

C O U R T N E Y • D E E R Y
ARCHAEOLOGY & CULTURAL HERITAGE

Archaeological Testing Report

Sweeney's Orchard

Abbey Quarter

Kilkenny City

Planning Register No. RA/170575

Licence: 18E0213

SMR: KK019-026

ITM: E650431 N656526

Site Director: Dr Kim Rice

On behalf of Kilkenny County Council

November 2018

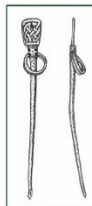
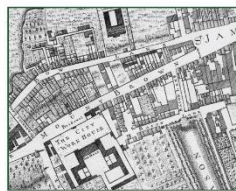
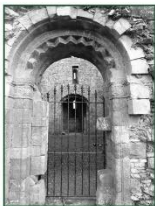


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EXECUTIVE SUMMARY

This report describes the results of archaeological testing that was carried out by Dr Kim Rice of Courtney Deery Heritage Consultancy Ltd. at a site known as ‘Sweeny’s Orchard’¹ in Kilkenny City (Licence No. 18E0213). The route of the Kilkenny Central Access Scheme forms the southern boundary of the site and the River Nore defines its eastern edge. It is located c. 100m due east of Vicar Street, c. 100m to the southwest of Green’s Bridge and c. 100m due south of Green Street, while the confluence of the Nore and Bregagh rivers lies 100m to the northeast (Figures 1 and 2). The work was undertaken on behalf of Kilkenny County Council for a proposed development that at the pre-planning phase and comprises a pre-Part 8 Application. Thus, the key objective of the assessment was to establish the extent, character and date of archaeological remains onsite, and thereby also inform the ensuing design process.

The testing methodology was informed by previous investigations onsite and in the immediate area (e.g. Ó Drisceoil 2003; Lohan 2004; O’Meara 2006; Gilligan 2008; Ó Drisceoil *et al.* 2008; Flynn 2015; Cotter 2016; Crowley 2016), as well as desktop studies that assessed the archaeological potential of the locale (Courtney 2015a and 2015b; Deery 2016). These demonstrated that there was a high potential for late medieval and post medieval remains, which included boundary walls, reclamation deposits and alluvial sediments, in addition to activities that were related to the ‘Chancellor’s Mills’ on the adjacent River Nore.

The assessment took place over eight days from Wednesday the 16th to Thursday the 25th of May 2018. Eleven test trenches were opened throughout the site, which uncovered a range of deposits, features and standing remains likely to date from the late medieval to post-medieval period (Drawings 1 & 2).

A mortar sample was examined from a wall revealed in Trench 11 as it was thought that the structure may be medieval in date and possibly associated with the city’s defensives. Analysis of the mortar found that the sample was not suitable for radiocarbon dating, however it is likely to be post medieval (Bolton 2018) as the following indicators were present in the sample:

- Coal was used – this is common in post-medieval samples, while timber, peat and charcoal are more often found in medieval samples.
- Brick/ceramic fragments were used – these are commonly found in post-medieval mortars.

¹ ITM: E650431 N656526

1. INTRODUCTION

1.1. General

This report describes the results of archaeological testing carried out by Dr Kim Rice of Courtney Deery Heritage Consultancy Ltd. (Licence No. 18E0213) on behalf of Kilkenny County Council in relation to a proposed development in the townland of Gardens, Kilkenny City, County Kilkenny (Figure 1). The proposed development footprint² comprises an area of land known as 'Sweeney's Orchard', which lies just 100m to the northeast of the confluence of the Nore and Breagagh rivers (Figures 1 and 2). The site is located c. 100m due east of Vicar Street, c. 100m to the southwest of Green's Bridge and c. 100m due south of Green Street. The River Nore delimits the eastern border of the site, while the route of the Kilkenny Central Access Scheme forms its southern boundary. The site presents as relatively flat ground that slopes gently downwards from its western edge (44.78m O.D.), towards the banks of the River Nore to the east (43.82m O.D.).

'Sweeney's Orchard' is within the designated zone of archaeological potential for Kilkenny City.³ The site is also situated within the confines of the medieval walled borough of Irishtown (e.g. Courtney 2015a and 2015b; Deery 2016). However, the medieval walls will not be impacted by the proposed development, as they lie c. 250m–300m to the north and northwest. The medieval ecclesiastical complex of St Canice's Cathedral⁴ is located c. 150m to the west, while Green Street to the north, comprised an important medieval routeway that was associated with a key fording point across the River Nore. During the medieval period, 'Sweeney's Orchard', or the 'Orchard Yard', formed part of the gardens of the brewery of St Francis' Abbey.⁵ These lands also incorporated a series of mills that were powered by the Nore. The Franciscan abbey was dissolved through the Reformation of 1537; however, another brewery was subsequently founded on the site by John Smithwick in 1705. The Smithwick's Brewery, which came under the ownership of Diageo in its latter years, operated on the site until December 2013. One recorded archaeological site is located at the southern-end of the proposed development (Figure 3).⁶ It comprises a watermill,⁷ which may represent the late fourteenth century 'Chancellor's Mills' (Bradley 2000).

² ITM: E650431 N656526

³ KK019-026

⁴ KK019-026029

⁵ KK019-026101

⁶ ITM: E650494 N656466

⁷ KK019-026124

1.2. Description of the Proposed Development

The proposed development is still at the design phase and comprises a pre-planning/Part 8 enquiry. Thus, Kilkenny County Council have not commenced a statutory consultation process. However, it is envisaged that the development will incorporate seventy-three housing units, that will consist of seventeen houses and fifty-six apartments. A provision for basement parking is included, which means that the ground level will be reduced by 2m across the entirety of the site. Kilkenny County Council also intends to develop a 'Regional Water-Sports Hub' that will access the river via a slipway, and will include a basement storage area for boats, kayaks and canoes. A community facility will also be constructed with a meeting room, kitchenette and office space. The development will be accessed from Green Street and Green's Bridge to the north.

2. ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

2.1. Historical Context

The proposed development area lies within the reclaimed flood-plains of the Nore and Breagh rivers; the extent of the river's flood waters has been reconstructed and mapped (Ó Drisceoil 2003; Ó Drisceoil *et al.* 2008). This process was achieved by plotting the occurrences of alluvial material in archaeological and geotechnical investigations throughout the city and relating them to its contours. It was concluded from these investigations that over half of the medieval town of Kilkenny was constructed on ground that was reclaimed in the thirteenth century from the floodplains of the Rivers Nore and Breagh. Indeed, the etymology of the River Breagh is derived from the Irish *bréagach* meaning deceitful, and there have been many occasions through history when the raging torrents of this otherwise innocuous stream has engulfed adjacent land holdings (Bradley 2000).

Prehistoric Period (8000 BC–400 AD)

Kilkenny City originated with the early medieval monastic foundation of St Canice's; however, it is probable that there was prehistoric settlement activity within the fertile river valley of the Nore area prior to its establishment. While there is little surviving evidence for prehistoric activity in the city, investigations associated with the River Nore Drainage Scheme produced twelve prehistoric artefacts that demonstrated the presence of Mesolithic and Neolithic communities along the route of the river. Evidence for later prehistoric activity include a Bronze Age fulacht fiadh and an Early Iron Age around St John's Bridge.

Early Medieval Period (AD 400–1100)

Kilkenny derives its name from the Irish *Cill Chainaigh*, meaning 'the Church of Canice', owing to the early medieval monastic foundation of St Canice's. The monastery was sited at the highest elevation in Kilkenny, which overlooked the main fording point of the River Nore and its associated marshy floodplains (Simms *et al.* 2000). The early ecclesiastical site was demarcated by an inner and outer enclosure. The inner enclosure encompassed the church, round tower and graveyard, while the outer enclosure incorporated settlements and activity areas. St Canice's had become an important ecclesiastical federation by the ninth century and was the principal church in the Diocese of Ossory.

The Anglo-Norman Borough of Irishtown (AD 1169–1550)

Leinster was granted to Strongbow following the Anglo-Norman invasion. He defeated the Chieftain of Ossory, Mac Giolla Padraig, in 1170, and by 1173 he had established Kilkenny Castle and the Borough of Hightown (Bradley 1990). The settlement around St Canice's and to the north of the River Breagh continued to flourish and became known as 'the Irish Town'. St Canice's Cathedral and the Bishop's Palace were developed during the thirteenth and fourteenth centuries alongside the expansion of the associated Borough of Irishtown. Irishtown had a municipal government, that was separate to the city, and received its charters from the Bishop of Ossory; however, it is unclear when the residents obtained borough status. This independent urban area held its own markets and had a court at the corner of Irishtown and St Canice's place.

Town Walls

Irishtown was defined by a series of protective walls from the late fourteenth century. The walls of Irishtown ran north from the Breagh River across Dean Street, then around St Canice's Cathedral up to Troy's Gate, before meeting the River Nore to the north of Green's Bridge. No evidence has been uncovered for a protective wall along the western banks of the Nore or along the northern banks of Breagh. Four gates provided access into the borough; Irishtown Gate (Watergate), Dean's Gate, Troy's Gate and Green's Gate, no mural towers are recorded, and the walls enclosed an area of 380m x 260m (c. 10ha). The Down Survey Map of the Kilkenny Liberties from c. 1536 depicts the walled precinct of Irishtown, while John Rocque's later map of 1758 shows the town gates.

Medieval and post-medieval Mills

The Chancellor's Mill⁸ was active on the western bank of the River Nore from 1398, although its precise location remains unclear (Bradley 2000). Several mills were located along the Nore during the medieval and post-medieval periods, which included a cluster of mill buildings at the V-weirs to the south of Green's Bridge. The Chancellor's Mill was replaced by a corn mill and a woollen factory by the early nineteenth century. There was a revival of Kilkenny's woollen industry in 1880, and by 1885 three companies were trading near Green's Bridge, while Nealy's Woollen Mills operated in Irishtown.

Tanneries

Tanneries converted raw cattle hide to cured leather, which was used for clothing and footwear. The tanning process involved steeping of skins in a series of tannin-enriched basins of water that would soften and condition the hide. Hogan's map of 1860 depicts the 'Chancellor's orchard and tan house', while the first edition Ordnance Survey map for the area (1839–40), shows a 'Tan yard' and 'Tannery' within the proposed development footprint.

3. PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

Three archaeological investigations have previously been undertaken within the footprint of the proposed development site, while several other assessments have been carried out within the immediate locale (Figures 4 and 6). The most recent comprised the archaeological monitoring⁹ of site investigation works on the 4th and 5th of October 2016. The assessment was carried out on behalf of Courtney Deery Heritage Consultancy by Mark Moraghan and Colm Flynn (Crowley 2016). Thirteen trial pits and two soak-away pits were opened throughout 'Sweeney's Orchard', and investigative boring and probing also occurred (Figure 6).

Archaeological remains were uncovered in four of the trial pits (see Table 1), which were all located in the western part of the site. However, the other pits and boreholes provided key information regarding the character and depth of the soil stratigraphy, hydrology and geology onsite. A mortar-bonded limestone wall was uncovered in Trial Pit 8 that was three courses high, while post-medieval drains were exposed in Trial Pit 7 and Trial Pit 10 that produced eighteenth to nineteenth century ceramics (Crowley 2016). The findings from these investigative works are outlined in Table 1.

⁸ DU019-026124

⁹ Licence: 16E0476

Table 1. Findings from the Trial Pits (TP) and Soak-Away Pits (SP)

Test Pit	Description
TP1	Hardfill to a depth of 0.5m BGL. ¹⁰ Topsoil and modern building debris to a depth of 1.6m BGL.
TP2	Concrete to 0.4m BGL. Topsoil and stone debris to 0.5m BGL.
TP3	Concrete and mortar to a depth of 0.5m BGL.
TP4	Hardfill to depth of 0.3m BGL. Modern rubble to 0.5m BGL. Garden soil and rubble to 1.1m BGL. Gravels and silt from 1.1m–1.9m BGL. River gravels and water from 1.9m BGL. Maximum depth of 2.4m BGL was excavated.
TP5	Mixed soils, stones and brick to depth of 0.6m BGL. Silt and garden soils from 0.6m–1.6m BGL. River gravels encountered between 1.6m–2.4m. Water entered the test pit at 1.6m BGL. A maximum depth of 2.4m was excavated.
TP6	Hardfill and stone to 0.45m BGL. Topsoil from 0.45m–1.6m BGL. Fine yellowish brown silty clay from 1.6m–1.8m BGL.
TP7	Hardfill to depth of 0.2m BGL. Building rubble from 0.2m–0.4m BGL. Garden soils from 0.4m–0.75m BGL. Dark greyish brown silt from 0.75m–1.5m BGL. A drain was noted at the east-end of the trench at a depth of 1.3m, which incorporated a base of water-rolled cobbles and pebbles.
TP8	Hardfill to depth of 0.4m BGL. An E-W mortar-bonded stone wall was exposed at a depth of 0.45m BGL. The structure was three courses high and was situated at south-end of the trench. Garden soil was subsequently encountered at a depth of 0.4m–1m BGL, while water-borne flood deposits were noted between 1m–2m BGL. Riverine deposits were hit at a depth of 2m BGL and river gravels at 2.7m BGL.
TP9	Hardfill to a depth of 0.5m BGL, which sealed a grey garden soil that extended from 0.5m–2.6m BGL. Silts were exposed from 2.6m BGL, and the pit was excavated to 2.7m BGL.
TP10	Hardfill to a depth of 0.4m BGL. Rubble and garden soil from 0.4m–0.8m BGL; a ceramic drain-pipe was noted at 0.7m BGL. A stony oily silty sand extended from 0.8m–1.6m BGL, which produced a sherd of a green-glazed red earthenware sherd. Fast running water entered the west-end of the pit at 1.2m BGL, while a grey riverine silt was encountered from 1.6m BGL.
TP11	Hardfill to a depth of 0.4m BGL, which sealed rubble and garden soil to 0.8m BGL. Water entered from the west-end at 0.8m BGL; this may indicate a possible water course. A fine silty marl extended from 0.8m–2m BGL, while a series of wooden planks were noted at 2m BGL.
TP12	Hardfill, concrete and topsoil to an excavated depth of 0.5m BGL.
TP13	Hardfill to depth of 0.6m BGL, which overlay a stony topsoil that was evident from 0.6m–1.2m BGL. A greyish blue silty marl extended from 1.2m–2m BGL.
SP1	Hardfill to a depth of 0.3m BGL and building rubble from 0.3m–0.6m BGL. A greyish blue to brown garden soil was evident from 0.6m–2.2m; the water table was not encountered in this pit.
SP2	Hardfill and concrete to a depth of 0.4m BGL, which sealed a layer of modern debris and soil from 0.4m–0.7m BGL. Mixed garden soils were in evidence from 0.7m–2.2m.

¹⁰ BGL: Below Ground Level

3.1. Post-medieval boundary walls

An archaeological assessment¹¹ was undertaken on the site in 2008, in advance of a proposed wastewater treatment plant (Gilligan 2008). Six test trenches were opened in the eastern half of the development area (Figure 4), which were orientated east-west (Test Trenches 1–4), and north-south (Test Trenches 5a–5b). The trenches uncovered the remains of two walls that were orientated north-south but were disturbed by later land reclamation and drainage activities, as well as modern construction works.

The first wall was exposed at a depth of 0.60m in Trench 1 (43.1m O.D.), while the second, in Trench 4, was uncovered at 1.7m below the present ground level (42.55m O.D). The two structures corresponded to boundary walls that are depicted on John Rocque's 'Map of the City of Kilkenny', which was surveyed in 1758 (Figure 5). The wall in Trench 4 consisted of a former north-south dividing wall within a burgage plot. The garden plot was associated with a property that fronted onto Vicar Street (possibly number 12), and it extended in a westerly direction from the rear of the house towards the River Nore. The wall in Trench 1 comprised a section of a boundary wall that delimited the area to the east of the river.

3.2. Works associated with drainage remediation works

Three phases of archaeological investigations¹² were undertaken between 2004 and 2006 in advance of remedial drainage works along the River Breagagh. Phases 1 and 2 focused on the area to the south of the river (Lohan 2004), while Phase 3 investigated a section that adjoined the southwest corner of the proposed development site (Figure 4). The Phase 3 assessment consisted of monitoring a series of service trenches and three deep pits, which were excavated to house petrol interceptor tanks (O'Meara 2006). The receptor pits were dug to depths of between 2.7m–3.5m. A deposit of black alluvial clay was uncovered that extended to a depth of 0.65m and sealed a sterile deposit of water-rolled stones and gravels.

A similar stratigraphic sequence was identified in Phases 1 and 2, which focused on the grounds to the south of 'Sweeney's Orchard' (Figure 4). A series of linear service trenches were opened to the north and northwest of the River Breagagh, which uncovered a sterile black riverine clay between 1.2m–2m below the present ground level. This alluvial clay was sealed by a substantial

¹¹ Licence: 17E1061

¹² Licence: 04E0694

deposit of building rubble interspersed with gravelly sand, that was interpreted as nineteenth and twentieth century reclamation deposits (Lohan 2004).

3.3. Kilkenny Central Access Route

Archaeological testing¹³ was undertaken to the south of 'Sweeney's Orchard' in July 2015 in advance of the construction of the Kilkenny Central Access Route (KCAS). The test trenches were excavated to the north of the River Breagagh, and archaeology was revealed in four trenches (Figure 4). The remains consisted of eighteenth and nineteenth century walls, hearths, floor surfaces and a flagstone floor (Flynn 2015). A cobbled area was exposed in Test Trench 4 that may represent the former Mill Lane; the surface was situated at a depth of 1m below the ground level and piled foundations were subsequently employed to minimise any impacts to it. A wheelhouse from a post-medieval mill¹⁴ was identified to the southeast of the proposed development site.¹⁵ The remains consisted of two parallel stone walls that were orientated north-south and were uncovered at a depth of 3m below ground level (41m O.D.). The walls were associated with wooden planks and steel straps that possibly represent the remains of wood paddles and the mill wheel. The millrace was not identified, but possibly lies to the north of the wheelhouse.

A seventeenth century masonry remnant was identified within an east-west boundary wall, during archaeological monitoring of the subsequent KCAS works. The piece comprised a limestone window opening with a chamfered sill, while several limestone quoins were in evidence along the corner of the wall. The structure may represent part of the former Chancellor's House, which is depicted on historical maps of the area. The western-end of the wall has a pebble-dash render and flat concrete coping, and it is possible that this modern finish obscures an older underlying wall (Flynn 2015).

4. FINDINGS FROM THE ARCHAEOLOGICAL TESTING

4.1. Introduction

Archaeological testing was carried out over seven days from the 16th to the 24th of May 2018; a total of eleven test trenches were opened (Figure 2 and Plates 1–19). The trenches were excavated with the assistance of a Hyundai Rodex 140LC-9; a 14-tonne tracked excavator that

¹³ Ministerial Direction: A62 and Reg. No. E4435

¹⁴ KK019–026124

¹⁵ ITM: 650494 656468

was fitted with a smooth grading bucket. All the trenches were excavated to the surface of archaeological, or potential archaeological deposits, or to the underlying natural subsoil, whichever was encountered first. Any potential archaeological features were cleaned and sectioned where necessary, to establish their nature, extent and character. Photographs, plans and context recording sheets were used to record any features of potential archaeological interest. The locations of the test trenches were georeferenced with a survey grade global positioning system, which also recorded the outlines of the uncovered features.

4.2. Summary of Findings from Test Trenches 1–11

A range of archaeological deposits, 18th to 19th century drains, post-medieval and medieval walls and a ditch were uncovered during testing. Table 2 provides a synopsis of the findings from each of the eleven test trenches, in addition to their respective dimensions and depths.

Table 2. Summary of Findings from the Archaeological Testing

Trench	Dimensions	Findings
Trench 1	17m (N-S) x 2.20m (E-W) 1.20m–1.60m deep Water table at 1.30m BGL Plate 1	A series of stratified layers were uncovered in the trench, which comprised a modern hardcore deposit sealing a layer of 20 th century rubble. The modern material overlaid a deposit of late 18 th to early 19 th century garden soil that sealed a deposit of dark grey alluvial clay (Table 3).
Trench 2	33m (E-W) x 2.20m (N-S) 1.20m–1.60m deep Water table at 1.10m BGL Plate 2	Comparable stratigraphic sequence to Test Trench 1 was revealed within the trench (Table 4). The testing also uncovered a series of four stone-lined drains [C5], [C7], [C9] and [C11], which were orientated N-S and were cut into the late 18 th to 19 th century deposit (C3).
Trench 3	25m (E-W) x 2.20m (N-S) 1.40m–2.20m deep Water table at 1.20m BGL Plate 3	The trench revealed a comparable stratigraphic sequence to Test Trenches 1 and 2, in addition to a sterile alluvial clay (C13), from a depth of 1.90m BGL (Table 5). The 18 th /19 th century drain [C11] was identified 5m from the east-end of the trench.
Trench 4	10m (N-S) x 2.20m (E-W) 1.30m–1.50m deep Water table at 1.10m BGL Plate 4	Trench 4 revealed a comparable stratigraphic sequence to Test Trenches 1–3 (Table 6). No archaeological features were identified.

Trench	Dimensions	Findings
Trench 5	20m (E-W) x 2.20m–4m (N-S) 1.20m–1.40m deep Water table at 1.10m BGL Plates 5 and 6	<p>Trench 5 was opened to the south of a possible standing medieval wall (see Crowley 2016). The upper trench deposits comprised modern demolition rubble, which overlay an 18th/19th century garden soil and alluvial clay (Table 7).</p> <p>The remains of a late medieval to post-medieval wall <C20> was uncovered at a depth of 0.80m–1.20m BGL, which was orientated N-S and extended for a length of 16m. It displayed a maximum height of two courses (0.60m) and was 0.50m in width. The structure was composed of substantial blocks of limestone (c. 0.45m x 0.26m x 0.10m), which were bonded with a compact white lime mortar (C21). The stone foundation for the wall extended outwards from the base for 0.20m.</p> <p>The easternmost extent of the structure, which extended for an additional 4m was disturbed by a drain and modern activity. These 4m had been modified with red brick and later material, and portions of the upper section were covered with concrete slab.</p>
Trench 6	19m (E-W) x 2.20m (N-S) 0.80m–1.60m deep Water table at 1.20m BGL Plate 7	<p>The base of a post-medieval wall <C14> was uncovered in the trench, which varied between 0.75m–0.80m in width, 0.35m–0.40m in height and extended E-W for 9m. The eastern-end of the wall was truncated by a series of drains, in addition to a modern soak-away pit. The structure was composed of large limestone boulders and smaller cobbles that were bonded with a compact white lime mortar with frequent gravels (C15). The quarried blocks displayed average dimensions of c. 0.55m x 0.20m x 0.30m, while the smaller cobbles were c. 0.08m x 0.05m x 0.07m.</p> <p>There was a stone-capped box drain <C16>, in the eastern-end of the trench that extended for 6m from SW-NE. A series of later ceramic drains were also noted in the east-end of the trench.</p>
Trench 7	23m (N-S) x 2.20m (E-W) 1.30m–2m deep Water table at 1.20m BGL Plates 8 and 9	<p>The base of a possible late medieval wall <C17>, was uncovered at a depth of 1.20m BGL in the central part of the trench. <C17> was set into the alluvial clay (C4), consequently it was inundated with water and there was only a short time to record it. The wall was orientated E-W and was exposed for a length of 2.20m. It was 0.60m in width and 0.50m high and was composed of substantial blocks of quarried limestone that were bonded with a compact lime mortar.</p> <p>The trench also uncovered a modern soak-away pit at its north-eastern edge.</p>

Trench	Dimensions	Findings
Trench 8	27m (N-S) x 2.20m (E-W) 1.80m–2.20m deep Water table at 1.80m BGL Plates 10 and 11	The uncovered deposits in Trench 8 were demonstrably different to those noted within the western half of the site (Table 10). The water table was not encountered until a depth of 1.80m BGL, which is remarkable given its proximity to the River Nore. It is possible that the clayey silt (C19) was representative of a fill associated with a former millrace; however, no evidence of an associated cut was identified. The eastern-ends of Test Trenches 3 and 4 from 2007 ¹⁶ were also encountered within the southern half of the trench (see Figure 4).
Trench 9	6m (N-S) x 2.20m (E-W) 1.80m deep Plate 12	The trench was backfilled with a mix of modern refuse, rubble and plastic. It was eventually abandoned at a depth of 1.80m, as the disturbed deposits were unstable and dangerous.
Trench 10	12m (N-S x 2.20m (E-W) 2m–2.40m deep Water table at 2m BGL Plate 13	The trench uncovered the remains of a substantial ditch [C26] in the southern-end of the trench at a depth of 1.40m BGL. The feature was cut into the garden soil (C23) (see Table 12) and was investigated to a depth of 2.40m BGL; however, the excavation had to be stopped as the sondage quickly filled with water (Plate 13). The width of the ditch at this level (2.40m BGL) was 1m and it was still extending downwards. [C26] was filled with a charcoal-rich dark greyish brown silty clay (C27). It incorporated <8% sub-angular and sub-rounded stones and pebbles, as well as moderate burnt clay inclusions. No artefacts were recovered that might suggest a date or function for the feature.

¹⁶ Licence: 07E1061

Trench	Dimensions	Findings
Trench 11	12m (E-W) x 2.20m (N-S) 2m–2.20m deep Water table at 2m BGL Plates 14–19	<p>Trench 11 was opened at a right angle to the southern-end of Trench 8 to establish if there was any evidence for a millrace cut (Figure 2). However, the southern half of Trench 11 was substantially disturbed by modern construction works, service trenches (see Plates 15 and 19), as well as Test Trench 5a from 2007 (Figure 4). Thus, no evidence for a cut could be established in this section of Trench 11.</p> <p>In contrast, the western half of the trench produced evidence for <i>in situ</i> deposits underlying c. 0.60m of modern demolition rubble (see Table 13 and Plate 18), while the remains of a substantial stone structure of possible medieval date were also uncovered (Plates 16–18.) This consisted of a N-S wall <C36> that was associated with a possible buttress <C37>. Mortar analysis has suggested that this wall is post-medieval in date.</p> <p><C36> was uncovered at a depth of 0.80m BGL, it displayed dimensions of 1.65m (N-S) x 0.95m (E-W) and was 0.75m high. The southern section of the structure was truncated by a modern concrete pipe (Plate 16), and it is unclear how far it extended beyond the limit of excavation. A series of flags were uncovered beneath the concrete pipe (Plate 14), which possible represent the remains of the truncated southern section. These measured 0.65m (E-W) x 0.55m (N-S) and were 0.40m in height.</p> <p>The possible buttress to the west <C37> measured 1.50m (N-S) x 0.55m (E-W) and was 0.60m high. The possible buttress was keyed into the wall. Both <C36> and <C37> were comparable in form and were constructed from large blocks of quarried limestone that averaged 0.60m x 0.40m x 0.20m and were sealed with a very compact lime mortar (C40). The two walls were set into a pale yellowish-brown bedding sand (C39), that overlay the alluvial clay (C35).</p>

The subsequent Tables 3–13 describes the stratigraphy of Test Trenches 1–11 and includes the types of inclusions that were noted in each deposit, as well as any recovered artefacts. A possible date is also offered for each of the deposits.

Table 3. Stratigraphy of Test Trench 1

Context	Depth (BGL)	Description	Interpretation
(C1)	0m–0.15m	Modern hardcore deposit	Hardcore
(C2)	0.15m–0.60m	Rubble deposit comprising broken concrete slabs, large stones, plastic and geotextile, in addition intact and crushed red brick. Occurred within a matrix of light grey sandy silty with frequent gravels and charcoal, as well as moderate amounts of broken slate. Bands of crushed mortar throughout.	Layer of 20 th century rubble
(C3)	0.60m–1m	Moderately compact dark greyish brown clayey silt with frequent charcoal, occasional fragments of red brick, bands of crushed mortar and c. 10% sub-rounded stones. The organic deposit included pieces of wood and straw, as well as occasional cow and pig bone. Finds included sherds of whiteware, manganese ware, transfer printed wares, black glazed earthenware and clay pipe stems.	Late 18 th –19 th century deposit
(C4)	1m–1.60m ⁺	Dark grey to black anaerobic alluvial clay with a plastic texture. It incorporated occasional shell fragments and charcoal flecks, in addition to c. 5% sub-rounded cobbles. A base sherd from a late medieval vessel was recovered from its upper section (1.10m BGL).	Alluvial clay

Table 4. Stratigraphy of Test Trench 2

Context	Depth (BGL)	Description	Interpretation
(C1)	0m–0.20m	Modern hardcore deposit	Hardcore
(C2)	0.20m–0.40m	Rubble deposit comprising broken concrete slabs, large stones, plastic and geotextile, in addition intact and crushed red brick. Occurred within a matrix of light grey sandy silty with frequent gravels and charcoal, as well as moderate amounts of broken slate. Bands of crushed mortar throughout.	Layer of 20 th century rubble
(C3)	0.40m–0.90m	Moderately compact dark greyish brown clayey silt with frequent charcoal, occasional fragments of red brick, bands of crushed mortar and c. 10% sub-rounded stones. The organic deposit included pieces of wood and straw, as well as occasional cow and pig bone. Finds included sherds of whiteware, manganese ware, transfer printed wares, black glazed earthenware and clay pipe stems.	Late 18 th –19 th century deposit

Context	Depth (BGL)	Description	Interpretation
(C4)	0.90m–1.60m ⁺	Dark grey to black anaerobic alluvial clay with a plastic texture. It incorporated occasional shell fragments and charcoal flecks, in addition to c. 5% sub-rounded cobbles.	Alluvial clay

Table 5. Stratigraphy of Test Trench 3

Context	Depth (BGL)	Description	Interpretation
(C1)	0m–0.30m	Modern hardcore deposit	Hardcore
(C2)	0.30m–0.60m	Rubble deposit comprising broken concrete slabs, large stones, plastic and geotextile, in addition intact and crushed red brick. Occurred within a matrix of light grey sandy silty with frequent gravels and charcoal, as well as moderate amounts of broken slate. Bands of crushed mortar throughout.	Layer of 20 th century rubble
(C3)	0.60m–1.10m	Moderately compact dark greyish brown clayey silt with frequent charcoal, occasional fragments of red brick, bands of crushed mortar and c. 10% sub-rounded stones. The organic deposit included pieces of wood and straw, as well as occasional cow and pig bone. Finds included sherds of whiteware, manganese ware, transfer printed wares, black glazed earthenware and clay pipe stems.	Late 18 th –19 th century deposit
(C4)	1.10m–1.90m ⁺	Dark grey to black anaerobic alluvial clay with a plastic texture. It incorporated occasional shell fragments and charcoal flecks, in addition to c. 5% sub-rounded cobbles.	Alluvial clay
(C13)	1.90m–2.20m ⁺	Light greenish grey sterile alluvial clay with a plastic texture. Water-logged and stone-free, quickly inundated with water.	Sterile alluvial clay

Table 6. Stratigraphy of Test Trench 4

Context	Depth (BGL)	Description	Interpretation
(C1)	0m–0.30m	Modern hardcore deposit	Hardcore
(C2)	0.30m–0.50m	Rubble deposit comprising broken concrete slabs, large stones, plastic and geotextile, in addition intact and crushed red brick. Occurred within a matrix of light grey sandy silty with frequent gravels and charcoal, as well as moderate amounts of broken slate. Bands of crushed mortar throughout.	Layer of 20 th century rubble

Context	Depth (BGL)	Description	Interpretation
(C3)	0.50m–0.90m	Moderately compact dark greyish brown clayey silt with frequent charcoal, occasional fragments of red brick, bands of crushed mortar and c. 10% sub-rounded stones. The organic deposit included pieces of wood and straw, as well as occasional cow and pig bone. Finds included sherds of whiteware, manganese ware, transfer printed wares, black glazed earthenware and clay pipe stems.	Late 18 th –19 th century deposit
(C4)	0.90m ⁺	Dark grey to black anaerobic alluvial clay with a plastic texture. It incorporated occasional shell fragments and charcoal flecks, in addition to c. 5% sub-rounded cobbles.	Alluvial clay

Table 7. Stratigraphy of Test Trench 5

Context	Depth (BGL)	Description	Interpretation
(C30)	0m–0.30m	Concrete slab	Concrete slab
(C31)	0.30m–0.50m	Deposit of modern rubble, hardcore and refuse. Possibly associated with the construction of the KAS to the south and southeast.	Modern construction debris
(C2)	0.50m–0.80m	Rubble deposit comprising broken concrete slabs, large stones, plastic and geotextile, in addition intact and crushed red brick. Occurred within a matrix of light grey sandy silty with frequent gravels and charcoal, as well as moderate amounts of broken slate. Bands of crushed mortar throughout.	Layer of 20 th century rubble
(C3)	0.80m–1.20m	Moderately compact dark greyish brown clayey silt with frequent charcoal, occasional fragments of red brick, bands of crushed mortar and c. 10% sub-rounded stones. The organic deposit included pieces of wood and straw, as well as occasional cow and pig bone. Finds included sherds of whiteware, manganese ware, transfer printed wares, black glazed earthenware and clay pipe stems.	Late 18 th –19 th century deposit
(C4)	1.20m ⁺	Dark grey to black anaerobic alluvial clay with a plastic texture. It incorporated occasional shell fragments and charcoal flecks, in addition to c. 5% sub-rounded cobbles.	Alluvial clay

Table 8. Stratigraphy of Test Trench 6

Context	Depth (BGL)	Description	Interpretation
(C1)	0m–0.40m	Modern hardcore deposit	Hardcore
(C3)	0.40m–0.80m	Moderately compact dark greyish brown clayey silt with frequent charcoal, occasional fragments of red brick, bands of crushed mortar and c. 10% sub-rounded stones. The organic deposit included pieces of wood and straw, as well as occasional cow and pig bone. Finds included sherds of whiteware, manganese ware, transfer printed wares, black glazed earthenware and clay pipe stems.	Late 18 th –19 th century deposit
(C4)	0.80m–1.60m ⁺	Dark grey to black anaerobic alluvial clay with a plastic texture. It incorporated occasional shell fragments and charcoal flecks, in addition to c. 5% sub-rounded cobbles.	Alluvial clay

Table 9. Stratigraphy of Test Trench 7

Context	Depth (BGL)	Description	Interpretation
(C1)	0m–0.50m	Modern hardcore deposit	Hardcore
(C2)	0.50m–0.80m	Rubble deposit comprising broken concrete slabs, large stones, plastic and geotextile, in addition intact and crushed red brick. Occurred within a matrix of light grey sandy silty with frequent gravels and charcoal, as well as moderate amounts of broken slate. Bands of crushed mortar throughout.	Layer of 20 th century rubble
(C3)	0.80m–1.20m	Moderately compact dark greyish brown clayey silt with frequent charcoal, occasional fragments of red brick, bands of crushed mortar and c. 10% sub-rounded stones. The organic deposit included pieces of wood and straw, as well as occasional cow and pig bone. Finds included sherds of whiteware, manganese ware, transfer printed wares, black glazed earthenware and clay pipe stems.	Late 18 th –19 th century deposit
(C4)	1.20m ⁺	Dark grey to black anaerobic alluvial clay with a plastic texture. It incorporated occasional shell fragments and charcoal flecks, in addition to c. 5% sub-rounded cobbles.	Alluvial clay

Table 10. Stratigraphy of Test Trench 8

Context	Depth (BGL)	Description	Interpretation
(C18)	0m–0.50m	Layer of modern construction debris topped with hardcore set atop a layer of geotextile	Modern rubble surface

Context	Depth (BGL)	Description	Interpretation
(C19)	0.50m–1.20m	Mid-orange brown silty clay of moderate compaction that was sterile and stone-free	Water-borne deposit
(C29)	1.20m–2.20m ⁺	Dark grey pure clay with a plastic texture that was largely sterile and stone-free. The upper section of the deposit was not as waterlogged as (C4) in the other trenches. Water only entered the deposit at 1.80m BGL.	Alluvial clay

Table 11. Stratigraphy of Test Trench 9

Context	Depth (BGL)	Description	Interpretation
(C32)	0m–0.10m	Grass-topped sod	Sod
(C33)	0.10m–1.80m ⁺	Extensive unstable deposit of modern disturbance that included concrete slabs, plastic and geotextile sheeting, fragments of plastic pipes, metal rebar, rubble, gravels, refuse and other construction debris.	Modern disturbance

Table 12. Stratigraphy of Test Trench 10

Context	Depth (BGL)	Description	Interpretation
(C18)	0m–0.80m	Layer of modern construction debris topped with hardcore set atop a layer of geotextile	Modern rubble surface
(C22)	0.80m–1.30m	Mid-grey silty clay with moderate quantities of mortar chunks, fragments of red brick and charcoal. The deposit was moderately compact and included c. 8% sub-rounded stones.	Late 18 th –19 th century deposit
(C23)	1.30m–1.70m	Light greyish brown silty clay with c. 3% sub-rounded stones and occasional charcoal	Garden soil
(C24)	1.70m–2m	Charcoal flecked silty clay that was brownish red in colour	Garden soil
(C25)	2m ⁺	Greenish grey pure clay that was plastic in texture and included c. 7% rounded cobbles and occasional charcoal flecks.	Alluvial clay

Table 13. Stratigraphy of Test Trench 11

Context	Depth (BGL)	Description	Interpretation
(C18)	0m–0.60m	Layer of modern construction debris topped with hardcore set atop a layer of geotextile	Modern rubble surface
(C28)	0.60m–1m	Greyish brown clayey silt with frequent charcoal and pockets of ash, moderate fragments of red brick and c. 5% sub-rounded stones.	18 th –19 th century layer
(C34)	1m–1.60m	Light greyish brown silty clay with occasional charcoal, largely stone-free	Alluvial clay

Context	Depth (BGL)	Description	Interpretation
(C35)	1.60m–2m+	Pale grey clay layer	Alluvial clay

5. CONCLUSIONS AND RECCOMENDATIONS

Both the historical and archaeological record suggest that the proposed development site at 'Sweeney's Orchard' occurs within an area of significant archaeological potential (Courtney 2015a and 2015b; Crowley 2016). This has also been demonstrated by previous archaeological work that has both been carried out onsite and within its immediate vicinity (Figure 4), which uncovered late medieval and post medieval remains, which included boundary walls, reclamation deposits and alluvial sediments, in addition to activities that were related to the 'Chancellor's Mills' on the adjacent River Nore. (Ó Drisceoil 2003; Lohan 2004; O'Meara 2006; Gilligan 2008; Ó Drisceoil *et al.* 2008; Flynn 2015; Cotter 2016; Crowley 2016).

The eleven test trenches that were opened throughout the site as part of the present investigation uncovered a comparable range of late medieval and post medieval remains, in addition to possible evidence for a substantial medieval structure in Trench 11 (Tables 2 and 13) (Drawing 1 and Drawing 2). Given the character and location of this wall and associated buttress it was suggested that they may represent a section of former defensive features that ran parallel to the River Nore and were associated with the medieval city walls to the south. A sample of mortar was obtained from the wall, for analysis.

It was not possible to recover any material for the mortars that were suitable for radiocarbon dating. However, given the comparative analysis that was carried out, it is likely that the mortar is post-medieval in date (See Appendix 1 for Mortar Report, Bolton 2018).

The fragments of mortar sample from the masonry wall within Trench 11 were all reasonably consistent in composition and share the following common features (*ibid.*):

- a. Most aggregate consisting of low sphericity rounded to well-rounded sand representing a range of stone types including limestone, chert, sandstone, siltstone and a lesser fraction of other lithics. This is probably a river sand.
- b. All samples showed significant water-related deterioration in the form of recrystallised lime. This lined the porous network, formed new layers within the mortar, and covered aggregate grains.
- c. The mortar contained abundant burnt fuel fragments – these appear to be coal.

- d. The mortars showed c.9.3->45% porosity.
- e. The original mix proportions could not be securely determined due to later alteration, but the most unaltered areas suggested a lime-rich mix.

As there was no charcoal or organic material within the mortar, it was deemed unsuitable for radiocarbon dating. There were abundant lime lumps (which can be radiocarbon dated). However, the degree of recrystallisation of the lime means that the sample is contaminated and could not be relied upon to provide an accurate date. As the lumps are altered, any date could give the date of recrystallisation and not the construction date.

From a comparative analysis with other mortars the following are indicators that the mortar is likely to be post medieval in date:

- Coal was used – this is common in post-medieval samples, while timber, peat and charcoal are more often found in medieval samples.
- Brick/ceramic fragments were used – these are commonly found in post-medieval mortars. While brick is a taxable commodity from the 13th century in Ireland, brick does not occur in the archaeological record until the sixteenth century, with the earliest brick dating to 1505 AD in Dublin. Brick was used for specialised purposes towards the end of the 16th century, but only came into more widespread use in Ireland from the 18th century onwards. While Kilkenny had high quality limestone masonry, the clay in the surrounding hinterland was suitable for making quality brickwork. Bricks were used in post-medieval buildings for wall linings and for their precision in the construction of building elements such as chimneys, dressings, window openings and creating pockets for floor joists. The waste from this activity (crushed brick) was then incorporated into mortars as an additive to improve setting and durability. This means that as brick pozzolan is found in the mortars from the wall in Trench 11, the mortar should be considered post-medieval.

Considering the findings from the 2018 testing programme, in addition to those from previous test excavations and archaeological monitoring, it is recommended no additional archaeological testing should be undertaken onsite. The rationale being that any further investigations will potentially impact sensitive archaeological remains, particularly if they consist of upstanding late medieval and post-medieval walls.

Consequently, it is recommended that any future works should first consider archaeological monitoring as an archaeological exercise. This is because the removal of topsoil deposits to the

level of the natural subsoils and/or sterile alluvial clays across the site would provide a much better indication of the layout of the different features on site, as well as how they relate to each other, the medieval city and the Chancellor's Mills to the east. It is proposed that the Department of Culture, Heritage and the Gaeltacht should then be consulted regarding the best course of action moving forward. This may consist of full excavation in advance of any construction works, or alternatively, preservation by record or a combination of both.

Please note that all recommendations are subject to approval by the National Monuments Section of the Heritage and Planning Division, Department of Culture, Heritage and the Gaeltacht.

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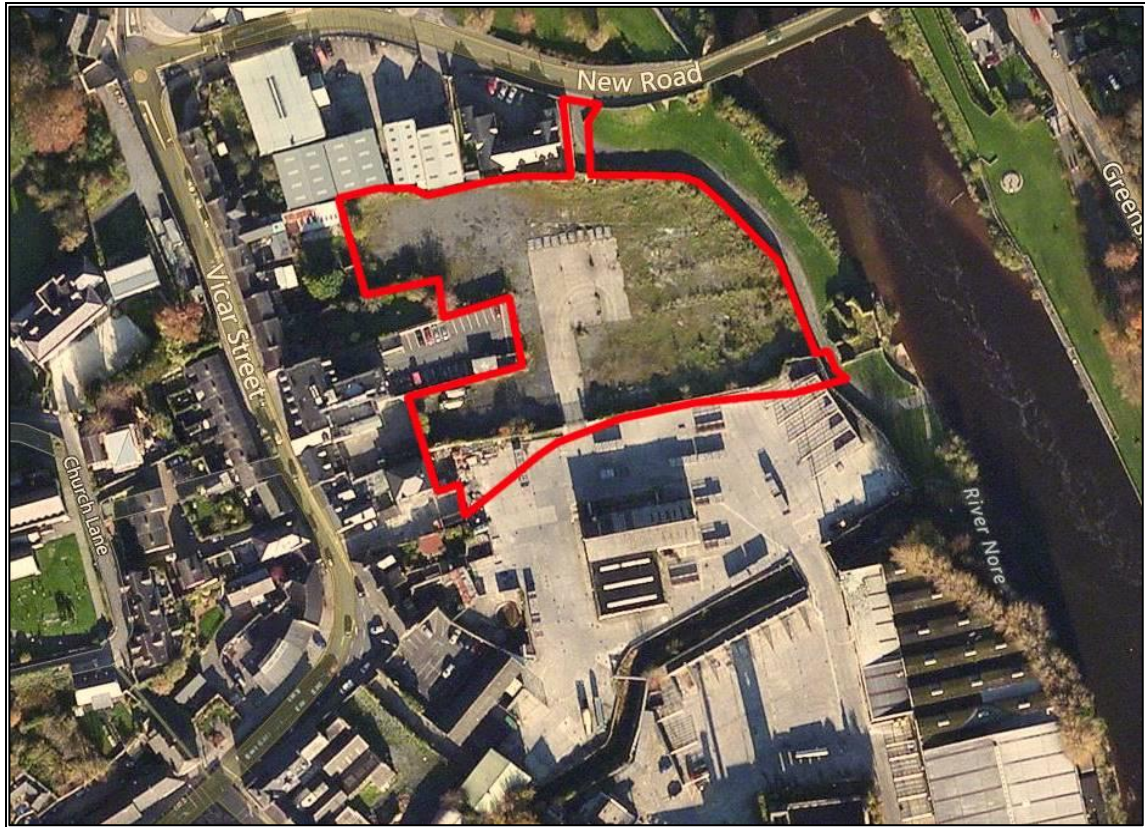


Figure 1. Aerial view of the proposed development site (outlined in red).

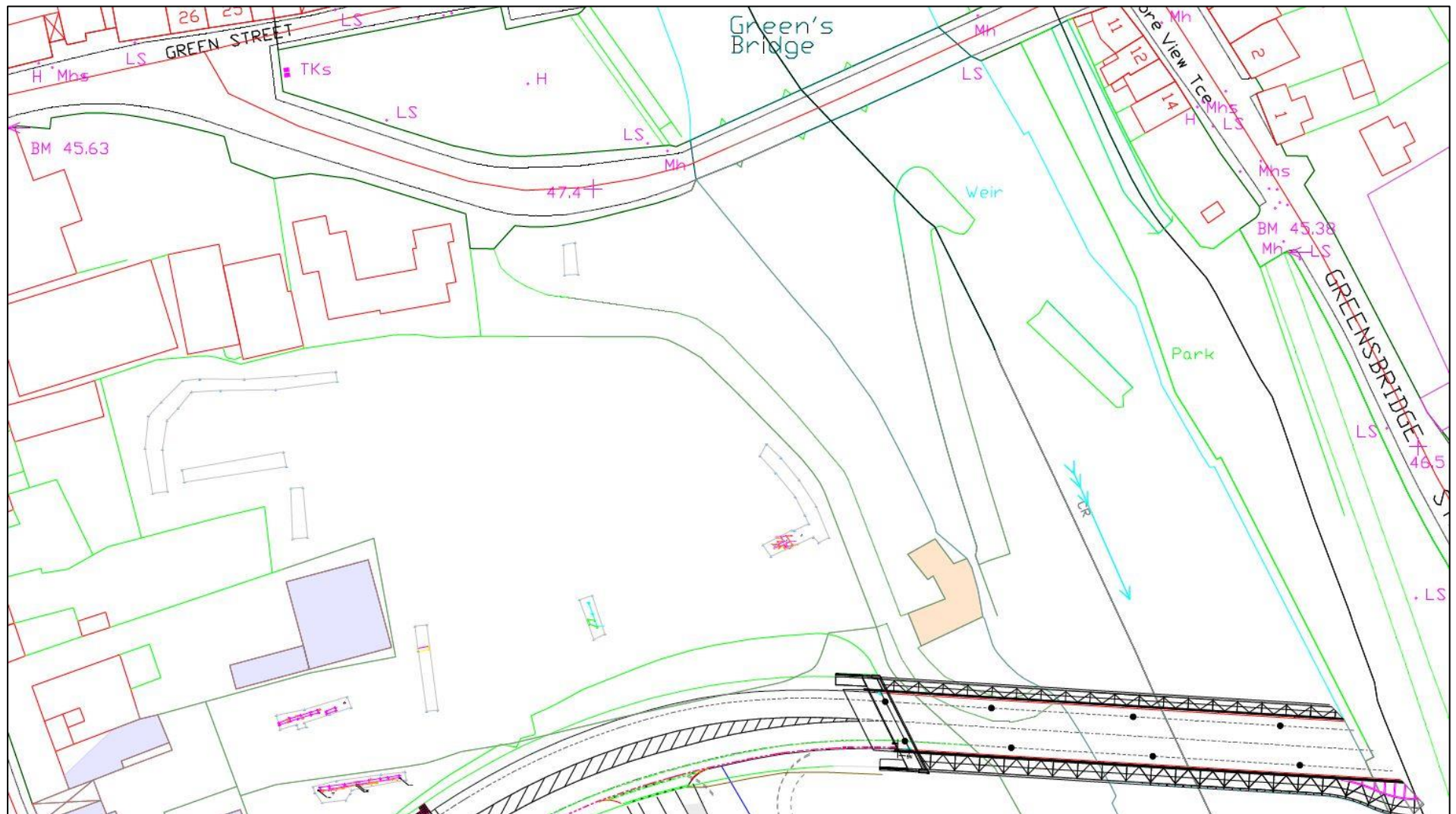


Figure 2. Site layout in relation to the River Nore, Green's Bridge and the KCAS bridge and road. The eleven test trenches and the uncovered archaeology are included.

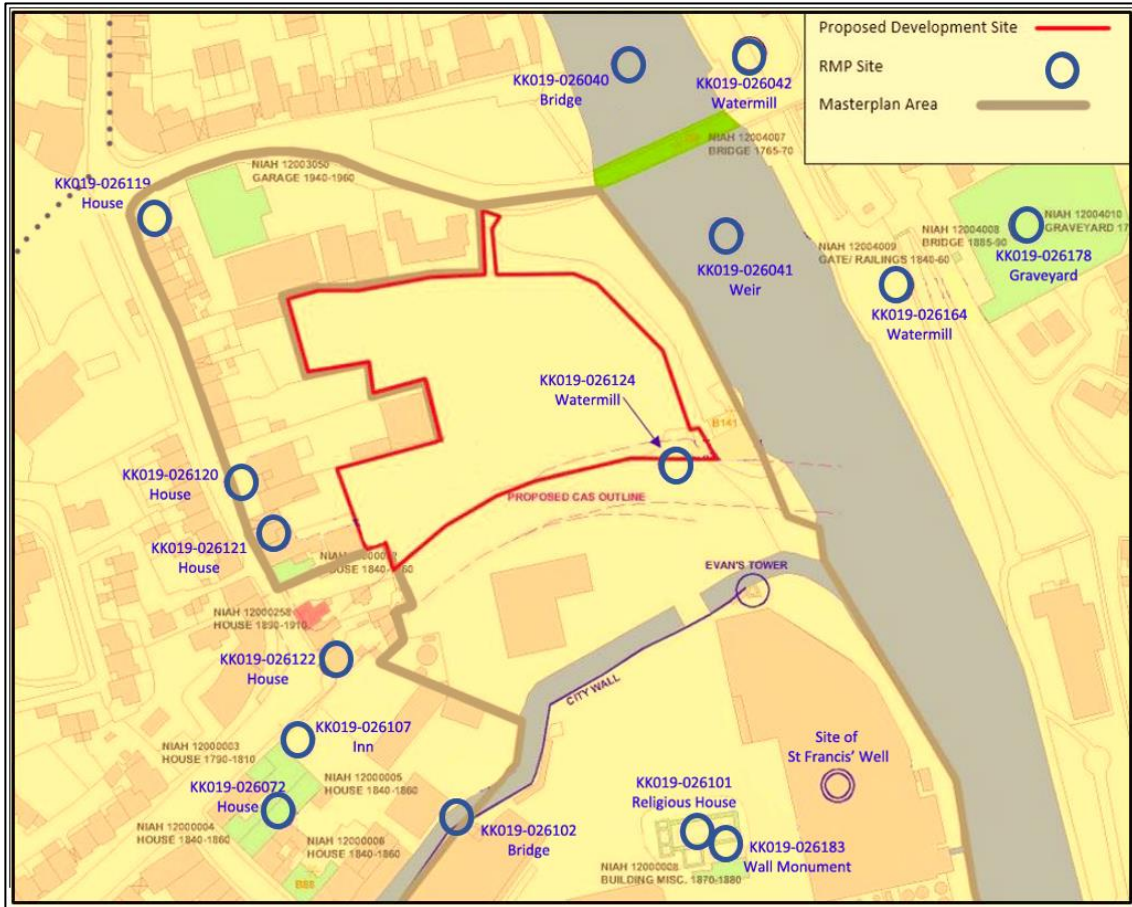


Figure 3. RMP sites within the vicinity of the proposed development (outlined in red).

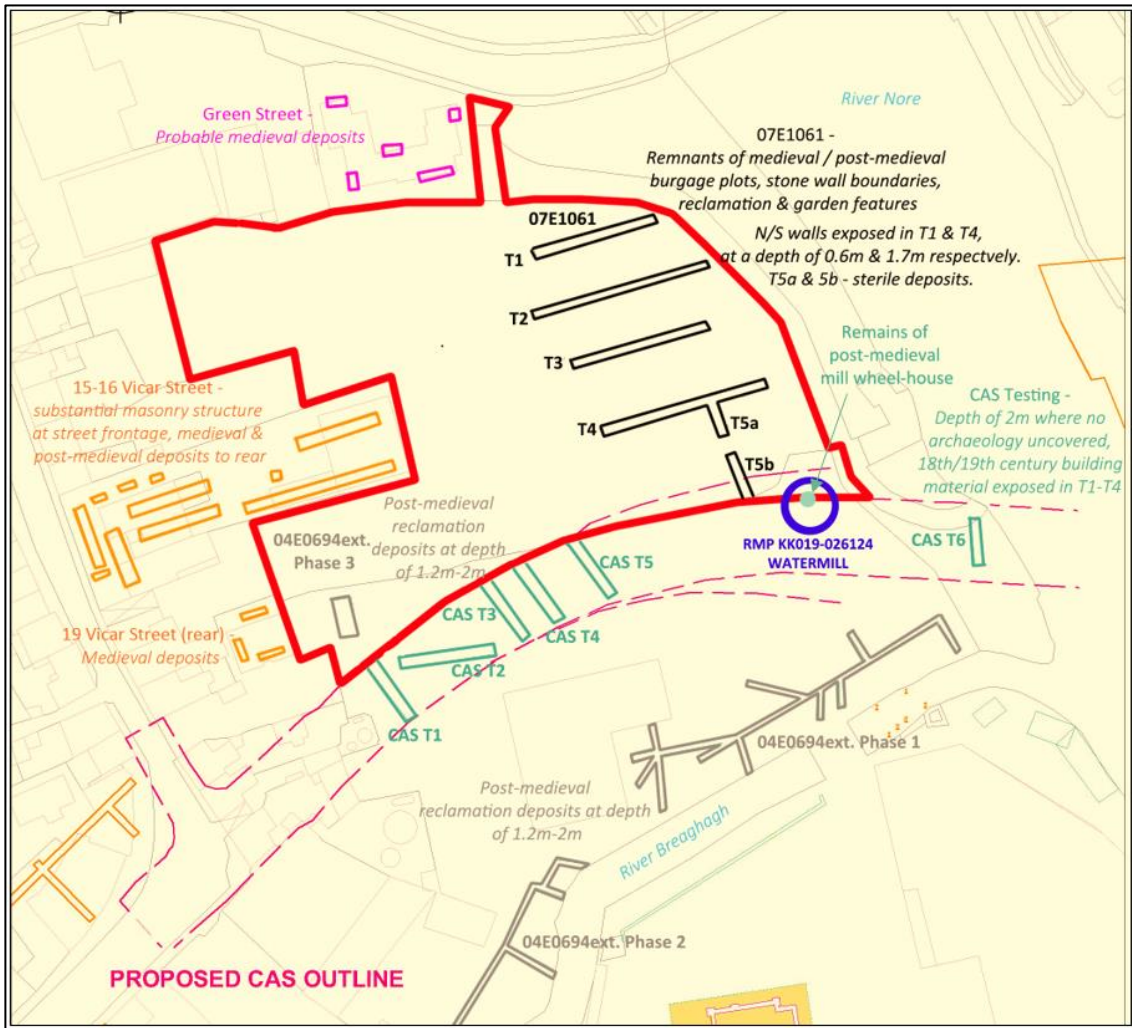


Figure 4. The location of previous archaeological excavations within the vicinity of the proposed development.



Figure 5. Inset from John Rocque's 'Map of the City of Kilkenny' (1758); the stone walls uncovered during testing are depicted in green.

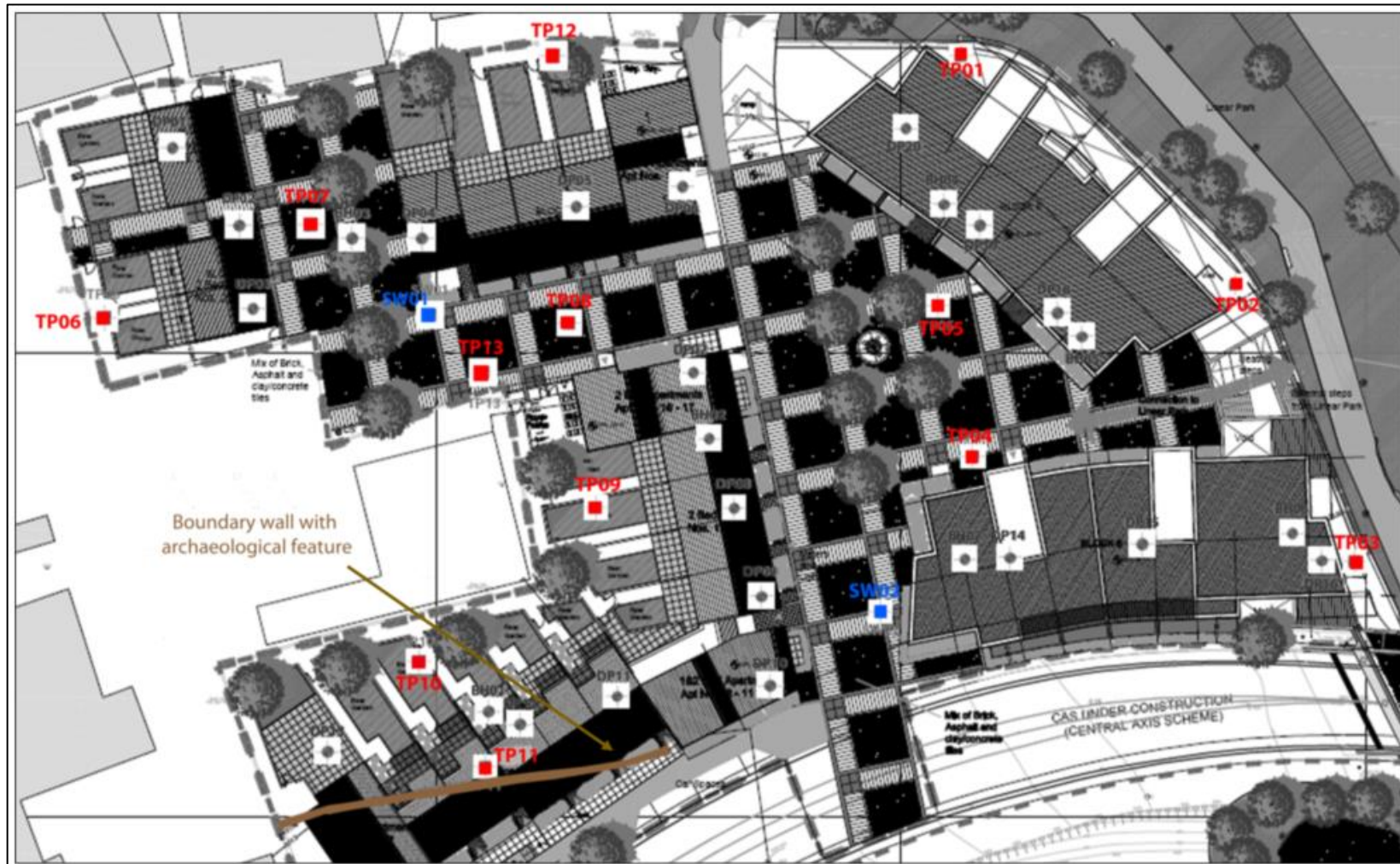


Figure 6. Map showing the location of the trial pits and soak-away pits from the 2016 investigation (16E0476).



Plate 1. Overview of Test Trench 1 facing south.



Plate 2. Overview of Test Trench 2, facing west.



Plate 3. Overview of Test Trench 3, facing east.



Plate 4. Overview of Test Trench 4, facing north.



Plate 5. Overview of Test Trench 5, facing west.



Plate 6. Western-end of Test Trench 5 with detail of wall, facing north.



Plate 7. Overview of Test Trench 6, facing west.



Plate 8. Overview of Test Trench 7, facing north.



Plate 9. Detail of wall in Test Trench 7, facing south.



Plate 10. Overview of Test Trench 8, facing north.



Plate 11. Detail of stratigraphy in Test Trench 8, Facing east.



Plate 12. Overview of Test Trench 9 showing level of disturbance.



Plate 13. Overview of Test Trench 10, facing south. The extent of the ditch is indicated by the ranging rods.



Plate 14. Overview of Test Trench 11, facing east.



Plate 15. Overview of eastern half of Test Trench 11 showing level of disturbance.



Plate 16. Disturbance to wall in Test Trench 11 from modern concrete pipe, facing northwest.



Plate 17. View of wall in Test Trench 11, facing east.



Plate 18. Detail of undisturbed stratigraphy to west of wall in Test Trench 11, facing north.



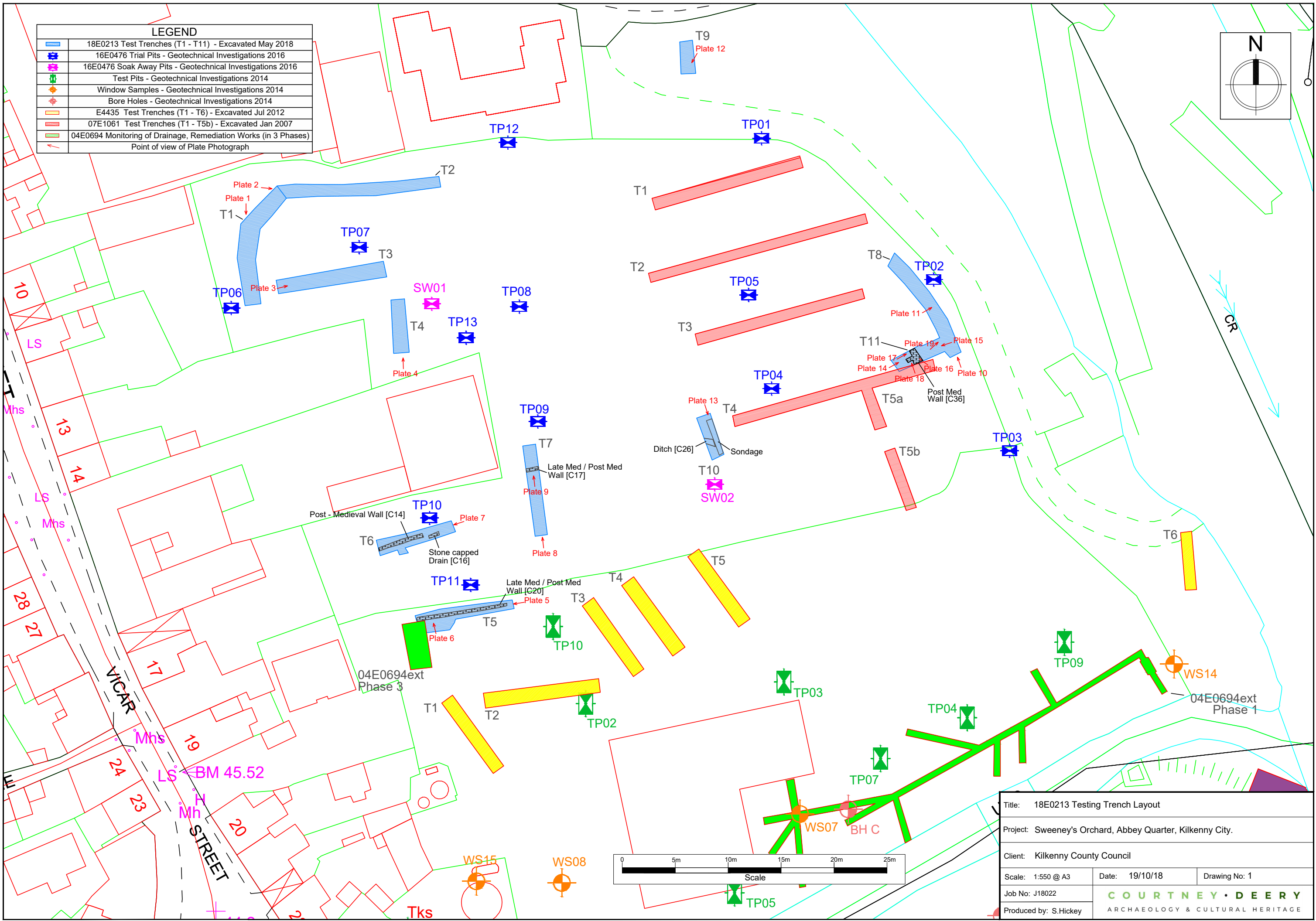
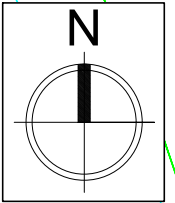
Plate 19. Detail of disturbed deposits to east of wall in Test Trench 11, facing northeast.

APPENDIX 1. CONTEXT REGISTER

Context	Trench	Description
(C1)	T1, T2, T3, T4, T6, T7	Modern hardcore deposit
(C2)	T1, T2, T3, T4, T5, T7	Rubble deposit comprising broken concrete slabs, large stones, plastic and geotextile, in addition intact and crushed red brick. Occurred within a matrix of light grey sandy silty with frequent gravels and charcoal, as well as moderate amounts of broken slate. Bands of crushed mortar throughout.
(C3)	T1, T2, T3, T4, T5, T6, T7	Moderately compact dark greyish brown clayey silt with frequent charcoal, occasional fragments of red brick, bands of crushed mortar and c. 10% sub-rounded stones. The organic deposit included pieces of wood and straw, as well as occasional cow and pig bone. Finds included sherds of whiteware, manganese ware, transfer printed wares, black glazed earthenware and clay pipe stems.
(C4)	T1, T2, T3, T4, T5, T6, T7	Dark grey to black anaerobic alluvial clay with a plastic texture. It incorporated occasional shell fragments and charcoal flecks, in addition to c. 5% sub-rounded cobbles.
[C5]	T2	Linear drain located 4m from east-end of trench. It occurred at a depth of 0.60m BGL, was 0.70m in width, was filled by (C6) and was cut into (C3). It immediately filled with water.
(C6)	T2	Fill of [C5], light brown clay with sub-rounded stones along base.
[C7]	T2	Linear drain located 10m from east-end of trench. It occurred at a depth of 0.70m BGL, was 0.30m in width, was filled by (C8) and was cut into (C3). It exhibited a U-shaped profile and immediately filled with water.
(C8)	T2	Fill of [C7], mid-brownish grey clay with sub-rounded stones along base.
[C9]	T2	Linear drain located 12m from east-end of trench. It occurred at a depth of 0.60m BGL, was 0.30m in width and 0.35m deep. It was filled by (C10), was cut into (C3) and had a U-shaped profile.
(C10)	T2	Fill of [C9], dark grey sticky clay with moderate amounts of charcoal and sub-rounded cobbles.
[C11]	T2 & T3	Linear drain located 17m from east-end of Trench 2 and 5m from east-end of Trench 3. It occurred at a depth of 0.55m BGL, was 1.40m in width and 0.60m deep. It was filled by (C12), was cut into (C3) and had a concave profile. Included a series of large rounded stones along its base.
(C12)	T2 & T3	Fill of [C11], light brown silty clay with moderate inclusions of animal bone, crushed mortar and red brick fragments.
(C13)	T3	Light greenish grey sterile alluvial clay with a plastic texture. Water-logged and stone-free, quickly inundated with water.
<C14>	T6	Base of wall uncovered at a depth of 0.75m–0.80m BGL. It extended east-west for 9m and was truncated by a modern soak-away pit and a series of drains. It varied between 0.45m–0.60m in width and 0.35m–0.40m in height. It displayed a maximum height of two courses, which consisted of large quarried limestone blocks (c. 0.55m x 0.20m x 0.30m) and smaller limestone cobbles (c. 0.08m x 0.05m x 0.07m). The stones were bonded with (C15).

Context	Trench	Description
(C15)	T6	Compact white lime mortar with frequent gravels; used as bonding agent in <C14>.
<C16>	T6	Stone-capped box drain in east-end of trench at a depth of 0.70m BGL that ran from southwest to northeast for 6m. The capping stones comprised cut limestone slabs (c. 0.50m x 0.45m x 0.16m). It's eastern-end was truncated by a series of later ceramic drains.
<C17>	T7	Wall running E-W. Possibly Late Medieval-Post Medieval.
(C18)	T8, T10 & T11	Layer of modern construction debris topped with hardcore set atop a layer of geotextile
(C19)	T8	Mid-orange brown silty clay of moderate compaction that was sterile and stone-free
<C20>	T5	Wall running E-W
(C21)	T5	Very compact white lime mortar with frequent black gravels; used as bonding agent in <C20>.
(C22)	T10	Mid-grey silty clay with moderate quantities of mortar chunks, fragments of red brick and charcoal. The deposit was moderately compact and included c. 8% sub-rounded stones.
(C23)	T10	Light greyish brown silty clay with c. 3% sub-rounded stones and occasional charcoal
(C24)	T10	Charcoal flecked silty clay that was brownish red in colour
(C25)	T10	Greenish grey pure clay that was plastic in texture and included c. 7% rounded cobbles and occasional charcoal flecks.
[C26]	T10	Cut of ditch running east-west that was filled with (C27).
(C27)	T10	Fill of [C26]
(C28)	T11	Greyish brown clayey silt with frequent charcoal and pockets of ash, moderate fragments of red brick and c. 5% sub-rounded stones.
(C29)	T8	Dark grey pure clay with a plastic texture that was largely sterile and stone-free. The upper section of the deposit was not as waterlogged as (C4) in the other trenches. Water only entered the deposit at 1.80m BGL.
(C30)	T5	Concrete slab
(C31)	T5	Deposit of modern rubble, hardcore and refuse. Possibly associated with the construction of the KCAS to the south and southeast.
(C32)	T9	Grass-topped sod
(C33)	T9	Extensive unstable deposit of modern disturbance that included concrete slabs, plastic and geotextile sheeting, fragments of plastic pipes, metal rebar, rubble, gravels, refuse and other construction debris.
(C34)	T11	Light greyish brown silty clay with occasional charcoal, largely stone-free
(C35)	T11	Pale grey clay layer
<C36>	T11	Post-Medieval wall
<C37>	T11	Post-Medieval buttress associated with <C36>.
(C39)	T11	Bedding sand into which <C36> and <C37> were set.
(C40)	T11	Lime mortar that bonded the stones of <C36> and <C37>.

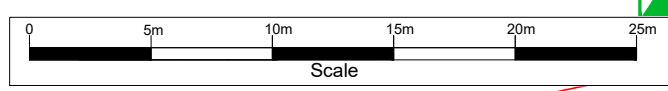
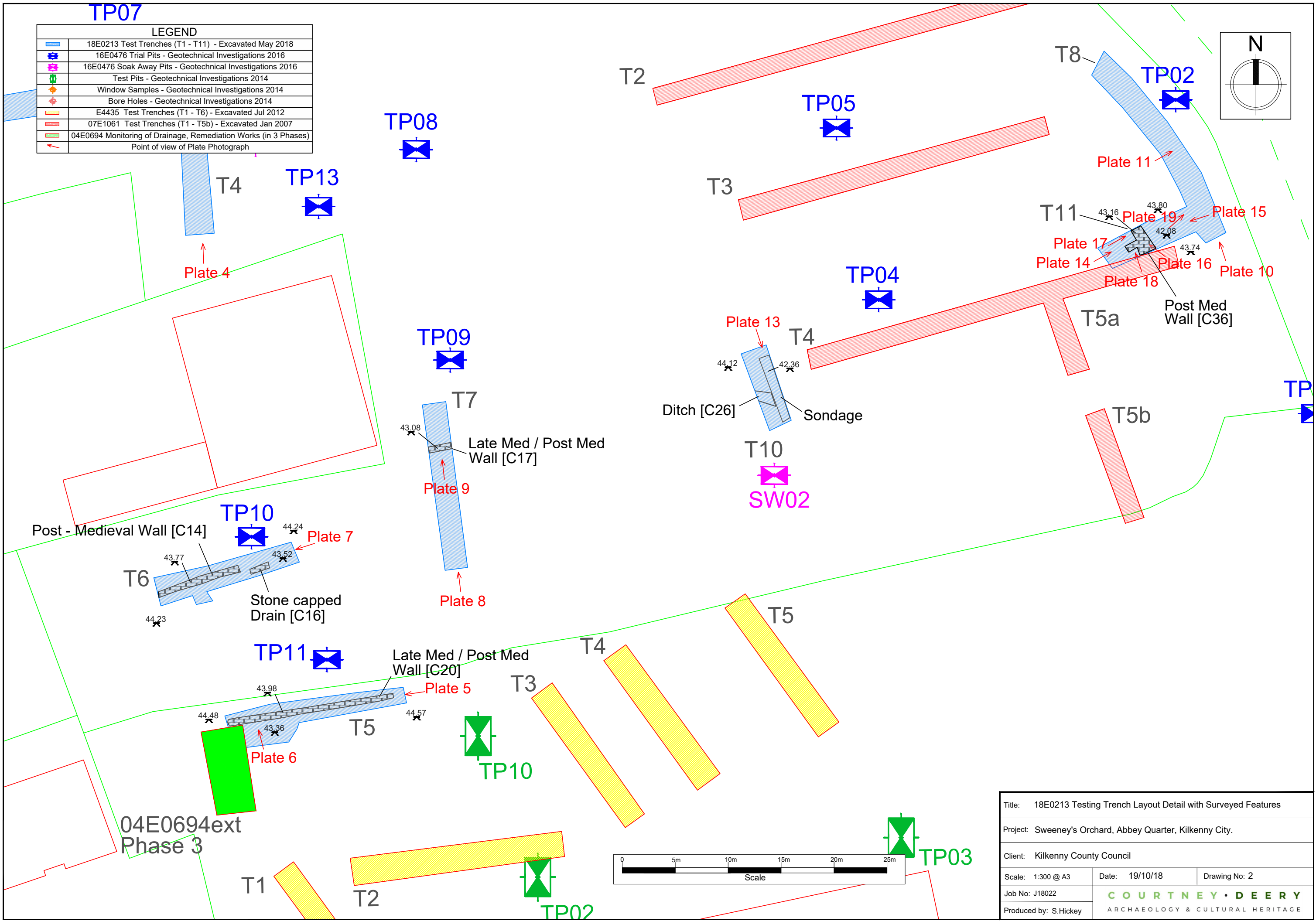
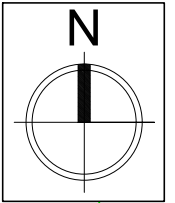
LEGEND	
	18E0213 Test Trenches (T1 - T11) - Excavated May 2018
	16E0476 Trial Pits - Geotechnical Investigations 2016
	16E0476 Soak Away Pits - Geotechnical Investigations 2016
	Test Pits - Geotechnical Investigations 2014
	Window Samples - Geotechnical Investigations 2014
	Bore Holes - Geotechnical Investigations 2014
	E4435 Test Trenches (T1 - T6) - Excavated Jul 2012
	07E1061 Test Trenches (T1 - T5b) - Excavated Jan 2007
	04E0694 Monitoring of Drainage, Remediation Works (in 3 Phases)
	Point of view of Plate Photograph



Title: 18E0213 Testing Trench Layout		
Project: Sweeney's Orchard, Abbey Quarter, Kilkenny City.		
Client: Kilkenny County Council		
Scale: 1:550 @ A3	Date: 19/10/18	Drawing No: 1
Job No: J18022		
Produced by: S.Hickey		

TP07

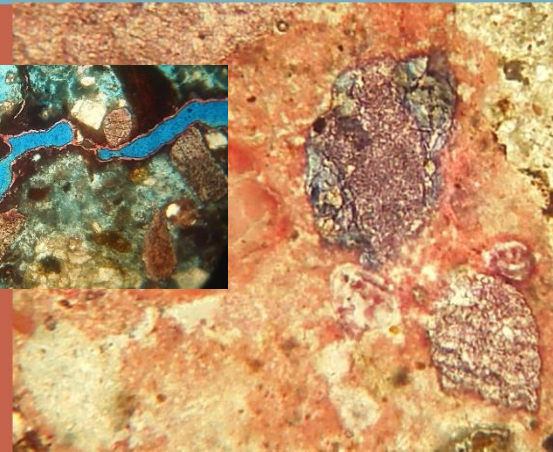
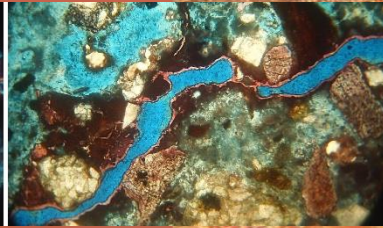
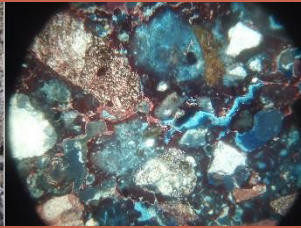
LEGEND	
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	16E0476 Trial Pits - Geotechnical Investigations 2016
	16E0476 Soak Away Pits - Geotechnical Investigations 2016
	Test Pits - Geotechnical Investigations 2014
	Window Samples - Geotechnical Investigations 2014
	Bore Holes - Geotechnical Investigations 2014
	E4435 Test Trenches (T1 - T6) - Excavated Jul 2012
	07E1061 Test Trenches (T1 - T5b) - Excavated Jan 2007
	04E0694 Monitoring of Drainage, Remediation Works (in 3 Phases)
	Point of view of Plate Photograph



Title: 18E0213 Testing Trench Layout Detail with Surveyed Features		
Project: Sweeney's Orchard, Abbey Quarter, Kilkenny City.		
Client: Kilkenny County Council		
Scale: 1:300 @ A3	Date: 19/10/18	Drawing No: 2
Job No: J18022	 ARCHAEOLOGY & CULTURAL HERITAGE	
Produced by: S.Hickey		

Sweeney's Orchard, Kilkenny City,
Licence: 18E0213

APPENDIX 2. MORTAR REPORT



Conservation Research Analysis

Sweeney's Orchard, Abbey Quarter, Kilkenny – 18 E 0213

Mortar Report

November 2018

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3.	Findings	4
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IMPORTANT

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1. Introduction and Purpose of the Report

The aim of this report is to examine a sample of mortar revealed through archaeological testing under excavation (Licence 18E0213) at Sweeney's Orchard, Abbey Quarter, Kilkenny City; to determine its composition; and to assess its potential for radiocarbon dating. All fragments were examined by hand and with the microscope. Two fragments were thin sectioned for petrographic analysis. This report was prepared at the request of Courtney Deery Heritage Consultancy, who noted:

"The eleven test trenches that were opened throughout the site as part of the present investigation uncovered a comparable range of late medieval and post medieval remains, in addition to possible evidence for a substantial medieval structure in Trench 11 (Tables 2 and 13). Given the character and location of this wall and associated buttress it is suggested that they may represent a section of former defensive features that ran parallel to the River Nore and were associated with the medieval city walls to the south. A sample of mortar was obtained from the wall, which is being sent for analysis and if possible, radiocarbon dating. Thus, given the possible significance of the structure, it is recommended that the Department of Culture, Heritage and the Gaeltacht should be consulted regarding how the possible monument might be preserved. Consequently, this report only details the preliminary findings from the testing programme, and a full report will be issued to all the relevant bodies following on from a meeting with the Department and once the results have been received from the mortar analysis and radiocarbon dating"¹.



No.	Material	Notes	Porosity (%)
A	Lime	Mortar Fragments (multiple) – Sweeney's Orchard TT11 C40 "Lime mortar from a wall (C36)".	9.38

Table 1: Sample provided for analysis by Courtney Deery, with value for total available porosity.

2. Methodology and Limitations of Inspection

The sample (see Table 1) was provided by Courtney Deery and was found from archaeological testing of a masonry wall Trench 11 of eleven trenches at the site of 'Sweeney's Orchard'. Photographs of the wall showed the lower courses of a tripartite limestone masonry wall surviving below current ground level. The sample consisted of a number of rounded and sub-angular fragments of a lime-based mortar which retained reasonable cohesion.



Above: General views of Sample A in hand specimen.

The mortar sample was dried until constant weight. The mortar fragments were examined using visual microscopy with basic geochemical testing for the presence of carbonates. The evaluation of the mortars drew on the methodologies laid out in Teutonico (1988)², Pavia & Bolton (2000)³, Ashurst (2002⁴), Van Hees *et al* (2004⁵), Groot *et al* (2010⁶) and Ingram (2011⁷), while also considering current planning guidelines⁸, together with published and unpublished works on historic Irish mortars⁹. The analyses consisted of a petrographic assessment (in hand specimen, supported by instrumental visual microscopic analysis), and geochemical (acid test¹⁰) analysis. The mortar samples were analysed using both physical and chemical methods. Mortars were carefully cleaned with a soft brush to remove dirt as well as any detached aggregate and binder. All samples were examined with the naked eye and with the help of a magnifying glass and an optical microscope. All samples were recorded following a standardised procedure. Selected areas of each mortar were treated with standard hydrochloric acid digestion to assess the nature and composition of some aggregate and binder. Basic physical testing was also carried out to determine values relating to porosity and water transport. Porosity strongly influences drying processes, which is important as the presence of moisture impacts how a material may deteriorate¹¹. The total porosity of a porous building material includes open, closed and trapped porosity¹², and testing focused on the percentage of porosity accessible to water under normal weathering conditions. However, the fragments were small and varied in porosity from sample to sample and the value given (Table 1) should be understood as the value of a weathered mortar. Part of the sample was prepared and mounted on a glass slide for more detailed thin section preparation. The slide was not covered and the mortar was also examined with a scanning electron microscope.

2.1 Materials Context

The site was not visited. Sweeney's Orchard is located c.100m to the northeast of the confluence of the Nore and Breaghagh rivers within the designated area of archaeological potential for Kilkenny City (KK019-026). The site formed part of the gardens of the brewery of St. Francis' Abbey (KK019-02601) in the medieval period. The lands incorporated a series of mills and became the site of Swithwick's Brewery (founded in 1705) which operated until 2013.

The city is underlain by what is popularly termed 'Kilkenny Limestone' or 'Kilkenny Marble' and consists of a blue-grey to dark grey fossiliferous crinoidal wackestone/packstone limestone from the Ballyadams Formation. The stone varies from thick-bedded to massive and contains distinctive fossils including lithostrotioid corals and gigantoproductid brachiopods. Very dark-grey argillaceous limestone from the Butlersgrove Formation lies to the south-east of the city, and which has been dolomitised in some areas, including areas exposed on the riverbed of the Nore; while shaley fossiliferous and oolitic limestone from the Durrow Formation lies to the west. Quarry faces of the Kilkenny Marble quarries can still be seen at Archersgrove¹³ on the Bennettsbridge Road south-east of the city on the banks of the Nore, and George Wilkinson writing in 1845 noted limestone masonry could be obtained from the Black Quarry, Bonnett's Rath 1 ½ miles from the city and from Templemartin 3 ¾ miles from Kilkenny.

The riverbed of the Nore c.100m east of the site is composed of a wide range of poorly sorted cobble, pebble and sand-sized aggregate¹⁴. This aggregate includes fossiliferous Kilkenny limestone, cherty blue crinoidal limestone, argillaceous siltstones and silty mudstones, sandstones and black shale. A number of sand and gravel pits are noted in the hinterland of the city on historic Ordnance Survey maps including a series of pits in the townlands of Cashel and Maidenhill west of the city, gravel pits at Newparks north of the city on the banks of the Nore, and a series of pits on the east side of Green's Bridge. Lime kilns are also noted surrounding the city.

3 Findings



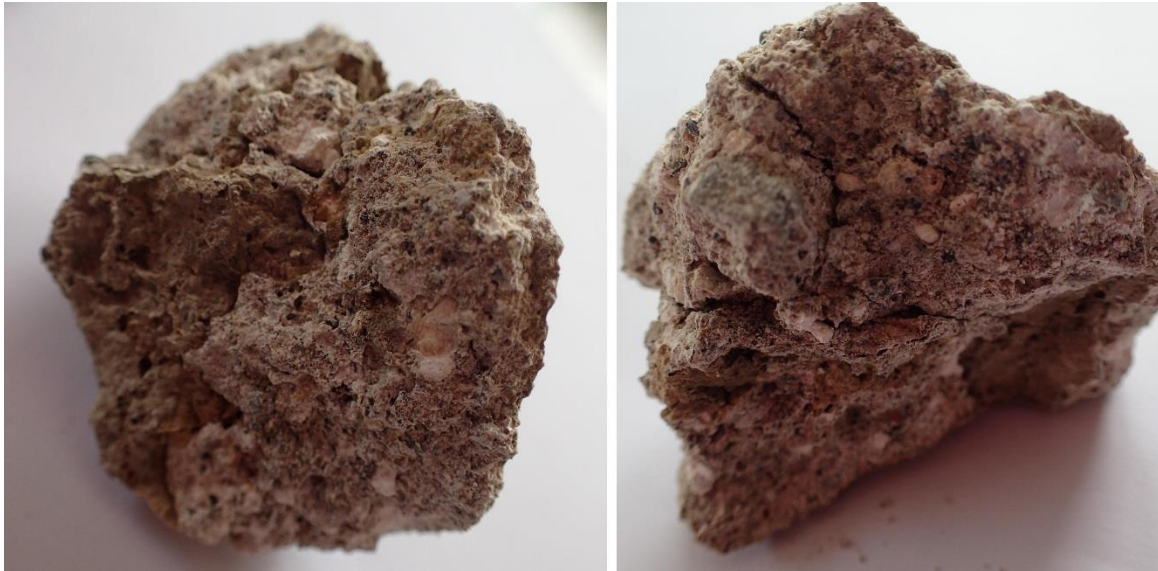
Above: General views of Sample A in hand specimen.

Well carbonated lime-based mortar comprising poorly-sorted aggregate in a lime matrix with abundant alteration features, and containing occasional relatively large (29mm) limestone aggregate. The mortar is weathered and commonly shows areas of recrystallised lime. The mortar is aggregate-rich, with an estimated mix ratio of 3:2 aggregate:lime. The aggregate has two morphologies – most of the aggregate is sub-rounded to well-rounded low sphericity limestone and quartz (with a fraction of fine material comprising a range of lithics) sized <6mm in maximum dimension; while there is also a distinct fraction of coarse high sphericity sub-rounded to rounded flakes of greywacke c.2mm thick and c.10-12mm in maximum dimension.

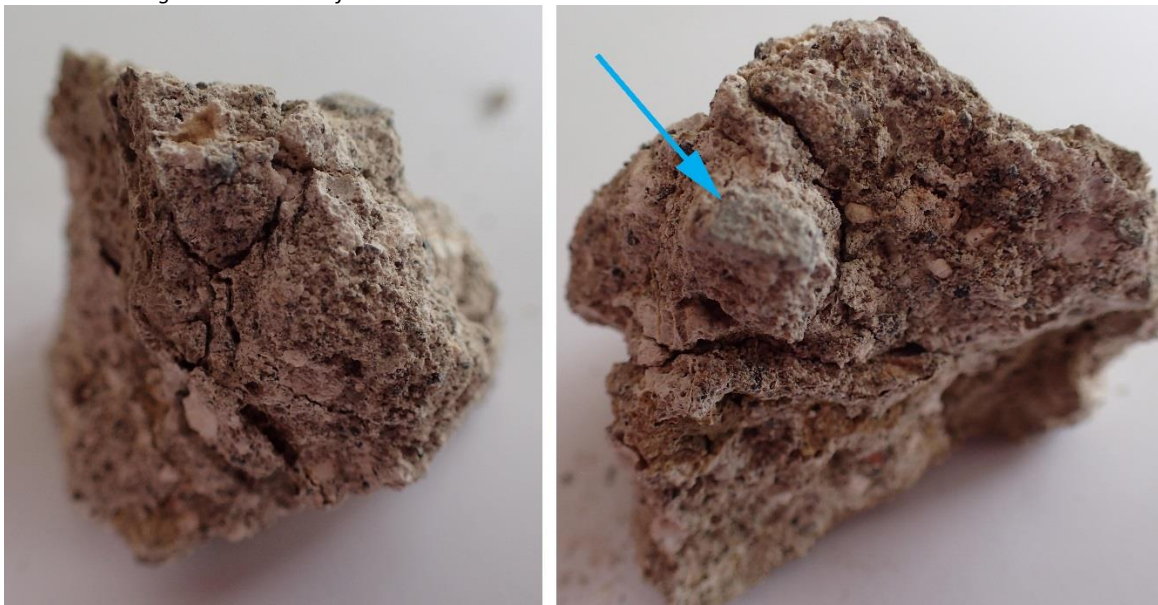
Interpretation: The mortar is consistent with a traditional lime-based mortar. The aggregate appears to be a river sand.

Key Properties			
Colour	Off-white	Size	Various
Dry Weight (gm)	335	Porosity (%)	9.38% - >45%
Aggregate	Sub-angular to sub-angular low-sphericity and high-sphericity poorly-sorted limestone, sandstone, chert, quartz, siltstone and other lithic aggregate sized <12mm, and most aggregate sized <2mm. 'Lime lumps', a by-product of lime burning, are commonly found well dispersed throughout the mortar, and now act as part of the aggregate.		
Porosity	Visible open macro-pores (<1.5mmØ)		
Inclusions	No hair or other additions noted Angular brick / fired clay ceramic fragments are present.		
Condition	Enlarged pores and vuggy voids (≤4mm) present suggesting enhanced porosity due to weathering. The pores are commonly lined with recrystallised lime.		

Table 2: Description of the lime mortar sample from Trench 11, Sweeney's Orchard

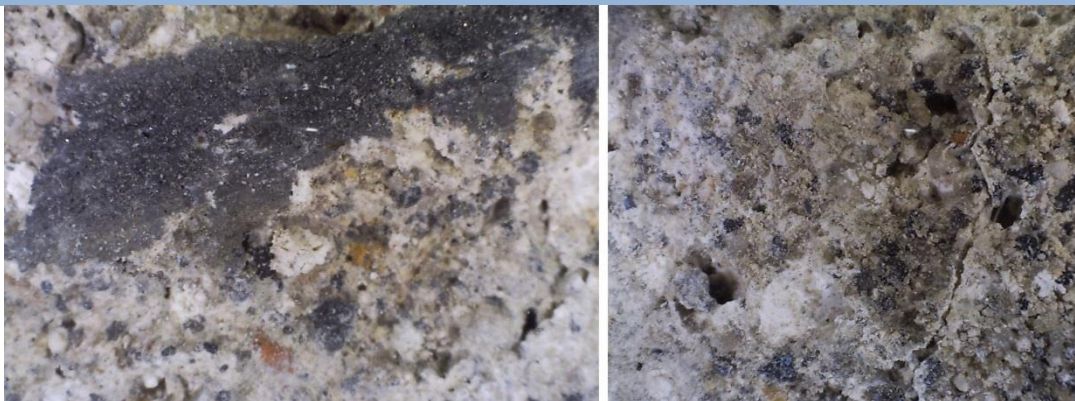


Above: View of mortar from Sweeney's Orchard in hand sample. Note the formation of a separate layer (left) on the underside through redistribution of the lime.



Above: View of mortar sample showing cracking, whitish 'lime lumps' & recrystallised lime (arrowed).

Sweeney's Orchard, Kilkenny – Sample #1



Above: Microscopic view of the mortar showing lime lumps and poorly sorted aggregate in a lime binder matrix (left). Open cracks are commonly seen (right).



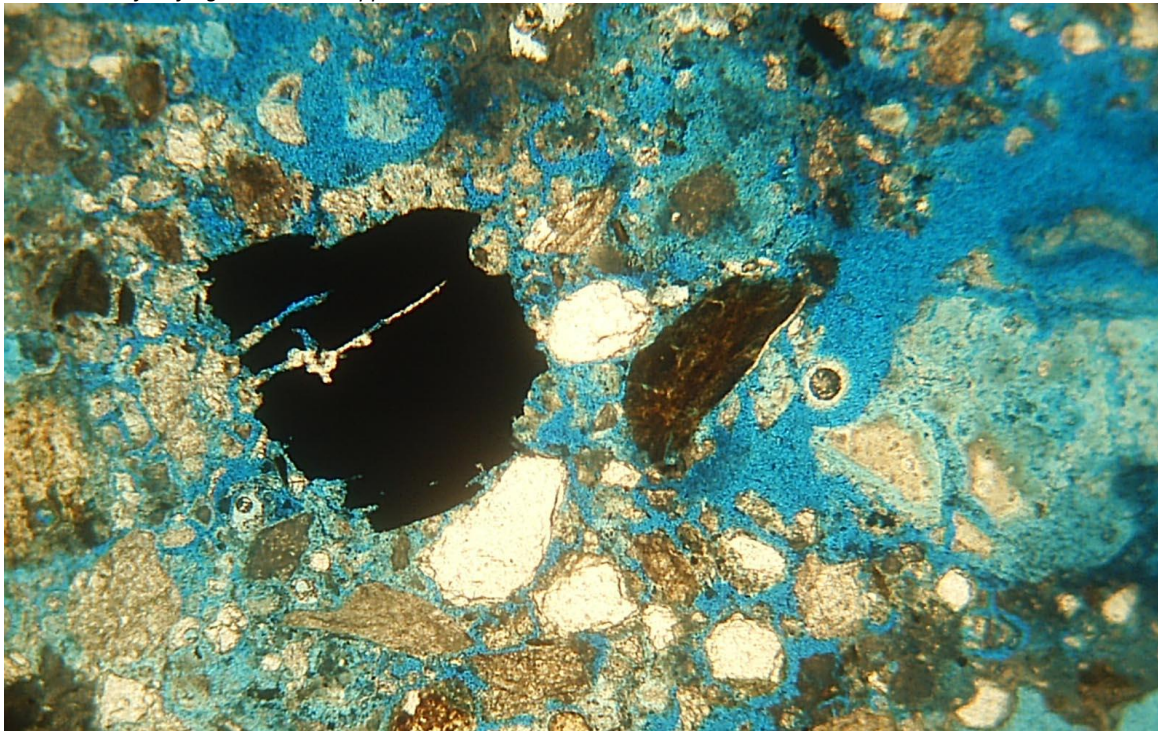
Above: Microscopic view of the mortar showing fine aggregate & an angular ceramic fragment (pozzolan, arrowed).



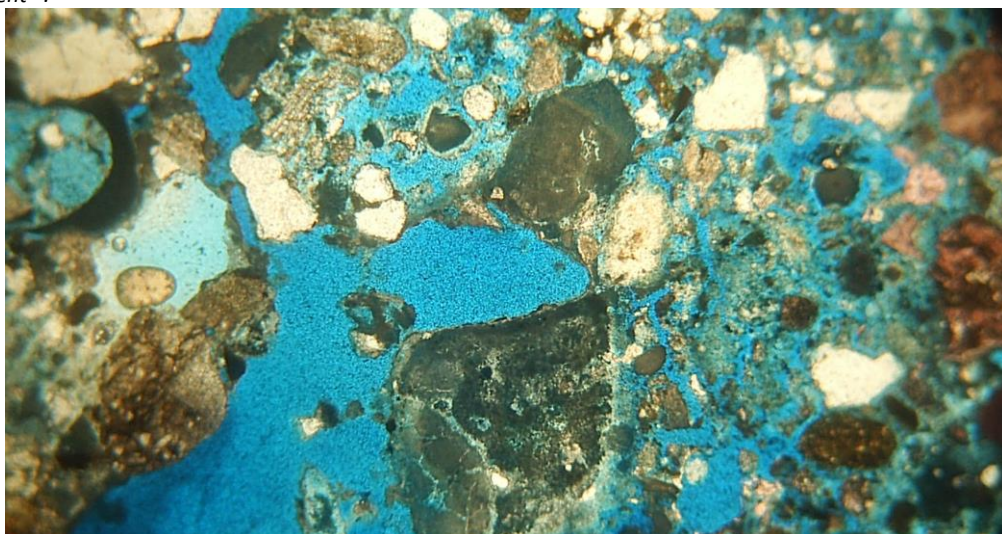
Above: Microscope detail showing clay (brown & yellow-brown) and a ceramic fragment (pozzolan, arrowed).



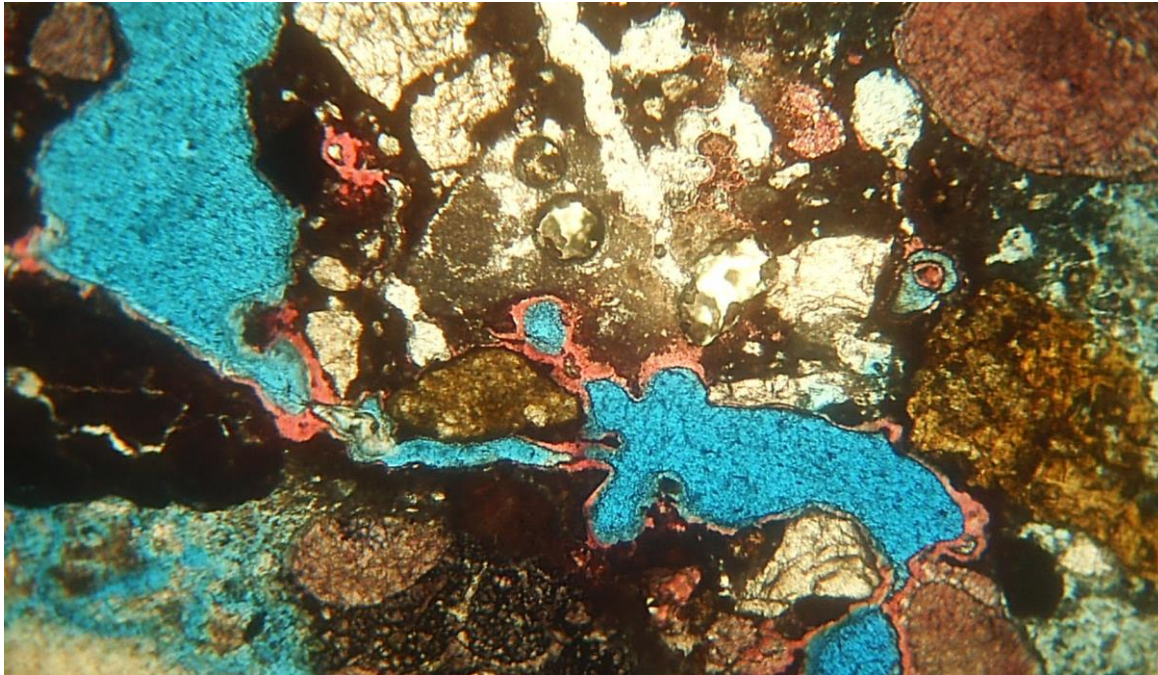
Above: Burnt fuel fragments which appear to be coal.



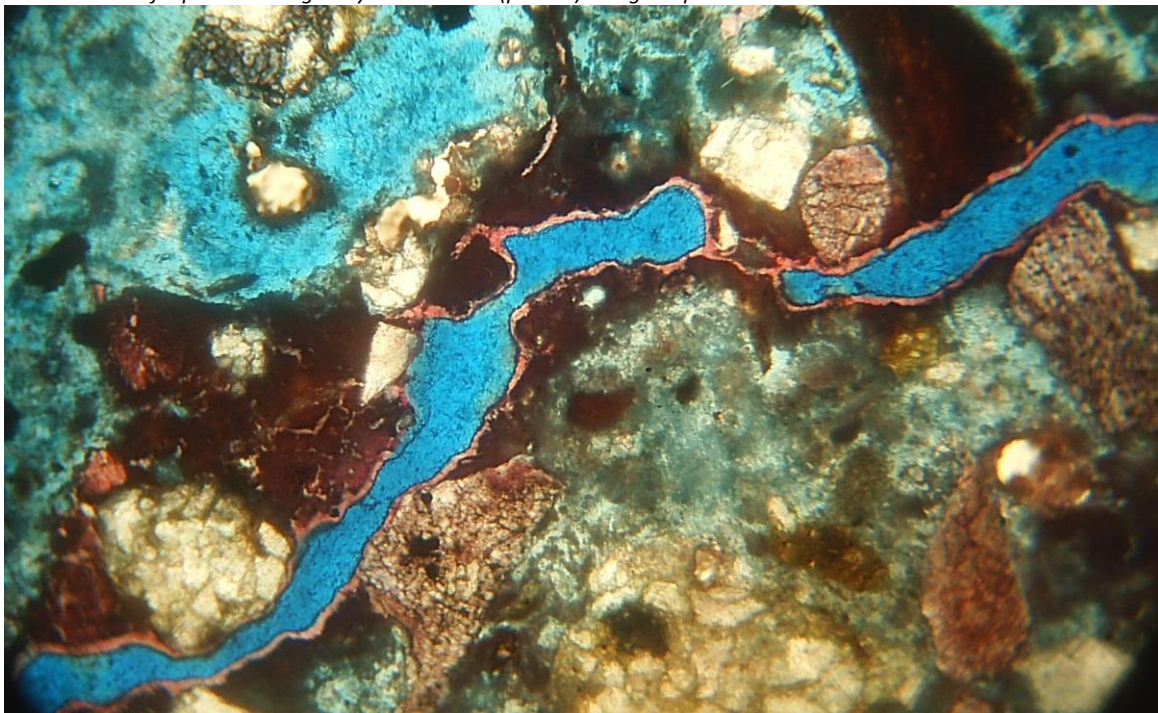
Above: View of Thin Section #1 showing a weathered lime-based mortar with enhanced porosity and a burnt fuel fragment¹⁵.



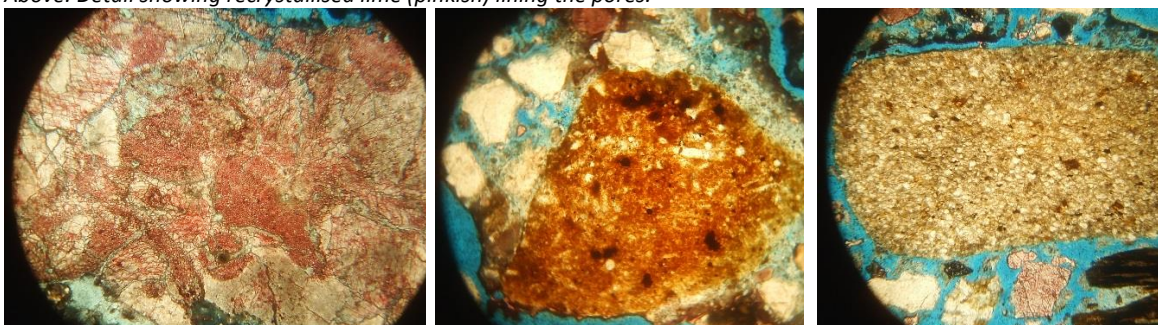
Above: Much of the mortar shows enhanced porosity (blue areas) which suggests prolonged weathering



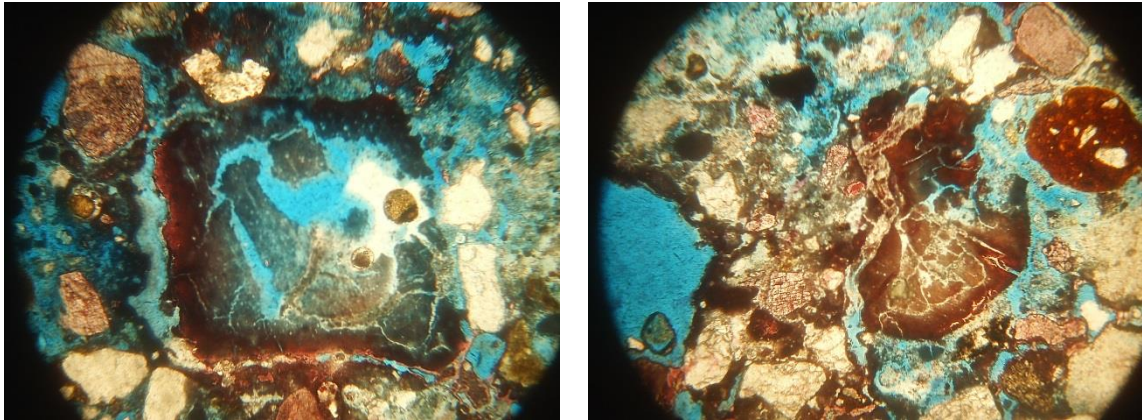
Above: Detail of a pore showing recrystallised lime (pinkish) lining the pores.



Above: Detail showing recrystallised lime (pinkish) lining the pores.

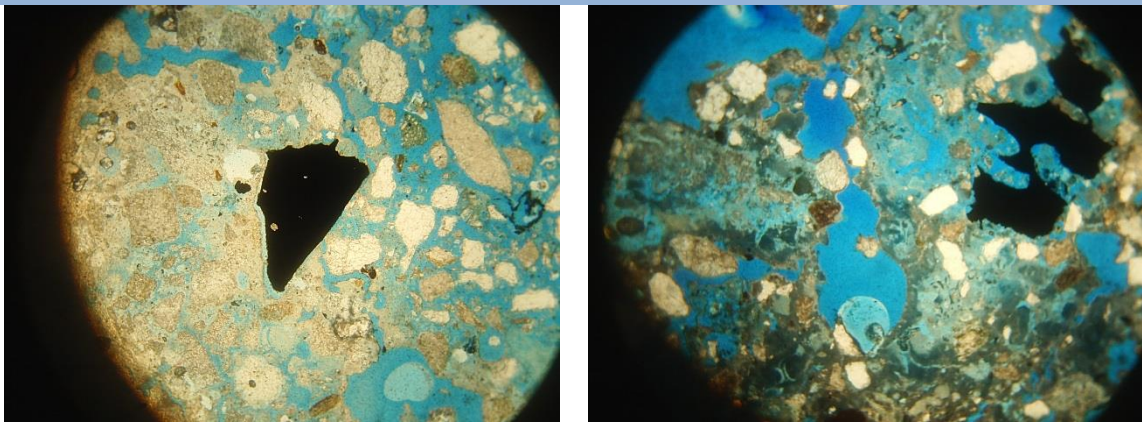


Above: The aggregate consists of a range of lithics including fossiliferous and other limestones, chert, sandstone, siltstones

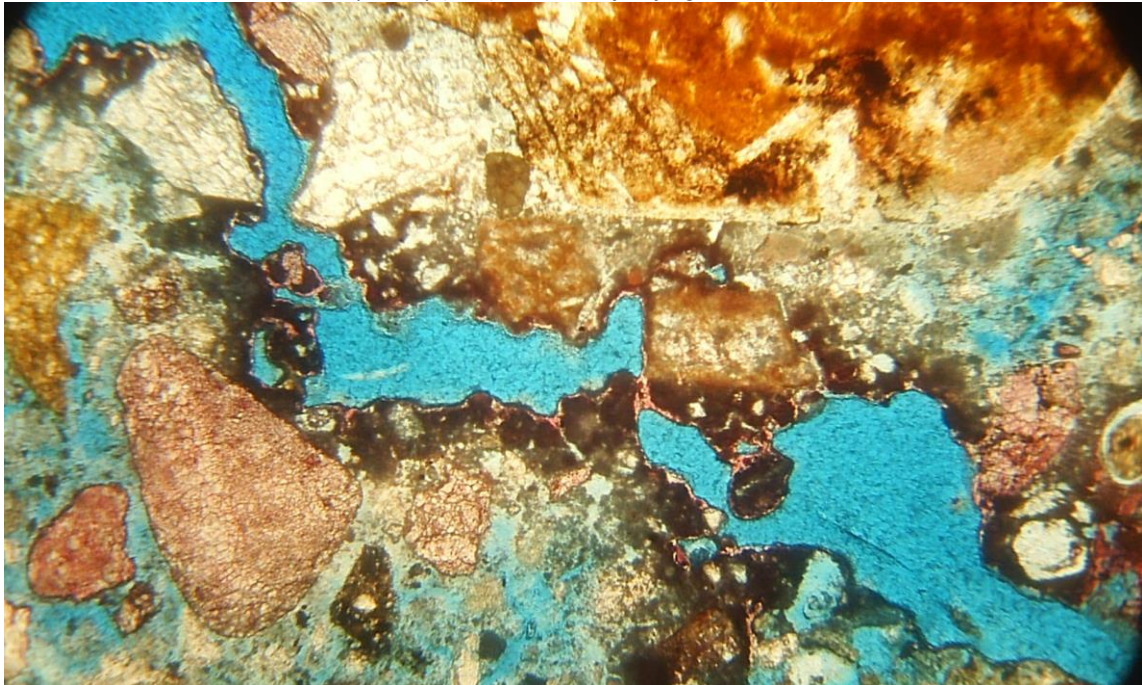


Above: Fractured 'lime lumps' now form part of the aggregate fraction of the mortar.

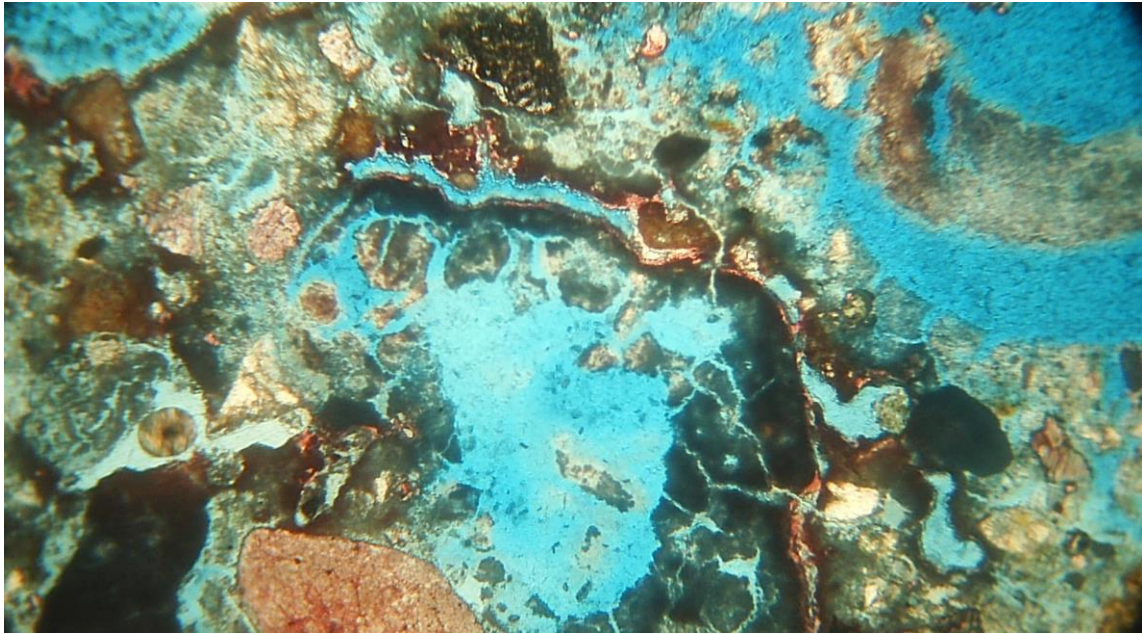
Sweeney's Orchard, Kilkenny – Sample #2



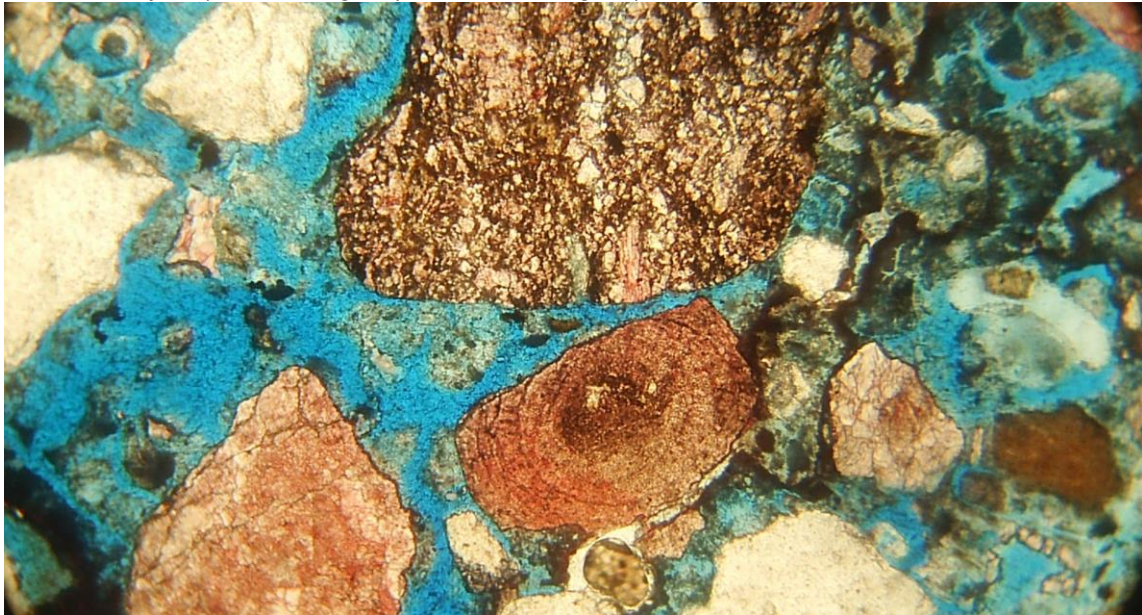
Above: The mortar shows enhanced porosity (blue) and coarse fuel fragments (black).



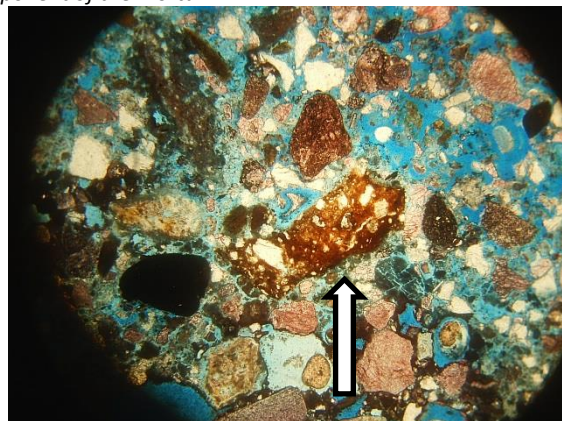
Above: Detail showing recrystallised lime (pinkish) lining the pores, with poorly sorted aggregate of limestone, chert and other lithics supported by a lime binder matrix.



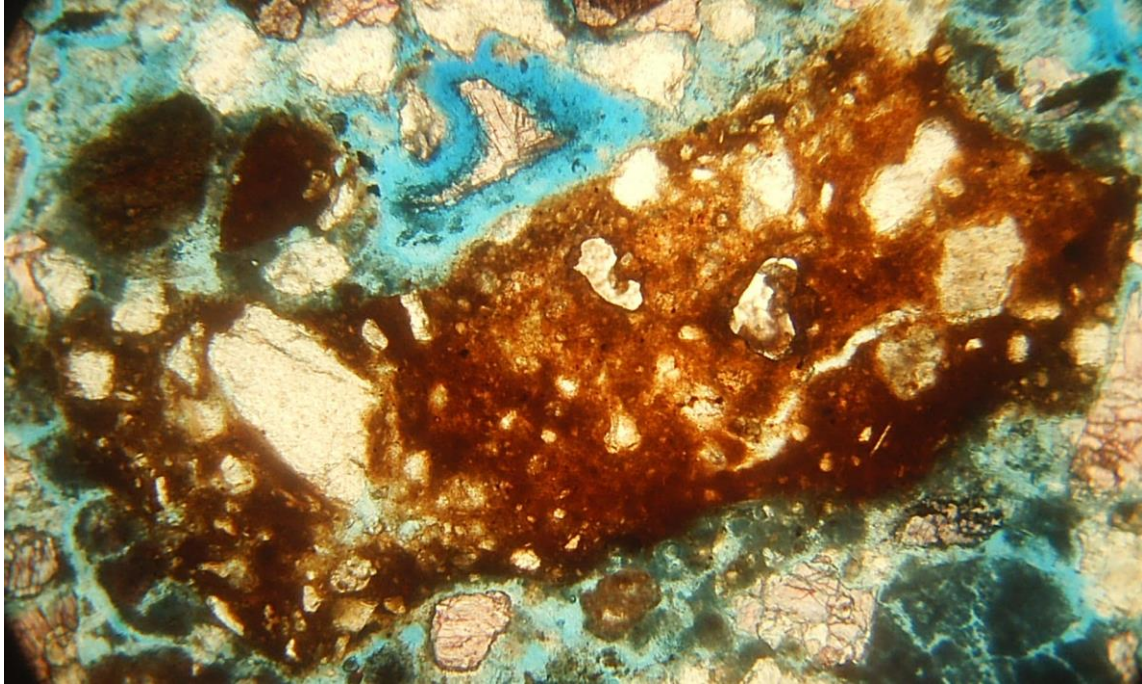
Above: Detail of Sample #2 showing recrystallised lime lining the pores.



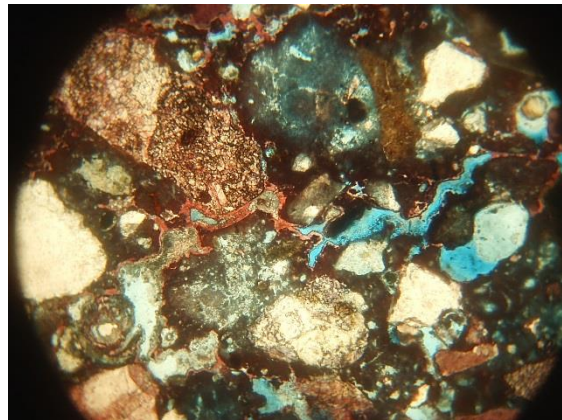
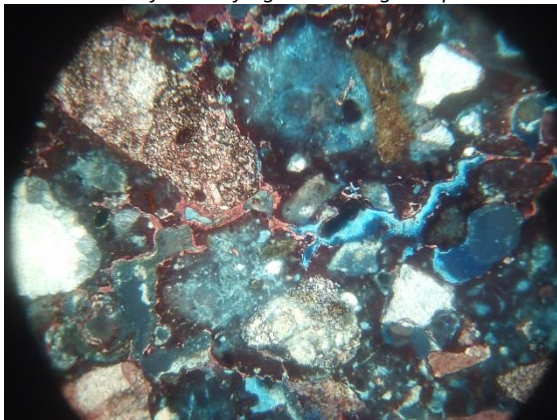
Above: Limestone predominates among the aggregate component of the mortar



Above: The sample contains burnt ceramic fragments – brick dust was often added to post-medieval mortars as a pozzolan to provide a hydraulic set to the mortar.



Above: Detail of a brick fragment acting as a pozzolan.



Above: General view of the mortar showing enhanced porosity, poorly sorted aggregate composed of a range of different stone types, and recrystallised lime lining the pores.

4. Discussion

The fragments of mortar sample recovered from the masonry wall within Trench 11 were all reasonably consistent in composition and share common features:

- a. Most aggregate consisting of low sphericity rounded to well-rounded sand representing a range of stone types including limestone, chert, sandstone, siltstone and a lesser fraction of other lithics. This is probably a river sand.
- b. All samples showed significant water-related deterioration in the form of recrystallised lime. This lined the porous network, formed new layers within the mortar, and covered aggregate grains.
- c. The mortar contained abundant burnt fuel fragments – these appear to be coal.
- d. The mortars showed c.9.3->45% porosity.
- e. The original mix proportions could not be securely determined due to later alteration, but the most unaltered areas suggested a lime-rich mix

Potential for Radiocarbon Dating: The samples offer very poor prospects for dating:

- There was no charcoal or organic material within the mortar which would have been suitable for dating.
- There are abundant lime lumps (which can be radiocarbon dated). However, the degree of recrystallisation of lime means that the sample is contaminated and cannot be relied upon to provide an accurate date. Note that recrystallised lime is found coating lime lumps (see Photos P.5 & P.10). As the lumps are altered, any date could give the date of recrystallisation and not the construction date.

Relative Dating: There are some indicators that the mortar is likely to be post-medieval:

Coal was used – this is common in post-medieval samples, while timber, peat and charcoal are more often found in medieval samples¹⁶.

Brick/ceramic fragments were used – these are commonly found in post-medieval mortars. While brick is a taxable commodity from the 13th century in Ireland, brick does not occur in the archaeological record until the sixteenth century, with the earliest brick dating to 1505 AD in Dublin¹⁷. Brick was used for specialised purposes towards the end of the 16th century, but only came into more widespread use in Ireland from the 18th century onwards. While Kilkenny had high quality limestone masonry, the clay in the surrounding hinterland was suitable for making quality brickwork. Bricks were used in post-medieval buildings for wall linings and for their precision in the construction of building elements such as chimneys, dressings, window openings and creating pockets for floor joists. The waste from this activity (crushed brick) was then incorporated into mortars as an additive to improve setting and durability. This means that as brick pozzolan is found in the mortars from the wall in Trench 11, the mortar should be considered post-medieval.

Endnotes

- ¹ Rice, K. DRAFT archaeological testing report – Sweeney's Orchard, Abbey Quarter, Kilkenny City. License 18E0213. Unpublished report dated July 2018 by Courtney Deery Archaeological & Cultural Heritage. P.21
- ² Teutonico, J.M. (1988) *Architectural Materials – a Conservation Laboratory Manual*. Rome. Unpublished ICCROM manual.
- ³ Pavia, S. and Bolton, J. (2000) *Stone Brick and Mortar: historical use, decay and conservation of building materials in Ireland*. Bray. Wordwell books.
- ⁴ Ashurst, J. (2002) *Mortars, Renders and Plasters in Conservation*. Second Edition. Leominster. Ecclesiastical Architects and Surveyors Association.
- ⁵ Van Hees, R.J., Binda, L., Papayianni, I. & Toumbakari, E. (2004) "Characterisation and damage analysis of old mortars", *Materials and Structures*, Vol. 37, Pp.644-648
- ⁶ Croot, C.J.W.P. et al (2010) "TC.07 Performance and Repair Requirements for Renders and Plasters" in Valék, J., Groot, C. & Hughes, J.J. [eds] *2nd Historic Mortars Conference HMC2010 and RILEM TC 203-RHM Final Workshop*, 22-24 September 2010, Prague, Czech Republic. Pp. 1359 - 1363
- ⁷ Ingham, J. (2011) *Geomaterials under the microscope*. London. Manson.
- ⁸ Department of the Environment, Heritage and Local Government. (2004) *Architectural Heritage Protection: guidelines for planning authorities – guidance on Part IV of the Planning and Development Act 2000*.
- ⁹ e.g. Bolton, J. (2010) "Irish Medieval Mortars: Implications for the formulation of new replacement mortars", *2nd Historic Mortars Conference & RILEM TC 203-RHM Repair Mortars for Historic Buildings*, Prague, 22-24
- ¹⁰ The chemical compound hydrochloric [or muriatic] acid is the aqueous (water-based) solution of hydrogen chloride (HCl) gas. The acid was used as a simple acid catalyst to test for the presence of calcium carbonate [which effervesces vigorously releasing carbon dioxide].
- ¹¹ Mechanical resistance is lowered, thermal insulation is reduced, harmful chemical reactions, biodeterioration processes and salt-related decay processes may occur.
- ¹² 'Trapped' pores are an important fraction of the porous network, and may reach c.60% of the total porosity. These are filled with air and can act as an 'empty' expansion space during ice/salt growth.
- ¹³ The operation of this quarry is described in Hand. T. (2011) " 'Doing Everything of Marble wch can be Done with it': some descriptive accounts of the Kilkenny Marble Works", *Irish Architectural and Decorative Studies*, No.11, Pp.74-99
- ¹⁴ The riverbed and associated masonry structures were examined by the report author as part of underwater archaeological survey of the Nore by ADCO in advance of flood protection works. The River Bregagh was too contaminated to allow diver survey.
- ¹⁵ The material appears to be coal. However, coals are usually examined microscopically under high power in reflected light using oil-immersion objectives, and their detailed petrology is beyond the scope of expertise of this report.
- ¹⁶ Coal has been reported in medieval mortar samples from other countries. However, I have not (yet) encountered coal in a sample from a medieval mortar from Ireland.
- ¹⁷ A.Giacometti, pers.comm.

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