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Assessment of materials from 528/WAT

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Abstract

The submitted material comprises four small assemblages (total of 173 pieces weighing 21g) derived from environmental samples. These include 8g (19 pieces) from <30> (236), 1g (21 pieces) from <32>, 1g (10 pieces) from <34> and 12g (23 pieces) from <36> (248).

The samples were submitted on the basis that they are lithic material with a marked green colour and thus potentially copper ores.

The materials can be identified as small pebbles (almost entirely of flint) and angular chips (of similar material) that have a green coating and, in some cases a degree of impregnation by green minerals. The green mineral is identified as glauconite (an iron potassium silicate mineral, approximately: $(K,Na)(Fe^{3+},Al,Mg)_2(Si,Al)_4O_{10}(OH)_2$.

The coatings would have formed during the period when these grains were on the sea floor and early during their diagenesis. The green colour is thus both natural and not associated with copper.

Although glauconite is not an uncommon mineral in the geological strata of SE England (it gives the Greensand its green colour for instance), this particular style of occurrence as a coating on flint is less common, but is characteristic of the Bullhead Bed, at the base of the Thanet Formation, which forms the unconformable base of the Palaeogene succession in the London Basin over the Upper Chalk. This important geological horizon crops out across southern Hertfordshire and is likely to be the source (directly or indirectly) of the present grains.

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Methods

All materials were examined visually, using a low-powered binocular microscope where required and catalogued (Table 1). The identifications of materials in this report, as an assessment, are necessarily limited and must be regarded as provisional.

The material derives from fieldwork with site-code 528/WAT. This assessment was conducted in November 2021 and was commissioned by Nicola Bell of KDK Archaeology Ltd.

Description of the assemblage

The submitted material comprised several small assemblages of green-coloured siliceous material, mostly flint. The green colour is mostly present as an external coating to the flint, but in some cases (the more porous?) the coloration extends in from the surface slightly.

The flint substrate is present mainly as well-rounded pebble, high-sphericity particles or angular fragments apparently derived from similar grains. The green coating appears to have been generated pre-fracturing in most, if not all, cases. In some instances, there are also small dark areas within the overgrowth.

The green material can be identified, broadly speaking, as glauconite*:* $(K,Na)(Fe^{3+},Al,Mg)_2(Si,Al)_4O_{10}(OH)_2$. The identity of the black mineral is uncertain.

Interpretation

The Cretaceous and Tertiary succession in SE England contains numerous horizons at which glauconite was developed. Glauconite typically forms during episodes of reduced sedimentation and reworking of the superficial sediments (Odin 1988). The most usual form for the development of glauconite is as small, millimetre-scale, pellets. Development as an overgrowth on flint has been much less commonly reported. One horizon at which such material does occur, however, is immediately above the unconformity of the Tertiary (Palaeogene) succession upon the Upper Chalk.

Through much of the London Basin (Aldiss 2012), the lowest Paleogene unit is the 'Bullhead Bed' at the base of the Thanet Formation (BGS undated). This contains flint of up to 400mm coated in glauconite. To the northeast of London, the basal Palaeogene unit is the Ormesby Clay Member, which is described as 'comprising unworn, green-coated flints in a matrix of bright green, glauconitic-rich sand or sandy silt' (BGS undated). It appears that the basal bed of the Tertiary succession bears such flint throughout the basin, despite the changing varying lithology of the following unit.

It would appear likely that the present material derives from the Bullhead Bed (or a closely-similar lithology) either directly, or indirectly through reworking into other superficial deposits.

The green colour has no connection with copper mineralisation, despite the superficial similarity.

Further work

These materials are interpreted as being natural; no further analysis is currently recommended. The materials of not of significance for retention in the site archive.

References

ALDISS, D T. 2012. *The stratigraphical framework for the Palaeogene successions of the London Basin, UK*. British Geological Survey Open Report, OR/12/004. 94pp.

BGS. Undated. *Lexicon of Named Rock Units* https://webapps.bgs.ac.uk/lexicon/lexicon.cfm

ODIN, G.S., (ed.) 1988, *Green Marine Clays. Oolitic Ironstone Facies, Verdine Facies, Glaucony Facies and Celadonite-Bearing Facies - A comparative study*: Developments in Sedimentology 45, Elsevier.

Table 1: summary catalogue of materials. Weights presented to nearest gram.

sample	context	Wt.	No.	item description
<30>	*(236)*	*8g*	19	Green coated and impregnated flint pebbles and angular fragments
<32>,	Sk1, skull	*8g*	21	Green coated and impregnated flint pebbles and angular fragments
<34>	mandible	*1g*	10	Green coated and impregnated flint pebbles and angular fragments
<36>	*(248)*	*12g*	23	Green coated and impregnated flint pebbles and angular fragments

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