



## Neogene (NEO)

### Block Description

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For Mesozoic-Tertiary Stratigraphy GCR block descriptions and GCR site lists,  
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## Introduction

The GCR sites selected for this GCR Block represent the British geological record of Earth history from about 23.8 to 1.81 million years ago (Ma). This interval is the second period of the Cainozoic Era, which encompasses the history of the Earth from the end of the Cretaceous Period (65 Ma) to the present day. Rocks that formed during the Neogene Period constitute the Neogene System, which in turn comprises the Miocene (23.8–5.32 Ma) and Pliocene (5.32–1.81 Ma) epochs, and precedes the Quaternary Period. Together, the Palaeogene and succeeding Neogene periods form the Tertiary Sub-Era. The Tertiary Sub-Era comprises all but the final two million years or so of the Cainozoic Era of 'recent life'. The definition of the end of the Tertiary sub-era, the Pliocene–Pleistocene boundary has been the subject of some debate. Rocks of this age are referred to as East Anglian 'Crag'. Two formations termed the 'Coralline Crag' and the 'Red Crag' were identified at first in 1835, followed by a third division, the Mammiferous Crag in 1837, which later became known as the Norwich Crag.

## Outcrop pattern

In Britain Neogene deposits are most widespread in East Anglia, though to a considerable extent below a Pleistocene cover, whilst elsewhere, a few outliers include the limestone fissure fills of Miocene–Pliocene Lenham Beds, preserved only in solution pipes in Kent, and of Brassington, Derbyshire. The few onshore remnants of Neogene strata provide glimpses of palaeoenvironmental conditions in the British area.

The lower Crag was termed the 'Coralline Crag' after the abundance of 'corals', later found to be the skeletal remains of bryozoans. The upper Crag was termed the 'Red Crag' after its characteristic ferruginous coloration. The Coralline Crag is a formation of marine skeletal carbonate sands and silty sands with an outcrop restricted to south-east Suffolk and an adjacent area of the southern North Sea. The outcrop consists of an elongate NE–SW trending main body and three small outlying bodies to the south-west of the main outcrop. Erosion, probably during the late Pliocene time, has removed much of the former extent of this deposit. The formation exceeds 20 m thick in places and everywhere rests unconformably on the London Clay Formation (Palaeocene–Eocene) which had already been deeply eroded into an undulose surface before the Pliocene marine transgression.

The Red Crag is restricted to south-east Suffolk and north-east Essex, and is marked by an unconformity at its base. In places it overlies Coralline Crag. The relationship between the Red Crag and succeeding Norwich Crag has not been yet elucidated.

## Palaeoenvironment and palaeogeography

Inferences of palaeoclimate from the East Anglian Crag deposits have played an important part in the establishment of the stratigraphic terminology and sequence in the British Neogene. Climatic deterioration can be traced from the Coralline Crag, through Red Crag, Norwich Crag and finally to the onset of glaciation in the British Isles.

For further discussion of Tertiary palaeogeography, see **Palaeogene (PGN)**.

During Neogene times the North Sea occupied an area similar to that at the present time, although its extent varied with marine transgressive/regressive cycles. The main depocentre lay along the axis of the subsiding Rhine Graben and consequently thick and fairly continuous Neogene sequences are preserved in the Netherlands. In contrast, eastern England lay on the western margin of the basin and therefore the Neogene deposits here consist mostly of thin sequences of shallow marine and marginal marine sediments deposited during regional highstands and separated by long stratigraphical gaps.

To the south, uplift of the Weald–Artois Axis which began in Lutetian times had severed connection between the North Sea Basin and the English Channel and it is unlikely that this connection was restored until Pleistocene times. Certainly it is unlikely that any connection existed through the area of the modern Dover Straits until that time. There are no marine

deposits of unequivocal Neogene age on the UK mainland south of this axis. If there was a Neogene seaway between the London and Hampshire basins (as has been postulated), it apparently left no deposits in the Hampshire Basin.

Although the early to middle Miocene marine transgression was probably one of the most extensive of the Tertiary Period, and produced extensive deposits in the North Sea and continental Europe, it appears to have left little evidence in eastern England

A period of regression during the late Miocene as a result of a major eustatic sea-level fall preceded a renewed transgression in the latest Miocene–earliest Pliocene. In Kent, the Lenham Beds, which may be of latest Miocene age, contain a poorly preserved fauna in decalcified ferruginous sands contained within solution pipes in the surface of Late Cretaceous Chalk.

A renewed transgression in the mid-Pliocene deposited the Coralline Crag, a formation of carbonate-rich marine sands and silty sands with an outcrop on land restricted to eastern Suffolk.

The overlying late Pliocene Red Crag formation has the most extensive outcrop of any Neogene deposit in the UK and shows evidence of a shallowing-upward sequence from subtidal marine sands to intertidal sand flat deposition.

During Neogene times, therefore, the southern North Sea was probably a semi-enclosed embayment which periodically inundated parts of eastern England. The deposits are dominantly of shallow marine and marginal marine facies (Coralline Crag and Red Crag) although in the east Midlands terrestrial deposits of Neogene age (the Brassington Formation) are preserved in solution subsidence hollows within Carboniferous Limestone.

## **GCR site selection**

The following networks are identified:

- The Lenham Beds
- Coralline Crag
- Red Crag

## **Palaeontology, fauna and flora**

That Tertiary faunas and floras are essentially modern in aspect has made the task of palaeogeographical and palaeoenvironmental interpretation considerably easier than for earlier periods of geological time. Using ostracods and forams, for example, it has been possible to determine quite narrow ranges of water salinity and depth, rather than the broader generalizations so often unavoidable with older strata. The dinosaurs which had dominated the Earth in Mesozoic times had died out before the Tertiary began, to be replaced by the more readily comprehensible mammals which began to establish themselves in the Palaeocene prior to their great diversification at the beginning of the Eocene. The flora too became distinctly modern in aspect; the angiosperms flourished.

Since the mid-19th century there have been reports of human artefacts and remains from both the Coralline and Red Crag of Suffolk and Essex. These have included bone spear heads from the coprolite bed, a carved shell from the Red Crag of Walton-on-the-Naze, flint implements from several localities in the Red Crag including Buckenay Farm and Coralline Crag at Rockhall Wood, Sutton, and a human mandible from the Red Crag at Foxhall near Ipswich.