

The landscape and geology of Mousehold Heath

Mousehold Heath has been valued resource for the people of Norwich for over a thousand years. Cartloads of its sand, gravel, lime and flint have gone into building the city.

Mousehold Heath today is the last remnant of a once larger tract of open heathland founded on Ice Age sands and gravels. In the 19th century it was a rolling and hummocky expanse of heather and bracken, much painted by artists; it was dotted with quarry pits and hollows, and home to distinctive heathland wildlife.

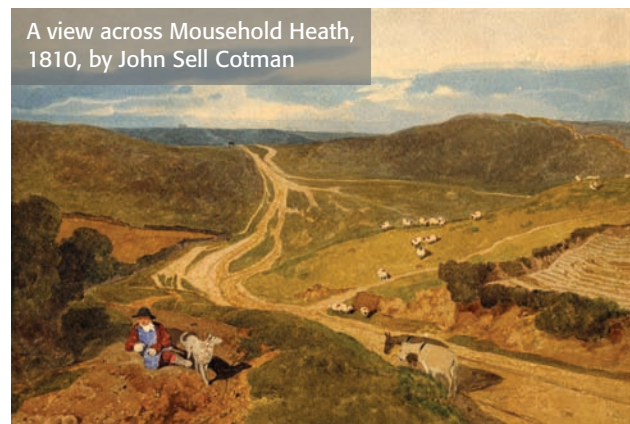


Photo © Trustees of the British Museum

The open Heath was maintained by the nibbling teeth of sheep and rabbits, by quarrying and continuing removal of firewood. In 1886 it was declared an outdoor leisure space for the City.

A few areas of original heathland remain today, carefully maintained for their fragile wildlife value. Tree cover has increased over the last 70 years, so that most of the historic heath has now become wooded. Most of the old quarries are now shady pits and dells. The Heath is now a designated County Wildlife Site.

Mousehold Heath has a fascinating Earth heritage. Imagine peeling back its surface layers and discovering the million year-old stories in its rocks and sediments.

We invite you to explore the 'geodiversity' of the Heath, the processes which have shaped it over deep time, and its history of mineral extraction. This leaflet introduces the Trail, and further information will be made available on the Web.

Find out more

- Visit the Geological Society of Norfolk website: www.norfolkgeology.co.uk
- Find out about the Heathland Habitat Action Plan at Norfolk Biodiversity Partnership's website: www.norfolkbiodiversity.org
- Find out about managing the Heath at Norwich City Council website: www.norwich.gov.uk



- Find out more about conserving Norfolk's Earth heritage via the Norfolk Geodiversity Partnership website: <https://sites.google.com/site/norfolkgeodiversity/>

Acknowledgements

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Picture credits

Cover photos :

- Gravel pit © British Geological Survey P205584
- Flint axe Courtesy Proceedings of the Prehistoric Society, 1935
- Fossil jaw © British Geological Survey P779768

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Exploring Mousehold Heath

EARTH HERITAGE TRAIL



INTRODUCTION

The Earth Heritage Trail introduces you to the geological history of Mousehold Heath, and over two centuries of quarrying. Thanks to its sandy soils, the Heath is a valuable example of heathland habitat, with a range of fascinating wildlife.

The Trail

There are 18 points of interest; some are marked with waymark posts. You can discover them in any order; each one links the landscape and wildlife of the Heath today with its deep geological history.

The map overleaf shows the location of the posts, and other information such as car parks and public toilets.



Trail post

The landscape history of Mousehold

75 million years ago - Part of a warm, tropical sea in the Cretaceous period. The Chalk is deposited, and now forms the local bedrock.

75 to 0.7 million - Any sediment deposited during this time period has been removed by erosion.

2 to 0.7 million - The Norwich area is near the western edge of the North Sea in a cool temperate climate. Marine sands, gravels and clays of the Craggs are deposited on top of the Chalk.

630,000 to 425,000 years ago - The Norwich area is over-run by two ice-sheets. Sands, gravels and clays are deposited beneath the ice or by meltwater, forming a thick stack of glacial sediments at Mousehold.

420,000 to 10,000 - Through several cycles of warm and cold climatic periods, Mousehold begins to take shape as an upland area on the edge of the Wensum valley. In cold phases it is part of the permafrost zone with a tundra climate. Neanderthals visit the area in milder periods. Humans of our own species recolonise Norfolk from about 12,000 years ago as the climate warms up.

10,000 to present day - Mousehold becomes forested. Human impacts lead to the development of heathland and sandy podzol soils. Quarrying for chalk, flint, sand, gravel and brickearth alters the natural shape of the land.

1 St James Hill

This is an outlying spur of the Mousehold plateau, giving wonderful views of Norwich and the Wensum valley. The valley began to form at the end of the Anglian glacial period, some 425,000 years ago.



Mousehold Heath is underlain by a thick stack of glacial and Crag sediments. A borehole near Britannia Barracks recorded 26 m (107 ft) of sand and gravel resting on Chalk.

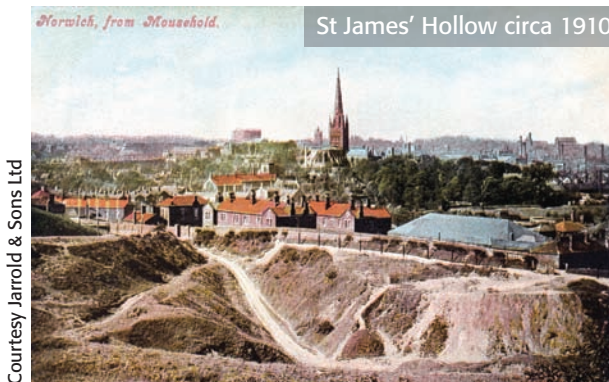


Sheep's Sorrel *Rumex acetosella*
and Cypress-leaved Plait-moss
Hypnum cupressiforme

St James' Hill is a good place to see one of the dry valley landforms of Mousehold. Dry valleys formed in permeable soils during the Ice Age, perhaps when climate was wetter

and ground-water levels were higher, or in permafrost conditions, when the ground was frozen so it could be eroded by meltwaters.

The sandy soils of St James' Hill support heathland wildlife. Gorse and bramble scrub are being controlled to encourage other plants to flourish. Interesting bee and wasp species have been recorded from St James' Hill. It is part of Mousehold Heath County Wildlife Site.



Courtesy Jarrold & Sons Ltd

Norwich, from Mousehold.

St James' Hollow circa 1910

2 St James' Hollow

This impressive hole in the ground is one of the biggest chalk and gravel pits in the Norwich area.

The Chalk is a limestone laid down in tropical seas during the Cretaceous period. St James' Hollow is a Site of Special Scientific Interest, designated for its geological value as one of the best places in Britain to find the fossil remains of *Mosasaurus*.



Artwork © David Waterhouse

The reptile *Mosasaurus* could reach 15 m (50 ft) in length. This powerful predator resembled a sort of marine crocodile with flippers.

There is interesting geology in the south pit. You can see Chalk beneath the basement bed of the Norwich Crag, a sandy marine deposit laid down about 2 million years ago.

A boulder bed of large flint nodules was eroded out of the sea-bed by tidal currents. A similar environment can be seen today where Chalk rock is exposed along the Norfolk coast, as at West Runton.



A section through the early Pleistocene sea bed: sands and clays of the Norwich Crag Basement Bed overlying an undulating surface of Chalk bedrock

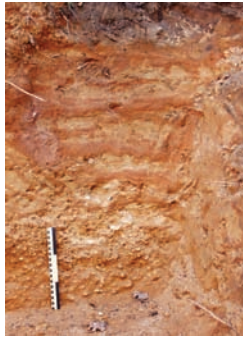
3 Upper Birch Walk

A small gravel pit near the top of Birch Walk shows some of the coarse glacial gravels which underlie the high ground of the Heath. These are thought to have been part of a 'sandur' or outwash plain at the end of the Anglian glacial period, perhaps 430,000 years ago. Tree clearance here will benefit heathland wildlife.

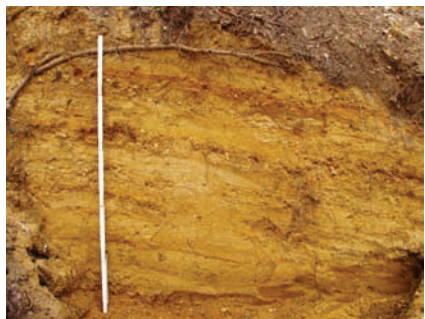


4 Lower Birch Walk

A small sand pit shows geology from an older, deeper layer of Mousehold. Gravel is overlain by alternating layers of yellow sand and brown, clayey sand. The gravel was deposited by a meltwater stream flowing across a glacial outwash plain, while the sandy layers would have been deposited in quieter water - perhaps a lagoon. These layers may date from a glaciation older than the Anglian.



5 Gilman Road bank

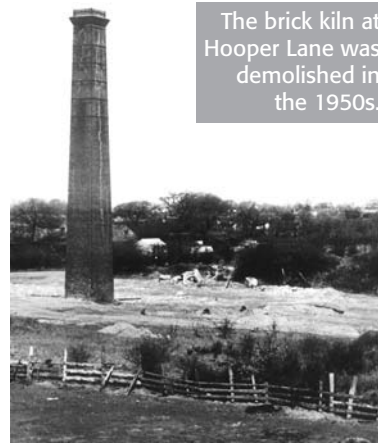


Gilman Road bank is the best place on the Heath to see the glacial sands and gravels which form the main body of Mousehold. Three cuttings have been made in the bank,

allowing us to see what the environment close to the ice front was like. Chaotically-bedded gravels alternate with sands and thin clay seams. They were probably laid down on an outwash plain with slabs of dead ice, and unstable gravel bodies slumping into pools or streams of meltwater.

9 Hooper Lane brick field

A hundred years ago this was a busy complex of brick pits and kilns. Brickearth lies beneath the layers of sand and gravel on Mousehold. The north-western slopes of the Heath were quarried away, and two picturesque windmills were destroyed. In the later 19th century a large Hoffmann kiln was built, allowing bricks to be made continuously, as the fire burned in rotation through a series of chambers. Brick making continued here until after World War 2.



The brick kiln at Hooper Lane was demolished in the 1950s.

Photo: Eastern Daily Press © Archant Norfolk

10 Vinegar Pond gravel pits

Sand and gravel has been dug on this part of the Heath since the Middle Ages. Quarrying stopped here after 1880. Fresh-looking hummocky ground nearby is probably the result of wartime dumping of soil. Vinegar Pond is a wet hollow left by the quarrying and wartime manoeuvres, fed only by rainwater.

12 Oak Avenue brick pit

Until 1880 this leafy dell known as 'Deep Hole' was a scene of industrial activity, as the glacial brickearths of Mousehold Heath were quarried here for brick making. The sides of the valley made it easy for the diggers to get at the valuable silts and clay beds.

16 Mousehold Stone Pit Company quarry



Stone Pit No. 2, 1907, showing the Prison and Britannia Barracks in the distance.

Photo courtesy Norfolk Heritage Centre

The pitch & putt golf course and the hummocky area round Valley Drive were a big sand and gravel quarry, active until the 1950s.

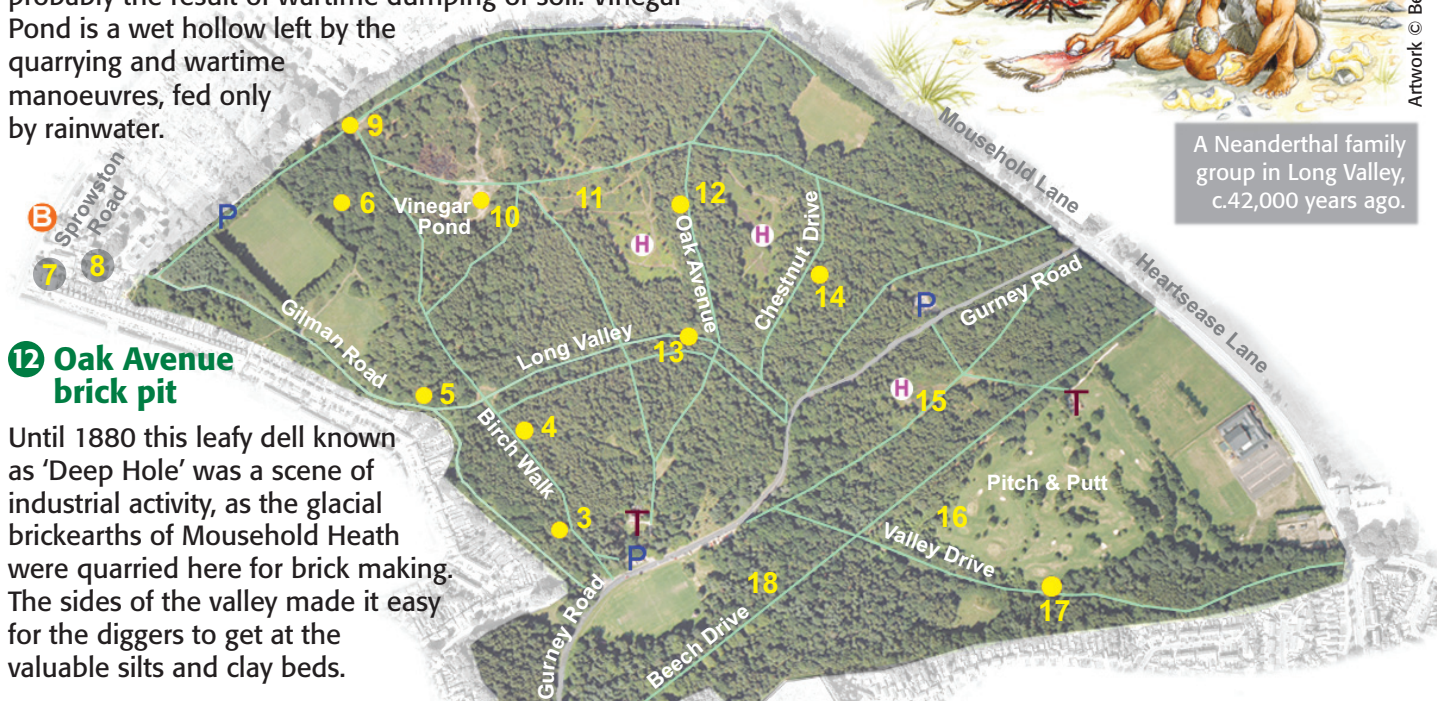
17 Valley Drive Neanderthal findspot

In 1935 a Neanderthal hand-axe was found in a gravel pit beside Valley Drive. It was probably made during the Devensian cold period, perhaps 60,000 or 42,000 years ago. The landscape would have been like the steppe heathland of northern Scandinavia today.



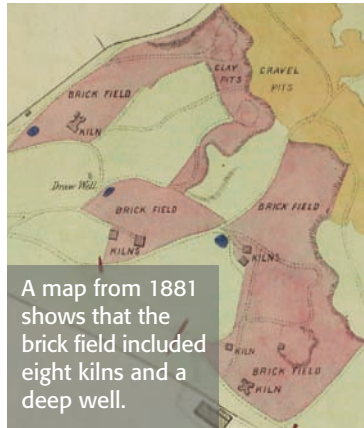
A Neanderthal family group in Long Valley, c.42,000 years ago.

Artwork © Beverly Curf



6 Gilman Road brick pits

The sandy, glacial clays of Mousehold can be fired to make red bricks. These so-called 'mussel bricks' were made here in vast quantities until the late 19th century. There was a major brick field near Gilman Road; the site was landscaped and now lies beneath the Sports Ground.



Courtesy Norfolk Record Office N/EN 26/1

7 The Lazar House

Most of the building materials used in the walls of the Lazar House at Gilman Road would have been sourced from Mousehold, including the flint stone rubble and builders' lime. The wall in the south-western corner is buttressed with 'mussel bricks'. The door frames are made of imported Barnack limestone transported by boat from the Peterborough area.



8 Gilman Road lime kiln

The gardens of the block of flats in Gilman Road conceal a lime kiln. This was the last working lime kiln in Norwich (1968). The kiln was built about 200 years

ago as a ring-shaped underground structure. Chalk was 'burnt' (calcined) here to make builders' lime. It is preserved below ground, marked by a circle of gravel and shrubbery.



13 Long Valley

Long Valley is the best example of a dry valley on the Heath, formed in the past when groundwater levels were higher or the ground was frozen. It meanders for almost a mile, heading westwards from Heartsease Lane towards the Wensum valley, and has several tributary dry valleys. Its natural shape has been altered by over the centuries by quarrying and rabbits.



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14 Chestnut Drive brick pit

A brick pit was sited here in the 19th century, but digging ceased after 1880, when the Heath became designated as a 'People's Park'. This is the best place to see the torrent gravels of Mousehold Heath. Look high up on the eastern rim of the pit: the plateau surface of the Heath has a capping of coarse gravel containing large flint cobbles. They were laid down on a glacial outwash plain during the Anglian glacial period, about 430,000 years ago. Powerful meltwater streams emerged from the ice front and dumped their bedload of sand and stones.



Coarse gravels in a modern glacial outwash plain at Sólheimajökull, Iceland.

Photo © Ólafur Ingólfsson <http://notendur.hi.is/oi>

- 18 Trail point of interest
- Trail waymark post
- Principal footpaths

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- P Car parking
- T Public toilets
- B Bus stop (Route 11)
- H Heathland restoration area

18 Beech Drive hills & hollows

The hummocky land round Beech Drive is a legacy of centuries of digging for glacial sand, gravel and brickearth. Quarrying stopped in the area north of the Drive in the 1880s, when this part of the Heath became a 'People's Park'; it continued in the 20th century on land to the south. The sports ground was once a brick field. The massive mound in the woods is the butts for a rifle range, used by the army in Victorian times before the area became thickly wooded.

11 & 15 Heathland restoration areas

200 years ago, Mousehold was open heathland with very few trees. Local people dug for sand and gravel, herded livestock and collected firewood. These traditional land-uses ceased once the Heath became a public park, and trees began to invade. Today, the Conservators and Wardens are working together to restore as much of the open heath as possible; this work will benefit a wide variety of species.



© Nick Owens

Sand wasp
Ammophila sabulosa

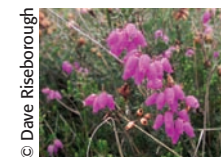


Regenerating heather *Calluna vulgaris* growing on cleared ground



© Peter Lindsley

Small Copper
Lycaena phlaeas



© Dave Riseborough

Bell Heather
Erica cinerea



© Robin Stevenson

Heath Plait-moss
Hypnum jutlandicum



© Nick Owens

White-tailed Bumblebee
Bombus lucorum