

## DORSET LOCAL GEOLOGICAL SITE SURVEY

**Site number**                   GSU01/11 & SU01/12

**Site names**                   EDMONDSHAM ESTATE, MUTTON HOLE AND CASTLE HILL PIT

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### **Summary description**

**Castle Hill gravel pit, Edmondsham   NGR SU060.125**

**Palaeogene: Reading Formation/London Clay.**

Rounded flint pebbles in a range of sizes, with three sets of graded bedding. Some patches have been cemented with ferruginous sand, at a level approximately 1.5m below the ground surface. Otherwise the pebbles are loosely surrounded by sand. This deposit is exceptionally important for interpreting the Palaeoenvironment. The flint has eroded from the upper Chalk, and subsequently been rounded on a beach, such as Chesil Beach. With sea-level fall the beach has then been re-worked by a river, mixing the pebbles with sand.

**Mutton Hole, Edmondsham   NGR SU063.122**

**Geomorphological feature**

A sheer-sided doline or swallow-hole, showing very clearly how these are formed. There is a small stream running over Reading Formation clay in a gradually deepening valley. Suddenly, it falls over a waterfall into a sheer hole with Chalk clearly visible, and the stream disappears at the bottom. It is about 6m deep, with about 1m of that being clay at the top, the rest Chalk. No exit can be seen but the course of the stream can be followed by a channel in the woodland which leads to a much larger doline, well vegetated, about 100m further downstream. At the lip of the waterfall are several large rounded flint pebbles, as seen in the gravel pit.

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**Geomorphological feature**

Geologically, the majority of the Edmondsham woodland is underlain by Tertiary Palaeogene sediments of sand, gravel and clay. These overly Chalk which outcrops on the western and northern edges.

Walking north up the valley behind the house, the first point of interest is a large vegetated doline, or swallow hole, from which one can follow a rapidly deepening dry valley to Mutton Hole. Here the steep sides of the valley consist of about 5 metres of Reading Beds clay, and the Hole is cut vertically into Chalk, like a well-shaft. Although the stream bed on the clay may be dry in the summer, in wetter weather a waterfall drops into the hole, and the water disappears at the bottom. There is another doline upstream, and near the church is a spring where the water re-emerges downstream.

The paths in the wood have been surfaced with rounded flint pebbles from the pit on Castle Hill which is the second R.I.G.S. About 10 metres deep, the pit has been cut into a deposit of rounded flint pebbles ranging in diameter from 12 cm to 3 cm. In some places the pebbles support each other, in others they are supported by coarse grit or sand and are cemented by iron. The pebbles have not been deposited in continuous beds, but in patches of graded bedding cut abruptly by patches of mixed sizes. The lower part of the pit has become degraded and covered with vegetation in the past few years, but originally three sets of graded bedding were visible.

Recent work of the British Geological Survey further south in the Bournemouth and Dorchester areas has suggested that the environment of the time starts with an eroded Chalk landscape, covered with soil as the present day. Sea level begins to rise, moving from the south east, with a coastline trending north east to south west. Barrier beach sands formed, as well as pebble beaches where the flints being eroded from the Chalk would have been rounded by wave action. Thick deposits of sands are found at Black Hill, Bere Regis, and pebble deposits similar to Castle Hill are on the tops of the hills at Badbury Rings, Pentridge and several hills north of Wimborne and around Cranborne, particularly around Boveridge.

Outlying deposits of Tertiary sands and pebbles at Blackdown (Hardy's Monument) and Bincombe near Weymouth show that they were considerably more extensive than today, but have mostly been eroded away.

The Reading Beds mapped on the Edmondsham Estate are the oldest of the Tertiary sands and clays in Dorset. They rest on an eroded surface of the Chalk. The Chalk is an entirely marine deposit, but about 65 million years ago continental movement associated with the opening of the north Atlantic pushed the edge of Europe upwards to become land. The opening of the north Atlantic was also accompanied by volcanic activity on the western margin of Britain, particularly in western Scotland.

As the movement was pushing from the west, the landmass tended to dip in an easterly direction, though not evenly, and Britain was on the western margin of a 'North Western European Tertiary Basin which extended eastwards at least as far as Poland'. Within that basin there were shallower and deeper parts that received the sediment eroded from the land around it. The North Sea area was particularly deep, and south east England was deeper than the Dorset area. For about 15 million years much of Britain was land and was subject to weathering and erosion.

At the beginning of the Reading Beds time Britain was at a latitude of 40° N and the Earth's general climate was warmer and more equitable than now. Plant fossils, and microscopic plankton, give us clues on the temperature, and on the fluctuation of sea level in southern England. In some parts of the Reading Beds there are marine plankton and in some parts mottling of the clay shows that it has been exposed to aerial weathering.

As sea level fluctuated the beach sands and pebbles could have been re-worked by a braided river. This would have moved the pebbles and redeposited them as we see them at Castle Hill pit, where in some places the sizes are mixed, and in others they have been left as graded bedding with large pebbles at the bottom, and progressively smaller ones on top. Occasional patches of cementing with iron-rich sand is typical of river deposits. The iron-rich sandstone found on the estate, and used in building the church probably formed as groundwater rich in iron trickled through the sand and the flow slowed on reaching the clay. The iron would then be deposited in the lowest part of the sand, not as a continuous bed that could be mapped, but in occasional patches.

This progression of events has been repeated several times during the formation of the London Clay, which is mapped on the eastern side of the Edmondsham estate, with clay forming from ancient soils, and sea level rising and falling.

Since the Ice Ages of the last million years weathering has eroded most of the Reading Beds and London Clay deposits further west and north, leaving the estate tantalisingly on the edge, with the Portsdown Chalk re-emerging on the boundary, any later Chalk having been eroded away.

Reference:

Bristow CR, Freshney EC & Penn IE 1991: Geology of the country around Bournemouth. British Geological Survey.

Daley B, and Balson P 1999: British Tertiary Stratigraphy. Geological Conservation Review Series. JNCC. BGS map sheet 314, Ringwood.