

## Geology of Havering-atte-Bower

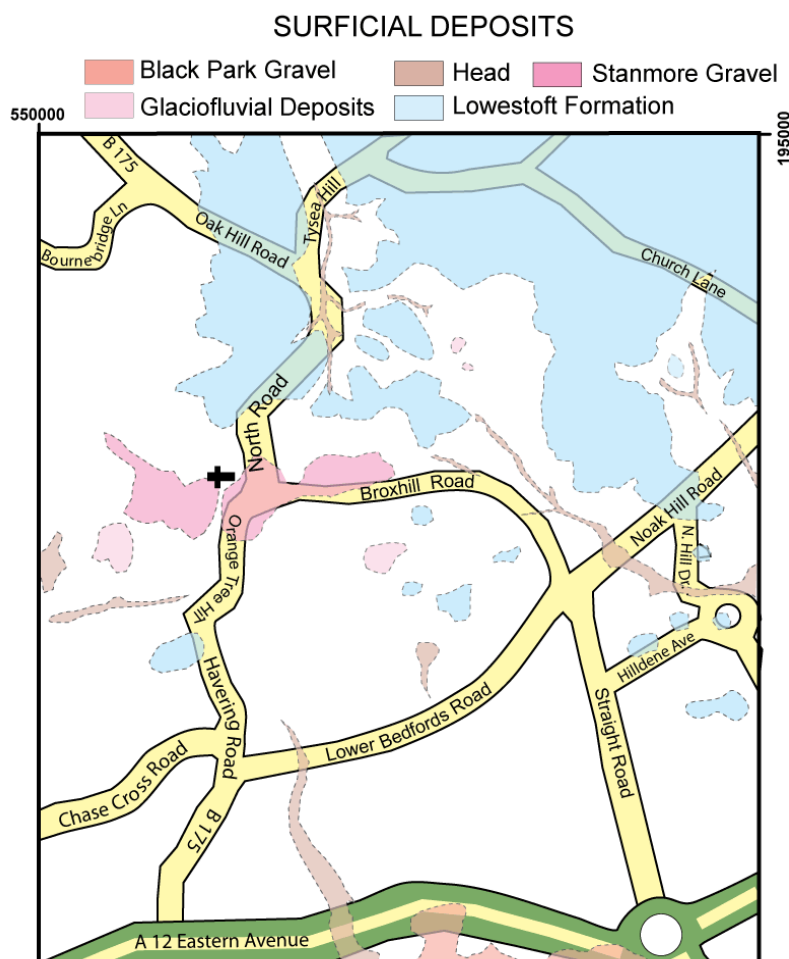
The geology of Havering village consists of deposits of clays, gravels and sands variously classed as 'bedrock' and 'superficial' deposits. Clays and sands seem rather dull but they record two periods of very different extreme climate. The youngest, surficial deposits are associated with an ice age when most of Britain was covered by thick ice. The older sedimentary rocks were deposited during a period when Havering was under warm tropical seas.

### 1. Superficial deposits

Most of the superficial deposits are related to the Anglian glaciation that took place about 450,000 years ago during the Quaternary period. At this time most of Britain was covered by thick sheets of ice rather like on Greenland today. Havering would have been at the southern limits of the ice sheet and so was it was unlikely to have been covered by thick or long-lived ice.

Sediments deposited in a glacial –ice sheet environment are classified as either direct glacial products (tills) or indirect (fluvioglacial, or glaciomarine). The geology of Havering contains examples of both types of deposit.

The British Geological Survey (BGS) identify five types of superficial deposit in the Havering area, shown on the map below:



### Descriptions of mapped superficial units

**Head:** A term used to describe a poorly sorted mix of gravels, sands and clays that accumulated by solifluction and soil creep. These are gravity-driven processes that cause the slow movement of waterlogged sediment down hillslopes. Associated with areas bordering glaciers or ice sheets.

**Glaciofluvial Deposits:** A bucket term to describe sands and gravels with lenses of silt, clay or organic material deposited by rivers supplied by glacial meltwaters.

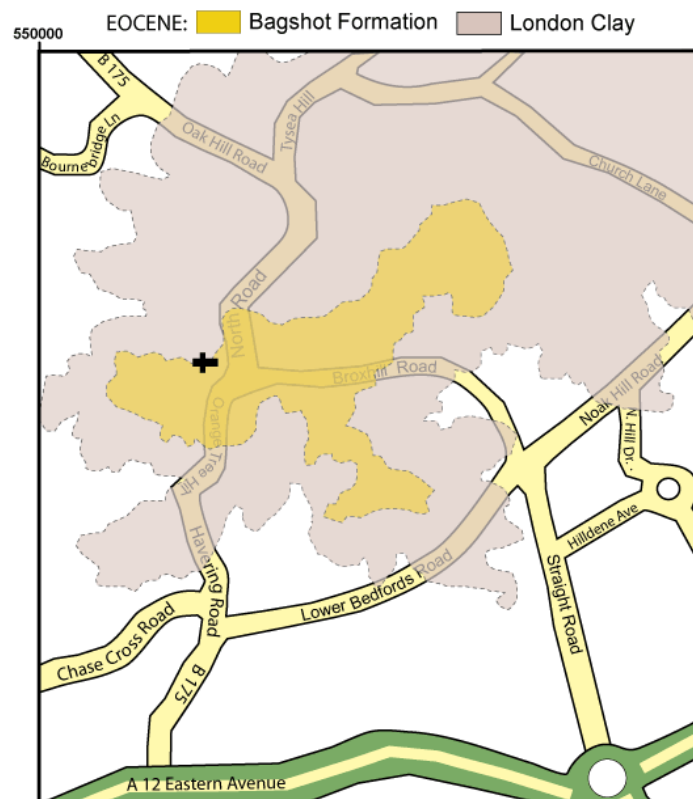
**Black Park Gravel:** Is a name given to 1-6m thick layers of sands and gravels with lenses of silt, clay or peat in the Thames valley region that were deposited by rivers that flowed 450,000 yrs ago during the Anglian stage.

**The Lowestoft Formation:** This is a chalky till (chaotic mix of fine material with large clasts of chalk and flint), together with outwash sands and gravels, silts and clays. The till is characterised by its chalk and flint content. The tills across Havering are thought to represent the southern limit of the Anglian Ice sheet.

**Stanmore Gravel:** Flint rich gravels and sands supported by an orange-brown to pale grey silty clay matrix. These deposits are older and date to the Middle Pleistocene. Their origin is debated with some arguing for deposition within an offshore or beach environment, others interpret them as river deposits possibly related to the forerunner of the River Thames drainage system that 600,000 yrs ago flowed further to the northeast.

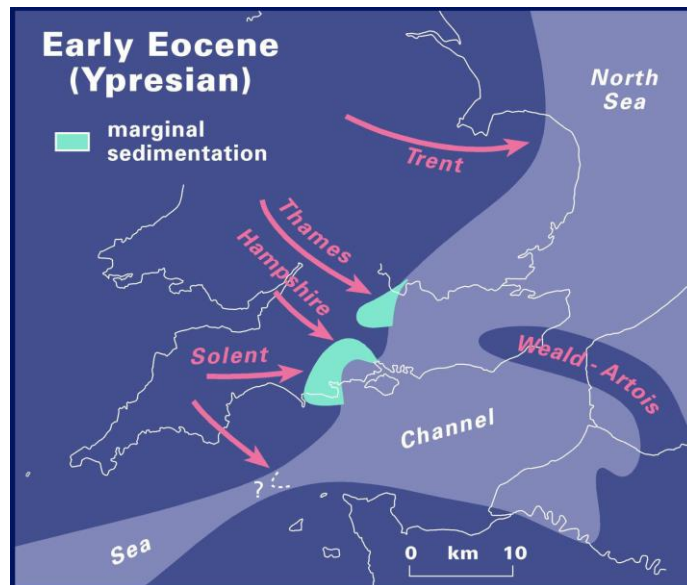
## 2. Bedrock Geology

Below the glacial tills and river deposits are much older deposits classed as bedrock. In the Havering area the British Geological Survey map two sedimentary bedrock units deposited in the Eocene Period.

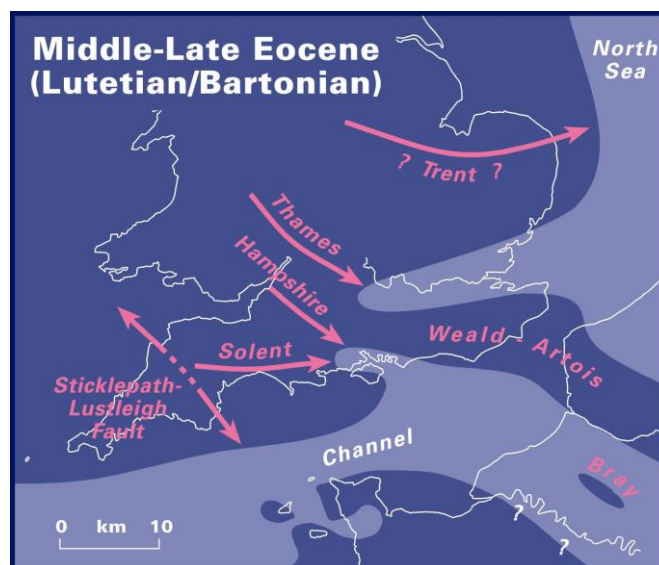


Derived from BGS digital geological mapping,  
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During the early Eocene, between 56 and 48 million years ago, most of Essex and London was covered by sea. The main land area was located in the present-day Midlands, from which rivers flowed southeast. Pink arrows on the paleogeographic reconstruction below show the main river drainage directions. The Earth's atmosphere at this time contained three times more CO<sub>2</sub> than today and as a consequence the climate and vegetation was tropical to sub-tropical, similar in many respects to the present-day Malay Peninsula. Hard to believe, but yes Havering once had a tropical climate!



The start of the Eocene was marked by a rise in sea levels and retreat of coastlines inland. This marine transgression led to the deposition of the **London Clay**, which is the most extensive rock unit in Havering. The clay has a bluish-grey colour and includes silty and sandy clay intervals. Fossils (sharks teeth, starfish, crabs, lobsters, fish, turtles, bivalves and gastropods) are mainly found in concretions and hard layers (known as cementstones) within the clay. These are diagnostic of a marine environment.



As time passed the river systems expanded and a combination of a drop in sea level and uplift of the land surface led to the formation of large river deltas that expanded to the east. Increased land area and retreating coastlines are shown on the middle Eocene (circa 40 million years ago) paleogeographic reconstructions (above). At this

time Havering would still have been underwater but in much shallower conditions in a near coastal setting. Sands and gravels of the **Bagshot Formation** (found below the village green, St Francis Hospice and large parts of Bedfords Park) were deposited on top of the London Clay in a shallow marine to estuarine environment. The sands are white to buff or crimson in colour and include thin layers of pale clay and localised beds of pebble gravels rich in flint. Fossils are rare but occasionally you may find marine molluscs.

### **Economic Geology (historical)**

**Kilns:** The thick clays in Havering have long been used for tile and brickmaking. Documents of medieval Assizes held in the Essex records office mention tile making in Havering in the 15<sup>th</sup> century. Brickells' (derived from Brick fields) on the south side of Havering Park may have been the site of a brick kiln in Tudor times or earlier. The bend in Orange Tree road was once known as brick kiln corner, the actual kilns would have been sited to the west of Elmer Avenue. The 1777 Chapman and Andre map of Essex shows kilns on Orange Tree Hill and at the junction between what is now the Straight Road and Lower Bedfords Road. These kilns are also shown on an 1805 map. A new brick kiln location appears on the 1881 OS map in Broxhill Road, downhill of the South Lodge. Another kiln is placed behind Fernside. By 1921 maps refer to these two sites as the Brickfields and Brick Yard respectively suggesting that by this time the kilns were no longer in use. An old resident with long family roots in the village once told me that that the yellow bricks used to build the houses on the green next to the church hall came from a local brick kiln.

**Water supply:** Before a piped water supply reached the village water came from wells. A village pump was located on the wall next to the Blacksmiths (shown below) and Knightsbridge butchers, next door, also had their own pump. Other properties around the village have reported finding disused wells. In most cases the water would have come from shallow aquifers, most likely from within the Stanmore Gravels. The much deeper chalk aquifer would have been very expensive to access and only the large farms and grand houses in the area could have drawn water from the chalk.



The chalk is classified by the Environment Agency as a 'Major Aquifer' (layer of water-bearing permeable rock, gravel, sand, or silt from which groundwater can be extracted). It provides clean water because it is normally protected from pollution by the sealing layer of London Clay that lies above it. In the Havering area the chalk is found at great depth, between 150 and 250m below the surface. Pyrgo Park Farm still has a functioning well that was constructed in 1887. It draws its water from the

Upper Chalk breached at a depth of 602 feet. The well continues down to 665 feet below the surface and still delivers high purity water.

### **Further Information**

A history of the Pleistocene glaciations and impacts of regional river systems can be found at: <http://www.qpg.geog.cam.ac.uk/research/projects/nweurorivers/>

More on the Eocene paleogeography of southern Britain can be found at;

<http://www.qpg.geog.cam.ac.uk/research/projects/tertiaryrivers/>