APPENDIX I

The Welton-le-Wold mammalian assemblage

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Provenance of the material

According to the section drawings presented in Alabaster and Straw (1976), faunal material from Section A was collected predominantly from a single horizon, within a "pale brown flint gravel with whitish sand", 0.2-0.3m thick and 3.25-4.25m below the till. This light-coloured gravel terminates against a silt seam towards the east and is considered by Alabaster and Straw to represent a period of quieter deposition. At the western end of the section, straight-tusked elephant molars, tusk and cranial fragments were present at a similar height but within a medium-brown flint gravel with sand. A red deer antler was reported from a dark brown gravel approximately 20m to the east of these remains, although again occurring at a similar height. The large tusk in Section B was separated from the other tusk tip in Section A by approximately 12m and the two astragali by 14m.

Species List

Re-examination by the author of the specimens collected in the 1970s has reassigned material attributed to the giant deer (*Megaloceros giganteus*) to a large bovid (*Bos*, or more probably *Bison*). The identification of the associated elephant molars has also been revised (see below). Minimum numbers (MNI) of individuals are given in brackets.

PROBOSCIDEA
Elephantidae
Palaeoloxodon antiquus (Falconer and Cautley, 1845), straight-tusked elephant (MNI = 2)
PERISSODACTLYA
Equidae *Equus* sp., horse (MNI = 1)
ARTIODACTLYA
Cervidae
Cervus elaphus Linné, 1758, red deer (MNI = 1)
Bovidae
Bovini sp., large bovid (*Bos* or *Bison*) (MNI = 2)

Description of the finds

The dentition of the straight-tusked elephant (*Palaeoloxodon antiquus*) is characterized by two large tusks (incisors) and high, narrow, lophodont molars. Both of these elements are present in the Welton-le-Wold assemblage. The cheek teeth are comprised of a series of enamel plates or "lamellae", which are joined at the base and the enamel of the plates is coarsely wrinkled and usually thick (1.0-3.5mm, Maglio, 1973).

Two associated molars of *Palaeoloxodon antiquus*, originally described by Boylan (in Alabaster and Straw, 1976) as the upper second and third molars, are in fact an upper first and second molar. The presence of associated teeth, apparently found in life position, strongly implies that further cranial material was originally also present at the time of deposition (a possibility hinted at by Alabaster and Straw [1976] on the basis of the presence of "many friable bone fragments" that were found around the teeth). A small fragment of maxillary bone is present on the buccal side of the M2, although no other cranial material is apparent in the existing collection. The M1 is well worn and comprises 10 plates, although the back part of the tooth is missing, as are the roots. The occlusal surface clearly shows the prominent median expansion of the plates that is characteristic of this species. The M2 is just coming into wear and comprises 13 plates and a posterior talon. As is typical in the early stages of wear, the enamel of the anterior plates has an elongated oval ring (*annulus*) flanked by smaller circular rings. This tooth was the most complete and was therefore the only one to be measured:

Overall length of the tooth, measured along the axis of growth and perpendicular to the lamellar plane): 254mm
Breadth of the tooth, measured at the widest part of the occlusal surface: 67.80mm
Height of the tooth: 213mm
Enamel thickness: 2.86mm
Lamellar frequency (number of plates over 100mm): 6

The relatively modest plate count and the size of the tooth conform most clearly with the upper second molar, based upon the observations of the author and the plate counts of 12-13 given by Falconer (1865) and Adams (1877-81), rather than the original identification of an upper third molar by Boylan (in Alabaster and Straw, 1976). Although plate counts vary enormously in the last upper molar, 15-20 is the norm. The anterior talon is only just visible and the roots are missing. Coarse sand and small gravel clasts are lodged in the exposed hollow ends of the molar plates.

A small molar fragment (2 plates), cf. *P. antiquus*, broken in down the median line of the plate and across the centre of the plate, was found near the associated molars but cannot certainly be attributed to the same individual. A mid-posterior section of an upper molar (6 plates) of *P. antiquus* is also present in the assemblage. The roots are missing but the crown height and different degree of wear suggest that this is a separate individual to the one with the associated teeth. A minimum number of two elephants is therefore implied. The large, virtually complete adult tusk of *P. antiquus* is now in several large pieces with a number of smaller fragments. Measuremements are given in Alabaster and Straw (1976). A 25cm straight section of tusk, including the tip, was found near the associated molars although it cannot certainly be attributed to the same animal. It is in a weathered and rolled condition. The surface has fine angular gravel clasts and coarse sand adhering to it.

A single small fragment of molar of horse (*Equus* sp.) is present in the assemblage. The tooth is broken transversally in the area of the lingual loop and is missing the lingual surface and roots. A small fragment of the posterior lingual edge is also present but the two do not conjoin. From the occlusal surface, the tooth is apparently in mid-wear but the absence of roots precludes a more precise estimation. On the basis of this small fragment, it cannot be determined whether the tooth is that of a 'true' caballine horse or one of the ass-like stenonid species.

An unshed antler base (?right) of *Cervus elaphus* is also present. The specimen is crushed, fragmentary and has undergone extensive consolidation and could therefore not be measured. The surface of the antler is blackened, probably due to manganese staining, and it has substantial amounts of coarse sand and small angular gravel clasts adhering. The antler belongs to an adult male individual and its unshed state indicates that the animal must have died between September and March, based upon present day antler growth cycles (Corbet and Harris, 1991).

Three finds originally attributed to giant deer (*Megaloceros giganteus*) have been reassigned to a large bovid (?*Bison* sp.), comprising a fragment of a lower molar and two right astragali, indicating a minimum number of two individuals. The molar is broken after the first cusp in the thinnest part of the tooth, immediately anterior to the mesostyle. It shows the characteristic selenodont cusp pattern of the large bovids and the tooth is both higher-crowned than in deer and with no sign of the basal narrowing of the buccal wall of the molar that should already be apparent were the tooth that of a large cervid. The postcranial material is extremely abraded and has been thickly coated in consolidant so any reinterpretation must be regarded as tentative. The less complete of the astragali has partial iron staining and small angular gravel chips adhering to the surface. The overall morphology of the two specimens is more consistent with Bovini than with giant deer, in particular, the two lobes of the caudal surface are more symmetrical than in *Megaloceros*. The astragali are of relatively small size, even taking into account the degree of erosion of the original bone surface, and are visually most comparable with smaller bison specimens (probably females) from early Devensian deposits in Britain. However, sexual dimorphism is extremely pronounced in bison, as are fluctuations in size in relation to climate change. In addition, two species are known from the British Pleistocene, *Bison schoetensacki* (Freudenberg) from the early Middle Pleistocene and *Bison priscus* Bojanus, from the late Middle and Late Pleistocene. Any further identification is therefore not possible on the basis of such limited material.

Taphonomy

Virtually all of the material has been treated with a thick consolidant ('Trycolac' according to a note in the collection) that has unfortunately obscured the original bone surface and with it any evidence of modification such as cutmarks. Discolouration of the consolidant over the years is probably responsible for the brown, 'treacly' consistency currently observed. There is no visible evidence of carnivore modification on the limited amount of postcranial material present, although it is very abraded. Nevertheless, it is clear that different elements of the mammalian assemblage are very variable in its condition, the elephant molars being the best preserved material in the collection and the bovid astragali the least, suggesting different depositional histories. The red deer antler is too crushed and too heavily consolidated and the bovid and horse molar fragments too small to say much about their depositional history. However, since these teeth are naturally compact and robust, the presence of only fragmentary material is an indication of transport in a coarse substrate, trampling or other forms of breakage. With respect to the elephant molars, the occurrence of articulating teeth suggests that there has been only minimal disturbance of the material since deposition (resulting in the destruction of the maxilla and the removal of the fragile roots but leaving the specimens in life position). The presence of a fragile and relatively complete tusk also suggests that there has been little post-depositional movement. This contrasts markedly with the heavily abraded bovid astragali, which show clear evidence of transportation and have certainly been derived.

Evidence of local environment and climate from the vertebrate remains

The varying condition of the bones and teeth warns against consideration of the different elements as a unitary assemblage. Only the better-preserved elements, namely the elephant remains, are likely to provide the most accurate reconstruction of contemporary climate and environment. The apparent period of quieter deposition inferred for the pale brown gravel also argues against long distance transportation of these elements. Straight-tusked elephant is restricted to interglacial or interstadial occurrences in Britain during the Pleistocene and is generally associated with local mixed or deciduous woodland habitats. In contrast, horse, red deer and bison are found in both cold-climate and temperate episodes. Horse is indicative of open grassland, whereas red deer and bison inhabit a wide range of environments at the present day, including both closed woodland and more open

habitats. Local temperate forest is therefore certainly indicated but a mosaic of environments is possible, depending on the degree of reworking of the non-elephant material.

Biostratigraphy

The utility of mammalian assemblages as indicators of relative age for Pleistocene sediments has been repeatedly demonstrated (eg. Currant and Jacobi, 2001; Schreve 2001; Stuart and Lister 2001) but the limited vertebrate assemblage from Welton-le-Wold is unfortunately not particularly age diagnostic. The two taxa identified to species level have some of the longest biostratigraphic ranges of any large Pleistocene mammals, thereby rendering age determination extremely difficult. The first occurrence of *P antiquus* in Britain is in the Early Middle Pleistocene at Pakefield and Kessingland (Suffolk). This site is currently being reinvestigated by the Ancient Human Occupation of Britain (AHOB) project but analysis of a new small vertebrate assemblage now suggests that it pre-dates the Cromerian stratotype of West Runton (*contra* Stuart and Lister, 2001) and that a place within the very earliest early Middle Pleistocene is more appropriate. Although *P. antiquus* is not known from West Runton and continental correlates such as Voigtstedt (Germany), it reappears in Britain during the latest part of the early Middle Pleistocene at sites such as Ostend (Norfolk) and is a common component of all four post-Anglian interglacials before becoming extinct prior to the Last Glacial Maximum. Red deer, which are still extant, have a similarly long stratigraphic range, appearing in NW Europe during the early Middle Pleistocene. Stenonid horses first occur during the Early Pleistocene but are present only sporadically throughout the Middle Pleistocene in Britain although they apparently survived into the Neolithic in southern Europe (Bökönyi, 1954). Caballine horses are present from the early Middle Pleistocene onwards and are known from every succeeding temperate episode with the exception of the Last (Ipswichian) Interglacial and the early part of the Devensian (Currant and Jacobi, 2001). The mammalian assemblage from Welton-le-Wold could therefore fit within any Middle or Late Pleistocene interglacial or interstadial with the exception of the Last Interglacial.

Recommendations for future work

The collection of new micro- and macrofaunal material is a priority for this important site.

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Inventory

1. Unshed antler base (?right) of *Cervus elaphus*, comprising pedicle, coronet, broken brow tine, detached tine and beam fragments.

2. Incomplete right astragalus of cf. Bovini (?*Bison*).

3. Incomplete right astragalus of cf. Bovini (?*Bison*).

4. Anterior fragments of cf. right first lower molar of Bovini.

5. Anterior fragment of a right lower cheek tooth (Rp3-m2) of *Equus*.

6. Left first upper molar (LM1), *Palaeoloxodon antiquus*, associated with:

7. Left second upper molar (LM2) of *Palaeoloxodon antiquus*.

8. Small molar fragment (2 plates), cf. *Palaeoloxodon antiquus*.

9. Mid-posterior section of an upper molar (6 plates), cf. *Palaeoloxodon antiquus*.

10. Complete adult tusk in several parts, *Palaeoloxodon antiquus*

11. Section of tusk tip, *Palaeoloxodon antiquus* and associated bag of tusk fragments.

Bags 1-4: sediment samples containing multiple comminuted fragments of indeterminate elephant molar (probably *Palaeoloxodon antiquus*) and tusk?. Sorted for microvertebrate and molluscan remains but none noted.

Small bag containing 3 small indeterminate bone fragments