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Our ref: 7583si

3202100 76P

Site Investigation Report

for land at

Mitton Road, Whalley

For: Prospect Homes
5 Meridian Business Village
Hansby Drive
Hunts Cross
Liverpool
L24 9LG

22 October 2020

Park House, Sandpiper Court,
Chester Business Park,
Chester, CH4 9QU

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Document Verification

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Document Register

Report Reference	Rev	Date	Description	Prepared	Checked and Approved
7583si	-	22/10/2020	Site Investigation Report	B W Hill	P R Sykes

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1.0 Introduction

This report is the findings of a site investigation on the ground conditions, generic contamination aspects and anticipated engineering/foundation requirements for a proposed residential development on land at Mitton Road, Whalley. This report was prepared on instructions received from our client, Prospect Homes, 5 Meridian Business Village, Hansby Drive, Hunts Cross, Liverpool, L24 9LG.

The site is proposed for residential development by Prospect Homes, comprising of 50 No. residential properties, including a combination of traditional detached and semi-detached houses with associated roads, private driveways, garages, gardens and landscaping. The proposed development layout is shown on Eden Rose Consulting, Planning Layout, referenced MR/W-SJS-PL01, dated 1 October 2020. An extract of which is overlain on Coopers Drawing No. 7583/Fdz, revision A, within Appendix 13. It is also assumed that all materials and workmanship will comply with the Building Regulations and the NHBC Standards, and no significant re-grading will be carried out.

The accuracy of map extracts cannot be guaranteed and it should be recognised that different conditions on /adjacent the site may have existed between and subsequent to the various map surveys. Historical map extracts are produced as an appendix Report by Groundsure under licence from Ordnance Survey. Coopers can reproduce and use these extracts in this report under their Ordnance Survey Licence No. AL100005579.

Where data supplied by others, including that from previous investigations, has been used it has been assumed that the information is correct. No responsibility can be accepted by Coopers for inaccuracies within the data supplied by others. We would advise that our client makes their own detailed enquiries to the Local Authorities to determine any additional planning constraints which may be applied to this site and which have not been identified within this report.

The results of the exploratory holes explorations are based upon the facts established from observations and field tests. It should be recognised that strata may vary considerably from point to point and the groundwater regime may be influenced by seasonal or other factors. While every attempt is made to assess the likelihood and extent of such variations, conditions may nevertheless exist which are undisclosed by this investigation.

This report has been prepared in accordance with the Building Regulations Part C (2004), and complies with the requirements associated with the planning guidance. This report should address the conditions placed within the planning conditions regarding the ground conditions and contamination. This report has been prepared in accordance with the requirements of the NHBC Standards, Chapter 4.1. The scope of this report complies with the criteria for certification under the Initial Assessment including the Desk Study (D1), the Walkover Survey (D2), and the Basic Investigation (D4). This report constitutes a Phase I and II report in accordance with LCMR. The report is also prepared in accordance with BS10175: 2011+A2:2017, and complies with Phase 1 (Preliminary Investigation), and Phase 2 (Exploratory Investigation) investigation.

The further actions deemed necessary to be completed prior to development of the proposed site for residential development have been listed in Section 28 of this report. The full extent of further actions may not be limited to those issues stated and, during the course of the development, additional further actions may be required.

The report should be read in its entirety, including all associated drawings and appendices. Coopers cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.

Arboricultural Survey and advice on arboricultural issues are considered to be outside the scope of this report except for their effect on the foundations to the proposed buildings. Where identification of any species is made, especially invasive plants such as Japanese Knotweed, Himalayan Balsam or Giant Hogweed, this should only be considered as a preliminary assessment and subject to confirmation by a professional Arboriculturist. Coopers take no responsibility for failing to identify, or the incorrect identification of, any tree or plant species on site.

This report is prepared and written in the context of the purposes stated above and should not be used in a different context. Furthermore, new information, improved practices and legislation may necessitate an alteration to this report in whole or in part after its submission. Therefore, with any change in circumstances or after the expiry of one year from the date of this Report, the report should be referred to Coopers for reappraisal.

2.0 Executive Summary

Grid Reference	SD 726 375 (Refer to Drawing No. 7583/L1 in Appendix 13).
Approximate Area	The site is split into two parcels (north and south) divided by Pendle Drive and adjacent residential houses: Northern Parcel – 1.29 Hectares (3.19 acres). Southern Parcel – 0.97 Hectares (2.40 acres).
Development Proposals (Section 3)	The site is proposed for residential development by Prospect Homes, comprising of 50 No. residential properties, including a combination of traditional detached and semi-detached houses with associated roads, private driveways, garages, gardens and landscaping.
Site Investigation Data (Appendices 4, 5 and 13)	Coopers undertook 12 No. trial pits (referenced TP01 to TP12), 17 No. hand dug trial pits (referenced HD01 to HD17) and 8 No. small diameter boreholes (referenced WS01 to WS08). No previous investigations on the site, although Coopers hold records of investigations for the various phases of the adjacent residential developments of Calderstones Hospital site from 1999 onwards.
Site Description (Sections 4 and 5)	The site comprised of residential housing fronting Mitton Road, with associated gardens, private access roads, parking areas and open landscaping/trees. The majority of the properties were unoccupied at the time of the site walkover, although no internal access for inspection was provided. Suspected invasive plant species (Himalayan Balsam) were identified within numerous open areas of the site and annotated on the site plan in Appendix 13).
Site History (Section 7)	From 1846 the site consisted of parts of open land with farm houses and ponds, prior to development of residential houses, first recorded by 1912 and shown as completed by 1932. The land to the west was formerly parts of the Calderstones Hospital, referenced as established in 1915 for treatment of mental health conditions.
Hazardous Installations and Development Constraints (Section 8)	No identified hazardous installations or significant development constraints. Local Authority consultation highlights the presence of groups of Tree Preservation Orders for trees within and adjacent to the site. Suspected Himalayan balsam on the site. It is advisable to hold consultation with the local authority regarding any specialist reports or information needed in relation to the proposed development.
Utility Locations (Section 5.0)	Live services are recorded within the site, including connections to the existing properties and sewers cross the site.
Landfill Sites & Ground Gases (Section 9 and 17)	2 No. former landfills recorded within 250m of the site, situated from 160m to the west of the site, referenced as relating to wastes deposited from the Calderstones Hospital. Previous consultations with the Environment Agency and Local Authority primarily incinerator ash, and non-putrescible materials. Investigations of the landfill were undertaken as part of the investigations for the proposed development, identifying the landfill to be <3m in depth and primarily consisting of materials as referenced, therefore posing little risk or hazardous for migration of landfill leachate or gases. Gas Monitoring is ongoing, with initial monitoring data indicating elevated concentrations of methane and/or carbon dioxide in area of former pond, and in the north east of the site (related to either organic inclusions in the clay of partial filling of the railway cutting in the tunnel under Mitton Road. Amber 1 gas mitigation measures assumed to be required on 9 No. plots within these areas.
Geology, Hydrology & Hydrogeology (Section 10)	**Drift** - Glacial Till. **Bedrock** – Clitheroe Limestone Formation. **Geological Faults** – None on or close to the development. **Groundwater** – Site not within a groundwater source protection zone. Aquifer designations vary by strata type, including designations of Secondary Aquifer (undifferentiated) and Secondary A Aquifer. No active groundwater abstraction licenses recorded. **Hydrology** – The closest surface water body is an unnamed tributaries to the River Calder. Located 36m north east and 62m south of the site. **Flood Risk** – Outside of recorded zones of flooding from rivers, seas or reservoirs. **Compressible Ground and Subsidence Hazards** – Environmental data reports reference no significant hazards. **Mineral Safeguarding** – No likely defined mineral resources. **Oil and Gas Production** – Within licensed permit area for oil and gas production, related to hydraulic fracturing of shales for gas production. These areas are wide spread over large parts of the north west, and unlikely to be a significant limitation to the proposed development.
Environmental, Archaeological, Ecological and Conservation Issues (Section 11)	Numerous ecological items are listed within 1km of the site, including areas of ancient woodland, green belt, impact zones to Sites of Special Scientific Interest, Private Habitat Inventories, and Habitat Enhancement Zones. Areas and individual trees within and adjacent to the site are designated as covered by a group Tree Preservation Order. Consultation with specialists in these fields and Local Authority regarding any limitations or requirements for additional surveys and assessments.

Coal Mining and Brine Extraction (Section 12)	**Brine Subsidence** – The site is not within a zone of potential impact from brine subsidence. **Coal Mining** – The site is not within a zone of Coal Authority reporting – site unaffected.
Radon (Section 13)	<1% of buildings above action threshold - No special precautions required for new buildings.
Ground Conditions (Section 15)	**Topsoil** – 0.1m to 0.55m over open areas of the site. **Madeground** – shallow reworked natural, other than within the former ponds where madeground was present to 3.5m with layers of ash & clinker interspersed with reworked clays. **Natural Drift Strata** – Primarily firm-stiff glacial clay with areas of soft clays/silts in parts of the site. **Bedrock** – not encountered.
Contamination and Waste (Sections 16, 18 and 19)	**Conceptual Model** – Primary risks associated with madeground in the former ponds, reworked soils within residential gardens and potential for PCBs associated with adjacent electrical substation. **Contamination Testing** – Generally most soils were proven uncontaminated for residential end use. The area of the former ponds were identified to contain trace chrysotile asbestos fibres within the madeground and topsoil. Some of the topsoil samples from the residential gardens identified as having sporadic slight elevations of the inorganic and PAH contaminants, commonly associated with individual properties and their use over time. **Remediation** – Segregate topsoil from adjoining properties gardens into separate stockpiles for further sampling and testing to determine if viable for areas to remain. Prior to testing assume the topsoil is to be disposed. Plots situated over the former pond are to have an inert cover system, consisting of 600mm of inert cover (min 150mm of topsoil), overlying geotextile. **Waste** – Segregation and reuse of soils could be a waste activity and would require relevant Environment Agency exemptions, Material Management Plans and/or CL:AIRE registered CoP registrations prior to reuse of soils within the site. **Soil Disposal** – Should soil disposal be required the majority of the soils would likely be designated as inert or non-hazardous waste. **Potable Water** – Potable water supply pipelines are expected to be standard Polyethylene pipes (no volatile or mobile contaminants).
Sub-Soil Classification (Section 20)	Concrete Classification (Based on BRE Special Digest 1 (2005) **Madeground** – DS1, AC-1, DC-1 **Glacial Clay** - DS-1, AC-1s, DC-1 Shrinkage Potential **Glacial Clay** – Medium shrinkage potential.
Trees (Section 21)	Local Authority have confirmed reference to group Tree Preservation Orders applied to trees on and adjacent to the site. Tree survey has been provided referencing tree species and heights for assessment of the influence to the proposed foundations.
Ground Floor Slabs (Section 22)	Based upon our client's preferred floor slab construction the following slab types are proposed: • Block and Beam – Subfloor void of 250mm required in areas of heave influence.
Anticipated Foundations (Section 23)	**Foundation Types:** The subsequent foundation types are based upon depths to bearing strata, assuming the stripping of topsoil without prior earthworks/regrading, with plot specific foundation proposals shown on Coopers Drawing No. 7583/Fdz, revision A, in Appendix 13: • **Traditional Strip Foundations** – Areas where depth to foundation formation level are <1.2m (6 No. plots) • **Mass Concrete Trench Fill Foundations** - Areas where depth to foundation formation level is >1.2m, and <2.5m, but without tree heave influence (4 No. plots) • **Mass Concrete Trench Fill Foundations Including Heave Precautions** - within tree influence zones including heave, where existing tree influence is >1.5m and <2.5m of total tree influence (17 No. plots). • **Piled Foundations and Associated Ground Beams** – where depth to moisture stable bearing strata is >2.5m in depth but outside of heave influence zones from trees (4 No. plots). • **Piled Foundations and Associated Ground Beams including Heave Precautions** – Within areas under heave influence from trees where depth to moisture stable bearing strata is >2.5m (27 No. plots).
Dewatering and Trench Side Stability (Section 24 and 25)	Trench Stability – Good short-term stability in glacial clays any entry to trenches or requirements for being left open for extended periods to be fully supported or battered (where feasible to do so). Dewatering – localised perched waters considered to be feasible for traditional methods of dewatering where collecting in construction excavations. Traditional soakaways – not permitted due to moisture susceptible clays with shrink-swell behaviour (in additional to the low permeability of the strata), in accordance with CIRIA C753.

Road Sub-Grade (Section 26)	Following site clearance, vegetation removal and earthworks regrading levels the anticipated roads and car parking sub-grade materials are likely to comprise natural firm to stiff, or stiff clays. CBR values typically 2.5% to 7% in clays, subject to proof rolling and soft spot removal. If madeground is to be placed in road corridors these will require placement to an engineering specification.
Slope Stability (Section 27)	Former railway cutting to the north of the northern site boundary. Inspection of this area by Coopers was limited by dense vegetation with no clear evidence of slope failure. No topographic survey or levels were provided beyond the site boundary and would be required to determine if further assessments of slope stability are required. The northern parcel contained a raised embankment on the northern part of the western site boundary where the adjacent residential development had been raised above the site by circa 1.5m. Consideration of the proposed levels and development in this is area is required to ensure the development does not destabilise the embankment.
Further Actions (Section 28)	**Further action which Coopers consider will be required to progress the development status could include, but not necessarily be limited to: -** • Submit site investigation report for local authority and NHBC for approval. • Topographic survey recommended within the railway cutting beyond the northern site boundary. • Complete ground gas monitoring, and finalise assessment/mitigation proposals. • Following eradication/removal of suspected Himalayan Balsam further investigation is recommended to delineate the former ponds and determine any significant variations in the nature of the infill. • During initial stage of development topsoil from sections of residential garden to be segregated to separate piles for additional testing to determine if localised areas are suitable for reuse. • Any reuse of waste soils to be registered and recorded in accordance with EA guidance. • Placement of inert cover systems within the gardens over the former pond to be subject to validation holes confirming the depth of inert cover. • Chemical testing of imported soils (if intended) for placement within gardens. • Verify remediation works with reporting to satisfy Local Authority and NHBC. • Validation of installation of gas mitigation measures.

3.0 Proposed Development

(Refer to Appendix 13)

The site is proposed for residential development by Prospect Homes, comprising of 50 No. residential properties, including a combination of traditional detached and semi-detached houses with associated roads, private driveways, garages, gardens and landscaping. The proposed development layout is shown on Eden Rose Consulting, Planning Layout, referenced MR/W-SJS-PL01, dated 1 October 2020. An extract of which is overlain on Coopers Drawing No. 7583/Fdz, revision A, within Appendix 13.

4.0 Site Location

(Refer to Appendix 13)

The proposed development is located at National Grid Reference SD 726 375, Post Code BB7 9JX, situated to the west of Mitton Road (B6246), within Nethertown, approximately 1.1km to the north west of Whalley, and approximately 4.5km to the south west of Clitheroe The surrounding land use consisted of a residential housing to the west, open land with a former railway cutting (not filled) to the north, agricultural land, cattle breeding centre and depot to the east and Calderstones Hospital to the south and south west.

The location of the site is shown on Drawing No. 7583/L1 in Appendix 13.

5.0 Site Description

(Refer to the Site Plan in Appendix 13)

5.1 Site Walkover

A site walkover was undertaken by Coopers on 22nd August 2020.

The site consisted of residential housing, open landscaping, an access road, garages and areas of dense vegetation. The site was divided into a northern and southern parcels, separated by Pendle Drive and residential properties fronting the road (refer to Figures 1 and 2). The topography of the site was relatively flat, with a 2m high, raised embankment within the northern parcel along the northern part of the western site boundary.

Figure 1: Annotated aerial photograph from Google Earth with approximate site boundaries.

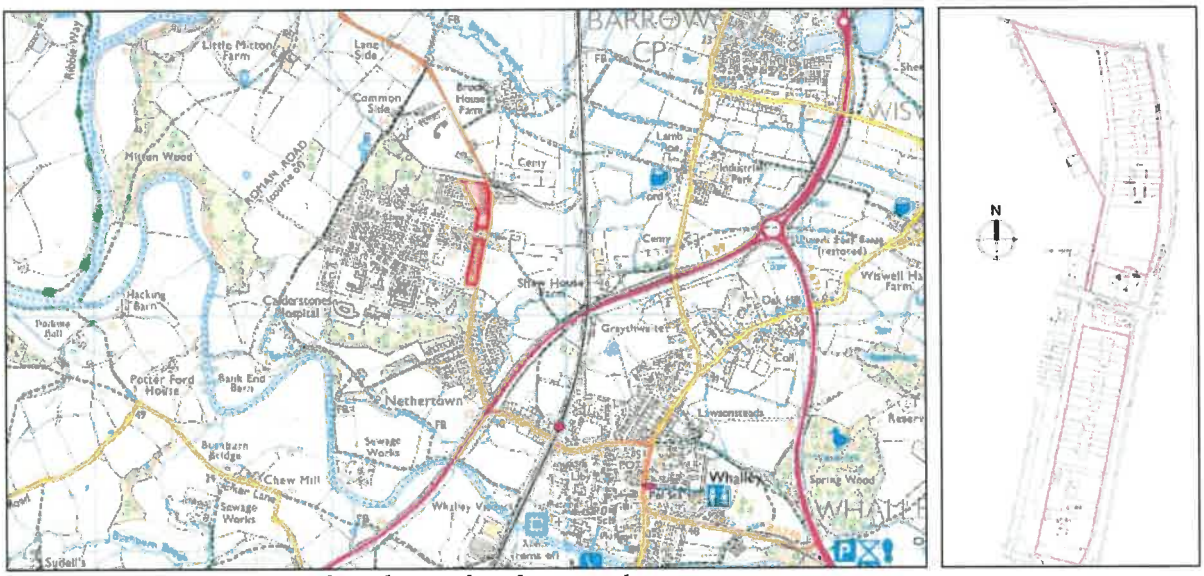


Figure 2: Existing site layout with northern and southern parcels.

The majority of the houses were unoccupied, although no access to the properties was available during the site walkover.

Northern Parcel:

The northern parcel contained 3 No. blocks of two storey mews houses (6 houses to each block), fronting Mitton Road, an open area of communal grassland in the north west, and dense vegetation/trees in the southern part.

The houses were early 20th Century construction, of brick and rendered construction with pitched slate roofs (refer to Photograph 1). The houses contained individual gardens to the front and rear, separated by timber fencing. To the rear of the houses was a tarmac private access road, with 2 No. blocks of adjoining garages (refer to Photograph 2) for the housing.

Photograph 1: Residential Housing blocks viewed from the rear.

Photograph 2: Garages and access road to the rear of the housing.

The north western part of the northern parcel comprised a large open grassed space (refer to Photograph 3), triangular in shape, with 3 no. raised manhole chambers from an active foul sewer. The western boundary parallel to this open space comprised significant suspected Himalayan Balsam (refer to Photograph 4) within an embankment approximately 2.5m in height, raising to the adjacent housing.

Photograph 3: Open grassed area in the north west of the northern parcel

Photograph 4:Embankment on the western boundary of the northern parcel containing suspected Himalayan Balsam.

The southern part of the northern parcel contained an area of dense vegetation and trees (refer to Photograph 5) with further extensive growths of suspected Himalayan Balsam.

Photograph 5: Area of dense vegetation and trees in the southern part of the northern parcel.

Photograph 6: Electrical substation to the immediate south of the northern parcel.

The land adjacent to the northern parcel consisted of Mitton Road to the east, an electrical substation (refer to Photograph 6) and houses fronting Pendle Drive to the south, an area of mature woodland and residential houses to the west, and woodland within a disused railway cutting to the north. The railway cutting was densely vegetated, with areas of toppled trees, although no detailed inspection of the slope was possible to determine evidence of slope instability. The railway cutting had been infilled under the bridge beneath Mitton Road close to the north eastern corner of the site (refer to Photograph 7). The bridge contained a memorial plaque to the former hospital and the use during WWI for treatment of soldiers (refer to Photograph 8)

Photograph 7: Infilled bridge beneath Mitton Road of the former railway cutting.

Photograph 8: Plaque on bridge along Mitton Road to the former military hospital.

Southern Parcel:

The southern parcel consisted of entirely residential housing fronting Mitton Road to the east and associated front and rear gardens. The housing within the central and northern areas comprised 3 No. blocks of two storey mews houses (4-6 houses to each block) of similar construction/age to the northern parcel. The southern area contained two detached houses (refer to Photograph 9) of similar age and construction as the mews buildings and larger garden areas.

Photograph 9: Detached residential house in the southern part of the southern parcel.

The southern parcel was bounded by Mitton Road to the east, Calderstones Drive to the south, a tarmac private access road to the rear of the gardens to the west, beyond which an open grassed area of communal landscaping/park and housing, and further houses off Pendle Drive to the north.

6.0 Previous Investigations and Scope of Works

No previous investigations or reports have been provided to Coopers for this site.

Cooper Associates (former trading name of Coopers) investigated the land to the east of the site from 1999-2006 on behalf of various residential developers as part of the Calderstones Hospital redevelopment (project number 2309 – refer to Figures 3 and 4). Information and records relating to the ground conditions close to the boundary of the site or in relation to source/pathway models have been included in relevant sections of this report.

Figure 3: Annotated extract from Google Earth showing red line approximate boundary of investigations for the adjacent Calderstones Hospital redevelopment (Project reference 2309) in relation to the approximate site boundary in pink line for this project (reference 7583).

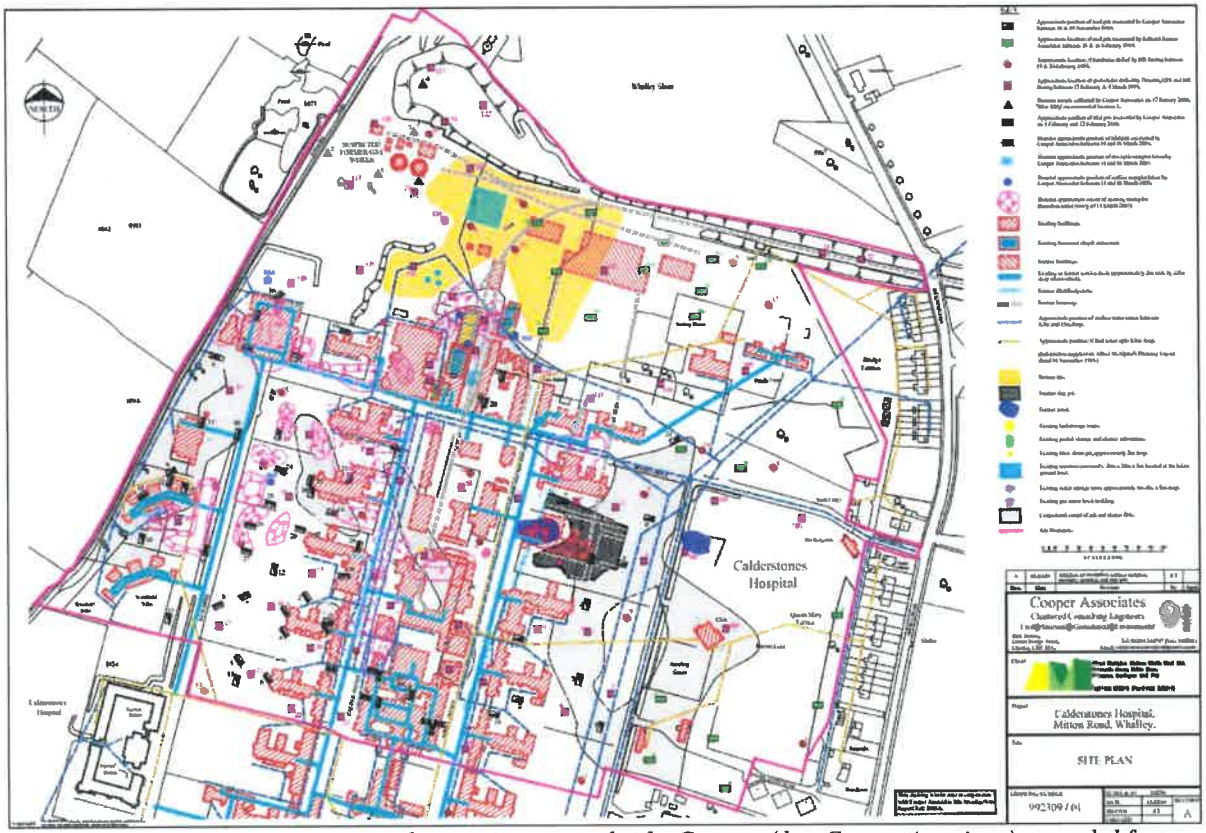


Figure 4: Former Calderstones Hospital site investigation plan by Coopers (then Cooper Associates), recorded features and exploratory holes to the west of the site..

The site investigation works undertaken by Coopers are detailed in Section 14. The investigation areas available were limited to areas outside of the existing buildings, services, occupied gardens and within areas not containing suspected invasive/notifiable plant species (Himalayan Balsam). The presence of various services, current and former features are recorded on the Coopers Site Plan, Drawing No. 7583/01 in Appendix 13.

7.0 Site History

(Refer to Appendices 3 and 13)

The following site history has been compiled from various sources, these include a literature review, historical Ordnance Survey (OS) maps, and internet searches.

A full copy of the historical maps generated by Groundsure are provided in Appendix 3. Relevant former features indicated on these map extracts have been reproduced on the Site Plan, Drawing No. 7583/01, in Appendix 13.

As part of the literature review numerous websites detail the history of the Calderstones Hospital site, the main area of which was located to the west of the site. Details of the early history of the site are provided in https://www.countyasylums.co.uk/calderstones-clitheroe/ (refer to Figure 5). The hospital was referenced as having opened on 14 April 1915, serving as a military hospital until 5 November 1920, long stay units operational until 1995, although southern part of the hospital remains in current use.

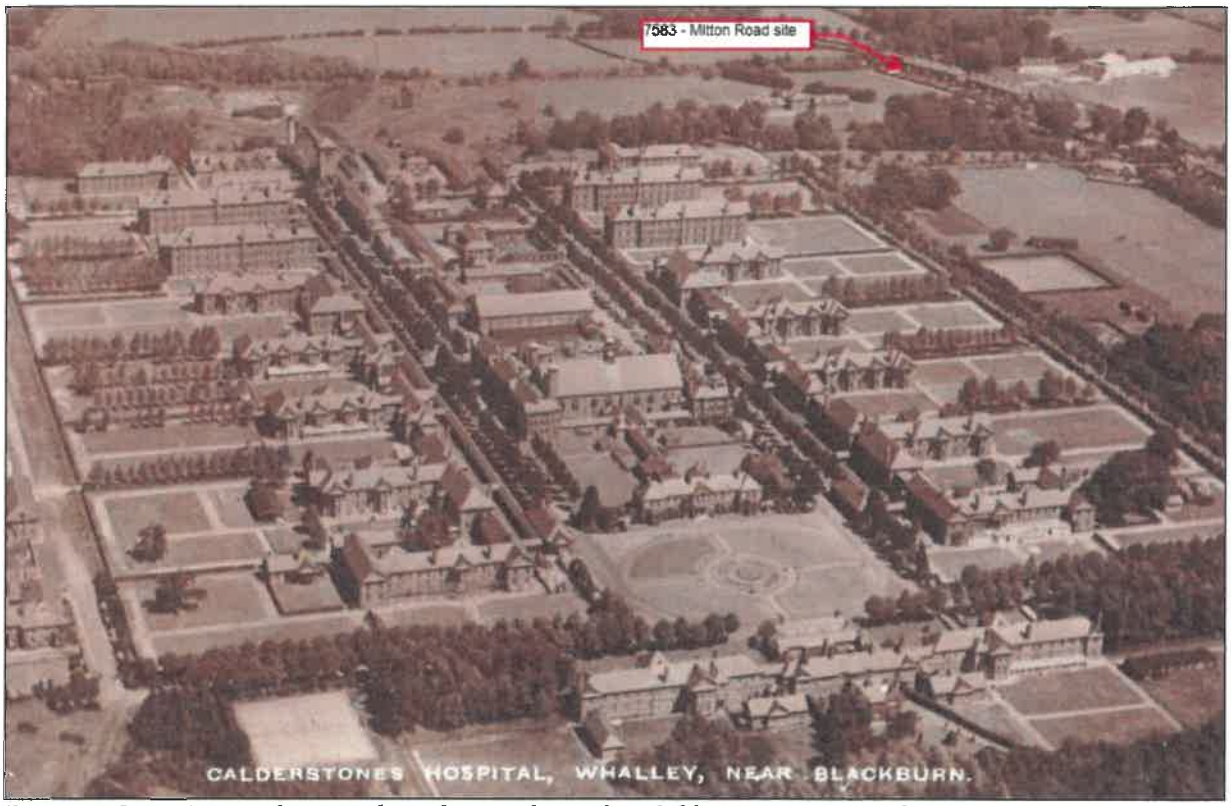
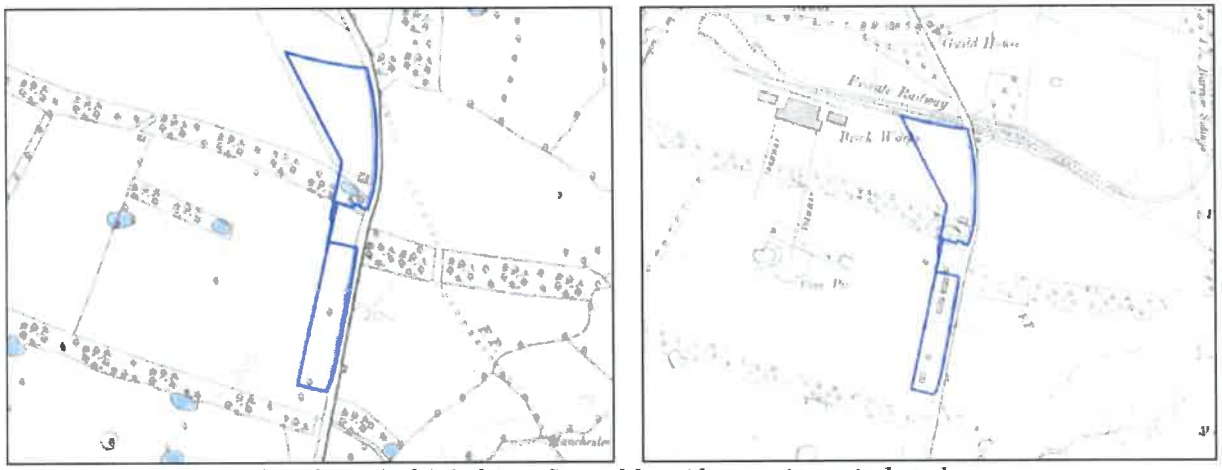


Figure 5: Annotated aerial photograph of Calderstones Hospital, original image from https://www.countyasylums.co.uk/calderstones-clitheroe/.

Details of the background reference the original plans were developed from 1904 with land purchased from Brook House Farm (eastern part of the hospital) and Whalley Abbey Estate, with construction commencing from 1910 with bricks from clay dug and fired on the site. The site was originally named as Queen Mary's Military Hospital. The articles reference the presence of a gas works adjacent to a railway line running along the northern periphery of the hospital grounds.

1846-1892: The site consisted of agricultural land with a section of woodland in the south of the northern parcel (refer to Figure 6). To the east of the site was Mitton Road, by 1892 the higher resolution maps indicate the presence of 2 No. former ponds within the woodland in the southern part of the northern parcel, with a small building, likely to be a farm house, situated close to the ponds.



Figures 6 and 7: 1892 (left) and 1912(right) Ordnance Survey Map with approximate site boundary

1910-1912: The 1910 map edition records residential housing in the southern part of the site. Adjacent to the northern boundary of the northern parcel was a railway cutting, referenced as "private railway" running under Mitton Road, and connecting to a large brickworks, situated approximately 90m to the west of the site (refer to Figure 7). The brickworks contained referenced tramways connecting to a clay pit, approximately 200m to the east of the site. A large zone of spoil heap was recorded at the end of the private railway line, 250m to the west of the site.

1932-1999: The 1932 further residential houses had been constructed on the southern parcel and all but the north western part of the northern parcel. Both ponds in the southern part of the site had been infilled and farm houses extended. The brickworks were no longer recorded with construction of large hospital to the west of the site, including area of "*isolation hospital*" and main "*Calderstones Institution (Mental Defectives)*" with staff club, church, swings, football ground, cricket ground, etc. The clay pits were infilled, with areas of spoil and sloping ground recorded close to the former brickworks, approximately 150m from the site. The 1:10,560 scale shows the hospital contained a reservoir approximately 300m to the west of the site, with structures characteristic of a gas works, located approximately 400m to the west of the site (refer to Figure 8).

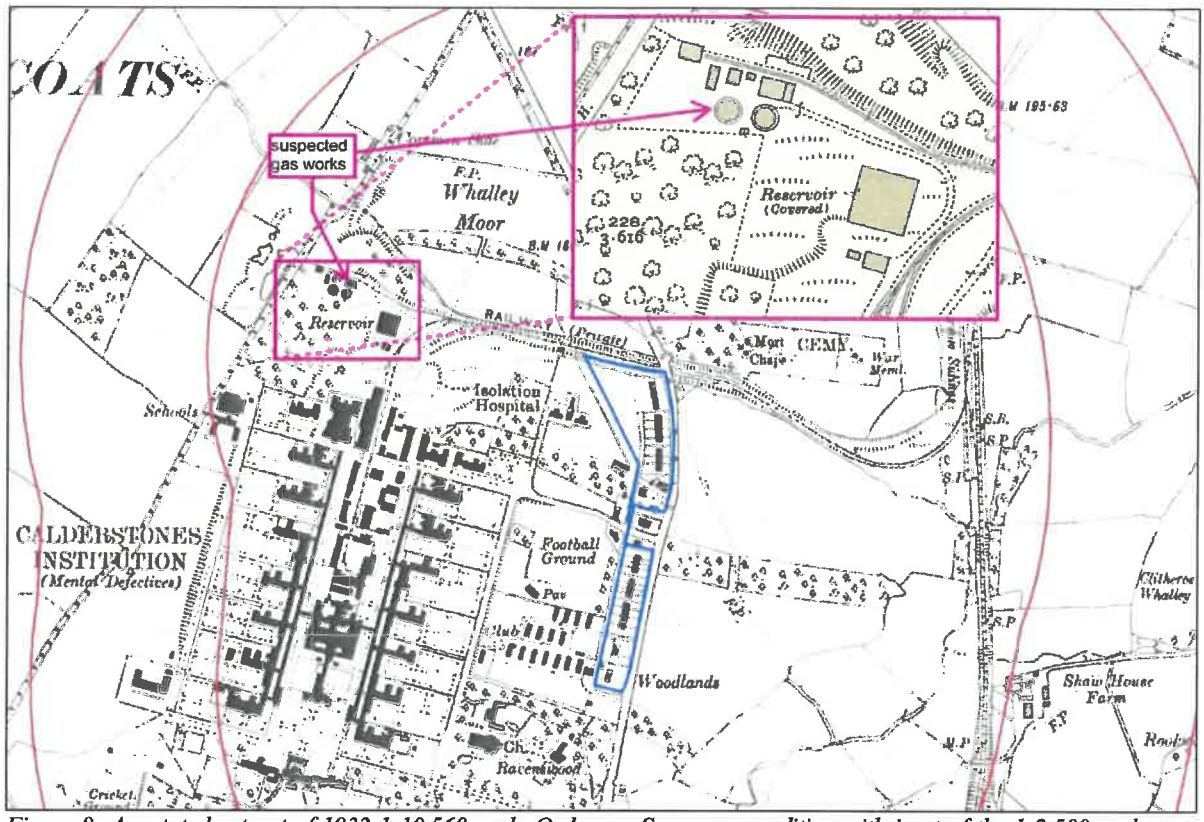


Figure 8: Annotated extract of 1932 1:10,560 scale Ordnance Survey map edition with inset of the 1:2,500 scale map edition showing features characteristic of a gas works approximately 400m to the west of the site.

By 1966 the former farmhouse in the northern parcel was demolished within the area of the farm house and former ponds remaining generally open. 2 rows of adjoining residential garages (parking) were constructed in the central of part of the northern site associated with the adjoining residential properties. The building currently housing an electrical substation adjacent to the southern boundary of the northern parcel was also recorded on this map edition. Between 1950 and 1969 the gas works were removed (following nationalisation, commencing in 1948).

2001-Present: No further changes were recorded to the site during this period. The 2001 map edition recorded the full extent of the hospital to the west of the site as per the earlier editions, although the northern part of the hospital was ongoing demolition by 2001 with initial residential properties constructed as part of the "*Calderstones Park*" residential development (Coopers site reference 2309 – refer to Section 6.0 and Figure 9).

Figure 9: Annotated oblique view aerial photograph from 2001 provided as part of Coopers ground investigation of the adjacent Calderstones Hospital site.

8.0 Hazardous Installations and Development Constraints

(Refer to Appendix 1, 2 and Site Plan in Appendix 13)

8.1 Findings

There are no significant likely hazardous installations identified from public data and records. The response from Ribble Valley Borough Council (Appendix 1) details that they will need to check details of consultation zones for Hazardous Installations, but no further response was provided. Further details of incidents and registers relating to the site are provided within the Groundsure Enviro+Geo Report (hereafter referenced as Groundsure Report) in Appendix 2.

Pollution Incidents: The Groundsure report references 3 No. Environment Agency recorded pollution incident within 500m of the site. Two of incidents relate to the demolition and/or construction on the former Calderstones Hospital grounds with the incidents recorded 304m to 308m to the west of the site. Both incidents were recorded as Category 3 (minor), associated with air (fumes) on 2 July 2001, and land impact (gas and fuel oils) on 20 September 2002. The third pollution incident was located 364m to the north of the site impacting land and water associated with a diesel spillage.

Given the location and nature of the incidents these are not considered to have any significant impact to the proposed development.

Dangerous/Hazardous Sites: The Groundsure Report contained within Appendix 2, includes public records of hazardous installations. This referenced no COMAH (Control of Major Accidents and Hazards), NIHHS (Notification of Incidents Handling Hazardous Substances), Explosive Sites, Planning Hazardous Substance Consents and Planning Hazardous Substance Enforcements within 500m of the site.

Discharge Consents: There are 6 No. recorded discharge consent within 500m of the site detailed within the Groundsure Report. The discharge consents are located between 199m to 458m north of the site to brooks and other tributaries to the River Ribble. 5 No. of the consents have either been revoked or listed as historic, with the only current consent relating to sewage discharges of treated effluent to the Barrow Brook located 435m to the north of the site. This is not considered as likely to have a significant impact to the proposed development.

Current Land Uses: The Groundsure Report identified 1 No. recorded industrial use on site, associated with the electrical substation adjacent to the southern part of the northern site boundary. A further 11 No. industrial sites are registered to be within 250m, as follows:

- 4 No. for infrastructure (substations and tanks/pumping stations for sewers) located 46m to 243m from the site.
- 4 No. for commercial premises opposite the site to the east of Mitton Road (business park, packaging, furniture products, and depot/container storage) recorded as 45m to 132m to the east of the site.
- 1 No. for agricultural use (farming silo) located 100m to the east of the site.
- 2 No. for commercial services registered to residential properties (car cleaning/valet and farm animal feeds).

Historical Industrial Land Uses : The Groundsure report details the presence of 54 No. historical industrial features within 250m of the site. The majority of which are repeat entries on subsequent map editions. There are 6 No. features recorded on the site, all of which relate to the proximity to the railway cutting to the north of the site. The other features referenced relate to the following:

- Cemetery - 19-32m to the north east of the site.
- Hospital, tanks and infrastructure – from 31m to the south west and west of the site.
- Brick works, tile works, clay pits and areas of disturbed ground from 199m to the west of the site.
- Railway cuttings and sidings – (onsite/northern boundary and 478m to the east of the site)

Conservation and Ecology Designations: The Groundsure report details that within 2km of the site the following environmental designations are present:

- 13 No. areas designated as Ancient Woodland (defined as continuous woodland since 1600AD) – These relate to 4 No. named woodlands, located 813m to 1871m from the site in the north west, west, south east, and east.
- 2 No. areas designated as Green Belt (areas designed to mitigate urban sprawl, intended to remain undeveloped) – situated 1352m to the south and 1930m to south east.
- 1 No. SSSI Impact Risk Zone - On site (these relate to initial screening areas where new applications for extraction of gas, oil or minerals may provide a risk to a SSSI).

There are no recorded visual and cultural designated sites within 250m of the site.

There are 21 No. recorded Priority Habitat Inventory within 250m of the site, all of which relate to deciduous woodland, the closest of which are adjacent to the northern boundary and an area to the west of the northern parcel. There is also a Habitat Enhancement Zone 1 situated 156m to the north of the site, the type of habitat is not specified but referenced as typically relating to the Priority Habitat Inventories.

Extensive areas of suspected Himalayan Balsam were identified during Coopers site description, as referenced is Section 5, approximate areas of which are recorded on Coopers Site Plan, Drawing No. 7583/01 in Appendix 13. Surveys by qualified specialists are recommended to identify if any significant plant species are present where treatment would be required.

Hazardous Building Materials: As detailed within Coopers' site description, the walkover was limited to the external areas of the buildings. The buildings consisted of residential houses constructed between 1912 and 1932, and small rows of single storey residential garages constructed prior to 1966. Whilst the residential buildings were constructed prior to peak asbestos use, any refurbishment works may have utilised these products. The garages were constructed during the peak usage of asbestos although no suspected products were observed.

Live Utilities: Utilities plans have been provided indicating the presence of live services including water mains, sewers, gas, telecoms and electricity cables. An electrical substation is also located adjacent to the southern boundary of the northern parcel. It is advisable that all services should be traced and discussions should be held with utilities providers regarding any proposals to divert, adopt or abandon any utilities.

8.2 Conclusions

Based on the findings of our review there are no significant hazardous installations or likely development limitations, although specialist surveys would be required in respect of buildings, ecology, invasive weeds and utilities.

9.0 Landfill Sites and Infilled Ground

(Refer to Appendix 1, 2 and 13)

9.1 Findings

According to the Groundsure Report (Appendix 2) and Local Authority consultation (Appendix 1) there are 2 No. recorded Environment Agency registered Historical Landfills situated within 250m of the site. These relating to filling within the grounds of Calderstones Hospital between 160m to 187m from the site. The registers provide the following details:

- Calderstones Hospital A – 160m west of the site, consisting of inert commercial and household waste, last deposited on 31/12/1974.
- Calderstones Hospital B – 187m west of the site, consisting of inert, commercial, and household waste, deposited between 1960 and 1992.

The nature of the waste within these landfill areas was determined as part of the former ground investigations for Calderstones Hospital, discussed in detail within Section 17 (Hazardous Ground Gas).

The Groundsure Report details the records of 2 No. historical mineral extractive industries within 500m of the site, as registered by the British Geological Survey "*Britpit*" database, these relate to Whalley Moor Brick Works, located 229m to the west of the site, and Whalley Moor Tile Works, located 430m to the west of the site.

The Groundsure Report also identifies the presence of 29 No. potentially filled sites within 250m of the site. These relate to any recorded slopes, embankments, pits or regrading evident on historical Ordnance Survey maps, many of which are the same features on subsequent map editions. Of the potentially infilled sites, 6 No. are referenced within the site, all of which relate to area defined land containing brick works, or the railway cutting beyond the site boundary.

Further discussions on the potential influence of locally filled ground are contained in Section 17.

10.0 Geology, Hydrology & Hydrogeology

10.1 General

The following section is based upon desk study information only. For details of the findings of the ground investigation and ground conditions refer to Section 14. The following sources of information have been assessed:

- 1:10,560 scale Geological Map - National Grid Series, Sheet SD73NW
- 1:50,000 scale online maps – British Geological Survey (BGS) website.
- Groundsure Report (Appendix 2)

10.2 Drift

According to the BGS maps the site is recorded as underlain by Devensian Till (formerly Boulder Clay).

10.3 Bedrock

The site is recorded on the Geological Maps to be underlain by Mudstone of the Clitheroe Limestone Formation and Hodder Mudstone Formation, which is Carboniferous in age (337-347 million years old). No dip direction or angles are provided within the site with highly variable readings locally.

10.4 Geological Faults

None in the vicinity of the site.

10.5 Groundwater Vulnerability and Hydrogeology

The site is located outside of any designated Groundwater Source Protection Zones.

The Glacial Till across the site is designated as a "Secondary Aquifer – Undifferentiated Layer." This is described as "*assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.*"

The bedrock of Clitheroe Limestone Formation and Hodder Mudstone Formation is designated as "Secondary A Aquifer", described as "*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.*"

The Groundsure Report records 2 No. historical licensed groundwater abstractions within 2km of the site:

- 982m to the north west, licensed in 1998, "General use relating to second category (medium loss)" and referenced as "Middleton", no volumes provided.

- 1744m to the north east of the site, licensed in 2004, "General use relating to second category (medium loss)" and referenced as "Pendle View Fisheries Ltd", no volumes provided.

10.6 Hydrology

The closest surface water bodies to the site are unnamed tributaries of the River Calder. The tributaries are located approximately 36m north east to 62m south of the site. The tributaries confluence with the River Calder approximately 760m to the south west of the site.

The Groundsure Report records 2 No. active surface water abstraction license within 2km of the site.

- 1515m south east of the site – annual volume of abstraction is 118,800,000m^3 (4 cumecs) for hydroelectric power generation at Whalley Weir.
- 1947m east of the site – annual volume of abstraction of 238,937m^3 (654m^3 daily) from reservoir at Barrow for fish farm/cress pond through flow by Pendle View Fisheries.

10.7 Flood Risk

The site is not situated within a zone of potential flooding from rivers and seas, which would be designated as Zone 1 in accordance with National Planning Policy Framework. Site specific assessments of flood risks are not part of the remit of this report and specialist advice is recommended to assess these risks, where required.

10.8 Mineral Safeguarding

Where mineral resources are present the mineral planning authority may designate areas as Mineral Safeguarding Areas (MSA) and Mineral Consultation Areas (MCA). These are aimed to safeguard areas from unnecessary sterilization by non-mineral development. The BGS Mineral Resources maps designate the areas of potential mineral resources and where active/lapsed planning permission was granted for mineral extraction. The BGS Lancashire Mineral Resources Map defines the site to lie outside of any defined mineral resources.

10.9 Oil and Gas Production

The Oil and Gas Authority website details the site is situated within a region of licenses for future hydraulic fracturing (or fracking) of shales (primarily Bowland Shale Formation) for gasification is present (License No. PEDL271). Individual sites are subject to planning conditions which would consider the use in the context of the land use in the area. Coopers cannot comment on the reported safety, policy or environmentally sustainability of these operations, although consider the potential for future drilling for exploration or abstraction wells close to the site to be relatively low given the context of the site and the geological conditions.

10.10 Subsidence Hazards

The Groundsure Report notes that the site is designated as very low risk, or negligible risk from compressible ground, collapsible ground, ground dissolution, landslides, running sands or shrinking and swelling clays. As this information is based upon generic assumptions from geological maps these aspects are superseded by the site-specific ground conditions and findings, discussed in subsequent sections of this report.

11.0 Environmental, Archaeological, Ecological and Conservation Issues

(Refer to Appendix 1 and 2)

11.1 General

The determination of important archaeological, ecological or conservation constraints would require assessments by suitably qualified persons and are considered beyond the scope for appraisal within this report.

The Groundsure Report (Appendix 2) details sensitive conservation and ecological designations within 1km of the site, which are:

- 13 No. areas designated as Ancient Woodland (defined as continuous woodland since 1600AD) – These relate to 4 No. named woodlands, located 813m to 1871m from the site in the north west, west, south east, and east.
- 2 No. areas designated as Green Belt (areas designed to mitigate urban sprawl, intended to remain undeveloped) – situated 1352m to the south and 1930m to south east.
- 1 No. SSSI Impact Risk Zone - On site (these relate to initial screening areas where new applications for extraction of gas, oil or minerals may provide a risk to a SSSI).
- 21 No. recorded Priority Habitat Inventory within 250m of the site, all of which relate to deciduous woodland, the closest of which are adjacent to the northern boundary and an area to the west of the northern parcel.
- A Habitat Enhancement Zone 1 situated 156m to the north of the site, the type of habitat is not specified but referenced as typically relating to the Priority Habitat Inventories.

Consultation is advised with the Local Authority on any specific considerations with respect to environmental, archaeological, ecological and conservation issues and any further reports required.

Consultations with Ribble Valley Borough Council (Appendix 1) details there are trees within and adjacent to the site covered by Tree Preservation Orders. Refer to Section 21 for further details.

11.2 Conclusions

Based on the findings of our desk study, we do not anticipate that the site is likely to be significantly affected by environmental, archaeological, ecological, or conservation issues. It is advisable to contact the local authority planning department regarding any limitations or restrictions associated with the proposed development.

12.0 Coal Mining and Brine Extraction

(Refer to Appendix 2)

12.1 Brine Subsidence

The Groundsure Report (Appendix 2) defines the site as being outside of a zone of historical brine abstraction, with no soluble rocks identified. The site is therefore not at risk of brine subsidence.

12.2 Coal Mining – Consultation Areas and Risk Designation

According to the Groundsure Report (Appendix 2) the site lies outside of a Coal Authority reporting area, where no further information from the Coal Authority is required. The site is therefore not at risk of historical coal mining influence.

13.0 Radon

(Refer to Appendix 2)

The Groundsure Report (Appendix 2) and BRE 211 *Radon, Guidance on Protective Measures for New Buildings,* the site is located within an area where <1% of properties are above the action level. This is designated as a level where no special precautions are required for new buildings.

14.0 Ground Investigation

(Refer to Appendices 4, 5 and 13).

14.1 Methodology

The ground investigation by Coopers was designed to disclose the typical ground conditions across the site and target potential abnormal ground conditions. The investigation required boreholes for the purposes of installation of monitoring wells along with in situ testing for geotechnical appraisals. These were supplemented by additional trial pits for the purposes of delineating ground conditions.

The site development boundary changes between undertaking the intrusive investigations and the writing of this report, adding a section of land adjacent to the eastern part of the southern parcel. The site investigation boundary in relation to the development boundary are shown on Coopers Site Plan, Drawing No. 7583/01 in Appendix 13.

No investigation was possible within the existing residential buildings, nor within gardens of occupied housing. A network of live services limited the methods of investigations within the non-occupied residential gardens. Areas of invasive weeds (Himalayan Balsam) were identified within open parts of the site, which were therefore considered in accessible for investigation.

Coopers undertook the following:

- 8 No. small diameter boreholes (referenced WS01 to WS08) up to 5.45m in depth.
- 12 No. trial pits (referenced TP01 to TP12) up to 3.0m in depth.
- 15 No. hand dug trial pits (referenced HD01 to HD15)

All exploratory hole positions and samples are shown on Coopers Drawing No. 7583/01 in Appendix 13, with copies of exploratory hole logs contained in Appendix 4 and 5.

14.2 In-situ Testing

Boreholes by Coopers included Standard Penetration Tests (SPTs) at 1m intervals. Coopers small diameter boreholes and trial pits also included hand shear vane readings of natural clay. These works provided specific geotechnical information for use in the foundation appraisal, contained in Section 23.

14.3 Monitoring Wells

Monitoring wells were installed in the small diameter boreholes to assess the potential presence of hazardous ground gases. Details of the monitoring wells are provided on the boreholes logs and were constructed in accordance within BS8576. Discussions of the response zones and sampling are included in Section 17.

14.4 Sampling Strategy

Coopers investigation and sampling looked to address the key considerations for the proposed site development with consideration of the previous uses of the site. This included sufficient coverage and targeting to identify typical ground conditions and potential variations with likely abnormal conditions.. Coopers Drawing No. 7583/01 in Appendix 13 includes an overlay of the historical buildings and features, in conjunction with the exploratory holes by Coopers.

Types of laboratory suites by Coopers were scheduled for chemical testing based upon the likely types of contaminants in accordance with series of BS ISO 18400 (2017) "*Soil Quality – Sampling*" and visual/olfactory observations during the exploratory holes. The suites of testing by Coopers were reflective of the conceptual model and ground condition. The initial conceptual model and basis of the sampling strategy are discussed in further detail in Section 16 of this report.

Chemical and Geotechnical laboratory testing was commissioned by Coopers for testing by Element Materials Technology Ltd, and Murray Rix to define the typical properties of the strata.

Copies of the chemical test results are provided in Appendix 7 and the geotechnical testing in Appendix 8.

15.0 Ground Conditions Encountered

(Refer to Appendices 4, 5 and 13)

15.1 Hardstanding, Foundations and Services

The type and nature of the substructures to the housing and garages within the site are unknown.

A tarmac hardstanding access road to the rear of the properties with the garages was recorded within the northern and southern parcels of the site.

Services to the housing were live at the time of the site investigation, with records indicating the majority of the connections were to the rear of the properties, with the exception of overhead telephone connections to the front. A mains sewer was recorded within the northern part of the northern parcel. An electrical substation was recorded beyond the southern boundary of the northern parcel.

An unrecorded culvert was encountered within trial pit TP3 in the northern part of the site. The culvert contained backed up waters, but with no flow evident, and suspected to have been associated with drainage from the former hospital.

15.2 Topsoil

Topsoil was identified within all of the trial pits and window samples across the site, identified to be between 0.1m to 0.55m thickness. The topsoil was predominately clayey and sandy.

15.3 Madeground

Madeground was limited to areas of the former ponds to the south of the northern parcel located close to the active off-site electrical sub-station, 2.0m in depth. Madeground was identified to be clay with inclusion of anthropogenic materials such as ash and clinker, brick fragments, concrete, ceramics, glass and plastics.

Other areas identified to contain madeground were the former garden areas from the clay madeground described above. They were highly localised and comprised of reworked natural clay.

15.4 Natural Drift Strata

Clays

Glacial clays were found to be present across the site and broadly heterogenous in nature. They were found at depths up to 5.0m as identified within WS01, WS04, WS06 and WS08.

The clays were brown or brown with grey mottling and the consistency was noted to be firm to very stiff (predominantly stiff) with exception of TP12 which was observed to be grey soft (20kPa) below 2.0m of madeground former pond material. Whilst the strength recorded in the field using a shear vane varied from medium strength to very high strength (56kPa->192kPa). This does not take into account readings taken from window sample holes which are more disturbed. TP02 and TP04-TP06 noted to have a very silty clay/very clayey silt strata at varying depths between 1.60m and 2.25m.

15.5 **Bedrock**

During the site investigation no bedrock was encountered.

15.6 **Groundwater**

Groundwater ingress was identified within TP12 at 2.0m at the base of the madeground, rising to 2.0m after five minutes. All other excavated or drilled locations did not find groundwater.

16.0 Contamination Assessments

(Refer to Appendices 2, 3, 6, 7, 9, 11, 12, 14 and 15)

16.1 **General**

Coopers were commissioned to undertake an intrusive investigation with assessment of potential contamination. The investigation was designed to target the potential sources of contaminants and delineate, where possible, the extent.

The site is proposed for residential development by Prospect Homes, comprising of 51 No. residential units, including a combination of traditional detached and semi-detached buildings with associated roads, private driveways, garages, gardens and landscaping. The proposed development layout is shown on Eden Rose Consulting Sketch Layout 02 and 03, Drawing No. MR/W-SJS-SK02 & 03, an extract of which is overlain on Coopers Drawing No. 7583/Fdz, revision A, within Appendix 13

This is an appraisal of the issues identified to date regarding contamination with respect to future residents occupying the site, contractors working on site, the surrounding residents/ workers/members of the public and the surrounding environment.

Details regarding the legislation which sets the framework for contaminated land assessment have been included within Appendix 9.

16.2 **Summary of Initial Conceptual Site Model – Sources/Exposure Pathways/Receptors.**

The initial conceptual model has been provided based upon the current use of the site, disclosed during the site walkover (refer to Section 5) and former use of the site based upon desk study data (refer to Section 7). The site formerly consisted of agricultural land and 2 No. former ponds from 1846. The ponds were infilled and residential houses constructed on the site between 1910 to 1932. Rows of detached garages were added by 1966.

Approximately 200m to the east of the site was a former brick works and associated clay pit, last recorded in 1912, and infilled prior to construction of Calderstones Hospital, which opened in 1915. An existing electric substation is present adjacent to the southern boundary of the northern parcel. The substation was constructed prior to 1966.

Potential Source of Contaminants – General madeground containing inorganic and PAH compounds.

The infilling of the former ponds, and reworking of the shallow soils associated with development and use as residential housing have the potential to have introduced materials containing

contaminants posing risks to human health. The most common contaminants within reworked soils are inorganics and PAH compounds associated with mixed wastes primarily derived from combustion processes. Whilst materials such as ash and clinker commonly contain elevated concentrations of these contaminants, the determination of the potential presence of elevated concentrations requires laboratory testing with rare visual or olfactory indication.

The site investigation identified the madeground to be generally thin to absent over the site, generally consisting of reworked natural strata or topsoil with occasional inclusions of brick or organic inclusions. The main exception was the former ponds where layers of ash and clinker were identified.

Potential Source of Contaminants – Petroleum Range Hydrocarbons

The use as residential housing can involve discrete release of relatively small volumes of fuels or oils associated with a variety of potential uses (e.g. vehicle maintenance) although the volumes are typically small and localised. These are commonly identified via visual or olfactory means and where detected requires specific testing to determine the concentrations and associated risks. Where present petroleum hydrocarbons can migrate with preferential groundwater movements and pose risks to human health through inhalation, dermal and secondary ingestion, as well as to the surrounding environment.

The site investigation identified no visual or olfactory indication of petroleum hydrocarbons during the investigation works.

Potential Source of Contaminants – Asbestos Fibres or Asbestos Containing Materials (ACMs).

Asbestos is listed as a common type of contaminant in all DoE industrial profiles. The residential houses within the site were constructed prior to peak asbestos use, although asbestos products were in use at the time of construction and may have been used in subsequent refurbishment works. The introduction of madeground within filling or reworking of soils will also commonly contain inclusions of brick derived from historical demolition where asbestos fibres or ACMs are also commonly found.

Whilst large fragments of ACMs may be visually identified during ground investigations, the presence of loose fibres, fibre bundles or discrete fragments will generally only be identified through laboratory testing. Testing is commonly targeted towards materials where inclusions of brick or other demolition derived materials are present.

The primary risks posed by asbestos are from inhalation during disturbance of soils containing asbestos, although secondary inhalation pathways from dermal/contact with soils can occur, particular where soils are brought into homes on shoes or clothes, contributing to the indoor dusts.

Th site investigation identified no visual indication of ACMs within the soils, although madeground with brick/ceramic inclusions was present, indicative of mixing of materials derived from former construction.

Potential Source of Contaminants – Electrical Substation.

Electrical substations are commonly associated with the historical use of Polychlorinated Biphenyls (PCB's). PCB's were used between the 1950's and the late 1970's as a dielectric fluid in most capacitors (used to stabilise fluctuations in electrical current, mainly on industrial sites) and <1% of transformers (used to change voltage of power supply). PCB's are a restricted substance which is prohibited for manufacture in the UK, first controlled under the 1986 Control of Pollution Regulations (*Department of Environment Industry Profile – Engineering Works: Electrical and Electronic Equipment, Manufacturing Works*).

PCB's provide a risk to human health and ecosystems, which are recorded to cause chloracne (skin condition) in humans and found in animals to reduce the autoimmune system, damage liver, effect reproduction and cause cancers, amongst other health effects (*HSE website*). PCB's are stable and highly persistent once released into the environment, characterised by their very low mobility, as highly viscous fluids or solids. PCB's bioaccumulate within a food chain and considered a high risk to fresh water ecosystems, although low risk to groundwater (*Department of Environment Industry Profile – Engineering Works: Electrical and Electronic Equipment, Manufacturing Works*).

Given the age of the adjacent substation these may have used or contain dielectric fluids with PCBs. If released during installation or maintenance these are likely to be present in shallow soils in close proximity to the source, based upon the viscosity of the products. These will commonly have no visual or olfactory indication of the potential presence.

Pathway of Mobile Contaminants.
The presence of low permeability glacial till within the site would be anticipated to limit significant migration of mobile or leachable contaminants. Where present these will commonly form discrete and complex migration pathways following low points within the clays such as foundations and services, and collect within higher permeability strata such as pockets of sand or madeground overlying clays.

Receptors – Human Health.
The primary human receptors are assumed to be the future residents with exposure to contaminants within gardens or properties through inhalation (vapours or dusts), dermal (soil contact), or ingestion (via hand to mouth or particles adhered to vegetable growth). Other common human health receptors can be contractors on site, adjacent residents, utilities maintenance workers and landscape gardeners. Whilst it is difficult to account for non-conventional uses of the site the likely exposure of these key receptors is considered in the context of the contamination findings in subsequent sections.

Receptors – Controlled Waters.

The groundwater is not considered as a particularly sensitive receptor, the site is situated outside of any designated groundwater source protection zones, with underlying low permeability glacial till, designated as a "Secondary Aquifer – Undifferentiated Layer." This is described as "*assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.*" The bedrock of Clitheroe Limestone Formation and Hodder Mudstone Formation is designated as "Secondary A Aquifer", described as "*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.*" Limited continuity between drift and bedrock is likely, given the low permeability of the drift strata and limited potential sources on site.

The closest surface water bodies to the site are unnamed tributaries of the River Calder. The tributaries are located approximately 36m north east to 62m south of the site. The tributaries confluence with the River Calder approximately 760m to the south west of the site. There are limited potential sources with no significant migration pathways, although should mobile contaminants be present then consideration of the migration pathways to these receptors would be required.

16.3 Investigation Strategy and Sampling Protocols

The ground investigation was designed to get a general coverage across accessible areas of the site, and target specific areas to address local variations. The targeted positions were:

- Areas of former ponds.
- Adjacent to electrical substation.

The investigations positions and types were limited by the presence of existing buildings, occupied gardens, services and invasive plant species (suspected Himalayan Balsam) within the site. Between the site investigation and the writing of this report the development site boundary changed with areas added to the site, primarily within the eastern part of the southern site boundary. The investigation included a combination of small diameter boreholes and hand dug pits within the unoccupied gardens and mechanical excavated trial pits within the open areas of the site. The investigation included a total of the following:

- 8 No. small diameter boreholes.
- 12 No. mechanical excavated trial pits.
- 17 No. hand dug pits.

Based upon the initial conceptual model and findings from the exploratory holes, Coopers scheduled the following samples for initial laboratory testing by Element Materials Technology (EMT):

- 24 No. samples for standard inorganics, PAH-16, pH, TOC, and sulphates).
- 23 No. samples for asbestos.
- 4 No. samples for PCB (WHO-12 suite).
- 3 No. samples for TPH (CWG suite with aliphatic and aromatic banding by carbon range).

Samples were taken on the day in appropriate containers for laboratory testing and stored within cool boxes, for return to refrigerators for cold storage prior to issue to the laboratory within 5 days to ensure samples were appropriate for the forms of chemical testing and not listed as deviating by the laboratory.

16.3 Contamination Results

The laboratory testing was scheduled in batches following a phased approach to the investigation. Analysis was undertaken by Element Materials Technology (EMT) for accredited analysis. The results of the testing are provided within the following laboratory certificates, contained in Appendix 7:

- EMT Test Report No. 20/11874, dated 4 September 2020.
- EMT Test Report No. 20/12011-2, dated 8 September 2020.
- EMT Test Report No. 20/12889, dated 22 September 2020.

Samples were screened against available generic screening values for residential gardens with plant uptake, contained in Appendix 9 with associated explanation sheets. The results of which are discussed in subsequent sections.

Inorganic and PAH compounds

Elevated concentrations of contaminants were identified within 4 of the 25 No. samples tested, as detailed within Table 1. The results disclosed the majority of the site to contain no elevated contaminants.

Table 1: Elevated inorganics and PAH compounds

Hole Ref.	Depth (m)	Strata	Arsenic	Lead	Vanadium	Zinc	Benzo(a)anthracene	Benzo(a)pyrene	Chrysene	Dibenzo(ah)anthracene	Indeno(123cd)pyrene
HD8	0.05	Madeground (Topsoil)	65.3	208	84	-	-	-	-	-	-
HD9	0.10	Madeground (Topsoil)	64.3	294	87	404	4.85	5.14	-	-	-
HD13	0.10	Madeground (Topsoil)	-	305	166	-	9.61	6.65	6.93	0.82	4.33
HD15	0.10	Madeground (Topsoil)	53.1	443	95	321	5.14	5.77	6.21	-	3.76
		Tier 1 (Threshold)	**37**	**200**	**79**	**300 (*1)**	**3.1**	**5.0**	**6.0**	**0.76**	**3.18**

**1 – Phytotoxic Threshold varies by pH, value shown is applicable to the pH of these samples.*

Local results indicated no elevated concentrations with madeground, natural strata, topsoil from the field area in the north west and the large gardens to buildings in the south. The topsoil for the terraced/housing was identified to have elevated concentrations in residential gardens within 4 of the 8 No. samples tested. These may be localised under the influence of activities specific to each garden.

Asbestos Containing Soils (ACS) and Asbestos Containing Materials (ACM)

As outlined in the initial conceptual model, the potential presence of asbestos fibres or fragments of ACM are considered as likely based upon the previous use and nature of the materials encountered. Coopers did not identify any suspected ACM fragments during the investigation. A general array of testing across the site included a relatively high frequency of samples to disclose if asbestos was present in specific areas or more generally over the site.

Laboratory testing was undertaken on 23 No. samples of madeground or reworked topsoil across the site. 2 No. samples were identified chrysotile fibre bundles, both of which were from borehole WS4, situated within the former pond. The samples identified were from the topsoil at 0.2m depth, and the base of the madeground at 3.0-3.4m depth. Coopers scheduled quantification which identified the amount of asbestos as <0.001% in both samples.

Further discussions and assessments of the presence chrysotile fibre bundles are detailed within the assessment section.

Petroleum Range Hydrocarbons

No visual or olfactory evidence of petroleum range hydrocarbons were identified by Coopers field staff. Chemical testing of nominal recorded samples identified no elevated concentrations above thresholds for residential gardens.

Polychlorinated Biphenyls (PCBs)

In accordance with the conceptual model laboratory testing for PCBs was undertaken on 4 No. samples from shallow soils close to the offsite electrical substation to determine if these substances were present within this area. The laboratory testing identified no detected concentrations and therefore considered to not impact the soils within the site.

Groundwater Sampling and Results

No water sampling was undertaken, given the nature of the ground conditions, contaminants identified, groundwater receptors and proposed remediation, the risks to controlled waters are insignificant.

16.4 **Contamination Assessment – Inorganic and PAH contaminants, forensic assessments and recommended remedial actions.**

As detailed in Section 16.3 the topsoil within 4 No. of the 8 No. samples taken from the terraced/mews gardens identified elevated concentrations of inorganic and PAH contaminants. These were sporadic across the gardens and therefore considered likely to relate to activities of the individual residents rather than in relation to the soils originally placed in the residential gardens prior to construction of the houses. An indicative plan showing the locations of topsoil testing across the site is shown in Figures 10 and 11 below.

Figures 10 and 11: Showing areas where topsoil was identified to contain elevated concentrations of inorganic and PAH compounds within northern parcel (left) and southern parcel (right). NTS.

The likely source of the contaminants is hard to judge given the variable potential to introduce contaminants to shallow soils during the residential use. Commonly residents mixed materials with the soils to improve soil fertility which can introduce inorganic or PAH compounds to the soils. Also historical storage of coal can result in slight elevations of these compounds.

An initial forensic assessment of the PAH compounds was undertaken utilising a source signature double ratio plot to determine potential sources for these contaminants. This is derived from the relationship of 4 No. PAH compounds (benz(a)anthracene, chrysene, fluoranthene and pyrene) to determine whether the high concentrations of PAH are anticipated to be petroleum, combustion or coal derived. It is considered possible to differentiate petroleum based hydrocarbon concentrations from natural organic units by determining the rates of combustion and the relative losses of PAH compounds within samples analysed. Forensic environmental scientists, predominately situated within the United States, have investigated the relationships between many combinations of PAH compounds and it is generally considered the 4 No. compounds mentioned above have a suitable and representative correlation for this assessment.

The method of assessment requires the 2 ratios of the 2 pairs of diagnostic source ratio compounds to be calculated, and the results plotting on a graph. The graph has areas compartmentalised into petroleum, combustion and coal derived sources, with plant derived sources situated in the bottom right hand corner. These designations have been derived from extensive work completed by Environmental Forensic scientists such as H J Costa and T C Sauer.

With regards to petroleum derived products, the fresh compounds tend to be situated on the mid left-hand side of the graph, with combusted and heavier fuels moving northeast across the graph. Coal is generally positioned in the top right area of the graph, with combustion products such as ash and clinker, soot and burnt coal being situated between coal and petroleum sections. It should be noted that smokeless fuels appear within the mid petroleum derived column as the processes involved in the formation of this fuel includes the removal of certain PAH compounds. Peat forms PAH compounds due to the degradation of organic matter and is represented in the bottom right hand corner of the graph. Asphalt and coal tar derived tarmac can also be determined from this form of analysis. Details provided explaining the forensic approach have been included within Appendix 10.

The plots of the relationship show the elevated concentrations are all situated within the coal derived section, with extract in Figure 12 below and full sheet outputs within Appendix 10. These therefore support the likely source of the contaminants are from historical coal storage within gardens. These have significantly lower exposure pathways than combustion or petroleum derived sources, where fragments are less likely to be accidentally ingested or inhaled as indoor dusts.

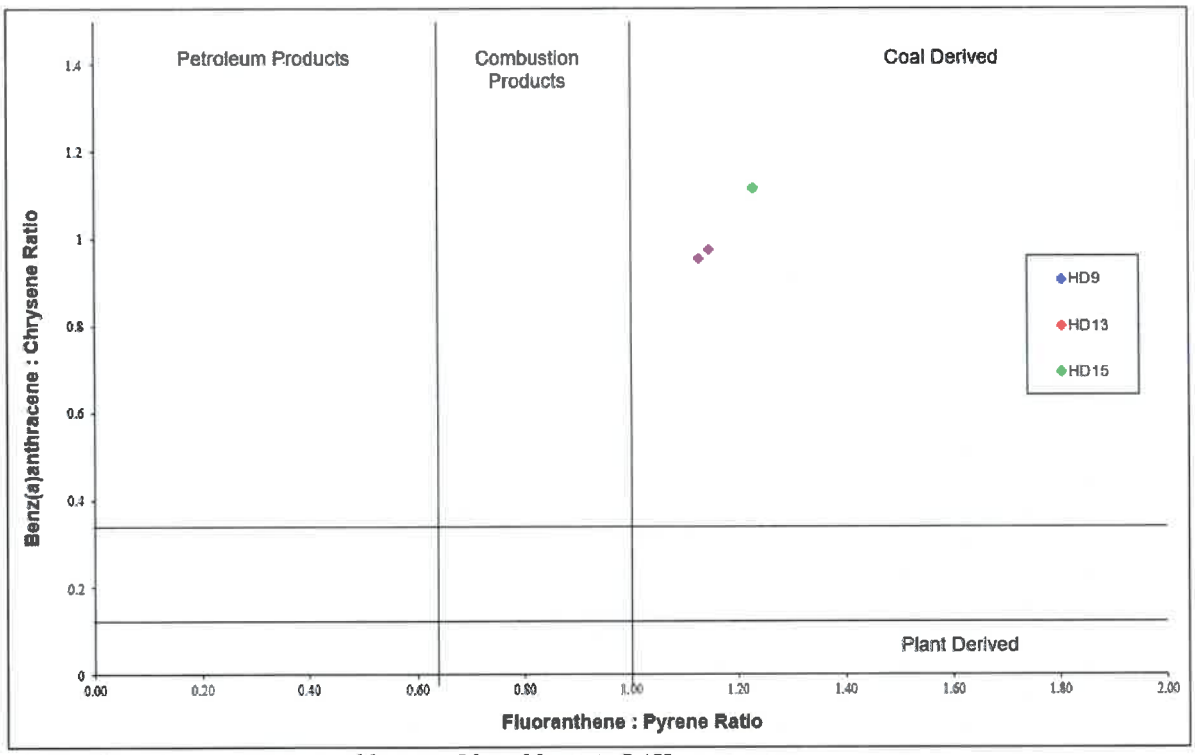


Figure 12: Source Signature Double Ratio Plot of forensic PAH assessments.

The results for samples where fragments of coal are present are also not representative of the material as a whole, therefore indicative that the soils are non-homogenous. To confirm the lower risk source and determine a true representative concentration would require a larger population size and considering assessments in relation to statistical approaches. Previous approaches to statistical assessments of soils were withdrawn on 2 October 2020 and replaced with the CL:AIRE (2020) publication "*Guidance on applying statistics to land contamination decision-making.*"

To allow further assessments of the suitability of groups or gardens it is recommended each area is segregated and stored separately for testing and assessment for the suitability for reuse of the topsoil. It is likely that either treatment or removal of topsoil within areas of suspected Himalayan Balsam are also required. Any soils within these areas intended for reuse would also require testing to determine if suitable for residential gardens.

16.5 Contamination Assessment – Asbestos Containing Soils

Summary of Contamination Results

As outlined in Section 16.3 trace chrysotile asbestos fibres at <0.001% were identified within the deep pond infill and overlying topsoil within this area. The filling of the pond occurred prior to the construction of the houses and contains materials of different provenance than madeground elsewhere on site.

Generic Thresholds and Guidance/Regulations

Specific guidance on assessments and requirements for Asbestos Containing Soils (ACSs) are included in the following:

- CIRIA C733, 2014, "*Asbestos in Soils and Madeground*".
- CL:AIRE, 2016. "*Control of Asbestos Regulations 2012 - Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry guidance.*"
- CIRIA C765, 2017, "*Asbestos in Soil and Made Ground Good Practice Guide.*"

There are no acceptable generic thresholds for Asbestos Containing Soils (ACSs) by designated end use. CIRIA C733 advocates a staged approach with initial qualitative assessment, and where higher risks are identified then further detailed quantitative assessments and exposure assessments should be complete. It should be noted there is no generic threshold for determining relative lower or higher risks, although risk assessment tools have been released by CL:AIRE to aid assessments. The approach of several companies to infer laboratory detection limit or withdrawn ICRCL threshold as an applicable threshold for risk is not appropriate, as detailed within CIRIA C733 "*the value of 0.001 per cent mentioned in ICRCL should not be used in this capacity.*" This is further detailed that "*It is not a level below which ICRCL considered that risks are acceptable or below which potential civil liberties could be assumed to be negligible. So, it is not an appropriate generic assessment criterion for ACSs.*"

At the time of this report production further research is being undertaken by SOBRA and CL:AIRE Joint Industry Working Group with further publications and guidance likely to be generated in the near future. In addition to the normal contaminated land legislation the following regulations and acts apply to asbestos exposure:

- Control of Asbestos Regulations, 2012.
- Health and Safety at Work Act, 1974.
- Construction (Design and Management) Regulations, 2015.
- Management of Health and Safety at Work Regulations, 1999.

Initial Qualitative Assessment Approach

Exposure Risks

The primary asbestos risk to human health is through the inhalation of respirable fibres, where they can provide non-malignant pleural disease, asbestosis, lung cancer, and mesothelioma. CIRIA C733 details that environmental exposure (non-work related) to asbestos is not considered a concern for non-malignant pleural disease and asbestosis, with asbestos related lung cancer and mesothelioma the primary human health risks. The HSE have stated that occupational exposure to asbestos is "*the single greatest cause of work-related deaths in UK*" with an estimated circa 4000 deaths annually in the UK alone (CIRIA C733).

Initial Asbestos Analysis and Supplemental Investigation Method.

To undertake a robust qualitative assessment of the risks a method of qualitative assessment has been assessed by SOBRA within publication "*Summer Workshop Report – Asbestos in Soils*" (2015). The approach is based upon assessments of the nature of the asbestos, the soil characteristics, quality of the data and the receptor types during each activity where asbestos containing soils are liable to be disturbed. The approach assessed by SOBRA has been included into assessment tools by CL:AIRE. The CL:AIRE sheets have been undertaken to supplement the assessment below, however the tools do not allow a justification or discussion of the parameters utilised and therefore Coopers have used these in support of the assessment rather than replacing it, a copy of which has been included in Appendix 8. A summary of the SOBRA approach is provided in Table 2 (below), followed by appraisal of each criteria.

Table 2 - Qualitative Assessments Criteria Based Upon SOBRA Guidance

Assessment Criteria		Explanation
Asbestos Nature	Asbestos type	whether chrysotile, amosite, crocidolite or a mixture of fibre types
	Asbestos composition	whether bonded, unbonded, and whether in a poor or good condition
	Asbestos quantity	percentage asbestos content in the soil
	ACM matrix	the ACM matrix degradation rate – i.e. the potential release rate of asbestos fibres from the matrix
	Respirable fibres	the respirable fibre index – a measure of the proportion of respirable fibres in the ACM, as opposed the total fibre count
Soil Characteristic	Soil type	sand, loam, silt, clay and aggregates
	Moisture content	-
	Depth to ACS	-
	Ground cover and propensity for surface wind erosion	-
	Heterogeneity of ground conditions	spatial scale of variation
Data	Data Quality	Assessment of the ground investigation to characterise the asbestos in soils (see below)
Receptor	Age group	-
	Exposure frequency	-
	Exposure duration	-
	Activity level	Associated with physical intensity of soil disturbance activity and propensity for dust generation

Asbestos Nature:

- Fibre bundles of chrysotile at trace levels (<0.001%).
- The free fibres were present within 2 of the 4 samples taken from WS04 within the former pond, indicating the distribution is variable.
- The potential fibre release to the air from trace fibre bundles would be relatively low.

Soil Characteristics:

- The ACSs were a reworked topsoil containing half brick fragments and within reworked clay with ceramic inclusions. The variations in the soil types would directly correlate with the potential for the fibres to be released from the soil matrix and become airborne (where it becomes a risk to human health via inhalation).
- The clay content of the soils hold a greater proportion of moisture and therefore relatively less liable to release fibres than granular soils. CIRIA C733 details the relative proportion of asbestos release from cohesive strata to sand strata is 40%.

Data Quality:

- The data quality was sufficient to provide a reasonably high confidence in the findings. A large number of exploratory holes and samples were taken.
- It should be made clear that with any investigation there is a potential for undisclosed contaminants to be found. With ACMs the common risk is the deliberate burial in discrete locations. These are difficult to disclose during the investigations and during any soil disturbance contractors would be required to identify any potential disturbance of ACMs and any removal of the materials would be provided with prior regulator notification.

Receptor:

- The receptor sensitivity varies by work activity and stage. The primary phase of soil disturbance would be during the initial soil stripping/segregation where soils are widely disturbed. The receptors most exposed to soil dusts would be the contractors, due to proximity, who are less sensitive receptors, due to age. The adjacent residents would be considered less likely to be impacted (due to proximity to the work area) but more sensitive to exposure (due to age, with infants and children potentially playing in the gardens).
- The receptor sensitivity for adjacent residents during the soil strip is typically low, as the areas identified are not adjacent to the residential gardens. Overall it is recognised that the contractors are commonly at greater risk, although cognisance of airborne particles and mitigation should be addressed via monitoring and managing of the risks. As detailed within CIRIA C733 the airborne fibres decrease exponentially with an increase in soil moisture content. The primary methods of control of fibres is therefore damping of soils during periods of dry weather. The monitoring of airborne fibres during the works would be considered prudent to ensure airborne fibre release is within defined limits.
- The future residents are the most sensitive receptor if asbestos containing soils were present within the garden growing medium, due to the potential for repeat and long term exposure. It is generally accepted that no acceptable amounts of asbestos within residential gardens are acceptable under planning regimes for new developments.

The above qualitative assessment shows the risks posed by asbestos are relatively low and if managed appropriately with damping down (unless wet/raining). The future residents would be protected with no asbestos containing soils within the garden growing medium, therefore the primary risks are during the pre-development soil segregation phase/demolition, due to the high degree of soil disturbance. The contractors would need to be cognisant of these risks and implementing procedures with appropriately trained staff to manage dusts to ensure these works do not provide an unacceptable level of risk to their personnel or the surrounding residents.

The Joint Industry Working Group (JIWG)/CL:AIRE decision support tools for categorisation of works activities involving asbestos in soil and qualitative risk ranking assessment models had been used to support the qualitative assessment and copies are contained in Appendix 10. These are used to aid in qualitative assessments of the risks to receptors. A second calculator to define specific work activities compliant with Control of Asbestos Regulations (CAR) has also been released. The CAR assessment model in relation to protection of workers during proposed soil segregation would be specific to the activities and defined as CAR does not apply due to the trace definition of the source.

The risks to each receptor based upon the JIWG/CL:AIRE tool is detailed in Table 3, based upon assumed the following scenarios:

- Risks to the future residents without remediation (exposure to fibres within the topsoil or subsoil).
- Risks to the future residents after remediation (exposure to fibres below an inert cover system).
- Risks to the contractors on site where topsoil/madeground is disturbed during construction (exposure to fibres).
- Risks to the adjacent residents where topsoil/madeground is disturbed during construction (exposure to fibres).

Table 3: Summary of CL:AIRE Decision Support Tools for Qualitative Assessment of Receptor Risks

Future Residents – No Remediation	
Loose Fibres (chrysotile)	
Source Hazard	Low
Emission-Exposure	Very Low
Receptor	High
Pathway	High
Overall Risk	High
Future Residents – Post Remediation	
Loose Fibres (chrysotile)	
Source Hazard	Low
Emission-Exposure	Very Low
Receptor	High
Pathway	Negligible
Overall Risk	Negligible
Contractors During Development	
Loose Fibres (chrysotile)	
Source Hazard	Low
Emission-Exposure	Very Low
Receptor	Medium
Pathway	Low
Overall Risk	Low
Adjacent Residents During Development	
Loose Fibres (chrysotile)	
Source Hazard	Low
Emission-Exposure	Very Low
Receptor	High
Pathway	Low
Overall Risk	Low

16.6 Further Works

The following further works are recommended to satisfy the risks associated with contaminants identified within the site:

- Submit site investigation report for local authority and NHBC approval.
- Any reuse of waste soils to be registered in accordance with EA guidance.
- Segregate areas of topsoil from terraced housing in separate piles for further testing this may allow areas of the topsoil from the gardens to be reused, subject to assessment.
- The topsoil from the area of the former ponds requires segregating for removal from site. It is unsuitable for use in gardens or under buildings/roads. The soils may also require treatment for Himalayan Balsam prior to disposal.
- The placement of subsoil and topsoil within the area of the former ponds would require validation to satisfy Local Authority and NHBC.
- Any imported soils (if required) should be testing to ensure suitable for use.

17.0 Ground Gas Monitoring and Assessment

Refer to Appendix 4 to 6 and 13.

17.1 General

All information and advice regarding requirements for gas precaution measures are considered to be provisional until approval from statutory bodies has been granted. The assessment within this report includes assessments in relation to provisional monitoring which will need to be confirmed and approved prior to construction.

The approaches to ground gas investigations and assessments of risks are detailed within the following British Standards:

- BS 8485:2015+A1:2019 '*Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.*'
- BS 8576:2013 '*Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).*'

The British Standards also refer to further guidance by CIRIA and NHBC, relating to assessments of gas risks, particularly CIRIA C665: '*Assessing risks posed by hazardous ground gases to buildings*' and NHBC Report No. 10627-R01 (04) "*Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide Are Present.*" It should be noted that the characteristic design models within the NHBC report assumes all properties have a pre-cast suspended slab. We have been advised by the report authors that for other types of slab construction reference should be made to the design and assessment criteria within CIRIA C665.

The ingress of hazardous ground gases into properties can occur through a variety of means, as summarised within British Standards BS8485 and illustrated within Figure 13 below.

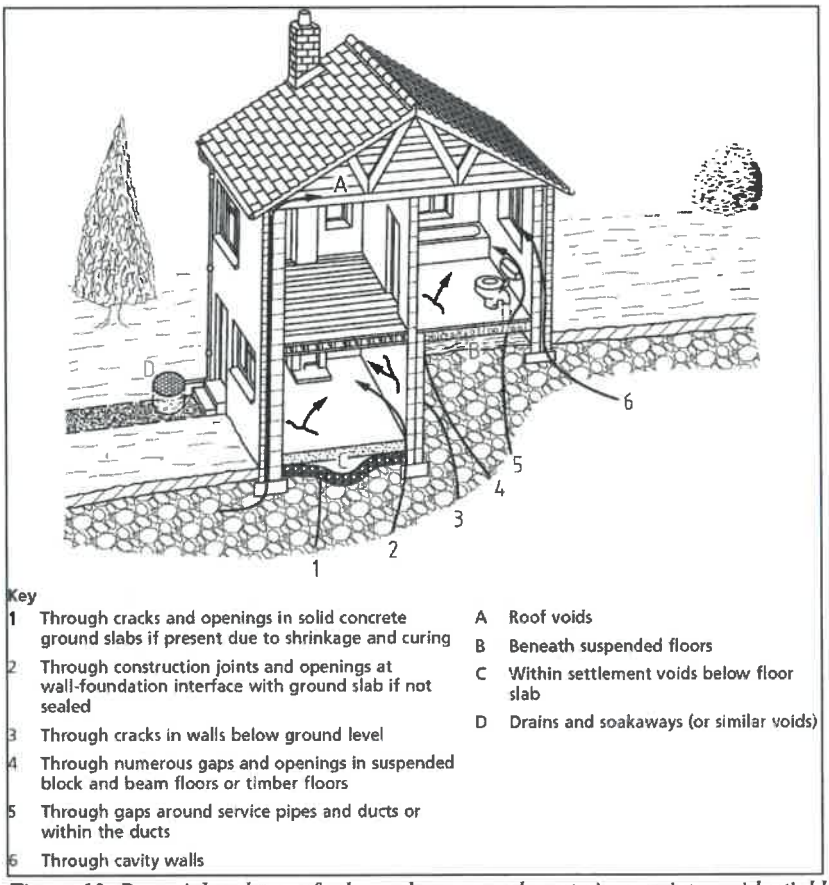


Figure 13: Potential pathways for hazardous ground gas to ingress into residential buildings (from BS8485)

Other papers relating to the design of gas mitigation measures (along with BS8485) are CIRIA C735 "*Good practice on the testing and verification of protection systems for buildings against hazardous ground gases*" and CIRIA C748 "*Guidance on the use of plastic membranes as VOC vapour barriers.*"

Coopers have appraised the potential risk of ground gases to provide an initial conceptual model in terms of source-pathway-receptor following current standards and guidance.

17.2 Initial Conceptual Model - Potential Sources

General: - In accordance with BS8485, Clause 4, "*To complete an assessment of the risks posed by the presence of permanent and other ground gases, the potential sources of gas in and around a site should be identified; guidance on the collection of the relevant information is provided in BS 8576.*"

In accordance with BS8576, Clause 6, the development of a preliminary conceptual site model is the first stage in determining the program for gas monitoring. The initial stage of which is identification of "*Potential sources of hazardous gases based on a review of the current and previous uses of the site and neighbouring land, and the underlying natural and man-made geology and hydrogeology;*"

To aid classification of the risk of different sources of hazardous ground gas a decision matrix has been provided in BS8576, Clause 8.7, Figure 7, which classifies the generation potential of sources of hazardous ground gas from very low to very high.

The review of potential sources and ground conditions identifies the site as at very low to low risk, detailed in the following appraisal.

Landfills (off site): - A detailed review of multiple sources of information has been undertaken to assess the gas generation potential for offsite landfills. The reviews have included the findings of a Groundsure report (Appendix 2), and government database, which disclosed 2 No. former landfills within 250m of the site (refer to Figure 14)

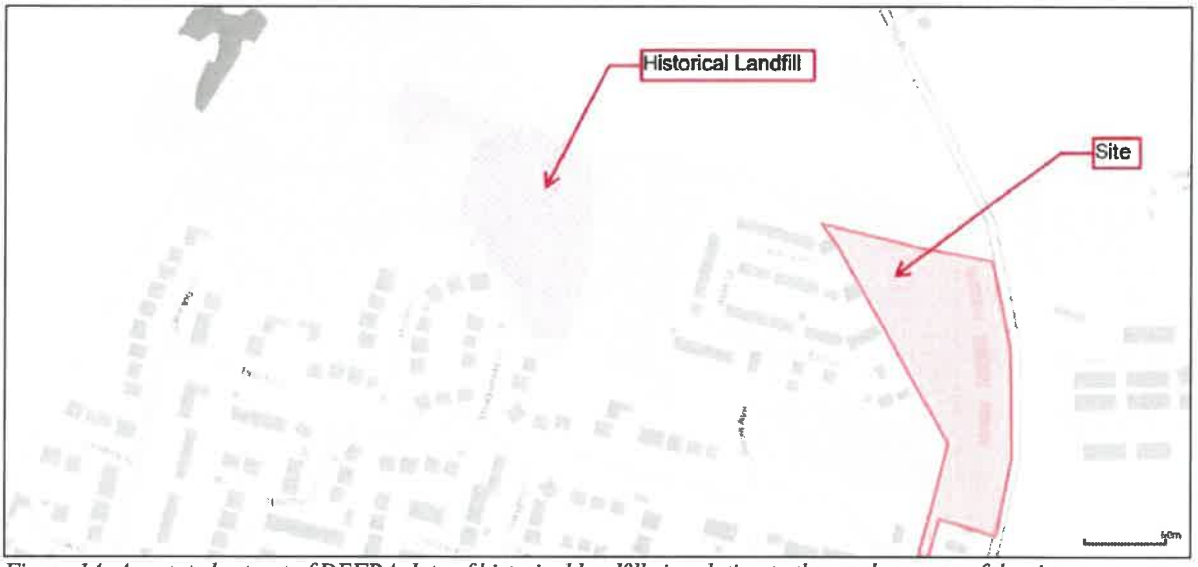


Figure 14: Annotated extract of DEFRA data of historical landfills in relation to the northern part of the site

The types and nature of the hazardous gases generated from landfills depend upon the types of wastes, age and conditions of deposition (such as methods of placement, dewatering, etc). Landfills with a higher degradable organic carbon (DOC) content (such as wood or food wastes, etc,) breakdown through bacterial action generating methane or carbon dioxide (the proportions of which change by availability aerobic conditions). Landfills which contain materials with high DOC have characteristic properties which are clearly identifiable within ground gas monitoring. There are high proportions of carbon dioxide, and methane, commonly in the region of 40-60% (ATDSR), as shown in Figure 15.

The generation rates (and associated flow rates, and travel distance) decrease with time, exponentially, the typical profile is discussed within CIEH publication (2008) "*The Local Authority Guide to Ground Gas.*" The typical gas generation timescales are shown in an extract in Figure 16. The amount of years these take to reach close to a steady state vary significantly, although commonly are considered a lower risk where >50 years has elapsed since deposition. BS8576 (2013) specifically segregates risks posed by landfills by the type of materials and age of deposition.

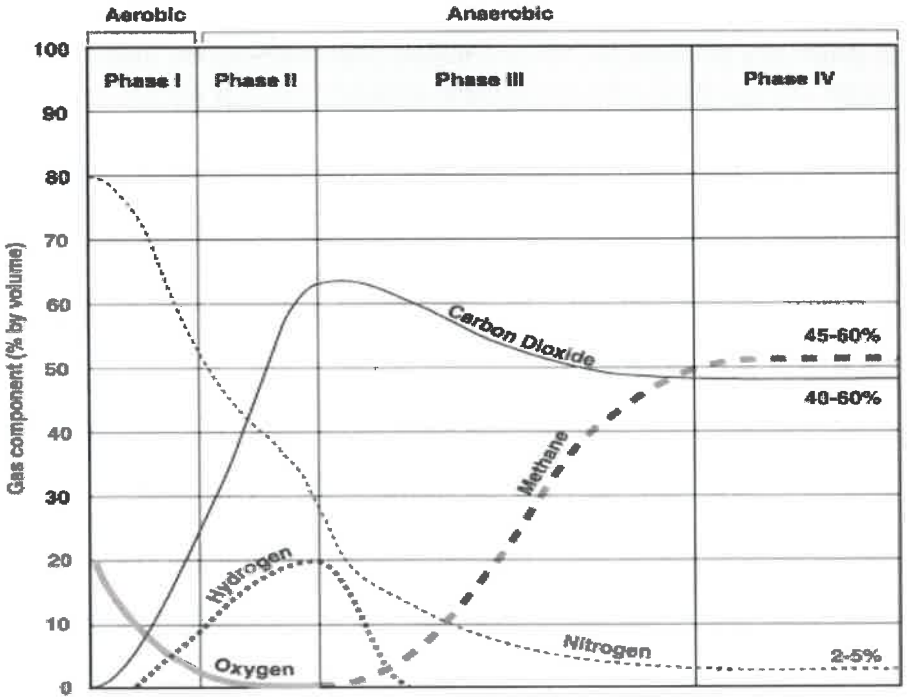


Figure 15: Production phases of typical landfill gas from Agency of Toxic Substances & Disease Registry Website (http://www.atsdr.cdc.gov/hac/landfill/html/ch2.html)

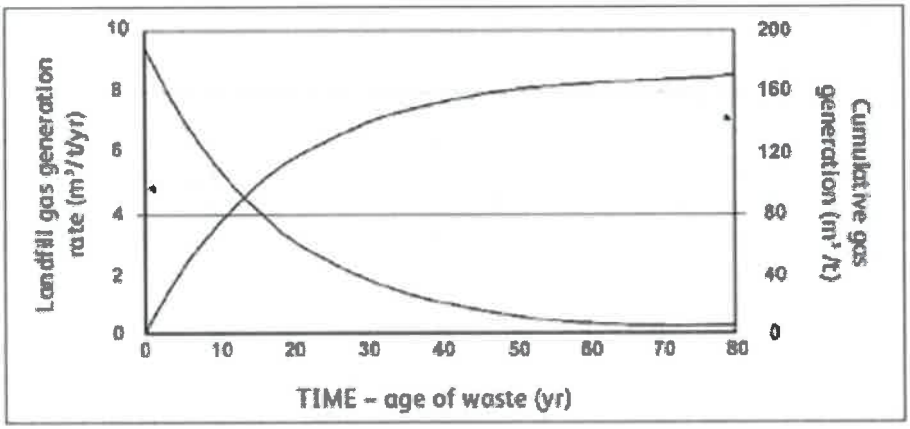


Figure 16: Typical landfill gas generation by time, from CIEH (2007)

The migration pathways of gases released from landfills are highly dependent upon the ground conditions. Migration pathways for older landfills are primarily vertical through the infill, with capping relatively rare, whilst modern landfills have controls to limit the offsite migration.

To determine the potential levels of risk posed by the landfills a review of the nature and age of the waste deposits was undertaken. The landfills both relate to different phases of filling of land within the northern extent of the grounds of the former Calderstones Hospital, within the area formerly occupied by the brickworks and associated clay pits.

The landfills are situated 160m to 187m to the west of the site and referenced within the Groundsure report as containing inert, commercial and household wastes. The closest area had no referenced date when the filling commenced, but referenced this as complete by 1974. The other landfill section was referenced as filled between 1960 and 1992.

Coopers previous investigations for the Calderstones Hospital included the area of the landfill with consultations to the local authority and Environment Agency, copies of the previous enquiries are contained within Appendix 1, with extracts of records in relation to these landfills shown in Figures 17 and 18, below:

Landfill Site	Reference	NGR	Distance
Calderstones Hospital	K1/03/021	SD 7235 3758	upon

Calderstones Hospital landfill site commenced operation before the controls imposed under the Control of Pollution Act (ie.before 14 June 1976) and unfortunately the Environment Agency have only limited records on this site Two areas of landfill have been identified at the Calderstones site Area A was tipped pre licensing and is thought to have been completed in the early 1960's. The types of wastes deposited here are thought to have been boiler/house incinerator, ash, rubble, furniture, textiles and general garden waste. The depth of the infill is unknown, but is thought to have been 8-10 feet in depth Tipping on area B commenced around 1960 and ceased in 1991

The types of wastes deposited here are similar to the wastes deposited in Area A Landfill gas monitoring has been carried out at the site with levels of 5 3%v/v carbon dioxide and 1 5%v/v methane being recorded There were no significant flows of gas detected The site closed in 1991

Waste Management Paper 27 recommends that great care must be taken whenever development is proposed on or within 250metres of a landfill site, and that the developer takes account of the need for the assessment and monitoring of any risk to the development posed by the site

Therefore, prior to any development taking place, it is recommended that a comprehensive landfill gas site investigation and assessment be carried out on the development area to determine whether or not the site is, or would have the potential to be, affected by subterraneous landfill gas migration from the nearby landfill site(s)

Figure 17: Extract of Environment Agency correspondence from 1999 in relation to Calderstones Hospital Landfill.

1. The site is within a 250m landfill consultation zone.

   Our records indicate (guide only) that the deposits comprise 85% incinerator ash and 15% non putrescible waste, eg glass.

   Monitoring data not listed or known.

Figure 18: Extract of Ribble Valley Borough Council correspondence from 1999 in relation to Calderstones Hospital Landfill.

Drilling within the landfill was undertaken as part of the pervious investigations on the hospital site, which identified the madeground to be 2.7m in depth, possibly 3.8m, with materials typically considered inert from a gas generation perspective, although occasional organic matter and possible timber were referenced (refer to Figure 19).

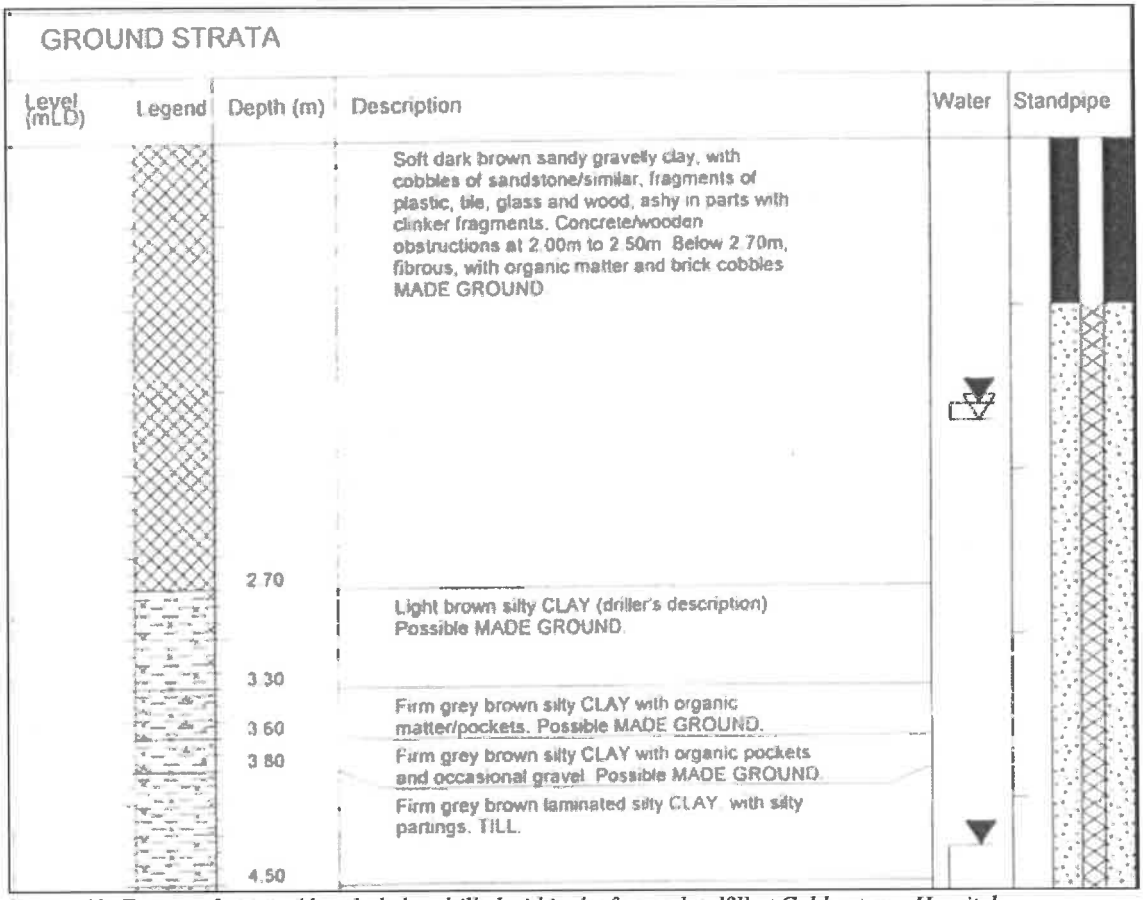


Figure 19: Extract of scanned borehole log drilled within the former landfill at Calderstones Hospital.

Given the nature and depth of the wastes, combined with the age since deposition, it is likely that the wastes would have relatively small volumes of hazardous ground gases with little flow rates to drive gases horizontally. The presence of low permeability drift would also likely limit lateral migration.

The landfill is therefore considered unlikely to have significant gas migration potential, although given the sensitivity of the proposed development would warrant monitoring to confirm or refine the conceptual model.

Coal Mining (on site) – Mine Workings: As detailed within Section 12, the site is situated outside of Coal Authority reporting area, with no specific risks associated with historical coal mining. Site unaffected.

Former Ponds (off site): - As detailed in Section 7, the historical OS maps record the presence of 2 No. former ponds within the site, the locations of which are shown in Figure 20 (below) and overlain in relation to the proposed development layout on Coopers Foundation Plan in Appendix 13.

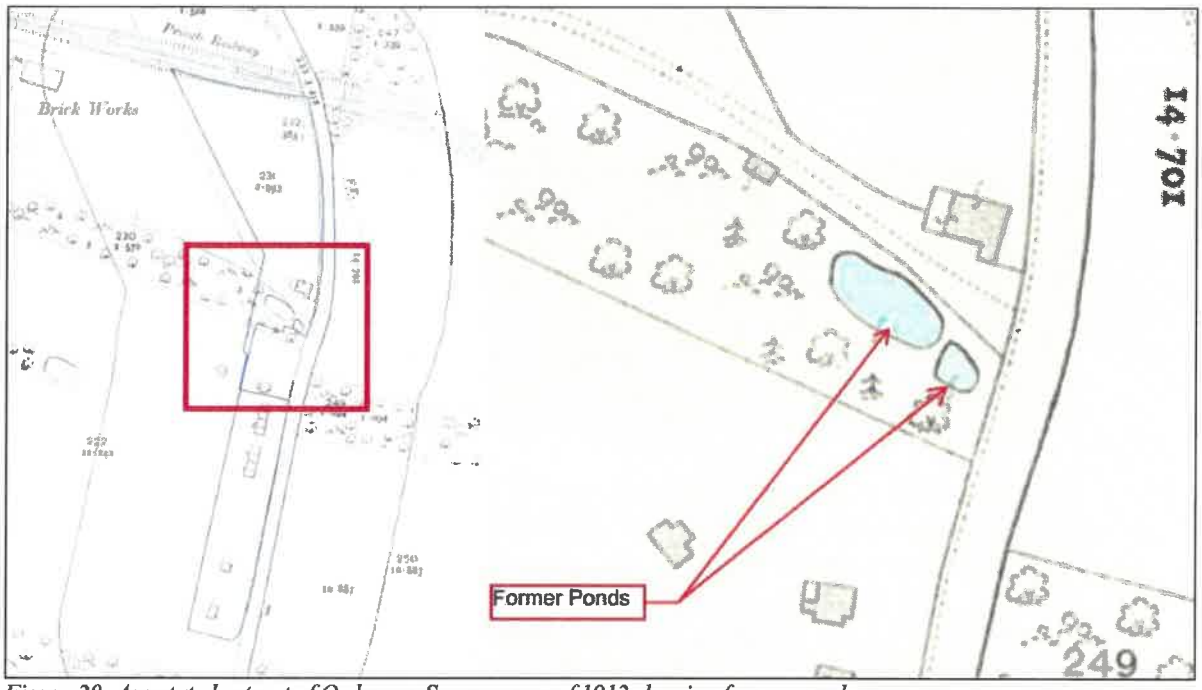


Figure 20: Annotated extract of Ordnance Survey maps of 1912 showing former ponds.

Former ponds commonly contain natural organic rich basal strata (e.g. peat) with overlying madeground, deposited as part of the historical infilling of the pond. The gas generation potential of the former ponds is highly dependent upon the nature of the materials found, perched waters, and age since deposition.

Where organic material is present at the base of former ponds these contain partially degraded organic carbon matter where bacterial action degrades this material generating methane and carbon dioxide, subject to the availability of oxygen. Where natural organic materials are present these are highly degraded with the rates of gas generation are very low. This results in commonly low to moderate concentrations of methane and carbon dioxide but at very low flow rates. BS8576 defines natural organic materials such as peat as a very low risk gas source.

The ponds were infilled between 1912 and 1932. Coopers borehole WS04 was drilled within the larger former pond, which identified madeground to a depth of 3.5m, consisting of layers of reworked natural strata, along with ash and clinker (boiler/incinerator derived ashes), towards the base of the pond the madeground appeared to be reworked clay with organic (plant) inclusions typical of a pond environment. A photograph of the madeground is shown in Photograph 10, below. The age and nature of this material would indicate a very low risk source, with the potential for slightly increased concentrations but generally at negligible flow rates.

Photograph 10: Showing nature of pond infill materials within borehole WS04.

The absence of peat or significant amounts of degradable organic carbon within the infill would indicate the potential for generation of significant volumes of hazardous ground gases are very low. Whilst elevated concentrations may be present these are unlikely to be driven with any significant pressure, given the nature of the materials and age since deposition. Any movement of gases would be anticipated to be passively migrating vertically through the pond infill with no significant potential for lateral migration, due to the very low permeability of the clays on the sides and base of the ponds.

Investigation of the second pond was not possible to the presence of Himalayan Balsam, after treatment/removal of Himalayan Balsam investigation of this area is recommended.

Deep Madeground (on site): - The site investigation has identified that outside of the former ponds (discussed above) the madeground is typically shallow to absent madeground across the site.

The railway cutting beyond the northern site boundary has been infilled beneath the bridge close to the north eastern site boundary. The age of infilling was unknown, but evidence of heavy vegetation/tree growth in this area is indicative that this was not a recent event. If materials utilised as infill contained organic inclusions these would have the potential to generate methane and carbon dioxide through bacterial action. The migration of the gases from this area would be expected to be primarily vertical to subvertical through the infill, rather than laterally through the low permeability drift adjacent to the cutting.

Whilst the potential gas generation from this source is unknown due to lack of evidence of the material types, the source would typically be defined as very low risk given the pathways for gas migration would be unlikely to enter the site through the low permeability drift.

Radon: - The site lies in an area where <1% of properties are affected by radon concentrations above the action level, and no protection measures are required for new properties.

Petroleum Hydrocarbons/Volatile Substance Vapours: - The contamination section details there are no significant vapour risks associated with petroleum range hydrocarbons or other volatile organic substances.

17.3 **Potential Pathways**

The glacial clays and silts would likely limit significant lateral migration pathways for hazardous ground gases from distant shallow sources.

Once gases generated have reached the surface they will dissipate rapidly through atmospheric diffusion unless confined by buildings or low points such as trenches. Hazardous gases beneath buildings can migrate through cracks or spaces in the floor slab and collect within the buildings. Any work in confined space (including trenches) must assess the potential for hazardous gases to be present and health and safety provisions should be applied in accordance with HSE guidance.

17.4 **Receptors**

Future Occupants: The primary receptors are anticipated to be the future occupants of the residential houses via the build up and ingress of potential hazardous gases/vapours through the ground floor slabs of the properties. These are considered highly sensitive receptors for the purposes of the conceptual model.

Adjacent residents: These can be exposed to hazardous gas if sources of gas are generated on site and migrate beyond the site boundary or preferential pathways exist for the horizontal migration of gases beyond the site boundary. The likelihood of this occurring is minimal due to the low potential for gas generation on site and pathways for gas migration being primarily vertical.

Construction/Maintenance Workers: Other receptors include construction workers, primarily through work within trenches or excavations where preferential pathways for the migration and collection of gases could occur. HSE guidance on safe work in confined space details potential dangers from gases within trenches, assessments required and precautions to take prior to entering a confined space. The appointment of a supervisor to ensure the necessary procedures and precautions are in place where construction workers intend to enter a confined space is advisable in accordance with HSE guidance.

17.5 **Conceptual Model Summary**

The conceptual model has demonstrated that generally, there is a very low to no significant risk posed by ground gases to be present on site, primarily due to the type of gas source or the pathways for these to reach the receptors. Given the high sensitivity of the receptors within the site it was considered beneficial to confirm the conceptual model of gas risks via a program of ground gas monitoring, the results of which are ongoing and discussed in subsequent sections. A summary of the sources, gas generation potential, pathways and risks to receptors is shown in Table 4.

Table 4: Summary of Initial Conceptual Model Associated with Hazardous Ground Gases

Sources	Gas	Receptor	Pathway	Risk
Landfills (off site)	Dependent on types of waste – primarily methane, carbon dioxide, and other minor constituents (commonly ammonia, sulphides, hydrogen, carbon monoxide, trichloroethylene, benzene, and vinyl chloride)	Future occupants, construction/ maintenance workers/off site residents	No significant likely pathway with low permeability strata between the source and the site.	Very low risk source given the nature of the infill and lack of pathway for significant lateral migration.
Coal Mining (on/offsite)	N/A	N/A	N/A	Site outside of defined coal mining risk area.
Ponds (on site)	Methane & carbon dioxide.	Future occupants, construction/ maintenance workers.	Vertical through infill with negligible lateral migration due to low permeability sides and base of former ponds	Localised very low risk source in close proximity to the ponds with no significant lateral migration.
Deep Madeground (on site)	N/A	N/A	N/A	No significant deep madeground identified outside of the former ponds
Deep Madeground (off site)	Infilled section of railway cutting beneath the bridge adjacent to the north eastern site boundary – nature of infill and gas types unknown, although commonly methane and carbon dioxide where organic materials are present.	Future occupants, construction/ maintenance workers/off site residents	No significant likely pathway with low permeability strata between the source and the site.	The age of filling is unlikely to be recent (evident by vegetation and tree growth) with no significant preferential pathway for gases to migrate into the site, which would define this as a very low risk source.
Radon (on site)	N/A	N/A	N/A	The site is within area where no radon precaution measures are required for new buildings.
Petroleum Hydrocarbons/ VOCs (on site)	N/A	N/A	N/A	No significant TPH and VOCs potential, therefore no vapour mitigation measures are require.

17.6 Profile of Potential Hazardous Ground Gases

The primary potential hazardous ground gases with the potential to be generated from the sources are methane and carbon dioxide. The properties, pathways and hazards posed by the these gases differ, with summary profile of the gases of concern contained in Tables 5 and 6 below.

Table 5: Profile of Methane as Significant Hazardous Ground Gas from BS8576

Methane - CH_4
Methane is a colourless, odourless, flammable gas. Methane is explosive at concentrations of between about 5% and 15% v/v (volume fraction) in air. Below 5% v/v (the lower explosive limit – LEL) there is insufficient methane to support combustion and above 15% v/v (the upper explosive limit – UEL) there is insufficient oxygen to support combustion. The flammability range of methane varies depending on the concentrations of other gases present. For example: • where carbon dioxide concentrations are >25% v/v, methane is non-flammable; and • if the oxygen concentration is reduced, the limits of flammability are reduced (e.g. at 13.45% v/v oxygen, the LEL and UEL are altered to 6.5% v/v and 7% v/v respectively, whilst at 13.25% oxygen, the mixture is incapable of propagating flame (see [14]). Methane is a low toxicity gas but can result in asphyxiation due to its ability to displace air and hence oxygen. Oxygen starvation occurs at 33% v/v methane, whilst at 75% v/v methane, death results after 10 minutes. Methane is less dense than air.

Table 6: Profile of Carbon Dioxide as Significant Hazardous Ground Gas from BS8576

Carbon Dioxide - CO_2
Carbon dioxide (CO_2) is a colourless, odourless gas. It is both highly toxic and an asphyxiant and can cause adverse health effects in concentrations greater than 0.5% v/v. It is denser than air. • 3% v/v carbon dioxide can result in headaches and shortness of breath, with increasing severity up to 5% v/v or 6% v/v; • 6% to 10-11% v/v causes visual distortion, headaches, increased heart rates, dizziness, mental depression, tremors and rapid loss of consciousness (less than 15 minutes) possibly resulting in death; • >22% v/v is likely to result in death. The Health and Safety Executive [74] has published the following limiting concentrations for work-related exposure: • Long-term exposure limit (LTEL – 8 hour period): 0.5% v/v; and • Short-term exposure limit (STEL – 15 minute period): 1.5% v/v. An additional hazard arises if air containing more than 0.5% carbon dioxide provides the combustion air to a central heating boiler or similar apparatus (e.g. it is drawn in from the sub-floor void). In these circumstances, there is a danger that carbon monoxide could be formed.

17.7 Monitoring Wells and Response Zones

CIRIA C665 (2007) made recommendations for prescriptive spacing of monitoring wells based upon source classification and receptor sensitivity. This failed to account for the common need to target monitoring at sources and primary pathways to disclose the risks. Changes to the prescriptive monitoring spacing were defined within BS8576 (2013), Chapter 8.4, which advocated appraisal of the conceptual model, gas migration, and determination if a non-targeted approach (grid based) was appropriate. Examples of circumstances where non-targeted methods would be appropriate were defined as:

i) Permanent and consistent on site gas source;
ii) VOCs in wide and undefined extent;
iii) Where the conceptual model is unable to suitably define the gas targets, such that a phased monitoring approach would be appropriate.

Coopers detailed appraisal of the gas risk defined the potential sources as a distant landfill (160m from the site), infilled section of railway cutting (adjacent to the site) and former ponds (on site). Monitoring was targeted to accessible positions closest to these sources and then spaced across the site to determine if variations were present related to each source. A total of 8 No. monitoring wells were installed, the positions of which are shown on Coopers Drawing No. 7583/01 within Appendix 13, with extract annotating the positions in relation to the gas sources shown in Figure 21.

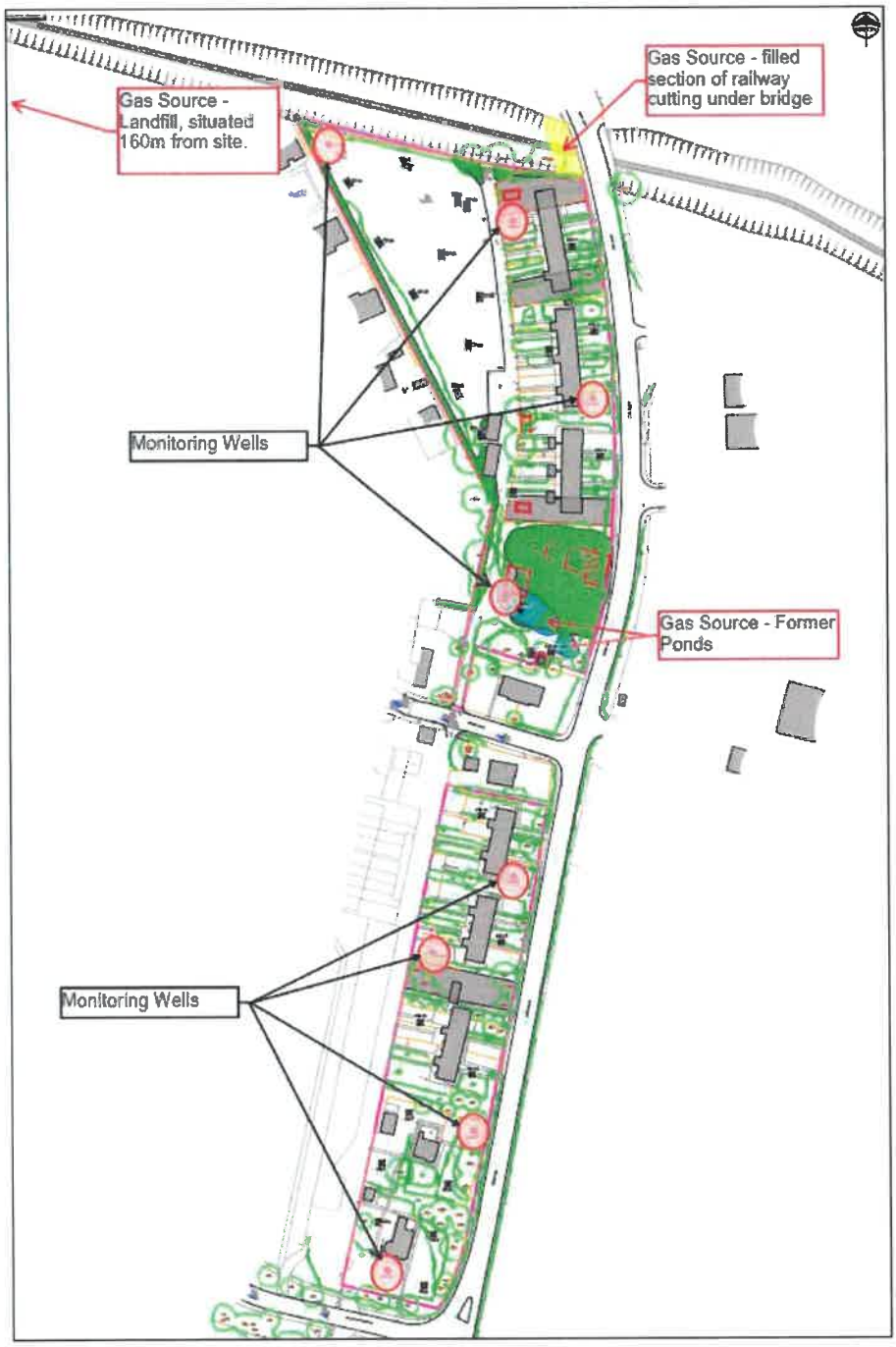


Figure 21: Showing gas monitoring positions in relation to the source location of hazardous ground gas.

Details of the monitoring wells and response zones are provided in the borehole logs, contained in Appendix 5. The gas monitoring wells constructed on behalf of Coopers consisted of 50mm HDPE pipe with slotted sections within a targeted response zone, geosoc surround to prevent silting up and inert gravel surround. Bentonite seals were constructed above the response zone to limit atmospheric gas ingress, with the base seal to target the response zone. A dual valve system with downfeed was constructed to homogenise stratified gases, compliant with BS8576 (2013), was included, as shown in Figure 22, with flush stopcock cover.

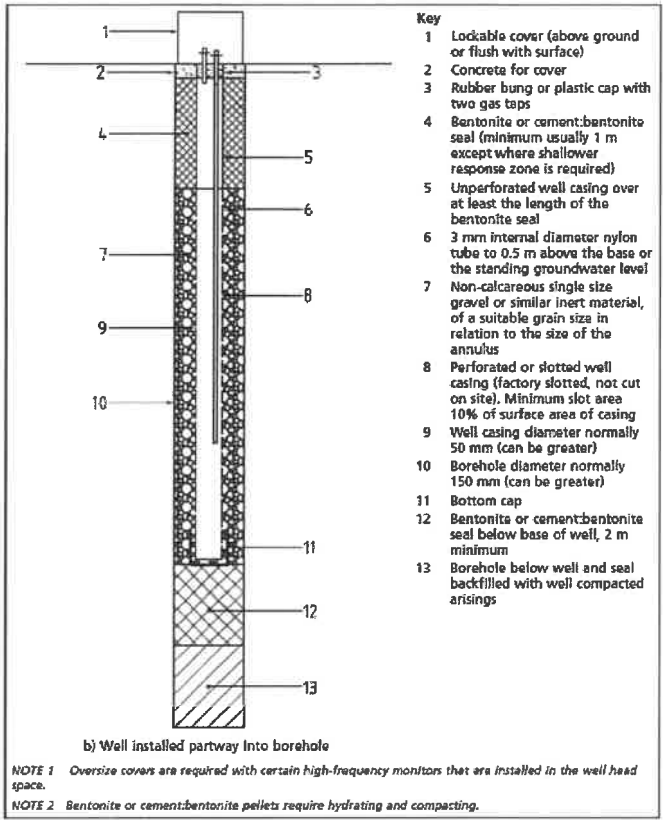


Figure 22: Extract of borehole monitoring well installation as recommended by BS8576

17.8 Gas Monitoring

As detailed in BS8485(2015)+A1:2019 the gas monitoring procedures are to follow BS8576 (2013). This removes prescribed monitoring periods and frequencies with the onus transferred to the consultants to justify that their monitoring data is sufficient to characterise the site. Specific guidance on the requirements for gas monitoring duration is detailed within BS8576, Clause 8.6, in which the consultants should assess and appraise the risks based upon the levels of protection, as follows "*Gas monitoring does not necessarily need to be carried out under worst case conditions. It does not necessarily need to be at low or falling atmospheric pressure, but rather should be continued until it is unlikely that additional data will change the interpretation of the data, the outcome of the risk assessment, and the proposed remedial actions. This requires continued assessment of data as the monitoring progresses. One of the main considerations is to assess whether gas flow rates or concentrations could possibly increase and thereby affect the risk assessment and hence the choice of protective measures.*"

The approach to determining the sufficiency of the data is provided within BS8576, Annex F: Assessment of Whether Sufficient Gas Monitoring Data Have Been Collected. Table F.1 to F.3 within the BS8576 provide a decision matrix to appraise the sufficiency of the gas data.

For the purposes of practically it is common practice to undertake a predefined set of monitoring visits to establish the ranges and variations that occur under different conditions and times. The monitoring proposed is to include 6 No. visits over a period of just under 3 months, which would be commonly considered appropriate for initial appraisal purposes.

2 No. monitoring visits have been completed at the time of reporting with the findings to be confirmed following the gas monitoring. These will include information to justify the range of pressure conditions and gases identified.

Coopers monitoring was undertaken with GA5000 gas analyser, manufactured by QED (formerly Geotechnical Instruments) with a copy of the 6-month manufacturer calibration certificate provided in Appendix 6. The monitoring procedures by Coopers include an initial flow reading recorded at 10 second intervals over a period of 1 minute (to allow rates to stabilise), followed by continuous monitoring of gas concentrations at 15 second intervals over a period of at least 5 minutes as recommended within BS8576. Following completion of the monitoring the bung is removed, water levels measured, followed by replacement of the bung and closing of valves.

The summary of peak and steady concentrations, flow rates and any relevant notes relating to the monitoring are contained on a summary table in Appendix 8. The range of results identified to date are summarised in Table 7 below.

Table 7: – Summary of Ground Gas Monitoring

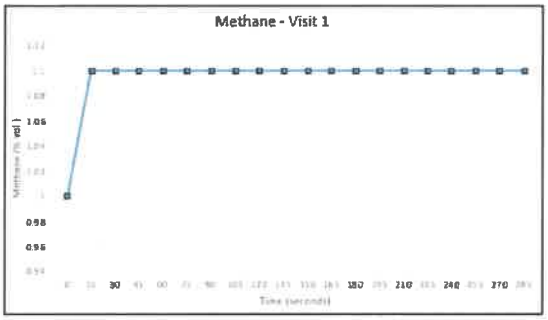
Borehole	Target Strata/Source	Response Zone (m bgl)	Pressure Range (mbar)	Peak Carbon Dioxide (% by Vol.)	Peak Methane (% by Vol.)	Min. Oxygen (% by Vol.)	Hydrogen Sulphide (ppm)	Carbon Monoxide (ppm)	Water Level (m bgl)	Steady Flow (l/h)
WS01	Very soft clay	2.0-4.0	996-1026	0.6-1.2	0.0-0.1	20.5-21.2	0	1	2.20-2.30	0.2-0.4
WS02	Soft Clay, with organic inclusions.	0.8-2.2	997-1026	3.1-3.7	1.0-1.1	16.2-17.5	0	2-4	0.95-1.40	0.1-0.3
WS03	Firm clay	1.0-4.0	996-1026	2.7-3.0	0.0	11.7-14.3	0	0	1.32-1.45	0.2-1.8
WS04	Madeground (pond infill)	1.0-3.0	995-1025	7.9	0.7-1.0	0.9-1.1	0	0-1	1.60-1.61	0.0
WS05	Madeground	0.5-1.1	995-1025	2.9-4.1	0.0-0.1	17.1-17.7	0	0-5	0.71-0.84	0.1
WS06	Stiff CLAY	1.5-4.0	995-1025	3.8-4.1	0.0	16.5-16.9	0	0-1	3.36	0.2
WS07	Firm clay	1.0-4.0	995-1025	2.1-3.7	0.0	13.3-18.0	0	0	2.50-3.10	0.0-0.2
WS08	Firm clay	1.0-4.0	995-1025	0.6-1.0	0.0	20.4-21.5	0	0	1.43-1.50	0.0-0.1

Notes to Table 7:

- *Readings of gases and flow rates represent steady state condition, due to potential for initial stratification of gases and initial pressure differential release.*

17.9 Ground Gas Data Assessment

The boreholes generally disclosed negligible concentrations and flow rates, with relatively slightly higher concentrations of carbon dioxide and/or methane identified within WS02 and WS04. Borehole WS02 was located in the north eastern part of the site, closest to the section of the former railway infill with response zone set into soft clay with organic plant inclusions. This position recorded identified slightly elevated concentrations of methane of between 1.0-1.1%. Borehole WS04 was located within the large of the former ponds with deeper madeground. This borehole was recorded as containing concentrations of methane of 0.7-1.0% and carbon dioxide of 7.9%. Gases were disclosed to be steadily indicative of static gases, without stratification, demonstrated in Figures 23 and 24 (below).



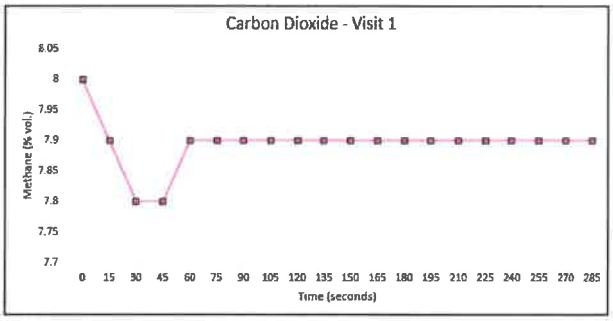


Figure 23 and 24: Demonstrating steady gases identified during monitoring over a 5 minute period, for methane within borehole WS02 (left) and carbon dioxide with borehole WS04 (right).

As the gas monitoring is ongoing, with only two visits to date, it is difficult to determine with confidence any correlations between ground gas concentrations and atmospheric pressure. The monitoring over the two visits were during high and low pressure systems with no significant variations in concentrations, indicative of steady gas concentrations. Should variations occur during subsequent monitoring then a detailed assessment of the potential for worst case gas generation.

All of the monitoring wells were identified to contain perched waters within the response zone, but none of which were flooded above the top of the response zone. Where a monitoring well is surrounded by low permeability strata (e.g. clay) with a perched water table high in the response zone the air becomes trapped and can cause a pressure differential within the well head space and the air. Upon opening the valve to undertake the monitoring the pressure release can cause an initial positive or negative flow rate that dissipates with time. This process was observed within borehole WS02 on the first monitoring visit where an initial flow rate of 5.3 l/hr was recorded which gradually dropped to 0.1 l/hr after 40 seconds and borehole WS03 on the second monitoring visit, which had an initial flow rate of 4.7l/hr and was still dropping at 1.8 l/hr after 1 minute. A plot of the reduction in flow rates over these monitoring visits is shown in Figures 25 and 26 (below). As detailed within BS8485, section 6.3.6 initial flow rates as a result of flooded response zones are not representative of gas generation and should be discounted.

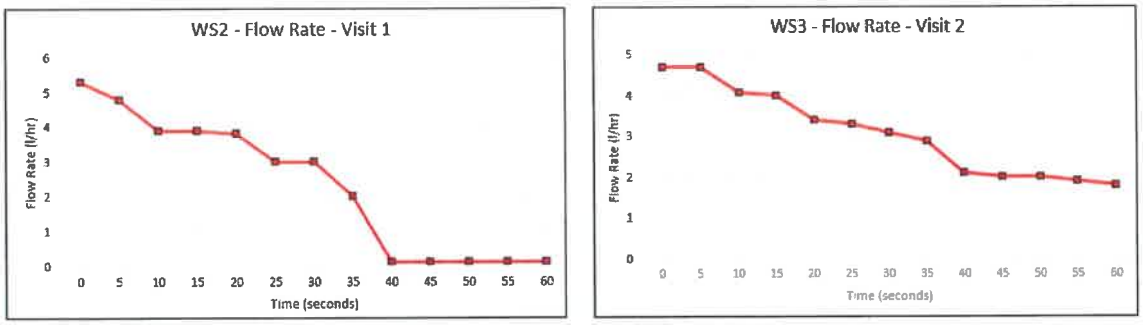


Figure 25 and 26: Demonstrating reduction in flow rate with time within boreholes WS2 (left) and WS3 (right) during monitoring indicative of pressure stabilisation rather than gas generation flow rates.

17.10 Ground Gas Assessment

BS8576 details that the primary hazardous ground gases comprise of methane, carbon dioxide, hydrocarbon vapours and radon. Other analysed gases can exist that pose a risk, such as carbon monoxide and hydrogen sulphide.

The assessments for radon are based upon BGS data for bedrock and drift geology and do not form part of any site-specific monitoring. As previously discussed, the site is not within an area where new build houses require protection measures against radon.

Assessments of vapours are provided within Section 16 (Contamination), and concludes there are no significant petroleum hydrocarbons or volatile organic carbons are present which could pose a risk to the proposed development.

As detailed within BS8576 there are no current gas screening values incorporating flow rates for carbon monoxide or hydrogen sulphide and existing thresholds are only available for occupational exposure limits (OEL). As monitoring for carbon monoxide and hydrogen sulphide were not included the consideration of thresholds has been omitted from this report. It is considered that given the lack of credible sources and pathways would however be considered that no significant concentrations of these gases would be likely unless other elevated gases, such as methane or carbon dioxide were encountered at significant levels.

BS8485 provides assessments for carbon dioxide and methane based upon Gas Screening Values (GSVs) utilising flow rates and concentrations. The site based GSVs for steady state methane and carbon dioxide are based upon the following equation:

$$GSV = \frac{concentration\ \ (by\ vol.)}{100} \times flowrate\ \ (l/hr)$$

The GSVs within BS8485 are based upon all buildings. The NHBC have also released GSVs based upon standard residential houses with precast concrete floors (block and beam) but cannot be adopted for any other floor slab construction.

Table 8: Thresholds for Gas Screening Values (GSV) in accordance with BS8485:2015 and NHBC Report No. 10627-R01

BS8485:2015			NHBC				
Classification	GSV (methane and carbon dioxide)	Limitations for Consideration	Classification	GSV (methane)	GSV (carbon dioxide)	Typical Maximum Carbon Dioxide	Typical Maximum Methane
CS1	<0.07	<1% CH4, <5% CO2	Green	<0.13	<0.78	5	1
CS2	<0.70	<70 L/hr	Amber 1	<0.63	<1.60	10	5
CS3	<3.5		Amber 2	<1.60	<3.10	30	20
CS4	<15		Red	>1.60	>3.10		
CS5	<70		-	-	-		
CS6	>70		-	-	-		

The current gas regime for each borehole is defined in Table 9 below, identifying typical low concentrations and flow rates during the monitoring, with relatively higher concentrations of methane, carbon dioxide and flow rates within borehole WS02 and WS04.

Table 9 – Summary of GSV's for Each Borehole

Borehole Reference	Characteristic Carbon Dioxide (%)	Characteristic Methane (%)	Characteristic Flow Rate (l/hr)	GSV Carbon Dioxide	GSV Methane	BS8475 CS Class	NHBC Traffic Light Class
WS01	1.2	0.1	0.4	0.0048	0.0004	CS1	Green
WS02	3.7	**1.1**	0.3	0.0111	0.0033	CS1	Green
WS03	3.0	0.1	0.2	0.0060	0.0033	CS1	Green
WS04	**7.9**	**1.0**	0.1	0.0079	0.0010	CS1	Green
WS05	4.1	0.1	0.1	0.0041	0.0001	CS1	Green
WS06	4.1	0.1	0.2	0.0082	0.0002	CS1	Green
WS07	3.7	0.1	0.2	0.0074	0.0002	CS1	Green
WS08	1.0	0.1	0.1	0.0010	0.0001	CS1	Green

Notes to Table 9:

- *Higher flow rates associated with water levels discounted and not considered as characteristic values of gas generation.*
- *Where concentrations or flow rates are reported as zero these have been assigned values of the instrument LOD (not possible to undertake gas screening value calculations for multiplication on values with zero).*

The gas monitoring results demonstrated the gas risks as Characteristic Situation 1 (CS1) and Green based upon GSVs. Boreholes WS02 and WS04 both identified higher peak concentrations marginally above the typical/limits for consideration. Both NHBC and BS8485 outline that limitations of peak concentrations are for consideration in relation to the conceptual model, rather than to be treated as an absolute threshold. Borehole WS02 contained organic inclusions and was situated closest to the railway cutting infill and borehole WS04 was located within a former pond, relating to the identified very low risk sources within the conceptual site model.

After the release of the 2019 update to BS8485, leading authors of ground gas assessment procedures have released a technical paper discussing the relative risks posed by madeground and natural organic strata (Card, G., et al, 2019, "*Risk and Reliability in Gas Protection Design*"). These discuss that whilst elevated concentrations can occur, the lack of significant driving force to generate flow rates are rarely sufficient to cause elevated concentrations to migrate into the indoor space of modern buildings where significant risks are caused. The paper highlights that with consideration of soil permeability and high frequency continuous monitoring (to provide confidence in the monitoring data) consideration of reduced or removal of protection measures can be reasonably justified. Prior to introduction in standards and without high frequency monitoring the assessment system would not be considered appropriate for use and therefore more conservative designs would be required.

The monitoring data indicates higher concentrations in relation to the sources of hazardous ground gas, with the sensitive end use, and concentrations identified are above typical values where consideration of protection measures are required. It would therefore be proposed to include gas mitigation measures within areas on or close to the sources of the gas (former ponds and organic clays/infilled section of railway cutting) to ensure adequate protection of the future residents. The assessment is subject to further monitoring where changes in gas concentrations over time would require further consideration.

Based upon the current development layout the plots within the areas of gas risk at Plots 1 to 7 , 30 and 31, as annotated within Figure 27, below. Detached garages do not have external wall cavities and are required to adequately vent gases due to car exhausts. As such these would not require gas protection measures.

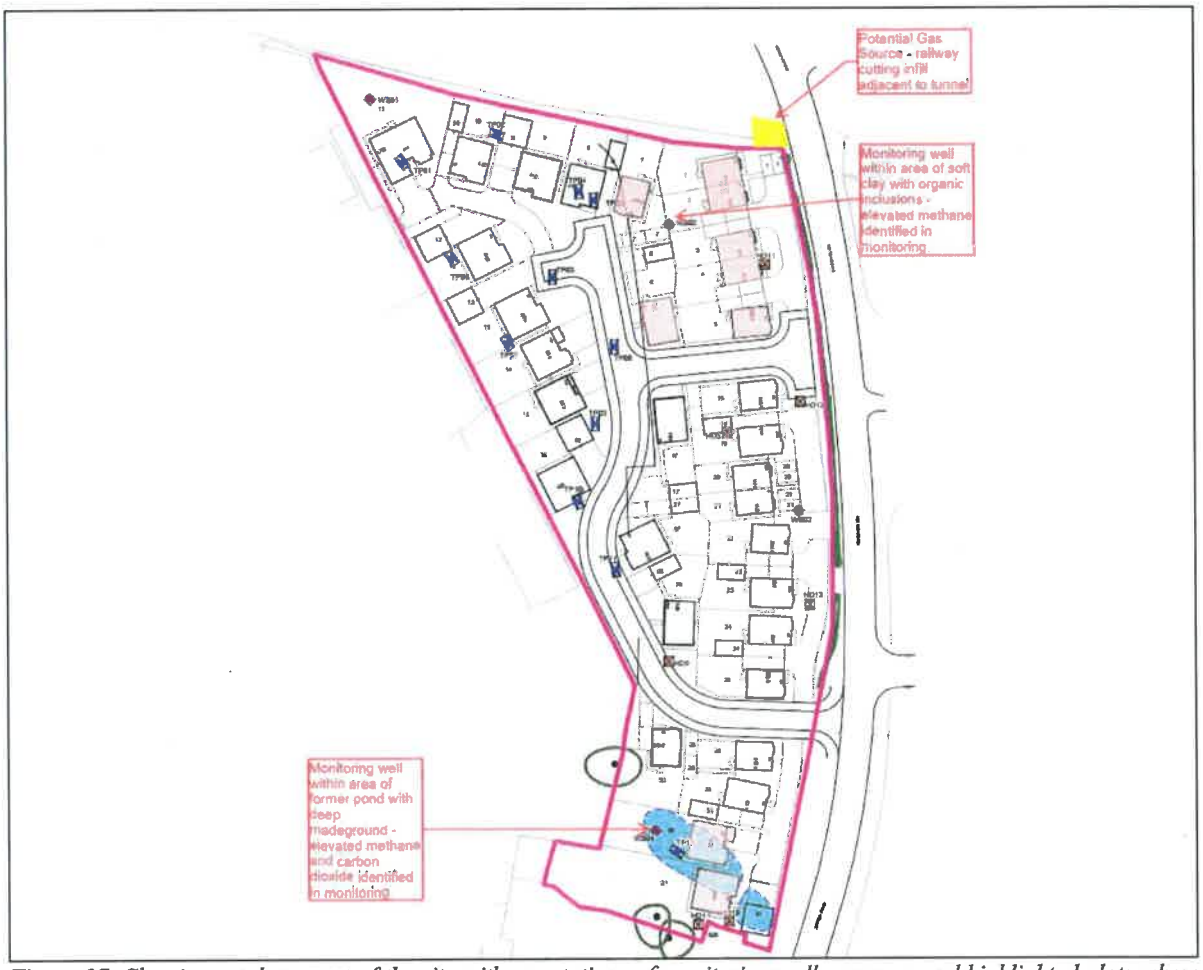


Figure 27: Showing northern part of the site with annotations of monitoring wells, sources and highlighted plots where gas mitigation measures are proposed.

The proposals for gas mitigation measures are subject to completion of gas monitoring over a range of atmospheric conditions and time, with a further 4 No. monitoring visits proposed.

17.11 Gas Mitigation Designs and Verification

The Prospect Homes floor slabs are proposed to consist of precast suspended (block and beam) floor slabs where the NHBC traffic light designation would apply. The proposed mitigation measures for Plots would be achieved through the very good passive venting of the sub-floor voids. Secondary protection is provided via the use a proprietary 2000 gauge, virgin polymer, LDPE, with independent verification to confirm the mitigation measures were correctly installed. The appended Coopers Drawing No. 7583/AMB1/PC/01 shows the typical construction details.

Design System: The NHBC requirements for the gas mitigation measures under their traffic light regime were summarised within NHBC's Technical Extra 20 (2016) (TE20), with extracted information relating to the gas risks for this site in Table 10.

Table 10: NHBC Gas Mitigation and Verification Requirements for Amber 1 Regime Based Upon TE20

Gas Regime	Minimum Gas Protection Expectations	Verification/Information Required
Amber 1	i) Ventilation – subfloor venting to achieve at least one air exchange per day (minimum 150mm void height; 1500mm²/m air vent opening or 500mm²/m² floor area spaced at not more than 2m centres on at least two opposing sides). ii) Membrane – must be suitable for purpose. iii) Membrane installation/design - to achieve complete integrity across entire building footprint. Penetrations and joints sealed.	i) Construction drawings – showing position of membrane; sealing details and ventilation points to be provided. ii) Membrane specification – technical data sheet(s) for gas membrane (including gas permeability data) to be provided. iii) Installation – photographic evidence of installed membrane may be requested.

Notes to Table 10:

- *Coopers venting designs are based upon computational fluid dynamic modelling research by Partners in Technology as referenced within BS8485, with specific consideration of the limitations of the research. This requires cross ventilation of buildings including internal/party walls and external walls. Coopers venting calculations can be provided upon request.*
- *TE20 discusses that verification of construction measures need to be independent of the supplier and installer, with verification needing to consider both membrane type and ventilation.*
- *NHBC require validation for higher risk gas sites (Amber 2 or similar), although would depend upon the site specific gas risk and mitigation design.*
- *Local Authorities will commonly designate any aspect designed for protection of human health to require independent verification by appropriately qualified and trained persons, which include verification of gas mitigation measures.*
- *The membrane specification is prescribed as a 2000 gauge, virgin polymer LDPE, given the relatively low reliance on the gas membrane and low gas risk of the site.*

Verification: CIRIA C735 details considerations in the verification of gas mitigation measures, accounting for a holistic approach supported within BS8485. The proposed verification of the installation of the gas mitigation measures are provided in Section 18.

17.12 Conclusions

The gas monitoring is ongoing with initial monitoring disclosing relatively higher concentrations of methane/carbon dioxide within the area of the former ponds in the southern part of the northern parcel and within a borehole in the north east of the site, either as result of localised organic (plant) inclusions or as a result of infill of the offsite railway cutting.

Provisional mitigation measures are proposed for Plots 1 to 7 in the north east of the site and Plots 30 and 31 over the former ponds, subject to completion of the gas monitoring. Mitigation designs have been provided and justification of the designs included within this report. Proposals for validation of the gas mitigation measures are included in Section 18.

18.0 Remediation and Validation

18.1 Remediation Proposals

The remediation and validation proposals within this document are final proposals to be undertaken during the development, subject to approval by the local authority.

The proposed remediation works are designed to protect human health and the surrounding environment from exposure to the contaminated soils discussed within Section 16. The remediation works should look to reuse soils and minimise landfill disposal as part of a sustainable development policy.

The contamination results, discussed in Section 16, identified the presence of elevated inorganic and PAH compounds in relation to localised topsoil within the existing gardens (metals and PAHs) and chrysotile asbestos fibres from the pond infill. The segregation of topsoil from the existing gardens are to be subject to additional testing to disclose if localised areas are suitable for reuse, prior to testing it is assumed the topsoil from the garden areas will require removal from site. The areas of the former pond will require placement of an inert cover system within the gardens to protect the future residents from exposure of the contaminated soils.

- Plots 30 to 31 (front and rear gardens) – inert cover system within landscaping and gardens.

Detailed discussions and review of the remediation options have been undertaken to ensure adequate protection to the future residents, and accounting for commercial and development considerations in the effective means to undertake these works.

18.2 Ground Gas Mitigation Measures

As detailed within Section 17, gas mitigation measures are proposed for Plots 1 to 7, 30 and 31, which are considered to be influenced by hazardous gas migration. Based upon the developers preferred floor slab construction (block and beam) Amber 1 mitigation measures (NHBC – Technical Extra 20) are proposed, with typical construction provided in Appendix 13.

Refer to Section 17 for detailed explanation of the design system for gas mitigation.

Refer to Section 18.8 for details of verification of gas mitigation measures.

18.3 Protection of Residents within Gardens

The contaminants identified within the site has been shown to be a risk to future residents through exposure within the proposed growing medium of gardens. The depths of garden activities and use of the garden area has to be reasonable. It is not feasible to carry out risk assessments regarding extreme land use; therefore, it has been assumed that the majority of domestic gardening occurs within the upper 0.6m of soil. The predominant depth of regular excavation will be up to 0.2m due to the planting of annual and biannual bedding plants with shallow weeding. It is anticipated that the deeper planting will be associated with the planting of deep potted shrubs, and is generally restricted to few occasions over several years.

It is anticipated that the majority of the gardens will comprise lawn and ornamental bedding. Residents may utilise their rear garden as allotments and grow vegetables. It is anticipated that the deepest cropping vegetable will be the potato and generally crops to depths of up to 0.5m (it should be noted that potatoes are generally over dug where by during the growth of the crop soil is piled onto the plant). It is therefore considered that the initial 0.6m depth of garden will be the threshold zone for risk to the resident for non-mobile contaminants. This assessment concurs with the findings of BRE Report 465, Cover Systems for Land Regeneration. It is highly unlikely that the resident will excavate to depths in excess of 0.6m. If this does occur, it will be on the basis of once or possibly twice a year for a very small period of time.

It is highly unlikely that the residents will be planting vegetables for consumption within the front gardens of the houses. It should be noted that it is unlikely that clauses will be present within the deeds to restrict this practice; however, we have to assume reasonable practices within these areas of the site. It is traditional to plant lawn and bedding plants, or pave the entire area of the front garden depending upon the resident's proficiency regarding gardening. It is generally assumed that the aesthetic value of having a vegetable patch in the front garden is significantly low, and produce may be lost by theft from passers-by. The potential for human health risk regarding the consumption of vegetables grown in these areas is hence negligible and should not be considered.

The transporting of soils into the property also poses a risk to the residents. The soils caked on shoes and adhered to clothing due to contact with soils will dry, desiccate and form dust in the houses.

Any excavations associated with the constructing of extensions to the property should only be completed after consulting the Planning Department of Ribble Valley Borough Council.

Children may come into contact with soils during unsupervised playtime through direct ingestion and during supervised playtime through inadvertent consumption of soils from toys, which have come into contact with soils. When very young children excavate in soils, it is anticipated the maximum depth will be in the order of 0.2m to 0.3m. It is anticipated that parents will not leave young children unsupervised in garden areas for any significant period of time.

Based upon the conceptual model the proposed reasonable use of the garden growing medium is restricted to 0.6m, with consideration of contaminants within this zone requiring remedial actions, discussed in the following sections.

18.4 Remediation - Garden Inert Cover Systems.

To protect the future residents from exposure to contaminants the madeground can be excavated from the 0.6m growing medium in rear gardens and 0.45m in front gardens for replacement with inert subsoil and topsoil. The madeground depth within parts of the gardens will sit outside of the former ponds, as such natural strata would be less than 0.6m deep, where the inert cover would in places remove the entirety of the madeground. Where the madeground is removed prior to the 0.6m inert cover depth the proposed gardens would be as demonstrated in Figure 28. Where madeground is still present at the base of the 0.6m cover layer a high tensile strength geotextile will be placed at the base to prevent inadvertent exposure to the underlying contaminants or cross-mixing. The cover system for the proposed gardens would be as demonstrated in Figure 29.

It is likely that the inert subsoil and topsoil to be placed within the gardens will be inert natural soils derived from the site, which have consistently been proven inert. Verification testing of any natural strata at low frequencies is considered appropriate to ensure it has not been cross-mixed during generation or should imported soils be utilised. Further discussions of soil testing are provided in Section 18.5.

Following placement of the inert subsoil and topsoil the depth of the inert cover will be confirmed via excavation of validation holes, to the full cover depth or natural strata. The validation holes should prove the presence of the geotextile or natural strata at the base of the validation holes. The validation strategy for verification of inert cover systems within gardens is provided in Section 18.6.

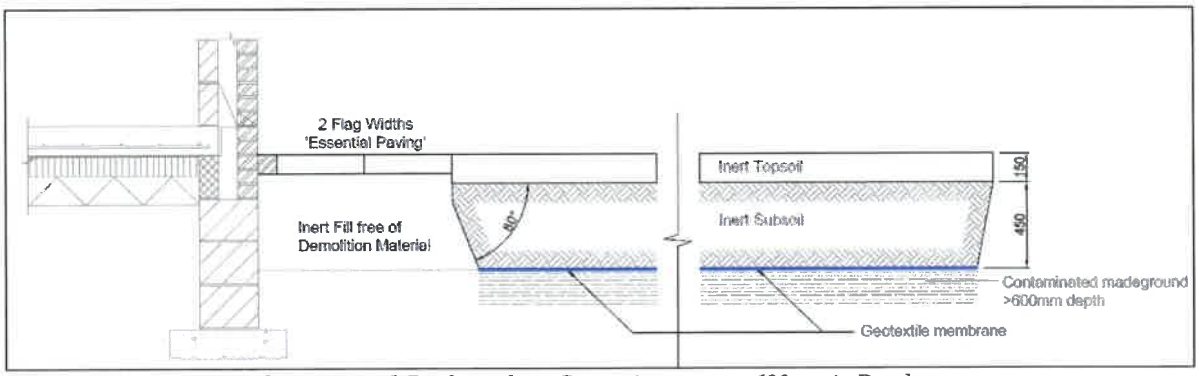


Figure 28: Inert Cover within Proposed Gardens where Contaminants are >600mm in Depth

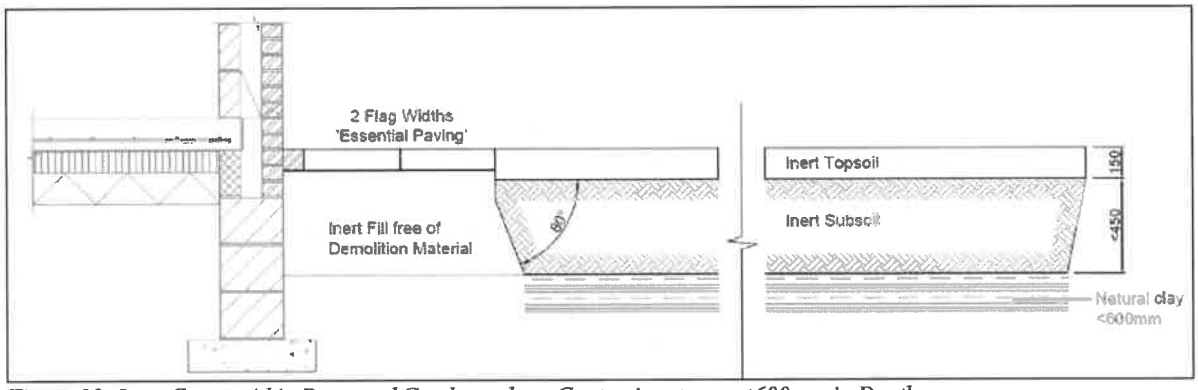


Figure 29: Inert Cover within Proposed Gardens where Contaminants are <600mm in Depth

18.5 Soil Testing.

The subsoils and topsoil intended for reuse within the proposed gardens should be stockpiled for testing prior to placement. It is anticipated that the majority or all of the soils for placement within the gardens will be inert natural strata and topsoil from the site. The soils testing during the site investigation and conceptual model indicate no significant risk of contaminants within these strata, unless accidentally cross-mixed during placement.

Should imported soils be required for use within the proposed gardens these will require testing prior to use, with suites and quotas subject to provenance. The source of any imported soils and indicative testing should be provided to Coopers in advance, to determine if appropriate for delivery to site for testing.

Once soils are delivered to site or generated from site and stockpiled the materials should be segregated by source and end use for testing by Coopers. Typical sample frequencies are provided within Table 11 (below), although for large volumes of materials a reduced frequency may be appropriate, subject to local authority and NHBC approval.

Table 11: Sample testing quota and suites by source for reuse in garden growing medium

Strata Type	Origin	Sample quote	Testing Suite
Imported Subsoil	Unverified	1:50m^3 (min. 3 samples)	Full CLEA suite (inorganics and PAH) incl. TPH-CWG, and asbestos
	Greenfield	1:100m^3 (min. 3 samples)	Full CLEA suite (inorganics and PAH) incl. asbestos
Imported Topsoil	Unverified	1:50m^3 (min. 3 samples)	Full CLEA suite (inorganics and PAH) incl. TPH-CWG, and asbestos
	Greenfield	1:100m^3 (min. 3 samples)	Full CLEA suite (inorganics and PAH) incl. asbestos
Imported Crushed Brick/Concrete	N/A	1:500m^3 (min. 3 samples)	Asbestos identification
Site Won Topsoil	Site	1:500m^3 (min 3 samples)	Full CLEA suite (inorganics and PAH)
Site Won Subsoil	Site	1:500m^3 (min 3 samples)	Full CLEA suite (inorganics and PAH)

18.6 Garden Validation

The remediation for the removal/capping of the madeground from the proposed gardens on Plots 30 and 31 will be subject to validation. Where the individual gardens are proposed for placement of an inert cover/removal of contaminated soil to natural, the inert cover depth and geotextile/natural strata at the base should be verified via validation holes. The validation of the placement of inert cover growing mediums will consist of:

- Upon completion of the gardens to finished level, Coopers are to attend site to excavate validation holes to prove cover thickness of the growing medium. This will be undertaken on a spacing of 1 hole per 1 No. front garden and 1 hole per 1 No. rear garden.
- The validation holes must not be pre-dug and be in locations of Coopers choosing. Placement of pipes and removal to validate depths are not considered as independent validation.
- Photographic evidence to demonstrate the location of the validation hole, the nature of the inert material and the depth of cover (refer to Photographs 11 to 14).
- Upon completion of the validation Coopers will produce a validation certificate to include all chemical testing, photographic records and verification documents required for statutory approvals.
- Upon completion of the development a validation completion report will be produced confirming the remediation requirements have been achieved including testing of all soils (reused or imported).

Photographs 11 & 12: Examples of validation photographs demonstrating validation hole location and soils forming inert cover

Photographs 13 & 14: Examples of validation photographs demonstrating inert cover depth and geotextile

18.7 Waste Exemptions/Requirements

Should reuse of soils from the development be proposed, these would require either conventional waste exemptions (if small volumes) or follow the CL:AIRE Definition of Waste – Code of Practice (DoW-CoP).

Where following the DoW-CoP the developer should establish a Material Management Plan (MMP) showing the location of the materials to be stockpiled and progressive use. The proposals should be agreed between the developer and their contractor. An independent suitably Qualified Person (QP) should review the information provided and complete the declarations for registration under the CL:AIRE system.

The QP will require regulatory approval of the remediation proposals, consultation with the Local Authority and Environmental Agency, prior to registering the declaration, which must be in place prior to the intended reuse of the madeground.

18.8 Validation of Gas Mitigation Measures

In accordance with NHBC Technical Extra 20, independent validation of gas mitigation measures for Amber 1 protection may be requested. The approaches to verification of gas mitigation measures are detailed within CIRIA C735, introducing the holistic approach accounting for 4 key criteria, detailed in Table 12.

Table 12 – Risk Based Approach to determine gas inspection program

Consideration	Assessment Criteria
Gas Regime	Risk based upon Characteristic Situation and levels of protection
Complexity of Designs	Based upon number of penetrations, building shape, steps in slab levels, etc.
Number of Plots/Buildings	The number of plots; where greater numbers are considered a high risk of variation and build duration.
Installation workforce	NVQ Level 2 qualification or general ground works contractor.

The gas regime is relatively low risk, gases have been identified to originate from a low risk source (alluvium), at low concentrations and flow rates, travelling through natural strata with confined permeability. The gas designs have the primary form of protection achieved through passive venting with relatively lower reliance on the gas membrane through the design. The floor slab however is not offering any significant protection against gas ingress.

The buildings are standard construction without complex designs, with no stepped levels, basements, or other complex construction means.

With 9 No. plots proposed for installation of protection measures there is unlikely to be significant potential for variations in frequencies of verification. Coopers do not advocate or support frequency inspections due to common problems with defects being revealed on contractor's photographs and potential for significant problems for the developer where retrospective mitigation or verification becomes very costly.

The installation workforce is likely to be general contractors without specialist NVQ 2 training. From Coopers' experience the standard of installation among general contractors is more varied with potential for the work to be completed by inexperienced personnel where common defects would be likely.

The verification is proposed to include independent inspection of each gas membrane, by competent persons in the inspection of membranes. There are various schemes launched where to demonstrate competence, such as NVQ4, CL:AIRE qualification (proposed), or British Verification Council (BVC membership). Should companies undertaking inspection not be able to demonstrate suitable competence then further integrity testing of joints/whole membrane is recommended.

A summary of the verification regime is provided in Table 13.

Table 13 – Gas Verification Requirements by Construction Method

Construction Method (Note *1)	Independent Inspection (Note *2)	Integrity Testing (Note *2 & 3)	Defect Integrity Testing (Note *3)
Block and beam floor slab, proprietary gas membrane with very good passive venting.	Plots 1-7, 30 and 31 (all plots to be inspected)	None.	None.

Notes to Table 13:

**1 – Changes to any proposed slab type, construction personnel and achievement of NVQ level 2 training must be reported to consultants for reassessment of the gas regime and inspection strategy.*

**2 – Inspectors of gas membranes installation to demonstrate competence/training in verification of gas membranes, for example NVQ4, BVC membership, otherwise integrity testing is proposed to further support the verification. The method of testing would be subject to the methods of jointing and installation, which should be agreed with the NHBC and local authority.*

**3 – If the integrity testing company are not qualified (NVQ4) or have recognised membership of BVC (interview and testing), or CL:AIRE accreditation (proposed at time of this report), then a defect test will be required to be carried out with the consultants and contractors to demonstrate the integrity testing is capable of identifying defects.*

The aspects to be verified are listed in Table 14 below, with example photographs 15 to 26 showing example photographs.

Table 14: Gas Mitigation Measures Inspection Criteria

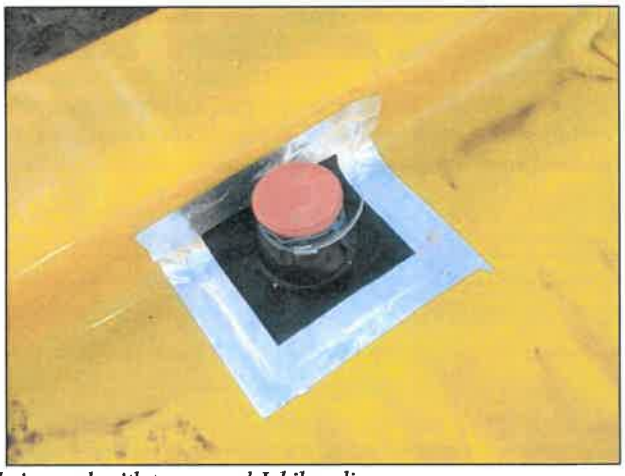
Item		Inspection Notes
1. Product Verification		*Confirmation that suitable products have been installed to consist of gas Membrane and tapes*
2. General Condition		*The membrane is to be inspected to ensure there are no tears, punctures or rips.*
3. Membrane Subgrade		*Commonly either insulation or sand blinding, check no gravel or other items with the potential to puncture.*
4. Jointing/Welds		*Checking the overlaps between membranes are correctly sealed, with correct tapes with sufficient overlaps or a good quality heat sealed weld if this method being utilised.*
5. Creases/folds		*Care must be taken to ensure that creases & folds within the membrane do not span over the jointing sections (bridging) as this provides an unacceptable gas pathway.*
6. Service Entry Points		*Verification of the presence of preformed tophats sealed to the pipe and membrane. If service entries are constructed using detailing strip or equivalent product then ensure adequate seal is achieved.*
7. Corner Sections		*Not cut and folded where punctures are present but concealed with tapes. Either formed with Detailing Strip or preformed corner units.*
8. Reinforcement Spacers		*Use of metal spacers/ties with potential to puncture the membrane would only be permitted with protection board.*
9. Membrane Dirt/Debris		*Whilst we appreciate the membranes are constructed on a real-world construction site, the membrane must be free of debris such as stones or mortar that would be liable to damage the membrane when weight is applied through subsequent construction. Whilst mud is inevitable on the membrane it must be kept to a minimal level to allow the membrane to be inspected and defects disclosed. If the membrane is not visible due to the amount of mud then it will be failed and need to be cleaned for reinspection.*
10. Puncture Repairs		*Punctures are relatively common and occasional damage with proper repair is not considered to be indicative of defective workmanship. All punctures require a patch that spans the damaged section by at least 150mm on each side.*
11. Party Walls		*The use of temporary blockwork for shuttering commonly involves placing the gas membrane above the blocks for the initial concrete pour. When this is removed, we advocate placing the membrane back to run flat through the party wall to allow this to be sealed and inspected on the subsequent plot. Alternative approaches are available but the membrane must not be cut and patched after the second plot is cast (due to additional damage, difficult repairs, and lack of inspection at this stage). Also if robust details adopted the membrane will need to drop through the cavity.*
12. Door Thresholds		*Care is required in relation to gas membrane positions through the wall cavity to the external wall around the door thresholds, closing the cavity, and protection beneath any sills. The use of preformed cloaking units and/or detailing strip protection would be recommended.*
13. Wall Cavity Inspection		*Confirming that proprietary gas membrane or gas DPC spans the external walls.*
14. Internal Garage		*One of the most common problems/defects in construction occur for internal garages where the membrane positions need to account for variations in proposed slab level. Consideration of the following items requires attention*
a)	Sloping Floor	*Check if the developer has sloping garages, if so these are critical to membrane positioning and requires particular attention to membrane positions.*
b)	Internal Walls	*If sloping floor then check the membrane transitions at a low level through the internal wall to the plot to ensure it will not be exposed above the frontage of the sloping garage.*
c)	External Walls	*If sloping floor then check the membrane steps up within the external wall cavity of the internal garage to ensure it is not exposed above the fall of the garage.*
d)	Pillars	*Check the pillar/garage entrance section for the use of detailed strip to ensure not exposed around the entrance and closure of the cavity – refer to construction guide for details.*
15. External Wall Venting		*Check positioning of vents are on 3 sides of dwelling at approximately 2m centres. Take photographs of vents on external walls for each plot.*
16. Subfloor Venting Type Checked		*If stone venting (for suspended cast in situ concrete floors) then check the stone is single sized, 20-40mm.*
17. Subfloor Venting Thickness		*The venting medium (void/stone) is of a designated thickness as shown on the gas design details. Photograph thickness of adjacent plots showing how large the void dimension will be with a staff.*
18. Internal/Partition Wall Venting		*Check the spacing and dimensions of any interconnecting pipes between the subfloor venting medium.*


Photographs 15 and 16: Confirm presence of internal venting pipes, diameter and spacing. The typical spacing is 1 No. 75mm diameter pipe every 1m. This can change depending upon the pipe diameter, and the presence of spaces below the blocks and between the beams (dependant upon site specific construction variations) or changes by . This may not be able to be directly observed on each plot, depending upon the site specific design of gas protection measures. If not recorded then observation of other plots under construction, or requesting photographs to be taken by construction management can be deemed appropriate depending upon confidence in the construction as site progresses

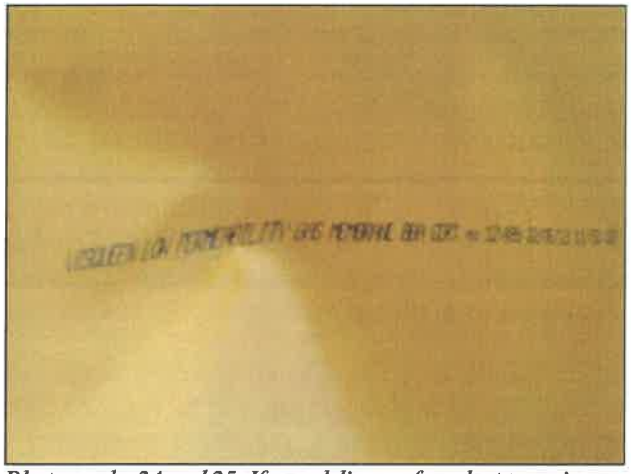

Photographs 17 and 18: Verify presence of cranked vents along the external walls and sufficient spacing. Areas of access points to internal garages or external adjoining garages may not be possible to have cranked venting and alternative construction options should be discussed where necessary. Plots with stone venting to include photographs demonstrating the cranked vents are aligned with the stone

Photograph 19: Check general condition of membrane for punctures/tears etc – take panoramic photograph showing general condition

Photographs 20 and 21: Check >150mm overlaps of membranes and proprietary tapes placed and sealed with photographs taken



Photographs 22 and 23: Check tophat is sealed to membrane and pipework with tapes, and Jubilee clip



Photographs 24 and 25: If new delivery of product types is present and copies of supply tickets are not available then inspect product labels to confirm manufacturers and product types

Photograph 26: If no product labels are present then inspect stores for product types

18.9 Conclusions

The remediation proposals include testing of soils, inert cover within gardens/landscaping over the former ponds (Plots 30 and 31) and gas mitigation measures for plots in the north east (Plots 1 to 7) and over the ponds (Plots 30 and 31).

Specific verification of the remediation works have been provided and are required for approval by the local authority.

19.0 Management of Materials and Waste

19.1 Management of Materials

Where materials are excavated for construction purposes these should be retained on site for engineering purposes where considered suitable for reuse in accordance with a sustainable development policy.

Any intended reuse of soils is considered to be a waste activity requiring specific exemptions from the Environment Agency or Material Management Plan (MMP) following the CL:AIRE Development Industry Code of Practice for the Definition of Waste, Version 2 (or superseding versions if relevant). This guidance expects a Remediation Strategy to be produced for the site (assuming it to be contaminated) to determine which strata or areas of the site are considered to be contaminated with regard to the proposed land use (Route A). A Design Statement maybe utilised for those sites which have no contamination (Route B). **Subject to Statutory Body requirements this site is expected to require a Remediation Statement, although reuse of natural strata may be deemed as Route B if contaminated soils are removed in advance.**

When applying for approval of the Code of Practice for this site, all engineering works on site have to be known. As part of the requirements, a full material management plan will be required. This will designate what material (including volumes) will be excavated, the likely positioning of stockpiles on site, as well as the fate of the soils. Those which have been determined as being contaminated and surplus to use on site will be considered as waste and will require disposal. Those soils which require treatment on site (e.g. bioremediation, stabilisation) will require justification and verification to prove once treated, this material is suitable for use. The justification and verification of formerly contaminated/unsuitable material which have been transformed by processing to suitable material will remove this material from being waste, unless the volume of material is considered surplus to the requirements of the site. All aspects associated with site management and excavation works should be completed by the groundwork's contractor, or an engineer supervising the groundwork's contractor.

Tracking systems of materials, stockpiles and remediation processes will be required to be robust within the site management systems. Should the process of material tracking be considered non-robust, this may fail the test whether excavated materials may be considered non-waste. It should be noted that it must be proved the volume of soils to be transferred will be utilised on the receiving site, otherwise this material may be considered waste.

Direct transfer of naturally occurring soils may be undertaken, however a robust assessment of the materials has to be undertaken to confirm this material is suitable for use and uncontaminated. It should be noted that the degree of threshold for contamination will be judged on the receiving sites requirements (based on the proposed end use).

It is recommended that all materials where possible are segregated with stockpiled natural strata kept away from stockpiled fill strata. Should material be disposed of at landfill, it may be possible to classify the natural material strata as a lower waste classification, however WAC (Waste Acceptance Criteria) analysis will commonly be required. This is an expensive form of analysis and should be completed on stockpiles prior to disposal or for transfer through the Code of Practice mechanism of movement of soils to hub sites (WAC analysis is not required for direct transfer).

The Code of Practice requires 4 No. factors to be addressed within the Material Management Plan:

(1) Protection of human health and protection of the environment
(2) Suitability of use, without further treatment
(3) Certainty of use
(4) Quantity of material

With regard to Box A within the Code of Practice (c.3.7, p.13), the material types encountered have been classified to determine the 'Categorisation of materials within the ground'. Should areas and volumes of strata be noted below, these are approximate values and require assessment by a qualified quantity surveyor. These volumes do not represent the volumes of soils likely to be excavated through any part of the demolition/construction phase of the site redevelopment, rather the anticipated total volume of that stratum. Additional investigation may be required to obtain more accurate detailed quantities:

Table 15: Categorisation of materials within the ground in accordance with Code of Practice:

(1)	Material that is capable of being used in another place on the same site without treatment*;
(2)	Material that is capable of being used in another place on the same site following ex-situ treatment on site*;
(3)	Material that is capable of being used in another development site without treatment (Direct Transfer);
(4)	Material that is capable of being used in another development site following ex-situ treatment on another site e.g. Hub site*;
(5)	Material that is not capable of being used on the site or elsewhere and requires recovery or disposal off site as waste; or
(6)	Material that will be surplus to requirements and requires recovery or disposal off site as waste.
*	Having regard to the conceptual model (receptors and pathways) and appropriate risk assessment of the location where materials are to be used.

Topsoil (1), (3), (5) or (6)
The topsoil from the open areas (excluding former pond) are inert and suitable for reuse, whilst the topsoil from the gardens contained sporadic elevations which require further testing following segregation to determine if viable to remain on site (assume disposal prior to further testing). Topsoil from the area of the pond contains asbestos and not suitable to remain on site.

Areas of inert topsoil should be kept segregated from soils from gardens where further testing is ongoing.

Treatment or disposal of soils may be required for areas impacted by suspected Himalayan Balsam with specialist advice required on treatment or disposal of soils from these areas.

Madeground – General (1), (3), or (6)
The sporadic general madeground is considered uncontaminated and suitable for reuse in gardens subject to geotechnical considerations subject to the end use.

Madeground – Pond (1), or (5)
The madeground from within the area of the pond contains trace chrysotile asbestos fibres unsuitable for retention or reuse in garden growing mediums. Subject to adequate control measures can be reused in other areas of the site, provided geotechnically suitable for the end use.

Natural Strata – (1), (3) or (6)
Natural strata were identified to be uncontaminated. These may be utilised as subsoil or beneath roads and buildings (subject to suitable compaction for the end use).

19.2 **Disposal of Waste Materials**

Environment Agency Technical Guidance WM3 - Hazardous Waste, details the requirements for classifications of materials as hazardous waste. The soils will typically be classified as one of the following, subject to specific assessments and verification:

17 05 03 soil (including excavated soil from contaminated sites), stones and dredging spoil [soil and stones containing dangerous substances], (WAC analysis required for disposal)

or

17 05 04 soil and stones other than mentioned in 17 05 03 – not containing dangerous substances. (WAC analysis may not be required).

Based upon the chemical analysis of the samples taken. **Coopers anticipate that all strata would be designated as non-hazardous waste, and natural strata and uncontaminated soils may be acceptable as inert waste.** It is advocated that any soils intended for disposal are segregated based upon likely disposal route, including segregation of topsoil, madeground and natural strata for specific testing agreed with the destination/disposal site.

20.0 Sub Soil Classification

(Refer to Appendices 4, 5, 7, 8 and 13)

20.1 **General**

Samples of the soils from the exploratory holes by Coopers were submitted to Element Materials Technology and Murray Rix.

In situ testing of soil strengths were also undertaken on the site by Coopers.

20.2 **Results of In Situ Testing**

Table 16 below details the in situ testing relevant to assessments of the construction requirements for this site. Further testing or assessments may be required for foundation design or earthworks purposes.

Table 16: - Summary of In Situ Testing

	Coopers Shear Vanes (kPa)	Coopers SPT (N Value)
Very stiff CLAY (Glacial)	180	-
Stiff CLAY (Glacial)	88-156	6-26
Firm to stiff CLAY (Glacial)	60-160	5-33
Firm CLAY (Glacial)	52-80	-
Soft to firm, soft or very soft, very silty CLAY	12-60	0-6

20.3 **Results of Laboratory Analysis**

Table 17 details the geotechnical analysis relevant to assessments of the construction requirements for this site.

Table 17: - Summary of Geotechnical Analysis

Strata	SO_4 (2:1) (water soluble) (mg/l)	SO_4 (total sulphate) (%)	pH (-)	Mobile/ Static (-)	Plasticity Index (%)	<425 micron (%)	<60 micron (%)	<2 Micron (%)
Madeground	1.5-58.4	0.01-0.09	6.08-8.12	mobile	-	-	-	-
Glacial Clay	1.5	0.02	7.78	static	31-34	100	-	-
Very clayey SILT/Silty CLAY	-	-	-	static	-	100	100	27-31

20.4 Interpretation

The testing by Coopers included testing of 3 No. samples of glacial clay for Atterberg limits. The results define this shrinkage potential as within the mid ranges for medium shrinkage potential following the NHBC classification system. This is further discussed in Section 21 (Trees) and Section 23 (Foundations).

Shrinkage Potential: **Glacial Clay** – Medium

Soil Classification: Based upon BRE Special Digest 1 (2005), the Design Sulphate (DS) class, Aggressive Chemical Environment for Concrete (AC) class, and Design Concrete (DC) class for each of the strata types is given below:

Madeground – DS-1, AC-1, DC-1
Glacial Clay/Silt - DS-1, AC-1s, DC-1

Any fill material to be imported onto the site should be tested and should not exceed the classifications given above. The designated concrete mix by end use is detailed in Table 18 (below).

Table 18: Sub-structure ready mix concrete designations by end use over the entire site

Use as substructure and ground floors		Ready-mixed concrete (designated mix)
General Use:		
• Rough blinding (non-structural)	-	GEN1
• Infill	-	GEN1
• Unreinforced oversite concrete below timber floors	-	GEN1
• Structural blinding and overbreak	-	GEN1
• In situ external concrete for drives and paths	-	PAV1
• In situ external concrete foundations for precast concrete paving slabs	-	GEN1
• Fill to wall cavity	-	GEN1
• Solid filling under steps	-	GEN1
Floor Slabs:		
• House or garage with reinforced concrete floor slab, either suspended or precast.	-	RC35
• House with non-reinforced slab (ground bearing) with either:		
a) Permanent finish to be added, e.g. screed or floating floor.	-	GEN1
b) No permanent finish to be added, e.g. carpet.	-	GEN2
• Garage with non-reinforced slab (ground bearing)	-	GEN3
Foundations:		
• Strip foundations	-	GEN1
• Trench fill	-	GEN1
• Other mass concrete foundations	-	GEN1
• Reinforced concrete footing	-	RC35

Notes to Table 18 on following page:

Notes to Table 18 (previous page):
1) *Worst case sulphate conditions over the entire site are ACEC Class AC-1s, and Design Chemical Class DC-1.*
2) *Classification and designation in accordance with NHBC guidance, Section 3.1 – Table 6, and BS8500-1, 2006.*
3) *The above conditions represent the worst case conditions identified within the testing of soils on the site.*
4) *Any fill material to be imported onto the site should be tested and should not exceed the classifications given above.*

21.0 Trees

(Refer to Appendix 1 and 13)

Semi-mature or mature trees and hedgerows were present around the periphery of the site, with planted trees/edges within areas of residential gardens. A tree survey has been provided by Prospect Homes, with specific cognisance of proposed tree retention and value. An overlay of the tree positions in relation to the planning layout is recorded on Coopers Drawing No. 7583/Fdz, revision A, within Appendix 13

Consultation with Ribble Valley Borough Council - Local Land Charges department, was undertaken to request if any trees are covered by Tree Preservation Orders (TPOs). The response was "*There is a TPO which affects the Calderstones Hospital site. This is TPO No.143 Calderstones Hospital, Whalley. A copy of the order can be provided at a cost of £22. If you would like a copy please contact our contact centre on 01200 425111 to make a payment*"

Previously supplied TPO plans for adjacent developments indicate the presence of a group TPO and two individual TPOs for trees in the south of the site, a copy of which is contained in Appendix 1. Other group TPOs were in the vicinity of the site, with annotate extract shown in Figure 30 (below). It is therefore advisable for arboricultural consultants to undertake consultation with the local authority regarding any TPOs on or close to the site and agree all proposals for tree felling with the local authority prior to felling.

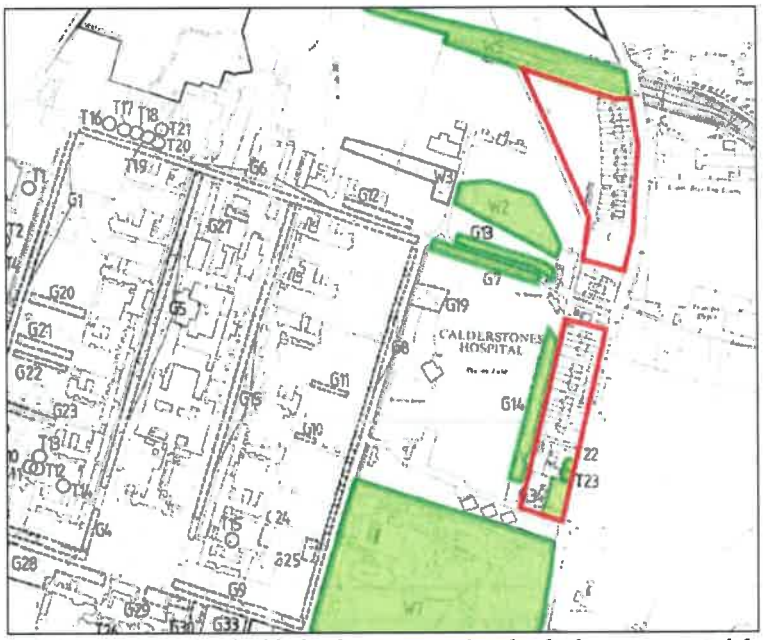


Figure 30: Showing highlighted groups and individual trees covered by Tree Preservation Orders in relation to approximate site boundary.

The shallow cohesive strata are subject to influence by changing moisture content associated with tree roots. Where existing trees are removed or their roots severed by construction of foundations, rehydration of clay subsoils may occur causing the clay to swell or 'heave'.

As immature to semi-mature trees grow the root ball expands and can cause the clay beneath foundations to shrink causing subsidence. Where heave or subsidence is likely to occur, it is possible that it will affect the foundation/slab designs for any proposed dwelling in their vicinity.

The glacial clay strata have been tested and determined as consistently medium shrinkage potential in accordance with NHBC guidance. Assessments of the tree influence in relation to current/proposed ground levels is therefore required for foundation designs. Zones of tree influence have been plotted on to the Coopers Foundation Zone Plan within Appendix 13.

Care must be taken to ensure that any existing trees scheduled for retention are not adversely affected by construction operations. Further guidance on this aspect of site works is given in the British Standards "*Guidance for Trees in Relation to Constructions*", BS5837.

22.0 Ground Floor Slabs

22.1 General Requirements

Based upon our client's preferred floor slab construction, all plots will include precast suspended (block and beam) slabs. Areas of heave influence will require an increased subfloor void of 250mm.

22.2 Gas Precaution Measures

Subject to completion of period of gas monitoring, it is assumed that Plots 1 to 7 and Plots 30 and 31 are to include Amber 1 mitigation measures due to identified gases from alluvium migrating into the sands beneath the site. A typical construction detail of the gas mitigation design is contained in Appendix 13.

23.0 Foundations

(Refer to Appendices 4, 5 and 13)

The foundation proposals for this site are based upon existing ground level. It is advisable that external works drawings should be provided to determine foundation depths relative to the proposed slab levels.

23.1 Development Proposals

Our current assessments assume that the site will be developed with 50 No. traditional residential houses, as detached or semi-detached buildings, assumed to be 2 stories in height, with associated garages. The development layout is recorded on Coopers Drawing No. 7583/Fdz, revision A, within Appendix 13.

23.2 Ground Conditions

The general ground conditions comprise shallow natural strata with the exception of the former ponds where deeper madeground was present to depths of circa 3.5m. Areas of very soft, soft and soft to firm clays have been identified in the northern part of the northern parcel and northern part of the southern parcel where conventional shallow foundations are not possible for design due to reduced allowable bearing capacities in this statum.

The glacial clays are defined as medium shrinkage potential with tree influence a key criteria in determination of the foundation depths. Where tree influence exceeds 2.5m depth the foundations are proposed to include piled foundations as this exceeds the maximum assessment depth permitted by the NHBC (unless post felling desiccation assessments are undertaken).

23.3 Heave Potential

The areas where tree influence of >1.5m from existing height (or mature height if >1/2 mature height) within the glacial clays are designated as liable to heave influence with associated protection required to the foundations.

23.4 Safe Bearing Pressure

The safe bearing pressure of the glacial clays have been assigned as 100kN/m^2 based upon the minimum value required by the structural engineers for foundation design purposes on this site. Higher values can be assigned within areas of firm to stiff, stiff, or very stiff clays, where required.

23.5 Foundation Recommendations

The foundation types are shown for each plot on the Coopers Drawing No. 7583/Fdz, revision A, within Appendix 13.

1) For plots outside of significant tree influence, former ponds and areas where shallow firm, firm to stiff, stiff or very stiff foundations the following foundation types are proposed:

Ts - Traditional Strip Foundations

- **For properties founded entirely on firm, firm to stiff, stiff, or very stiff clay, at less than 1.25m depth from original ground level and proposed slab level, and not within the tree zone requiring heave precautions.**
- Maximum safe bearing strata limited to 100kN/m^2.
- Minimum foundation depth of 0.9m below finished ground level.
- Where formation depth varies the foundations should be stepped in accordance with NHBC Standards.
- Where current ground level is above proposed ground level the soils should be reduced prior to commencing excavation.
- Where current ground level is below proposed ground level it is assumed the foundations will be constructed prior to upfilling.
- Should pockets/layers of glacial sand be identified within glacial clays the inclusion of nominal reinforced should be considered to account for minor variations in settlement across different strata types.
- Refer to Coopers typical construction detail, Drawing No. 7583/Ts in Appendix 13.
- **Based upon the current development layout a total of 6 No. Plots are proposed for this foundation type.**

2) For plots outside of the zone of heave influence from trees, where foundation depths are >1.25m and <2.5m in depth, the following foundation type is proposed:

Tf – Mass Concrete Trench Fill Foundation.
• **For properties founded entirely on firm, firm to stiff, stiff, or very stiff clay, at greater than 1.25m and less than 2.5m from original ground level and proposed slab level.**
• Where tree influence is >1.5m depth but outside of a tree heave zone, this is due to the tree being <½ mature height with foundation depth to account for subsidence (not heave) as agreed with the NHBC.
• Minimum concrete thickness of 0.5m, unless viable for transition into strip footings.
• Maximum safe bearing strata limited to 100kN/m^2.
• Minimum foundation depth of 0.9m below finished ground level.
• Where formation depth varies the foundations should be stepped in accordance with NHBC Standards.
• Where current ground level is above proposed ground level the soils should be reduced prior to commencing excavation.
• Where current ground level is below proposed ground level it is assumed the foundations will be constructed prior to upfilling.
• Refer to Coopers typical construction detail, Drawing No. 7583/Tf in Appendix 13.
• **Based upon the current development layout a total of 4 No. Plots are proposed for this foundation type.**

3) For Plots where tree heave influence of >1.5m within glacial clays the following foundation types are proposed:

TfH – Mass Concrete Trench Fill Foundation.
• **For properties founded entirely on firm, firm to stiff, stiff, or very stiff clay, at greater than 1.25m and less than 2.5m from original ground level and proposed slab level and within the heave influence zone from trees.**
• Heave precaution measures are required within heave influence zones on the internal face of the external wall foundations to accommodate 25mm of compression.
• Minimum concrete thickness of 0.5m, unless viable for transition into strip footings.
• Maximum safe bearing strata limited to 100kN/m^2.
• Minimum foundation depth of 0.9m below finished ground level.
• Where formation depth varies the foundations should be stepped in accordance with NHBC Standards.
• Where current ground level is above proposed ground level the soils should be reduced prior to commencing excavation.
• Where current ground level is below proposed ground level it is assumed the foundations will be constructed prior to upfilling.
• Refer to Coopers typical construction detail, Drawing No. 7583/TfH in Appendix 13.
• **Based upon the current development layout a total of 17 No. Plots are proposed for this foundation type.**

4) For Plots where outside of heave influence from trees and where depth to suitable bearing strata is >2.5m (either due to soft clays or future tree growth influence) the following foundation types are proposed:

P - Piled Foundations with Associated Ground Beams
• **For properties where formation depths exceed 2.5m from proposed slab level due to tree influence >2.5m (future growth not requiring heave protection), former ponds, and soft/organic silts/clays.** • Confirmation of the suitability for the proposed piled foundations should be sought from the piling contractor prior to construction. • The determination of the number of piles (and therefore the loads) against pile length is largely commercial and typically determined by the contractors. Assuming piles to be friction bearing within glacial till anticipated pile lengths are likely to be up to 10m. • Deeper cable percussive boreholes may be required for pile design purposes and associated approvals. • Piling platform to be designed in accordance with BR470 and subject to the rig specifications. • Confirmation should be sought from the local authority regarding noise or vibration issues associated with driven piles. • **Based upon the current development layout a total of 4 No. Plots are proposed for this foundation type.**

5) For Plots where due to heave influence from trees and where depth to moisture stable strata is >2.5m the following foundation types are proposed:

PH - Piled Foundations with Associated Ground Beams including Heave Precautions
• **For properties where influenced by trees to >2.5m where piles and ground beams require designs to account for the heave influence of trees.** • Heave precautions required under ground beams (100mm of compression) and on internal face of beams along external walls (25mm of compression). • Confirmation of the suitability for the proposed piled foundations should be sought from the piling contractor prior to construction. • The determination of the number of piles (and therefore the loads) against pile length is largely commercial and typically determined by the contractors. Assuming piles to be friction bearing within glacial till anticipated pile lengths are likely to be up to 10m. • Deeper cable percussive boreholes may be required for pile design purposes and associated approvals. • Piling platform to be designed in accordance with BR470 and subject to the rig specifications. • Confirmation should be sought from the local authority regarding noise or vibration issues associated with driven piles. • Refer to Coopers typical construction detail, Drawing No. 7583/PH in Appendix 13. • **Based upon the current development layout a total of 27 No. Plots are proposed for this foundation type.**

24.0 Trench Side Stability

(Refer to Appendix 4)

The excavations undertaken during the ground investigation demonstrated good trench side stability during or shortly after excavation. Should trenches need to remain open for longer periods or require manned entry then they should be supported at all times or, where suitable, safely battered. Battering of excavations should be avoided in the proximity of existing structures without assessment from experienced engineering personnel.

Trench excavations for foundations/services must be adequately supported at all times and should be in accordance with the recommendations of CIRIA Report 97: Trenching Practice.

Further guidance on this aspect of site works is given in the British Standards for "Workmanship on Building Sites", BS8000, Parts 1 and 14, and in the Construction Industry Training Board's Site Safety Note 10.

Excavations within drift deposits revealed by this investigation should be within the capacity of conventional hydraulic plant without the use of mechanical breakers.

25.0 Dewatering

(Refer to Appendix 4, 5 and 13)

The ground investigation has identified the general absence of perched waters.

Where perched water ingress is encountered during construction excavations these should be easily managed through traditional sump pumping.

Any pumping of groundwater should not be discharged into the existing sewer system without prior agreement from the Environment Agency and Local Authority. Further guidance can be obtained from the CIRIA Report 113 entitled "Control of Groundwater for Temporary Works".

It should be noted that seasonal factors may affect changes in groundwater levels at the site. Consequently, dewatering may be more prevalent in the winter or at times of prolonged rainfall for shallow foundations or drainage trenches.

Based upon the cohesive nature of the strata on site the use of traditional soakaways for surface water drainage would not be feasible due to the very low permeability of this stratum. Irrespective of the infiltration rates of the clays the use of soakaways for surface waters would not be permitted due to the presence of clays liable to shrink-swell behaviour associated with changes in moisture content, as specified within CIRIA C753, "*SuDS Manual 2015*" Chapter 25.2.3 and Figure 25.4.

26.0 Road Sub-Grade

(Refer to Appendix 4, 5 and 13)

26.1 Following site clearance, vegetation removal and earthworks regrading levels the anticipated roads and car parking sub-grade materials are likely to comprise natural firm to stiff, or stiff clays.

26.2 Road formation within natural strata are estimated to have CBRs of between 2.5% to 7%, subject to proof rolling and soft spot removal, based upon text book values. CBRs in clays are subject to construction conditions and moisture variable strengths of the strata.

27.0 Slope Stability

27.1 General

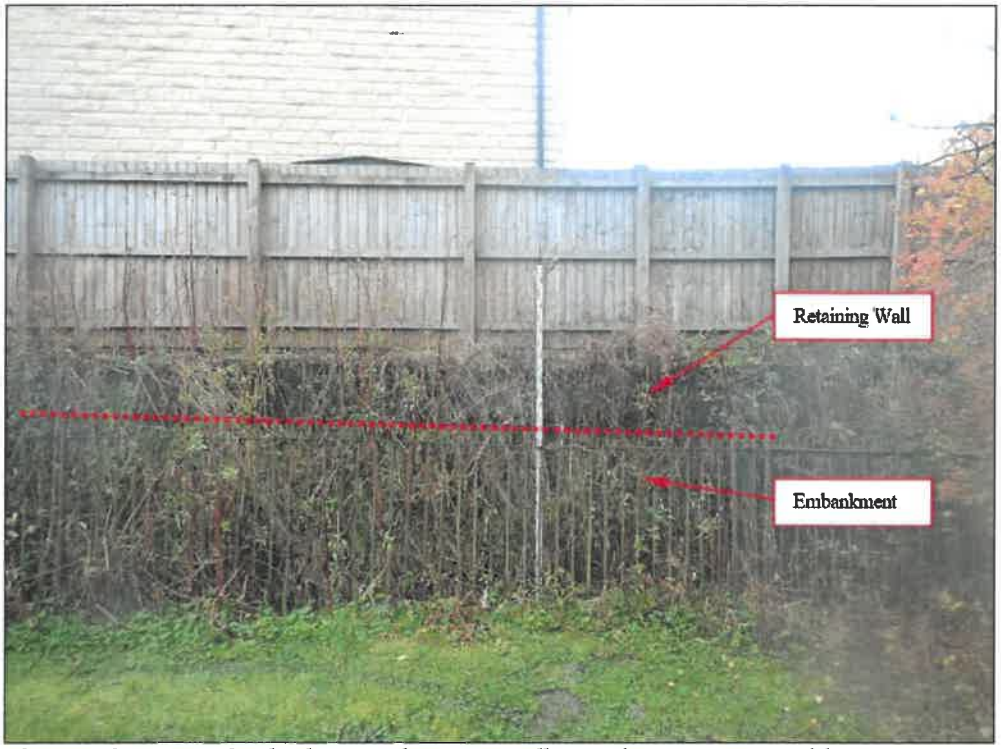
The majority of the site is relatively flat lying with no significant slopes within the site where assessments of slope stability would not be typically required.

To the north of the northern parcel is a former railway cutting partially filled within a tunnel beneath Mitton Road. No topographic survey has been undertaken along this slope and beyond the site boundary. Coopers undertook a walkover along the former cutting, with no clear evidence of failures, although individual toppled trees were present and the dense vegetation limited detailed inspections (refer to Photograph 27).

Photograph 27: Toppled trees and dense vegetation within former railway cutting to the north of the northern site boundary.

The exact position of the crest of the slope is varies, generally situated 1.2m to 1.5m beyond the existing fence boundary. The development layout indicates plots or garages are positioned circa 2.5m from the site boundary, circa 3.7m to 4.0m from the crest of the railway cutting. These buildings are proposed for piled foundations (due to tree influence). The slopes are assumed to be circa 5-6m in depth (typical for railway cuttings), and roughly 11m in length. It is advised to arrange for topographic information on the levels beyond the boundary to determine if further slope stability assessments or development offsets are required.

The development to the west of the northern parcel was raised above the site by up to 2.5m, with an embankment within the site. Part of the embankment in the north western corner contained a section of retaining wall (refer to Photograph 28). Consideration of the adjacent ground level, embankment stability and party walls are required as part of the proposals for the development.



Photograph 28: Raised embankment and retaining wall in north western corner of the site.

28.0 Conclusions and Further Actions

28.1 Conclusions

The site investigation has identified the ground conditions to consist of glacial clays commonly firm, firm to stiff, stiff or very stiff, with locally very soft, soft to firm or soft clays/silts, primarily in the northern part of the site.

Isolated areas of low mobility inorganic and PAH contaminants were identified within the topsoil in some of the residential gardens, and chrysotile asbestos fibres within topsoil and infill from the former pond.

Remediation proposals include an inert cover system within gardens and landscaping from the former pond (2 No. plots), with segregation for additional testing of the topsoil from the gardens to determine if localised areas are viable for reuse.

Gas monitoring is ongoing to determine if the former pond, or organic and local filling are generating significant ground gases to pose a risk to the future properties. Monitoring to date has identified locally higher concentrations and methane and carbon dioxide in the areas close to the source with outline proposals for gas mitigation measures within 9 No. plots close to the source.

Additional topographic surveys are recommended for the former railway cutting to the north of the site to determine if further slope assessment models and or development offsets are required.

28.2 Further Actions

Further action which Coopers consider will be required to progress the development status could include, but not necessarily be limited to: -

- Submit site investigation report for local authority and NHBC for approval.
- Topographic survey recommended within the railway cutting beyond the northern site boundary.
- Complete ground gas monitoring, and finalise assessment/mitigation proposals.
- Following eradication/removal of suspected Himalayan Balsam further investigation is recommended to delineate the former ponds and determine any significant variations in the nature of the infill.
- During initial stage of development topsoil from sections of residential garden to be segregated to separate piles for additional testing to determine if localised areas are suitable for reuse.
- Any reuse of waste soils to be registered and recorded in accordance with EA guidance.
- Placement of inert cover systems within the gardens over the former pond to be subject to validation holes confirming the depth of inert cover.
- Chemical testing of imported soils (if intended) for placement within gardens.
- Verify remediation works with reporting to satisfy Local Authority and NHBC.
- Validation of installation of gas mitigation measures.

29.0 References

- Published geological maps, memoirs and the British Geological Survey website.
- Groundsure Historical Maps.
- Groundsure Enviro+Geo Insight Report.
- Correspondences with Ribble Valley Borough Council.
- A review of data held in the Coopers archives.
- A review of desk study data obtained from internet sources.
- Findings of trial pits and boreholes undertaken by or on behalf of Coopers.
- Findings of laboratory testing by Element Materials Technology Ltd.
- Findings of laboratory testing by Murray Rix.
- Highways Agency, Volume 1 - Manual of Contract Documents for Highway, Series 600 - Earthworks, Amendment November 2016.
- Design Manual for Roads and Bridges Volume 7, Section 2, Standard Interim Advice Note 73/06 Revision 1.
- The Law Society's Guidance Notes and Directory for Coal Mining Searches.
- DOE/ARUP Map of Mining Instability in the Northwest.
- The Coal Authority Technical Guidance Note 1 (TGN1/2019).
- BS 3882:2015 - Specification for topsoil and requirement for use.
- BS 5837:2012 - Trees in relation to design, demolition and construction. Recommendations.
- BS 5930:2015 - Code of Practice for Ground Investigations.
- BS 8000-11:2011 - Workmanship on building sites. Internal and external wall and floor tiling. Ceramic and agglomerated stone tiles, natural stone and terrazzo tiles and slabs, and mosaics. Code of practice.
- BS10175: 2011+A2:2017 - Investigation of potentially contaminated sites. Code of practice.
- BS EN 1997-1:2004 - Eurocode 7. Geotechnical design. General rules.
- BS 8485:2015+A1:2019 – Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments.
- BS 8576:2013 – Guidance on Investigations for Ground Gas (Permanent Gases and Volatile Organic Compounds (VOCs)).
- BRE Special Publication 1– Concrete in Aggressive Ground, 2005.
- BRE/EA Report 414: Protective Measures for Housing on Gas Contaminated Land, 2001.
- BRE: Cover Systems for Land Regeneration, 2004.
- BRE Report 211, Radon: Guidance on Protective Measures for New Dwellings, 2007.
- CIEH and LQM Report Generic Assessment Criteria for Human Health Risk Assessment, 2nd Edition, July 2009.
- CIEH and LQM Report: The LQM/CIEH S4ULs for Human Health Risk Assessment, 2015.
- CIRIA Report 97 – Trenching Practice, 1992.
- CIRIA Report 113 - Control of Groundwater for Temporary Works, 2000.
- CIRIA Report C665: Assessing risks posed by hazardous ground gases to buildings, 2006.
- CIRIA Report C733: Asbestos in soil and made ground, 2014.
- CIRIA Report C735: Good Practice on the testing and verification of protection systems for buildings against hazardous ground gases, 2014.
- CIRIA Report C765 – Asbestos in soil and made ground good practice site guide, 2017
- CIRIA Report SP168: Asbestos in soil and made ground: a guide to understanding and managing risks, 2014.

- CITB – Report GE700: Construction Site Safety.
- DEFRA SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, 2014.
- DEFRA Environmental Protection Action 1990: Part 2A – Contaminated Land Statutory Guidance, revised 2012.
- Department for the Environment, Transport and the Regions: Passive Venting of Soil Gases beneath Buildings, Research Report, Guide for Design, Volume 1, September 1997.
- Environment Agency – Land Contamination Risk Management, (https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm), 2020.
- Environment Agency - Technical Advice to Third Parties of Controlled Waters for Part IIA of the EPA 1990, 2002.
- Environment Agency Report: SC050021/Final Technical Report 1 - A review of body weight and height data used within the Contaminated Land Exposure Assessment model (CLEA), 2009.
- Environment Agency Report: SC050021/SR2 - Human health toxicological assessment of contaminants in soil, 2009
- Environment Agency Report: SC050021/SR3 - Updated technical background to the CLEA model, 2009.
- Environment Agency Report: SC050021/SR4 - CLEA Software (Version 1.04 beta) Handbook, 2009.
- Environment Agency Report: SC050021/SR7 - Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guidance values, 2009.
- Environment Agency, Good practice for decommissioning redundant boreholes and wells, 2012.
- Environment Agency, Technical Guidance WM3: Waste Classification. Guidance on the classification and assessment of waste(1st edition 2015).
- Health and Safety Executive: Managing and Working with Asbestos - Control of Asbestos Regulations 2012. Approved Code of Practice and guidance, 2013.
- Highways Agency, Volume 1 - Manual of Contract Documents for Highway, Series 600 - Earthworks, Amendment November 2009.
- NHBC Standards.
- NHBC Report No. 10627-R01 (04): Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present, January 2007.
- Waste Management Report No. 27: Landfill Gas, Department of the Environment, 1991.
- Waste Management Paper No. 26A: Landfill Completion, Department of the Environment, 1994.

Appendix 1

Local Authority Consultations.

Environmental Agency Correspondence (for adjacent land).

Tree Preservation Order Plan (for adjacent land).

Ben Hill

From: Paul Wilkinson <Paul.Wilkinson@ribblevalley.gov.uk>
Sent: 16 September 2020 10:56
To: Sian Callister
Subject: RE: 7583 - Land at Mitton Road, Whalley

Good morning,

Please see responses below – I need to make further enquiries with reference to no. 4

1. As far as I am aware there are no current landfill sites within 250 metres of this site. The landfill sites are dealt with by Lancashire County Council, I would advise to check this with themselves. They would also be able to confirm if there any proposals for new sites.
2. Sorry this isn't something I can answer. We have a separate search request in for this site which will provide the planning history. I could only suggest you try our planning department directly. They can be emailed planning@ribblevalley.gov.uk
3. As far as I am aware groundwater abstraction is licenced by the Environment Agency, you would need to contact themselves. If there is any council involvement I would assume this would be Lancashire County Council rather than ourselves.
4. I need to check this, I will let you know
5. There is a TPO which affects the Calderstones Hospital site. This is TPO No.143 Calderstones Hospital, Whalley. A copy of the order can be provided at a cost of £22. If you would like a copy please contact our contact centre on 01200 425111 to make a payment.

Kind Regards

Paul Wilkinson
Local Land charges Officer
Ribble Valley Borough Council
01200 414405

From: Sian Callister <scallister@coopers.co.uk>
Sent: 10 September 2020 10:03
To: Paul Wilkinson <Paul.Wilkinson@ribblevalley.gov.uk>
Subject: 7583 - Land at Mitton Road, Whalley
Importance: High

Good morning,

I have recently submitted a search request to your colleagues at Lancashire Council regarding the above site, but I think I have made a mistake and that it is actually covered by yourselves at Ribble Valley. Can you please confirm if this is the case and if so, would you please be able to provide the information requested below and advise of costs associated with this request?

1. *Are there any closed, operational or proposed landfill sites within 250 metres of our client's site? If so will you please advise us and if possible provide us with copies of any waste disposal records, licenses, landfill gas monitoring results or other pertinent data which may be available. We would also welcome your comments on the risk of our client's site being affected by migrating leachate or landfill gas.*

2. *Do you have records of any former or existing uses/developments within, or in close proximity to, the proposed site, which may have a detrimental affect upon our client's proposed residential development?*

3. *Are there any licensed/unlicensed groundwater abstraction sites within 200m of the vicinity of the site for proposed residential development? If so please enclose details regarding location, uses of abstracted waters, depth to abstraction source, and abstraction rates if available.*

4. *Does the proposed site fall within a "consultation zone" for hazardous installations? If so please advise on the nature of the risk and the safety measures necessary for the proposed development to proceed.*

5. *Please provide details of any Tree Preservation Orders that are applicable to trees both within the proposed site and/or adjacent to the site boundaries.*

The reason we are requesting this information is because we have been asked by our clients to put together a site investigation report and this information would be for use in the report. I have attached an outline of the site and recent aerial photograph for your information. I understand that there may be a cost associated with the provision of this information.

I look forward to hearing back from you at your earliest convenience.

Many thanks

Siân Callister
for Coopers

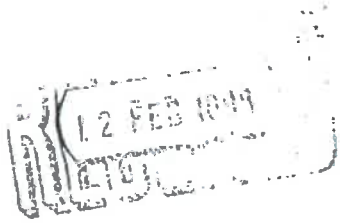
Tel: 01244 684910
Park House, Sandpiper Court, Chester Business Park, Chester, CH4 9QU
www.coopers.co.uk

RIBBLE VALLEY BOROUGH COUNCIL

please ask for DAVID HIND
direct line 01200 452463
my ref DH/MN
your ref
date 9 February 1999

Council Offices
Church Walk, Clitheroe
Lancashire. BB7 2RA

Tel: 01200 425111
FAX: 01200 426339
DX Clitheroe 15157



Dear Sir

CALDERSTONES HOSPITAL - CONFIRMATION OF MY FAX 4 FEBRUARY 1999

I thank you for your fax dated 4 February 1999 re the above and confirm below the answers to your questions raised.

1. The site is within a 250m landfill consultation zone.

   Our records indicate (guide only) that the deposits comprise 85% incinerator ash and 15% non putrescible waste, eg glass.

   Monitoring data not listed or known.

2. No data on file.

3. No.

I trust the above answers your questions, but if I can be of further assistance please do not hesitate to contact me.

I thank you for confirming that the cost of £30 will be forwarded to the Council in due course.

Yours sincerely

DAVID HIND
PRINCIPAL ENVIRONMENTAL HEALTH OFFICER

Mr Chris Burrows
Edward Roscoe Associates
Prospect House
20 Mellor Road
CHEADLE HULME
Cheshire SK8 5AU

MN/DH42708

2309

32021 0076P

RIBBLE VALLEY BOROUGH COUNCIL

please ask for DAVID HIND
direct line 01200 452463
my ref DH/EL
your ref 2309/99/RIB1202L
date 15 December 1999

Council Offices
Church Walk, Clitheroe
Lancashire BB7 2RA

Tel: 01200 425111
FAX: 01200 426339
DX Clitheroe 15157

Dear Sir

RE CALDERSTONES HOSPITAL, MITTON ROAD, WHALLEY, LANCASHIRE

Further to my telephone conversation with Mr Peter Sykes of your office on 14 December 1999 regarding your letter dated 2 December 1999 and accompanying data, I confirm below the points discussed.

I refer to plan numbers SH Edward Roscoe Associates dated February 1999 and 992309/100 Cooper Associates and note that the plots highlighted for the area of landfill are not equal to one another. As agreed, it is suggested that additional investigative work is undertaken to ascertain the extent of the landfill area, and therefore enable you to submit details to our planning department to comply with condition number 14 of their decision dated 19 February 1999, application number 3/98/0256/P.

I consider this is essential as the proposal submitted shows dwellings built upon filled land, and as such vented ground floor structures or other measures may be required by our building control team.

I trust my comments enable you to progress the application but if I can be of further assistance please do not hesitate to contact me.

Yours sincerely

DAVID HIND
PRINCIPAL ENVIRONMENTAL HEALTH OFFICER

cc Mike Kirby, Ribble Valley Borough Council, Church Walk, Clitheroe

Cooper Associates
Chartered Consulting Engineers
FAO Mr E Reynolds
Park House
Lower Bridge Street
CHESTER CH1 1RS

DH15-12D

ENVIRONMENT AGENCY

Our ref: CE\1999\001197\001
Your ref:

Date: 28 April 1999

M R Williams
Edward Roscoe Associates
Prospect House
20 Mellor Road
Cheadle Hulme
Cheshire SK8 5AU

RECEIVED
29 APR 1999

Dear Mr Williams

Calderstone Hospital Whalley

Thank you for your recent enquiry.

The River Calder which is designated as a main river watercourse is situated to the South West of this site. We have no records of past flooding occurring on the site, and no record of any surface water pollution incidents within the vicinity of the site.

I have attached information in respect of water quality for the site, and licensed groundwater abstractions within 1km of the site.

Sheet 10 (Groundwater Vulnerability of Central Lancashire) of the Policy and Practice for the Protection of Groundwater defines the site as being minor aquifer overlain by soils of low leaching potential. The map also shows low permeability deposits to occur at the surface.

The following notified Landfill Sites are within 500m of the Calderstones Hospital:

Calderstones Hospital Landfill site (Ref K1/3/021) is within the site boundary at approximately NGR SD 7235 3758.

Whalley Sewage Treatment Works Landfill Site (Ref. K1/3/022) is approx. 480m from the identified site at NGR SD 7222 3625.

Calderstones Hospital Landfill Site commenced operation before the controls imposed under the Control of Pollution Act (ie before 1974). The Environment Agency holds limited records regarding this site. Landfilling occurred in two areas in the north of the site. The first was tipped pre-licencing and is thought to have been completed in the early 1960s. The types of waste deposited here are thought to have been boiler-house/incinerator ash, rubble, furniture, textiles and general garden waste. The depth of the fill is unknown, but is thought to have been 8-10 feet. Tipping occurred later, commencing in approximately 1960, and ceased in 1991. The types of wastes deposited here are believed to be similar to those described above. Landfill gas monitoring has been carried out at the site, with levels of 5.3% v/v carbon dioxide, and 0.4% v/v methane being recorded. There were no significant flows of gas detected.

The Environment Agency
PO Box 519
South Preston
PR5 8GD
Tel: 01772 339882 Fax: 01772 627730
Mr P Greifenberg Central Area Manager

Whalley Sewage Works, Ridding Lane landfill site was tipped before the controls imposed under the control of Pollution Act (before 1974). The Environment Agency has limited records regarding the site. It is believed that the site received domestic refuse, which may have been fired. The site was completed in 1973.

We hold historical information on a limited number of sites known to have been the subject of investigation by other parties, however, we do not have any information pertaining to contaminated land at this site. You should note that this information does not constitute a formal register and you should satisfy yourself as to the previous history of the site by carrying out a full historical desk study and/or physical investigation of the site. It would also be advisable to contact the relevant Local Authority for information.

We have no record of any Process Industry Regulation or Radio Active Substances Registrations within 500m of the above site.

This information is subject to the attached conditions..

If you have any queries please contact Laura Saffery on 01772 339882.

Yours faithfully

L Saffery

Sue Halshaw
Customer Contact Team Leader

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WQInfo: GQA 1996

16-Mar-99

River Name	Stretch	Length	Up NGR	Down NGR	GQA96
CALDER	WHALLEY WEIR TO RIBBLE	4.2	SD7290 361	SD7090 371	D
CALDER	HYNDBURN BK TO WHALLEY WEIR	6.2	SD7569 331	SD7290 361	E
		10.4			

APPENDIX 3
GENERAL QUALITY ASSESSMENT (GQA)
CHEMICAL GRADING FOR RIVERS AND CANALS

Water Quality	Grade	Dissolved Oxygen (% saturation) 10 percentile	Biochemical Oxygen Demand (ATU)[1] mg/l 90 percentile	Ammonia (mg N/l) 90 percentile
Good	A	80	2.5	
	B	70	4	0.25
Fair	C	60	6	0.6
	D	50	8	1.3
Poor	E	20	15	2.5
Bad[2]	F	-	-	9.0

[1] as suppressed by adding allyl thio-urea

[2] i.e. quality which does not meet the requirements of grade E in respect of one or more determinands

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REPORT NUMBER : 5                                                                      CE/1999/001197

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END OF REPORT : 5
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DATA REQUEST EXPLANATION SHEET

This sheet shows an example and explains the layout of the computer print out of licensing information.

EXAMPLE LAYOUT

1..Tilcon Ltd — *2*..27 75 001 005 — *3*..11801
Quarries Production Office — *4*..Underground Strata at Cardew Mires Quarry, Dalston
PO Box 5, Fell Bank — *5*..I — *6*..37564800 — *7*..1341600
Birtley, Chester-Le-Street — *8*..NY348510
Co. Durham DH3 2ST — *9*..SG — *10*..C

1..Licence Holder & Address
2..Licence Serial Number
3..Aquifer Number (see below)
4..Source of Supply
5..Imperial (galls) / Metric (litres) indicator
6..Annual Licensed Quantity in Gallons or Litres
7..Daily Licensed Quantity in Gallons or Litres
8..National Grid Reference(s) of abstraction point(s)
9..Purpose of Use Codes (see below)
10..Status of Licence - Current, Revoked, Lapsed, Expired

AQUIFER NUMBERS

10300	Coal Measures
10700	Carboniferous Limestone Series
10900	Millstone Grit (Namurian)
11100	Superficial Deposits
118 --	Permo-Triassic - as below:
— 01	Carlisle Basin & Eden Valley
— 02	West Cumbria Coast
— 03	Furness
— 04	Fylde & Preston
— 05	Liverpool & Ormskirk
— 06	Lower Mersey Basin
— 07	Manchester & East Cheshire
— 08	Wirral
— 09	West Cheshire
— 10	South Cheshire & North Staffordshire
12000	Miscellaneous

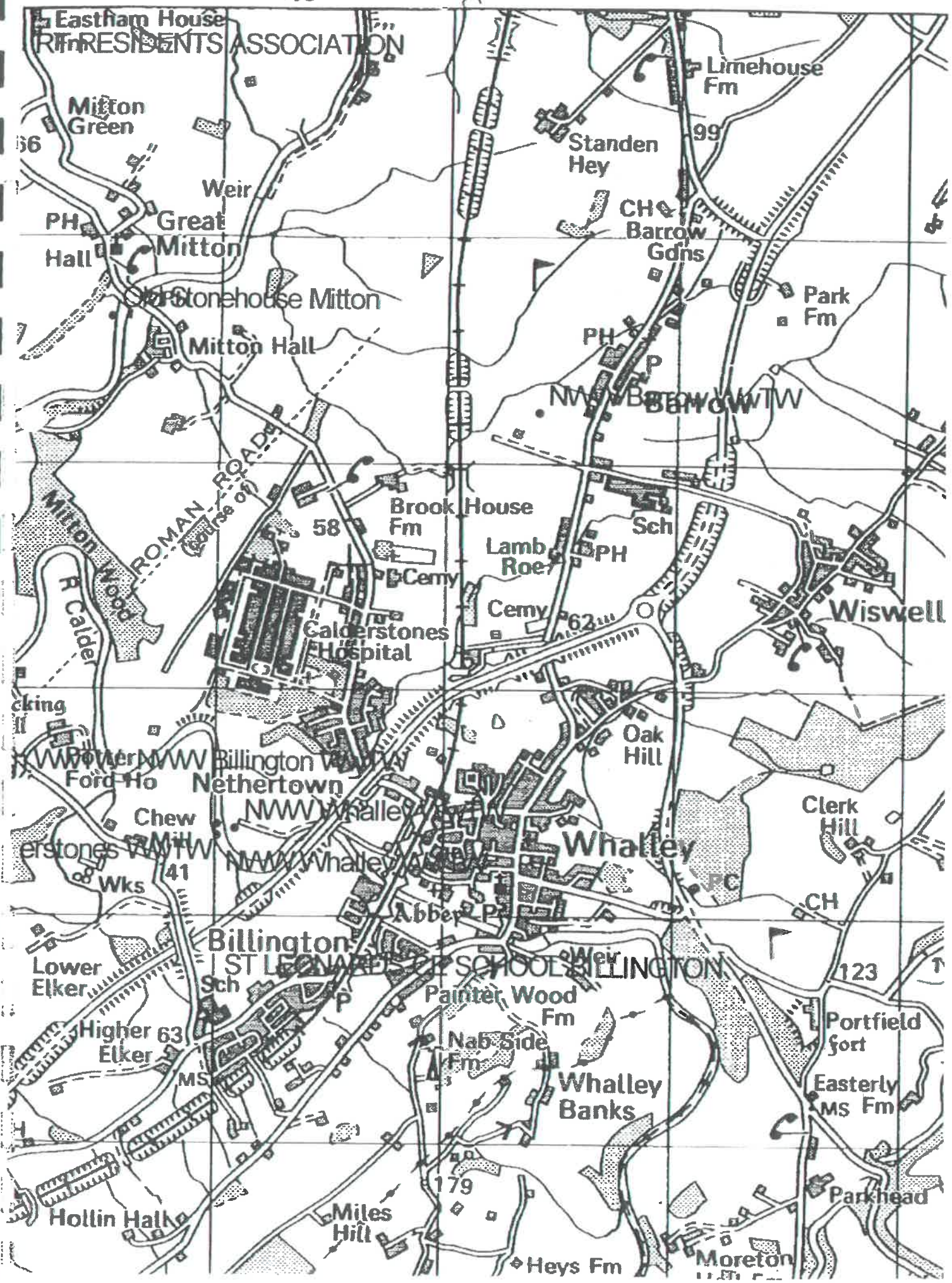
If 0 then abstraction is from a surface source

PURPOSE OF USE CODES

AG	Agriculture (not spray irrigation)
AM	Amenity
BF	Boiler feed
CM	Conveying materials
CO	Cooling
CP	Construction
DC	Domestic - commercial
DH	Domestic - household
DI	Domestic - industrial
DS	Domestic - swimming pools
DR	Drilling boreholes
DU	Dust suppression
ET	Effluent treatment
FA	Fish farming - agriculture
FF	Fire fighting
FR	Fish farming - re-stocking
IA	Spray irrigation - agriculture
IO	Spray irrigation - non-agricultural
IN	Industrial
MF	Manufacturing
MN	Mining
PC	Power generation
PH	Hydraulic power
PM	Paper making
PT	Pipeline testing
PW	Water power generation
RS	Research
SB	Standby / emergency
SG	Mineral washing
SR	Steam raising
TF	Transfer of water
VW	Vehicle washing
WO	Water supply - other
WS	Public water supply
XA	Coal washing
XB	Scrubbing & cooling incinerator gases
XC	Settling tank cleansing
XD	Washing down floors & machines
XE	Ashing purposes
XF	Laundering
XG	Monitoring water quality
XH	Food processing
XI	Fish pass / counter
XJ	Dilution of chemicals for spray irrigation
XK	Bottling water
XL	Vegetable washing
XM	Conservation / rearing of wildfowl

Whilst every effort is made to ensure the information is as accurate as possible, please note that this data is based on current licensed abstractions within the specified area. It is possible that unlicensed abstractions also exist, particularly for domestic and/or agricultural use, which are not included on the list. Further information regarding these abstractions, if any, may be obtained from the appropriate Environmental Health Department who are required to keep records of sources used for private water consumption

CONSENTED DISCHARGES



CE/1999/001197

REPORT NUMBER : 5

PRODUCED BY QUERYMASTER VERSION 255.00

USER NAME : ARVTELI

DATE : 25.03.99

SESSION NAME : PAT

TIME : 08:32:16

ADDRESS :

COMMAND

PRINT JOHN1 LIC_NO HYD_AREA,CATCH,SUB-C,NUM_SUB_C ,APLT_NUM,ADD1,ADD2,ADD3,ADD4,ADD5,SOUR_LOC,GRIDA-1,ANNUAL,DAILY,LIC_QUANT,USE-CAT-1,USE-QUANT-1,USE-CAT-2,USE-QUANT-2,USE-CAT-3,USE-QUANT-3,PURPOSE-DET-1,PURPOSE-DET-2 ,AQUIF WHERE LIC-STAT "C" AND APLT_NUM=8620

LICENCE

HYD_AREA CATCH SUB-C NUM-SUB-C APLT-NUM ADD1

ADD2 ADD3

ADD4 ADD5

SOUR-LOC GRIDA-1 ANNUAL

DAILY LIC-QUANT USE-CAT-1 USE-QUANT-1 USE-CAT-2 USE-QUANT-2 USE-CAT-3

USE-QUANT-3 PURPOSE-DET-1 PURPOSE-DET-2 AQUIF

26 71 310 10 8620 COLIN AND VIVIEN MIDDLETON

LITTLE MILTON FARM MILTON

CLITHEROE LANCS

KINGHOLME AT CLITHEROE SD718382 6570000

18000 M B1 1445226 0

0 AG 10700

END OF REPORT : 5

Our ref: CE\2000\003362\001
Your ref: 3/99/932

ENVIRONMENT AGENCY

Date: 31st January 2000

Chief Planning Officer
Ribble Valley Borough Council
Church Walk
Clitheroe
Lancashire
BB7 2RA

Dear Sir/Madam

RESIDENTIAL DEVELOPMENT OF 318 DWELLINGS WITH ASSOCIATED GARAGES AT CALDERSTONES HOSPITAL, MITTON ROAD, WHALLEY, CLITHEROE

Thank you for referring the above application to the Agency

The Agency requests that any approval includes the following Planning conditions:-

CONDITION

No development approved by this permission shall be commenced until a scheme for the provision of surface water drainage works has been approved by the Local Planning Authority. The scheme shall be completed in accordance with the approved Plans.

REASON

To prevent the increased risk of flooding by ensuring the provision of a satisfactory means of surface water disposal.

INFORMATIVES

The following notified landfill site is within 250 metres of the development:-

Landfill Site	Reference	NGR	Distance
Calderstones Hospital	K1/03/021	SD 7235 3758	upon

Calderstones Hospital landfill site commenced operation before the controls imposed under the Control of Pollution Act (ie.before 14 June 1976) and unfortunately the Environment Agency have only limited records on this site. Two areas of landfill have been identified at the Calderstones site. Area A was tipped pre licensing and is thought to have been completed in the early 1960's. The types of wastes deposited here are thought to have been boiler/house incinerator, ash, rubble, furniture, textiles and general garden waste. The depth of the infill is unknown, but is thought to have been 8-10 feet in depth. Tipping on area B commenced around 1960 and ceased in 1991.

Cont/d..

Environment Agency
Lutra House, Po Box 519, Preston, Lancashire PR5 8GD
Telephone : 01772 339882 Fax : 01772 627730

ENVIRONMENT AGENCY

The types of wastes deposited here are similar to the wastes deposited in Area A Landfill gas monitoring has been carried out at the site with levels of 5 3%v/v carbon dioxide and 1.5%v/v methane being recorded. There were no significant flows of gas detected The site closed in 1991

Waste Management Paper 27 recommends that great care must be taken whenever development is proposed on or within 250metres of a landfill site, and that the developer takes account of the need for the assessment and monitoring of any risk to the development posed by the site.

Therefore, prior to any development taking place, it is recommended that a comprehensive landfill gas site investigation and assessment be carried out on the development area to determine whether or not the site is, or would have the potential to be, affected by subterraneous landfill gas migration from the nearby landfill site(s).

Should the site investigation prove the presence of landfill gas in the development site then no development shall take place until it has been demonstrated, to the satisfaction of the Local Planning Authority, that expert advice has been taken and appropriate designs are to be incorporated in the construction and development area to alleviate any landfill gas associated risks to the development. Consideration should also be given to long-term methane/carbon dioxide monitoring to ensure integrity is being maintained. Similar conditions should also apply where the site investigation/assessment does not detect significant landfill gas but demonstrates that there is a potential for gas migration through to the development site (eg. permeable substrata) and the nearby landfill is known either to be producing landfill gas, or by the nature of the waste types deposited is likely to produce landfill gas.

All downspouts should be sealed directly into the ground ensuring the only open grids present around each dwelling are connected to the foul sewage systems.

Any development of this site must be drained on separate foul and surface water systems. All foul drainage must be connected to the foul sewers and only clean uncontaminated surface water should be connected to the surface water systems.

However, where there are established combined systems the possibility of deviation from this general policy may be discussed with your Council's Chief Technical Officer

No rainwater contaminated with silt/soil from disturbed ground during construction, must drain to the surface water sewer or watercourse without sufficient settlement.

Any culverting of a watercourse requires the prior written consent of the Agency under the terms of the Land Drainage Act 1991/Water Resources Act 1991. The Agency seeks to avoid culverting, and its consent for such works will not normally be granted except for access crossings. The Agency advises against building over any new or existing culverted watercourses.

Cont/d.

ENVIRONMENT AGENCY

The proposal includes Construction of a surface water outfall which require the prior formal consent of the Agency under the terms of the Land Drainage Act 1991.

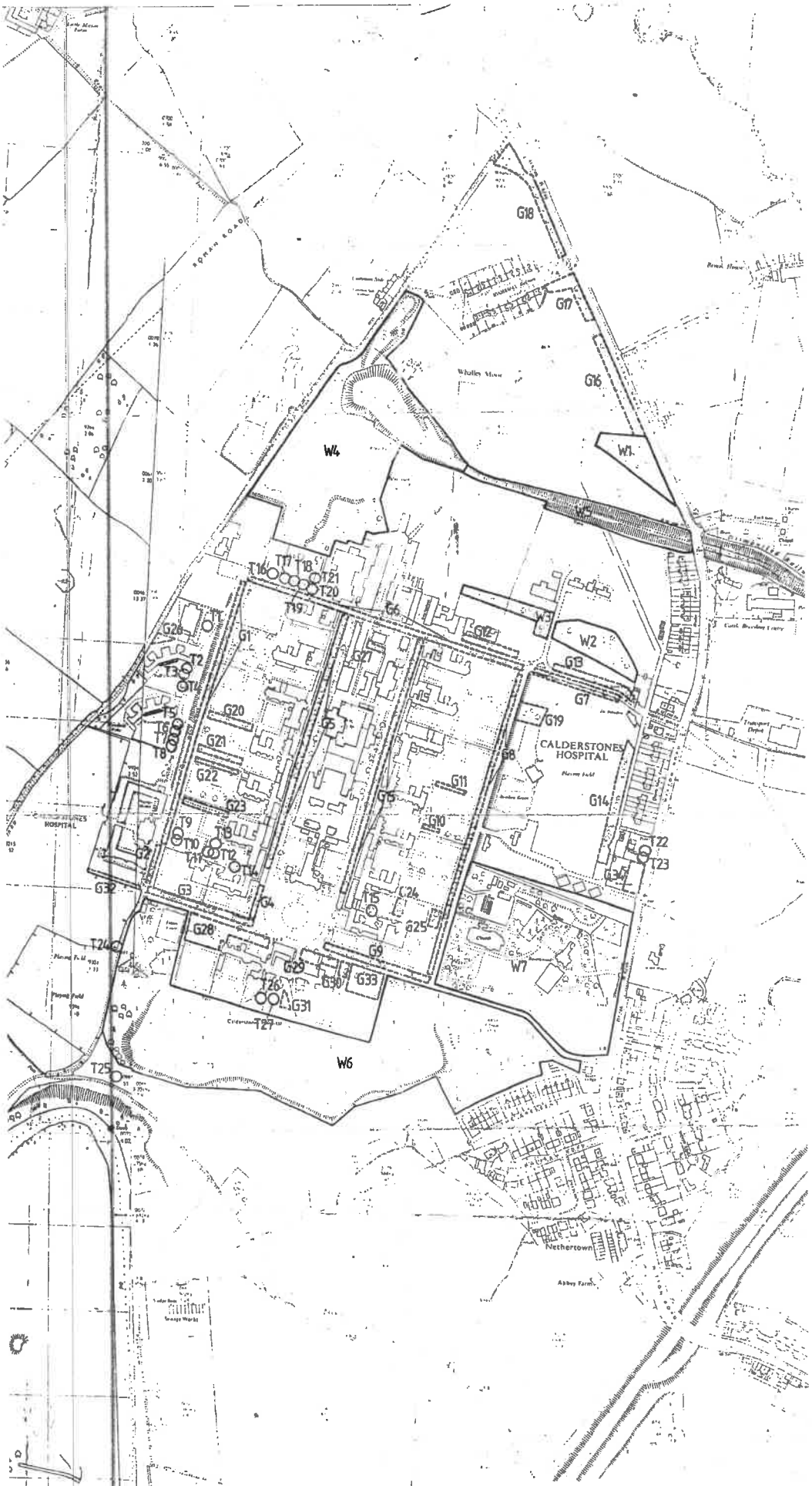
The application site incorporates land which is within the Calderstones Hospital Woodland/Railway Line County Biological Heritage Site and consultation with the County Ecologist is recommended.

Please send me a copy of the decision notice.

A copy of this letter has been sent to the applicant/agent.

Yours faithfully

Mrs Adrienne Beeby
Area Planning Liaison Officer



Ribble Valley Borough Council
Tree Preservation Order
Calderstones Hospital, Whalley

scale: 1/2500th
drawing number: 8/115/1
reference: PH
date: July 1996

David Morris MIEH ARSH MBIM, Director of Development
Ribble Valley Borough Council, Church Walk, Clitheroe, Lancs, BB7 2RA (STD 01200) 25111

Appendix 2

Groundsure Enviro+Geo Insight Report

Groundsure LOCATION INTELLIGENCE

Enviro+Geo Insight

MITTON ROAD, WHALLEY, BB7 9JT

Order Details

Date: 12/08/2020

Your ref: 7583_-_PO_8759BH

Our Ref: GS-6960965

Client: Coopers

Site Details

Location: 372623 437272

Area: 2.1 ha

Authority: Ribble Valley Borough Council

Contact us with any questions at:
info@groundsure.com
08444 159 000

Summary of findings

Page	Section	Past land use	On site	0-50m	50-250m	250-500m	500-2000m
11	1.1	**Historical industrial land uses**	7	6	10	31	-
14	1.2	**Historical tanks**	0	1	0	4	-
14	1.3	Historical energy features	0	0	0	0	-
14	1.4	Historical petrol stations	0	0	0	0	-
15	1.5	Historical garages	0	0	0	0	-
15	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped	On site	0-50m	50-250m	250-500m	500-2000m
16	2.1	**Historical industrial land uses**	9	8	12	36	-
19	2.2	**Historical tanks**	0	2	0	4	-
19	2.3	Historical energy features	0	0	0	0	-
20	2.4	Historical petrol stations	0	0	0	0	-
20	2.5	Historical garages	0	0	0	0	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
21	3.1	Active or recent landfill	0	0	0	0	-
21	3.2	Historical landfill (BGS records)	0	0	0	0	-
22	3.3	**Historical landfill (LA/mapping records)**	0	0	0	2	-
22	3.4	**Historical landfill (EA/NRW records)**	0	0	2	0	-
23	3.5	Historical waste sites	0	0	0	0	-
23	3.6	Licensed waste sites	0	0	0	0	-
23	3.7	**Waste exemptions**	0	0	1	2	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
24	4.1	**Recent industrial land uses**	1	4	7	-	-
25	4.2	Current or recent petrol stations	0	0	0	0	-
25	4.3	Electricity cables	0	0	0	0	-
26	4.4	Gas pipelines	0	0	0	0	-
26	4.5	Sites determined as Contaminated Land	0	0	0	0	-

26	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
26	4.7	Regulated explosive sites	0	0	0	0	-
26	4.8	Hazardous substance storage/usage	0	0	0	0	-
27	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
27	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
27	**4.11**	**Licensed pollutant release (Part A(2)/B)**	0	0	0	1	-
27	4.12	Radioactive Substance Authorisations	0	0	0	0	-
28	**4.13**	**Licensed Discharges to controlled waters**	0	0	2	4	-
29	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
29	4.15	Pollutant release to public sewer	0	0	0	0	-
29	4.16	List 1 Dangerous Substances	0	0	0	0	-
29	4.17	List 2 Dangerous Substances	0	0	0	0	-
29	**4.18**	**Pollution Incidents (EA/NRW)**	0	0	0	3	-
30	4.19	Pollution inventory substances	0	0	0	0	-
30	4.20	Pollution inventory waste transfers	0	0	0	0	-
30	4.21	Pollution inventory radioactive waste	0	0	0	0	-

Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
31	**5.1**	**Superficial aquifer**	Identified (within 500m)				
33	**5.2**	**Bedrock aquifer**	Identified (within 500m)				
34	**5.3**	**Groundwater vulnerability**	Identified (within 50m)				
35	**5.4**	**Groundwater vulnerability- soluble rock risk**	Identified (within 0m)				
35	5.5	Groundwater vulnerability- local information	None (within 0m)				
36	**5.6**	**Groundwater abstractions**	0	0	0	0	2
37	**5.7**	**Surface water abstractions**	0	0	0	0	7
39	**5.8**	**Potable abstractions**	0	0	0	0	2
40	5.9	Source Protection Zones	0	0	0	0	-
40	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-

Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
41	**6.1**	**Water Network (OS MasterMap)**	0	3	6	-	-

42	**6.2**	**Surface water features**	0	2	6	-	-
43	**6.3**	**WFD Surface water body catchments**	1	-	-	-	-
43	**6.4**	**WFD Surface water bodies**	0	0	0	-	-
43	**6.5**	**WFD Groundwater bodies**	1	-	-	-	-
Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
45	7.1	Risk of Flooding from Rivers and Sea (RoFRaS)	None (within 50m)				
45	7.2	Historical Flood Events	0	0	0	-	-
45	7.3	Flood Defences	0	0	0	-	-
45	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
46	7.5	Flood Storage Areas	0	0	0	-	-
47	7.6	Flood Zone 2	None (within 50m)				
47	7.7	Flood Zone 3	None (within 50m)				
Page	Section	Surface water flooding					
48	**8.1**	**Surface water flooding**	1 in 30 year, Greater than 1.0m (within 50m)				
Page	Section	Groundwater flooding					
50	**9.1**	**Groundwater flooding**	Low (within 50m)				
Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
51	10.1	Sites of Special Scientific Interest (SSSI)	0	0	0	0	0
52	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
52	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
52	10.4	Special Protection Areas (SPA)	0	0	0	0	0
52	10.5	National Nature Reserves (NNR)	0	0	0	0	0
53	10.6	Local Nature Reserves (LNR)	0	0	0	0	0
53	**10.7**	**Designated Ancient Woodland**	0	0	0	0	13
54	10.8	Biosphere Reserves	0	0	0	0	0
54	10.9	Forest Parks	0	0	0	0	0
54	10.10	Marine Conservation Zones	0	0	0	0	0
54	**10.11**	**Green Belt**	0	0	0	0	2
55	10.12	Proposed Ramsar sites	0	0	0	0	0

55	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
55	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
55	10.15	Nitrate Sensitive Areas	0	0	0	0	0
56	10.16	Nitrate Vulnerable Zones	0	0	0	0	0
57	**10.17**	**SSSI Impact Risk Zones**	1	-	-	-	-
58	10.18	SSSI Units	0	0	0	0	0
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
59	11.1	World Heritage Sites	0	0	0	-	-
59	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
59	11.3	National Parks	0	0	0	-	-
59	11.4	Listed Buildings	0	0	0	-	-
60	11.5	Conservation Areas	0	0	0	-	-
60	11.6	Scheduled Ancient Monuments	0	0	0	-	-
60	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
61	**12.1**	**Agricultural Land Classification**	Grade 3 (within 250m)				
62	12.2	Open Access Land	0	0	0	-	-
62	12.3	Tree Felling Licences	0	0	0	-	-
62	**12.4**	**Environmental Stewardship Schemes**	0	2	0	-	-
62	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
63	**13.1**	**Priority Habitat Inventory**	1	7	13	-	-
64	**13.2**	**Habitat Networks**	0	0	1	-	-
65	13.3	Open Mosaic Habitat	0	0	0	-	-
65	13.4	Limestone Pavement Orders	0	0	0	-	-
Page	Section	Geology 1:10,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
66	**14.1**	**10k Availability**	Identified (within 500m)				
67	14.2	Artificial and made ground (10k)	0	0	0	0	-
68	14.3	Superficial geology (10k)	0	0	0	0	-

68	14.4	Landslip (10k)	0	0	0	0	-
69	14.5	Bedrock geology (10k)	0	0	0	0	-
69	14.6	Bedrock faults and other linear features (10k)	0	0	0	0	-
Page	Section	Geology 1:50,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
70	**15.1**	**50k Availability**	Identified (within 500m)				
71	15.2	Artificial and made ground (50k)	0	0	0	0	-
71	15.3	Artificial ground permeability (50k)	0	0	-	-	-
72	**15.4**	**Superficial geology (50k)**	1	0	0	1	-
73	**15.5**	**Superficial permeability (50k)**	Identified (within 50m)				
73	15.6	Landslip (50k)	0	0	0	0	-
73	15.7	Landslip permeability (50k)	None (within 50m)				
74	**15.8**	**Bedrock geology (50k)**	1	0	0	2	-
75	**15.9**	**Bedrock permeability (50k)**	Identified (within 50m)				
75	15.10	Bedrock faults and other linear features (50k)	0	0	0	0	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
76	16.1	BGS Boreholes	0	0	0	-	-
Page	Section	Natural ground subsidence					
77	**17.1**	**Shrink swell clays**	Very low (within 50m)				
78	**17.2**	**Running sands**	Very low (within 50m)				
79	**17.3**	**Compressible deposits**	Negligible (within 50m)				
80	**17.4**	**Collapsible deposits**	Very low (within 50m)				
81	**17.5**	**Landslides**	Very low (within 50m)				
82	**17.6**	**Ground dissolution of soluble rocks**	Very low (within 50m)				
Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
84	18.1	Natural cavities	0	0	0	0	-
85	**18.2**	**BritPits**	0	0	1	1	-
85	**18.3**	**Surface ground workings**	6	4	19	-	-
86	18.4	Underground workings	0	0	0	0	0
87	18.5	Historical Mineral Planning Areas	0	0	0	0	-

87	**18.6**	**Non-coal mining**	1	0	0	0	0
87	18.7	Mining cavities	0	0	0	0	0
87	18.8	JPB mining areas	None (within 0m)				
88	18.9	Coal mining	None (within 0m)				
88	18.10	Brine areas	None (within 0m)				
88	18.11	Gypsum areas	None (within 0m)				
88	18.12	Tin mining	None (within 0m)				
88	18.13	Clay mining	None (within 0m)				
Page	Section	Radon					
89	**19.1**	**Radon**	Less than 1% (within 0m)				
Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
90	**20.1**	**BGS Estimated Background Soil Chemistry**	2	0	-	-	-
90	20.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
90	20.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-
Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
91	21.1	Underground railways (London)	0	0	0	-	-
91	21.2	Underground railways (Non-London)	0	0	0	-	-
92	21.3	Railway tunnels	0	0	0	-	-
92	**21.4**	**Historical railway and tunnel features**	3	0	1	-	-
92	21.5	Royal Mail tunnels	0	0	0	-	-
93	21.6	Historical railways	0	0	0	-	-
93	21.7	Railways	0	0	0	-	-
93	21.8	Crossrail 1	0	0	0	0	-
93	21.9	Crossrail 2	0	0	0	0	-
93	21.10	HS2	0	0	0	0	-

Recent aerial photograph

Capture Date: 03/04/2017

Site Area: 2.1ha

Recent site history - 1999 aerial photograph

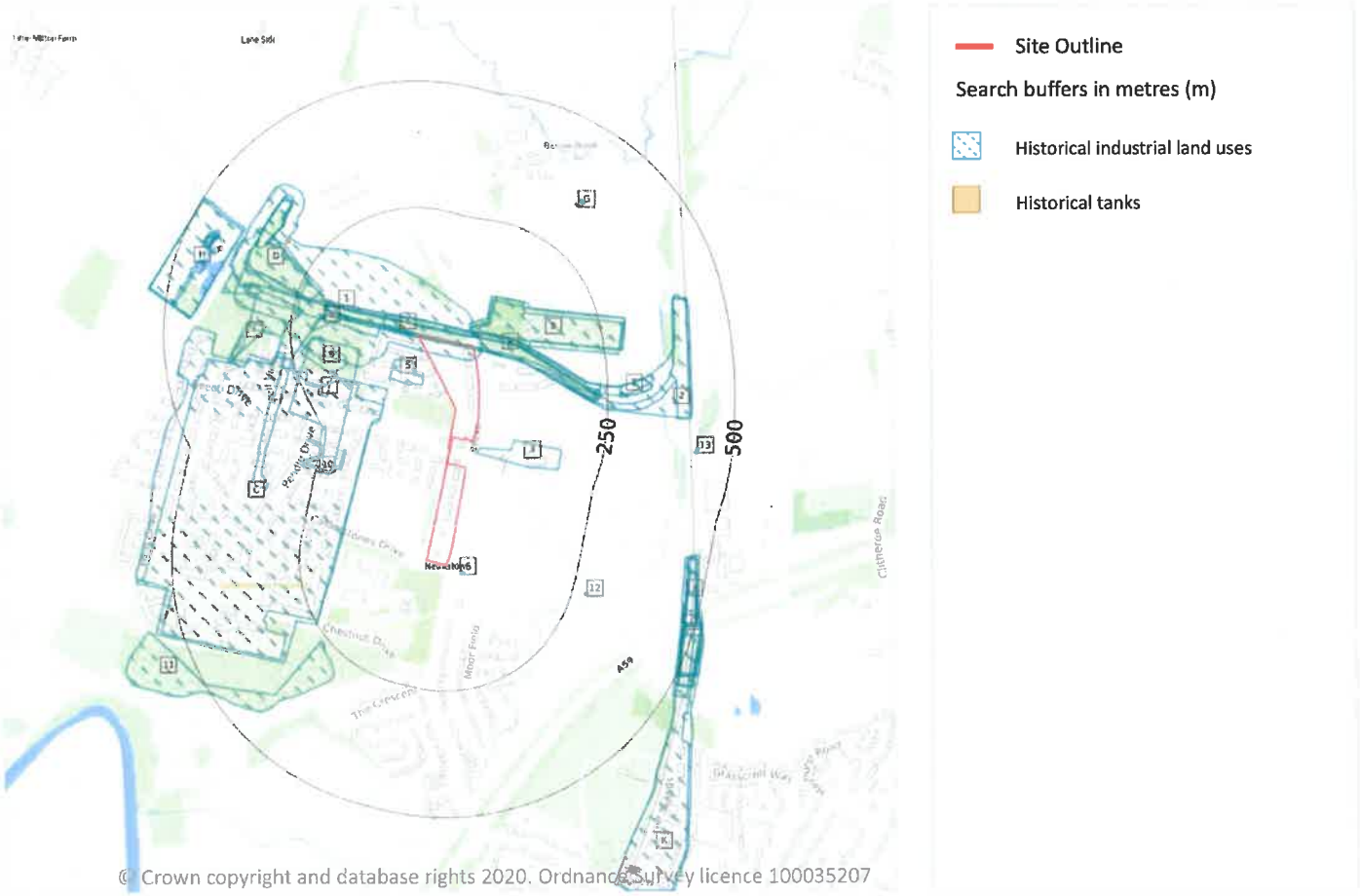
Capture Date: 10/09/1999

Site Area: 2.1ha

OS MasterMap site plan

Site Area: 2.1ha

1 Past land use



1.1 Historical industrial land uses

Records within 500m	54

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 1:10,560 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 11**

ID	Location	Land use	Dates present	Group ID
1	On site	Brick Works	1910	668945

ID	Location	Land use	Dates present	Group ID
2	**On site**	**Railway Sidings**	**1910**	**726429**
A	**On site**	**Cuttings**	**1950**	**745409**
A	**On site**	**Cuttings**	**1910**	**771974**
A	**On site**	**Railway Sidings**	**1932 - 1950**	**772789**
A	**On site**	**Cuttings**	**1969 - 1973**	**774861**
A	**On site**	**Cuttings**	**1932**	**781848**
3	18m SE	Transport Depot	1969 - 1973	791099
B	19m NE	Cemetery	1932	788018
B	25m N	Cemetery	1950	751486
5	31m SW	Isolation Hospital	1932	691838
B	32m NE	Cemetery	1969 - 1973	750582
6	33m SE	Unspecified Shed	1846	657509
C	102m SW	Hospital	1969 - 1973	740795
7	118m W	Tramway Sidings	1910	670707
C	123m SW	Isolation Hospital	1950	691837
8	144m W	Unspecified Ground Workings	1950	646823
9	148m W	Unspecified Heap	1950	650195
D	189m W	Refuse Heaps	1910	653413
10	199m W	Clay Pit	1910	676013
D	206m NW	Unspecified Heaps	1969 - 1973	739214
D	237m W	Unspecified Commercial/Industrial	1950	643067
E	245m E	Unspecified Pit	1950	689787
11	259m SW	Unspecified Heap	1950 - 1973	779779
12	275m E	Unspecified Shed	1846	657510
E	275m E	Cuttings	1969	642337
E	275m E	Cutting Works	1973	659390
F	296m W	Unspecified Ground Workings	1969 - 1973	740197
D	320m W	Unspecified Tanks	1950	666241

ID	Location	Land use	Dates present	Group ID
D	340m NW	Unspecified Heap	1932	650194
F	342m W	Unspecified Ground Workings	1950	752193
G	348m NE	Unspecified Tank	1910	722164
G	348m NE	Unspecified Tank	1932	760294
G	353m NE	Unspecified Tank	1950	674047
H	399m NW	Tile Works	1911	749874
H	399m NW	Tile Works	1892	725444
H	425m NW	Unspecified Tank	1911	674048
13	427m E	Pipe	1846	656347
H	435m NW	Unspecified Pit	1910	750750
H	435m NW	Unspecified Pit	1932	766345
H	436m NW	Unspecified Pit	1950	755075
H	437m NW	Unspecified Pit	1911	733156
H	439m W	Old Clay Pit	1910	639993
I	452m E	Cuttings	1846	709619
J	459m E	Cuttings	1910	737272
J	459m E	Cuttings	1932	751473
I	463m E	Cuttings	1950	790748
I	466m E	Cuttings	1892	783806
I	474m E	Cuttings	1969	770790
I	478m E	Cuttings	1910	716133
I	478m E	Cuttings	1933	789041
K	478m E	Railway Sidings	1910	711408
K	478m E	Railway Sidings	1933 - 1950	750329
I	480m E	Cuttings	1973	710791

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m	5

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 11**

ID	Location	Land use	Dates present	Group ID
4	29m W	Unspecified Tank	1966 - 1993	97810
D	310m NW	Unspecified Tank	1993	83019
G	343m NE	Unspecified Tank	1912	83021
G	348m NE	Unspecified Tank	1932	83020
H	419m NW	Unspecified Tank	1894	83023

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m	0

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.5 Historical garages

Records within 500m	0

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.6 Historical military land

Records within 500m	0

Areas of military land digitised from multiple sources including the National Archives, local records, MOD records and verified other sources, intelligently grouped into contiguous features.

This data is sourced from Ordnance Survey / Groundsure / other sources.

2 Past land use - un-grouped

2.1 Historical industrial land uses

Records within 500m	65

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 16**

ID	Location	Land Use	Date	Group ID
1	On site	Brick Works	1910	668945
A	On site	Railway Sidings	1932	772789
A	On site	Railway Sidings	1910	726429

ID	Location	Land Use	Date	Group ID
A	**On site**	**Railway Sidings**	**1950**	**772789**
A	**On site**	**Cuttings**	**1973**	**774861**
A	**On site**	**Cuttings**	**1969**	**774861**
A	**On site**	**Cuttings**	**1950**	**745409**
A	**On site**	**Cuttings**	**1932**	**781848**
A	**On site**	**Cuttings**	**1910**	**771974**
B	18m SE	Transport Depot	1973	791099
B	18m SE	Transport Depot	1969	791099
C	19m NE	Cemetery	1932	788018
C	25m N	Cemetery	1950	751486
2	31m SW	Isolation Hospital	1932	691838
C	32m NE	Cemetery	1973	750582
C	32m NE	Cemetery	1969	750582
3	33m SE	Unspecified Shed	1846	657509
E	102m SW	Hospital	1973	740795
E	102m SW	Hospital	1969	740795
4	118m W	Tramway Sidings	1910	670707
E	123m SW	Isolation Hospital	1950	691837
5	144m W	Unspecified Ground Workings	1950	646823
6	148m W	Unspecified Heap	1950	650195
F	189m W	Refuse Heaps	1910	653413
7	199m W	Clay Pit	1910	676013
F	206m NW	Unspecified Heaps	1973	739214
F	206m NW	Unspecified Heaps	1969	739214
F	237m W	Unspecified Commercial/Industrial	1950	643067
G	245m E	Unspecified Pit	1950	689787
H	259m SW	Unspecified Heap	1973	779779
H	259m SW	Unspecified Heap	1969	779779

ID	Location	Land Use	Date	Group ID
H	259m SW	Unspecified Heap	1950	779779
8	275m E	Unspecified Shed	1846	657510
G	275m E	Cutting Works	1973	659390
G	275m E	Cuttings	1969	642337
I	296m W	Unspecified Ground Workings	1973	740197
I	296m W	Unspecified Ground Workings	1969	740197
F	320m W	Unspecified Tanks	1950	666241
F	340m NW	Unspecified Heap	1932	650194
I	342m W	Unspecified Ground Workings	1950	752193
J	348m NE	Unspecified Tank	1932	760294
J	348m NE	Unspecified Tank	1910	722164
J	353m NE	Unspecified Tank	1950	674047
K	399m NW	Tile Works	1911	749874
K	399m NW	Tile Works	1892	725444
K	425m NW	Unspecified Tank	1911	674048
9	427m E	Pipe	1846	656347
K	435m NW	Unspecified Pit	1932	766345
K	435m NW	Unspecified Pit	1910	750750
K	436m NW	Unspecified Pit	1950	755075
K	437m NW	Unspecified Pit	1911	733156
K	439m W	Old Clay Pit	1910	639993
L	452m E	Cuttings	1846	709619
L	459m E	Cuttings	1932	751473
L	459m E	Cuttings	1910	737272
L	463m E	Cuttings	1950	790748
L	466m E	Cuttings	1892	783806
L	474m E	Cuttings	1969	770790
L	478m E	Cuttings	1933	789041

ID	Location	Land Use	Date	Group ID
L	478m E	Cuttings	1910	716133
M	478m E	Railway Sidings	1933	750329
M	478m E	Railway Sidings	1910	711408
L	478m E	Cuttings	1892	783806
L	480m E	Cuttings	1973	710791
M	480m E	Railway Sidings	1950	750329

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	6

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 16**

ID	Location	Land Use	Date	Group ID
D	29m W	Unspecified Tank	1993	97810
D	31m NW	Unspecified Tank	1966	97810
F	310m NW	Unspecified Tank	1993	83019
J	343m NE	Unspecified Tank	1912	83021
J	348m NE	Unspecified Tank	1932	83020
K	419m NW	Unspecified Tank	1894	83023

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	0

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.5 Historical garages

Records within 500m	0

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

3 Waste and landfill

3.1 Active or recent landfill

Records within 500m	0

Active or recently closed landfill sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.2 Historical landfill (BGS records)

Records within 500m	0

Landfill sites identified on a survey carried out on behalf of the DoE in 1973. These sites may have been closed or operational at this time.

This data is sourced from the British Geological Survey.

3.3 Historical landfill (LA/mapping records)

Records within 500m	2

Landfill sites identified from Local Authority records and high detail historical mapping.

Features are displayed on the Waste and landfill map on **page 21**

ID	Location	Site address	Source	Data type
4	264m W	Refuse Tip	1966 mapping	Polygon
5	290m W	Refuse Tip	1966 mapping	Polygon

This data is sourced from the Ordnance Survey/Groundsure and Local Authority records.

3.4 Historical landfill (EA/NRW records)

Records within 500m	2

Known historical (closed) landfill sites (e.g. sites where there is no PPC permit or waste management licence currently in force). This includes sites that existed before the waste licensing regime and sites that have been licensed in the past but where a licence has been revoked, ceased to exist or surrendered and a certificate of completion has been issued.

Features are displayed on the Waste and landfill map on **page 21**

ID	Location	Details		
2	160m W	Site Address: Calderstones Hospital A, Off Mitton Road, Whalley Moor, Blackburn, Lancashire Licence Holder Address: -	Waste Licence: - Site Reference: K1/01/021 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: - Licence Issue: - Licence Surrender: -	Operator: - Licence Holder: - First Recorded - Last Recorded: 31/12/1974
3	187m W	Site Address: Calderstones Hospital B, Off Mitton Road, Whalley Moor, Blackburn, Lancashire Licence Holder Address: -	Waste Licence: - Site Reference: K1/03/021 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: - Licence Issue: - Licence Surrender: -	Operator: - Licence Holder: - First Recorded 31/12/1960 Last Recorded: 31/12/1992

This data is sourced from the Environment Agency and Natural Resources Wales.

3.5 Historical waste sites

Records within 500m	0

Waste site records derived from Local Authority planning records and high detail historical mapping.

This data is sourced from Ordnance Survey/Groundsure and Local Authority records.

3.6 Licensed waste sites

Records within 500m	0

Active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.7 Waste exemptions

Records within 500m	3

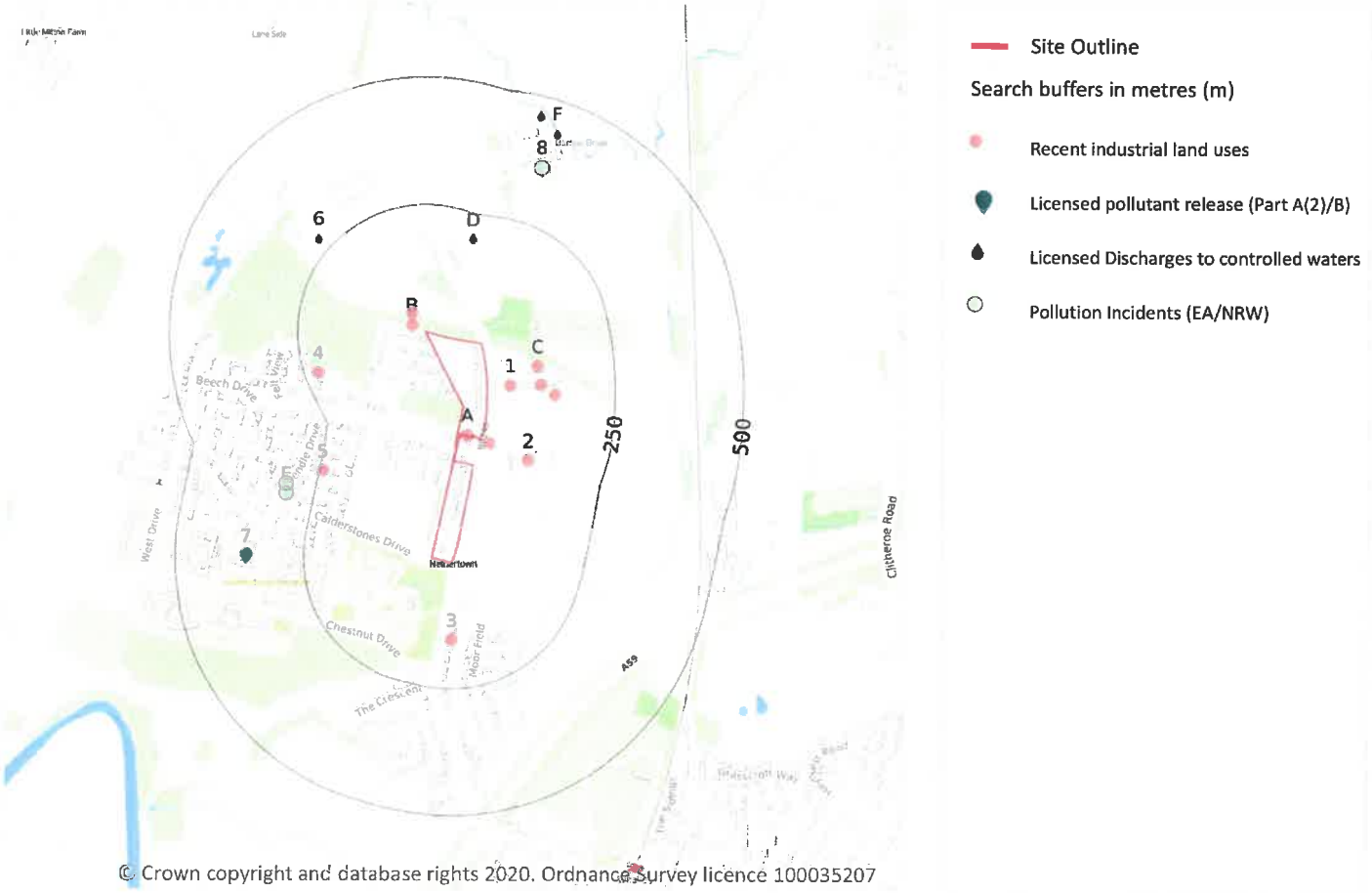
Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

Features are displayed on the Waste and landfill map on **page 21**

ID	Location	Site	Reference	Category	Sub-Category	Description
1	67m SE	npa - Depot at Barnes & Tipping, Mitton Road. Mitton Road BILLINGTON BB7 9JU	EPR/SF0135C W/A001	Storing waste exemption	Non-Agricultural Waste Only	Storage of waste in a secure place
A	500m E	Shaw House Farm (Mr Wearden) Clitheroe Road Clitheroe Lancs BB7 9AD	EPR/DE5240EP /A001	Using waste exemption	Both agricultural and non-agricultural waste	Spreading waste on agricultural land to confer benefit
A	500m E	Shaw House Farm (Mr Wearden) Clitheroe Road Clitheroe Lancs BB7 9AD	EPR/DE5240EP /A001	Using waste exemption	Both agricultural and non-agricultural waste	Use of waste for a specified purpose

This data is sourced from the Environment Agency and Natural Resources Wales.

4 Current industrial land use



4.1 Recent industrial land uses

Records within 250m	12

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 24**

ID	Location	Company	Address	Activity	Category
A	**On site**	**Electricity Sub Station**	**Lancashire, BB7**	**Electrical Features**	**Infrastructure and Facilities**
A	20m SE	Electricity Sub Station	Lancashire, BB7	Electrical Features	Infrastructure and Facilities
B	31m NW	Tank	Lancashire, BB7	Tanks (Generic)	Industrial Features

ID	Location	Company	Address	Activity	Category
1	45m E	Takumi Woodwork	Unit 1 Mitton Road Business Park, Mitton Road, Whalley, Clitheroe, Lancashire, BB7 9YE	Furniture	Consumer Products
B	46m NW	Pump House	Lancashire, BB7	Water Pumping Stations	Industrial Features
C	100m E	Silo	Lancashire, BB7	Hoppers and Silos	Farming
2	102m SE	Depot	Lancashire, BB7	Container and Storage	Transport, Storage and Delivery
C	106m E	Phoenix Handling Solutions Ltd	Unit 10 Mitton Road Business Park, Mitton Road, Whalley, Clitheroe, Lancashire, BB7 9YE	Packaging	Industrial Products
C	132m E	Business Park	Lancashire, BB7	Business Parks and Industrial Estates	Industrial Features
3	153m S	Jack Eddleston Farm Feeds Ltd	106, Mitton Road, Whalley, Clitheroe, Lancashire, BB7 9JN	Animal Feeds, Pet Foods, Hay and Straw	Foodstuffs
4	223m W	Electricity Sub Station	Lancashire, BB7	Electrical Features	Infrastructure and Facilities
5	243m W	Pro-clean Car Valeting	3, Pasture Grove, Whalley, Clitheroe, Lancashire, BB7 9SJ	Vehicle Cleaning Services	Personal, Consumer and Other Services

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m	0

Open, closed, under development and obsolete petrol stations.

This data is sourced from Experian.

4.3 Electricity cables

Records within 500m	0

High voltage underground electricity transmission cables.

This data is sourced from National Grid.

4.4 Gas pipelines

Records within 500m	0

High pressure underground gas transmission pipelines.

This data is sourced from National Grid.

4.5 Sites determined as Contaminated Land

Records within 500m	0

Contaminated Land Register of sites designated under Part 2a of the Environmental Protection Act 1990.

This data is sourced from Local Authority records.

4.6 Control of Major Accident Hazards (COMAH)

Records within 500m	0

Control of Major Accident Hazards (COMAH) sites. This data includes upper and lower tier sites, and includes a historical archive of COMAH sites and Notification of Installations Handling Hazardous Substances (NIHHS) records.

This data is sourced from the Health and Safety Executive.

4.7 Regulated explosive sites

Records within 500m	0

Sites registered and licensed by the Health and Safety Executive under the Manufacture and Storage of Explosives Regulations 2005 (MSER). The last update to this data was in April 2011.

This data is sourced from the Health and Safety Executive.

4.8 Hazardous substance storage/usage

Records within 500m	0

Consents granted for a site to hold certain quantities of hazardous substances at or above defined limits in accordance with the Planning (Hazardous Substances) Regulations 2015.

This data is sourced from Local Authority records.

4.9 Historical licensed industrial activities (IPC)

Records within 500m	0

Integrated Pollution Control (IPC) records of substance releases to air, land and water. This data represents a historical archive as the IPC regime has been superseded.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.10 Licensed industrial activities (Part A(1))

Records within 500m	0

Records of Part A(1) installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.11 Licensed pollutant release (Part A(2)/B)

Records within 500m	1

Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

Features are displayed on the Current industrial land use map on **page 24**

ID	Location	Address	Details	
7	362m W	Calderstones NHS Trust, Calderstones Hospital, Mitton Road, Whalley, Nr. Blackburn, BB6 9PE	Process: Combustion & Incineration Status: Revoked Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified

This data is sourced from Local Authority records.

4.12 Radioactive Substance Authorisations

Records within 500m	0

Records of the storage, use, accumulation and disposal of radioactive substances regulated under the Radioactive Substances Act 1993.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.13 Licensed Discharges to controlled waters

Records within 500m 6

Discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991.

Features are displayed on the Current industrial land use map on **page 24**

ID	Location	Address	Details	
D	199m N	KINGSMILL STW, NR WHALLEY	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - WATER COMPANY Permit Number: 017180349 Permit Version: 1 Receiving Water: TRIB RIVER CALDER	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 12/09/1989 Revocation Date: 24/04/1990
D	199m N	KINGSMILL STW, NR WHALLEY	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - WATER COMPANY Permit Number: 017180349 Permit Version: 2 Receiving Water: TRIB RIVER CALDER	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 25/04/1990 Revocation Date: -
6	277m NW	KINGSMILL STW, NR WHALLEY	Effluent Type: TRADE DISCHARGES - BOILER BLOWDOWN EFFLUENT Permit Number: 017160329 Permit Version: 1 Receiving Water: RIVER RIBBLE	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: - Revocation Date: -
F	435m N	THE OLD STABLES, 11 PROPERTIES AT THE OLD STABLES, MITTON ROAD, WHALLEY, LANCASHIRE, BB7 9PA	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: EPRDB3197RJ Permit Version: 1 Receiving Water: THE BARROW BROOK	Status: NEW ISSUED UNDER EPR 2010 Issue date: 12/10/2015 Effective Date: 12/10/2015 Revocation Date: -
F	458m N	BROOK HOUSE FARM, MITTON ROAD, WHALLEY	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: 017190784 Permit Version: 1 Receiving Water: BARROW BROOK	Status: REVOKED UNDER EPR 2010 Issue date: 24/10/2003 Effective Date: 01/12/2003 Revocation Date: 04/11/2014
F	458m N	BROOK HOUSE FARM, MITTON ROAD, WHALLEY	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: 017190784 Permit Version: 1 Receiving Water: BARROW BROOK	Status: REVOKED UNDER EPR 2010 Issue date: 24/10/2003 Effective Date: 01/12/2003 Revocation Date: 04/11/2014

This data is sourced from the Environment Agency and Natural Resources Wales.

4.14 Pollutant release to surface waters (Red List)

Records within 500m	0

Discharges of specified substances under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.15 Pollutant release to public sewer

Records within 500m	0

Discharges of Special Category Effluents to the public sewer.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.16 List 1 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List I of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.17 List 2 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List II of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.18 Pollution Incidents (EA/NRW)

Records within 500m	3

Records of substantiated pollution incidents. Since 2006 this data has only included category 1 (major) and 2 (significant) pollution incidents.

Features are displayed on the Current industrial land use map on **page 24**

ID	Location	Details	
E	304m W	Incident Date: 02/07/2001 Incident Identification: 12909 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Fumes	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
E	308m W	Incident Date: 20/09/2002 Incident Identification: 109282 Pollutant: Oils and Fuel Pollutant Description: Gas and Fuel Oils	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
8	364m N	Incident Date: 04/02/2003 Incident Identification: 134857 Pollutant: Oils and Fuel Pollutant Description: Diesel	Water Impact: Category 3 (Minor) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)

This data is sourced from the Environment Agency and Natural Resources Wales.

4.19 Pollution inventory substances

Records within 500m	0

The pollution inventory (substances) includes reporting on annual emissions of certain regulated substances to air, controlled waters and land. A reporting threshold for each substance is also included. Where emissions fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.20 Pollution inventory waste transfers

Records within 500m	0

The pollution inventory (waste transfers) includes reporting on annual transfers and recovery/disposal of controlled wastes from a site. A reporting threshold for each waste type is also included. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

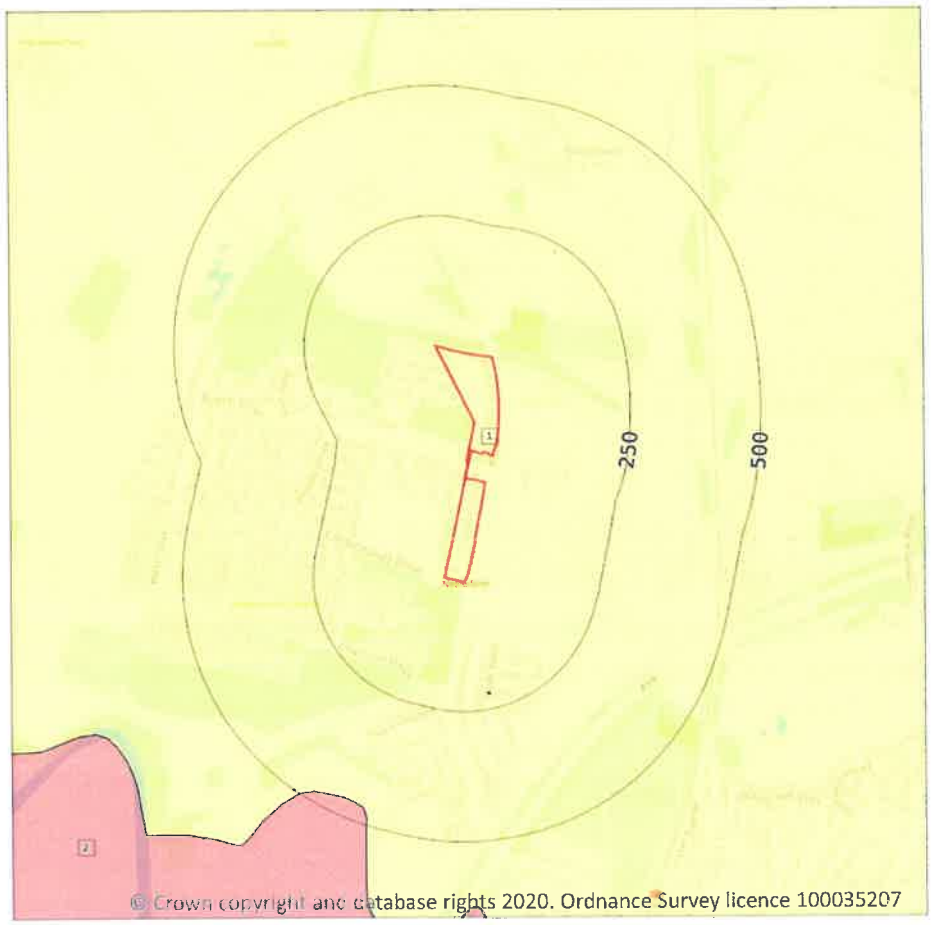
4.21 Pollution inventory radioactive waste

Records within 500m	0

The pollution inventory (radioactive wastes) includes reporting on annual releases of radioactive substances from a site, including the means of release. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

5 Hydrogeology - Superficial aquifer



Site Outline

Search buffers in metres (m)

- Principal
- Secondary A
- Secondary B
- Secondary Undifferentiated
- Unproductive
- Unknown

5.1 Superficial aquifer

Records within 500m	2

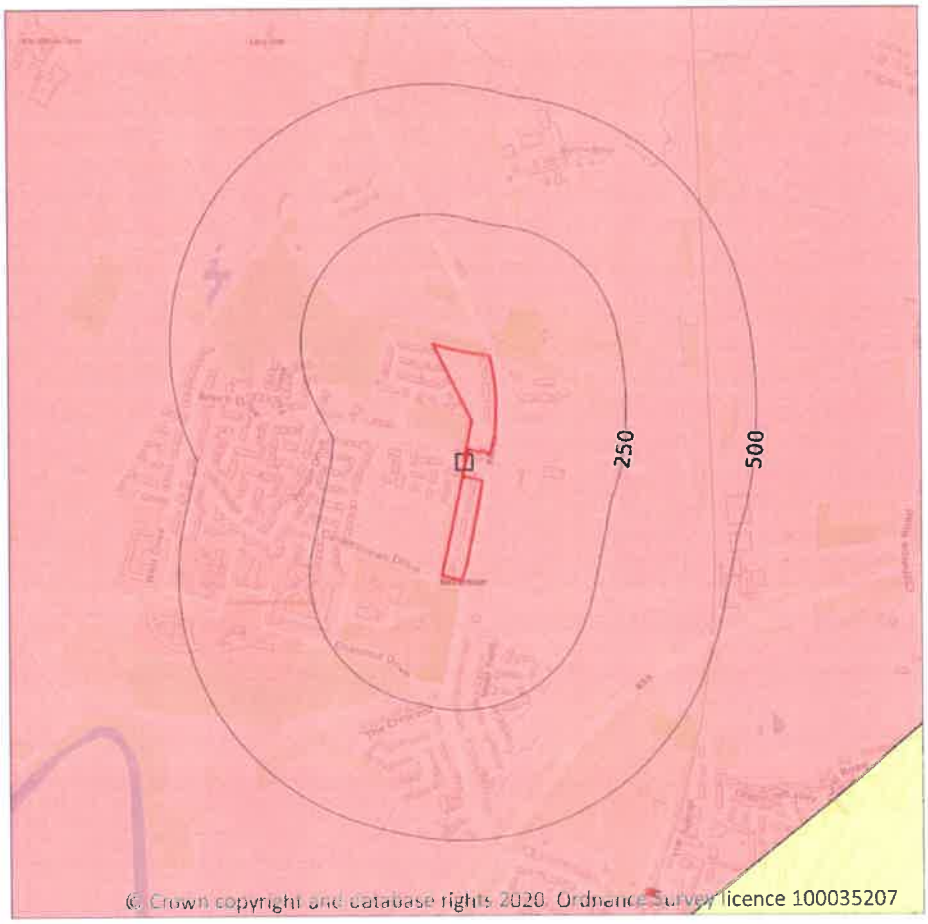
Aquifer status of groundwater held within superficial geology.

Features are displayed on the Hydrogeology map on **page 31**

ID	Location	Designation	Description
1	**On site**	**Secondary Undifferentiated**	**Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type**
2	466m SW	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Bedrock aquifer



Site Outline

Search buffers in metres (m)

- Principal
- Secondary A
- Secondary B
- Secondary Undifferentiated
- Unproductive

5.2 Bedrock aquifer

Records within 500m	1

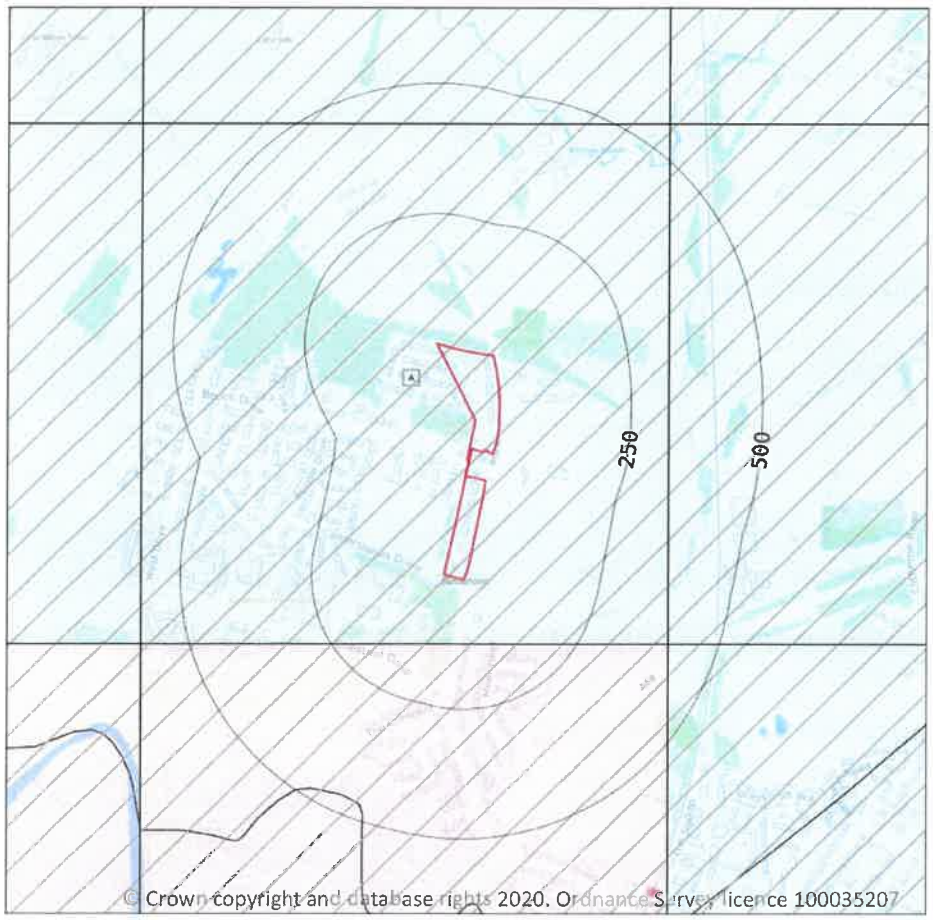
Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on **page 33**

ID	Location	Designation	Description
1	On site	Secondary A	**Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers**

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Groundwater vulnerability



Site Outline

Search buffers in metres (m)

Superficial vulnerability
- Principal superficial aquifer, high vulnerability
- Secondary superficial aquifer, high vulnerability
- Principal superficial aquifer, medium vulnerability
- Secondary superficial aquifer, medium vulnerability
- Principal superficial aquifer, low vulnerability
- Secondary superficial aquifer, low vulnerability

Bedrock vulnerability
- Principal bedrock aquifer, high vulnerability
- Secondary bedrock aquifer, high vulnerability
- Principal bedrock aquifer, medium vulnerability
- Secondary bedrock aquifer, medium vulnerability
- Principal bedrock aquifer, low vulnerability
- Secondary bedrock aquifer, low vulnerability

Other information
- Unproductive aquifer
- Soluble rock risk
- Local information

5.3 Groundwater vulnerability

Records within 50m	1

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

Features are displayed on the Groundwater vulnerability map on **page 34**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
A	On site	**Summary Classification: Secondary superficial aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer**	**Leaching class: Low Infiltration value: <40% Dilution value: >550mm/year**	**Vulnerability: Low Aquifer type: Secondary Thickness: >10m Patchiness value: >90% Recharge potential: Medium**	**Vulnerability: Low Aquifer type: Secondary Flow mechanism: Well connected fractures**

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

5.4 Groundwater vulnerability- soluble rock risk

Records on site	1

This dataset identifies areas where solution features that enable rapid movement of a pollutant may be present within a 1km grid square.

ID	Maximum soluble risk category	Percentage of grid square covered by maximum risk
A	**Significant soluble rocks are likely to be present. Problems unlikely except with considerable surface or subsurface water flow.**	**38.0%**

This data is sourced from the British Geological Survey and the Environment Agency.

5.5 Groundwater vulnerability- local information

Records on site	0

This dataset identifies areas where additional local information affecting vulnerability is held by the Environment Agency. Further information can be obtained by contacting the Environment Agency local Area groundwater team through the Environment Agency National Customer Call Centre on 03798 506 506 or by email on enquiries@environment-agency.gov.uk.

This data is sourced from the British Geological Survey and the Environment Agency.

Abstractions and Source Protection Zones

5.6 Groundwater abstractions

Records within 2000m	2

Licensed groundwater abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, between two points (line data) or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 36**

ID	Location	Details	
1	982m NW	Status: Historical Licence No: 2671310010 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT CLITHEROE Data Type: Point Name: MIDDLETON Easting: 371800 Northing: 438200	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 15/05/1998 Expiry Date: - Issue No: 100 Version Start Date: 15/05/1998 Version End Date: -
-	1744m NE	Status: Historical Licence No: 2671309052 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: LAND AT PENDLE VIEW FISHERIES, CLITHEROE Data Type: Point Name: PENDLE VIEW FISHERIES LTD Easting: 374240 Northing: 438310	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 29/06/2004 Expiry Date: 31/03/2012 Issue No: 2 Version Start Date: 29/06/2004 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.7 Surface water abstractions

Records within 2000m	7

Licensed surface water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 36**

ID	Location	Details	
-	1515m SE	Status: Active Licence No: NW/071/0329/001 Details: Hydroelectric Power Generation Direct Source: Surface, Non-Tidal - North West Region Point: RIVER CALDER AT WHALLEY WEIR, BILLINGTON, CLITHEROE Data Type: Point Name: Whalley Community Hydro Limited Easting: 373500 Northing: 435897	Annual Volume (m^3): 118,800,000 Max Daily Volume (m^3): 540,000 Original Application No: - Original Start Date: 25/09/2013 Expiry Date: 31/03/2028 Issue No: 1 Version Start Date: 26/11/2018 Version End Date: -

ID	Location	Details	
-	1721m E	Status: Historical Licence No: 2671309044 Details: Fish Farm/Cress Pond Throughflow Direct Source: "Surface, Non-Tidal - North West Region" Point: "RESERVOIR AT BARROW , BLACKBURN" Data Type: Point Name: PENDLE VIEW FISHERIES LTD Easting: 374300 Northing: 438100	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 21/02/1991 Expiry Date: - Issue No: 102 Version Start Date: 26/10/2001 Version End Date: -
-	1721m E	Status: Active Licence No: 2671309044 Details: Fish Farm/Cress Pond Throughflow Direct Source: Surface, Non-Tidal - North West Region Point: RESERVOIR AT BARROW , BLACKBURN Data Type: Point Name: PENDLE VIEW FISHERIES LTD Easting: 374300 Northing: 438100	Annual Volume (m^3): 238,937.76 Max Daily Volume (m^3): 654.62 Original Application No: - Original Start Date: 21/02/1991 Expiry Date: - Issue No: 102 Version Start Date: 26/11/2018 Version End Date: -
-	1947m E	Status: Historical Licence No: 2671336001 Details: General use relating to Secondary Category (Medium Loss) Direct Source: "Surface, Non-Tidal - North West Region" Point: "SPRING AT SHEEPEATE FARM,WISWELL." Data Type: Point Name: MR T WHITEWELL MRS A M WOOD Easting: 374600 Northing: 437100	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 11/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 11/03/1966 Version End Date: -
-	1947m E	Status: Historical Licence No: 2671336001 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface, Non-Tidal - North West Region Point: SPRING AT SHEEPEATE FARM,WISWELL. Data Type: Point Name: MR T WHITEWELL MRS A M WOOD Easting: 374600 Northing: 437100	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 11/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 11/03/1966 Version End Date: -

ID	Location	Details	
-	1964m E	Status: Historical Licence No: 2671336006 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Household" Direct Source: "Surface, Non-Tidal - North West Region" Point: "SPRING FED TANK AT WISWELL, CLITHEROE" Data Type: Point Name: SCHOLFIELD Easting: 374600 Northing: 437000	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 05/04/1976 Expiry Date: - Issue No: 100 Version Start Date: 01/04/1987 Version End Date: -
-	1964m E	Status: Historical Licence No: 2671336006 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Household Direct Source: Surface, Non-Tidal - North West Region Point: SPRING FED TANK AT WISWELL, CLITHEROE Data Type: Point Name: SCHOLFIELD Easting: 374600 Northing: 437000	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 05/04/1976 Expiry Date: - Issue No: 100 Version Start Date: 01/04/1987 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.8 Potable abstractions

Records within 2000m	2

Licensed potable water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 36**

ID	Location	Details	
-	1964m E	Status: Historical Licence No: 2671336006 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Household" Direct Source: "Surface, Non-Tidal - North West Region" Point: "SPRING FED TANK AT WISWELL, CLITHEROE" Data Type: Point Name: SCHOLFIELD Easting: 374600 Northing: 437000	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 05/04/1976 Expiry Date: - Issue No: 100 Version Start Date: 01/04/1987 Version End Date: -

ID	Location	Details	
-	1964m E	Status: Historical Licence No: 2671336006 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Household Direct Source: Surface, Non-Tidal - North West Region Point: SPRING FED TANK AT WISWELL, CLITHEROE Data Type: Point Name: SCHOLFIELD Easting: 374600 Northing: 437000	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 05/04/1976 Expiry Date: - Issue No: 100 Version Start Date: 01/04/1987 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.9 Source Protection Zones

Records within 500m	0

Source Protection Zones define the sensitivity of an area around a potable abstraction site to contamination.

This data is sourced from the Environment Agency and Natural Resources Wales.

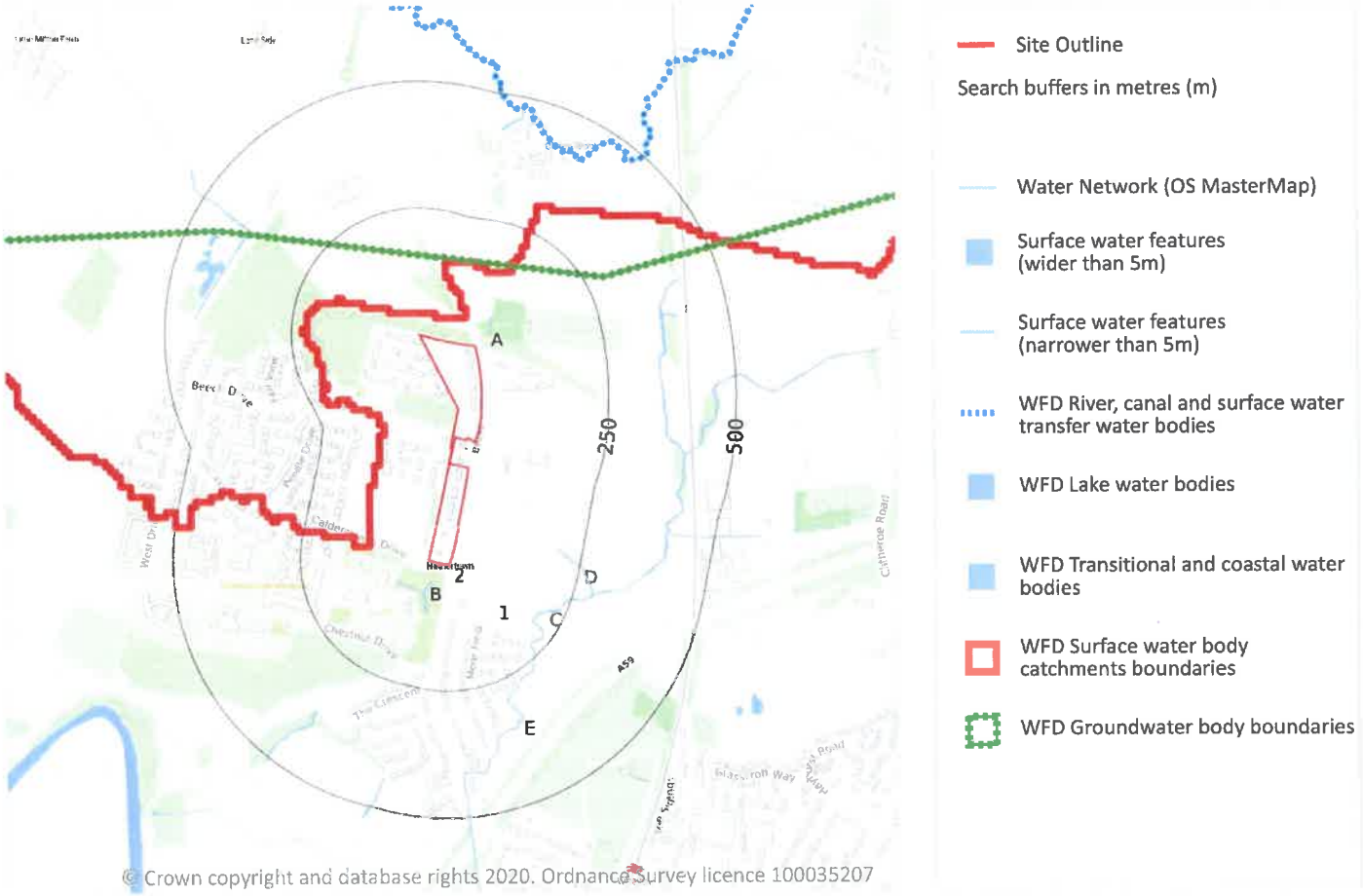
5.10 Source Protection Zones (confined aquifer)

Records within 500m	0

Source Protection Zones in the confined aquifer define the sensitivity around a deep groundwater abstraction to contamination. A confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place.

This data is sourced from the Environment Agency and Natural Resources Wales.

6 Hydrology



6.1 Water Network (OS MasterMap)

Records within 250m	9

Detailed water network of Great Britain showing the flow and precise central course of every river, stream, lake and canal.

Features are displayed on the Hydrology map on **page 41**

ID	Location	Type of water feature	Ground level	Permanence	Name
A	36m NE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-

ID	Location	Type of water feature	Ground level	Permanence	Name
B	37m S	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
A	42m NE	Inland river not influenced by normal tidal action.	Underground	Watercourse contains water year round (in normal circumstances)	-
A	50m NE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
B	62m S	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
B	66m S	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
C	199m SE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
D	202m E	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
E	224m SE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m **8**

Covering rivers, streams and lakes (some overlap with OS MasterMap Water Network data in previous section) but additionally covers smaller features such as ponds. Rivers and streams narrower than 5m are represented as a single line. Lakes, ponds and rivers or streams wider than 5m are represented as polygons.

Features are displayed on the Hydrology map on **page 41**

This data is sourced from the Ordnance Survey.

6.3 WFD Surface water body catchments

Records on site	1

The Water Framework Directive is an EU-led framework for the protection of inland surface waters, estuaries, coastal waters and groundwater through river basin-level management planning. In terms of surface water, these basins are broken down into smaller units known as management, operational and water body catchments.

Features are displayed on the Hydrology map on **page 41**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
1	**On site**	**River WB catchment**	**Calder - Pendle Water to conf Ribble**	**GB112071065490**	**Calder**	**Ribble**

This data is sourced from the Environment Agency and Natural Resources Wales.

6.4 WFD Surface water bodies

Records identified	1

Surface water bodies under the Directive may be rivers, lakes, estuary or coastal. To achieve the purpose of the Directive, environmental objectives have been set and are reported on for each water body. The progress towards delivery of the objectives is then reported on by the relevant competent authorities at the end of each six-year cycle. The river water body directly associated with the catchment listed in the previous section is detailed below, along with any lake, canal, coastal or artificial water body within 250m of the site. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each water body listed.

Features are displayed on the Hydrology map on **page 41**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
-	688m SW	River	Calder - Pendle Water to conf Ribble	GB112071065490	Moderate	Good	Moderate	2016

This data is sourced from the Environment Agency and Natural Resources Wales.

6.5 WFD Groundwater bodies

Records on site	1

Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each groundwater body listed.

Features are displayed on the Hydrology map on **page 41**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
2	**On site**	**Douglas, Darwen and Calder Carboniferous Aquifers**	**GB41202G100300**	**Poor**	**Poor**	**Good**	**2015**

This data is sourced from the Environment Agency and Natural Resources Wales.

7 River and coastal flooding

7.1 Risk of Flooding from Rivers and Sea (RoFRaS)

Records within 50m	0

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance).

This data is sourced from the Environment Agency and Natural Resources Wales.

7.2 Historical Flood Events

Records within 250m	0

Records of historic flooding from rivers, the sea, groundwater and surface water. Records began in 1946 when predecessor bodies started collecting detailed information about flooding incidents, although limited details may be included on flooding incidents prior to this date. Takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding, and includes flood extents that may have been affected by overtopping, breaches or blockages.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.3 Flood Defences

Records within 250m	0

Records of flood defences owned, managed or inspected by the Environment Agency and Natural Resources Wales. Flood defences can be structures, buildings or parts of buildings. Typically these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.4 Areas Benefiting from Flood Defences

Records within 250m	0

Areas that would benefit from the presence of flood defences in a 1 in 100 (1%) chance of flooding each year from rivers or 1 in 200 (0.5%) chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.5 Flood Storage Areas

3202100736P

Records within 250m 0

Areas that act as a balancing reservoir, storage basin or balancing pond to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel or to delay the timing of a flood peak so that its volume is discharged over a longer period.

This data is sourced from the Environment Agency and Natural Resources Wales.

River and coastal flooding - Flood Zones

7.6 Flood Zone 2

Records within 50m	0

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land between Flood Zone 3 (see next section) and the extent of the flooding from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year.

This data is sourced from the Environment Agency and Natural Resources Wales.

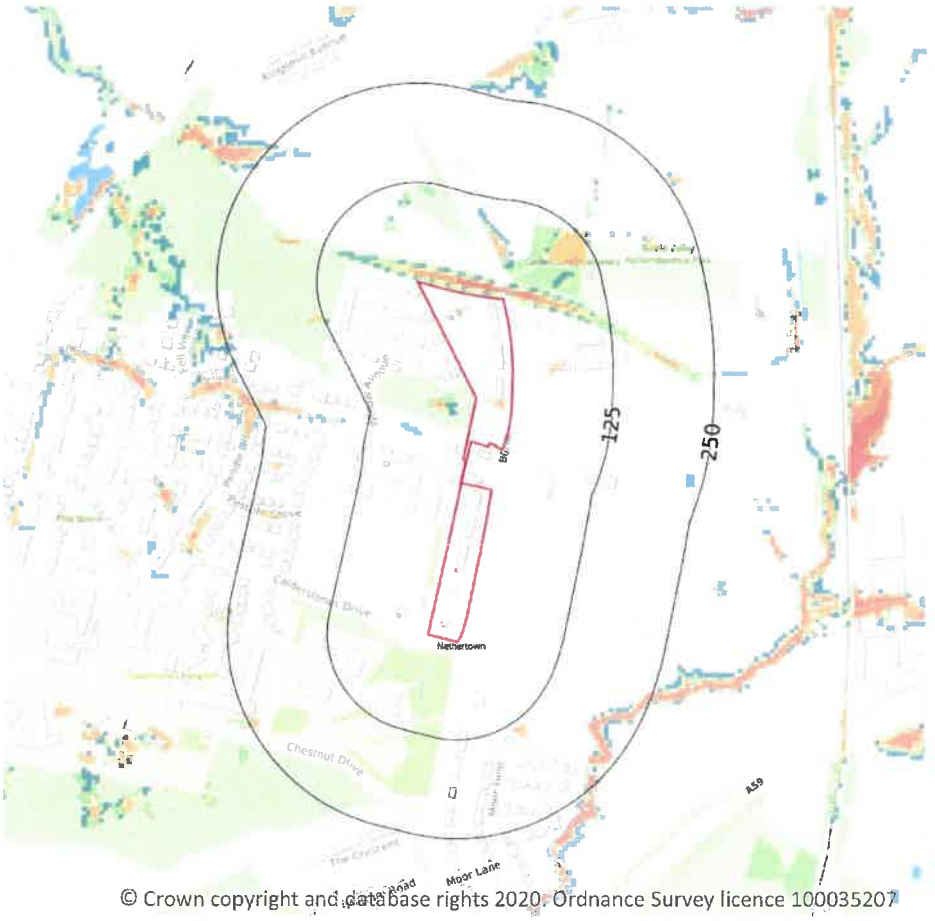
7.7 Flood Zone 3

Records within 50m	0

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

8 Surface water flooding



Site Outline

Search buffers in metres (m)

1 in 1000 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 250 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 100 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 30 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

8.1 Surface water flooding

Highest risk on site	**1 in 30 year, 0.1m - 0.3m**
Highest risk within 50m	**1 in 30 year, Greater than 1.0m**

Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

Features are displayed on the Surface water flooding map on **page 48**

The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on a site.

The table below shows the maximum flood depths for a range of return periods for the site.

Return period	Maximum modelled depth
1 in 1000 year	Between 0.1m and 0.3m
1 in 250 year	Between 0.1m and 0.3m
1 in 100 year	Between 0.1m and 0.3m
1 in 30 year	Between 0.1m and 0.3m

This data is sourced from Ambiental Risk Analytics.

9 Groundwater flooding

Site Outline

Search buffers in metres (m)

High

Moderate - High

Moderate

Low

Negligible

9.1 Groundwater flooding

Highest risk on site	**Low**
Highest risk within 50m	**Low**

Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Groundwater flooding tends to exhibit a longer duration than surface water flooding, possibly lasting for weeks or months, and as a result it can cause significant damage to property. This risk assessment is based on a 1 in 100 year return period and a 5m Digital Terrain Model (DTM).

Features are displayed on the Groundwater flooding map on **page 50**

This data is sourced from Ambiental Risk Analytics.

10 Environmental designations

10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m	0

Sites providing statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs were re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and (in Scotland) by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2010.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.2 Conserved wetland sites (Ramsar sites)

Records within 2000m	0

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. They cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities. These sites cover a broad definition of wetland; marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, and even some marine areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.3 Special Areas of Conservation (SAC)

Records within 2000m	0

Areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.4 Special Protection Areas (SPA)

Records within 2000m	0

Sites classified by the UK Government under the EC Birds Directive, SPAs are areas of the most important habitat for rare (listed on Annex I to the Directive) and migratory birds within the European Union.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.5 National Nature Reserves (NNR)

Records within 2000m	0

Sites containing examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats, provide special opportunities for scientific study or to provide public recreation compatible with natural heritage interests.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.6 Local Nature Reserves (LNR)

Records within 2000m	0

Sites managed for nature conservation, and to provide opportunities for research and education, or simply enjoying and having contact with nature. They are declared by local authorities under the National Parks and Access to the Countryside Act 1949 after consultation with the relevant statutory nature conservation agency.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.7 Designated Ancient Woodland

Records within 2000m	13

Ancient woodlands are classified as areas which have been wooded continuously since at least 1600 AD. This includes semi-natural woodland and plantations on ancient woodland sites. 'Wooded continuously' does not mean there is or has previously been continuous tree cover across the whole site, and not all trees within the woodland have to be old.

Features are displayed on the Environmental designations map on **page 51**

ID	Location	Name	Woodland Type
1	813m W	MITTON WOOD	Ancient & Semi-Natural Woodland
2	1238m W	MITTON WOOD	Ancient & Semi-Natural Woodland
3	1273m W	MITTON WOOD	Ancient Replanted Woodland
4	1302m W	MITTON WOOD	Ancient Replanted Woodland
6	1472m SE	SPRING WOOD	Ancient & Semi-Natural Woodland
7	1533m E	SPRING WOOD	Ancient & Semi-Natural Woodland
8	1562m NW	HOLDENS BREAST	Ancient & Semi-Natural Woodland
9	1576m NW	HOLDENS BREAST	Ancient & Semi-Natural Woodland
-	1677m E	SPRING WOOD	Ancient Replanted Woodland
11	1706m NW	HOLDENS BREAST	Ancient & Semi-Natural Woodland
-	1784m W	Unknown	Ancient & Semi-Natural Woodland
13	1816m SE	PLANES WOOD	Ancient & Semi-Natural Woodland
-	1871m W	Unknown	Ancient & Semi-Natural Woodland

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.8 Biosphere Reserves

Records within 2000m	0

Biosphere Reserves are internationally recognised by UNESCO as sites of excellence to balance conservation and socioeconomic development between nature and people. They are recognised under the Man and the Biosphere (MAB) Programme with the aim of promoting sustainable development founded on the work of the local community.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.9 Forest Parks

Records within 2000m	0

These are areas managed by the Forestry Commission designated on the basis of recreational, conservation or scenic interest.

This data is sourced from the Forestry Commission.

10.10 Marine Conservation Zones

Records within 2000m	0

A type of marine nature reserve in UK waters established under the Marine and Coastal Access Act (2009). They are designated with the aim to protect nationally important, rare or threatened habitats and species.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.11 Green Belt

Records within 2000m	2

Areas designated to prevent urban sprawl by keeping land permanently open.

Features are displayed on the Environmental designations map on **page 51**

ID	Location	Name	Local Authority name
5	1352m S	Liverpool and Manchester	Ribble Valley
-	1930m SE	Liverpool and Manchester	Hyndburn

This data is sourced from the Ministry of Housing, Communities and Local Government.

10.12 Proposed Ramsar sites

Records within 2000m	0

Ramsar sites are areas listed as a Wetland of International Importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) 1971. The sites here supplied have a status of 'Proposed' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.13 Possible Special Areas of Conservation (pSAC)

Records within 2000m	0

Special Areas of Conservation are areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive. Those sites supplied here are those with a status of 'Possible' having been identified for potential adoption under the framework.

This data is sourced from Natural England and Natural Resources Wales.

10.14 Potential Special Protection Areas (pSPA)

Records within 2000m	0

Special Protection Areas (SPAs) are areas designated (or 'classified') under the European Union Wild Birds Directive for the protection of nationally and internationally important populations of wild birds. Those sites supplied here are those with a status of 'Potential' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.15 Nitrate Sensitive Areas

Records within 2000m	0

Areas where nitrate concentrations in drinking water sources exceeded or was at risk of exceeding the limit of 50 mg/l set by the 1980 EC Drinking Water Directive. Voluntary agricultural measures as a means of reducing the levels of nitrate were introduced by DEFRA as MAFF, with payments being made to farmers who complied. The scheme was started as a pilot in 1990 in ten areas, later implemented within 32 areas. The scheme was closed to further new entrants in 1998, although existing agreements continued for their full term. All Nitrate Sensitive Areas fell within the areas designated as Nitrate Vulnerable Zones (NVZs) in 1996 under the EC Nitrate Directive (91/676/EEC).

This data is sourced from Natural England.

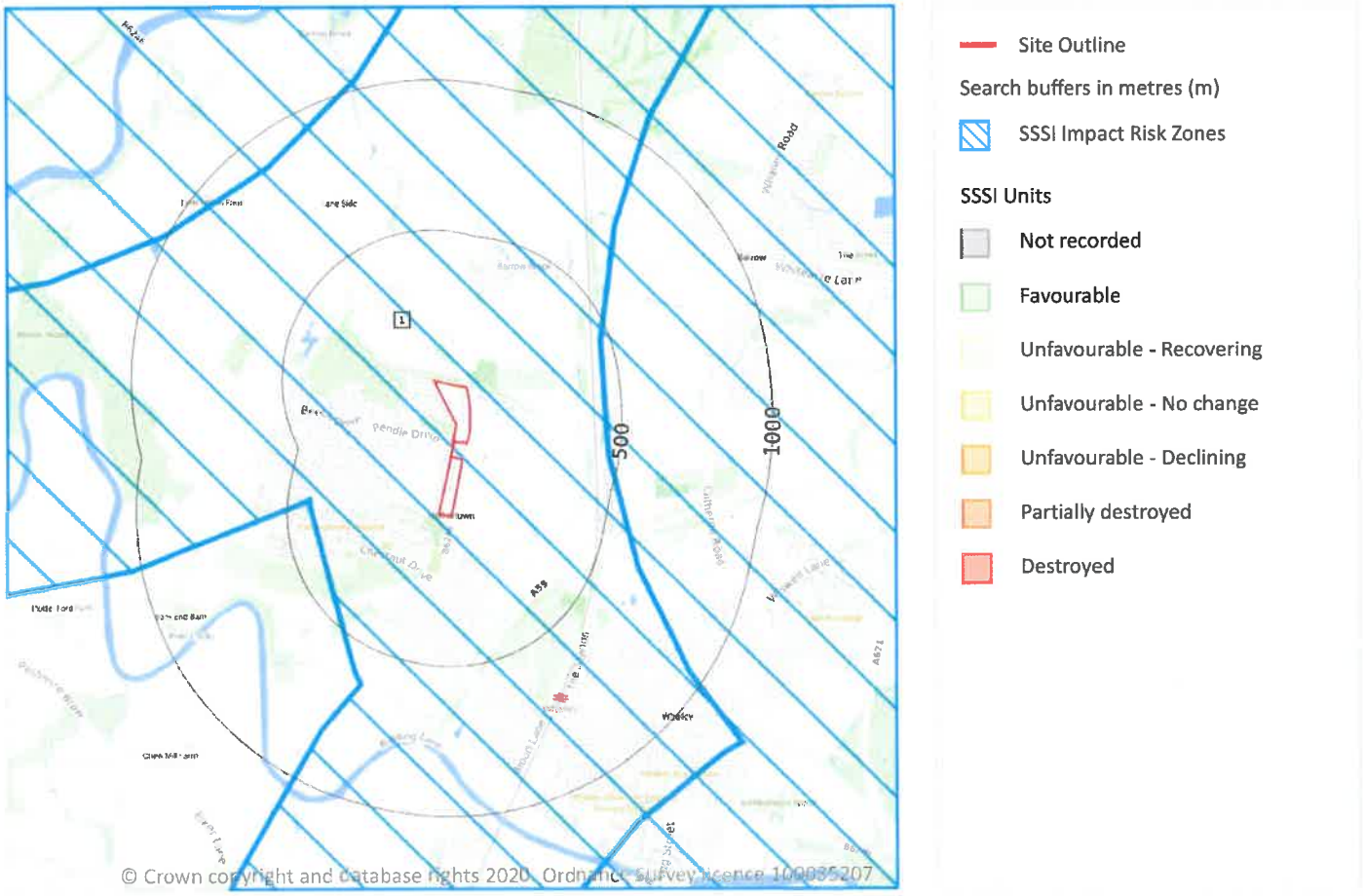
10.16 Nitrate Vulnerable Zones

Records within 2000m	0

Areas at risk from agricultural nitrate pollution designated under the EC Nitrate Directive (91/676/EEC). These are areas of land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture.

This data is sourced from Natural England and Natural Resources Wales.

SSSI Impact Zones and Units



10.17 SSSI Impact Risk Zones

Records on site	1

Developed to allow rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

Features are displayed on the SSSI Impact Zones and Units map on **page 57**

ID	Location	Type of developments requiring consultation
1	On site	**Minerals, Oil and Gas - Planning applications for quarries, including: new proposals, Review of Minerals Permissions (ROMP), extensions, variations to conditions etc. Oil & gas exploration/extraction.**

This data is sourced from Natural England.

10.18 SSSI Units

Records within 2000m	0

Divisions of SSSIs used to record management and condition details. Units are the smallest areas for which Natural England gives a condition assessment, however, the size of units varies greatly depending on the types of management and the conservation interest.

This data is sourced from Natural England and Natural Resources Wales.

11 Visual and cultural designations

11.1 World Heritage Sites

Records within 250m	0

Sites designated for their globally important cultural or natural interest requiring appropriate management and protection measures. World Heritage Sites are designated to meet the UK's commitments under the World Heritage Convention.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.2 Area of Outstanding Natural Beauty

Records within 250m	0

Areas of Outstanding Natural Beauty (AONB) are conservation areas, chosen because they represent 18% of the finest countryside. Each AONB has been designated for special attention because of the quality of their flora, fauna, historical and cultural associations, and/or scenic views. The National Parks and Access to the Countryside Act of 1949 created AONBs and the Countryside and Rights of Way Act, 2000 added further regulation and protection. There are likely to be restrictions to some developments within these areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

11.3 National Parks

Records within 250m	0

In England and Wales, the purpose of National Parks is to conserve and enhance landscapes within the countryside whilst promoting public enjoyment of them and having regard for the social and economic well-being of those living within them. In Scotland National Parks have the additional purpose of promoting the sustainable use of the natural resources of the area and the sustainable social and economic development of its communities. The National Parks and Access to the Countryside Act 1949 established the National Park designation in England and Wales, and The National Parks (Scotland) Act 2000 in Scotland.

This data is sourced from Natural England, Natural Resources Wales and the Scottish Government.

11.4 Listed Buildings

Records within 250m	0

Buildings listed for their special architectural or historical interest. Building control in the form of 'listed building consent' is required in order to make any changes to that building which might affect its special interest. Listed buildings are graded to indicate their relative importance, however building controls apply to all buildings equally, irrespective of their grade, and apply to the interior and exterior of the building in its entirety, together with any curtilage structures.

This data is sourced from English Heritage, Cadw and Historic Environment Scotland.

11.5 Conservation Areas

Records within 250m	0

Local planning authorities are obliged to designate as conservation areas any parts of their own area that are of special architectural or historic interest, the character and appearance of which it is desirable to preserve or enhance. Designation of a conservation area gives broader protection than the listing of individual buildings. All the features within the area, listed or otherwise, are recognised as part of its character. Conservation area designation is the means of recognising the importance of all factors and of ensuring that planning decisions address the quality of the landscape in its broadest sense.

This data is sourced from English Heritage, Cadw and Historic Environment Scotland.

11.6 Scheduled Ancient Monuments

Records within 250m	0

A scheduled monument is an historic building or site that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. The regime is set out in the Ancient Monuments and Archaeological Areas Act 1979. The Schedule of Monuments has c.20,000 entries and includes sites such as Roman remains, burial mounds, castles, bridges, earthworks, the remains of deserted villages and industrial sites. Monuments are not graded, but all are, by definition, considered to be of national importance.

This data is sourced from English Heritage, Cadw and Historic Environment Scotland.

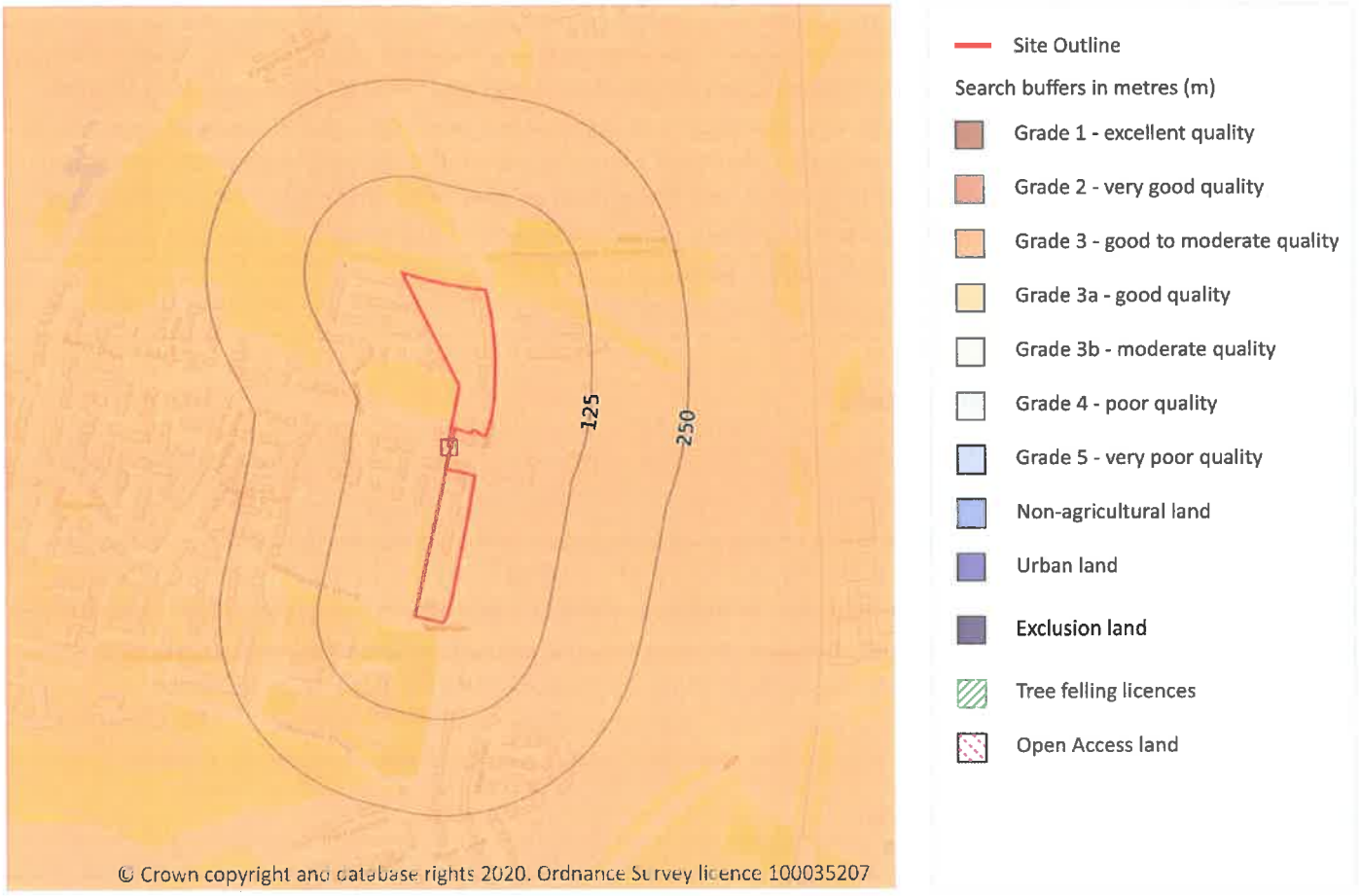
11.7 Registered Parks and Gardens

Records within 250m	0

Parks and gardens assessed to be of particular interest and of special historic interest. The emphasis being on 'designed' landscapes, rather than on planting or botanical importance. Registration is a 'material consideration' in the planning process, meaning that planning authorities must consider the impact of any proposed development on the special character of the landscape.

This data is sourced from English Heritage, Cadw and Historic Environment Scotland.

12 Agricultural designations



12.1 Agricultural Land Classification

Records within 250m	1

Classification of the quality of agricultural land taking into consideration multiple factors including climate, physical geography and soil properties. It should be noted that the categories for the grading of agricultural land are not consistent across England, Wales and Scotland.

Features are displayed on the Agricultural designations map on **page 61**

ID	Location	Classification	Description
1	On site	Grade 3	**Good to moderate quality agricultural land. Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.**

This data is sourced from Natural England.

12.2 Open Access Land

Records within 250m	0

The Countryside and Rights of Way Act 2000 (CROW Act) gives a public right of access to land without having to use paths. Access land includes mountains, moors, heaths and downs that are privately owned. It also includes common land registered with the local council and some land around the England Coast Path. Generally permitted activities on access land are walking, running, watching wildlife and climbing.

This data is sourced from Natural England and Natural Resources Wales.

12.3 Tree Felling Licences

Records within 250m	0

Felling Licence Application (FLA) areas approved by Forestry Commission England. Anyone wishing to fell trees must ensure that a licence or permission under a grant scheme has been issued by the Forestry Commission before any felling is carried out or that one of the exceptions apply.

This data is sourced from the Forestry Commission.

12.4 Environmental Stewardship Schemes

Records within 250m	2

Environmental Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment.

Location	Reference	Scheme	Start Date	End date
27m NW	AG00420211	Entry Level plus Higher Level Stewardship	01/03/2013	28/02/2023
41m N	AG00420211	Entry Level plus Higher Level Stewardship	01/03/2013	28/02/2023

This data is sourced from Natural England.

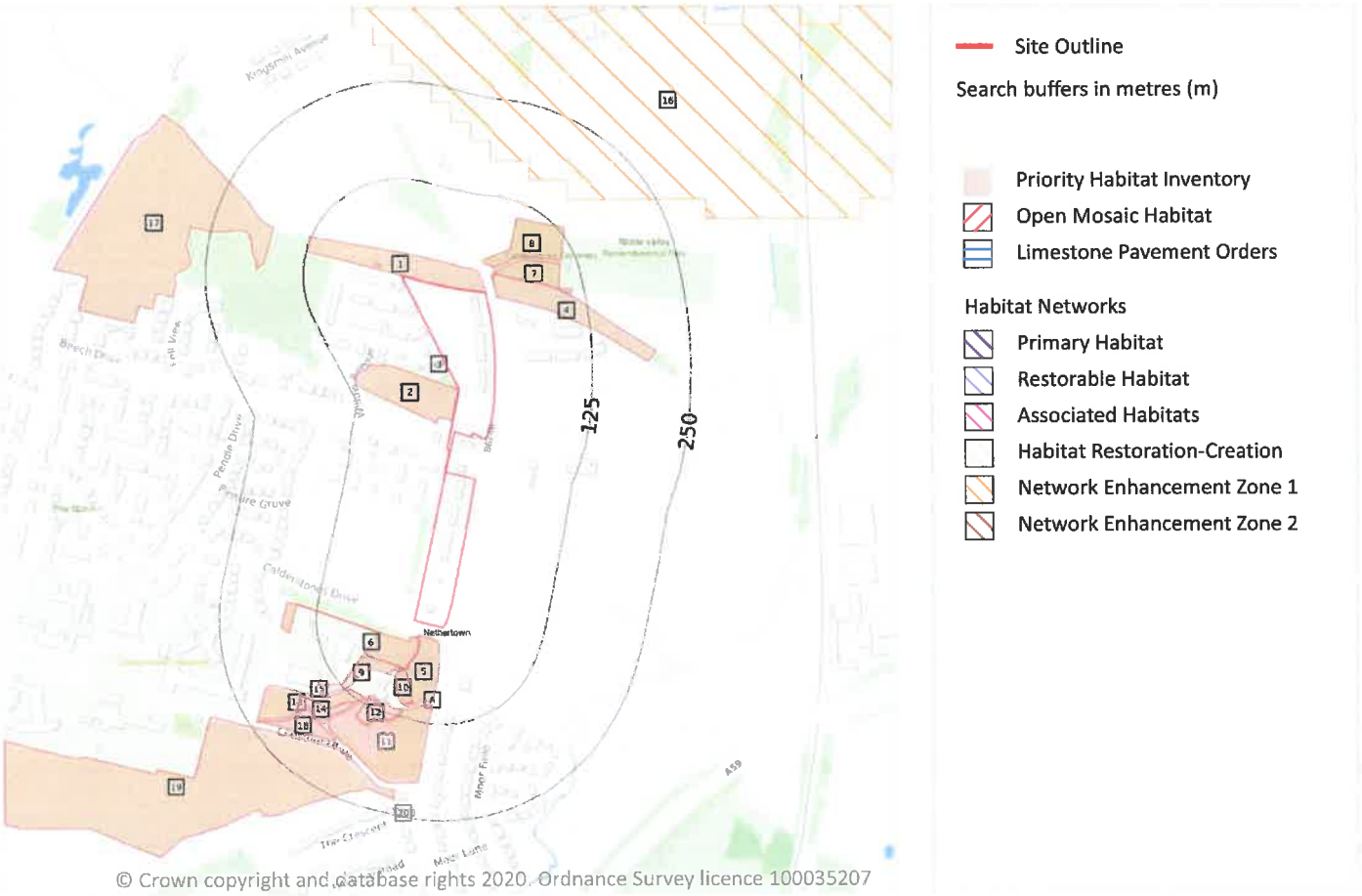
12.5 Countryside Stewardship Schemes

Records within 250m	0

Countryside Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. Main objectives are to improve the farmed environment for wildlife and to reduce diffuse water pollution.

This data is sourced from Natural England.

13 Habitat designations



13.1 Priority Habitat Inventory

Records within 250m	21

Habitats of principal importance as named under Natural Environment and Rural Communities Act (2006) Section 41.

Features are displayed on the Habitat designations map on **page 63**

ID	Location	Main Habitat	Other habitats
1	**On site**	**Deciduous woodland**	**Main habitat: DWOOD (INV > 50%)**
2	0m W	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
3	3m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
4	13m E	Deciduous woodland	Main habitat: DWOOD (INV > 50%)

ID	Location	Main Habitat	Other habitats
5	17m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
6	20m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
7	21m NE	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
8	32m N	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
9	62m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
10	65m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
A	90m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
11	101m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
A	101m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
12	112m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
13	118m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
14	132m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
15	142m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
17	174m W	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
18	178m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
19	192m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
20	239m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)

This data is sourced from Natural England.

13.2 Habitat Networks

Records within 250m **1**

Habitat networks for 18 priority habitat networks (based primarily, but not exclusively, on the priority habitat inventory) and areas suitable for the expansion of networks through restoration and habitat creation.

Features are displayed on the Habitat designations map on **page 63**

ID	Location	Type	Habitat
16	156m N	Network Enhancement Zone 1	Not specified

This data is sourced from Natural England.

13.3 Open Mosaic Habitat

Records within 250m	0

Sites verified as Open Mosaic Habitat. Mosaic habitats are brownfield sites that are identified under the UK Biodiversity Action Plan as a priority habitat due to the habitat variation within a single site, supporting an array of invertebrates.

This data is sourced from Natural England.

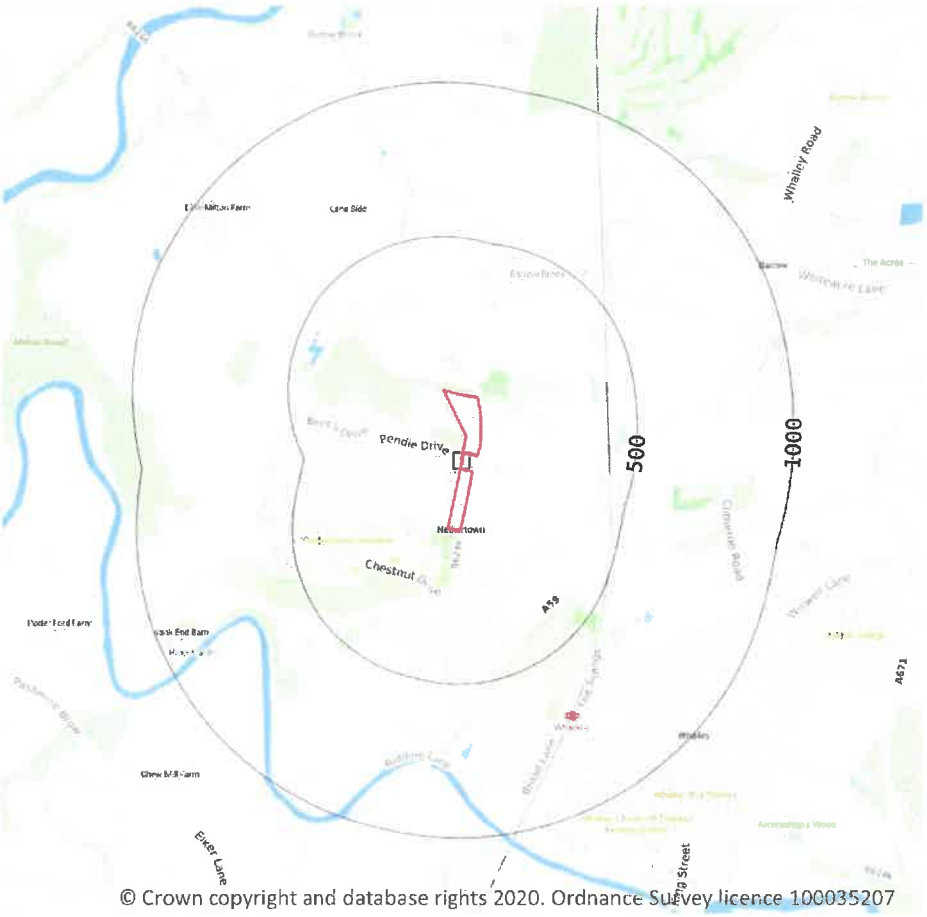
13.4 Limestone Pavement Orders

Records within 250m	0

Limestone pavements are outcrops of limestone where the surface has been worn away by natural means over millennia. These rocks have the appearance of paving blocks, hence their name. Not only do they have geological interest, they also provide valuable habitats for wildlife. These habitats are threatened due to their removal for use in gardens and water features. Many limestone pavements have been designated as SSSIs which affords them some protection. In addition, Section 34 of the Wildlife and Countryside Act 1981 gave them additional protection via the creation of Limestone Pavement Orders, which made it a criminal offence to remove any part of the outcrop. The associated Limestone Pavement Priority Habitat is part of the UK Biodiversity Action Plan priority habitat in England.

This data is sourced from Natural England.

14 Geology 1:10,000 scale - Availability



14.1 10k Availability

Records within 500m	1

An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:10,000 scale - Availability map on **page 66**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**No coverage**	**No coverage**	**No coverage**	**No coverage**	**NoCov**

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Artificial and made ground

14.2 Artificial and made ground (10k)

Records within 500m	0

Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Superficial

14.3 Superficial geology (10k)

Records within 500m	0

Superficial geological deposits at 1:10,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

This data is sourced from the British Geological Survey.

14.4 Landslip (10k)

Records within 500m	0

Mass movement deposits on BGS geological maps at 1:10,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Bedrock

14.5 Bedrock geology (10k)

Records within 500m	0

Bedrock geology at 1:10,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

This data is sourced from the British Geological Survey.

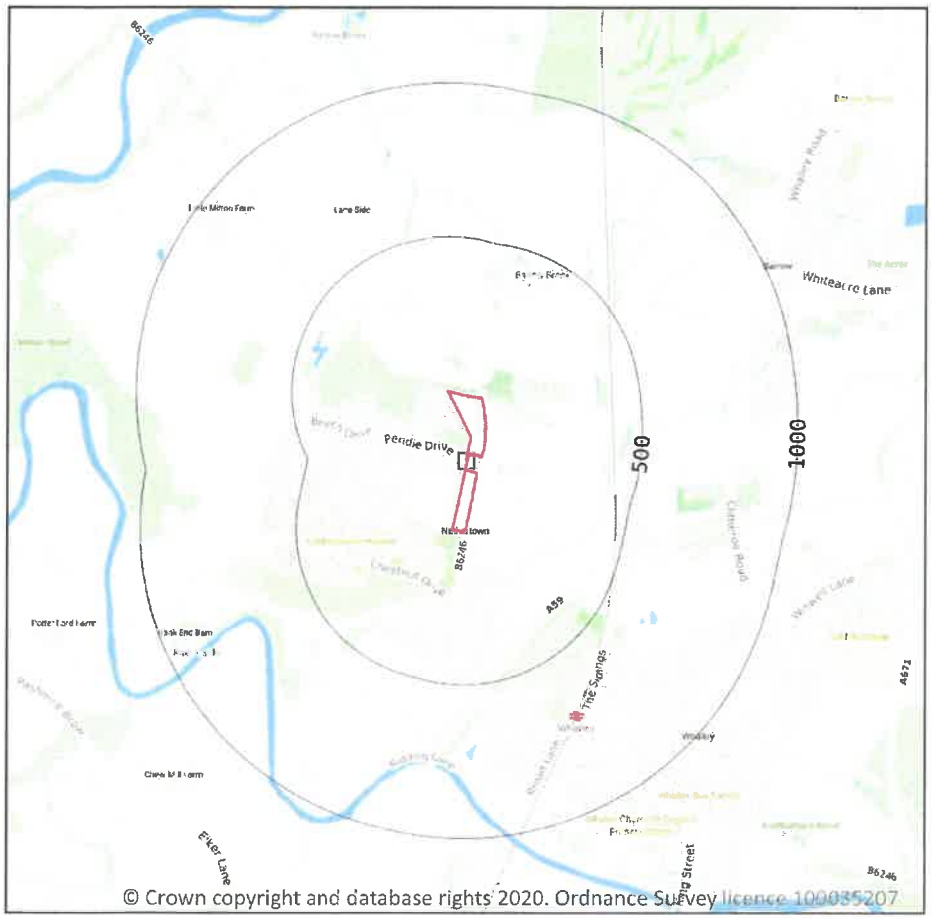
14.6 Bedrock faults and other linear features (10k)

Records within 500m	0

Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.

15 Geology 1:50,000 scale - Availability



15.1 50k Availability

Records within 500m	1

An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 70**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	No coverage	Full	Full	Full	EW068_clitheroe_v4

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Artificial and made ground

15.2 Artificial and made ground (50k)

Records within 500m	0

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

This data is sourced from the British Geological Survey.

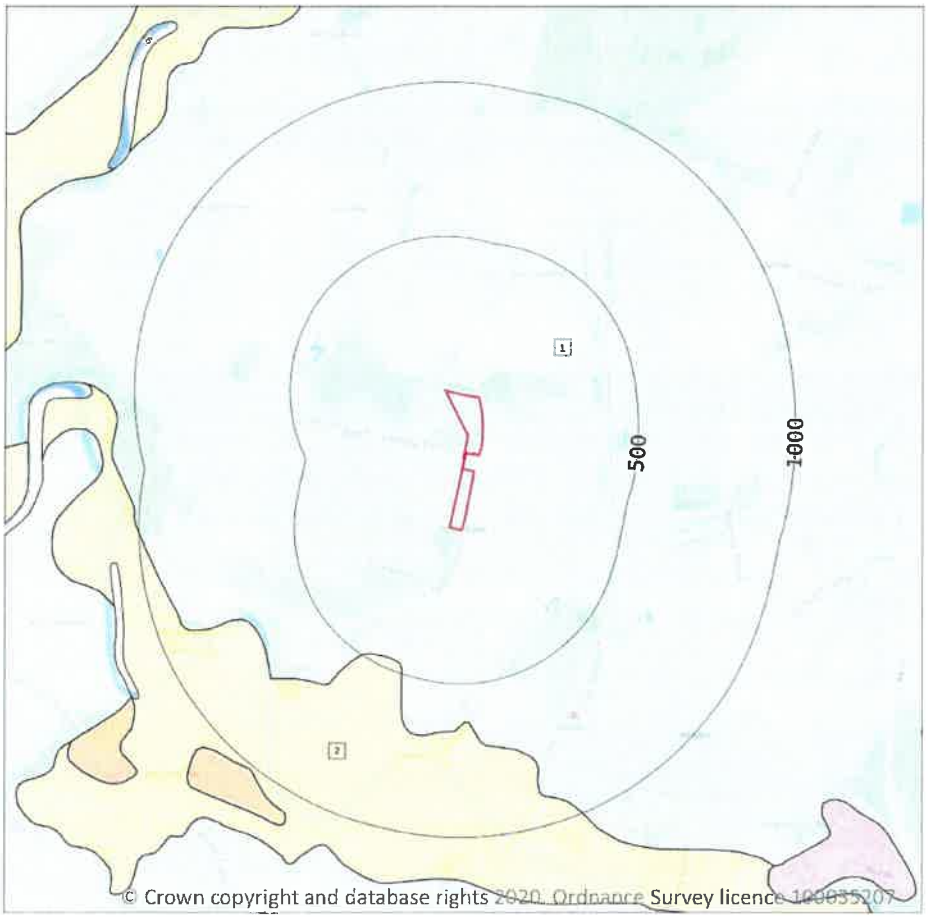
15.3 Artificial ground permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (50k)

Superficial geology (50k)
Please see table for more details.

15.4 Superficial geology (50k)

Records within 500m **2**

Superficial geological deposits at 1:50,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 72**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**TILLD-DMTN**	**TILL, DEVENSIAN**	**DIAMICTON**
2	466m SW	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL

This data is sourced from the British Geological Survey.

15.5 Superficial permeability (50k)

Records within 50m	1

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	Mixed	High	Low

This data is sourced from the British Geological Survey.

15.6 Landslip (50k)

Records within 500m	0

Mass movement deposits on BGS geological maps at 1:50,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

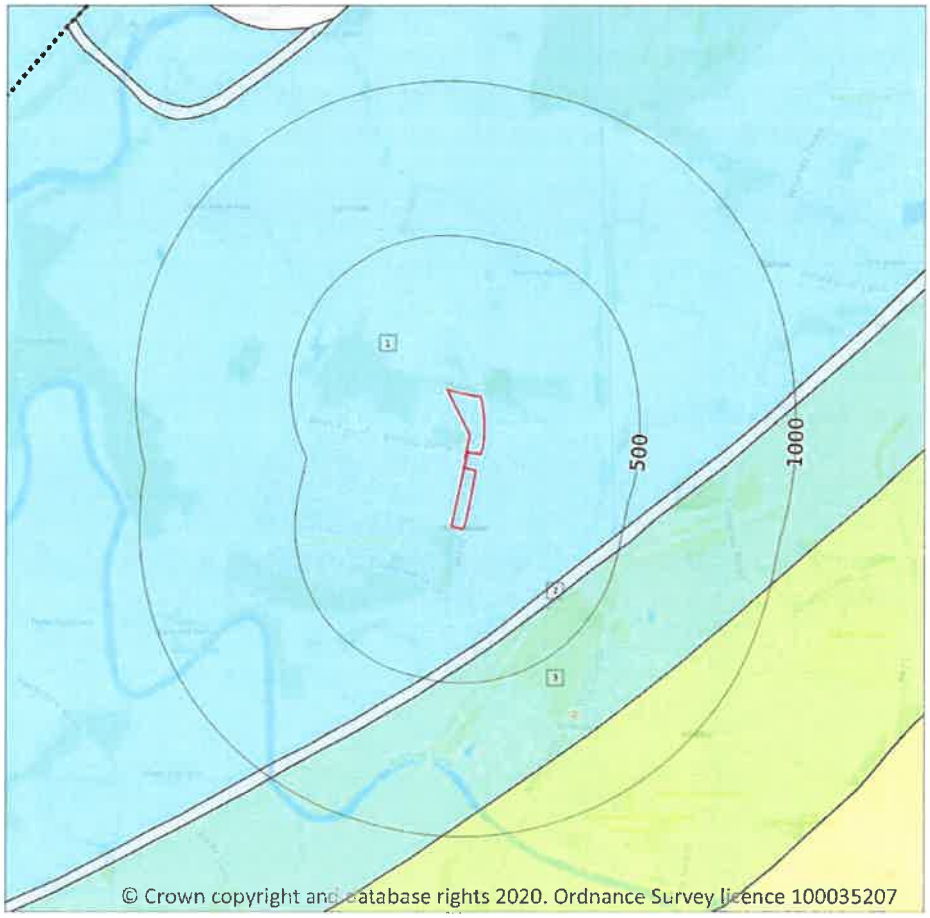
15.7 Landslip permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (50k)

Bedrock geology (50k)
Please see table for more details.

15.8 Bedrock geology (50k)

Records within 500m 3

Bedrock geology at 1:50,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 74**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CLHOM-MDST**	**CLITHEROE LIMESTONE FORMATION AND HODDER MUDSTONE FORMATION (UNDIFFERENTIATED) - MUDSTONE**	**VISEAN**
2	324m SE	BOH-LMST	HODDERENSE LIMESTONE FORMATION - LIMESTONE	VISEAN
3	362m SE	RKM-MDST	RAD BROOK MUDSTONE MEMBER - MUDSTONE	VISEAN

This data is sourced from the British Geological Survey.

15.9 Bedrock permeability (50k)

Records within 50m	1

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Fracture**	**Low**	**Low**

This data is sourced from the British Geological Survey.

15.10 Bedrock faults and other linear features (50k)

Records within 500m	0

Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.

3202100756P

16 Boreholes

16.1 BGS Boreholes

Records within 250m	0

The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several thousand metres deep.

This data is sourced from the British Geological Survey.

17 Natural ground subsidence - Shrink swell clays

17.1 Shrink swell clays

Records within 50m	1

The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 77**

Location	Hazard rating	Details
On site	Very low	**Ground conditions predominantly low plasticity.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands

17.2 Running sands

Records within 50m 1

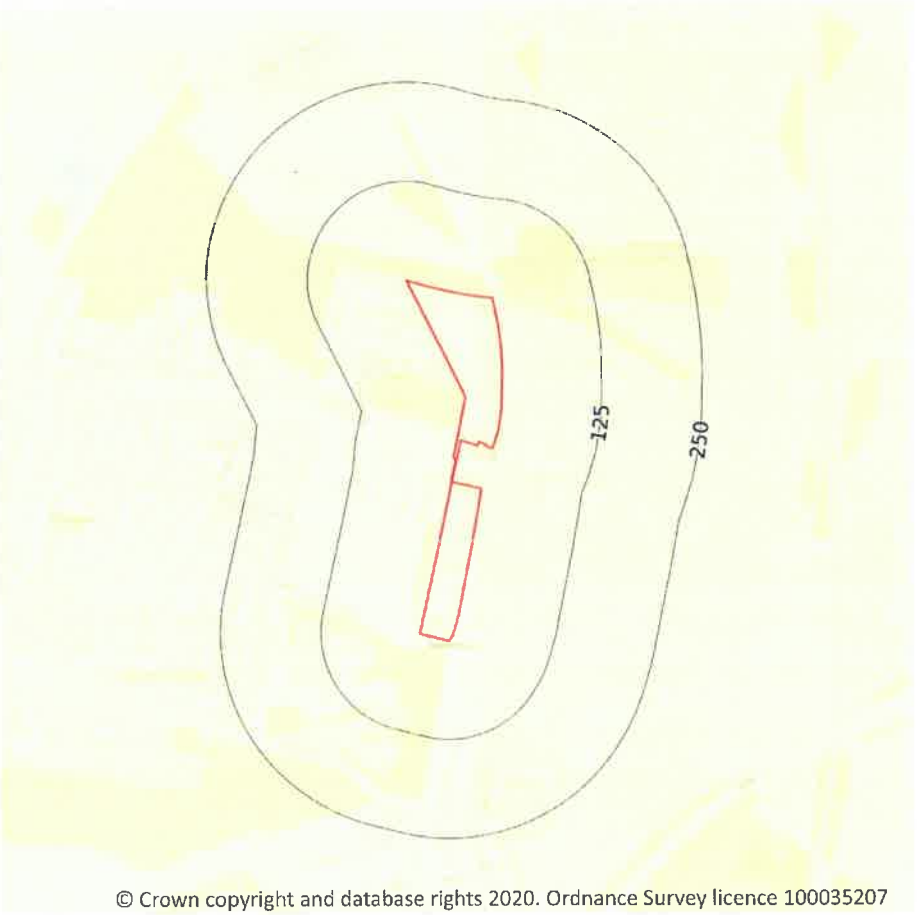
The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

Features are displayed on the Natural ground subsidence - Running sands map on **page 78**

Location	Hazard rating	Details
On site	**Very low**	**Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Compressible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.3 Compressible deposits

Records within 50m	1

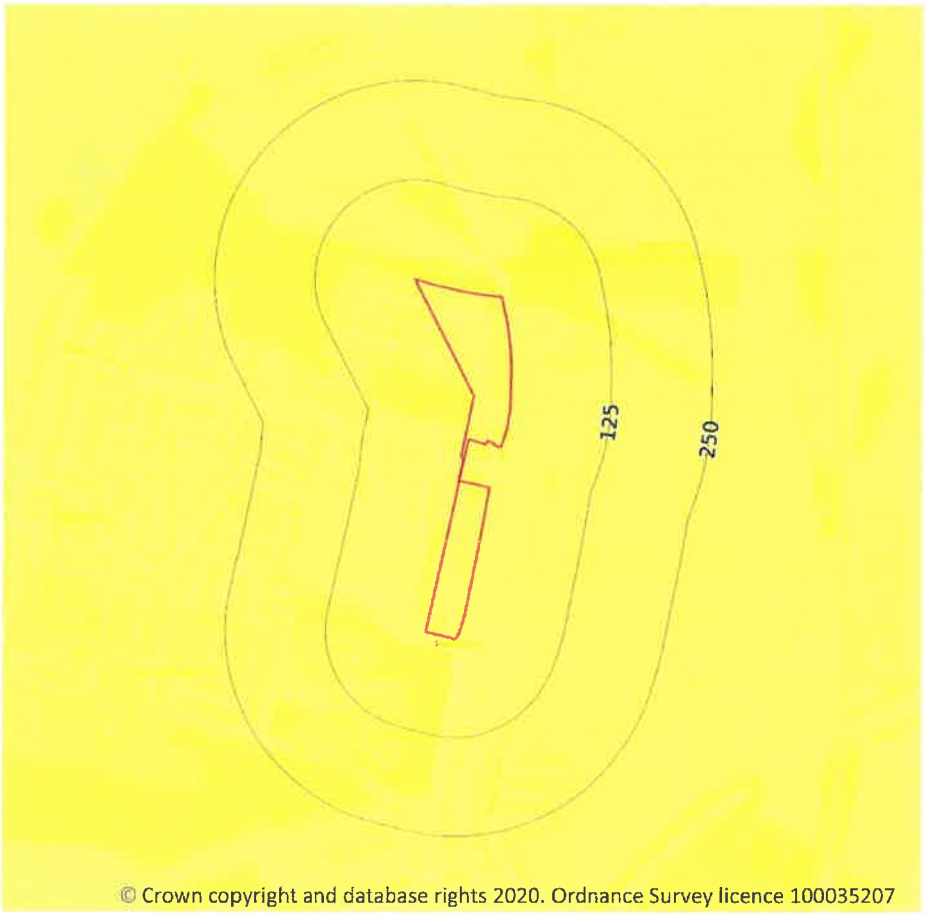
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 79**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Collapsible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.4 Collapsible deposits

Records within 50m	1

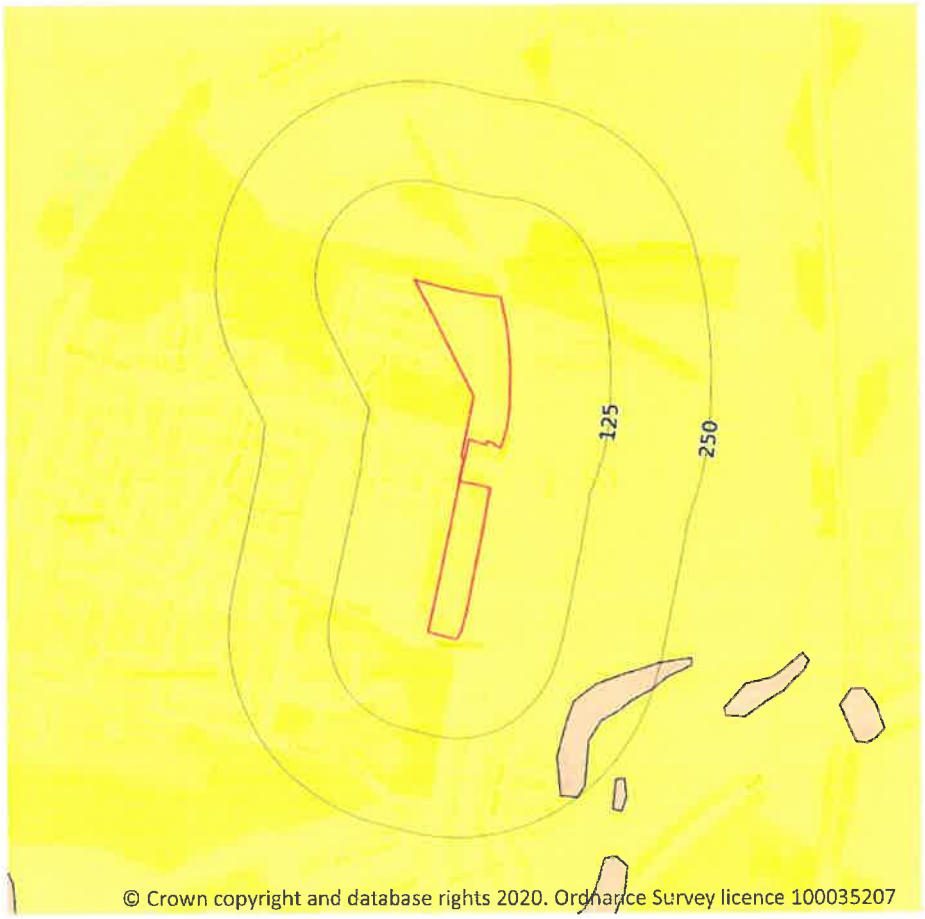
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 80**

Location	Hazard rating	Details
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Landslides



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.5 Landslides

Records within 50m	1

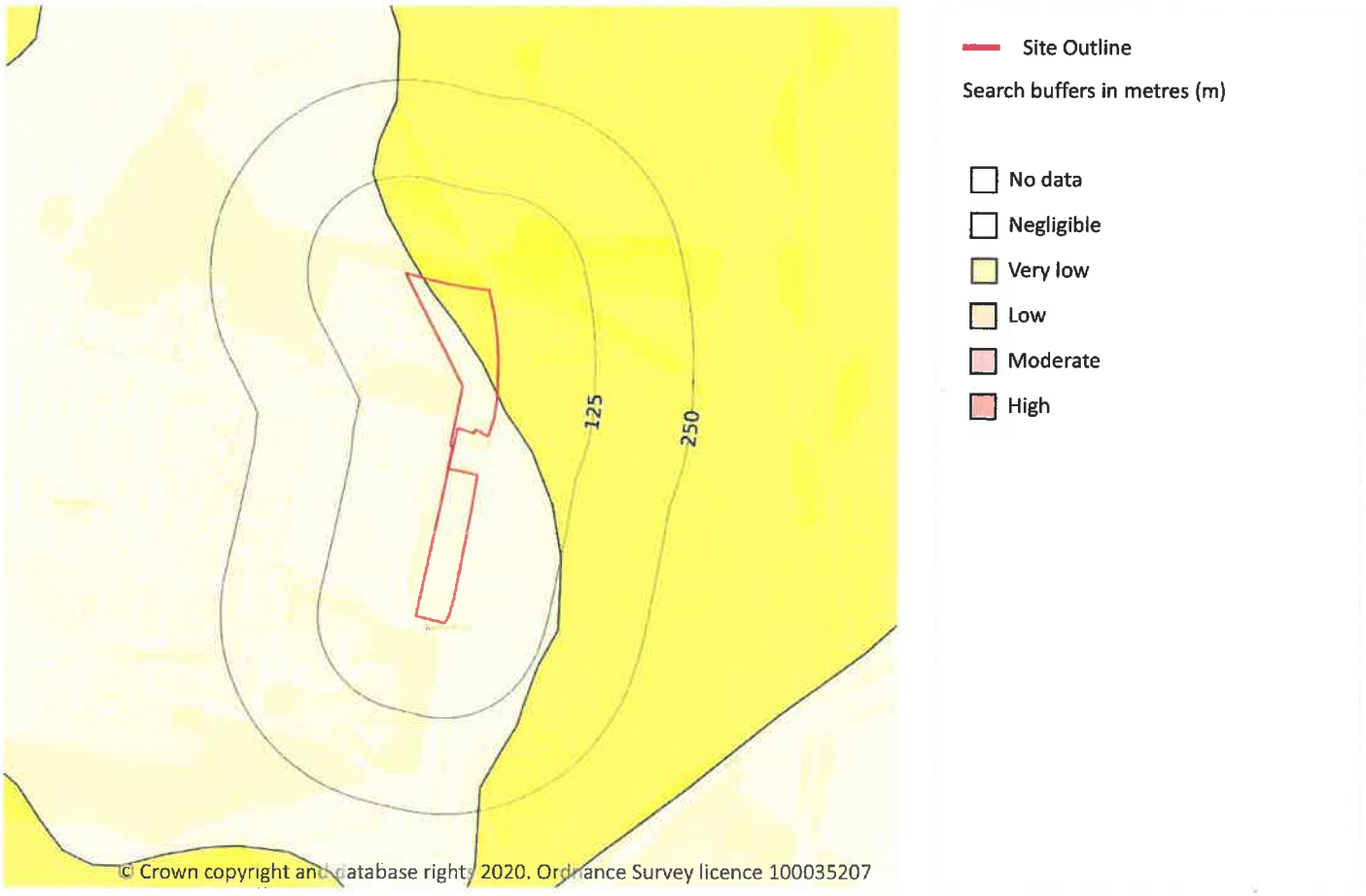
The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 81**

Location	Hazard rating	Details
On site	**Very low**	**Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Ground dissolution of soluble rocks



17.6 Ground dissolution of soluble rocks

Records within 50m	2

The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

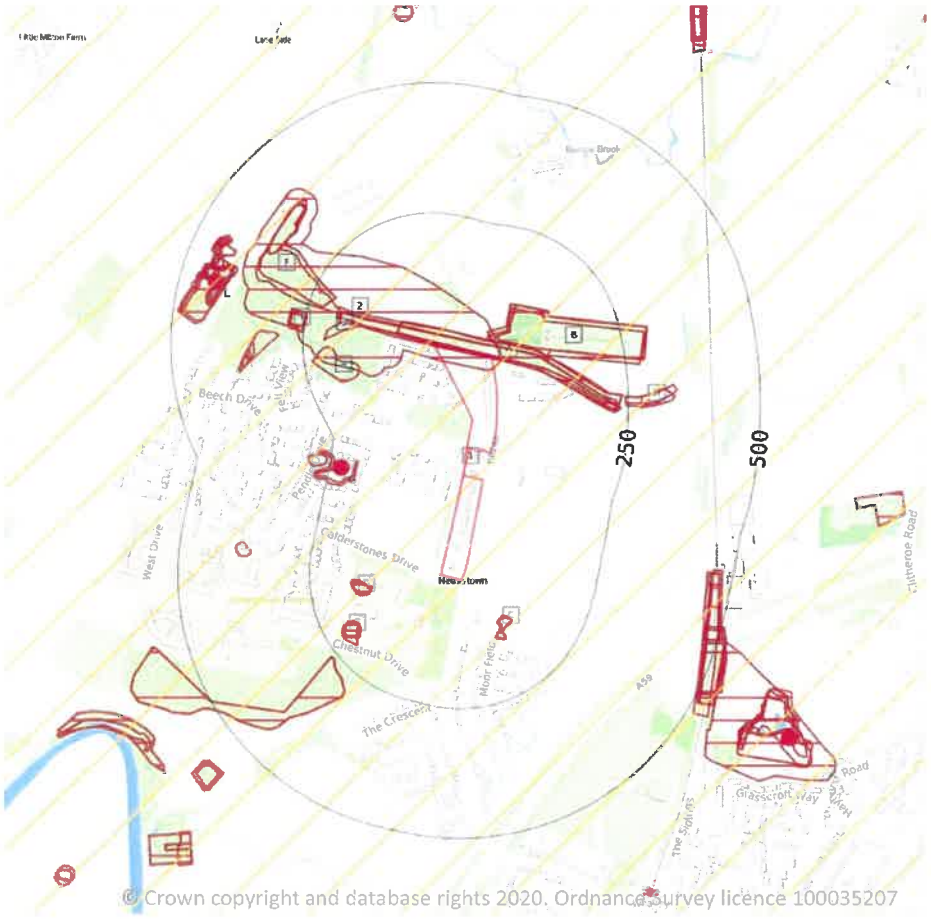
Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 82**

Location	Hazard rating	Details
On site	**Negligible**	**Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.**

Location	Hazard rating	Details
On site	**Very low**	**Soluble rocks are present within the ground. Few dissolution features are likely to be present. Potential for difficult ground conditions or localised subsidence are at a level where they need not be considered.**

This data is sourced from the British Geological Survey.

18 Mining, ground workings and natural cavities



18.1 Natural cavities

Records within 500m	0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Peter Brett Associates (PBA).

18.2 BritPits

Records within 500m 2

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

Features are displayed on the Mining, ground workings and natural cavities map on **page 84**

ID	Location	Details	Description
G	229m W	Name: Whalley Moor Brick Works Address: Whalley, GREAT HARWOOD, Lancashire Commodity: Clay & Shale Status: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Type: Ceased Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
L	430m W	Name: Whalley Moor Tile Works Address: Whalley, GREAT HARWOOD, Lancashire Commodity: Clay & Shale Status: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Type: Ceased Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority

This data is sourced from the British Geological Survey.

18.3 Surface ground workings

Records within 250m 29

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining, ground workings and natural cavities map on **page 84**

ID	Location	Land Use	Year of mapping	Mapping scale
2	**On site**	**Brick Works**	**1910**	**1:10560**
A	**On site**	**Cuttings**	**1932**	**1:10560**
A	**On site**	**Cuttings**	**1910**	**1:10560**
A	**On site**	**Cuttings**	**1973**	**1:10000**
A	**On site**	**Cuttings**	**1969**	**1:10560**
A	**On site**	**Cuttings**	**1950**	**1:10560**
B	19m NE	Cemetery	1932	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
B	25m N	Cemetery	1950	1:10560
B	32m NE	Cemetery	1973	1:10000
B	32m NE	Cemetery	1969	1:10560
C	106m SE	Ponds	1892	1:10560
C	108m SE	Ponds	1910	1:10560
D	134m W	Pond	1846	1:10560
D	136m W	Pond	1892	1:10560
D	139m W	Pond	1910	1:10560
3	144m W	Unspecified Ground Workings	1950	1:10560
4	148m W	Unspecified Heap	1950	1:10560
E	181m SW	Pond	1892	1:10560
E	183m SW	Pond	1910	1:10560
E	186m SW	Pond	1846	1:10560
F	189m W	Refuse Heaps	1910	1:10560
G	199m W	Clay Pit	1910	1:10560
F	206m NW	Unspecified Heaps	1973	1:10000
F	206m NW	Unspecified Heaps	1969	1:10560
H	245m E	Unspecified Pit	1950	1:10560
I	247m W	Reservoir	1932	1:10560
I	250m W	Reservoir	1973	1:10000
I	250m W	Reservoir	1969	1:10560
I	250m W	Reservoir	1950	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground workings

Records within 1000m **0**

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

This is data is sourced from Ordnance Survey/Groundsure.

18.5 Historical Mineral Planning Areas

Records within 500m	0

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

18.6 Non-coal mining

Records within 1000m	1

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

Features are displayed on the Mining, ground workings and natural cavities map on **page 84**

ID	Location	Name	Commodity	Class	Likelihood
1	On site	Not available	Vein Mineral	B	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered

This data is sourced from the British Geological Survey.

18.7 Mining cavities

Records within 1000m	0

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

This data is sourced from Peter Brett Associates (PBA).

18.8 JPB mining areas

Records on site	0

Areas which could be affected by former coal mining. This data includes some mine plans unavailable to the Coal Authority.

This data is sourced from Johnson Poole and Bloomer.

18.9 Coal mining

Records on site	0

Areas which could be affected by past, current or future coal mining.

This data is sourced from the Coal Authority.

18.10 Brine areas

Records on site	0

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

18.11 Gypsum areas

Records on site	0

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.12 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Mining Searches UK.

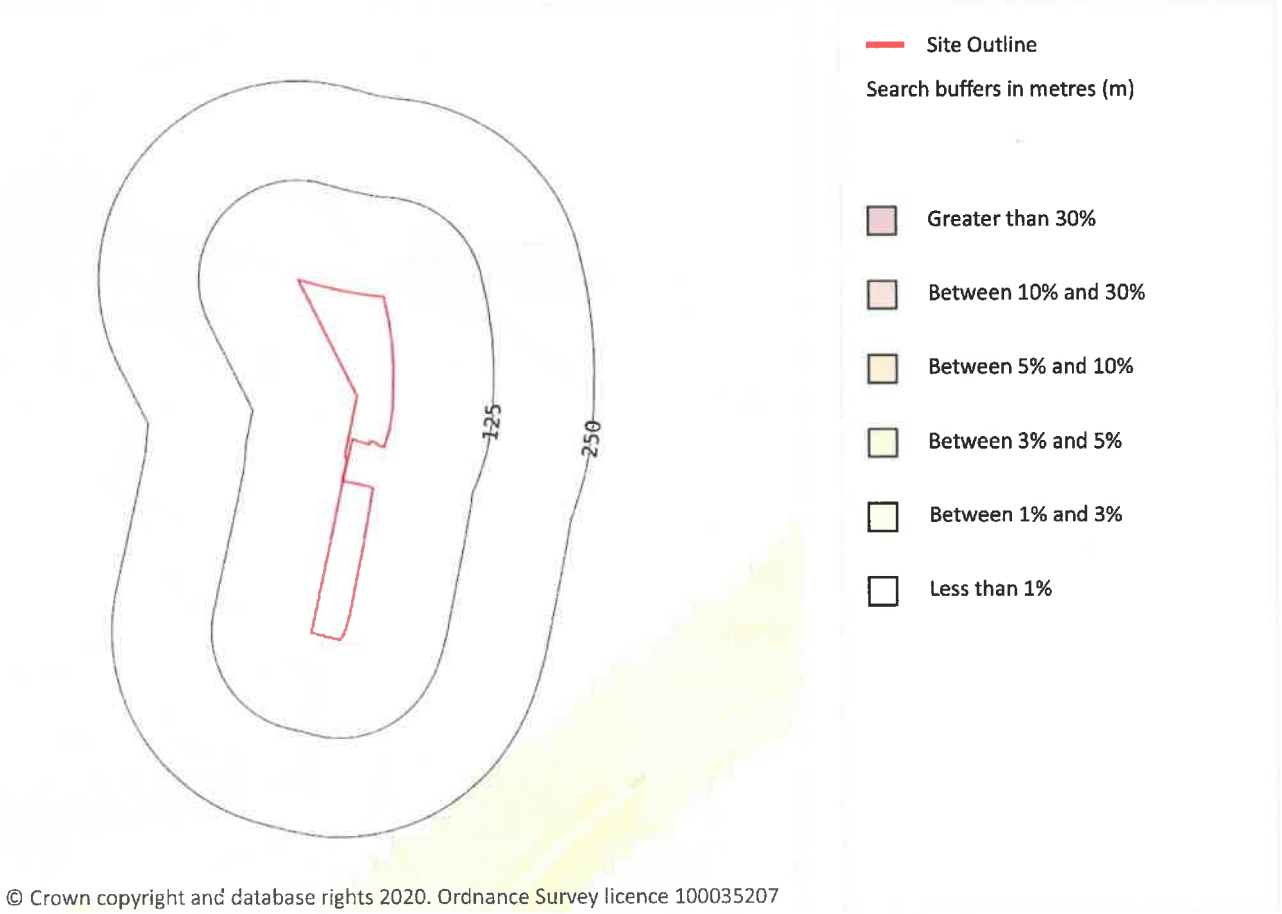
18.13 Clay mining

Records on site	0

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

19 Radon



19.1 Radon

Records on site	1

Estimated percentage of dwellings exceeding the Radon Action Level. This data is the highest resolution radon dataset available for the UK and is produced to a 75m level of accuracy to allow for geological data accuracy and a 'residential property' buffer. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain. The data was derived from both geological assessments and long term measurements of radon in more than 479,000 households.

Features are displayed on the Radon map on **page 89**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None****

This data is sourced from the British Geological Survey and Public Health England.

20 Soil chemistry

20.1 BGS Estimated Background Soil Chemistry

Records within 50m **2**

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km^2. In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km^2; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	**15 - 25 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 - 30 mg/kg**
On site	**15 - 25 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 - 30 mg/kg**

This data is sourced from the British Geological Survey.

20.2 BGS Estimated Urban Soil Chemistry

Records within 50m **0**

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km^2).

This data is sourced from the British Geological Survey.

20.3 BGS Measured Urban Soil Chemistry

Records within 50m **0**

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km^2.

This data is sourced from the British Geological Survey.

21 Railway infrastructure and projects

21.1 Underground railways (London)

Records within 250m	0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

21.2 Underground railways (Non-London)

Records within 250m	0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

21.3 Railway tunnels

Records within 250m	0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

21.4 Historical railway and tunnel features

Records within 250m	4

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

Features are displayed on the Railway infrastructure and projects map on **page 91**

Location	Land Use	Year of mapping	Mapping scale
On site	**Railway Sidings**	**1932**	**10560**
On site	**Railway Sidings**	**1910**	**10560**
On site	**Railway Sidings**	**1950**	**10560**
118m W	Tramway Sidings	1910	10560

This data is sourced from Ordnance Survey/Groundsure.

21.5 Royal Mail tunnels

Records within 250m	0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

21.6 Historical railways

Records within 250m	0

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

This data is sourced from OpenStreetMap.

21.7 Railways

Records within 250m	0

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

This data is sourced from Ordnance Survey and OpenStreetMap.

21.8 Crossrail 1

Records within 500m	0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

21.9 Crossrail 2

Records within 500m	0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

21.10 HS2

Records within 500m	0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

This data is sourced from HS2 ltd.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference.

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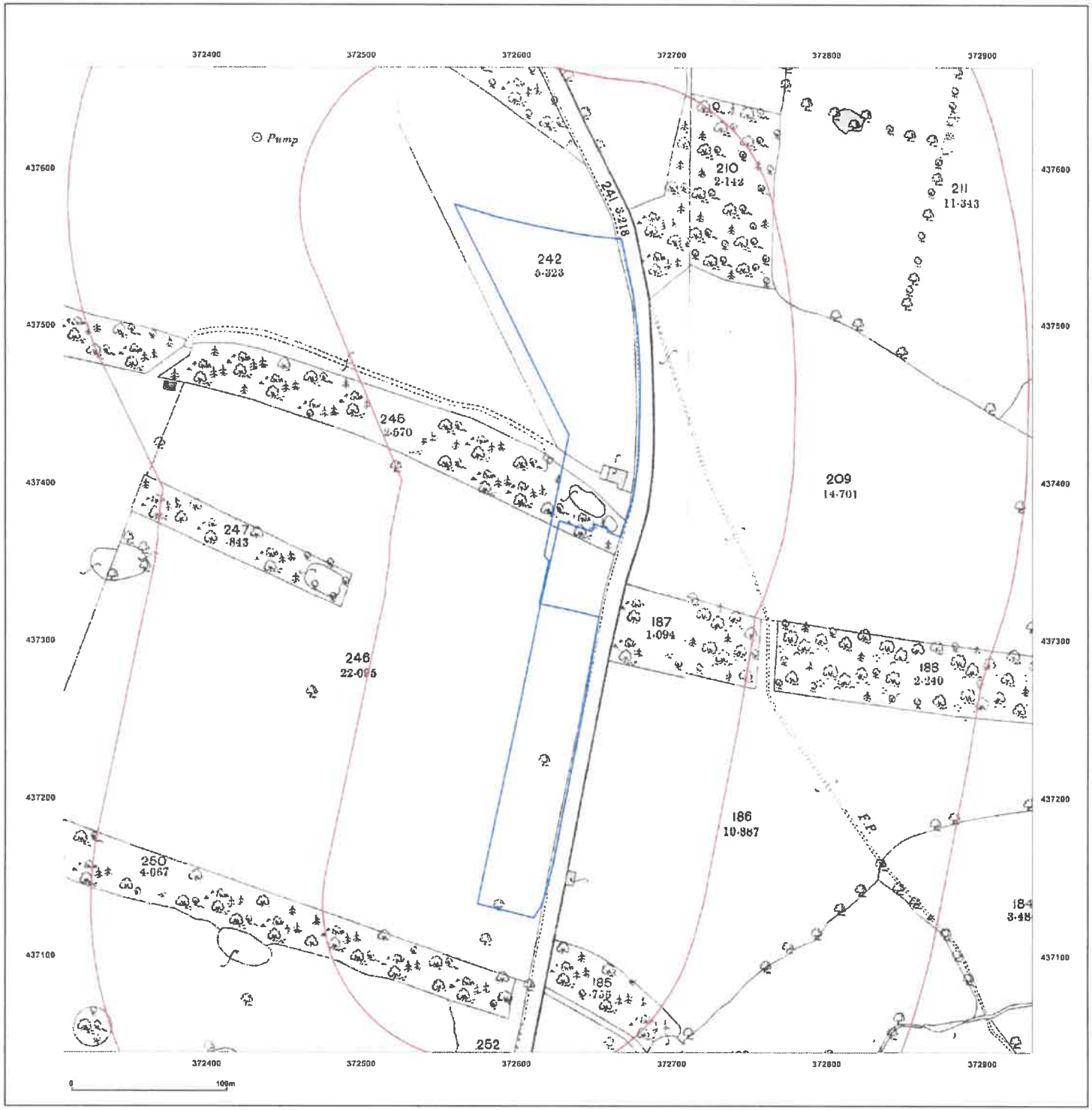
Appendix 3

Groundsure Historical Maps



Groundsure INSIGHTS

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Report Ref: GS-6960964
Grid Ref: 372619, 437351

Map Name: County Series
Map date: 1892
Scale: 1:2,500
Printed at: 1:2,500

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Surveyed 1892
Revised 1892
Edition N/A
Copyright N/A
Levelled N/A

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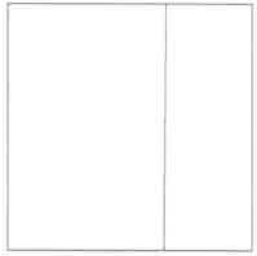
Revised 1892
Edition N/A
Copyright N/A
Levelled N/A



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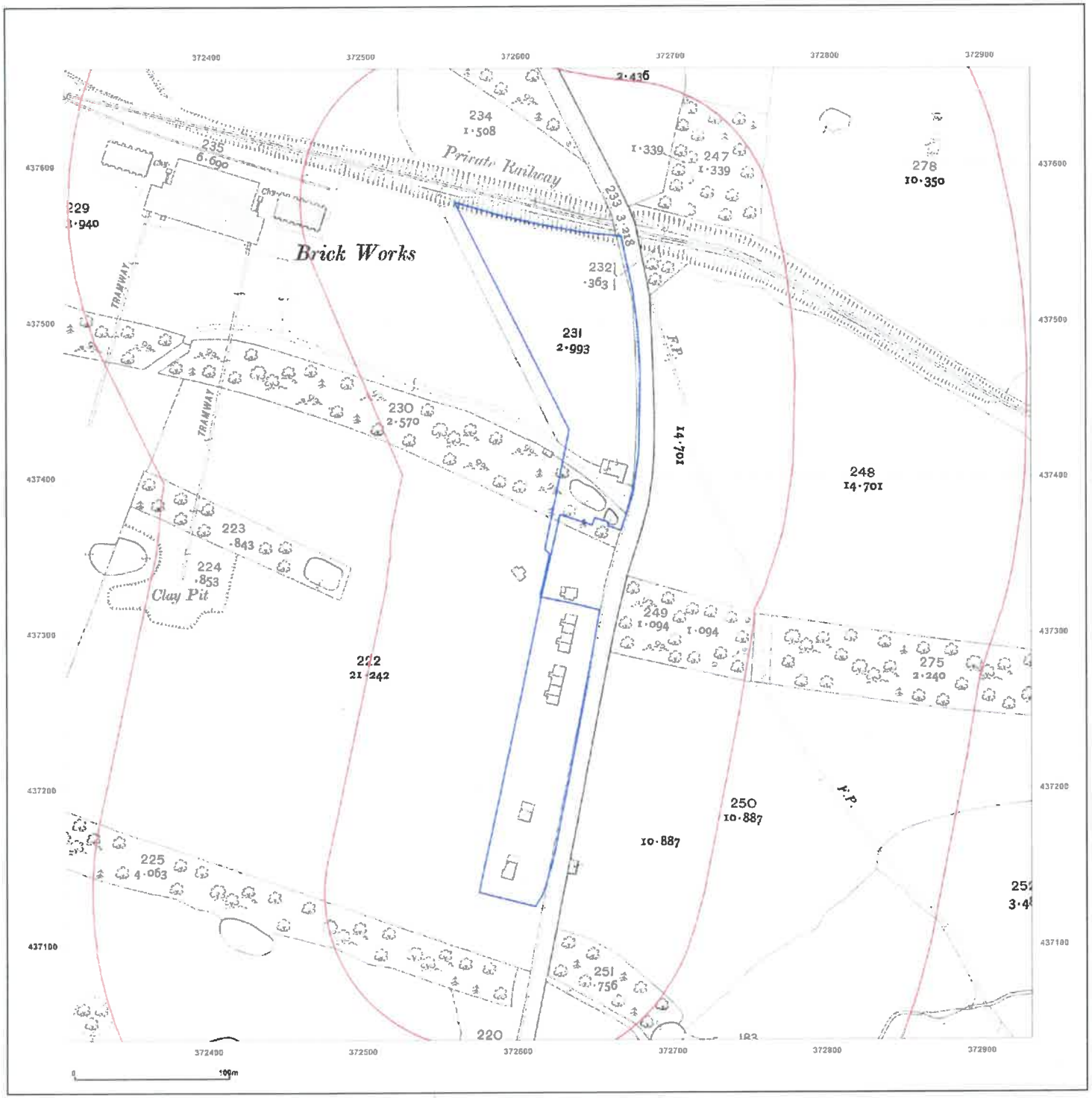

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Report Ref: GS-6960964
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Map Name: County Series
Map date: 1912
Scale: 1:2,500
Printed at: 1:2,500

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Surveyed 1912
Revised 1912
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1912
Revised 1912
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Copyright N/A
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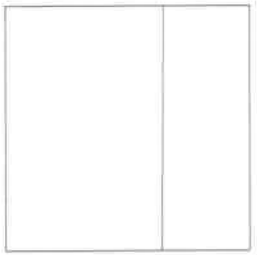

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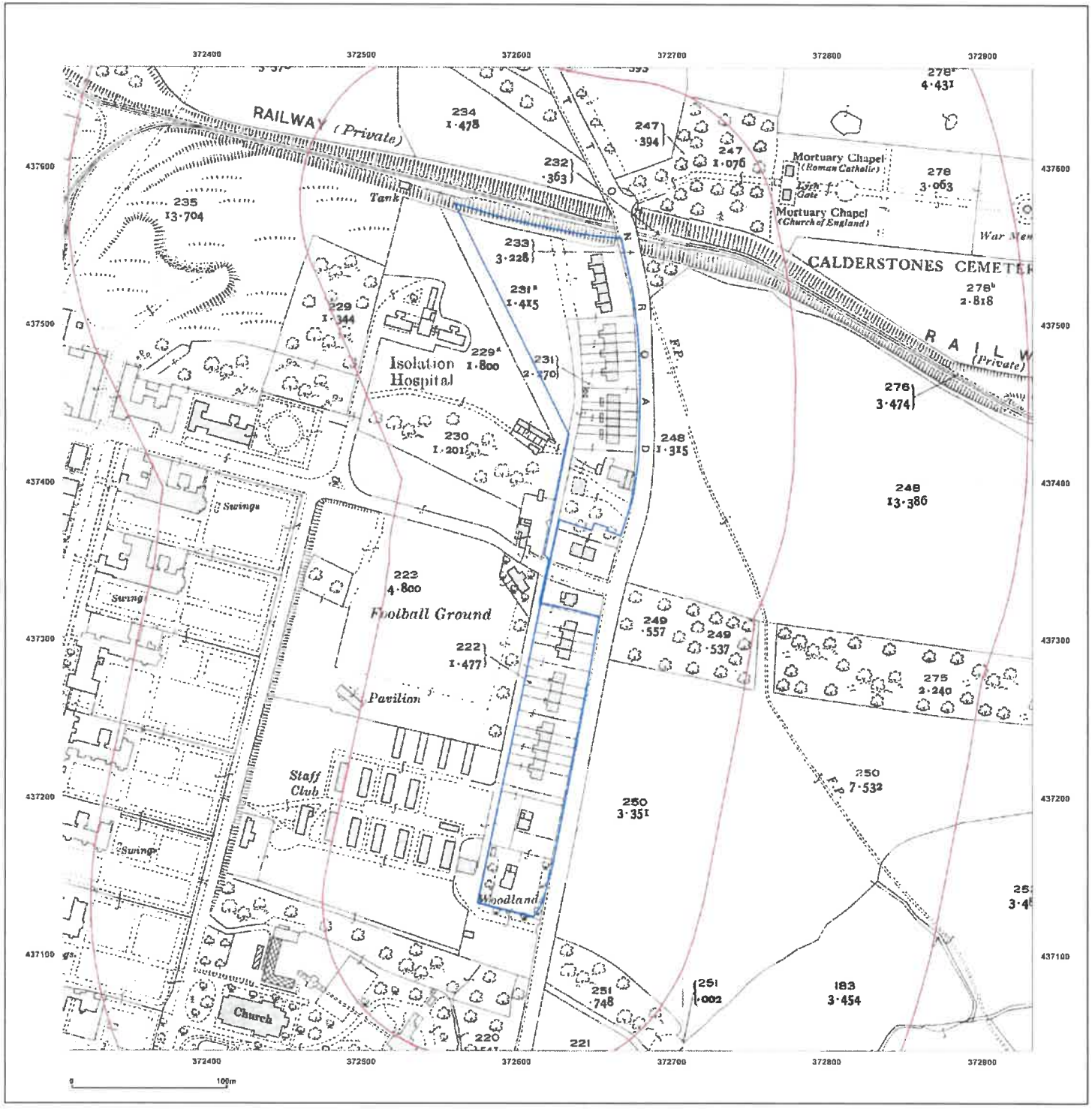

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Scale: 1:2,500
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Surveyed 1932
Revised 1932
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1932
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Edition N/A
Copyright N/A
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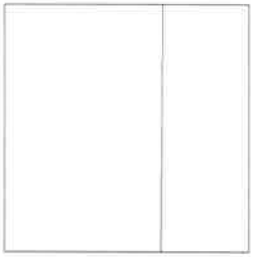

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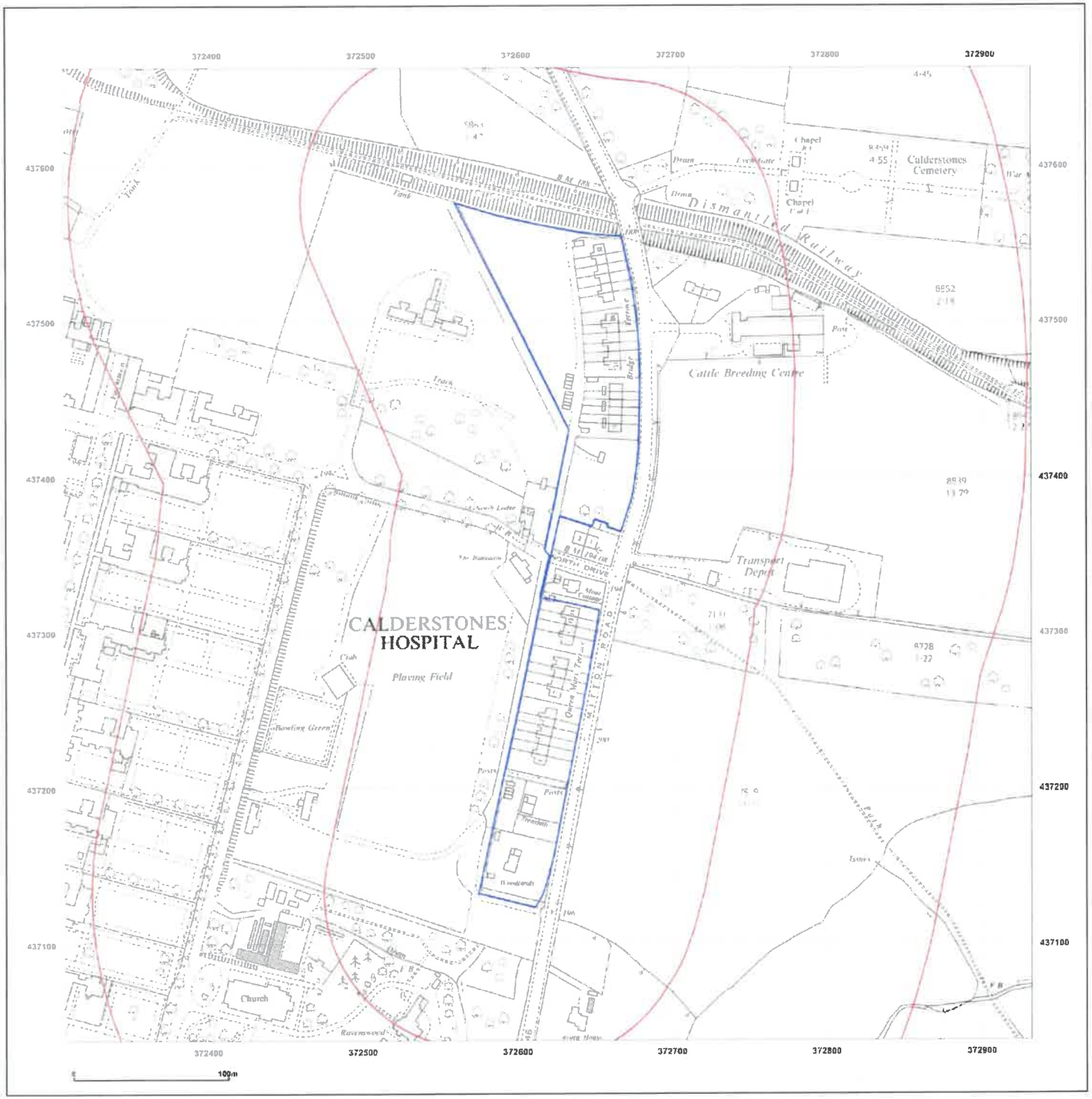

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Map Name: National Grid
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Scale: 1:2,500
Printed at: 1:2,500

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Edition N/A
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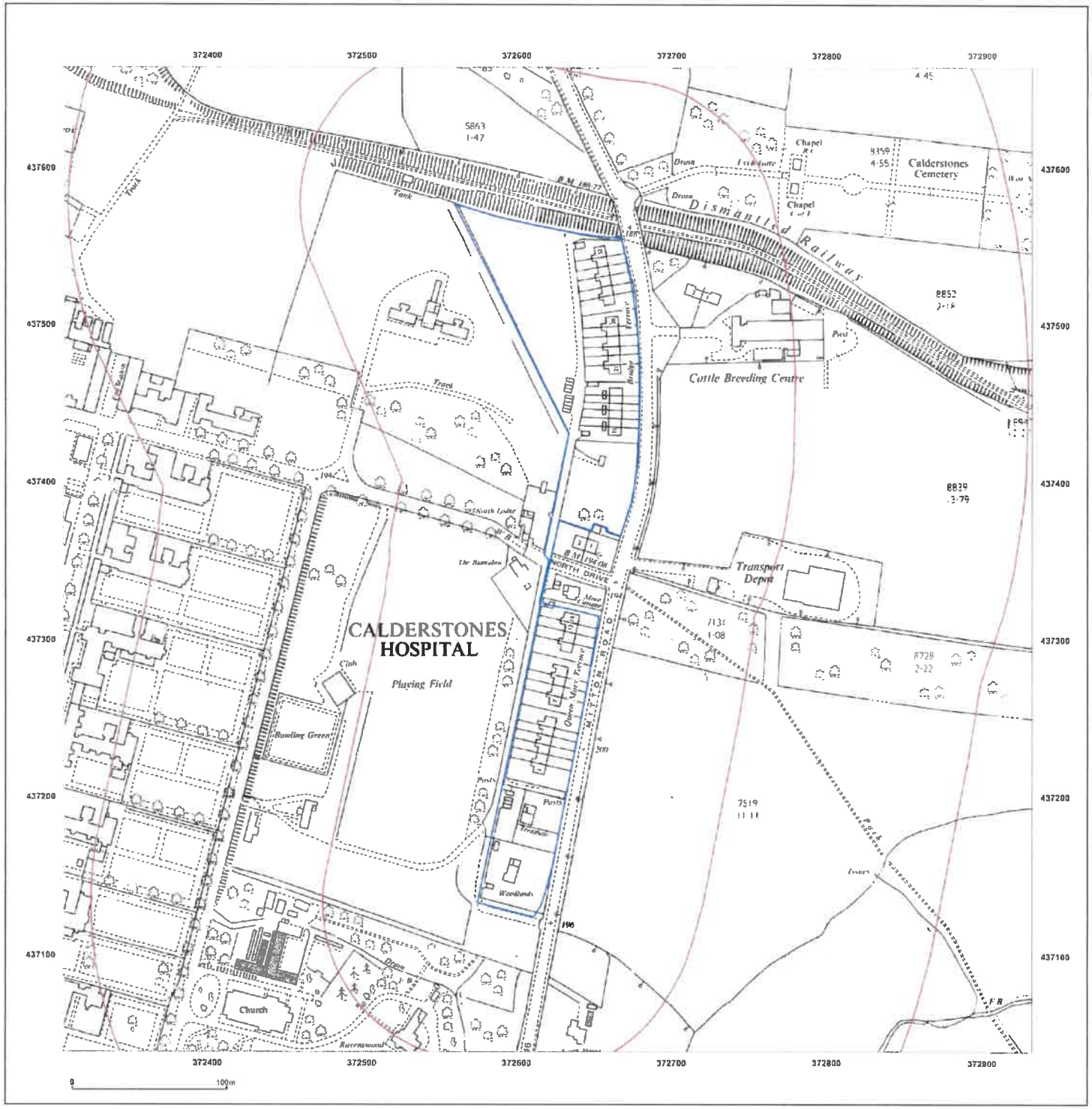

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Edition N/A
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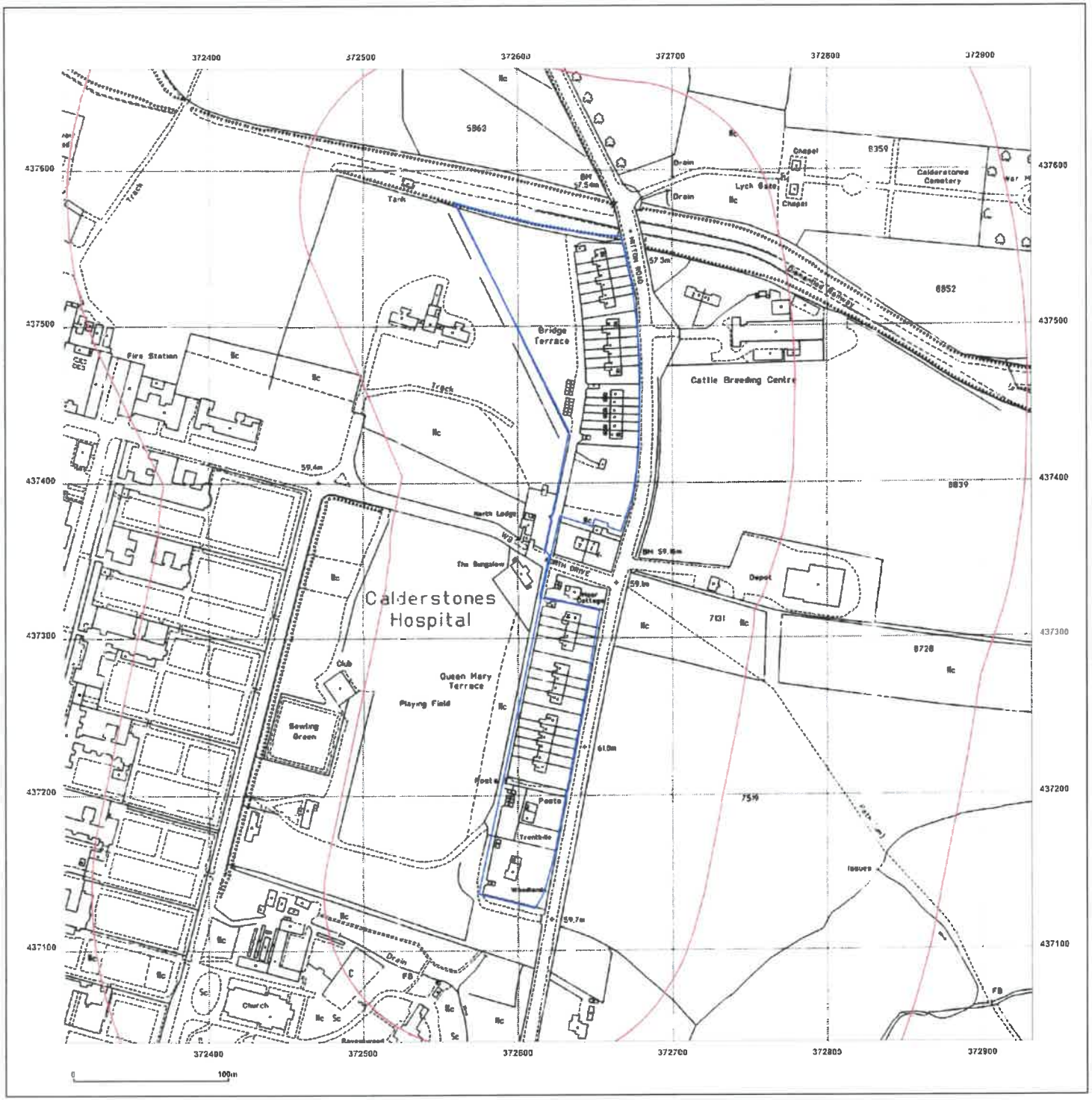

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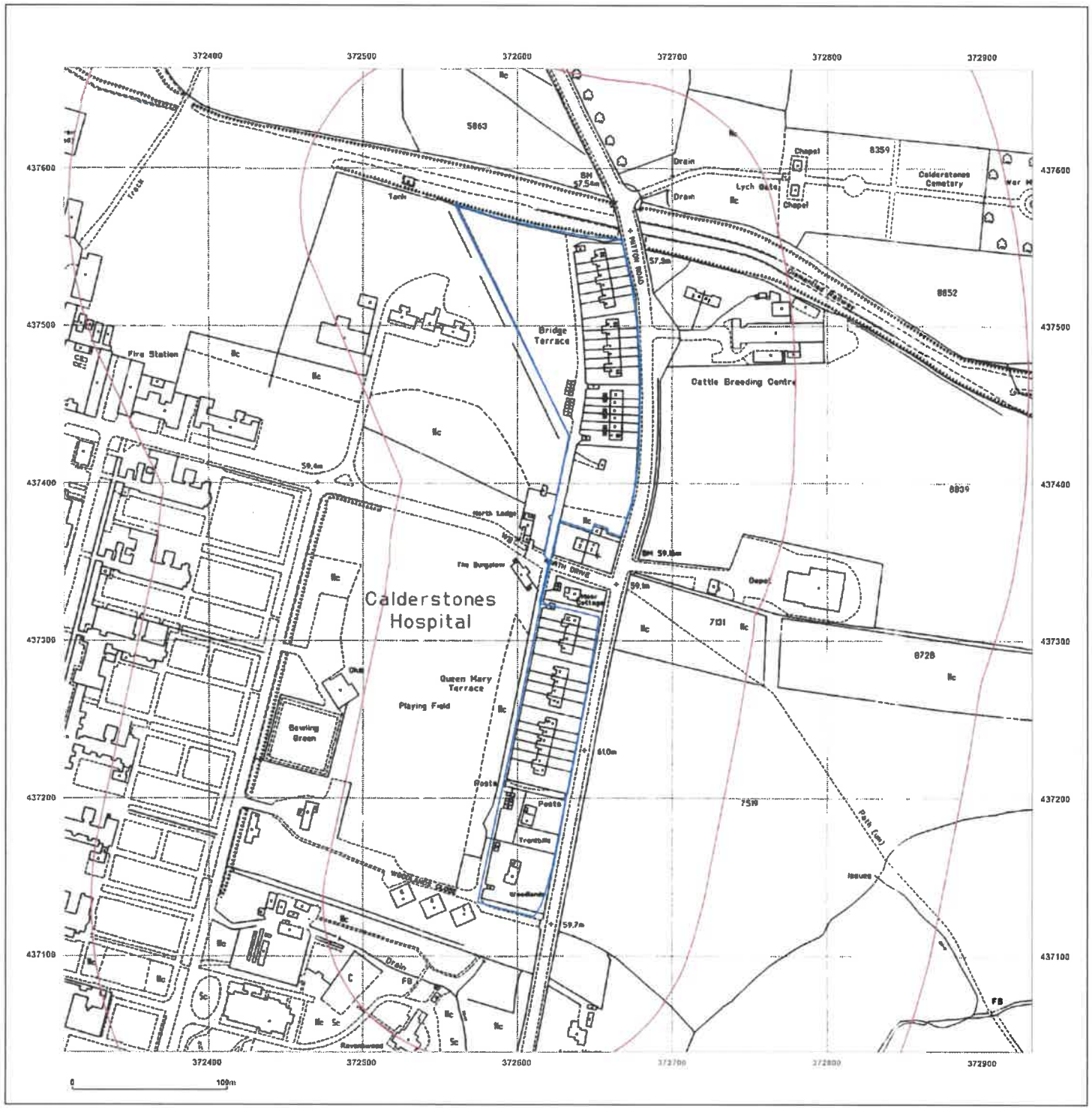

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Printed at:	1:2,500

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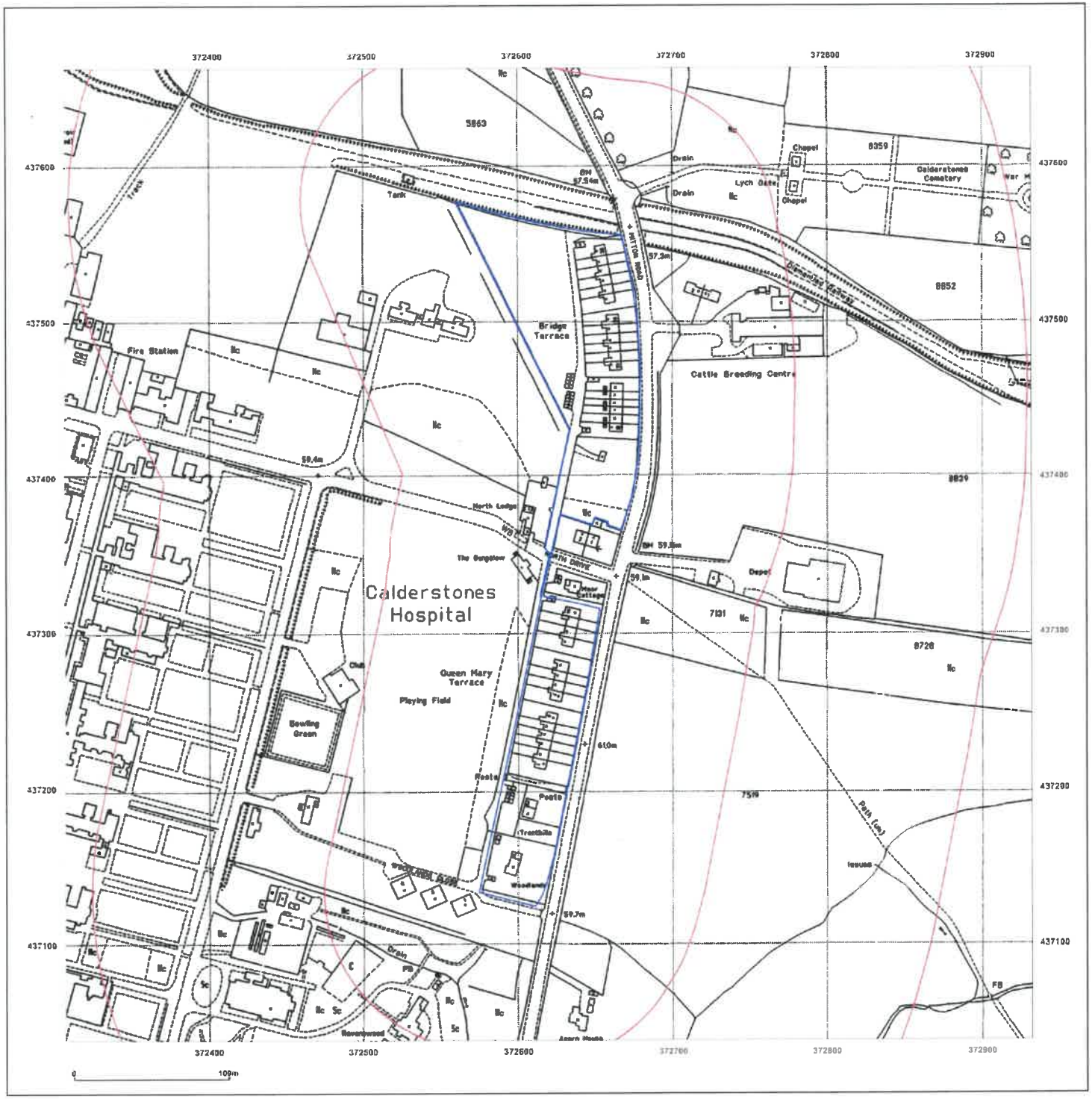

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Printed at: 1:2,500

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Revised N/A
Edition N/A
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Report Ref: GS-6960964
Grid Ref: 372619, 437351

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Printed at: 1:1,250

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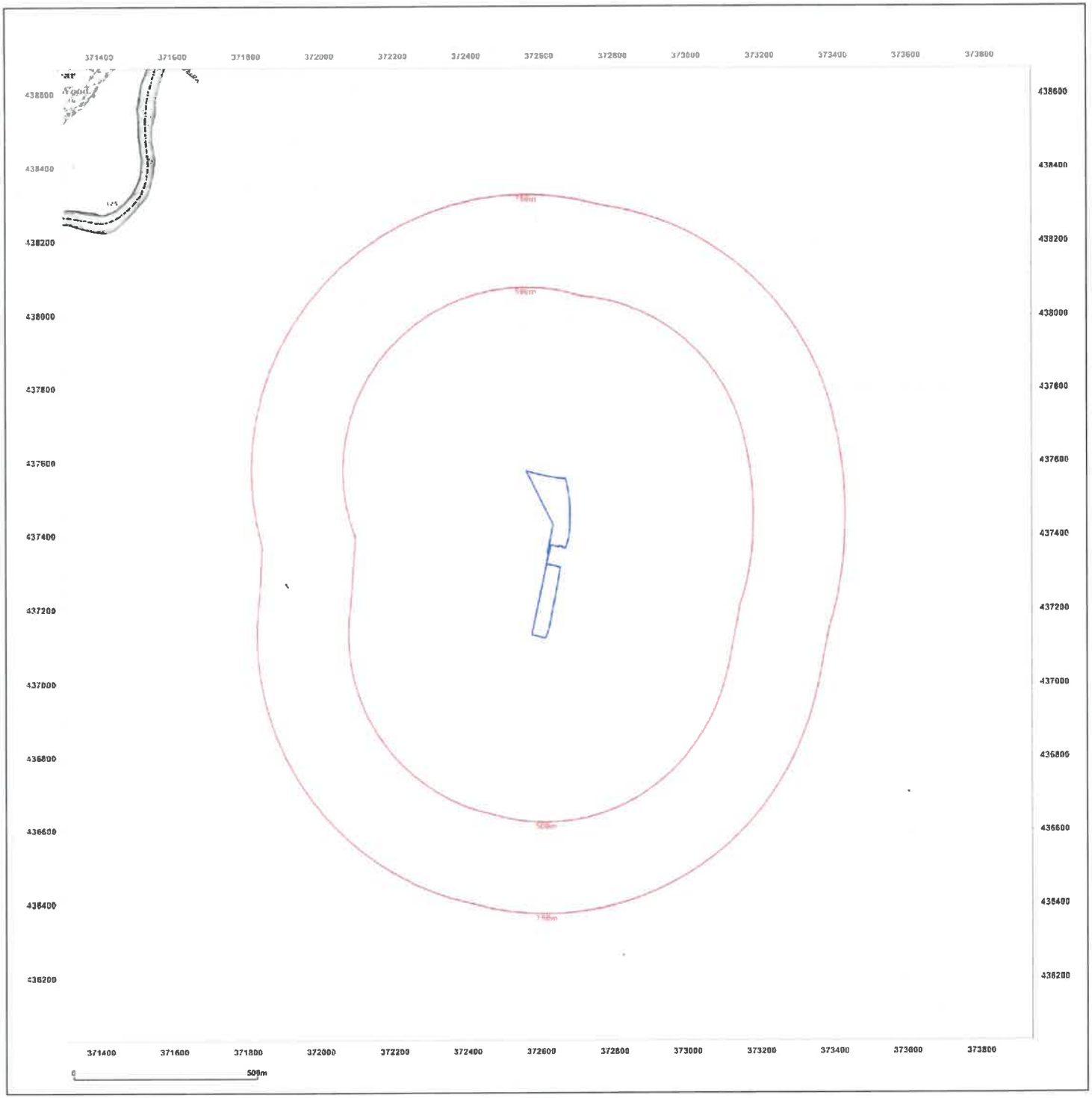

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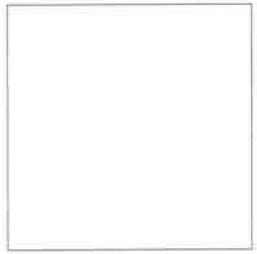

Surveyed 1847
Revised N/A
Edition 1848
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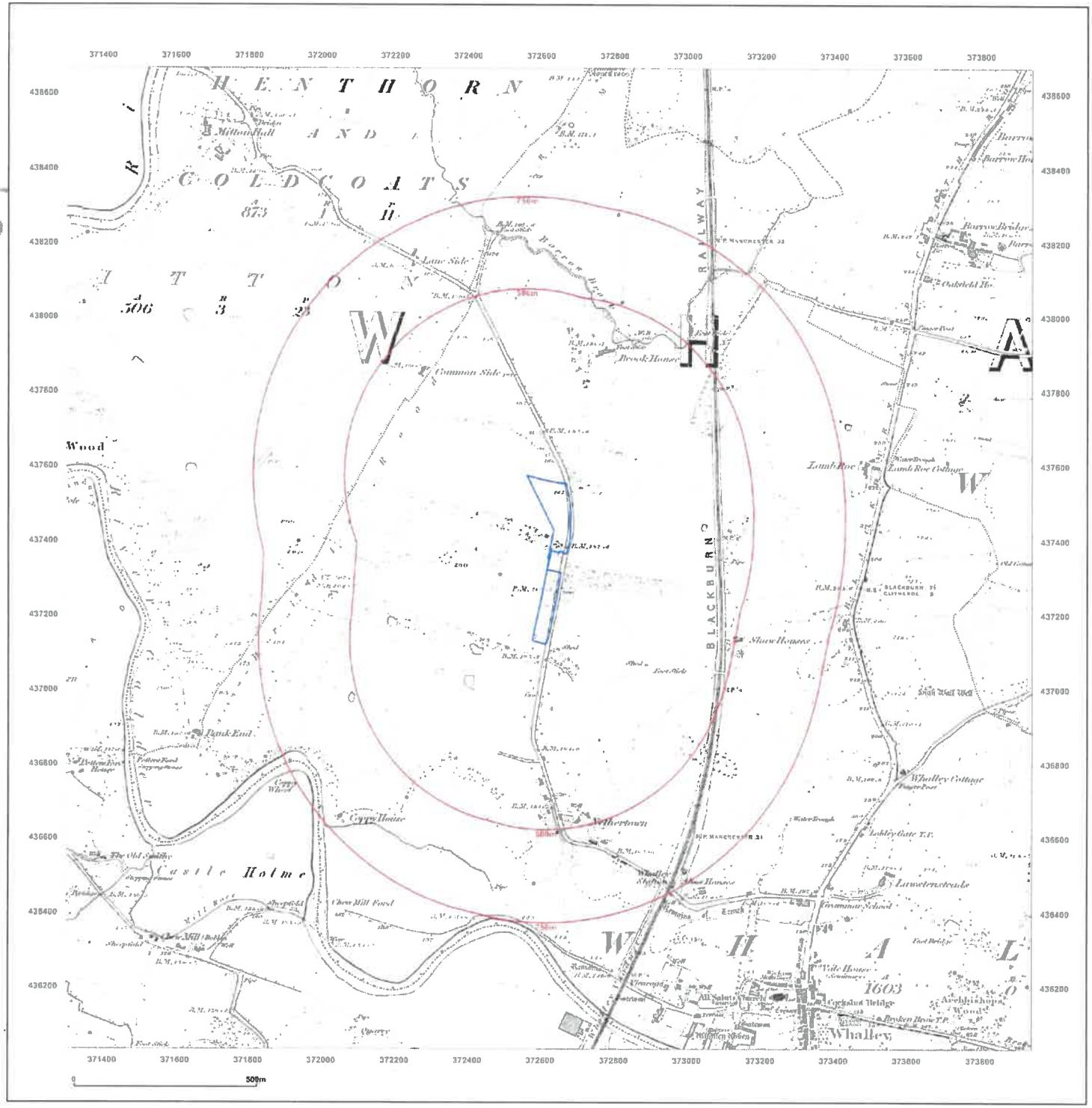

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Map Name: County Series
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Scale: 1:10,560
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Revised N/A
Edition 1848
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Levelled N/A

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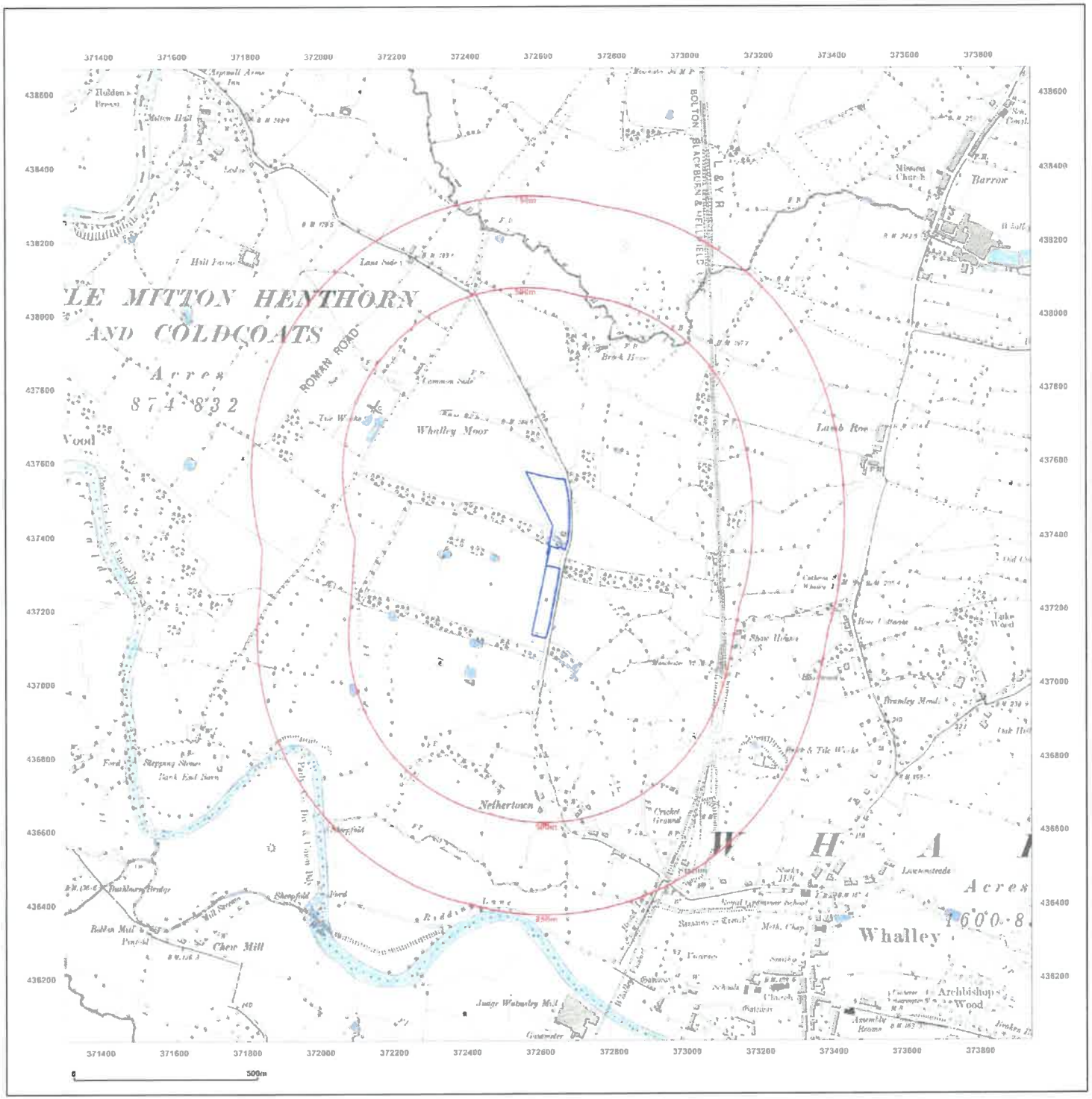

Groundsure INSIGHTS

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Map date: 1892
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Surveyed 1892
Revised 1892
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1892
Revised 1892
Edition N/A
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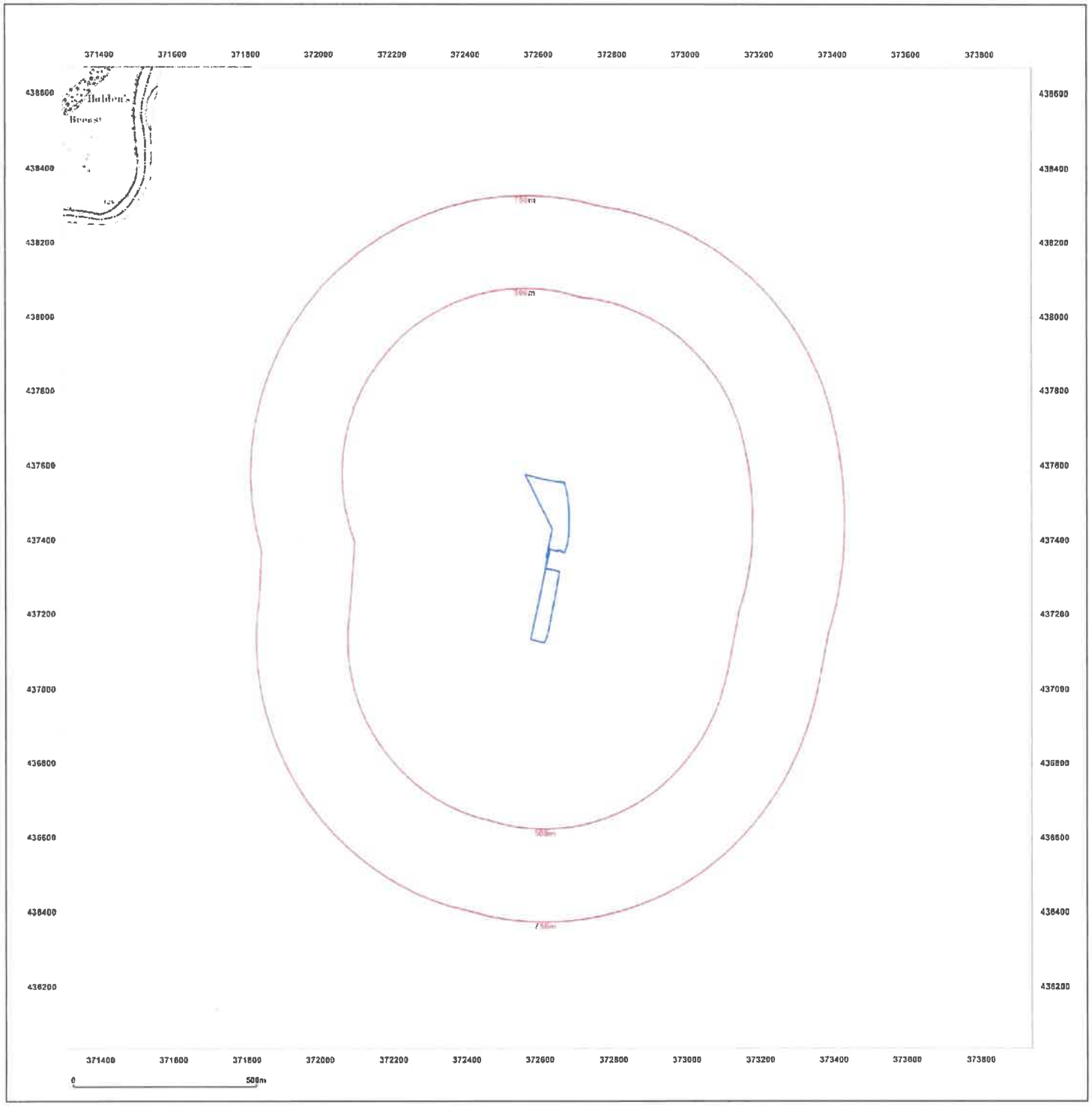

Groundsure INSIGHTS

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Map Name: County Series
Map date: 1896
Scale: 1:10,560
Printed at: 1:10,560

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Revised 1892
Edition 1896
Copyright N/A
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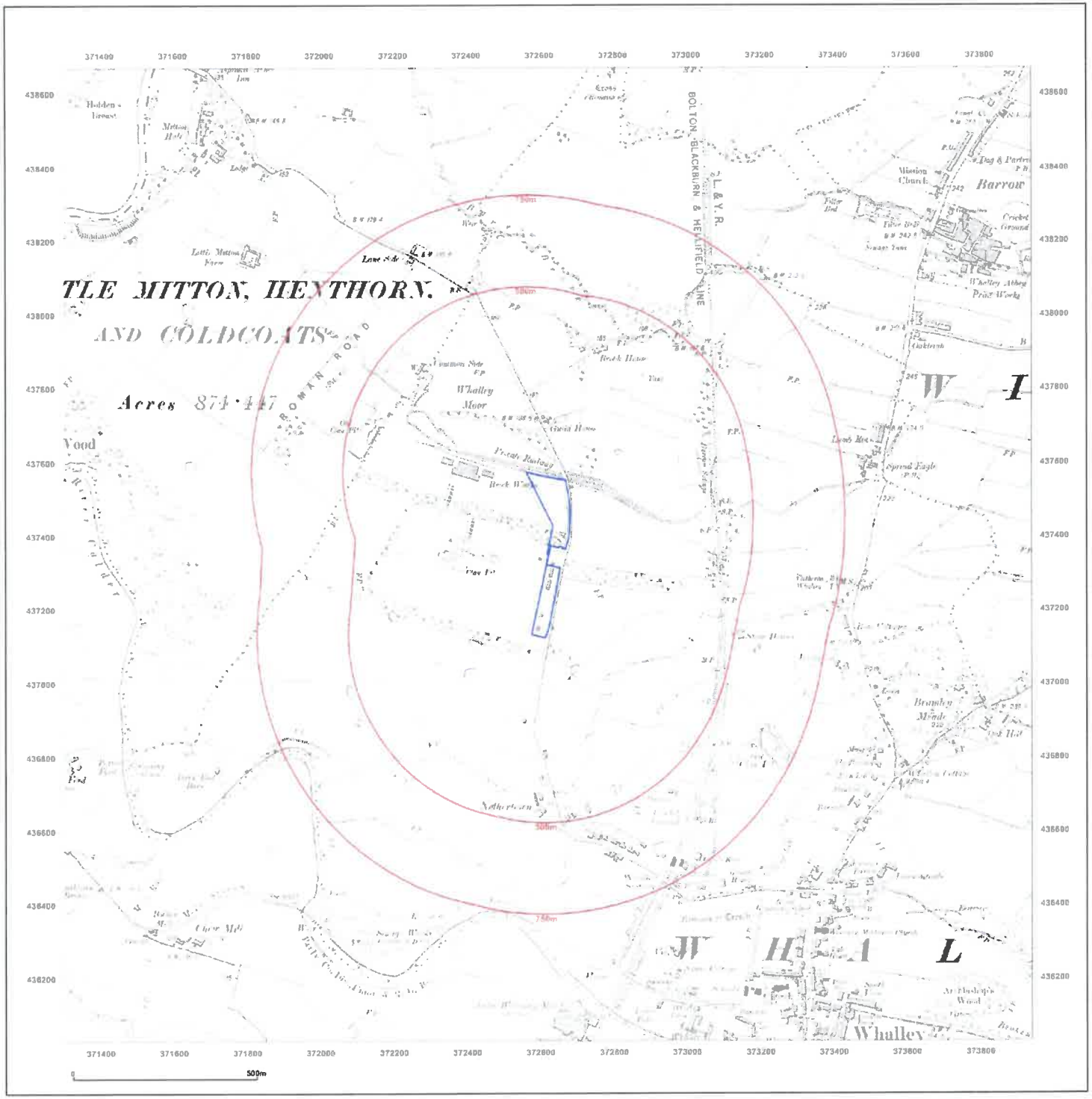

Groundsure INSIGHTS

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Map Name: County Series
Map date: 1910
Scale: 1:10,560
Printed at: 1:10,560

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Revised 1910
Edition N/A
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Levelled N/A

Surveyed 1844
Revised 1910
Edition N/A
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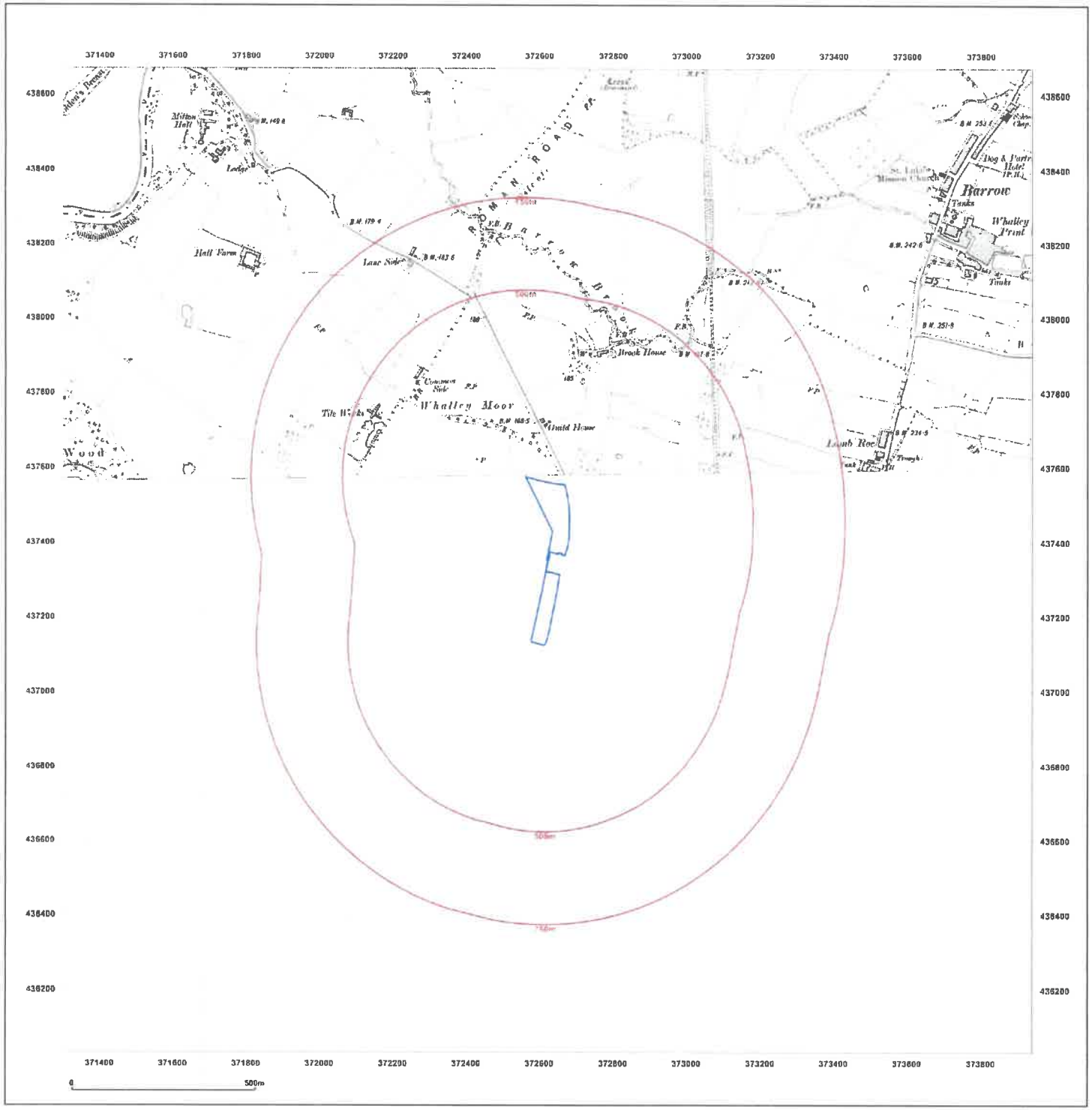

Groundsure INSIGHTS

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Map Name: County Series
Map date: 1911
Scale: 1:10,560
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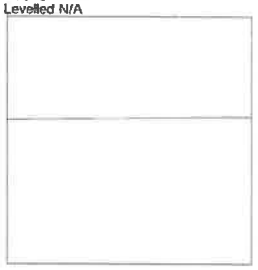
Surveyed 1847
Revised 1911
Edition N/A
Copyright N/A
Levelled N/A



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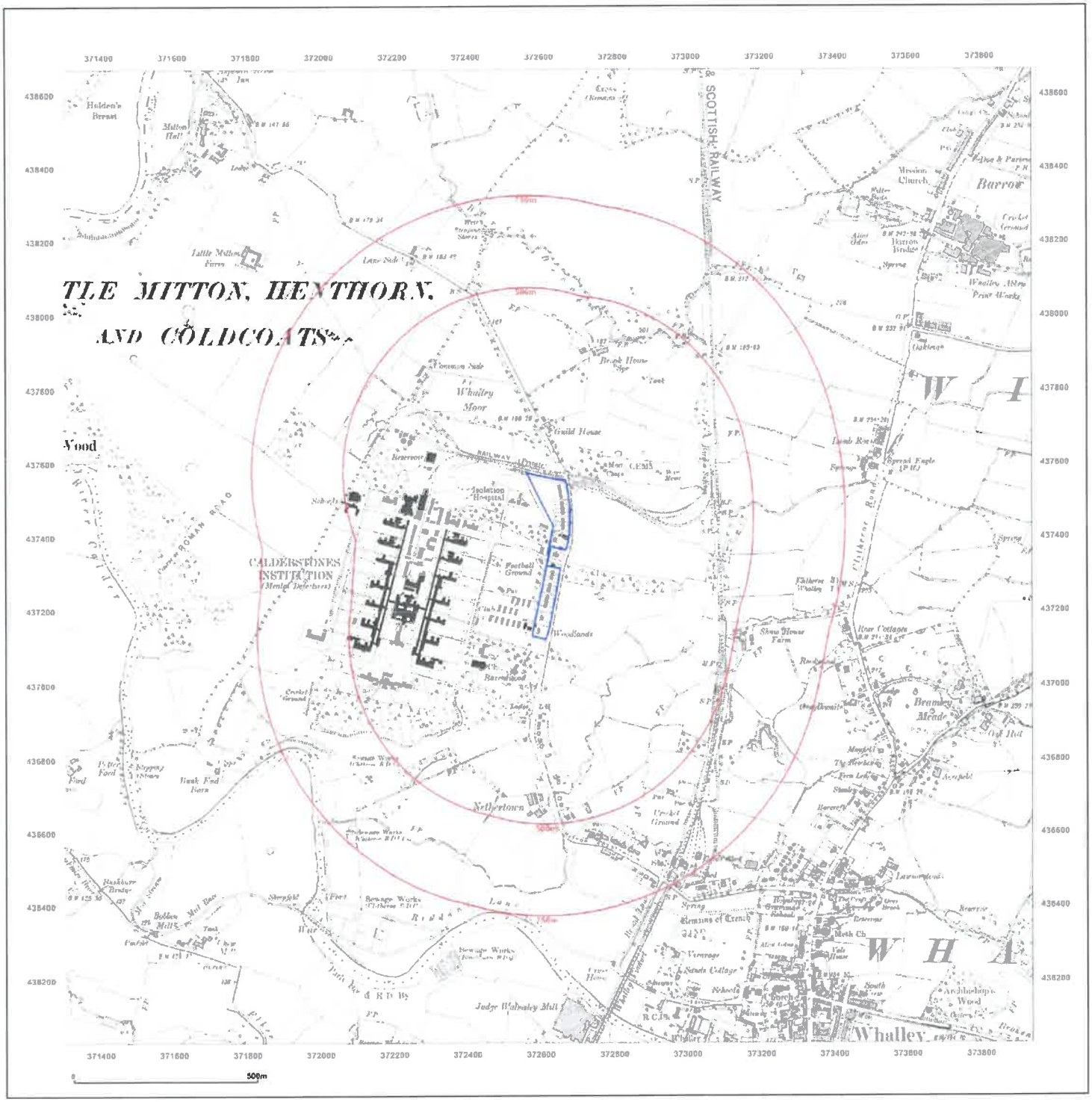

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Site Details:

MITTON ROAD, WHALLEY, BB7 9JT

Client Ref: 7583_-_PO_8759BH
Report Ref: GS-6960964
Grid Ref: 372619, 437351

Map Name: County Series
Map date: 1932-1933
Scale: 1:10,560
Printed at: 1:10,560

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Surveyed 1844
Revised 1932
Edition N/A
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Surveyed 1844
Revised 1933
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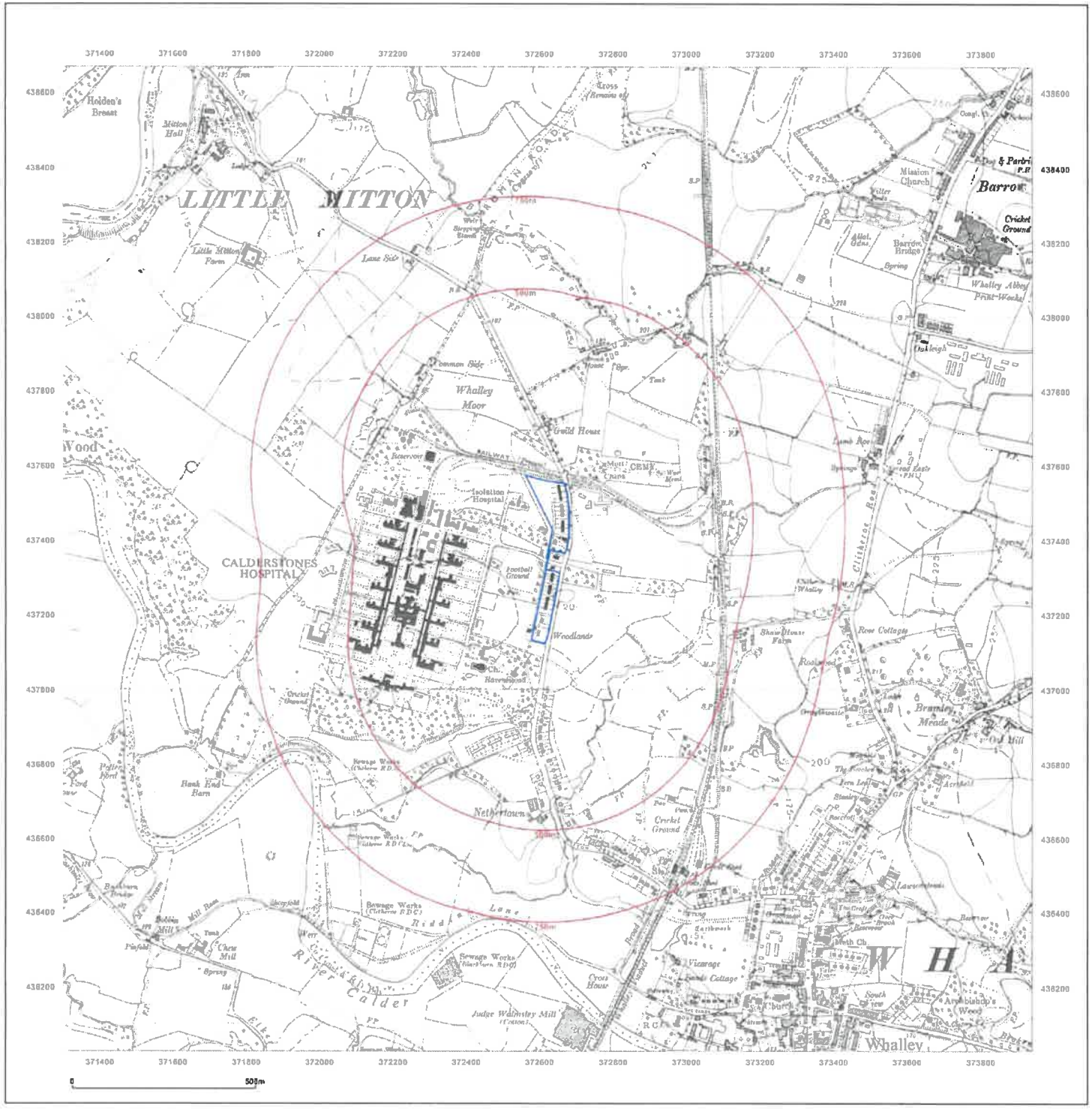

Groundsure INSIGHTS

Site Details:

MITTON ROAD, WHALLEY, BB7 9JT

Client Ref: 7583_-_PO_8759BH
Report Ref: GS-6960964
Grid Ref: 372619, 437351

Map Name: Provisional
Map date: 1950
Scale: 1:10,560
Printed at: 1:10,560

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Revised 1950
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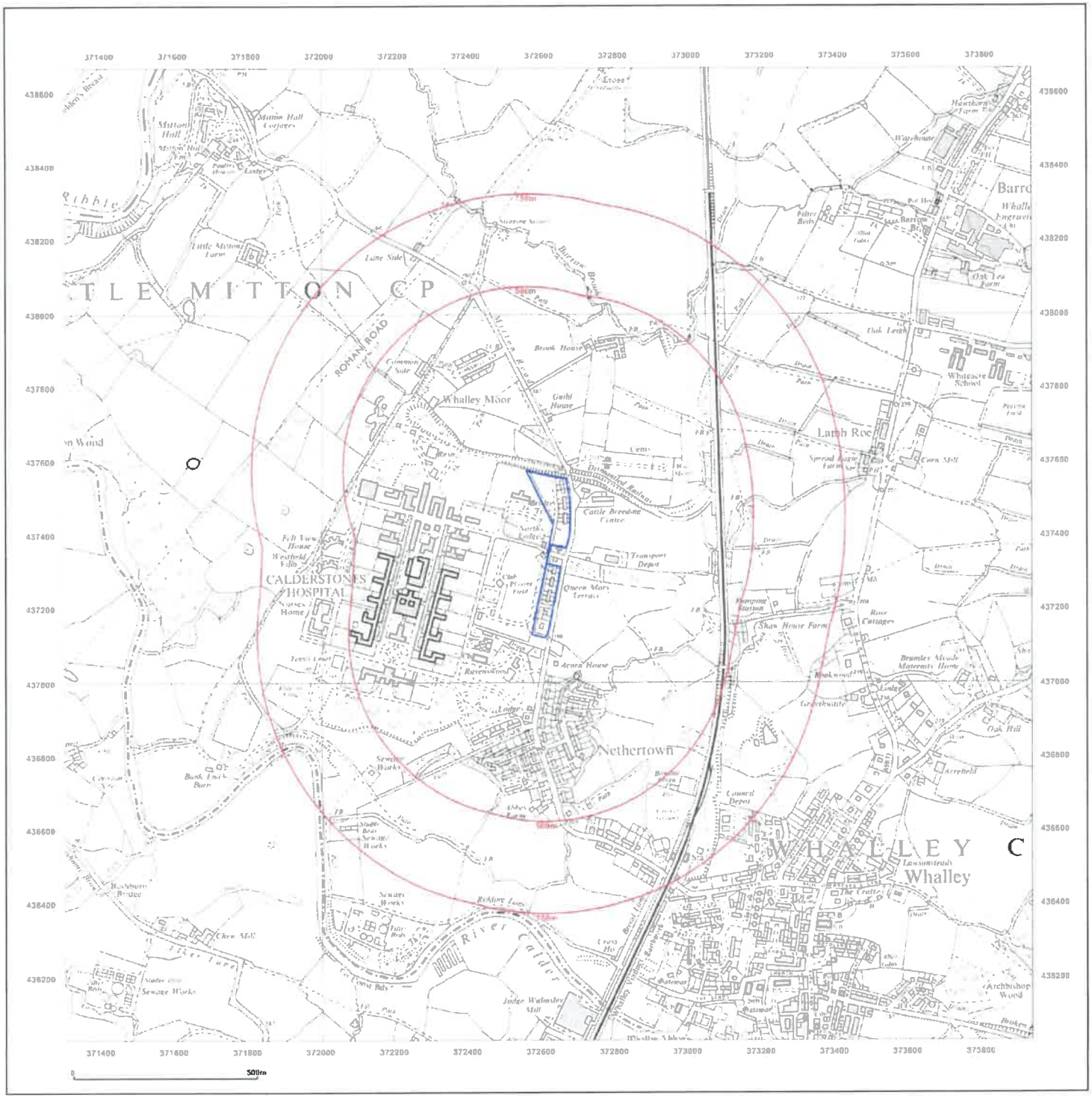

Groundsure INSIGHTS

Site Details:

MITTON ROAD, WHALLEY, BB7 9JT

Client Ref: 7583_-_PO_8759BH
Report Ref: GS-6960964
Grid Ref: 372619, 437351

Map Name: Provisional
Map date: 1969
Scale: 1:10,560
Printed at: 1:10,560

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Revised 1969
Edition N/A
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Map legend available at:
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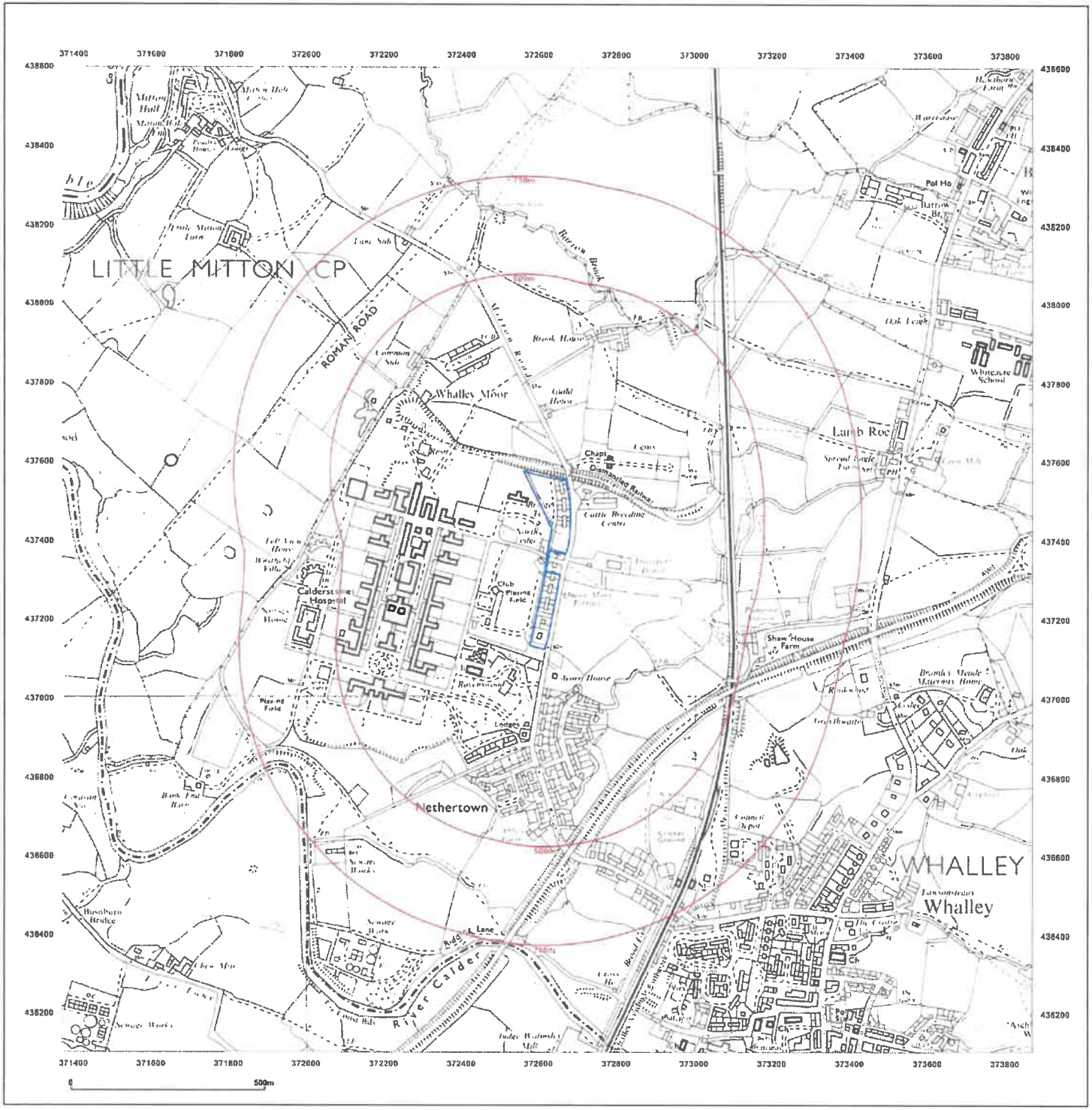

Groundsure INSIGHTS

Site Details:

MITTON ROAD, WHALLEY, BB7 9JT

Client Ref: 7583_-_PO_8759BH
Report Ref: GS-6960964
Grid Ref: 372619, 437351

Map Name: National Grid
Map date: 1973
Scale: 1:10,000
Printed at: 1:10,000

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Surveyed 1972
Revised 1973
Edition N/A
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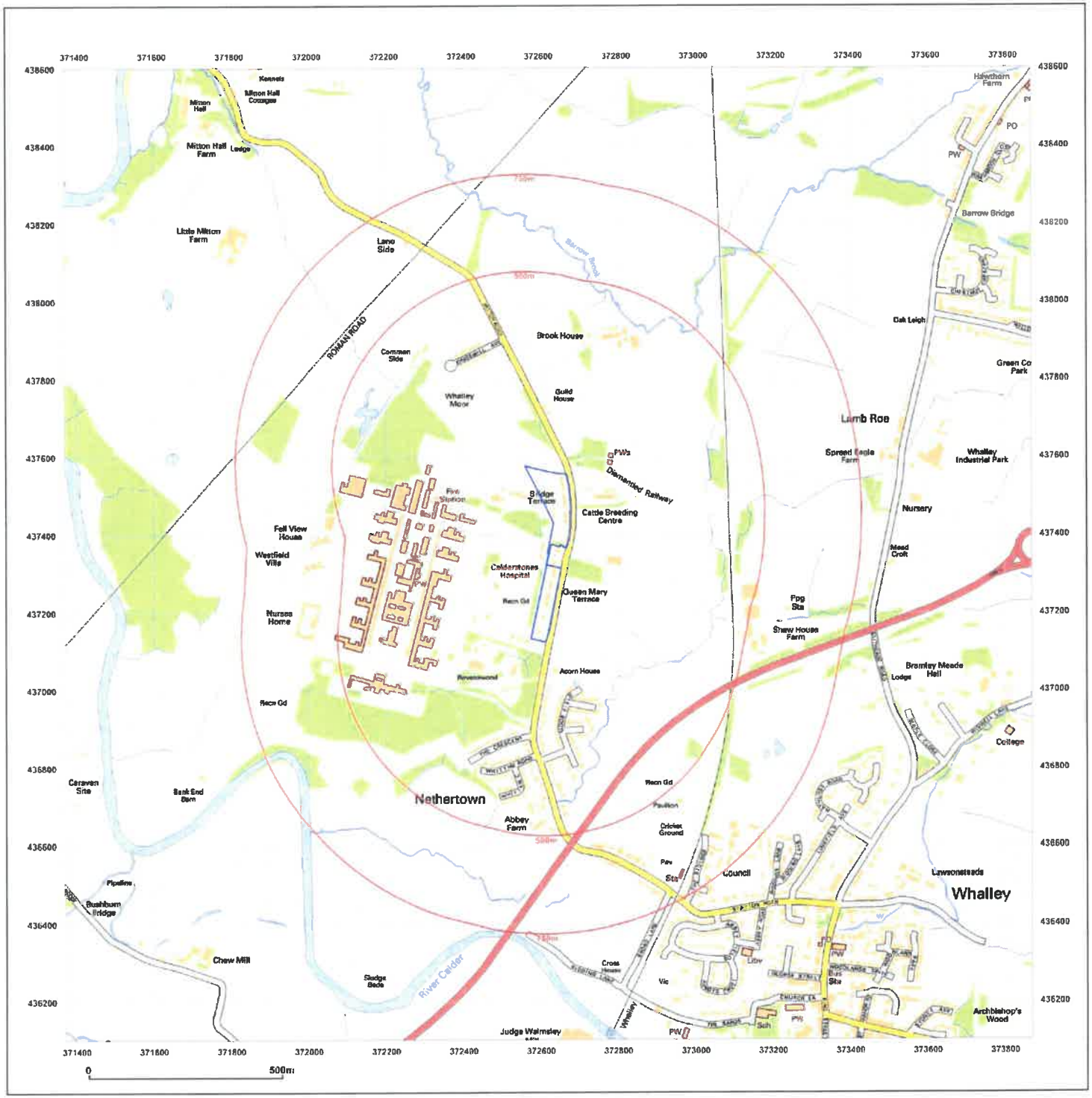

Groundsure INSIGHTS

Site Details:

MITTON ROAD, WHALLEY, BB7 9JT

Client Ref: 7583_-_PO_8759BH
Report Ref: GS-6960964
Grid Ref: 372619, 437351

Map Name: National Grid
Map date: 2001
Scale: 1:10,000
Printed at: 1:10,000

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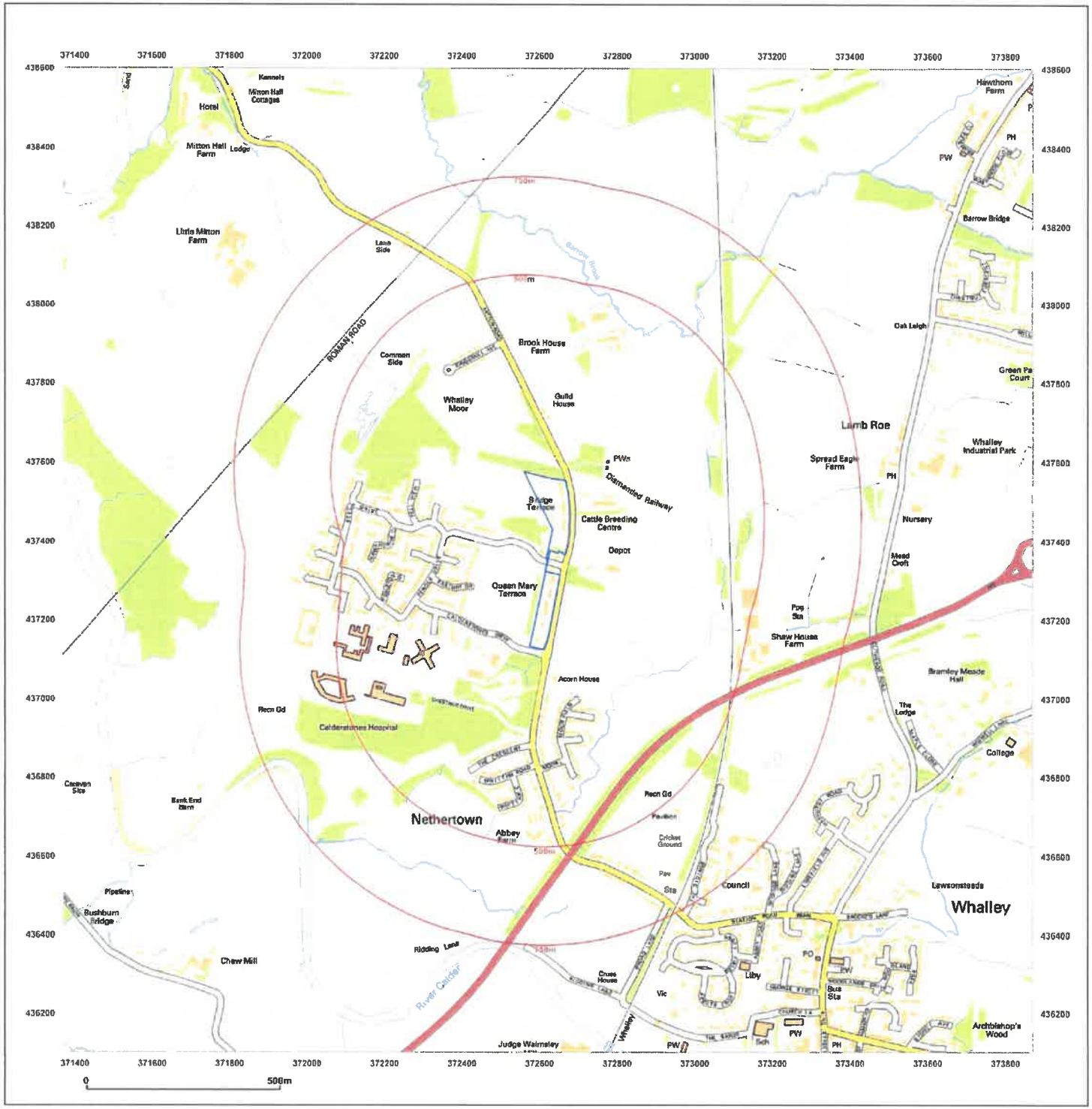

Groundsure INSIGHTS

Site Details:

MITTON ROAD, WHALLEY, BB7 9JT

Client Ref: 7583_-_PO_8759BH
Report Ref: GS-6960964
Grid Ref: 372619, 437351

Map Name: National Grid
Map date: 2010
Scale: 1:10,000
Printed at: 1:10,000

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Production date: 12 August 2020

Map legend available at:
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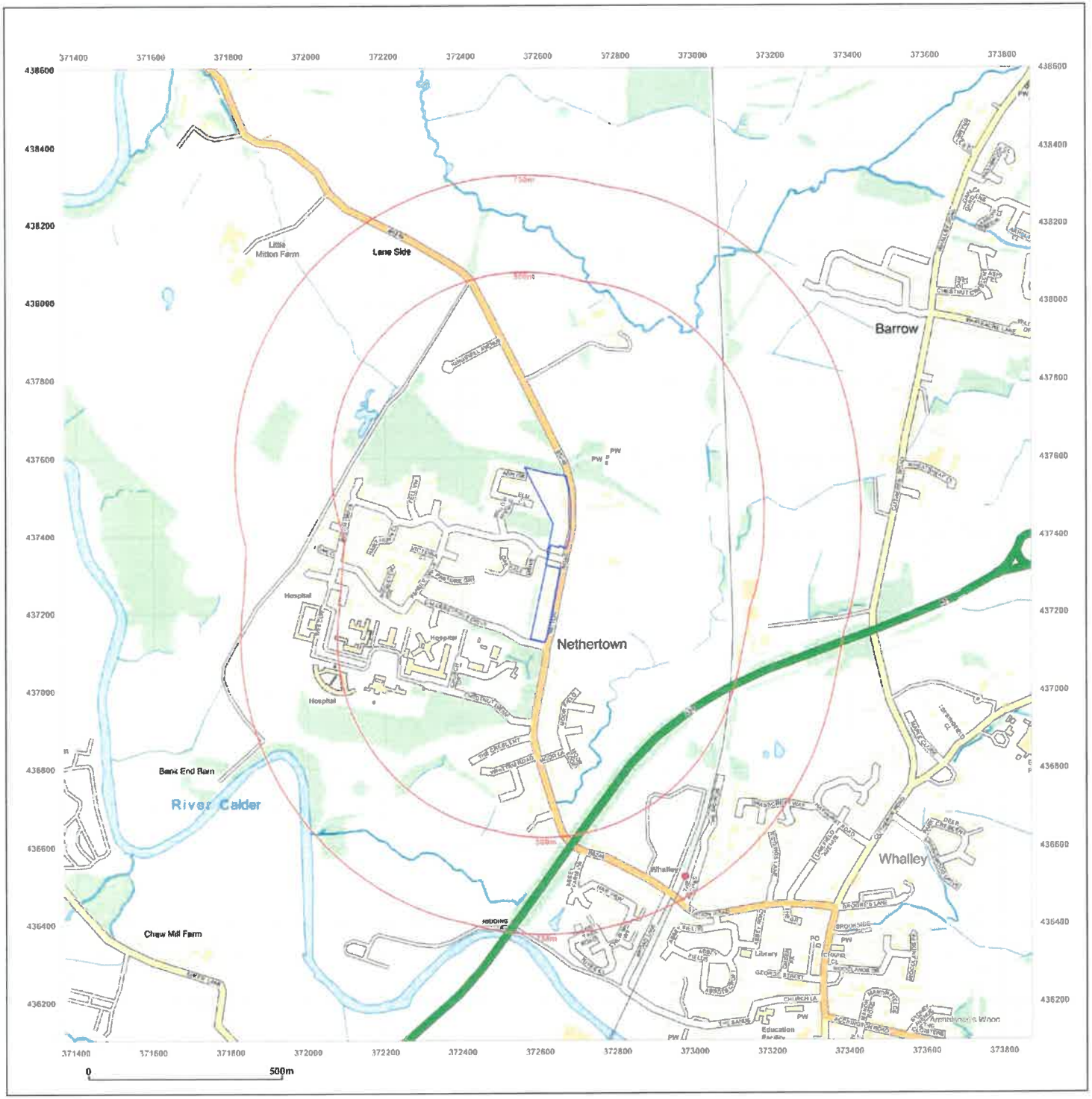

Groundsure INSIGHTS

Site Details:

MITTON ROAD, WHALLEY, BB7 9JT

Client Ref: 7583_-_PO_8759BH
Report Ref: GS-6960964
Grid Ref: 372619, 437351

Map Name: National Grid
Map date: 2020
Scale: 1:10,000
Printed at: 1:10,000

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Production date: 12 August 2020

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Appendix 4

Coopers Trial Pit Logs

Coopers Hand Dug Pit Logs

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Coopers (Chester) Ltd
tel: 01244 684 910
web: www.coopers.co.uk
email: admin@coopers.co.uk

Site MITTON ROAD, WHALLEY			**Trial Pit Number** TP01
Machine : 5 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 3.00 x 1.00 x 2.95m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 03/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.25)	Turf over dark brown, slightly clayey, silty TOPSOIL with some fine roots.		
					0.25	Firm, medium strength, grey/brown, slightly silty CLAY.		
0.40	SV 60kPa							
0.50	B							
0.80	SV 64kPa							
					(2.70)	Below 1.50m: Firm to stiff, high strength, grey/brown with lenses of silt and pockets of fine sand		
1.60	SV 80kPa							
1.60	B							
1.90	SV 100kPa							
2.10	SV 124kPa							
2.50	SV 120kPa							
2.60	B							
2.90	SV 120kPa				2.95	Complete at 2.95m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
No groundwater encountered during excavation.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit backfilled with arisings upon completion.

Scale (approx)	Logged By	Checked By
1:20	MW	PRS

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Site MITTON ROAD, WHALLEY			**Trial Pit Number** TP02
Machine : 5 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 3.50 x 1.00 x 3.00m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 03/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.25)	Turf over dark brown, slightly clayey TOPSOIL with some fine roots.		
0.30	SV 60kPa				0.25	Soft to firm, medium strength, grey mottled brown, silty, sandy CLAY.		
0.50 0.50	SV 60kPa B							
0.80	SV 60kPa				(1.35)			
			Minor seepage on east side pit(1) at 1.00m.					▽1
1.20	SV 68kPa							
1.50 1.50	SV 60kPa B				1.60	Soft to firm, medium strength, grey/brown, very silty CLAY/very clayey SILT.		
1.80 1.80	SV 56kPa B							
2.20	SV 52kPa				(1.40)			
2.50	B							
2.60	SV 60kPa							
2.90 2.90	SV 60kPa B				3.00	Complete at 3.00m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
Minor seepage at 1.00m on east side of trial pit during excavation.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
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Site MITTON ROAD, WHALLEY			**Trial Pit Number** TP03
Machine : 5 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 3.00 x 1.00 x 1.10m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 03/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Turf over dark brown, clayey TOPSOIL.		
					0.30	Soft to firm, medium strength, grey, very silty CLAY.		
0.40	SV 52kPa							
0.70	SV 52kPa		Rapid ingress from culvert(1) at 0.70m.		(0.80)	At 0.70m: Suspected brick lined culvert encountered (blocked), measuring 0.40 x 0.40m, running south west to north east. Rapid ingress		▽1
1.00	SV 56kPa							
					1.10	Complete at 1.10m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
Rapid ingress from culvert at 0.70m during excavation.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit backfilled with arisings upon completion due to ingress from culvert.

North	Scale (approx)	Logged By	Checked By
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Site MITTON ROAD, WHALLEY			**Trial Pit Number** TP04
Machine : 5 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 3.00 x 1.00 x 3.00m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 03/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	MADEGROUND. Turf over dark brown, clayey topsoil.		
0.20	JV				0.30	Soft, low to medium strength, grey mottled reddish brown, silty, sandy CLAY.		
0.50	SV 20kPa							
0.60	B				(1.30)			
1.00	SV 52kPa					Below 1.50m: Medium strength		
1.30	SV 48kPa							
1.50	SV 72kPa				1.60			▽1
			Seepage on north side(1) at 1.60m.			Soft to firm, medium strength, very silty CLAY/very clayey SILT.		
1.70	SV 64kPa							
1.70	B							
1.80	SV 60kPa							
2.20	SV 68kPa				(1.40)			
2.50	SV 56kPa							
2.70	B							
2.80	SV 56kPa							
2.90	SV 64kPa							
					3.00	Complete at 3.00m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
Seepage at 1.60m on north side of trial pit during excavation.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
→	1:20	MW	PRS

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Site MITTON ROAD, WHALLEY			**Trial Pit Number** TP05
Machine : 5 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 3.00 x 1.00 x 3.00m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 03/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.25)	Turf over dark brown, clayey TOPSOIL with some fine roots.		
					0.25	Firm, medium strength, brown/grey, silty CLAY with rare gravel of sub-angular to sub-rounded natural stone.		
0.40	SV 60kPa							
0.40	B							
0.60	SV 68kPa							
0.80	SV 64kPa							
					(2.00)			
						At 1.40m: Stiff, high strength		
1.50	SV 140kPa							
1.50	B							
1.70	SV 148kPa							
						Below 1.80m: Very high strength		
1.90	SV 160kPa							
2.20	SV 180kPa				2.25	Firm to stiff, high strength, very silty CLAY/very clayey SILT.		
2.40	SV 132kPa							
2.50	B							
2.60	SV 140kPa				(0.75)			
					3.00	Complete at 3.00m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
No groundwater encountered during excavation
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit backfilled with arisings upon completion.

Scale (approx)	Logged By	Checked By
1:20	MW	PRS

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Site MITTON ROAD, WHALLEY				**Trial Pit Number** TP06
Machine : 5 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 3.00 x 1.00 x 3.00m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 03/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Turf over dark brown, clayey TOPSOIL.		
0.10	B				0.20	Firm to stiff, high strength, grey mottled brown, silty CLAY with rare gravel of sub-rounded natural stone.		
0.40	SV 92kPa							
0.40	B							
0.60	SV 88kPa							
1.00	SV 100kPa							
					(2.10)			
						Below 1.40m: Very stiff, high strength		
1.50	SV 184kPa							
1.60	B							
1.80	SV 184kPa							
2.20	SV 176kPa				2.30	Firm to stiff, high strength, brown/grey, very silty CLAY/very clayey SILT.		
2.50	SV 140kPa							
2.50	B				(0.70)			
2.80	SV 136kPa							
2.90	SV 140kPa							
2.90	B				3.00	Complete at 3.00m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
No groundwater encountered during excavation
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit backfilled with arisings upon completion.

Scale (approx)	Logged By	Checked By
1:20	MW	PRS

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Site MITTON ROAD, WHALLEY			**Trial Pit Number** TP07
Machine : 5 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 3.00 x 1.00 x 3.00m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 03/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						Turf over dark brown, clayey TOPSOIL with some fine roots.		
0.15	B				(0.35)			
					0.35	Firm, medium strength, brown/grey, silty CLAY.		
0.50	SV 60kPa							
0.60	B							
0.80	SV 64kPa							
1.20	SV 60kPa							
1.50	SV 60kPa							
					(2.65)	Below 1.60m: Very stiff, very high strength, grey mottled brown with lenses of silt		
1.80	SV 180kPa							
1.80	B							
2.30	SV 192kPa							
2.80	SV 188kPa							
2.80	B							
					3.00	Complete at 3.00m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
No groundwater encountered during excavation
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit backfilled with arisings upon completion.

Scale (approx)	Logged By	Checked By
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Site MITTON ROAD, WHALLEY			**Trial Pit Number** TP08
Machine : 5 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 3.00 x 1.00 x 3.00m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 03/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Turf over dark brown, silty, clayey TOPSOIL.		
0.10	B				0.20			
0.30	SV 140kPa					Stiff, high strength, grey mottled brown, silty, gravelly CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of natural stone.		
0.50	B							
0.60	SV 140kPa							
0.90	SV 148kPa							
1.30	SV 156kPa							
1.50	B				(2.80)			
1.80	SV 140kPa					Below 1.80m: Grey, slightly silty		
2.00	B							
2.30	SV 152kPa							
2.50	SV 152kPa					At 2.50m: 1 No. small boulder measuring 1.00 x 0.50 x 0.60m		
2.80	SV 140kPa							
2.90	B							
					3.00	Complete at 3.00m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
No groundwater encountered during excavation
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit backfilled with arisings upon completion.

Scale (approx)	Logged By	Checked By
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Site MITTON ROAD, WHALLEY			**Trial Pit Number** TP09
Machine : 5 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 3.00 x 1.00 x 3.00m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 03/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Turf over dark brown, silty, clayey TOPSOIL with some roots.		
0.10	B				0.25	Firm to stiff, high strength, grey mottled brown, silty, gravelly CLAY. Gravel is fine to coarse, sub-rounded natural stone.		
0.40	B							
0.60	SV 100kPa		Minor seepage on south side(1) at 0.80m.					▽1
1.10	SV 132kPa							
1.40	SV 132kPa							
1.40	B				(2.65)			
1.80	SV 136kPa					Below 2.10m: Lenses of silt		
2.40	B							
2.70	SV 128kPa							
					2.90	Complete at 2.90m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
Minor seepage at 0.80m on south side of trial pit.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
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Site MITTON ROAD, WHALLEY			**Trial Pit Number** TP10
Machine : 5 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 2.80 x 1.00 x 2.85m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 03/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Turf over dark brown, clayey, gravelly TOPSOIL with some roots.		
0.20	B				0.25	Firm to stiff, high strength, grey mottled brown, silty CLAY with rare fine to coarse gravel and cobbles of sub-rounded natural stone.		
0.40	SV 120kPa							
0.50	B							
0.90	SV 120kPa							
1.00	B							
1.30	SV 120kPa							
					(2.60)			
1.80	SV 124kPa							
2.00	B							
2.30	SV 128kPa							
					2.85	Complete at 2.85m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
Minor seepage at 0.80m on south side of trial pit.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit backfilled with arisings upon completion.

North	Scale (approx)	Logged By	Checked By
→	1:20	MW	PRS

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Site MITTON ROAD, WHALLEY			**Trial Pit Number** TP11
Machine : 5 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 2.80 x 1.00 x 2.65m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 03/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.25)	Turf over dark brown, clayey, sandy TOPSOIL with some roots.		
					0.25	Firm to stiff, high strength, grey mottled brown, silty, gravelly CLAY. Gravel and cobbles of fine to coarse, sub-rounded natural stone. Occasional roots.		
0.50 0.50	SV 132kPa B							
1.00	SV 148kPa							
					(2.40)	Below 1.50m: Occasional cobbles and small boulders of sub-rounded to rounded natural. 2 No. measuring 0.50 x 0.50 x 0.80m		
1.60 1.60	SV 144kPa B							
						Below 2.00m: Friable		
2.60	B				2.65	Complete at 2.65m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
No groundwater encountered during excavation.
Below 2.00m clay friable and no shear vane readings taken.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit backfilled with arisings upon completion.

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Site MITTON ROAD, WHALLEY				**Trial Pit Number** TP12
Machine : 5 Tonne Tracked Excavator **Method :** Mechanical Excavation	**Dimensions** 3.00 x 1.00 x 2.90m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 03/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.55)	MADEGROUND (similar to topsoil). Dark brown, slightly sandy CLAY with some fragments of whole and half red brick, concrete, glass and timber.		
0.20	JV				0.55			
0.70	SV 60kPa					MADEGROUND. Firm, medium strength, grey, silty CLAY with occasional half bricks, plastics, metal pieces and timber.		
0.70	JV				(0.95)			
1.10	SV 60kPa							
1.40	SV 56kPa				1.50			
1.60	JV					MADEGROUND. Dark brown, sandy, very gravelly ASH and CLINKER. *Assumed as loose to medium dense.		
					(0.50)			
			Strong ingress on all sides(1) at 2.00m.		2.00			▽1
2.10	SV 20kPa					Soft, low strength, grey, very silty CLAY.		
2.10	JV				(0.90)			
2.60	SV 20kPa							
					2.90	Complete at 2.90m		

Remarks

Location CAT scanned prior to excavation.
Minor spalling between 1.50-2.50m during excavation.
Strong ingress at 2.00m on all sides of trial pit during excavation. Ground water level remained at 2.00m at time of backfill.
*Based upon trenchside stability characteristics.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit backfilled with arisings upon completion.

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Site MITTON ROAD, WHALLEY				**Trial Pit Number** HD01
Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.50 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 28/08/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	MADEGROUND (similar to topsoil). dark brown clayey with some roots.		
0.10	JV				0.20	Firm, grey/brown, silty CLAY.		
0.30	JV				(0.30)			
					0.50	Complete at 0.50m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
Hand dug pit next to sub station for PCB testing.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.

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Site MITTON ROAD, WHALLEY			**Trial Pit Number** HD02
Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.45 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 28/08/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	JV				(0.30)	Dark brown, silty, clayey TOPSOIL with some fine roots.		
					0.30			
0.40	SV 64kPa				(0.15)	Firm, medium strength, grey/brown, silty CLAY.		
0.40	JV				0.45	Complete at 0.45m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
Backfilled with arisings upon completion.
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Site MITTON ROAD, WHALLEY				**Trial Pit Number** HD03
Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.30 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 28/08/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown, silty, sandy TOPSOIL with some fine to medium roots.		
0.10	JV				0.25			
0.25	JV				0.30	Brown, silty, sandy CLAY.		
						Complete at 0.30m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
Backfilled with arisings upon completion.
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Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.40 x 0.30m	**Ground Level (mOD)**	**Site** MITTON ROAD, WHALLEY	**Trial Pit Number** **HD04**
	Location (Observed measurements)	**Dates** 28/08/2020	**Client** Prospect Homes Ltd	**Job Number** 7583
			Engineer Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Dark brown, slightly clayey, silty TOPSOIL with some fine roots.		
0.20	JV				0.30 (0.10) 0.40	Firm, medium strength, grey mottled brown, silty CLAY.		
0.35	JV					Complete at 0.40m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
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Site MITTON ROAD, WHALLEY			**Trial Pit Number** HD05
Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.40 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 28/08/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	JV				(0.30)	Dark brown, slightly clayey, silty TOPSOIL with some fine roots.		
0.35	JV				0.30 (0.10) 0.40	Firm to stiff, high strength, brown mottled grey, silty CLAY.		
						Complete at 0.40m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
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Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.45 x 0.30m	**Ground Level (mOD)**	**Site** MITTON ROAD, WHALLEY	**Trial Pit Number** HD06
	Location (Observed measurements)	**Dates** 28/08/2020	**Client** Prospect Homes Ltd	**Job Number** 7583
			Engineer Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Dark brown, silty, clayey TOPSOIL.		
0.20	JV				0.30 (0.15)	Firm to stiff, light brown mottled grey, silty CLAY.		
0.40	JV				0.45	Complete at 0.45m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
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Site MITTON ROAD, WHALLEY			**Trial Pit Number** HD07
Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.35 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 28/08/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	JV				(0.25)	Dark brown, clayey, sandy TOPSOIL.		
0.30	JV				0.25 (0.10) 0.35	Soft, slightly sandy, silty CLAY.		
						Complete at 0.35m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
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Machine : Manual Excavation **Method** : Hand Dug	**Dimensions** 0.30 x 0.30 x 0.30m	**Ground Level (mOD)**	**Site** MITTON ROAD, WHALLEY	**Trial Pit Number** HD08
			Client Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 17/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.05	JV				(0.10) 0.10	MADEGROUND. Dark brown, slightly clayey TOPSOIL over geotextile terram.		
0.20	JV				(0.20) 0.30	Firm, brown, silty CLAY.		
						Complete at 0.30m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during dig.
No groundwater encountered during dig.
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Site MITTON ROAD, WHALLEY			**Trial Pit Number** HD09
Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.40 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 17/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	JV				(0.30)	MADEGROUND (similar to topsoil). Dark brown, slightly clayey SAND.		
0.35	JV				0.30 (0.10) 0.40	Firm, light brown, silty CLAY.		
						Complete at 0.40m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during dig.
No groundwater encountered during dig.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
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Site MITTON ROAD, WHALLEY				**Trial Pit Number** HD10
Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.55 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 17/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	JV				(0.30)	MADEGROUND (similar to topsoil). Clayey, fine to medium SAND with some roots.		
					0.30 (0.10) 0.40	MADEGROUND. Grey, clayey, fine to coarse GRAVEL with some fragments of concrete and half brick.		
0.50	JV					Complete at 0.55m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
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Site MITTON ROAD, WHALLEY			**Trial Pit Number** HD11
Machine: Manual Excavation **Method** : Hand Dug	**Dimensions** 0.30 x 0.45 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 17/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.35)	Dark brown, slightly clayey, sandy TOPSOIL with some roots.		
0.20	JV				0.35			
0.40	JV				(0.10)	Firm, brown, silty CLAY.		
					0.45	Complete at 0.45m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
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Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.45 x 0.30m	**Ground Level (mOD)**	**Site** MITTON ROAD, WHALLEY	**Trial Pit Number** **HD12**
	Location (Observed measurements)	**Dates** 17/09/2020	**Client** Prospect Homes Ltd	**Job Number** 7583
			Engineer Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Dark brown, clayey TOPSOIL with some roots.		
0.20	JV				0.30			
0.40	JV				(0.15)	Firm, grey mottled brown, silty CLAY.		
					0.45	Complete at 0.45m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
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Site MITTON ROAD, WHALLEY			**Trial Pit Number** HD13
Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.40 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 17/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Dark brown, clayey TOPSOIL with some roots.		
0.10	JV				0.20			
					(0.20)	Firm to stiff, grey mottled brown, silty CLAY.		
0.30	JV				0.40			
						Complete at 0.40m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
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Site MITTON ROAD, WHALLEY				**Trial Pit Number** HD14
Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.45 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 17/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	MADEGROUND (similar to topsoil). Dark brown, clayey, fine to coarse SAND with some roots.		
0.20	JV				0.30			
0.35	JV				(0.15)	MADEGROUND. Light brown, fine to coarse SAND with 1 No. quarter fragment of brick.		
					0.45	Complete at 0.45m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
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Site MITTON ROAD, WHALLEY			**Trial Pit Number** HD15
Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.425 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 17/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	JV				(0.25)	MADEGROUND (similar to topsoil). Dark brown, sandy CLAY with some roots and small fragments of brick 5cm x 4cm.		
0.30	JV				0.25 (0.18) 0.43	MADEGROUND. Firm, brown/grey, silty CLAY with pieces of plastic and glass.		
						Complete at 0.43m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
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Site MITTON ROAD, WHALLEY			**Trial Pit Number** HD16
Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.35 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 17/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown, slightly silty, clayey TOPSOIL with some roots.		
0.10	JV				0.25			
					(0.10)	Firm, brown/grey, silty CLAY.		
0.30	JV				0.35	Complete at 0.35m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Backfilled with arisings upon completion.

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Site MITTON ROAD, WHALLEY			**Trial Pit Number** HD17
Machine : Manual Excavation **Method :** Hand Dug	**Dimensions** 0.30 x 0.35 x 0.30m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 17/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.15	JV				(0.20) 0.20	MADEGROUND. Brown, silty, sandy TOPSOIL with some fine roots.		
0.25	JV				(0.15) 0.35	MADEGROUND. Firm, brown/grey, silty, gravelly CLAY. Gravel is fine to coarse, angular to sub-angular natural stone. At 0.30m: 1 No. half brick		
						Complete at 0.35m		

Remarks

Sides stable during dig.
No groundwater encountered during dig.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
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Appendix 5

Coopers Small Diameter Borehole Logs

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Site MITTON ROAD, WHALLEY

Number WS01

Machine : Competitor Rig

Method : Drive-in Windowless Sampler

Dimensions 150mm to 5.45m

Ground Level (mOD)

Client Prospect Homes Ltd

Job Number 7583

Location (Observed measurements)

Dates 28/08/2020

Engineer Coopers (Chester) Ltd

Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.40)	MADEGROUND. Brown, very silty CLAY with some glass fragments and rare coal.			
0.30	B				0.40				
0.30	JV					Stiff, high strength, grey, slightly silty, sandy CLAY with rare gravel of sub-rounded natural stone.			
0.60	B								
1.00-1.45	SPT N=6		0,0/1,1,2,2						
1.30	SV 100kPa								
1.30-1.80	B								
1.45	SV 100kPa								
1.70	SV 108kPa								
1.90	SV 100kPa								
2.00	SV 120kPa								
2.00-2.45	SPT N=6		1,1/1,2,1,2			Below 2.05m: Very soft, low strength, very silty, sandy CLAY			
2.00-3.00	B								
2.00	SV 20kPa								
2.30	SV 20kPa								
2.70	SV 32kPa								
					(5.05)				
3.00	SV 32kPa								
3.00-3.45	SPT N=5		0,0/1,1,1,2						
3.00-3.50	B								
3.20	SV 24kPa								
3.50	SV 38kPa								
3.60-4.00	B								
3.80	SV 60kPa								
4.00-4.45	SPT N=7		1,1/1,2,2,2						
4.20	SV 80kPa					Below 4.10m: Firm to stiff, high strength, grey/brown, silty CLAY			
4.80	SV 88kPa								
5.00-5.45	SPT N=14		2,2/3,3,4,4						
					5.45	Complete at 5.45m			

Remarks
Location CAT scanned prior to drilling. Service pit excavated to 1.20m.
Sides stable during drilling. No groundwater encountered drilling.
Samples below 5.00m based upon retrieved SPT sample.
Monitoring well installed between surface and 4.00m, comprising 2.00m plain pipe, 2.00m slotted pipe with inert free draining gravel surround and bentonite seal above and below response zone.
SPT energy ratio = 61%.
Borehole not cased

Scale (approx) 1:40

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Site MITTON ROAD, WHALLEY			**Number** WS02
Machine : Competitor Rig **Method :** Drive-in Windowless Sampler	**Dimensions** 150mm to 4.45m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 28/08/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.30)	MADEGROUND (similar to topsoil). Dark brown, very silty, sandy CLAY with rare, small glass fragments.			
0.20	B				0.30	At 0.25m: 1 No. piece of ceramic			
0.20	JV								
0.50	B				(0.50)	MADEGROUND. Soft to firm, brown mottled grey, silty CLAY with some fine to coarse gravel of angular to sub-angular natural stone.			
0.50	JV								
0.60	SV 40kPa				0.80	At 0.70m: 1 No. half red brick			
0.90	SV 60kPa								
0.90	B					Soft to firm, grey slightly silty CLAY with rare gravel of fine to medium, sub-angular to sub-rounded natural stone. Occasional organic plant matter (no odour).			
1.00-1.45	SPT N=0		1,0/0,0,0,0			Below 1.20m: Soft, low strength			
1.10	SV 48kPa								
1.30	SV 24kPa								
1.30-1.60	B								
1.50	SV 20kPa								
1.70	SV 24kPa								
1.70-2.00	B								
1.90	SV 14kPa								
2.00-2.45	SPT N=4		1,0/1,1,1,1						
					(3.65)				
2.80-3.00	B					Below 2.80m: Firm to stiff, high strength, grey/brown, silty CLAY with rare gravel of sub-rounded natural stone			
2.90	SV 100kPa								
3.00-3.45	SPT N=13		2,2/3,3,3,4						
3.10	SV 104kPa								
3.20-3.50	B								
3.50	SV 112kPa								
3.60-4.00	B								
3.80	SV 120kPa								
4.00	SV 112kPa								
4.00-4.45	SPT N=16		2,3/3,3,5,5						
					4.45	Complete at 4.45m			

Remarks
Location CAT scanned prior to drilling. Service pit excavated to 1.20m.
Sides stable during drilling. No groundwater encountered drilling.
Samples below 4.00m based upon retrieved SPT sample.
Monitoring well installed between surface and 4.00m, comprising 0.80m plain pipe, 2.20m slotted pipe with inert free draining gravel surround and bentonite seal above and below response zone.
Borehole not cased.
SPT energy ratio = 61%.

Scale (approx)	Logged By
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Site MITTON ROAD, WHALLEY			**Number** WS03
Machine : Competitor Rig **Method :** Drive-in Windowless Sampler	**Dimensions** 150mm to 4.45m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 28/08/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.30)	MADEGROUND (similar to topsoil). Dark brown, very silty, gravelly CLAY. Gravel is fine to coarse, angular to sub-angular natural stone.			
0.20	B				0.30				
0.20	JV					Firm, medium strength, grey mottled brown, silty CLAY with rare organics and rootlets.			
0.50	SV 60kPa					At 0.30m: 1 No. piece of plastic			
0.50	B								
0.90	SV 72kPa								
1.00-1.45	SPT N=9		1,2/2,1,3,3			Below 1.00m: Firm to stiff, high strength			
1.10	SV 84kPa								
1.20	SV 100kPa								
1.20-1.50	B								
1.40	SV 132kPa								
1.60	SV 132kPa								
1.60-2.00	B								
1.80	SV 128kPa								
1.95	SV 136kPa								
2.00-2.45	SPT N=12		2,1/3,2,3,4						
2.10-2.50	B								
2.20	SV 132kPa				(4.15)				
2.50	SV 120kPa								
2.60-3.00	B								
2.70	SV 140kPa								
2.90	SV 140kPa								
3.00-3.45	SPT N=12		2,2/3,2,3,4						
3.00-3.40	B								
3.30	SV 132kPa								
3.50-4.00	B								
3.60	SV 128kPa								
3.80	SV 140kPa								
4.00-4.45	SPT N=13		2,3/3,3,3,4						
4.00-4.45	B								
					4.45	Complete at 4.45m			

Remarks
Location CAT scanned prior to drilling. Service pit excavated to 1.20m.
Sides stable during drilling. No groundwater encountered drilling.
Samples below 4.00m based upon retrieved SPT sample.
Monitoring well installed between surface and 4.00m, comprising 1.00m plain pipe, 3.00m slotted pipe with inert free draining gravel surround and bentonite seal above and below response zone.
Borehole not cased.
SPT energy ratio = 61%.

Scale (approx)	Logged By
1:40	MW
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Site MITTON ROAD, WHALLEY			**Number** WS04
Machine : Competitor Rig **Method** : Drive-in Windowless Sampler	**Dimensions** 150mm to 5.00m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 28/08/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.40)	MADEGROUND (similar to topsoil). Brown, very silty CLAY with rare half brick fragments.			
0.20	B								
0.20	JV				0.40				
					(0.30)	MADEGROUND. Firm to stiff, high strength, grey/brown, silty CLAY with rare, small quarter size brick pieces.			
0.60	B				0.70				
0.60	JV					MADEGROUND. Dark brown, very gravelly, sandy ASH and CLINKER. *Assumed as loose to medium dense.			
0.90	B				(0.70)	Below 1.00m: Very loose.			
0.90	JV								
1.00-1.45	SPT N=3		1,1/0,1,1,1		1.40				
						MADEGROUND. Firm to stiff, medium strength, grey, slightly silty CLAY.			
1.50	SV 60kPa							▽1	
1.50-2.00	B								
1.70	SV 60kPa		Groundwater(1) at 1.70m.						
1.90	SV 64kPa								
2.00-2.45	SPT N=2		0,0/0,1,1,0			Below 2.00m: Very soft, low strength, grey, slightly silty, gravelly CLAY. Gravel is fine to coarse, angular natural stone with some organics (no odour)			
2.20	SV 14kPa								
2.20-2.50	B								
2.40	SV 10kPa				(2.10)	At 2.50m: 1 No. piece of ceramic			
2.60-3.00	B								
2.70	SV 10kPa								
3.00	SV 16kPa								
3.00-3.45	SPT N=6		2,1/1,1,2,2						
3.00-3.40	B								
					3.50	Firm to stiff, high strength, grey, slightly silty CLAY with rare, fine to coarse gravel of sub-angular to sub-rounded natural stone.			
3.60-3.90	B								
3.70	SV 100kPa								
3.90	SV 100kPa								
4.00	SV 108kPa								
4.00-4.45	SPT N=7		1,1/1,1,2,3						
4.10-4.50	B				(1.50)				
4.30	SV 88kPa								
4.60	SV 96kPa								
4.60-5.00	B								
4.80	SV 92kPa								
4.90	SV 100kPa				5.00	Complete at 5.00m			

Remarks
Location CAT scanned prior to drilling. Service pit excavated to 1.20m.
Sides stable during drilling. Groundwater at 1.70m during drilling. *Based upon stability characteristics.
Unable to get SPT sample below 5.00m due to collapsing.
Monitoring well installed between surface and 4.00m, comprising 1.00m plain pipe, 2.00m slotted pipe with inert free draining gravel surround and bentonite seal above and below response zone.
Borehole not cased.
SPT energy ratio = 61%.

Scale (approx)	Logged By
1:40	MW
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Site MITTON ROAD, WHALLEY

Number WS05

Machine : Competitor Rig

Method : Drive-in Windowless Sampler

Dimensions 150mm to 4.45m

Ground Level (mOD)

Client Prospect Homes Ltd

Job Number 7583

Location (Observed measurements)

Dates 01/09/2020

Engineer Coopers (Chester) Ltd

Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10	B				(0.40)	MADEGROUND (similar to topsoil). Dark brown, slightly clayey, fine to coarse SAND with rare gravel of sub-rounded natural stone and pieces of plastic and rubber.			
0.10	JV								
					0.40				
0.60	SV 20kPa				(0.70)	MADEGROUND. Soft, low strength, grey, slightly sandy, silty CLAY with rare gravel and cobbles of fine to coarse, sub-angular to sub-rounded natural stone.			
0.60	B								
0.60	JV								
1.00-1.45	SPT N=5		2,1/1,1,1,2		1.10	At 1.00m: 1 No. piece of metal			
1.00-1.40	B					Soft, low strength, grey, very silty CLAY.			
1.60	SV 40kPa								
1.60-2.00	B								
1.75	SV 44kPa								
1.90	SV 52kPa					Firm, medium strength			
2.00-2.45	SPT N=3		0,0/0,0,1,2		(2.00)	At 2.10m: 1 No. sub-angular cobble, measuring 0.10 x 0.07 x 0.06m			
2.00-2.45	B								
2.20-2.60	B								
2.30	SV 18kPa								
2.60	SV 12kPa								
2.80-3.00	B								
2.90	SV 20kPa								
3.00-3.45	SPT N=19		3,9/7,4,4,4		3.10	Stiff, high strength, grey/brown, slightly sandy, silty, gravelly CLAY. Gravel is fine to coarse, sub-angular to sub-rounded natural stone with occasional cobbles of sub-angular to sub-rounded natural stone.			
3.00-3.45	B								
3.10-3.50	B								
3.20	SV 100kPa							▽1	
3.60	SV 100kPa		Groundwater(1) at 3.60m.						
3.60-4.00	B				(1.35)				
3.80	SV 88kPa								
3.90	SV 108kPa								
4.00-4.45	SPT N=26		3,4/4,5,7,10						
4.00-4.45	B								
					4.45	Complete at 4.45m			

Remarks
Location CAT scanned prior to drilling. Service pit excavated to 1.00m.
Sides stable during drilling. Groundwater at 3.60m during drilling and remained at 3.60m at time of completion.
Samples below 4.00m based upon retrieved SPT samples.
Monitoring well installed between surface and 1.10m, comprising 0.50m plain pipe, 0.60m slotted pipe, 0.90m of bentonite and 2.6m of free draining gravel surround with a bentonite seal above and below response zone.
Borehole not cased.
SPT energy ratio = 61%.

Scale (approx) 1:40

Logged By MW

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Site	Number
MITTON ROAD, WHALLEY	WS06

Machine : Competitor Rig Method : Drive-in Windowless Sampler	Dimensions 150mm to 5.45m	Ground Level (mOD)	Client Prospect Homes Ltd	Job Number 7583
	Location (Observed measurements)	Dates 01/09/2020	Engineer Coopers (Chester) Ltd	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.20	B				(0.50)	MADEGROUND. Firm, medium strength, grey, silty, gravelly CLAY. Gravel is fine to coarse, angular to sub-angular natural stone.			
0.20	JV								
0.40	SV 72kPa				0.50				
0.70	B					MADEGROUND. Grey, clayey, sandy GRAVEL. Gravel is coarse, angular, natural stone.			
0.70	JV				(0.80)				
1.00-1.45	SPT N=1		1,1/0,0,0,1						
1.00-1.45	B				1.30				
1.30-1.60	B					Firm to stiff, high strength, brown mottled grey, silty CLAY.			
1.40	SV 80kPa								
1.60	SV 88kPa								
1.70-2.00	B								
1.80	SV 68kPa					Below 1.80m: Medium strength			
1.90	SV 80kPa								
2.00-2.45	SPT N=5		1,0/1,1,1,2						
2.00-2.40	B				(1.70)				
2.20	SV 64kPa								
2.40	SV 60kPa								
2.50-3.00	B								
2.60	SV 80kPa								
2.80	SV 68kPa								
3.00	SV 56kPa		Groundwater(1) at 3.00m.		3.00			▽1	
3.00-3.45	SPT N=7		1,1/1,1,2,3		(0.10)	Grey, slightly silty, fine to coarse GRAVEL of angular to sub-rounded natural stone.			
3.00-3.20	B				3.10				
3.30	SV 52kPa					Firm, medium strength, brown/grey, slightly silty CLAY with occasional gravel of fine to coarse, sub-rounded natural stone.			
3.30-3.60	B								
3.50	SV 60kPa								
3.60-4.00	B								
3.70	SV 80kPa								
3.90	SV 80kPa								
4.00-4.45	SPT N=7		2,1/2,1,2,2						
4.00-4.45	B				(2.35)				
4.30	SV 64kPa								
4.30-4.80	B								
4.50	SV 64kPa								
4.80	SV 68kPa								
5.00-5.45	B								
					5.45	Complete at 5.45m			

Remarks
Location CAT scanned prior to drilling. Service pit excavated to 1.20m.
Sides stable during drilling. Groundwater at 3.00m during drilling.
Samples below 5.00m based upon retrieved SPT samples.
Monitoring well installed between surface and 4.00m, comprising 1.50m plain pipe, 2.50m slotted pipe with inert 10mm free draining gravel surround and bentonite seal to above and below response zone.
Borehole not cased.
SPT energy ratio = 61%.

Scale (approx)	Logged By
1:40	MW
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Site MITTON ROAD, WHALLEY			**Number** WS07
Machine : Competitor Rig **Method :** Drive-in Windowless Sampler	**Dimensions** 150mm to 4.45m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 01/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.45)	MADEGROUND (similar to topsoil). Dark brown, slightly sandy, silty CLAY.			
0.20	B								
0.20	JV				0.45	At 0.40m: Clay land drain measuring approximately 100mm in diameter, orientated north to south (dry)			
0.60	SV 112kPa					Firm to stiff, high strength, grey/brown, silty CLAY with occasional gravel and cobbles of fine to coarse, sub-angular to sub-rounded natural stone.			
0.60	B								
1.00-1.45	SPT N=7		2,1/1,1,3,2						
1.20	SV 128kPa					Below 1.30m: Grey mottled brown			
1.20-1.60	B								
1.20-1.65	B								
1.40	SV 132kPa								
1.60	SV 140kPa								
1.70-2.00	B								
1.80	SV 140kPa								
2.00-2.45	SPT N=33		2,4/6,9,9,9			Below 2.00m: Some fine to coarse gravel of sub-angular to sub-rounded natural stone			
2.10	SV 140*kPa								
2.10-2.50	B								
2.40	SV 140*kPa				(4.00)				
2.60-3.00	B								
2.80	SV 142*kPa								
3.00-3.45	SPT N=13		2,3/3,3,3,4						
3.00-3.45	B								
3.30	SV 148*kPa							▽1	
			Groundwater(1) at 3.50m.						
3.70	SV 136*kPa					At 3.80m: 1 No. large cobble At 3.85m: 1 No. large cobble			
4.00-4.45	SPT N=21		4,4/4,5,5,7						
4.00-4.45	B								
					4.45	Complete at 4.45m			

Remarks
Location CAT scanned prior to drilling. Service pit excavated to 1.20m.
Sides stable during drilling. Groundwater at 3.50m during drilling.
Samples below 4.00m based upon retrieved SPT samples. *Spurious results due to gravel content.
Monitoring well installed between surface and 4.00m comprising 1.00m plain pipe, 3.00m slotted pipe with inert 10mm free draining gravel surround and bentonite seal above and below response zone.
Borehole not cased.
SPT energy ratio = 61%.

Scale (approx)	Logged By
1:40	MW
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Site MITTON ROAD, WHALLEY			**Number** WS08
Machine : Competitor Rig **Method :** Drive-in Windowless Sampler	**Dimensions** 150mm to 5.45m	**Ground Level (mOD)**	**Client** Prospect Homes Ltd	**Job Number** 7583
	Location (Observed measurements)	**Dates** 01/09/2020	**Engineer** Coopers (Chester) Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10	B				(0.30)	Dark brown, silty, sandy TOPSOIL with some fine roots.			
					0.30	Firm to stiff, high strength, brown, silty CLAY.			
0.50	SV 100kPa								
0.50	B								
0.90	SV 100kPa								
1.00	SV 80kPa								
1.00-1.45	SPT N=8		1,1/2,1,2,3						
1.00-1.45	B								
1.00-1.50	B								
1.20	SV 80kPa								
1.40	SV 80kPa								
1.60	SV 128kPa								
1.60-2.00	B								
1.80	SV 160kPa								
2.00-2.45	SPT N=10		2,2/2,2,3,3						
2.00-2.50	B								
2.20	SV 136kPa								
2.40	SV 124kPa								
2.60	SV 124kPa								
2.60-3.00	B								
2.80	SV 180kPa				(5.15)	Below 2.80m: Very stiff, very high strength			
3.00-3.45	SPT N=11		2,2/2,2,3,4			Below 3.00m: Firm to stiff, high strength, slightly fine sandy			
3.00-3.45	B								
3.10	SV 80kPa								
3.10-3.50	B								
3.30	SV 80kPa								
3.50	SV 84kPa								
3.60-4.00	B								
3.70	SV 80kPa								
3.90	SV 100kPa								
4.00-4.45	SPT N=11		1,1/2,2,3,4						
4.00-4.45	B								
4.00-4.45	B								
4.10	SV 80kPa								
4.30	SV 60kPa								
4.50	SV 88kPa								
4.70	SV 64kPa								
4.90	SV 60kPa								
5.00-5.45	SPT N=19		2,4/5,4,5,5						
5.00-5.45	B								
					5.45	Complete at 5.45m			

Remarks
Location CAT scanned prior to drilling. Service pit excavated to 1.00m.
Sides stable during drilling. No groundwate during drilling.
Samples below 5.00m based upon retrieved SPT samples.
Monitoring well installed between surface and 4.00m, comprising 1.00m plain pipe, 3.00m slotted pipe with inert 10mm free draining gravel surround and bentonite seal above and below response zone.
Borehole not cased.
SPT energy ratio = 61%.

Scale (approx)	Logged By
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Appendix 6

Coopers Ground Gas Monitoring Results (interim)

Gas Monitor Calibration Certificates

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Project Name: Milton Road, Whalley
Project No. 7583
Prepared by: MW
Checked by: BWH

Date of Production: 21/10/2020

GROUND GAS MONITORING RECORD SUMMARY SHEET

Borehole Reference	Response Depth (m bgl)	Date	Time	Temp (°C)	Gas Analyser	Weather Conditions	CH_4 (peak) (%)	CH_4 (steady) (%)	CO_2 (peak) (%)	CO_2 (steady) (%)	O_2 (min.) (%)	O_2 (steady) (%)	H_2S (peak) (ppm)	CO (peak) (ppm)	Flow (initial) (l/hr)	Flow (steady) (l/hr)	TWL (m bgl)	Atmos. Pressure (mbar)	Remarks
WS01	2.0-4.0	17/09/2020	11:42:00	14	GA5000	Warm, sunny	0	0	0.6	0.6	20.5	**20.5**	**1**	1	0.2	0.2	2.2	1026	
		30/09/2020	12:35:02	9	GA5000	Cold, Raining	0.1	0.1	1.2	1.2	21.2	21.2	**0**	1	0.2	0.4	2.3	996	
WS02	0.8-2.2	17/09/2020	11:59:00	14	GA5000	Warm, sunny	1.1	1.1	3.7	3.7	16.1	16.2	**1**	4	5.3	0.1	1.4	1026	
		30/09/2020	12:50:34	9	GA5000	Cold, Raining	1	1	3.1	3.1	17.5	17.5	**0**	2	0.1	0.3	0.95	997	
WS03	1.0-4.0	17/09/2020	12:17:00	14	GA5000	Warm, sunny	0	0	2.7	2.7	14.3	14.3	**0**	0	0.1	0.2	1.45	1026	
		30/09/2020	13:08:28	9	GA5000	Cold, Raining	0	0	3.1	3	11.7	11.7	**0**	0	4.7	1.8	1.32	995	
WS04	1.0-3.0	17/09/2020	12:36:00	14	GA5000	Warm, sunny	0.7	0.7	8	7.9	1.1	1.1	**0**	1	0	0	1.8	1026	
		30/09/2020	13:26:44	9	GA5000	Cold, Raining	1	1	8	7.9	0.9	0.9	**0**	0	0	0	1.61	996	
WS05	0.5-1.1	17/09/2020	12:54:00	14	GA5000	Warm, sunny	0	0	3	2.9	17.7	17.7	**0**	0	0.1	0.1	0.84	1026	
		30/09/2020	13:43:54	9	GA5000	Cold, Raining	0.1	0.1	4.3	4.1	17.1	17.1	**0**	5	0.1	0.1	0.71	995	
WS06	1.5-4.0	17/09/2020	13:09:00	14	GA5000	Warm, sunny	0	0	4.1	4.1	16.5	16.5	**0**	1	0.1	0.2	3.36	1025	
		30/09/2020	13:58:23	9	GA5000	Cold, Raining	0	0	3.9	3.8	16.9	16.9	**0**	0	0	0.2	3.36	995	
WS07	1.0-4.0	17/09/2020	13:43:00	14	GA5000	Warm, sunny	0	0	2.1	2.1	18	18	0	0	0	0	3.1	1025	
		30/09/2020	14:14:49	9	GA5000	Cold, Raining	0	0	3.7	3.7	13.3	13.3	0	0	0.1	0.2	2.5	995	
WS08	1.0-4.0	17/09/2020	14:01:00	14	GA5000	Warm, sunny	0	0	1	1	20.4	20.4	0	0	0	0	1.43	1025	
		30/09/2020	14:39:57	9	GA5000	Cold, Raining	0	0	0.6	0.6	21.5	21.5	0	0	0	0.1	1.5	995	

Visit Conditions Summary

Visit Date	Temperature	Atmos Pressure	Pressure Trend	Weather
17/09/2020	14	1026	Steady	Warm, sunny
30/09/2020	9	996	Falling	Cold, Raining

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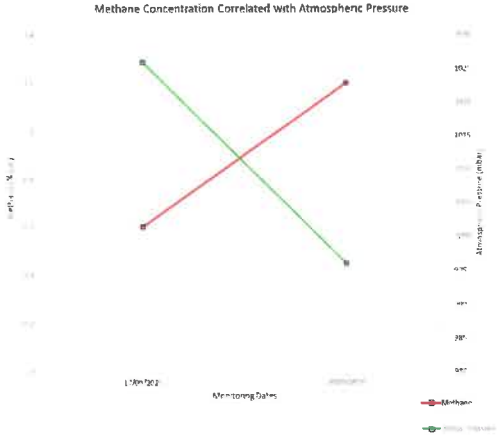
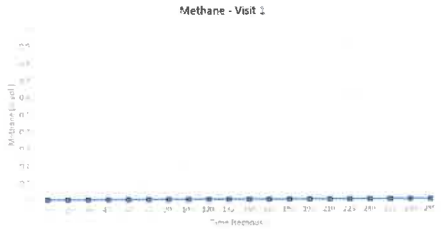
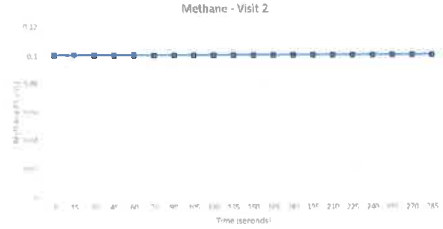
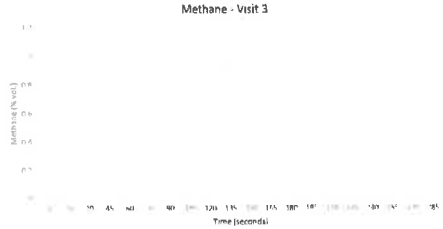
Borehole Summary Data	
Borehole:	WS01
Visits:	2
Peak CH_4:	0.1
Peak CO_2:	1.2
Min O_2:	0.1
Peak Flow:	0.4

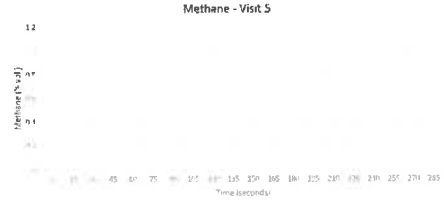
Borehole Risk Classifications	
CH_4 GSV:	0.0004
CO_2 GSV:	0.0048
NHBC GSV Class:	Green
BS8485 GSV Class:	CS1
BS5576 flow change:	5.83
BS5576 % change:	17.50

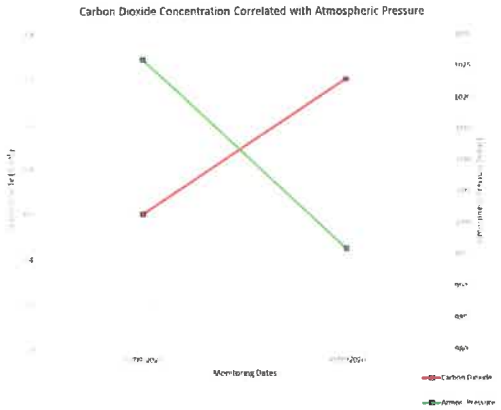


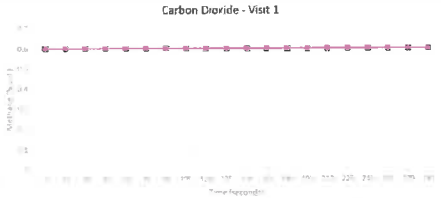


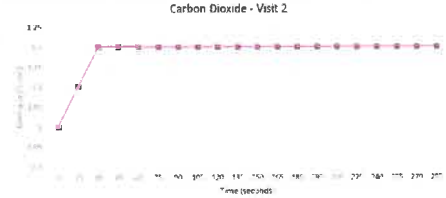


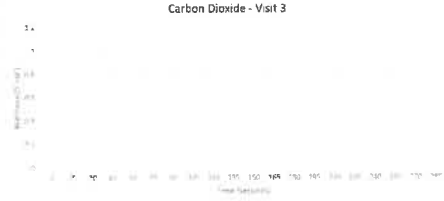


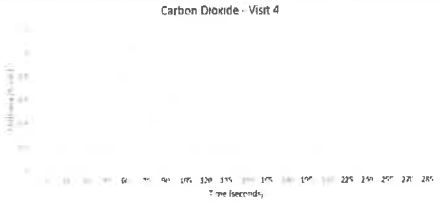


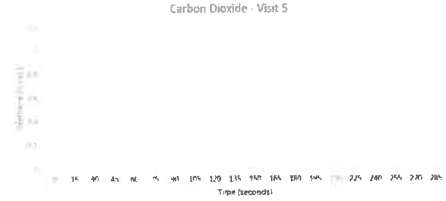


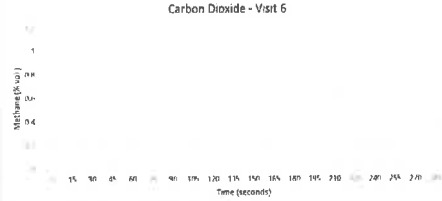












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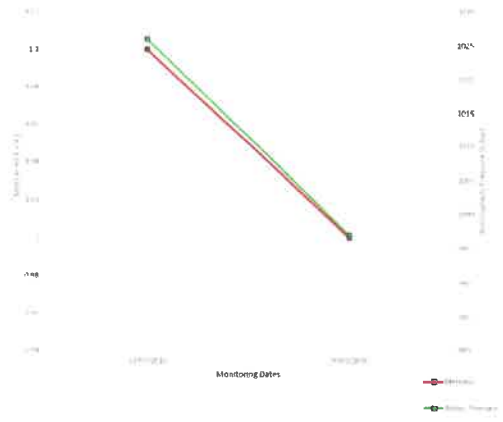
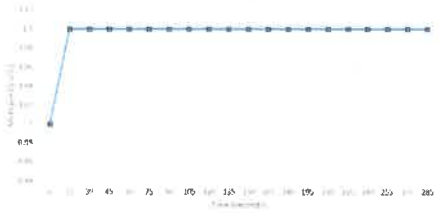
Borehole Summary Data	
Borehole:	WS02
Visits:	2
Peak CH_4:	1.1
Peak CO_2:	3.7
Min O_2:	0.1
Peak Flow:	0.3

Borehole Risk Classifications	
CH_4 GSV:	0.0033
CO_2 GSV:	0.0111
NHBC GSV Class:	Green
BS8485 GSV Class:	CS1
BS8576 flow change:	1.89
BS8576 % change:	23.33

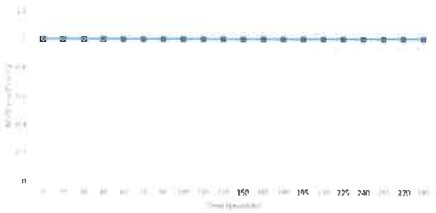
Methane Concentration Correlated with Atmospheric Pressure



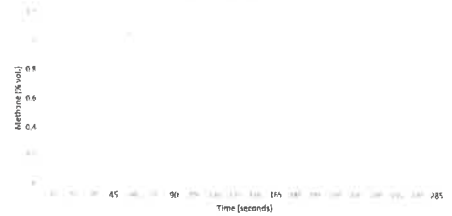
Methane - Visit 1



Methane - Visit 2

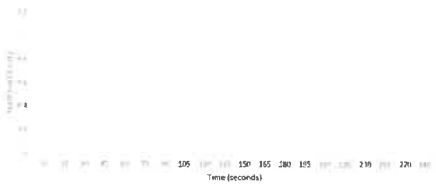


Methane - Visit 3

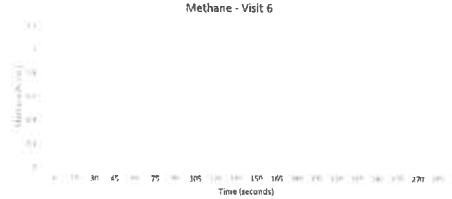


Methane - Visit 4

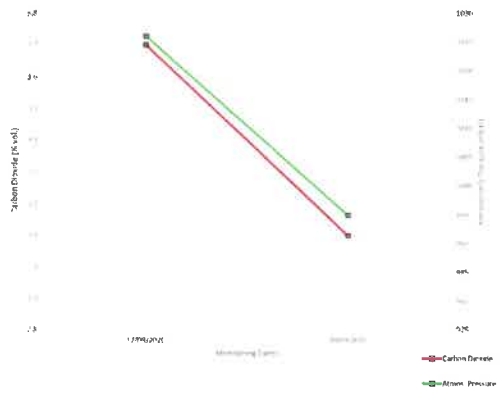
Methane - Visit 5



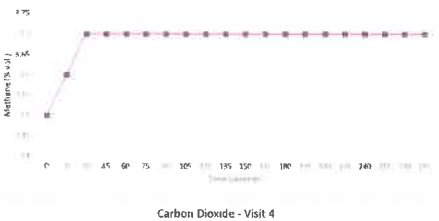
Methane - Visit 6



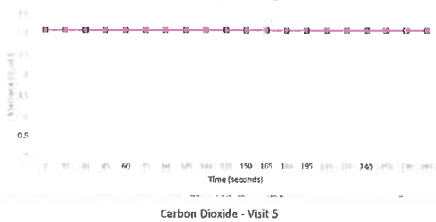
Carbon Dioxide Concentration Correlated with Atmospheric Pressure



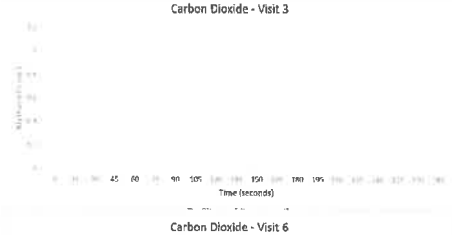
Carbon Dioxide - Visit 1



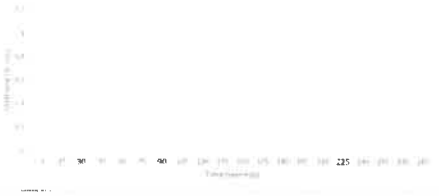
Carbon Dioxide - Visit 2



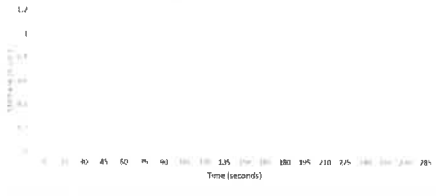
Carbon Dioxide - Visit 3



Carbon Dioxide - Visit 4



Carbon Dioxide - Visit 5



Carbon Dioxide - Visit 6

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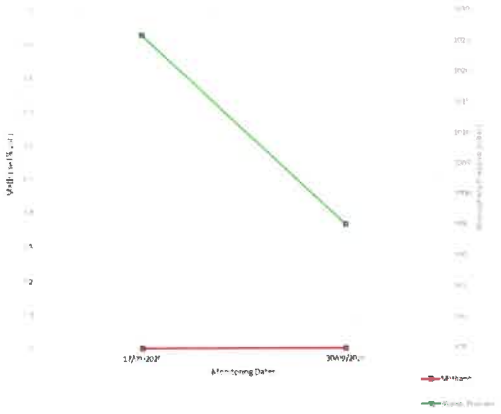
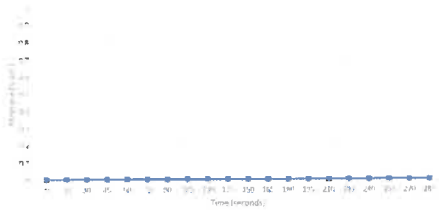
Borehole Summary Data	
Borehole:	WS03
Visits:	2
Peak CH_4:	0.1
Peak CO_2:	3.1
Min O_2:	0.1
Peak Flow:	1.8

Borehole Risk Classifications	
CH_4 GSV:	0.0018
CO_2 GSV:	0.0558
NHBC GSV Class:	Green
BS8485 GSV Class:	CS1
BS8576 flow change:	2.26
BS8576 % change:	3.89

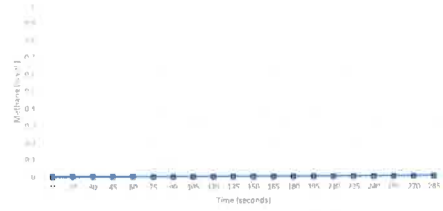
Methane Concentration Correlated with Atmospheric Pressure



Methane - Visit 1



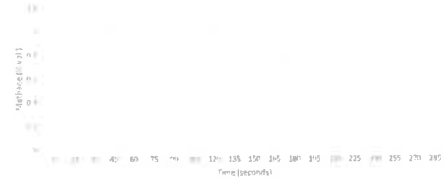
Methane - Visit 2



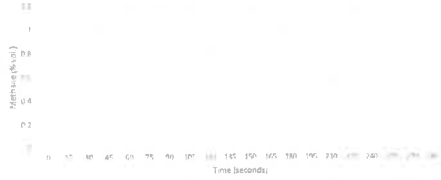
Methane - Visit 3

Methane - Visit 4

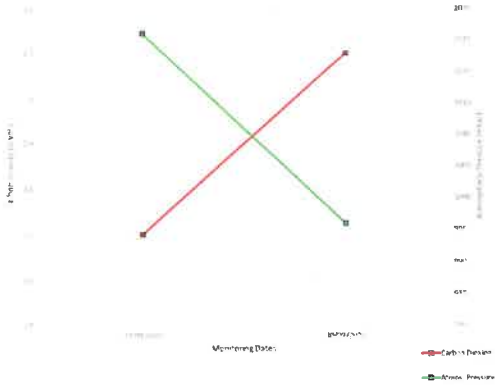
Methane - Visit 5



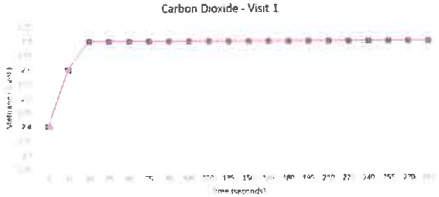
Methane - Visit 6



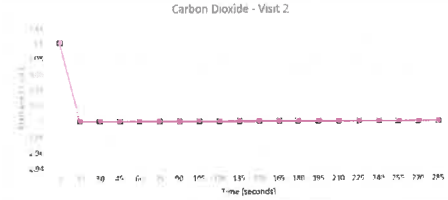
Carbon Dioxide Concentration Correlated with Atmospheric Pressure



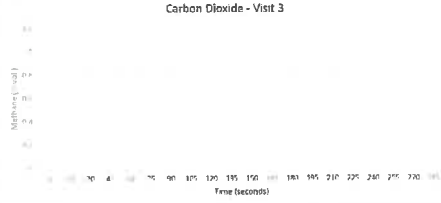
Carbon Dioxide - Visit 1



Carbon Dioxide - Visit 2

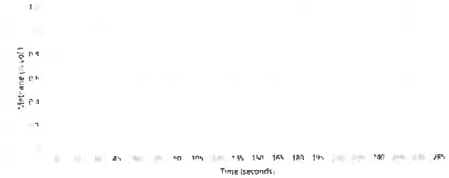


Carbon Dioxide - Visit 3

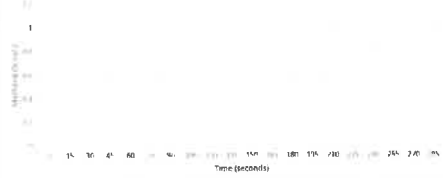


Carbon Dioxide - Visit 4

Carbon Dioxide - Visit 5



Carbon Dioxide - Visit 6



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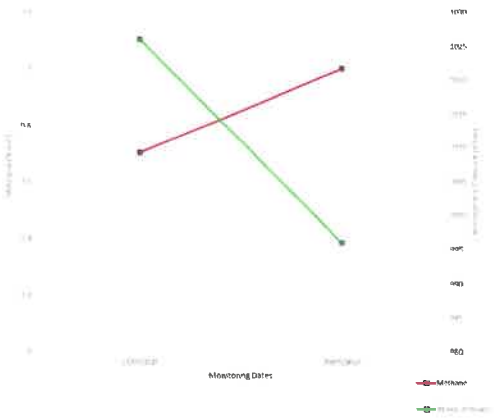
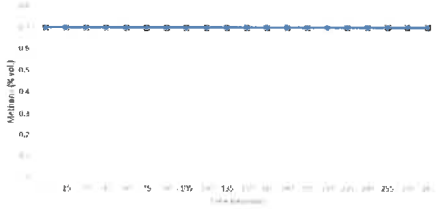
Borehole Summary Data	
Borehole:	WS04
Visits:	2
Peak CH_4:	1
Peak CO_2:	8
Min O_2:	0.1
Peak Flow:	0.1

Borehole Risk Classifications	
CH_4 GSV:	0.001
CO_2 GSV:	0.008
NHBC GSV Class:	Green
BS8485 GSV Class:	CS1
BS8576 flow change:	0.88
BS8576 % change:	70.00

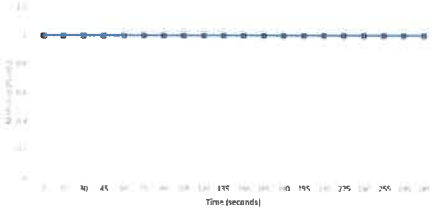
Methane Concentration Correlated with Atmospheric Pressure



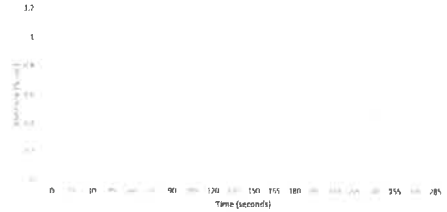
Methane - Visit 1



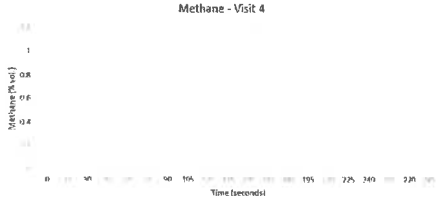
Methane - Visit 2



Methane - Visit 3

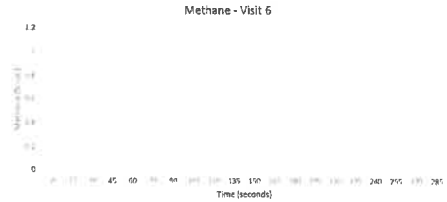


Methane - Visit 4

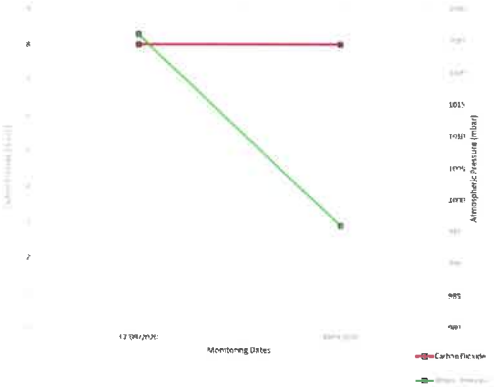


Methane - Visit 5

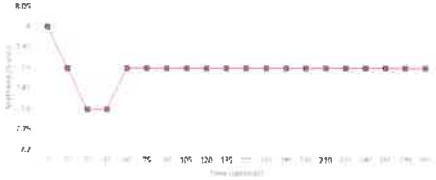
Methane - Visit 6



Carbon Dioxide Concentration Correlated with Atmospheric Pressure



Carbon Dioxide - Visit 1



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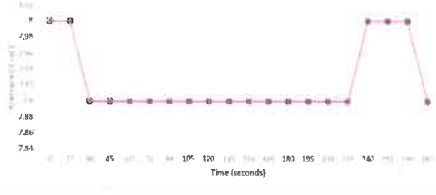
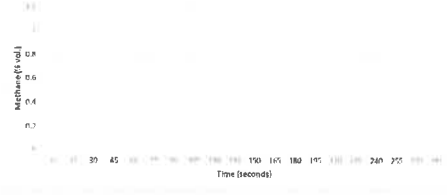
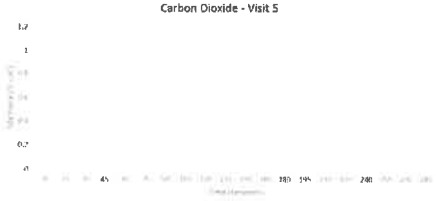


Carbon Dioxide - Visit 3

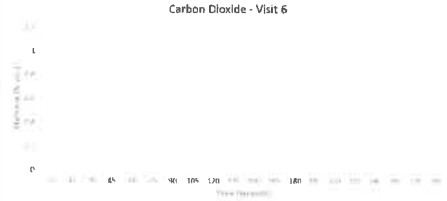


Carbon Dioxide - Visit 4

Carbon Dioxide - Visit 5



Carbon Dioxide - Visit 6



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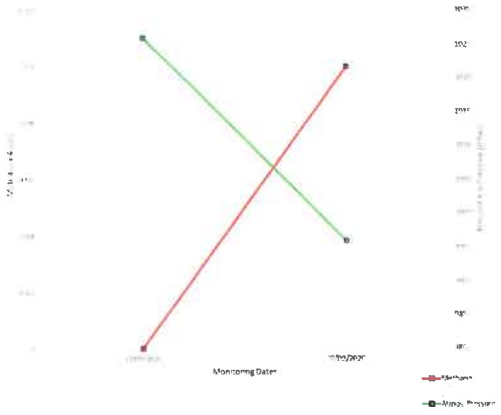
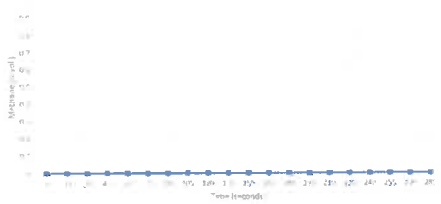
Borehole Summary Data	
Borehole:	WS05
Visits:	2
Peak CH_4:	0.1
Peak CO_2:	4.3
Min O_2:	0.1
Peak Flow:	0.1

Borehole Risk Classifications	
CH_4 GSV:	0.0001
CO_2 GSV:	0.0043
NHBC GSV Class:	Green
BS8485 GSV Class:	CS1
BS8576 flow change:	1.63
BS8576 % change:	70.00

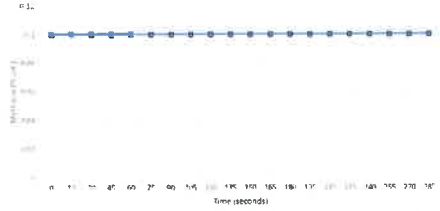
Methane Concentration Correlated with Atmospheric Pressure



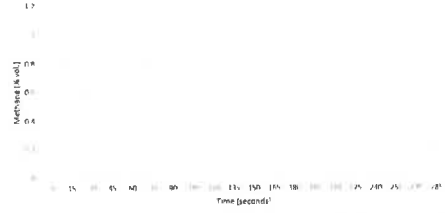
Methane - Visit 1



Methane - Visit 2



Methane - Visit 3

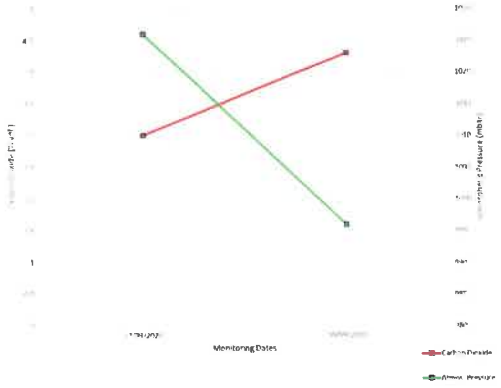


Methane - Visit 4

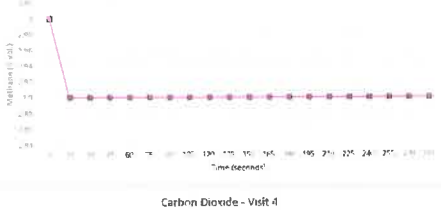
Methane - Visit 5

Methane - Visit 6

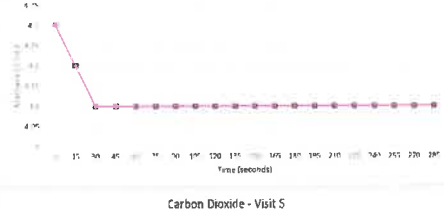
Carbon Dioxide Concentration Correlated with Atmospheric Pressure



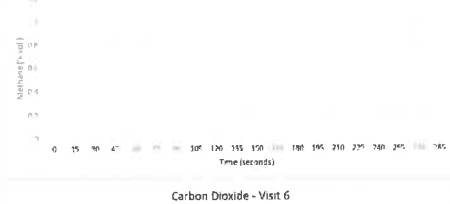
Carbon Dioxide - Visit 1



Carbon Dioxide - Visit 2

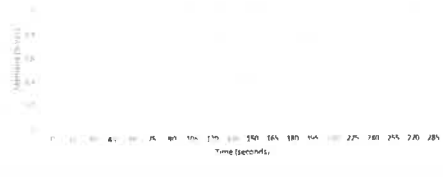


Carbon Dioxide - Visit 3

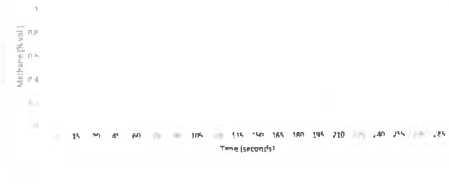


Carbon Dioxide - Visit 4

Carbon Dioxide - Visit 5



Carbon Dioxide - Visit 6



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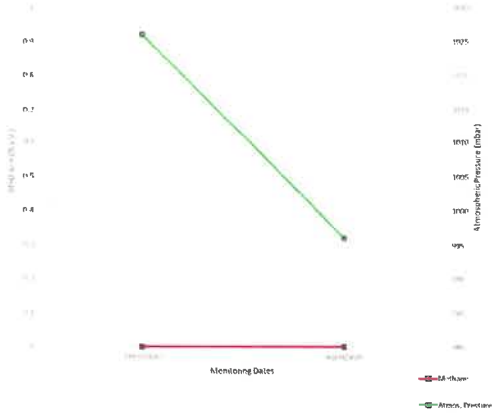
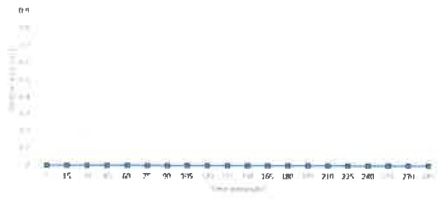
Borehole Summary Data	
Borehole:	WS06
Visits:	2
Peak CH_4:	0.1
Peak CO_2:	4.1
Min O_2:	0.1
Peak Flow:	0.2

Borehole Risk Classifications	
CH_4 GSV:	0.0002
CO_2 GSV:	0.0082
NHBC GSV Class:	Green
BS8485 GSV Class:	CS1
BS8576 flow change:	1.71
BS8576 % change:	35.00

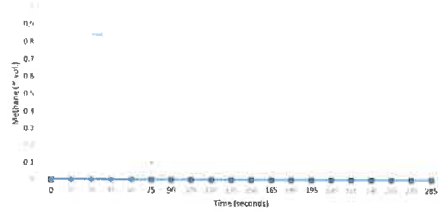
Methane Concentration Correlated with Atmospheric Pressure



Methane - Visit 1



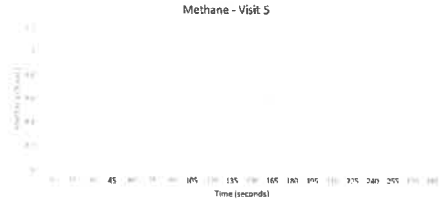
Methane - Visit 2



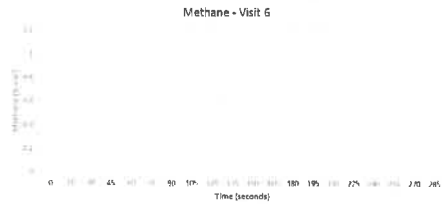
Methane - Visit 3

Methane - Visit 4

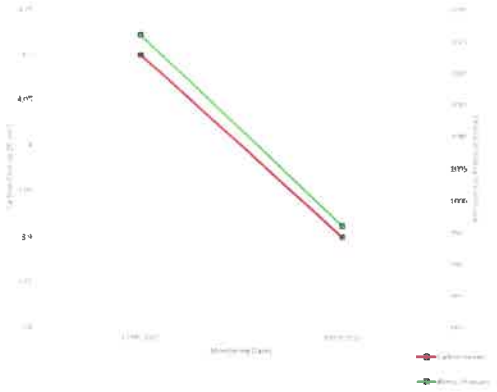
Methane - Visit 5



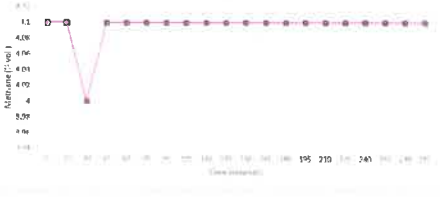
Methane - Visit 6



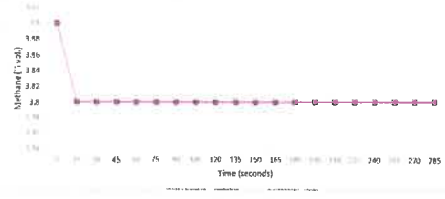
Carbon Dioxide Concentration Correlated with Atmospheric Pressure



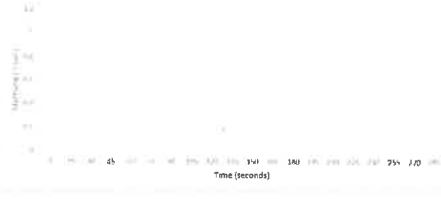
Carbon Dioxide - Visit 1



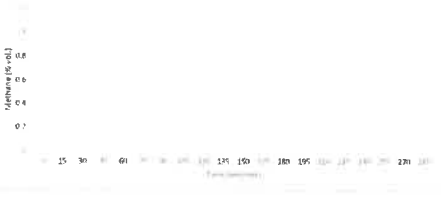
Carbon Dioxide - Visit 2



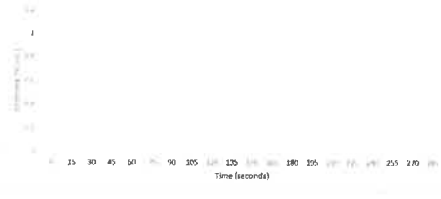
Carbon Dioxide - Visit 3



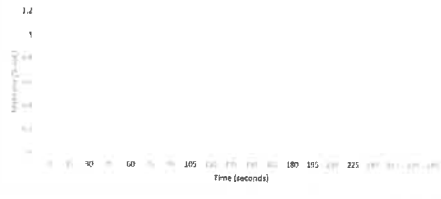
Carbon Dioxide - Visit 4



Carbon Dioxide - Visit 5



Carbon Dioxide - Visit 6



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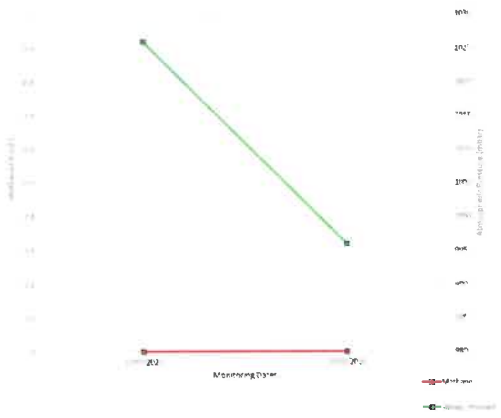
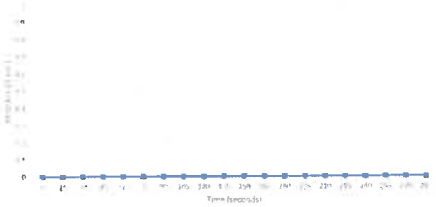
Borehole Summary Data	
Borehole:	WS07
Visits:	2
Peak CH_4:	0.1
Peak CO_2:	3.7
Min O_2:	0.1
Peak Flow:	0.2

Borehole Risk Classifications	
CH_4 GSV:	0.0002
CO_2 GSV:	0.0074
NHBC GSV Class:	Green
BS8485 GSV Class:	CS1
BS8576 flow change:	1.89
BS8576 % change:	35.00

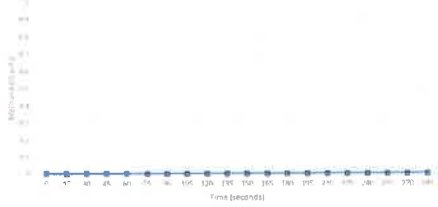
Methane Concentration Correlated with Atmospheric Pressure



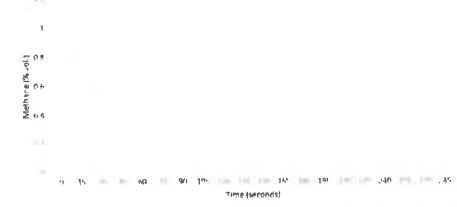
Methane - Visit 1



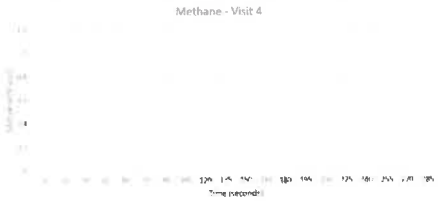
Methane - Visit 2



Methane - Visit 3

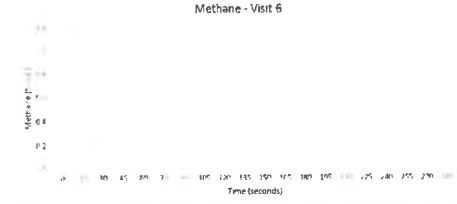


Methane - Visit 4

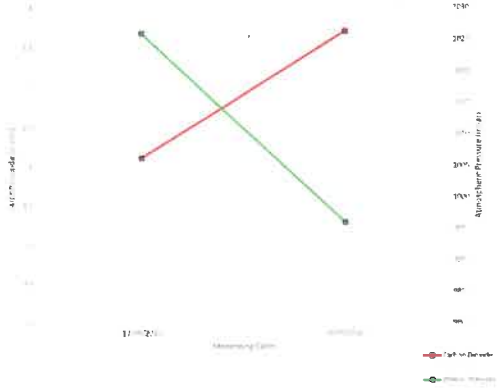


Methane - Visit 5

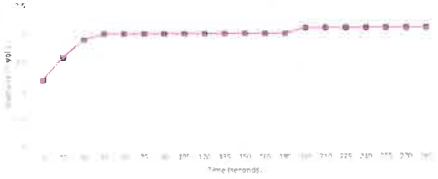
Methane - Visit 6



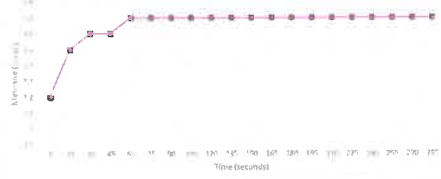
Carbon Dioxide Concentration Correlated with Atmospheric Pressure



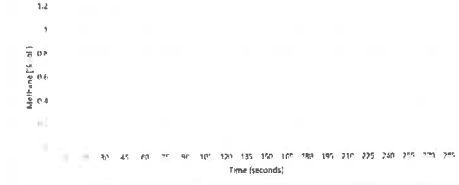
Carbon Dioxide - Visit 1



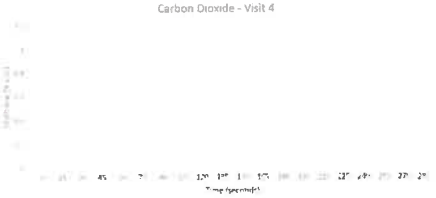
Carbon Dioxide - Visit 2



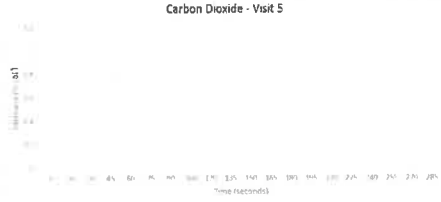
Carbon Dioxide - Visit 3



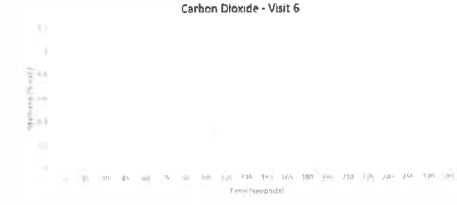
Carbon Dioxide - Visit 4



Carbon Dioxide - Visit 5



Carbon Dioxide - Visit 6



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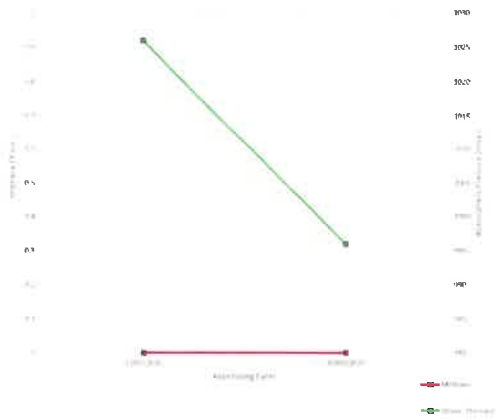
Borehole Summary Data

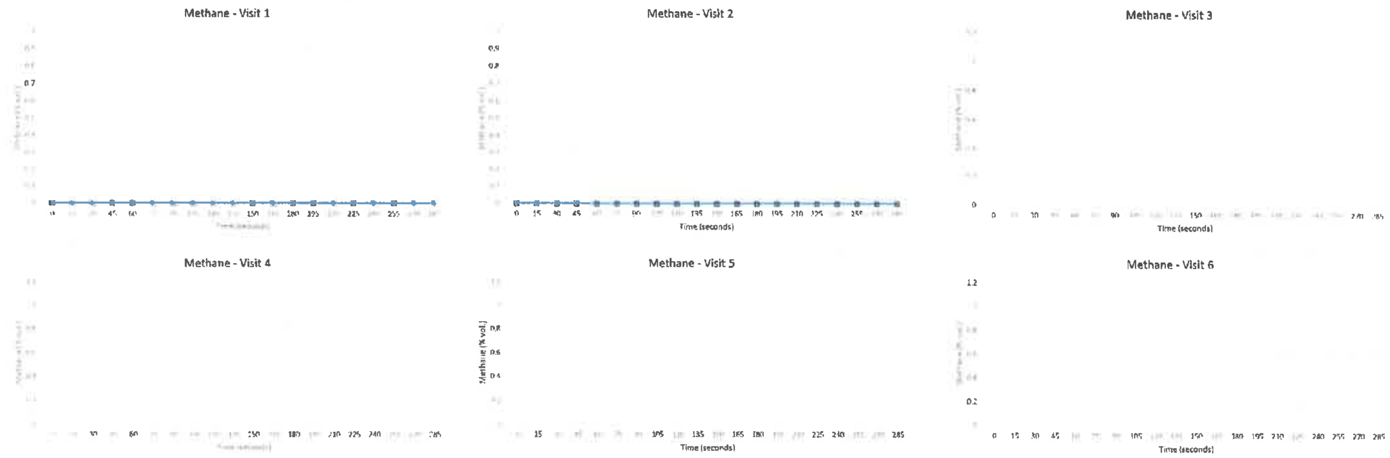
Borehole:	WS08
Visits:	2
Peak CH_4:	0.1
Peak CO_2:	1
Min O_2:	0.1
Peak Flow:	0.1

Borehole Risk Classifications

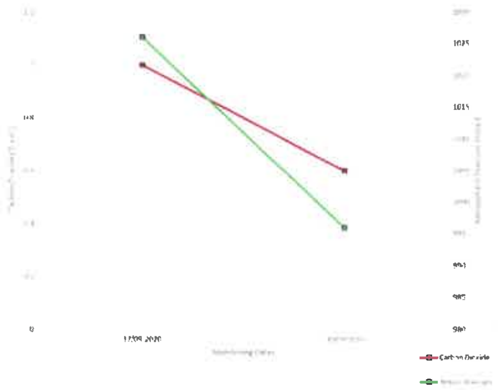
CH_4 GSV:	0.0001
CO_2 GSV:	0.001
NHBC GSV Class:	Green
BS8485 GSV Class:	CS1
BS8576 flow change:	7.00
BS8576 % change:	70.00

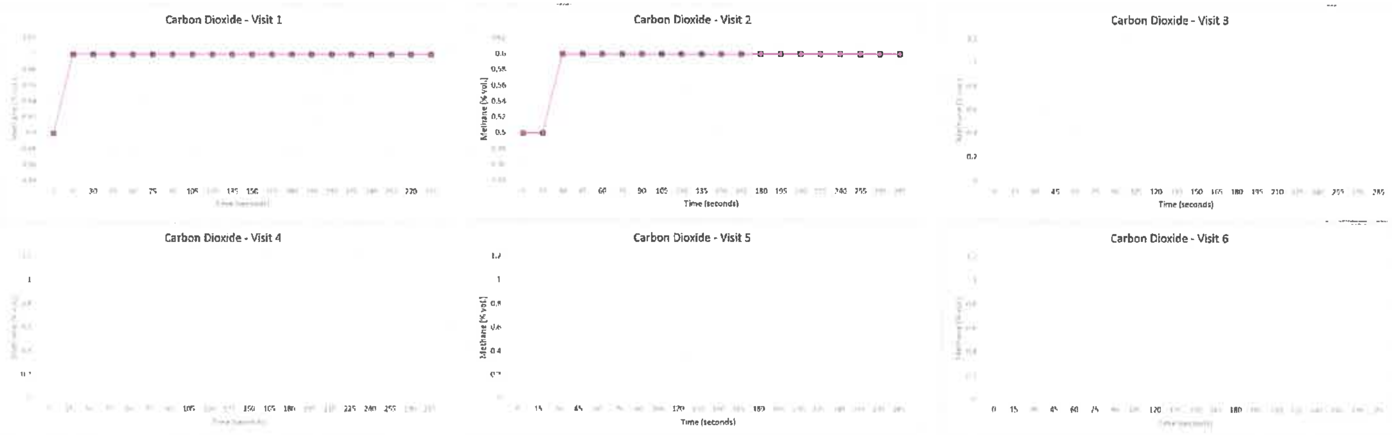
Methane Concentration Correlated with Atmospheric Pressure





Carbon Dioxide Concentration Correlated with Atmospheric Pressure





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CERTIFICATION OF CALIBRATION

4533

Date Of Calibration: 04-Mar-2020 **Certificate Number:** G501314_1/25211

Issued by: QED Environmental Systems Ltd.

Customer: **Coopers**
Park House Sandpiper Court Chester Business Park
CHESTER CH4 9QU UNITED KINGDOM

Description: Gas Analyser

Model: GA5000

Serial Number: G501314

UKAS Accredited results:

Results after adjustment :

Methane (CH_4)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	4.9	0.41
15.0	14.9	0.64
50.0	49.6	0.94

Carbon Dioxide (CO_2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	5.0	0.43
15.0	15.0	0.70
50.0	50.3	1.1

Oxygen (O_2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
21.3	21.4	0.31

The inwards assessment was carried out 24-Feb-2020.
The maximum adjustment was less than the inwards assessment uncertainty.
Inwards assessment data is available if requested.

All concentrations are molar.

CH_4, CO_2 readings recorded at : 30.2 °C ± 2.5 °C

O2 readings recorded at : 21.6 °C ± 2.5 °C

Barometric Pressure : 0998 mbar ± 4 mbar

Method of Test : The analyser is calibrated in a temperature controlled chamber using a series of reference gases, in compliance with procedure LP004.

www.qedenv.com +44 (0) 333 800 0088 sales@qedenv.co.uk

QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

CERTIFICATION OF CALIBRATION

4533

Date Of Calibration: 04-Mar-2020 **Certificate Number:** G501314_1/25211

Issued by: QED Environmental Systems Ltd.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Calibrations marked 'Non-UKAS Accredited results' on this certificate have been included for completeness.

Non-UKAS accredited results after adjustment:

Barometer (mbar)	
Reference	**Instrument Reading**
998	998

Additional Gas Cells		
Gas	**Certified Gas (ppm)**	**Instrument Reading (ppm)**
CO	504	504
H_2S	262	262

Internal Flow	
Applied (l/hr)	**Instrument Reading (l/hr)**
5.00	5.10
10.00	10.20

Date of Issue : 09-Mar-2020 **Approved by Signatory** Laura McBride

Laboratory Inspection

www.qedenv.com +44 (0) 333 800 0088 sales@qedenv.co.uk

QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

SERVICE REPORT

Issued by: QED Environmental Systems Ltd.

Customer Name: Coopers

Model:	GA5000	**Date of Service:**	09-Mar-2020
Part Number:	GA5KB0C0-101	**Service Engineer:**	David Edwards
Serial Number:	G501314	**Calibration Engineer:**	Suk Balrey

Verification / Approved By: Laura McBride **Signature:**

Reason for Return (inc. Customer Comments):

Returned for full service and calibration

Service Comments/Feedback:

Thank you for returning your gas analyser to the Geotech Service Centre for full service and calibration.

We are pleased to inform you that the analyser was received and fully assessed by one of our experienced Service Engineers and no significant faults or issues were observed during the assessment.

Our extensive service was carried out, and any necessary components replaced.

The O2 electrochemical sensor has been replaced due to it being over 3 years old in accordance with the manufacturer's recommendations, and also as a proactive measure based on our experience of the typical lifetime of this type of sensor.

The analyser has successfully passed all of our rigorous testing and quality checks and has been calibrated using our bespoke, state of the art calibration facility.

For further information about how to get the best use from your instrument please visit our YouTube channel http://www.youtube.com/GeotechTV and on our Website http://www.geotechuk.com

If you require any further assistance with your instrument please email our Technical Support Team at technical@geotech.co.uk or call us on +44 1926 338111 (Monday to Thursday 08.30 - 17.00 & Friday 08.30 - 15.30) UK time zone.

Next Service Due: 09-Sep-2020

CERTIFICATION OF CALIBRATION

4533

Date Of Calibration: 18-Sep-2020

Certificate Number: G501314_1/26487

Issued by: QED Environmental Systems Ltd.

Customer: **Coopers**
Park House Sandpiper Court Chester Business Park
CHESTER CH4 9QU UNITED KINGDOM

Description: Gas Analyser

Model: GA5000

Serial Number: G501314

UKAS Accredited results:

Results after adjustment :

Methane (CH_4)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	4.9	0.072
15.0	15.0	0.13
60.0	59.9	0.42

Carbon Dioxide (CO_2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	5.0	0.074
15.0	15.0	0.13
39.9	40.1	0.29

Oxygen (O_2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
21.4	21.5	0.25

The inwards assessment was carried out 14-Sep-2020.
The maximum adjustment is larger than the inwards assessment uncertainty.
Inwards assessment data is available if requested.

All concentrations are molar.

CH_4, CO_2 readings recorded at : 32.6 °C ± 2.5 °C

O2 readings recorded at : 22.8 °C ± 2.5 °C

Barometric Pressure : 1015 mbar ± 4 mbar

Method of Test : The analyser is calibrated in a temperature controlled chamber using a series of reference gases, in compliance with procedure LP004.

Instrument has passed calibration as the measurement result is within the specification limit. The specification limit takes into account the measurement uncertainty.
The results relate only to the item calibrated

www.qedenv.com +44 (0) 333 800 0088 sales@qedenv.co.uk

QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

CERTIFICATION OF CALIBRATION

4533

Date Of Calibration: 18-Sep-2020 **Certificate Number:** G501314_1/26487

Issued by: QED Environmental Systems Ltd.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Calibrations marked 'Non-UKAS Accredited results' on this certificate have been included for completeness.

Non-UKAS accredited results after adjustment:

Barometer (mbar)	
Reference	**Instrument Reading**
1015	1015

Internal Flow	
Applied (l/hr)	**Instrument Reading (l/hr)**
5	4.9
10	10

Date of Issue : 22-Sep-2020 **Approved by Signatory** Michael Holton

Laboratory Inspection

End of Certificate

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QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

SERVICE REPORT

Issued by: QED Environmental Systems Ltd.

Customer Name: Coopers

Model:	GA5000	**Date of Service:**	22-Sep-2020
Part Number:	GA5KB0C0-101	**Service Engineer:**	Ricky Cottrill
Serial Number:	G501314	**Calibration Engineer:**	Suk Balrey

Verification / Approved By: Mike Holton **Signature:**

Service Comments/Feedback:

Thank you for returning your gas analyser to the QED Service Centre for full service and calibration. We are pleased to inform you that the analyser was received and fully assessed by one of our experienced Service Engineers and no significant faults or issues were observed during the assessment. Our extensive service was carried out, and any necessary components replaced. The analyser has successfully passed all of our rigorous testing and quality checks and has been calibrated using our bespoke, state of the art calibration facility.
For further information about how to get the best use from your instrument please visit our YouTube channel http://www.youtube.com/GeotechTV and on our Website https://qedenv.com
We have replaced the battery because it is over 2 years old. This is in accordance to the battery cell manufacturer's recommendation.

If you require any further assistance with your instrument please email our Technical Support Team at technical@qedenv.co.uk or call us on +44 (0) 333 800 0088 (Monday to Thursday 08.30 - 17.00 & Friday 08.30 - 15.30) UK time zone.

Next Service Due: 18-Mar-2021

Appendix 7

Chemical Test Results

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

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F: +44 (0) 1244 833781
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Coopers
Park House
Sandpiper Court
Chester Business Park
Chester
CH4 9QU

Attention :	Matthew Wall
Date :	10th September, 2020
Your reference :	7583 (PO 8778-MW)
Our reference :	Test Report 20/11874 Batch 1
Location :	Mitton Road Whalley
Date samples received :	4th September, 2020
Status :	Final report
Issue :	1

Sixteen samples were received for analysis on 4th September, 2020 of which sixteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Element Materials Technology

Client Name: Coopers
Reference: 7583 (PO 8778-MW)
Location: Mitton Road Whalley
Contact: Matthew Wall
EMT Job No: 20/11874

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30			
Sample ID	WS1	WS2	WS3	WS4	WS4	WS4	WS4	WS5	WS5	WS6			
Depth	0.30	0.50	0.20	0.20	0.60	0.90	3.00-3.40	0.10	0.60	0.20	Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	LOD/LOR	Units	Method No.
Arsenic #	17.6	14.6	15.8	-	10.8	10.0	-	9.4	10.1	13.4	<0.5	mg/kg	TM30/PM15
Barium #	272	283	222	-	169	275	-	152	197	182	<1	mg/kg	TM30/PM15
Beryllium	2.1	1.9	1.6	-	2.0	3.5	-	1.4	2.6	1.9	<0.5	mg/kg	TM30/PM15
Cadmium #	0.8	0.9	0.6	-	0.2	0.7	-	0.4	0.5	0.6	<0.1	mg/kg	TM30/PM15
Chromium #	47.8	43.3	49.6	-	49.8	44.9	-	52.4	42.0	44.4	<0.5	mg/kg	TM30/PM15
Copper #	39	41	63	-	26	97	-	28	40	33	<1	mg/kg	TM30/PM15
Lead #	80	40	90	-	34	24	-	41	27	34	<5	mg/kg	TM30/PM15
Mercury #	0.2	<0.1	0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	mg/kg	TM30/PM15
Nickel #	28.5	51.8	24.3	-	32.5	42.9	-	24.0	33.7	43.3	<0.7	mg/kg	TM30/PM15
Selenium #	2	2	2	-	1	<1	-	<1	1	1	<1	mg/kg	TM30/PM15
Total Sulphate as SO4 BRE	0.08	0.03	0.09	-	0.02	0.03	-	0.03	0.04	0.02	<0.01	%	TM50/PM29
Vanadium	57	43	49	-	49	68	-	30	33	39	<1	mg/kg	TM30/PM15
Water Soluble Boron #	1.1	1.0	2.5	-	1.0	0.2	-	0.7	1.1	1.0	<0.1	mg/kg	TM74/PM32
Zinc #	101	124	100	-	81	149	-	75	83	111	<5	mg/kg	TM30/PM15
Arsenic	-	-	-	22.1	-	-	8.0	-	-	-	<0.5	mg/kg	TM30/PM62
Barium	-	-	-	252	-	-	228	-	-	-	<1	mg/kg	TM30/PM62
Beryllium	-	-	-	1.7	-	-	1.7	-	-	-	<0.5	mg/kg	TM30/PM62
Cadmium	-	-	-	0.8	-	-	1.3	-	-	-	<0.1	mg/kg	TM30/PM62
Chromium	-	-	-	42.7	-	-	40.8	-	-	-	<0.5	mg/kg	TM30/PM62
Copper	-	-	-	40	-	-	39	-	-	-	<1	mg/kg	TM30/PM62
Lead	-	-	-	61	-	-	29	-	-	-	<5	mg/kg	TM30/PM62
Mercury	-	-	-	<0.1	-	-	<0.1	-	-	-	<0.1	mg/kg	TM30/PM62
Nickel	-	-	-	51.3	-	-	48.9	-	-	-	<0.7	mg/kg	TM30/PM62
Selenium	-	-	-	3	-	-	3	-	-	-	<1	mg/kg	TM30/PM62
Total Sulphate as SO4 BRE	-	-	-	0.05	-	-	0.01	-	-	-	<0.01	%	TM50/PM129
Vanadium	-	-	-	50	-	-	43	-	-	-	<1	mg/kg	TM30/PM62
Water Soluble Boron	-	-	-	1.2	-	-	0.6	-	-	-	<0.1	mg/kg	TM74/PM61
Zinc	-	-	-	131	-	-	123	-	-	-	<5	mg/kg	TM30/PM62

Element Materials Technology

Client Name: Coopers
Reference: 7583 (PO 8778-MW)
Location: Mitton Road Whalley
Contact: Matthew Wall
EMT Job No: 20/11874

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	LOD/LOR	Units	Method No.
Sample ID	WS1	WS2	WS3	WS4	WS4	WS4	WS4	WS5	WS5	WS6			
Depth	0.30	0.50	0.20	0.20	0.60	0.90	3.00-3.40	0.10	0.60	0.20			
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020			
PAH MS													
Naphthalene #	<0.04	0.21	<0.04	<0.04	<0.04	0.09	<0.04	0.05	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	0.09	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	0.39	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	0.31	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	2.76	0.06	0.30	0.13	0.18	<0.03	0.13	<0.03	0.10	<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	0.79	<0.04	0.09	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	4.60	0.21	0.89	0.39	0.29	<0.03	0.12	<0.03	0.17	<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	3.85	0.19	0.76	0.34	0.25	<0.03	0.12	<0.03	0.15	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	2.15	0.14	0.45	0.23	0.16	<0.06	0.11	<0.06	0.10	<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	2.32	0.13	0.38	0.18	0.16	<0.02	0.11	<0.02	0.09	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	4.64	0.24	0.82	0.35	0.26	<0.07	0.15	<0.07	0.15	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	2.83	0.14	0.45	0.18	0.16	<0.04	0.07	<0.04	0.06	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	1.92	0.10	0.28	0.12	0.09	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	0.35	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	1.95	0.10	0.28	0.12	0.11	<0.04	<0.04	<0.04	0.05	<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	29.2	1.3	4.7	2.0	1.8	<0.6	0.9	<0.6	0.9	<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	3.34	0.17	0.59	0.25	0.19	<0.05	0.11	<0.05	0.11	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	1.30	0.07	0.23	0.10	0.07	<0.02	0.04	<0.02	0.04	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	109	103	109	107	101	109	99	109	98	95	<0	%	TM4/PM8
TPH CWG													
Aliphatics													
>C5-C6 #	-	-	-	-	-	<0.1 SV	-	-	-	-	<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	-	-	-	-	<0.1 SV	-	-	-	-	<0.1	mg/kg	TM36/PM12
>C8-C10	-	-	-	-	-	<0.1 SV	-	-	-	-	<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	-	-	-	-	<0.2	-	-	-	-	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	-	-	-	-	-	<4	-	-	-	-	<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	-	-	-	-	-	<7	-	-	-	-	<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	-	-	-	-	-	<7	-	-	-	-	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	-	-	-	-	-	<19	-	-	-	-	<19	mg/kg	TM36/PM12/PM8/PM16
Aromatics													
>C5-EC7 #	-	-	-	-	-	<0.1 SV	-	-	-	-	<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	-	-	-	-	<0.1 SV	-	-	-	-	<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	-	-	-	-	<0.1 SV	-	-	-	-	<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	-	-	-	-	<0.2	-	-	-	-	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	-	-	-	-	-	<4	-	-	-	-	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	-	-	-	-	-	<7	-	-	-	-	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	-	-	-	-	-	<7	-	-	-	-	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	-	-	-	-	-	<19	-	-	-	-	<19	mg/kg	TM36/PM12/PM8/PM16
Total aliphatics and aromatics(C5-35)	-	-	-	-	-	<38	-	-	-	-	<38	mg/kg	TM36/PM12/PM8/PM16
MTBE #	-	-	-	-	-	<5 SV	-	-	-	-	<5	ug/kg	TM36/PM12
Benzene #	-	-	-	-	-	11 SV	-	-	-	-	<5	ug/kg	TM36/PM12

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Coopers
Reference: 7583 (PO 8778-MW)
Location: Mitton Road Whalley
Contact: Matthew Wall
EMT Job No: 20/11874

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	LOD/LOR	Units	Method No.
Sample ID	WS1	WS2	WS3	WS4	WS4	WS4	WS4	WS5	WS5	WS6			
Depth	0.30	0.50	0.20	0.20	0.60	0.90	3.00-3.40	0.10	0.60	0.20			
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020			
Toluene #	-	-	-	-	-	<5 SV	-	-	-	-	<5	ug/kg	TM36/PM12
Ethylbenzene #	-	-	-	-	-	<5 SV	-	-	-	-	<5	ug/kg	TM36/PM12
m/p-Xylene #	-	-	-	-	-	<5 SV	-	-	-	-	<5	ug/kg	TM36/PM12
o-Xylene #	-	-	-	-	-	<5 SV	-	-	-	-	<5	ug/kg	TM36/PM12
PCB 77	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 81	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 105	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 114	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 118	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 123	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 126	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 156	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 157	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 167	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 169	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 189	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
Total 12 PCBs	-	-	-	-	-	-	-	-	-	-	<60	ug/kg	TM17/PM8
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	mg/kg	TM26/PM21
Natural Moisture Content	51.4	29.7	60.0	32.6	29.5	31.8	39.8	33.1	37.5	29.0	<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	<0.0015	0.0215	<0.0015	-	0.0253	0.0234	-	0.0017	0.0259	0.0215	<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	-	-	-	0.0176	-	-	0.0094	-	-	-	<0.0015	g/l	TM38/PM60
Chromium III	47.8	43.3	49.6	-	49.8	44.9	-	52.4	42.0	44.4	<0.5	mg/kg	NONE/NONE
Chromium III	-	-	-	42.7	-	-	40.8	-	-	-	<0.5	mg/kg	NONE/NONE
Total Cyanide #	0.8	<0.5	<0.5	0.7	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	5.02	1.63	4.81	NDP	1.96	15.59	NDP	3.66	2.15	1.41	<0.02	%	TM21/PM24
pH #	6.08	7.74	7.91	7.90	7.89	7.51	7.92	8.10	7.87	8.11	<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name: Coopers
Reference: 7583 (PO 8778-MW)
Location: Mitton Road Whalley
Contact: Matthew Wall
EMT Job No: 20/11874

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	31-33	34	35	36-38	39-41	42-44					LOD/LOR	Units	Method No.
Sample ID	WS7	WS8	WS8	HD1	HD1	HD5							
Depth	0.20	0.10	0.50	0.10	0.35	0.10							
COC No / misc													
Containers	V J	B	B	V J	V J	V J							
Sample Date	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020							
Arsenic #	18.7	13.6	13.5	31.0	-	16.8					<0.5	mg/kg	TM30/PM15
Barium #	184	166	188	289	-	161					<1	mg/kg	TM30/PM15
Beryllium	1.7	1.9	2.0	2.4	-	1.5					<0.5	mg/kg	TM30/PM15
Cadmium #	0.7	0.5	0.1	1.0	-	0.4					<0.1	mg/kg	TM30/PM15
Chromium #	50.2	46.8	43.7	63.2	-	48.1					<0.5	mg/kg	TM30/PM15
Copper #	37	40	33	95	-	26					<1	mg/kg	TM30/PM15
Lead #	125	65	31	181	-	54					<5	mg/kg	TM30/PM15
Mercury #	0.1	<0.1	0.1	<0.1	-	<0.1					<0.1	mg/kg	TM30/PM15
Nickel #	27.1	28.4	33.0	40.8	-	24.8					<0.7	mg/kg	TM30/PM15
Selenium #	2	1	1	1	-	2					<1	mg/kg	TM30/PM15
Total Sulphate as SO4 BRE	0.08	0.05	0.02	0.08	-	0.07					<0.01	%	TM50/PM29
Vanadium	50	41	46	58	-	48					<1	mg/kg	TM30/PM15
Water Soluble Boron #	1.7	1.0	0.7	2.6	-	1.7					<0.1	mg/kg	TM74/PM32
Zinc #	133	91	84	209	-	77					<5	mg/kg	TM30/PM15
Arsenic	-	-	-	-	-	-					<0.5	mg/kg	TM30/PM62
Barium	-	-	-	-	-	-					<1	mg/kg	TM30/PM62
Beryllium	-	-	-	-	-	-					<0.5	mg/kg	TM30/PM62
Cadmium	-	-	-	-	-	-					<0.1	mg/kg	TM30/PM62
Chromium	-	-	-	-	-	-					<0.5	mg/kg	TM30/PM62
Copper	-	-	-	-	-	-					<1	mg/kg	TM30/PM62
Lead	-	-	-	-	-	-					<5	mg/kg	TM30/PM62
Mercury	-	-	-	-	-	-					<0.1	mg/kg	TM30/PM62
Nickel	-	-	-	-	-	-					<0.7	mg/kg	TM30/PM62
Selenium	-	-	-	-	-	-					<1	mg/kg	TM30/PM62
Total Sulphate as SO4 BRE	-	-	-	-	-	-					<0.01	%	TM50/PM129
Vanadium	-	-	-	-	-	-					<1	mg/kg	TM30/PM62
Water Soluble Boron	-	-	-	-	-	-					<0.1	mg/kg	TM74/PM61
Zinc	-	-	-	-	-	-					<5	mg/kg	TM30/PM62

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Coopers
Reference: 7583 (PO 8778-MW)
Location: Mitton Road Whalley
Contact: Matthew Wall
EMT Job No: 20/11874

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	31-33	34	35	36-38	39-41	42-44					LOD/LOR	Units	Method No.
Sample ID	WS7	WS8	WS8	HD1	HD1	HD5							
Depth	0.20	0.10	0.50	0.10	0.35	0.10							
COC No / misc													
Containers	V J	B	B	V J	V J	V J							
Sample Date	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020							
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	<0.04	-	<0.04					<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	0.06	-	<0.03					<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	-	<0.05					<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04	-	<0.04					<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.13	0.07	<0.03	0.42	-	<0.03					<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	0.13	-	<0.04					<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.45	0.07	<0.03	1.26	-	<0.03					<0.03	mg/kg	TM4/PM8
Pyrene #	0.38	0.07	<0.03	1.08	-	<0.03					<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.25	<0.06	<0.06	0.56	-	<0.06					<0.06	mg/kg	TM4/PM8
Chrysene #	0.21	0.04	<0.02	0.55	-	<0.02					<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.40	<0.07	<0.07	1.18	-	<0.07					<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.21	<0.04	<0.04	0.60	-	<0.04					<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	0.13	<0.04	<0.04	0.39	-	<0.04					<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	0.07	-	<0.04					<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.14	<0.04	<0.04	0.36	-	<0.04					<0.04	mg/kg	TM4/PM8
PAH 16 Total	2.3	<0.6	<0.6	6.7	-	<0.6					<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.29	<0.05	<0.05	0.85	-	<0.05					<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.11	<0.02	<0.02	0.33	-	<0.02					<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	103	103	105	108	-	97					<0	%	TM4/PM8
TPH CWG													
Aliphatics													
>C5-C6 #	-	-	-	-	-	-					<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	-	-	-	-	-					<0.1	mg/kg	TM36/PM12
>C8-C10	-	-	-	-	-	-					<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	-	-	-	-	-					<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	-	-	-	-	-	-					<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	-	-	-	-	-	-					<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	-	-	-	-	-	-					<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	-	-	-	-	-	-					<19	mg/kg	TM36/PM12/PM8/PM16
Aromatics													
>C5-EC7 #	-	-	-	-	-	-					<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	-	-	-	-	-					<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	-	-	-	-	-					<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	-	-	-	-	-					<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	-	-	-	-	-	-					<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	-	-	-	-	-	-					<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	-	-	-	-	-	-					<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	-	-	-	-	-	-					<19	mg/kg	TM36/PM12/PM8/PM16
Total aliphatics and aromatics(C5-35)	-	-	-	-	-	-					<38	mg/kg	TM36/PM12/PM8/PM16
MTBE #	-	-	-	-	-	-					<5	ug/kg	TM36/PM12
Benzene #	-	-	-	-	-	-					<5	ug/kg	TM36/PM12

Element Materials Technology

Client Name: Coopers
Reference: 7583 (PO 8778-MW)
Location: Mitton Road Whalley
Contact: Matthew Wall
EMT Job No: 20/11874

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	31-33	34	35	36-38	39-41	42-44					LOD/LOR	Units	Method No.
Sample ID	WS7	WS8	WS8	HD1	HD1	HD5							
Depth	0.20	0.10	0.50	0.10	0.35	0.10							
COC No / misc													
Containers	V J	B	B	V J	V J	V J							
Sample Date	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020	02/09/2020							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020	04/09/2020							
Toluene #	-	-	-	-	-	-					<5	ug/kg	TM36/PM12
Ethylbenzene #	-	-	-	-	-	-					<5	ug/kg	TM36/PM12
m/p-Xylene #	-	-	-	-	-	-					<5	ug/kg	TM36/PM12
o-Xylene #	-	-	-	-	-	-					<5	ug/kg	TM36/PM12
PCB 77	-	-	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 81	-	-	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 105	-	-	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 114	-	-	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 118	-	-	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 123	-	-	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 126	-	-	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 156	-	-	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 157	-	-	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 167	-	-	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 169	-	-	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 189	-	-	-	<5	<5	-					<5	ug/kg	TM17/PM8
Total 12 PCBs	-	-	-	<60	<60	-					<60	ug/kg	TM17/PM8
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	-	<0.15					<0.15	mg/kg	TM26/PM21
Natural Moisture Content	59.3	34.5	34.3	43.5	37.7	47.3					<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	-	<0.3					<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0140	0.0042	<0.0015	0.0186	-	0.0297					<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	-	-	-	-	-	-					<0.0015	g/l	TM38/PM60
Chromium III	50.2	46.8	43.7	63.2	-	48.1					<0.5	mg/kg	NONE/NONE
Chromium III	-	-	-	-	-	-					<0.5	mg/kg	NONE/NONE
Total Cyanide #	<0.5	<0.5	<0.5	<0.5	-	<0.5					<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	6.52	3.68	1.05	5.93	-	3.75					<0.02	%	TM21/PM24
pH #	6.15	7.87	7.78	7.33	-	7.73					<0.01	pH units	TM73/PM11

Client Name: Coopers
Reference: 7583 (PO 8778-MW)
Location: Mitton Road Whalley
Contact: Matthew Wall

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11874	1	WS1	0.30	3	07/09/2020	**General Description (Bulk Analysis)**	soil.stones
					07/09/2020	**Asbestos Fibres**	NAD
					07/09/2020	**Asbestos ACM**	NAD
					07/09/2020	**Asbestos Type**	NAD
					07/09/2020	**Asbestos Level Screen**	NAD
20/11874	1	WS2	0.50	6	07/09/2020	**General Description (Bulk Analysis)**	soil.stones
					07/09/2020	**Asbestos Fibres**	NAD
					07/09/2020	**Asbestos ACM**	NAD
					07/09/2020	**Asbestos Type**	NAD
					07/09/2020	**Asbestos Level Screen**	NAD
20/11874	1	WS3	0.20	9	08/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					08/09/2020	**Asbestos Fibres**	NAD
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	NAD
					08/09/2020	**Asbestos Level Screen**	NAD
20/11874	1	WS4	0.20	12	08/09/2020	**General Description (Bulk Analysis)**	soil-stones
					08/09/2020	**Asbestos Fibres**	Fibre Bundles
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	Chrysotile
					08/09/2020	**Asbestos Level Screen**	less than 0.1%
					10/09/2020	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					10/09/2020	**Total Detailed Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					10/09/2020	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	<0.001 (mass %)
					10/09/2020	**Asbestos PCOM Quantification (Fibres)**	<0.001 (mass %)
					10/09/2020	**Asbestos Gravimetric & PCOM Total**	<0.001 (mass %)
20/11874	1	WS4	0.60	15	08/09/2020	**General Description (Bulk Analysis)**	soil-stones
					08/09/2020	**Asbestos Fibres**	NAD
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	NAD
					08/09/2020	**Asbestos Level Screen**	NAD
20/11874	1	WS4	0.90	18	08/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					08/09/2020	**Asbestos Fibres**	NAD
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	NAD

Client Name: Coopers
Reference: 7583 (PO 8778-MW)
Location: Mitton Road Whalley
Contact: Matthew Wall

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11874	1	WS4	0.90	18	08/09/2020	**Asbestos Level Screen**	NAD
20/11874	1	WS4	3.00-3.40	21	08/09/2020	**General Description (Bulk Analysis)**	soil-stones
					08/09/2020	**Asbestos Fibres**	Fibre Bundles
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	Chrysotile
					08/09/2020	**Asbestos Level Screen**	less than 0.1%
					10/09/2020	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					10/09/2020	**Total Detailed Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					10/09/2020	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	<0.001 (mass %)
					10/09/2020	**Asbestos PCOM Quantification (Fibres)**	<0.001 (mass %)
					10/09/2020	**Asbestos Gravimetric & PCOM Total**	<0.001 (mass %)
20/11874	1	WS5	0.10	24	08/09/2020	**General Description (Bulk Analysis)**	soil-stones
					08/09/2020	**Asbestos Fibres**	NAD
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	NAD
					08/09/2020	**Asbestos Level Screen**	NAD
20/11874	1	WS5	0.60	27	08/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					08/09/2020	**Asbestos Fibres**	NAD
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	NAD
					08/09/2020	**Asbestos Level Screen**	NAD
20/11874	1	WS6	0.20	30	08/09/2020	**General Description (Bulk Analysis)**	soil-stones
					08/09/2020	**Asbestos Fibres**	NAD
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	NAD
					08/09/2020	**Asbestos Level Screen**	NAD
20/11874	1	WS7	0.20	33	08/09/2020	**General Description (Bulk Analysis)**	soil-stones
					08/09/2020	**Asbestos Fibres**	NAD
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	NAD
					08/09/2020	**Asbestos Level Screen**	NAD
20/11874	1	WS8	0.10	34	08/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					08/09/2020	**Asbestos Fibres**	NAD
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	NAD
					08/09/2020	**Asbestos Level Screen**	NAD
20/11874	1	HD1	0.10	38	08/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					08/09/2020	**Asbestos Fibres**	NAD
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	NAD
					08/09/2020	**Asbestos Level Screen**	NAD
20/11874	1	HD5	0.10	44	08/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					08/09/2020	**Asbestos Fibres**	NAD
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	NAD

Client Name: Coopers
Reference: 7583 (PO 8778-MW)
Location: Mitton Road Whalley
Contact: Matthew Wall

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11874	1	HD5	0.10	44	08/09/2020	**Asbestos Level Screen**	NAD

Client Name: Coopers
Reference: 7583 (PO 8778-MW)
Location: Mitton Road Whalley
Contact: Matthew Wall

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Method No.	NDP Reason
20/11874	1	WS4	0.20	10-12	TM21/PM24	Asbestos detected in sample
20/11874	1	WS4	3.00-3.40	19-21	TM21/PM24	Asbestos detected in sample

Client Name: Coopers
Reference: 7583 (PO 8778-MW)
Location: Mitton Road Whalley
Contact: Matthew Wall

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/11874						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/11874

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/11874

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes

EMT Job No: 20/11874

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM129	A hot hydrochloric acid digest is performed on an as received sample, and the resulting liquor is analysed.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

EMT Job No: 20/11874

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	Yes
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM61	As received solid samples are extracted with hot water in a 20:1 ratio of water to soil ready for analysis by ICP.			AR	Yes
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
TM131	Quantification of Asbestos Fibres and ACM based on HSG248 First edition:2006, HSG 264 Second edition:2012, HSE Contract Research Report No.83/1996, MDHS 87:1998, WM3 1st Edition v1.1:2018	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	NONE	No Method Code			AR	Yes

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Coopers
Park House
Sandpiper Court
Chester Business Park
Chester
CH4 9QU

Attention :	Ben Hill
Date :	24th September, 2020
Your reference :	7583 (P/O 8783-MW)
Our reference :	Test Report 20/12011 Batch 1
Location :	Mitton Road, Whalley
Date samples received :	8th September, 2020
Status :	Final report
Issue :	2

Eight samples were received for analysis on 8th September, 2020 of which eight were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Element Materials Technology

Client Name: Coopers
Reference: 7583 (P/O 8783-MW)
Location: Mitton Road, Whalley
Contact: Ben Hill
EMT Job No: 20/12011

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1	2	3-5	6-8	9	10	11	12			LOD/LOR	Units	Method No.
Sample ID	TP2	TP7	TP12	TP12	TP2 (DUP 1)	TP2 (DUP 2)	TP2 (DUP 3)	TP2 (DUP 4)					
Depth	0.10	0.15	0.20	1.60	0.10	0.10	0.10	0.10					
COC No / misc													
Containers	B	B	V J	V J	B	B	B	B					
Sample Date	03/09/2020	03/09/2020	03/09/2020	03/09/2020	<>	<>	<>	<>					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020					
Arsenic #	19.8	18.5	20.8	24.5	-	-	-	-			<0.5	mg/kg	TM30/PM15
Barium #	256	192	260	532	-	-	-	-			<1	mg/kg	TM30/PM15
Beryllium	1.7	1.7	2.2	2.3	-	-	-	-			<0.5	mg/kg	TM30/PM15
Cadmium #	0.7	0.6	0.9	<0.1	-	-	-	-			<0.1	mg/kg	TM30/PM15
Chromium #	58.2	51.6	50.5	42.0	-	-	-	-			<0.5	mg/kg	TM30/PM15
Copper #	44	34	66	99	-	-	-	-			<1	mg/kg	TM30/PM15
Lead #	117	85	145	12	-	-	-	-			<5	mg/kg	TM30/PM15
Mercury #	0.2	<0.1	<0.1	<0.1	-	-	-	-			<0.1	mg/kg	TM30/PM15
Nickel #	69.9	35.0	48.5	45.3	40.0	64.9	49.5	43.9			<0.7	mg/kg	TM30/PM15
Selenium #	3	2	1	<1	-	-	-	-			<1	mg/kg	TM30/PM15
Total Sulphate as SO4 BRE	0.14	0.12	0.04	0.05	-	-	-	-			<0.01	%	TM50/PM29
Vanadium	70	58	56	75	-	-	-	-			<1	mg/kg	TM30/PM15
Water Soluble Boron #	1.5	1.8	1.3	0.6	-	-	-	-			<0.1	mg/kg	TM74/PM32
Zinc #	125	128	164	29	-	-	-	-			<5	mg/kg	TM30/PM15
Nickel - HNO3 extract	68	-	-	-	-	-	-	-			<1	mg/kg	TM030S
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	0.25	-	-	-	-			<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	-	-	-	-			<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	0.23	-	-	-	-			<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	0.16	-	-	-	-			<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.28	0.07	0.45	1.92	-	-	-	-			<0.03	mg/kg	TM4/PM8
Anthracene #	0.08	<0.04	0.10	0.37	-	-	-	-			<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.38	0.17	1.25	1.89	-	-	-	-			<0.03	mg/kg	TM4/PM8
Pyrene #	0.32	0.13	1.11	1.58	-	-	-	-			<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.25	0.12	0.61	0.76	-	-	-	-			<0.06	mg/kg	TM4/PM8
Chrysene #	0.19	0.07	0.75	0.79	-	-	-	-			<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.30	0.13	1.41	1.14	-	-	-	-			<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.17	<0.04	0.85	0.72	-	-	-	-			<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	0.11	<0.04	0.49	0.34	-	-	-	-			<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	0.07	<0.04	-	-	-	-			<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.09	<0.04	0.45	0.34	-	-	-	-			<0.04	mg/kg	TM4/PM8
PAH 16 Total	2.2	0.7	7.5	10.5	-	-	-	-			<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.22	0.09	1.02	0.82	-	-	-	-			<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.08	0.04	0.39	0.32	-	-	-	-			<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	114	107	104	104	-	-	-	-			<0	%	TM4/PM8

Please see attached notes for all abbreviations and acronyms

All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name: Coopers
Reference: 7583 (P/O 8783-MW)
Location: Mitton Road, Whalley
Contact: Ben Hill
EMT Job No: 20/12011

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1	2	3-5	6-8	9	10	11	12			LOD/LOR	Units	Method No.
Sample ID	TP2	TP7	TP12	TP12	TP2 (DUP 1)	TP2 (DUP 2)	TP2 (DUP 3)	TP2 (DUP 4)					
Depth	0.10	0.15	0.20	1.60	0.10	0.10	0.10	0.10					
COC No / misc													
Containers	B	B	V J	V J	B	B	B	B					
Sample Date	03/09/2020	03/09/2020	03/09/2020	03/09/2020	<>	<>	<>	<>					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020					
TPH CWG													
Aliphatics													
>C5-C6 #	-	-	-	<0.1	-	-	-	-			<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	-	-	<0.1	-	-	-	-			<0.1	mg/kg	TM36/PM12
>C8-C10	-	-	-	<0.1	-	-	-	-			<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	-	-	<0.2	-	-	-	-			<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	-	-	-	<4	-	-	-	-			<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	-	-	-	<7	-	-	-	-			<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	-	-	-	<7	-	-	-	-			<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	-	-	-	<19	-	-	-	-			<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 #	-	-	-	<0.1	-	-	-	-			<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	-	-	<0.1	-	-	-	-			<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	-	-	<0.1	-	-	-	-			<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	-	-	<0.2	-	-	-	-			<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	-	-	-	19	-	-	-	-			<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	-	-	-	53	-	-	-	-			<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	-	-	-	88	-	-	-	-			<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	-	-	-	160	-	-	-	-			<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35)	-	-	-	160	-	-	-	-			<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	-	-	-	<5	-	-	-	-			<5	ug/kg	TM36/PM12
Benzene #	-	-	-	<5	-	-	-	-			<5	ug/kg	TM36/PM12
Toluene #	-	-	-	<5	-	-	-	-			<5	ug/kg	TM36/PM12
Ethylbenzene #	-	-	-	<5	-	-	-	-			<5	ug/kg	TM36/PM12
m/p-Xylene #	-	-	-	<5	-	-	-	-			<5	ug/kg	TM36/PM12
o-Xylene #	-	-	-	<5	-	-	-	-			<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	-	-	-	-			<0.15	mg/kg	TM26/PM21
Natural Moisture Content	89.0	65.0	44.1	46.7	-	-	-	-			<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	-	-	-	-			<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0096	0.0092	0.0267	0.0584	-	-	-	-			<0.0015	g/l	TM38/PM20
Chromium III	58.2	51.6	50.5	42.0	-	-	-	-			<0.5	mg/kg	NONE/NONE
Total Cyanide #	<0.5	<0.5	<0.5	<0.5	-	-	-	-			<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	7.62	4.87	6.21	14.02	-	-	-	-			<0.02	%	TM21/PM24
pH #	5.87	5.92	7.67	7.16	-	-	-	-			<0.01	pH units	TM73/PM11

All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name: Coopers
Reference: 7583 (P/O 8783-MW)
Location: Mitton Road, Whalley
Contact: Ben Hill
EMT Job No: 20/12011

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1												
Sample ID	TP2												
Depth	0.10												
COC No / misc													
Containers	B												
Sample Date	03/09/2020												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	08/09/2020												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Dissolved Nickel #	9										<2	ug/l	TM30/PM14

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Coopers
Reference: 7583 (P/O 8783-MW)
Location: Mitton Road, Whalley
Contact: Ben Hill

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/12011	1	TP2	0.10	1	09/09/2020	**General Description (Bulk Analysis)**	soil.stones
					09/09/2020	**Asbestos Fibres**	NAD
					09/09/2020	**Asbestos ACM**	NAD
					09/09/2020	**Asbestos Type**	NAD
					09/09/2020	**Asbestos Level Screen**	NAD
20/12011	1	TP7	0.15	2	09/09/2020	**General Description (Bulk Analysis)**	soil/stones
					09/09/2020	**Asbestos Fibres**	NAD
					09/09/2020	**Asbestos ACM**	NAD
					09/09/2020	**Asbestos Type**	NAD
					09/09/2020	**Asbestos Level Screen**	NAD
20/12011	1	TP12	0.20	5	10/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					10/09/2020	**Asbestos Fibres**	NAD
					10/09/2020	**Asbestos ACM**	NAD
					10/09/2020	**Asbestos Type**	NAD
					10/09/2020	**Asbestos Level Screen**	NAD
20/12011	1	TP12	1.60	8	09/09/2020	**General Description (Bulk Analysis)**	soil.stones
					09/09/2020	**Asbestos Fibres**	NAD
					09/09/2020	**Asbestos ACM**	NAD
					09/09/2020	**Asbestos Type**	NAD
					09/09/2020	**Asbestos Level Screen**	NAD

Element Materials Technology

Notification of Deviating Samples

Client Name: Coopers
Reference: 7583 (P/O 8783-MW)
Location: Mitton Road, Whalley
Contact: Ben Hill

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
20/12011	1	TP2 (DUP 1)	0.10	9	All analyses	No sampling date given
20/12011	1	TP2 (DUP 2)	0.10	10	All analyses	No sampling date given
20/12011	1	TP2 (DUP 3)	0.10	11	All analyses	No sampling date given
20/12011	1	TP2 (DUP 4)	0.10	12	All analyses	No sampling date given

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/12011

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/12011

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes		AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes

EMT Job No: 20/12011

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	Yes
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes

EMT Job No: 20/12011

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	

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Coopers
Park House
Sandpiper Court
Chester Business Park
Chester
CH4 9QU

Attention :	Ben Hill
Date :	30th September, 2020
Your reference :	7583 (P/O 8795 - MW)
Our reference :	Test Report 20/12889 Batch 1
Location :	Mitton Road Whalley
Date samples received :	22nd September, 2020
Status :	Final report
Issue :	1

Seven samples were received for analysis on 22nd September, 2020 of which seven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Element Materials Technology

Client Name: Coopers
Reference: 7583 (P/O 8795 - MW)
Location: Mitton Road Whalley
Contact: Ben Hill
EMT Job No: 20/12889

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21					
Sample ID	HD8	HD9	HD10	HD10	HD13	HD14	HD15					
Depth	0.05	0.10	0.10	0.50	0.10	0.35	0.10					
COC No / misc												
Containers	V J	V J	V J	V J	V J	V J	V J					
Sample Date	17/09/2020	17/09/2020	17/09/2020	17/09/2020	17/09/2020	17/09/2020	17/09/2020					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	1	1	1	1	1					
Date of Receipt	22/09/2020	22/09/2020	22/09/2020	22/09/2020	22/09/2020	22/09/2020	22/09/2020					

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Arsenic #	65.3	64.3	-	-	30.6	23.5	53.1				<0.5	mg/kg	TM30/PM15
Barium #	451	429	-	-	389	154	418				<1	mg/kg	TM30/PM15
Beryllium	3.3	3.2	-	-	2.4	1.1	3.3				<0.5	mg/kg	TM30/PM15
Cadmium #	0.8	1.1	-	-	0.8	0.8	0.9				<0.1	mg/kg	TM30/PM15
Chromium #	86.1	65.1	-	-	66.1	33.4	60.3				<0.5	mg/kg	TM30/PM15
Copper #	113	122	-	-	78	34	119				<1	mg/kg	TM30/PM15
Lead #	208	294	-	-	305	58	443				<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	-	-	<0.1	<0.1	1.2				<0.1	mg/kg	TM30/PM15
Nickel #	52.8	60.3	-	-	51.9	17.5	47.9				<0.7	mg/kg	TM30/PM15
Selenium #	3	3	-	-	2	<1	2				<1	mg/kg	TM30/PM15
Total Sulphate as SO4 BRE	0.08	0.08	-	-	0.06	0.09	0.06				<0.01	%	TM50/PM29
Vanadium	84	87	-	-	166	29	95				<1	mg/kg	TM30/PM15
Water Soluble Boron #	2.2	1.6	-	-	1.6	0.6	2.0				<0.1	mg/kg	TM74/PM32
Zinc #	273	404	-	-	200	117	321				<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	0.09	0.15	-	-	0.17	0.12	0.11				<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.07	0.44	-	-	0.98	0.08	0.29				<0.03	mg/kg	TM4/PM8
Acenaphthene #	0.36	0.17	-	-	0.22	0.12	0.24				<0.05	mg/kg	TM4/PM8
Fluorene #	0.24	0.14	-	-	0.24	0.09	0.18				<0.04	mg/kg	TM4/PM8
Phenanthrene #	2.17	2.42	-	-	3.69	1.28	3.62				<0.03	mg/kg	TM4/PM8
Anthracene #	0.60	0.88	-	-	2.08	0.38	1.33				<0.04	mg/kg	TM4/PM8
Fluoranthene #	2.86	8.92	-	-	12.04	2.89	14.00				<0.03	mg/kg	TM4/PM8
Pyrene #	2.44	7.91	-	-	10.51	2.43	11.38				<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	1.48	4.85	-	-	6.76	1.39	6.93				<0.06	mg/kg	TM4/PM8
Chrysene #	1.44	5.08	-	-	6.93	1.56	6.21				<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	2.20	9.61	-	-	11.85	2.63	10.41				<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	1.24	5.14	-	-	6.65	1.49	5.77				<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	0.78	3.49	-	-	4.33	0.96	3.76				<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	0.18	0.65	-	-	0.82	0.18	0.68				<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.73	3.63	-	-	4.37	1.03	3.68				<0.04	mg/kg	TM4/PM8
PAH 16 Total	16.9	53.5	-	-	71.6	16.6	68.6				<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	1.58	6.92	-	-	8.53	1.89	7.50				<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.62	2.69	-	-	3.32	0.74	2.91				<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	107	106	-	-	98	109	102				<0	%	TM4/PM8
PCB 77	-	-	<5	<5	-	-	-				<5	ug/kg	TM17/PM8
PCB 81	-	-	<5	<5	-	-	-				<5	ug/kg	TM17/PM8
PCB 105	-	-	<5	<5	-	-	-				<5	ug/kg	TM17/PM8
PCB 114	-	-	<5	<5	-	-	-				<5	ug/kg	TM17/PM8
PCB 118	-	-	<5	<5	-	-	-				<5	ug/kg	TM17/PM8
PCB 123	-	-	<5	<5	-	-	-				<5	ug/kg	TM17/PM8
PCB 126	-	-	<5	<5	-	-	-				<5	ug/kg	TM17/PM8
PCB 156	-	-	<5	<5	-	-	-				<5	ug/kg	TM17/PM8

All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name: Coopers
Reference: 7583 (P/O 8795 - MW)
Location: Mitton Road Whalley
Contact: Ben Hill
EMT Job No: 20/12889

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21				LOD/LOR	Units	Method No.
Sample ID	HD8	HD9	HD10	HD10	HD13	HD14	HD15						
Depth	0.05	0.10	0.10	0.50	0.10	0.35	0.10						
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J						
Sample Date	17/09/2020	17/09/2020	17/09/2020	17/09/2020	17/09/2020	17/09/2020	17/09/2020						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1						
Date of Receipt	22/09/2020	22/09/2020	22/09/2020	22/09/2020	22/09/2020	22/09/2020	22/09/2020						
PCB 157	-	-	<5	<5	-	-	-				<5	ug/kg	TM17/PM8
PCB 167	-	-	<5	<5	-	-	-				<5	ug/kg	TM17/PM8
PCB 169	-	-	<5	<5	-	-	-				<5	ug/kg	TM17/PM8
PCB 189	-	-	<5	<5	-	-	-				<5	ug/kg	TM17/PM8
Total 12 PCBs	-	-	<60	<60	-	-	-				<60	ug/kg	TM17/PM8
Total Phenols HPLC	<0.15	<0.15	-	-	<0.15	<0.15	<0.15				<0.15	mg/kg	TM26/PM21
Natural Moisture Content	49.9	38.1	51.1	25.9	57.6	30.9	38.3				<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	-	-	<0.3	<0.3	<0.3				<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0221	0.0155	-	-	0.0344	0.0426	0.0092				<0.0015	g/l	TM38/PM20
Chromium III	86.1	65.1	-	-	66.1	33.4	60.3				<0.5	mg/kg	NONE/NONE
Total Cyanide #	<0.5	1.0	-	-	<0.5	<0.5	<0.5				<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	6.06	6.40	-	-	7.05	3.64	8.33				<0.02	%	TM21/PM24
pH #	7.01	7.71	-	-	7.55	8.12	7.72				<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Coopers
Reference: 7583 (P/O 8795 - MW)
Location: Mitton Road Whalley
Contact: Ben Hill

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/12889	1	HD8	0.05	3	28/09/2020	**General Description (Bulk Analysis)**	soil-stones
					28/09/2020	**Asbestos Fibres**	NAD
					28/09/2020	**Asbestos ACM**	NAD
					28/09/2020	**Asbestos Type**	NAD
					28/09/2020	**Asbestos Level Screen**	NAD
20/12889	1	HD9	0.10	6	28/09/2020	**General Description (Bulk Analysis)**	soil-stones
					28/09/2020	**Asbestos Fibres**	NAD
					28/09/2020	**Asbestos ACM**	NAD
					28/09/2020	**Asbestos Type**	NAD
					28/09/2020	**Asbestos Level Screen**	NAD
20/12889	1	HD13	0.10	15	28/09/2020	**General Description (Bulk Analysis)**	soil-stones
					28/09/2020	**Asbestos Fibres**	NAD
					28/09/2020	**Asbestos ACM**	NAD
					28/09/2020	**Asbestos Type**	NAD
					28/09/2020	**Asbestos Level Screen**	NAD
20/12889	1	HD14	0.35	18	28/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					28/09/2020	**Asbestos Fibres**	NAD
					28/09/2020	**Asbestos ACM**	NAD
					28/09/2020	**Asbestos Type**	NAD
					28/09/2020	**Asbestos Level Screen**	NAD
20/12889	1	HD15	0.10	21	28/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					28/09/2020	**Asbestos Fibres**	NAD
					28/09/2020	**Asbestos ACM**	NAD
					28/09/2020	**Asbestos Type**	NAD
					28/09/2020	**Asbestos Level Screen**	NAD

Element Materials Technology

Notification of Deviating Samples

Client Name: Coopers
Reference: 7583 (P/O 8795 - MW)
Location: Mitton Road Whalley
Contact: Ben Hill

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/12889						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/12889

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/12889

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes

EMT Job No: 20/12889

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	Yes
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes

Appendix 8

Geotechnical Test Results

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client	Coopers (Chester) Ltd
Address	Park House Sandpiper Court Chester Business Park Chester CH4 9QU
Contract	7583 – Mitton Road, Whalley
Purchase Order	8784 – MW
Job Number	MRN 3776/25
Date of Issue	01 October 2020
Page	**1 of 8**

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted. This does not, however, guarantee the balance of the materials from which the tested samples have been taken to be of equal quality.

MURRAY RIX
ANDREW HOUSE, HADFIELD STREET
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.5: 1990

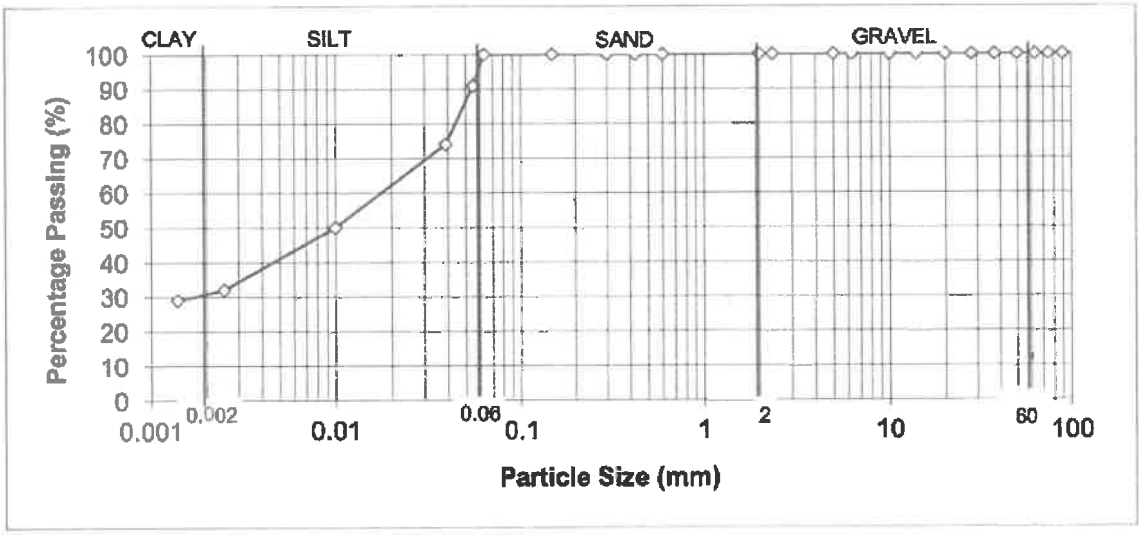
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Coopers (Chester) Ltd
SITE	7583 - Mitton Road, Whalley
JOB NUMBER	MRN 3776/25

SAMPLE LABEL	TP2 2.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92320	DATE RECEIVED	11-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff grey brown silty CLAY
ADVISED SOURCE	Site Won

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2.36	100	
90	100		2	100	
75	100		0.6	100	
63	100		0.425	100	
50	100		0.3	100	
37.5	100		0.15	100	
28	100		0.063	100	
20	100		0.055	91	
14	100		0.039	74	
10	100		0.01	50	
6.3	100		0.0025	32	
5	100		0.0014	29	



REMARKS
As received moisture content = 28%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 01-Oct-20

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1680

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

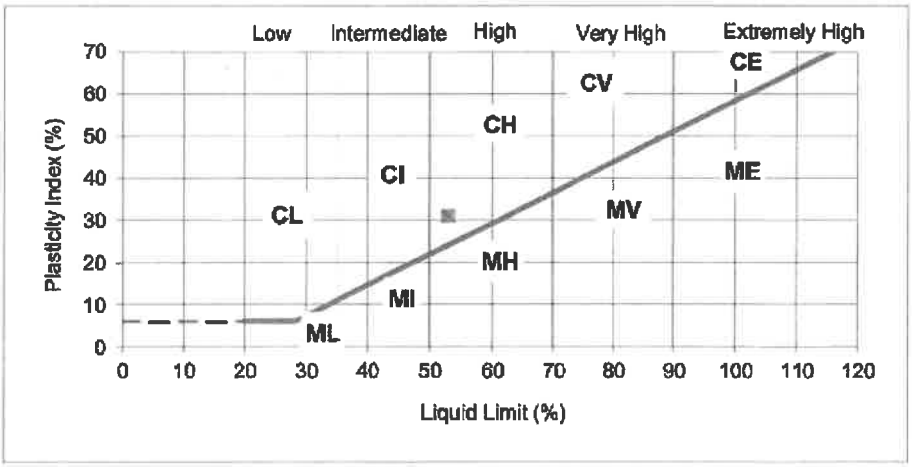
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Coopers (Chester) Ltd
SITE	7583 - Milton Road, Whalley
JOB NUMBER	MRN 3776/25

SAMPLE LABEL	TP2 0.5	DATE SAMPLED	Not advised
SAMPLE No.	92321	DATE RECEIVED	11-Sep-20
DATE TESTED	17-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff grey brown silty CLAY
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
27	53	22	31	100



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons) DATE 01-Oct-20
(Laboratory Manager)

MURRAY RIX
ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.5: 1990

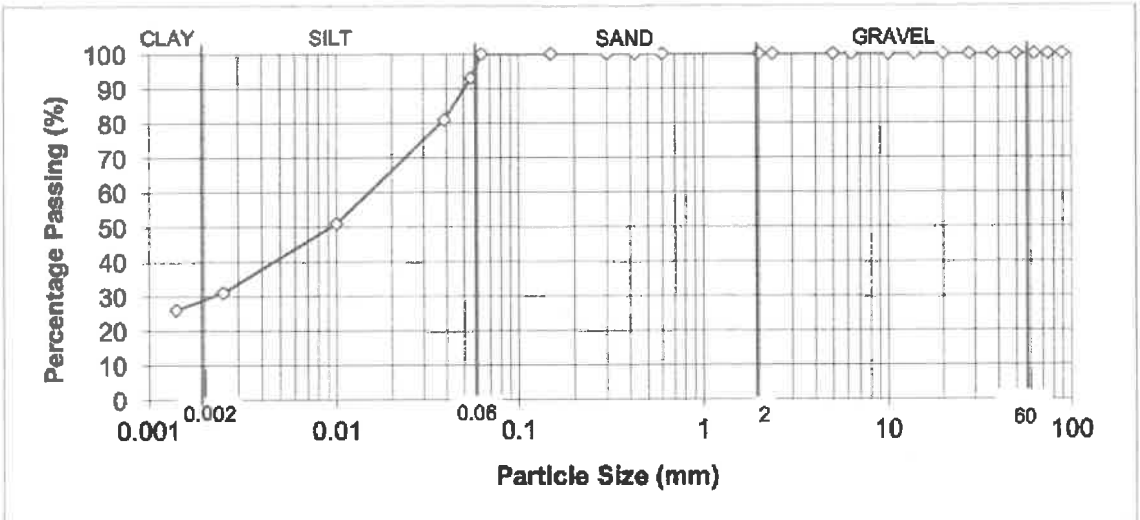
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Coopers (Chester) Ltd
SITE	7583 - Mitton Road, Whalley
JOB NUMBER	MRN 3776/25

SAMPLE LABEL	TP4 1.7	DATE SAMPLED	Not advised
LAB SAMPLE No	92322	DATE RECEIVED	11-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff grey brown silty CLAY
ADVISED SOURCE	Site Won

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2.36	100	
90	100		2	100	
75	100		0.6	100	
63	100		0.425	100	
50	100		0.3	100	
37.5	100		0.15	100	
28	100		0.063	100	
20	100		0.055	93	
14	100		0.039	81	
10	100		0.01	51	
6.3	100		0.0025	31	
5	100		0.0014	26	



REMARKS
As received moisture content = 28%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 01-Oct-20

MURRAY RIX
ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.5: 1990

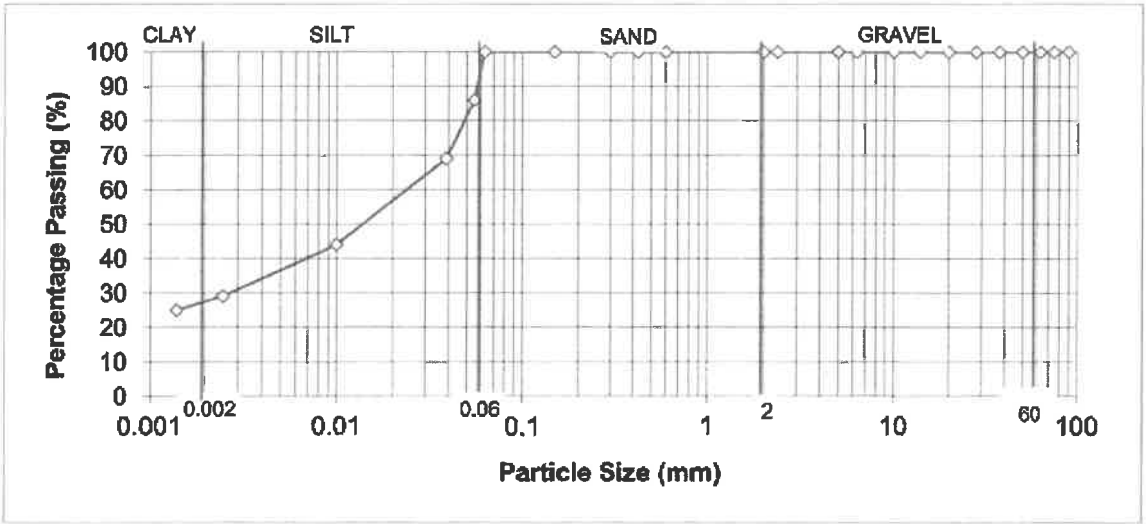
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Coopers (Chester) Ltd
SITE	7583 - Mitton Road, Whalley
JOB NUMBER	MRN 3776/25

SAMPLE LABEL	TP5 2.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92323	DATE RECEIVED	11-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff grey brown silty CLAY
ADVISED SOURCE	Site Won

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2.36	100	
90	100		2	100	
75	100		0.6	100	
63	100		0.425	100	
50	100		0.3	100	
37.5	100		0.15	100	
28	100		0.063	100	
20	100		0.055	86	
14	100		0.039	69	
10	100		0.01	44	
6.3	100		0.0025	29	
5	100		0.0014	25	



REMARKS
As received moisture content = 28%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 01-Oct-20

MURRAY RIX
ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.5: 1990

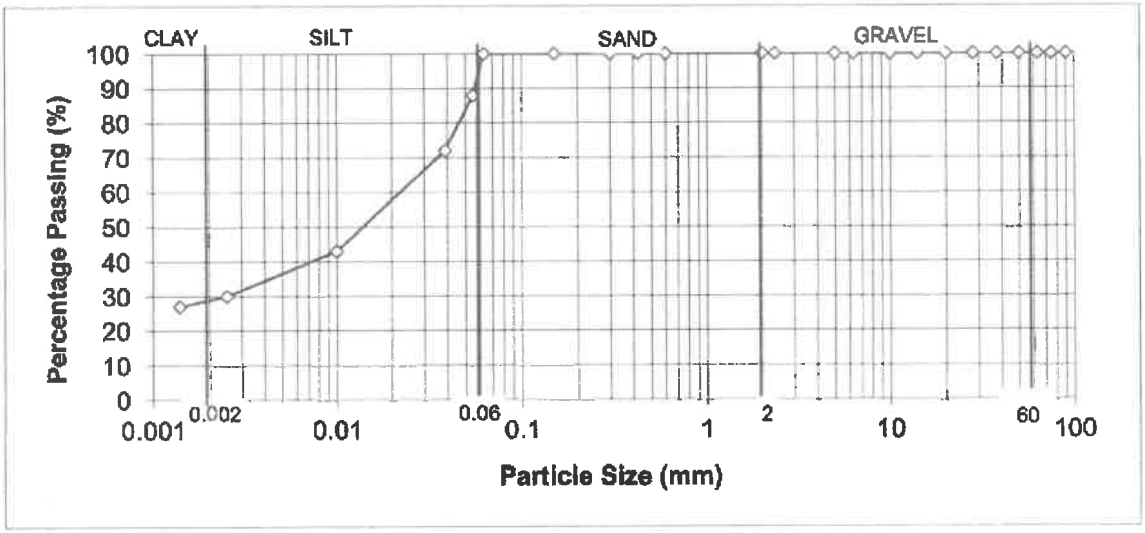
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Coopers (Chester) Ltd
SITE	7583 - Mitton Road, Whalley
JOB NUMBER	MRN 3776/25

SAMPLE LABEL	TP5 2.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92323	DATE RECEIVED	11-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Firm grey brown silty CLAY
ADVISED SOURCE	Site Won

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2.36	100	
90	100		2	100	
75	100		0.6	100	
63	100		0.425	100	
50	100		0.3	100	
37.5	100		0.15	100	
28	100		0.063	100	
20	100		0.055	88	
14	100		0.039	72	
10	100		0.01	43	
6.3	100		0.0025	30	
5	100		0.0014	27	



REMARKS
As received moisture content = 37%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 01-Oct-20

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING
1680

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

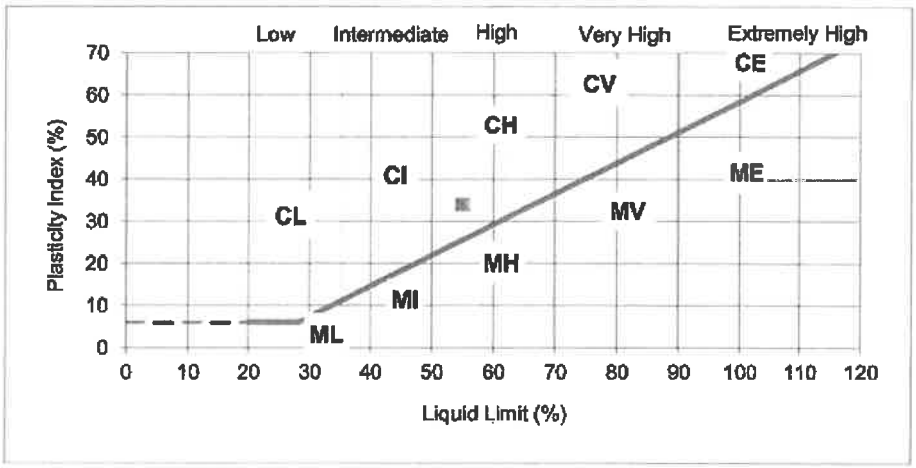
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Coopers (Chester) Ltd
SITE	7583 - Mitton Road, Whalley
JOB NUMBER	MRN 3776/25

SAMPLE LABEL	TP10 1.0	DATE SAMPLED	Not advised
SAMPLE No.	92325	DATE RECEIVED	11-Sep-20
DATE TESTED	17-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff grey brown silty CLAY
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
31	55	21	34	100



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons) DATE 01-Oct-20
(Laboratory Manager)

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

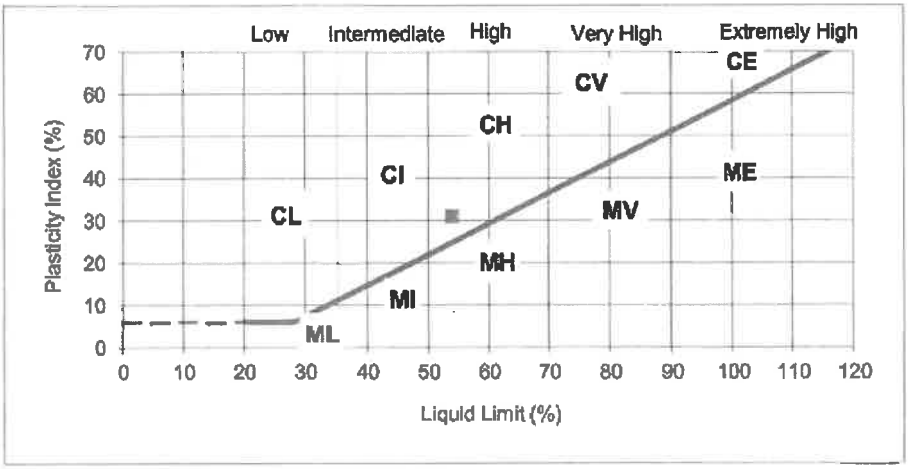
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Coopers (Chester) Ltd
SITE	7583 - Mitton Road, Whalley
JOB NUMBER	MRN 3776/25

SAMPLE LABEL	WS8 1.0-1.5	DATE SAMPLED	Not advised
SAMPLE No.	92326	DATE RECEIVED	11-Sep-20
DATE TESTED	17-Sep-20	SAMPLED BY	Client

MATERIAL	Firm grey brown silty CLAY
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
43	54	23	31	100



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons) DATE 01-Oct-20
(Laboratory Manager)

Appendix 9

Tier 1 Risk Assessment Screening Values

Controlled Water Receptor Threshold Values

Legislation Framework which Drives the Contamination Assessment of Land in England and Wales

coopers

chartered consulting engineers

Soil Tier 1 Threshold Values (mg/kg) Residential and POS

		Elements and compounds	S4UL	Small Terrace	Med/Large Terrace	Semi-detached	Detached	Residential (without Veg)	POS (Resi)	POS (Park)
				White, yellow & green values are NOAEL with orange values C4SL				C4SL (S4UL) (1% SOM)		
Silty clay	Metals/Semi-metals	Arsenic	37	37 (32.4 CLEA)				40 (40)	79 (79)	168 (170)
		Beryllium	1.7 (inh.)	51 (to be used with caution and superseded)				(1.7)	(2.2)	(63)
		Boron	290	291				(11,000)	(21,000)	(46,000)
		Cadmium	11	22 (11 CLEA)				150 (85)	220 (120)	880 (532)
		Chromium (III)	910	3000				(910)	(1,500)	(33,000)
		Chromium (VI)	6	21 (4.3)				21 (6)	51 (7.7)	250 (220)
		Copper	2,400	2,330 (Phytotoxic pH <6 = 100, pH6-7 = 135, pH >7 = 200)				(7,100)	(12,000)	(44,000)
		Lead	-	200				310	630	1,300
		Mercury (methyl)	11	7.4				(15)	(40)	(68)
		Mercury (inorganic)	40	169				(56)	(120)	(240)
		Mercury (Hg)	1.2	1.2				(1.2)	(16)	(30vap (25.8))
		Nickel	130	(130 S4UL) (Phytotoxic pH <6 = 60, pH6-7 = 75, pH >7 = 110)				(180)	(230)	(800)
		Selenium	250	351				(430)	(1,100)	(1,800)
		Vanadium	410	79				(1,200)	(2,000)	(5,000)
		Zinc	3,700	3,750 (Phytotoxic pH <6 = 200, pH6-7 = 200, pH >7 = 300)				(40,000)	(81,000)	(170,000)
	PAH	Acenaphthene	210	205				(3,000 – 57 s)	(15,000)	(29,000)
		Acenaphthylene	170	168				(2,900 – 86.1 s)	(15,000)	(29,000)
		Anthracene	2,400	2,260				(31,000 – 1.17 v)	(74,000)	(150,000)
		Benzo(a)anthracene	7.2	3.1				(11)	(29)	(49)
		Benzo(a)pyrene	2.2	5 (6% SOM) (0.83 CLEA)				5.3 (3.2)	10 (5.7)	21 (11)
		Benzo(b)fluoranthene	2.6	5.56				(3.9)	(7.1)	(13)
		Benzo(ghi)perylene	320	10.7				(360)	(640)	(1,400)
		Benzo(k)fluoranthene	7.7	8.5				(110)	(190)	(370)
		Chrysene	15	6.0				(30)	(57)	(93)
		Dibenz(ah)anthracene	0.24	0.76				(0.31)	(0.57)	(1.1)
		Fluoranthene	280	257				(1,500)	(3,100)	(6,300)
		Fluorene	170	163				(2,800 – 30.9 s)	(9,900)	(20,000)
		Indeno(123-cd)pyrene	27	3.18				(45)	(82)	(150)
		Phenanthrene	95	91.8				(1,300 – 36 s)	(3,100)	(6,200)
		Pyrene	620	563				(3,700)	(7,400)	(15,000)
Sandy loam		Naphthalene	2.3	1.54	1.71	1.7	1.97	(2.3)	(4,900)	(1,200 – 76.4 s)
	BTEX	Benzene	0.087	0.2 (1%) (0.079 CLEA)	0.082	0.082	0.085	0.89 (0.38)	140 (72)	190 (90)
		Toluene	130	119	122	122	125	(869)	(56,000)	(87,000 v)
		Ethylbenzene	47	62.5	68	67.9	71.6	(83)	(24,000)	(17,000 v)
		Xylene (based on p)	56	41.7	45.5	45.3	50.9	(70)	(41,000)	(17,000 v)
		Phenol	280	184	207	206	224	(750)	(760)	(760)
	Aliphatic	5-6	42	30				(42)	(570,000 – 304 s)	(95,000 – 304 s)
		6-8	100	73				(100)	(600,000)	(150,000 – 144 s)
		8-10	27	19				(27)	(13,000)	(14,000 – 78 s)
		10-12	130 (48)	93 (48)^{vap}				(130 – 48 v)	(13,000)	(21,000 – 48 s)
		12-16	1,100 (24)	740 (24)^{sol}				(1,100 - 24 v)	(13,000)	(25,000 – 24 s)
		16-35	65,000 (8.48)	45,000 (8.48)^{sol}				(65,000)	(250,000)	(450,000)
		35-44	65,000 (8.48)	45,000 (8.48)^{sol}				(65,000)	(250,000)	(450,000)
	Aromatic	8-10	34	27				(47)	(5,000)	(7,200 – 613 v)
		10-12	74	69				(250)	(5,000)	(9,200 – 364 s)
		12-16	140	140				(1,800)	(5,100)	(10,000)
		16-21	260 (	250				(1,900)	(3,800)	(7,600)
		21-35	1,100	890				(1,900)	(3,800)	(7,600)

Notes:

The soil organic matter has been assumed to be 1% as this is the most conservative value for organic compounds. Inorganic compounds unaffected by this parameter.

Silty clay strata appears to prove more conservative threshold values for metals, semi-metals and several PAH compounds. Sandy loam strata appears to prove more conservative threshold values for TPH compounds, phenol and naphthalene.

The assessment of hydrocarbon fractions should be completed additively to determine the total risk of the whole range of compounds present as well as by single TPH fractional units, however this should be undertaken on a sample by sample basis where significant hydrocarbon concentrations have been encountered to derive a compound TPH concentration.

Although benzene has a C4SL value, this has been calculated for small terraced housing and not other housing stock, therefore other housing stock should either adopt the more conservative CLEA thresholds or that of a small terraced property. All thresholds not coloured orange (C4SL) for different housing stock have utilised LQM/CIEH Generic Assessment Criteria for Human Health Risk assessment, 2nd edition, 2009. CLEA values in brackets where C4SL values are available.

Vap denotes where the threshold is exceeded beyond the vapour saturation limit. Sol denotes where the threshold is exceeded beyond the solubility saturation limit.

It should be noted that these threshold values only relate to human health risk assessment and an assessment for potential groundwater risk should be undertaken as a separate risk assessment.

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Soil Tier 1 Threshold Values (mg/kg) – Residential and Commercial

		Elements and compounds	S4UL	Small Terrace	Med/Large Terrace	Semi-detached	Detached	Commercial
				White, yellow & green values are NOAEL with orange values C4SL				
Silty clay	Metals/Semi-metals	Arsenic	37	37 (32.4 CLEA)				640
		Beryllium	1.7 (inh.)	51 (to be used with caution and superseded)				12
		Boron	290	291				240,000
		Cadmium	11	22 (11 CLEA)				190
		Chromium (III)	910	3000				8,600
		Chromium (VI)	6	21 (4.3)				33
		Copper	2,400	2,330 (Phytotoxic pH <6 = 100, pH6-7 = 135, pH >7 = 200)				68,000
		Lead	-	200				2,300
		Mercury (methyl)	11	7.4				320
		Mercury (inorganic)	40	169				1,100
		Mercury (Hg)	1.2	1.2				58 [vap] 25.8
		Nickel	130	(130 S4UL) (Phytotoxic pH <6 = 60, pH6-7 = 75, pH >7 = 110)				980
		Selenium	250	351				12,000
		Vanadium	410	79				9,000
		Zinc	3,700	3,750 (Phytotoxic pH <6 = 200, pH6-7 = 200, pH >7 = 300)				730,000
	PAH	Acenaphthene	210	205				84,000 (57.0) [sol]
		Acenaphthylene	170	168				83,000 (86.1) [sol]
		Anthracene	2,400	2,260				520,000
		Benzo(a)anthracene	7.2	3.1				170
		Benzo(a)pyrene	2.2	5 (6% SOM) (0.83 CLEA)				35
		Benzo(b)fluoranthene	2.6	5.56				44
		Benzo(ghi)perylene	320	10.7				3,900
		Benzo(k)fluoranthene	7.7	8.5				1,200
		Chrysene	15	6.0				350
		Dibenz(ah)anthracene	0.24	0.76				3.5
		Fluoranthene	280	257				23,000
		Fluorene	170	163				63,000 (30.9) [sol]
		Indeno(123-cd)pyrene	27	3.18				500
		Phenanthrene	95	91.8				22,000
		Pyrene	620	563				54,000
Sandy loam		Naphthalene	2.3	1.54	1.71	1.7	1.97	1960 (76.4) [sol]
	BTEX	Benzene	0.087	0.2 (1%) (0.079 CLEA)	0.082	0.082	0.085	27
		Toluene	130	119	122	122	125	56,000 [vap] (869)
		Ethylbenzene	47	62.5	68	67.9	71.6	5,700 [vap] (518)
		Xylene (based on p)	56	41.7	45.5	45.3	50.9	5,900 [sol] (576)
		Phenol	280	184	207	206	224	
	Aliphatic	5-6	42	30				3,200 (304) [sol]
		6-8	100	73				7,800 (144) [sol]
		8-10	27	19				2,000 (78) [sol]
		10-12	130 (48)	93 (48)[vap]				9,700 (48) [sol]
		12-16	1,100 (24)	740 (24)[sol]				59,000 (24) [sol]
		16-35	65,000 (8.48)	45,000 (8.48)[sol]				1,600,000
		35-44	65,000 (8.48)	45,000 (8.48)[sol]				1,600,000
	Aromatic	8-10	34	27				3,500 (613) [vap]
		10-12	74	69				16,000 (364) [sol]
		12-16	140	140				36,000 (169) [sol]
		16-21	260 (	250				28,000
		21-35	1,100	890				28,000

Notes:

The soil organic matter has been assumed to be 1% as this is the most conservative value for organic compounds. Inorganic compounds unaffected by this parameter.

Silty clay strata appears to prove more conservative threshold values for metals, semi-metals and several PAH compounds. Sandy loam strata appears to prove more conservative threshold values for TPH compounds, phenol and naphthalene.

The assessment of hydrocarbon fractions should be completed additively to determine the total risk of the whole range of compounds present as well as by single TPH fractional units, however this should be undertaken on a sample by sample basis where significant hydrocarbon concentrations have been encountered to derive a compound TPH concentration.

Although benzene has a C4SL value, this has been calculated for small terraced housing and not other housing stock, therefore other housing stock should either adopt the more conservative CLEA thresholds or that of a small terraced property. All thresholds not coloured orange (C4SL) for different housing stock have utilised LQM/CIEH Generic Assessment Criteria for Human Health Risk assessment, 2nd edition, 2009. CLEA values in brackets where C4SL values are available.

Vap denotes where the threshold is exceeded beyond the vapour saturation limit. Sol denotes where the threshold is exceeded beyond the solubility saturation limit.

All commercial values with the exclusion of lead have been based on threshold concentrations obtained from the LQM/CIEH S4UL's for Human Health Risk Assessment. It should be noted that these threshold values only relate to human health risk assessment and an assessment for potential groundwater risk should be undertaken as a separate risk assessment.

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CONTROLLED WATER RECEPTOR THRESHOLD VALUES (µg/l)

Compound/element		Groundwater Quality Threshold Values[1] Maximum value	Environmental Quality Standards (EQS)			
			Long term (mean) for fresh waters[13]	Short term (95th percentile) for fresh waters[13]	Annual average (AA-EQS) for inland surface waters[14]	Maximum allowable concentration (MAC-EQS)[14] for inland surface waters[15]
Inorganic elements and compounds	Ammonium	500	-	-	-	-
	Arsenic	10	50	-	-	-
	Boron	1000	-	-	-	-
	Cadmium[9]	5.0	-	-	≤0.08 (Class 1)	≤0.45 (Class 1)
		-	-	-	0.08 (Class 2)	0.45 (Class 2)
		-	-	-	0.09 (Class 3)	0.6 (Class 3)
		-	-	-	0.15 (Class 4)	0.9 (Class 4)
		-	-	-	0.25 (Class 5)	1.5 (Class 5)
	Chromium (III)	50	4.7	32	-	-
	Chromium (VI)	-	3.4	-	-	-
	Chloride	250,000	-	-	-	-
	Chlorine	-	2	5	-	-
	Copper	2000	1[5]	-	-	-
	Cyanide	50	1	5	-	-
	Iron	-	1,000	-	-	-
	Lead	10	-	-	1.2[5]	14
	Manganese	-	123[5]	-	-	-

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Compound/element		Groundwater Quality Threshold Values[1] Maximum value	Environmental Quality Standards (EQS)			
			Long term (mean) for fresh waters[13]	Short term (95th percentile) for fresh waters[13]	Annual average (AA-EQS) for inland surface waters[14]	Maximum allowable concentration (MAC-EQS)[14] for inland surface waters[15]
	Mercury	1.0	-	-	-	0.07
	Nickel	20	-	-	4[5]	34
	Nitrate[2]	50,000	-	-	-	-
	Nitrite[2]	500	-	-	-	-
	Selenium	-	-	-	-	-
	Sulphate	250,000	-	-	-	-
	Zinc	-	10.9	-	-	-
PAH compounds	Anthracene	-	-	-	0.1	0.1
	Benzo(a)pyrene	0.01	-	-	$1.7x10^{-4}$	0.27
	Fluoranthene	-	-	-	0.0063	0.12
	Naphthalene	-	-	-	2	130
	PAH compounds (benzo(b)fluoranthene + benzo(k)fluoranthene + benzo(ghi)perylene + indeno(1,2,3-cd)pyrene)	0.1	-	-	$1.7x10^{-4}$[(12)]	0.27[(12)]
	Benzo(b)fluoranthene	-	-	-	-	0.017
	Benzo(k)fluoranthene	-	-	-	-	0.017
	Benzo(ghi)perylene	-	-	-	-	$8.2x10^{-3}$
	Indeno(1,2,3-cd)pyrene	-	-	-	-	n/a
BTEX compounds	Benzene	1.0	-	-	10	50
	Ethene	-	-	-	-	-
	Toluene	-	74	380	-	-
	Xylene	-	-	-	-	-
VOCs	Carbon tetrachloride	-	-	-	12	n/a

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			Long term (mean) for fresh waters[13]	Short term (95th percentile) for fresh waters[13]	Annual average (AA-EQS) for inland surface waters[14]	Maximum allowable concentration (MAC-EQS)[14] for inland surface waters[15]
	C10-C13 Chloroalkanes (e.g. chloroethane, bromomethane, chloromethane)	-	-	-	0.4	1.4
	1,2-dichloroethane	-	-	-	10	n/a
	Trihalomethanes total (trichloromethane (chloroform) + bromoform + dibromochloromethane + bromodichloromethane)	100	-	-	-	-
	Vinyl chloride	0.5	-	-	-	-
	1,2 dichloroethane	3.0	-	-	-	-
	Trichlorobenzenes	-	-	-	0.4	n/a
	Tetrachloroethane + trichloroethylene	10	-	-	-	-
	Trichloroethylene	-	-	-	10	n/a
	Tetrachloroethane	-	140	1848		
	Tetrachloroethylene	-	-	-	10	n/a
	Trichloromethane (alternative name chloroform)	-	-	-	2.5	n/a
	Tetrachloromethane	3	-	-	-	-
SVOC	Benzyl butyl phthalate	-	7.5	51	-	-

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			Long term (mean) for fresh waters[13]	Short term (95th percentile) for fresh waters[13]	Annual average (AA-EQS) for inland surface waters[14]	Maximum allowable concentration (MAC-EQS)[14] for inland surface waters[15]
	Bis(2-ethylhexyl)phthalate (alternative name: di(2-ethylhexyl)-phthalate	-	-	-	1.3	n/a
	Brominated diphenylethers[8]	-	-	-	na	0.14
	2,4-dichlorophenol	-	4.2	140	-	-
	Hexa-chlorobenzene	-	-	-	-	0.05
	Hexa-chlorobutadiene	-	-	-	-	0.6
	Pentachlorophenol	-	-	-	0.4	1
Other organic comp-ounds	Phenol	-	7.7	46	-	-
Pesticides in groundwater	**Pesticides & related products[3]**	-	-	-	-	-
	Aldrin	0.03	-	-	-	-
	Dieldrin	0.03	-	-	-	-
	Heptachlor	0.03	-	-	-	-
	Heptachlo epoxide	0.03	-	-	-	-
	Other pesticides	0.1	-	-	-	-
	Pesticides total[4]	0.5	-	-	-	-
Pesti-cides in surface waters	Atrazine	-	-	-	0.6	2.0
	Chlorfenvinphos	-	-	-	0.1	0.3
	Chlorpyrifos (Chlorpyrifosethyl)	-	-	-	0.03	0.1

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			Long term (mean) for fresh waters[13]	Short term (95th percentile) for fresh waters[13]	Annual average (AA-EQS) for inland surface waters[14]	Maximum allowable concentration (MAC-EQS)[14] for inland surface waters[15]
	Cyclodiene pesticides: aldrin, dieldrin, endrin[10]	-	-	-	0.01	n/a
	Cypermethrin	-	0.0001	0.0004	$8x10^{-5}$	$6x10^{-4}$
	Diazinon	-	0.01	0.02	-	-
	DDT total[11]	-	-	-	0.025	n/a
	2,4 dichlorophenoxyacetic acid (2,4 D)	-	0.3	1.3	-	-
	Dichlorvos	-	-	-	$6x10^{-4}$	$7x10^{-4}$
	Dimethoate	-	0.48	4.0	-	-
	Endosulfan	-	-	-	0.005	0.01
	Heptachlor and hetachlorepoxide	-	-	-	$2x10^{-7}$	$3x10^{-4}$
	Mecoprop	-	18	187	-	-
	Permethrin	-	0.001	0.01	-	-
	Simazine	-	-	-	1	4
	Terbutryn	-	-	-	0.065	0.34

NOTES

1. Threshold values based on The Water Supply (Water Quality) Regulations 2016
2. The water must satisfy the formula "[nitrate]/50 + [nitrite]/3 ≤ 1", where the square brackets signify the concentrations in mg/1 for nitrate (NO_3) and nitrite (NO_2).
3. "pesticides and related products" means any of the following, and includes their relevant metabolites, degradation and reaction products— (a) organic insecticide; (b) organic herbicide; (c) organic fungicide; (d) organic nematocide; (e) organic acaricide; (f) organic algicide; (g) organic rodenticide; (h) organic slimicide; (i) any product related to any of (a) to (h) (including any growth regulator).

4. The sum of the concentrations of the individual compounds detected and quantified in the monitoring process.
5. "Bioavailable" meaning the fraction of the dissolved concentration of the metal likely to result in toxic effects as determined using the UKTAG Metal Bioavailability Assessment Tool (also referred to as a PNEC Estimator) for the relevant metal.
6. The Environment Agency (EA) must define the type of river systems according to their alkalinity and altitude and the acid neutralising capacity for the river due to the dissolved carbon content. The definition due to alkalinity and altitude is in Table 1, as follows:

Site altitude	Table 1 - Alkalinity (as mg/l $CaCO_3$)				
	<10	≥10 to <50	≥50 to <100	≥100 to <200	>200
Under 80m	Type 1	Type 2	Type 3	Type 5	Type 7
Over 80m			Type 4	Type 6	

The quality of the rivers or river sections will then be categorised by the EA, according to the dissolved oxygen content, biological oxygen demand and ammonia levels relative to the type denoted in Table 1. The ammonia standards would be classified as follows in Table 2.

Table 2 -Ammonia standards for rivers (rivers categorised by type in accordance with river type in Table 1 above.				
Total ammonia as nitrogen (mg/l) (90 percentile)				
Type	High	Good	Moderate	Poor
1, 2, 4 and 6	0.2	0.3	0.75	1.1
3, 5 and 7	0.3	0.6	1.1	2.5

7. Ambient background concentrations have been presented in the Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 with regards to the ambient background dissolved zinc concentrations.
8. The EQS refers to the sum of the concentrations of congener numbers 28, 47, 99, 100, 153 and 154.
9. The EQS for cadmium and its compounds is dependent on the water hardness as specified: Class 1: <40mg $CaCO_3$/l, Class 2: 40 to <50mg $CaCO_3$/l, Class 3: 50 to <100mg $CaCO_3$/l, Class 4: 100 to <200mg $CaCO_3$/l and Class 5: ≥200mg $CaCO_3$/l.
10. EQS relates to the sum of aldrin, dieldrin and endrin.
11. DDT total comprises the sum of the isomers 1,1,1-trichloro-2,2 bis (p-chloropheny) ethane, 1,1,1-trichloro-2 (o-chlorophenyl)-2-(p-chlorophenyl) ethane, 1,1 -dichloro-2,2 bis (p-chlorophenyl) ethylene and 1,1-dichloro-2,2 bis (p-chlorophenyl) ethane.

12. For the group of PAH compounds benzo(b)fluoranthene + benzo(k)fluoranthene + benzo(ghi)perylene + indeno(1,2,3-cd)pyrene, the EQS for benzo(a)pyrene must be applied, this being considered to be a marker for these PAH compounds.
13. Fresh water includes rivers and lakes.
14. Where the MAC-EQS is noted as n/a, the AA-EQS values are considered protective against short-term pollution peaks in continuous discharges as they are significantly lower than the values derived on the basis of acute toxicity.
15. Inland surface waters includes rivers and lakes and related artificial or heavily modified water bodies.

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Legislation Framework which drives the Contamination Assessment of Land in England and Wales

Foreward

In the UK, historical contaminated land is regulated by the planning and development control system and the contaminated land regime set out in Part IIA of the Environmental Protection Act 1990. The Water Act 2003 has amended the Part IIA legislation in respect of controlled waters.

When considering an application for development, the potential for the land to be contaminated is a material consideration, and the planning authority should satisfy itself that any contamination is properly assessed and adequately remediated, based on a suitable for use approach. This is to ensure that the land is made suitable for its proposed new use.

For those development sites where potential sources of contamination are present on site as of the 1 March 2009 (England) and 6 May 2009 (Wales), and are either suspected of, or known to be a source of contamination after these dates, a remediation notice may be placed on this site/operator under the Environmental Damages (Prevention and Remediation) Regulations 2009. This may include diffuse contamination and potentially includes developer's site practices.

The legislation in the form of Acts and Regulations, aims to deter pollution events from occurring. When pollution events do occur, apportionment of the 'blame' for the pollution event has a specific protocol to be followed to assess which parties, assuming multiple parties have utilised sites, is responsible. The polluter will then be expected to clean up the pollution event ideally voluntarily, or a remediation notice is posted whereby the polluter will be forced to undertake the works, assuming their appeal was unsuccessful.

Developers should not take on liability for all previous pollution the vendor and previous owners have left on the site. If some liability has to be taken to progress the sale of the site, a full appreciation of the liabilities of the contamination must be understood. It is common during the course of the ground investigation that all sources of historical contamination are not revealed and hence it is prudent to keep liability for these unknown events with the previous operators.

The developers own conduct is relevant to the legislation, as fuel tanks are often on site as mobile point sources, or static point sources for the refuelling of plant. In addition, soils [generic term for all non-construction materials] used to raise site levels, form engineering platforms (i.e. piling and roads), and for use in garden areas are imported to site. The developer will be responsible under the Environmental Damages Regulations for their operations.

The legislation is complex and often is interchangeable depending upon the time of release for the contamination and the receptors which have been detrimentally affected by the contamination. A summary of the most relevant legislation and guidance is noted below.

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Interaction of the Planning Regime with the Environmental Protection Act 1990 – Part IIA

Guidance applicable to England has been published by the Department of Communities and Local Government, the *'National Planning Policy Framework'*, March 2012, and by the Department of Environment, Food and Rural Affairs (DEFRA), the *'Environmental Protection Act 1990: Part 2A. Contaminated Land Statutory Guidance'*, April 2012, which replaces the DEFRA Circular 01/2006, *'Environmental Protection Act 1990: Part IIA – Contaminated Land'* (September 2006). The Welsh Government has published *'Planning Policy Wales, Edition 7'*, July 2014 and *'Contaminated Land Statutory Guidance for Wales 2012'*, 2013. Both planning policies continue to promote the 'suitable for use approach', with the emphasis now related to ensuring that the future use or development being undertaken would not be designated as contaminated land under Part IIA of the Environmental Protection Act 1990. Where remediation is required this should be undertaken in such a manner that it would not have an adverse impact on the environment.

In order for a planning decision to be made, a site investigation carried out by a specialist must be provided, which assesses the potential hazards to future site users and the local environment arising from past activities or natural factors. Where remediation is required to mitigate these impacts, the remediation scheme must show that the land would not be designated as contaminated land under Part IIA of the Environmental Protection Act 1990. If contamination cannot be overcome satisfactorily, the authority may refuse planning permission.

The responsibility for ensuring the development is undertaken in such a manner lies with the developer/land owner.

The definition of contaminated land is presented in the Environmental Protection Act 1990 as follows: *'any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that—*
(a)significant harm is being caused or there is a significant possibility of such harm being caused; or
(b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused;.....'

Before the local authority can conclude that land appears to be contaminated land, the authority must assess the risk that a significant pollutant linkage exists.

This means that each of the following has to be present:
(a) a **contaminant**;
(b) a **receptor**; and
(c) a **pathway**.

Guidance defines the risk as the combination of:

'(a) the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land; and
(b) the scale and seriousness of such harm or pollution if it did occur'.

Environmental Protection Act 1990 – Part III

It should be noted that under the Environmental Protection Act 1990, the statutory nuisance regime applies to *'premises which may be prejudicial to health or a nuisance'*. In this case the term *'health'* does not apply to contaminated land issues. However, nuisance may apply where the effects of deposits of substances on land cause offence to human senses (such as stenches).

Environmental Damage (Prevention and Remediation) Regulations 2009

In 2009 the Environmental Damage (Prevention and Remediation) Regulations No. 153 were enacted. This legislation is designed to prevent contamination events occurring. The meaning of 'environmental damage' has been detailed by DEFRA's guidance document applicable to these Regulations as shown below:

'An important point to note is that the Regulations are a 'backstop', only applying when something has gone wrong and there is an imminent threat or actual 'environmental damage' within the scope of the Regulations. The emphasis should be on proactively putting in place appropriate pollution prevention measures to reduce risks to the environment. Those running businesses and other operations can reduce the likelihood of ever being caught by the Regulations' requirements by minimising risks to the natural resources covered by the Regulations. This means that businesses should be aware, in particular, where they:

- *Operate within or near areas of high biodiversity value, especially Sites of Special Scientific Interest (SSSIs);*
- *Operate near water bodies; and/or*
- *Carry out activities with potential risks to human health*
- *This is so they can take the necessary steps to manage the relevant risks effectively, including implementing and monitoring appropriate pollution prevention measures.*

The Regulations do not cover all types of damage to the environment. They only cover 'environmental damage' which is one or more of damage to:

- *protected species and natural habitats or to a site of special scientific interest (these are referred to collectively in the guidance as **damage to species and habitats**);*
- *surface water or groundwater (these are referred to collectively in the guidance as **damage to water**); and,*
- *land. (Damage to land is contamination of land by substances, preparations, organisms or micro-organisms that results in a significant risk of adverse effects on human health.*

Regulation 8(1) states they do not apply in relation to:

(a) damage that took place before the coming into force (CIF) of these Regulations;
(b) damage that takes place after (the CIF date), or is threatened after that date, but is caused by an incident, event or emission that took place before (the CIF date); or,
(c) damage caused by an incident, event or emission that takes place after (the CIF date) if it derives from an activity that took place and finished before (the CIF date).

Regulation 8(3) states that the Regulations: only apply to environmental damage caused by pollution of a diffuse character if it is possible to establish a causal link between the damage and specific activities.

Regulation 14(1) states: An operator of an activity that has caused environmental damage, or has caused damage where there are reasonable grounds to believe that the damage is or will become environmental damage, must immediately –

(a) take all practicable steps to prevent further damage, and
(b) notify all relevant details to the enforcing authority appearing to be the appropriate one

Regulation 14 also covers damage that will become 'environmental damage'. This is where damage has occurred which is not yet 'environmental damage' but is sufficiently likely to become environmental damage 'if no action is taken. To use the example of a tank, where the tank has leaked and the contamination has already started to enter the aquifer, the damage does not yet qualify as water damage. However, without action to control further migration of contamination into the aquifer, the damage is likely to become water damage'.

Revised Statutory Guidance on the Contaminated Land Regime under Part IIA of the Environmental Protection Act 1990, April 2012

The revised Statutory Guidance under Part IIA of the Environmental Protection Act 1990 was issued as part of the 'Red Tape Challenge' to simplify policies. It has been confirmed by both DEFRA and the Welsh Government that the risk approach defined by the contaminated land guidance may be applied to applications under planning.

As part of the revisions, a new four category test will be applied to assess whether land is contaminated or not. Category 1 sites are sites which have a high likelihood of contamination and would be considered as a significant problem. Category 4 sites are sites which are obviously not contaminated on the basis of either desktop information or a basic intrusive investigation. Categories 2 and 3 lie between the obviously uncontaminated and contaminated sites, with the division between these categories being considered as contaminated land under Part IIA. Risk assessment will be required to assess whether a site lies within Category 2 or 3. The risk assessment will initially be determined by health risks, then by socio-economic factors should health risks be uncertain, with a default decision of contaminated should the tests not be adequately met (refer to Figure 1).

For the purpose of determining whether a site may be classified as contaminated land, soil guidance values (SGV)/generic assessment criteria (GAC) should not be utilised as determining factors, however these may be used to confirm Category 4 sites where no risk of harm to human health is considered to be applicable. It should be noted that SGV and GAC threshold values are not considered to act as threshold values for Category 4 sites. New Category 4 Screening Levels (C4SL) have been produced for arsenic, cadmium, chromium (VI), lead, benzo(a)pyrene and benzene and represent low observed adverse effect level (LOAEL), and hence is considered appropriate for use as a threshold parameter in accordance with the planning regime. Exceedance of C4SL does not necessarily mean that the site will be considered as contaminated land as this threshold will be set sufficiently below the boundary between Category 3 and 4 sites.

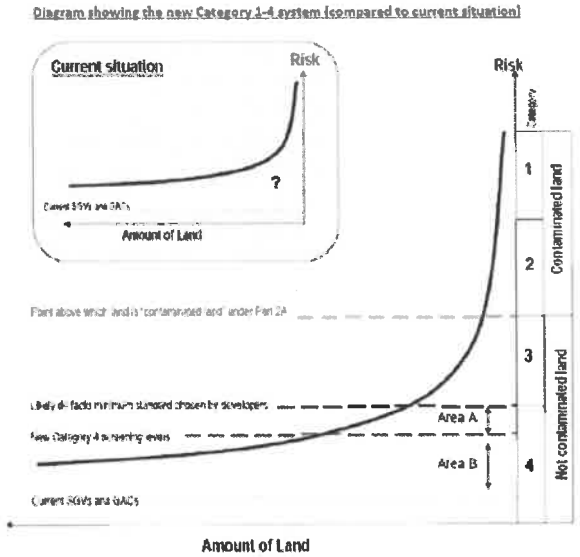

Figure 1: The New Four Category System

Appendix 10

Cl:AIRE Asbestos Containing Soils Decision Support Tools for Receptors.

Source Signature Double Ratio Plots.

Source Signature Double Ratio Plot Explanation Sheets.

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Asbestos in Soil and Construction & Demolition Materials

Decision Support Tool for Receptor Risk Ranking

Stage 1

Hazard Identification		Score
Select ACM type (run model for each type to generate 'Worst Case' output)	Free dispersed fibres/fibre bundles	2
Extent of degradation of ACMs	Disaggregated (dominated by loose fibrous material; extreme degradation in ACM and/or free asbestos fibres/fibre bundles)	4
Friability and degree of bonding by matrix (ACM matrix, not ground materials)	Friable ACM or ACM with fibres not linked in any matrix (free dispersed fibres/fibre bundles)	4
Distribution of Visible Asbestos Across Affected Area	No visible ACMs/fibre bundles	0
Asbestos fibre type	Chrysotile alone	0
Sub-total		10
Hazard ranking		Low

Step 2

Emission Factors		Score
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Trace quantities - <0.0001 to <0.001 %wt/wt	0
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Negligible	0
Activity type and effect on deterioration of ACMs	Minimal disturbance, no deterioration expected	1
Best description of primary host material matrix	Fine Silt and/or Clay	1
Sub-total		2
Exposure ranking		Very Low

Pathway and Receptor Sensitivity		Score	
Receptor category	Construction	No score required	
Age of Receptor	Young adult (>16 and <24)	2	
Duration of exposure/site occupancy	> 1hr <10 hr daily exposure (e.g. part-time to full time occupational exposure or extended daily recreational exposure)	3	
Receptor ranking		5	Medium
Combined hazard, exposure and receptor ranking			Medium
Pathway: Distance of Receptor from Source	In or within 10m of area of disturbance	4	
Pathway: Depth to impacted material	Material buried at shallow depth, potential to be disturbed by excavation	C	
Pathway ranking		4C	Low
Overall ranking			Low

Project Reference	7583
Site Name	Mitton Road, Whalley
Client	Prospect
Run by	B W Hill
Date	21-Oct-20
Reviewed by	P R Sykes
Characterisation of scenario being evaluated	Ground works contractor during soils disturbance at the time of development with soils containing trace chrysotile fibres
Interpretation of scenario ranking by DST	Low risks posed by disurbance of trace fibres, standard advice to minimise exposure risks through control of dusts (dampening soils prior to disturbance during periods of warm and dry weather).

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Asbestos in Soil and Construction & Demolition Materials

Decision Support Tool for Receptor Risk Ranking

Stage 1

Hazard Identification		Score
Select ACM type (run model for each type to generate 'Worst Case' output)	Free dispersed fibres/fibre bundles	2
Extent of degradation of ACMs	Disaggregated (dominated by loose fibrous material; extreme degradation in ACM and/or free asbestos fibres/fibre bundles)	4
Friability and degree of bonding by matrix (ACM matrix, not ground materials)	Friable ACM or ACM with fibres not linked in any matrix (free dispersed fibres/fibre bundles)	4
Distribution of Visible Asbestos Across Affected Area	No visible ACMs/fibre bundles	0
Asbestos fibre type	Chrysotile alone	0
Sub-total		10
Hazard ranking		Low

Stage 2

Emission Factors		Score
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Trace quantities - <0.0001 to <0.001 %wt/wt	0
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Negligible	0
Activity type and effect on deterioration of ACMs	Minimal disturbance, no deterioration expected	1
Best description of primary host material matrix	Fine Silt and/or Clay	1
Sub-total		2
Exposure ranking		Very Low

Stage 3

Pathway and Receptor Sensitivity		Score	
Receptor category	Residential (Pre-Remediation)	No score required	
Age of Receptor	Infant (under 5)	4	
Duration of exposure/site occupancy	>> 10 hours per day (e.g. 24 hour residential exposure)	4	
Receptor ranking		8	High
Combined hazard, exposure and receptor ranking			High
Pathway: Distance of Receptor from Source	In or within 10m of area of disturbance	4	
Pathway: Depth to impacted material	Material visible at the surface, very likely to be disturbed by wind erosion and/or human/animal disturbance of soi	E	
Pathway ranking		4E	High
Overall ranking			High

Project Reference	7583
Site Name	Mitton Road, Whalley
Client	Prospect
Run by	B W Hill
Date	21-Oct-20
Reviewed by	P R Sykes
Characterisation of scenario being evaluated	Future residential gardens with trace chrysotile fibres within the topsoil (no remediation)
Interpretation of scenario ranking by DST	The assessment indicates that witout remediation a high risk is posed to the future residents - remediation is therefore required.

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Asbestos in Soil and Construction & Demolition Materials

Decision Support Tool for Receptor Risk Ranking

Stage 1 Hazard Identification		Score
Select ACM type (run model for each type to generate 'Worst Case' output)	Free dispersed fibres/fibre bundles	2
Extent of degradation of ACMs	Disaggregated (dominated by loose fibrous material; extreme degradation in ACM and/or free asbestos fibres/fibre bundles)	4
Friability and degree of bonding by matrix (ACM matrix, not ground materials)	Friable ACM or ACM with fibres not linked in any matrix (free dispersed fibres/fibre bundles)	4
Distribution of Visible Asbestos Across Affected Area	No visible ACMs/fibre bundles	0
Asbestos fibre type	Chrysotile alone	0
Sub-total		10
Hazard ranking		Low

Version 2, February 2017

Stage 2

Emission Factors		Score
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Trace quantities - <0.0001 to <0.001 %wt/wt	0
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Negligible	0
Activity type and effect on deterioration of ACMs	No disturbance activity	0
Best description of primary host material matrix	Fine Silt and/or Clay	1
Sub-total		1
Exposure ranking		Very Low

Pathway and Receptor Sensitivity		Score	
Receptor category	Residential (Post Remediation)	No score required	
Age of Receptor	Infant (under 5)	4	
Duration of exposure/site occupancy	>> 10 hours per day (e.g. 24 hour residential exposure)	4	
Receptor ranking		8	High
Combined hazard, exposure and receptor ranking			High
Pathway: Distance of Receptor from Source	In or within 10m of area of disturbance	4	
Pathway: Depth to impacted material	Material buried at significant depth, very unlikely to be disturbed.	A	
Pathway ranking		4A	Negligible
Overall ranking			Negligible

Project Reference	7583
Site Name	Mitton Road, Whalley
Client	Prospect
Run by	B W Hill
Date	21-Oct-20
Reviewed by	P R Sykes
Characterisation of scenario being evaluated	Future residential gardens after placement of inert cover system within the gardens with deeper madeground containing trace chrysotile fibres
Interpretation of scenario ranking by DST	Post remediation the risks to the future residents are negligible - remediation is therefore appropriate

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Asbestos in Soil and Construction & Demolition Materials

Decision Support Tool for Receptor Risk Ranking

Stage 1 Hazard Identification		Score
Select ACM type (run model for each type to generate 'Worst Case' output)	Free dispersed fibres/fibre bundles	2
Extent of degradation of ACMs	Disaggregated (dominated by loose fibrous material; extreme degradation in ACM and/or free asbestos fibres/fibre bundles)	4
Friability and degree of bonding by matrix (ACM matrix, not ground materials)	Friable ACM or ACM with fibres not linked in any matrix (free dispersed fibres/fibre bundles)	4
Distribution of Visible Asbestos Across Affected Area	No visible ACMs/fibre bundles	0
Asbestos fibre type	Chrysotile alone	0
Sub-total		10
Hazard ranking		Low

Version 2, February 2017

Stage 2

Emission Factors		Score
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Trace quantities - <0.0001 to <0.001 %wt/wt	0
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Negligible	0
Activity type and effect on deterioration of ACMs	No disturbance activity	0
Best description of primary host material matrix	Fine Silt and/or Clay	1
Sub-total		1
Exposure ranking		Very Low

Pathway and Receptor Sensitivity		Score	
Receptor category	Residential (Adjacent Residents)	No score required	
Age of Receptor	Infant (under 5)	4	
Duration of exposure/site occupancy	>> 10 hours per day (e.g. 24 hour residential exposure)	4	
Receptor ranking		8	High
Combined hazard, exposure and receptor ranking			High
Pathway: Distance of Receptor from Source	>10m of edge of area of disturbance	3	
Pathway: Depth to impacted material	Material buried at shallow depth, potential to be disturbed by excavation	C	
Pathway ranking		3C	Low
Overall ranking			Low

Project Reference	7583
Site Name	Mitton Road, Whalley
Client	Prospect
Run by	B W Hill
Date	21-Oct-20
Reviewed by	P R Sykes
Characterisation of scenario being evaluated	Exposure to adjacent residents from trace loose chryostile fibres as a result of soil disturbance during construction
Interpretation of scenario ranking by DST	Low risks posed by disurbance of trace fibres, standard advice to minimise exposure risks through control of dusts (dampening soils prior to disturbance during periods of warm and dry weather).

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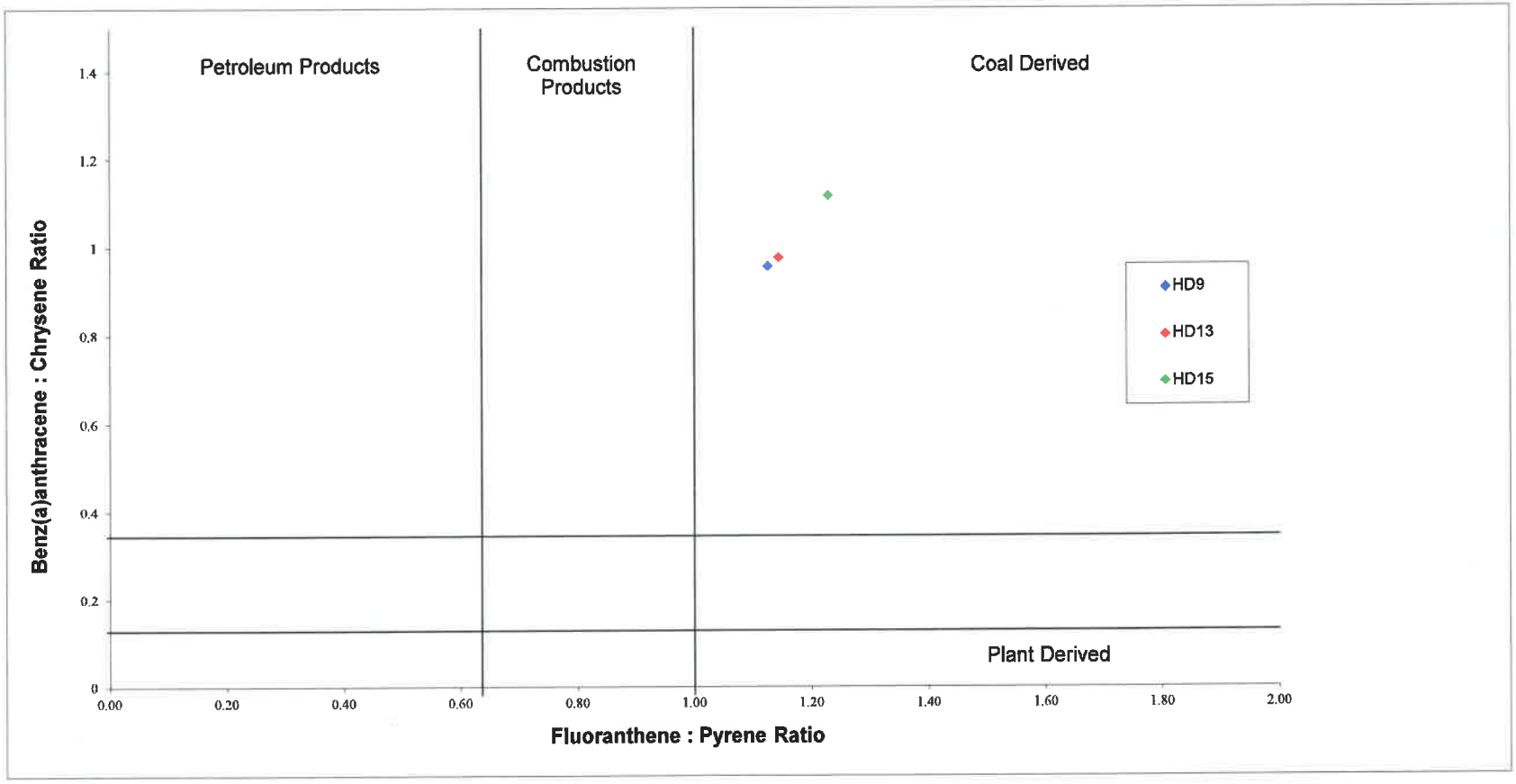
Source Signature Double Ratio Plot

Coopers Project Number:	7583
Laboratory Reference Number:	N/A

Sample Type:	Topsoil/Madeground (similar to topsoil)
Laboratory:	Element

Sample No.	HD9	HD13	HD15		
Benzo(a)anthracene	4.85	6.76	6.93		
Chrysene	5.08	6.93	6.21		
Fluoranthene	8.92	12.04	14		
Pyrene	7.91	10.51	11.38		

All concentrations are in mg/kg



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Source Signature Double Ratio Plot Explanation Sheet

When coal forms, organic matter is converted to coal via low grade metamorphism. The geological process which converts the fresh organic matter to a carbon based strata is noted to comprise carbonisation as well as dehydrogenation. The carbonisation process forms methane gases as well as partially converts the material into hydrocarbon based products. As carbonisation progresses, the volume of volatile gases diminish as these are driven from the strata and complex organic compounds are formed. The slow cracking of the organic material over many millions of years, where a constant heat flow is present will eventually strip the material of hydrogen, nitrogen and oxygen, producing purer carbon products. The presence of the PAH concentrations encountered to date within the samples analysed are not beyond what may be expected for a coal. Other methods of PAH formation comprise the partial combustion of fuel such as coal and petroleum.

To determine whether the source of the PAH compounds are petroleum or pyrogenically (from coal fragments) formed, a source signature double ratio plot assessment was undertaken. This method of appraisal compares a ratio of comparative compound pairs for 4 No. PAH compounds. This means that the properties of the comparative PAH compounds are similar (such as aqueous solubility, molecular weight, Kow) and have diagnostic source ratios which should retain their relative concentrations and hence their ratio remain constant. Cooper Associates have adopted a classification of double ratio PAH compounds fluoranthene/pyrene and benzo(a)anthracene/chrysene in accordance with Costa and Sauer 2005. These have been considered the most appropriate pairing to determine a differentiation between petroleum fuels, coal, coal derived products, combustion products and natural plant matter (such as peat and lignin).

The method for differentiating petroleum based hydrocarbon concentrations from natural organic units is by determining the rates of combustion and the relative losses of PAH compounds within samples analysed. Forensic environmental scientists, situated predominately within the United States, have investigated the relationships between many combinations of PAH compounds and it is generally considered the 4 No. compounds mentioned above have a suitable and representative correlation for this assessment.

The method of assessment requires the 2 ratios of the 2 pairs of diagnostic source ratio compounds to be calculated, and the results plotting on a graph. The graph has areas compartmentalised into petroleum, combustion and coal derived sources, with plant derived sources situated in the bottom right hand corner. These designations have been derived from ALcontrol Geochem's extensive knowledge with regards to PAH signatures as well as the extensive work completed by Environmental Forensic scientists such as H J Costa and T C Sauer. ALcontrol Geochem have been using this method for tracing hydrocarbon sources for many years and have pooled their extensive database of material type traces for their graphic representation (refer to Figure 1 below).

PAH compounds can be both created and lost through combustion. With regards to petroleum derived products, the fresh compounds tend to be situated on the mid left hand side of the graph, with combusted and heavier fuels moving north east across the graph. Coal is generally positioned in the top right area of the graph, with combustion products such as ash and clinker, soot and burnt coal being situated between coal and petroleum sections. It should be noted that smokeless fuels appear within the mid petroleum derived column as the processes involved in the formation of this fuel includes the removal of certain PAH compounds.

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Peat forms PAH compounds due to the degradation of organic matter and is represented in the bottom right hand corner of the graph. Asphalt and coal tar derived tarmac can also be determined from this form of analysis.

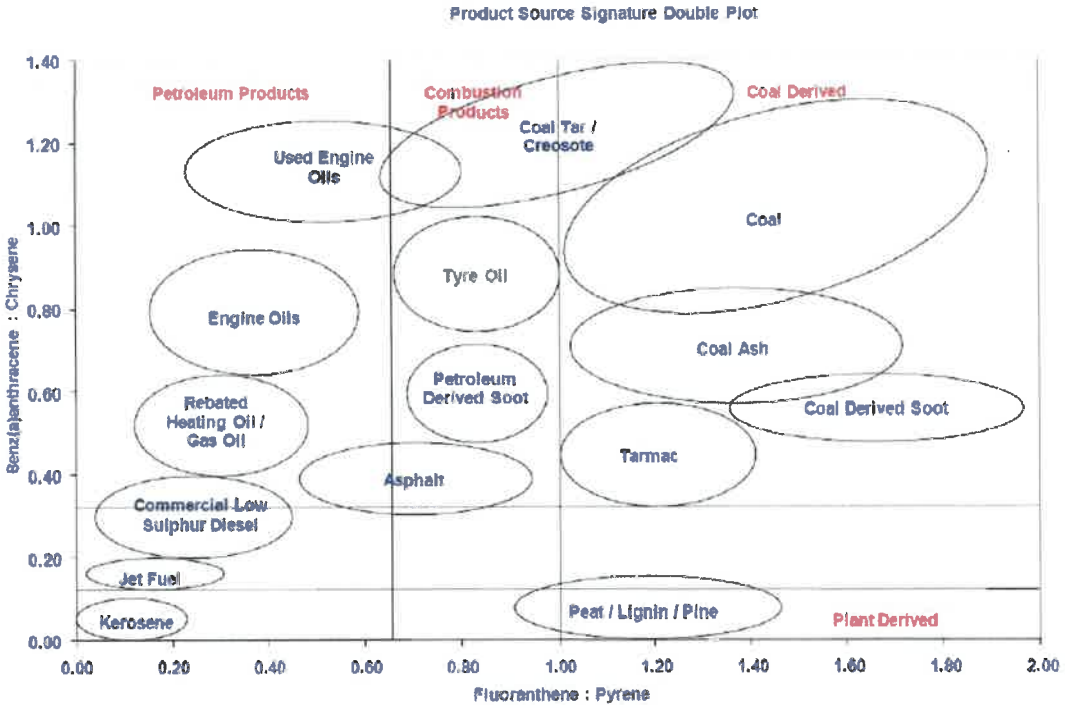

Figure 1: Key to source signature double ratio plots based on conjectured source.

Double ratio plots – references

Double ratio plots have been developed as a result of expanding our Environment Forensic capabilities and is based on the following references amongst others.

Yunker, M. B., Macdonald, R. W., Vingarzin, R., Mitchell, R. H., Goyette, D., and Sylvestre, S. 2002. PAH in the Fraser River basin: A critical appraisal of PAH ratios as indicators of PAH source and composition. *Organic Geochemistry* 33:489-515.

Costa, H. J., and Sauer, T. C., Jr. 2005. Technical Note - Forensic Approaches and Considerations in Identifying PAH Background. *Environmental Forensics,* 6:9-16.

As for how robust the technique is, for low concentrations, or where the PAHs being used to determine the ratios are very similar it will not be completely reliable, but we have found that in most cases it offers a very good correlation with visual and/or site histories. Ratios other than those on the flier can also be used.

Environmental forensics is basically a matter of using the most appropriate ratios to identify sources and correlate spills. There are hundreds of possible combinations, and it is very much a case of experience and knowledge as to which will give the most meaningful answers, as no two sites are the same.

The Fluoranthene:Pyrene vs Benz(a)anthracene:chrysene ratios have been found to be the best in identifying the sources of PAH compounds with regard to petroleum, petrogenic (coal), combustion (ash and clinker) or recently formed (peat).

Appendix 11

CDM Information

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Client : Prospect Homes
Project : Mitton Road. Whalley
Project No : 7583

DESIGN RISK ASSESSMENTS FOR FOUNDATION OPTIONS

ACTIVITY/ELEMENT OF DESIGN	HAZARD (ie slips, trips, falls, manual handling, use of mobile plant, chemicals etc.)	RISK ASSESSMENT								HAZARD AVOIDANCE MEASURES (specify measures required to avoid or minimize risk using hierarchy of controls)
		Construction Phase				Operational/Maintenance Phase				
		High	Med	Low	N/A	High	Med	Low	N/A	
Foundations <1200mm deep and House Drainage (ie Traditional & Nominally Reinforced Strip Footings)	Falls/slips/trips		✓						✓	Provide information and training on working in excavations. Use daily inspections by competent person prior to entry into trench and recording on Excavation Register
	Trench Collapse			✓					✓	Ensure excavation sides battered back to a safe angle of repose. Provide information and training on working in excavations. Use daily inspections by competent person.
Breaking out existing foundations	Noise /vibration		✓						✓	Identify existing foundations and dig out using mechanical excavator. If not possible break out using hand held breakers. Minimise vibration in breakers by maintenance. Ensure use of thick gloves/appropriate PPE
	Contamination			✓					✓	Removal of contaminated material to a licensed landfill site or use of inert cover over contaminated strata . Use of PPE by groundworkers. Enforcement of good hygiene rules and provision of welfare facilities.
Handling of blocks/bricks and steel mesh	Musculo-Skeletal Injury		✓						✓	Use of mechanical handling plus manual handling risk assessment. Certificate required for mechanical handling. Designer to specify use of blocks/bricks and mesh of suitable unit weight for manual handling. Contractor to ensure mesh lengths take into account manual handling. Mechanical handling where possible.
Concrete pouring/mortars	Skin Irritation/Eczema		✓						✓	Contractor to ensure proper use of barrier cream/PPE. Designer to ensure suitable mortar additives. Contractor to carry out COSHH assessments.
	Existing services		✓						✓	Contact utilities management companies to confirm existence or absence of live services. Provide utilities plans to Contractor. Use of Cat and Genny during excavation and proceed with care. Hand dug excavations where necessary.
Foundations >1200mm deep and Drains/Services (ie Deep Strip footings or Mass Concrete Trench Fill	Trench collapse	✓							✓	Ensure excavation sides supported by propping/trench sheeting, or battered back to a safe angle of repose. Provide information and training on working in excavations. Use daily inspections by competent person. Added risk in areas of groundwater. Ensure that excavation pumped dry at all times.
	Slips/trips/falls	✓							✓	Provide information and training on working in excavations. Use daily inspections by competent person prior to entry into trench and recording on Excavation Register
	Contamination			✓					✓	Removal of contaminated material to a licensed landfill site or use of inert cover over contaminated strata. Use of PPE by groundworkers. Enforcement of good hygiene rules and provision of welfare facilities.
	Existing Services			✓					✓	Contact utilities management companies to confirm existence or absence of live services. Provide utilities plans to Contractor. Use of Cat and Genny during excavation and proceed with care. Hand dug excavations where necessary.

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Project : Mitton Road. Whalley
Project No : 7583

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DESIGN RISK ASSESSMENTS FOR FOUNDATION OPTIONS

ACTIVITY/ELEMENT OF DESIGN	HAZARD (ie slips, trips, falls, manual handling, use of mobile plant, chemicals etc.)	RISK ASSESSMENT								HAZARD AVOIDANCE MEASURES (specify measures required to avoid or minimize risk using hierarchy of controls)
		Construction Phase				Operational/Maintenance Phase				
		High	Med	Low	N/A	High	Med	Low	N/A	
Foundations >1200mm deep and Drains/Services	**Continued**									
Installation of polystyrene sheets for heave protection requiring manned entry to unsupported excavations	Trench collapse Slips/trips/falls	✓							✓	Install inaccordance with approved method statement and to include edge protection and adequate cross over points. Alternatively consider integral raft foundation with stone blanket.
Concrete pouring/mortars	Skin Irritation/Eczema	✓							✓	Contractor to ensure proper use of barrier cream/PPE. Designer to ensure suitable mortar additives. Contractor to carry out COSHH assessments.
Handling of blocks/bricks and steel mesh	Musculo-Skeletal injury		✓						✓	Use of mechanical handling plus manual handling risk assessment. Certificate required for mechanical handling. Designer to specify use of blocks/bricks and mesh of suitable unit weight for manual handling. Contractor to ensure mesh lengths take into account manual handling. Mechanical handling where possible.
	Asphyxia and confirmed space working	✓							✓	Confined space procedures for working in deep excavations/manholes. Ensure fumes from mechanical plant, such as pumps, are well controlled.
Breaking out existing foundations	Noise/Vibration			✓					✓	Identify existing foundations and dig out using mechanical excavator. If not possible break out using hand held breakers. Minimise vibration in breakers by maintenance. Ensure use of thick gloves/appropriate PPE
Raft Foundations with Integral floor slab	Slips/trips/falls		✓						✓	Provide information and training on working in excavations. Use daily inspections by competent person prior to entry into trench and recording on Excavation Register
Strip existing fill material and remove to approved bearing strata. Backfill with approved consolidated granular fill.	Trench collapse	✓							✓	Ensure excavation sides supported by propping/trench sheeting, or battered back to a safe angle of repose. Provide information and training on working in excavations. Use daily inspections by competent person. Added risk in areas of groundwater. Ensure that excavation pumped dry at all times.
	Contamination			✓					✓	Removal of contaminated material to a licensed landfill site or use of inert cover over contaminated strata. Use of PPE by groundworkers. Enforcement of good hygiene rules and provision of welfare facilities.

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Project No : 7583

DESIGN RISK ASSESSMENTS FOR FOUNDATION OPTIONS

ACTIVITY/ELEMENT OF DESIGN	HAZARD (ie slips, trips, falls, manual handling, use of mobile plant, chemicals etc.)	RISK ASSESSMENT								HAZARD AVOIDANCE MEASURES (specify measures required to avoid or minimize risk using hierarchy of controls)
		Construction Phase				Operational/Maintenance Phase				
		High	Med	Low	N/A	High	Med	Low	N/A	
Raft Foundations with Integral floor slab	**Continued**									
Construction of granular blanket beneath raft for heave precautions, depth <1200mm.	Trench collapse Slips/trips/falls			✓					✓	Ensure excavation sides battered back to a safe angle of repose. Provide information and training on working in excavations. Use daily inspections by competent person. Use daily inspections by competent person prior to entry into trench and recording on Excavation Register.
Breaking out existing foundations	Noise/Vibration			✓					✓	Identify existing foundations and dig out using mechanical excavator. If not possible break out using hand held breakers. Minimise vibration in breakers by maintenance. Ensure use of thick gloves/appropriate PPE
	Existing Services			✓					✓	Contact utilities management companies to confirm existence or absence of live services. Provide utilities plans to Contractor. Use of Cat and Genny during excavation and proceed with care. Hand dug excavations where necessary.
	Backfilling			✓					✓	Use mechanical excavators to place approved granular fill in layers and lightly compact. Geotextile wrap fills in 1m max. lift heights and use graded granular material with good self compacting properties. Compaction with plant only when excavation depth <1200mm deep.
Steel Fixing	Musculo-Skeletal injury		✓						✓	Designer to schedule bars to take into account manual handling. Avoid long large diameter bars. Use of mechanical handling where possible plus manual handling risk assessment. Certificate required for machanical handling
Concrete pouring/mortars	Skin Irritation/Eczema	✓							✓	Contractor to ensure proper use of barrier cream/PPE. Designer to ensure suitable mortar additives. Contractor to carry out COSHH assessments.
Foundations-piled										
Mobilisation of plant	Sequencing of piling work with other construction to avoid unsafe conditions		✓						✓	Tender documents to include site investigation report and current services information. Contractor to plan site access. Provision of stone support blanket where required to protect buried services. Design of piling platform to BR470. Agree working clearances with highway authority
	Damage to buried services		✓						✓	
	Rig overturning		✓						✓	

Client : Prospect Homes
Project : Mitton Road. Whalley
Project No : 7583

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Coopers
Consulting Engineers

DESIGN RISK ASSESSMENTS FOR FOUNDATION OPTIONS

ACTIVITY/ELEMENT OF DESIGN	HAZARD (ie slips, trips, falls, manual handling, use of mobile plant, chemicals etc.)	RISK ASSESSMENT								HAZARD AVOIDANCE MEASURES (specify measures required to avoid or minimize risk using hierarchy of controls)
		Construction Phase				Operational/Maintenance Phase				
		High	Med	Low	N/A	High	Med	Low	N/A	
Foundations-piled	**Continued**									
Pile driving - CFA	Hearing loss		✓						✓	Contractor to establish closed working zone inside which PPE to be mandatory (ear defenders, etc)
	Contamination		✓						✓	Any arisings from pile excavation to be segregated and disposed of as controlled waste. Operatives to be provided with adequate welfare provisions for washing and eating.
-CFA auger changes	Musculo-skeletal injury		✓						✓	Limit number of pile sizes to struicture.
- Steel fixing	Musculo-skeletal injury		✓						✓	Schedule bars to take into account manual handling. Avoid long large diameter bars whose weight would exceed 20kgs. Consider automated cage reinforcement equipment.
-Reinforcement lifting	Injury from falling steel bars		✓						✓	Design of reinforcement cages to be robust enough for lifting.
- Concrete pouring	Skin irritation/ eczema		✓						✓	Contractor to ensure proper use of barrier cream/ PPE
Pile driving - precast concrete segmental	Hearing loss	✓							✓	Contractor to establish closed working zone inside which PPE to be mandatory (ear defenders, etc)
	Musculo-skeletal injury Trapping/ crushing	✓							✓	Contractor to prepare Method Statement. Provide information and training in handling and jointing piles. COSHH assessment of adhesives used in pile jointing.. Use of PPE.
Pile trimming to cut-off level and expose reinforcement. - Scabbling pile surface	Noise/Vibration Musculo-skeletal injury Trapping/ crushing Cuts & abrasions		✓						✓	Correct use of mechanical pile croppers or other means of trimming that do not involve excessive use of hand held tools. Minimise vibration in hand held breakers by maintenance. Ensure use of thick gloves/appropriate PPE. Use protection caps on exposed bars after trimming.
Ground Beams										
Retained ground "fill": excavation < 1.2m	Trench collapse		✓						✓	Ensure excavation sides battered back to angle of safe repose. Provide information and training on working in excavations. Use "permit to work" system and daily inspections by competent person.
Retained ground "fill": excavation > 1.2m	Trench collapse/ trips/ falls	✓							✓	Ensure excavation sides supported by propping/ trench sheeting, or battered back to angle of safe repose. Provide information and training on working in excavations. Use "permit to work" system and daily inspections by competent person.
Steel fixing	Musculo-skeletal injury		✓						✓	Schedule bars to take into account manual handling. Avoid long large diameter bars whose weight would exceed 20kgs.
Concrete pouring	Skin irritation/ eczema		✓						✓	Contractor to ensure proper use of barrier cream/ PPE

Park House, Sandpiper Court,
Chester Business Park,
Chester, CH4 9QU

COOPERS is the trading name of Coopers (Chester) Limited.
Company registered in England & Wales. Company number 09730429.
Registered office Park House, Sandpiper Court, Chester, CH4 9QU

tel: 01244 684 910
web: www.coopers.co.uk
email: admin@coopers.co.uk

Appendix 12

United Utilities Potable Water Supply Pipeline Risk Assessment

Risk assessment for water pipes (RA)

United Utilities
helping life flow smoothly

The risk assessment for water pipes will help you choose appropriate materials for your development. We are happy to deal with a risk assessment for water pipes in advance of any formal application for a new water supply.

If you need any help completing the form please call us on **0345 072 6067.**

Section 1: Development details	
Development Name *(if it has one)*	N/A
Development Address	Mitton Road, Whalley
OS Grid Reference *(mid point)*	
Developers Name	
UUW reference number *(for UU use only)*	

Please provide details below of the current and historical use of the site and adjacent sites.
If your supporting information has details of the current and historical site use, please reference below the relevant sections of your report.

Refer to Coopers Report No. 7583si for detailed description of site history.
ONSITE:
Current - residential housing, parking, and open land.
Historical - fields and a former pond from 1846 until development of the housing from 1912-1933.

ADJACENT:
Current - The surrounding land use consisted of a residential housing to the west, open land with a former railway cutting (not filled) to the north, agricultural land, cattle breading centre and depot to the east and Calderstones Hospital to the south and south west.

Historical - The residential housing was constructed on areas of the former Calderstones Hospital, developed from 1999 (area formerly investigated by Coopers).

Section 2: Preliminary risk assessment	
Has your desk study and site walkover identified any land potentially affected by contamination?	■ Yes ☐ No

If the site is potentially affected by contamination but you have not completed any intrusive site investigation please provide details below of the rationale behind the intended pipe selection.
If your supporting information has details of the rationale behind the intended pipe selection, please reference below the relevant sections of your report.

N/A - Site investigations complete - refer to Coopers Report No. 7583si for details.

Section 3: Intrusive site investigation

Have you completed any intrusive site investigation?	■ Yes ☐ No
Have you completed any none intrusive site investigation?	☐ Yes ■ No
Date(s) when the site investigation(s) undertaken	09/02/20 to 10/02/20
At what level has groundwater been encountered?	perched metres below ground level or ■ Not encountered

Table 1 (Pipeline Selection Risk Assessment Summary (PSRAS)) below classifies testing required where the preliminary risk assessment has identified land potentially affected by contamination. Please provide details below of any test groups which have not been tested and the rationale for not testing.

If your supporting information has details of the rationale behind not testing any particular test groups, please reference below the relevant sections of your report.

Suites of chemical testing determined based upon the site conceptual model and ground conditions for statutory approval. Refer to Coopers Report No. 7583si for details.

If the intrusive site investigation has identified concentrations above the PE threshold (see PSRAS) and your intended pipe selection is PE. Please provide details below of the rationale behind the intended pipe selection.

If your supporting information has details of the rationale behind the intended pipe selection, please reference below the relevant sections of your report.

The former pond contained trace amounts of TPH, with elevated concentrations identified within one of the exploratory holes above the C10-12 range. These were entirely within the high carbon aromatic range TPHs determine by forensic analysis to be coal based PAHs. The deeper pond infill and coal/PAHs are not considered a risk to fuel pipeline materials.

Section 4: Site remediation

Please provide details below of any site remediation (which may include a change in site levels) already completed.

If your supporting information has details of the site remediation already completed, please reference below the relevant sections of your report.

N/A - no remediation completed.

Has the PSRAS (Table 1) been completed using appropriate data after remediation?	☐ Yes ■ No ☐ N/A

Please provide details below of any proposed site remediation and an analysis of whether this will affect your intended pipe selection.

If your supporting information has details of any proposed site remediation and whether this will affect your intended pipe selection, please reference below the relevant sections of your report.

Remediation is limited to removal of localised areas of contaminated topsoil, and inert cover systems within gardens.

Section 5: Final use of site

Please provide details below of any chemicals (including fuel) to be stored on site and any other future contamination risks which may affect your intended pipe selection.

If your supporting information has details of potential contamination risks which may affect your intended pipe selection, please reference below the relevant sections of your report.

N/A - proposed residential end use.

What water pipe materials are intended to be used on site?	■ PE ☐ PE Barrier Pipe Type A ☐ PE Barrier Pipe Type B Other *(please specify)*:

Section 6: Additional information

Please provide details below of any chemicals (including fuel) to be stored on site and any other future contamination risks which may affect your intended pipe selection.

If your supporting information has additional information to support your intended pipe selection, please reference below the relevant sections of your report.

Please refer to Coopers Site Investigation Report No. 7583si for further details.

Section 7: Risk assessor

Name and relevant qualifications of person directing the risk assessment for water pipes	B W Hill - Chartered Scientist BSc (Hons), CSci, MIEnvSc, FGS
Name and address of risk assessor's company	Coopers Chester (Ltd), Park House, Sandpiper Court, Chester Business Park, Chester, CH4 9QU
Date risk assessment performed	21 10 2020

Section 8: Declaration

I confirm I have completed this form and provided supporting information in accordance with 'UKWIR Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' and UUW's Supplementary Guidance. I also confirm that if any further site investigation is needed and carried out, I will be required to submit an additional Risk Assessment for Water Pipes with the relevant supporting information. I understand that failure to supply any of the required information may delay my application being processed.

Name	B W Hill	Company	Coopers Chester Ltd
Telephone	01244 684 910	Date	21 10 2020

Please email the completed form and supporting information to **DeveloperServicesWater@uuplc.co.uk**. Alternatively you can fax a paper version to **01925 677973** or post to us at United Utilities Water, Developer Services, Windermere House, Lingley Mere, Warrington WA5 3LP.

United Utilities
helping life flow smoothly

About us

United Utilities is the North West's water company. We keep the taps flowing and toilets flushing for seven million customers every day. From Crewe to Carlisle, we work hard behind the scenes to help your life flow smoothly.

United Utilities Water Limited, Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Warrington WA5 3LP.
Registered in England and Wales. Registered Number 2366678.

Table 1 - Pipe selection risk assessment summary (PSRAS)	
1. Testing must be undertaken on the materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials. Please use the appropriate testing data to complete Table 1 below.	
2. If more than one pipe selection is being made, for example, for pipes in different areas of a large site, a completed PSRAS is required for each selection.	
What materials have been tested to populate Table 1 below?	☑ Existing ground materials ☐ Remediated materials ☐ Imported capping materials

All concentrations in mg/kg								
Test Group	**Testing Required?**	**PE threshold**	**Metal Pipes/ Barrier Pipe**	**Laboratory Detection Limit**	**Testing UKAS accredited Y/N**	**Maximum concentration at proposed pipeline depth** *See Note [2]*	**Maximum site concentration** *See Note [3]*	**Locations and depths where concentrations exceed proposed pipeline threshold**
Total VOCs	Where Preliminary Risk Assessment (PRA) has identified land potentially affected by contamination	0.5	Pass	N/A	N/A	N/A	N/A	N/A
Total BTEX & MTBE		0.1	Pass	0.005	Y	0.011	0.011	None
Total SVOCs (excluding PAHs and those substances marked with an *)		2	Pass	N/A	N/A	N/A	N/A	N/A
EC5-EC10 aliphatic and aromatic hydrocarbons		2	Pass	0.1	Y	<LOD	<LOD	None
EC10-EC16 aliphatic and aromatic hydrocarbons		10	Pass	4	Y	<LOD	19	None
EC16-EC40 aliphatic and aromatic hydrocarbons		500	Pass	7	Y	141	<LOD	None
Phenols* (from SVOC analysis)		2	Pass	N/A	N/A	N/A	N/A	N/A
Cresols and chlorinated phenols* (from SVOC analysis)		2	Pass	N/A	N/A	N/A	N/A	N/A
Ethers*	Only where identified	0.5	Pass	N/A	N/A	N/A	N/A	N/A
Nitrobenzene*		0.5	Pass	N/A	N/A	N/A	N/A	N/A
Ketones*		0.5	Pass	N/A	N/A	N/A	N/A	N/A
Aldehydes*		0.5	Pass	N/A	N/A	N/A	N/A	N/A
Amines		Fail	Pass	N/A	N/A	N/A	N/A	N/A
Corrosive	Conductivity, Redox and pH	Pass	*See Note [1]*	N/A	N/A	N/A	N/A	N/A

Note [1] Threshold: For wrapped steel, corrosive if pH<7 and conductivity > 400µS/cm. For wrapped ductile iron corrosive if pH<5, Eh not neutral and conductivity > 400µS/cm. For copper, corrosive if pH<5 or >8 and Eh positive.

Note [2] Water pipes are normally laid at 0.75-1.35m below finished ground level.

Note [3] Also state if liquid free product is present in soil or groundwater.

Appendix 13

Reference Drawings

Drawing No.	Rev.	Drawing Title
7583/L1	-	Site Location Plan
7583/AP	-	Aerial Photograph
7583/01	-	Site Plan
7583/FDZ	A	Foundation Zone Plan
7583/Ts/01	-	Typical Details for Traditional Strip Footing
7583/Tf/01	-	Typical Details for Trenchfill Foundation
7583/TfH/01	-	Typical Details for Trenchfill Foundation with Heave Precautions
7583/PH/01	-	Typical Details for Piled Foundation with Heave Precautions
7583/AMB1/PC/01	-	Typical Gas Detail for Amber 1 Mitigation Measures.

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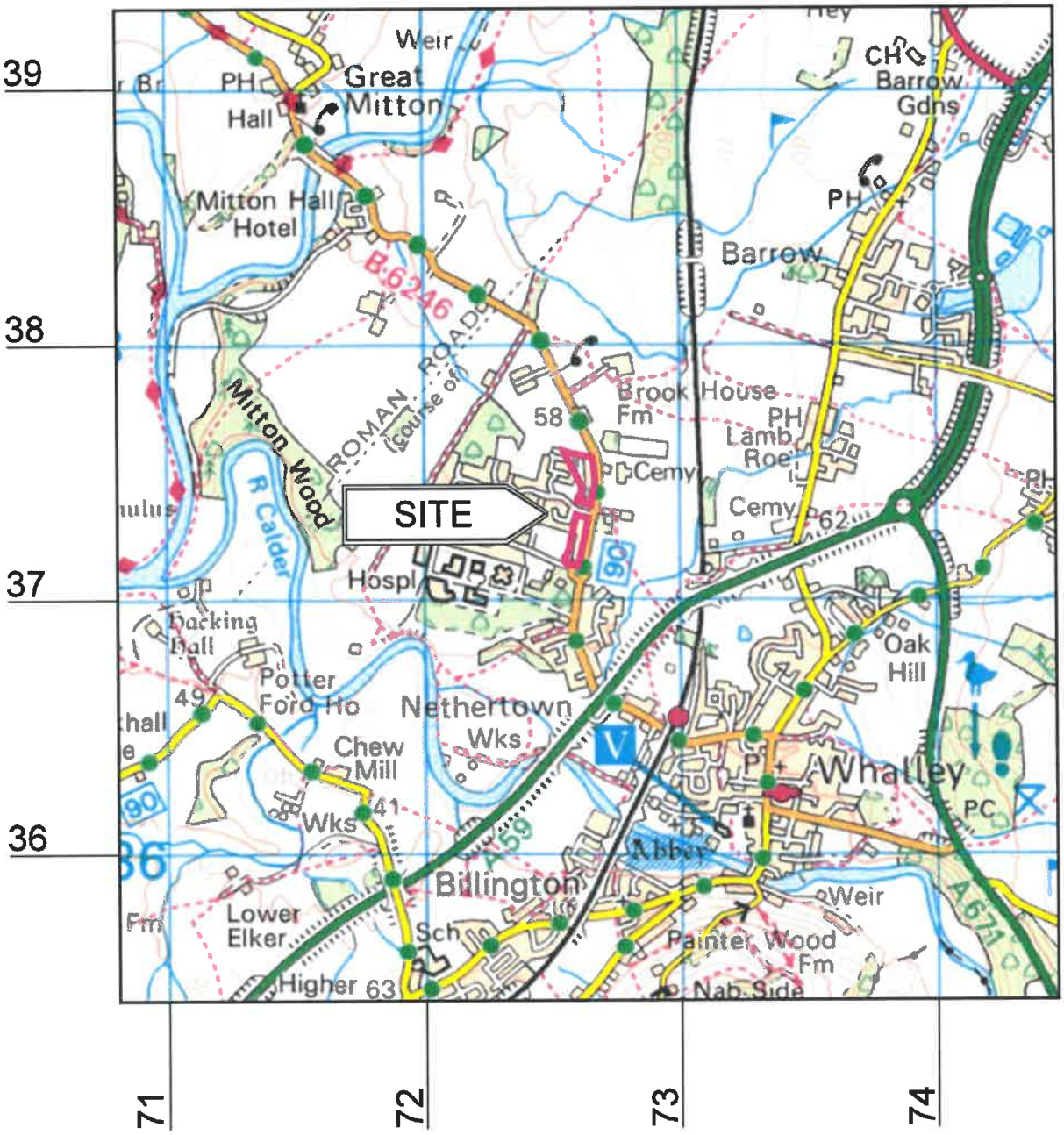
SCALE	1:25000@A4	Mitton Road, Whalley.	
DATE	27.08.20		
DRAWN	OS	SITE LOCATION PLAN	
CHEK'D	BH	Drg No:	7583 / L1

NORTH

National Grid reference of the proposed site.	SD 726 373



0 200 400 600 800 1000 1500 2000

SCALEBAR (m)

The original of this drawing contained coloured symbols and/or features.
Any black and white reproduction should not be relied upon.

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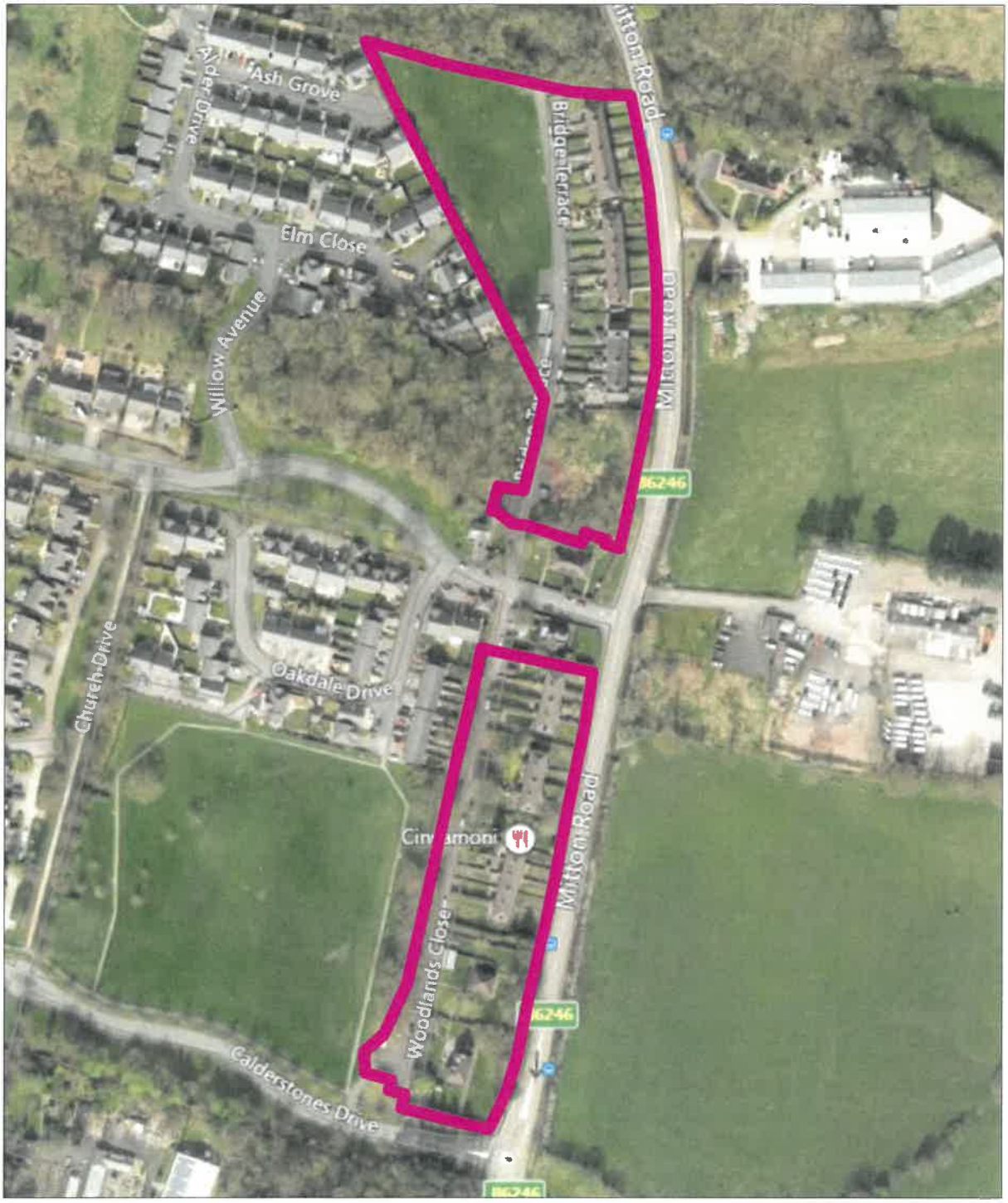
SCALE	1:2500 @A4	Mitton Road, Whalley.	
DATE	27.08.20	AERIAL PHOTOGRAPH	
DRAWN	OS		
CHEK'D	BH	Drg No:	7583 / AP

NORTH

KEY

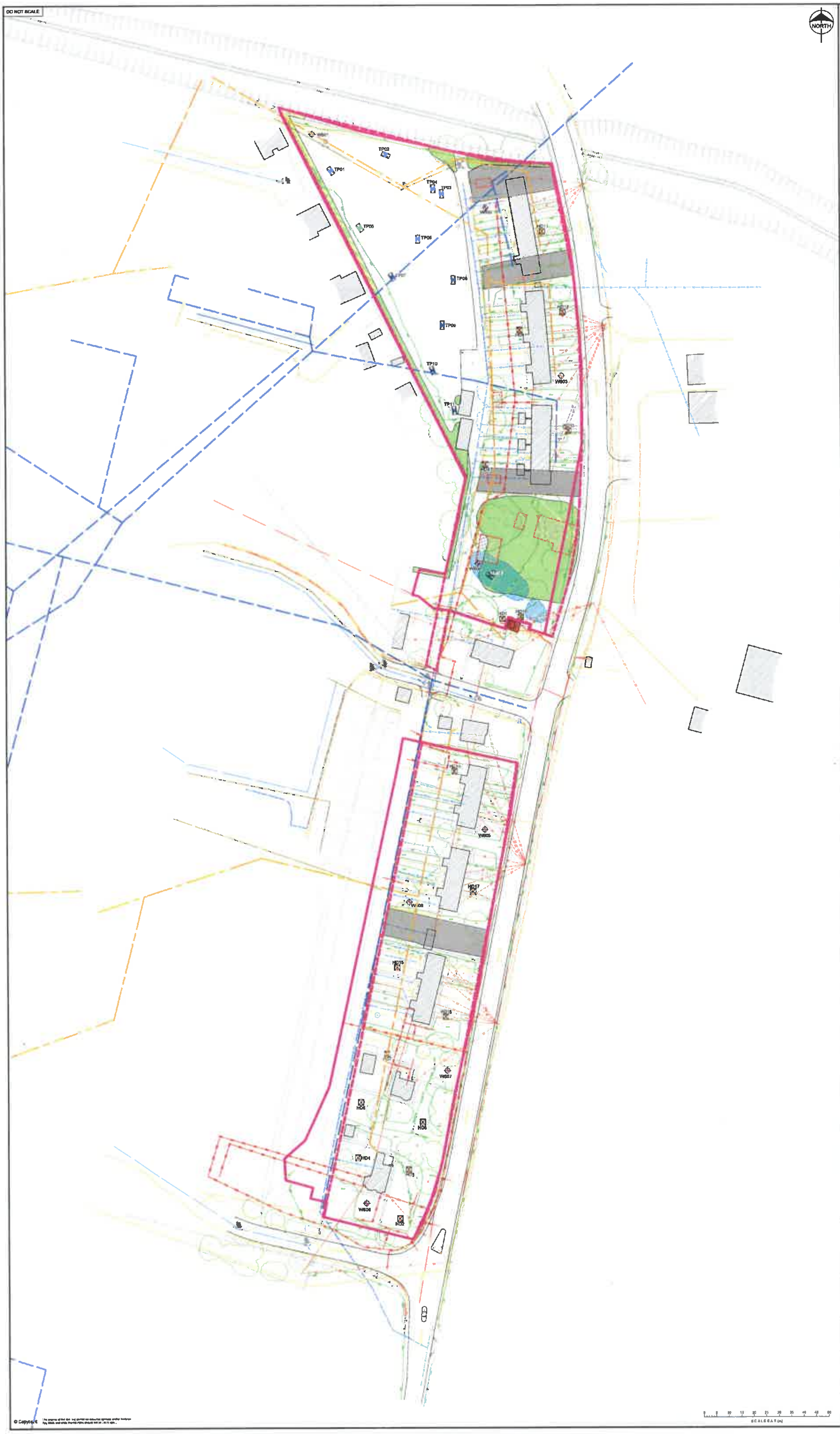
Site boundary



0 10 20 40 60 80 100 150 200

SCALEBAR (m)

The original of this drawing contained coloured symbols and/or features.
Any black and white reproduction should not be relied upon.



KEY TO EXPLORATORY HOLES
(All positions are approximate unless otherwise stated)

- Trial pits TP01 - TP12 excavated by Coopers on 03 September 2020
- Hand dig trial pits HD1 - HD17 excavated by Coopers between 28 August - 17 September 2020
- Window sample boreholes WS1 - WS8 drilled for Coopers between 28 August - 01 September 2020

KEY TO EXISTING FEATURES
(All positions are approximate unless otherwise stated)

- Surveyed buildings (taken from ref. g)
- Surveyed tree (taken from ref. g)
- Surveyed vegetation (taken from ref. g)
- Surveyed fenceline (taken from ref. g)
- Occupied properties - no investigation permitted
- Areas on Himalayan Balsam observed by Coopers on 22 July 2020
- Electricity substation (taken from ref. g)
- Original site investigation boundary (taken from ref. a)
- New site boundary (taken from ref. h)

KEY TO FORMER FEATURES
(All positions are approximate unless otherwise stated)

- Former buildings (taken from ref. f)
- Former hedgeline (taken from ref. f)
- Former pond (taken from ref. f)
- Former railway (taken from ref. f)

KEY TO CONJECTURED SERVICES
(All positions are approximate unless otherwise stated)

- BT lines (taken from ref. c)
- Surveyed BT overhead lines (taken from ref. g)
- High voltage electricity lines (taken from ref. e)
- Low voltage electricity lines (taken from ref. e)
- Gas lines (taken from ref. b)
- Potable water mains (taken from ref. d)
- Potable water private lines (taken from ref. d)
- Potable abandoned water lines (taken from ref. d)
- Surface water lines (taken from ref. d)
- Foul sewer line (taken from ref. d)
- Former surface water lines (taken from Coopers archived project No. 2309)
- Former foul sewer line (taken from Coopers archived project No. 2309)

Note:
Only above services available to Coopers at time of drawing production

This drawing is to be read in conjunction with the following:-

a) Prospect Homes, Mitton Road, Whalley, Location Plan, ref. LP001 dated July 2020.
b) Cadent Gas, ref. 372649 437364, dated 12 August 2020.
c) BT Openreach utilities map, ref. DTH02115X & WXL02118N, dated 12 August 2020.
d) United Utilities, Land at Mitton Road, Clitheroe, ref. UUPS-ORD-164086, dated 13 May 2020.
e) Electricity North West, GIS Viewer, search dated 12 August 2020.
f) Groundsure, Mitton Road, Whalley, BB7 9JT, ref. GS-6960964, dated 12 August 2020.
g) SurveyEng Ltd, Mitton Road, Whalley, Topographical Land Survey, ref. PRO.TS.07, dated 19 August 2020.
h) Prospect Homes, Mitton Road, Whalley, Draft Planning Layout, ref. MRW-SJS-PL01, received by Coopers on 16 October 2020.

THIS DRAWING SHOULD ONLY BE PRINTED IN COLOUR

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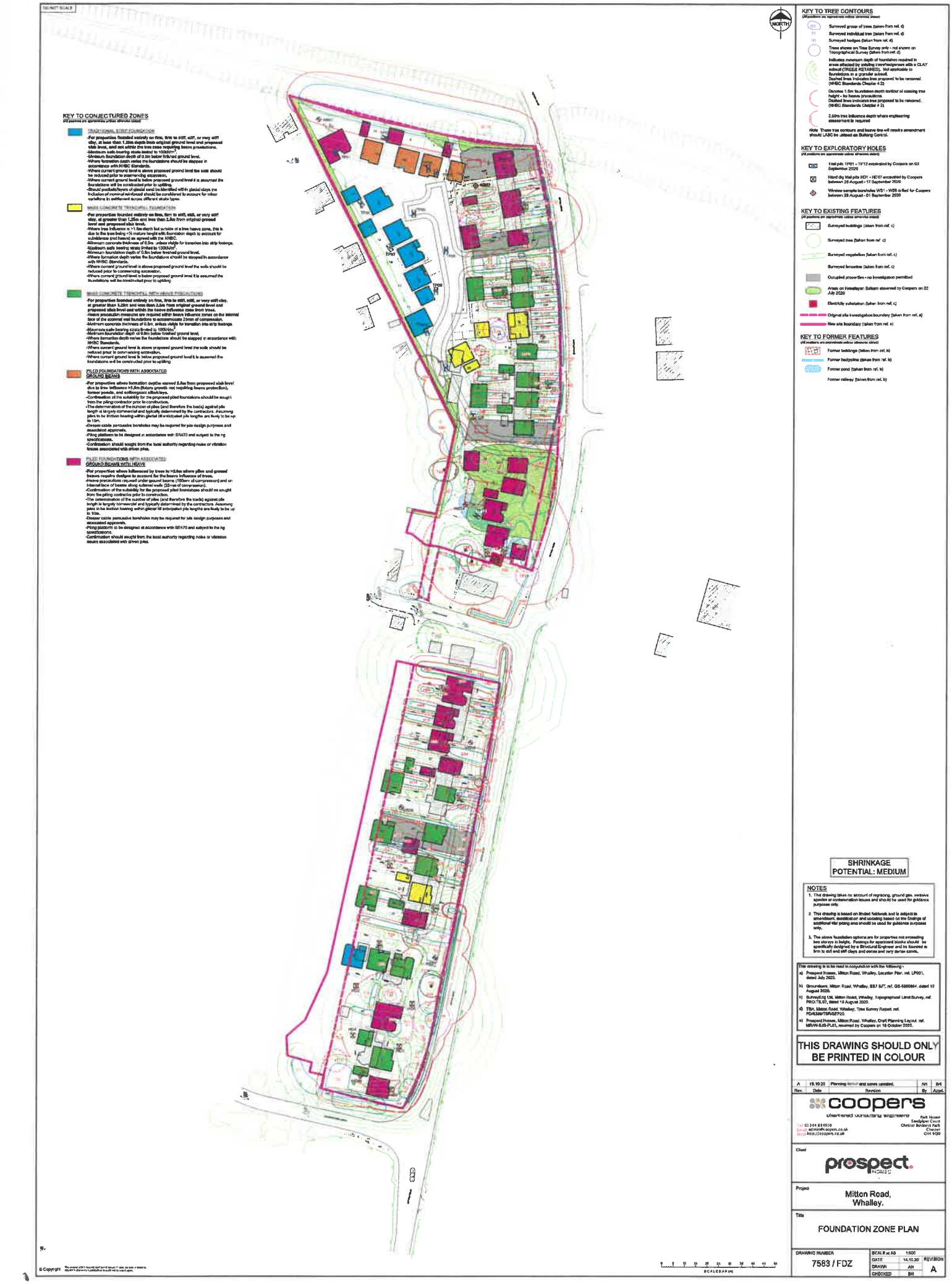
Email: admin@coopers.co.uk
Web: http://coopers.co.uk

Client: prospect.

Project: Mitton Road, Whalley.

Title: SITE PLAN

DRAWING NUMBER	SCALE at A3	1:500	REVISION
7583 / 01	DATE	21.10.20	-
	DRAWN	AM	
	CHECKED	BH	


NORTH
KEY TO CONJECTURED ZONES
TRADITIONAL STRIP FOUNDATION
MASS CONCRETE TRENCHFILL FOUNDATION
MASS CONCRETE TRENCHFILL WITH HEAVE PRECAUTIONS
PILED FOUNDATIONS WITH ASSOCIATED GROUND BEAMS
PILED FOUNDATIONS WITH ASSOCIATED GROUND BEAMS WITH HEAVE
KEY TO TREE CONTOURS
KEY TO EXPLORATORY HOLES
KEY TO EXISTING FEATURES
KEY TO FORMER FEATURES
SHRINKAGE POTENTIAL: MEDIUM
NOTES
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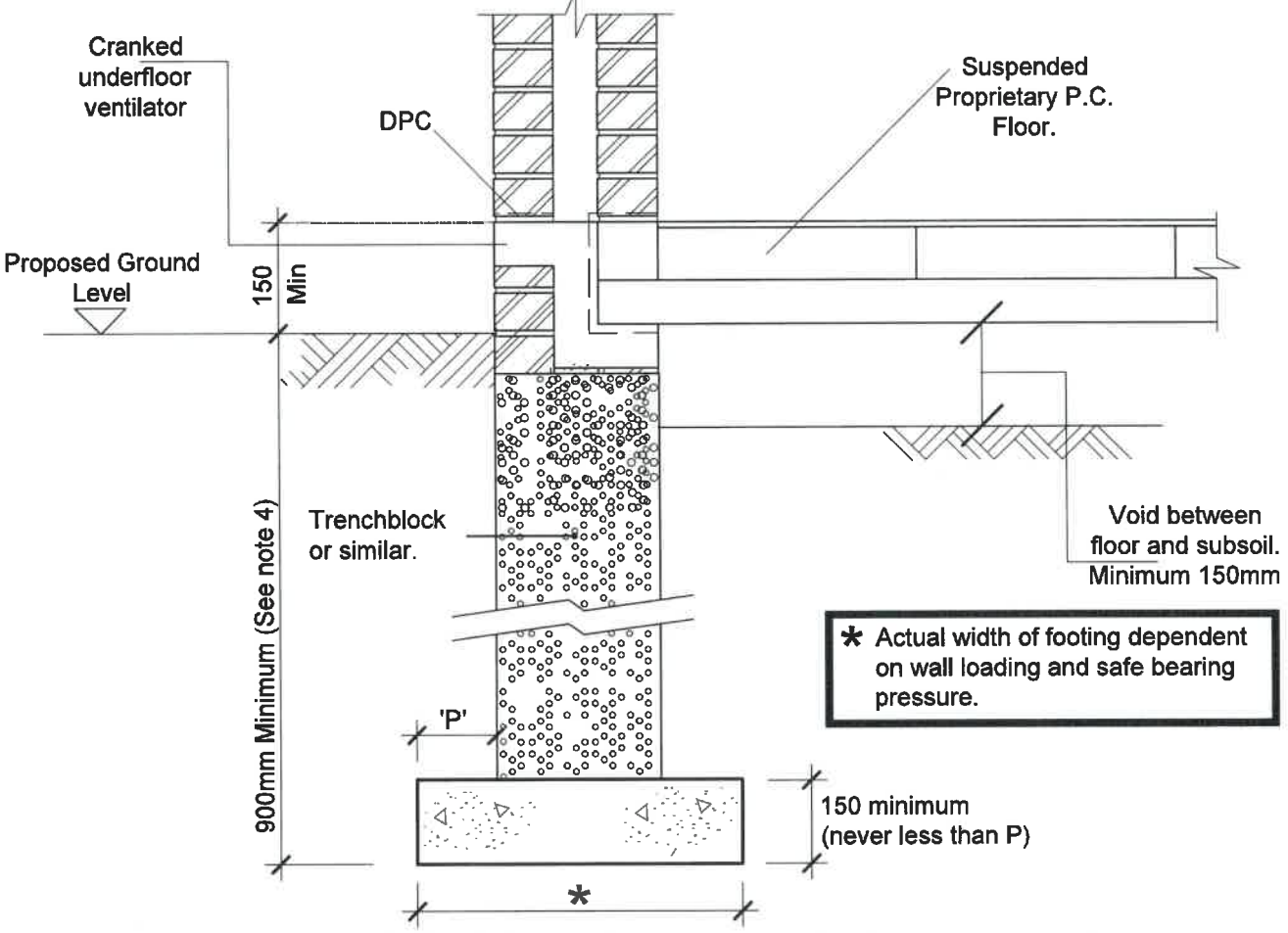
coopers
prospect.
Mitton Road, Whalley.
FOUNDATION ZONE PLAN
7583 / FDZ
1:500
14.10.20
A

THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE RELEVANT HOUSE TYPE DRAWINGS, FOUNDATION PLAN & SCHEDULE AND THE SITE SPECIFIC SITE INVESTIGATION REPORTS



TRADITIONAL STRIP FOOTING IN CLAY BEARING STRATA WITH PRECAST FLOOR SLAB

NOTES

1. This drawing is to be read in conjunction with Coopers Site Investigation Report Ref: 7583si.

2. The safe bearing pressure on clay strata limited to that indicated in the Foundation Plan referred to in Note 1 above.

3. Foundation depths indicated assume that the proposed foundations are outside the zone of influence of former, existing and proposed trees (Refer to NHBC Standards Chapter 4.2).

4. Minimum foundation depth for footings founded in the Clay Bearing Strata are to be in accordance with the NHBC Standards Chapter 4.2, Section 4.2.7, Table 4 and are as follows:-

SHRINKAGE POTENTIAL	MINIMUM DEPTH (mm)
MEDIUM	900

5. All backfill material to the foundation excavations and floor voids to be inert, non-biodegradable and free of all harmful contaminants in accordance with Approved Document C/1/2/3 of the Building Regulations (1992).

6. All wall cavities below ground to be filled with GEN 1 concrete to BS 5328 (max. agg. size 10mm). Wall cavities to be filled prior to the commencement of backfill to the foundation excavations and/or the floor voids. All backfilling to be completed in a uniform manner to prevent horizontal forces being applied to the foundation walls.

7. For Concrete, Blockwork/Brickwork and Mortar below DPC refer to the information contained in the Foundation Plan referred to in Note 1 above.

CDM HIGH RISK ASSESSMENT

FOR ALL RISKS REFER TO DESIGN RISK ASSESSMENT

REVISIONS

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CH4 9QU

CLIENT

prospect. HOMES

PROJECT

Mitton Road, Whalley.

TITLE

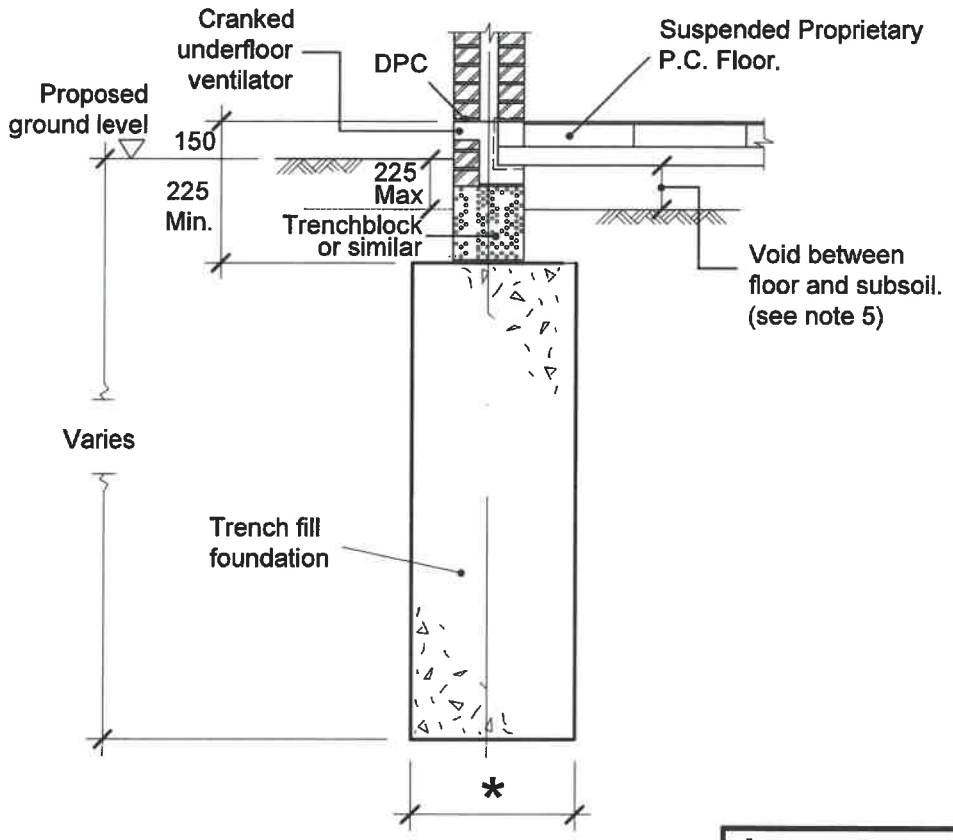
Typical Details for Traditional Strip Footing in Clay Bearing Strata with Precast Slab

DRAWN BY	AH
DATE	21.10.20
SCALE(S)	NTS

DRAWING NUMBER: 7583/Ts/01

REVISION: -

THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE RELEVANT HOUSE TYPE DRAWINGS, FOUNDATION PLAN & SCHEDULE AND THE SITE SPECIFIC SITE INVESTIGATION REPORTS



TRENCH FILL FOUNDATION

* Actual width of foundation dependent on wall loading and safe bearing pressure.

NOTES

1. This drawing is to be read in conjunction with Coopers Site Investigation Report Ref: 7583si.
2. The safe bearing pressure on strata limited to that indicated in the Foundation Plan referred to in Note 1 above.
3. For Concrete, Blockwork/Brickwork and Mortar below DPC refer to the information contained in the Foundation Plan referred to in Note 1 above.
4. All backfill material to the foundation excavations and floor voids to be inert, non-biodegradable and free of all harmful contaminants in accordance with Approved Document C/1/2/3 of the Building Regulations (1992).
5. The minimum clear void below the suspended precast concrete ground floor is to be 150mm and should be adequately ventilated in accordance with the Building Regulations (1992) and NHBC Standards Chapter 4.2 S4(d) table 10. The level of backfill to the floor voids is to be within 225mm of the adjoining outer ground level, with the backfill material being effectively drained.
6. All wall cavities below ground to be filled with GEN 1 concrete to BS 5328 (max. agg. size 10mm). Wall cavities to be filled prior to the commencement of backfill to the foundation excavations and/or the floor voids. All backfilling to be completed in a uniform manner to prevent horizontal forces being applied to the foundation walls.
7. Refer to proprietary precast concrete floor manufacturers specialist drawing for all P.C. floor details.

CDM HIGH RISK ASSESSMENT

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PROJECT

Cottam Way (Phase 5), Cottam

TITLE

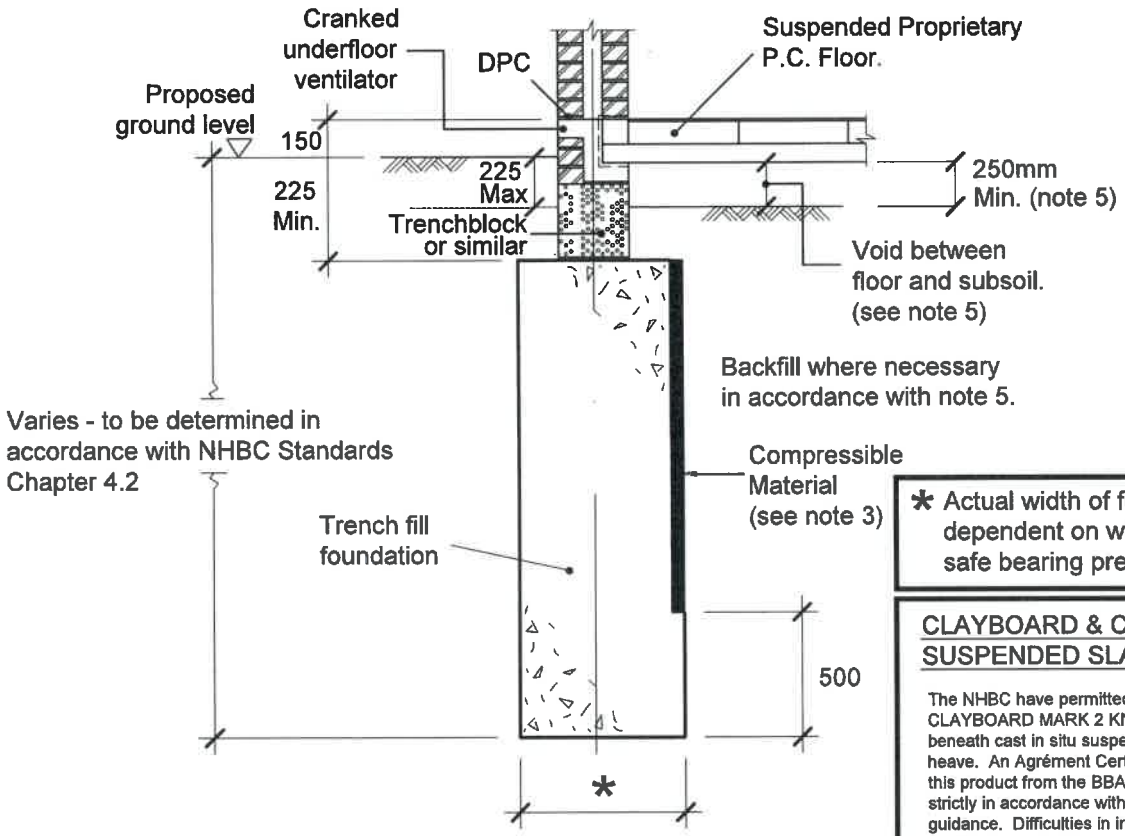
Typical Details for Trenchfill Foundation

DRAWN BY	AH
DATE	21.10.20
SCALE(S)	NTS

DRAWING NUMBER: 7583/Tf/01

REVISION: -

THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE RELEVANT HOUSE TYPE DRAWINGS, FOUNDATION PLAN & SCHEDULE AND THE SITE SPECIFIC SITE INVESTIGATION REPORTS



TRENCH FILL FOUNDATION AFFECTED BY EXISTING TREES REQUIRING HEAVE PRECAUTIONS (MEDIUM SHRINKAGE POTENTIAL)

* Actual width of foundation dependent on wall loading and safe bearing pressure.

CLAYBOARD & CAST IN SITU SUSPENDED SLABS

The NHBC have permitted the use of the new CLAYBOARD MARK 2 KN30 VOID SYSTEM beneath cast in situ suspended slabs to cater for heave. An Agrément Certificate is available for this product from the BBA. Installation must be strictly in accordance with the manufacturers guidance. Difficulties in installation may be experienced and use of this product is at the house builders discretion. Minimum void former dimension beneath suspended slab in accordance with NHBC Standards Chapter 4.2 S4(d) Table 9.

NOTES

1. This drawing is to be read in conjunction with Coopers Site Investigation Report Ref: 7583si.
2. The safe bearing pressure on strata limited to that indicated in the Site Investigation Report referred to in Note 1 above.
3. Claymaster or similar approved to be provided against internal face of perimeter foundations.
4. All backfill material to the foundation excavations and floor voids to be inert, non-biodegradable and free of all harmful contaminants in accordance with Approved Document C/1/2/3 of the Building Regulations (1992).
5. The minimum clear void below the suspended precast concrete ground floor is to be 250mm and should be adequately ventilated in accordance with the Building Regulations (1992) and NHBC Standards Chapter 4.2 S4(d) table 10. The level of backfill to the floor voids is to be within 225mm of the adjoining outer ground level, with the backfill material being effectively drained.
6. All wall cavities below ground to be filled with GEN 1 concrete to BS 5328 (max. agg. size 10mm). Wall cavities to be filled prior to the commencement of backfill to the foundation excavations and/or the floor voids. All backfilling to be completed in a uniform manner to prevent horizontal forces being applied to the foundation walls.
7. Refer to proprietary precast concrete floor manufacturers specialist drawing for all P.C. floor details.
8. For Concrete, Blockwork/Brickwork and Mortar below DPC refer to the information contained in the Site Investigation Report referred to in Note 1 above.

CDM HIGH RISK ASSESSMENT

FOR ALL RISKS REFER TO DESIGN RISK ASSESSMENT

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CLIENT

prospect. HOMES

PROJECT

Mitton Road, Whalley.

TITLE

Typical Details for Trenchfill Foundation Affected by Existing Trees Requiring Heave Precautions

DRAWN BY	OS
DATE	15.10.20
SCALE(S)	NTS

DRAWING NUMBER: 7583/TfH/01

REVISION: -

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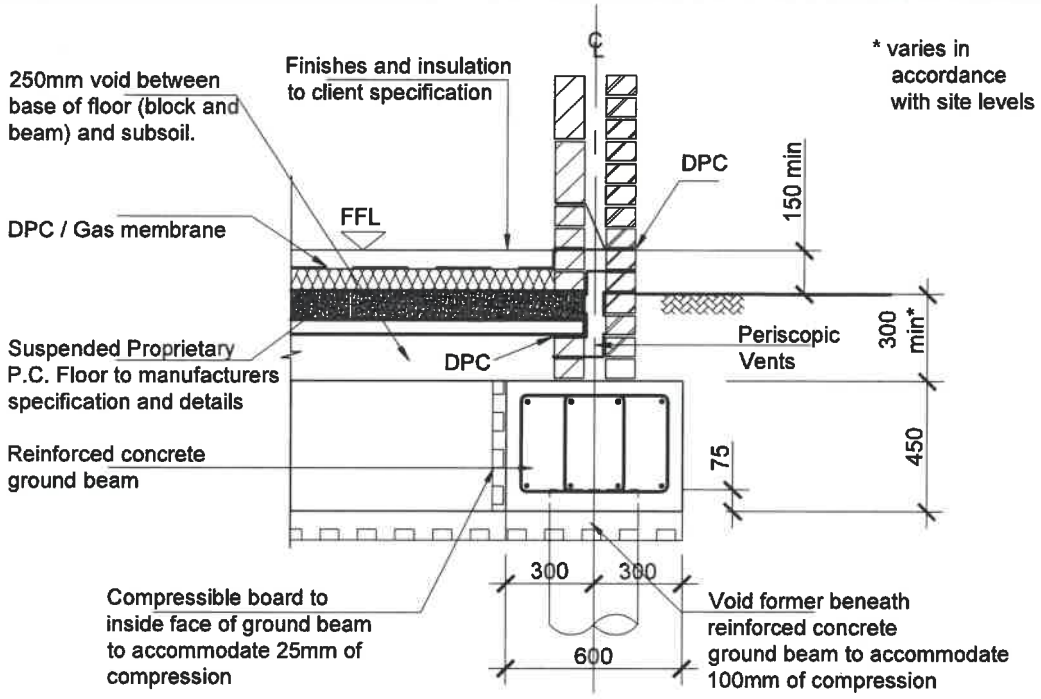
SCALE	1:25 @ A4	Mitton Road, Whalley. Typical Pile & Ground Beam Details Requiring Heave Precautions		
DATE	15.10.20			
DRAWN	OS			
CHEK'D	BH	Drg No:	7583/ PH / Typ / 02	Rev: -

This drawing must be read in conjunction with the relevant house type drawings, foundation plan, gas mitigation details & schedule and the site specific site investigation reports

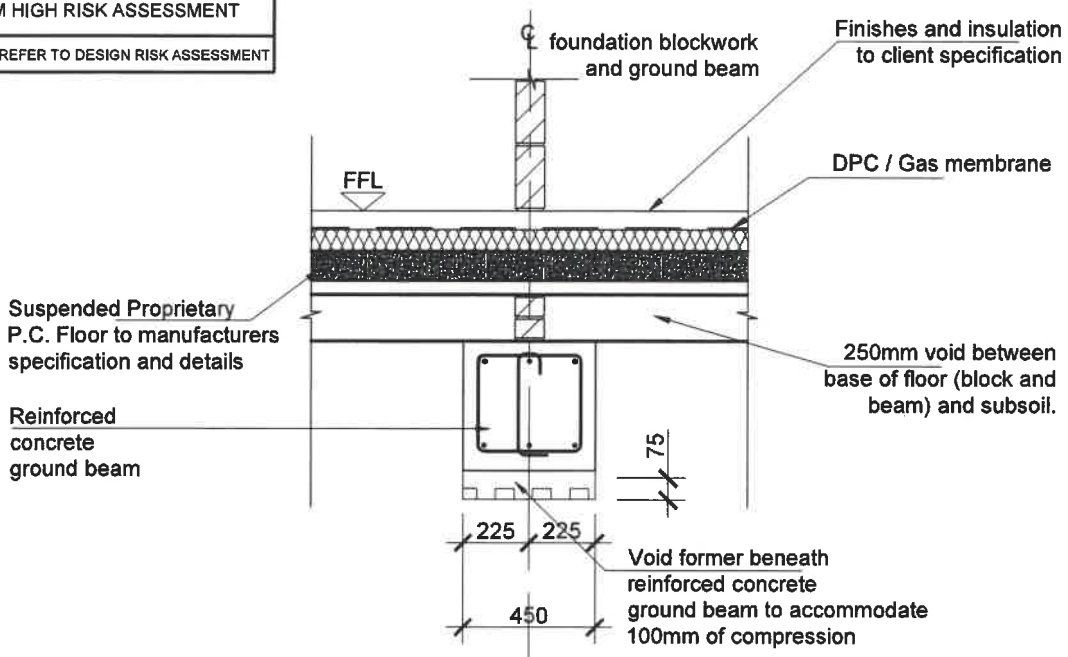


TYPICAL EXTERNAL SECTION WITH HEAVE

(SCALE 1:25)

CDM HIGH RISK ASSESSMENT

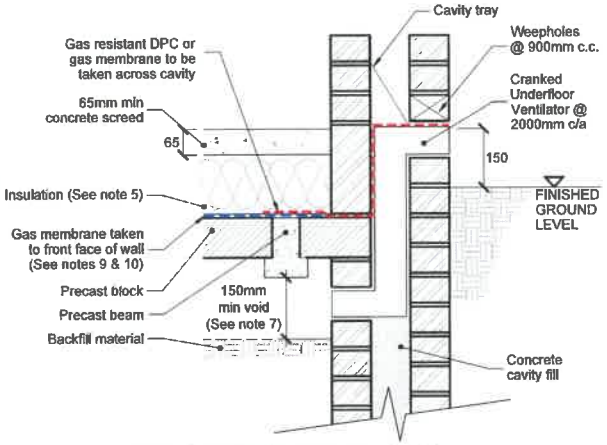
FOR ALL RISKS REFER TO DESIGN RISK ASSESSMENT



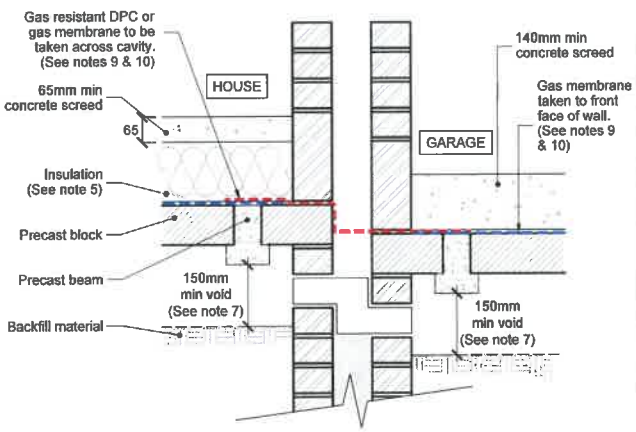
TYPICAL INTERNAL SECTION WITH HEAVE

(SCALE 1:25)

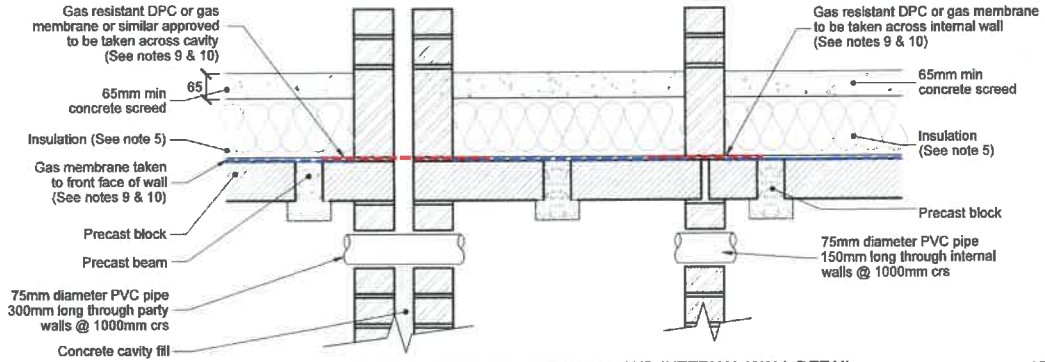
THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE RELEVANT HOUSE TYPE DRAWINGS, FOUNDATION PLAN & SCHEDULE AND THE SITE SPECIFIC GROUND GAS & SITE INVESTIGATION REPORTS



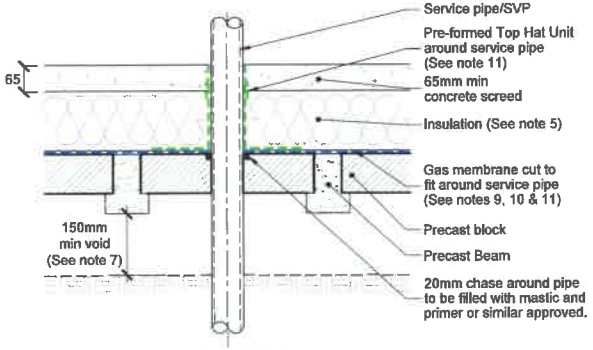
SLAB EDGE DETAIL AT EXTERNAL WALL



SLAB EDGE DETAIL WITH INTERNAL GARAGE



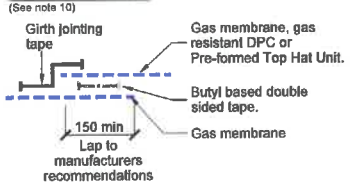
SLAB EDGE DETAIL AT PARTY WALL AND INTERNAL WALL DETAIL

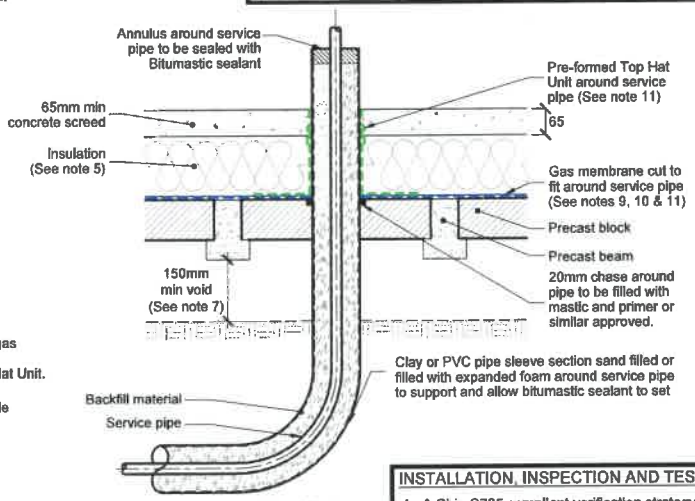


SERVICE ENTRY

FOR GUIDANCE PURPOSES ONLY

JOINTING DETAIL
(See note 10)





SLEEVED SERVICE ENTRY

NOTES

1. Coopers take no responsibility for the inappropriate use of this detail on a development. It is the responsibility of the Developer to commission a suitably qualified geo-environmental consultant to assess the relevant ground gas conditions at a development based upon the findings of in situ monitoring and/or qualitative risk assessment.
2. Coopers drawing is in accordance with current best practice with respect to design of measures and specification of membranes for the adequate protection of dwellings from the ingress of harmful ground gases. The details contained on this drawing are generic and for guidance purposes only. Any proposed amendments to the detail due to variations on specific house types should be referred back to Coopers for review and approval prior to implementation on site.
3. This drawing was prepared for the purpose stated. New products, improved practices and legislation may necessitate an alteration to this drawing in whole or in part after its submission. It is recommended that this drawing is referred to Coopers for reappraisal no later than one year from the date on this drawing. Continued use of this drawing beyond this date is at the Developers own risk.
4. Refer to precast slab drawing for relevant house types.
5. Refer to insulation details on specific house type slab drawings.
6. For details of proposed foundations refer to site specific foundation plan and site investigation report.
7. The minimum clear void below the suspended precast concrete ground floor is to be 150mm (plus heave thickness, where applicable) and should be adequately ventilated in accordance with the Building Regulations. The base of the void is to be within 450mm of the outer ground level unless masonry is designed by a structural engineer. The backfill material should be effectively drained.
8. The gas resistant membrane should be a minimum 500µm (2000 gauge) first generation, high quality polyethylene membrane which has low permeability to carbon dioxide and also acts as a damp proof membrane as well as a barrier to radon. **The specification of the gas resistant membrane should be submitted to Coopers for approval prior to use.**
9. All gas membranes should be installed to the manufacturers guidelines and recommendations. Special care must be taken to ensure that the gas membrane is not snagged, torn, punctured, stretched or in any way damaged during construction. All damaged areas of the gas membrane must be replaced or repaired to manufacturers recommendations.
10. Joints between sheets of gas membrane should be well lapped (150mm min) and taped between sheets with a double sided butyl based tape in accordance with manufacturers recommendations. Depending on the manufacturer, an optional girth jointing strap can be provided, as shown below, for additional security.
11. All service entry points should be fitted with pre-formed gas resistant top hats. Tophats should be sealed to the pipe and gas membrane using butyl based double sided tape and fixed to the pipe with a jubilee clip.
12. Characteristic Situation is defined in NHBC Technical Extra 20.

This typical detail is provided as a guide for construction. House type specific variations are required to account for slopes on garage floor slabs, stepped slab levels, full building level access, party wall temporary shuttering, corner unit construction, cloaking units around doors, piers, and other similar specific considerations. We would advocate the contractors hold pre-construction discussions with Coopers (and the verification consultants if another consultant) on the approaches and considerations for specific house type construction prior to commencing installation. Should variations be constructed without prior consent these will be deemed by Coopers as a defect and not suitable for construction or approval by us or third parties.

INSTALLATION, INSPECTION AND TESTING

1. A Ciria C735 compliant verification strategy is likely to be required, subject to approval by the Local Authority and NHBC.

CDM HIGH RISK ASSESSMENT

FOR ALL RISKS REFER TO DESIGN RISK ASSESSMENT

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CLIENT: prospect

PROJECT: Mitton Road, Whalley.

TITLE: Typical Gas Precaution Detail to a Precast Concrete Slab and a Vented Void **for Amber 1 Gas Risk (NHBC)**

DRAWN BY	AH
DATE	21.10.20
SCALE(S)	NTS

DRAWING NUMBER: 7583/AMB1/PC/01 REVISION: -