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INTRODUCTION

This chapter describes the existing physical and environmental characteristics of the quarry workings at Carlton Main, the proposed Southern Extension and its surrounding environs. Allied to this, a number of the chapters within this volume provide descriptions of the application site in relation to particular environmental topics, providing *inter alia* 'baseline' surveys.

- 2.1 In this respect, Chapter 6 considers the landscape character and topography of both the proposed extension and its surroundings whilst Chapter 7 describes the ecological habitats, flora and fauna that exist within the proposed extension and wider Quarry. Chapter 8 describes the geological and water environment surrounding the Quarry and Southern Extension. All chapters describe the baseline conditions as they exist today, plus provide an indication as how the baseline may change with time in the absence of the proposed development.
- 2.2 These existing conditions provide a base against which the effects of the proposals may be evaluated.

LOCATION

- 2.3 The Carlton Main brickworks is located¹ approximately 7km to the east of Barnsley and 4.4km to the south west of South Kirkby, with Wakefield lying 15.5km to the north-northwest. More specifically, it is located immediately to the south of Grimethorpe, in the eastern side of the A6195 Park Spring Road.
- 2.4 The brickworks comprises a brick manufacturing plant and associated stockyards within the western part of the applicant's land holding along with a quarry which provides the raw materials for the plant. The Southern Extension is located at the south-eastern corner of the quarry workings and extends southwards for around 250m.
- 2.5 For identification purposes the extent of the Quarry is centred on National Grid Reference (NGR) SE 41319 08218 and illustrated on **Drawing CM 2/1**.

SITE DESCRIPTION

Existing Quarry

- 2.6 The approximate extent of the brickworks and Quarry is shown edged in blue on **Figure 2-1** below, which is based on aerial imagery produced by Google Earth. In addition, the extent of the proposed extension is edged in red and the current extraction boundary edged in orange. **Drawing CM 2/2**

¹ All distances measured from the centre of the site to centre of the settlement using Google Earth

illustrates the extent of the application site in more detail and shows the extent of the extension (edged in red) and land under the control of the prospective applicant (edged in blue).

Figure 2-1
Site Context



- 2.7 The existing Quarry is broadly rectangular in shape with the northern boundary mainly formed by the southern edge of Grimethorpe and the southern boundary formed by the New Park Springs Country Park (a reclaimed colliery tip). The eastern boundary abuts a cemetery and open land whilst the western boundary is formed by a clay stockpile, buildings and yard areas associated with the brickworks.
- 2.8 The planning permission for the Quarry extends to around 27.7ha and is illustrated on **Drawing CM 2/3**; however, the extraction limit is around 19ha due to wide landscaped margins being left to the northern and eastern edges of the workings. In this respect, land outside of the extraction limit forms a buffer to the residential area to the north and cemetery to the east, and has been landscaped through tree planting. Within this buffer zone is a footpath. A further landscaped area is located at the south-western corner of the site, where overburden and soils have been placed to create a screen mound. The boundary of the Quarry, in common with the adjacent brickworks is securely fenced with 2.4m high palisade fencing.
- 2.9 Within the Quarry, the workings have been developed in a series of low faces, ranging from 3m to 5m in height separating intermediate benches used for accessing different strata, resulting in a sequence of north to south trending quarry faces advancing up the hill. Final excavation faces have been formed along sections of the north, west, and east boundaries. The final slope profile

achieved in these areas is approximately 33° (1V:1.5H), with face angles of around 45° and intermediate benches of up to 4m.

- 2.10 Within the boundary of the site, the topography takes on an irregular undulating form due to the working of clay. A series of benches have been created rising from around 30m AOD at the base of the quarry workings to a bench at 67m AOD adjacent to the eastern boundary. From this bench, the topography continues to rise towards the site boundary and meet original ground levels. The deepest part of the workings are within the western part, within this area is the main quarry sump, which runs north to south at the eastern toe of the in-pit landfill in the south of the site. The water level recorded in the December 2016 topographic survey was around 27m AOD and sits at the base of the permitted excavation for this part of the site.
- 2.11 **Drawing CM 2/2** illustrates the topography of the site.

The Southern Extension

- 2.12 The proposed Southern Extension to the quarry workings is located at, and contiguous with, the south-eastern corner of the existing workings. It is rhomboid in shape with a pronounced apex at the southern tip, and covers an area of around 3.5ha. The northern part of the Southern Extension lies within the current Quarry boundary and comprises the current Quarry margin between the top of the excavation and the site boundary.
- 2.13 The eastern part of the Southern Extension gently slopes downwards from the eastern boundary before becoming more level. It forms the north eastern-corner of the country park and is characterised by open areas of grassland and recent woodland planting. The area is crossed by several informal paths.
- 2.14 As previously noted **Drawing CM 2/2** shows the extent of the proposed Southern Extension edged in red, with land under the control of the applicant edged in blue.

Access

- 2.15 Access into the brickworks is off the eastern side of Clayburn Road at NGR SE 40918 08247. Clayburn Road joins Springvale Road which is the main road through a small industrial area to the north. To the west, Springvale Road joins the A6195 at a four arm roundabout.
- 2.16 Whilst access into the quarry workings can be gained from within the brickworks, a secondary access is located at NGR SE 41061 08341, off a short industrial estate road which joins Springvale Road.

Habitats

- 2.17 The Southern Extension comprises several areas of grassland which were created during the restoration of the former colliery tip as part of the development of the New Park Springs Country Park approximately 20 years ago.
- 2.18 The grassland supports a sward indicative of predominantly neutral conditions. Red fescue (*Festuca rubra*) is the most frequent grass species, which is abundant in places; tufted hair-grass

(*Deschampsia cespitosa*) and Yorkshire fog (*Holcus lanatus*) is frequent, and occasional cock's-foot (*Dactylis glomerata*), perennial ryegrass (*Lolium perenne*), rough-stalked meadow-grass (*Poa trivialis*), soft brome (*Bromus hordeaceus*) and sweet vernal grass (*Anthroxanthum odoratum*) were also recorded.

- 2.19 The sward is locally flower-rich and includes species such as the locally abundant common knapweed (*Centaurea nigra*), frequent or occasional black medick (*Medicago lupulina*), common vetch (*Vicia sativa*), hairy tare (*Vicia hirsuta*), smooth tare (*Vicia tetrasperma*), ox-eye daisy (*Leucanthemum vulgare*), perforate St. John's wort (*Hypericum perforatum*), ribbed melilot (*Melilotus officinalis*), alsike clover (*Trifolium hybridum*) and hedge bedstraw (*Galium mollugo*). There are also occasional calcareous and calcifugous indicators such as wild carrot (*Daucus carota*) and more rarely betony (*Betonica officinalis*). This mix of species is likely to have occurred due to the restoration substrate materials and seed mix used in the restoration.
- 2.20 Broad-leaved woodland within the Southern Extension comprises a young and even-aged stand. The main sections were planted c. 11-12 years ago, whereas the woodland on the southern margin was planted c. 20-30 years ago. The planted woodland supports frequent bird cherry (*Prunus avium*), alder (*Alnus glutinosa*), hawthorn (*Crataegus monogyna*), field maple (*Acer campestre*), goat willow (*Salix caprea*), hazel (*Coryllus avellana*) and silver birch (*Betula pendula*), with occasional pedunculate oak (*Quercus robur*), sessile oak (*Quercus petraea*) and rowan (*Sorbus aucuparia*). Woodland ground flora has not yet developed due to its young age, and a grassland sward is present with abundant red fescue.
- 2.21 Finally, there are two patches of tall ruderal vegetation within the proposed extension which support common nettle (*Urtica dioica*), creeping thistle (*Cirsium vulgare*) and rosebay willowherb (*Chamerion angustifolium*).

Land Use

- 2.22 Within the Quarry land use is mainly associated with the mineral workings. In particular it includes the following:
- mineral extraction;
 - overburden and soils storage;
 - mineral stockpiling;
 - restoration works, including areas restored by landfill;
 - ancillary infrastructure including fuel storage, surface water management lagoons and haul roads.
- 2.23 There are no public rights of way through the operational areas of the existing permitted quarry; public rights of way have been diverted around the periphery of the workings.

THE SURROUNDING AREA

Land Use

- 2.24 The area surrounding the Quarry and the proposed extension is rural in character, dominated by agricultural land and large blocks of woodland, punctuated by small to medium sized settlements. To the north of the Quarry is the village of Grimethorpe, with residential areas bordering the Quarry to the north and east. Within this area is a primary school and cemetery. To the west of the Quarry is the brickworks and an industrial area. Finally, to the south is the country park, beyond which are three wind turbines and an individual distribution warehouse (ASOS) with associated areas for parking and vehicle manoeuvring.

Geology

Regional Geology

- 2.25 The geology of the area around Grimethorpe comprises late Carboniferous (Westphalian) strata of the Middle and Upper Pennine Coal Measures. The geology of the area is shown on the British Geological Survey 1:50,000 scale map no. 87 (Barnsley) and documented in the associated memoir.
- 2.26 The Coal Measures strata dip gently to the east-north-east at around 3° and, whilst largely unaffected by folding, are intersected by a large number of normal faults typical of the extensional tectonic setting in the Pennine Basin.
- 2.27 The strata comprise cyclical sequences of clastic sedimentary rocks (mudstones, sandstones and conglomerates) interspersed with coal seams and ironstones. The sequence of Coal Measures strata beneath Grimethorpe attains a thickness of 1,200m, beneath which are found the Millstone Grit series and deeper still the Carboniferous Limestone series.
- 2.28 Argillaceous rocks predominate throughout the Coal Measures.
- 2.29 The Westphalian strata are strongly dislocated by faults, typically with a northwest-southeast trend, and a system of WNW-ESE-trending fold².
- 2.30 The BGS specify that *'Within the Coal Measures thinner sandstones are generally lenticular, passing laterally as well as vertically into siltstones and mudstones.'*²
- 2.31 Superficial deposits are largely absent regionally with the exception of localised alluvial channels along the route of watercourses and some localised areas of Till, Head and Glaciofluvial deposits. These typically have limited geographical extent and form isolated pockets of superficial deposits.

Local Geology

- 2.32 According to the online BGS Geindex mapping service, the proposed extension area is underlain by mudstones, siltstones and sandstones of the Pennine Upper Coal Measures Formation. The BGS

² Morris B.L. (2005) Hydrogeological notes for the Sheffield District (sheet 100) British Geological Survey Internal Report, IR/05/045. 21pp.

Lexicon³ describes this formation as *'interbedded grey mudstone, siltstone and pale grey sandstone, commonly with coal seams, but no mudstones containing marine fossils are present'*. The BGS⁴ further state that rocks of the Pennine Upper Coal Measures Formation *'are largely sandstone and mudstone, mostly reddened to some degree, with a few thin coals and claystone seatearths.'*

- 2.33 The mapping indicates that the Newstead Rock outcrops immediately to the east of the proposed extension area (and the existing Quarry). This is a sandstone unit within the Pennine Upper Coal Measures Formation. The presence and extent of this sandstone horizon has been assessed further by site investigation across the development area.

Geological SSSI

- 2.34 The central and western parts of the Quarry excavation are designated as a geological Site of Special Scientific Interest (SSSI), which extends across 15.5 ha of the existing quarry site.
- 2.35 The particular interest is a horizon which is the highest Coal Measures marine band (the Westphalian C Top Marine Band, also known as the Cambriense Marine Band in more recent publications) in Britain, which is the latest evidence of normal marine conditions in this country during the Carboniferous period.

Hydrology

- 2.36 The Quarry (and proposed extension) is located within the catchment of the River Dearne, an EA main river located c.975m to the southwest of the proposed extension area at its closest.
- 2.37 The River Dearne rises c. 25km to the west and flows in a broadly east or south-easterly direction through Barnsley prior to passing to the south-west of the Quarry before turning south to south-easterly to its ultimate confluence with the River Don, c. 23km to the south-east of the site.
- 2.38 The river runs through the base of the valley at an elevation of c.30mAOD and is therefore considered to potentially be in continuity with the regional groundwater.
- 2.39 A minor un-named tributary of the River Dearne flows to the west of the Quarry. This watercourse flows in a southerly direction immediately to the west of the A6195 (Park Spring Road) prior to its ultimate confluence with the River Dearne. There are also several other minor drainage ditches within the country park to the south of the site.
- 2.40 A minor watercourse is shown on Ordnance Survey mapping to rise within the proposed extension area., close to the southern edge of the current Quarry, and flow in a south-easterly direction through New Spring Park. This ultimately drains to a localised low point which includes a pond. Given that this is a topographical hollow it is assumed that any flows along this ditch will ultimately discharge to ground.

³ British Geological Survey Lexicon of Named Rock Units: Pennine Upper Coal Measures Formation, available at: <https://www.bgs.ac.uk/lexicon/lexicon.cfm?pub=PUCM> (accessed 28th August 2020)

⁴ British Geological Survey Earthwise Website: Westphalian Coal Measures, Carboniferous, Northern England, available at: http://earthwise.bgs.ac.uk/index.php/Westphalian_Coal_Measures,_Carboniferous,_Northern_England (accessed 28th August 2020)

- 2.41 Given that the drainage ditches to the south are located on the former colliery tip it is considered that these will receive only surface water run-off with little or no baseflow component.

Hydrogeology

Aquifer Classification and Vulnerability

- 2.42 The Pennine Middle Coal Measures are classified by the Environment Agency as a 'Secondary A aquifer' described as *'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers'*.
- 2.43 The alluvial deposits to the west of the Site are also classified by the Environment Agency as a 'Secondary A aquifer' but these do not extend across either the existing Quarry or proposed extension area.
- 2.44 The groundwater vulnerability mapping indicates that the groundwater vulnerability at the site is "High" indicating a high risk from pollution events to groundwater quality.
- 2.45 There are no Source Protection Zones (SPZs) within 10km of the site.

Aquifer Characteristics

- 2.46 The BGS⁵ indicates that sandstones of the Coal Measures are *'very well cemented, extremely hard and dense and in consequence possess very little primary porosity or intergranular permeability. Sandstone permeability is directly related to the distribution and size of fractures present in sandstone horizons.'*
- 2.47 Mining subsidence has led to increased fracturing within the Coal Measures, particularly in the Upper Coal Measures. Increased fracturing has resulted in the disruption of the complex multi-layered aquifer system and in certain cases individual sandstones horizons that used to act as separate aquifers are now hydraulically connected.
- 2.48 In some areas of Coal Measures deposits the hydraulic continuity extends between aquifer horizons and mine workings.
- 2.49 The laterally extensive marine bands and coal seams generally have little hydrogeological significance.
- 2.50 Site-specific aquifer properties within the underlying Coal Measures are difficult to predict due to mining subsidence. It is expected that the thin sandstone layers encountered in previous site investigations have limited primary porosity or intergranular permeability, however flow will predominantly occur through fractures within the sandstone horizons which will potentially have been enhanced by mining subsidence.

⁵ Jones H.K., Morris B.L., Cheney C.S., Brewerton L.J., Merrin P.D., Lewis M.A., MacDonald A.M., Coleby L.M., Talbot J.C., McKenzie A.A., Bird M.J., Cunningham J., and Robinson V.K. (2000) The physical properties of minor aquifers in England and Wales. *British Geological Survey Technical Report*, WD/00/4. 234pp. Environment Agency R&D Publication 68.

- 2.51 Thicker sandstone layers underlying the proposed base of the Site may have increased aquifer properties and will potentially provide significant groundwater flow.

Landscape and Topography

- 2.52 The Quarry site is located on the western flank of a small hill, with elevations ranging from around 40m AOD on the western side to in excess of 75m AOD at the north eastern corner.
- 2.53 The area surrounding the Quarry is undulating with varied gradients of slopes, creating steep sided valleys in places. Levels range from around 25m AOD to the south of the Quarry (in the vicinity of Little Houghton Bridge, NGR SE 42094 05261) to 105m AOD at the Park (NGR SE 43378 09031) to the east of the Quarry and 119m AOD at Monk Bretton to the west of the Quarry (NGR SE 43378 09031).

Environmental Receptors

Residential/Human receptors

- 2.54 The nearest residential properties are located to the north-east (off Chestnut Street), approximately 300m from the closest boundary of the proposed extension and 220m from the boundary of the existing Quarry. In addition, to the north of the existing Quarry boundary are properties fronting Taylor Crescent, Duke Street and Tudor Court; these are around 415m from the proposed extension and around 70m to 80m from the current Quarry boundary.

Ecology and Nature Conservation Designations

- 2.55 Referring to the MAGIC website, within 2km of the Quarry (including the proposed extension) there are no:
- Special Areas of Conservation;
 - Special Protection Areas;
 - Ramsar Sites;
 - National Nature Reserves.
- 2.56 The nearest biological Site of Special Scientific Interest (SSSI, see below) is located around 500m to the south-west, with others located at much greater distances: Stairfoot Brickworks SSSI at 4km; South Elmsall Quarry SSSI 7km to the north-east; and Bilham Sand Pits SSSI over 7km to the east.
- 2.57 The MAGIC website identifies the following nature conservation designations within 2km of the Quarry (including the proposed extension):

Sites of Special Scientific Interest

- Dearne Valley Wetlands SSSI (biological) approximately 500m to the south-west of the existing Quarry (700m from the proposed extension); and

- Carlton Main Brickworks SSSI (geological) within the quarry workings.

Local Nature Reserve

- West Haigh Wood (approximately 450m to the east of the existing Quarry boundary).

Ancient Woodland

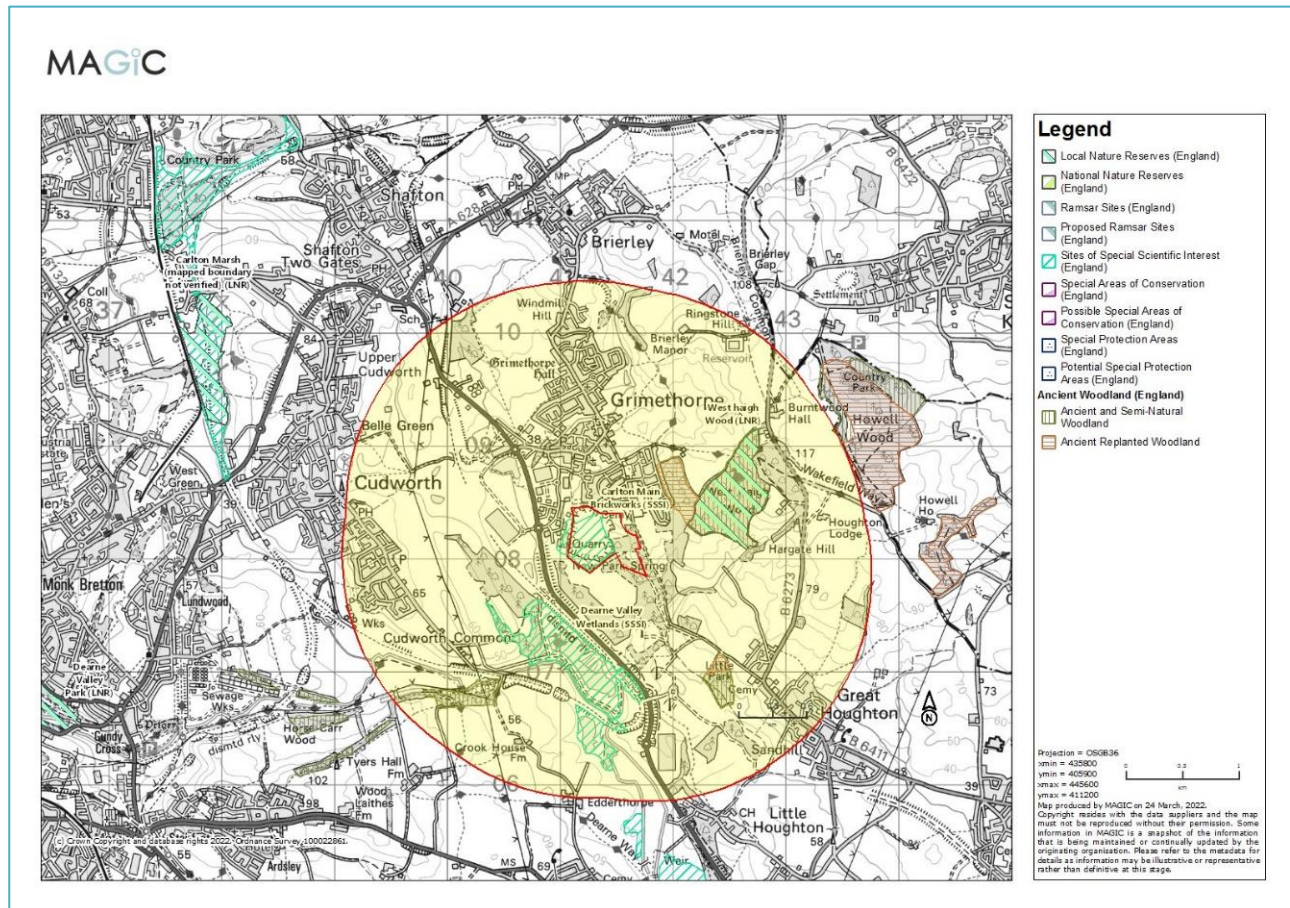
- West Haigh Wood (Ancient & Semi-Natural Woodland and Ancient Replanted Woodland) covering 38.1ha and 10.6ha respectively located some 410m to the north-east to east of the existing Quarry boundary;
- Little Park (Ancient & Semi-Natural Woodland and Ancient Replanted Woodland) covering some 6.2ha and 1.7ha respectively located some 940m to the south-southeast of the Southern Extension; and
- Stoors Wood (Ancient & Semi-Natural Woodland) covering some 10.2ha located around 1.3km to the south-west of the existing Quarry boundary

2.58 **Figure 2-2** provides an extract from the MAGIC website showing key ecological designated features within 2.5km of the site boundary.

2.59 In addition, local searches (refer to Chapter 7 below) has identified the following locally designated sites:

- West Haigh Woodland LWS around 70m east from the Quarry
- Edderthorpe Ings LWS around 500m south-west from the Quarry
- Sunny Bank, Horse Carr and Storrs Woodland LWS around 1.2km south-west from the Quarry

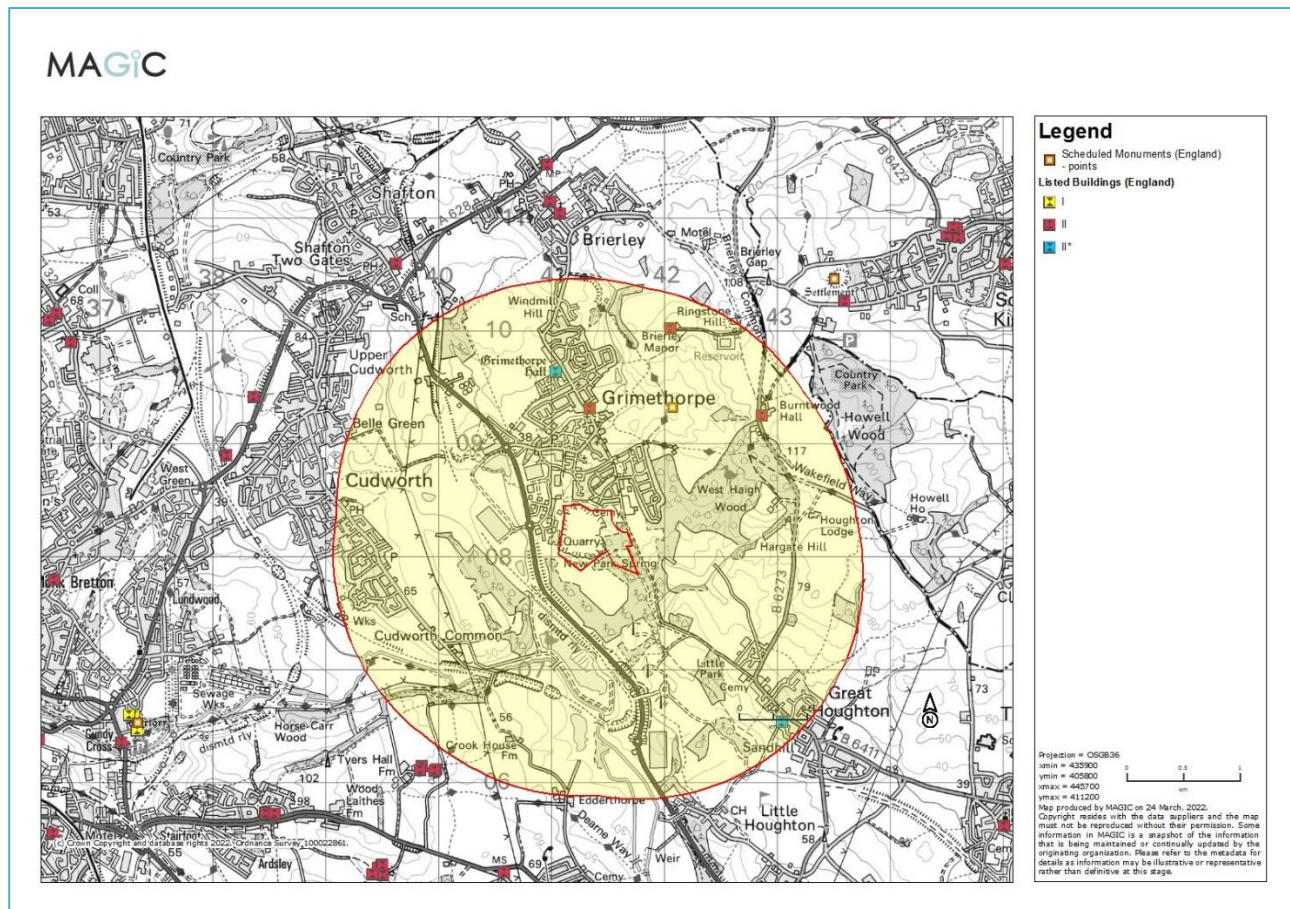
Figure 2-2
Extract from MAGIC – Ecological Designations



Cultural Heritage Designations

- 2.60 There is one Scheduled Monument within 2km of the site:
- Hallsteads moated site, Grimethorpe (approximately 1.1km to the north north-east of the existing Quarry boundary, NGR SE 4206 0934)
- 2.61 In addition, there are 5 listed buildings within 2km of the extended Quarry site, the closest of which (Bridge Farmhouse, NGR SE 4133 0931) is located around 800m to the north of the existing Quarry boundary.
- 2.62 **Figure 2-4** illustrate the Scheduled Monuments and listed buildings within 2km of the extended quarry workings.

Figure 2-1
MAGIC Search (Heritage Assets)



Landscape Designations

- 2.63 There are no National Parks or Areas of Outstanding Natural Beauty (AONB) within 10km of the site. The closest is the Peak District National Park, the boundary of which is around 18km to the south-west of the existing Quarry.

Air Quality

- 2.64 The site does not lie within, or close to an Air Quality Management Area. The nearest is the M1 motorway, some 9km to the west of the Quarry.

Water Environment

- 2.65 Neither the Quarry nor the proposed extension are located within or close to a source protection zone; the closest is located around 14.3km to the east.
- 2.66 In terms of flood risk from rivers and the sea, the whole of the existing Quarry and proposed extension site is classed as Flood Zone 1. Turning to flood risk from surface water, the base of the

quarry workings is shown to be at risk, and a narrow pathway is shown to cross the proposed extension site.

2.67 Neither the Quarry, nor the proposed extension are at risk from flooding from reservoirs.

2.68 This is considered further in Chapter 8 (Water Environment)

PLANNING HISTORY

2.69 Carlton Main Quarry is a long established mineral operation understood to have operated since c. 1950, supplying raw materials to the adjacent brickworks.

2.70 The quarry workings were subject to reviews under the Planning and Compulsory Purchase Act 1991 (for an Interim Development Order) and the Environment Act 1995 (Review of Old Mineral Permission). Consents have been granted since the reviews in 1999, 2003 and 2008. Table 2-1 below summarises the planning history for the Quarry.

Table 0-1
Schedule of Planning Permissions

Date	Ref	Description
28/06/1994	B/93/1053/HR	Determination of Conditions on an Interim Development Order Permission - Winning and Working of Minerals, Carlton Main Brickworks Quarry,
20/06/1994	s.106 Agreement	To apply conditions determined under IDO permission to other planning permission
05/06/1997	B/97/0215/HR	Approval of operating conditions pursuant to Environment Act 1995: Review of Planning Permission.
19/10/1999	B/99/0678/HR	Extension to existing Quarry for brick making reserves
05/08/2003	B/02/1669/HR	Extension to existing brick clay quarry followed by phased infilling with non-hazardous wastes and restoration
04/01/2008	2007/1784	Section 73 application to not comply with Conditions 7 and 13 of planning permission B/02/1669/HR.

2.71 Whilst the 2003 permission is described as an extension to the workings it is understood that the application site covered the whole of the quarry workings; this is corroborated by the information on the council's website relating to the 2008 permission. As such, despite the earlier permissions, planning permission B/02/1669/HR brought the workings under the umbrella of a single planning permission, effectively superseding the earlier permissions. As the 2003 planning permission was amended in 2008 (planning permission ref 2007/1784 refers) by an application under s.73 of the Town and Country Planning Act 1990 then it is the 2008 planning permission that now regulate quarry operations⁶.

⁶ A planning permission issued under s.73 is a full permission in its own right.