

11. PALAEONTOLOGY

Introduction

- 11.1 Due to the high level of potential paleontological interest at Ardley Quarry and the impacts associated with the proposed development on this resource, a stand alone assessment of the potential impacts of the proposed development on this resource has been prepared as a stand alone chapter.
- 11.2 The geology, hydrogeology and hydrology of the application site and surrounding area has been described in detail in Chapter 9 and is therefore not covered in detail in this Chapter.

Methodology

- 11.3 A desk-based study has been undertaken to allow a qualitative risk assessment to be made on the potential for paleontological interests to be unearthed at Ardley Quarry during ground excavation work.

Baseline Conditions

- 11.4 The underlying geology of the proposed development site consists of the White Limestone Formation which is part of the Great Oolite Group of middle Jurassic age. The White Limestone Formation comprises hard, fractured, fine to medium grained oolitic limestones consisting of Massive Limestone and the Upper, Middle and Lower Flaggy Limestones. Each Limestone layer is underlain by a marl horizon typically between 0.5m and 10m thick.
- 11.5 In the middle Jurassic age, Ardley was a region of swamp lands inhabited by a variety of dinosaurs. A shallow sea (less than 10m) extended and shelved very gradually towards the north and west and low-lying forested land extended east and south. The marine environmental conditions during this period of shallow and non-tidal waters produced fine-grained micritic sediment and large numbers of bivalves, gastropods, echinoids, ooliths and other benthic organisms which would eventually lead to the formation of the limestone present today. Fluctuations in sea levels throughout this period occasionally exposed mudflats and it is within one such horizon within the Upper Flaggy Limestone layer that fossilized footprints and trackways of dinosaurs, that walked across the soft sediments 168 million years ago, have been found at Ardley Quarry.
- 11.6 In 1997, during works to supply clay for the permitted landfill operations, the dinosaur footprints and trackways were discovered. The footprints form trackways made by two different dinosaurs. The most numerous belong to the herbivorous sauropods believed to be of a Cetiosaurus (the Oxford Brontosaurus) whose bones have been found in the White Limestone Formation in Oxfordshire. The other footprints are from a bipedal carnivorous dinosaur believed to be a Megalosaurus that was known to inhabit this area during the middle Jurassic period. A total of 40 such trackways have been unearthed to date, some of which show changes in speed and have provided invaluable evidence on the movement mechanics of the aforementioned

dinosaurs¹. Some of these trackways have been removed and placed into the Woodstock Museum. The remaining trackways have, or are being covered with the basal liner of the permitted landfill waste cells.

- 11.7 No trackways have been found at the site of the proposed EfW facility to date. However, within this southeast corner it is believed that the extraction of limestone has left a thin clayey bed over the particular horizon where dinosaur footprints have been found in other parts of the site. There is, therefore, the potential for further footprints and trackways to be present beneath the proposed development site.
- 11.8 Natural England has indicated that they would consider designating a geological Site of Special Scientific Interest (SSSI) if further dinosaur trackways are found at Ardley. Natural England has indicated that this will not apply to the existing permitted landfill site.

Assessment of Potential Impacts

- 11.9 This section identifies the potential impacts of the proposed development on the paleontological resource that may be present beneath the development site.
- 11.10 The proposed HWRC improvements will not impact on this geological horizon and any footprints within the active landfill area have already been recorded and/or removed as appropriate. The only part of the site where any potential may remain is in the currently undisturbed area where the EfW is proposed to be located. However it is understood that the clay has been removed from this area and that the potential of finding new trackways is considered to be very low.
- 11.11 The potential impact on the paleontological resource will arise from works during the construction of the EfW facility that will necessitate excavation, drilling and/or piling work into the limestone strata and which will break through the horizon that may contain dinosaur trackways.
- 11.12 Groundworks throughout this part of the site have the potential to expose further dinosaur footprints in the horizon within the Upper Flaggy Limestone. Any loss of particularly good examples of dinosaur trackways would be a significant impact on the paleontological resource.
- 11.13 By their very nature, drilling and/or piling work will not expose dinosaur trackways if used during the construction of the EfW Facility. However, whilst these have the potential to significantly impact on the paleontological resource under the EfW facility during the construction works, any piling or drilling work will be very localised and unless directly beneath the drill or pile is unlikely to damage the wider potential resource and is therefore considered to be low risk.

¹ Mossman, D. J., Bruning R. and Powell, H. P. (2003). *Anatomy of a Jurassic Theropod Trackway from Ardley, Oxfordshire, U.K.* *Ichnos*, Taylor and Francis Ltd, Volume 10, pp195-207.

Proposed Mitigation

- 11.14 Prior to the start of all groundworks, all contractors will be fully briefed on the paleontological features to look out for when undertaking excavations on site.
- 11.15 During groundworks through the horizon where dinosaur trackways have been found, care will be taken to strip this horizon in layers and if any dinosaur footprints are exposed all works within that area will stop and Natural England will be contacted for advice.
- 11.16 Where any footprint and/or trackway is deemed worthy of protection these will be removed and preserved under the guidance of suitable palaeontologists as advised by Natural England and the County Council.
- 11.17 During all drilling and piling, all machinery will be 'fit for purpose' and all appropriate methods employed to ensure that the minimum amount of disturbance and damage will be caused during these operations to the surrounding environment.

Assessment of Residual Impacts

- 11.18 It is considered that there are no significant residual impacts associated with the development on the paleontological interest, provided the mitigation measures detailed above are implemented.

Summary and Conclusions

- 11.19 The dinosaur footprints and trackways found to date at Ardley Quarry have provided an important insight into how two species of dinosaur that lived 168 million years ago moved. There is a low possibility that further trackways remain in a horizon of the Upper Flaggy Limestone under the proposed EfW facility site that could be exposed during construction works. However, it is concluded that provided the mitigation measures are implemented, the proposed development is not likely to have a significant impact on the potential paleontological resource at Ardley Quarry.