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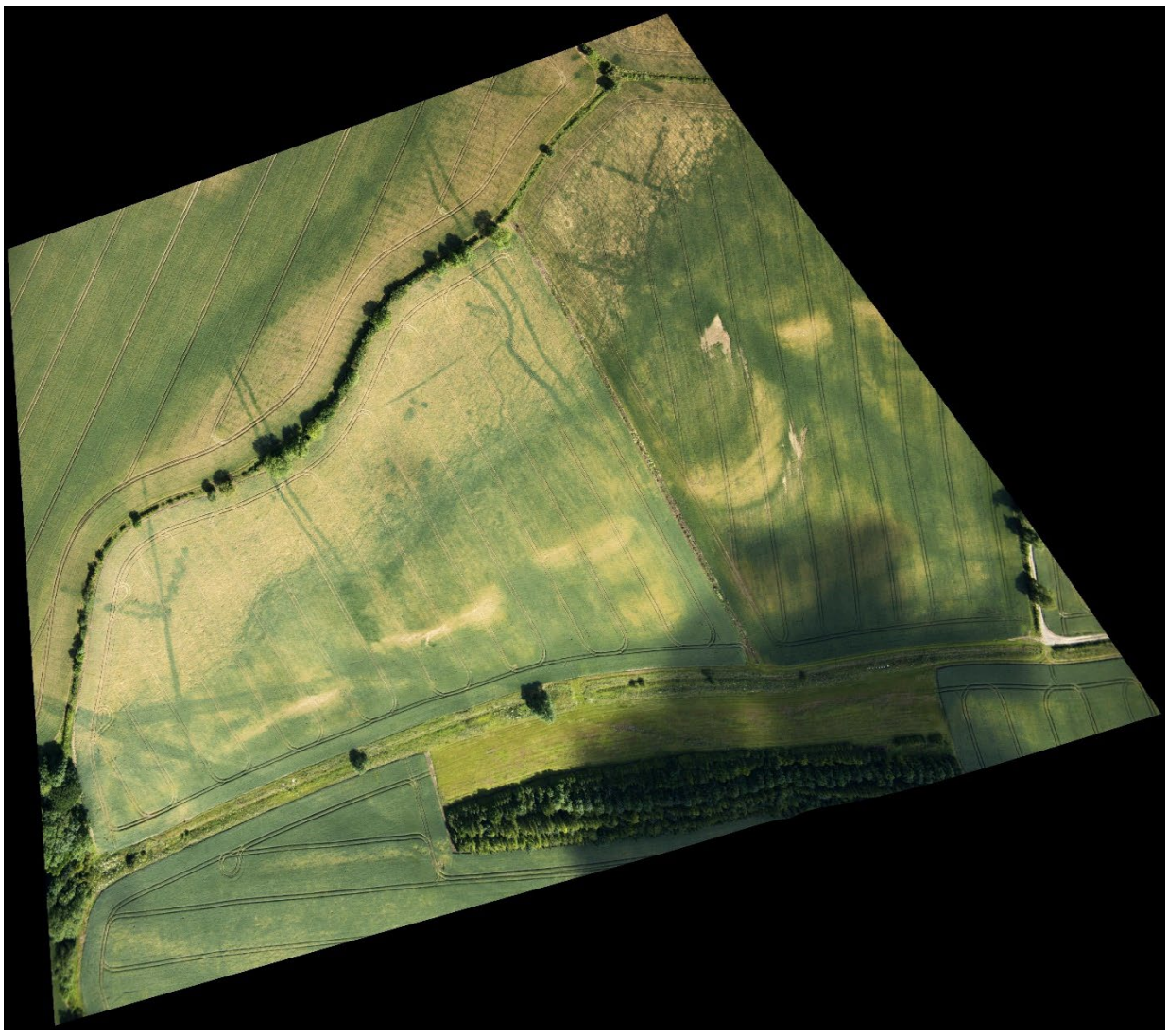
Historic England

Rutland Roman Villa Environs

Aerial Investigation and Mapping Project

Fiona Small



Archaeological Investigation Team

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Summary

This report summarises the results of the assessment and mapping of aerial photographs and lidar data undertaken for the Rutland Roman Villa Project. In 2020 the site of a Roman villa was identified within a single large arable field to the south-west of Ketton, Rutland overlooking the River Chater. Initial investigations revealed part of a mosaic and finds. A subsequent aerial investigation and mapping of cropmarks of the site was undertaken in August 2020 by Historic England to assess the extent of the site. Geophysical survey and two seasons of excavation over the summers of 2021 and 2022 funded by Historic England, revealed a complex of Roman buildings dating to mid-late 3rd to the 4th century AD, one containing the mosaic identified in 2022, lying within a multi-ditched enclosure. As part of this ongoing project an aerial investigation and mapping survey of the contextual area of 30 sq. km around the villa site has been undertaken by Historic England Aerial Investigation team to assess the presence of any further archaeological remains. These results are contained in this report.

Contributors

The aerial photographic analysis and mapping was undertaken by Fiona Small and Amanda Dickson of Historic England and the report was researched and written by Fiona Small. Unless otherwise credited, the copyright for all illustrations belongs to Historic England. Information from the results of the excavations at Rutland Roman villa was provided by Rachel Cubitt, Fay Worley and Ian Barnes of Historic England. Matt Oakey, Sally Evans, Rachel Cubitt, Fay Worley, Ian Barnes and Nick of Historic England Carter commented on the final text.

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- University of Leicester Archaeological Services ULAS
- Dr Jeremy Taylor, University of Leicester

Archive location

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The Engine House, Firefly Avenue
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Date of survey/research/investigation

Initial Aerial Investigation and Mapping - August 2020

Aerial Investigation and Mapping - between May 2022 and July 2023

The report was written between June and August 2023.

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Front cover image: Rectified aerial photograph of later prehistoric trackways, boundaries and enclosures visible as cropmarks on a limestone ridge east of Tixover. 27020_016 20-JUN-2011 © Historic England Archive.

Introduction

The Rutland Roman Villa project was developed to investigate the site of a Roman villa which was identified within a single large arable field to the south-west of Ketton, Rutland overlooking the River Chater.

Following its discovery in the summer of 2020, investigations revealed the presence of a mosaic and finds indicating the site is Roman and likely to be a villa. A concurrent survey and interpretation of cropmarks of the villa site was undertaken by Historic England as part of an assessment revealing the presence of at least two buildings lying within a large, ditched enclosure. These results were then confirmed by subsequent geophysical surveys and excavation over the summers of 2021 and 2022 funded by Historic England, which revealed a complex of Roman buildings dating from the mid-late 3rd century through to the 4th century AD, one containing the mosaic identified in 2022 (containing scenes depicting the battle between Achilles and Hector), lying within a multi-ditched enclosure.

The villa site has subsequently been scheduled. List Entry Number:1477234.

As part of this ongoing project a further aerial investigation and mapping project has been undertaken by Historic England of a contextual area of 30km squares around the villa site to assess the presence of any further archaeological remains associated with the villa and its immediate landscape. These results are contained in this report.

Topography and Geology

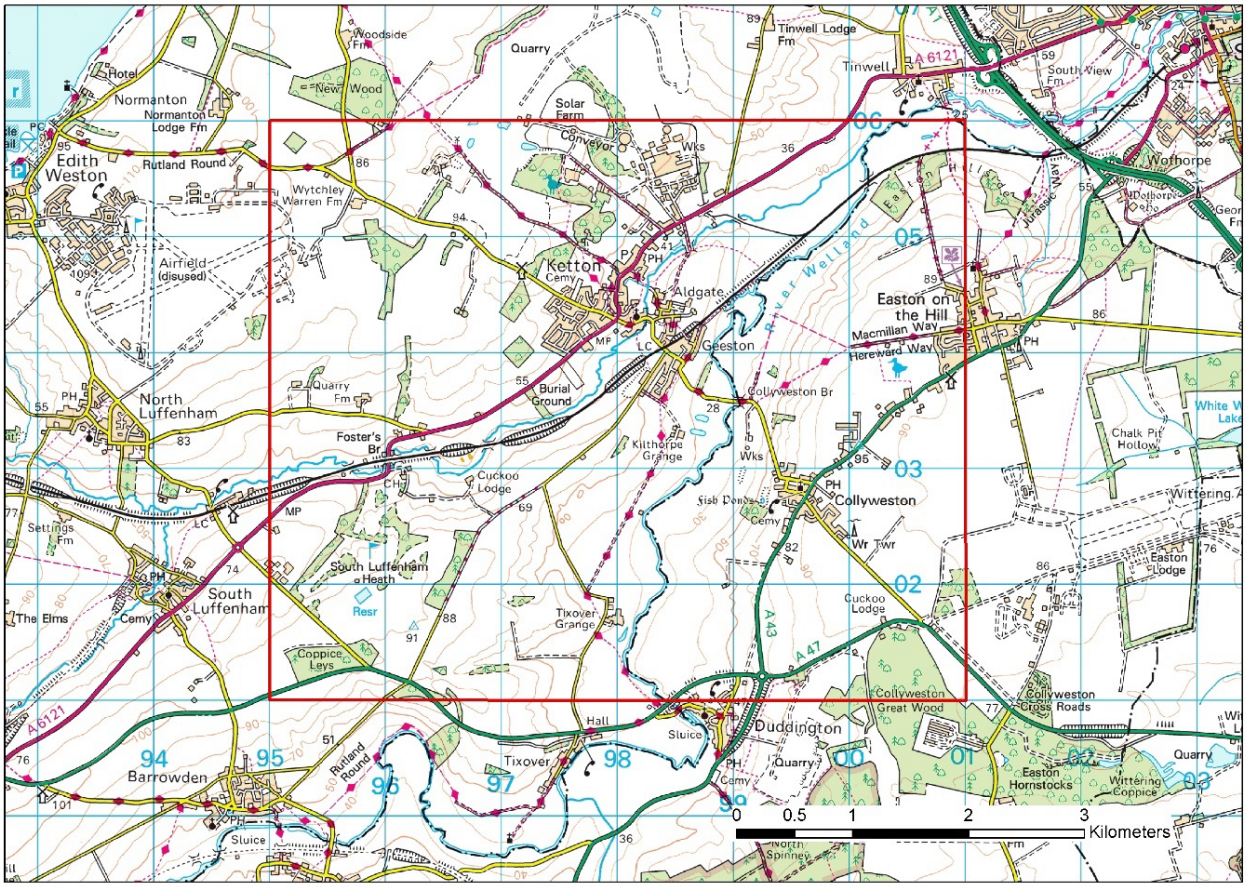


Figure 1: Rutland Roman Villa Environs Aerial Investigation and Mapping Project area. Base map© Crown Copyright and database right 2023. All rights reserved. Ordnance Survey Licence number 100019088.

The area covered by this survey comprises 30 sq. km centred on the village of Ketton, Rutland (Fig.1). The project area comprises gently rolling landscape bisected south-west to north-east by the valleys of the River Welland and the River Chater which converge to north-east of Ketton. Between the valleys the land rises to around 90m OD, descending to *c.* 30m OD in both river valleys. The River Welland forms the county boundary between the counties of Rutland to the north-west and Northamptonshire to the south-east.

The geology of the area comprises a sequence of sedimentary rocks, dominated by Jurassic limestones including the Upper and Lower Lincolnshire Limestone and limestones of the Rutland and Bilsworth formations. Whitby Mudstones and Oxford Clays outcrop in the river valleys. The predominance of limestones has resulted in largely freely draining landscape with the exception of the two river valleys where the exposed mudstone beds impede drainage (BGS 2023). The dominant soils are a mixture of shallow lime-rich soils over limestone and lime-rich loamy and clayey soils (UKSO 2023)

A distinct relationship has been observed between the visibility of archaeology as cropmarks and the underlying geology and soils across the survey area. The traces of buried archaeological features recorded as cropmarks were largely confined to areas of free-draining limestone outcrops and were less frequent in the areas of Whitby mudstones and Oxford clays.

Outcrops of iron-rich ooidal ironstone of the Northampton Sand Formation and the Lower Lincolnshire Limestones around Collyweston have been extensively quarried from at least the Roman period to the present day with traces of historic quarrying visible across the area. These ironstones have formed the basis of the local iron industry since at least the Roman period. Collyweston limestone has a fissile quality which allows the weathered stone to be split into thin sheets which have been used widely since the Roman period for roofing slates developing into a local industry by the 14th century (Clifton-Taylor 1962, 99).

Previous Archaeological Investigation

The survey area is bisected north-east to south-west by the county boundary between Northamptonshire to the south-east and Rutland to the north-west. The parts falling within Northamptonshire have been surveyed from aerial photographs by Alison Deegan in 2000 as part of the Northamptonshire National Mapping Programme (NMP) project (Deegan 2002). This project completed full Ordnance Survey quarter sheets which incorporated parts of the adjoining counties. This included the south-western edge of Rutland together with the location of the newly discovered villa at Ketton. The NMP project reviewed all available aerial photographs in the Historic England Archive, the Cambridge University Collection of Aerial Photography (CUCAP, now closed indefinitely) and relevant local sources (Deegan 2002, 25). The project did not record anything in the location of the villa and there are no existing archaeological records which suggests that the site has not been recorded as a cropmark before, despite repeat aerial photography since the 1940s.

A comprehensive analysis of the archaeology of Northamptonshire and parts of adjacent counties including the sites mapped during the Northamptonshire NMP - Mapping Ancient Landscapes in Northamptonshire - has been published by Glenn Foard and Alison Deegan (Deegan & Foard 2007).

The NRHE and both HERs (Historic Environment Record) for both Rutland and Northamptonshire hold records of archaeological sites identified during quarrying, pipeline installation and development, some of which have also been excavated and are discussed where relevant throughout this report.

The Archaeology

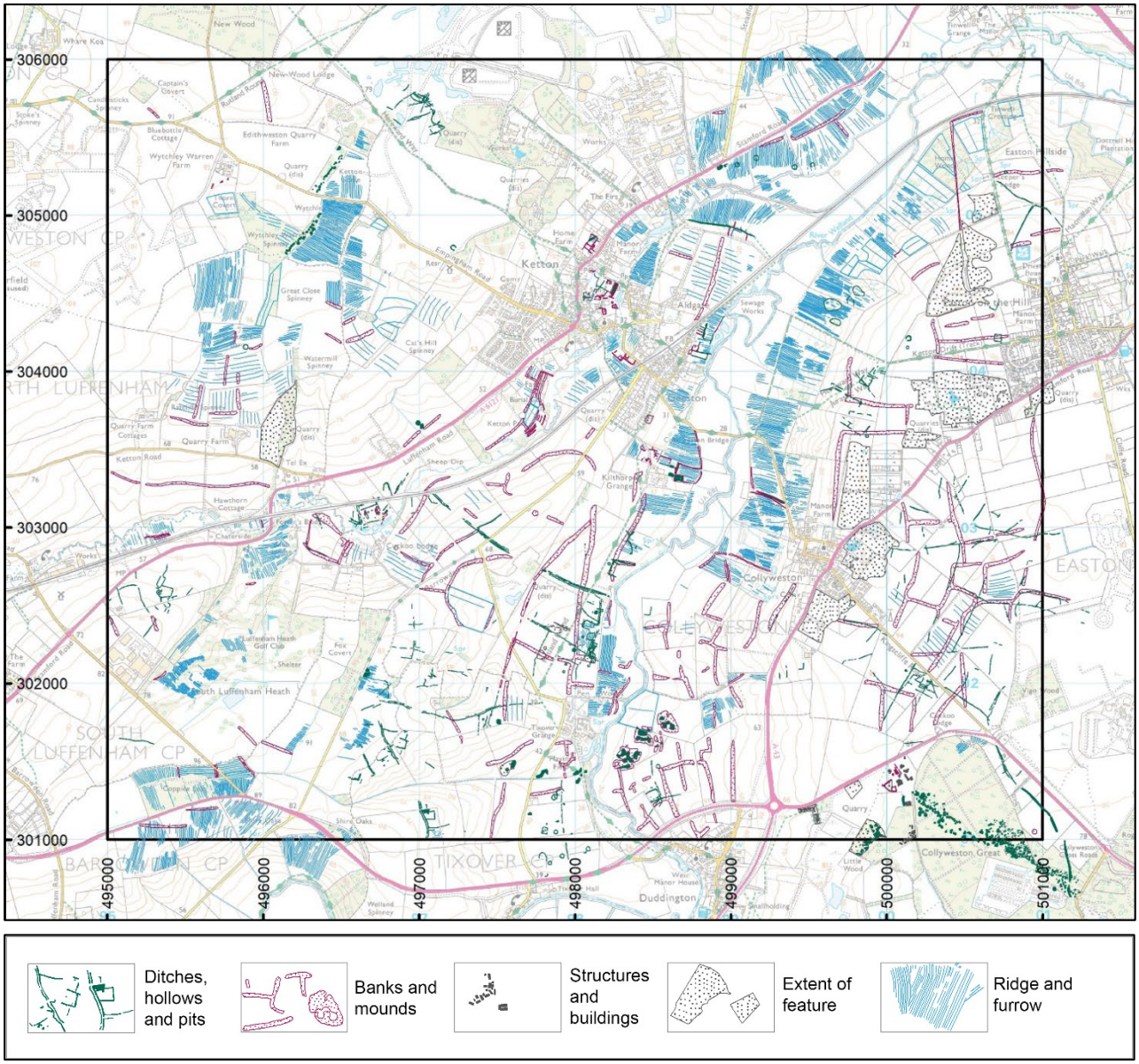


Figure 2: All mapped features recorded within the Rutland Villa Survey area. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

Analysis of aerial photographs and lidar data reveals a mixed picture of archaeological survival and visibility across the area (Fig.2). This is due to a range of factors such as geology and soils affecting the type of crops cultivated, and extent of historical ploughing, cropmark prorogation. Evidence of prehistoric activity is concentrated along the margins of the River Welland south of the village of Ketton which appears to have been a focus for ritual activity through the Neolithic into the Iron Age. Elsewhere there are cropmark traces of isolated Iron Age and Roman settlement and two large areas of later prehistoric ditched

and pit-defined field systems and boundaries have been recorded. These are overlain by a later embanked system of fields with may be early medieval in date. There are a number of medieval settlement sites still visible as earthworks around the villages of Ketton, Geeston, Easton on the Hill and Collyweston and extant or recently extant medieval ridge and furrow has been recorded across much of the area which may mask earlier archaeological sites. The local outcrops of ironstone and limestones suitable for building, roofing and more recently cement production have all been exploited since at least the Roman period (Collyweston Historical and Preservation Society) and the remains of quarrying and mining can be seen across the area. In the twentieth and twenty first centuries much of this has been large-scale open-cast quarrying which has removed and destroyed much of the earlier archaeology in its path.

For the purposes of this report, apart from the history of local stone quarrying industries, the findings are presented by period.

Neolithic

The Neolithic period in Britain is marked by the widespread cultural shift over a several centuries from hunter-gatherer societies to the adoption of agriculture and pastoralism and significant changes in the material culture with the first use of pottery and new forms of stone tools. This also brought with it the first industries based on flint and stone mining and the adoption of new domestic and monumental architecture. Domestic sites such as houses leave slight traces, usually only detected during excavation and remote sensing methods of survey, but the ritual sites which emerge in the Neolithic to Bronze Age period are frequently substantial excavated ditched and embanked structures, the remains of which are the earliest visible sites we see in the landscape. These take the form of enclosures such as causewayed enclosures, cursus monuments and henges, stone circles, monoliths and rows, and funerary monuments in the form of long barrows, and round barrows constructed from the Neolithic-Bronze Age (Oswald et al. 2001,1-2). These sites were clearly constructed and laid out in a landscape which had already been cleared extensively of tree cover by the Neolithic period.

The earliest sites identified in this survey are those of two possible Neolithic mortuary enclosures seen as cropmarks near Ketton, to the north of Tixover Grange on the western river terrace overlooking the River Welland (Figs.3 and 4). These form part of a multi-period complex of probable Neolithic and Bronze Age ritual monuments cut through by a system of possibly Bronze Age-Iron Age boundaries. Much of the complex including these enclosures has been mapped and assessed by earlier surveys including the Northamptonshire NMP project (where they are referred to as Ketton A and B, Deegan and Foard 2007, 64). Ketton A (Figure 4) is an elongated ditch-defined enclosure with straight sides and rounded ends which is aligned north-north-east to south-south-west and

measures 13m x 100m. It is thought to be an example of the class of monuments described as mortuary enclosures. No dating evidence has been collected but it has been suggested to be Neolithic based on its morphology and similarity to a site at Cardington in Bedfordshire which predates a number of Neolithic sites (including a mortuary enclosure, a cursus and a henge monument) (Malim 2000,78). Though some examples do have evidence of burials, the mortuary activity is frequently related to a later phase and appears not to be the primary function of the site.

Figure 3: Multi-phase complex of ritual enclosures and barrows close to the River Welland dating from the Neolithic to the Iron Age with earthworks traces off a possible early medieval embanked field system. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

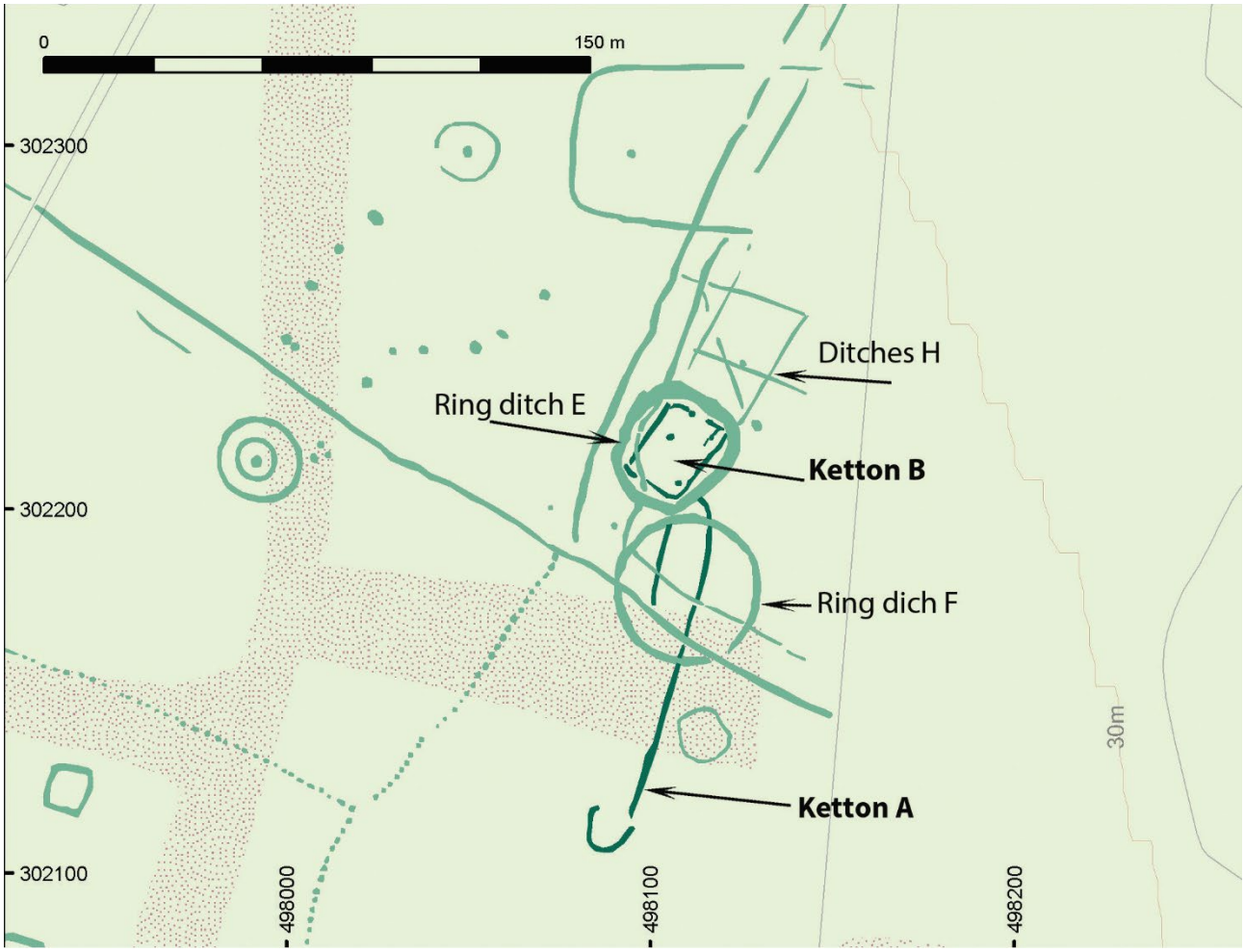


Figure 4: An extract of mapping highlighting two possible Neolithic enclosures (described by Deegan and Foard as Ketton A and B) within the multiphase complex of cropmarks south of Ketton (highlighted). Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

Within the same complex of features is a second possible Neolithic mortuary enclosure (Ketton B) which appears as a rectangular ditched enclosure lying within a large irregular and later ring ditch (possibly a round barrow, E in Figs. 4 and 8) which lies just to the north of and cuts the end of the elongated enclosure (Ketton A) described above (Deegan & Foard 2007, 52 & 64) and shown in Fig. 4). The placing of a probable later Neolithic - Bronze Age round barrow over the top of the probable mortuary enclosure suggests continuity of use at the site over a considerable period of time and generations. Immediately to the north of the broad ring ditch (E) there are further cropmarks of fragments of perpendicular ditches (H) which align on the rectilinear enclosure within which could be interpreted as a continuation of the same set of ditches which have been interpreted as the discrete rectangular enclosure Ketton B.

This pairing of long enclosures and mortuary enclosures in river valley locations, as at Ketton, appears common in the east of England. Other documented examples include

sites recorded as Flore D and Elton A in Cambridgeshire, Cosgrove A and B adjacent to the River Ouse, and three excavated sites in the Nene Valley (*ibid*, 66-67).

Figure 5: A possible Neolithic enclosure seen as cropmarks within the Bronze Age barrow cemetery at Tixover. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

The site of a third possible mortuary enclosure has also been mapped amongst the cropmark remains of a round barrow cemetery at Tixover. It lies just over a kilometre to the south of the Ketton enclosures, in a similar location overlooking the River Welland. This site appears as an irregular rectangular ditched enclosure with three slightly curved corners and one angular corner measuring 31m x 39m. The enclosure has off-set opposing entrances in the western and eastern sides and traces within of at least six irregular pits ranging in size from 1.8m to 3.6m across (Fig.5).

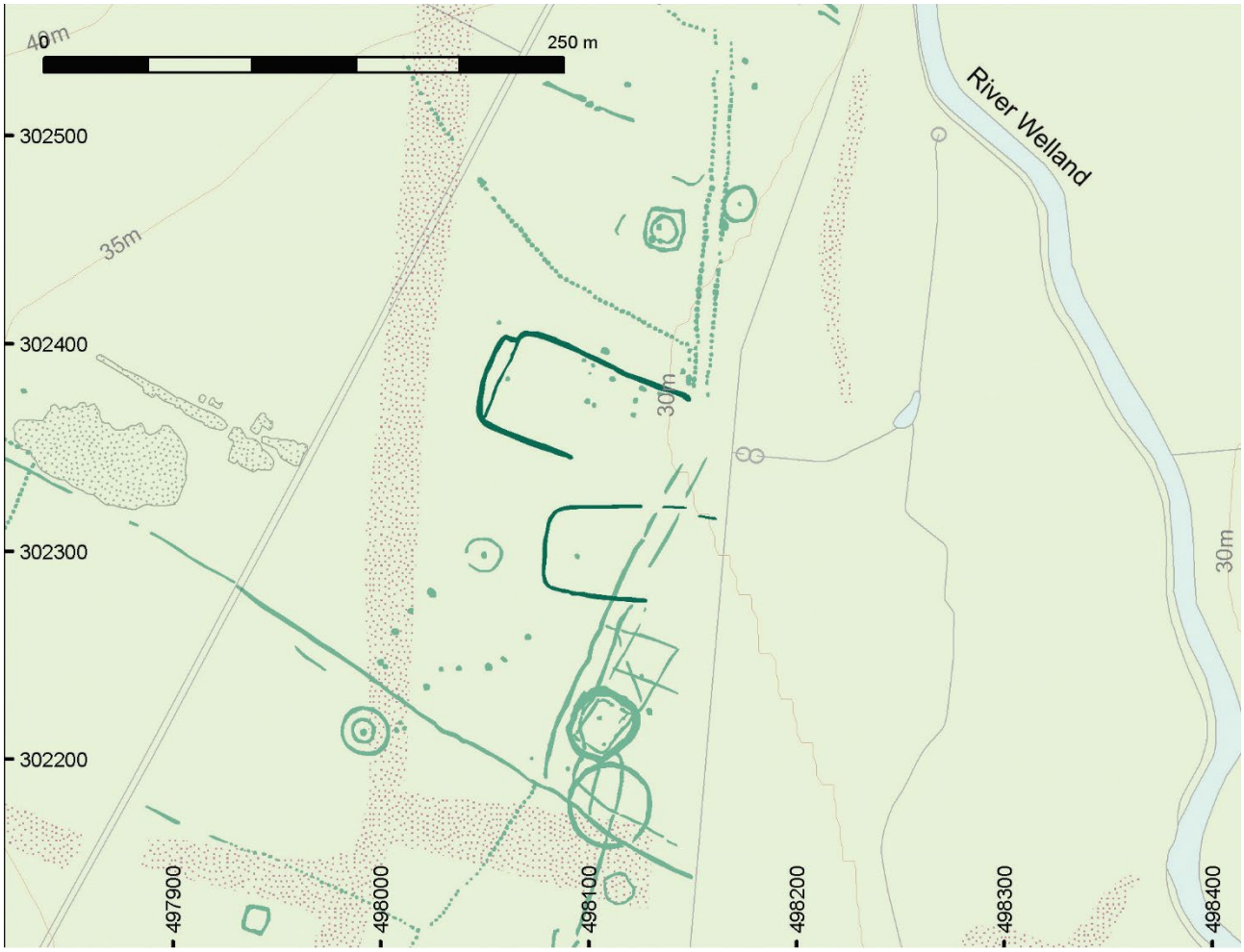


Figure 6: Transcriptions of two possible Neolithic cursus monuments within the multiphase complex of cropmarks south of Ketton (in bold). Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088

At the heart of the Ketton complex are two large incomplete rectilinear enclosures, both open-ended facing in the direction of the River Welland to the east (Fig. 6). The northern enclosure is aligned north-west to south-east and is defined by a broad ditch ranging from 1.8m - 2.8m in width. The enclosure measures *c*. 50m between the northern and southern ditches, and the longer northern side can be traced for *c*. 90m where it terminates close to the southern end of a double pit alignment. The shorter southern side of the enclosure can be traced for 48m. Its western end has evidence of alteration in plan with a narrower ditch cutting off a narrow area within the slightly convex end. It is not clear if the square-ended enclosure defined by the narrow inner ditch is all that is visible of an earlier enclosure which was subsequently re-dug with a broader ditch incorporating the curved northern corner before changing plan with a right-angled corner to create an irregular curved end to the enclosure. The southern enclosure is simpler with a single narrower ditch defining part

of a sub-rectangular enclosure with curved corners and slightly convex sides measuring 46m across and traceable to the east for *c.* 80m on its northern, more complete side.

It is not clear if these are the complete remains or they both extended into the adjacent field to the east, but both enclosures bear more than a passing similarity to Neolithic cursus monuments and would benefit from further investigation.

Bronze Age

Funerary monuments

In Britain, the practice of burial under round barrows and burial mounds of earth or stone was used widely from about 3800-1400 BC - from around the late Neolithic to middle Bronze Age. They occur in a number of forms, but the most common types are the bowl barrow comprising a bowl-shaped mound and bell barrows which have a flattened bell-shaped mound surrounded an encircling ditch surrounded by a ditch. The former is difficult to detect if they have been levelled unless some of the mound material remains, but the ring ditch of bell barrows and less common forms such as saucer, pond and disc barrows are easily identifiable from the cropmarks of their ring ditches. They can range in size from 5m to 40m in diameter (Historic England 2018b, 3-4).

The sites of a number of round barrows identified in the vicinity of Ketton, all seen as cropmarks of the remains of barrow ring ditches reflecting the long history of ploughing and cultivation in the area. The sample of barrows recorded here is relatively small, but a wide range of sizes and forms are represented and there is evidence of re-use of earlier monuments and expansion of the barrows themselves. A significant amount of medieval ridge and furrow still survives as earthworks throughout this area of the East Midlands which has the potential to preserve sub-surface remains of earlier sites which have yet to be discovered. Aerial photographs taken since the Second World War have recorded the gradual loss of areas of ridge and furrow and the subsequent emergence of traces of earlier buried sites such as Bronze Age round barrows as cropmarks.

Round barrows have been recorded in number of groups or cemeteries situated on the river terraces of the Welland and Chater Rivers. The largest single grouping of barrows recorded occurs at the southern end of the survey area between Tixover Grange and Tixover Hall on a flat area on the western bank of the River Welland where the river bends sharply to the west at Duddingon and passing to the south the site (Fig. 7). This group of round barrows appears as fragmented cropmarks of at least ten complete and partial ring ditches of varying size and shape. One of the larger barrows is distinctly oval and two other ring ditches at the northern end of the grouping appear to overlap. The site is cut through from north to south by a pit-defined boundary.

Figure 7: An extract of mapping showing the remains of a Bronze Age round barrow cemetery in a bend of the River Welland at Tixover. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

Less than 1km to the north of this group of barrows in a similar location on the west river terrace of the River Welland is the site of the multi-phase prehistoric ritual site near Ketton (Fig. 8) within which there are the remains of seven round barrows of varying size and form. All are levelled and only visible as cropmarks of their ring ditches. Four of the smaller ring ditches (Fig. 8, A-D) have an inner pit, possibly the remains of a pit to accommodate a central burial. One of these ring ditches (A) has an inner circuit of *c*. 11m outer slightly oval secondary ditch 21m x 23m, and barrow (C) has an irregular ring ditch 12.5m x 12.9m surrounded by an outer, secondary sub-rectangular enclosure of unknown date 19m x 20m with no entrances, but with three pits, two of which cut the ring ditch. Barrow G is sub-circular and defined by a narrow irregular ditch. Of the remaining two, (F) is a large circular ring ditch with a diameter of 40m which overlies the northern end of the possible Neolithic long mortuary enclosure and (E) is an irregular, sub-circular enclosure defined by a broad irregular ditch which incorporates an inner rectilinear enclosure.

Figure 8: Bronze Age round barrows south of Ketton. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

A smaller grouping of four ring ditches has been identified as cropmarks strung out along the first river terrace overlooking the River Chater (close to its confluence with the River Welland) to the north-east of Ketton. Here the medieval/post medieval ridge and furrow still survives as earthworks, but modern ploughing has eroded the ridge and furrow and reduced the depth of soil over long-buried prehistoric remains, so cropmarks are more likely develop. (Fig.9).

Several isolated and paired examples of barrow sites have been identified as cropmarks across the survey area and others discovered during quarrying. These may be individual monuments or part of larger barrow groups masked by surviving ridge and furrow or removed by ploughing, quarrying, or simply built upon. One such barrow seen as an incomplete oval ring ditch on aerial photographs was identified during quarrying (now destroyed) at Grange Top Quarry to the north-west of Ketton.

Figure 9: Bronze Age round barrows visible as cropmarks along the River Chater to the north-east of Ketton emerging from beneath the earthworks of medieval/post medieval ridge and furrow. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

Later Prehistoric linear boundaries and settlements

The traces of a fragmented system of boundaries presumed to be later prehistoric in date have been recorded widely across this part of the east Midlands and mapped extensively in Northamptonshire (see Deegan & Foard 2007, 82-90). These boundaries are typically defined by lines of oblong pits, and/or arrangements of single, double and triple ditches which in almost all cases are only detectable as cropmarks. This most recent survey centred on Ketton has recorded many of the same boundaries. The use of additional, more recent aerial photographs has increased the number and known spread of these boundaries significantly. The new mapping project has also demonstrated the connectivity between some of the groups of boundaries and revealed that these piecemeal groups are an extensive system of land division and trackways (Fig. 10). The separate groups of boundaries may not necessarily have been laid out at the same time, and there are suggestions of overlapping phases on different alignments in some locations, but the common style of boundary construction using pit alignments in conjunction with ditches

suggests they belong to a particular phase of land division by the same people over a number of generations.

Central to the survey area is a striking triple boundary comprising two substantial parallel ditches ranging between 1.3-2.8m in width set between 4.5m and 6m apart (Fig. 10). These ditches are shadowed on the southern side by a pit-defined boundary offset *c*. 7m from the nearer ditch. The boundary can be traced in two sections (broken mid-way by an area of quarrying) for over 1300m between the courses of the River Welland in the south-east to its tributary, the River Chater in the north-west. In common with all the boundaries seen in this area, no surface trace remains, and are only visible as a cropmark on aerial photographs. The north-west section is visible as a patchy faint cropmark as far as the railway line but cannot be detected beyond this to the river. The south-eastern end of this boundary, adjacent to the River Welland appears to be part of a complex of pit-defined boundaries, the incomplete remains of which appear to divide an area of 600m by 500m into a series of rectilinear/sub-rectangular units. Although the remains are fragmented, none of the boundaries, with exception of ring ditch F and possibly enclosure E (Fig. 8), appear to cut or clearly respect earlier barrows so it is not clear whether they remained extant and visible when the landscape was subsequently divided up in the later prehistoric period.

To the south-west of the main group of boundaries a double boundary comprising a ditch and parallel pit-defined boundary on its southern side extends westwards on a slightly sinuous course for over 1km. Cropmarks of further associated perpendicular boundaries can be seen branching off this boundary to the north and south. A section of this boundary peters out where it passes across a combe or dry valley where the buried ditch is presumed to be obscured by a depth accumulated colluvium.

These boundaries, particularly those made up of pit alignments have proved difficult to date and the remains here suggest several phases of construction and use over a considerable length of time. Three separate areas of ditched boundaries have been identified near Ketton within the Rutland Villa survey area, including the triple boundary mentioned above which was excavated in 1990 (Mackie 1993, 7). The pit alignment of the triple boundary produced evidence which firmly dated it to the Late Bronze Age to Middle Iron Age.

By association with the triple boundary, the ditched land boundaries are thought to have been initially laid out at a similar time, broadly similar to the period of construction other large planned systems land divisions in the British Isles such as the Dartmoor reaves in the south-west peninsular (Newman 2011,77).

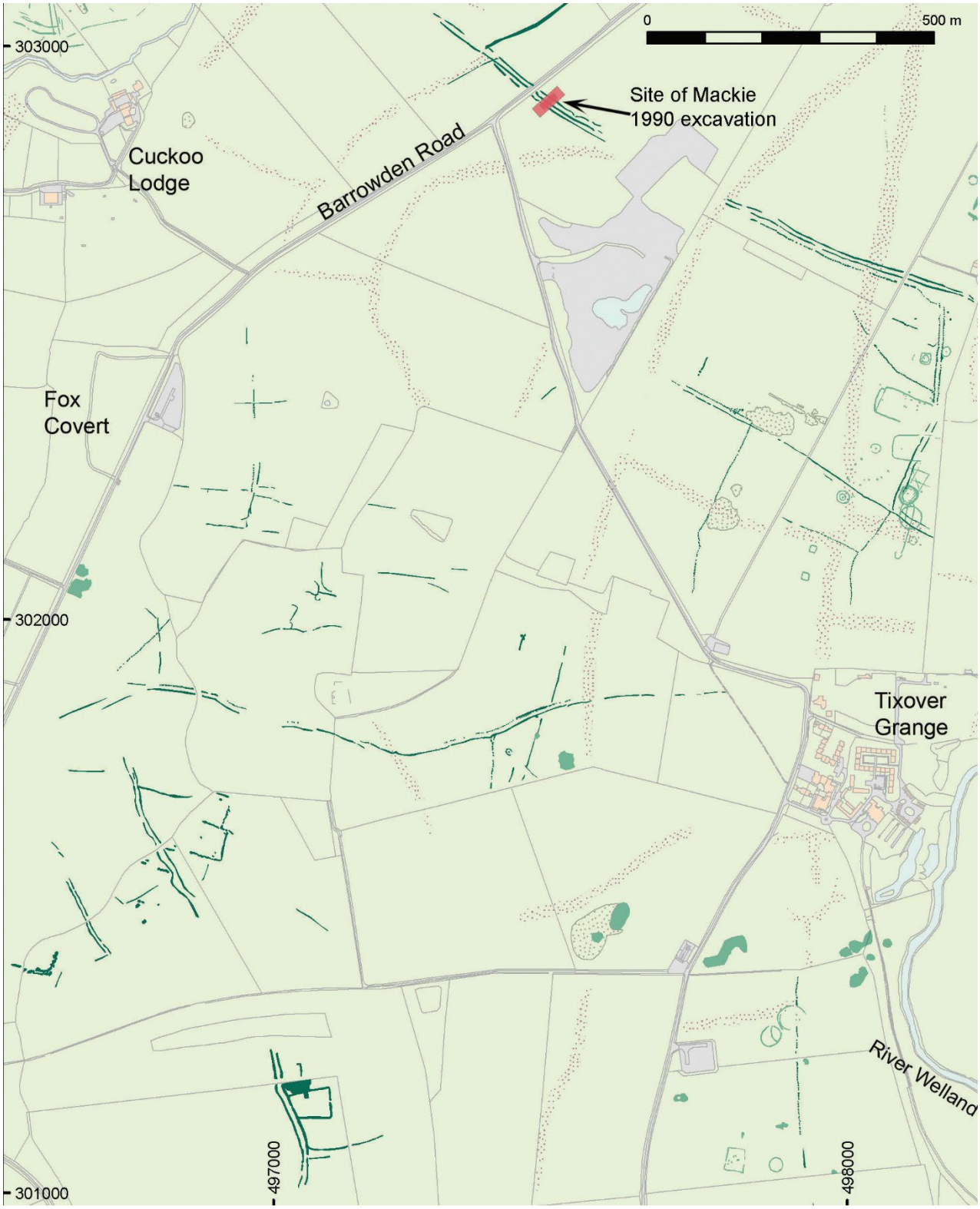


Figure 10: Triple boundary and associated pit-defined and ditched boundaries between the Welland and Chater rivers (shown in green). Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

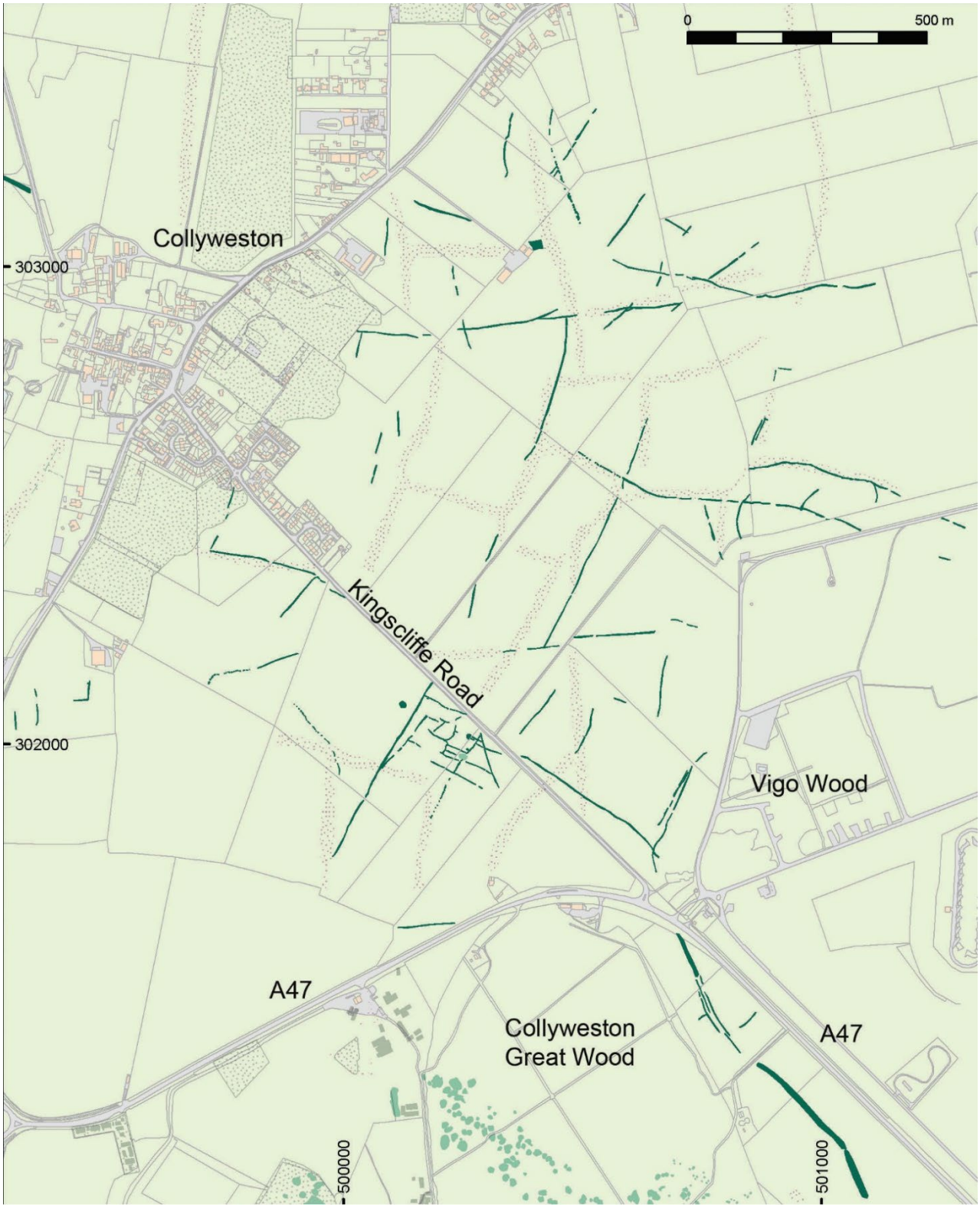


Figure 11: The fragmented field system to the east of Collyweston and the River Welland with possible settlement and associated with a prehistoric trackway (shown in green). Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

The function of such boundaries is the subject of some debate, but in this part of the country the extensive remains make is possible to build up a more complete picture of a network of boundaries which clearly represent the fragmented remains of a region-wide division of a landscape which had already been cleared of forest and established as open grassland from at least the Late Bronze Age to Early Iron Age (1200 BC to 700 BC - 800 BC to 300 BC) (Deegan & Foard 2007, 89).

To the east of Collyweston further ditches and pit-defined boundaries of a possible system of fields of uncertain date have been recorded as cropmarks (Fig.11). These boundaries appear different in form from those to the west at Ketton which an absence of double-ditched boundaries and a less organised, more irregular pattern to the construction and layout. However, there is a similarity in the manner of construction using a combination pit-alignments interspersed with ditches within the system indicating a common style and knowledge of boundary construction. On the south-western side is a cluster of smaller enclosures, ditches and pit-alignments and pits which may be the remains of a settlement associated with the field system. At the southern end, the remains of a substantial trackway (HER MNN138695) of uncertain date (possibly later prehistoric) can be seen extending south-south-east for over 1.2km past the eastern side of Collyweston Great Wood. The track extends south-south-east from a point north of the wood and the present-day A47, passing through a series of modern fields between the wood and the south-eastern branch of the A47 Though largely plough-levelled parts of this trackway are so deeply incised through prolonged use that its course can still be seen as a slight earthwork on lidar images. However, the relationship between the ditched field systems to the north and the trackway are unclear (Figs. 11 and 30).

Iron Age or Roman settlements

The remains of a small handful of probable Iron Age or Roman settlements have been identified within the survey area (Fig. 12). All have been seen as cropmarks and they are all typically limited to a single a farmstead. They represent a variety of forms, and only two have been excavated or dated. Four of the sites appear to be centred on a single ditched enclosure with suggestions of further enclosures or structures. Site A is located at SK 9536 0259 to the north of South Luffenham comprising a polygonal ditched compound with several smaller attached enclosures to the north and south. Within the main enclosure is an inner curvilinear enclosure attached to western side containing a single hut circle. A funnel entrance leads out of the compound to the north-west into the fragmented remains of a system of ditched fields to the west. A second site with a probable single hut circle is site C which has a sub-rectangular settlement enclosure located at SK 9851 0128 north of Duddington, just to the east of the River Welland. The hut circle is sub-circular with a diameter of c.18m. It appears to lie within the south-eastern corner of the enclosure, but on closer inspection the two enclosures can be seen to overlap with a portion of the ring ditch

protruding beyond the broad enclosure ditch, possibly lying beneath the corner. However, from the aerial photographic evidence alone it is not possible to be certain which came first, but in the very least this indicates at least two phases of development at the site.

Site B (SK 9988 0395) appears as a single sub-rectangular ditched enclosure likely to be a small settlement with traces of a possible sub-dividing ditch off the eastern side and further fragments of ditch and possible enclosure to its north-east. The site has no visible internal features such as pits or hut circles, but the absence of an obvious hut circle may simply mean the absence of a drip gully under the eaves of a hut or simply the lack of cropmark production over slight ditches and post holes.

Site D (SK 9707 0114) is a late Iron Age settlement enclosure attached to a double-ditched trackway with traces of further ditched boundaries to the south. The enclosure has an entrance in the eastern side opposite the trackway, but apart from later quarrying in the northern part of the enclosure there are no apparent traces of internal features, but as with settlement B this could simply be due to methods of construction. Fieldwalking to the east of the site in 1983 yielded Iron Age/Roman pottery and the site was excavated in 1990-91 revealing late Iron Age settlement remains within and outside the enclosure with evidence of both domestic and industrial processes with kilns/ovens and numerous finds including bone fragments from a baby, pottery, animal bone, a beehive quern and bone and metal tools (Jones 1991, Beamish 1991).

The trackway cropmarks disappear to the north where the track crossed a valley, presumed to be covered by sediment or colluvium, reappearing on the ridge to the north-east.

Settlements E and F are more difficult to define. Site E appears to represent the south-western edge of a more extensive site located at SK 9697 0567 on the edge of Ketton Quarry. The visible remains were mapped as cropmarks on photographs taken in July 1984 and in 1990 as exposed ditches after the topsoil was stripped prior to expansion of the quarry. The remains represent several separate phases of development with evidence of recut ditches, overlapping ditches and enclosures of a probable later prehistoric or Roman settlement. These ditches (which have now all been destroyed by quarrying) lie immediately to the south-west of the known location of Roman settlement finds and north-east of the site of an excavated late Anglo-Saxon settlement so could be associated in part with either or both settlements.

Site F is less certain. The remains appear as a series of perpendicular ditches forming rectilinear enclosures which may be part of a settlement site on the southern edge of a system of ditched and pit-defined boundaries at TF 0023 0199 to the east of Collyweston. However, some elements of this site are possibly natural or geological features caused by

cracks in the underlying limestone or where disturbances in the overlying sediments can allow cropmarks to form that may resemble archaeological ditches.

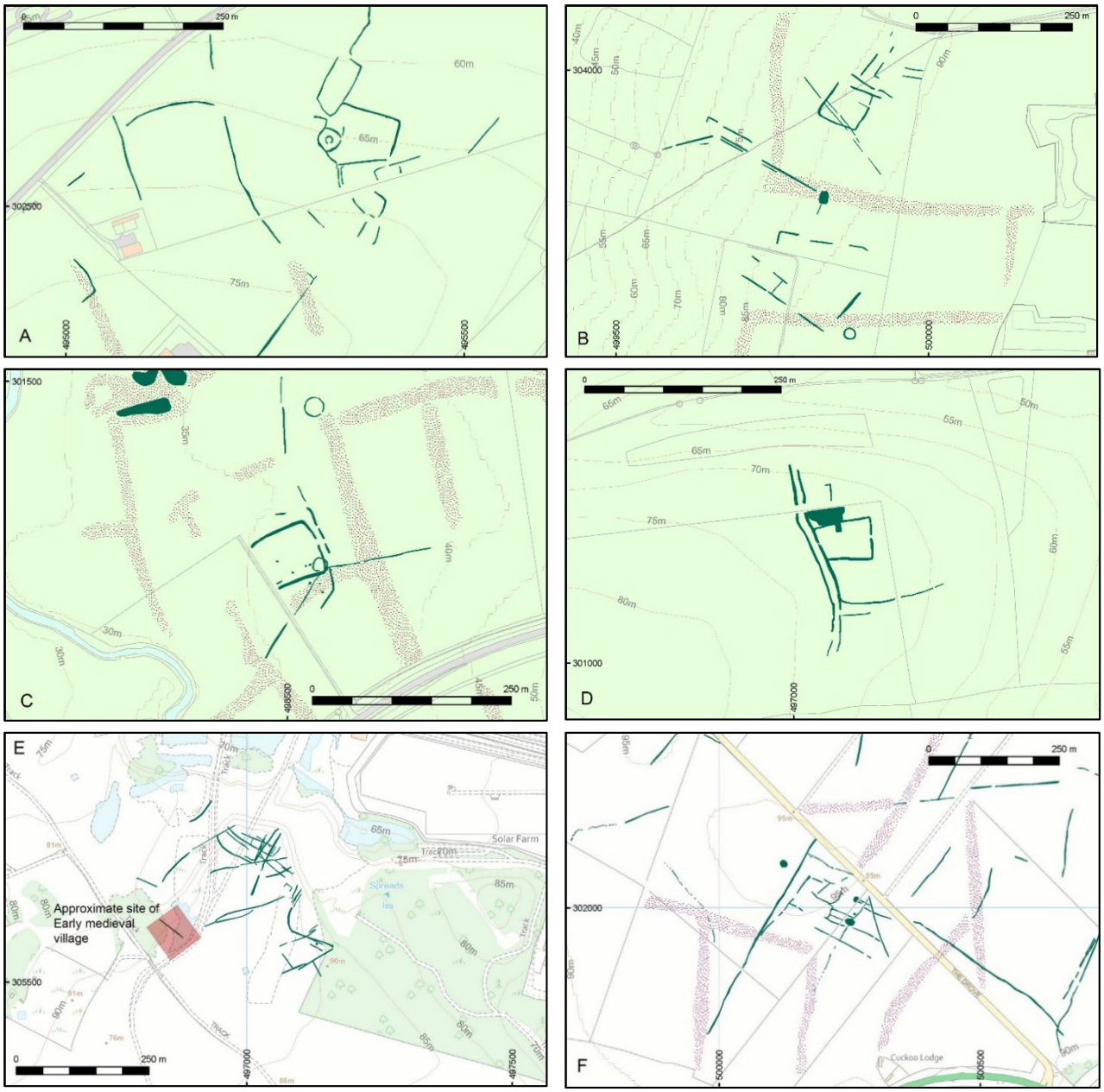


Figure 12: Illustrations of six selected possible later prehistoric settlements representing a range of periods all identified as cropmarks. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

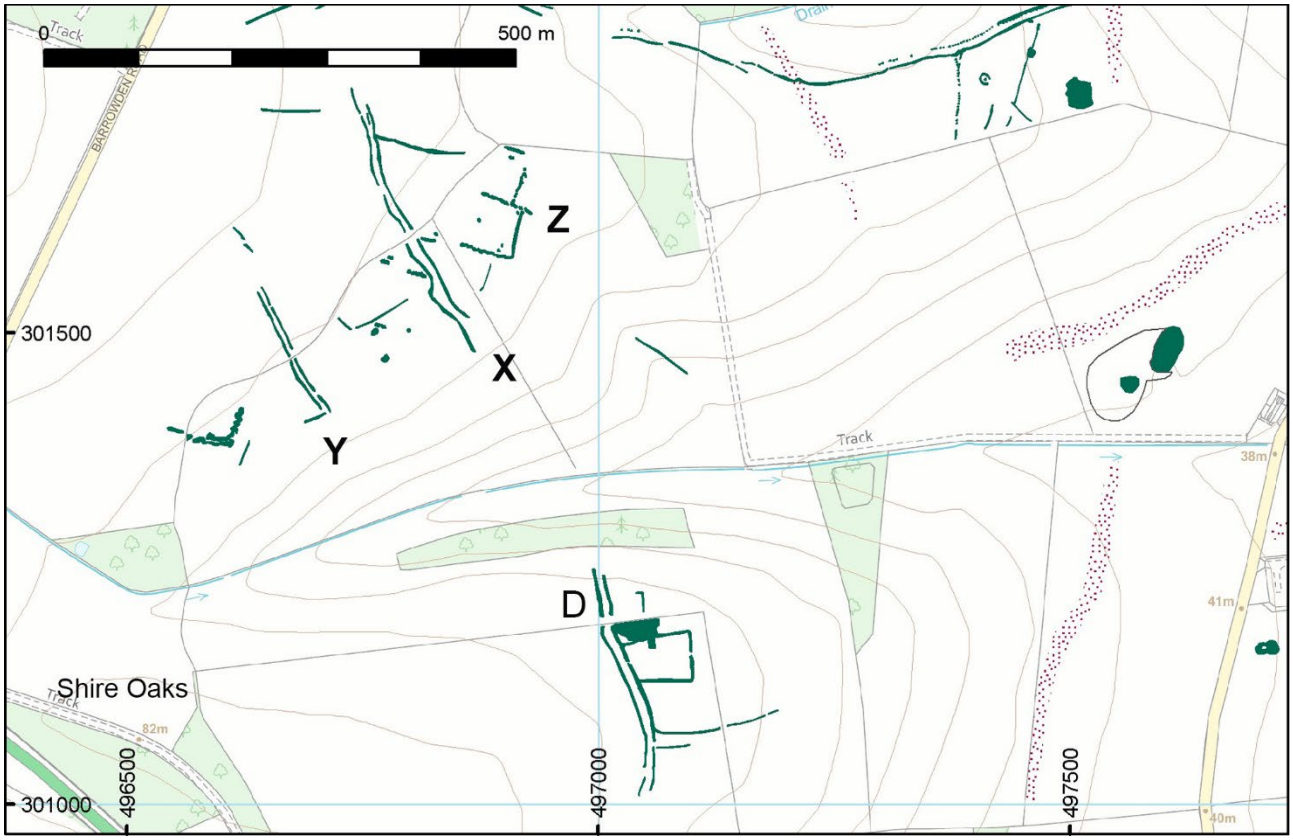


Figure 13: Iron Age settlement and trackway interrupted by the valley sediments obscuring the buried remains. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088

The Iron Age settlement site (MLE5819) in Tixover parish (feature D, Figs. 12 and 13), appears to be part of the wider network of tracks and boundaries discussed above. Its trackway appears to be aligned with a second northern section of trackway (X) (MLE5818) located at SZ 9480 0162 on the opposite side of a shallow valley just to the north. Approximately 170m to the south-west of this northern section of trackway are the cropmarks of a second pair of parallel ditches (Y) centred at SK 9668 0147, also on the same north-west to south-east alignment. These /trackways seem to be part of the larger system of boundaries and land division seen at Ketton. The double-ditched boundary to the west of the trackway were excavated in 1990 during pipeline works (Mackie 1993,7), and in common with the ditches excavated near Ketton, was similarly dated to the late Bronze-middle Iron Age (Fig. 10). These fragments of parallel trackway and boundary (X and Y) also appear to cut through the fragmented traces of ditches and rectilinear enclosures (Z), of uncertain date which lie on a different alignment, representing an earlier or later phase of land division or settlement at this location. Only a very patchy picture of the settlement and land divisions have been detected in part due to the soils and geology.

In this area only features located on the ridges appear as cropmarks whilst the buried remains such as this 'missing' section of trackway between D and X is probably obscured by an accumulation of sediment and colluvium within the valley in-between.

Figure 14: View looking south of cropmarks of boundaries and trackways (features X, Y and Z, Fig.13 and discussed in the text) visible on the ridge (yellow areas) but disappearing into green areas where there is deeper soil in the adjacent valleys. 27020_016 20-JUN-2011 © Historic England Archive.

Iron Age burial sites

The remains of Iron Age burial are less commonly identified than those of Bronze Age barrows. During the Iron Age there was a resurgence of barrow construction, but never on the same scale as in the Bronze Age. Some burials were placed in existing mounds already considered ancient in the Iron Age, or new mounds were constructed. These tended to be smaller (typically 0.5m high and a few metres square) than Bronze Age barrows and square in plan with a shallow square ditch. The diminutive size of these barrows meant they were less likely to survive later levelling (Historic England 2018b, 7).

Within the large multi-phase complex of later prehistoric ritual features seen as cropmarks at Ketton are the cropmark remains of two Iron Age square barrows which lie to the south-west of the main group barrows, enclosures, and boundaries (Fig. 15). They lie 36m apart

and both have a similar form and size with a single ditch and slightly rounded corners. The northern barrow measures 11.7m x 12.8m and the southern 13m x 13.5m.

Figure 15: A pair of Iron Age square barrows seen as cropmarks on aerial photographs. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

Roman

The Rutland Roman villa complex

Despite the extensive and substantial sub-surface survival of the Rutland Roman villa complex, there little surface evidence of the villa site which has only once been identified on aerial photographs as a cropmark visible in 2018 despite aerial photographs of the area existing from 1946 to 2021. There appears to be a problem with surface manifestation or cropmark generation across the site which may be due to the underlying geology combined with soils and methods of construction. This has been observed during other aerial mapping projects in Jurassic limestones areas such as the Gloucestershire Cotswolds (Small 2023, pers. comm). Possibly, where buildings have been constructed using the local limestone there is little physical difference between man-made structures

and the surrounding permeable bedrock resulting in insufficient variation in the soil moisture to create cropmarks.

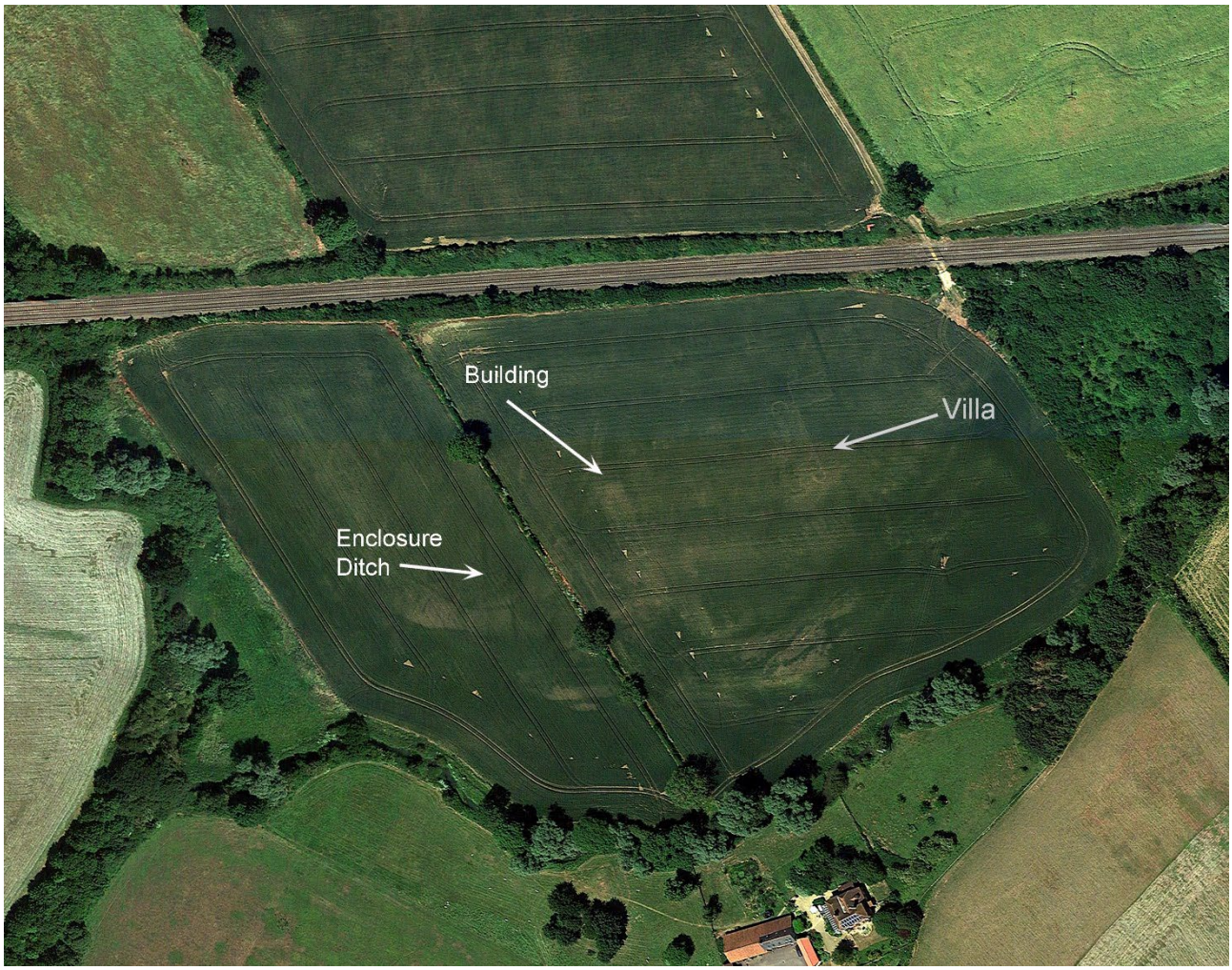


Figure 16: Faint cropmarks of the Rutland Roman villa complex on the only aerial photograph to show traces of the site visible between the railway line and a curve of the River Chater showing the villa, and hints of further buildings within a multi-ditched enclosure. Extract of Google Earth 25-JUN-2018 © Landsat/Copernicus.

The single aerial photograph of the site shows cropmarks of the faint outline of a long rectangular building with an apsidal end to the north and two curvilinear protuberances on the southern end (Fig.16). A large rectangular annex can also be seen to the north-east appearing to be joined to the main building by a small square room. All other features were detected as vague patches suggesting the presence of buried rubble of further buildings. The entire site was surrounded by a multi-ditched polygonal enclosure. The site was subsequently surveyed by SUMO GeoSurveys using ground penetrating radar (GPR) and magnetometry (Fig. 17) followed by two seasons of excavation at the site in 2021 and 2022 (forthcoming) revealed the full extent of the site (including the mosaics within the main villa building) first hinted at by the initial survey from aerial photographs (Small 2020).

Figure 17: Transcribed features mapped from 2018 and 2021 aerial photographs overlaid on the geophysical survey of the site. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088. GPR/Magnetic image © SUMO GeoSurveys 2020.

Immediately north of the railway line the faint cropmarks of an enigmatic inverted V-shaped double-ditched feature (Fig .18, feature X) measuring *c*.85m long were also noted on aerial photographs. It is not clear if this is the remains of an archaeological feature or a result of cultivation or ploughing, but traces of the feature can be seen on aerial photographs taken in two separate years suggesting the presence of a buried ditch influencing the crop growth in this field.

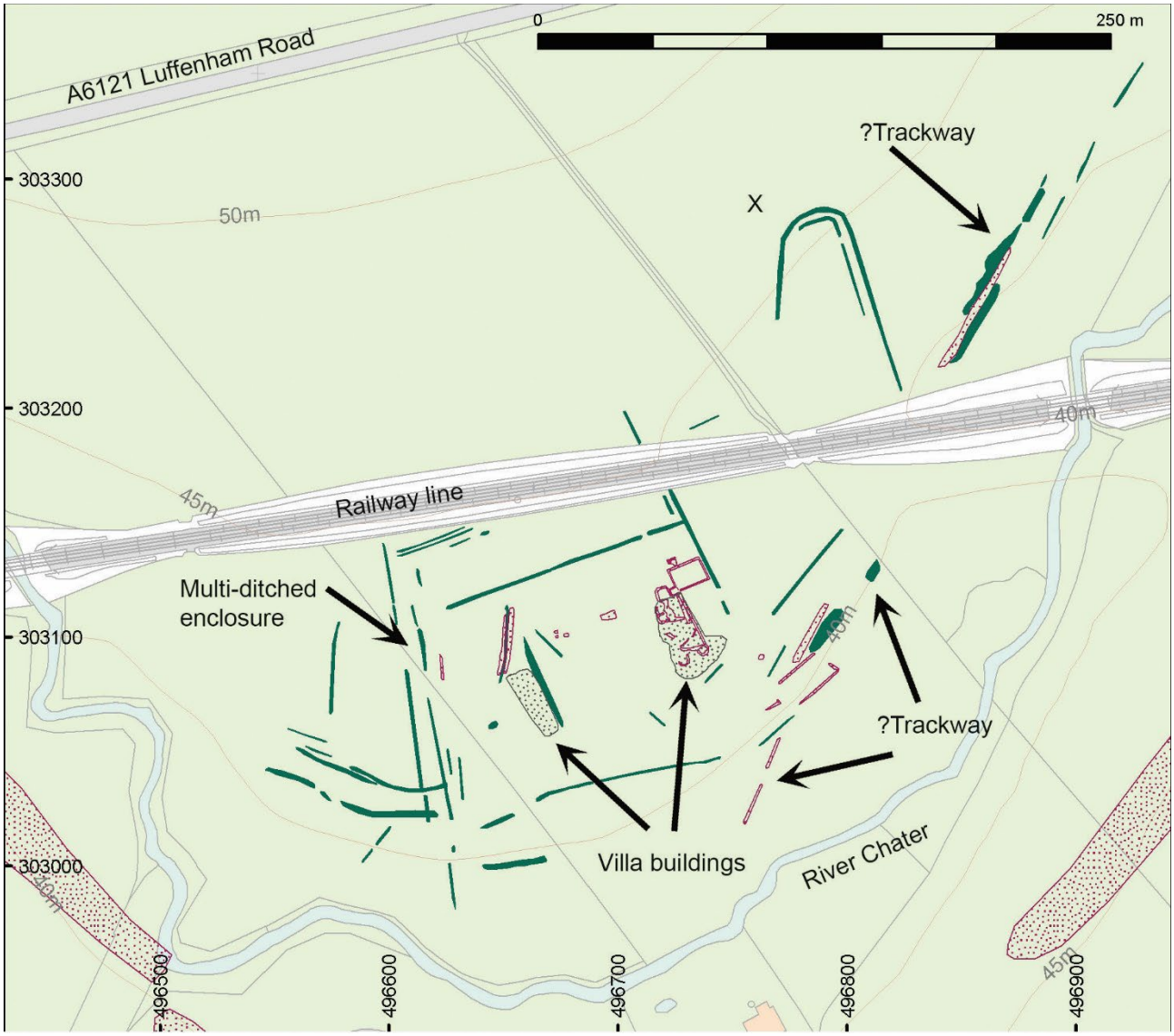


Figure 18: Traces of the Rutland Roman villa complex and surrounding features mapped from aerial photographs and lidar. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

Just over 1km to the south-east of the villa site earlier surveys have identified the possible remains of the speculated Roman road from Great Casterton (a Roman town located just to the north of Stamford) (Rutland HER-MLE 5425) extending south-west to a crossing of the River Welland at Tixover (Deegan and Foard 2007, 88). This appears as a line of short sections of positive cropmark suggesting a buried metalled surface over *c*.400m between SK 9756 0214 and SK 9769 0252 (Fig. 19).

In addition to these cropmarks the Rutland Villa Project aerial investigation and mapping also identified the remains of two lengths of slight earthwork linear bank on lidar images coinciding with and extending further north-east and south-west beyond the previously

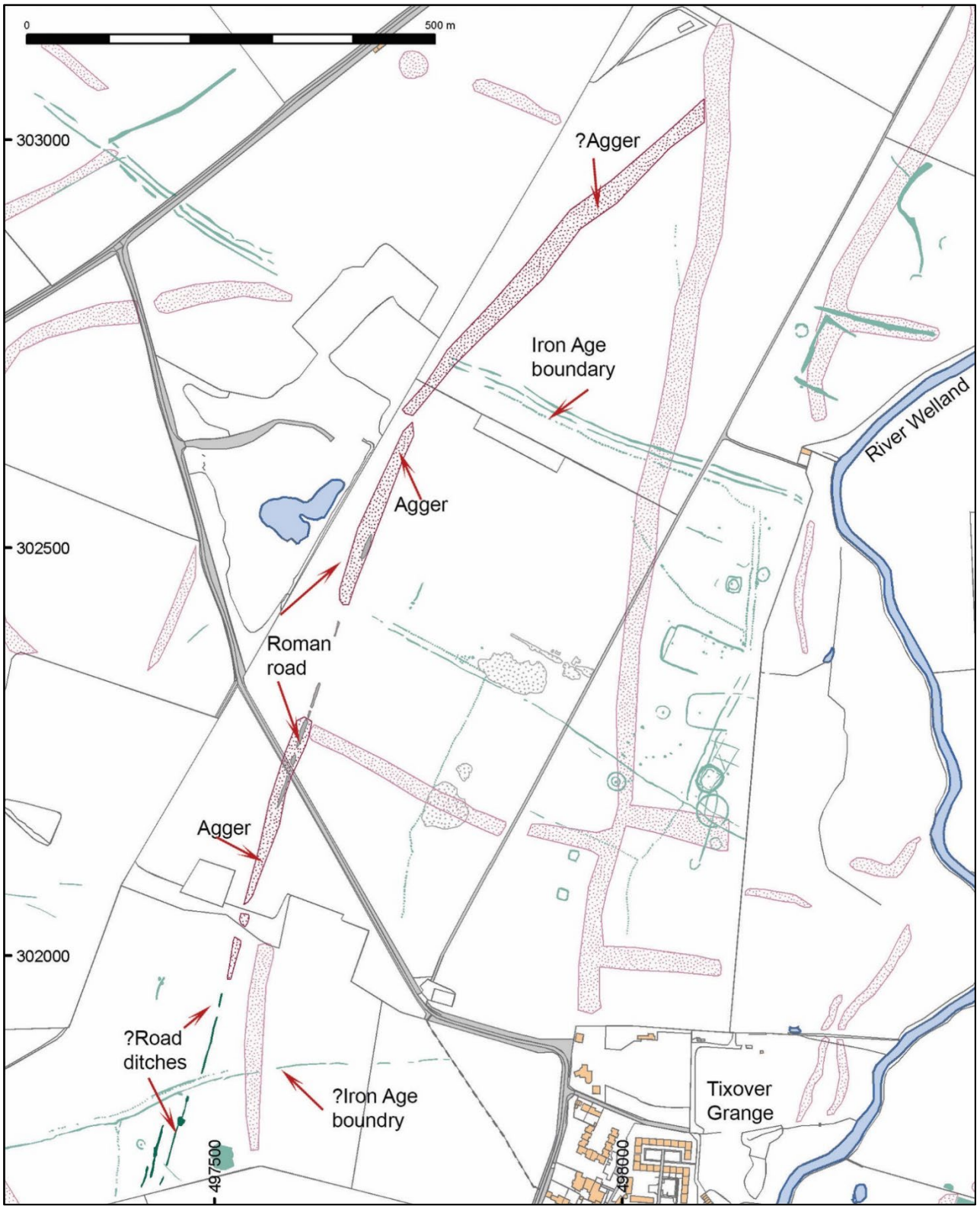


Figure 19: Extract of mapping showing the cropmark and earthwork remains of the possible Roman Road and surrounding archaeological remains. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

noted cropmark remains of metalling, between SK 9774 0265 and SK 9752 0197, which may be the slight earthwork remains of the embanked agger of the road. A third longer similar slight bank can also be seen continuing north-east on a slightly altered course for a further 525m. Whether this is part of the same possible road alignment is less certain. This linear appears to terminate where it meets a north-south aligned linear embanked boundary which is thought to be part of an early medieval system of boundaries visible as slight earthworks on lidar images. These boundaries are discussed in more detail below.

To the south of these sections of this possible Roman road the linear alignment appears to continue as the cropmark traces of a single narrow ditch fragmented into four sections visible on aerial photographs extending from SK 9751 0195 for a further 250m to the south-west, crossing the line of a probable Iron Age boundary defined by a ditch and pit alignment (NRHE 1570791) to the west of Tixover Grange. South of this boundary a second ditch parallel to the first is visible 17m to the west extending for 65m on the same alignment. Neither can be traced further, stopping short of the field boundary to the south at SK9742 0172. The entire length of the combined elements of this linear arrangement of banks, ditches and metalling extends on the same course for over 1.5km. It is not clear if the cropmark traces of metalling are associated with the course of a Roman road, or if the further embanked and ditched elements are associated with this or the remains of earlier boundaries following the same alignment.

Traces of Roman settlement in and around Ketton

Significant Roman settlement remains have been identified in and around the present-day village of Ketton, most through chance finds and excavation. Within the village, fragments of a tessellated floor indicative of a high-status dwelling were found in 1902 on the west side of the High Street (NRHE 325191), and outside the village to the east of the cement works a small Roman stone building was observed during a watching brief of a pipeline; interpreted as a possible Roman villa site indicating occupation from the 2nd-4th century AD (NRHE 117407).

Two adult Roman inhumations and a child's burial with five associated pottery vessels and two brooches of the 1st century AD were found on a building site adjacent to the brewery at Geeston indicating the presence of a possible Roman settlement or dwelling (NRHE 325220).

Further south at Tixover Grange (SK 982019) the site of a villa was identified in the late 19th century 200m from the River Welland. The site was subjected to a series of excavations in the early 20th century uncovering the remains of a substantial late 4th century AD villa with hypocaust, mosaics, and a bath house, but older finds indicate earlier

Roman occupation of the site (McWhirr, 1971,1-4) (NRHE 325200). Just of 1km south-west of this surface finds of pottery associated with a stone spread and iron slag have been interpreted as the site of a further possible Roman villa (NRHE 965058).

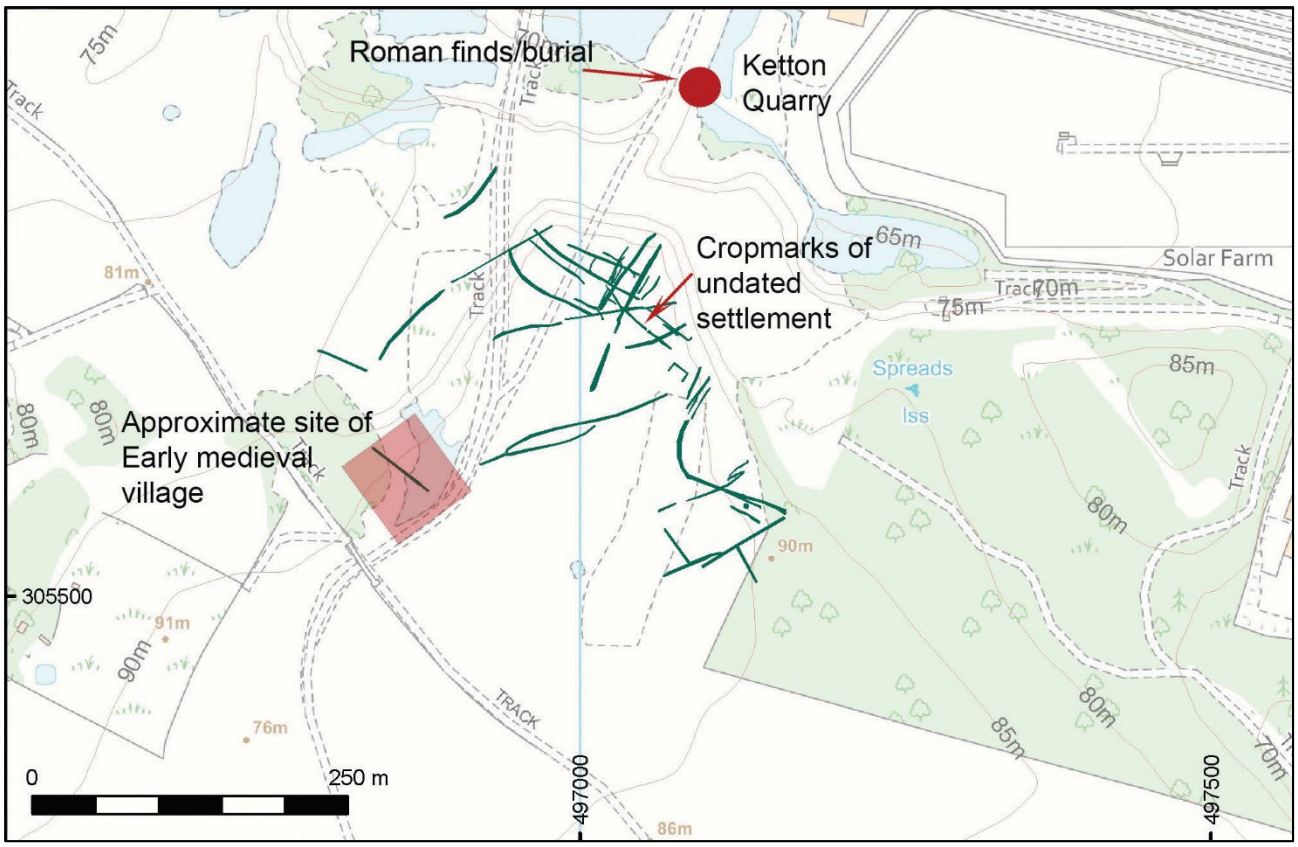


Figure 20: The site of a possible multi-period later prehistoric/Roman settlement seen as cropmarks and soilmarks prior to expansion of Ketton Quarry adjacent to the excavated site of an early medieval village. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

At SK 9701 0571 in Ketton Quarry the traces of part of a multi-phase settlement, probably Iron Age or Roman in date, was visible as both cropmarks and soilmarks of ditches, enclosures and trackways on aerial photographs take in 1999 and as exposed soilmarks in the stripped land prepared for expansion of Ketton Quarry on photographs taken in just prior to expansion of the quarry and the sites destruction (Fig. 20). The site probably extended further north-east and may be part of or associated with the finds of a possible Roman settlement including a pit, hearth with Roman pottery, nails, and a grindstone NRHE 325102 and a Roman burial MLE5390 found in 1959 by quarrymen in the advancing quarry face 125m to the north-east (East Midlands Archaeology Bulletin 1959, 15).

Early medieval

Evidence of settlement from the early medieval period is invariably underrepresented in this kind of survey because of the practice of constructing in wood, often posts with little or no foundations. These construction methods leave only slight traces which rarely form as cropmarks and are more frequently encountered during excavation or chance finds during quarrying and construction.

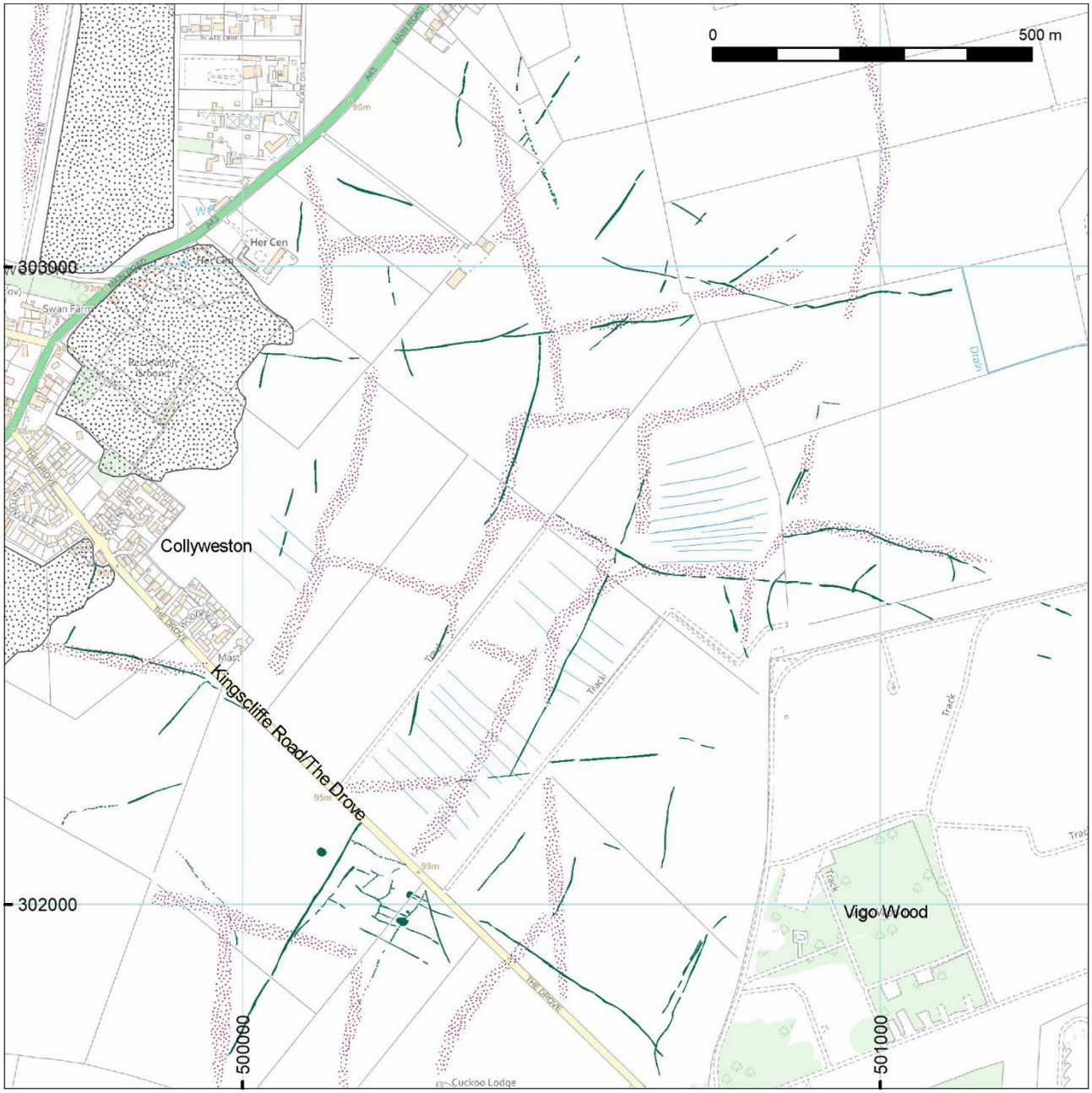


Figure 21: Mapping illustrating the layers of ditched (green) and embanked field systems (red stipple), medieval ridge and furrow (blue) against the present field pattern to the east of Collyweston. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

One such early medieval settlement site was identified during quarrying immediately to the south-west of the cropmarks recorded at Ketton Quarry. This site has been suggested to be the site of the lost hamlet of Newbottle. Excavations in 1999 revealing a pre-Domesday settlement with traces of three aisled timber halls and a timber church (Knox 2004,103).

This Anglo-Saxon village appears not to have been recorded from aerial photographs prior to the excavation and subsequent destruction by expansion quarrying. No further potential settlements of this period have been identified during this survey, but just over 500m to the south-west of the village site the remains of an early medieval iron smelting site (MLE24143) was located and excavated by MOLA in 2017. The site including up to 11 iron smelting furnaces has been thought to have been used to process the local nodular ironstone (Leicestershire Archaeological and Historical Society 2018).

The slight earthwork remains of numerous embanked linear boundaries have been identified on lidar across the survey area (Fig. 21). These are heavily ploughed and generally not visible on aerial photographs. Few have any relationship with modern or recent field boundaries or field layouts recorded on historic maps and have no apparent relationship with the majority of medieval or post medieval fields of ridge and furrow cultivation. It is therefore possible that these banks are the traces of an early medieval system of land division predating the medieval open field system of ridge and furrow cultivation – which in places can clearly be seen to overlie the banks.

The largest and most complete area of these embanked fields occurs across the parishes of Tixover and Collyweston where the medieval ridge and furrow has been levelled. Though fragmentary, enough of the banks survive to show the extent and form of the field system. To the east and south-east of Collyweston, beneath the embanked boundaries the cropmark traces of an earlier system of land division (possibly Bronze Age-Iron Age in date) can be seen as ditched and pit-defined boundaries with trackways and an associated settlement extending across 2-3 sq. km. These two field systems, the medieval ridge and furrow and the modern field layout depicted on the modern Ordnance Survey mapping are on different alignments and plans.

Medieval settlement and cultivation

The villages of Ketton, Collyweston and Tixover were all larger than average villages recorded in in 1086 in Domesday Book (Anne Powell-Smith, 2023). Traces of medieval settlement earthworks have been identified at both Ketton and Collyweston (Parker and Thorn 1980, EN1-2; Thorn and Thorn 1979, 31,1).

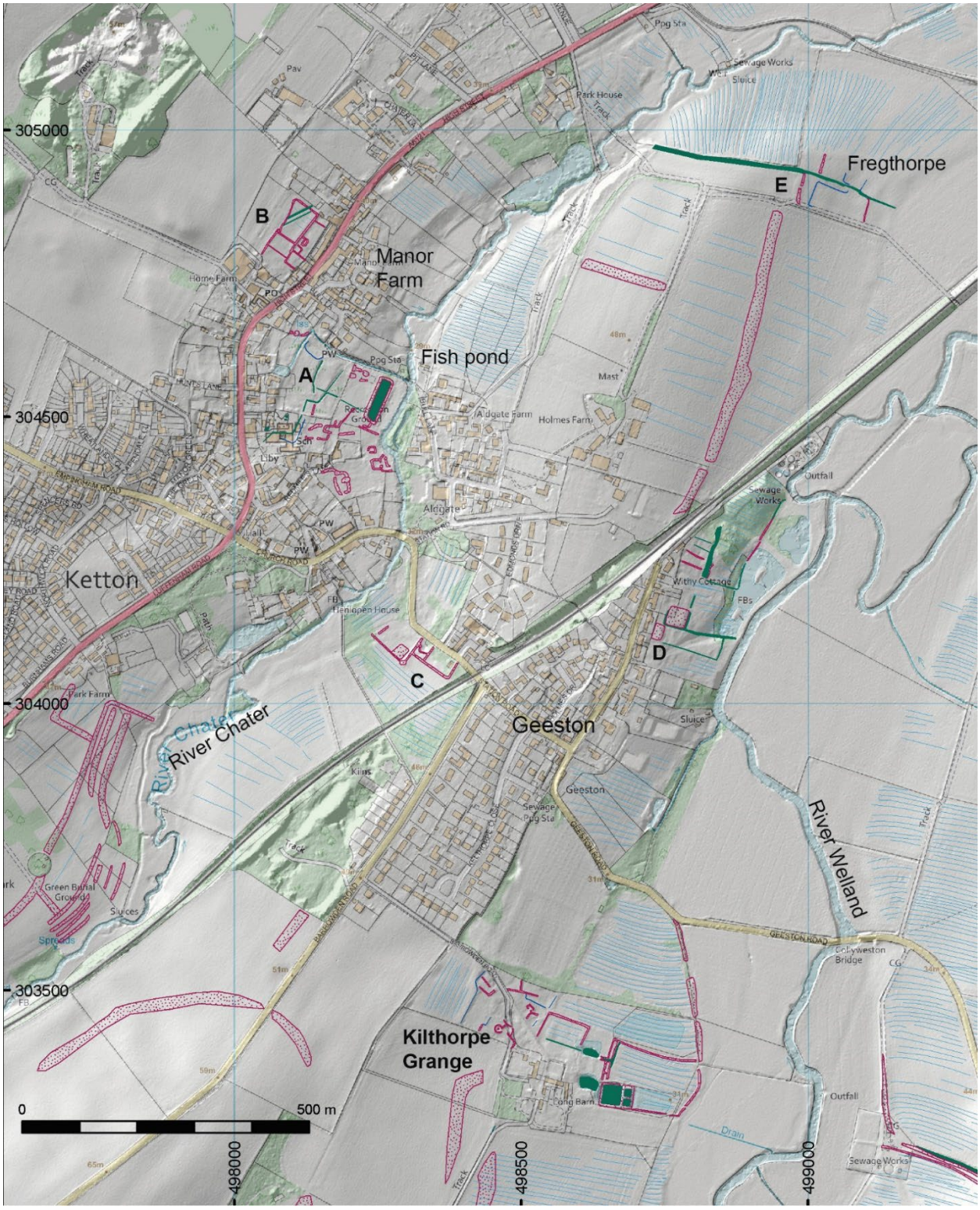


Figure 22: Adjacent villages of Ketton and Geeston surrounded by traces of medieval settlement and ridge and furrow cultivation. Transcribed archaeology over lidar and OS (Ordnance Survey) mapping. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088. LIDAR DTM 16-FEB-2009 © Historic England. Source Environment Agency.

Both villages have developed and spread since the medieval, but significant traces of medieval settlement, remain in open spaces and fields. There is still a significant level of preservation of medieval ridge and furrow around both villages, but in common with other such areas across the east midlands this is under threat from plough damage. Traces of medieval/post medieval ridge and furrow survives as earthworks in pockets across much of the area. There are well-preserved remains of both village and manorial earthworks at Ketton and Collyweston. Where the ridge and furrow does still survive as earthworks there is potential for sub-surface survival of pre-medieval archaeological sites unaffected by more modern deep ploughing techniques.

In addition to the village and rural hamlets, there appear to be a high number of high-status sites within this area indicated by existing monument records. As well as the agricultural value of the area which is evident from the still widespread ridge and furrow throughout the midlands the locally occurring outcrops and deposits of Collyweston Limestone, Ketton Limestone and Ironstone have been the basis of three separate industries producing building stone, roof slates and iron smelting from at least the Roman period. These industries burgeoned through the medieval and post medieval periods and would have brought considerable wealth to the area. This would explain the density of and distribution of medieval settlement and activity around the present villages of Ketton and Collyweston. However, the region has still essentially remained rural with pockets of industry and no major industrialised towns excepting Corby further to the south-west.

In and around the present village of Ketton the scattered remains of surviving medieval of village and manorial earthworks (Fig. 22, A) (MLE10831) including a large rectangular fishpond (28m x 80m) have been recorded from both RAF aerial photographs and lidar images in the village recreation ground and school grounds between the High Street and the River Chater (centred at SK 9816 0450). On the northern edge of the village on the western side of the High Street (opposite Manor Farm) the remains of embanked closes of land likely to be crofts and tofts (B) MLE10381 were recorded at SK 9410 0481 from lidar images. South of the River Chater on the south-west side of the road between Aldgate and Geeston further fragments of a medieval croft and toft (C) survive as earthworks surrounded by traces of ridge and furrow at SK 9830 0409.

Adjacent to the River Welland further on the north-eastern edge of modern Geeston area the surviving settlement earthworks of the medieval/post medieval village of Geeston (D). RAF aerial photographs and lidar images reveal the earthwork remains of two building platforms, a hollow way, ditches, and banks interspersed with traces of ridge and furrow can be seen extending eastwards down to the river.

Around 500m NNE of Geeston are the traces of the deserted settlement known as Fregthorpe (MLE5411) identified on lidar images but marked on historic maps until

recently (E). The site was ploughed up in 1980, but slight traces remain of house sites and old closes on either side of a hollow way, surrounded by the remains of its fields of ridge and furrow.

On the southern side of Geeston are the earthwork remains of an extensive medieval settlement or manorial complex known as Kilthorpe Grange with traces of fishponds and a circular feature thought to be the remains of a dovecote (MLE5413). The Manor of Kilthorpe was first mentioned in the 12th century (Hartley 1983, 24; Page 1935,156). Fregthorpe and Kilthorpe are two examples of a handful of place names in Rutland with Norse origins (Waites 1987; Bourne 2003, 104 and 107).

Towards the north-west part of the survey area is the site of three former pillow mounds recorded at Wychley Warren Farm near Edith Weston (NRHE 1631187, MLE 5134). These were extant when recorded on RAF aerial photographs taken in 1946 but have since been levelled, though were detected as slight cropmarks in 2020 suggesting sub-surface survival. The mounds were all capsule shaped and of varying size and alignment. No other associated features have been recorded, but suggest a nearby manor or park, such as Normanton Park to the north-west. The construction of Rutland water has drowned the western half of the original park.

20th Century/Military

The Rutland Villa survey area lies between the sites of two Second World War airfields – RAF North Luffenham to the north-west and RAF Collyweston just to the south-east. Dispersed hutted camps, Second World War accommodation for RAF Collyweston Airfield is recorded towards the south-east of the survey area. The airfield itself, apart from the western perimeter road, lies mostly outside the limits of the survey to the east. The airfield had a grass runway and was first used for Spitfires of Nos. 266 Squadron (resident from June to October 1941) and 32 Squadron for night training, later joined by Hurricanes. Captured German aircraft were also flown from the airfield.

In 1945 the site was integrated with RAF Wittering, Peterborough. It was still in use in the 1990s for Harrier training (Lowry, B (ed) 1999, 35).

To the north-west of the survey area are the remains of the north-east end of the primary runway of the former Second World War airfield of RAF North Luffenham (Fig.23). This airfield opened in December 1940, initially a grass airfield with two aircraft hangars (Type J) and technical buildings used as a base for 17 Elementary Flying Training school, but for much of the war it was an operational base for Royal Air Force Bomber Command: from July 1941 was use by bomber units of Squadrons 61 and 144 flying Hampdens, Squadron

144 operating out of the airfield until April 1942. The airfield was upgraded between 1943-1944 with three new concrete runways and hardstandings and additional Type T2 hangars to accommodate heavier aircraft. The airfield then took on a training role (principally 29 Operational Training Unit). Glider training also took place in preparation for D Day. It remained as a training base until November 1951 when in the site was taken over by RCAF flying Sabres. It returned to an RAF training site between April 1955 until June 1958 when flying ceased (Lowry, B (ed) 1999,103).

During the late 1950s North Luffenham also became the site of one of the twenty Thor missile bases dispersed across the east of England between 1959 and 1964 deployed under joint British/US control (ibid,133). The missile complex was located in an isolated

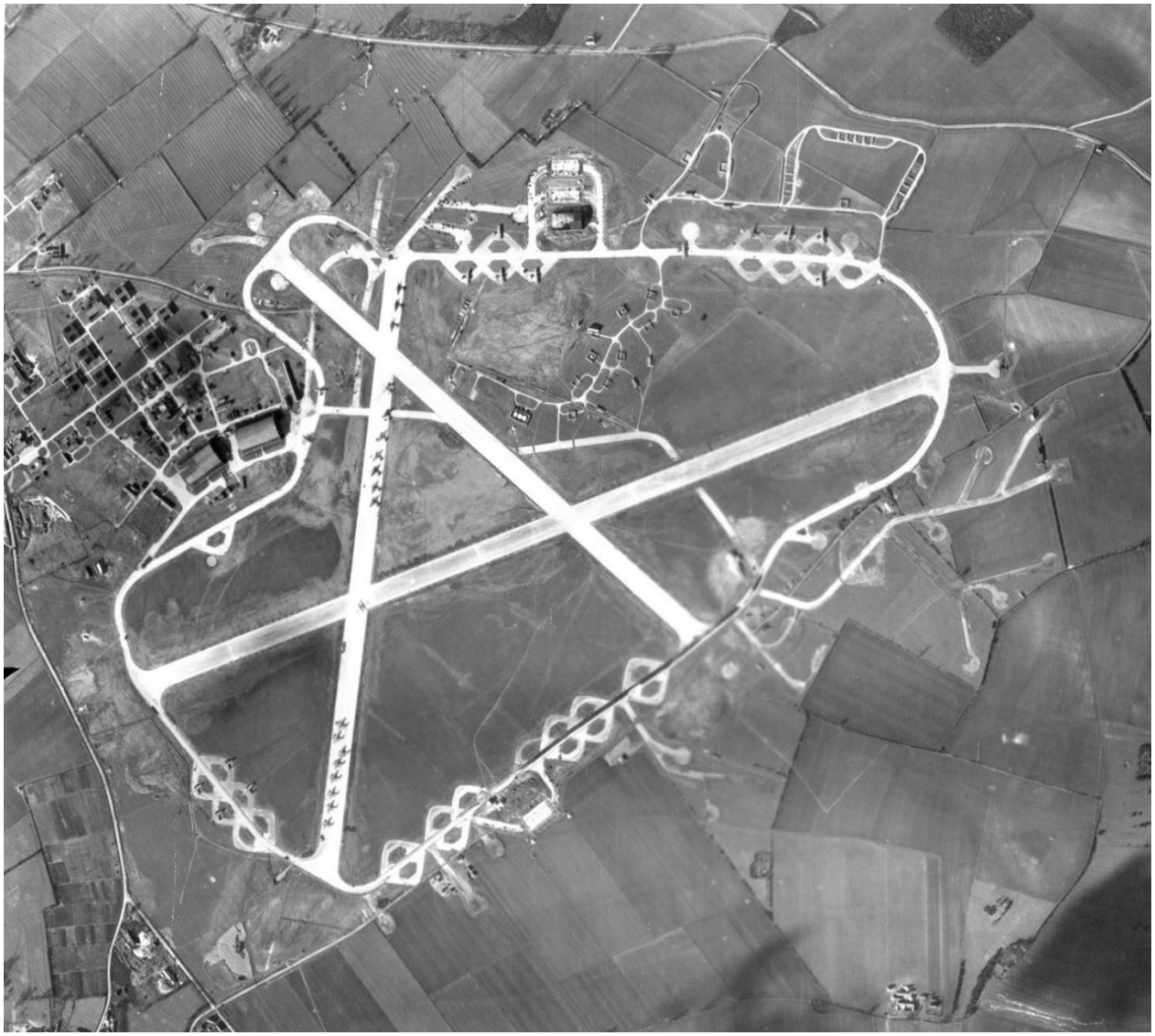


Figure 23: Aerial view of RAF North Luffenham towards the end of the Second World War. US/7PHG/LOC/190 12044 02-MAR-1944. Source: Historic England Archive (USAAF photography).

position on the south side of the eastern edge of the airfield accessed from the airfield perimeter track, extending across several of the existing Second World War concrete frying-pan and spectacle loop aircraft dispersal hardstandings (Fig.24). The three reinforced concrete launch emplacements are arranged in the typical, broadly triangular configuration remain within a compound. All three emplacements retain their blast walls, launcher erector mountings, fuel dump pit footings on either side of the erector and most of the rails to the causeway and the end of the shelter. The fuel pipe conduits from the pits to the launcher remain and the steel fuel pipes surrounding the launcher mounting are apparent as are the platforms for the short-range theodolites. All emplacements retain their theodolite shed platforms, but only the central and eastern emplacements retain partially standing theodolite sheds and the lower portion of the concrete long-range theodolite pillars. The Surveillance and Inspection Building, a single-storey, flat-roofed building constructed from prefabricated concrete slabs has been extended along its length to the north by a taller structure covered in corrugated metal.

Figure 24: The remains of the Cold War Thor missile complex at North Luffenham. The outlines of the underlying Second World War airfield frying pan and spectacle loop dispersals are visible in the grass. 33983_014 12-Nov-2020 © Historic England Archive.

Subsequently the radar station for controlling Bloodhound Missiles was also sited at North Luffenham. Royal Air Force ground units continued to use the base until 1997. In the

following year the base was transferred to the Army (the Royal Anglian Regiment) (Historic England 2023).

Though the airfield is now unused as such, the three runways, perimeter road, hard-standings, dispersals, and numerous old and new buildings remain. The site is home to St George's Army Barracks, a military installation due to close in 2026.

History of mineral extraction around Ketton and Collyweston

The geology of this area comprises sequences of sedimentary rocks, dominated by Jurassic limestones including the Upper and Lower Lincolnshire Limestone, limestones of the Rutland and Bilsworth formations and outcrops of iron-rich ooidal ironstone of the Northampton Sand Formation. Each of these bands of rock has a different quality which has been exploited variously for building and roofing stone, agricultural lime and cement production or processed for iron production. The bands and outcrops are closely associated resulting in adjacent quarries, or in one case a single quarry exploiting two distinct types of rock. As a result, quarrying and processing of the stone and ore has been and remains the basis of local industry and employment. Both the Lower Lincolnshire Limestones and ironstones have been extensively quarried in this area from at least the Roman period to the present day with traces of historic quarrying visible across the area as well as large active modern opencast quarries such as the Ketton Quarry.

Ketton Limestone Quarry

The largest quarry in the survey area is Ketton Quarry (Fig. 25) which produces Ketton Stone, an oolitic Jurassic limestone which has been used locally for building since the 16th century. This is a fine-grained stone typically ranging in colour from cream to yellow and pink, which can be worked with a chisel to produce ornamental stonework and tracery without shattering and was used in many of the colleges in Cambridge.

Ketton Quarry provides limestone for the adjacent Ketton Cement Works which was established in 1921 and is a major producer of Portland cement in the country. Though Ketton Stone is still used for specialist construction this represents a small part of the business which selected cut into building blocks. The quarry workings are relatively shallow following the almost horizontal bedding with little overburden. Over its lifetime the quarry has expanded north and north-west of Ketton village, the northern edge of which is dominated by the sprawling cement works. Ketton Quarry is still active, but large parts of the adjacent former quarry lands have now been landscaped and adopted as nature reserves designated as a biological and geological SSSI (Site of Special Scientific Interest).

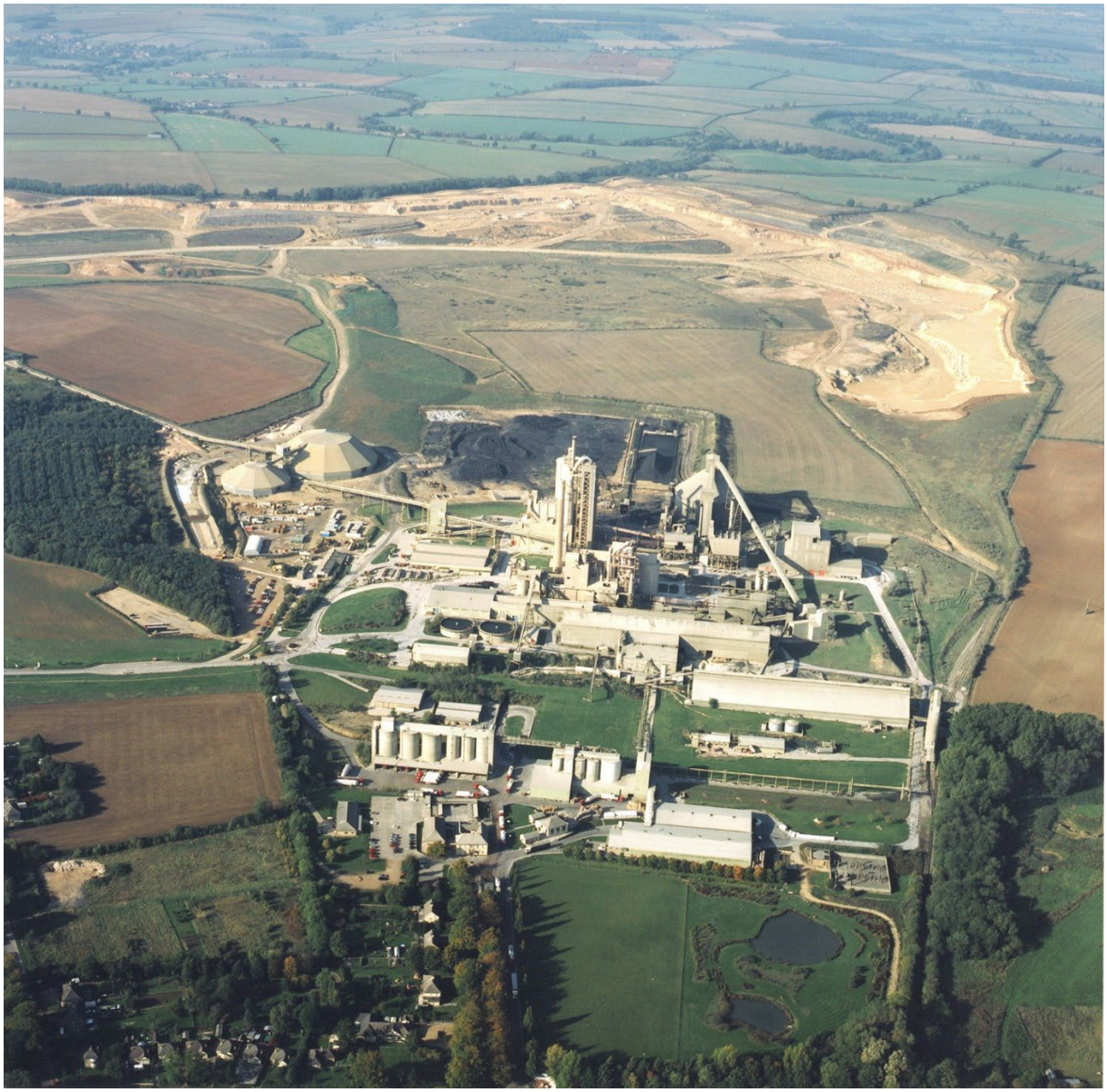


Figure 25: Aerial photograph of Ketton Cement works and adjacent limestone quarry. NMR 24081_08 10-OCT-2015 © Historic England Archive.

Collyweston Slate Quarries

Collyweston limestone, known locally as Collyweston slate, differs in nature from Ketton Stone and has long been exploited because of its fissile nature which allows the weathered stone to be split into thin sheets ideal for roofing. Formed in the Jurassic period in shallow marine conditions from a gradual accumulation of layers of sand, shells and mud bonded with precipitated calcium carbonate. Once quarried the stone must be exposed to frost to break down the calcite cement between the thin bedding planes enabling splitting along what is known locally as '*cliving planes*' to make thin sheets which can be shaped into slates which are thin and light enough to be used for roofing. These slates have been used widely since the Roman period for roofing probably using surface

stone known as ‘gifts’ (Collyweston Historical and Preservation Society) with examples of Collyweston slates found at several villa sites across the East Midlands (Dykes 2019) including a substantial number recovered from the excavations at Ketton (Rachel Cubitt 2023, pers. comm.). The Collyweston slate industry reappeared again in the later Middle Ages, becoming highly sought after in 16th century with the rediscovery of the frosting process (Clifton-Taylor 1962,117). The tiles were prized for their thinness and lightness, each tile weighing on average half that of an equivalent Cotswold slate, requiring a significantly lighter roof structure to hold the weight of the slates (*ibid*, 118). Tiles were shaped and dressed, and a peg or nail hole drilled or bored. Roman examples are hexagonal in shape with a single peg hole, but the later medieval and post medieval industry favoured rectangular tiles. Tiles were made in a range of sizes and laid in diminishing courses, largest at the eaves and smallest and lightest at the top of the roof ridge line. They were fixed with a peg hung over a horizontal lath secured at the head with a dab of lime mortar - known as head-bedding, and then pointed all around the exposed tile edge -tail bedding- and coated with a layer of lime plaster inside the roof (Dykes 2019) called torching, which helped weatherproof the roof (Collyweston Historical and Preservation Society).

Collyweston slates were used locally for centuries as the primary roofing material contributing to the strong local character of the architecture. Historically the bulky nature of stone slates made transportation further afield difficult and costly but was the chosen roofing material of ecclesiastic buildings and grand houses and buildings (*ibid*). There was an established local slate industry through the medieval period with records of 14,000 slates being supplied to Rockingham Castle in 1375 and 1390. By the 1600s there were both open pits and mines recorded around the village of Collyweston (Collyweston Historical and Preservation Society).

Production peaked in the late 1800s, but with the influx of industrially produced materials in the 19th century onwards it became commercially unviable, production stopped altogether in the 1970s (Historic England 2015). The last Collyweston slate quarry was closed by the 1960s, due to decreasing demand in competition with cheaper mass-produced alternative roofing products with most slates are acquired through reclamation of slates from demolished or re-roofed buildings. However, there has recently been a small revival in slate mining and production with the reopening of a mine at Collyweston by Claude N Smith Ltd supplying slates for refurbishing heritage sites such as Bodley’s Court, Kings College Cambridge and Apethorpe Palace (Dykes 2019) and Old Westbury Gardens in Long Island, New York. A new access tunnel was dug through 100m of rock to reach the bed of limestone ensuring a steady supply for the increasing demand for Collyweston Slate.

Due to warmer winters and infrequent frosts new methods of weathering using artificial frosting in freezers were developed in the late 1990s by English Heritage (now Historic England) and Burghley Estate in Lincolnshire and Sheffield Hallam University, refined further by English Heritage in 2012 for renovating Apethorpe Palace (Historic England 2015, Claude N Smith Ltd. 2023).

During the excavations at the Rutland villa a large selection of Roman stone roof tiles of Collyweston Slate was recovered from the rubble of the collapsed Roman buildings (Browning 2021, Fig.68, 61). These tiles had been shaped into a diamond/lozenge shape with a single peg hole bored into one corner point for hanging the tile lengthways. One example was recovered with an *in-situ* nail (*ibid*, 43) and some tiles also retained traces of mortar (*ibid*), an early example of the long-established practice of 'head-bedding' with a dab of mortar mentioned above. It is clear from these and finds from other Roman sites that the same methods of manufacturing and finishing roof slates from the local limestone has prevailed unchanged in the local area through to the present day.

Evidence of historic small-scale mineral extraction

Evidence of historic small-scale mineral extraction and quarrying of the various local stone resources can be seen across the area, particularly around Ketton and Collyweston. There are traces historic quarrying visible on both aerial photographs and lidar as partially infilled, mostly post medieval, quarries as well as smaller patches of disturbed ground and clusters of smaller infilled hollows and spoil of uncertain date which have been ploughed and partially levelled. The dark cropmarks of other infilled extractive pits of varying size and shape appear as across the area. One such area of former limestone quarrying of uncertain date has been seen on lidar images to the south and east of Tixover Grange (Fig. 26).

These sites of former quarrying appear as clusters of large pits surrounded by the remains of up cast material on either side of the river. Though levelled and ploughed, the slight earthworks can still be detected as low earthworks of disturbed ground on lidar images. All of this group of extractive pits lie over the Lincolnshire Limestone, but is not clear if this extraction was to exploit limestone, the overlying of riverine sand and gravels or even the underlying ironstone which are exposed in a narrow band along the river and lie close to the surface below the limestone in the region of the areas of former extraction.

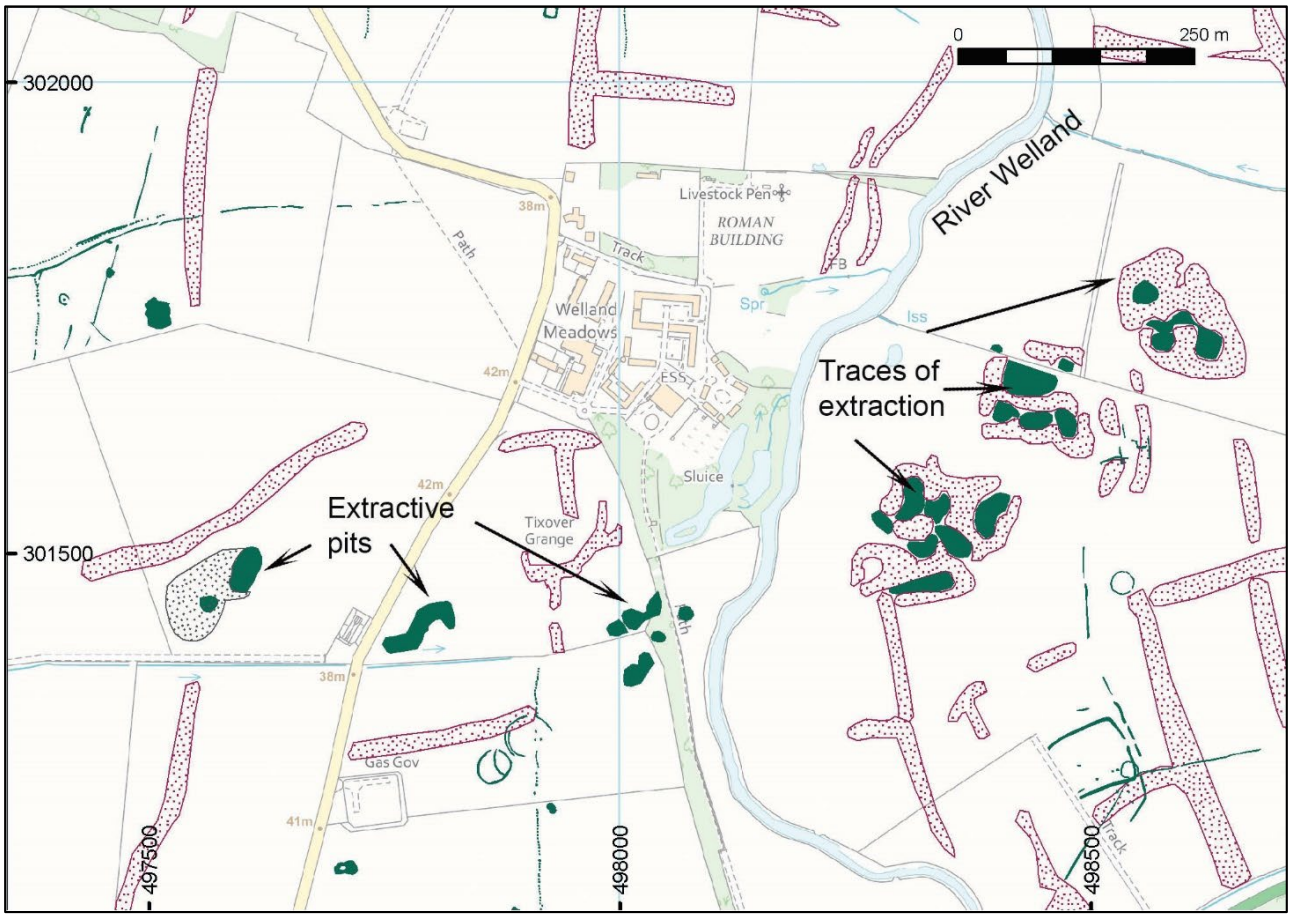


Figure 26: Map of traces of former extraction of uncertain date around Tixover visible as slight earthworks of pits and up cast material on lidar, largely levelled by ploughing and cultivation. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

Figure 27: Extract of mapping showing linear extraction surviving in woodland as earthworks at Wytchley Warren Spinney, Long Covert and in Ketton Gorse. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

Evidence of previously unrecorded historic linear quarrying has been identified in two separate locations within the survey area surviving as well-preserved earthworks in woodland (Fig.27). The first site is in fact two areas of linear extraction surviving as earthworks in two areas of woodland separated by the Empingham Road. The south-western group of pits lie within Wytchley Warren Spinney and Long Covert and the north-east group in Ketton Gorse. Both appear as the earthwork remains of numerous extractive pits in a narrow north-east-south-west band which lie over an outcrop of Argillaceous (clayey) rocks with subordinate sandstone and limestone of the Jurassic Rutland Formation, but may have exploited underlying deposits. The extraction appears to be linear, but this may simply be due to the quarry pits surviving in woodland.

The quarrying in Ketton Gorse survives in the woodland, but parts have now been removed with the expansion of Ketton limestone quarry. Immediately to the south-west of Ketton Gorse (at SK 9626 0524) adjacent to the road is the site of an early-mid Saxon iron smelting site which was excavated in 2017 revealing the remains of at least 11 iron

smelting furnaces (Leicestershire Archaeological and Historical Society 2018, 295-6). The nearest surface outcrops of nodular iron ore occur just under 1km to the north of the site, and also along the course of the River Chater around 2km to the south and south-east.

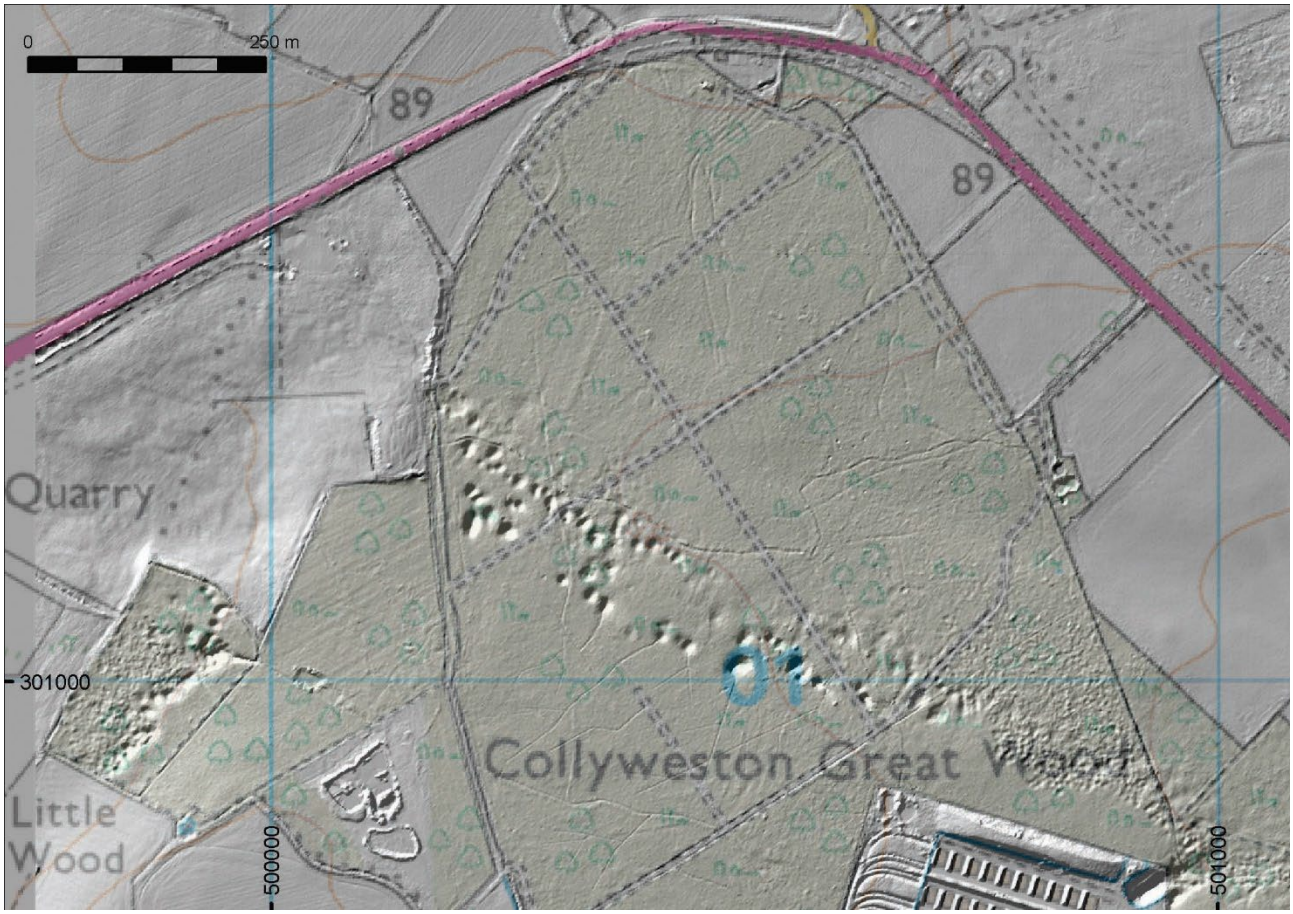


Figure 28: Extensive extraction in Collyweston Great Wood and Little Wood detected as earthworks on lidar images overlain on the OS base map. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088. LIDAR DTM 16-FEB-2009 © Historic England. Source Environment Agency.

The second area of intensive historic (possibly medieval) extraction has been identified to the south of Collyweston, within and around Collyweston Great Wood and Little Wood (Fig.28). There is extensive evidence of surface extraction in the form of numerous pits and hollows of varying size and depth visible in the woodland which has been detected on lidar. The extraction extends across a broad swathe north-west to south-east beyond the survey area which can be seen on RAF photographs taken in 1946 as a distinct area of patchy tree growth in the woodland (fig 29). The style of extraction across the wood appears to change from larger pits of between 8m-15m in diameter in the western half of the wood to wider densely pitted band of extractive pits between 3m and 6m in diameter.

Figure 29: Extract of RAF aerial photographs showing the western perimeter road and hard-standings and dispersals of RAF Collyweston. To the west of Collyweston Great Wood is further dispersed accommodation huts and sewage works. Patchy tree growth within the wood is due to disturbance caused by historic quarrying. RAF/CPE/UK/2109 4026 28-MAY-1947 Source: Historic England Archive (RAF Photography).

Further faint traces of ploughed out quarry pits can also be seen in cultivated land beyond the woodland to the east surviving as slight earthworks. In contrast, to the north-west of the wood the ground has been subject to quarrying sometime after the Second World War following clearance of the wartime installation and accommodation site linked to RAF Collyweston (Fig. 29). These quarries at Collyweston Great Wood appear, like the quarries at Wychley Warren to the north-west (Fig 27), to exploit the same Argillaceous beds of the Rutland Formation. To the east of Collyweston Great Wood the course of a substantial trackway of uncertain date, possibly associate with ditched field systems to the north, can also be seen (see page 18 and Fig 11).

Figure 30: Mapped extent of extraction in Collyweston Great Wood and the remains of a possible later prehistoric trackway and later road/drove to the east. Archaeological mapping © Historic England. Base map © Crown copyright and database right 2023. All rights reserved. Ordnance Survey licence number 100019088.

The northern half is visible as cropmarks suggesting a single track with parts defined by double-ditches, while the southern section can be seen as a both a dark linear cropmark, but also survives as can a slight hollow way visible on lidar images suggesting a route in use for a considerable length of time. The track changes direction to the south close to Collyweston Crossroads, passing through the south-eastern swathe of quarry pits. This part of the track is marked on the OS original 1 Inch maps as a track extending from a junction off the main road from Collyweston appearing to link into the older route way.

Iron stone mining

Deposits of ironstone have been quarried in this area and throughout the east Midlands forming the basis of the local iron industry for centuries. Between Ketton and Collyweston the River Welland has cut through the younger Jurassic limestones to expose earlier deeper beds of Jurassic iron-rich sediments of the Northampton Sand Formation and

below that beds of Whitby Mudstones. A narrower band of ironstone and Whitby Mudstones are also exposed along the course of the River Chater extending through Ketton to the south-west. There is some evidence of small-scale former quarrying in these areas which could be the remains of early (Iron Age-Roman period through to medieval) extraction of the more easily won iron ore deposits. Away from these surface exposures the iron ore beds continue beneath the overlying limestone. Ironstone was quarried from beneath these beds where the limestone overburden was not too thick to remove to access the iron-bearing deposits below. A few small ironstone mines have operated near to Ketton, but not on the scale of the massive operations seen elsewhere at mines such as Corby which became the centred for large-scale iron manufacturing in the 20th century.

The sites of two former ironstone quarries lie within this survey area. Easton on the Hill ironstone mine was established in 1873 by the Wingerworth Iron Company and was re-worked by three separated companies in 1892, 1902 and from 1913, it was operated by North Lincolnshire Iron Co Ltd until its closure in 1922. The quarry's final footprint covers approximately 885m x 400m and is located north-east of the village of Easton on the Hill. The remains of the narrow-gauge railway used to move stone around the quarry is still visible within the now landscaped quarry as are the remains of the 700m long straight incline which linked the quarry to the main Midland railway line between Stamford and Oakham.

Further west to the north of Fosters Bridge, North Luffenham are the remains of the site of an early 20th century quarry operated by the Luffenham Iron Co. It opened during the First World War to mine desperately needed home-grown iron ore for the iron and steel required to produce armaments, replacing imported sources of ore cut off by enemy action at sea. This site was the smallest ironstone mine in the area, but failed to come into production before the end of the war and only outputting a small quantity of ore between 1920 and 1921 before depth of limestone overburden and cambering in the ore-bearing strata caused the quarry to switch to limestone quarrying instead until closure in 1930 (Waites (ed) 1983, 111). The remains of the quarry are visible on RAF aerial photographs taken in the middle half of the 20th century. Most of the site has since been infilled and taken back into agriculture (part of the aptly named Quarry Farm), but the footprint can still be seen as slight earthworks on lidar, and the course of the inclined tramway still survives as an overgrown embankment and cutting heading southward to join the Midland Railways Syston to Peterborough line.

Up to the mid-20th century the extensive outcrops of the ironstone which gently slope eastwards had been easily quarried from the surface, but as the easier won deposits were quarried away the quarrymen had to contend with removing increasing depths of unwanted limestone overburden. From the 1950s increased demand forced the quarrying even deeper as they followed the dipping ironstone beds further eastwards. To achieve

this end a mechanical stripping shovel capable of removing up to 18m of overburden was developed. The quarry depth was increased further at the larger quarries such as Brookfield Cottage Quarry by the introduction of a massive mechanical excavator known as a walking dragline (Fig. 31). One such dragline (Bucyrus-Erie 1150-B) able to scoop over 20m of overburden was imported from the USA in 1950. Despite the increased capacity offered this was still considered inadequate for the depth of overburden anticipated at quarries in the area leading to the development of the even larger dragline by Ransome and Rapier of Ipswich designed specifically to meet these requirements. Five draglines were commissioned between 1951 and 1974. The first W1400 was assembled on site at Priors Hall quarry in 1951 ably accessing ironstone up to 30m below the surface with its 86m boom and bucket with a capacity of *c*. 17-21 cubic metres, followed by four other draglines which were employed at Cowthick, Oakley and Exton Park Ironstone quarries. The dragline at Oakley was the largest – a type W1800 – weighing 1767 tons with a bucket with the capacity of *c*. 23-27cubic metres (Rocks by Rail 2023). Instead of using caterpillar tracks, draglines were able to walk using two mechanical feet, each step covering around 2.8m, giving an average turn of speed of around 1/10 of a mile/hour. The units were powered electrically from an external 6.600-volt supply cable run from an on-site power station (Dean 1999,13).

Sundew's Walk to Corby

In 1957 Exton Park Quarry received a W1400 walking dragline named Sundew after the Grand National Winner that year. At the time this was the largest excavator in the world. It worked the quarry face until output began to dwindle and the quarry finally shut in 1971. This coincided with an increase in imports of imported ore. Sundew was put to work levelling and infilling the quarry before awaiting decommissioning, but a new quarry requiring a dragline was opened by the British Steel Corporation's Tubes Division, Minerals Department at Wakerley, nine miles to the south of Exton Park. The process of dismantling, transporting, and re-building Sundew was estimated to take over two years at a cost of around £250,000. it was therefore decided to walk Sundew from Exton to Wakerley (Dean 1999, 11).

The proposed route was carefully researched over the following year, plotting a course to negotiate Rutland Water, North Luffenham airfield and North Luffenham village and negotiate 15 main obstacles in addition to the river, road, and rail crossing points. It also had to consider contours and geology, gradients and any undue camber which would potentially put too much strain on the machine's walking gear. This resulted in a final route of 13 miles with a corridor of between 30m and 45m wide to accommodate the 24m wide

dragline. Permissions were obtained to survey the land of the sixteen tenants whose land the projected route passed (*ibid* ,12). An added complication was that the dragline was powered externally so provision was made to power the first half of the walk by a land line from the on-site power station at Exton, switching half-way to a cable from the power station at its destination at Harrington (*ibid* ,13).

Figure 31: A working walking dragline quarrying ironstone off Stamford Road, Weldon near Corby in 1953. EAW051406 1953. © Historic England Archive

Sundew's walk south began on 30th May 1974, following a route prepared by an organised advance party of engineers successfully arriving at its destination on 8 August

1974. Roads on the route were cushioned with a depth of ballast and railway lines were lifted. In two instances rivers were temporarily diverted in culverts and the dry river beds were filled with concrete pipes and ballast enabling the dragline to cross. Hedge lines, fences and a powerline were removed and replaced as quickly as possible, and obstacles filled or levelled with layers of crushed limestone.

Sundew's walk passed from north to south through the entirety of the Ketton survey area, passing through the field containing the Roman villa. On the 26 June 1974 it crossed a minor Ketton to Edith Weston road, proceeding southwards to just short of the A6121 Stamford to Uppingham road. Here it was parked for three weeks in a fenced off enclosure while preparations were made for it cross first the road, then the railway and finally the River Chater and the electricity supply was switched to a cable from Harringworth. It set off on the second half of the walk on 20 July 1974 crossing the A6121 (cushioned by layers of bulldozed ballast) into fields north of the railway line. At midnight on 20 July the railway tracks and ballast were lifted and the cutting infilled with crushed limestone to allow Sundew to cross in the early hours of 21 July. It then proceeded southwards to the prepared crossing point on the River Chater before continuing its way south. At this point the land sloped gently down to the river (*c*. 3.7m wide at this point), but the opposite southern bank rose to 4.5m above the water level, offering a gradient and step too great for the dragline to navigate. To smooth out this obstacle the river had been diverted into a buried pipe and a 40m long causeway of packed limestone ballast up to 1.8m thick was constructed over the alluvial clay to provide a level crossing to the opposite river bank (*ibid* 21-22). The causeway was subsequently deconstructed and the river bed restored.

During the excavations of the Rutland Roman villa complex in 2022 an unexplained layer of crushed limestone was encountered within the section (at the southern end of trench H (Ian Barnes 2023 pers com)), just north of the crossing point of the river (Fig 32. X), appearing consistent with the descriptions of consolidating and levelling the dragline's route across the plain and river using quantities of crushed limestone. This area also appears waterlogged on aerial photographs taken in 1946. Unfortunately, there are no available contemporary aerial photographs taken during or immediately after the completion of Sundew's walk to confirm the exact course through the villa field.

Chronologically, the next available set of aerial photographs were part of a vertical survey by the Ordnance Survey taken in 1976, but these do not extend as far south as the villa site. A subsequent set of OS aerial photographs taken in August 1977 does cover the site and appears to show the probable siting of Sundew's holding enclosure on the north side of the A6121 where the unit was parked for three weeks prior to commencing the second half of its walk. A large layby on the north side of the road just south of this enclosure visible on photographs taken in 1977 appears to have been enlarged after it was photographed 1973, possibly to accommodate support vehicles and equipment associated

with the dragline's walk. Although, by the time these photographs were taken three years had elapsed since the dragline walk, but there are visible signs of several missing and immature (newly planted replacement) lengths of hedge line which are indications of the route taken by the dragline.

Further to the north aerial photographs taken in 1976 and 1977 show signs of the route past New Wood to the north of Witchley Warren Farm, indicated by missing hedges and a broad line through the field on the proposed course.

A. MAL/73004 034 09-FEB-1973 B. OS/77137 283 04-SEP-1977

Figure 32: Aerial photographs taken in 1973 (left) and 1977 (right) before and after the passage of the Walking Dragline 'Sundew' N-S over the road, railway line and River Chater – the proposed route is marked in orange. The possible holding area of the Dragline and layby on the A6121 are visible as well as breaks in hedge lines. X indicates the location of crushed limestone encountered during excavations in 2022. Left image MAL/73004 034 'Soil image © Cranfield University and for the Controller of HMSO, 2024 used with permission', right image OS/77137 283 04-SEP-1977 © Crown copyright Ordnance Survey.

Discussion and further work

This survey set out to assess the wider contextual area around the recently discovered villa complex at Ketton. There are a number of significant villa sites and numerous finds indicating both agriculturally and industrially that this was a thriving and wealthy region of the country during the Roman occupation of Britain. As well as productive agricultural land deposits of ironstone have been exploited and processed locally since the Iron Age and local limestone began to be exploited to supply the new Roman construction methods using stone and brick. The local Ketton Limestone proved ideal for building and Collyweston Limestone 'slate' ideal for roofing, both of which were used in the construction of the Rutland Roman villa. Quantities of dressed roof slates found at the site were quarried and manufactured locally and represent the start of a local industry which is still alive today using techniques which have remained unchanged for nearly 2000 years. These resources and their associated industries have shaped the pattern of rural settlement and the development of the villages of Ketton and Collyweston through the medieval period. Quarrying and ironstone extraction has continued through to the present day, but only in the last hundred years has extraction and processing been possible on a large industrial scale due to the introduction of mechanised diggers and industrial cement manufacturing.

There is abundant evidence of earlier episodes of quarrying which predate the early maps visible as earthworks across the area, much of which remains undated, but could date from the Roman, early medieval, medieval or post medieval periods. Being able to date and perhaps associate these extraction sites with nearby contemporary settlement sites or industrial sites (such as the early medieval smelting site south-west of Ketton Quarry) would provide a valuable insight into the industry and settlement through time.

A number of high-status Roman sites have been discovered in and around the villages of Ketton and Collyweston over the last century. The largest of these is the villa at Tixover Grange, sited on a gravel terrace over Inferior Oolite limestone (McWhirr 1971,2). Many of these sites, like the new Ruland villa complex, have only come to light by chance, usually during building redevelopment or exposed during quarrying. These sites tend not to have any above ground level survival, but surprising few have been detected as cropmarks, despite the often-substantial sub-surface remains exposed during subsequent excavations. This particular phenomenon has been encountered during other aerial surveys of areas of similar limestone geology such as the Cotswolds. At many of these Roman villa sites the walls have historically been robbed to the lower courses of limestone blocks at foundation level, which were constructed directly on bedrock made of the same limestone. Although cropmarks are readily generated in well-drained soils over permeable geologies such as limestone and chalk, this combination of limestone construction on

natural limestone bedrock creates little differentiation needed for cropmark generation, effectively rendering the site 'invisible' from the air. Elsewhere in the survey area there are many examples of cut features appearing as weak cropmarks on limestone ridges which disappear as the feature heads into deeper soil in interstitial valleys where alluvium and colluvium have accumulated over time. This is illustrated in Figures 12 and 13, as well as the cover image.

This area appears to lie between the major military Roman road network, east of the major town *Ratae,* (Leicester). Few traces of secondary and minor roads which would have fed into the main network have been located. The only possible road through the area is that from Great Casterton to the north-east which is represented by a fragmented cropmark and slight earthwork of parts of agger, metalling and possible side ditch. Other minor routes would have linked the smaller settlements to the main road network, perhaps utilising existing pre-conquest routes, but the number of high-status villa sites and the local exploitation of building stone and iron ore would have required a network of roads suitable for supplying goods to theses estates and transporting heavy cargoes out to the larger towns. The Rutland villa appears to have traces of a trackway leading from the adjacent River Chater north-east in the direction of Ketton which probably linked with a larger road which may lie beneath present-day A6121 which heads west from the village of Ketton, with other key roads also concealed beneath modern roads.

Appendix 1

Scope

The scope of the mapping adhered to Historic England's Aerial Investigation & Mapping Standards. It included all archaeological features visible as earthworks, structures, soilmarks and cropmarks, including features visible as earthworks on historic photographs which have since been levelled. Chronologically, these ranged in date from the Neolithic to the 21st century.

Cropmarks, parchmarks and soilmarks

All sub-surface archaeological remains visible as cropmarks, parchmarks or soilmarks were mapped and recorded.

Earthworks

All archaeological earthworks were mapped and recorded. This included features visible as earthworks on early photographs which have since been levelled. Archaeological earthworks depicted on OS maps were also mapped if visible on aerial sources.

Buildings and structures

The foundations of ruined buildings visible as cropmarks, soilmarks, parchmarks, earthworks or stonework were mapped and recorded. Standing roofed or unroofed buildings were not normally mapped. The exceptions were in specific archaeological contexts such as industrial and military complexes, or when associated with other cropmark and earthwork features.

Ridge and furrow

Medieval and post medieval ridge and furrow was mapped and recorded, regardless of preservation. Where possible the line of each furrow was mapped as a single line.

Post medieval field boundaries

Post medieval field boundaries (upstanding or levelled) that were not depicted on current OS maps were mapped and recorded. This included boundaries that were depicted on historic OS or tithe maps.

Parkland, landscape parks, gardens and country houses

Vestigial manmade elements of landscape parks and gardens were mapped and recorded. Those elements of the park that are still in use such as formal gardens and tracks were not recorded.

Industrial features and extraction

All extraction, irrespective of size, was mapped and recorded. Industrial complexes were mapped as seen.

20th century military features

Military features up to and including the Cold War were mapped and recorded. This included any roofed or unroofed structures.

Methods

Sources

Aerial photographs

All readily available vertical and oblique aerial photographs were assessed. These principally comprised print and digital material from the following sources:

- The Historic England Archive.
- Aerial Photography for Great Britain (APGB) orthophotographs.
- Google Earth.

Historic England Archive

All available aerial photographs held by the Historic England Archive were reviewed as prints or born-digital files. This collection comprised 434 specialist oblique photographs and 583 vertical aerial photographs taken for non-archaeological purposes at intervals from the 1929 to present day, including RAF Photography, OS Photography, Aerofilms and copies of a range of commercial vertical photographs.

Lidar

Environment Agency lidar data was downloaded from the Defra Survey Data Download Platform. The entire project area is covered by the National LIDAR Programme at a resolution of 1m, flown between 12th March 1998 and 1st September 2020.

APGB

APGB - Georeferenced digital images were supplied to Historic England through the Air Photography for Great Britain agreement by Next Perspective. ©Bluesky International/Getmapping PLC. Tiles:

SK 9501, SK 9502, SK 9503, SK 9504, SK 9505, SK 9601, SK 9602, SK 9603, SK 9604, SK 9605, SK 9701, SK 9702, SK 97503, SK 9704, SK 9705, SK 9801, SK 9802, SK 9803,

SK 9804, SK 9805, SK 9901, SK 9902, SK 9903, SK 9904, SK 9905, TF0001, TF0002, TF0003, TF0004 and TF0005 flown:1999, 2004, 2006, 2011, 2016 and 2019.

Online sources of vertical aerial photographs included:

Google Earth (taken at intervals from unknown day/month between 1999 to 2021) were also consulted.

Other sources

In addition to the aerial photographs and lidar, other sources of information were consulted to inform interpretation and understanding of sites. These included:

- Historic Ordnance Survey maps.
- HER data – spatial data and textual monument records. Any other GIS layers (e.g., pre-OS historic maps etc.)
- Historic England research records (Warden).
- The National Heritage List for England.
- Tithe maps (Genealogist website accessed through the Historic England Library).
- British Geological Survey (BGS) data (BGS GeoIndex Onshore map viewer).
- Soil data from Soilscapes, a 1:250,000 scale, simplified soils dataset covering England and Wales (BGS UK Soil Observatory map viewer).
- Results from previous archaeological investigations (reports, survey data, journal articles, monographs, East Midlands Research Framework).

Assessment and mapping

All available aerial photographs were viewed under magnification and in stereo where possible. Digital photographs were viewed on screen.

Lidar data were processed using the Relief Visualization Toolbox 2.2.1 (Kokalj and Somrak 2019; Zakšek, Oštir and Kokalj 2011) to produce 2D visualisations as GeoTIFF images. The visualisations were viewed in the GIS. Lidar data were also viewed in 3D in Quick Terrain Reader and Modeler.

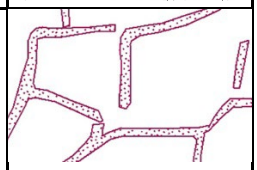
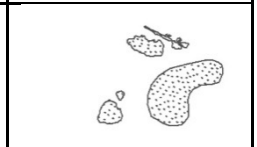
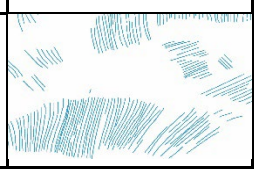
Georeferenced and rectified digital images were produced of key photographs using the University of Bradford AERIAL 5.36 rectification programme. Ordnance Survey Mastermap and the APGB orthophotos were used as control to correlate the aerial photographs to the

base map. Height data at 5m resolution was used to improve the accuracy of rectifications. Where good control information is available on the photography and source used for control, the accuracy of rectifications is commonly within ±1m of true ground position. In areas with poor control and/or high topographic variation this error may be larger (Evans 2019, 44–5).

All archaeological features from the Neolithic to 20th-century military remains visible as cropmarks and earthworks on aerial photographs and lidar were mapped across the entire survey area. This included sites previously recorded by earlier aerial surveys, which were re-mapped to achieve the best fit with newly mapped features, benefiting from more modern and accurate georeferencing. Features were recorded according to using Historic England mapping conventions.

Archaeological features were mapped as line and polygon data within a geodatabase using ArcMap 10.7.1 in accordance with Historic England's 'Standards for Aerial Investigation and Mapping Projects' and Aerial Investigation and Mapping Technical Specification. See Table 1.

Table 1. Mapping layer content and drawing conventions, based on AI&M standards.

Layer name	Layer content	Layer colour	Feature type	
MONUMENT_ POLYGON	Polygon encompassing features within a single NRHE record	Black	Polygon	
BANK	Polygon for features such as banks, platforms, mounds and spoil heaps	Red	Polygon	
DITCH	Polygon for features such as ditches, hollows, pits or hollow ways	Green	Polygon	
EXTENT_OF_ FEATURE	Polygon outlining a feature or group of features such as industrial complexes	Orange	Polygon	
RIDGE_AND_ FURROW_ ALIGNMENT	Polyline depicting the direction of a plot of ridge and furrow	cyan	Polyline	

STRUCTURE	Polygon for built features including stone, concrete, metal and wood	Purple	Polygon	
SCARP_ SLOPE_EDGE	Polylines in form of a schematic t-hachure depicting break of slope	Blue	Polyline	

Textual data were recorded in an attribute table. Monument polygons were created to outline the extent of a single monument.

Monument recording was undertaken in the Historic England Research Records database (Warden).

Appendix 2

Scheduled Monument area and official List Entry

Scheduled Monument: Roman Villa East of Foster's Bridge

List entry 1477234

Date first listed:23-Nov-2021

Location: Centred on SK 96673 03053

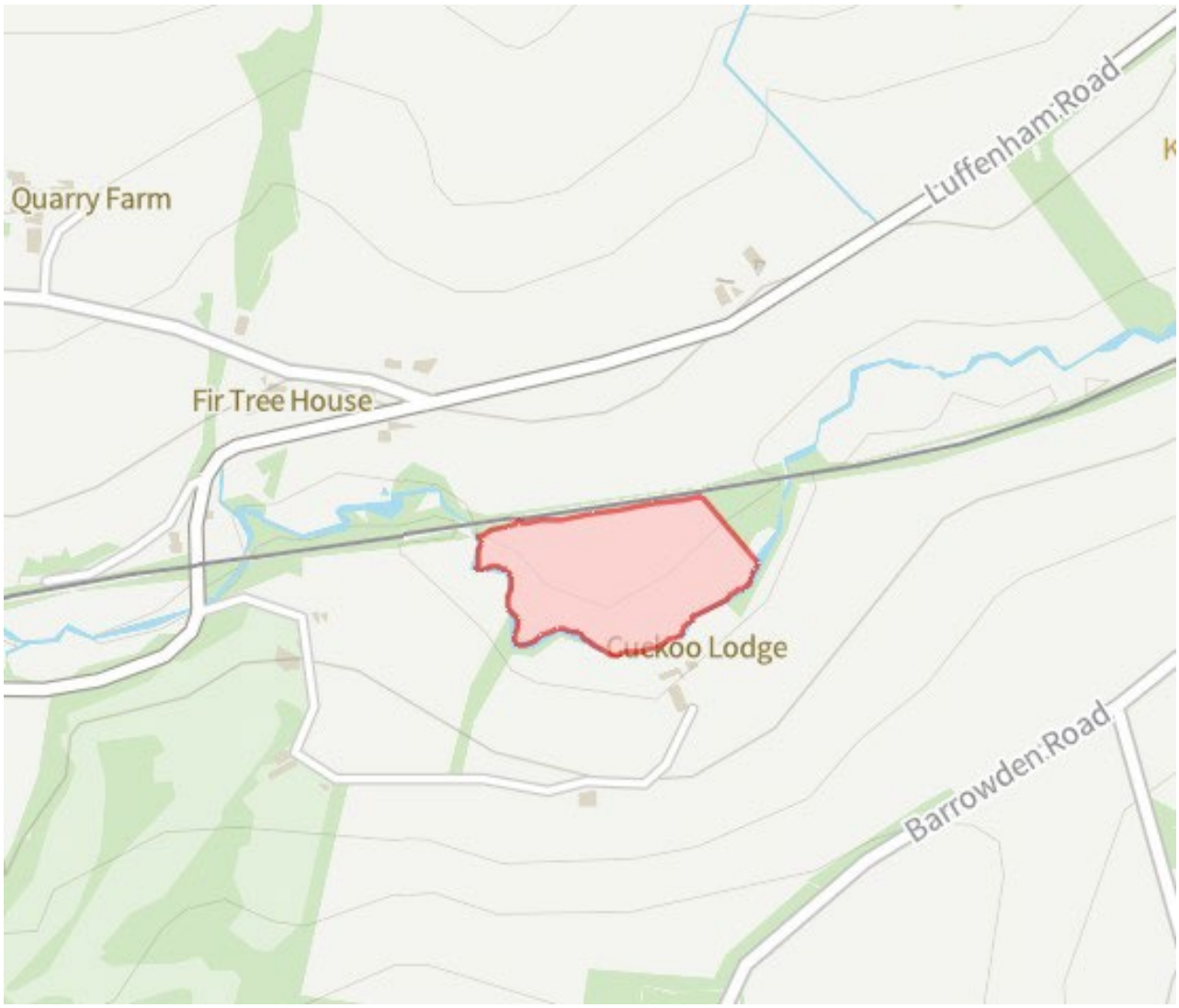


Figure 33. Location and extent of scheduled area for Roman Villa East of Foster's Bridge. Contains Ordnance Survey data © Crown copyright and database right 2024. © Historic England. © Crown Copyright 2024. Released under OGL. | © Crown Copyright 2024. Contains data © Crown copyright and database right 2024. Released under OGL.

Summary

The buried remains of a Roman villa dating from the mid- to late Roman period, with evidence for some post-Roman activities on the site.

Follow the link below to read the full listing details:

https://historicengland.org.uk/listing/the-list/list-entry/1477234

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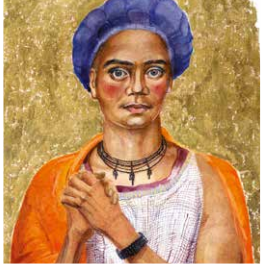



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