



**DESK STUDY & PHASE I COAL
MINING RISK ASSESSMENT
FOR
HOYLAND COMMON, BARNSELEY,
M1 JUNCTION 36 - DRY BASIN**



REPORT STATUS SHEET

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APPENDIX A

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- Dry Basin Site Boundary on Groundsure Historic Maps from 1855 (Drawing No. AG3080-19-21)
- Proposed Drainage GA S104 Approval (Sheet 5 of 6) (RPS Drawing No. HOYLA-RPS-SI-XX-DR-D-335 Rev P08)
- Basin Earthwork Volumes (RPS Drawing No. HOYLA-RPS-SI-XX-DR-C-SK001 Rev P01)

APPENDIX B

DESK STUDY DATA

- Historical OS Maps (Set Ref. EMS-605482_809329)
- Historical OS Maps (Set Ref. EMS-598513_800719)
- Groundsure Enviro+GeolInsight Report (Ref. EMS-605482_809330)
- Groundsure Enviro+GeolInsight Report (Ref. EMS-598513_800720)
- BGS Archive Borehole Records (2 No.)
- MAGIC Maps (2 No.)
- Coal Authority Consultants Mining Report (Ref. 51002273480001)
- Coal Authority Consultants Mining Report (Ref. 51002257913001)
- Coal Authority Mine Abandonment Plans (NE290, 10651 & 5843)

1.0 INTRODUCTION

An area of land between the M1 motorway and Sheffield Road, to the south of Hoyland Common near Barnsley (the site) is to be developed by Newlands Developments (the Client). The proposals comprise creation of attenuation basins and associated earthworks and landscaping. The basins will form an integral part of the drainage strategy for a new industrial development to the north.

Applied Geology has previously undertaken a desk study & ground investigation for the southern part of the site and subsequently produced reports as detailed below:

- Desk Study & Phase I Coal Mining Risk Assessment for Hoyland Common, Barnsley, M1 Junction 36- Balancing Pond, Ref. AG3080-19-AK38-Issue 2 dated June 2020.
- Report on Ground Investigation Report for Balancing Pond, Hoyland Common, Barnsley, M1 Junction 36, Ref. AG3080-19-AK40 dated July 2020.

Since the issue of these reports the proposed 'pond' has been redesigned as two adjacent basins the largest of which will be adoptable by the water authority and will be predominantly dry and will be referred to hereafter as 'Basin 1'. The smaller basin will remain in private ownership, referred to hereafter as 'Basin 2', and will constantly maintain some level of water in order to meet ecological requirements. The consequence of this re-design is that the basins will be shallower and hence, needs to cover a larger surface area in order to be able to accommodate the calculated volumes from rare flood events. Therefore, the site boundary has been revised and now also includes most of the field to the north of the original site. This report includes information from the above reports as well as the new information obtained for the field to the north and therefore supersedes the previous Desk Study & Phase I Coal Mining Risk Assessment referenced above.

Applied Geology was appointed by Newlands Developments to undertake a revised Desk Study/Phase 1 Geo-environmental Risk Assessment and a Phase 1 Coal Mining Risk Assessment (CMRA) for the whole site to:

- Permit formulation of an opinion, as to the potential for hazardous substances or conditions to exist on, at or near the site at levels or in a situation likely to warrant mitigation or consideration appropriate to the intended end use proposed by the Client and as stated above.
- Establish anticipated geological conditions to assist with the design of a ground investigation.
- Identify and assess the mining risks that could impact the development.

More specifically, the services provided are summarised below and detailed in the following Sections.

- A site inspection and walkover survey to identify indicators (as defined in later sections) of the existence of hazardous substances or conditions on and in the vicinity of the site.

- A review of the following sources to provide data on likely ground conditions, geohazards and features which may affect development and to obtain information about the potential for hazardous substances to exist at and in the vicinity of the site:
 - ❑ Groundsure Reports – obtained on the 6th March and 16th April 2020
 - ❑ Barnsley Council Planning Portal
 - ❑ BGS - Published Information & Borehole Database
 - ❑ Historical Maps
 - ❑ Government Web Site – historic landfill database
 - ❑ Coal Authority Web Site and liaison with the Coal Authority
 - ❑ Coal Mining Report and Abandonment Plans
 - ❑ MAGIC Web Site
 - ❑ Archaeological Desk-based Assessment by Oxford Archaeology (ref.2019-20/2051)

- Assessment and reporting of the results of the works.

The northern part of the site, along with another smaller parcel of land to the northwest, was previously proposed for siting balancing ponds and desk study data (Groundsure and Coal Authority Reports) were obtained for these areas. However, the Phase 1 report was never progressed as the southern part of the current site was chosen as the preferred location. This updated report therefore uses both sets of data, notably the separate Groundsure Reports obtained on the 6th March and 16th April 2020, and therefore the maps and data within these Groundsure Reports do not show the current site boundary but combined they do cover the entire area required. Drawing AG3080-19-21 in Appendix A shows the current site boundary and the areas covered by each Groundsure Report overlaid onto an historical map from 1855.

This report should be read in conjunction with the General Notes at the end of the report text.

2.0 SITE LOCATION AND DESCRIPTION

2.1 General

The site is located to the east of Black Lane and to the west of Sheffield Road (A6135), approximately 1km south of the village of Hoyland Common and approximately 7km south of Barnsley, in South Yorkshire. Junction 35a of the M1 is c.1km south of the site and junction 36 is c.1.5km to the northwest. The Ordnance Survey grid reference for the centre of the site is approximately 435888 398929, as shown on the Site Location Plan in Appendix A.

The site is irregular in plan view, comprising an oblong shaped field in the north and an 'L' shaped field in the south. The maximum extents are approximately 390m (NW-SE) and 220m (SW-NE), and covers an area of approximately 6.5ha. The site slopes down towards the southeast from the northwest of the site.

2.2 Walkover Survey

A site inspection/walkover was undertaken by Applied Geology on 29th March 2021. Access to the site was gained via Black Lane through an opening in the north-western field boundary.

At the time of inspection, the site comprised two open arable fields (north and south) with no buildings present. The ground surface of the northern field had been ploughed and comprised bare soil, whereas the southern field comprised low vegetation (grass). The two fields were partially divided by a hedgerow trending SW-NE. The field boundaries comprised hedges throughout, as well as wooded areas along the north-western and eastern boundaries.

An overhead power line, c.10m in height, was present in the northern field adjacent to the northwest boundary, trending SW-NE. There is anecdotal evidence of a private gas main crossing the northern field. During the previous phase of ground investigation, Applied Geology was approached by an employee from a company who was attempting to locate a reported leak from a private gas main running parallel to the wood, within the northern field of the updated site area. It is not known whether this gas main was located by that company.

Pockets of standing water were observed in the lowest topographical area of the northern field (adjacent to the northern corner of the southern field), close to the small watercourse running southeast along the northeast site boundary.



The site was bound to the west and southwest by Black Lane, to the northwest by the Bell Ground wooded area, to the northeast by an open field, to the east by a wooded area and to the south by open fields.

It should be noted that Applied Geology Limited does not provide arboricultural surveys or specialist surveys for the detection of invasive plant species (such as Japanese Knotweed) or protected species of wildlife.

2.3 Proposed Construction

The strategic drainage for the proposed development site has been designed to convey surface water by the use of a gravity drainage system which outfalls to an existing Environment Agency (EA) managed watercourse to the south of the site (Harley Dyke). The drainage network from the development to the north comprises of manholes and carrier pipes which will discharge to the proposed Basin 1 (adoptable dry basin), which has been designed to provide attenuation for a 1 in 30 year storm event and has been designed such that it can be adopted by Yorkshire Water. This basin has been designed to overtop a weir wall at events in excess of 1 in 30 year, the weir wall feeds into Basin 2 (private attenuation basin) which caters for up to 1 in 100 year + 30% climate change events. Both basins discharge via a Hydroslide / Hydro-brake flow control system into a swale for the storage and treatment of water pollutants prior to the site outfall into the EA managed watercourse.

Basin 1 will require the largest excavation with the base of the basin ranging in level from 101.57m OD to 101.40m OD, which will require cut depths of between c. 3m and 7m in approximately the east / northeast half of the basin and depths of up to c. 7m and 10m in approximately the west / southwest half. The boundary cut slopes will be formed at a gradient of 1v:4h.

The base of Basin 2 will range in level from 100.1m OD near the overflow weir from Basin 1 to 100.0m OD at the outlet necessitating cut depths of between c. 2m and 5m in the southern half of the basin and c. 5m to 11m in the northern half. As with Basin 1 the boundary slopes will be formed at a gradient of 1v:4h.

It is intended to line both basins using a layer of site won clay to minimise infiltration.

The proposed attenuation basins are shown on Proposed Drainage GA S104 Approval (Sheet 5 of 6) RPS Drawing No. HOYLA-RPS-SI-XX-DR-D-335 Rev P08, a copy of which is included in Appendix A.

3.0 DESK STUDY INFORMATION

3.1 Site History

Historical Ordnance Survey maps were obtained in order to determine any significant past activity or land usage. Copies of these maps are presented in Appendix B of this report and are described below in Table 1.

Table 1: Site History

Map Date	On the Site	In the Vicinity of the Site
1855	The site comprises parts of four fields, with trees along the field boundaries in the centre of the site. An 'L-shaped' structure and a pond are present in the south of the site.	The surrounding area is predominantly agricultural, with numerous ironstone pits and bell pits to the north, west and south of the site, with the closest being ironstone pits adjacent to the north and south boundaries. A sandstone quarry is labelled c.75m southwest of the site. Thorncliffe and Elsecar Railway is adjacent to the southeast of the site and Tankersley Park Railway is adjacent to the north of the site, both providing transport to and from the ironstone pits, bell pits and sandstone quarry in the area. The Tankersley Park Railway connects with the Thorncliffe and Elsecar Railway c.400m east of the site. Black Lane runs adjacent to the southwest boundary of the site. The bell pits north of the site form Swallow Wood Mine. Land adjacent to the north is labelled 'Bell Ground', with Bell Ground Cottage located within. An 'Old Hall' is shown to be in ruins c.50m west of the site with an associated pump. Three ponds are present c.250m south, southwest and west of the site.
1891-1894	The 'L-shaped' structure in the south of the site has been labelled as an 'Old Ironstone Pit'. The pond appears to have been infilled.	An 'Old Shaft' is present c.10m south of the site. The area adjacent to the east of the site is now shown to be a refuse heap, extending c.250m east, with air shafts labelled within, the closest being c.90m east. The Thorncliffe and Elsecar Railway and Tankersley Park Railway are no longer present. The sandstone quarry south of the site is shown as an old quarry. Swallow Wood Mine has been replaced in part by a wood named Bell Ground, which is present from the north boundary of the site. The Bell Pits north of the site are no longer shown. A pumping station is labelled c.155m southwest of the site. Two ponds are present close to Bell Ground Cottage. The Lidgett Colliery is shown c.400m east of the site. Brick works and an associated reservoir are present c.750m east of the site. Further bell pits are present from c.500m west of the site.
1903-1905	A new pond is present in the south of the site.	The Lidgett Colliery has expanded, with Wentworth and Hoyland Common Station present adjacent to Lidgett Colliery with the Chapeltown Branch Extension trending northeast to southwest (c.200m southeast of the site) currently under construction. The ironstone pits northeast of the site have been labelled as 'Old Ironstone Pits'. There is a pond c.250m east.
1929-1931	The 'Old Ironstone Pit' on site is no longer shown.	The Lidgett Colliery is no longer labelled.
1938-1948	No significant changes.	No significant changes.
1951-1956	The pond previously on site is no longer shown and a different pond is shown in the position of the old ironstone pit.	Tanks are present c.180m southwest of the site, associated with the pumping station.
1965-1966	No significant changes.	The air shafts east of the site are labelled as disused. The ironstone pits north of the site are no longer labelled.
1970-1978	No significant changes.	No significant changes.
1980	No significant changes.	The M1 motorway has been constructed c.250m west of the site, trending northwest to southeast. Old Hall Farm has been constructed in the vicinity of the remains of the Hall.

Map Date	On the Site	In the Vicinity of the Site
1987-1992	The pond is no longer present on site.	The area adjacent to the east is no longer shown to be a refuse heap and has trees on it.
1993-2003	No significant changes.	No significant changes.

Summary: the site has comprised fields since at least 1855, with an ironstone pit and three ponds in various locations in the south and southeast of the site, with Black Lane forming the southwestern boundary. The immediate surrounding area has been subject to ironstone, sandstone and coal extraction, with a coal shaft 10m south of the site and numerous ironstone pits and bell pits to the north, west and south of the site. In addition, railways lines linking the pits and quarries were also present in the immediate surrounding area. During the 1970's, the M1 was constructed c.250m west of the site.

The Archaeological Desk-based Assessment undertaken by Oxford Archaeology provided by the Client outlines that the site area was previously part of the Tankersley Deer Park and was stocked with deer until the mid-nineteenth century. An estate plan dated 1840-41 showed that the field in the north of the site was subject to mining, with bell pits shown to cover the area, as shown below:



Extract from Estate Plan from Archaeological Desk-Based Assessment

Although not obvious from the historical Ordnance Survey maps, it is known that part of the site was previously opencast mined for coal, with restoration back to agricultural use. Further details are given in Section 7.0 of this report.

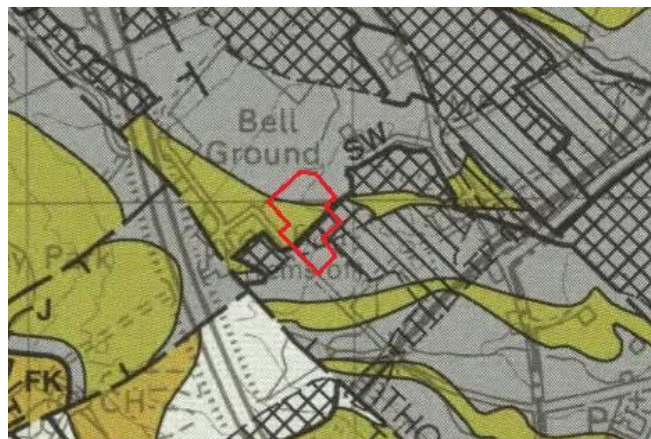
3.2 Anticipated Geology

Reference to the published 1:50,000 scale British Geological Survey (BGS) map, Sheet 87 (Barnsley) [Bedrock and Superficial Geology] dated 2008 indicates the site to be underlain by Solid Geology of the Pennine Middle Coal Measures Formation of Carboniferous age. The Pennine Middle Coal Measures Formation typically comprises interbedded grey mudstone, siltstone and sandstone with numerous workable coal, ironstone and fireclay seams, which have been historically

worked in the area. No natural Superficial Deposits are shown to be present on or in the vicinity of the site as shown below.

The Groundsure Report identifies that infilled ground is present in the northern half of the southern field and the presence of two coal seams (one inferred and one observed) crossing the centre of the site. These are considered to be the same seam and is shown at the same location as the Swallow Wood Coal seam is shown to outcrop in the Coal Authority Consultants Coal Mining Report (ref. 51002273480001, dated 26/03/20). The Coal Mining Report states that the Swallow Wood Coal seam dips to the northeast by 1.4 degrees. Copies of the Groundsure Reports and the Coal Mining Reports are included in Appendix B.

The 1:10,000 map (extract below) shows the Swallow Wood Coal seam to outcrop in the southern field, orientated west to east, with opencast mining shown in the northern half of the southern field. The location of the seam on this map appears to follow the line of the seam as it would have been exposed in the opencast mine. The Swallow Wood Coal seam is identified on the geological map and in the Coal Mining Report to be 0.94m thick. The Geological Memoir ‘Geology of the Country around Barnsley’ dated 1947 states that the Swallow Wood Coal seam is the same as the Netherton Thick Coal seam and the Top Haigh Moor Coal seam encountered elsewhere around Barnsley. The southwestern half of the northern field is underlain by a sandstone layer.



The general sequence of coal seams below the Swallow Wood Coal, based on the BGS 1:10,000 scale maps, BGS Memoir and Coal Authority report is as follows:

Table 2: Summary of Workable Seams Beneath Site

Seam* ¹	Colliery	Approx. Depth (m bgl)* ²	Date Last Worked	Comments
Swallow Wood	Unnamed	5	1845	Possibly Swallow Wood Mine (Record held by Rockingham Colliery)
Lidgett	Lidgett	49	1894	
Tankersley-Ironstone	Tankersley	104	1879	
Top Fenton	Barley Hall	158	1945	Also Skiers Spring
Low Fenton	Barley Hall	162	1964	Also Tankersley
Parkgate	Rockingham	182	1917	
Silkstone	Rockingham	201	1915	

Notes: 1. Names of seams vary depending on source of information
 2. Depths will vary due to site topography and dip of strata

The BGS online archive was checked for records of any relevant archived boreholes within the vicinity of the site. Two boreholes were shown c.180m southwest of the site (ref. SK39NE281 and SK39NE13). The logs of both boreholes were identical and the BGS have advised they are duplicates as they have been sent to them twice at different times and they therefore cannot be certain how the grid references for each borehole ID were derived. The borehole was undertaken as part of Tankersley Colliery and is labelled as ‘Tankersley Park Pit’. The depth and thickness of the coal and ironstone seams encountered is summarised in Table 3 below.

Table 3: Summary of Coal and Ironstone Seams in SK39NE281/13

Seam	Depth (m bgl)	Thickness (m)
Lidgett	2.6-3.1	0.5
Joan	21.1-21.6	0.5
Tankersley- Ironstone	32.5-34.4	1.9
Flockton Thick Coal	43.1-45.4	2.3
Flockton Thin Coal	71.66-81.5	9.84
Top Fenton	97.2-98.6	1.4
Black Mine Ironstone	98.64-100.9	2.26
Low Fenton	101.25-102.7	1.45
Parkgate	119.9-122.6	2.7

The Ground Investigation described in Report Ref. AG3080-19-AK40 was undertaken in the southern field of the site and encountered Made Ground- Opencast Backfill to the north of the inferred Swallow Wood Coal seam coal outcrop. The Made Ground deposits deepened to the northern and eastern field boundaries, following the dip of the coal seam. To the south of the inferred outcrop natural materials of the Pennine Coal Measures Formation were encountered. Trial pits were undertaken adjacent to the north field boundary in the field in the south of the site but the opencast high wall was not encountered.

A layer of Topsoil/ Made Ground typically less than 0.50m thick was encountered at the surface. The Made Ground- Opencast Backfill typically consisted of reworked natural coal measures material. The in-situ natural coal measures strata consisted of an initial weathered clay horizon where natural materials were present from shallow depth, increasing to rock strength mudstone, siltstone and sandstone with depth and directly below the Opencast Backfill.

3.3 Mining History/Geological Cavities

The Groundsure Report identifies more than two hundred historic underground workings within 500m of the site, predominantly for ironstone and coal. The closest were unspecified old shafts, old ironstone pits and the Lidgett colliery on site. A Coal Mining Risk Assessment is presented in Section 7.0 of this report, although brief information is presented below.

The site is within a Coal Mining Reporting Area, with much of the site within a Development High Risk Area.

The Coal Mining Report identifies seven shafts on the site and twelve shafts within the immediate vicinity of the site, relating to either coal or ironstone workings. It is considered that the old bell pits in the far centre of the site and in the northwest and the ironstone pit formerly in the south of the site on the historical maps indicate

ironstone were possibly recorded as shafts, as they may have extracted both coal and ironstone.

Abandonment plan ref. NE290 shows the extent of opencast mining of the Swallow Wood Seam undertaken across much of the northern half of the southern field and extending into the south of the northern field. It also shows old voids that were uncovered along the northeast boundary. The thickness of the seam is noted as 0.99m (3' 3"). The depth of the excavation is shown to have ranged between 1.5m bgl and 9.6m bgl. Opencast mining on site began in June 1956 and the area was 're-soiled' and converted back to agricultural use in September 1957.

Abandonment Plan ref. 10651 shows the Swallow Wood Mine Old Workings which occurred across the majority of the northern half of the site and extending off-site to the north and around Bell Ground with dates of workings ranging from 1824 to 1858. Three old shafts (depths unknown) are shown to the east of the site and an adit is shown to the southeast of the site near the Lidgett Colliery (which is marked as disused). The outcrop of the Swallow Wood Seam (then referred to as the Haigh Moor Coal) is shown running across the southern field, broadly along the same route as that shown on the Coal Authority and Groundsure Reports. The plan does not indicate any depths of workings.

Abandonment plan ref. 5843 shows that underground mining of the Lidgett seam was undertaken across nearly the entire site, apart from the far south. According to the Coal Mining Report, the depth of workings of the Lidgett seam is thought to be deeper than 49m below ground level (bgl) and was last mined in 1897.

The Groundsure Report identifies that the site is not located in an area of recorded natural cavity formation, nor is it within area of known brine or gypsum extraction.

3.4 Natural Ground Stability Hazards

The GroundSure Report has classified the risk of various natural ground stability hazards, depending on the anticipated ground conditions on site. These tend to have a range of risk, given that part of the site is underlain by backfilled opencast pits and some by natural ground.

The risk of ground dissolution of soluble rocks is negligible, of shrink-swell of clays and running sand is negligible to very low, of collapsible deposits and landslides is very low and of compressible deposits is negligible to moderate.

3.5 Radon

The Groundsure Report, which sources information on radon affected areas from the BGS/Public Health England, identifies that the site is within an area where between 1% and 3% of properties are above the Action Level. Therefore, no precautions against ingress of radon into buildings would be necessary if any new buildings were constructed on site in the future.

3.6 Hydrology

It is understood that the site and the surrounding area generally drain to the south and east. A small watercourse was observed to be present running southeast along

the northeast boundary of the site. Most of the nearby streams (within 250m) to the southwest, south, and east of the site, appear to link up and flow towards Harley Dyke to the southeast. It is understood that the proposed outflow from the ponds will connect to the watercourse to the south/southeast.

There are no surface water abstractions within 500m of the site.

According to the Groundsure Report, there are two licensed discharge consents within 500m of site, both for sewage discharges (final/treated effluent); one c.185m east of the site into a tributary of Harley Dyke, and another c.250m west of the site into Old Hall Farm Pond.

The site is not within Fluvial Flood Zones 2 or 3. However, this report is not intended to be a full hydrological study and if a flood risk assessment is needed, additional analysis by others is recommended to confirm this aspect of the development.

3.7 Hydrogeology

The Pennine Middle Coal Measures Formation is classified by the Environment Agency as a Secondary A Aquifer. There is one active groundwater abstraction licence within 500m of the site, 275m southwest of the site for spray irrigation at Tankersley Park Golf Club. The site is not located within a groundwater Source Protection Zone.

3.8 Environmental Searches

Information pertaining to environmental issues was obtained from the Groundsure Report. This database contains sets of data corresponding to the databases held by a number of sources including the Environment Agency, British Geological Survey, British Gypsum, The Coal Authority, Public Health England, Johnson Poole & Bloomer and Peter Brett Associates.

The Government website and Groundsure Report indicate that there are no recorded historical landfill sites within 250m of the site, although it is known that opencast pits were formerly present in the centre of the site and off site and have since been infilled. The Groundsure Report identifies an historical waste site c.215m southwest of the site, taken from 1956-1989 maps, although this is not apparent from the historical maps Applied Geology viewed. There are no recorded active landfill sites within 250m of the site.

There is one recorded pollution incident within 250m of the site, which occurred 249m east in 2003. This involved asbestos, resulting in 'significant' impact (Category 2) to land.

The Groundsure Report states that there are no current or historic fuel filling stations within 250m of the site.

The Groundsure Report states that neither the site nor any land within 500m is currently designated as Contaminated Land under Part IIA of the Environmental Protection Act.

3.9 Current Industrial Land Uses

Five current industrial land uses have been identified within the Groundsure Report within 250m of the site. These relate to a shaft c.20m south, air shafts c.85m and 145m east, a telecommunication mast c.200m southeast of the site and a pumping station c.230m west of the site.

3.10 Railways and Tunnels

There is an active railway c.175m southeast of the site. The Groundsure Report notes that the 2016 revised High Speed 2 proposed route passes approximately 110m from the eastern extremity of the site. However, the 2017 Preferred Route for the Eastern leg of Phase 2b, between the West Midlands and Leeds (assessed on 30/03/2020) shows the HS2b route as being several miles to the east of the site. It should be noted that the route had not been finalised at the time of writing this report.

3.11 Ecology

Information from environmental and ecological datasets was obtained from a review of the MAGIC (Multi-Agency Geographic Information for the Countryside) website undertaken on the 31st March 2021 and the Groundsure Report.

There are several priority habitats within 250m of the site, including deciduous woodlands, the closest being the woodland adjacent to the east of the site. The site is within a designated farmland bird breeding area and a priority area for addressing lapwing habitat issues. The site is located in a Nitrate Vulnerable Zone and is within the South and West Yorkshire Greenbelt.

It is understood that a detailed assessment of ecological aspects is being undertaken by others for the proposed development.

3.12 Unexploded Ordnance

The Zetica on-line bomb risk map identifies the site to be within a low-risk area of unexploded bombs from WWII.

3.13 Information from the Planning Portal

No pertinent information was available from Barnsley Metropolitan Borough Council's Planning Portal.

4.0 CONCEPTUAL MODEL

In developing a Conceptual Model for the site, pollutant linkages are determined by identifying likely sources of contamination from previous and current site uses, possible targets such as site users, neighbouring site users and Controlled Waters and linkages between them. These are discussed below.

4.1 Summary of Site History based on available Historical Maps

The site was previously part of the Tankersley deer park and was stocked with deer until the mid-nineteenth century. The site has comprised fields since at least 1855,

with an ironstone pit and three ponds present in the south and southeast of the site, and Black Lane forming the southwest boundary. An estate plan dated 1840-1841 showed that the field in the north of the site was subject to mining, with bell pits covering the area. The immediate surrounding area has been subject to ironstone, sandstone and coal extraction, with numerous ironstone pits and bell pits to the north, west and south of the site. In addition, railway lines linking the pits and a sandstone quarry were also present in the surrounding area. During the 1970's, the M1 was constructed c.250m west of the site.

4.2 Summary of Anticipated Geology

In the southern field, Made Ground- Opencast Backfill was encountered to the north of the inferred Swallow Wood Coal seam coal outcrop. The Made Ground deposits deepened to the northern and eastern field boundaries, following the dip of the coal seam. To the south of the inferred outcrop natural materials of the Pennine Coal Measures Formation were encountered. It is anticipated that the high wall of the opencast mine will be present close to the north of the field boundary between the north and south fields. The Swallow Wood Mine is anticipated to be present from 10m to 20m bgl across the northern field.

4.3 Sources

The following specific potential sources of contamination were identified in the desk study:

- Backfill to the former opencast pits (probably overburden materials) in the northern half of the southern field and off site colliery spoil, if present, associated with potential unrecorded historic coal/ironstone workings on site;
- Ground gases from backfill material and any spoil on and off site;
- Mine gases on and off site;
- Sulphates in backfill material, any spoil or underlying natural strata on site.

The Ground Investigation undertaken on the southern field did not identify any evidence of contamination in the opencast backfill or Made Ground soils encountered.

There is considered to be limited potential for contaminants such as heavy metals and hydrocarbons from the former railway adjacent to the southeast and northeast of the site to have impacted the site.

Given the distance from the site, the historical waste site, pollution incident and active railway are considered too far away to represent plausible sources of contaminants that could impact the site.

Other nearby industrial uses, including the telecommunication mast, are not considered to be viable sources of contamination that could impact the site.

4.4 Receptors

The following receptors have been identified:

- Proposed dry basin (when containing flood water) and connecting water course (Harley Dyke);

- Watercourse adjacent to site;
- Pennine Middle Coal Measures Formation (Secondary A Aquifer);
- Buried substructure concrete (Building Materials);
- Occupiers of nearby properties.

The proposals for the site mean that a human presence will not be required on site, as such, end-users are not considered to be a plausible receptor. There are no immediate neighbours and those nearby are only likely to be at risk from migrating mine/soil gas. Any workers that may be required on site are anticipated to be subject to only short-term exposure. Similarly, the risk to construction workers is not included here due to the short-term exposure times that they will be subject to and the assumption that good hygiene practices will be adopted on site and the appropriate use of relevant PPE/RPE will be adhered to when exposed to potentially contaminated soils.

4.5 Pathways

Taking into account the proposed commercial/industrial end use, the following pathways are relevant to this development:

- Gas migration to off-site receptors;
- Leaching and/or migration through permeable horizons, worked seams;
- Vertical migration through historic coal shafts on site;
- Direct contact with soil by buried concrete.

4.6 S-P-R Linkages and Assessed Risks

The Conceptual Model described above is summarised below together with the source-pathway-receptor linkages and qualitatively assessed levels of risk:

Table 4: Initial Conceptual Site Model

Source	Pathway	Receptor	Risk*
Backfill material to historic opencast pits (on and off site) and possible spoil from any historic unrecorded workings (on site).	Leaching/migration	Flood water within basin and connecting watercourse	Low
		Watercourse adjacent to site	Low
		Aquifer	Low
	Downward and lateral migration via old shafts/worked seams	Aquifer	Low
Ground gas from spoil from any historic unrecorded workings and backfill material to historic opencast pits (on and off site)	Migration and inhalation	Neighbours	Low-negligible
Mine gas from the Pennine Middle Coal Measures strata (on site)	Migration and inhalation	Neighbours	Low

Source	Pathway	Receptor	Risk*
Potential metals, other inorganic contaminants and hydrocarbons from former land uses (off site)	Migration and leaching	Flood water within basin and connecting watercourse	Low
		Watercourse adjacent to site	Low
Elevated sulphates in backfill material, any spoil and natural soils (on site)	Direct contact	Buried concrete	High

*** Definition of Risk Categories**

Negligible - Contaminants that might have unacceptable impact on key receptors, are unlikely to be present, or, no pathway is envisaged.

Low Risk: Contaminants may be present but are unlikely to be at levels to have unacceptable impact on key receptors, or pathways are likely to be minimal.

Medium Risk: Contaminants are probably present and might have an unacceptable impact on key receptors. Pathways may also be present therefore remedial measures may be necessary to reduce the risks.

High Risk – Contaminants probably or certainly present and pathways are probably also present. Therefore, contaminants are likely to have an unacceptable impact on key receptors and remedial measures are likely to be necessary to reduce the risks to acceptable levels.

5.0 PRELIMINARY GEOENVIRONMENTAL ASSESSMENT

Based on the available information, there is considered to be an overall low risk with regard to Human Health and Controlled Waters receptors.

Although significant parts of the site are anticipated to comprise opencast backfill, there is no evidence that the backfill comprised contaminated materials. In addition, the ground investigation undertaken by Applied Geology on the southern field found the Made Ground- Opencast Backfill on site comprised reworked natural coal measures strata with no evidence of significant contamination. An area to the north of the site has recently been investigated by Applied Geology, with the backfill material encountered as clay, mudstone, sandstone, and shale derived from the overburden stripped off to access the coal seams (and possible shallow ironstone). However, such natural materials (assumed not to have been engineered when placed into the void) may still give rise to high levels of some heavy metals, PAHs, sulphates and ground gas.

Based on the anticipated largely natural materials/spoil in the north field of the site, the likelihood of elevated concentrations of ground gas (methane and carbon dioxide) being present and mobilised to affect off-site receptors is considered to be low to negligible.

Mine gas (methane, carbon dioxide, carbon monoxide and hydrogen sulphide) could be present from remnant shallow unworked coal seams and/or deeper workings, which could potentially migrate to the surface via old shafts or laterally along old workings. In addition, the proposed excavations could intercept the historically worked Swallow Wood underground mine in the south of the northern field, allowing migration of mine gas.

Although a Secondary A Aquifer, the Coal Measures strata at the site have been subject to shallow and deeper coal mining and it is not anticipated that this will be viewed as a key receptor.

The other potential sources of contamination from off-site sources, include hydrocarbons and metals and other inorganic contaminants from the historic railway adjacent to the southeast of the site, and are considered to represent a low to negligible risk to the identified receptors due to the distance and the likely presence of low permeability cohesive soils near surface.

6.0 PRELIMINARY GEOTECHNICAL ASSESSMENT

Excavations up to c.10m deep will be required to form the basins. The excavated materials are intended to be used as engineered fill, generally on the main development site to the north but with a small volume used as fill to the immediate south of Basin 2 (private basin).

Near surface materials in the northern field could be disturbed and possibly voided as a result of the old bell pits shown historically in this area. Based on the site investigation in the southern field and desk study information it is anticipated that the opencast backfill materials will be variable from clays to boulder size lumps of siltstone, sandstone and ironstone. Additionally, in areas outside the former opencast limits, natural Coal Measures strata, comprising clay, mudstone, siltstone, sandstone and possibly coal and ironstone may need to be excavated. Considering the opencast highwall was not encountered during the ground investigation in the southern field, it is anticipated that it will be present towards the southern edge of the northern field. Given the anticipated depth of the opencast backfill and the area of the basins that was not subjected to opencast mining, a significant volume of rock strength material is anticipated to be encountered during the excavation. The area north of the area opencast mined is shown to be underlain by a more persistent and possibly more competent sandstone layer. Excavations are likely to intercept the underground workings of the Swallow Wood seam in the area immediately north/northwest of the former opencast, possibly including the two former mine shafts identified by the Coal Authority. Such excavations could encounter coal from former pillars (assuming room and pillar workings).

The base of the excavation will comprise variable materials from clays, opencast backfill, mudstone, sandstone, ironstone and potentially worked and unworked coal seams. Such materials will have different infiltration rates, which will need to be taken into account by the drainage engineer.

The coal content and calorific value of the materials to be re-used as engineered fill will need to be investigated along with the engineering properties and material classification.

The permeability of remoulded samples of clays to be excavated should be investigated to help assess its suitability to form a liner to the basins.

The proposed cut slopes will include some partly within the opencast backfill and will need careful design, taking into account long-term stability. Possible coal mine workings may also be present beneath cut slopes, potentially at or just below the toe and if present will require treatment / stabilising.

There may be a small amount of fill required towards the southern end of Basin 2 to suit finished levels. This fill will need to be engineered and it is envisaged low permeability materials will be used. The fill will probably be placed on natural coal

measures strata (as opposed to opencast backfill materials) and so, with only around 1m of fill to be placed, imposed settlements are not envisaged to be a concern. However, this will need to be considered during design.

Elevated concentrations of sulphates, and potentially low (acidic) pH should be anticipated in the opencast backfill materials but may also be present in the natural Coal Measures strata and sulphate-resisting concrete is envisaged to be required for headworks, connecting pipework etc.

7.0 PRELIMINARY COAL MINING RISK ASSESSMENT

The site is located within an area designated by the Coal Authority (CA) as being of Development High Risk as a result of historic coal mining legacy. As a result, a Coal Mining Risk Assessment (CMRA) is required to identify the historic coal mining risks and any mitigation measures required prior to the proposed development of the site.

Assessment has been made using 1:10,000 scale geological maps, The Geological Memoir 'Geology of the Country around Barnsley', the CA Interactive Maps and Consultants Coal Mining Report and CA Abandonment Plans.

7.1 Published Geology

7.1.1 Made Ground and Superficial Strata

Although the site has not been subject to any built development, significant thicknesses of disturbed ground are expected beneath the south of the northern field and have been proven in the north of the southern field, associated with historic opencast coal mining and the far south of the site, associated with a former ironstone pit.

For the most part, this Made Ground is expected to comprise reworked natural strata (mainly clays, mudstone, siltstones and sandstone) derived from excavation and replacement of overburden after the removal of coal and ironstone. While this form of mining and restoration is unlikely to result in the creation of residual voids, it will not have been compacted to an engineering specification. Former bell pits in the northern field are considered likely to have been dug for ironstone and could have resulted in the presence disturbed and possibly voided ground near surface. It is expected that the thickness of the Made Ground in the opencast area will not extend much further beneath the base of the Swallow Wood Seam depth, up to c.10m bgl, as indicated by Abandonment Plan NE290.

No Superficial Deposits are mapped on or in the vicinity of the site.

7.1.2 Solid Strata

Solid strata of the Pennine Middle Coal Measures Formation laid down in the Carboniferous Period are present beneath the site. These strata comprise cyclical sequences (cyclothems) of mudstone, siltstone and sandstones with thin coal and ironstone seams. The strata sequence expected to immediately underlie the site at depths likely to influence the proposed development comprise those between the Swallow Wood Coal seam and the Lidgett Coal seam. The Swallow Wood Coal seam is marked as outcropping across the centre of the site, dipping to the

northeast by c. 1.4-1.9 degrees. The Lidgett Coal seam is anticipated at below 48m bgl at the site.

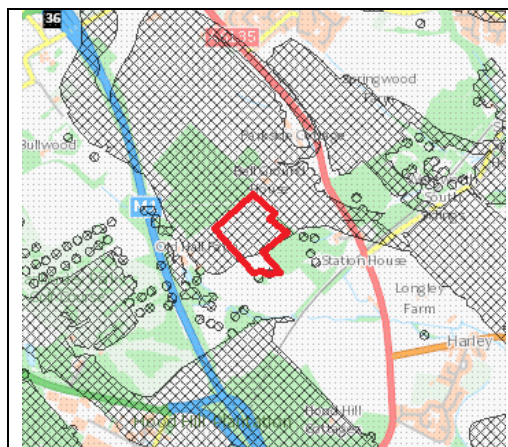
Several coal seams are reported to be present at the Lidgett Coal level, of which the thickest is normally taken to be the defining layer. At Lidgett Colliery (to the east of the site), the shaft section shows the Lidgett at a depth of approximately 66m bgl, which consists of a top leaf (0.66m thick) and a bottom leaf (0.23m thick) separated by black shale (0.15m thick) giving a total seam thickness of 1.04m.

Whilst the 1:10,000 geological map states that the Swallow Wood Coal seam is 0.94m thick, like the Lidgett Coal, the Swallow Wood Coal seam is often encountered as two or three leaves. It is also often marked by band(s) of ironstone nodules. At Rockingham Colliery on site, the shaft section shows the Swallow Wood Coal seam at a depth of about 21m bgl, where it consists of a top leaf (0.08m thick) a bottom leaf (0.74m thick) separated by claystone (clod) (0.13m thick); giving a total seam thickness of 1.25m. Records of the Swallow Wood seam thickness recorded on the Bell Ground II Opencast abandonment plan (NE290) indicate an upper leaf of 3' 3" (0.99m) but also a lower leaf of 8" (0.2m) with interceding mudstone / shale 3' (0.9m) thick meaning total working might be up to c. 2.1m. The Swallow Wood Coal seam is not recorded at Lidgett Colliery. The separation distance between the Lidgett and Swallow Wood at Rockingham Colliery is 66.25m. At Tankersley Common Opencast (to the north of the site) the Swallow Wood Coal seam is recorded to be 0.84m thick.

No geological faults are shown on the published geological maps on site.

7.1.3 Coal Authority Interactive Map and Consultants Coal Mining Report

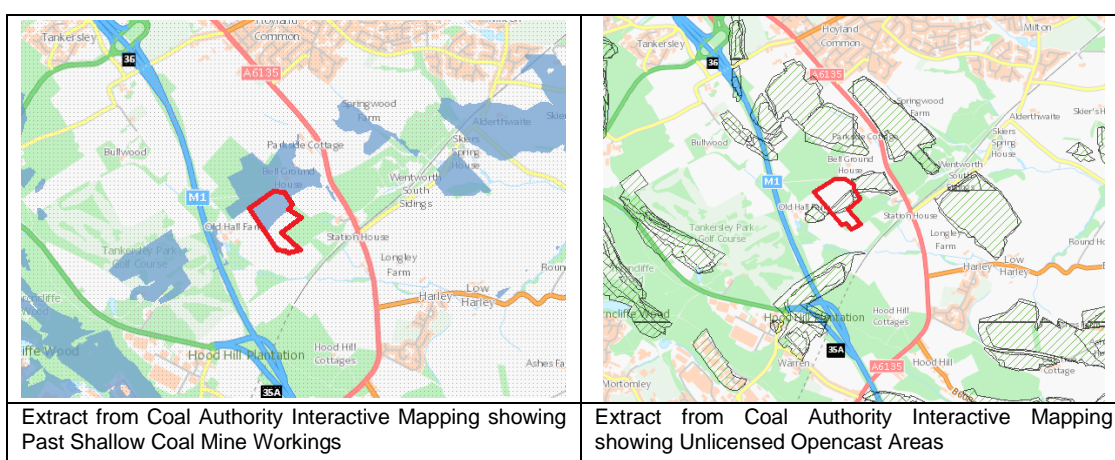
Consultation of the Coal Authority's Mining Searches Directory indicates that the site lies in an area for which a standard mining report is required for a new development. Copies of the CA Consultants Coal Mining Reports are presented in Appendix B. Reference to the CA Interactive Map shows most of the site falls within a Development High Risk Area (DHRA). This means that the Local Authority is required to refer any planning application to the CA, and the CA will require the preparation of this CMRA to assess the risks posed by historical mining legacy.



Extract from Coal Authority Interactive Mapping showing the Development High Risk Areas

Basic information on underground mining is provided by the CA Consultants Report (*ibid.*). The extent of local coal mining history is demonstrated by the fact that at least seven separate coal and ironstone seams have been mined by at least four different collieries. A general summary is present in Table 2 of Section 3.2 of this report.

The CA Interactive Mapping shows where historic coal mine workings are known or thought to have existed. At this site, the DHRA shown above relates to ‘probable shallow coal mine workings’, associated with the presence of the Swallow Wood Coal seam outcropping across the centre of the site and documented opencast pits. Past underground shallow coal mine working of the Swallow Wood Coal seam may have occurred in the north of the site, where the seam was deeper, probably at around 10m bgl as suggested in the CA Consultants Report.



Ironstone is known to have been mined on site, as shown by the ironstone pit in the extreme south of the site on the historical maps and the bell pits indicated in the northern field on the 1840-41 plan. The CA Consultants Coal Mining Report identifies the shallowest ironstone seam to be the Tankersley seam at 104m bgl, which is thought have been last mined in 1879 as part of Tankersley Colliery. The ironstone pits are therefore thought to represent shallower workings of unnamed ironstone seams.

The Interactive Mapping and CA Consultants Report both show the positions of recorded mine entries (shafts or adits) within influencing distance of the site. Seven shafts have been identified as being on the site and eight shafts are within the immediate vicinity of the site, all thought to be related to coal workings. A summary of known information relating to those within and closest to the site is provided below.

Table 5: Mineshafts and adits

CA Reference	Coordinates	General location	Mineral	Treatment/ Comments
435398-051	435926,398947	On site (centre)	Coal	No treatment records.
435398-052	435894,398915	On site (centre)	Coal	No treatment records.
435398-053	435870,398887	On site (centre)	Coal	No treatment records.
435398-062	435976,398744	On site (S)	Coal	No treatment records.
435398-106	435924,398740	On site (S)	Coal	No treatment records.
435398-050	435871,398952	On site (centre)	Coal	No treatment records.
435398-054	435837,398911	On site (centre)	Coal	No treatment records.
436399-042	436012,399058	N of site	Coal	No treatment records.

CA Reference	Coordinates	General location	Mineral	Treatment/ Comments
436398-003	436139,398921	E of site	Coal	Filled within 0.4m of ground level with a 4m x 4m concrete cap.
435398-006	435925,398720	S of site	Coal	Capped in November 1989. Water and gas levels are monitored by the Coal Authority every 3 months.
435399-005	435685,399014	NW of site	Ironstone	No treatment records.
435398-021	435679,398991	NW of site	Ironstone	No treatment records.
435399-006	435682,399003	NW of site	Ironstone	No treatment records.
435399-004	435687,399029	NW of site	Ironstone	No treatment records.
435399-026	435857,399120	N of site	Ironstone	No treatment records.
435399-025	435787,399125	N of site	Ironstone	No treatment records.
435399-024	435833,399159	N of site	Ironstone	No treatment records.
435399-027	435944,399159	N of site	Ironstone	No treatment records.
435399-011	435996,399131	N of site	Ironstone	No treatment records.

The Swallow Wood Coal Seam was last worked as part of the opencast mining shown in abandonment plan ref.NE290 in 1956 and 1957. Before this the Swallow Wood Coal seam was last thought to be worked (by underground mining) in the south of the northern field on site, and possibly just encroaching onto, the north of the south field on site in 1838-1840 (Abandonment Plan 10651).

An extract from an estate plan dated 1840-1841 (see above in section 3.1) including in an Archaeological Desk-Based Assessment provided by the Client shows the area in which recorded shafts 435398-050, 435398-051, 435398-052, 435398-053, 435398-054 are situated is occupied by bell pits. The pits are no longer shown on the 1855 OS map. It is therefore possible that these shafts were used to extract both coal and ironstone.

Shaft 435398-062 is stated as being for coal in the CA Consultants Report. However, the Interactive Map names this shaft as an ironstone shaft and it is in the location of the former ironstone pit, as shown on the historical OS maps.

Shaft 435398-006 adjacent to the south of the site is shown on the Interactive Map as being 53m deep and called Black Lane Pit.

The Interactive Map shows shafts 435399-004, -005 and -006 are adjacent to the northwest boundary of the site were recorded as ironstone pits. The depths are unknown but the diameter for each is assumed to be 2.5m. Shaft 435398-021 shown to be alongside these is labelled as an ironstone shaft and was 2m in diameter.

While shafts 436398-003, 43699-042, 435399-011, 435399-024, 435399-025, 435399-026 and 435399-027 are recorded within 50m of the boundary, it is not considered that these constitute a risk to the proposed development.

Other data contained within the CA report can be summarised as follows:

- there are no managed tips within 500m of the enquiry boundary;
- there have been no site investigations or remediation works recorded within 50m of the enquiry boundary;

- the CA is not aware of any request having been made to carry out preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991;
- there have been no reports of mine gas incidents within 500m of the enquiry boundary;
- there have been no claims regarding coal mining subsidence within 50m of the property boundary;
- there are no mine water treatment schemes in the vicinity of the site;
- there are no licences for current coal mining or future underground coal mining within 200m of the site.

7.1.4 Coal Mine Abandonment Plans

The Coal Authority archives were searched and copies of five mine abandonment plans were obtained (numerous others were available but were for seams worked at significant depths below the site). A summary of the pertinent information contained on the plans is provided below and copies are included in Appendix B.

Table 6: Abandonment Plans

CA Ref:	Title	Date	Relevant Information
5843 Part A*	Lidgett, Plan of Abandonment	Not shown	<ul style="list-style-type: none"> • Lidgett Coal seam worked beneath virtually the whole site
10651*	Rockingham Colliery, Haigh Moor Seam	1931	<ul style="list-style-type: none"> • Swallow Wood Coal seam is labelled as the Haigh Moor Coal seam and in a slightly different location/orientation to on the CA documentation; • Swallow Wood Mine (old workings) are present predominantly across much of the north field on site apart from the far southwest, and extending slightly into the north edge of the southern field. The mine is shown to extend off site to the north.
NE169 Sheet 1 of 2	Bell Ground	1952	<ul style="list-style-type: none"> • No working shown on site • Site is numbered 219 and 232. • Harley and unidentified seam worked to the north of the site.
NE169 Sheet 2 of 2	Bell Ground	1932	<ul style="list-style-type: none"> • No information on the site; • Harley and unidentified seam worked to the north of the site.
NE290*	Bell Ground II	1958	<ul style="list-style-type: none"> • Swallow Wood Coal seam opencast in the north of the southern field on site, extending slightly into the south of the northern field; • Seam comprises two leaves – main one 0.99m thick with a thinner 0.23m thick seam approx. 0.9m deeper. • Dipping to the northeast by 1 in 30 (1.9°); • Depth of extraction up to 9.6m bgl; • Small fault runs through the site, orientated NE-SW with variable downthrow (only 3.3 to 4.3m) • Former bell pit workings encountered within area opencast • Overburden comprises sandy shale and shale with ironstone bands.

* Copies of Plans 5843, 10651 and NE290 are included in Appendix B.

7.2 Summary of Coal Mining Issues

Based on available data, the table below summarises the potential risks associated with the mining legacy for the proposed development site.

Table 7: Coal Mining Issues Summary

Coal Mining Issue	Yes/No	Risk Assessment
Recorded underground shallow mine workings	Yes	Minor risks – present beneath most northern field, locally within depth of excavations
Unrecorded underground shallow mine workings	No	Negligible – mining is recorded
Recorded Mine entries (shafts and adits)	Yes	Minor risks in northern field
Unrecorded Mine entries (shafts and adits)	Yes	Minor risks in northern field
Mining geology (faults and fissures)	No	Negligible
Record of past mine gas emissions	No	Negligible
Recorded mining surface hazard	No	Negligible
Surface mining (opencast workings)	Yes	Low Risk: Uncontrolled backfill

7.2.1 Recorded Underground Shallow Mine Workings

Shallow underground mine workings of the Swallow Wood Coal seam are recorded on mine abandonment plan 10651 in the northern field and encroaching into the north western edge of the southern field. The depths of the mine workings are not shown on the abandonment plan other than a cross section of the No 2 Shaft where the Swallow Wood seam is shown at c.21m bgl, but the location of No 2 Shaft is unknown. Conversely, the Coal Authority Consultants Coal Mining Risk Assessment shows the depth of the Swallow Wood seam on site to be 10m bgl and that it was last mined around 1845 on site, which corresponds with the dates shown on the abandonment plan. It is therefore considered the depth of these mine workings to likely be from around 10m bgl which pose a risk to surface stability and may have implications on ground infiltration given the proposed depths of excavations for Basin 1. [This depth generally accords with the maximum depth of opencast mining of the same seam encountered during the ground investigation of the southern field].

Underground mine workings of the Lidgett Coal seam are shown on mine abandonment plan 5843 Part A beneath all parts of the site. However, the depth of working is thought to be more than c.48m beneath the site. It is considered that there is sufficient thickness of solid strata between the workings and the ground surface to mitigate against the risk of void migration. No further mitigation is required. Recorded workings in coal and ironstone seams below the Lidgett are therefore also considered to present a negligible risk to surface instability.

7.2.2 Recorded Mine Entries

Twelve recorded mine entries exist within, or very close to the site. However, some appear to relate to shallow bell pits or shallow shafts that were used to extract ironstone and coal and some were subsequently encountered during the opencast mining activities. Two shafts located just off site have been capped and their positions known (one is still being used by the Coal Authority for groundwater monitoring purposes). Given the location of other shafts and the site proposals, it is considered possible that their positions will be identified physically during construction of Basin 1. The three shafts in the southern field are anticipated to have been removed as part of the opencast operations. The two shafts in the northern field may still be present but will also largely be removed as part of the basin excavation. These shafts are not anticipated to extend beyond the Swallow Wood Coal seam but, depending on their actual depth and the precise depth of the

proposed basin in the immediate area, may need to be capped/removed in their entirety.

7.2.3 Unrecorded Mine Entries

The proposed development site's coal mining context is such that there will always be a low risk of unrecorded mine entries being present. At this stage, it is considered that a watching brief should be undertaken during all excavation and ground works within the development. Any anomalous features that may indicate historic mine entries should be investigated and recorded by a competent person.

7.2.4 Surface Mining (Opencast Workings)

The proposed development area has been subject to historic opencast mining in the northern half of the southern field, and likely encroaching into the south of the northern field. Opencast operations do not result in a residual risk to ground instability. However, variations in backfilling compaction can result in variable and unpredictable settlement when new loads are applied. This is particularly the case at highwalls, where sudden variations in thickness of Made Ground can occur. Even so, the plans for this site are not particularly sensitive to differential settlements and so the risk is deemed to be low. Most of the opencast backfill is to be excavated as part of the works but it will locally have implications for slope stability at the edges of the basins where it remains in place.

The composition of the fill material may differ from the in situ strata outside of the former opencast pit and therefore the permeability may vary. As such, this may affect the suitability of parts of the site for the basin, in terms of its infiltration potential/ability to retain water.

7.3 **Conclusions**

This CMRA has revealed a diverse mining heritage at the proposed development site. This has included ironstone and coal mining dating back to the beginning of the 19th Century and possible earlier. Coal mining has included recorded shallow coal mining across the north of the site and deep coal mining across the whole site, along with extensive opencast mining in the northern half of the southern field. Bell pits for probable ironstone (and possibly coal) mining are shown across the northern field on a plan from 1840-41. The proposed excavations for the basins will intercept the former opencast backfill materials and is also likely to encounter the shallowest parts of the former underground Swallowood Mine beneath the site and the two former mineshafts identified by the Coal Authority searches in the northern field.

8.0 **RECOMMENDATIONS**

A ground investigation is recommended to confirm the anticipated ground conditions, validate the conceptual site model, investigate possible recorded and unrecorded shallow mine workings, locate the highwall associated with the former opencast pits on site and assess the suitability of materials for re-use in the proposed earthworks.

A series of trial pits are envisaged to investigate the nature and lateral extent of the opencast backfill materials and obtain representative samples for permeability testing, earthworks classification testing and chemical testing. Some trial pits may

be extended as trenches to identify the highwall. Other trial pits will be used to investigate mapped coal shaft and bell pit locations in the northern field. Where the depth of the proposed basins is greater than that achievable by trial pitting, boreholes will be required.

Boreholes comprising Driven Continuous Sampling (DCS) followed by a rotary method across the site are proposed to investigate the presence and depth of any shallow underground coal workings where likely to be within or close to the depth of excavation. It is expected these will be required to reach 12-15m bgl but could extend to suit findings.

If, as expected, the backfill materials comprise inert natural materials derived from the overburden, large numbers of chemical tests are not considered necessary. However, as there could be elevated concentrations of naturally occurring sulphates and possibly arsenic in the opencast backfill and in-situ Coal Measures strata, sufficient testing should be undertaken to appropriately classify the materials. Testing should comprise a general suite of contaminants and a few selected samples should be tested for pesticides and Topsoil suitability in accordance with BS3882, the latter to determine its suitability for re-use in the main proposed development site (or elsewhere).

Geotechnical laboratory testing is envisaged to comprise soil and rock classification testing, remoulded permeability testing and BRE SD1 sulphate testing.

Ground/mine gas and groundwater monitoring wells should be installed throughout the site and monitoring should be undertaken to help establish groundwater levels and the presence of any mine gas. Where appropriate, groundwater samples should be obtained and tested for sulphate levels and a range of commonly occurring contaminants.

This desk study/Phase I Geo-environmental Risk Assessment and Phase I Coal Mining Risk Assessment Coal should be submitted with the Planning Application to demonstrate that the site has been adequately investigated at the pre-planning stage and that sufficient information has been obtained to design an appropriate Phase II intrusive investigation.

On completion of the intrusive investigation, the Coal Mining Risk Assessment will be updated and submitted as part of the Ground Investigation Report (GIR).

Liaison with the Coal Authority is recommended at an early stage to discuss likely measures required in respect of where the proposed excavation is likely to encounter the former underground workings.

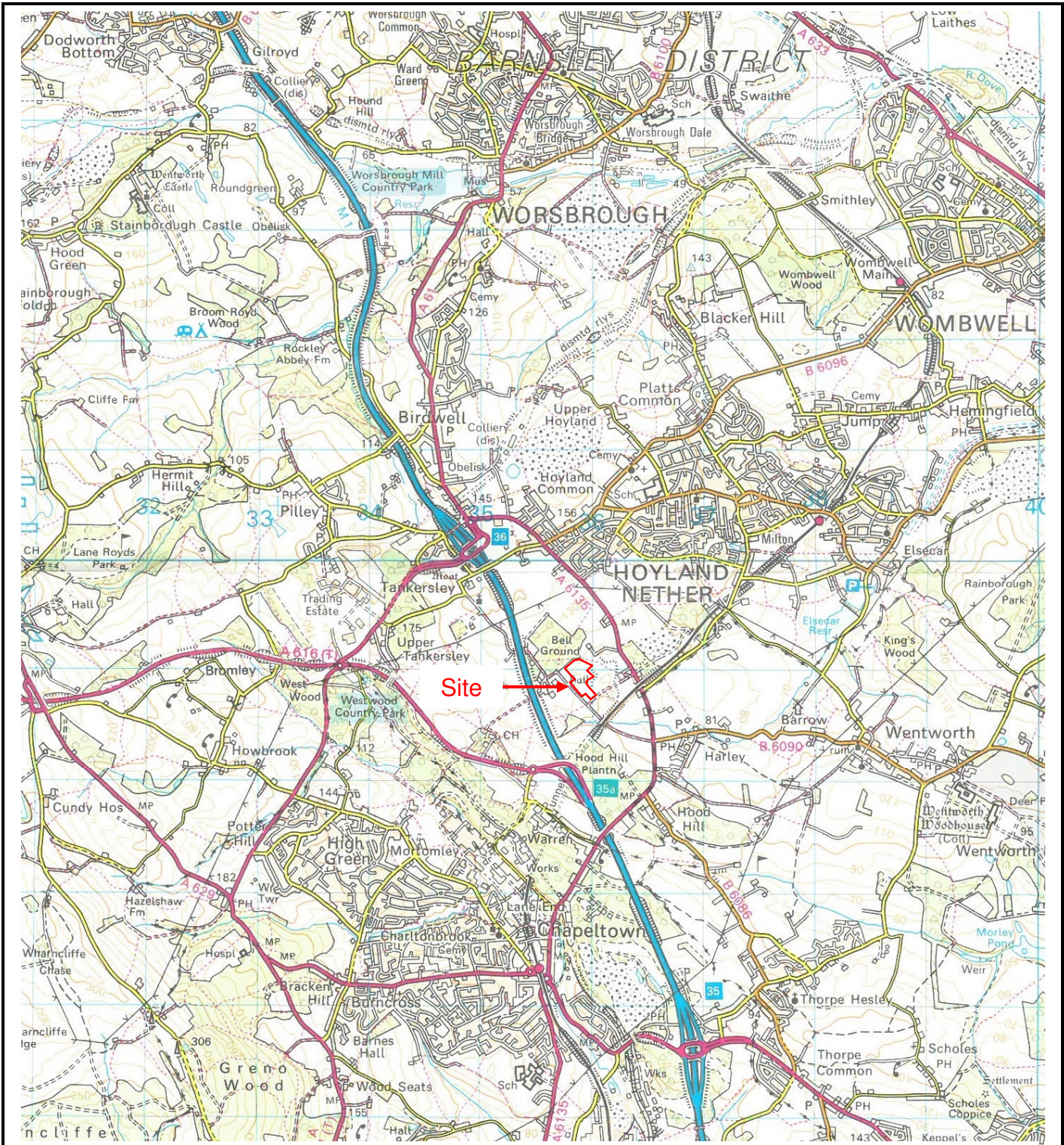
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APPENDIX A

GENERAL NOTES

- A) The assessment made in this report is based on the site terrain and ground conditions revealed by the various field investigations undertaken and also any other relevant data for the site including previous site investigation reports (if available) and desk study data. There may be special conditions appertaining to the site, however, which have not been revealed by the investigation and which have not, therefore, been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available. It must be recognised that many of the Environmental Searches obtained during the course of the desk study are often lengthy. Applied Geology have, where appropriate and in the interests of simplicity, only reproduced the summary of the searches within the report. A full copy of all the search data is held at the Applied Geology office and is available for inspection if required.
- B) Where any data supplied by the Client or other external source, including that from previous site investigations, has been used it has been assumed that the information is correct. No responsibility can be accepted by Applied Geology for inaccuracies within this data.
- C) Whilst the report may express an opinion on possible configurations of strata between or beyond the exploratory locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy.
- D) Comments on groundwater (and landfill gas) conditions are based on observations made during the course of the present and past investigations or with reference to published data unless otherwise stated. It should be noted, however, that groundwater (and landfill gas) levels vary due to seasonal (or atmospheric conditions) or other effects.
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- F) This report is prepared and written in the context of the proposals stated in the introduction to the report and should not be used in a differing context. Furthermore, new information, improved practices and legislation may necessitate an alteration to the report in whole or in part after its submission. Therefore with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to Applied Geology for re-assessment and if necessary, re-appraisal.
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- I) Unless specifically stated, the investigation has not taken into account the possible effects of mineral extraction.
- J) The economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, depends on very many factors in addition to geotechnical considerations and hence its evaluation is outside the scope of this report.
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<p>Drawn By: FD</p> <p>Checked By: SD</p> <p>Paper Size: A4</p>			<p>Project:</p> <p>HOYLAND COMMON, BARNSELY M1 JUNCTION 36 – DRY BASIN</p>
<p>Scale: NTS</p> <p>Date: 01.04.2021</p> <p>NGR: 435888 398929</p>			<p>Title:</p> <p>SITE LOCATION PLAN</p>
<p>Drawing No: AG3080-19-01A</p>		<p>Revision: 1</p>	



KEY:

- Site Boundary
- Site Boundary from Groundsure Report Reference EMS-598513_800720
- Site Boundary from Groundsure Report Reference EMS-605482_809329

APPLIED GEOLOGY

Unit 23
Abbey Park
Stareton
Kenilworth
CV8 2LY

Tel: 02476 511822
email: admin@appliedgeology.co.uk

Client:



Project:

HOYLAND COMMON, BARNSELY
M1 JUNCTION 36

Title:

DRY BASIN SITE BOUNDARY ON
GROUNDSURE HISTORIC MAP FROM 1855

Drawn By:

FD

Checked By:

SD

Paper Size:

A3

Scale:

NTS

Date:

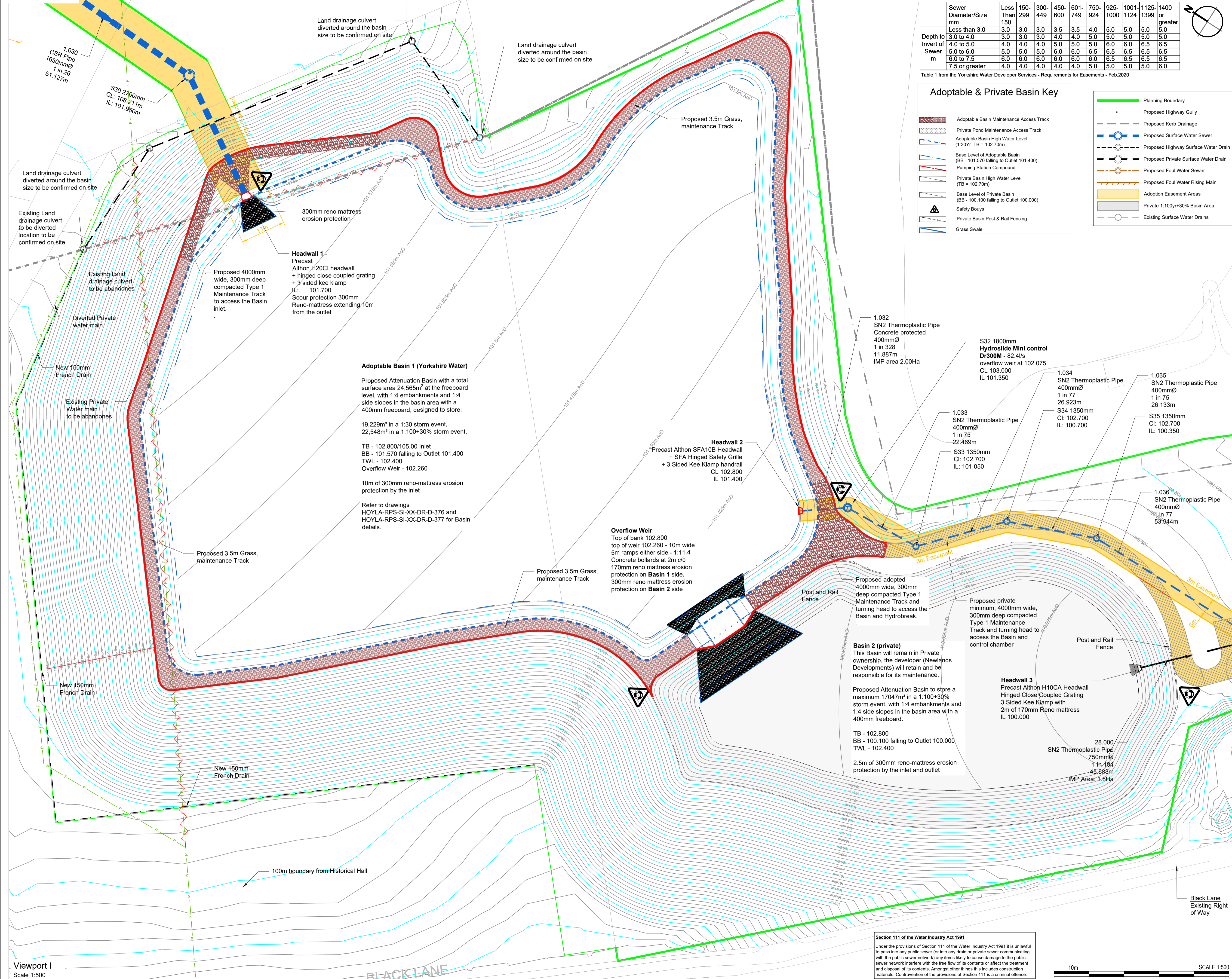
01.04.2021

Drawing No:

AG3080-19-21

Revision:

0



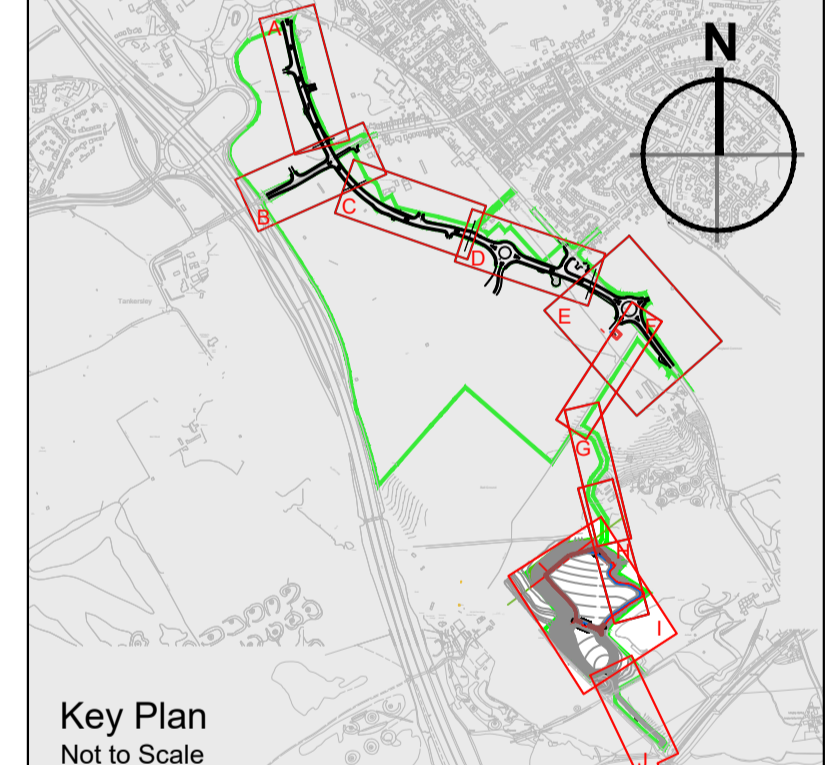
Sewer Diameter/Size mm	Less Than 150	150-299	300-449	450-600	601-749	750-924	925-1000	1001-1124	1125-1399	1400 or greater
Depth to Invert of Sewer m	3.0 to 4.0	3.0 to 4.0	3.0 to 4.0	3.0 to 4.0	3.0 to 4.0	3.0 to 4.0	3.0 to 4.0	3.0 to 4.0	3.0 to 4.0	3.0 to 4.0
3.0 to 4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4.0 to 5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
5.0 to 6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6.0 to 7.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
7.5 or greater	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0

Adoptable & Private Basin Key

- Adoptable Basin Maintenance Access Track
- Private Pond Maintenance Access Track
- Adoptable Basin High Water Level (1:30Yr TB = 102.70m)
- Base Level of Adoptable Basin (BB - 101.570 falling to Outlet 101.400)
- Pumping Station Compound
- Private Basin High Water Level (TB = 102.70m)
- Base Level of Private Basin (BB - 100.100 falling to Outlet 100.000)
- Safety Buoys
- Private Basin Post & Rail Fencing
- Grass Swale

- Planning Boundary
- Proposed Highway Gully
- Proposed Kerb Drainage
- Proposed Surface Water Sewer
- Proposed Highway Surface Water Drain
- Proposed Private Surface Water Drain
- Proposed Foul Water Sewer
- Proposed Foul Water Rising Main
- Adoption Easement Areas
- Private 1:100yr+30% Basin Area
- Existing Surface Water Drains

- #### Notes
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 - This drawing should be read in conjunction with all other relevant drawings and specifications.
 - Masterplan taken from PHP drawing 4400-001 Rev P30, received 02/11/2020.
 - All works to be carried out in accordance with the Specification for Highway Works, the South Yorkshire Residential Design Guide and the requirements of Barnsley Metropolitan Borough Council (BMBC) and Sewer Sector Guidance.
 - All information shown on this drawing is subject to Technical Approval from BMBC and Yorkshire Water.
 - Foul water designed in line with Sewer Sector Guidance, Flows from:
 - 7.1 - Industrial plots based on 0.0l/s/ha
 - 7.2 - Residential plots based on 4000l/unit/day peak flow.
 - Highway drains designed to DMRB and SSG specifications.
 - Kerb drainage based on detailed design by Marshalls PLC.
 - All adoptable sewer works and material to be in accordance with "Code for Adoption", The Relevant British/European and Yorkshire Water's Standards/Requirements/Addendum to the Mechanical and Electrical Specification and Kitemarked.
 - The outside edge of adoptable sewers should be a minimum of 1m and manholes 0.5m from kerb faces and service margins.
 - Sewers must have 5 metres clearance from trees and hedges.
 - Adoptable plastic sewer pipes to be BS1 Kitemarked (certified to WIS 4-35-01 and BS EN 13476). Adoptable plastic sewer pipes to be laid in maximum 3 metre lengths unless there is a specific operational need to lay longer lengths. Plastic channel sections in manholes are not acceptable and Yorkshire Water would prefer cast-in-place concrete in manholes. We have found that plastic channels are difficult to set in concrete because they float and a satisfactory finish cannot be obtained on the benching.
 - Manhole covers shall have a clear opening of 600mm and shall be Class D400 to BS EN 124 with 150mm deep frames in highways.
 - The pipes are to be selected by the contractor to have a suitable strength for the service conditions. The bedding shown are the minimum requirements. The contractor must ensure that the bedding provided is suitable for the selected pipes and loading conditions. Details of proposals for the pipes and bedding's are to be submitted to the contract administrator for approval before the work commences.
 - All pipes are to be suitable for main road traffic unless specified otherwise.
 - Yorkshire Water is not obliged to accept filter drain/land drainage run-off into the public sewer network or adoptable drainage system (directly or indirectly). An alternative method of disposal of the land drainage run-off will therefore be required and you will have to liaise with the Local Authority, Land Drainage Section with regard to the disposal of the filter drain drainage run-off.
 - Cover slabs must carry the BS1 Kitemark or will be rejected by Yorkshire Water Inspector. Where the clear opening of the Kitemarked product is different to that of the cover and frame, a loading bearing slab should be filled above the cover slab to bring the size down to 600mm x 600mm for the Yorkshire Water specified cover size. Please refer to Concrete Pipe Systems Association (CPSA), 'Technical Bulletin' issued 2004 for Kitemarked cover slab opening sizes.
 - Sulphate resistant cement (C30-DC2) and precast concrete products must be used, or a laboratory report provided proving that such precautions are not necessary.
 - Sewers to be laid in class 'S' bedding (150mm Granular bed and surround). Where depth of cover to top of sewer is less than 1.2m in highways and verges (or less than 900mm in non-vehicular access areas) then a concrete slab should be provided above granular bed and surround.
 - Yorkshire Water policy is that Type 'C' brick manholes and 1050mm dia manhole rings are not preferred. Instead it is preferred that you use a type 'B' manhole with 1200mm dia or 1500mm dia rings, with the opening sized over the chamber where depth of cover to pipe soft is 1 - 1.5m.
 - The minimum crushing strength for clay pipes should be as follows: 100mm dia. 40kN/m, 150mm dia. 40kN/m, 225mm dia. 45kN/m and 300mm dia. 72kN/m. The minimum crushing strength for concrete pipes should be - (Class 120 to EN 1916/BS5911-1:2002). Plastic pipes should conform to WIS 4-35-01 and BS EN13476.
 - Filled ground must be filled and consolidated under the supervision and to the satisfaction of Yorkshire Water before any sewer works are carried out.
 - Bedding and backfill material to conform to the requirement of Water Industry Specification 4-08-02 (Table A2).
 - Filled ground must be filled and consolidated under the supervision and to the satisfaction of Yorkshire Water before any sewer works are carried out.
 - The chamber size of manholes with more than one connection in them may need to be increased an increment to accommodate the connections and bends.
 - Where a B125 cover and frame has been approved, this must not be coated in plastic and must have lifting eyes suitably sized to accommodate standard lifting keys. Screw down covers are not acceptable.
 - Yorkshire Water's Signs will be required once the detention basin is transferred to Yorkshire Water (Yorkshire Water will provide the signs and charge the developer for the signs).



P08	Revised to suit YWS comments	ANT	SH	08.04.21
Rev	Description	By	Ckd	Date



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Client: **newlands developments**

Project: **Hoyland Common**

Title: **Proposed Drainage GA S104 Approval (Sheet 5 of 6)**

RPS Project Number	Scale @ A1	Date Created
NK020040	1:500	18.08.2020
Task Team Manager	Information Author	Task Information Manager
SG	JNB	SMC
Status	S4 (Suitable for Stage Approval)	
Document Number	HOYLA-RPS-SI-XX-DR-D-335	
Revision	P08	
Project Code - Originator - Zone - Level - Type - Role - Drawing Number	rpsgroup.com	

Section 111 of the Water Industry Act 1991
Under the provisions of Section 111 of the Water Industry Act 1991 it is unlawful to pass into any public sewer (or into any drain or private sewer communicating with the public sewer network) any items likely to cause damage to the public sewer network interfere with the free flow of its contents or affect the treatment and disposal of its contents. Amongst other things this includes construction materials. Contravention of the provisions of Section 111 is a criminal offence.

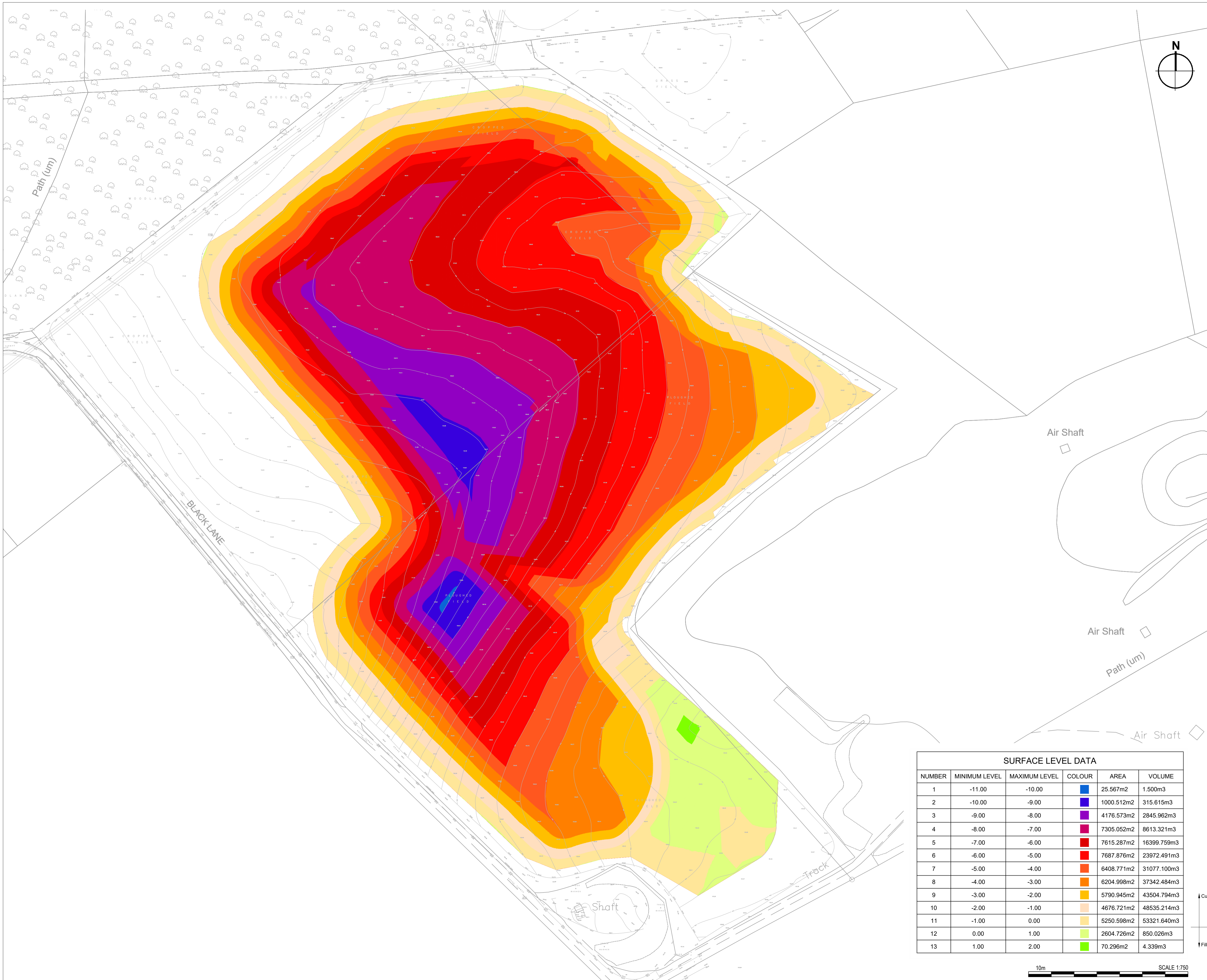
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2. If received electronically it is the recipient's responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.

Design Assumptions

1. No allowance has been made for a site strip.
2. No bulking factors have been applied to the figures below.
3. No allowance has been made for drainage or foundation arisings
4. Cut & Fill volumes:

Total cut = 265,929m³
Total Fill = 854m³
Net (Cut) = 265,075m³



SURFACE LEVEL DATA					
NUMBER	MINIMUM LEVEL	MAXIMUM LEVEL	COLOUR	AREA	VOLUME
1	-11.00	-10.00	Blue	25.567m ²	1.500m ³
2	-10.00	-9.00	Dark Blue	1000.512m ²	315.615m ³
3	-9.00	-8.00	Purple	4176.573m ²	2845.962m ³
4	-8.00	-7.00	Red	7305.052m ²	8613.321m ³
5	-7.00	-6.00	Dark Red	7615.287m ²	16399.759m ³
6	-6.00	-5.00	Red-Orange	7687.876m ²	23972.491m ³
7	-5.00	-4.00	Orange	6408.771m ²	31077.100m ³
8	-4.00	-3.00	Light Orange	6204.998m ²	37342.484m ³
9	-3.00	-2.00	Yellow-Orange	5790.945m ²	43504.794m ³
10	-2.00	-1.00	Yellow	4676.721m ²	48535.214m ³
11	-1.00	0.00	Light Yellow	5250.598m ²	53321.640m ³
12	0.00	1.00	Light Green	2604.726m ²	850.026m ³
13	1.00	2.00	Green	70.296m ²	4.339m ³

10m SCALE 1:750

P01	First Issue	JB	SMC	15.03.21
Rev	Description	By	Ckd	Date



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Client
Hoyland

Title
Pond Earthwork Volumes

RPS Project Number NK020040	Scale @ A1 1:750	Date Created 11.03.21
Task Team Manager SH	Information Author JB	Task Information Manager SMC

Status
S2 (Suitable for Information)

Document Number
HOYLA-RPS-SI-XX-DR-C-SK001

Project Code - Originator - Zone - Level - Type - Role - Drawing Number
 rpsgroup.com

↑ Cut
 ↓ Fill

APPENDIX B