Replica Kiln Build & Firings

Report

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Introduction

Potters have always felt a certain allure to natural spaces — people who are no strangers to being forced to slow down with the seasons and allow the natural cycles to take effect. There is a lot of waiting involved in pottery: for kilns to cool, for pots to rest before trimming, for glazes to be refilled. But something that has been nearly completely removed from modern practice is the wait for available clay. It is something taken for granted — the fact that these materials form over hundreds of thousands of years, then lay waiting to be processed, roughly moulded, and tossed into a fire to be changed forever into ceramic.

When the Roman Empire developed Londinium around two thousand years ago, a small ceramics site was established in the rolling hills approximately five miles north-west of its centre. The potters of the time — most likely just as enamoured with natural spaces as we are today — found a thriving woodland with streams, Hornbeams, Oaks, and, most importantly, rich clay deposits. They established what would become the largest Roman pottery manufacturing site found in London, operating for over 100 years in what is now Highgate Woods.

It is incredibly fortunate that Highgate Woods has remained one of the few untouched natural spaces in London, and that such a rich history can be gleaned from its geological and archaeological record. Through the Friends of Highgate Roman Kiln, a project to better understand the site through practical archaeology has taken shape — given additional impetus when Turning Earth opened a ceramics studio in 2022 just across the road from the historic site. Between 2024 and 2025, over 130 potters participated, contributng to the volunteer pool who built the replica kiln, and making more than 800 pots across three firings of the kiln.

This report covers the research and practical achievements of the Roman Kiln Project from its inception through September 2025, encompassing three firings of the replica updraft wood kiln. The project has been carried out in collaboration between the Friends of Highgate Roman Kiln, Turning Earth Ceramics, and Potted History, with community participation at its core.

Highgate Clay
Geology and Properties

The clay that forms in and around Highgate Woods — known as part of the "Claygate" beds — has been locally referred to as "Highgate Clay". It can be identified by its rich turmeric colour, high iron content, and willingness to be formed in its raw state. Crucially, this clay also has an exceptionally high silica content compared to other clay bodies. Due to its geological history, this clay in its pure form can only be found in a few areas around London. The most notable deposit is in Highgate Woods, with smaller pockets in Queens Wood, Hampstead Heath, and local residential gardens and allotments in the area. The ratios of clay content vary quite rapidly, as evidenced by geological surveys, with some spots yielding between 4–20% clay.

A quick field test — rolling the moistened clay into a 4mm-thick coil and wrapping it around a forefinger — gives an initial sense of plasticity and clay percentage. And indeed, Highgate Clay has some remarkable properties for a wild clay body. Being both iron-rich like most earthenwares but also high in silica like stoneware, it forms a sort of natural hybrid. It is highly plastic and can be thrown incredibly thin, yet when bone dry it is very durable — a characteristic that proves especially well suited to Roman kiln firing techniques.

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Highgate Clay
Processing

Approximately 2.5 tons of clay have been collected from the woods and processed for the project to date. Due to the local climate and the properties of the clay, wet processing is strongly recommended over dry processing for this particular material. The following method has been refined across the project's duration:

Identify a suitable seam, free from large tree root structures and concrete foundations (both introduce leaching acids that degrade the mica and render fired material brittle)

Slake the clay in water (just enough to cover) for at least one week, breaking into smaller sections by tearing — not squeezing — to aid absorption

Mix thoroughly, then allow to settle for a further 24–48 hours so rocks sink and roots float

Siphon off the top water carefully, preserving the fine surface particles, then pass through a 60 mesh sieve into a secondary bucket

Allow to settle for up to another week, then siphon again

Transfer into double-layered cotton or polycotton pillowcases; hang to drip and air-dry, or arrange in a frame to dry in even 'sheets'

Once the desired consistency is reached, wedge thoroughly on plaster or wood to incorporate any settled sediment and even out moisture content

An important caveat: if left too long, the processed clay becomes extremely hard and resistant to re-slaking, owing to the strong silica-alumina bonds that form as moisture dissipates. Once the window of workability has passed, the slaking process must begin again from the start. The clay is fully usable immediately after processing; the effect of 'ageing' clay — traditionally thought to improve plasticity — remains under investigation for this specific body.

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Highgate Clay
Replica Ware Creation

The pottery produced in and around the Highgate Woods site in the Roman period consisted predominantly of storage and cookware, along with functional vessels. The most notable form is the 'poppy-head beaker' — a distinctive vessel whose form has been closely studied through original sherds and documented in the archaeological record.[1]

Participants in the project have studied original pottery fragments recovered nearby, replicating the minute details of rolled rim finishing, decorative techniques, and throwing style. This examination of the physical evidence has been central to understanding the making process and to producing work that genuinely engages with the Roman potters' own practice. Courses in wild clay processing deepened participants' understanding of the geological and structural qualities of the material before approaching the wheel.

Over 130 potters have now participated across the three firings, with more than 800 pots produced in total. The overwhelming enthusiasm and commitment from everyone involved — to build, fill, and fire the replica kiln across three cycles — has been one of the most rewarding aspects of the research. The project has also forged a connection between contemporary ceramic practice and the deep history of the specific landscape in which Turning Earth, the partner pottery studio, operates.

1 see *The Roman Pottery Manufacturing Site in Highgate Wood*, Brown & Sheldon).

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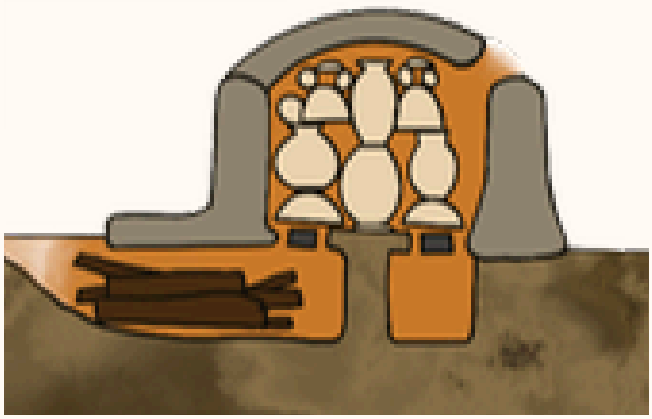
Replica Kiln
Design and Construction

The replica Roman kiln, built in 2024, was constructed using historically accurate techniques under the leadership of master potter Graham Taylor of Potted History. It is the largest replica Roman kiln in the country. The kiln follows blueprints based closely on the original excavated kilns at the Highgate Woods site. [1] Graham Taylor is not only a highly experienced potter with extensive experience in heritage ceramic techniques, but has also constructed and fired the replica Roman kiln at Vindolanda, Northumbria.

The key structural elements are: wattle and daub walls using vertical hornbeam support posts and woven willow; a Roman arch technique firebox; a central plinth with firebars (pre-made by Graham Taylor) allowing heat and flame through to the chamber; and a capping roof erected over each firing. The firebox is notably longer than average — a feature believed to relate to the efficient use of coppiced Hornbeam branches of a specific length. Branches of this dimension were ideal: thicker ones would have been more valuable as fenceposts; longer ones unwieldy to handle; shorter ones would burn too quickly.

The main body of the kiln is then ready for stacking with pottery and capping off with more daub (a process repeated for each firing). Loading the kiln requires careful attention to flame paths and heat distribution. Iron-rich work is stacked to allow good air circulation in the lower sections, with the pack becoming progressively denser towards the top while maintaining flame routes throughout.



Once loaded, the roof is sealed using wasters (broken or sacrificial pieces), pre-formed roof-support bars spanning between the kiln wall and central pillar, and then packed with daub over the top. A small fire is maintained below 100°C for 1–2 hours to set the daub roof prior to the main firing.

[2] The Roman Pottery Manufacturing Site in Highgate Wood: Excavations 1966–78 by A.E. Brown and H.L. Sheldon)
[3] This ‘recipe’ may not be directly transferable to other clay bodies or sites. Continued documentation is recommended..

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Replica Kiln
Firings 1 and 2 (2024)

Firing 1 (1st September 2024): Foundation and Proof of Concept

The first firing, led by Graham Taylor, coincided with the public reveal of the original Roman kiln. Approximately 340 pots were loaded, comprising a mixture of Highgate clay and commercial stoneware (roughly 30–40% Highgate clay). As a freshly built kiln with walls still retaining moisture despite pre-heating efforts, it struggled to reach full temperature; the maximum recorded was around 900°C at a single measurement point.

The firing was nonetheless a considerable success. Breakage was approximately 15–20%, within the accepted threshold of 20–25% for experimental firings of this type. Reduction was patchy — pockets of reduced, darkened pottery appeared where pots were stacked inside one another, creating micro-environments that restricted oxygen. This observation informed subsequent loading strategies. Graham Taylor raised the question of a small access flue apparent in the archaeological record near the rear of the firebox, suggesting it may have been used to introduce additional reduction during the cooling phase.

Firing 2 (21st September 2024): Pushing for Full Temperature and Reduction

The second firing, led by Shem Morgan of Turning Earth, reloaded many of the same pots in an attempt to reach the full target temperature of 1000°C and achieve comprehensive reduction throughout the kiln. The kiln reached the goal temperature and achieved full reduction, but rain water pooling in the firebox led to the re-oxidising of work before reduction could be held. The lessons learned regarding flame paths, pack density, and kiln management informed the significantly more detailed preparations for the third firing.

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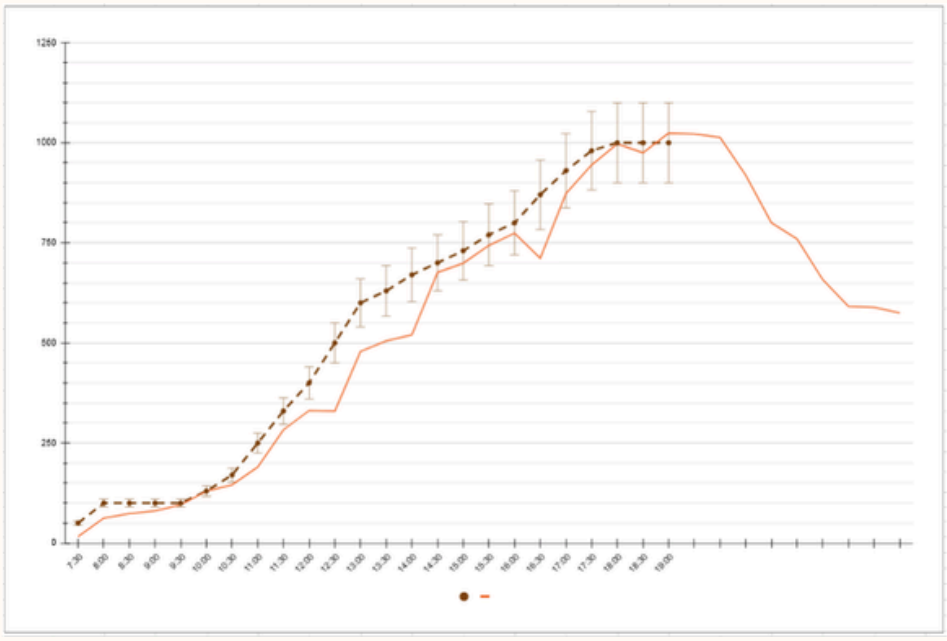
Replica Kiln
Firing 3 (2025)

The third and most ambitious firing took place on 13th September 2025. Preparation was the most intensive and informed of the three, building on two years of accumulated learning. Key decisions included:

Using only Highgate clay with no commercial blends. The hypothesis was that higher concentrations of iron-rich clay would facilitate better reduction.

Revising the kiln pack to allow clear flame paths and airflow through the lower sections, with packing becoming progressively denser towards the top to encourage even heat distribution. The ceramicist Nancy Fuller kindly lent her expertise of loading and firing anagama kilns to aid with this process. 407 pots were loaded in total — the largest firing yet, with over 100 potters having contributed work.

The results exceeded expectations. The kiln achieved sustained temperatures of 1000–1100°C held for approximately 2–3 hours, allowing the entire chamber to reach temperature.



A total firing takes approximately 12 hours, followed by a reduction shift before cooling. The third firing produced the most accurate temperature ramp data to date, enabling comparison across all three firings. A notable event at around 800°C — potentially related to quartz inversion — has been flagged for further analysis.

The Roman potters would have gauged temperature by the heat emanating from the flue and the colour of the flame — analogous to techniques still used in salt-glaze firing, where test items are periodically removed from the kiln once a certain visual threshold is reached.

Replica Kiln
Firing 3 (2024) continued

The result was a fully reduced kiln load: pots emerged with an almost pewter-like appearance — deep blacks and greys — vitrified to the point of holding water.

This was the most successful firing to date in terms of temperature, reduction, vitrification, quantity, and overall community engagement.

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Replica Kiln
Key Learnings and Reflections

Structural considerations

Several structural challenges and questions have emerged from operating Mooki across three firings and inform decisions about future kiln construction:

- The central plinth has suffered cracking and crumbling due to the daub mix and the stresses of firing; investigation into whether a stable earth core remains underneath is required, as further investigation may cause further deterioration.

• The firebox was lined with bricks in the 2025 firing to combat erosion from repeated fuel insertion. This is not evidenced in the Roman archaeological record, raising the question of whether the characteristically wide fireboxes of original kilns were a response to this same erosion problem.

• Location on the flat playing field plateau resulted in flooding of the firebox during rainfall, leading to re-oxidisation of work in Firing 2. The question of whether original kilns were angled for drainage, or deliberately positioned on a slope, merits further investigation.

• A decision must be made on whether to continue with and repair the kiln (with thicker walls from the outset in any rebuild), or construct a new kiln in a better-positioned location.

Kiln Fuel

Each firing consumed between 350–400 kg of wood. The primary fuel is coppiced hornbeam — its branch length is believed to have directly influenced the unusually long firebox design of the original Roman kilns. Oak and other fast-burning hardwoods were used in the replica firings to reach and sustain higher temperatures. One significant operational challenge has been that Hornbeam was not fully seasoned in either firing, introducing moisture that disrupted the steady temperature rise. Questions remain for ecologists regarding the Roman potters' original harvesting schedule and storage methods to ensure adequately seasoned wood at firing time.

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Replica Kiln
Key Learnings and Reflections

Transfer of experiential knowledge

A key learning of the project was the importance of knowledge transfer. This principally occurred from Graham Taylor to Shem Morgan, both in respect to the construction of the kiln but also its operation. Other members of both build and firing teams also gained unique experience. This mirrors traditional methods of apprenticeship, hands-on learning and generational experience.

Role definition and team co-ordination

Each firing involved a coordinated and rotating team of volunteers fulfilling distinct roles. **Stokers** control the flame and adjust the heatwork by riddling the coals and managing the firebox. **Daubers** continuously reinforce and patch the kiln capping throughout the firing. **Stackers / wood crew** split, sort, weigh and record the wood supply so accurate records can be kept of how mch wood is consumed. A **foreman** coordinates operations and monitors the overall firing. This includes monitoring the temperature of the kiln as recorded on the four thermal sensors installed in the walls of the kiln.

Detailed record keeping and close analysis of firing 'mistakes' provide valuable insight

It was important to record the position of the various wares in the kiln, as this allowed analysis of marks, cracks and warping, which in turn provided insights into the flow of heat around the stacked kiln.

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Replica Kiln
Areas for Further Research

The following questions and investigations are outstanding and will inform the next phase of the project:

- Chemical analysis data for Highgate Clay

- Geological survey comparison: clay ratio variation across Highgate, Queens Wood, and Hampstead Heath sites

- Effect of clay 'ageing' on plasticity and workability — currently under controlled observation

- Temperature ramp analysis: comparison of all three firings, including the 800°C event and its potential relationship to quartz inversion.

- Ecological questions: what was the Roman harvesting schedule for Hornbeam? How was wood stored to ensure adequate seasoning at firing time?

- Were the original kiln fireboxes angled for drainage and heat direction? Were bases levelled or did they take advantage of the hillside topography?

- The function of the small access flue at the rear of the firebox evidenced in the archaeological record — possible use for introducing late-stage reduction

- Assessment of remaining viable life of current kiln vs. feasibility of new kiln construction; optimal location for any future kiln

- Further form experimentation: additives to Highgate Clay yet to be trialled; range of achievable forms by different potters

- Investigation of the origin of terra sigillata that ‘fits’ the Highgate clay shrinkage rate

- Further investigation based on the different forms exhibited in the range of Roman kilns found in Highgate Wood. What are the material effects of the differences in form and size?

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Conclusion

The Roman Kiln Project has achieved more than its initial scope over the 2024–2025 period. What began as a practical archaeology initiative has grown into a rich, participatory research programme — producing real scientific data on Highgate Clay, advancing understanding of Roman kiln design and operation, and reconnecting a large community of contemporary potters with a landscape of profound historical significance.

The third firing of Mooki in September 2025 represents the clearest demonstration yet of what the project can achieve: fully reduced, vitrified pottery produced using wild local clay and a historically informed kiln — precisely as it was done in these same woods two thousand years ago. The project will continue to contribute to the research of the Highgate site and its unique clay, and to share its findings with passionate potters and archaeologists far and wide.

The project team wishes to acknowledge with particular gratitude: Nick Peacey, Harvey Sheldon, Charlie Andrew, the Highgate Wood team led by Cindy Blaney, Kieren Keeton, Monika Smith, Graham Taylor, Rob Shakespeare, and all the talented potters who took part. And to Mooki the potter, who gives her name to the kiln — may she continue to inspire.


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