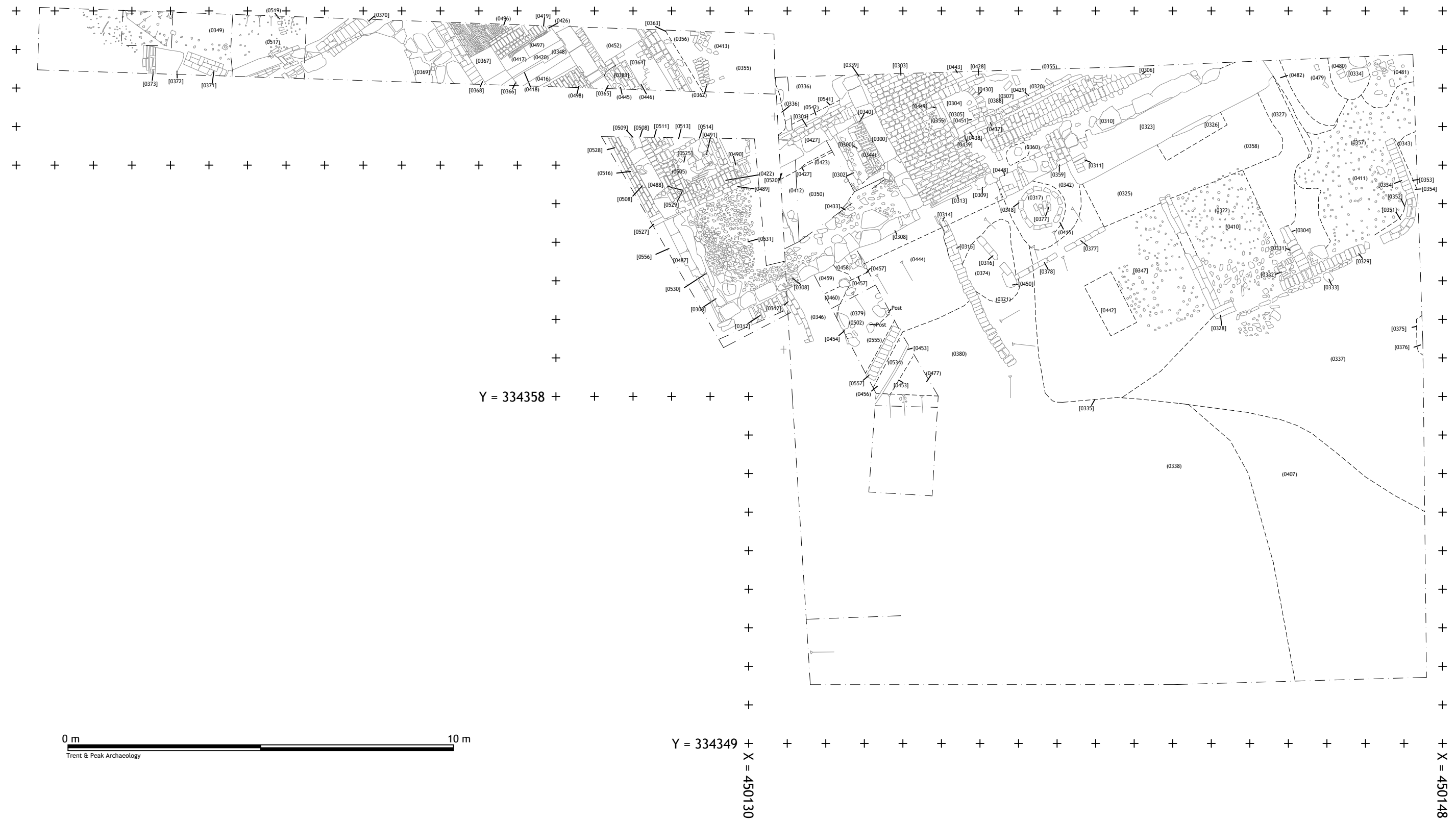




Key

■	First Half 18th Century
■	Early 19th Century
■	Later 19th Century
■	Undated
■	Stonework
■	Possible Medieval





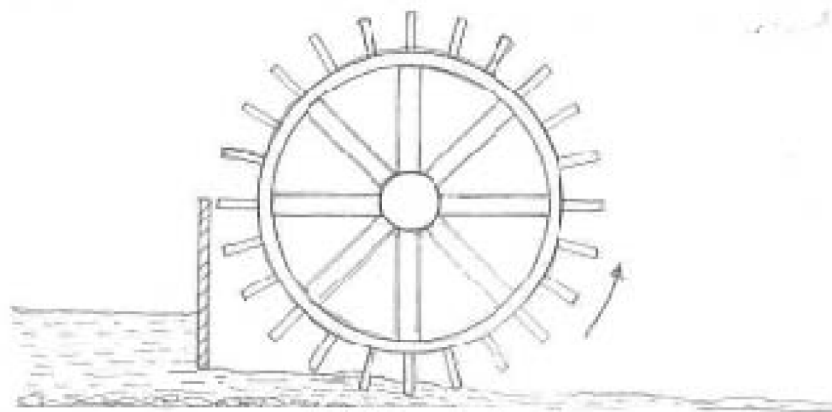
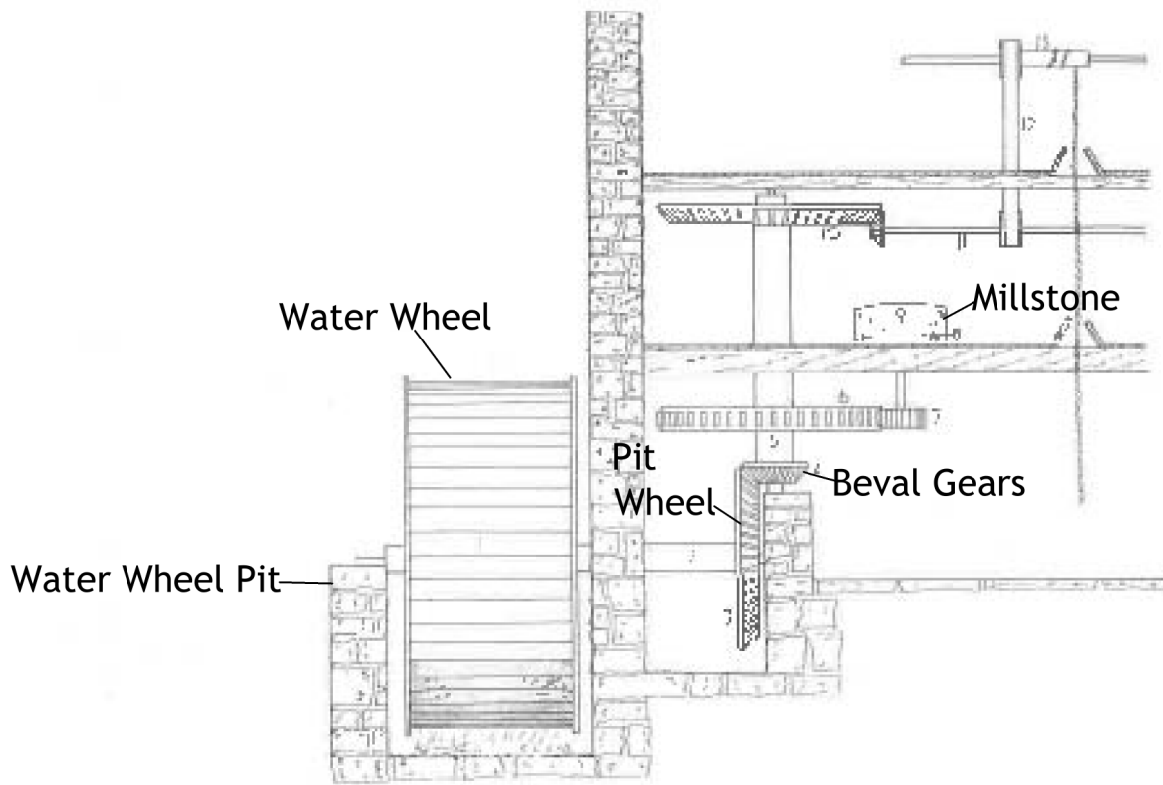


Fig 3 Undershot wheel

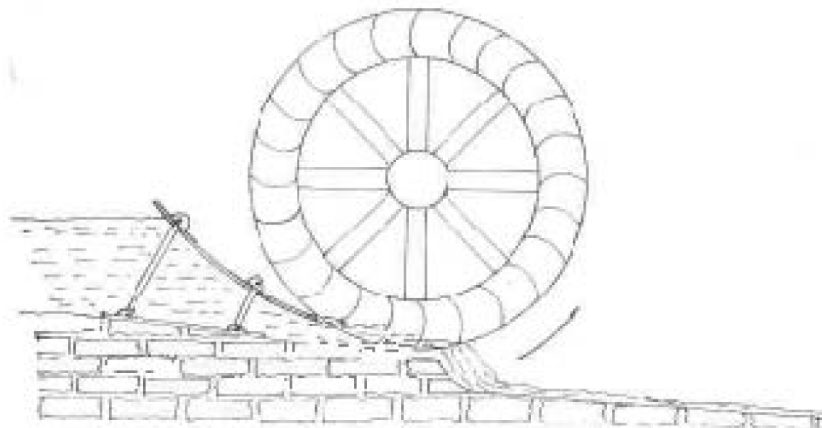
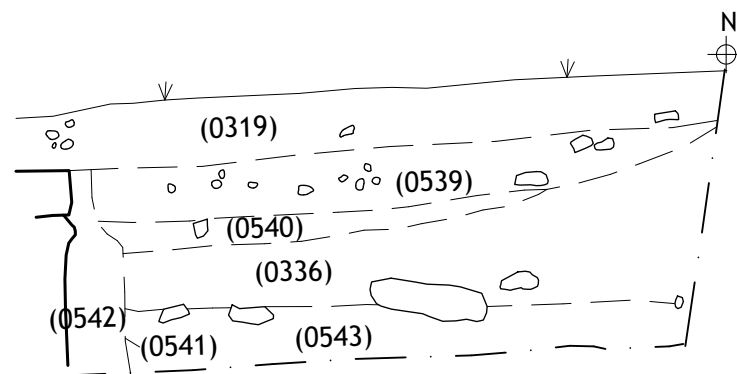
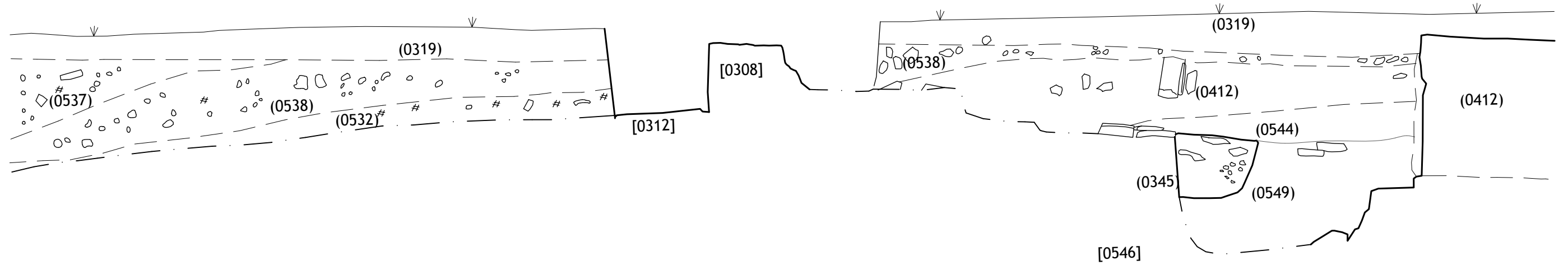
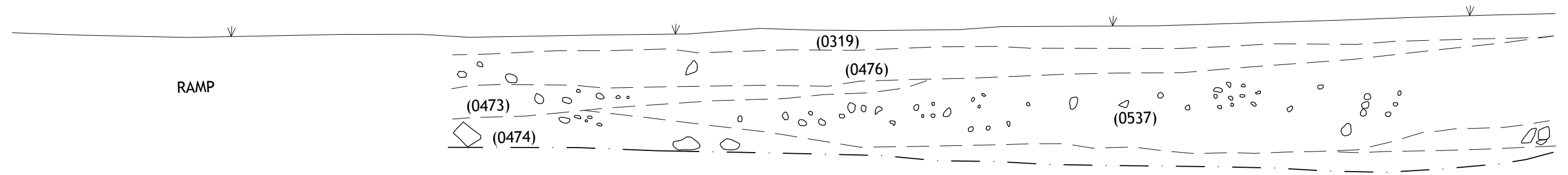


Fig 4 Poncelet type of undershot wheel

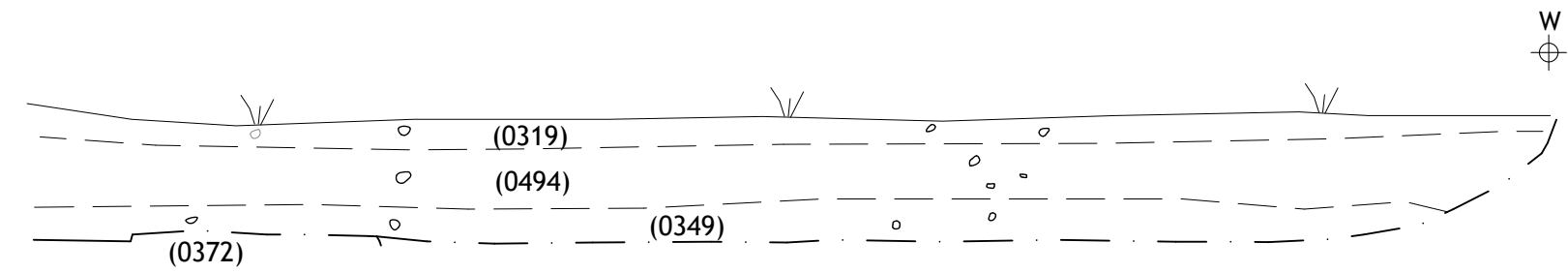
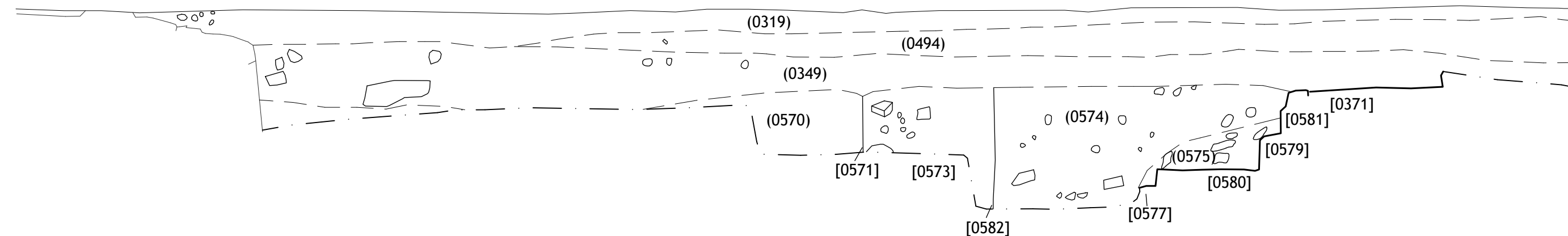
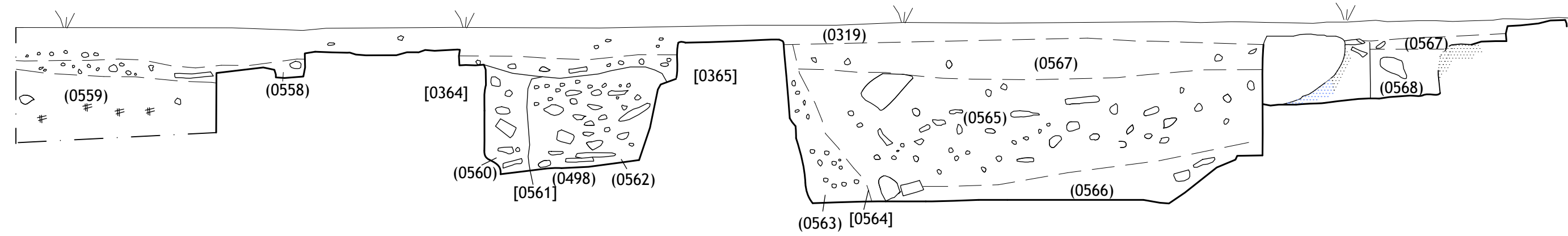
28.78 S



0 m 1 m
Trent & Peak Archaeology



28.96 E



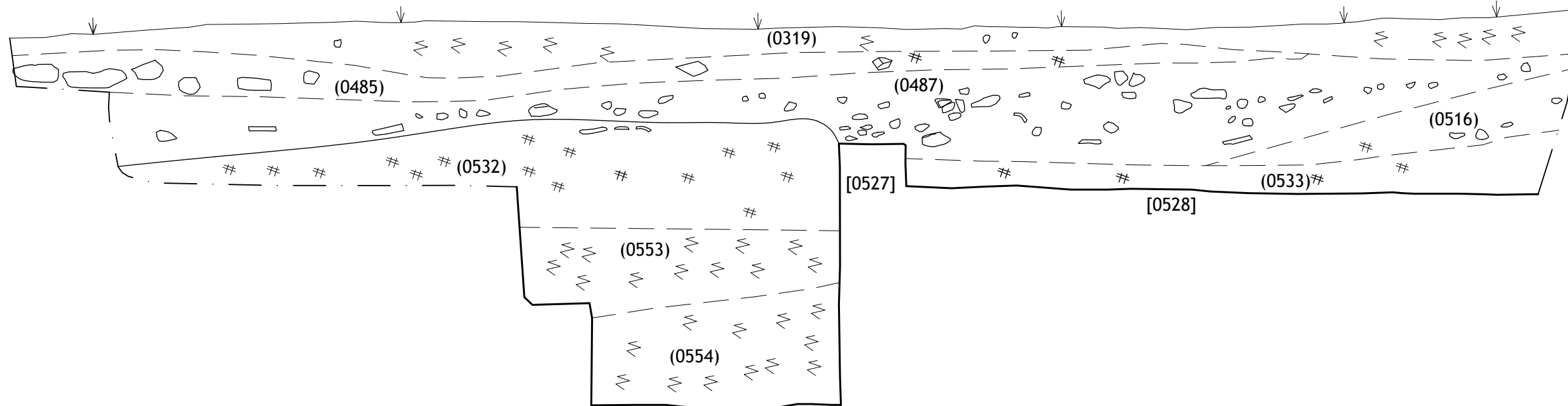
 Mortar

W



28.78 SE

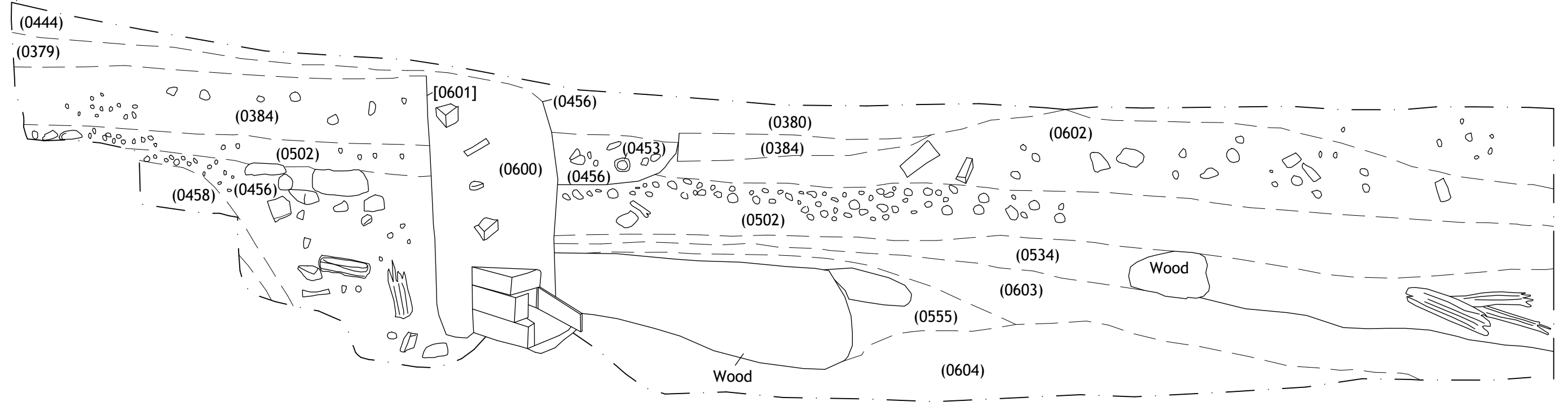
NW



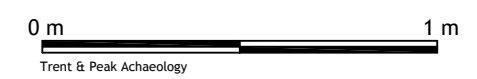
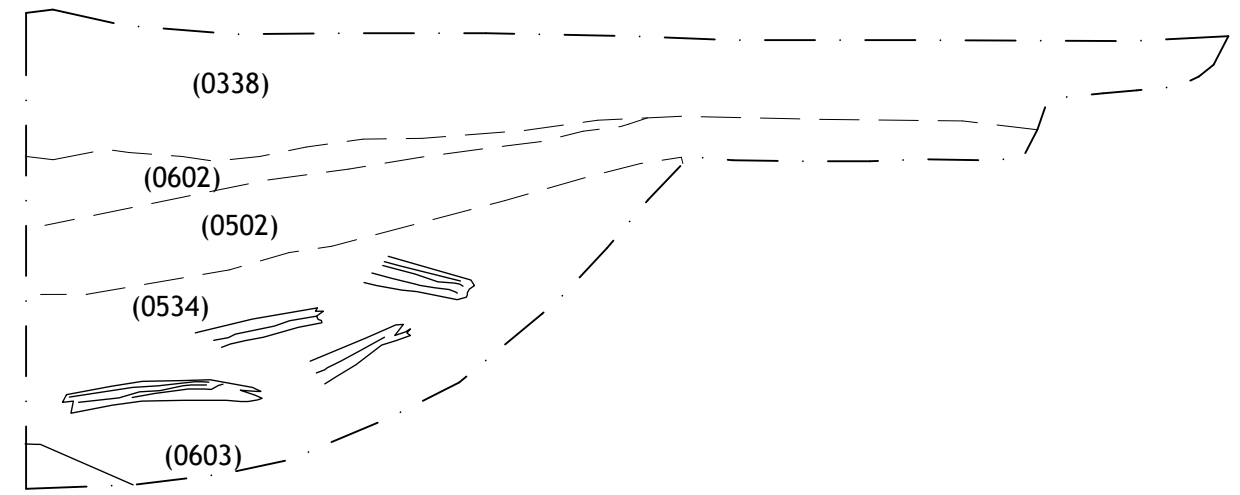
0 m 1 m
Trent & Peak Archaeology

28.51

NW

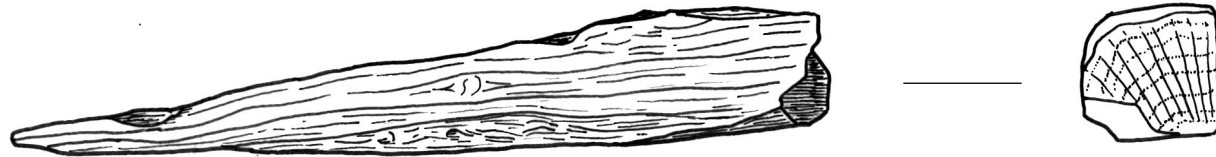


SE





Timber DBO



Timber DBP

Figure 10: Timbers DBO and DBP from Toton Mill. Scale = 1:10