The Geology of Pegwell Bay

by Peter Golding

In the past few years, clearance work has taken place to re-expose part of the classic coastal cliffs in Pegwell Bay, southwest of Ramsgate on the Isle of Thanet in Kent. The work, initiated by English Nature under their Face Lift programme, was organised by Thanet Council and used a local contractor. Kent RIGS Group also provided assistance and is now regularly maintaining the cleared sections.

Interest is focused on three aspects of the degraded cliffs:

1. 0.9km stretch of Palaeocene sediments with overlying Pleistocene brickearth in cliffs below the car park at TR 350642
2. Palaeocene-Cretaceous unconformity at Redcliff Point, TR 354644
3. The adjacent Pleistocene filled channel.

Pegwell Bay has a long history of accretion and cliff abandonment. Whitaker (1872) refers to the Palaeocene cliffs as “much overgrown and hidden by fallen earth”. Rapid growth of scrub followed construction of the Hoverport in the 1970s and part of the section was permanently lost under the access road. In contrast, Redcliff Point was actively eroded at this time and the section there was “probably better exposed than for some time previously” (Ward 1977). However, silting returned and the unconformity and filled channel at Redcliff Point were almost totally obscured until the cleaning of February 2005.

Phase 1 in the winter of 2002/2003 saw the removal of scrub and talus from three 30metre sections below the car park.

These reveal at the top of the cliff up to 4 metres of brickearth (loess) which stands in a typically vertical face with rough prismatic jointing. Its upper metre or so is decalcified and reddish brown in colour, whilst the lower part is yellowish brown and calcareous. Here, one of the early investigations into loess took place (Pitcher et al. 1954). The deposit has recently been dated as Late Devensian, 15-18 ka (Parks and Rendell 1992). Its junction with the underlying “Thanet Sands” is often marked by a line of small black flint pebbles, orientated by frost action. Together with the cliffs at Reculver, Pegwell Bay provides the international stratotype section for the Thanetian stage of the Palaeocene, although currently no GSSP [Global Stratotype Section and Point] has been defined. The youngest sediments preserved are the Reculver Silts, a series of yellowish grey fine silty sands, with some glauconite and bands of drifted comminuted bivalve shells. Various authors have commentated on the lines of prominent doggers formed within impersistent beds of clean fine sand. These appear to represent storm events.

At the base of the cleared sections, Pegwell Marls have been re-exposed for the first time in many years. These are dark greenish grey marls with mica flakes and glauconite. Bivalves, such as the ubiquitous Artica *morrisi* occur throughout, as do various foraminifera (Burrows and Holland 1896).

Phase 2 during winter of 2003/2004 opened another section, this time behind the access road to the Hoverport. Here the lower part of the Pegwell Marls has been exposed but part of the sequence still remains obscured by the road.

Phase 3 in February 2005 has seen the completion of the cleaning programme. The unconformity between the Chalk and the lowest sediments of the Palaeocene, the Stourmouth Clays, the Cliffsend Greensand Bed and the Bullhead Bed, has been re-exposed at Redcliff Point. The adjacent filled channel has also been cleaned. It, together with a similar valley at Birling Gap, is now to be the subject of research into chalk weathering etc. during the Pleistocene.

The Bullhead Bed of solution-pitted, green-coated flints in a sandy marl matrix, marks the famous Palaeocene/Cretaceous unconformity. Knox (1979) has shown that originally the flints were set in a montmorillonite clay derived from volcanic ash, and that the abundant glauconite in the overlying ‘Greensand’ bed is from the same origin. He suggests a possible source in the Hebridean Volcanic province. Below the Bullhead Bed is a curious brown-grey layered flint of controversial origin at the unconformity. Soft white Margate Chalk of the Marsupites *testudinarius* zone lies below the junction.

At the northeast end of the unconformity, the chalk becomes increasingly shattered as the filled channel is approached. In 1977 the 10th International Quaternary Association Congress visited the site and a diagram showing complex filling of the valley was produced for the field guide. It shows the valley to be steeper on its western side and filled with various gravels, chalky drift and loams with strong cryoturbation. Brickearth completes the fill in the south-west but to the north-east a fossil soil dated at 6123 ± 250 BP is developed upon it but buried by hillwash (Shephard-Thorn and Wymer 1977). Research was being carried out on the channel before its cleaning. Loess deposits above the solifluction gravels have been dated by OSL at 17.2 ± 1.4ka thus giving a minimum date for its infilling (Murton et al. 1998). Subsequent dating of the silty valley fill below the solifluction gravels gave dates as old as 88.0 ± 3.6ka near the base (Murton et al. 2003).

Beyond the cleaned section, erosion maintains the famous white chalk cliffs of Thanet. From the unconformity and beyond the Little Cliffsend tunnel the cliffs continue to expose the 'Margate Chalk' characterised as soft relatively flintless chalk. This lithostratigraphic Member of the Upper Chalk Formation covers (upwards) : the uppermost Micraster *coranguinum*, Uintacrinus *socialis*, Marsupites *testudinarius* and the basal Offaster *pilula* fossil zones.

Walking east from the tunnel, the zone of U. *socialis* is crossed and after about 150 metres the SSW dip brings 'Barrois' Sponge Bed' and the overlying Conulus *albogalerus* bed to the surface. The Conulus Bed is a band of chalk where the echinoid, although often crushed, is common together with M. *coranguinum*, Echinocorys *scutata*, the brachiopod Cretirhynchia *plicatilis* and the belenmite Actinocamax *verus*. Barrois' Sponge Bed marks the top of the underlying 'Seaford Chalk' characterised as soft to firm, flinty white chalk. It is equivalent to the rest of the M. *coranguinum* zone.

Continuing east the next marker bed is the conspicuous 'Whitaker's 3 inch Flint', a mostly continuous layer with individual flints up to 1 metre wide. This first appears in the sides of the coombe at Pegwell village. Here it also forms a pavement like surface on the shore platform in front of the sea wall. The coombe itself is excavated along the line of two faults and has been the site of rapid erosion in the past.

Although the whole section is faulted, faulting becomes more intense towards Ramsgate. Whitaker's flint effectively marks the sense of fault movement as it steadily reaches the cliff top. The final marker bed before the coastal protection of Ramsgate is reached is Bedwell's Columnar Flint. This is a nodular flint band associated with large paramoudra flints and the wavy shells of Cladoceramus *undulatoplicatus*, the basal Santonian index fossil. Other fossils here include the brachiopod Gibbithyris *ellipsoidalis* and the crinoid Bourgueticrinus.

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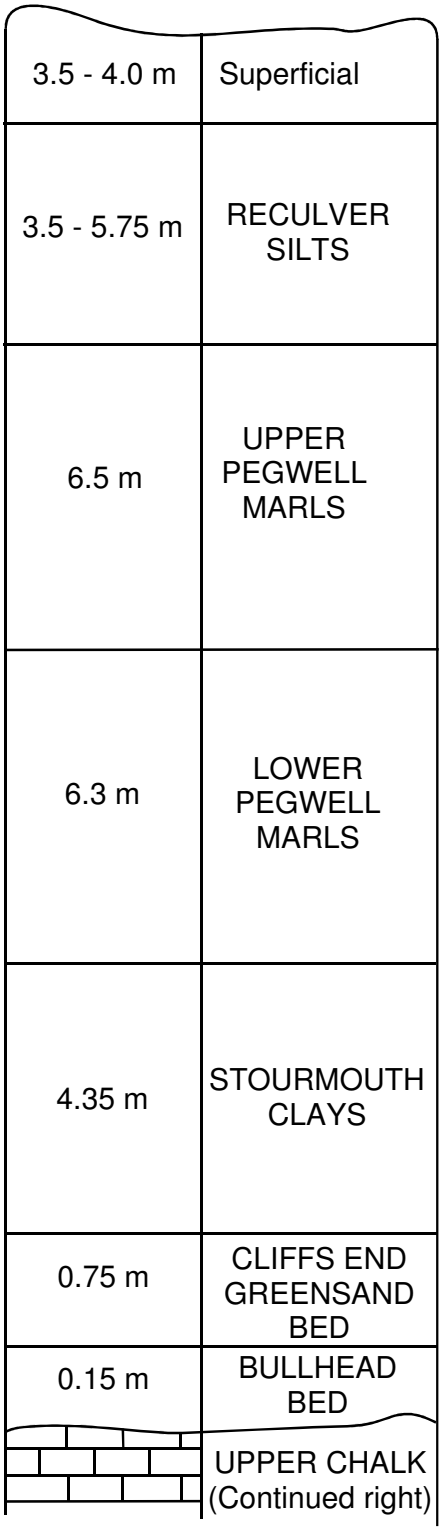
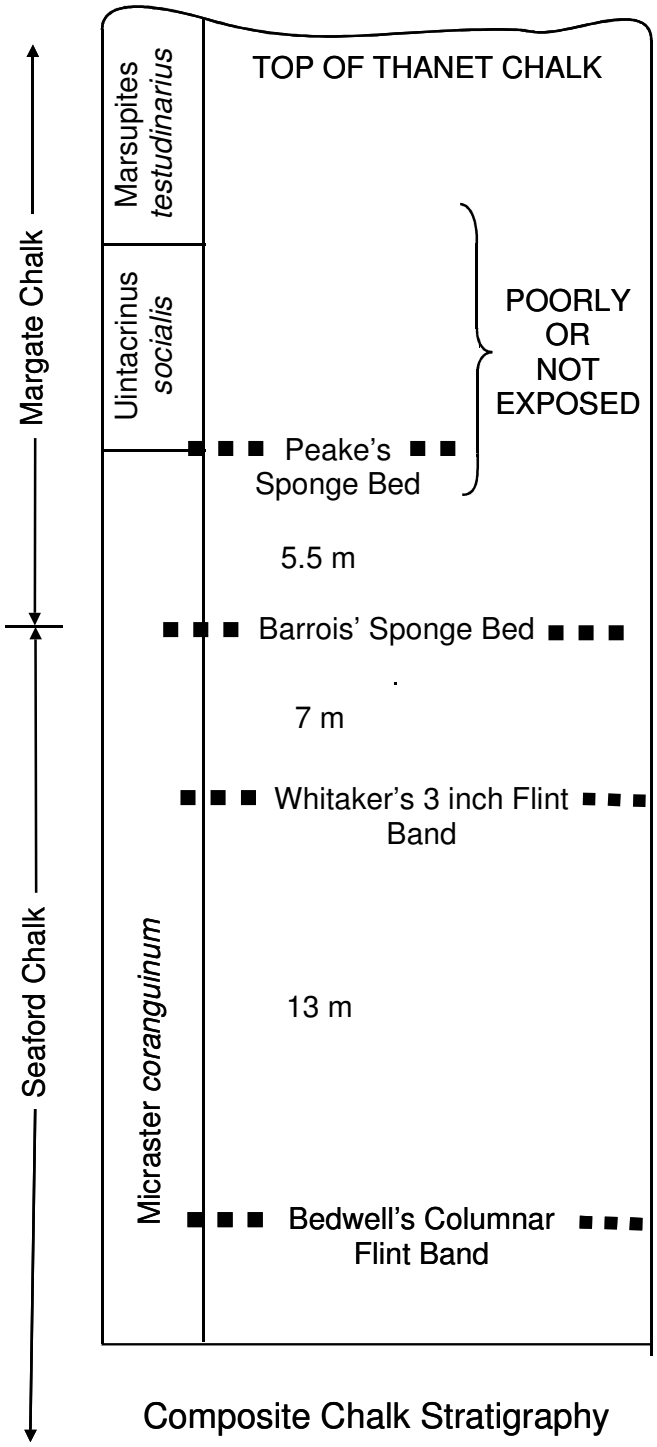
Stratigraphy of the Chalk and Palaeocene of Pegwell Bay
(Not to scale)



Thickness after
(Burrows & Holland, 1897)



Composite Chalk Stratigraphy