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Geology of the Syke House Farm area, Barwick in Elmet, Yorkshire

Geology and Landscape, Southern Britain Programme
Internal Report CR/06/138

BRITISH GEOLOGICAL SURVEY

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Geology of the Syke House Farm area, Barwick in Elmet, Yorkshire

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Editor

P.Strange

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Front cover

Cover picture details. Yellow Sands Formation in the middle of the excavation west of Syke House Farm.

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Foreword

This report is the published product of a study by the British Geological Survey (BGS) for the Environment Agency (York and Pickering). It details a site visit to Syke House Farm, Barwick in Elmet, Yorkshire to investigate exposures and check the validity of the published geological maps.

Acknowledgements

The author acknowledges the help and discussion given in the field by Ruth Buckley and Ian Rowe of the Environment Agency. The report has benefited from the editing and quality assurance undertaken by Mr Poul Strange and Mr Jon Ford.

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Summary

This report details a site visit to Syke House Farm [NGR: 439800, 438400], Barwick in Elmet, Yorkshire undertaken for the Environment Agency to investigate exposures and check the validity of the published geological maps. An open excavation proved the base of the Permian sequence and showed it to be about 15m further to the south than it is shown on the published maps. The excavation exposed weathered and purple-stained Lower Coal Measures Formation mudstone overlain by about 1.3m of fine to medium-grained sandstone of the Rotleigende Group, Yellow Sands Formation (formerly called the Basal Permian Sandstone). This was overlain by about 10m of dolomite belonging to the Zechstein Group, Cadeby Formation (formerly called the Lower Magnesian Limestone). The published map shows the area crossed by an approximately east-west trending fault downthrown to the north. On the north side of this fault line the exposure of Cadeby Formation dipped at 20 degrees in a northerly direction suggesting folding as part of a drag fold against the fault. In the southern exposure of the Cadeby Formation, the dip was to the south-east at about 24 degrees; here the sequence was more brecciated with slightly open fissures and a dip caused by cambering and collapse of the escarpment edge appears the most likely cause. The site had extensive made ground that was built up on the side of the valley; in places there was evidence that some of the bedrock had also been excavated, especially where the exposures were visible. Made ground and excavations were also observed in the floor of the valley where an elongate lagoon was being filled with tipped material. Copple Syke Spring was observed, but in a slightly different place to that shown on the published Ordnance Survey map.

1 Introduction

1.1 TERMS OF REFERENCE

The site of Syke House Farm has been used for unauthorised waste disposal. The site is partly on the major aquifer of the Cadeby Formation and the Environment Agency via Ruth Buckley requested verification of the site geology especially with respect to exposures that have been excavated. A site visit was arranged on the 28th June 2006 when the report author visited the site for about four hours with Ruth Buckley and Ian Rowe of the Environment Agency. Observations were made and representative samples of the sequence were collected by the Environment Agency.

1.2 LOCATION

Syke House Farm is situated 1km north of Barwick in Elmet Church and the area of the waste disposal site has a National Grid Reference of [439800, 438400] (Figure 1).

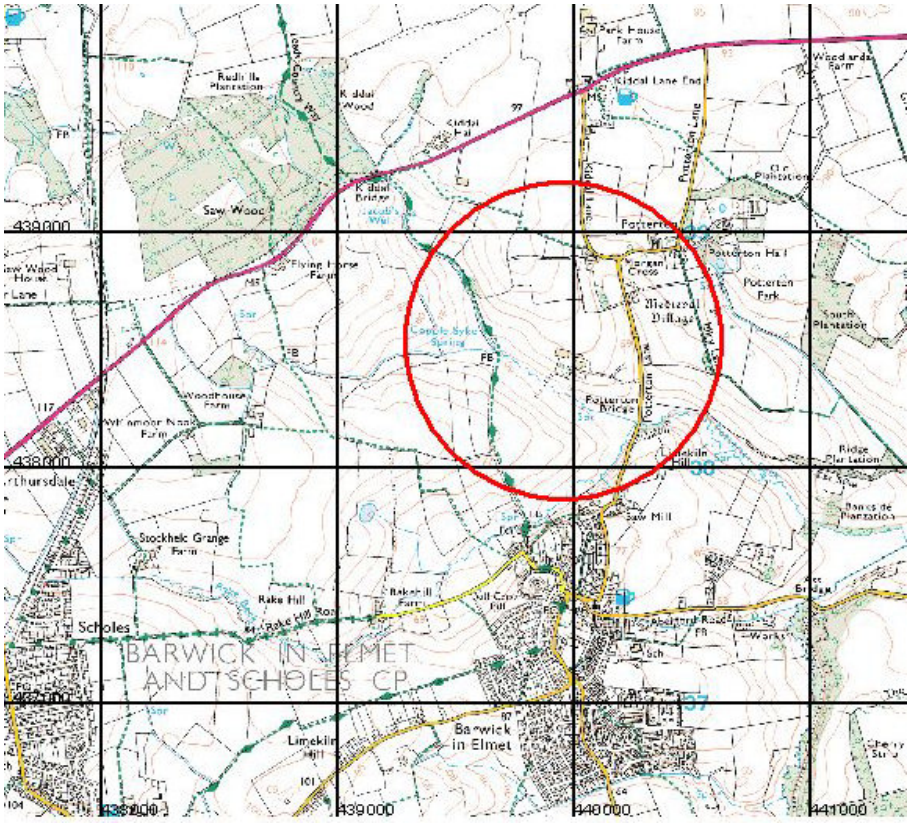

Figure 1 Location of Syke House Farm, Barwick in Elmet, extract from 1;25,000 scale Ordnance Survey map (not to scale, each grid square represents 1km).

2 Published geological information for the area

The area around Sykes House Farm was originally surveyed in the 1880's and completely resurveyed and revised on the 1:10,560 scale by W. Edwards in 1938. The accompanying 1:63,360 scale map was published in 1950 along with the sheet memoir describing the area (Edwards et al., 1950). The majority of the area was resurveyed on the 1:10,000 scale by M.T.Dean in 1989-1990 and the eastern part by A.H.Cooper in 1999. The accompanying 1:50,000 scale map was published in 2003 with the descriptive sheet explanation (Cooper and Gibson, 2003). The geological information for the area is available in digital format at both the 1:10,000 and 1:50,000 scales. The geological information comprises four layers of data, bedrock, superficial, mass movement and artificial. The bedrock data is the information about the solid rocks beneath the site (Figure 2). The superficial data records the pre-glacial, glacial and post glacial deposits in the area (Figure 3). There are no mass movement deposits in the study area and Figure 4 shows a combination of solid, superficial and artificial geology data.

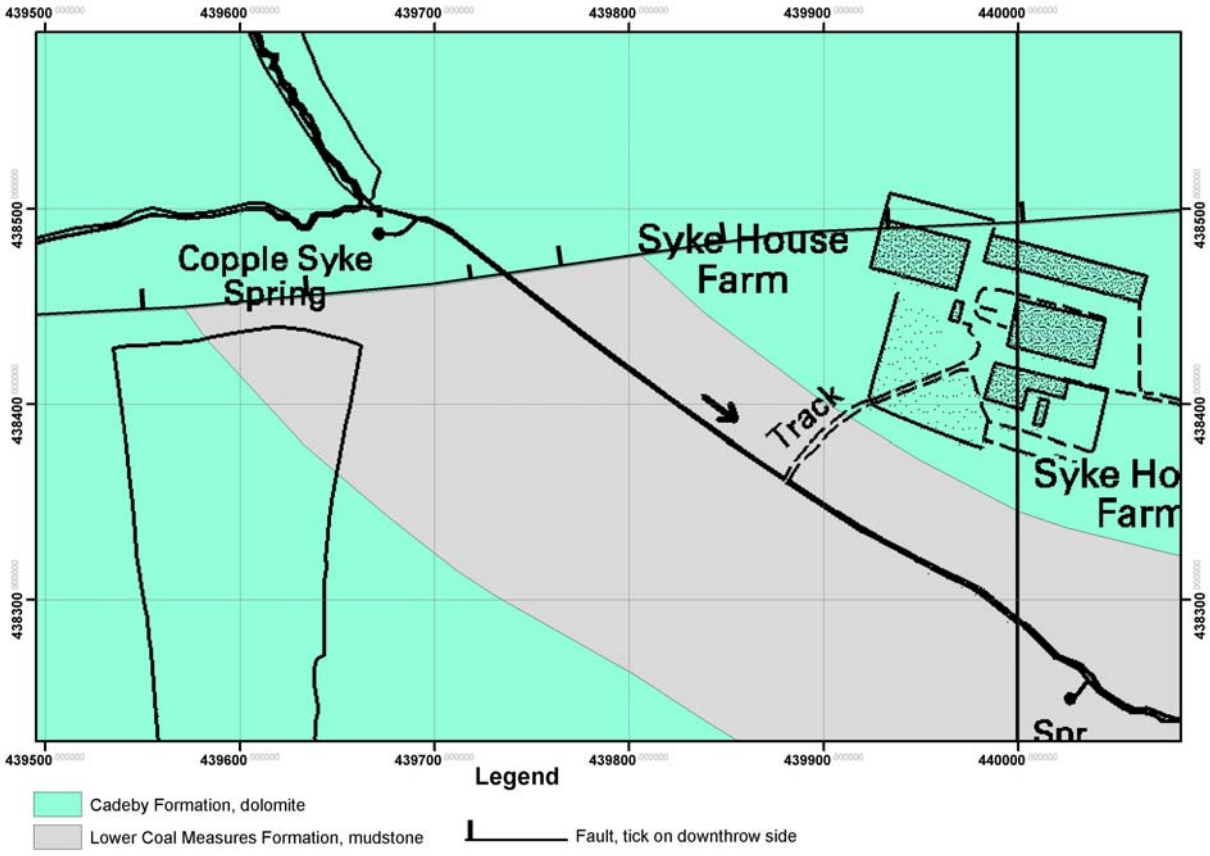

Figure 2 The published 1:10,000 scale bedrock dataset for the Syke House Farm area. Enlarged, not to scale, each grid square represents 100 metres.

Figure 3 The published 1:10,000 scale superficial geology for the Syke House Farm area. Enlarged, not to scale, each grid square represents 100 metres.

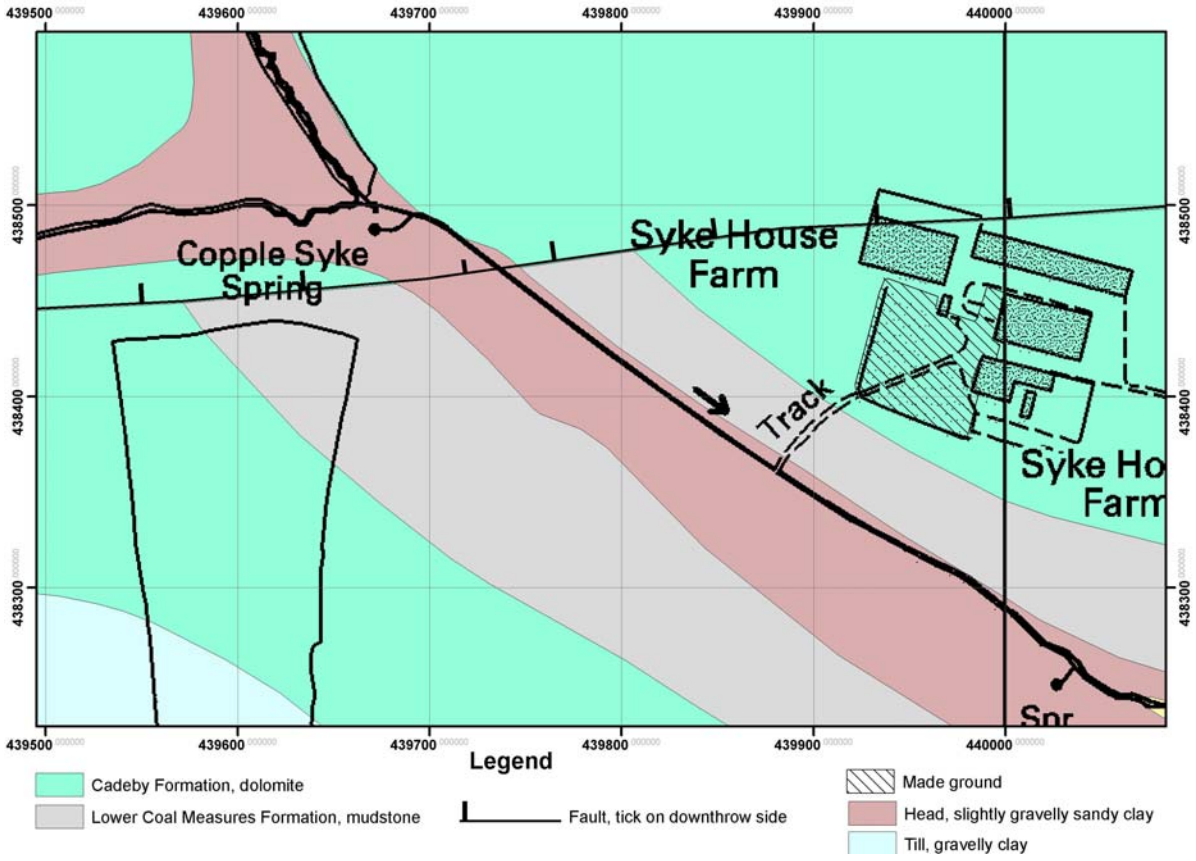

Figure 4 The published 1:10,000 scale bedrock, superficial and artificial datasets for the Syke House Farm area. Enlarged, not to scale, each grid square represents 100 metres.

2.1 THE GEOLOGICAL SEQUENCE

2.1.1 Bedrock Geology

The bedrock geology comprises two main sequences of rock separated by an erosion period and unconformity. The lowest and oldest rocks present in the valley comprise mudstones of Carboniferous age belonging to the Lower Coal Measures Formation. These are unconformably overlain by the Permian sequence, which on the published geological maps is shown only as the Cadeby Formation which is a dolomite rock. In some places, a thin friable sandstone sequence is present beneath the Cadeby Formation especially in the Garforth and Pontefract areas to the south (Cooper and Gibson 2003); this is the Yellow Sands Formation of Permian age. Although not mapped in this area the Yellow Sands Formation has now been proved at this site (see below)

Age	Group	Formation	Local lithology	Thickness
Permian (late)	Zechstein Group	Cadeby Formation	Dolomite	Around 60m, approximately lowest 10m seen
Permian (early)	Rotliegende Group	Yellow Sands Formation	Fine to medium-grained sandstone with rounded aeolian grains.	1.3m seen,
Carboniferous (Westphalian)	Coal Measures Group	Lower Coal Measures Formation	Mudstone underlain by mudstone, siltstone and sandstone	Tens of metres, underlain by Namurian sandstones and mudstones.

2.1.2 Superficial Geology

Very little of the area is covered by superficial deposits. Capping the hill to the south-west a small area of glacial till is mapped. This is a deposit left by the melting of the ice most probably during the Ice-Age before last. During and after the last Ice-Age the area was subjected to considerable freeze and thaw action resulting in solifluction deposits which blanket the valley bottoms. These are referred to as head deposits and locally comprise sandy clay with some local and a little erratic gravel and boulder content. In places these deposits have been modified by fluvial action and the stream along the valley took a meandering course before the landowner straightened it. These deposits are at least 2.0m thick, but the underlying bedrock was not seen so the full thickness is unknown.

2.1.3 Artificial Deposits

Three types of artificial ground are mapped in the area. Worked ground is shown where there is evidence of excavations in either the bedrock or superficial deposits. Made ground is shown where there are deposits built up on the surface. Worked and made ground or infilled ground is shown where excavations have been filled in with artificial deposits. On the published geological maps only on small area of made ground is shown, however, on the maps revised after the site visit (Figures 7 and 12) areas of worked, made and infilled ground are shown, details of the deposits are given in section 3.

3 Site visit and revision of the geological map of the area.

3.1 SITE VISIT AND INTERPRETATION

The site was visited and numerous exposures of rock and superficial deposits were examined. These confirmed the existing geological maps, but also yielded some very minor alterations in some geological linework and the sequence of rocks exposed.

The site permitted numerous observations to be made of the geological sequence, especially of the bedrock and the valley deposits. The work was undertaken on 1:2,500 scale maps (enlarged from 1:10,000) and aerial photographs (Figures 5 and 6). Field location was fixed using a Silva Compass and Etrex Summit Global Positioning System (GPS). The GPS gave an accuracy of ±5m and the position was adjusted manually using features on the air photograph where necessary. The open lagoon was measured by Ian Rowe. The individual field observations are shown on Figures 7 and 8.

Figure 5 Air photograph of the site, taken approximately in 1999-2000. Not reproduced to a specific scale, each grid square represents 100 metres. Aerial Photography by UK Perspectives.

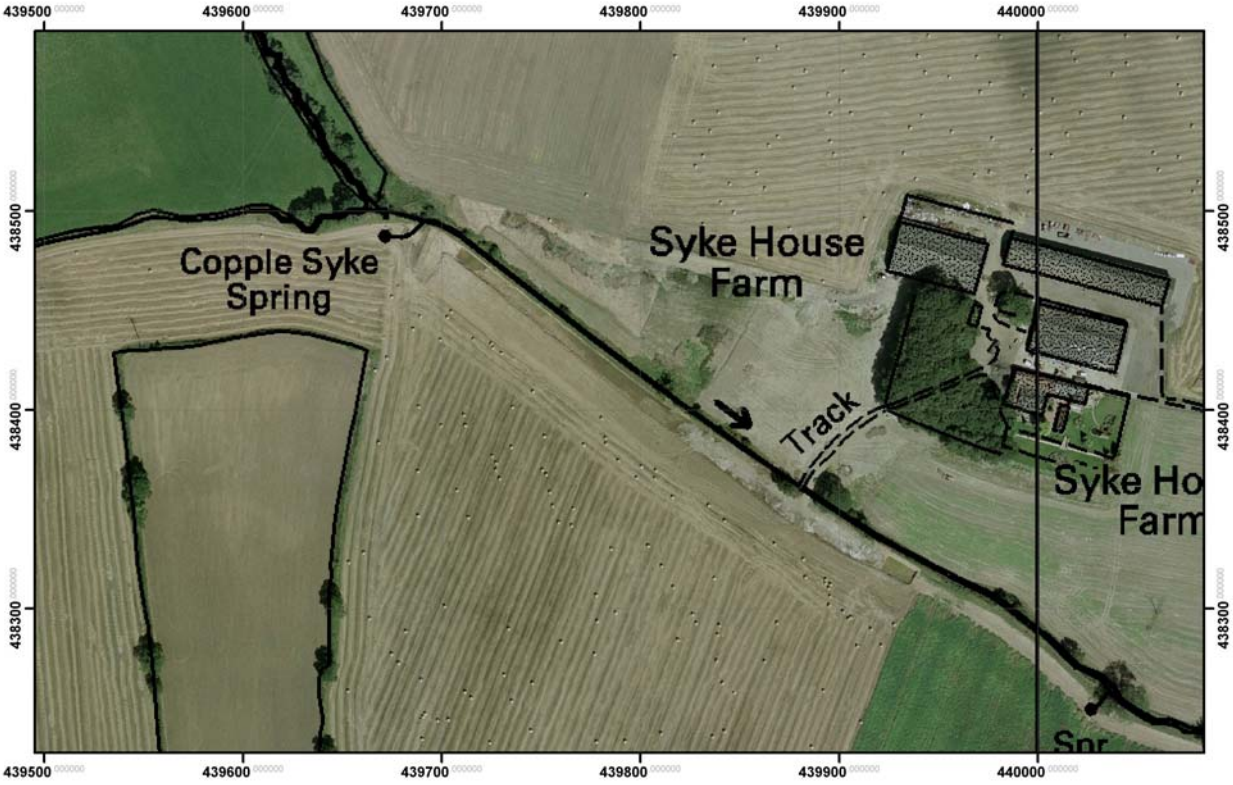

Figure 6 Air photograph of the site, taken approximately in 1999-2000 with the 1:10,000 scale Ordnance Survey topography. Not reproduced to a specific scale, each grid square represents 100 metres. Aerial Photography by UK Perspectives.

3.2 FIELD OBSERVATIONS

The individual field observations are summarised on Figure 7 and detailed below with a note about each numbered locality shown on Figure 7.

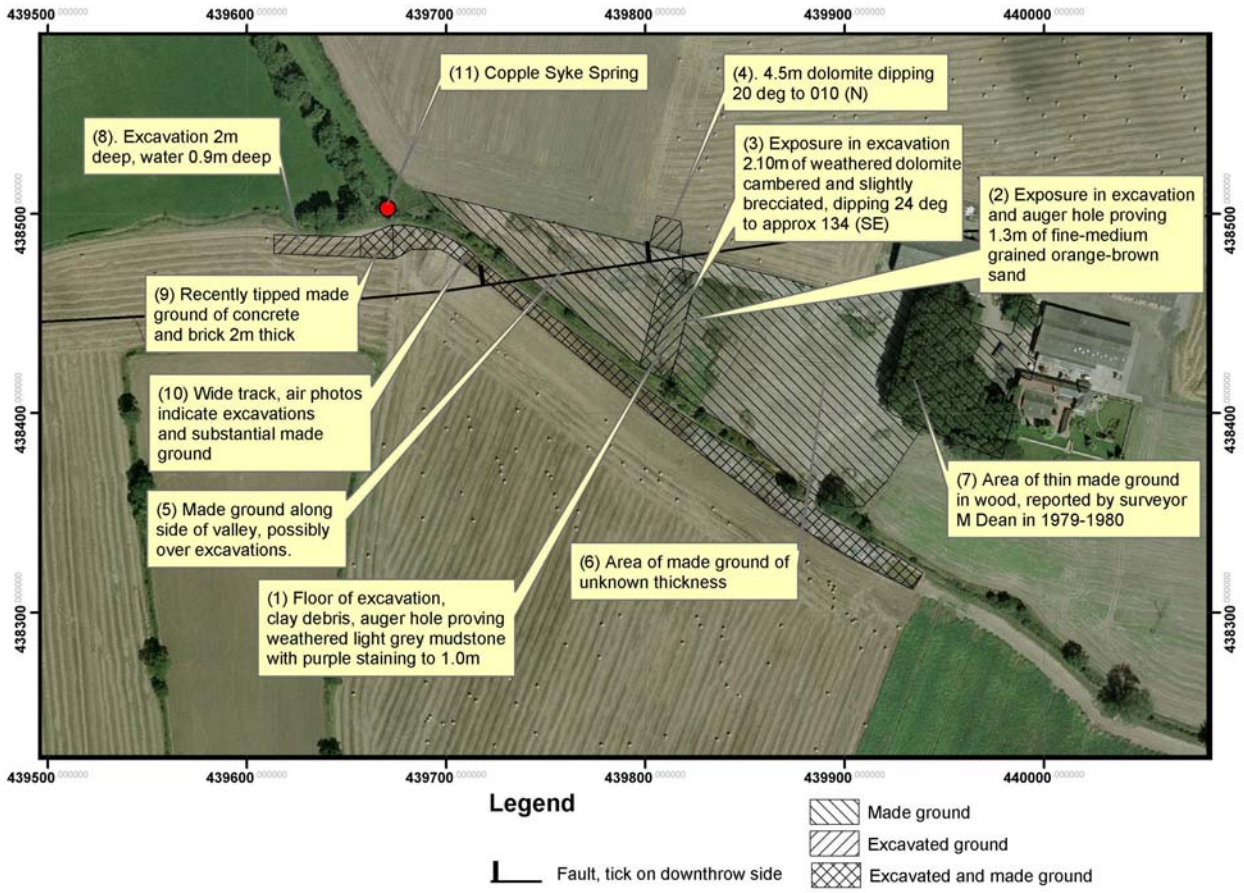

Figure 7 Air photograph of the site, taken approximately in 1999-2000 with field observations and areas of artificial ground shown. Not reproduced to a specific scale, each grid square represents 100 metres. Aerial Photography by UK Perspectives.

3.2.1 Locality 1. Carboniferous mudstone [439814,438441]

The central part of the site was an excavation about 2-2.5m deep with poor exposures on the eastern side. The floor of the excavation was covered with light grey and dark purple and reddish brown weathered clay. This material was interpreted to be weathered Carboniferous mudstone belonging to the Lower Coal Measures Formation. An auger hole to a depth of 1m from the base of this excavation proved similar clay to a depth of 1m, with small fragments of mudstone in the lower parts of the hole. The dark purple and reddish brown weathering was interpreted as being a result of Permian weathering at the unconformity between these rocks and the overlying Permian sequence.

Figure 8 (Locality 1). Weathered Carboniferous mudstone of the Lower Coal Measures Formation exposed in the bottom of the excavation and proved by hand auger to a depth of 1m.

Figure 9 (Locality 2). Fine and medium-grained sand belonging to the Yellow Sands Formation overlying grey Carboniferous mudstone at a depth of 0.5m

3.2.2 Locality 2. Yellow Sands Formation [438818,438442]

At the side of the excavation there was an exposure showing 0.8m of fine to medium-grained light and medium orange-brown sand and friable sandstone. Examined under the hand lens the grains of the sand were dominantly composed of quartz and many of the grains were well-rounded. This is typical of the Yellow Sands Formation and indicative of formation from an aeolian (wind-blown) environment. Similar sands and sandstone were exposed in the cuttings for the A1-M1 link in the Garforth area (Cooper and Gibson,2003, plate2). An auger hole penetrated the base of the sand at a depth of 0.5m and proved a few fragments of fine gravel resting on dark slightly purple grey mudstone of the underlying Carboniferous sequence (Figure 9 above). The exposure and the auger hole indicate that the Yellow Sands Formation is about 1.3m thick here.

3.2.3 Locality 3. Cadeby Formation dolomite, weathered, broken and cambered [439820,438457]

Towards the back (north) of the main excavation, the Cadeby Formation dolomite was exposed overlying the Yellow Sands Formation described above. The exposure had traces of good bedding, but was all rubbly and highly weathered. The general dip of the strata was towards the valley at 24 degrees to approximately 134 (SE). The dolomite was fine-grained to muddy, highly weathered comprising thin and very thin beds with clay laminae up to 0.01m. Approximately 2.1m of strata was exposed and the upper metre or so was highly weathered and more orange in colour than the lower material. The broken nature of the strata and the dip towards the valley suggest that the material has slipped or cambered slightly on the underlying sand and mudstone. It is thus possible that the thickness of the Yellow Sands Formation noted above should be regarded as a minimum figure.

Figure 10 (Locality 3). Broken and weathered Cadeby Formation dolomite dipping towards the valley

3.2.4 Locality 4. Cadeby Formation dolomite dipping to the north [439814,438495]

Locality 4 was situated in a small turning area excavated into the bedrock. The locality plotted just to the north of the fault that was mapped on the published geological maps. The exposure had a dip of 20 degrees to 010 (N) and 4.5m of strata were exposed. The unusually steep dip of the strata was inferred to have been caused by drag adjacent to the fault, which was mapped with a downthrow to the north (Figures 3 and 5). The lowest 1.3m of strata exposed comprised yellow-brown dolomite, which was hard and fairly compact, finely crystalline with open vughs up to 0.02m across. The beds were up to 0.25m thick and a thin clay bed that ranged from 0.02-0.05m thick capped the sequence. This sequence was overlain by 1.2m of dolomite that was similar to the material below, but which was present in beds that ranged from 0.06-0.15m thick. Above this there was 2m of highly weathered fairly massive slightly banded dolomite which could be easily broken by hand and dug out with a spade or hammer.

Figure 11 (Locality 4). Cadeby Formation dolomite dipping to the north (left) showing the 0.25m beds near the car passing up into thinner beds then weathered material to the left.

3.2.5 Locality 5. Made ground along the side of the valley [436762,438473]

West of the excavated area with the exposures, the ground was uneven with abundant tipped material covering a roughly triangular area of approximately 4445 sq m. Just west of the turning point of Locality 4, at the side of this material, there was an excavation several metres deep. There were no other indications of the fill thickness and the deposit may either be built up on the side of the former valley, fill in excavations, or be a combination of these two types of fill.

3.2.6 Locality 6. Area of made ground towards farm [439889,438411]

East of the excavated area there is an area of made ground that comprises a roughly rectangular area approximately 10360 sq m in extent. This extends from the track at the top to the stream at the bottom and around the corner of the wood near the farm. The surface of the made ground included numerous man-made artefacts and the form of the land showed it standing higher than the fields to the east. The air photograph (Figure 5) indicates the eastern limit of this made ground and the present change of slope feature accords with this position.

3.2.7 Locality 7. Area of made ground in wood [439936,438411]

This area of made ground was surveyed by M. Dean in 1989-90. It is shown on the published geological standard at the 1:10,000 scale and noted on his field maps as including rock, oil drums and batteries. No indication of thickness was given, but the presence of healthy trees suggests it is thin.

3.2.8 Locality 8. Excavation at west of site [439624,438481]

At the west of the site near Copple Syke Spring, there was an open excavation cut into the head deposits of the valley floor. The water filled part of the excavation was measured by Ian Rowe as being 43m long and 10m wide by 2m deep with 0.9m of standing water (area 430 sq m, volume 860 cu m). The sides of the excavation showed a sequence of 1.1m above water level comprising medium, slightly orange-brown slightly sandy clay with sporadic angular and rounded Carboniferous sandstone blocks and gravel. This was interpreted as being part of the head deposits, but it was also noticed that the surface 0.5m or so included more stone content than the lower material.

3.2.9 Locality 9. Recently tipped made ground at end of excavation [439667,438483]

Adjacent to the east end of locality 8 the excavation was filled with recently dumped concrete and brick with a little soil. This material had fresh track marks and covered and area of approximately 195 sq m. At the water's edge the fill material was approximately 2m thick.

3.2.10 Locality 10. Wide track of made ground [439709,438477]

Locality 9 described above is and extension of the material described here for locality 10. Locality 10 was a wide track (approximately 8-10m) with some wider passing places. The air photograph (Figure 5) indicated that at both the west middle and east ends of this track the excavations were deep enough to contain standing water, the area in the east looking like a deep lagoon. The photograph also indicated areas of made ground dumped along parts of the track. The whole of this track area is now made ground which covers an area of approximately 3172 sq m.

3.2.11 Locality 11. Copple Syke Spring [439668,438502]

This spring is named on the Ordnance Survey map and is shown located to the south of the beck. However, on the geologist's field map surveyed by W.Edwards it is shown as a cross adjacent to the north of the beck. This is the position in which the spring was observed on the visit of June 28th 2006. The spring was flowing well with a small stream emanating from it. There was no tufa associated with the spring and it must be inferred that it was "fresh" water without large amounts of dissolved carbonate. It is possible that the spring is associated with the fault that crosses the area and the fold that has developed next to the fault.

4 Revised geological map for Syke House Farm

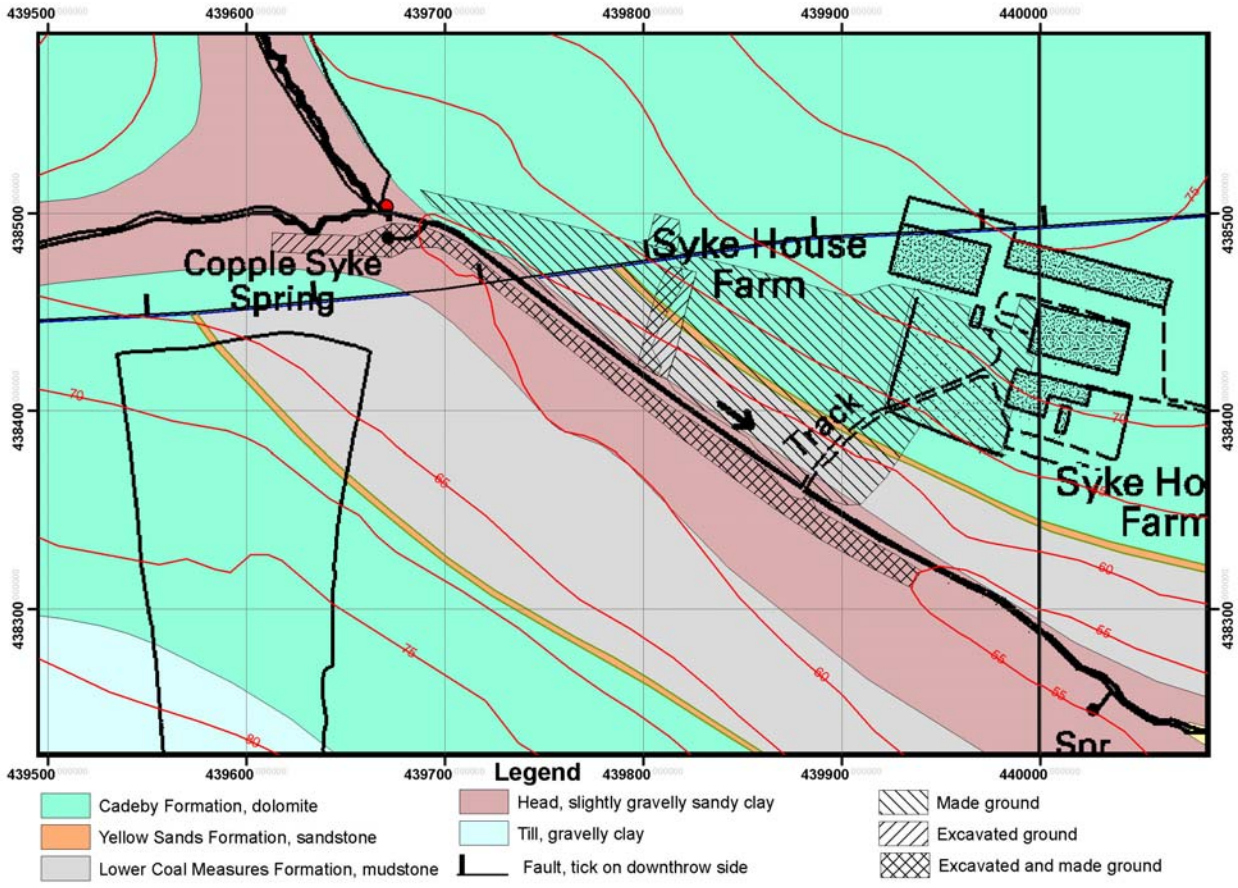

Figure 12. Revised geological map for the Syke House Farm area, contours in red.

The new geological information has permitted the geological map for the area to be revised. Compared with the currently published geological maps (Figures 2-4) the new map has the boundary of the Permian and Carboniferous rocks moved very slightly to the south by about 10-15m. In addition to this move, the Yellow Sands Formation has been mapped at the base of the Cadeby Formation. These changes are shown in Figure 12 above. In addition to the changes in the bedrock map, there are substantial additions to the artificial ground deposits as detailed above in section 3.

References

Most of the references listed below are held in the Library of the British Geological Survey at Keyworth, Nottingham. Copies of the references may be purchased from the Library subject to the current copyright legislation.

COOPER, A H. and GIBSON, A. 2003. Geology of the Leeds district - a brief explanation of the geological map. *Sheet Explanation of the British Geological Survey,* 1:50,000 Sheet 70 Leeds (England and Wales)

EDWARDS, W., MITCHELL, G.H. and WHITEHEAD, T.H. 1950. Geology of the district north and east of Leeds. *Memoir of the Geological Survey of Great Britai*n, 1:63,360 Sheet 70 Leeds (England and Wales)

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