



The Geology of Beckford Nature Reserve (Beckford Gravel Pit)



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Introduction

Beckford Nature Reserve contains a geological Site of Special Scientific Interest (SSSI), designated for its exposure of sediments (sands and gravels) deposited during the last period in which there were persistent glaciers in the British Isles. The full SSSI designation document is available from Natural England¹.

In line with its policies, the Herefordshire and Worcestershire Earth Heritage Trust has designated the site as a Local Geological Site, a non-statutory designation similar to Special Wildlife Sites. This does not carry obligations in the same way that SSSI designation does.

Summary

The sands and gravels exposed at Beckford Nature Reserve date from the Devensian Stage, the geological definition of the time from 120,000-10,000 years ago. During this time, the climate of the British Isles was significantly colder than the present (known as a glacial period) and significant amounts of ice accumulated in the British area. It is important to note that simply because the Devensian period was 'glacial', the land was not necessarily covered in ice for the whole time. Glacial periods can contain warmer phases when ice recedes and phases of low precipitation can result in very little ice accumulating regardless of temperature. Generally, the Beckford area is considered to have been south of the main ice sheets and therefore represents an interesting interface environment.

At the end of the Devensian, the climate moved into the present interglacial (warmer period) known as the Flandrian Stage. This shift in climate melted the ice sheets and led to a rise in sea level, inundating the previously dry southern North Sea area. These climatic changes prompted our ancestors to colonise the British Isles.

The geology of the Nature Reserve consists of alternating layers (beds) of gravel and sand. The gravels are mostly pieces of Cotswold limestone of a type found higher on Bredon Hill. The angular nature of the individual pieces of gravel indicates that the material has not travelled far. The sand is not local, the nearest sandstones being found in northwest Worcestershire. The well-worn nature of the sand grains also indicates that they were blown into the area by the winds. This somewhat complicates the task of identifying the source of the sand. The predominant winds in the British Isles are from the South West, indicating that the sand grains may either have originated much further away or have been derived from river deposited sediments. The alternation of sand and gravel suggests that the area was a mostly dry, cold desert with periodic floods, bringing the gravels down Bredon Hill in dramatic fashion. Down valley from Beckford the gravels tend to be river related, such as the terraces of the Severn-Avon river system found near Kemerton.

The same geology is exposed in various old sand and gravel workings around Beckford. The more detailed geological report below has been compiled from records held by the Trust.

¹ www.sssi.naturalengland.org.uk/

Geological Report

General site information

The Beckford Gravel Pits are of national importance. They comprise a large complex of gravel workings in fan gravels associated with the run off from Bredon Hill into the Carrant Valley. Beckford Nature Reserve is an important site of late Devensian slope and adjacent floodplain deposits, which are particularly significant in relation to environmental change in the Severn basin. The deposits here include gravels associated with mass-movements, slope wash² and sand which may have been imported by aeolian transport³. These sediments record transport processes operating under different palaeoenvironmental conditions⁴. A number of reactivation surfaces indicate episodic activity. Downslope, the deposits interdigitate with lithofacies deposited by water flow parallel to the valley axis, marking a transition to the (river) terrace deposits.

Site Description (following a survey on 10/02/2010)

The locality contains a significant cliff (bearing 091) exposing interbedded sands and gravels. Gravel beds are 10-30 cm in thickness, sand beds are generally ~10 cm thick but occasionally up to 20 cm in sand wedges. Transitions between gravel and sand are sharp, indicating an erosive or sudden nature in the transition between gravel and sand deposition. Excluding sand wedges, most beds are reasonably laterally continuous within the exposed section. Sand appears to have been incorporated into the gravel beds. Within the lower gravel beds there are possible slumping/buckling and frost heave features. Sand grains show high sphericity and roundness. Grains are mostly quartz with a few unidentifiable dark lithic fragments. Gravel clasts are mostly <10 cm x 10 cm x 1cm in size, although there are very occasional larger pieces of limestone (> 20 cm x 20 cm x 5 cm) in the upper part of the exposure. The majority of clasts are composed of Cotswold limestone, with very occasional darker, nodular clasts.

Site Interpretation

The SSSI designation indicates that the Beckford Terrace has been dated to the Devensian. The Devensian (120-10 ka) contained the last glacial maximum (LGM) in the UK. If these sediments are indeed Devensian, they provide valuable evidence of the Palaeoclimate. The overall indication is of a cold, arid climate with significant wind blown sand. The sand is not local to the immediate area. The nearest source is the Triassic sandstones of NW Worcestershire. However, if the prevailing winds in

² Dawson, M.R (1986) Late Devensian fluvial environments of the Lower Severn Basin, PhD Thesis. U.K

³ Briggs, D.J et al (1975) Late Pleistocene terrace deposits at Beckford, Worcestershire, England, Geological Journal, Vol.10, pp.1-17

⁴ Zeuner, F.E (1959) The Pleistocene Period: its climate, chronology and faunal successions; Hutchinson, London

the Devensian were from the southwest, the sand may have been reworked from river sediments to the SW. Periodically there appear to have been flood events, which brought limestone fragments down slope from Bredon Hill to the North. It is possible that there was some reworking of older glacial deposits, which included non-local rock types. The presence of frost heave and wind blown features supports the argument that there area was not covered with ice during the LGM, but was subject to very cold temperatures. Up section, the gravel beds appear to generally thin. In the topmost meter, large clasts indicate periods of much higher energy transport, possibly as a result of the deglaciation at the end of the Devensian/Flandrian boundary. The upper-most portion of the exposure may therefore be composed of more fluvial sediments, although erosion and soil generation complicates the interpretation.