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# Ground Investigation Report

Proposed floodlit artificial 3G pitch

Redbank Playing Fields

May 2021

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# Proposed floodlit artificial 3G pitch

# Redbank Playing Fields

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|---|---|
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Soiltechnics
Unit 9, Clarence Avenue
Trafford Park, Manchester
M17 1QS
0161 947 0270
mail@soiltechnics.net
www.soiltechnics.net

## Document history and status

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|---|---|---|---|---|---|
| A | May 2021 | First Issue | JP | MOH | SCD |
| B | May 2021 | Second Issue (update recommended pitch location) | JP | MOH | SCD |

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# Executive Summary

## Development proposals and site description

The project comprises construction of a 106m x 70m LED floodlit 3G Football Turf Pitch (FTP), including extension of the existing car parking area to the southwest of the field. A new pavilion is also proposed, with either demolition of the existing facility or refurbishment for storage.

## Site history

The earliest available maps date back to the late 1800s, and shows a watercourse flowing through the pitch (NW to SE), along with a rope-walk present along-side it. A well and a spring are also noted to be present within the approximate footprint of the proposed pitch.

By the mid-1930s, a refuse tip / landfill is encroaching within the site's northern boundary and has extended further still within the 1950s mapping. From the 1960s, the site appears to have been covered, and made into an area of public open space. The small building within the southwest of the site, along with the carparking area is recorded from circa. 1970.

## Ground conditions

The boreholes encountered Made Ground soils between 5.1m and 10.1m below ground level (bgl) overlying Pennine Middle Coal Measures bedrock (typically mudstone with coal seams).

## Coal mining

A previous desk-based Coal Mining Risk Assessment has been completed for the site (Report ref: STT-5261-CMRA01 Rev A) which determined shallow coal mining risks could exist. Subsequent intrusive investigations indicated the presence of intact coal seams between depths of 17.9m and 21.9m below the centre of the development area. A likely void and soft strata were recorded at a depth of 26.6m bgl to the south east of the development area.

Based on our assessment, there is unlikely to be a significant risk of land instability occurring at the site as a result of possible collapse of identified workings. However, in consideration of the preliminary stages the development is at currently, it would be prudent to move the location of the proposed pitch as far west and north as is practicably possible, to mitigate against the current residual risk of land instability.

No coal seams were recorded across the north of the development area, however, we anticipate the Rams seam was exploited historically through opencast techniques based on site observations.

## Drainage and infiltration potential

Made Ground soils and underlying Pennine Middle Coal Measures deposits are not considered amenable to the discharge of stormwater collected by the proposed development. An alternative means of drainage may be via the public surface water main (600mm dia.) recorded within the north eastern part of the site, however a full drainage survey will be required to confirm this.

## CBR assessment and pitch foundations

Based on in-situ testing, a CBR design value of 4% can be used for the proposed pitch foundations. Due to the composition and thickness of Made Ground at the site, we recommend that such soils present at and below formation levels are appropriately conditioned to achieve a more uniform level of compaction and minimise levels of total and differential settlement.

## Floodlight foundations

Made Ground deposits in their current condition are not considered suitable to provide sufficient support to proposed floodlights on traditional shallow pad type foundations. Due to the thickness of the Made Ground, adoption of pad foundations supported by underlying competent natural soils will be difficult to successfully achieve. Therefore, a piled foundation solution or alternative ground improvement methods, which may allow adoption of shallow foundations, are recommended to adequately support proposed floodlights.

A concrete class of DS-2 and ACEC-2 is required for the Made Ground soils.

## Recommendations for further works

No further works are recommended. However, should an alternative approach to foundation design be considered, further site investigation could be required to facilitate design of such specialist techniques.

# 1 Introduction

## 1.1 Project Brief

1.1.1 The project comprises construction of a 106m x 70m LED floodlit 3G Football Turf Pitch (FTP), including extension of the existing car parking area to the southwest of the field. A new pavilion is also proposed, with either demolition of the existing facility or refurbishment for storage. At present, the proposed location of the new pavilion is not known, however, we have assumed for the purposes of our coal mining risk assessment that it would be positioned local the area of the proposed pitch.

1.1.2 The scope of works is bespoke and has been completed to further refine our desk-based coal mining risk assessment report (Report Ref: STT-5261-CMRA01 Rev A) completed in February 2021. The site works comprised a ground investigation utilising rotary borehole techniques to assess the coal mining risk, but also provide information necessary to allow design of the artificial sports pitch and floodlight foundations (excluding the proposed car parking and pavilion). The report will also advise on abnormal ground conditions.

## 1.2 Site Location and Description

1.2.1 The proposed pitch development lies within the Redbank Playing Field existing grass-surfaced sports field. A small facility building and car parking area is located to the southwest, where the site is accessed at the following postal address:

Radcliffe Juniors Football Club
Unsworth Street
Radcliffe
Manchester
M26 3RF

1.2.2 Surface levels across the majority of the pitch are relatively flat; however there is a notable drop in elevation within the southeast corner.

1.2.3 An aerial image of the site (red) and development area (blue) is shown below.

*Figure 1-1 Aerial image and approximate site boundary.*

# 2 Desk Study

## 2.1 Site History

2.1.1 An attempt to trace the history of the site has been carried out by reviewing readily available Ordnance Survey maps. The earliest available maps date back to the late 1800s, and shows a watercourse flowing through the pitch (NW to SE), along with a rope-walk present along-side it. A well and a spring are also noted to be present within the approximate footprint of the proposed pitch. Just off site, to the south east is a bleach and dye works. No buildings are recorded.

2.1.2 By the mid-1930s, a refuse tip / landfill is encroaching within the site's northern boundary and has extended further still within the 1950s mapping; however, its full extent is not clear.

2.1.3 From the 1960s, the site appears to have been covered, and made into an area of public open space. The small building within the southwest of the site, along with the carparking area is recorded from circa. 1970.

## 2.2 Recorded Geology and Hydrogeology

2.2.1 An extract from open-source British Geological Survey (BGS) mapping data for the area is presented below. Superficial deposits are predominantly Devensian Till (clay), with a glacial river channel present within the west of the site, depositing Glaciofluvial Deposits (sands and gravels).

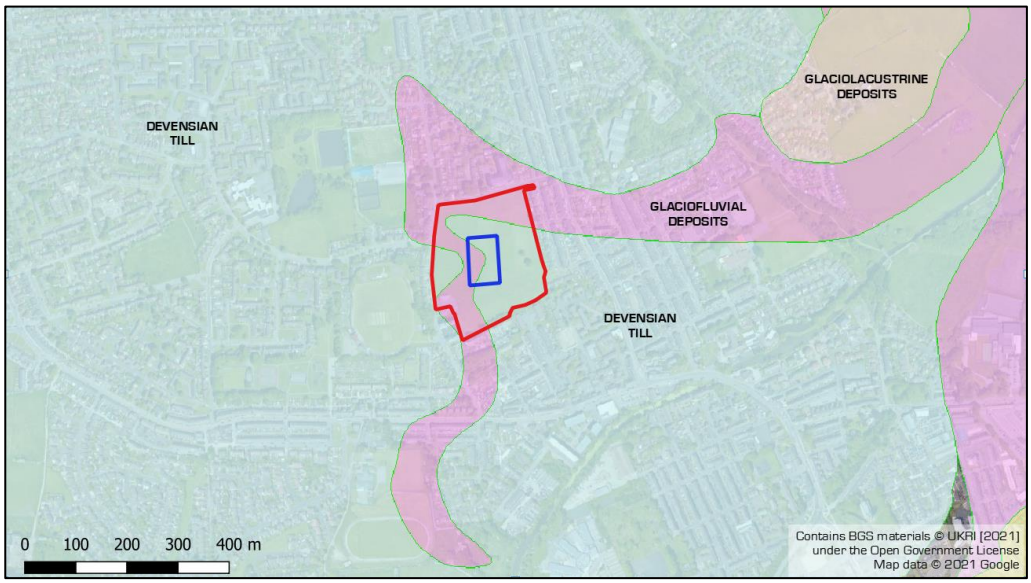



*Figure 2-1 Superficial geology and artificial ground deposits*

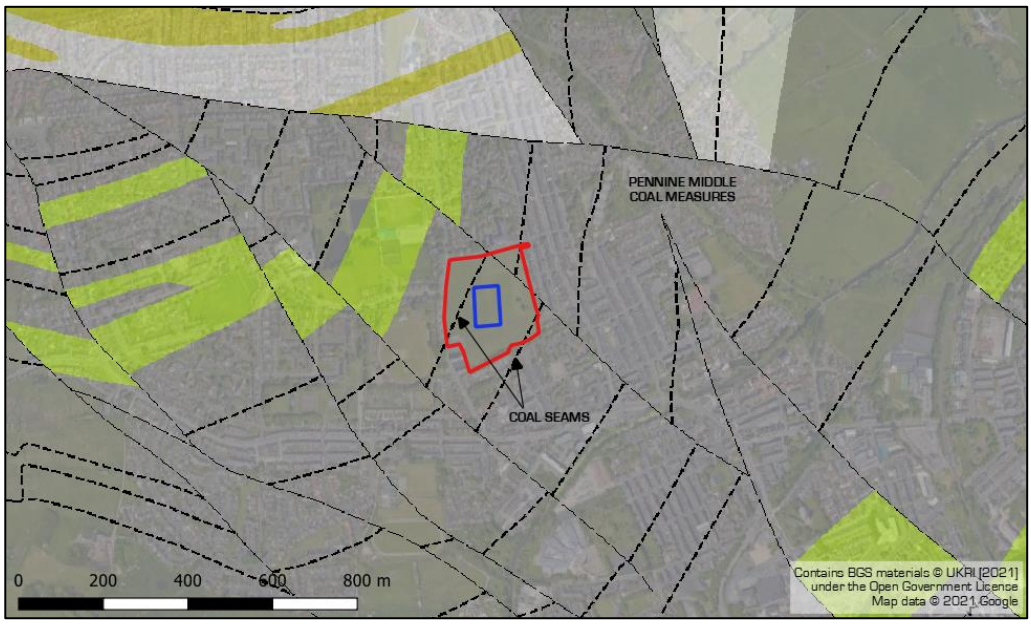



*Figure 2-2 Bedrock geology and linear features*

2.2.2 The BGS does not record significant artificial deposits to be present on site, or within close proximity.

2.2.3 The underlying bedrock is recorded to be the Pennine Lower Coal Measures, with two inferred coal seams present in close proximity to the site.

2.2.4 Based on local BGS borehole records we anticipate the Glaciofluvial Deposits and Devensian Till to amount to a thickness of approximately 10-12m within the area.

2.2.5 Based on the evidence within the historical maps, it is anticipated that groundwater levels will be shallow.

2.2.6 From the site's history Made Ground / landfill deposits are expected to be present within the development area. It is unclear whether these deposits extend across the entire pitch envelope or are restricted to the northern part only. The table below summarises potential ground conditions on site:

| Strata | Bedrock or superficial | Approximate thickness | Typical soil type | Likely permeability |
|---|---|---|---|---|
| Made Ground (Domestic landfill) | - | Unknown depth and extent | Reworked imported soils over household waste | Variable |
| Glaciofluvial Deposits (west) | Superficial | <10m | Sands and gravels | High permeability |
| Devensian Till (most of the site) | Superficial | <10m | Clays | Low permeability |
| Pennine Middle Coal Measures Formation | Bedrock | Basal unit | Sandstone, mudstone and siltstone with coals | Permeable (Secondary A Aquifer) *[no Source Protection Zone present]* |

*Table 1 Summary of geology and hydrogeology*

2.3.7 The geological map indicates that the Pennine Middle Coal Measures dip at an angle of around 22$^{o}$ to the south east (local to the site). As shown on Figure 2-2 a fault is recorded across the north east of the site (likely attributed to the Bradley Fold Fault) which downthrows to the south west. Such faulting may influence the local dip of bedrock.

2.3.8 Based on published geological records either the Top Furnace or Brassey (Roger) coal seam subcrops within the Redbank playing field to the south east of the proposed development area (south of fault line) and likely dips to the south east. We, therefore, do not anticipate this seam to be present beneath the proposed development area (footprint of proposed pitch).

2.3.9 The Rams (Bottom Furnace) coal seam subcrops at the north western boundary of the proposed development site (south of fault line) within the Redbank playing field and again likely dips to the south east. We, therefore, anticipate this seam to be present beneath the proposed development area (footprint of proposed pitch).

2.3.10 It should be noted that mines often used local nomenclature to define coal seams in the Manchester coal fields. We understand that the Roger coal seam is also known as the Nine Feet seam, with the Rams coal seam also known as the Six Feet coal seam.

## 2.3 Quarrying and Mining

2.3.1 Coal Authority mapping data shows the site lies within a Coal Mining Reporting Area, and within a Development High Risk Area, associated with the potential for unrecorded shallow workings.

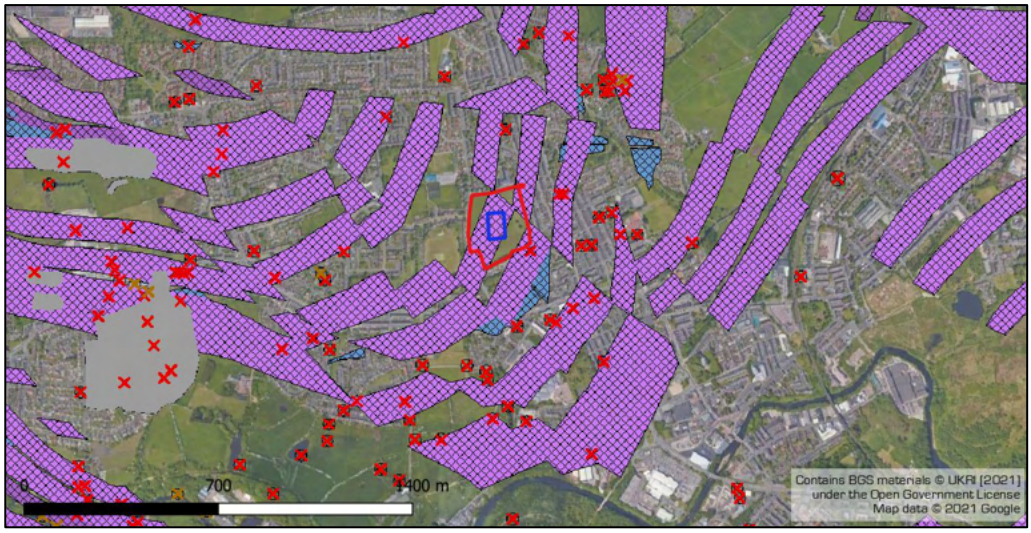



*Figure 2-3 Coal mining specific risks*

2.3.2 We have, therefore, previously undertaken a desk-based coal mining risk assessment for the site (Report ref: STT-5261-CMRA01 Rev A) in February 2021.

2.3.3 The report concluded that there was a possible land instability risk relating to unrecorded shallow coal mining which could be present within the proposed development area, associated to the Rams Coal seam. As such further on-site investigation was required to confirm the presence/absence of coal seams/workings beneath the site to a depth of 30m.

## 2.4 Hydrology and Flood Risk

2.4.1 The nearest down-gradient surface water feature is Manchester, Bolton and Bury Canal, some 350m southeast of the site. The River Irwell is present approximately 900m southeast.

2.4.2 Environment Agency flood maps indicate the site is within a Flood Zone 1, suggesting a low probability of flooding. However, the site does fall within a general Flood Risk Area.

2.4.3 It should be noted that, historically, a spring was noted on site or in very close proximity to the pitch boundaries. Therefore, there is considered to be a potential risk from groundwater flooding.

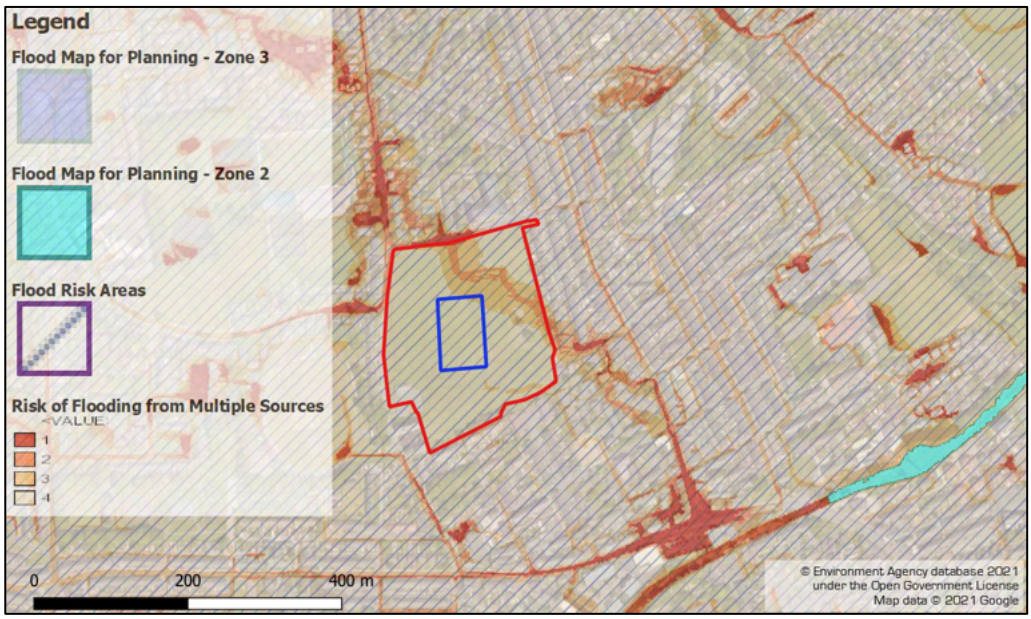



*Figure 2-4 Flood Map for Planning (Rivers and Sea)*

## 2.5 Landfilling

2.5.1 Open-source Environment Agency landfill mapping data shows that an historical landfill site is recorded across the entire pitch footprint. The records indicate the landfill wastes were deposited circa. 1950s and accepted household refuse. This landfill record corroborates the findings from a review of the historical mapping records.

2.5.2 In addition, there is a potential risk of harmful ground gases emanating from shallow worked coal seams, and this will require further consideration and possible investigation along with the potential ground instability risks.

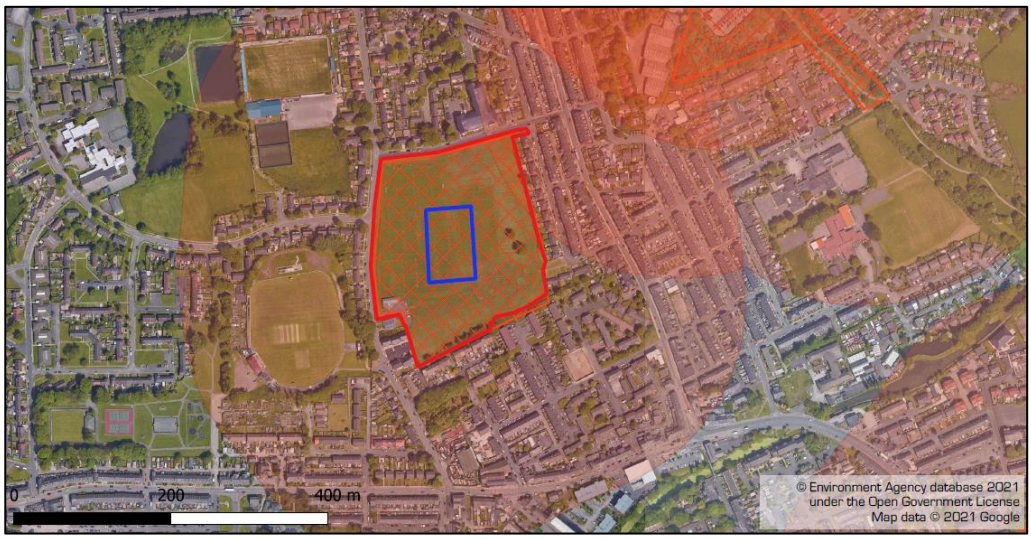



*Figure 2-5 Historical and Permitted Landfills*

## 2.6 Unexploded Ordnance (UXO)

2.6.1 MACC International Ltd, who are a UXO specialist, were commissioned by Soiltechnics to undertake a preliminary risk review for the ground investigation only; a copy of their review is presented as Appendix B. The review concluded there is not a credible likelihood of encountering UXO on the plot and consequently, the UXO risk is considered to be low within the site boundary.

## 2.7 Enquiries with Statutory Undertakers

2.7.1 We have contacted a number of Statutory Undertakers and have visited the Linesearch website to obtain copies of available records to avoid damaging buried apparatus during fieldwork activities. Copies are presented as Appendix C.

2.7.2 A review of the information indicates that a public surface water main (600mm dia.) crosses the north-eastern corner of the pitch, as shown below.

*Figure 2-6 United Utilities Sewer Records, dated 26/01/2021*

2.7.3 No other statutory services are recorded within the pitch footprint. However, private runs are typically excluded from these records.

2.7.4 All statutory undertakers should be contact to confirm the location of their apparatus and any construction easements and site restrictions which may apply. It would also be recommended to conduct a full services survey of the area to identify public and private utility runs.

# 3 Fieldwork

## 3.1 Fieldwork Summary

3.1.1 Fieldwork was undertaken on 15th and 16th April 2021, and the works completed are summarised below. Exploratory hole logs are presented in Appendix D, and an exploratory hole location plan is presented as Drawing 01.

| Exploratory hole ID | Method | Achieved depth (m bgl) | Purpose |
|---|---|---|---|
| BH01 to BH05 | Rotary boreholes | 11.0 to 30.0 | Prove ground conditions for pitch/floodlights and determine presence/absence of coal seams/workings |
| DCP01 to DCP05 | Dynamic cone penetrometer | 0.34 to 0.92 | Determine CBR value for sports pitch |

*Table 2 Summary of fieldwork undertaken*

3.1.2 All soils encountered utilising dynamic sampling techniques were described in accordance with BS EN ISO 14688 “Identification and classification of soil”. Rock, where encountered, was described in accordance with BS EN ISO 14689 “Identification and classification of rock”.

3.1.3 All logging of cuttings produced by rotary open hole air flush and air mist techniques were only described by their colour and strata. No geotechnical parameters can be derived from rotary open hole techniques.

## 3.2 Site Restrictions

3.2.1 Owing to the presence of underground public and private sewers, proximity to homes off Lever Street (boreholes must be greater than 50m from properties, stipulated by the Coal Authority permitting) and whilst also avoiding damage to the existing grass pitches, we were unable to complete a rotary borehole towards the north east of site.

## 3.3 Sampling

3.3.1 During the fieldwork, sampling of materials has been undertaken in accordance with BS EN ISO 22475-1 “Geotechnical Investigation and testing – sampling by drilling and excavation and groundwater measurements”. Various sampling and sub-sampling methodologies have been adopted, depending on the medium, excavation / drilling method and analysis requirements, with the primary aim of obtaining the highest quality sample class practicable.

## 3.4 In-situ Testing

3.4.1 Field testing comprised the following tests:

| Test type | Applicable standard / guidance |
|---|---|
| Standard penetration test (SPT) | BS EN ISO 22476-3 |
| Pocket penetrometer | Manufacturer's instructions |
| Dynamic cone penetrometer (DCP) | Highways England Document CS229 Data for Pavement Assessment |

*Table 3 Summary of field testing undertaken*

3.4.2 The raw data from the DCP in-situ testing is presented in Appendix E, and other results are summarised on individual exploratory hole logs where appropriate.

# 4 Ground Conditions

## 4.1 Overview

4.1.1 The boreholes encountered a relatively consistent profile of soils, with Topsoil overlying Made Ground associated to historical landfilling with colliery spoil at depth (associated to possible unrecorded opencast backfilling). Made Ground typically comprised dark brown slightly clayey very sandy gravels of clinker, glass, ceramics, clayware, brick, sandstone, concrete, and rare timber fragments. Pockets of dark brown gravelly clay were also recorded within the Made Ground. Deposits of very soft light grey silts, clays and sands were also recorded towards the centre of the site (BH02), which we anticipate are likely to represent reworked Glaciofluvial Deposits.

4.1.2 Deposits of Made Ground ranged in thickness from 5.1m bgl (south of development area) to 10.1m bgl (north of development area), c.7m depth centrally.

4.1.3 Beneath a depth of 4.0m bgl rotary open hole techniques were adopted, as such only the colour and composition of the arising contained in flush returns provided an indication of the strata type. A typical profile of near surface Made Ground is presented in Figure 4-1 below.

4.1.4 Beneath the Made Ground, bedrock deposits of the Pennine Middle Coal Measures were recorded beyond a depth of 30.0m bgl. Deposits typically comprised grey to reddish brown weathered (shallower depths) and unweathered mudstone with grey siltstone bands.

4.1.5 Intact coal seams were recorded towards the centre of the development area (BH02 and BH05), whilst voiding associated with likely worked coals was recorded towards the south east of the development area (BH03). Further details with respects to the coal mining risk is presented within Section 5, below.

*Figure 4-1 Photo from BH03 showing soils from ground level to 4m depth*

## 4.2 Groundwater

4.2.1 No groundwater was observed within the boreholes.

## 4.3 Evidence of Possible Contamination

4.3.1 During the ground investigation works no visual or olfactory evidence of contamination was observed beyond a slight organic odour (assumed plant matter) observed at a depth of 3.1m bgl within BH04 (south west of site), and the general presence of anthropogenic material in Made Ground.

## 4.4 Obstructions and Instability

4.4.1 A single obstruction (assumed concrete) was encountered between 0.8m and 1.2m depth in BH01 (north of site).

# 5 Coal Mining Risk Assessment

## 5.1 Overview of Desk Study

5.1.1 A desk-based Coal Mining Risk Assessment was completed for the site in February 2021 on behalf of our client The Football Foundation (Report Ref: STT-5261-CMRA01 Rev A). We recommend the following report is not read in isolation to the desk-based risk assessment.

5.1.2 Based upon evidence presented within the report we had identified possible land instability risks relating to unrecorded shallow coal mining which could be present within the proposed development area, associated to the Rams Coal seam. It was anticipated, based on the likely thickness of superficial deposits overlying bedrock, the Rams seam could be located at depths of c.10m below the north west corner of the pitch, dipping to the south east and present at depths of c.23m at the south east corner of the proposed pitch.

5.1.3 In order to quantify the possible land instability risks associated with the unrecorded shallow workings in the Rams Coal seam, intrusive investigations were recommended. These consisted of a series of rotary boreholes to target depths of 30m (as detailed in Section 3, above) to determine the presence of any possible workings (voids) associated with the Rams Coal seam. Most importantly determining if there is sufficient rock cover, thus allowing a risk assessment to be made.

## 5.2 Findings

5.2.1 The rotary logs indicated the following coal seams/voids to be present beneath the site.

| Borehole | Location (development area) | Depth of seam (m) | Thickness (m) | Condition |
|---|---|---|---|---|
| BH02 | Centre | 20.7 – 21.2 | 0.5 | Intact black coal |
| | | 21.5 – 21.9 | 0.4 | Intact black coal containing carbonaceous mudstone. |
| | | This is likely to represent one seam, 1.2m in thickness with a 0.3m thick parting. | | |
| BH03 | South East | 26.6 – 27.9 | 1.3 | Possible Void / Broken Ground |
| | | 27.9 – 28.8 | 0.9 | Soft ground |
| | | Could represent one large worked seam, with some backfill deposits representing the 'soft ground'. | | |
| BH05 | Western Centre | 17.9 – 18.4 | 0.5 | Intact black coal containing carbonaceous mudstone. |
| | | 19.8 – 20.6 | 0.8 | |

*Table 4 Coal seams recorded during fieldwork investigation.*

5.2.2 Data indicates the presence of possibly a single coal seam which increases in depth from north west to south east. It is also possible that to the south east of the development area the seam had been worked as part of the Radcliffe Colliery. We therefore anticipate that the seams recorded beneath the site are associated to the Rams Coal seam, as indicated in our desk-based investigation.

5.2.3 Made Ground associated to the historical landfill was also recorded across the entire site to a depth between 3.2m and 5.6m bgl. Deposits typically comprised gravels of clinker, brick, ceramics, glass, sandstone and concrete. Across the north and centre of site the Made Ground was underlain by colliery spoil to a depth of 7.0m to 10.1m bgl (recorded deepest towards the north of the development area). As such we anticipate that coal towards the north of the site (BH01) may have been exploited through historic unrecorded opencast/bell pitting techniques, and as such coals/workings were not recorded during fieldwork activities.

## 5.3 Conclusion and Recommendations

5.3.1 On site investigations indicated the presence of the Ram Coal seam beneath the central and southern extents of the current development area. This appears to have been exploited historically via opencast techniques in northern areas where Made Ground is thickest, observed in an intact state at its shallowest depth towards the centre of the site.

5.3.2 There is evidence, however, of the seam being worked in the south eastern part of the site, with voiding/broken ground recorded beneath the development area at a depth of 26.6m. Loss of flush and drop of the drilling apparatus suggested the void extended to a depth of 27.9m (1.3m in thickness). Evidence of soft material was present below the void, extending to a depth of 28.8m (0.9m in thickness). It is not clear what this material could represent, but could be partially backfilled workings. The working does not appear to be laterally extensive across the development site based on data obtained to date, and is likely to be confined to the south eastern part of the development area and extend offsite to the south and east.

5.3.3 Using guidance contained within CIRIA C758, if we assume a conical collapse of the recorded working/void of the Rams seam beneath the south eastern part of the development area (assuming a worst case thickness of 2.2m, including the softer basal material), and assuming pillar and stall type workings, then we would anticipate following roof collapse that the resultant void would potentially migrate to a depth of 4.6m below surface level in this part of the site.

5.3.4 Whilst not applicable to all sites and should be assessed site specifically, an indicative rule of thumb is to work to a ratio of 10:1 of intact competent rock cover above a void (i.e. for a 1m thick void, 10m of intact competent rock cover) should arrest the migration of any resultant void if collapse occurred. On the above assessment, in consideration that competent mudstone bedrock is located at a depth of 6.0m, and weathered bedrock is present at 5.1m which can be considered as part of the assessment of 'competent' material, this would provide 21.5m of competent cover above the likely working; a ratio of 9.8:1. Thus, there could be a very residual risk that if collapse occurred, it could affect the proposed development. However, there is a degree of conservatism built into our assessment here, given the void is not physically 2.2m in thickness.

5.3.5 Based on the above, there is unlikely to be a significant risk of land instability occurring at the site as a result of possible collapse of identified workings. However, in consideration of the preliminary stages the development is at currently, based on our findings it would be prudent to move the location of the proposed pitch as far west and north as is practicably possible, to mitigate against the current residual risk of land instability. The preferred location of the proposed pitch based on exploratory works completed to date, is presented as the red line boundary in Drawing 01, however we understand this could be constrained by surrounding land use.

# 6 Laboratory Testing

## 6.1 Overview

6.1.1 Upon completion of the fieldworks, selected samples obtained from exploratory holes were sent to independent laboratories for geotechnical testing.

6.1.2 The testing schedules were developed by Soiltechnics taking cognisance of the scheme proposals and based on the initial findings of the fieldworks.

## 6.2 Geotechnical Testing

6.2.1 Laboratory test certificates are presented as Appendix F, and the total number of geotechnical tests undertaken is summarised below:

| Geological Unit | Test | Quantity |
|---|---|---|
| Made Ground | pH, sulphate, sulphur and water-soluble sulphate | 1 |
| Made Ground Reworked Glaciofluvial Deposits | Atterberg limits | 1 |

*Table 5 Summary of geotechnical laboratory testing*

# 7 Engineering Assessment

## 7.1 Ground Conditions Summary

7.1.1 In general, the soils comprise Made Ground deposits in excess of 5.1m bgl across the development area. Made Ground deposits in their current condition are not considered suitable to provide sufficient support to proposed floodlights on traditional pad type foundations. Due to the thickness of the Made Ground, adoption of pad foundations supported by underlying competent natural soils will be difficult to successfully achieve. Therefore, a piled foundation solution or alternative ground improvement methods, which may allow adoption of shallow foundations, are recommended to adequately support proposed floodlights.

## 7.2 Abnormal Ground Conditions

7.2.1 We anticipate there to be the possibility of encountering localised obstructions within the Made Ground.

## 7.3 Floodlight Foundations

### 7.3.1 Piled Foundations

7.3.1.1 A piled foundation solution is likely to obtain support in end bearing, socketing within the Pennine Middle Coal Measures at depth.

7.3.1.2 We recommend the type, design and installation of the piles are determined by a specialist piling contractor who has experience in pile installation in these or similar ground conditions and may be able to interpret the observed ground conditions in a different and potentially more beneficial manner. The borehole data provided in Appendix D should provide sufficient information to allow design of a piled foundation solution.

7.3.1.3 It should be noted, however, that adoption of piled foundations in the south eastern part of the site are likely to obtain end bearing support within the potential collapse zone above identified coal mine workings. If such a collapse occurred, there is the risk that piled foundations would lose support within coal measure deposits, leading to catastrophic failure. If the pitch was located further north and west of its current location, outside the area of identified workings, such issues would be mitigated. Alternatively, floodlights should be excluded from the south eastern part of the proposed pitch if piled foundations are adopted.

### 7.3.2 Alternative Foundation Solutions

7.3.2.1 Due to a combination of cost, programme and site constraints, some alternative foundation or ground improvement solutions to minimise settlement below floodlight foundations are unlikely to be viable for the development. The following solutions may be technically feasible for the site and are discussed in brief below: -

- Controlled Modulus Columns (CMC)
- Rapid Impact Compaction (RIC)
- Soil Mixing

7.3.2.2 Controlled Modulus Columns (CMC) provide a fast and economical alternative to piling. The technique installs low strength concrete columns (280mm to 500mm) in diameter, utilising a displacement tool attached to a rig. The concrete columns would enhance the bearing capacity beneath proposed floodlights, which would in turn reduce total/ differential settlement. Such a solution could still be influenced by the presence of mine workings identified in the south eastern part of the site.

7.3.2.3 Rapid Impact Compaction (RIC) compacts granular/mixed soil surfaces through introduction of high frequency energy impacts. The RIC consists of a compaction foot which is placed on the ground and repeatedly struck by a 7-12 tonne hydraulic rammer, resulting in top-down compaction of the soil, thus enhancing bearing capacities, reducing settlement and allowing adoption of shallow pad foundations. This could be a preferable solution, subject to suitability of soils, as shallow pad type foundations could be adopted, maximising the distance between the base of the foundation and the upper limits of the zone of instability caused by possible mine working collapse to the south east.

7.3.2.4 Soil mixing involves modifying the properties of weak soils to improve load carrying and permeability characteristics. The process uses a single or multi tool auger to break up the soil, which is then injected at low pressures with a specifically designed binder and mixed within the soils. Similarly, if such techniques would allow adoption of a shallow foundation, this would be a preferable solution in south-eastern parts of the site.

7.3.2.5 Should an alternative approach to foundation design be considered, we would recommend the advice of a specialist in the field of the above processes is sought ahead of design. It is also possible that further site investigation would be required to facilitate design of such specialist techniques.

## 7.4 Artificial Pitch Foundations

7.4.1 We have determined CBR value for the proposed artificial pitch foundations using in-situ Dynamic Cone Penetrometer testing following the methodology defined by the Highways England Document CS229 Data for Pavement Assessment. The results are presented in Appendix E and the location of test positions are shown on Drawing 01.

7.4.2 We anticipate that the proposed artificial sports pitch foundations will be located at or about existing ground levels with the formation located on Made Ground soils following removal of any Topsoil type material.

### 7.4.3 Determination of subgrade CBR using the Dynamic Cone Penetrometer

7.4.3.1 Based on the anticipated founding depth and our understanding of the ground conditions, a CBR design value of 4% can be adopted.

#### 7.4.4 Treatment of formation

7.4.4.1 Due to the composition and thickness of Made Ground at the site, we recommend that such soils present at and below formation levels are appropriately conditioned to achieve a more uniform level of compaction and minimise levels of total and differential settlement.

7.4.4.2 Once formation levels have been established it is recommended that the formation be trimmed and rolled following current requirements of the Highways Agency Specification for Highways Works (clause 616) (refer www.dft.gov.uk/ha/standards/mchw/vol1). Such a process will identify any soft areas, which we recommend be either excavated out and backfilled with a suitable well compacted material similar to those exposed in the sides of the resulting excavation, or large cobbles of a good quality stone rolled into the formation to stabilise the 'soft' area.

7.4.4.3 Alternatively, consideration should be given to excavating, sorting and compacting the initial 1m depth of Made Ground to achieve consistent levels of compaction across the pitch footprint and minimising the potential effects of differential settlement, potentially in addition to the use of a geosynthetic reinforcement.

7.4.4.4 In addition, increasing and homogenising the density of the Made Ground through ground improvement techniques such as vibrotreatment or permeation grouting/lime & cement stabilisation could be undertaken. These are notably expensive and would require specialist input at the feasibility stage.

#### 7.4.5 Subgrade frost susceptibility

7.4.5.1 Any clay subgrade soils are likely to be deemed frost susceptible and will probably be the overriding criteria for pavement foundation design purposes. It should also be noted that the thickness of the pavement foundation also relates to the amount and loading from construction traffic, which is discussed in detail in the Transport and Road Research Laboratory (TRRL) Report LR1132 'Structural design of Bituminous Roads'.

#### 7.4.6 Moisture susceptibility

7.4.6.1 The localised cohesive nature of the Made Ground soils will render them moisture susceptible with small increases in moisture content giving rise to a rapid loss of support to construction plant. We therefore recommend, as soon as formation is trimmed and rolled, that sub-base is laid in order to avoid deterioration of the subgrade in wet or frosty conditions.

## 7.5 Drainage and Infiltration Potential

7.5.1 Made Ground soils are not considered amenable to the discharge of stormwater collected by the proposed development. Water freely/directly discharged into the Made Ground could cause collapse of air voids contained in these deposits, which promotes compaction of the soils around the soakaway causing depression of the general area around the soakaway as well as potentially affecting pipe runs leading to the soakaway.

7.5.2 The underlying Pennine Middle Coal Measures comprised mudstone with interbedded siltstone. In our experience, such deposits are unlikely to be capable of disposing of stormwater collected by the development.

7.5.3 Existing soakaway features were not observed on site during the ground investigation works; however, a full drainage survey was not undertaken.

7.5.4 Given the proximity of the public surface water main (600mm dia.) detailed in Section 2.7, this is considered to be a feasible and practical option for the potential disposal of surface water collected by the proposed pitch development. However, a comprehensive drainage assessment will be required to determine the potential impact on the capacity of the existing systems, to identify the invert levels of existing features, and to confirm drainage gradients will be achievable across the proposed pitch area. It should be noted at the time of investigation only the manhole shown to the north of the development area was visible, however, we were unable to lift this at the time of investigation.

## 7.6 Aggressiveness of the ground to buried concrete

7.6.1 The aggressiveness of the ground with respect to buried concrete has been assessed in accordance with British Research Establishment Special Digest 1: Concrete in Aggressive Ground Third Edition (2005).

7.6.2 The site is interpreted to be a brownfield site where pyrite is likely to be present.

7.6.3 The classification of each strata is tabulated below:

| Stratum | Design sulphate classification | Aggressive chemical environment for concrete classification |
|---|---|---|
| Made Ground | DS-2 | ACEC-2 |
| Made Ground – Reworked Glaciofluvial Deposits | DS-1 | ACEC-1s |

*Table 6 Summary of the aggressiveness of the ground to buried concrete*

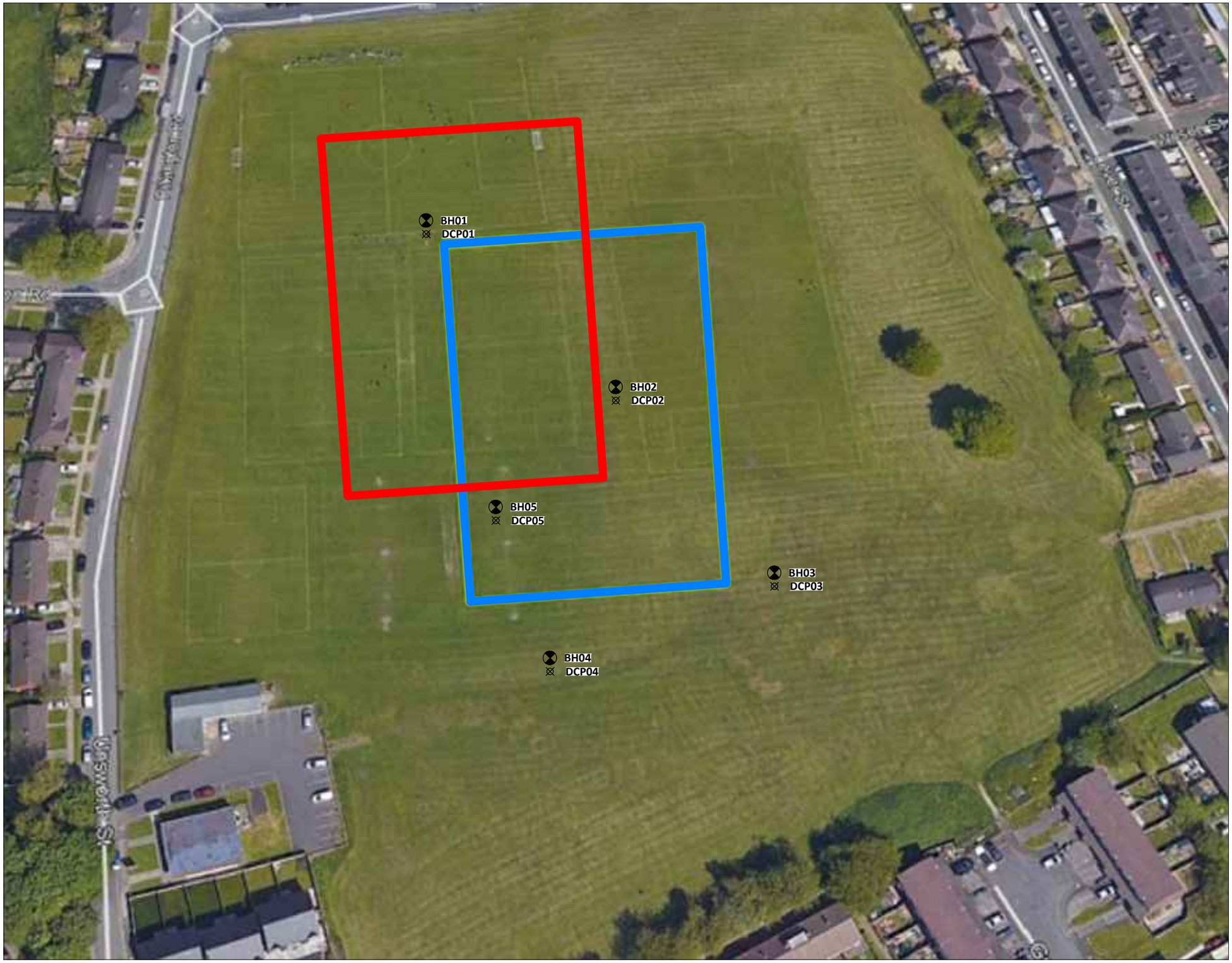
7.6.4 It should be noted that where concrete is in contact with more than one soil type then the most onerous DS and ACEC classification should be adopted.

## 7.7 Recommendations for further works

7.7.1 At this stage we do not consider further investigations to be necessary.

7.7.2 Should an alternative approach to foundation design be considered, further site investigation could be required to facilitate design of such specialist techniques.

# Drawings




**Key**

| | |
|---|---|
| RBH | Rotary borehole |
| DCP | Dynamic cone penetration |
| | Proposed pitch location |
| | Preferred pitch location based on presence of workings |

**Notes**

1. Map data © 2021 Google
2. Exploratory locations are approximate

| REV | DESCRIPTION | PRODUCED | CHECKED | REVIEWED | DATE |
|---|---|---|---|---|---|
| A | First issue | KD | JP | SCD | 19.05.2021 |

soiltechnics
environmental • geotechnical • building fabric

PROJECT
Redbank Playing Fields, Manchester

TITLE
Exploratory hole plan (current layout)

| PROJECT NO. | SCALE AT A3 | DRAWING NO. |
|---|---|---|
| STT5261 | Not to scale | 01 |

# Appendix A Coal Authority Consultants Coal Mining Report

The Coal Authority

# Consultants

## Coal Mining Report

43 Unsworth Street
Radcliffe
Bury
M26 3RF

| | |
|---|---|
| Date of enquiry: | **8 February 2021** |
| Date enquiry received: | **8 February 2021** |
| Issue date: | **8 February 2021** |
| | |
| Our reference: | **51002350078001** |
| Your reference: | **STT5261** |

# Consultants

# Coal Mining Report

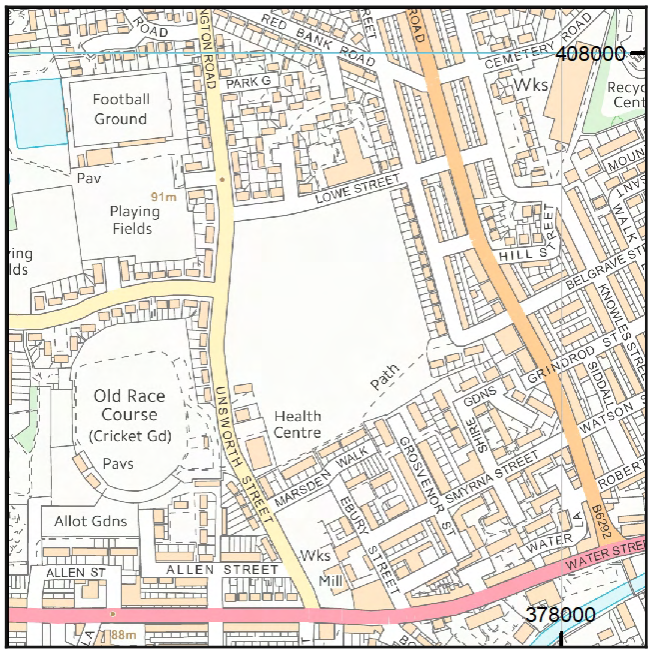
This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

**Client name**

Soiltechnics Limited

**Enquiry address**

43 Unsworth Street
Radcliffe
Bury
M26 3RF




Approximate position of property

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**How to contact us**

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

@coalauthority
/company/the-coal-authority
/thecoalauthority
/thecoalauthority

# Section 1 – Mining activity and geology

## Past underground mining

| Colliery | Seam | Mineral | Coal Authority reference | Depth (m) | Direction to working | Dipping rate of seam worked (degrees) | Dipped direction of seam worked | Extraction thickness (cm) | Year last mined |
|---|---|---|---|---|---|---|---|---|---|
| unnamed | ROGER | Coal | 3Z40 | 15 | Beneath Property | 9.5 | East | 200 | 1880 |
| unnamed | RAMS | Coal | 3YQ3 | 55 | South-East | 6.9 | South | 180 | 1900 |
| unnamed | TRENCHERB ONE | Coal | 3YYL | 280 | West | 11.2 | South | 110 | 1888 |
| unnamed | CANNEL | Coal | 3YPA | 323 | Beneath Property | 9.3 | South | 90 | 1894 |

## Probable unrecorded shallow workings

Yes.

## Spine roadways at shallow depth

No spine roadway recorded at shallow depth.

## Mine entries

| Entry type | Reference | Grid reference | Treatment description | Mineral | Conveyancing details |
|---|---|---|---|---|---|
| Shaft | 377407-011 | 377862 407627 | | Coal | |

## Abandoned mine plan catalogue numbers

The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

| | | |
|---|---|---|
| 3428 | 5419 | NW1060 |
| NW983 | 0 | 16820 |
| 1507 | NW991 | 1249 |

**Please contact us on 0345 762 6848** to determine the exact abandoned mine plans you require based on your needs.

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## Outcrops

| Seam name | Mineral | Seam workable | Distance to outcrop (m) | Direction to outcrop | Bearing of outcrop |
|---|---|---|---|---|---|
| RAMS | Coal | Yes | Within | N/A | 7 |
| RAMS | Coal | Yes | Within | N/A | 22 |
| ROGER | Coal | Yes | Within | N/A | 27 |

## Geological faults, fissures and breaklines

Please refer to the 'Summary of findings' map (on separate sheet) for details of any geological faults, fissures or breaklines either within or intersecting the enquiry boundary.

Fault under or close to the property recorded.

## Opencast mines

None recorded within 500 metres of the enquiry boundary.

## Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

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# Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

## Site investigations

| Distance to site investigation (m) | Direction |
|---|---|
| 6.4 | North |
| Within | N/A |

See Section 4 for further information.

## Remediated sites

None recorded within 50 metres of the enquiry boundary.

## Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

## Mine gas

None recorded within 500 metres of the enquiry boundary.

## Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

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# Section 3 – Licensing and future mining activity

### Future underground mining
None recorded.

### Coal mining licensing
None recorded within 200 metres of the enquiry boundary.

### Court orders
None recorded.

### Section 46 notices
No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

### Withdrawal of support notices
The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

### Payments to owners of former copyhold land
The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

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# Section 4 – Further information

The following potential risks have been identified and as part of your risk assessment should be investigated further.

### Development advice

The site is within an area of historical coal mining activity. Should you require advice and/or support on understanding the mining legacy, its risks to your development or what next steps you need to take, please contact us.

### Site investigations

The site is within an area of previous interest. It is close to where the Coal Authority has received information relating to past site investigations.

The site requires further investigation and may influence how you approach your risk assessment.

**For further information on specific site or ground investigations in relation to any issues raised in Section 4, please call us on 0345 762 6848 or email us at groundstability@coal.gov.uk.**

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# Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk.**

### Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

### Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

### Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

### Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

### Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

### Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

### Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

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### Opencast mines

Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

### Coal Authority managed tips

Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

### Site investigations

Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

### Remediated sites

Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

### Coal mining subsidence

Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

### Mine gas

Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission.

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### Mine water treatment schemes

Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

### Future underground mining

Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

### Coal mining licensing

Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

### Court orders

Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

### Section 46 notices

Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

### Withdrawal of support notices

Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

### Payment to owners of former copyhold land

Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

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The Coal Authority

# Summary of findings

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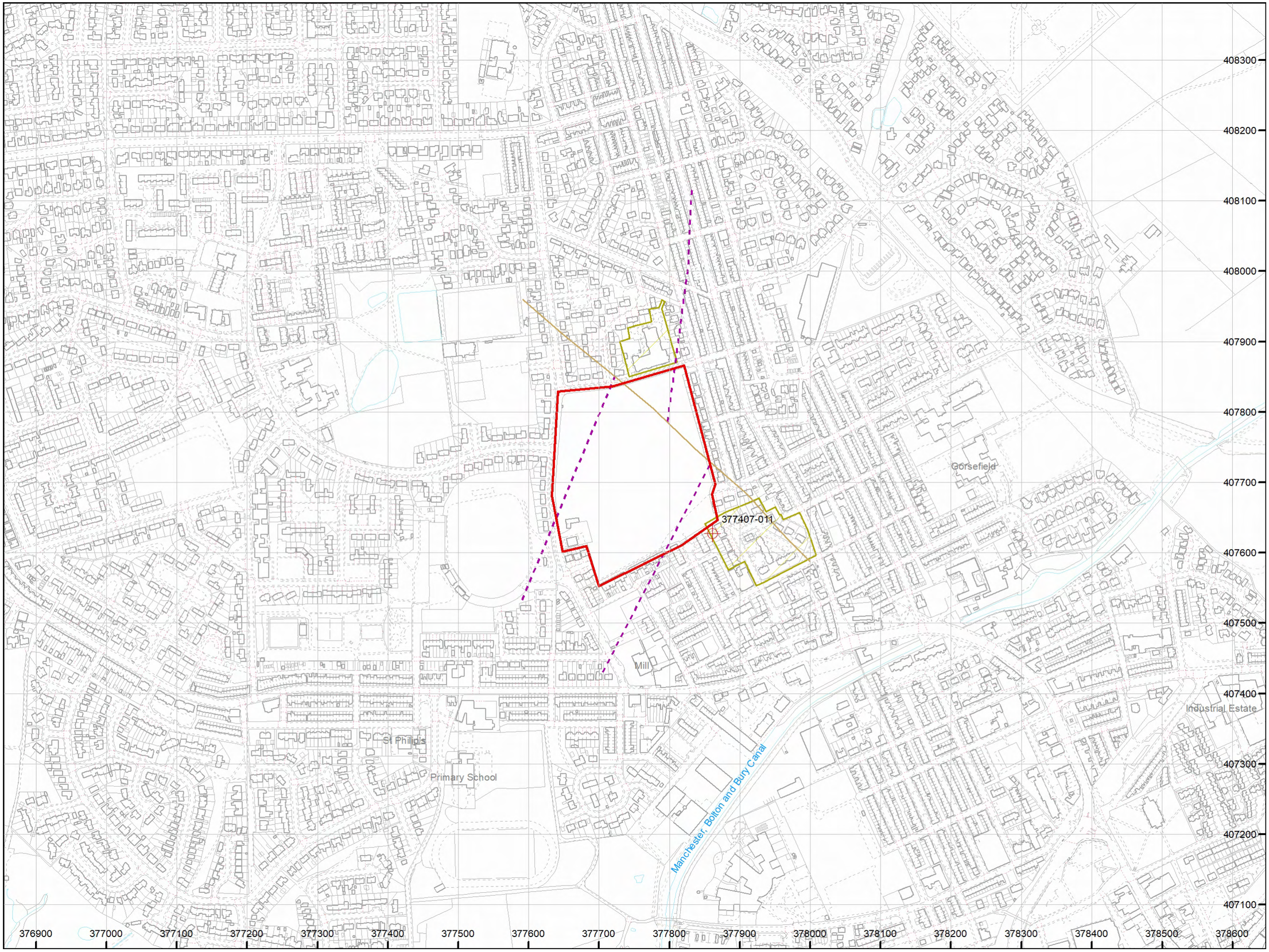
The map highlights any specific surface or subsurface features within or near to the boundary of the site.

## Key

- Approximate position of the enquiry boundary shown
- Disused mine shaft
- Outcrop (Conjectured)
- Geological faults
- Site investigations




## How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)
www.groundstability.com

# Appendix B UXO Preliminary Risk Review

MACC International Ltd, Camilla Court, Nacton, Ipswich, Suffolk, IP10 0EU, UK

Lauren Wenham
Senior Administrator
Soiltechnics Ltd

Email 1st Instance: L.Wenham@soiltechnics.net

Your Reference:

Our Reference: JM/3536/657

Date: 12/04/2021

**Unexploded Ordnance Preliminary Risk Review**
**Redbank Playing Field, 43 Unsworth Street, Radcliffe, Manchester, M26 3RF**

MACC International Ltd (MACC) has conducted a preliminary risk review for the site footprint. The review has drawn on open source and in-house information, references have been provided where available (See Annex A).

The review has been conducted to provide Soiltechnics Limited with a review of the risk which may be posed by UXO while conducting investigations on the site.

This document has been produced in the United Kingdom by MACC International Limited and has been provided solely as an aid in decision making. It is not intended to be used by any person for any purpose other than that specified. Any liability arising out of use by a third party of this document for purposes not wholly connected with the above shall be the responsibility of that party, who shall indemnify MACC International Limited against all claims, costs, damages and losses arising out of such use.

Although the surrounding area did suffer enemy bombing raids during WWII, no records were found to indicate a bomb strike within the footprint. Whilst considering the history of the site and the level of post-war development, the following conclusions have been reached:

- It is considered that there is not a credible likelihood of encountering UXO on the plot. Consequently, the UXO risk is considered to be LOW within the site boundary.
- Nevertheless, it is recommended that:
    - All site personnel are provided with a UXO Safety Awareness Talk before intrusive works are commenced.

I trust this document has provided you with sufficient information to meet your immediate needs, should you require anything further, please do not hesitate to contact me.

Yours Sincerely

John Morrison
Operations Manager

Tel: +44 (0)1473 655127 Fax: +44 (0)1473 655098
E-mail: info@macc-eod.com Web: www.macc-eod.com
Registered in England: No. 3014471

Annex ‘A’ to
Document JM/3536/657
Dated 12/04/2021

Unexploded Ordnance Preliminary Risk Review

| | |
|---|---|
| **Site location** | **Site Address:** Redbank Playing Field, Unsworth Street, Radcliffe, Manchester, M26 3RF<br>**Grid Reference:** 377733, 407724<br> |
| **Scope of Intended works** | Preliminary review of the risk that may be posed by UXO to geotechnical investigations. |
| **History** | **Wartime Use:** The site was undeveloped land during WWII.<br><br>**Post War Development:** The site has undergone little to no post-war development. |
| **Wartime History** | **Enemy Bombing:** Despite the presence of industrial and military targets at Radcliffe, the town did not suffer extensive enemy bombing during WWII. No records were found to indicate a bomb strike within the site footprint with the nearest recorded bombing incident approximately 250m north of the site at Red Bank Road. Anecdotal evidence suggests a V1 Flying Bomb fell on Radcliffe in 1944 with damage recorded at Lord Street (approximately 450m south-east of the site).<br><br>**Anti-Aircraft Guns:** No guns were recorded to have been positioned on site. The nearest Heavy Anti-Aircraft battery was positioned approximately 3.3km south-east of the site footprint.<br><br>**Military Use:** Although there was military presence in the area with Radcliffe’s Prisoner of War camp at the present day Bury Road and a Royal Ordnance Factory located at Bradley Moor Road, no records were found to confirm military use of the site footprint. |
| **Unexploded Ordnance (UXO) Finds** | No records were found to indicate that items of UXO have been found within the site footprint. |

# Appendix C Statutory Undertakers Responses

Water for the North West

**How to contact us:**

**United Utilities Water Limited**
**Property Searches**
**Haweswater House**
**Lingley Mere Business Park**
**Great Sankey**
**Warrington**
**WA5 3LP**

**Telephone: 0370 7510101**

**E-mail: propertysearches@uuplc.co.uk**

**Soiltechnics**

**Soiltechnics**
**white lodge, walgrave**
**walgrave, nothants**
**nn6 9py**

**FAO:**

**Your Ref: STT5261**
**Our Ref: UUPS-ORD-240356**
**Date: 26/01/2021**

**Dear Sirs**

## Location: Redbank Playing Fields Manchester

I acknowledge with thanks your request dated 20/01/2021 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx .

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please contact us .

Yours Faithfully,

Karen McCormack
Property Searches Manager



*United Utilities Water Limited*
*Registered In England & Wales No. 2366678*
*Registered Office Haweswater House, Lingley Mere Business Park,*
*Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP*

Water for the North West

# TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

**TERMS AND CONDITIONS:**

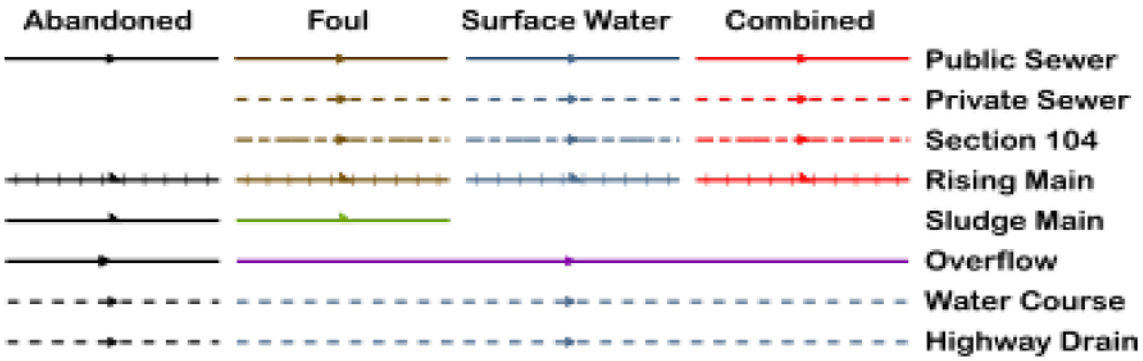
- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



*United Utilities Water Limited*
*Registered In England & Wales No. 2366678*
*Registered Office Haweswater House, Lingley Mere Business Park,*
*Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP*

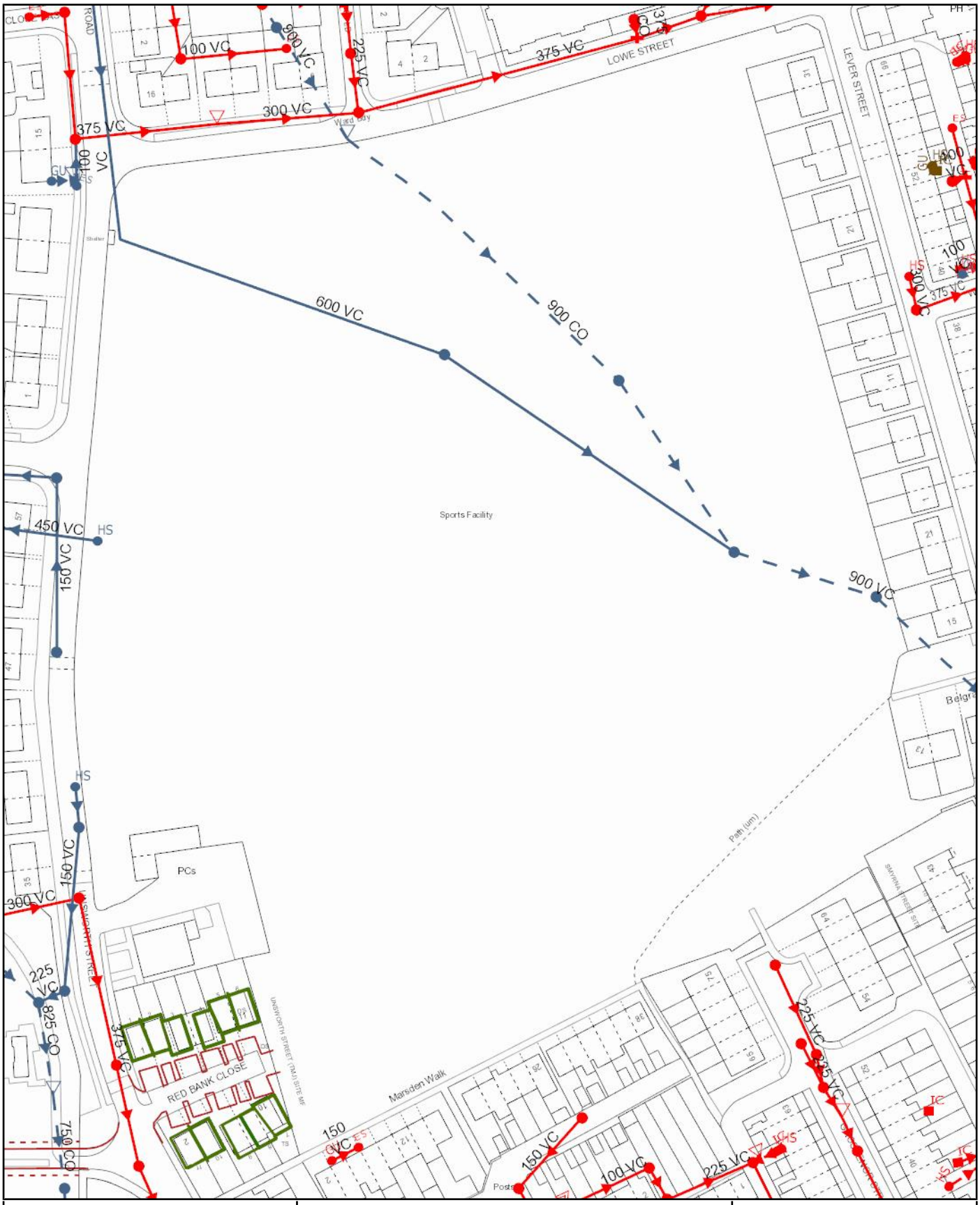
United Utilities
Water for the North West

# Wastewater Symbology




| | |
|---|---|
| All point assets follow the standard colour convention: | red – combined<br>blue – surface water |
| | brown - foul<br>purple - overflow |

- Manhole
- HS Head of System
- ES Extent of Survey
- RE Rodding Eye
- IN Inlet
- DP Discharge Point
- HY Vortex
- PE Penstock
- WO Washout Chamber
- VA Valve
- AV Air Valve
- NRV Non Return Valve
- SO Soakaway
- GU Gully
- CA Cascade
- FM Flow Meter
- HA Hatch Box
- OI Oil Interceptor
- SM Summit
- DS Drop Shaft
- OP Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- IC Inspection Chamber
- Bifurcation Chamber
- LH Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- T Network Storage Tank
- V Sewer Overflow
- WwTW Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic




| | | |
|---|---|---|
| **Scale:** 1:1418<br>**Date:** 26/01/2021 | **SEWER RECORDS** | United Utilities<br>Water for the North West |
| **Address or Site Reference:** Redbank Playing Fields Manchester<br>**Printed by:** Property Searches | | |

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United Utilities
Water for the North West

# Clean Water Symbology

| Proposed | Abandoned | Live | |
|---|---|---|---|
| | | | Distribution Main |
| | | | Trunk Main |
| | | | Comms Pipe |
| | | | Private Pipe |
| | | | Concessionary Service |
| | | | Raw Water |
| | | | LDTM Raw Water |
| | | | LDTM Treated Water |

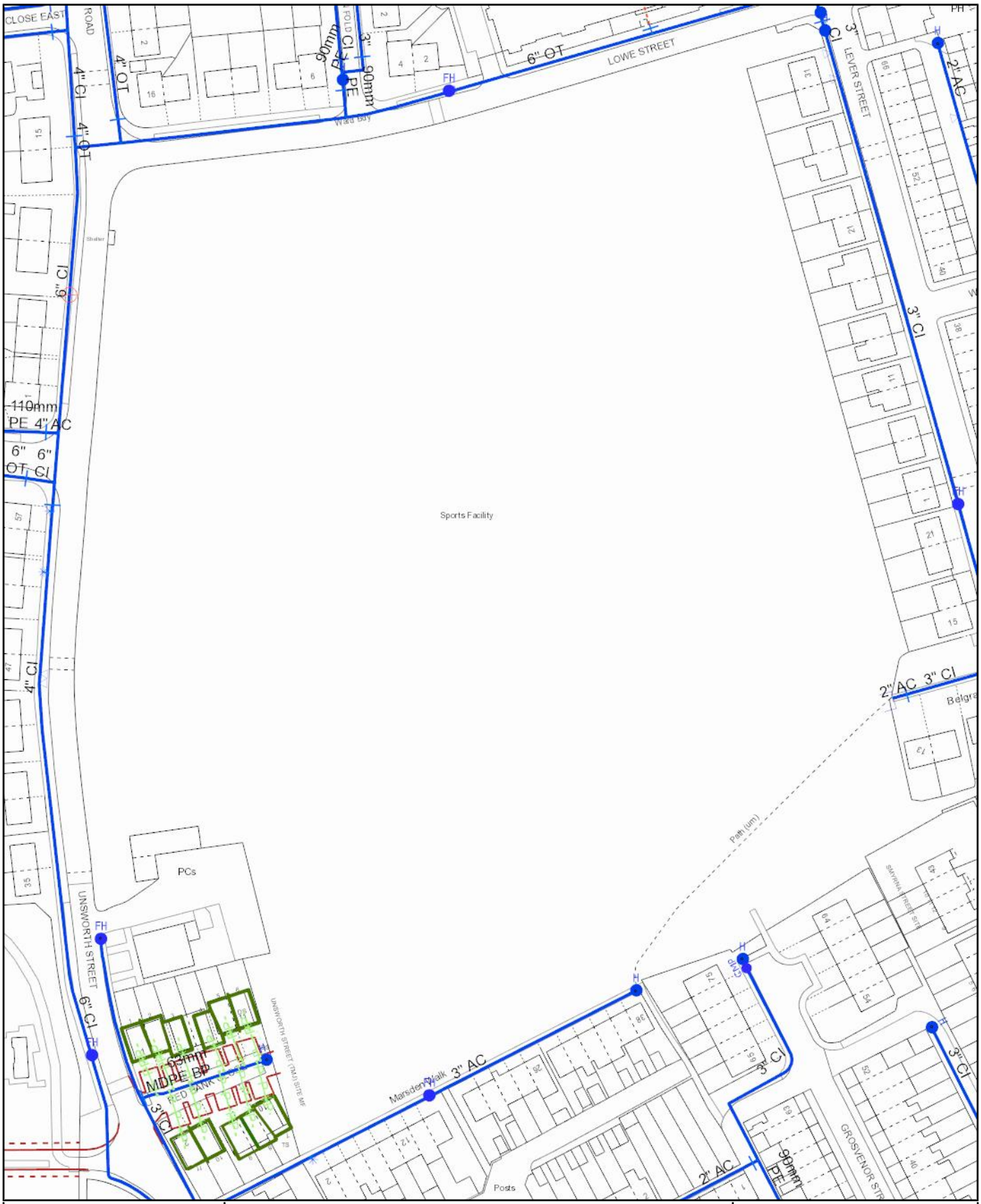
- Air Valve
- AC Valve, open
- AC Valve, closed
- CC Valve, open
- CC Valve, closed
- Non Return Valve
- Pressure Management Valve
- OMS Valve
- Stop Tap
- Flow Meter
- Domestic Meter
- Commercial Meter
- Pump
- Hydrant
- Fire Hydrant
- Anode
- Chlorination Point
- De-chlorination Point
- Strainer Point
- Access Point
- Hatch Box
- IP Point
- Sampling Station
- Logger Box

- Bore Hole
- Inlet Point
- Bulk Supply Point
- End Cap
- Site Termination
- Change of Characteristic
- Condition Report

Property Types

- Water Tower
- Valve House
- Booster Pumping Station
- Intake Pumping Station
- Water Treatment Works
- Supply Reservoir
- Service Reservoir
- Impounding Reservoir
- Pipe Bridge

Symbology for proposed assets is the same as above, but shown in green
Symbology for abandoned assets is the same as above, but shown in black




| | | |
|---|---|---|
| **Scale:** 1:1418<br>**Date:** 26/01/2021 | **WATER MAINS RECORDS** | United Utilities<br>Water for the North West |
| **Address or Site Reference:** | Redbank Playing Fields Manchester | |
| **Printed by:** | Property Searches | |

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Water for the North West

**How to contact us:**

**United Utilities Water Limited**
**Property Searches**
**Haweswater House**
**Lingley Mere Business Park**
**Great Sankey**
**Warrington**
**WA5 3LP**

**Telephone: 0370 7510101**

**E-mail: propertysearches@uuplc.co.uk**

**Soiltechnics**

**Soiltechnics**
**white lodge, walgrave**
**walgrave, nothants**
**nn6 9py**

**FAO:**

**Your Ref: STT5261**
**Our Ref: UUPS-ORD-240356**
**Date: 26/01/2021**

**Dear Sirs**

## Location: Redbank Playing Fields Manchester

I acknowledge with thanks your request dated 20/01/2021 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx .

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please contact us .

Yours Faithfully,

Karen McCormack
Property Searches Manager



*United Utilities Water Limited*
*Registered In England & Wales No. 2366678*
*Registered Office Haweswater House, Lingley Mere Business Park,*
*Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP*

Water for the North West

# TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

**TERMS AND CONDITIONS:**

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



*United Utilities Water Limited*
*Registered In England & Wales No. 2366678*
*Registered Office Haweswater House, Lingley Mere Business Park,*
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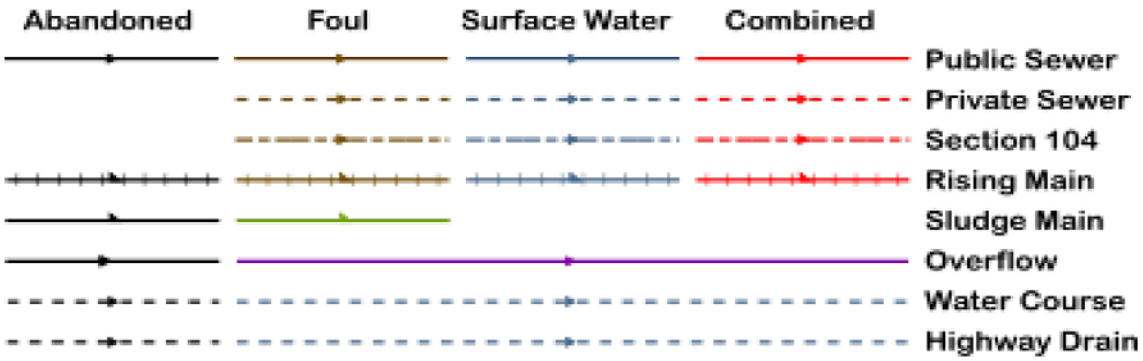
United Utilities
Water for the North West

# Wastewater Symbology

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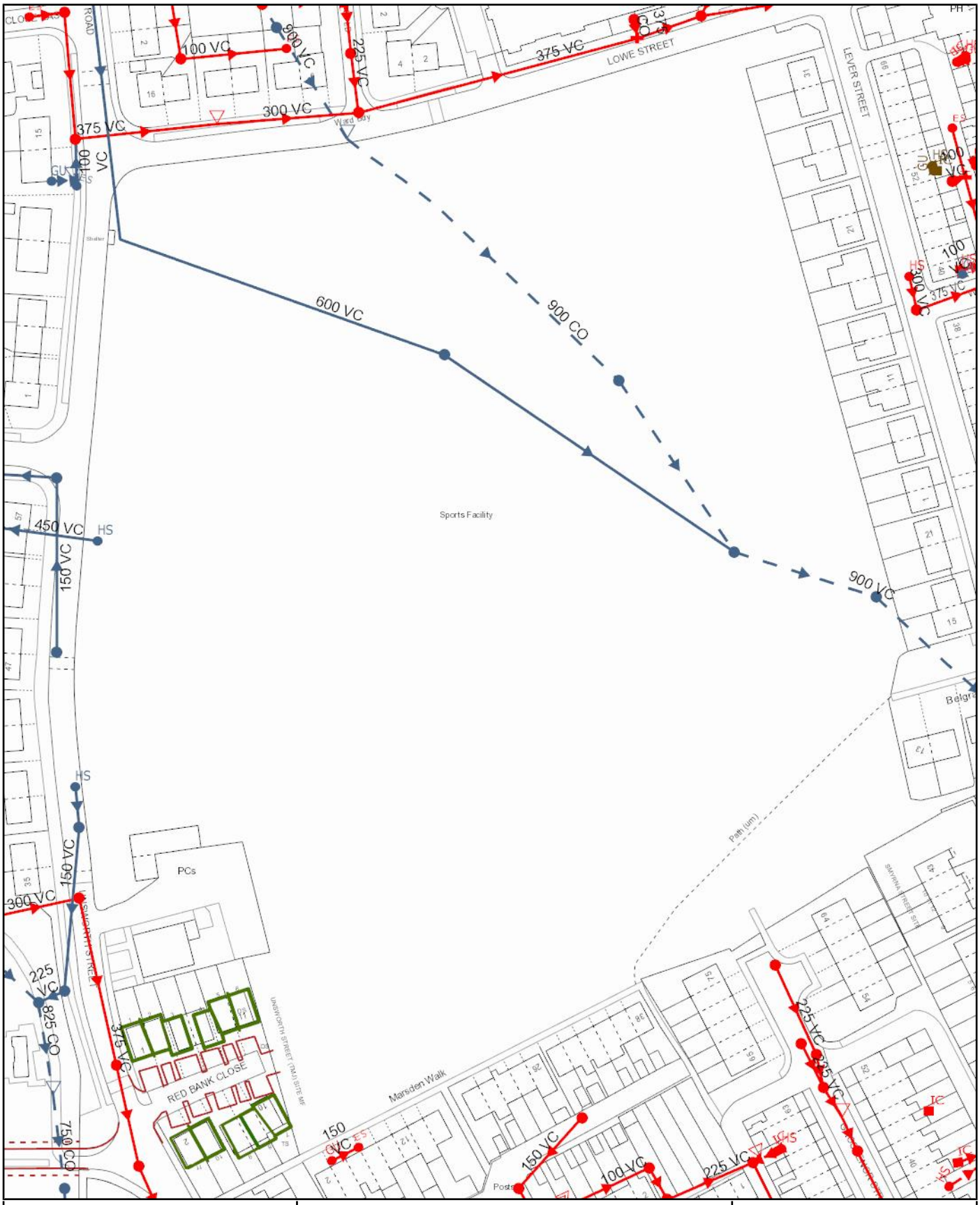


| | | |
|---|---|---|
| **Scale:** 1:1418<br>**Date:** 26/01/2021 | **SEWER RECORDS** | United Utilities<br>Water for the North West |
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United Utilities
Water for the North West

# Clean Water Symbology

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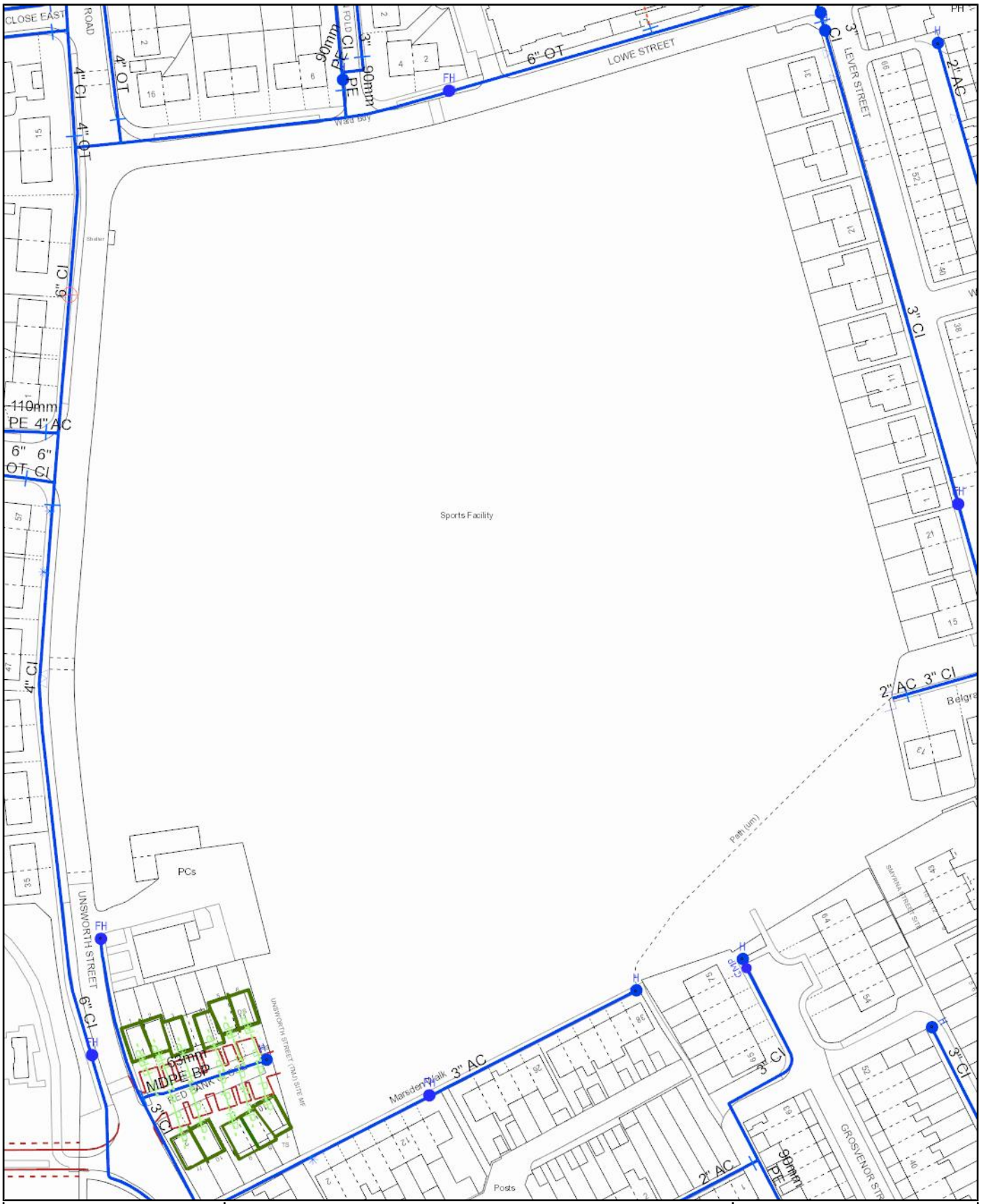


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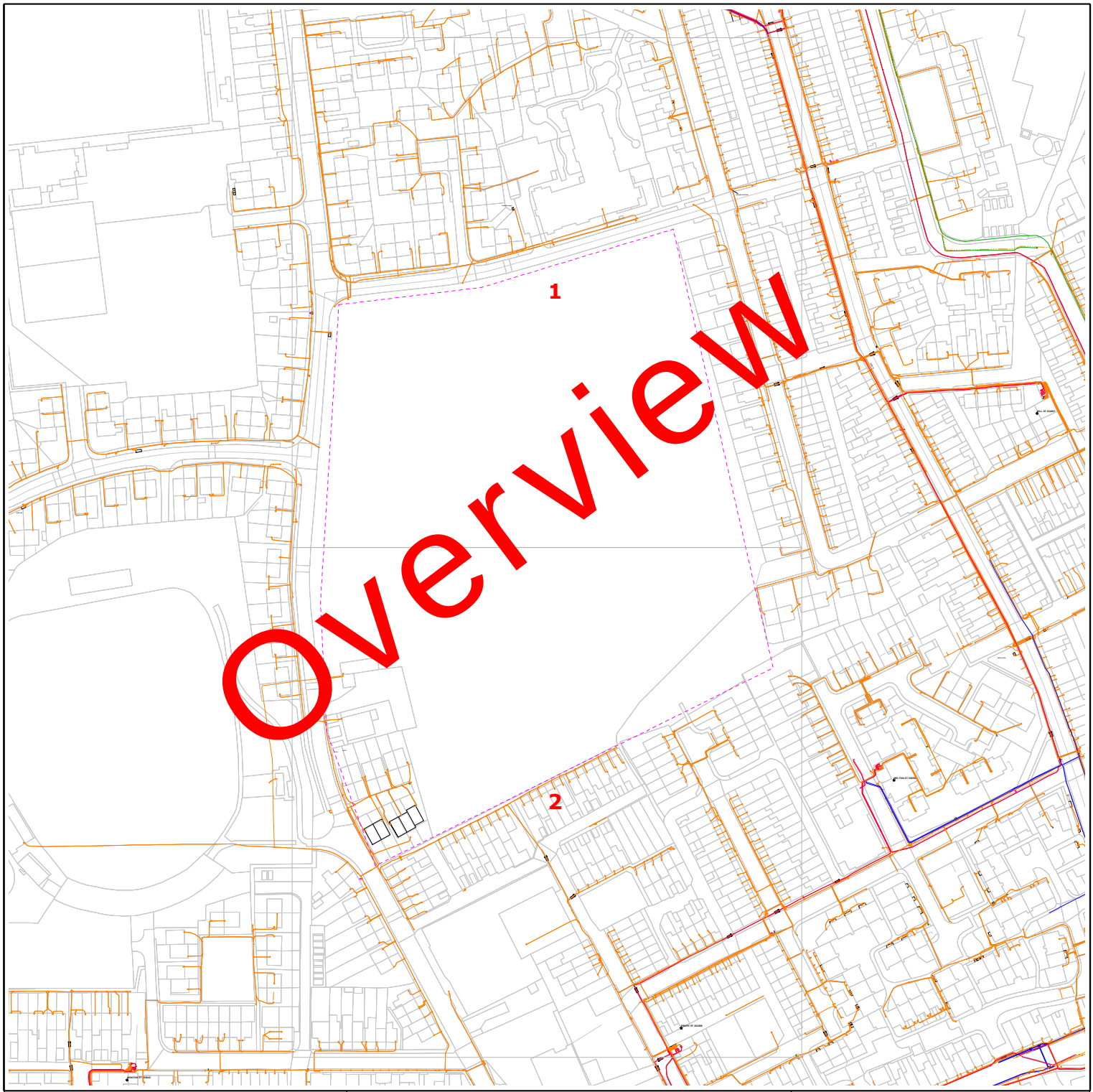


Requested by: Alexa Band

Company: Soiltechnics

Date Requested: 20/01/2021

Job Reference: 21065650

Your Scheme/Reference: STT5261

Dig Sites:

Area Line

| Operating Voltage | Colour Code | Line Colour |
|---|---|---|
| 132kV | Black | |
| 33kV | Green | |
| 22kV-25kV | Yellow | |
| 11kV | Red | |
| 6kV-6.6kV | Blue | |
| 1kV-6kV | Violet | |
| LV | Orange | |
| Unknown Voltage | Brown | |

electricity north west

Data Management
Electricity North West
Linley House
Dickinson Street
Manchester, M1 4LF
Phone: 0800 195 4141
Email: planrequest@enwl.co.uk

Scales on A4 paper:
1:1250 Area dig site
1:250 Line dig site

Unless otherwise indicated the depth of Electricity North West Limited cables are in accordance with NJUG (450mm for Low Voltage & 600mm for 11kV cables) 33kV and 132kV cables are laid at depths as marked. The depth and positions of Electricity North West Limited equipment was accurate as shown when the equipment was installed. However third parties may have altered the level & other reference data. Therefore Electricity North West Limited accept no responsibility for the position of Electricity North West Limited equipment being different from shown. No person, body or company, shall be relieved from liability for damage caused to Electricity North West Limited equipment by reason of being located differently to the indications on this drawing. Service cables are not necessarily shown but must be assumed to exist to all premises, streetlights and signs. There may be other Electricity North West Limited apparatus in the vicinity which is not indicated on the cable records. Other apparatus may also be present which is owned by a third party other than Electricity North West Limited.

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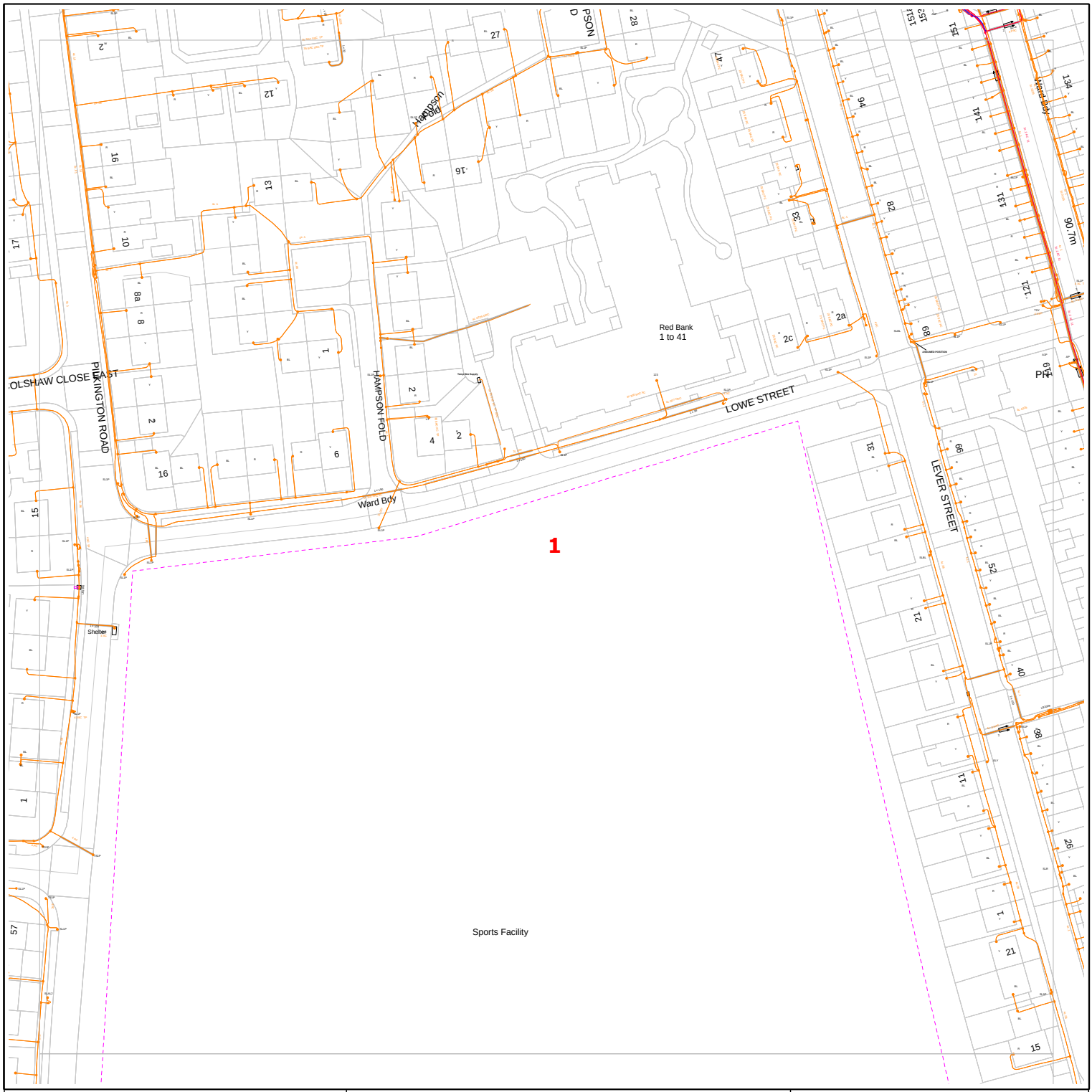
Reference should be made to HSE Guidance, HS(G)47 "Avoiding Danger from Underground Services" and GS6 "Avoidance of Danger from Overhead Power Lines".

Electricity North West Limited 304 Bridgewater Place, Birchwood Park, Warrington WA3 6XG. Registered in England and Wales. Registered No 02366949

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| Unknown Voltage | Brown | |

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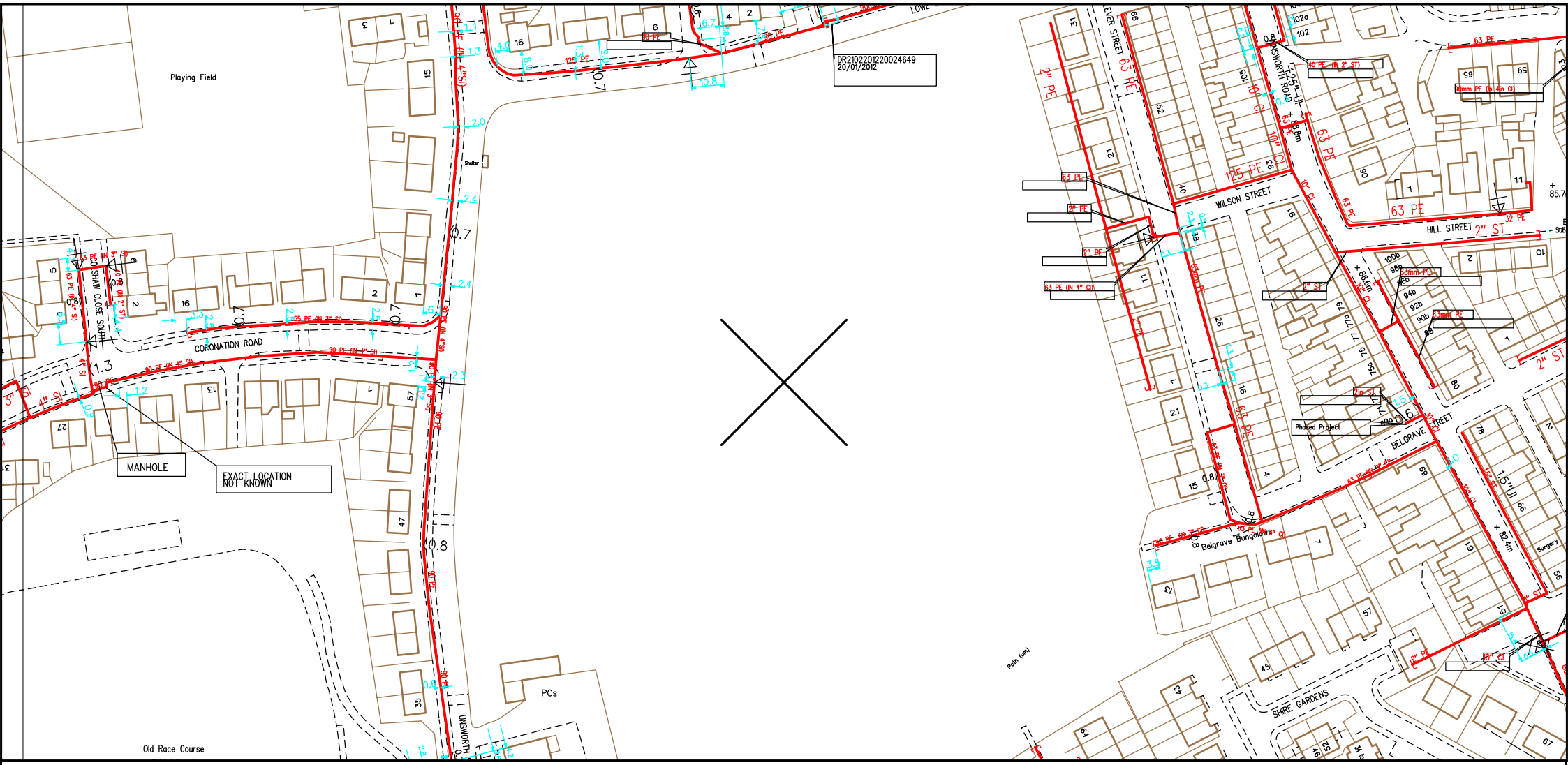


| | |
|---|---|
| SCALE: Not to scale | LP MAINS |
| USER ID: ABand | MP MAINS |
| DATE: 20/01/2021 | IP MAINS |
| EXTRACT DATE: 01/12/2020 | LHP MAINS |
| MAP REF: SD7707 | |
| CENTRE: 377743, 407737 | |

Some examples of Plant Items:

Valve | Depth of Cover | Syphon | Diameter Change | Material Change | Out of Standard Service

This plan shows those pipes owned by Cadent Gas Ltd in their role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections, etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Ltd or their agents, servants or contractors for any error or omission. Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue. Further information on all DR4s can be determined by calling the DR4 hotline on 01455 892426 (9am-5pm) A DR4 is where a potential error has been identified within the asset record and a process is currently underway to investigate and resolve the error as appropriate.

MAPS Viewer Version 5.8.0.1

Local Machine

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Table 1 - Excavation widths and pipe bed & surround thickness

| Diameter of main | 63mm | 90mm | 110mm | 160mm | 225mm | 315mm |
|---|---|---|---|---|---|---|
| Nominal excavation width | 350mm | 400mm | 400mm | 500mm | 600mm | 600mm |
| Pipe bed and surround (compacted) | 50mm | 75mm | 75mm | 100mm | 150mm | 150mm |

Key for Mains & Service Pipework

- Existing LP mains or services operating up to 75 millibar gauge
- Proposed LP mains or services operating up to 75 millibar gauge
- Existing MP mains or services operating between 75 millibar and 2 bar gauge
- Proposed MP mains or services operating between 75 millibar and 2 bar gauge
- Existing IP mains or services operating between 2 bar and 7 bar gauge
- Proposed IP mains or services operating between 2 bar and 7 bar gauge

DRAWING NOMENCLATURE

- 90 | 125 — CHANGE IN DIAMETER NOMINAL BORE
- MAINS NOT CONNECTED
- VALVE
- PRESSURE REGULATOR
- CAP END
- PRESSURE / PURGE POINT
- 0.8M — DEPTH OF COVER MAIN OR SERVICE


ES PIPELINES

ES Pipelines
HAZELDEAN
STATION ROAD
LEATHERHEAD
SURREY
KT22 7AA
Tel: 01372 227560 FAX: 01372 377996


N
W E
S

| Rev. | | Date |
|---|---|---|

TITLE

TMJ CONTRACTORS
UNSWORTH STREET, BURY
PROPOSED GAS DESIGN
DRAWING

C:\USERS\RYAN WOODCOCK\DESKTOP\BETHELL UTILITY LOGO.JPG


BETHELL UTILITY SERVICES
DANE HOUSE, EUROPA PARK
STONECLOUGH ROAD, KEARSLEY,
M26 1GE TEL. 01204 439100


| | | |
|---|---|---|
| DRAWN | RYAN WOODCOCK | 11/05/16 |
| CHECKED | SARAH STANDISH | 11/05/16 |
| APPROVED | PAUL CONNOLLY | 11/05/16 |
| DRG No. | BU0019-G-P1 | REV 0 |

SCALE 1:250 @ A1

# Enquiry Confirmation

**LSBUD Ref: 21065650**

Date of enquiry: 20/01/2021
Time of enquiry: 13:49

## Enquirer

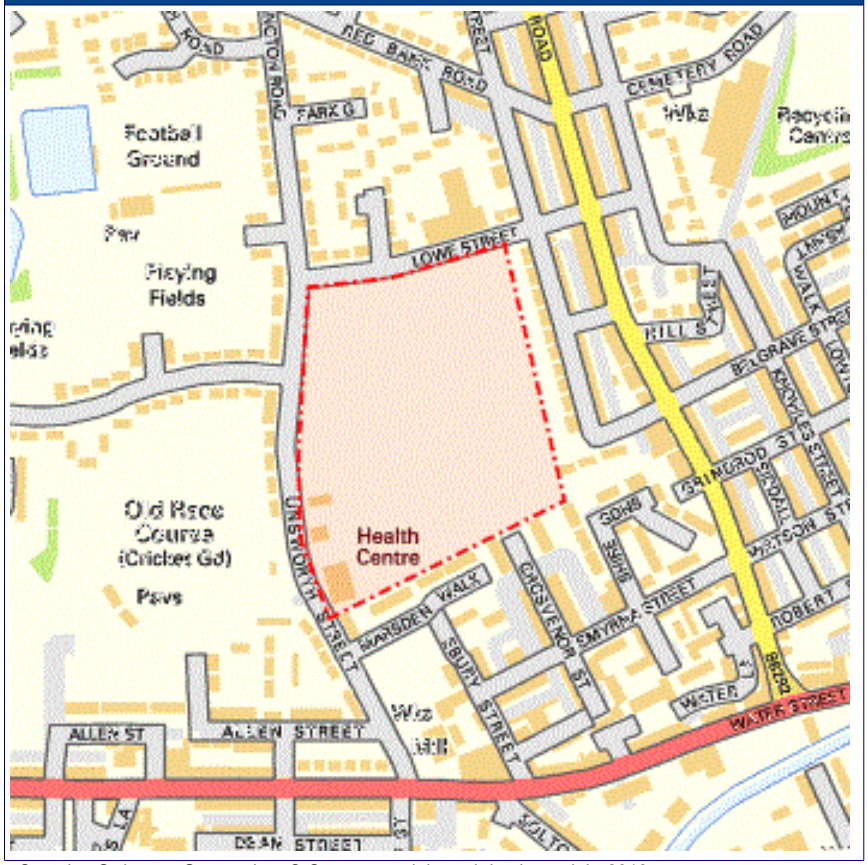
| | | | |
|---|---|---|---|
| Name | Miss Alexa Band | Phone | 01604 781877 |
| Company | Soiltechnics | Mobile | Not Supplied |
| Address | Cedar Barn White Lodge<br>Walgrave Northamptonshire<br>NN6 9PY | | |
| Email | Alexa.Band@soiltechnics.net | | |

## Enquiry Details

| | | | |
|---|---|---|---|
| Scheme/Reference | STT5261 | | |
| Enquiry type | Initial Enquiry | Work category | Development Projects |
| Start date | 21/01/2021 | Work type | Commercial/industrial |
| End date | 21/01/2021 | Site size | 48868 metres square |
| Searched location | XY= 377743, 407737 | Work type buffer* | 25 metres |
| Confirmed location | 377744 407749 | | |
| Site Contact Name | Not Supplied | Site Phone No | Not Supplied |
| Description of Works | | | |

* The WORK TYPE BUFFER is a distance added to your search area based on the Work type you have chosen.

## Site Map





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# Enquiry Confirmation

**LSBUD Ref: 21065650**

Date of enquiry: 20/01/2021
Time of enquiry: 13:49

## Asset Owners

**Terms and Conditions.** Please note that this enquiry is subject always to our standard terms and conditions available at www.linesearchbeforeudig.co.uk ("Terms of Use") and the disclaimer at the end of this document. Please note that in the event of any conflict or ambiguity between the terms of this Enquiry Confirmation and the Terms of Use, the Terms of Use shall take precedence.

**Notes.** Please ensure your contact details are correct and up to date on the system in case the LSBUD Members need to contact you.

**Validity and search criteria.** The results of this enquiry are based on the confirmed information you entered and are valid only as at the date of the enquiry. It is your responsibility to ensure that the Enquiry Details are correct, and LinesearchbeforeUdig accepts no responsibility for any errors or omissions in the Enquiry Details or any consequences thereof. LSBUD Members update their asset information on a regular basis so you are advised to consider this when undertaking any works. It is your responsibility to choose the period of time after which you need to resubmit any enquiry but the maximum time (after which your enquiry will no longer be dealt with by the LSBUD Helpdesk and LSBUD Members) is 28 days. If any details of the enquiry change, particularly including, but not limited to, the location of the work, then a further enquiry must be made.

**Asset Owners & Responses.** Please note the enquiry results include the following:

1. "LSBUD Members" who are asset owners who have registered their assets on the LSBUD service.
2. "Non LSBUD Members" are asset owners who have not registered their assets on the LSBUD service but LSBUD is aware of their existence. Please note that there could be other asset owners within your search area.

Below are three lists of asset owners:

1. LSBUD Members who have assets registered within your search area. ("Affected")
   a. These LSBUD Members will either:
      i. Ask for further information ("Email Additional Info" noted in status). The additional information includes: Site contact name and number, Location plan, Detailed plan (minimum scale 1:2500), Cross sectional drawings (if available), Work Specification.

      ii. Respond directly to you ("Await Response"). In this response they may either send plans directly to you or ask for further information before being able to do so, particularly if any payments or authorisations are required.

2. LSBUD Members who do not have assets registered within your search area. ("Not Affected")

3. Non LSBUD Members who may have assets within your search area. Please note that this list is not exhaustive and all details are provided as a guide only. It is your responsibility to identify and consult with all asset owners before proceeding.

**National Grid.** Please note that the LSBUD service only contains information on National Grid's Gas above 7 bar asset, all National Grid Electricity Transmission assets and National Grid's Gas Distribution Limited above 2 bar asset.

For National Grid Gas Distribution Ltd below 2 bar asset information please go to www.beforeyoudig.nationalgrid.com

# Enquiry Confirmation

## LSBUD Ref: 21065650

Date of enquiry: 20/01/2021
Time of enquiry: 13:49

**LSBUD Members who have assets registered on the LSBUD service within the vicinity of your search area.**

| List of affected LSBUD members | | | |
|---|---|---|---|
| **Asset Owner** | **Phone/Email** | **Emergency Only** | **Status** |
| Electricity North West Limited | 08001954141 | 08001954141 | Await response |
| ESP Utilities Group | 01372227560 | 01372227560 | Await response |

**LSBUD Members who do not have assets registered on the LSBUD service within the vicinity of your search area. Please be aware that LSBUD Members make regular changes to their assets and this list may vary for new enquiries in the same area.**

| List of not affected LSBUD members | | |
|---|---|---|
| AWE Pipeline | Balfour Beatty Investments Limited | BOC Limited (A Member of the Linde Group) |
| Box Broadband | BP Exploration Operating Company Limited | BPA |
| Carrington Gas Pipeline | CATS Pipeline c/o Wood Group PSN | Cemex |
| Centrica Storage Ltd | Chrysaor Production (UK) Limited | CLH Pipeline System Ltd |
| CNG Services Ltd | Concept Solutions People Ltd | ConocoPhillips (UK) Teesside Operator Ltd |
| Diamond Transmission Corporation | DIO (MOD Abandoned Pipelines) | DIO (MOD Live Pipelines) |
| Drax Group | E.ON UK CHP Limited | EirGrid |
| ENI & Himor c/o Penspen Ltd | EnQuest NNS Limited | EP Langage Limited |
| ESSAR | Esso Petroleum Company Limited | Fulcrum Pipelines Limited |
| Gamma | Gas Networks Ireland (UK) | Gateshead Energy Company |
| Gigaclear Ltd | Gtt | Heathrow Airport LTD |
| Humbly Grove Energy | IGas Energy | INEOS FPS Pipelines |
| INEOS Manufacturing (Scotland and TSEP) | INOVYN ChlorVinyls Limited | INOVYN Enterprises Limited |
| Intergen (Coryton Energy or Spalding Energy) | Jurassic Fibre Ltd | Mainline Pipelines Limited |
| Manchester Jetline Limited | Manx Cable Company | Marchwood Power Ltd (Gas Pipeline) |
| Melbourn Solar Limited | Murphy Utility Assets | National Grid Gas (Above 7 bar), National Grid Gas Distribution Limited (Above 2 bar) and National Grid Electricity Transmission |
| Northumbrian Water Group | NPower CHP Pipelines | NYnet Ltd |
| Oikos Storage Limited | Ørsted | Perenco UK Limited (Purbeck Southampton Pipeline) |
| Petroineos | Phillips 66 | Portsmouth Water |
| Premier Transmission Ltd (SNIP) | Redundant Pipelines - LPDA | RWE - Great Yarmouth Pipeline (Bacton to Great Yarmouth Power Station) |
| RWEnpower (Little Barford and South Haven) | SABIC UK Petrochemicals | Scottish and Southern Electricity Networks |
| Scottish Power Generation | Seabank Power Ltd | SES Water |
| SGN | Shell | Shell NOP |
| SSE Enterprise Telecoms | SSE Generation Ltd | SSE Utility Solutions Limited |
| Tata Communications (c/o JSM Construction Ltd) | Total (Colnbrook & Colwick Pipelines) | Total Finaline Pipelines |
| Transmission Capital | UK Power Networks | Uniper UK Ltd |

| | | |
|---|---|---|
| University of Cambridge Granta Backbone Network | Vattenfall | Veolia ES SELCHP Limited |
| Veolia ES Sheffield Ltd | Wales and West Utilities | West of Duddon Sands Transmission Ltd |
| Western Power Distribution | Westminster City Council | Zayo Group UK Ltd c/o JSM Group Ltd |

# Enquiry Confirmation

## LSBUD Ref: 21065650

Date of enquiry: 20/01/2021
Time of enquiry: 13:49

**The following Non-LSBUD Members may have assets in your search area. It is YOUR RESPONSIBILITY to contact them before proceeding. Please be aware this list is not exhaustive and it is your responsibility to identify and contact all asset owners within your search area.**

| Non-LSBUD members (Asset owners not registered on LSBUD) | | | |
|---|---|---|---|
| **Asset Owner** | **Preferred contact method** | **Phone** | **Status** |
| BT | https://www.swns.bt.com/pls/mbe/welcome.home | 08000232023 | Not Notified |
| Cadent Gas | plantprotection@cadentgas.com | 0800688588 | Not Notified |
| CenturyLink Communications UK Limited | plantenquiries@instalcom.co.uk | 02087314613 | Not Notified |
| CityFibre | asset.team@cityfibre.com | 033 3150 7282 | Not Notified |
| Colt | plantenquiries@catelecomuk.com | 01227768427 | Not Notified |
| ENGIE | nrswa.uk@engie.com | 01293 549944 | Not Notified |
| GTC | https://pe.gtc-uk.co.uk/PlantEnqMembership | 01359240363 | Not Notified |
| Last Mile | plantenquiries@lastmile-uk.com | 01698404646 | Not Notified |
| Mobile Broadband Network Limited | mbnlplantenquiries@turntown.com | 01212 621 100 | Not Notified |
| Sky UK Limited | nrswa@sky.uk | 02070323234 | Not Notified |
| Sota | SOTA.plantenquiries@instalcom.co.uk | | Not Notified |
| United Utilities | WastewaterDeveloperServices@uuplc.co.uk | 08707510101 | Not Notified |
| Utility assets Ltd | assetrecords@utilityassets.co.uk | | Not Notified |
| Verizon Business | osp-team@uk.verizonbusiness.com | 01293611736 | Not Notified |
| Virgin Media | http://www.digdat.co.uk | 08708883116 | Not Notified |
| Vodafone | osm.enquiries@atkinsglobal.com | 01454662881 | Not Notified |

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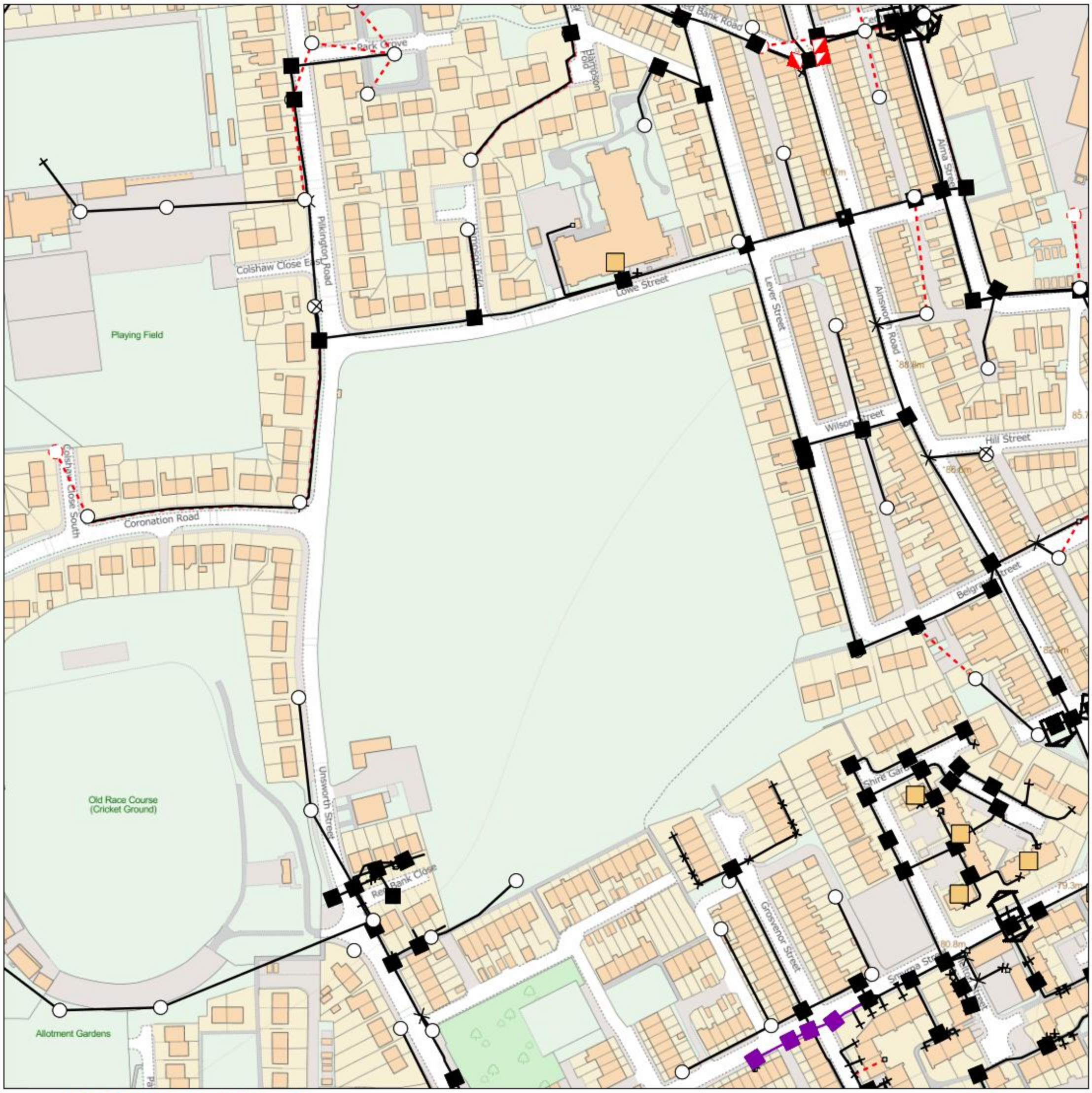
# Maps by email Plant Information Reply




## IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.

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## CLICK BEFORE YOU DIG

FOR PROFESSIONAL FREE ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED
(Office hours: Monday - Friday 08.00 to 17.00)
www.openreach.co.uk/cbyd

**Accidents happen**

If you do damage any Openreach equipment please let us know by calling 0800 023 2023 (opt 1 + opt 1) and we can get it fixed ASAP

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## KEY TO BT SYMBOLS

| | Planned | Live |
|---|---|---|
| PCP | | |
| Pole | | |
| Box | | |
| Manhole | | |
| Cabinet | | |

| | | | |
|---|---|---|---|
| Change Of State | + | Hatchings | |
| Split Coupling | × | Built | |
| Duct Tee | ▲ | Planned | |
| Building | | Inferred | |
| Kiosk | K | Duct | |

Other proposed plant is shown using dashed lines.
BT Symbols not listed above may be disregarded.
Existing BT Plant may not be recorded.
Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.

| | Pending Add | In Place | Pending Remove | Not In Use |
|---|---|---|---|---|
| Power Cable | | | | |
| Power Duct | | | | N/A |

BT Ref : TZP01481A
Map Reference : (centre) SD7774307737
Easting/Northing : (centre) 377743,407737
Issued : 20/01/2021 13:48:54

**WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk**

# Appendix D Exploratory hole records

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# Key to legends

| Composite materials, soils and lithology | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Topsoil | | Made Ground | | Boulders | | Chalk |
| | Clay | | Coal | | Cobbles | | Concrete |
| | Gravel | | Limestone | | Mudstone | | Peat |
| | Sand | | Sandstone | | Silt | | Siltstone |

*Note: Composite soil types are signified by combined symbols.*

# Key to 'test results' and 'sample/core recovery' columns

| Test result | |
|---|---|
| Depth | Records depth that the test was carried out (i.e.: at 2.10m or between 2.10m and 2.55m) |
| Result | PP – Pocket penetrometer result reported as an equivalent undrained shear strength (kN/m$^2$) by applying a factor of 50.<br><br>SV – Hand held shear vane result reported as an undrained shear strength (kN/m$^2$). Where multiple readings are taken at the same level the average value is shown on the log.<br>* Signifies that instrument limit reached. |
| | SPT – Standard Penetration Test result (N value) (uncorrected)[1,2,3]<br>SPT(c) – Standard Penetration Test result (solid cone) (N value) (uncorrected)[1,2,3] |
| | UT – Undisturbed sample 100mm diameter sampler with number of blows of driving equipment required to obtain sample |

| Sample/core recovery | |
|---|---|
| Run No. | Records depth and number of the abstracted core[3] |
| Total Core Recovery (TCR) % | Ratio of core recovered (solid and non-intact) to length of core run |
| Solid Core Recovery (SCR) % | Ratio of solid, cylindrical, pieces of rock core recovered to length of core run |
| Rock Quality Designation (RQD) % | Ratio of core pieces longer than 100mm to length of core run |
| Fracture Index (FI) | Inverse of fracture spacing, per metre, over arbitrary length |

*Note 1: Seating blows recorded in brackets.*

*Note 2: Casing depth records depth of casing.*

*Note 3: The depths of open holing will be recorded in the notes. Method of lubrication of and diameter of drilling tools will be recorded on the log, together with location of circulation loss during drilling.*

# Water observations

Described at foot of log and shown in the 'water strike' column.

Water level observed after specified delay in drilling

Water strike

# Installation details

| | | | |
|---|---|---|---|
| | Gravel filter | | Bentonite |
| | Slotted pipe | | Unslotted pipe |
| | Arisings | | Grout |
| | Extensometer magnet | | Vibrating wire piezometer |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |
| | Grass onto brown slightly clayey fine to medium SAND with frequent rootlets. (TOPSOIL) | 0.10 | | | | | | | | | | | | | | | 0.05 | | D |
| | Firm dark brown slightly sandy gravelly CLAY. Gravel is fine to medium angular to subangular brick, glass, ceramics and sandstone. (MADE GROUND) | | | | | | | | | | | | | | PP 0.80 | PP=75 | 0.50 | | ES |
| | *...between 0.6m and 0.8m depth, frequent gravel of fine to coarse subrounded sandstone.* | 1.20 | | | | | | | | | | | | | | | 1.20 | | ES |
| | *...between 0.8m and 1.2m depth, obstruction.* | | | | | | | | | | | | | | | | | | |
| | [Loose to medium dense] dark brown slightly clayey very sandy GRAVEL of fine to medium angular to subrounded clinker, glass, ceramic, clayware, brick, sandstone and coal with rare fragments of timber present. (MADE GROUND) | | | | | | | | | | | | | | | | 2.00 | | ES |
| | Brown SAND. (MADE GROUND - FILL) | 4.20 | | | | | | | | | | | | | | | | | |
| | Brown reworked CLAY and colliery spoil. (MADE GROUND) | 8.10 | | | | | | | | | | | | | | | | | |
| | Grey MUDSTONE with siltstone bands. (PENNINE MIDDLE COAL MEASURES) | 10.10 | | | | | | | | | | | | | | | | | |

CONTINUED ON NEXT SHEET

| | | | |
|---|---|---|---|
| **Notes**<br>Dynamic sampler to 4.2m depth, rotary open hole thereafter. | **Title**<br>Rotary core record | | **Date(s)**<br>15/04/2021 |
| | **Method**<br>Dynamic sample/rotary drill | **Logged by**<br>JP | **Sheet number**<br>Sheet 1 of 3 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>- | **Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377699mE, 407771mN | **Checked by**<br>MOH | **BH01** |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |

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| | | | |
|---|---|---|---|
| **Notes**<br>Dynamic sampler to 4.2m depth, rotary open hole thereafter. | **Title**<br>Rotary core record | | **Date(s)**<br>15/04/2021 |
| | **Method**<br>Dynamic sample/rotary drill | **Logged by**<br>JP | **Sheet number**<br>Sheet 2 of 3 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>- | **Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377699mE, 407771mN | **Checked by**<br>MOH | **BH01** |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |
| | Reddish brown MUDSTONE.<br>(PENNINE MIDDLE COAL MEASURES) | 28.60 | | | | | | | | | | | | | | | | | |
| | BOREHOLE TERMINATED AT 30.00m | 30.00 | | | | | | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| **Notes**<br>Dynamic sampler to 4.2m depth, rotary open hole thereafter. | **Title**<br>Rotary core record | | **Date(s)**<br>15/04/2021 |
| | **Method**<br>Dynamic sample/rotary drill | **Logged by**<br>JP | **Sheet number**<br>Sheet 3 of 3 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>- | **Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377699mE, 407771mN | **Checked by**<br>MOH | **BH01** |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |
| | Grass onto brown slightly clayey fine to medium SAND with frequent rootlets. (TOPSOIL) | 0.10 | | | | | | | | | | | | | | | 0.05 | | D |
| | | | | | | | | | | | | | | | | | 0.10 | 1.00 | ES |
| | [Loose to medium dense] dark brown to black slightly sandy GRAVEL of fine to medium subangular clinker, brick, ceramic and glass. (MADE GROUND) | | | | | | | | | | | | | | | | | | |
| | Soft dark grey slightly sandy CLAY and SILT. (MADE GROUND - REWORKED GLACIOFLUVIAL DEPOSITS) | 2.10 | | | | | | | | | | | | | PP 2.30 | PP=25 | | | |
| | | 2.50 | | | | | | | | | | | | | | | 2.60 | | D |
| | Very soft light grey very sandy CLAY. (MADE GROUND - REWORKED GLACIOFLUVIAL DEPOSITS) | 2.90 | | | | | | | | | | | | | | | 2.90 | 3.20 | B |
| | [Very loose] orangish brown to light brown slightly clayey fine to medium SAND. (MADE GROUND - REWORKED GLACIOFLUVIAL DEPOSITS) *...from 3.2m depth, becoming clayey.* *...between 3.6m and 3.7m depth, gravel sized pockets of brown clay.* | | | | | | | | | | | | | | PP 3.65 | PP=75 | | | |
| | | 4.00 | | | | | | | | | S 4.00 - 4.45 | (2) 6 | 4.00 | | | | | | |
| | Very loose reddish brown clayey SAND. (MADE GROUND - REWORKED GLACIOFLUVIAL DEPOSITS) | | | | | | | | | | | | | | | | | | |
| | Colliery spoil GRAVEL. (MADE GROUND) | 5.60 | | | | | | | | | | | | | | | | | |
| | Grey CLAY. (WEATHERED PENNINE MIDDLE COAL MEASURES) | 7.00 | | | | | | | | | | | | | | | | | |
| | Reddish brown MUDSTONE. (PENNINE MIDDLE COAL MEASURES) | 8.30 | | | | | | | | | | | | | | | | | |
| | Grey MUDSTONE. (PENNINE MIDDLE COAL MEASURES) | 9.20 | | | | | | | | | | | | | | | | | |

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| | | | |
|---|---|---|---|
| **Notes**<br>Dynamic sampler to 4m depth, rotary open hole thereafter. | **Title**<br>Rotary core record | | **Date(s)**<br>15/04/2021 |
| | **Method**<br>Dynamic sample/rotary drill | **Logged by**<br>JP | **Sheet number**<br>Sheet 1 of 3 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>- | **Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377748mE, 407728mN | **Checked by**<br>MOH | **BH02** |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |
| | Black COAL.<br>(PENNINE MIDDLE COAL MEASURES) | 20.70 | | | | | | | | | | | | | | | | | |
| | Black to grey carbonaceous MUDSTONE.<br>(PENNINE MIDDLE COAL MEASURES) | 21.20 | | | | | | | | | | | | | | | | | |
| | Black COAL and carbonaceous MUDSTONE.<br>(PENNINE MIDDLE COAL MEASURES) | 21.50 | | | | | | | | | | | | | | | | | |
| | Dark grey MUDSTONE.<br>(PENNINE MIDDLE COAL MEASURES) | 21.90 | | | | | | | | | | | | | | | | | |

CONTINUED ON NEXT SHEET

| | | | |
|---|---|---|---|
| **Notes**<br>Dynamic sampler to 4m depth, rotary open hole thereafter. | **Title**<br>Rotary core record | | **Date(s)**<br>15/04/2021 |
| | **Method**<br>Dynamic sample/rotary drill | **Logged by**<br>JP | **Sheet number**<br>Sheet 2 of 3 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>- | **Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377748mE, 407728mN | **Checked by**<br>MOH | **BH02** |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |
| | BOREHOLE TERMINATED AT 30.00m | 30.00 | | | | | | | | | | | | | | | | | |

| | | |
|---|---|---|
| **Notes**<br>Dynamic sampler to 4m depth, rotary open hole thereafter. | **Title**<br>Rotary core record | **Date(s)**<br>15/04/2021 |
| | **Method**<br>Dynamic sample/rotary drill<br>**Logged by**<br>JP | **Sheet number**<br>Sheet 3 of 3 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>-<br>**Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377748mE, 407728mN<br>**Checked by**<br>MOH | **BH02** |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |
| | Grass onto brown slightly clayey fine to medium SAND with frequent rootlets. (TOPSOIL) | 0.10 | | | | | | | | | | | | | | | 0.00 | 1.00 | ES |
| | | | | | | | | | | | | | | | | | 0.05 | | D |
| | [Loose] dark brown to black slightly clayey sandy GRAVEL of fine to coarse angular to subangular brick, sandstone, glass and clinker. (MADE GROUND) | | | | | | | | | | | | | | | | 1.00 | 2.00 | ES |
| | | | | | | | | | | | | | | | | | 3.50 | | D |
| | Firm dark brown to dark grey sandy CLAY and SILT. (MADE GROUND) | 3.70 | | | | | | | | | | | | | PP 3.80 | PP=71 | | | |
| | Grey CLAY. (WEATHERED PENNINE MIDDLE COAL MEASURES) | 5.10 | | | | | | | | | | | | | | | | | |
| | Grey MUDSTONE with siltstone bands. (PENNINE MIDDLE COAL MEASURES) | 6.00 | | | | | | | | | | | | | | | | | |

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| | | | |
|---|---|---|---|
| **Notes**<br>Dynamic sampler to 4m depth, rotary open hole thereafter. | **Title**<br>Rotary core record | | **Date(s)**<br>15/04/2021 |
| | **Method**<br>Dynamic sample/rotary drill | **Logged by**<br>JP | **Sheet number**<br>Sheet 1 of 3 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>- | **Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377789mE, 407680mN | **Checked by**<br>MOH | **BH03** |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |
| | Hard grey SILTSTONE.<br>(PENNINE MIDDLE COAL MEASURES) | 17.40 | | | | | | | | | | | | | | | | | |
| | Grey MUDSTONE and SILTSTONE.<br>(PENNINE MIDDLE COAL MEASURES) | 18.60 | | | | | | | | | | | | | | | | | |

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|---|---|---|---|
| **Notes**<br>Dynamic sampler to 4m depth, rotary open hole thereafter. | **Title**<br>Rotary core record | | **Date(s)**<br>15/04/2021 |
| | **Method**<br>Dynamic sample/rotary drill | **Logged by**<br>JP | **Sheet number**<br>Sheet 2 of 3 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>- | **Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377789mE, 407680mN | **Checked by**<br>MOH | **BH03** |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |
| | Possible VOID/BROKEN GROUND. Loss of flush. Assumed worked coal seam. (PENNINE MIDDLE COAL MEASURES) | 26.60 | | | | | | | | | | | | | | | | | |
| | SOFT DEPOSITS. No recovery. (PENNINE MIDDLE COAL MEASURES) | 27.90 | | | | | | | | | | | | | | | | | |
| | Assumed MUDSTONE. Limited recovery. (PENNINE MIDDLE COAL MEASURES) | 28.80 | | | | | | | | | | | | | | | | | |
| | BOREHOLE TERMINATED AT 30.00m | 30.00 | | | | | | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| **Notes**<br>Dynamic sampler to 4m depth, rotary open hole thereafter. | **Title**<br>Rotary core record | | **Date(s)**<br>15/04/2021 |
| | **Method**<br>Dynamic sample/rotary drill | **Logged by**<br>JP | **Sheet number**<br>Sheet 3 of 3 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>- | **Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377789mE, 407680mN | **Checked by**<br>MOH | **BH03** |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |
| | Grass onto brown slightly clayey fine to medium SAND with frequent rootlets. (TOPSOIL) | 0.20 | | | | | | | | | | | | | | | 0.10 | | D |
| | Firm dark brown slightly sandy gravelly CLAY. Gravel is fine to coarse angular to subangular brick, sandstone, glass and clinker. (MADE GROUND) | 1.00 | | | | | | | | | | | | | PP 0.50<br>PP 0.70 | PP=58<br>PP=71 | 0.75<br>1.00<br>1.20 | 2.00 | ES<br>D<br>ES |
| | [Loose] dark brown to black slightly clayey sandy GRAVEL of fine to coarse angular to subangular brick, sandstone, glass and clinker. (MADE GROUND) | | | | | | | | | | | | | | | | | | |
| | Soft light brown sandy CLAY and SILT with slight organic odour. (MADE GROUND) | 3.10 | | | | | | | | | | | | | PP 3.30<br>PP 3.50<br>PP 3.70 | PP=13<br>PP=21<br>PP=17 | 3.50 | | D |
| | Reworked brown CLAY and SAND. (MADE GROUND) | 4.00 | | | | | | | | | | | | | | | | | |
| | Grey CLAY. (WEATHERED PENNINE MIDDLE COAL MEASURES) | 5.20 | | | | | | | | | | | | | | | | | |
| | Grey MUDSTONE. (PENNINE MIDDLE COAL MEASURES) | 6.00 | | | | | | | | | | | | | | | | | |
| | BOREHOLE TERMINATED AT 11.00m | 11.00 | | | | | | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| **Notes**<br>Dynamic sampler to 4m depth, rotary open hole thereafter to 11m depth to prove rockhead. | **Title**<br>Rotary core record | | **Date(s)**<br>15/04/2021 - 16/04/2021 |
| | **Method**<br>Dynamic sample/rotary drill | **Logged by**<br>JP | **Sheet number**<br>Sheet 1 of 1 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>- | **Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377731mE, 407658mN | **Checked by**<br>MOH | **BH04** |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |
| | Grass onto brown slightly clayey fine to medium SAND with frequent rootlets. (TOPSOIL) | 0.10 | | | | | | | | | | | | | | | | | |
| | Dark brown to black CLAY and SAND with fragments of brick present. (MADE GROUND) | | | | | | | | | | | | | | | | | | |
| | Grey reworked sandy CLAY. (MADE GROUND) | 1.80 | | | | | | | | | | | | | | | | | |
| | Greyish brown CLAY. (MADE GROUND) | 3.20 | | | | | | | | | | | | | | | | | |
| | Colliery spoil GRAVEL. (MADE GROUND) | 5.50 | | | | | | | | | | | | | | | | | |
| | Brown MUDSTONE. (PENNINE MIDDLE COAL MEASURES) | 7.00 | | | | | | | | | | | | | | | | | |
| | Grey MUDSTONE. (PENNINE MIDDLE COAL MEASURES) | 7.60 | | | | | | | | | | | | | | | | | |

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|---|---|---|---|
| **Notes**<br>Rotary openhole from surface. | **Title**<br>Rotary core record | | **Date(s)**<br>15/04/2021 |
| | **Method**<br>Rotary core | **Logged by**<br>JP | **Sheet number**<br>Sheet 1 of 3 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>- | **Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377717mE, 407697mN | **Checked by**<br>MOH | **BH05** |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |
| | Black carbonaceous MUDSTONE. (PENNINE MIDDLE COAL MEASURES) | 17.60 | | | | | | | | | | | | | | | | | |
| | Black COAL and carbonaceous MUDSTONE. (PENNINE MIDDLE COAL MEASURES) | 17.90 | | | | | | | | | | | | | | | | | |
| | Grey MUDSTONE. (PENNINE MIDDLE COAL MEASURES) | 18.40 | | | | | | | | | | | | | | | | | |
| | Black COAL and carbonaceous MUDSTONE. (PENNINE MIDDLE COAL MEASURES) | 19.80 | | | | | | | | | | | | | | | | | |
| | Grey MUDSTONE. (PENNINE MIDDLE COAL MEASURES) | 20.60 | | | | | | | | | | | | | | | | | |
| | Black COAL. (PENNINE MIDDLE COAL MEASURES) | 21.50 | | | | | | | | | | | | | | | | | |
| | Grey MUDSTONE. (PENNINE MIDDLE COAL MEASURES) | 21.70 | | | | | | | | | | | | | | | | | |

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|---|---|---|---|
| **Notes**<br>Rotary openhole from surface. | **Title**<br>Rotary core record | | **Date(s)**<br>15/04/2021 |
| | **Method**<br>Rotary core | **Logged by**<br>JP | **Sheet number**<br>Sheet 2 of 3 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>- | **Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377717mE, 407697mN | **Checked by**<br>MOH | **BH05** |

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| INSTALL | STRATA | | | | WATER STRIKES | CORING | | | | | SPT TESTING | | | | OTHER IN SITU TESTING | | SAMPLING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DESCRIPTION | DEPTH (m) | REDUCED LVL (m OD) | LEGEND | | DEPTH (m) | TCR (%) | SCR (%) | RQD (%) | FI | TYPE / DEPTH (m) | RESULT | CASING DEPTH (m) | WATER LEVEL (m) | TYPE / DEPTH (m) | RESULT | FROM (m) | TO (m) | TYPE |
| | Hard grey SILTSTONE with mudstone bands. (PENNINE MIDDLE COAL MEASURES) | 26.50 | | | | | | | | | | | | | | | | | |
| | BOREHOLE TERMINATED AT 30.00m | 30.00 | | | | | | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| **Notes**<br>Rotary openhole from surface. | **Title**<br>Rotary core record | | **Date(s)**<br>15/04/2021 |
| | **Method**<br>Rotary core | **Logged by**<br>JP | **Sheet number**<br>Sheet 3 of 3 |
| **Groundwater observations**<br>No groundwater encountered. | **Level (m OD)**<br>- | **Compiled by**<br>KD | **Revision** |
| | **Co-ordinates**<br>377717mE, 407697mN | **Checked by**<br>MOH | **BH05** |

# Appendix E In situ test results

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## Dynamic Cone Penetrometer (DCP) raw data

| Location | Penetration below ground level (mm) | Cumulative blows |
|---|---|---|
| DCP01 | 90 | 1 |
| DCP01 | 131 | 2 |
| DCP01 | 152 | 3 |
| DCP01 | 175 | 4 |
| DCP01 | 195 | 5 |
| DCP01 | 215 | 6 |
| DCP01 | 240 | 7 |
| DCP01 | 260 | 8 |
| DCP01 | 280 | 9 |
| DCP01 | 295 | 10 |
| DCP01 | 310 | 11 |
| DCP01 | 320 | 12 |
| DCP01 | 330 | 13 |
| DCP01 | 340 | 14 |
| DCP01 | 350 | 15 |
| DCP01 | 360 | 16 |
| DCP01 | 370 | 17 |
| DCP01 | 380 | 18 |
| DCP01 | 390 | 19 |
| DCP01 | 405 | 20 |
| DCP01 | 417 | 21 |
| DCP01 | 432 | 22 |
| DCP01 | 450 | 23 |
| DCP01 | 465 | 24 |
| DCP01 | 480 | 25 |
| DCP01 | 495 | 26 |
| DCP01 | 515 | 27 |
| DCP01 | 540 | 28 |
| DCP01 | 575 | 29 |
| DCP01 | 630 | 30 |
| DCP01 | 700 | 31 |
| DCP01 | 730 | 32 |
| DCP01 | 741 | 33 |
| DCP01 | 750 | 34 |
| DCP01 | 760 | 35 |
| DCP01 | 770 | 36 |
| DCP02 | 110 | 1 |
| DCP02 | 157 | 2 |
| DCP02 | 190 | 3 |
| DCP02 | 217 | 4 |
| DCP02 | 228 | 5 |
| DCP02 | 245 | 6 |
| DCP02 | 260 | 7 |

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## Dynamic Cone Penetrometer (DCP) raw data

| Location | Penetration below ground level (mm) | Cumulative blows |
|---|---|---|
| DCP02 | 275 | 8 |
| DCP02 | 297 | 9 |
| DCP02 | 320 | 10 |
| DCP02 | 340 | 11 |
| DCP02 | 365 | 12 |
| DCP02 | 387 | 13 |
| DCP02 | 410 | 14 |
| DCP02 | 437 | 15 |
| DCP02 | 470 | 16 |
| DCP02 | 495 | 17 |
| DCP02 | 530 | 18 |
| DCP02 | 565 | 19 |
| DCP02 | 615 | 20 |
| DCP02 | 697 | 21 |
| DCP02 | 820 | 22 |
| DCP02 | 915 | 23 |
| DCP03 | 50 | 1 |
| DCP03 | 62 | 2 |
| DCP03 | 72 | 3 |
| DCP03 | 84 | 4 |
| DCP03 | 95 | 5 |
| DCP03 | 110 | 6 |
| DCP03 | 121 | 7 |
| DCP03 | 131 | 8 |
| DCP03 | 145 | 9 |
| DCP03 | 160 | 10 |
| DCP03 | 175 | 11 |
| DCP03 | 205 | 12 |
| DCP03 | 242 | 13 |
| DCP03 | 280 | 14 |
| DCP03 | 330 | 15 |
| DCP03 | 385 | 16 |
| DCP03 | 450 | 17 |
| DCP03 | 510 | 18 |
| DCP03 | 576 | 19 |
| DCP03 | 630 | 20 |
| DCP03 | 700 | 21 |
| DCP03 | 745 | 22 |
| DCP03 | 810 | 23 |
| DCP03 | 875 | 24 |
| DCP03 | 900 | 25 |
| DCP04 | 120 | 1 |
| DCP04 | 210 | 2 |

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## Dynamic Cone Penetrometer (DCP) raw data

| Location | Penetration below ground level (mm) | Cumulative blows |
|---|---|---|
| DCP04 | 230 | 3 |
| DCP04 | 252 | 4 |
| DCP04 | 280 | 5 |
| DCP04 | 300 | 6 |
| DCP04 | 320 | 7 |
| DCP04 | 340 | 8 |
| DCP04 | 370 | 9 |
| DCP04 | 400 | 10 |
| DCP04 | 438 | 11 |
| DCP04 | 478 | 12 |
| DCP04 | 520 | 13 |
| DCP04 | 550 | 14 |
| DCP04 | 570 | 15 |
| DCP04 | 590 | 16 |
| DCP04 | 615 | 17 |
| DCP04 | 635 | 18 |
| DCP04 | 650 | 19 |
| DCP04 | 675 | 20 |
| DCP04 | 691 | 21 |
| DCP04 | 705 | 22 |
| DCP04 | 715 | 23 |
| DCP04 | 727 | 24 |
| DCP04 | 728 | 25 |
| DCP04 | 740 | 26 |
| DCP04 | 752 | 27 |
| DCP04 | 770 | 28 |
| DCP04 | 780 | 29 |
| DCP04 | 795 | 30 |
| DCP04 | 802 | 31 |
| DCP04 | 810 | 32 |
| DCP04 | 820 | 33 |
| DCP04 | 830 | 34 |
| DCP04 | 840 | 35 |
| DCP04 | 865 | 36 |
| DCP04 | 880 | 37 |
| DCP04 | 895 | 38 |
| DCP04 | 910 | 39 |
| DCP05 | 95 | 1 |
| DCP05 | 165 | 2 |
| DCP05 | 190 | 3 |
| DCP05 | 215 | 4 |
| DCP05 | 237 | 5 |
| DCP05 | 257 | 6 |

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## Dynamic Cone Penetrometer (DCP) raw data

| Location | Penetration below ground level (mm) | Cumulative blows |
|---|---|---|
| DCP05 | 275 | 7 |
| DCP05 | 285 | 8 |
| DCP05 | 295 | 9 |
| DCP05 | 297 | 10 |
| DCP05 | 305 | 11 |
| DCP05 | 310 | 12 |
| DCP05 | 315 | 13 |
| DCP05 | 321 | 14 |
| DCP05 | 325 | 15 |
| DCP05 | 327 | 16 |
| DCP05 | 333 | 17 |
| DCP05 | 335 | 18 |
| DCP05 | 336 | 19 |

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## Dynamic Cone Penetrometer (DCP) summary

| Location | Layer No. | Mod.CBR (%) | Thickness (mm) | Start depth (mmBGL) | Base depth (mmBGL) |
|---|---|---|---|---|---|
| DCP01 | 1 | 11.5 | 200 | 100 | 300 |
| DCP01 | 2 | 24.6 | 100 | 300 | 400 |
| DCP01 | 3 | 12.4 | 200 | 400 | 600 |
| DCP01 | 4 | 3.7 | 100 | 600 | 700 |
| DCP01 | 5 | 17.3 | 60 | 700 | 760 |
| DCP02 | 1 | 9.0 | 150 | 100 | 250 |
| DCP02 | 2 | 8.8 | 300 | 300 | 600 |
| DCP02 | 3 | 2.4 | 300 | 600 | 900 |
| DCP03 | 1 | 18.8 | 150 | 50 | 200 |
| DCP03 | 2 | 6.3 | 100 | 200 | 300 |
| DCP03 | 3 | 4.0 | 550 | 300 | 850 |
| DCP04 | 1 | 9.1 | 400 | 200 | 600 |
| DCP04 | 2 | 19.8 | 250 | 600 | 850 |
| DCP05 | 1 | 4.1 | 200 | 0 | 200 |
| DCP05 | 2 | 18.1 | 100 | 200 | 300 |

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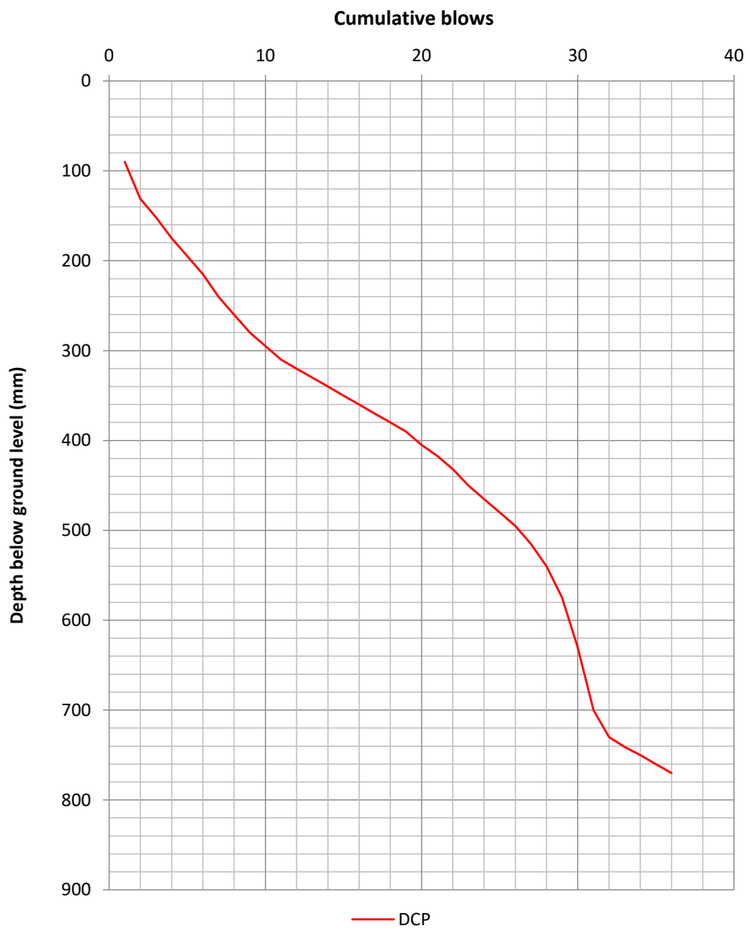
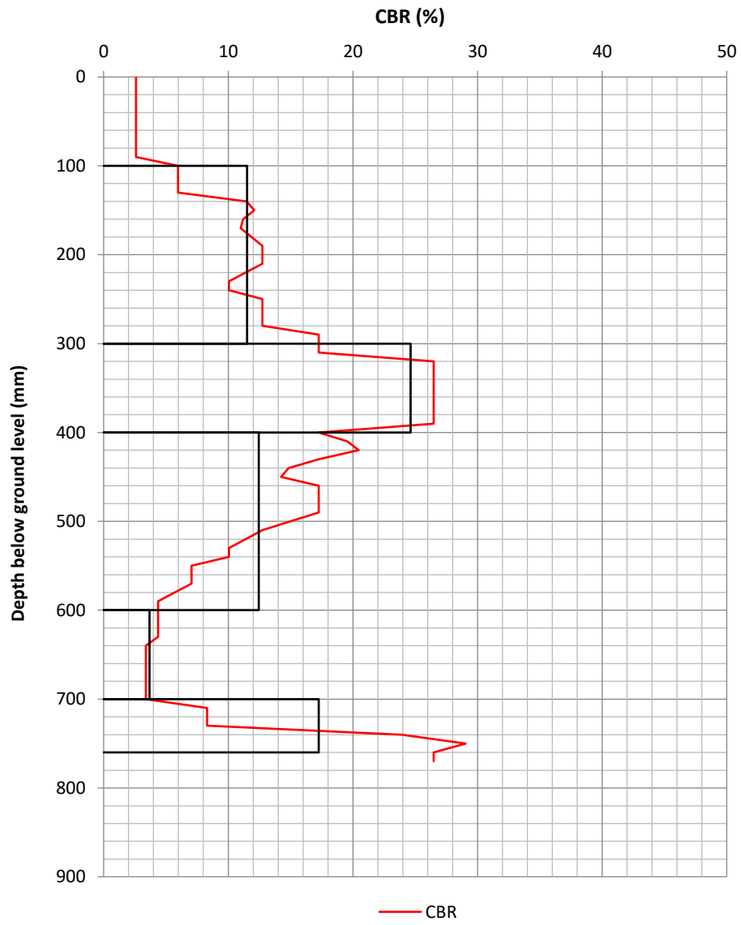
## Dynamic Cone Penetrometer (DCP) test

| Location | Date of test | Start depth (mm) | Zero reading (mm) | Operator |
|---|---|---|---|---|
| DCP01 | 15/04/2021 | 0 | 40 | JP |

## Plot showing number of blows against depth




## Plot showing CBR (%) against depth




## Layer properties

| Layer No. | Mod. CBR (%) | Thickness (mm) | Start depth (mmBGL) | Base depth (mmBGL) |
|---|---|---|---|---|
| 1 | **11.5** | 200 | 100 | 300 |
| 2 | **24.6** | 100 | 300 | 400 |
| 3 | **12.4** | 200 | 400 | 600 |
| 4 | **3.7** | 100 | 600 | 700 |
| 5 | **17.3** | 60 | 700 | 760 |

## Notes

1. Test procedure following Highways England Document CS229 Data for Pavement Assessment.

## Calculations

Log10 (Uncorrected (UC) CBR) = 2.48 - 1.057Log10(mm/blow)

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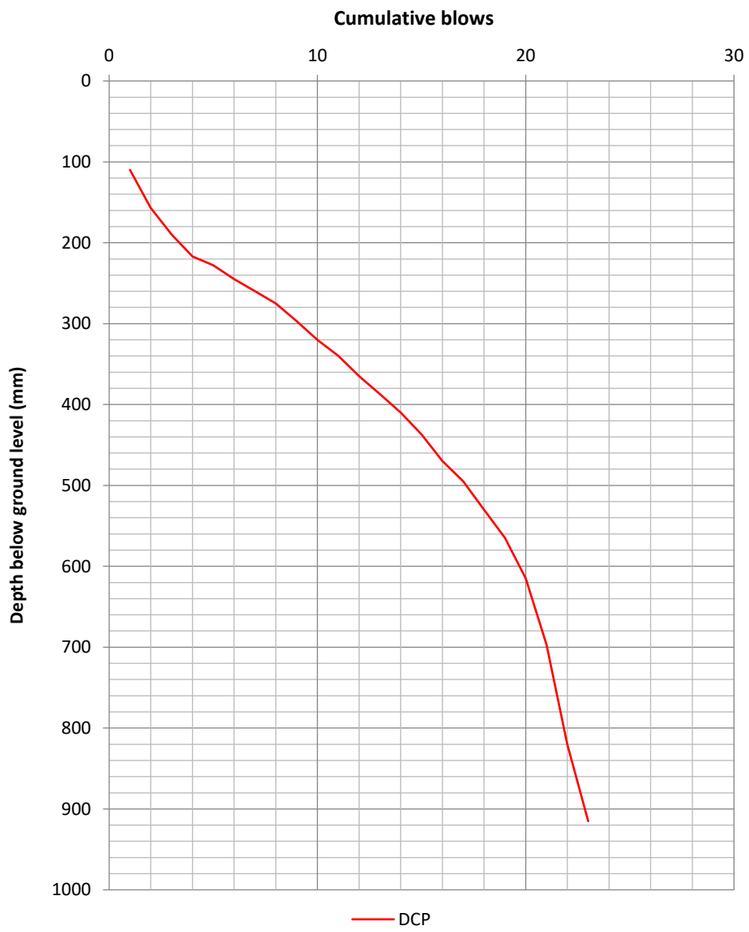
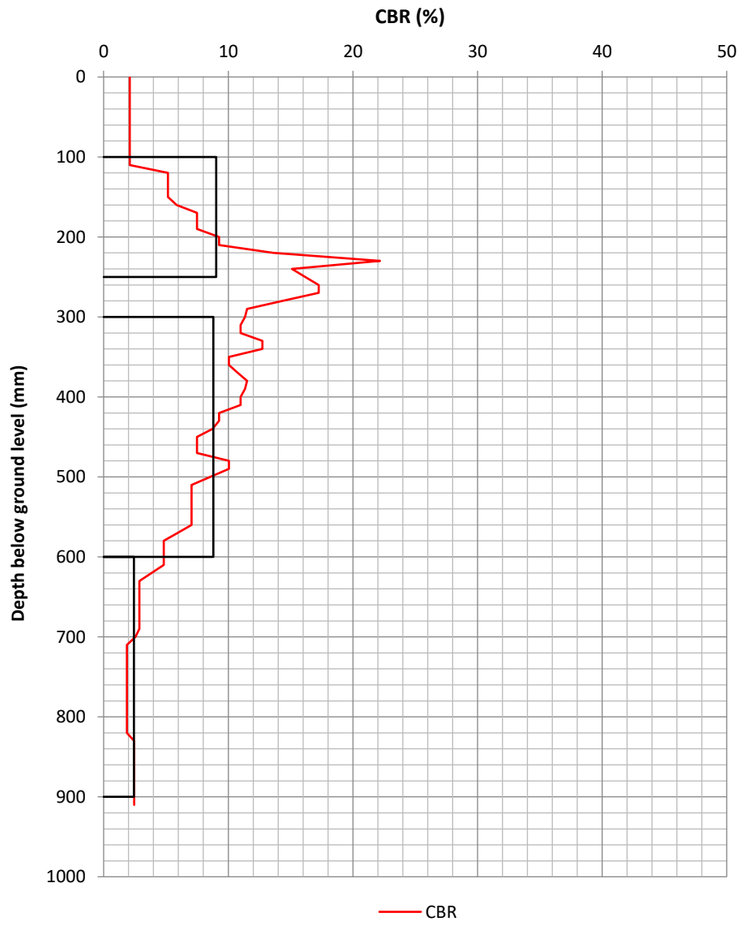
## Dynamic Cone Penetrometer (DCP) test

| Location | Date of test | Start depth (mm) | Zero reading (mm) | Operator |
|---|---|---|---|---|
| DCP02 | 15/04/2021 | 0 | 35 | JP |

## Plot showing number of blows against depth




## Plot showing CBR (%) against depth




## Layer properties

| Layer No. | Mod. CBR (%) | Thickness (mm) | Start depth (mmBGL) | Base depth (mmBGL) |
|---|---|---|---|---|
| 1 | **9.0** | 150 | 100 | 250 |
| 2 | **8.8** | 300 | 300 | 600 |
| 3 | **2.4** | 300 | 600 | 900 |

## Notes

1. Test procedure following Highways England Document CS229 Data for Pavement Assessment.

## Calculations

Log10 (Uncorrected (UC) CBR) = 2.48 - 1.057Log10(mm/blow)

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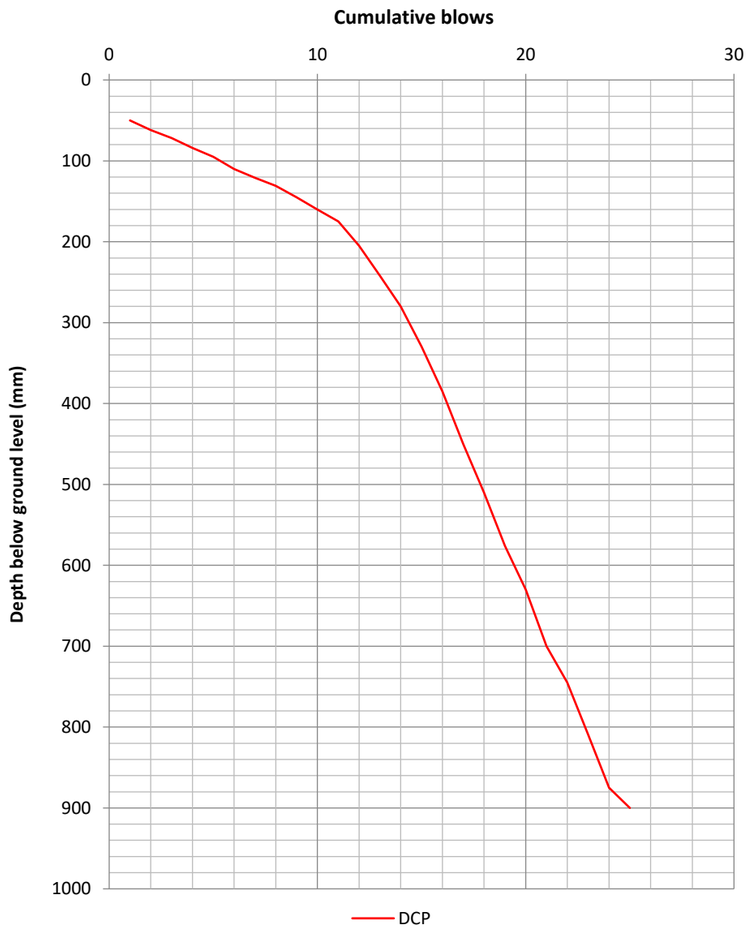
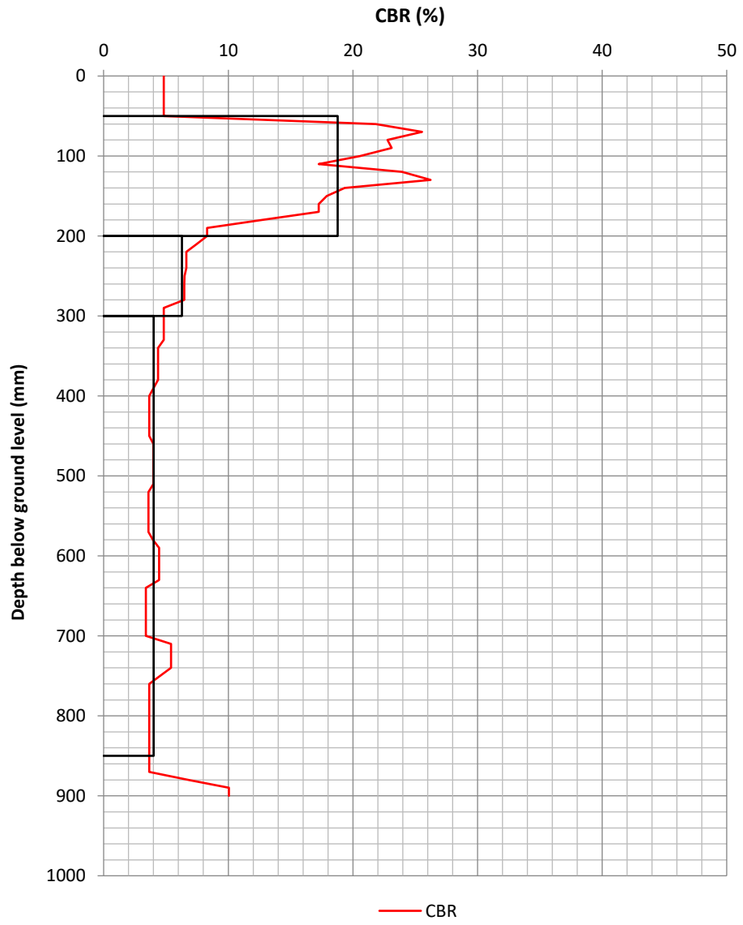
## Dynamic Cone Penetrometer (DCP) test

| Location | Date of test | Start depth (mm) | Zero reading (mm) | Operator |
|---|---|---|---|---|
| DCP03 | 15/04/2021 | 0 | 60 | JP |

## Plot showing number of blows against depth




## Plot showing CBR (%) against depth




## Layer properties

| Layer No. | Mod. CBR (%) | Thickness (mm) | Start depth (mmBGL) | Base depth (mmBGL) |
|---|---|---|---|---|
| 1 | **18.8** | 150 | 50 | 200 |
| 2 | **6.3** | 100 | 200 | 300 |
| 3 | **4.0** | 550 | 300 | 850 |

## Notes

1. Test procedure following Highways England Document CS229 Data for Pavement Assessment.

## Calculations

Log10 (Uncorrected (UC) CBR) = 2.48 - 1.057Log10(mm/blow)

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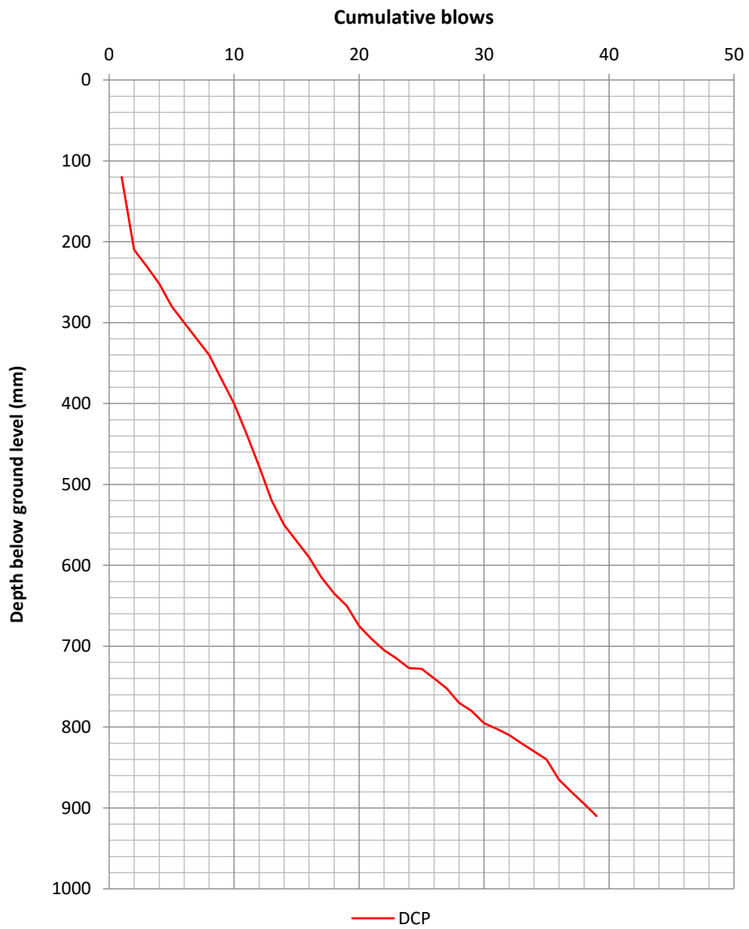
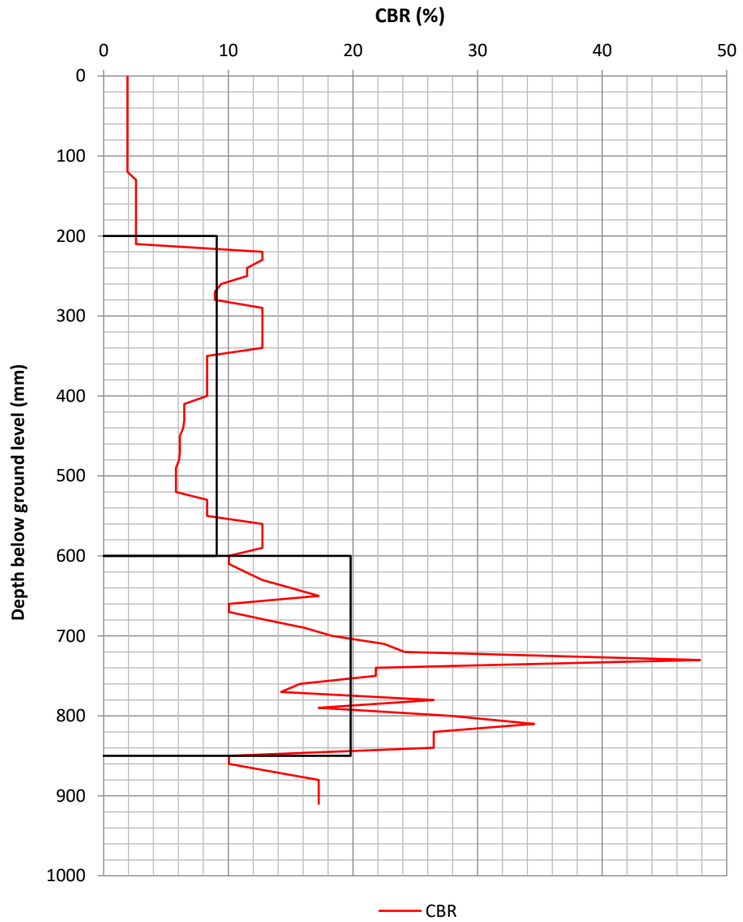
## Dynamic Cone Penetrometer (DCP) test

| Location | Date of test | Start depth (mm) | Zero reading (mm) | Operator |
|---|---|---|---|---|
| DCP04 | 15/04/2021 | 0 | 30 | JP |

## Plot showing number of blows against depth




## Plot showing CBR (%) against depth




## Layer properties

| Layer No. | Mod. CBR (%) | Thickness (mm) | Start depth (mmBGL) | Base depth (mmBGL) |
|---|---|---|---|---|
| 1 | **9.1** | 400 | 200 | 600 |
| 2 | **19.8** | 250 | 600 | 850 |

## Notes

1. Test procedure following Highways England Document CS229 Data for Pavement Assessment.

## Calculations

Log10 (Uncorrected (UC) CBR) = 2.48 - 1.057Log10(mm/blow)

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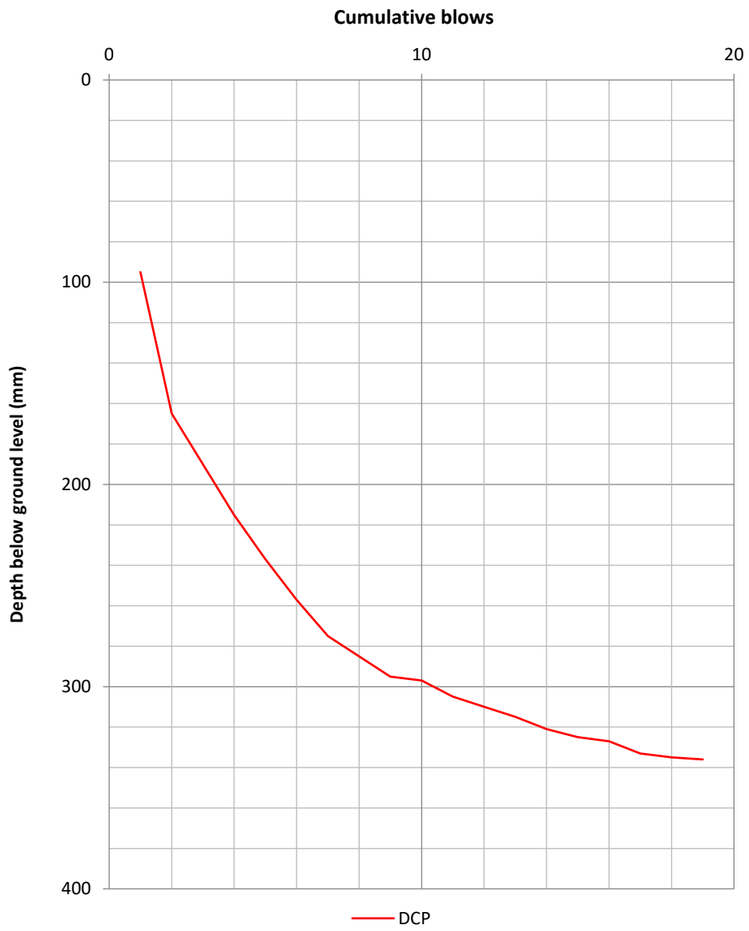
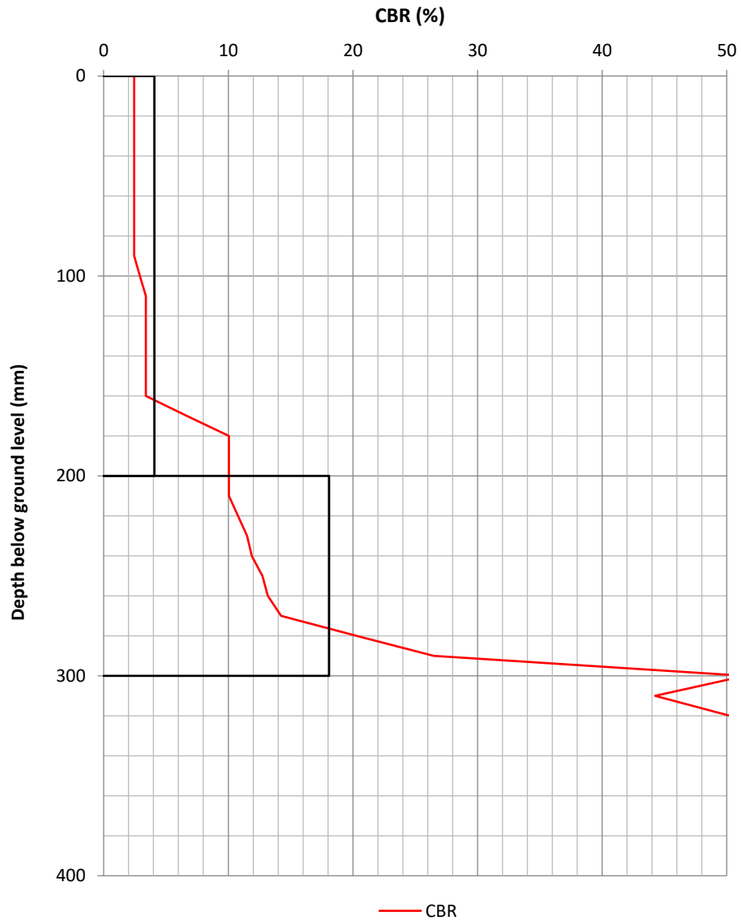
## Dynamic Cone Penetrometer (DCP) test

| Location | Date of test | Start depth (mm) | Zero reading (mm) | Operator |
|---|---|---|---|---|
| DCP05 | 15/04/2021 | 0 | 35 | JP |

## Plot showing number of blows against depth




## Plot showing CBR (%) against depth




## Layer properties

| Layer No. | Mod. CBR (%) | Thickness (mm) | Start depth (mmBGL) | Base depth (mmBGL) |
|---|---|---|---|---|
| 1 | **4.1** | 200 | 0 | 200 |
| 2 | **18.1** | 100 | 200 | 300 |

## Notes

1. Test procedure following Highways England Document CS229 Data for Pavement Assessment.

## Calculations

Log10 (Uncorrected (UC) CBR) = 2.48 - 1.057Log10(mm/blow)

# Appendix F Geotechnical Laboratory Test Certificates

**Lauren Wenham**
Soiltechnics Limited
Cedar Barn
White Lodge
Walgrave
Northampton
NN6 9PY

**e:** L.Wenham@soiltechnics.net

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

**t:** 01923 225404
**f:** 01923 237404
**e:** reception@i2analytical.com

# Analytical Report Number : 21-70022

| | | | |
|---|---|---|---|
| **Project / Site name:** | Redbank Playing Fields, Manchester | **Samples received on:** | 21/04/2021 |
| **Your job number:** | STT5261 | **Samples instructed on/ Analysis started on:** | 21/04/2021 |
| **Your order number:** | STTS261-202104201347-I2 | **Analysis completed by:** | 29/04/2021 |
| **Report Issue Number:** | 1 | **Report issued on:** | 30/04/2021 |
| **Samples Analysed:** | 2 soil samples | | |

**Signed:**

Rachel Bradley
Deputy Quality Manager
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

| | |
|---|---|
| soils | - 4 weeks from reporting |
| leachates | - 2 weeks from reporting |
| waters | - 2 weeks from reporting |
| asbestos | - 6 months from reporting |

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 21-70022**
**Project / Site name: Redbank Playing Fields, Manchester**
**Your Order No: STTS261-202104201347-I2**

| | | | | | |
|---|---|---|---|---|---|
| **Lab Sample Number** | | | | 1844457 | 1844458 |
| **Sample Reference** | | | | BH02 | BH04 |
| **Sample Number** | | | | BH022.601 | BH041.001 |
| **Depth (m)** | | | | 2.60 | 1.00-2.00 |
| **Date Sampled** | | | | 15/04/2021 | 16/04/2021 |
| **Time Taken** | | | | None Supplied | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | |
| Stone Content | % | 0.1 | NONE | < 0.1 | < 0.1 |
| Moisture Content | % | 0.01 | NONE | 19 | 24 |
| Total mass of sample received | kg | 0.001 | NONE | 1.5 | 0.70 |

**General Inorganics**

| | | | | | |
|---|---|---|---|---|---|
| pH - Automated | pH Units | N/A | MCERTS | 6.4 | 7.0 |
| Total Sulphate as SO4 | % | 0.005 | MCERTS | 0.025 | 0.230 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | 0.020 | 0.070 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | 19.7 | 69.9 |
| Water Soluble Chloride (2:1) (leachate equivalent) | mg/l | 0.5 | MCERTS | 6.9 | 4.5 |
| Total Sulphur | % | 0.005 | MCERTS | 0.019 | 0.198 |
| Water Soluble Nitrate (2:1) as N (leachate equivalent) | mg/l | 2 | NONE | < 2.0 | < 2.0 |

**Heavy Metals / Metalloids**

| | | | | | |
|---|---|---|---|---|---|
| Magnesium (water soluble) | mg/kg | 5 | NONE | < 5.0 | 14 |
| Magnesium (leachate equivalent) | mg/l | 2.5 | NONE | < 2.5 | 6.8 |

U/S = Unsuitable Sample  I/S = Insufficient Sample

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

**Analytical Report Number : 21-70022**
**Project / Site name: Redbank Playing Fields, Manchester**

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

| Lab Sample Number | Sample Reference | Sample Number | Depth (m) | Sample Description * |
|---|---|---|---|---|
| 1844457 | BH02 | BH022.601 | 2.6 | Brown clay and loam with gravel and vegetation. |
| 1844458 | BH04 | BH041.001 | 1.00-2.00 | Brown loam and sand with gravel and glass. |

**Analytical Report Number : 21-70022**
**Project / Site name: Redbank Playing Fields, Manchester**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)**

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| Magnesium, water soluble, in soil | Determination of water soluble magnesium by extraction with water followed by ICP-OES. | In-house method based on TRL 447 | L038-PL | D | NONE |
| Moisture Content | Moisture content, determined gravimetrically. (30 oC) | In house method. | L019-UK/PL | W | NONE |
| pH in soil (automated) | Determination of pH in soil by addition of water followed by automated electrometric measurement. | In house method. | L099-PL | D | MCERTS |
| Stones content of soil | Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight. | In-house method based on British Standard Methods and MCERTS requirements. | L019-UK/PL | D | NONE |
| Total Sulphate in soil as % | Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES. | In house method. | L038-PL | D | MCERTS |
| Total Sulphur in soil as % | Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES. | In house method. | L038-PL | D | MCERTS |
| Sulphate, water soluble, in soil (16hr extraction) | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent). | In house method. | L038-PL | D | MCERTS |
| Water Soluble Nitrate (2:1) as N in soil | Determination of nitrate by reaction with sodium salicylate and colorimetry. | In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction. | L078-PL | W | NONE |
| Chloride, water soluble, in soil | Determination of Chloride colorimetrically by discrete analyser. | In house method. | L082-PL | D | MCERTS |
| Sulphate, water soluble, in soil | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent). | In house method. | L038-PL | D | MCERTS |

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**
**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**
**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

**Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.**