Geotechnical

SUPPLEMENTARY GEOENVIRONMENTAL APPRAISAL REPORT

Land at Shaw Lane, Carlton

For Network Space

Date: **January 2025**

Report reference: C10271

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Drawing No.	Title	Scale
C10271/01	Site Location Plan	1:25,000 at A4
C10271/02	Site Features Plan	1:1,000 at A2
C10271/03	Exploratory Hole Location Plan	1:2,000 at A3
C10271/04	Combined Exploratory Hole Location Plan	1:2,000 at A3
C10271/05	Indicative Foundation Zoning Plan	1:2,000 at A3
C10271/06	Revised Conceptual Site Model	NTS
C10271/07	Indicative Contamination Constraints Plan	1:2,000 at A3
P3921 SPA XX ZZ M2 A 10 001 RevA	Red Line Boundary by Spawforths, dated July 2021	1:1,000 at A1
P0-MP-SPA-P3921-51L-1000-0002 RevA	Indicative Masterplan by Spawforths, dated January 2023	NTS
AC-2701 P1	Constraints Plan by WYG dated November 2017	1:1,000 at A0

Executive Summary

Proposed Development	Sirius Geotechnical Ltd (Sirius) was commissioned by Network Space to undertake a supplementary geoenvironmental appraisal of land at Shaw Lane, Carlton, Barnsley (the "site"). It is understood that consideration is being given to development for residential use (including both houses with private gardens and two apartment blocks), areas of public open space (POS) and attenuation basins. No proposed development levels have been received, and for the purposes of this appraisal, it is assumed that ground levels will not change significantly from existing.
Site Details	The site is accessed off Shaw Lane via a trackway which runs south to north along a portion of the western boundary. The site is relatively flat with a gradual rise from the southeast towards the west. The site comprises an agricultural field with a vegetated pond located within the central-northern area. An area of marsh land was formerly located within the northwestern site area, with made ground appearing to have been imported and placed on the site to raise levels within the 1990's and early 2000's. Overhead cables are located crossing the site in a north-south orientation, with several associated supporting wooden poles. A recorded combined sewer is located within the east of the site, with raised chambers noted within the site.
Ground and Groundwater Conditions	The investigations undertaken have identified topsoil / reworked topsoil across the site to between 0.25m and 0.4m below ground level (bgl), overlying cohesive made ground within the western and central areas of the site, to depths of between 0.5m and 1.8m bgl. The cohesive made ground was underlain by an organic-rich cohesive soil / relic topsoil to a maximum depth of 2.3m bgl, within a number of exploratory hole locations, generally located surrounding the existing pond area. Granular made ground was locally encountered within the central area of the site. Cohesive glacial till deposits were encountered across the majority of the site, comprising firm to stiff, medium strength (locally soft and low strength), slightly sandy slightly gravelly clay. Localised granular bands comprising medium dense sands were recorded. Residual and / or competent Pennine Middle Coal Measures Formation (PMCMF) mudstone / sandstone bedrock was encountered at depths of between 1.0m and >3.9m bgl. Groundwater ingresses were noted between 1.0m and 3.6m bgl.
Ground Stability	All soils should be assumed to be unstable in the short term within all excavations to any depth, and appropriate support should be provided to all excavations.
Mining and Quarrying	Based on the findings of this investigation, the risk of surface instability resulting from potential shallow coal mineworkings beneath the site is considered to be low. No historical quarrying is recorded within the site.
Foundations and Floor Slabs	The topsoil and made ground / organic rich soils are considered unsuitable as bearing strata for structural loads due to the potential for excessive total and differential settlements. Structural loads associated with the development could be supported on spread foundations comprising a mix of strip and trench fill foundations bearing on to competent natural strata of adequate bearing resistance (at least firm to stiff, medium strength cohesive glacial till or residual PMCMF strata). Locally, the depth of existing weak organic soils may necessitate trench fill foundation depths greater than 2.5m, in which case engineer design will be required. Trees may affect the moisture content of clays to greater depths and as such, foundations may be required to extend to greater depths to penetrate to a moisture stable level within the area of influence of existing or proposed trees. In particular, based on observations at the time of the investigation, it is anticipated that foundations along the site peripheries and the existing vegetated pond may require to be locally deepened to mitigate the effects of trees.

	The recorded presence of shallow groundwater indicates that an allowance for provision of support and dewatering for foundation excavations would be prudent. Suspended floor slabs should be assumed.
Sulphate Class	Buried concrete structures should be provided with the following levels of protection against chemically aggressive ground when potentially in contact with the following materials: Made ground and natural superficial soils: DS-1 and AC-1 PMCMF strata: DS-2 and AC-4z Groundwater: DS-2 and AC-2.
Contamination	Elevated concentrations of benzo(a)pyrene (with respect to adopted human health risk screening criteria) were detected within reworked topsoil and made ground soils.
Asbestos	Asbestos fibres (trace concentration) have been detected within one sample of reworked topsoil.
Remedial Options	Remedial action is required for the PAH and (locally) asbestos impacted reworked topsoil and made ground soils, likely comprising provision of a suitable cover soil system where impacted soils remain within areas of gardens and landscaping. Localised asbestos impacted soils should be removed and placed at depth (i.e. >600mm) below proposed areas of soft landscaping where it will thereafter remain undisturbed. It is recommended that additional sampling, testing and assessment be undertaken of the reworked topsoil, to assess its suitability for use within informal POS. The reworked topsoil is considered chemically unsuitable for use within residential gardens. Natural topsoil outwith the re-worked topsoil area may be suitable for re-use on site within proposed garden areas, subject to additional sampling and analysis during enabling works.
Soakaway Testing	Based on the ground conditions encountered during the site investigation soakaway drainage is considered unlikely to be viable.
Ground Gas	The results of monitoring indicate a classification of Characteristic Situation 2 (CS2). No radon protective measures are required.
Invasive and Protected Species	No evidence of any invasive or protected species was observed during the investigation, however it is recommended that the absence or otherwise of invasive species is confirmed by a qualified ecological consultant.

The executive summary is an overview of the key findings and conclusions of the report. There may be other information contained in the body of the report which puts into context the findings of the executive summary. No reliance should be placed on the executive summary in isolation, particularly when deriving design detail/abnormal costs.

1. Introduction

1.1 Authorisation

Sirius Geotechnical Ltd (Sirius) was commissioned by Network Space to undertake a supplementary geoenvironmental appraisal of land at Shaw Lane, Carlton, Barnsley (the "site"). It is understood that consideration is being given to development for a residential with private gardens end use.

1.2 Development Plans

It has been assumed in the production of this report that the site will be developed for a residential end use with associated infrastructure. The proposed site layout is shown on Spawforth's Indicative Masterplan (Drawing ref. P0-MP-SPA-P3921-51L-1000-0002 Rev A, last dated January 2023), a copy of which is provided in Appendix A. The indicative proposed layout shows residential properties (including houses with private gardens and two apartment blocks), areas of public open space (POS) and attenuation basins.

No proposed development levels have been received, and for the purposes of this appraisal, it is assumed that ground levels will not change significantly from those described in this report and that housing will be of low-rise construction (up to three storeys in height). If this is not the case, then the conclusions and recommendations given in this report may require revision.

The investigation boundary is shown in Figure 1.1, extracted from the red line boundary plan provided by Network Space (Drawing ref. P3921 SPA XX ZZ M2 A 10 001 Rev A) enclosed within Appendix A.



Figure 1.1 - Site Boundary Plan

1.3 Objectives

The site has previously been the subject of a ground investigation undertaken on behalf of the client by Tetra Tech dated January 2022 [ref. B in Table 1.1]. The previous ground investigation identified potential geoenvironmental constraints to the proposed development which require further investigation/assessment. The objectives of this appraisal were:

- Review third party reports and publicly available geological, environmental, waste, pollution, hydrological, hydrogeological and mining data.
- Confirmation of the Preliminary Contaminated Land Risk Assessment and Conceptual Site Model through review of the above information.
- Intrusive investigation of soil, groundwater and ground gas conditions.
- Provision of exploratory hole logs.
- Derive an updated Generic Quantitative Risk Assessment (GQRA) and Revised Conceptual Site Model.
- Determine the potential risks posed by any ground contamination and provide recommendations on remedial measures to manage such risks.
- Establish the risks associated with hazardous ground gas.
- Establish the risks associated with historical mine workings beneath the site and discuss outline mitigation recommendations.
- Provide outline advice relating to geotechnical issues associated with the site.
- Provide outline foundation and other built environment considerations and recommendations.

This report, which was designed to meet the requirements of relevant current guidance, presents the factual information available during this appraisal, an interpretation of the data obtained and recommendations relevant to the defined objectives.

1.4 Limitations

It is assumed that ground levels will not change significantly from those described in this report. If this is not the case, then amendments to the recommendations made in this report may be required.

Where the report refers to the potential presence of invasive plants (such as Japanese Knotweed) or asbestos-containing materials (ACMs), such observations are for information only and should be verified by a suitably qualified expert.

The comments and opinions presented in this report are based on the findings of the desk study, ground conditions encountered during intrusive investigation works performed by Sirius and the results of tests carried out within one or more laboratories. There may be other conditions prevailing on the site which have not been revealed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for any ground conditions/risks not revealed by this investigation. Any diagram or opinion on the possible configuration of strata, contamination or other spatially variable features between or beyond investigation positions is conjectured and given for guidance only. Confirmation of ground conditions between exploratory holes should be undertaken if deemed necessary. Evaluation of ground gas and groundwater is based on observations made at the time of the investigation and monitoring visits. It should be noted that ground gas and groundwater levels and quality may vary due to seasonal and other effects.

All marked site features (including historical features, potential contaminant constraints, and any other potential constraint or feature of note) shown on the appended drawings are given for indicative purposes only. Enclosed drawings should not be underlaid in isolation to determine proposed development layouts. Reference should be made to the text enclosed within this report for commentary on the potential location of these features including coordinates if available and any further works required to locate features.

This investigation has not been designed to classify waste soils. It is likely that further testing will be required once waste soils have been identified or generated. Any mention of waste classification within this report is indicative only.

No information pertaining to the potential flood risk of the site is included as part of this appraisal. It is recommended that a detailed flood risk assessment for the site is undertaken by an appropriate flood risk consultant.

Potential risk to site construction / maintenance workers have not been considered within this appraisal on the basis that any risks to workers would be dealt with under the Health and Safety at Work Act (1974) and regulations made under the Act. It is recommended that the relevant findings of this report are made available to site construction/maintenance workers to enable appropriate risk assessment to be undertaken to mitigate the risk to site construction / maintenance workers from potential contaminants identified within the site.

1.5 Sources of Information

Table 1.1 details the sources of information which have been used to prepare this report. They are referred to by the reference number provided.

Table 1.1 - Sources of Information

Ref	References
A.	Geoenvironmental Desk Top Study, for Shaw Lane, Barnsley by WYG Environment Planning Transport Ltd, on behalf of Network Space Developments Limited, dated August 2019. Report ref. A112913/Reports/Final Issue 1.
B.	Ground Investigation Report for Shaw Lane, Carlton, by Tetra Tech, on behalf of Network Space Developments Limited, dated January 2022. Report ref. B029129.
C.	BGS Radon Report, report ID BGS_340356/57034, dated 15th October 2024, included within Appendix B.
D.	BGS 1:10,000 scale geological map (Sheet SE31SE, Royston, dated 2005) https://largeimages.bgs.ac.uk/iip/mapsportal.html?id=19899404
E.	BGS 1:10,560 scale geological map (Sheet 87SW, Barnsley, dated 1878) https://largeimages.bgs.ac.uk/iip/mapsportal.html?id=1000464
F.	BGS 1:50,000 scale geological map (Sheet 87, Barnsley, dated 2008) https://largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001576
G.	Geology of the Barnsley district — a brief explanation of the geological map Sheet 87 Barnsley https://webapps.bgs.ac.uk/Memoirs/docs/B06096.html
H.	Geology of the country around Barnsley: Explanation of sheet 87, dated 1947 https://pubs.bgs.ac.uk/publications.html?pubID=B01551Hi
I.	BGS GeoIndex https://mapapps2.bgs.ac.uk/geoindex/home.html
J.	BGS Lexicon of Named Rock Units https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=PLCM

K. Barnsley Council Local Plan Map
https://www.barnsley.gov.uk/barnsley-maps/local-plan-map/

L. Mining Remediation Authority Map Viewer
https://datamine-cauk.hub.arcgis.com/

M. Zetica UXO Risk Maps
https://zeticauxo.com/downloads-and-resources/risk-maps/.

2. Desk Study Summary

2.1 Introduction

The following section summarises the pertinent information reviewed to inform the Desk Study part of this appraisal using the sources outlined within Table 1.1 in Section 1.5.

2.2 Summary of Site Details, History and Environmental Setting

A summary of the pertinent site details as shown on site plans and from a walkover undertaken by a Sirius engineer on 8th October 2024 is summarised in Table 2.1, below.

Table 2.1 - Site Details

Location	A site location plan is provided as Drawing No. C10271/01 within Appendix A. The site is located off Shaw Lane, Carlton, c. 5km north-east of Barnsley town centre.
Site Area	The site is irregular in shape and covers an area of approximately 7.6 Ha.
National Grid Reference	437370, 410320
Site Boundaries	The investigation boundary is limited to the area denoted by the red line boundary shown on Drawing No. P3921 SPA XX ZZ M2 A 10001, enclosed within Appendix A. The site boundaries are defined by the following features: North and west: Hedgerows East: Steel mesh fence, beyond which lies Network Rail embankment and track South: Drainage ditch and Shaw Lane
Site Description	The site is accessed off Shaw Lane by a trackway which runs along a portion of the western boundary. The site is relatively flat with a gradual rise from the southeast towards the west with levels of c. 42.5m above Ordnance Datum (aOD) in the southeast and c. 47m aOD in the northwestern site corner. The site comprises an agricultural field with a vegetated pond located within the central-northern site area. Overhead cables are located crossing the site in a north-south orientation, with several associated supporting wooden poles. A recorded combined sewer is located within the east of the site, with raised chambers noted within the site, which runs north to south toward an offsite Yorkshire Water pumping station to the south. Anecdotal evidence indicates an 18” diameter land drain running from the pond to the drainage ditch on the southern boundary, which was installed by the current tenant farmer.
Evidence of Fly-Tipping on Site?	None recorded.
Site Surroundings	North: Agricultural farmland and open fields East: Railway, beyond which lies an industrial estate and scrap metal yard South: Yorkshire Water facility, and residential dwellings West: Agricultural farmland and a disused canal (Barnsley Canal).

2.3 Site History

The history of the site has been summarised based on the information and historical map extracts provided within the previous desk study report [Ref A]. Reference should be made to the full history of the site and surrounding area provided within the WYG Desk Study.

The earliest historical Ordnance Survey (OS) maps dated 1854 show the site to comprise open fields with possible associated drainage ditches. No significant changes are noted on site until 1962, when an area in the northwest is noted as marsh land. A trackway running towards the centre of the area of marsh land is shown on the 1990 map; the track is re-orientated towards the north by 2006. The existing pond is noted from 1999.

Off-site historical features included the Midland Railway directly to the east, and a sewage works c. 50m to the south. The Aire and Calder Navigation Barnsley Branch canal, located 50m to the west, was in use up until the late 1950's. Carlton Main Colliery and associated reservoirs and clay pits, spoil and refuse heaps was located from 200m to 500m to the south between the late 1800's and 1950's. A 'tip' is noted from 200m to the south of the site dated from the mid 1960's and shown as disused by the 1970's.

2.4 Geological Setting

A summary of geological information reviewed in this assessment is provided in Table 2.2.

Table 2.2 - Geological Summary

Information Sources	D to J
Made Ground	Made ground is recorded on published geological mapping within the northwest of the site.
Superficial Deposits	Superficial deposits underlying the site are shown as comprising Glacial Till, described as 'clay, stony, grey to yellow mottled'. Superficial deposits are shown to be absent within the southwestern site area.
Solid Geology	The solid geology is shown to comprise undifferentiated strata of the Pennine Middle Coal Measures Formation (PMCMF), described as *'Interbedded grey mudstone, siltstone, pale grey sandstone and commonly coal seams….'*. The Aegiranum (Mansfield) Marine Band (AGMB) is shown within the northwestern site area, truncated by a conjectured fault. The marine band is shown to dip towards the north / northeast. Marine bands are recorded by the BGS as *'beds of dark grey mudstone with a marine fauna including age-diagnostic ammonoids. They generally occur a short distance above a coal or a seatearth, and although normally only a few centimetres thick, some may attain thicknesses in excess of a metre'*. Oaks Rock (sandstone) is shown to stratigraphically underlie the undifferentiated PMCMF strata below the site. The 1947 BGS memoir [ref. H] states that '*Just above the Oaks Rock there is usually a thin coal….the rest of the measures between the Oaks Rock and the Mansfield Marine Bed are chiefly shale, however, they do contain a thin sandstone…'*.
BGS Borehole Records	A BGS borehole record shown to be located to the east of the site, within the locality of the railway (ref. SE31SE15 dated from 1930, at a ground level of 49.4m aOD). The record indicates 'clay' to a depth of 1.6m, underlain by 'blue bind' and 'grey bind and thin beds of blue rock' to a depth of 6.8m. This is shown to be underlain by 'blue rock' denoted as comprising Oaks Rock, to a depth of 30.6m bgl. Bands of fireclay and coal are recorded between 38.6m and 43.4m depth.

	A series of BGS borehole records is available located c.500m south of the site, in the locality of the former colliery. BGS borehole record ref. SE30NE1, (dated 1873), records bands of 'soil' and 'clay' to c.3m bgl, underlain by Oaks Rock to c.40m bgl. A 1.8m thick band of fireclay is recorded at 40.2m bgl, and a 0.18m thick band of coal is recorded at 45m bgl. The Meltonfield, Two Foot, Winter and Kilnhurst coal seams are recorded at depths of between 113m and 154m bgl.
Faults and Key Features	A fault transects the northern part of the site, orientated northeast to southwest with a downthrow to the southeast, forming 'northern' and 'southern' fault blocks within the site. The Mansfield marine band is shown to have a horizontal displacement of c.300-400m on the fault.
Stability	The Envirocheck report records the hazard potential for ground stability hazards at the site as 'no hazard' or 'very low'.

2.5 Mining and Quarrying

A summary of mining and quarrying information reviewed in this assessment is provided in Table 2.3.

Table 2.3 - Mining and Quarrying

Information Sources	A, D to L
Coal Seams	An un-named 'thin' coal seam is conjectured to outcrop c. 100m to the north of the site, dipping to the north, away from the site. The coal seam is not conjectured to outcrop within the southern fault block. No coal seams are shown to stratigraphically underlie the site at shallow depth.
Recorded Coal Mining	A Coal Authority (CA) report included within ref [A] identifies that the site is underlain by recorded underground coal mining in 8 no. seams of coal ranging between 130-480m depth. The CA report states that 'it is unlikely that these features will impact on the stability of the enquiry boundary'. The site does not lie within a development high risk area.
Other Mining	None recorded.
Mine Entries	None recorded within the site, or within 20m of the site.
Quarrying/ Opencast Mining	None recorded within the site. Off site sandstone quarries shown on historical plans 250m to the northwest.
Mineral Safeguarding	The site is not shown to be located within a designated mineral safeguarding area within Ref. K.

2.6 Environmental Setting

A brief summary of relevant available information pertaining to the environmental setting of the site is provided in Table 2.4.

Table 2.4 - Environmental Summary

Category	Data Source	Summary
Landfilling and Waste	A	**Landfill and Waste Management Facility Records (within 250m)** Two historical landfill sites are recorded within 250m, the closest located 213m to the east, last dated from 1992. The record relates to inert, industrial, commercial and household wastes deposited in 'disused railway sidings' at Shaw Lane. The second record is located 247m to the north, located at 'Near Pools Dyke, Shaw Lane', last dated from 1995, with wastes including 'household, special wastes and liquid sludge'. Two local authority recorded landfill sites are recorded within 250m, the closest located 203m to the east. No relevant details are provided. A registered landfill site is recorded 70m to the south, last dated from 1984. The site is classed as 'closed'. Authorised wastes included construction and demolition wastes. A second registered landfill site is recorded 234m to the east at 'ex railway sidings', last dated from 1985. The record is currently lapsed / cancelled. Two entries, for a waste management facility and a waste treatment / disposal site are listed as being within the site itself, both relating to the same operator (T Thornton), designated as a very small scrapyard treating motor vehicles. However, the positional accuracy of the entries is within 100m, and it is anticipated that the records relate to land beyond the site boundary.
Hydrology	A	**Watercourses (within 250m)** An un-named Drain, 140m south Shaw Dike, 210m east **Licensed surface water abstractions (within 1km)** 2 No. licensed surface water abstractions are shown within 1km of the site. Both are listed as surface water extractions for general industrial usage and are situated 416m northeast and 900m north of the site. Both licenses are listed as revoked. **Other surface water features (Canals, Ponds, Lakes, etc.) (within 250m)** The site has a pond located within the northern centre of the site. A pond is located c. 215m south, within the area of the sewage works. Barnsley Canal, 45m southwest (classed as 'disused').
Hydrogeology	A	**Licensed Abstractions (within 1km)** None recorded. **Source protection zones (within 500m)** None recorded. **Aquifer status** Superficial Deposits – Glacial Till deposits located beneath the majority of site are classified as a Secondary Undifferentiated Aquifer. Bedrock – Secondary A Aquifer. **Groundwater Vulnerability** The underlying aquifers are classified as high vulnerability.

Category	Data Source	Summary
		Groundwater Flooding The site is recorded to have the potential for groundwater flooding to occur at surface.
Ecology	A	No evidence of any invasive plant or protected species was observed during the investigation nor has Sirius been made aware of the presence of such species within the site. It is recommended that the absence or otherwise of invasive species is confirmed by a qualified ecological consultant. The site is recorded to be located within an area of adopted green belt and a nitrate vulnerable zone.
Radon	C	The site specific BGS radon report (included within Appendix B of this report), indicates that no radon protective measures are required for new dwellings within the site.
UXO	M	Zetica risk maps indicate that the site lies within a low risk area of unexploded WWII bombs.
COMAH	A	A Control of Major Accident Hazard site (COMAH) is located 622m to the southwest; the record is a 'lower tier', relating to a bakery.
Pollution Incident Register Records	A	A substantiated pollution incident register record is located on site, dated from 2007. The record indicates a Category 2 - Significant Incident to land impacts, sourced from 'commercial wastes'. The water impact is recorded as 'no impact'.
Discharge Consents	A	A sewage pumping station with a sewage discharge consent is recorded 40m to the southeast, last dated from 2004. A second consent was revoked in 2017.

2.7 Previous Investigation Findings

2.7.1 Previous Reports

Sirius has been provided with copies of the following reports which have been prepared for the site by third parties. Sirius has taken the factual data presented in those reports in good faith in order to supplement the understanding of the ground conditions present at the site. Pertinent factual information presented in those reports is summarised below.

Geoenvironmental Desk Top Study for Shaw Lane, Barnsley by WYG Environment (Report ref. A112912/Reports/Final), dated August 2019

WYG Environment Planning Transport Ltd (WYG) was commissioned by Network Space Developments Limited to undertake a Geo-Environmental Desk Top Study for the site. The objective was to provide an initial assessment of the site's ground conditions, environmental setting, and develop a Conceptual Site Model (CSM) to assist a planning application for a proposed residential development.

The desk study included obtaining and reviewing a Landmark environmental data report, Coal Authority mining report and information obtained from pertinent online sources regarding the geology / hydrogeology of the site.

Potential on site sources of contamination included the recorded presence of made ground, and hazardous ground gas associated with the made ground and radon. Potential receptors included site end users, the underlying Secondary A Aquifer and surface water courses.

Ground Investigation Report for Shaw Lane, Carlton by Tetra Tech (Report ref. B029129), dated January 2022

Following completion of the desk study, Tetra Tech (formerly WYG) was commissioned by Network Space to undertake ground investigation works at the site.

Tetra Tech carried out a ground investigation in September 2021 with subsequent gas and groundwater monitoring visits. The investigation included 5 No. window sample boreholes to a maximum depth of 5.18m below ground level (bgl) (DS01 to DS05), 7 No. trial pits to a maximum depth of 3.40m bgl (TP01 to TP07), and 3 No. soakaway test pits to a maximum depth of 1.60m bgl (SA01 to SA03). Ground gas / water monitoring wells were installed within each window sample borehole. The exploratory hole locations from the Tetra Tech ground investigation (as well as those from the Sirius ground investigation) are shown on Drawing No. C10271/04, in Appendix A.

Ground conditions comprised reworked topsoil between 0.2m and 0.55m thick, with gravel fractions including sandstone, mudstone, quartzite, coal, brick and ceramic. Localised ash content was noted within DS01 and DS02.

Evidence of made ground identified during the desk study within an area of historic marsh land was confirmed during the ground investigation. Localised within the central northern area, made ground soils underlying the reworked topsoil were described as brown grey sandy gravelly clay in TP02 and TP03 comprising gravel fractions with anthropogenic material such as plastic, timber and metal. Made ground ranged from 0.50m to a maximum depth of 1.40m bgl within DS03, DS04, DS05, TP03 and TP03. Made ground within DS04 was also noted with the presence of coal and clinker fragments within grey sandy gravelly clay.

The deepest area of made ground at TP03 was recorded as being underlain by soft dark grey black peaty clay comprising 'abundant decaying organic matter' between 1.40m to 1.60m bgl, described as relic topsoil. A similar possible relic topsoil was also present within DS04 (between 1.3m and 1.8m bgl comprising a soft grey silty clay) and TP02 (between 0.7m and 1.0m bgl, comprising an organic odour).

A firm to stiff grey-mottled green grey organic silty clay was noted within DS01 between 1.7m and 2.3m bgl, with 'local decaying organic plant matter'. No overlying made ground was recorded within this locality.

Superficial deposits were recorded within the majority of exploratory hole locations comprising cohesive glacial till typically described as firm to stiff (locally soft) orange-brown sandy gravelly clay. Hand shear vane results of between 38kPa and 92kPa, indicative of low to high strength clays, were recorded. Granular deposits were noted within DS02, DS04 and DS05 at depths of between 1.3m and 2.3m bgl, described as medium dense grey-orange-brown gravelly silty sand. Superficial strata were generally recorded to depths of between 0.9m and 2.5m, but to a depth exceeding 3.0m bgl within TP03.

Weathered PMCMF bedrock was encountered underlying the made ground and superficial deposits, generally recorded as stiff grey-brown sandy gravelly clay. Hand shear vane results of between 76kPa and 142kPa, indicative of high strength clays, were recorded. Bands of weathered coal were recorded within DS04 (1.9m to 2.4m bgl) and TP04 (0.9m to 1.3m bgl). Window sample boreholes and trial pits refused within the bedrock at depths of between 2.1m and 5.0m bgl.

Groundwater seepage was encountered in two trial pits. Within the monitoring wells, standing groundwater depths ranged between 1.09 to 2.00m bgl, with the exception of DS03 which remained dry for all three monitoring visits.

Soakaway testing concluded that soakaways are not suitable for surface water drainage at the site. Water levels did not fall to 25% of the effective depth during testing in any of the locations, and therefore infiltration rates could not be calculated.

Chemical laboratory testing was undertaken on a limited number of selected soil samples, with test results screened against screening values for a proposed residential end use including domestic gardens. Elevated benzopyrene was reported in DS04 at 0.10m and 0.50m bgl, with values of 11.17mg/kg and 5.04mg/kg, respectively. These elevated concentrations were considered likely to be linked to the presence of clinker noted within made ground in the exploratory holes and such soils were recommended to be removed, placed beneath hardstanding or a suitable 'clean cover' system.

Asbestos screening identified one sample of made ground (topsoil) containing chrysotile fibres at 0.30m in SA01. Supplementary quantification testing found the concentration of asbestos to be <0.001%. Tetra Tech recommended that the impacted soils were to be placed beneath hardstand or a clean cover system including a geotextile membrane.

Geotechnical laboratory testing was undertaken on selected natural soil samples, including Atterberg limits, particle size distribution tests (PSDs) and pH and water-soluble sulphates. Cohesive soils tested were indicated to range between low and high plasticity and were considered to have a low to high volume change potential in accordance with NHBC Chapter 4.2: Building near Trees.

Sulphate and pH assessment of made ground and natural soils were undertaken to provide a design classification of concrete for the site. Assuming mobile groundwater and assessed in accordance against BRE SD1:2005 Concrete in Aggressive Ground, a design classification of DS-2 and a ACEC class of AC-2 was recommended.

Standard penetration testing (SPT) across the site identified SPT N values between 4 and 15 in superficial cohesive soils and an N value of 23 within granular soils, indicative of low to medium strength clays and medium dense sands. SPT N values within weathered bedrock ranged between 20 and >50. One SPT N value within made ground was recorded at 5.

Ground gas monitoring across 3 No. visits identified peak methane (CH_4) and carbon dioxide (CO_2) concentrations of 0.1% and 7.9%, respectively. The maximum steady state flow recorded across the three visits was 0.3 litre/per hour (l/hr), with a peak negative flow rate of -1.9 l/hr recorded on one occasion. Due to the highest recorded concentration of CO_2 exceeding 5%, a classification of Characteristic Situation 2 (CS2) was recommended.

Tetra Tech considered that traditional strip foundations founded on 'firm clay' were likely to be suitable. However, in areas of soft strata then raft foundations comprising reinforced concrete and thickened edge beams were advised. In areas of deep made ground, deeper trench fill foundations were considered likely to be necessary founded within the firm clay or weathered bedrock. The minimum founding depth was stated to be 1.00m due to the high volume change potential associated with the cohesive strata.

Tetra Tech recommended that supplementary site investigation and gas monitoring be undertaken, in addition to production of a Remediation Strategy, to enable development of the site.

2.7.2 Conceptual Site Model

Based on the desk study information, and findings of the site investigation, Tetra Tech provided an updated CSM for the proposed future land use (residential with gardens). This summarised surface and sub-surface features and the potential contaminant sources, transport pathways and receptors present to identify potential contaminant linkages.

In summary, the CSM identified the following potential significant pollutant linkages following development:

- Asbestos within made ground posing a moderate / low risk to site end users, and a high risk to construction workers.
- Elevated concentrations of benzo(a)pyrene within made ground soils posing a low risk to site end users, assuming the impacted made ground is placed below hardstand or a clean cover layer.
- Hazardous ground gas associated with 'local infilled marsh and made ground' posing a moderate risk to site end users, buildings and services.

Tetra Tech considered that risks to controlled waters were low.

'Low level' gas protection measures were recommended by Tetra Tech, in accordance with a CS2 classification.

Assumptions and Data Gaps

Tetra Tech identified made ground and marsh type organic soils as part of their investigation, which are recommended to be further and assessed and delineated, to confirm the shallow ground and contamination profile.

Potential contaminants associated with the made ground (including made ground infilling the western site area) are considered to present a generally low risk to end users based on the findings of the Tetra Tech investigation, other than the identified localised asbestos and benzo(a)pyrene exceedances. It is recommended that additional testing and assessment of the made ground soils is undertaken to confirm the Tetra Tech assessment, including assessing the suitability of the site won topsoil for re-use.

Tetra Tech recommended further gas monitoring to increase the existing dataset and provide an updated assessment.

3. Fieldwork

3.1 Scope of Investigation

The information contained in this report is limited to areas of land accessible during the investigation within the site boundary. An exploratory hole location plan is presented as Drawing No. C10271/03 in Appendix A. A combined exploratory hole location plan, also including the previous Tetra Tech exploratory hole locations is presented as Drawing No. C10271/04 in Appendix A.

The supplementary investigation, which was supervised by a Sirius Geoenvironmental Engineer, took place between 28th October and 22nd November 2024 and comprised:

- Excavation of 18 No. machine-excavated trial pits (TP101 to TP118) to a maximum depth of 3.9m bgl;
- Drilling of 15 No. window sample boreholes (WS101 to WS115) to a maximum depth of 4.0m bgl;
- Infiltration testing of 3 No. soakaway test holes (SA101 to SA103) to a maximum depth of 2.1m bgl; and,
- Excavation of 3 No. hand dug pits (HDP101 to HDP103) to a maximum depth of 0.6m bgl.

Buried and overhead services are located crossing the site, including overhead power lines, an underground Yorkshire Water (YW) sewer and a private drain, the locality of which was indicated by anecdotal evidence only. Easements were included as part of the site investigation, comprising a 10m stand off from the overhead cables, and a minimum 3m easement from the recorded YW sewer.

Given the uncertainty of the locality of the private drain, a larger easement area was incorporated. Hand dug pits were completed within the private drain easement area to infill areas of uncertainty. The recorded and anecdotal services and associated easements are shown on the exploratory hole location plan (Drawing No. C10271/03, included within Appendix A).

3.2 Exploratory Hole Locations

The exploratory hole locations were selected using the findings of the preliminary conceptual site model in order to achieve general site coverage, target specific areas of interest and resolve key uncertainties. The principles given in BS 10175[1] were followed when determining exploratory hole locations.

Table 3.1 - Exploratory Hole Location Rationale

Exploratory Hole	Rationale
TP101 to TP113 and WS105 to WS115	Trial pits and window sample boreholes to target and delineate an area of historic marsh land / made ground and obtain soil samples for contamination and geotechnical testing.
TP114 to TP118 and WS101 to WS104	Window sample boreholes and trial pits across the eastern site area to confirm the shallow soil profile outside of the extent of marsh / infilled land and obtain soil samples for contamination and geotechnical testing.
SA101 to SA103	Soakaway test pits located within areas of proposed attenuation basins to assess shallow soil profile and assess indicative infiltration rates.

[1] BS 10175:2011+A2:2017 Investigation of potentially contaminated sites – Code of practice

Exploratory Hole	Rationale
HDP101 to HDP103	Hand dug pits within the easement area of private drain (where safe access permitted) to visually assess the shallow ground profile.

3.3 Strata Description

Strata descriptions were logged in accordance with BS EN ISO 14688-1[2], BS EN ISO 14688-2[3] and BS EN ISO 14689[4]. Detailed descriptions of strata and groundwater observations made during investigation works, together with samples recovered and the results of all in situ field testing, are presented on the Engineer's records in Appendix D. The depths of strata on the record sheets are recorded from current ground levels at each location, unless indicated otherwise.

3.4 Geotechnical Testing

Geotechnical laboratory testing on selected soil samples was carried out under subcontract by The Testing Lab, a UKAS-accredited laboratory.

Geotechnical test results are included within Appendix E of this report.

3.5 Chemical Testing

Selected samples of the made ground, natural soils and groundwater were tested for a range of potential contaminants under subcontract with Eurofins Chemtest a UKAS accredited laboratory, with MCERTS accredited test methods used where available.

The potential contaminants of concern identified by the preliminary risk assessment and outlined in Section 2 were selected as the analytes for the samples recovered from the site. The results of the chemical analysis, as received from the laboratory, are presented in Appendix F of this report.

[2] BS EN ISO 14688-1: 2018 Geotechnical Investigation and Testing – Identification and Classification of Soil, Identification and Description (ISO 14688-1: 2017)
[3] BS EN ISO 14688-2: 2018 Geotechnical Investigation and Testing – Identification and Classification of Soil, Principals of Classification (ISO 14688-2: 2017)
[4] BS EN ISO 14689: 2018 Geotechnical Investigation and Testing – Identification, Description and Classification of Rock (ISO 14689; 2017)

4. Ground Conditions

4.1 Ground Model Summary

The following information is based on the records of exploratory holes completed as part of this (Sirius) 2024-2025 investigation and the previous 2021 Tetra Tech site investigation.

Table 4.1 - Ground Model Summary

Stratum	Depth Range to Stratum (m bgl) (Thickness Range m)	Description
Made Ground and Topsoil		
Topsoil	Ground level (0.25m to 0.40m)	Topsoil was encountered across the site and was described as soft to firm dark brown slightly sandy slightly gravelly clay. Gravels generally comprised fine to coarse sandstone, mudstone, quartzite, brick, ceramics and locally concrete. Rare glass was noted within TP107 and WS102.
Cohesive Made Ground	0.25m to 0.40m (0.30m to 1.6m)	Cohesive made ground was encountered in the majority of exploratory locations within the western and central areas of the site, to depths of between 0.5m and 1.8m bgl. The cohesive made ground was generally recorded to comprise friable / variably soft to firm, medium strength, dark brown-grey slightly sandy gravelly clay, with gravels including sandstone, mudstone, concrete, brick and ceramics and rare wood and plastic fragments. A low cobble and / or boulder content of concrete and brick was noted within cohesive made ground soils in several trial pits located to the north of the existing ponds. A 0.3m thick band of reworked cohesive made ground was recorded within the east of the site (DS03 at 0.2m depth) as part of the Tetra Tech investigation, comprising stiff light brown mottled grey slightly sandy, slightly gravelly clay with low cobble content.
Granular Made Ground	0.20m to 0.30m (0.80m)	Granular made ground was encountered within TP111 and Tetra Tech's DS04 both located within the central area of the site at depths of between 0.2m and 1.0m bgl. The granular made ground within TP111 was described as a dark brown mottled orange gravelly slightly clayey sand, with gravels of concrete, brick and ceramic and low cobble content of sandstone. A concrete boulder was noted at 0.5m bgl. Brown silty sand and gravel was recorded within DS04, with gravels including brick, concrete, ceramics, coal, clinker and sandstone.
Cohesive Relic Topsoil / Reworked Organic Rich Soils	0.70m to 1.80m (0.10m to 0.60m)	The cohesive made ground was underlain by an organic-rich cohesive soil at depths of between 0.9m and 2.3m bgl, within a number of exploratory hole locations, generally surrounding the existing pond.

Stratum	Depth Range to Stratum (m bgl) (Thickness Range m)	Description
		The organic rich soil is considered to represent a relic topsoil and / or reworked organic rich alluvial soils, typically comprising soft to firm, low to medium strength, brown-dark greyish brown, slightly sandy slightly gravelly clay with organic odours or many rootlets. Organic silty clay was recorded between 1.7m-2.3m within DS01 in the southwestern site corner. The organic clay was overlain by soft to firm orange-brown mottled grey silty clay and orange-brown slightly gravelly sand between 0.8m and 1.7m bgl, considered to represent reworked natural soils and / or alluvial soils. The organic rich soils / relic topsoils are considered attributable to the former area of marsh land that has been filled in with made ground.
Natural Superficial Deposits		
Cohesive Glacial Till	0.25m to 2.10m (0.70m to 2.90m)	Cohesive glacial till was encountered across the majority of the site and recorded at depths between 0.25m to >3.90m bgl. Glacial till deposits appear to be absent within DS01, within the southwestern site corner. Cohesive glacial till deposits were generally recorded as comprising firm to stiff, medium strength (locally soft and low strength), orange-brown-grey mottled slightly sandy slightly gravelly clay, with gravels (and locally cobbles) of sandstone and mudstone.
Granular Glacial Till	1.30m to 2.00m (0.20m to 0.50m)	Granular superficial deposits were locally encountered within Tetra Tech exploratory hole locations DS01, DS02, DS04 and DS05, and ranged between depths of 1.3m and 2.5m bgl. The granular deposits were described as loose to medium dense grey-brown slightly gravelly slightly clayey silty sand. Gravel comprised fine to coarse mudstone, sandstone and siltstone.
Weathering Profile and Solid Geology		
Residual and Competent PMCMF	1.00m to >3.90m (thickness not proven)	Residual and / or competent PMCMF strata were encountered within all positions with the exception of TP106, WS112, SA102 and SA103, which did not reach the base of the superficial glacial till deposits. Excavations terminated within the trial pits due to machine reach limitations or upon reaching an appropriate depth for soakaway infiltration testing. WS112 terminated at 2.0m bgl upon a refusal. Tetra Tech recorded residual PMCMF strata within a number of exploratory hole locations, recorded as comprising stiff, high strength, grey mottled orange slightly sandy slightly gravelly clay, and grey-brown sandy silty gravel and cobbles of mudstone. Competent PMCMF bedrock was encountered as extremely to very weak light or dark grey mudstone, generally recovered as angular to subangular gravel.

Stratum	Depth Range to Stratum (m bgl) (Thickness Range m)	Description
		Extremely weak light orangish brown sandstone was encountered within TP107 and TP111, recovered as slightly sandy angular to subangular gravel. Bands of weathered coal were recorded within WS106 between 2.0m to 2.7m bgl, DS03 between 1.9m and 2.4m bgl and TP04 between 0.5m and 1.3m bgl, recovered as extremely weak dark black slightly clayey gravel of coal / medium dense black sandy gravel / gravelly sand of coal. Occasional bands of weathered coal were noted within TP02 between 1.5-2.6m bgl.

4.2 Material Properties

4.2.1 Topsoil

Owing to the shallow nature of topsoil, and its assumed inherent unsuitability for use as an engineering material, no geotechnical testing has been carried out on this stratum.

4.2.2 Made Ground and Organic Rich Soils / Relic Topsoil

The results of in situ hand shear vane tests (HSVs) and SPTs undertaken within cohesive made ground and organic rich soils / relic topsoil are summarised in Figures 4.1 and 4.2 below.

3 No. laboratory remoulded CBRs undertaken within cohesive and granular made ground recorded CBR values of between 1.9% and 3.2%.

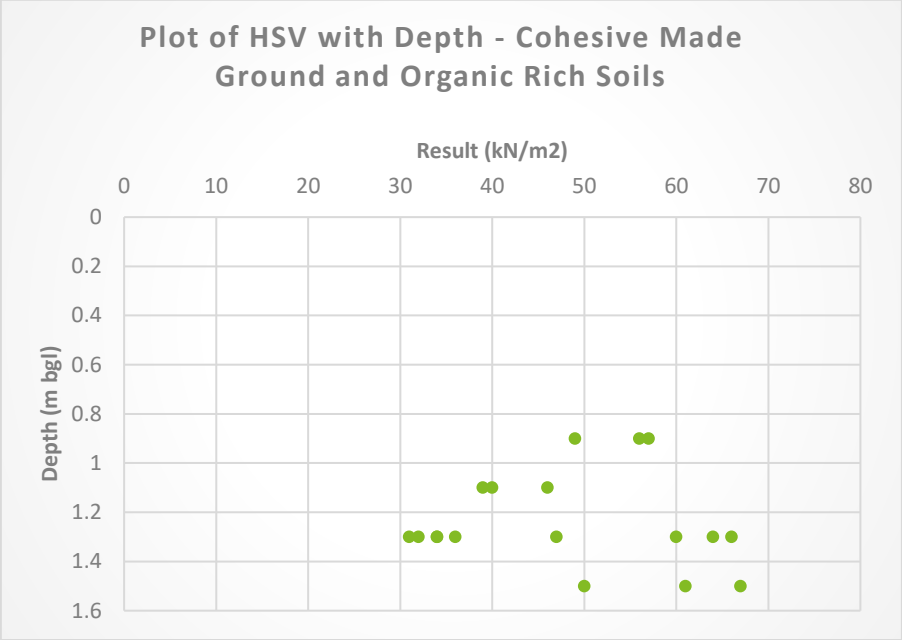


Figure 4.1 - Plot of HSV with Depth (Cohesive Made Ground and Organic Rich Soils)

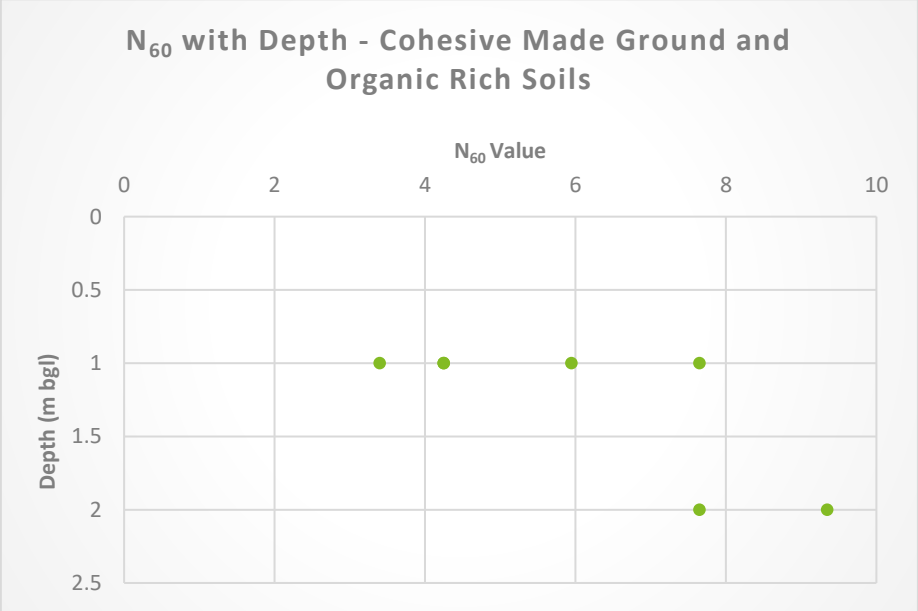


Figure 4.2 - Plot of N_{60}* with Depth (Cohesive Made Ground and Organic Rich Soils)

* N_{60} calculation: N Value x Energy Ratio (%) x Rod Length Factor λ / 60. The SPT Hammer Energy Test Report for the hammer used is enclosed within Appendix D.

4.2.3 Superficial Deposits

Cohesive Glacial Till

The results of in situ HSVs and SPTs undertaken within cohesive glacial till are summarised in Figures 4.3 and Figure 4.4. SPT N=50 values have been excluded on the assumption that they are as a result of cobbles struck during the test and are not representative of the soil density/strength.

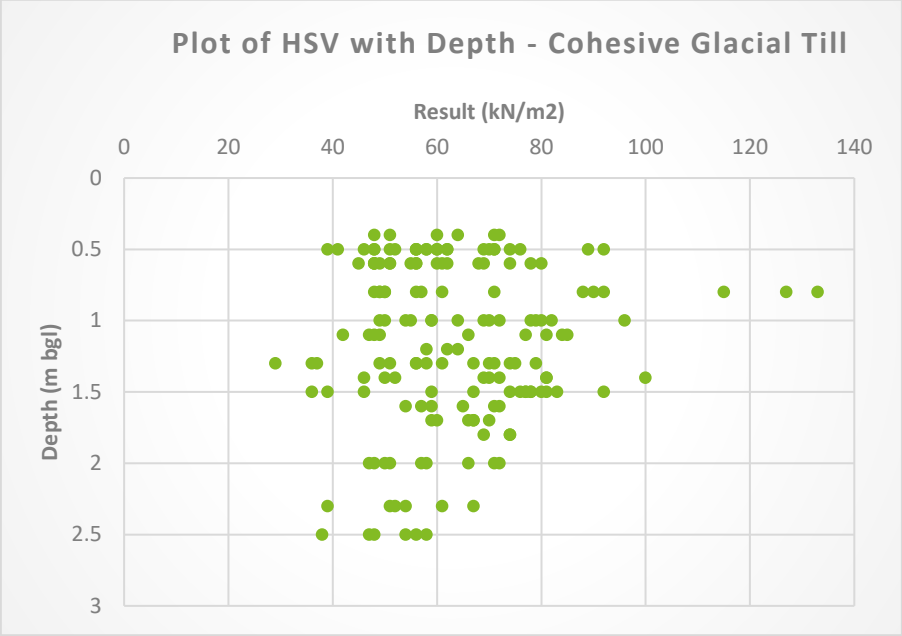


Figure 4.3 - Plot of HSV with Depth (Cohesive Glacial Till)

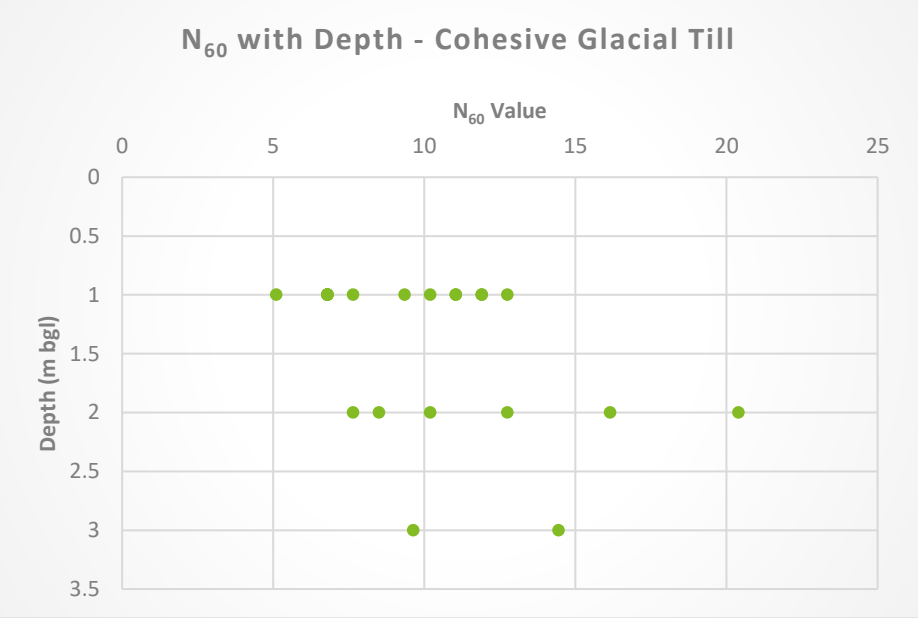


Figure 4.4 - Plot of N_{60}* with Depth (Cohesive Glacial Till)

The results of laboratory testing of cohesive glacial till are presented in Table 4.2 below.

Table 4.2 - Laboratory Test Data Summary (Cohesive Glacial Till)

Test / Parameter	No. of Tests	Range of Results		Commentary
		Min.	Max.	
Natural Moisture Content (%)	13	15	38	
Liquid Limit (%)	13	31	55	Indicative of **low to high plasticity clays**.
Plastic Limit (%)	13	16	30	
Plasticity Index (PI) (%)	13	12	26	Calculation of the modified PI, in accordance with NHBC standards, indicates these soils to have a **low to medium volume change potential**.
Consistency Index (Ic)	13	0.56	1.33	The Ic values for the samples tested indicate the material to be of **firm to very stiff** consistency.
CBR (%) (Laboratory Remoulded)	2	3.9 - 4.2%		Tests undertaken on bulk samples of cohesive Glacial Till at depths of 0.5m.

4.2.4 Residual PMCMF Soils

The results of laboratory testing of residual PMCMF soils undertaken by Tetra Tech are included in Table 4.3 below.

Table 4.3 - Laboratory Test Data Summary (Residual PMCMF Soils)

Test / Parameter	No. of Tests	Range of Results		Commentary
		Min.	Max.	
Natural Moisture Content (%)	7	12	31	
Liquid Limit (%)	7	45	69	Indicative of **typically intermediate to high plasticity clays**.
Plastic Limit (%)	7	22	30	
Plasticity Index (PI) (%)	7	21	40	Calculation of the modified PI, in accordance with NHBC standards, indicates these soils to have a **medium volume change potential**.
Consistency Index (Ic)	7	0.97	1.56	The Ic values for the samples tested indicate the material to be of **stiff to very stiff** consistency.

Assessment of laboratory determined Plasticity Indices enables a factor (f1) to be derived (Stroud 1975[5]) allowing undrained shear strength to be calculated from SPTs, as the product of a combination of f1 and SPT N values. In this instance, an average Plasticity Index of 22% is considered appropriate for the cohesive superficial deposits leading to an f1 value of 5.

It should be recognised, that in accordance with Eurocode 7, the use of in situ SPTs within cohesive soils has a low applicability for assessing undrained shear strength. In view of this, the results of the SPTs are considered only tentatively and, typically, greater emphasis is given to the results of hand shear vane test results.

Based on a review of the in situ HSV and SPT data, a **characteristic** minimum shear strength for the cohesive made ground and organic rich soils within the site, of 30kN/m^2 is considered appropriate at depths greater than 1m.

A **characteristic** minimum shear strength for the cohesive glacial till soils within the site, of 45kN/m^2 is considered appropriate at depths greater than 1m. For the granular soils encountered across the site, based on a design corrected **characteristic** SPT N60 value of at least 7 for the granular superficial deposits, at depths of circa 1.0m bgl, a minimum angle of shearing resistance (Φ') of at least 30° could be assumed.

Characteristic values have been determined based on a review of the available data and are provided to inform likely foundation solutions for the site. Characteristic values should not be applied uniformly across the site to inform foundation design. Consideration of local changes in ground conditions should be undertaken on a plot by plot basis via review of all exploratory hole data, which should be undertaken as part of production of a detailed foundation schedule for the site.

4.2.5 Solid Geology

A total of 25 No. in situ SPTs were undertaken within residual and competent PMCMF strata, 17 No. of which recorded N values exceeding 50 blows. Extrapolated values have been estimated ranging between N = 55 and 1500, indicative of extremely to very weak (locally moderately weak) bedrock.

4.2.6 Geochemical Analysis

The results of soluble sulphate and pH analyses performed on soil and groundwater samples from both the Tetra Tech and recent Sirius investigation are presented in Table 4.4, below, along with the Design Sulphate Class and ACEC Class for buried concrete structures in contact with the referenced strata in accordance with BRE SD1[6].

Table 4.4 - Sulphate and pH Analysis Results

Soil Type	No. of Tests	Range of Results		Concrete Classification	
		Water Soluble Sulphate (g/l)	pH	Design Sulphate Class	ACEC Class
Topsoil	11	<0.01 - 0.038	6.9 - 8.4	DS-1	AC-1
Made Ground	9	0.0174 - 0.265	6.97 - 9.0	DS-1	AC-1
Cohesive Glacial Till	14	<0.01 - 0.365	6.1 - 8.3	DS-1	AC-1

[5] Stroud, M.A. "The standard penetration test in insensitive clay and soft rocks", Proceedings of the European Symposium on Penetration Testing, 2, 367-375 1975.
[6] BRE Digest SD1 (v3): 2005 Concrete in Aggressive Ground

Residual / Competent PMCM Strata	3	0.0365 - 1.56	5.0 - 7.98	DS-2	AC-4z
Groundwater	5	0.074 - 0.41*	7.6 - 7.9	DS-2	AC-2

*Total sulphate concentration in groundwater. Further commentary is given in Section 6.3.3.

4.3 Shallow Coal / Mine Workings

Bands of weathered inconsistent coal were locally recorded within northern and western site areas (i.e., WS106 (2.0m - 2.7m bgl), DS03 (1.9m-2.4m bgl), TP04 (0.5m-1.3m bgl) and TP02 (1.5-2.6m bgl). No evidence of any associated mine workings was encountered.

4.4 Obstructions

No sub-surface obstructions were encountered during the investigation. Exploratory holes refused at depths of between 2.0m and 5.0m bgl within PMCMF bedrock.

4.5 Shallow Ground Stability

Trial pits and window sample boreholes were recorded to be stable during excavation/drilling.

4.6 Groundwater

Monitoring results for 6 No. visits undertaken by Sirius are included in Appendix G. Tables 4.5 and 4.6 summarise groundwater observations made during the investigation and in subsequent monitoring visits, respectively.

Table 4.5 - Summary of Groundwater Observations Encountered During Site Investigation

Exploratory Hole	Depth Encountered (m bgl)	Description	Stratum
SA102	1.0	Slow ingress of groundwater	Cohesive Glacial Till
TP102	2.1	Slow ingress of groundwater	Cohesive Glacial Till
TP103	3.6	Slow ingress of groundwater	PMCMF mudstone
TP104	3.4	Slow ingress of groundwater	PMCMF mudstone
TP105	2.5	Medium ingress of groundwater	PMCMF mudstone
TP106	2.8	Slow ingress of groundwater	Cohesive Glacial Till
TP111	2.0	Slow ingress of groundwater	Cohesive Glacial Till
TP112	1.2	Slow ingress of groundwater	Cohesive Made Ground
TP113	1.4	Medium to fast ingress of groundwater	Cohesive Made Ground
TP115	2.7	Slow ingress of groundwater	PMCMF mudstone
WS106	1.6	Groundwater encountered during drilling	Cohesive Glacial Till
TP01	2.05	Rose to 1.7m bgl after 20 minutes.	Residual Sandstone

Exploratory Hole	Depth Encountered (m bgl)	Description	Stratum
TP03	2.2	Groundwater seepage.	Cohesive Glacial Till
TP03	3.0	Rose to 2.8m bgl after 20 minutes.	Cohesive Glacial Till

Table 4.6 - Summary of Groundwater Levels During Monitoring

Exploratory Hole	Depth Encountered (m bgl)	Depth Encountered (m AOD)	Stratum in Which Monitoring Well Screened
WS102	GL - 1.38	43.92 - 45.30	Cohesive glacial till / mudstone
WS104	GL - 1.42	40.88 - 42.30	Cohesive glacial till / mudstone
WS105	0.67 - 1.63	44.27 - 45.23	Cohesive glacial till / mudstone
WS107	0.70 - 1.20	45.40 - 45.90	Made ground / cohesive glacial till / mudstone
WS108	1.28 - 2.90	43.40 - 45.02	Cohesive glacial till / mudstone
WS110	GL - 1.39	45.11 - 46.50	Cohesive glacial till / mudstone
WS111	GL - 1.69	44.71 - 46.40	Cohesive glacial till
WS113	GL - 1.72	44.68 - 46.40	Made ground / cohesive glacial till / mudstone
DS01	0.98 - 1.69	43.81 - 44.52	Reworked natural / organic rich soils / weathered PMCMF strata
DS02	1.00 - 1.37	41.83 - 42.20	Cohesive / granular glacial till / weathered PMCMF strata
DS03	0.28 - 2.84	43.96 - 46.52	Cohesive glacial till / weathered PMCMF strata
DS04	0.36 - 1.72	44.18 - 45.54	Made ground / cohesive / granular glacial till / weathered PMCMF strata
DS05	GL - 1.02	45.48 - 46.50	Cohesive / granular glacial till / weathered PMCMF strata

GL – Ground Level

Given the high groundwater levels recorded over the monitoring period, a series of rising head tests were completed within a number of the monitoring wells. Rising head tests were completed to provide an indicative rate of recharge of groundwater only. The results indicated rises of groundwater within the monitoring wells of between 150mm and up to 1.5m over a ten minute period.

4.7 Evidence of Contamination

No visual or olfactory evidence of gross hydrocarbon or similar contamination was noted during fieldwork.

4.8 Infiltration Testing

Soakaway tests were undertaken as far as practical in accordance with the test method specified in BRE Digest 365 - Soakaway Design.

Owing to the anticipated instability of shallow soils, and expected prolonged periods of testing, soakaways were conducted by forming mechanically excavated trial pits. The trial pits were subsequently backfilled with granular fill, incorporating two vertical, perforated observation tubes extending to the full depth of the soakaway test pit.

Water was continuously added to the test pits via one observation tube, with water level in the pit monitored via the other tube. Water was added to a level considered likely to reflect the invert level of drainage into full-sized soakaways within the development. Water levels within the test pit were subsequently monitored using a dipmeter at appropriate time intervals.

Full depth tests, in which water levels are required to fall to at least 25% of the start level, as required by BRE Digest 365, could not be achieved owing to very low rates of infiltration.

The results of the soakaway tests are included in Appendix D, and are summarised in Table 4.7.

Table 4.7 - Soakaway Test Results

	SA101 (Test 1)	SA102 (Test 1)	SA103 (Test 1)
Strata Tested	Cohesive glacial till and mudstone	Cohesive glacial till	Cohesive glacial till
Base Depth of Soakaway Pit (m bgl)	2.0	2.0	2.1
Start Water Depth (mm)	0	0	220
End Water Depth (mm)	670	450	680
Total fall in Water Level (mm)	670	450	460
Volume Outflow (m^3)	1.61	1.61	1.75
Duration of Test, Mins (Hrs)	1440 (24)	1440 (24)	1440 (24)
Test Completed to 25% Level?	No	No	No
Infiltration Rate (m/s)	N/A	N/A	N/A

4.9 Ground Gas Monitoring Results

Ground gas monitoring has been carried out on 6 No. occasions as part of the Sirius 2024-2025 investigation in accordance with CIRIA C665[7] and BS8576:2013 [8].

The results are summarised in Table 4.8. Full details of ground gas monitoring results are included within Appendix G.

Owing to the site geology, the response zone within the majority of monitoring wells were confined by surrounding low permeability glacial till or cohesive made ground which is known to have a considerable impact on peak borehole flow rates and to a lesser extent, gas concentrations. In light of this, the flow rates detected

[7] CIRIA C665: 2007 Assessing risks posed by hazardous ground gases to buildings.
[8] BS 8576:2013 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).

within selected wells during the monitoring period may be considered unlikely to be representative of the true flow conditions within the strata observed.

High groundwater levels flooding the response zones were recorded in the majority of monitoring wells over visit nos. 3 to 6 (dated December 2024 to January 2025). Groundwater was bailed out of each borehole on visit nos. 5 and 6, with both 'pre' and 'post' purge gas monitoring undertaken.

The monitoring data above was recorded across six visits under atmospheric pressure conditions ranging from 993 to 1024 mbar, with periods of falling, rising and steady pressure trends.

Table 4.8 - Summary of Gas Monitoring Results (Sirius 2024-2025)

BH ID	Response Zone	Methane range (peak) %v/v	Carbon Dioxide range (steady state) %v/v	Oxygen range (minimum) %v/v	Peak Flow Rate* (range) l/hr	Steady State Flow Rate (range) l/hr
WS102	Cohesive glacial till and PMCMF mudstone	ND	ND - 0.2	18.6 - 19.6	ND - 14.5	ND - 0.4
WS104		ND	ND	18.2 - 19.9	ND - 0.5	ND - 0.5
WS105		ND	ND - 1.1	19.1 - 20.0	-17.5 - 0.3	ND - 0.2
WS107	Made ground, cohesive glacial till and PMCMF mudstone	ND	ND - 4.1	16.0 - 19.7	ND - 65.2	ND - 3.4
WS108	Cohesive glacial till and PMCMF mudstone	ND	ND - 0.1	14.2 - 19.8	ND - 0.5	ND - 0.4
WS110		ND	ND	18.1 - 20.1	ND - 0.4	ND - 0.4
WS111	Cohesive glacial till	ND	ND - 1.6	6.9 - 19.6	-18.2 - 0.7	-3.4 - 0.7
WS113	Made ground, cohesive glacial till, relic topsoil and PMCMF mudstone	ND	ND - 3.4	16.8 - 19.7	ND - 1.0	ND
DS01	Cohesive organic rich soils and residual PMCMF	ND	1.3 - 4.0	10.7 - 20.0	-7.6 - 1.0	ND
DS02	Cohesive glacial till and residual PMCMF	ND	ND - 0.8	12.2 - 19.8	ND - 0.6	ND - 0.4
DS03		ND	ND - 1.5	13.3 - 19.7	ND - 0.5	ND - 0.4
DS04	Made ground, cohesive glacial till and residual PMCMF	ND	ND - 1.7	16.2 - 19.7	ND - 0.6	ND - 0.5
DS05	Cohesive and granular glacial till and residual PMCMF	ND	ND - 0.7	17.4 - 19.9	ND - 0.3	ND - 0.3

ND – Not detected.
Post bailing flow rates not considered representative of likely realistic conditions and not included in table
*High flows are considered attributable to shallow groundwater and sealed well conditions.

No significantly elevated concentrations of hydrogen sulphide, carbon monoxide or VOCs have been detected.

Peak gas flow rates of 65.2 litres per hour (l/hr) and 14.5 l/hr were recorded within WS107 and WS102 respectively, with flow rates generally reducing to steady low / non-detectable values within less than 1 to 2 minutes. Maximum steady positive gas flows of 3.4 l/hr were recorded in WS107 during the third visit. It is acknowledged that a number of monitoring wells were flooded with surface water during multiple visits; this is known to have an impact on peak flow rates and therefore the high readings detected in WS107 and WS102 are

considered unlikely to represent the true flow conditions with the locations and have been disregarded as part of this assessment.

Negative flow rates were detected within WS105, WS111 and DS01. It is likely that these are directly related to pressure differences between the installations and atmosphere and do not represent gas ingress / migration within the gas regime at the site.

5. Generic Quantitative Risk Assessment

5.1 Assessment Methodology

5.1.1 Soil Data

The laboratory test data for the relevant soil strata and averaging area were reviewed for completeness and consistency.

For this site, it is considered that the use of benzo(a)pyrene as a surrogate marker for other polycyclic aromatic hydrocarbons (PAHs) is generally appropriate (with the exception of TP109 at 0.2m, which has been assessed separately). For each potential contaminant of concern, analytical data were evaluated against the relevant Generic Assessment Criterion (GAC), taking account of the soil organic matter (SOM) content. For this site, measured values were compared to GACs derived for a residential with gardens end use. Source data for all GACs are provided in Appendix H.

If any samples recorded contaminant concentrations that exceeded that GAC, then consideration was given to the applicability of statistical data evaluation in line with the methods described in CL:AIRE, 2020[9] . A statistical approach is only adopted where a sufficient number of analytical results are available and the results of such an approach is useful to assist the decision-making process.

Soil samples were tested for the below test suites as outlined in Table 5.1 below:

- **Sirius Soil Suite**: metals (arsenic, cadmium, chromium (total and hexavalent), copper, lead, mercury, selenium, nickel and zinc), phenol, total organic carbon (TOC) and speciated PAHs.
- **Asbestos ID**.
- **Hydrocarbon Suite:** Aliphatic and aromatic TPHCWG bands, MTBE, benzene, toluene, ethylbenzene and xylene (BTEX).
- **Pesticide Suite.**

pH and water-soluble sulphate were also tested within a number of soil samples as part of the Sirius Soil Suite and separately as part of the geotechnical laboratory testing. However, these have not been included within the human health risk assessment. Exceedances of pH are unlikely to be considered indicative of a potential significant risk to human health. The GAC for water-soluble sulphate is derived based on the potential for attack of buried concrete products, assessment of which is given above. Sulphates are generally considered to be non-toxic to human health, and this determinand is not considered further in that respect.

5.1.2 Groundwater Data

The Sirius GAC values for controlled waters risk assessment, included within Appendix F are based on two sets of criteria; Environmental Quality Standards (EQS) values for surface water ecosystem receptors, and Drinking Water Standards (DWS) for potable groundwater and surface water sources. Inland EQS values have been used in the first instance, and where EQS values are unavailable, the relevant DWS has been used as a screening value.

Water samples were tested for the below test suites as outlined in Table 5.1 below:

- **Sirius Water Suite**: metals (arsenic, cadmium, total chromium, copper, lead, total mercury, selenium, nickel and zinc), sulphate, phenol, speciated PAH, electrical conductivity and ammonia.
- **Hydrocarbon Suite:** Aliphatic and aromatic TPHCWG bands, MTBE and BTEX.

[9] CL:AIRE 2020 'Professional guidance : Comparing Soil Contamination Data with a Critical Concentration'.

5.2 Averaging Areas

The assessment of contaminated land risk undertaken in this report seeks to consider uncertainty via the interpretation of average values rather than on single measurements. As such the risk assessment classification decisions are based on the following averaging areas. A summary of the testing undertaken for each averaging area as part of this current investigation is provided in Table 5.1.

Table 5.1 - Summary of Averaging Areas

Averaging Area	Description	Analytical Testing	No. of Samples
Topsoil	Samples of topsoil obtained across the site.	Sirius Soil Suite	5
		Asbestos ID	5
		Pesticide Suite	1
		Calorific Value	1
Reworked Topsoil	Samples of reworked topsoil obtained across the site.	Sirius Soil Suite	3
		Asbestos ID	3
		Hydrocarbon Suite	3
		Pesticide Suite	1
Made ground	Samples of made ground obtained across western site areas.	Sirius Soil Suite	4
		Asbestos ID	4
		Hydrocarbon Suite	2
		Pesticide Suite	2
		Calorific Value	1
Natural soils	Samples of natural cohesive strata	Sirius Soil Suite	2
		Asbestos ID	2
		Calorific Value	1
Site wide – groundwater	Groundwater samples from WS105, WS107, WS108, WS111 and WS113	Sirius Water Suite	5
		Hydrocarbon Suite	5

5.3 Soil Analysis

The following section presents a summary of the analytical results highlighting where exceedances of the relevant GAC have been recorded only. The full data set is included in Appendix F and incorporated within the previous Tetra Tech report. Commentary on the assessment of human health risk is provided in Section 6.4 below.

Soil testing results from the previous Tetra Tech investigation have been re-screened against Sirius Stage 1 and 2 GACs with exceedances listed within Tables 5.2 to 5.4 below.

A number of samples returned concentrations of TOC exceeding the GAC. TOC is a measure of organic carbon within the material and is not a determinand that directly poses a risk to human health. These results are used primarily to determine the classification of material for removal from site to a licenced disposal facility, if

required. The TOC is also used to derive the relevant SOM for the soils, necessary to derive an appropriate GAC for some organic determinands. TOC is therefore not considered further in respect of human health risk assessment.

5.3.1 Reworked Topsoil

Results returned on samples of reworked topsoil for determinands which exceed the applicable GAC from both the recent Sirius and previous Tetra Tech site investigations are summarised in Table 5.2 below.

Table 5.2 - Summary of Soil Analysis - Reworked Topsoil GAC Exceedances

Analyte	No. of Samples Tested	Range of Results (mg/kg)	Stage 1 / 2 GAC (2.5% SOM) (mg/kg)	No. of Samples >Stage 1 / 2 GAC	Samples Exceeding Stage 2 GAC (location and depth)
Organics - Polycyclic Aromatic Hydrocarbons					
Benzo(a)pyrene	5	2.43 - 11.17	2.1 / 4.9	5 / 4	TP101 at 0.2m TP111 at 0.2m WS107 at 0.2m DS04 at 0.1m
Asbestos	4	No asbestos detected - <0.001%	Asbestos detected	1	SA01, 0.3m

Four samples of reworked topsoil were recorded with concentrations of benzo(a)pyrene in exceedance of both the Stage 1 and 2 GACs. One sample of reworked topsoil obtained from SA01 at 0.3m recorded a concentration of benzo(a)pyrene in exceedance of the Stage 1 GAC, but not the relevant Stage 2 GAC. Each exploratory hole location was located within the western site area, with topsoil underlain by made ground.

Asbestos fibres (chrysotile, with concentration <0.001% mass) were recorded by Tetra Tech within reworked topsoil obtained from SA01 within the northwestern site area.

5.3.2 Made Ground

Results returned on samples of made ground for determinands which exceed the applicable GAC are summarised in Table 5.3 below.

Table 5.3 - Summary of Soil Analysis - Made Ground GAC Exceedances

Analyte	No. of Samples Tested	Range of Results (mg/kg)	Stage 1 / 2 GAC (2.5% SOM) (mg/kg)	No. of Samples >Stage 1 / 2 GAC	Samples Exceeding Stage 2 GAC (location and depth)
Organics - Polycyclic Aromatic Hydrocarbons					
Benzo(a)pyrene	10	<0.04 - 34	2.1 / 4.9	5 / 5	WS107 at 0.6m WS109 at 0.5m WS111 at 0.5m WS113 at 0.4m DS04 at 0.5m

Five samples of made ground taken from within the western site area were recorded with concentrations of benzo(a)pyrene in exceedance of both the Stage 1 and 2 GACs.

5.3.3 Statistical Assessment

Table 5.4 below summarises the statistical analysis of exceedances within made ground. An insufficient dataset is currently available to enable statistical analysis on reworked topsoil.

Table 5.4 - Statistical Analysis for Made Ground

Analyte	Sample Type	No. of Samples Tested	Range of Results (mg/kg)	Stage 2 GAC (1% SOM) (mg/kg)	No of Samples >Stage 2 GAC	Upper Confidence Level (95%) (mg/kg)
Organics - Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene	Made ground	10	<0.04 - 34	4.9	5	**14.95***

* Denotes exceedance of upper confidence level compared to the relevant Stage 2 GAC.

The results of statistical analysis indicate the 95% upper confidence levels of the dataset for benzo(a)pyrene exceed relevant GACs within made ground soils. This is discussed further in Section 6.4.

5.3.4 Calorific Value

In accordance with ICRCL Note 61/84[10], materials with a CV exceeding 10MJ/kg are most likely combustible, and materials with a CV less than 2MJ/kg are unlikely to burn.

Calorific value (CV) soil testing recorded values of <0.1 MJ/kg and 1.5 MJ/kg.

Therefore, the samples tested are not considered to pose a significant risk of combustion.

5.4 Groundwater Analysis

Groundwater samples were obtained from five selected window sample boreholes during the first monitoring round on 7th November 2024.

Results returned on samples of groundwater for determinands which exceed the applicable GAC are summarised in Table 5.5 below.

[10] ICRCL Note 61/84 "*Notes on the fire hazards of contaminated land*",

Table 5.5 - Summary of Groundwater Analysis - GAC Exceedances

Analyte	No. of Samples Tested	Range of Results (µg/l unless specified)	GAC value (EQS) (µg/l unless specified)	GAC value (DWS) (µg/l unless specified)	No. of Samples >GAC	Samples Exceeding GAC (location)
Metals and Metalloids						
Copper	5	1.1 - 2.7	1.0	2,000	5 (EQS)	WS105 / WS107 / WS108 / WS111 / WS113
Nickel	5	3.8 - 12	4.0	20	4 (EQS)	WS105 / WS107 / WS111 / WS113
Zinc	5	6.4 - 14	10.9	5,000	2 (EQS)	WS105 / WS113
Others						
Ammoniacal Nitrogen* (mg/l)	5	0.056 - 0.86	0.3	0.5	2 (EQS/DWS)	WS107 / WS113
Sulphate (mg/l)	5	74 - 410	NA	250	2 (DWS)	WS105 / WS111

* EQS is hardness related; assessment criteria based on assumed hardness values of <40mg/l and <10mg/l respectively for cadmium and ammonia.

6. Discussion, Conclusions and Recommendations

6.1 Preamble

This geoenvironmental appraisal has been performed for land off Shaw Lane, Carlton, Barnsley, on behalf of Network Space.

The site comprises an agricultural field with a vegetated pond located within the central-northern area. An area of marsh land was formerly located within the northwestern site area, with made ground appearing to have been imported and placed on the site to raise levels within the 1990's and early 2000's.

It has been assumed in the production of this report that the site will be developed for a residential end use with associated infrastructure. The proposed site layout is shown on Spawforth's Indicative Masterplan, a copy of which is provided in Appendix A. The indicative proposed layout shows residential properties (including both houses with private gardens and apartment blocks), areas of POS and attenuation basins. For the purposes of this appraisal, it is assumed that ground levels will not change significantly from those described in this report and that housing will be of low-rise construction (up to three storeys in height).

6.2 Coal Mining Risk Assessment and Mineral Extraction

6.2.1 Coal Mining

No coal seams are conjectured to outcrop directly below the site, although an un-named 'thin' coal seam is conjectured to outcrop c.100m to the north of the site, dipping to the north (away from the site).

The site is recorded to be underlain by workings at depth (i.e. >100m bgl) and not located within any Development High Risk Area.

A thin, inconsistent and weathered coal band was noted near surface within several exploratory hole locations.

The 1947 BGS memoir states that '*Just above the Oaks Rock there is usually a thin coal'.* It is considered likely that this is the un-named coal seam identified on the site. No evidence of any associated shallow mine workings was noted.

Based on the published geological information and the results of the site investigation, the risk of surface instability resulting from potential shallow unrecorded and recorded mineworkings beneath the site is considered to be low.

However, given the presence of an underlying thin coal seam, the possibility of unrecorded shallow workings such as bell pits or crop workings cannot be discounted. Similarly, although no mine entries are recorded within the site, there are recorded deep mine workings beneath the site and therefore the possibility of encountering unrecorded mine entries cannot be entirely discounted. It is recommended that during enabling and development works, the natural soils at formation be inspected for mine entries, bell pits and crownholes, etc. If evidence of a mining feature or ground disturbance is suspected, advice regarding treatment/ foundation precautions should be sought from a suitably qualified engineer.

6.2.2 Other Resource Extraction (Quarrying)

No other resource extraction activities (quarrying etc.) are recorded to be on site or adjacent to the site.

6.2.3 Mineral Safeguarding

The site is not known to be located within a mineral safeguarding area, and as such the potential for sterilisation of mineral resources arising from the proposed development has not been considered further.

6.3 Geotechnical

6.3.1 Foundations

The following discussion is given on the understanding that the site is to be developed with standard house types, in which structural loads are assumed to be in the order of 70kN/m run. In addition, the following comments are based on the assumption that ground levels and ground conditions (as a result of earthworks or other preparatory measures) will not change significantly prior to development.

The investigations undertaken have identified topsoil / reworked topsoil across the site to between 0.25m and 0.40m bgl, overlying cohesive made ground within the western and central areas of the site, to depths of between 0.50m and 1.80m bgl. The cohesive made ground was underlain by an organic-rich cohesive soil / relic topsoil to a maximum depth of 2.30m bgl, within a number of exploratory hole locations, generally located surrounding the existing pond area. Granular made ground was locally encountered within the central area of the site.

Cohesive glacial till deposits were encountered across the majority of the site, comprising firm to stiff medium strength (locally soft and low strength), slightly sandy slightly gravelly clay. Localised granular bands comprising medium dense sands were recorded. Residual and / or competent PMCMF strata were encountered at depths of between 1.0m and >3.9m bgl, with the exception of exploratory hole locations TP106, WS112, SA102 and SA103, which did not reach the base of the superficial glacial till deposits.

Groundwater ingresses were noted between 1.0m and 3.6m bgl.

The cohesive soils on this site have been found to be of predominantly medium volume change potential as defined in NHBC Standards, Chapter 4.2. Foundations placed into natural clay soils should be a minimum of 0.9m deep (below finished or original ground levels, whichever is the lower). Trees may affect the moisture content of clays to greater depths and as such, foundations may be required to extend to greater depths to penetrate to a moisture stable level within the area of influence of existing or proposed trees. In particular, based on observations at the time of the investigation, it is anticipated that foundations along the site peripheries and the existing vegetated pond may require to be locally deepened to mitigate the effects of trees.

Heave protection measures should be adopted in foundation design where the requirement for deepening due to the presence of existing trees or shrubs exceeds 1.5m. If the requirement for deepening due to existing trees exceeds 2.5m, an engineer-designed foundation is required. The removal of trees may also cause heave of cohesive soils and, as such, foundations should be extended to a moisture stable level in the location of felled trees and incorporate heave protection into the foundation design (both spread and pile foundations).

SHALLOW SPREAD FOUNDATIONS

The topsoil and made ground / organic rich soils are considered unsuitable as bearing strata for structural loads due to the potential for excessive total and differential settlements. Structural loads associated with the development could be locally supported on spread foundations comprising a mix of either strip or trench fill foundations bearing on to competent strata (at least firm to stiff, medium strength cohesive glacial till or residual PMCMF strata).

In situ testing of the cohesive glacial till deposits indicates a characteristic undrained shear strength, at likely shallowest potential foundation depths, of c. 45kN/m^2. An assumed shear strength value of 45kN/m^2 has been adopted for preliminary foundation calculations within these soils.

By way of example, based on Eurocode 7 compliant calculations, a 600mm wide strip foundation bearing onto natural cohesive glacial till with a characteristic undrained shear strength of at least 45kN/m^2, at a minimum depth of 0.9m below ground level, could support a line load of up to 70kN/m run. The application of such a line load is expected to induce settlement of 25mm or less.

Locally in the north west of the site, the thickness of made ground and / or weak organic soils may necessitate trench fill foundations greater than 2.5m deep, which would require an engineer design. Attention is also drawn to the potential presence of shallow groundwater. Accordingly, an allowance for provision to support and dewater foundation excavations and would be prudent. It is recommended that, in order to reduce the possibility of softening or swelling of cohesive soils at the base of foundation trenches as a result of exposure to rain or groundwater, these should be suitably blinded with concrete in the event foundation concrete is not poured immediately following excavation of the foundation trench.

GUIDANCE ON DETAILED FOUNDATION DESIGN

It must be recognised that the outline indicative foundation designs provided above are provided for guidance only at this stage and are based on a theoretical foundation and load scenario likely to be applicable to the proposed development. Foundation bearing capacity and settlement calculations must be reviewed once final loading arrangements and foundation types and dimensions are known. It must also be acknowledged, that the provision of a single 'design bearing capacity' for the soils at this, and any other site is not appropriate, and not compliant with Eurocode 7 design requirements. The carrying capacity of foundations requires both shear failure and settlement mechanisms to be considered and determination of the likely magnitude of the latter requires knowledge of the foundation dimensions required to satisfy the former. Foundation design should be carried out by an experienced geotechnical specialist conversant with the principles of soil mechanics.

It is recognised that there will be other constraints on founding elevations across the site, including the presence of existing, removed and proposed trees, and requirements for reprofiling of the site to accommodate proposed development levels. As a consequence, it is possible that foundations will bear onto different strata than assumed above.

It is recommended that a plot specific foundation schedule is prepared, to enable detailed design of foundations to individual structures, taking into account the exact line loads, ground conditions, soil properties and effects of trees, on each individual foundation. This should, as noted above, be undertaken by, or in conjunction with, a geotechnical specialist.

Drawing No. C10271/05 within Appendix A shows areas which are considered likely, based on the findings of this investigation, to be suitable for spread foundations and where alternative / deepened foundation solutions may be required, on the basis. However, this plan should be considered as indicative and, owing to the variability of soil, excavations for foundations to plots should be inspected and where necessary tested, on a plot-by-plot basis by an appropriately experienced engineer, to confirm adequate bearing capacity for the foundation type proposed. In addition, the influence of tree effects has not been taken into account during the production of the indicative foundation zoning plan.

In some areas of the site, competent rockhead is to be expected at depths of c. 2.0m bgl. Subject to requirements for extending foundations in depth to mitigate the effects of trees, rockhead may be at or above the scheduled founding elevation for part of some plots. Bedrock at the site may be assumed to have no volume change potential; any spread foundations need only 'key in' to rock by 150mm.

If foundation excavations encounter bedrock, then it is recommended that all of the foundation bears upon rock and thus limits the potential for unacceptable differential settlements. Foundations bearing solely onto competent rockhead may have similar dimensions and load bearing capacity to those designed for the overlying soils without further design calculations. If a higher bearing capacity is required in such circumstances, then further design will be required.

Foundations should be taken below a line drawn up at 45° from the base of any existing or proposed services. The layout of foundations should also consider any relict foundations, substructures or other potential obstructions on site. Foundation arrangements will need to consider the location of the existing water main to ensure that no undue loading is placed onto the structure. Consideration should be given to the existing overhead electricity power lines, and any associated easements as part of detailed design.

It should be noted that any groundwater encountered may have an adverse effect on foundation construction and performance (such as softening/loosening of founding materials, instability of excavation walls, etc.), particularly in wet weather. This should be considered when designing foundations.

If coal is encountered at normal formation depth within foundation excavations, the excavation should be extended through the coal seam into competent strata below. If the depth to the base of coal increases to greater than 2.5m bgl within the foundation excavation, then an alternative engineer-designed foundation (e.g. deep trench fill, piles etc) may be required. In addition, foundations extending through any shallow coal seams will require protection from potential spread of fire, and advice should be sought from a suitably qualified structural engineer.

Anti-floatation design may be required for any proposed below ground structures (e.g. attenuation tanks) due to the risk of shallow groundwater. Potential uplift / swelling of shallow soils post excavation should be taken into consideration.

6.3.2 Floors

Suspended floor slabs may be required where soil swelling could occur, as a consequence of the influence of trees, and where made ground / fill material will be in excess of 600mm thick. Floor slab design should also address the requirements for ground gas protection measures.

6.3.3 Concrete Risk to Chemical Attack

Based on the samples tested, the below Design Sulphate Class and ACEC Class should be used for buried concrete structures in contact with the below materials:

Table 6.1 - Summary of Design Sulphate and ACEC Classes

Stratum	DS Class	ACEC Class
Made Ground	DS-1	AC-1
Cohesive Natural Strata (Glacial Till)	DS-1	AC-1
PMCMF Strata	DS-2	AC-4z
Groundwater	DS-2	AC-2

6.3.4 Groundworks, Excavation Stability and Groundwater

Excavations into the natural soils should generally be within the capacity of traditional plant.

Excavations into the soils present across the site should be assumed to be unstable, even in the short term, and it is recommended that allowance is made for provision of support to all excavations including for drainage and foundation construction.

No personnel entry into unsupported excavations shall be allowed without an appropriate risk assessment. Reference to relevant current guidance and legislation should be made to establish suitable means of support or battering of excavation sides.

Shallow weathered/residual bedrock (mudstone and sandstone) is unlikely to be problematic for construction of foundations, which may bear directly onto the surface of competent rock, or for shallow domestic service connections. Deep excavations, for example deep drainage or attenuation tanks, or construction of foundations / service connections into competent bedrock, may however require the use of hydraulic breakers.

Based on the results of this investigation, groundwater seepages or inflows within shallow (<2.0m) excavations are considered possible. Based on observations made during this investigation, it should be possible to deal with seepages through normal site pumping practices for any shallow excavations (<2.0m) open for short periods of time. Should deeper excavations be required dewatering using an alternative method, e.g. well pointing combined with trench support, may be required. Any pumping and discharge/ disposal of water will require appropriate treatment/consents.

It is recommended that an adequate drainage system for surface water be installed by a competent contractor in order to prevent surface water ponding or collecting both during and post construction, as this may lead to deterioration of the founding stratum.

6.3.5 Pavements and Highways

Remoulded laboratory CBR testing has returned CBR values ranging from 3.9% to 4.2% for the cohesive glacial till soils. In addition to remoulded laboratory testing, further assessment via laboratory analysis can also be used to estimate CBR. On the basis of the recorded Atterberg Limit determinations using TRL LR1132[11] a CBR value of 3% may be considered appropriate for preliminary highways design, assuming construction in "average" conditions and assuming a 'thin' layered construction.

Values of Subgrade Surface Modulus (SSM) can be estimated from CBR. The following values of SSM are determined from the above CBR values using Equation 2.4 of CD225[12]. For derived CBR values of 3% the equivalent SSM values of 36 MPa is calculated for a subgrade comprising natural clays. For made ground / organic rich soils a SSM value of <30MPa should be assumed based on an assumed CBR of <2.5%.

Areas of deeper made ground and geotechnically poor / organic rich soils will require treatment/improvement along the alignment of highways prior to commencement of construction in order to provide a suitable formation for foundation construction and to mitigate the risk of settlement post construction. Where SSM values fall below 30 MPa the subgrade is considered unsuitable to support pavement construction. Note 2 of CD225 indicates remedial solutions for when the SSM of <30 MPa can comprise the following:

- Excavation and replacement of between 500mm and 1000mm of soft subgrade with granular fill.
- Use of mechanical stabilisation (geotextiles and geogrids)
- Soil stabilisation.

Notwithstanding the above, it is recommended that in situ CBR testing is carried out within proposed highways following completion of the enabling works, at final formation levels, to give the final design CBR values.

All road design should be discussed with the relevant local authority if highways are to be subject to a Section 38 agreement.

6.3.6 Soakaway Drainage

Based on the ground conditions encountered during the site investigation and results of the soakaway testing, soakaway drainage is considered unlikely to be viable at the site. No significant infiltration was recorded for the duration of the soakaway tests undertaken (i.e., over a period of 24 hours).

[11] TRL publication LR1132 "Structural design of bituminous roads", 1984
[12] Highways England CD225 Design for new pavement construction

6.4 Contamination and Ground Gas

6.4.1 Introduction

The results of the chemical testing indicates that potentially unacceptable contaminant linkages exist for future site users. Contaminant linkages assessed as a Low or Negligible risk are not considered significant or requiring remedial action and are not discussed further.

Further discussion of the potential contaminants of concern is given in Section 6.4.2 below. The revised conceptual site model showing the residual contaminant linkages is presented within Section 7.0 and on Drawing No. C10271/06, enclosed within Appendix A.

An indicative contamination constraints plan is included as Drawing No. C10271/07, included in Appendix A.

6.4.2 Human Health Risk Assessment

The following contaminants were detected within soils on the site above the applicable GACs. Further discussion on the potential risk to human health is given below. Outline remedial measures are given in Section 8.

Table 6.2 - Summary of Elevated Contaminants above the Applicable GACs

Contaminant	Impacted Soil/ Material Type	Location	Considered to Pose an Unacceptable Risk to Human Health?*
Asbestos fibres	Reworked Topsoil in SA01	Recorded by Tetra Tech in one sample of reworked topsoil.	Yes - further details are as below.
Organic (benzo(a)pyrene)	Reworked Topsoil and Made Ground	Western site areas.	

*Defined as greater than low risk

MADE GROUND

Concentrations of benzo(a)pyrene recorded within made ground were greater than the relevant Stage 1 and 2 GACs. Made ground soils are not considered suitable to remain at shallow depth within residential gardens or areas of landscaping and remedial action will be required to break potential pollutant linkages. Made ground soils are also considered texturally unsuitable to remain at shallow depth within garden areas.

REWORKED TOPSOIL

Concentrations of benzo(a)pyrene recorded within reworked topsoil (i.e., where placed over made ground soils) were greater than the relevant Stage 1 and 2 GACs. Based on the results of a source signature double ratio plot (comparison of the ratios of two pairs of PAHs; benzo(a)anthracene to chrysene, and fluoranthene to pyrene), the most likely source of the detected PAHs within the samples are combustion products (i.e. ash) or unburnt coal. Coal / ash derived PAHs are generally accepted to be less mobile and less of concern to human health than other sources i.e. petroleum hydrocarbons. The reworked topsoil appears to have been placed above made ground within the area of marsh land in the 1990's and 2000's.

The reworked topsoil is considered chemically unsuitable for use within residential gardens. It is recommended that additional sampling, testing (to increase the dataset) and updated assessment be undertaken of the reworked topsoil, to assess its potential suitability for use within informal POS.

ASBESTOS CONTAINING MATERIALS (ACM)

No visible ACMs were noted during the site investigation, and with the exception of the asbestos encountered by Tetra Tech within reworked topsoil in SA01, none of the soil samples analysed were recorded to contain asbestos. On the basis that these soils are locally removed, relocated at depth and will thereafter remain

undisturbed, the risk to site end users is considered to be low. A higher risk to human health is noted for construction and maintenance personnel during the construction phase of the development.

Given the history of the site, the potential presence of asbestos within soils cannot be discounted. Asbestos impacted soils are considered to present an unacceptable risk to human health should these materials be used in areas of gardens or soft landscaping.

6.4.3 Phytotoxic Risk Assessment

No contamination has been encountered which is likely to specifically affect the health of proposed vegetation within the development.

6.4.4 Controlled Waters Risk Assessment

Exceedances of potential contaminants in groundwater have been identified for copper, nickel, zinc, ammoniacal nitrogen and sulphate as part of this ground investigation.

The nearest water feature to the site is the on site pond, and Shaw Dike, 210m to the east. Given the relatively low resource value of the underlying aquifer (Secondary A Aquifer, with no nearby groundwater abstractions), plus the predominantly low permeability nature of the shallow soils and bedrock underlying the site, it is considered that the contaminants which were encountered are unlikely to be sufficiently mobile to significantly affect groundwater resources at the concentrations detected.

Elevated concentrations of ammoniacal nitrogen within groundwater are commonly found within both urban and rural settings. Possible sources of elevated concentrations of ammonia in groundwater include leakage from sewers and organic matter in organic-rich soils.

Given the relatively low sensitivity of the potential receptors the risks to controlled waters are considered low and do not warrant remedial action.

6.4.5 Utilities Risk Assessment

A formal water pipeline assessment has not been undertaken as part of this investigation.

It is recommended that the results of the chemical testing and details of the proposed remedial works are provided to the appropriate utility companies to determine the necessity for service protection.

6.4.6 Construction and Maintenance Workers Risk Assessment

Contamination may pose a short-term (acute) or long-term (chronic) risk to workers during construction and maintenance in addition to the potential for the presence of ground gases or the absence of oxygen within confined spaces including any below ground excavations even where open to the atmosphere. Assessment of the risks to construction and maintenance workers has not been undertaken as part of this report. The potential risks must be specifically assessed as part of the health and safety evaluation for the works to be performed in accordance with prevailing legislation.

The findings of this report should be forwarded to any contractors undertaking groundworks or maintenance personnel in order for them to assess the risk to their personnel.

6.4.7 Ground Gas Risk Assessment

Table 6.3 below summarises the conceptual site model for ground gas.

Table 6.3 - Summary of the Conceptual Site Model for Ground Gas

Source	Pathway	Receptor	Discussion
Carbon dioxide and methane generated in made ground soils and organic rich soils	Lateral migration within made ground / shallow soils	Residents, Built Environment	No significant organic component was observed in the made ground encountered during the investigation. The organic rich soils encountered are limited in thickness and extent. Both soil types are considered to have a limited potential to generate significant quantities of hazardous ground gases.

Ground gas monitoring undertaken as part of the previous Tetra Tech gas risk assessment identified peak methane and peak carbon dioxide concentrations of 0.1% and 7.9% respectively. The maximum steady state flow recorded across three visits was 0.3 l/hr, with a peak negative flow rate of -1.9 l/hr recorded on one occasion.

In summary, the key findings for gas concentrations / flow rates used in the assessment of ground gas regime were:

- Maximum peak methane concentration: 0.1% v/v (detection limit of the gas analyser)
- Maximum steady carbon dioxide concentration: 7.9% v/v (DS01 during a Tetra Tech monitoring visit)
- Maximum peak gas flow rate: 3.6 l/hr (WS107 during visit no. 2)
- Maximum steady gas flow rate: 3.4 l/hr (WS107 during visit no. 3)

Qhg (quantity of hazardous gas) values for methane and carbon dioxide were calculated in accordance with BS8485[13] on the basis of measured gas flows and concentrations or a limit of detection of 0.1 l/hr and 0.1% v/v respectively, whichever is the higher.

The Qhg is calculated in two ways, with increasing levels of conservatism. This includes the worst-credible case at each monitoring well (based on the maximum flow and maximum gas concentration from any monitoring event, excluding any disregarded concentrations and / or flows), and the worst-possible case for the whole site.

In accordance with the requirements of BS8485 the worst-possible case condition for the site has been calculated for methane and carbon dioxide as a 'worst-case' check, using the representative concentrations and flow rates discussed above. In accordance with the guidance, adopting the worst case Qhg as the Gas Screening Value (GSV) should be undertaken only when considered prudent and reasonable to do so.

Based on the monitoring results obtained across each Sirius and Tetra Tech monitoring visit, the worst possible Qhg values of 0.0036 l/hr and 0.269 l/hr have been calculated for methane and carbon dioxide respectively. If these values are applied as GSV's for the site, they are indicative of **Characteristic Situation 2 (CS2)** ground gas risk conditions, as defined in Table 2 of BS8485.

CS2 conditions are consistent with the findings of the previous Tetra Tech gas risk assessment.

Carbon monoxide and hydrogen sulphide concentrations were generally within normal ranges / parameters however it should be noted that significantly lower than atmospheric oxygen levels (<15% v/v) were recorded within several monitoring wells (in particular, WS111).

[13] BS8485:2015+A1:2019 "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings".

For CS2 conditions, ground gas protection measures providing a minimum protection "score" of 3.5 points are required for Type A buildings in accordance with Table 4 of BS8485. To achieve the required gas protection score, a combination of two or more of the following three types of protection measures should be used:

- The structural barrier of the floor slab
- Sub-floor ventilation measures
- Gas resistant membrane

By way of example only, a gas protection score of 3.5 points could be achieved by the use of a passive subfloor ventilation layer designed to achieve "good" performance (1.5 points) and the installation and verification of an appropriate gas resistant membrane (2 points). More details are provided in Tables 5 to 7 of BS8485.

Prior to undertaking any construction on the site, the proposed design of gas protection measures and strategy for verification ("Ground Gas Verification Plan") must be prepared in accordance with CIRIA Report C735 and agreed with the local authority and building warranty provider. The building construction details (including foundation and floor slab arrangements) will need to be known in order to produce a Ground Gas Verification Plan.

No additional gas protection measures are required for protection of proposed new buildings from the ingress of radon gas.

POTENTIAL INFLUENCE OF THE PROPOSED DEVELOPMENT ON THE GROUND GAS REGIME

Preparatory or remedial works for proposed developments, including but not limited to foundation solutions, particularly pile or vibro-stone columns, and earthwork proposals (cut/fill), have the potential to influence the ground gas regime for the site, which may require reconsideration following these preparatory or remedial works for the site.

On the basis of the proposed foundation solutions and remedial works outlined in this report, it is not considered that the proposed development will not significantly influence the ground gas regime for the site.

7. Revised Conceptual Site Model

7.1 Summary of Residual Contaminant Linkages

The preliminary combined conceptual site model and conceptual exposure model, developed from the desk study information and presented in Section 2.7.2, has been revised in light of the supplementary ground investigation, chemical analysis and generic quantitative risk assessment presented above.

A revised conceptual site model (RCSM) has been developed for the proposed future land use (residential with private gardens). This summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors, prior to the implementation of any remedial measures for the site.

The qualitative risk assessment of identified contaminant linkages has also been revised, following the methodology described in Appendix C.

The RCSM is presented in schematic form on Drawing No. C10271/06 in Appendix A.

In summary, the RCSM has identified the following potential pollutant linkages which could result in an unacceptable risk to the proposed end-use, denoted as 'low to moderate' or higher risk on the CSM:

- Inhalation of asbestos fibres detected within reworked topsoil in the vicinity of SA01, presenting a potential moderate risk to residential end users.
- Ingestion, inhalation of dust and dermal contact with elevated concentrations of benzo(as)pyrene in reworked topsoil and made ground within the west of the site, associated with historic placement of made ground soils in this area, presenting a potential moderate risk to residential end-users.
- Generation of carbon dioxide ground gas, associated with made ground and organic rich soils, with migration and accumulation in buildings / confined spaces, assessed to present a moderate risk to end users and the built environment.

8. Outline Remediation Requirements

With cognisance to the history of the site, and the distribution of the contamination identified, it is considered that the reworked topsoil and made ground beneath the western site area is not considered suitable to remain at shallow depth in areas of proposed landscaping or residential gardens.

The potential outline remedial measures are summarised within Table 8.1 below. The actual remedial measures proposed to be undertaken within the site is subject to preparation of a remediation strategy and further discussion with the client, and regulatory bodies if required, on the preferred remedial options.

Table 8.1 - Summary of Outline Remedial Measures

Site Area	Impacted Soil/ Material Type	Outline Remedial Measures Summary	Justification
Residential development	Reworked Topsoil (impacted with benzo(a)pyrene)	Subject to further testing and assessment, strip all reworked topsoil (i.e., existing topsoil placed over made ground) and place within informal POS landscaped areas (but not beneath buildings, roads or utilities). This would be subject to the results of further assessment and regulatory approval. Alternatively, remove from site.	Contamination encountered within northwestern site area, where made ground has been placed. PAH contamination encountered within reworked topsoil and made ground within the northwest. Asbestos fibres encountered within one trial pit location within the northwest.
	Reworked Topsoil (locally impacted with asbestos fibres within SA01)	Removal of localised impacted soils and placement at depth (i.e. >600mm) below proposed areas of soft landscaping (where it thereafter remain undisturbed). Validation of placed cover soils.	
	Made ground (impacted with benzo(a)pyrene)	Provision of 600mm clean cover layer (including at least 150mm site won / imported topsoil) and clean subsoil (site-won and / or imported) within garden and landscaped areas where made ground is present. Validation of placed cover soils.	
Where natural soils remain at surface	N/A	Provision of a minimum of 100mm clean topsoil in line with NHBC requirements where natural soils remain at surface in gardens, increased where / if rock is present at surface.	To provide a suitable growing medium for garden plants

Site Area	Impacted Soil/ Material Type	Outline Remedial Measures Summary	Justification
Residential development	N/A	Ground gas protection measures, to be commensurate with CS2 classification.	Potential gas sources identified.

GENERAL COMMENTS

The outline remedial measures given above do not comprise a formal remediation strategy and it is recommended that a Remediation Strategy is prepared for the site for submission to the Local Planning Authority (LPA). The proposed remedial measures including the intended thickness and components of the clean cover system will require approval from the LPA.

Consideration of the most appropriate remedial solution for the site should consider aspects such as the anticipated extent and volume of soils to be removed, final proposed site levels and the accommodation of a clean cover layer and ongoing validation requirements and potential for cross contamination of impacted soils.

For the areas of the site not underlain by made ground, it is recommended that a minimum thickness of 100mm of topsoil is placed in areas of private gardens and landscaping, to provide a suitable growth media for vegetation, in accordance with NHBC Standards.

8.1 Unexpected Contamination

Should unexpected or more widespread contamination be noted during the construction phase, further assessment may be required and should be undertaken by a suitably experienced geo-environmental consultant to reappraise the potential risks.

If ACMs, e.g. asbestos sheeting, used as shuttering, and/or fragments of asbestos-containing materials at surface or within soils are encountered, advice should be sought from an appropriately qualified asbestos specialist and an appropriate strategy developed for the safe removal and disposal of the material.

8.2 Invasive and Protected Species

An ecological assessment is outwith the scope of this report. Notwithstanding, no evidence of invasive or protected species was observed during the investigation and Sirius has not been made aware of the presence of such within the site. However, it is recommended that advice is sought from a suitably qualified ecologist. The treatment of any invasive plant species, if identified, should be undertaken prior to construction.

8.3 Waste and Soil Resource Management

8.3.1 Soils Re-use

Article 4 of the revised EU Waste Framework Directive (Directive 2008/98/EC) sets out five steps for dealing with waste, ranked according to environmental impact - the 'waste hierarchy'. The five steps are prevention, preparing for re-use, recycling, other recovery and as a final option disposal. All site won, imported and exported soils are classified as a waste material unless demonstrated otherwise.

With reference to the Waste Hierarchy, where possible to do so, it is recommended that site won soils should be retained and re-used on site as far as practicable. If re-use is an option, it must be demonstrated by the waste producer that the soils are not a waste and there is certainty of use. This should be done using a MMP in accordance with the DoWCoP. Any surplus natural, uncontaminated soils have the potential to be transferred to other development sites subject to meeting the requirements of the DoWCoP. Contaminated soils and made ground can only be re-used on the site of origin if suitable for use. Where soils are re-used under an MMP a

Verification Plan and subsequent Verification Report will be required. It is recommended that consideration of re-use of soil is undertaken as early as possible in the planning process to ensure that the most cost efficient and sustainable options for soil re-use can be explored.

It is noted that alternatives to an MMP are available, such as an Environmental Permit, however an MMP is typically the most suitable option for a residential development.

8.3.2 Topsoil Re-use

At this stage, based on the laboratory test results, it is considered that natural topsoil outwith the western area of the site (indicative extent shown on Drawing No. C10271/07, included in Appendix A), may be suitable for re-use within gardens and landscaped areas in the development, subject to regulatory approval. Similarly, the underlying natural soils are also considered suitable for re-use within a residential development, where required. However, it is recommended that any site won topsoil and subsoil is stockpiled and further chemically tested and visually assessed/screened for suitability, as part of the enabling works, before being approved for re-use.

There may be a requirement for further chemical testing and visual assessment/ screening for suitability as part of the enabling works, subject to the local authority regulatory position on the scope of testing for re-use on the site of origin. If the topsoil is intended to be used on other sites, particularly as part of remedial works, then additional testing to satisfy the density of testing required under YALPAG guidance is likely to be required.

Based on the samples obtained during the investigation and subsequent contaminated land risk assessment it is considered that site won reworked topsoil (i.e., where currently underlain by made ground soils) will not be chemically suitable for re-use within a residential setting (at surface in private gardens). It is recommended that additional sampling, testing and assessment be undertaken of the reworked topsoil, to assess its suitability for use within informal POS. The reworked topsoil is considered chemically unsuitable for use within residential gardens.

Whilst the soils may be considered suitable for this use in this context it does not remove the requirement to comply with the DoWCoP as detailed in Section 8.3.1.

8.3.3 Surplus Soils

If any surplus soils or materials are generated during construction which cannot be re-used they will be regarded as a waste and should be disposed of in accordance with current UK waste legislation to a suitably licenced facility under appropriate Duty of Care. It is the waste producers responsibility to adequately classify the waste, which should be undertaken in accordance with Guidance on the classification and assessment of waste (WM3[14]). Please note that this ground investigation is unlikely to be sufficient to provide a detailed classification of any waste generated on site.

It is recommended that a detailed cut/fill balance is produced for the site in advance of the development to confirm whether surplus soils will be produced.

[14] Environment Agency Technical Guidance WM3 Version 1.2.GB October 2021 Waste Classification guidance on the classification and assessment of waste.

9. Recommended Actions

It is recommended that the following actions are undertaken in order to progress the scheme.

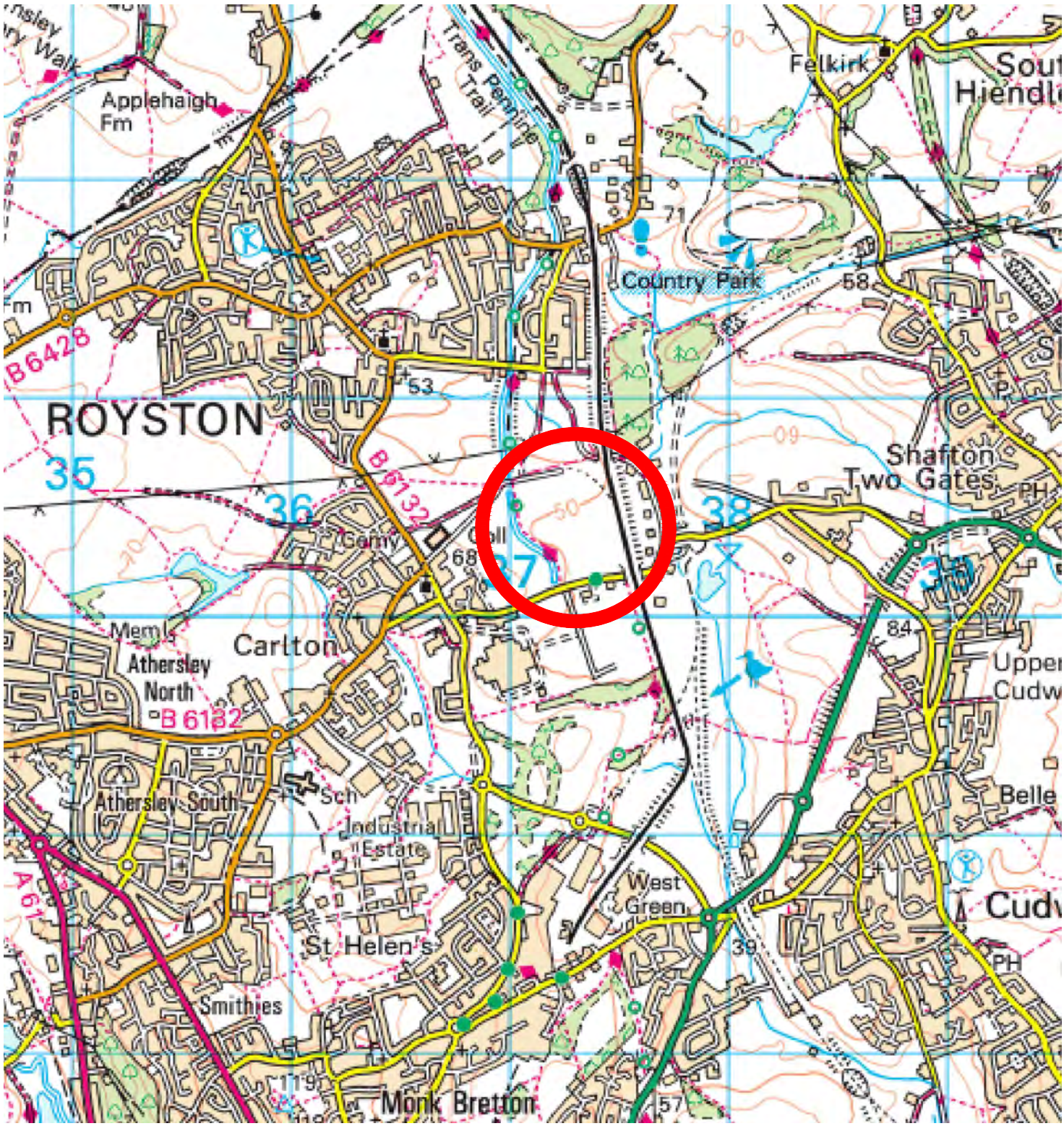
- Cut/fill balance for the site to confirm any volumes of material likely required to be disposed off site.
- Preparation of a detailed foundation schedule prepared by a competent geotechnical engineer, taking account of all ground conditions, development layout, tree survey report and reprofiling requirements.
- Production of a Ground Gas Protection Verification Plan, including the proposed design of gas protection measures and strategy for verification.
- Production of a Remedial Strategy confirming the remedial proposals to mitigate the risks from elevated contaminants within the site.
- Production of an MMP for the site to cover the reuse of soils within the site.

10. Regulatory Approvals

The conclusions and recommendations presented above are considered reasonable based on the findings of the site investigation. However, these cannot be guaranteed to gain regulatory approval and, therefore, the report should be passed to the appropriate regulatory authorities and/or other relevant organisations for their comment and approval prior to undertaking any works on site.

APPENDICES

APPENDIX A
Drawings



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NOTES

Site Location

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4245 Park Approach, Thorpe Park, Leeds LS15 8GB
www.thesiriusgroup.com
TEL: 0113 264 9960
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CLIENT	DRAWING NO.	REVISION NO.
Network Space	C10271/01	0
SITE: Shaw Lane, Carlton	DRAWN BY: MF	APPROVED BY: GH
DRAWING TITLE: Site Location Plan	DATE: January 2025	SCALE: 1:25,000

A4



Photo 1 View of gated access along southern site boundary.



Photo 2 View of site looking north.



Photo 3 View of site looking north, to the east of the overhead cables.



Photo 4 Photo looking east along the southeastern site boundary.



Photo 5 View looking north along extent of buried water main, with manhole evident.

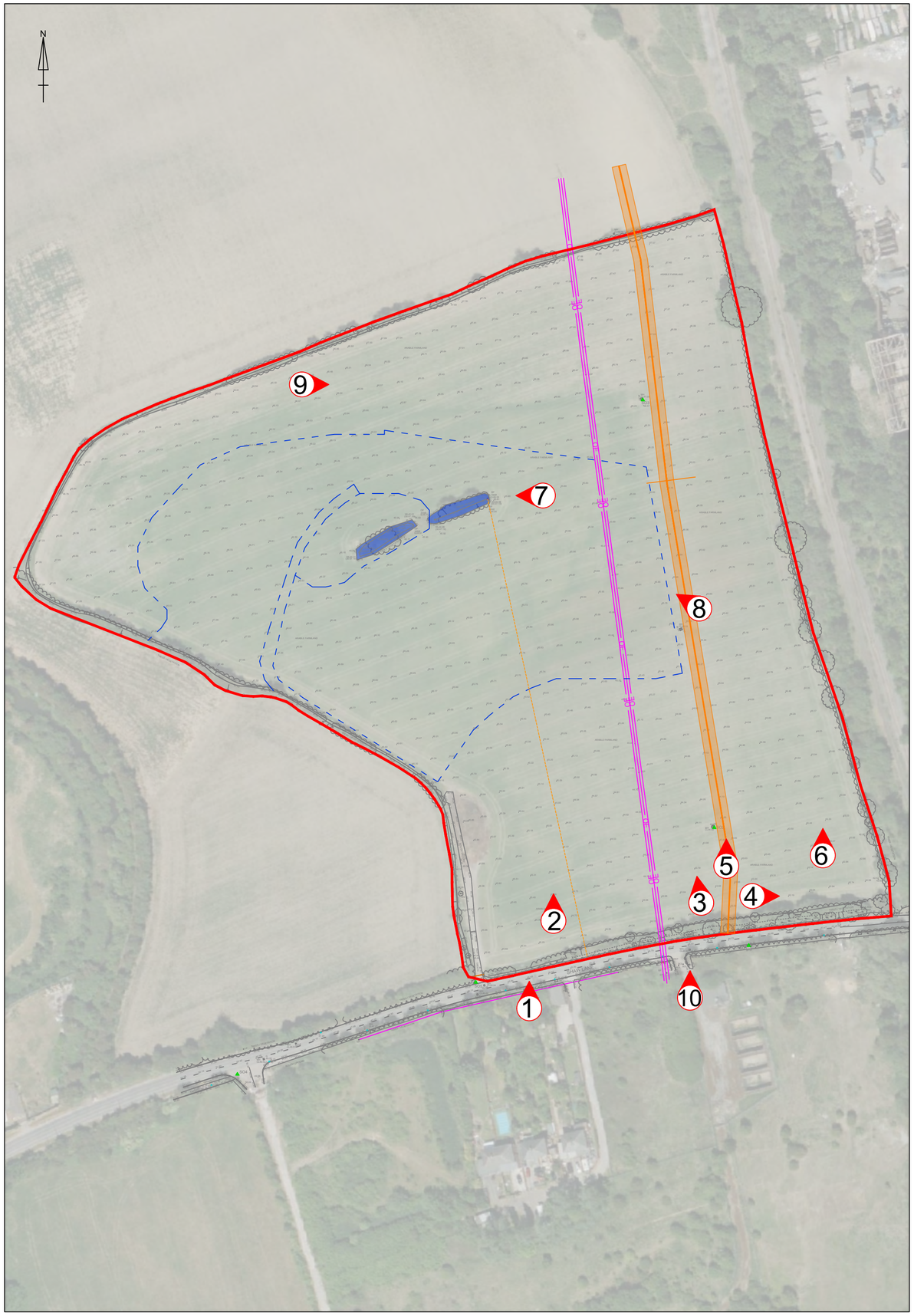




Photo 6 View of eastern site boundary looking north.



Photo 7 View of vegetated pond looking west.



Photo 8 View of site looking towards the northwest.



Photo 9 View of northern site boundary looking east.



Photo 10 Photo looking north, towards southern site boundary.

NOTES

- Site Boundary
- Photo Location and Direction
- Overhead Cables
- Buried water main
- Anecdotal water main / drain (location along southern boundary unknown)
- Former site features, as shown on 1999 historical map.

Notes

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2. The locations of services shown on this drawing are approximate and are based on utility plans provided by the client. Locations of services are given for the purposes of indicating constraints to the site investigation only. Reference should be made to original utility plans and HSG47 for locating of services within the site.
3. All marked site features shown on this drawing are given for indicative purposes only. This drawing should not be underlaid in isolation to determine proposed development layouts. Reference should be made to the accompanying report for commentary on the potential location of these features including coordinates if available and any further works required to locate features if required.

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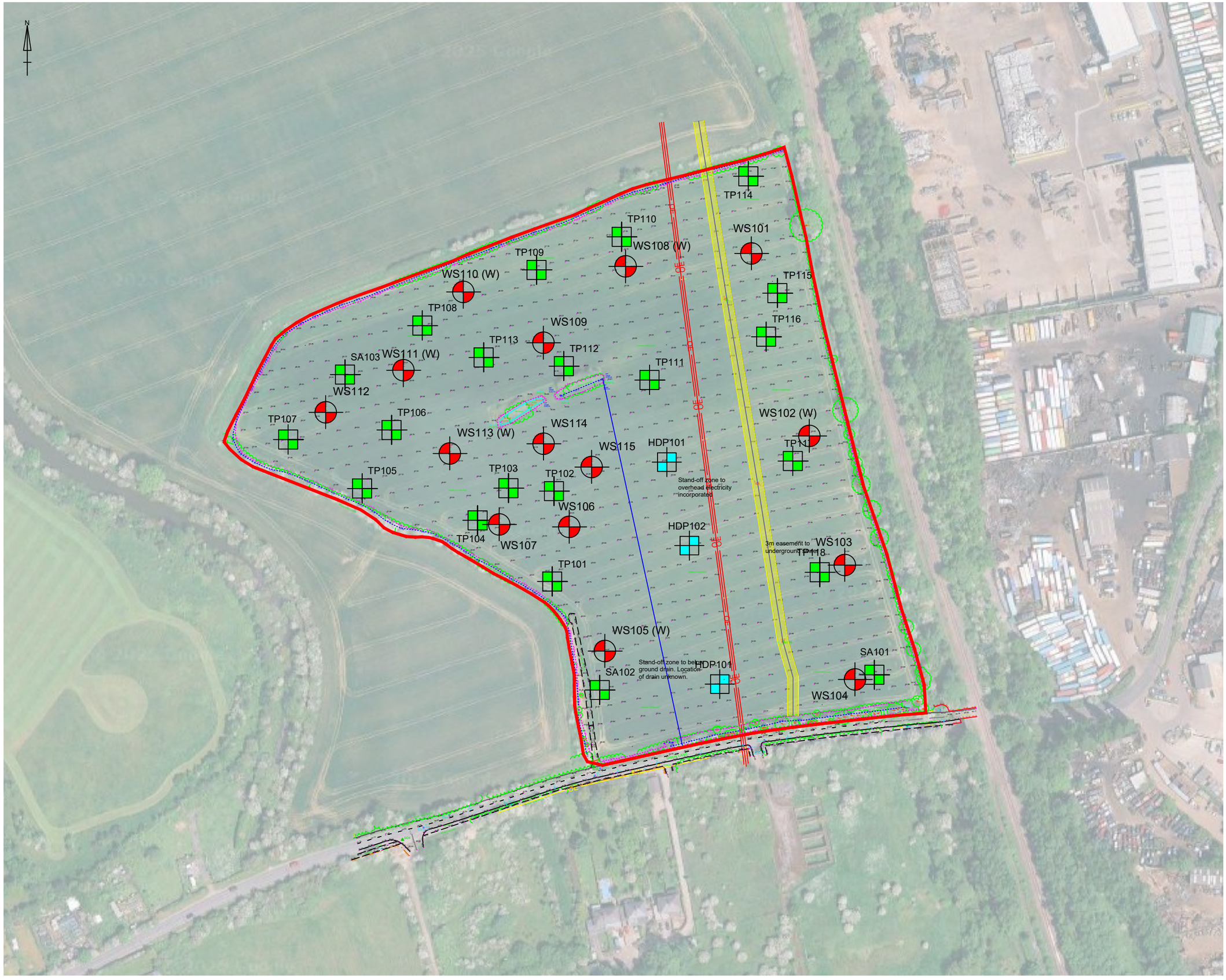
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**Shaw Lane,
Carlton**

DRAWING TITLE

Site Features Plan

DRAWING NO.	REVISION NO.
C10271/02	0
DRAWN BY	APPROVED BY
MF	GH
DATE	SCALE	PAPER SIZE
January 2025	1:1000	A2



NOTES

- Site Boundary
- TP — Sirius Trial Pit Location
- SA — Sirius Soakaway Testing Location
- WS — Sirius Window Sample Borehole Location
- WS (W) — Sirius Gas/ Groundwater Monitoring Well Location
- HDP101 — Sirius Hand Dug Pit Locations

Notes

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Shaw Lane, Carlton

DRAWING TITLE

Exploratory Hole Location Plan

DRAWING NO.	REVISION NO.
C10271/03	0

DRAWN BY	APPROVED BY
MF	GH

DATE	SCALE	PAPER SIZE
January 2025	1:2000	A3



NOTES

- Site Boundary
- TP — Sirius Trial Pit Location
- SA — Sirius Soakaway Testing Location
- WS — Sirius Window Sample Borehole Location
- WS (W) — Sirius Gas/ Groundwater Monitoring Well Location
- HDP101 — Sirius Hand Dug Pit Locations
- TP — Tetra-Tech Trial Pit Location
- WS — Tetra-Tech Dyanamic Sampler Borehole Location

Proposed Layout taken from Network Space, "Indicative Masterplan" by Spawforths, dated January 2023 (ref. P0-MP-SPA-P3921-51L-1000-0002)

Notes

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DRAWING TITLE

Combined Exploratory Hole Location Plan

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AEC	GH

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NOTES

Site Boundary

- Sirius Trial Pit Location
- Sirius Soakaway Testing Location
- Sirius Window Sample Borehole Location
- Sirius Gas/ Groundwater Monitoring Well Location
- Sirius Hand Dug Pit Locations
- Tetra-Tech Trial Pit Location
- Tetra-Tech Dynamic Sampler Borehole Location

Proposed Layout taken from Network Space, "Indicative Masterplan" by Spawforths, dated January 2023 (ref. P0-MP-SPA-P3921-51L-1000-0002)

Traditional strip / trench fill foundations taken to <1.5m bgl may be possible (subject to requirement for over deepening for trees)

Foundations anticipated to be deepened to >1.5m bgl.
Engineer designed foundations may be locally required where foundations required to be over deepened >2.5m bgl.

Engineer designed foundations may be required where foundations required to be over deepened >2.5m bgl.

This plan is indicative in nature only, and does not take into account any detailed layouts or levels, or the findings of a tree survey.

Notes

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Network Space

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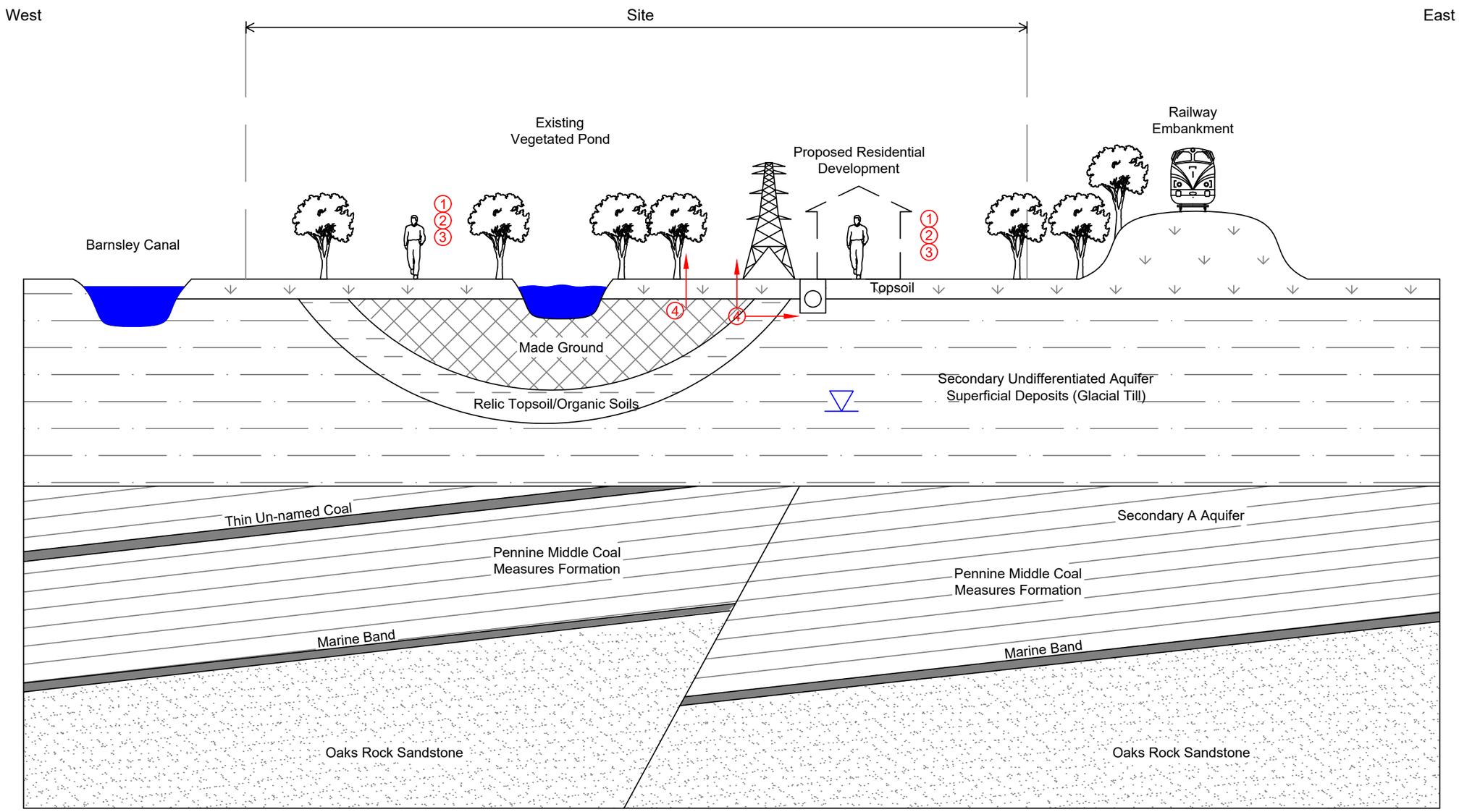
**Shaw Lane,
Carlton**

DRAWING TITLE

Indicative Foundation Zoning Plan

DRAWING NO.	REVISION NO.
C10271/05	0
DRAWN BY	APPROVED BY
AEC	GH

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Contamination Source	Contamination Pathway	Potential Receptors	Risk of Significant Contamination Linkage
Localised asbestos and benzo(a)pyrene in made ground and reworked topsoil	1 - Dermal contact 2 - Direct and indirect ingestion 3 - Inhalation of particles and dust/ asbestos fibres	Current and future site users, construction workers and adjacent site users	Moderate
Generation of hazardous ground gas, associated with made ground and organic rich soils.	4 - Migration and accumulation of hazardous ground gas in buildings / confined spaces	Current and future site users, construction workers and adjacent site users	Moderate

NOTES

Notes
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D	>>	>>	>>

SIRIUS
GEOTECHNICAL LTD
4245 Park Approach,
Thorpe Park,
Leeds
LS15 8GB
www.thesiriusgroup.com
TEL: 0113 264 9960
FAX: 0113 264 9962

CLIENT

Network Space

SITE

Shaw Lane,
Carlton

DRAWING TITLE

Revised Conceptual Site Model

DRAWING NO.	REVISION NO.
C10271/06	0
DRAWN BY: MF	APPROVED BY: GH
DATE: January 2025	SCALE: NTS / PAPER SIZE: A3



NOTES

Site Boundary

- TP — Sirius Trial Pit Location
- SA — Sirius Soakaway Testing Location
- WS — Sirius Window Sample Borehole Location
- WS (W) — Sirius Gas/ Groundwater Monitoring Well Location
- HDP101 — Sirius Hand Dug Pit Locations
- TP — Tetra-Tech Trial Pit Location
- WS — Tetra-Tech Dynamic Sampler Borehole Location

Proposed Layout taken from Network Space, "Indicative Masterplan" by Spawforths, dated January 2023 (ref. P0-MP-SPA-P3921-51L-1000-0002)

Asbestos fibres identified during 2021 Tetra Tech site investigation.

Extent of recorded made ground and reworked topsoil. All made ground soils should be assumed to be impacted with benzo(a)pyrene requiring remedial action. All reworked topsoils should be assumed to be chemically unsuitable for re-use within residential gardens.

Notes

1. This drawing should not be viewed in isolation from the accompanying report.
2. All exploratory hole locations are based on handheld GPS coordinates unless stated otherwise on the exploratory hole logs.
3. The locations of services shown on this drawing are approximate and are based on utility plans provided by the client. Locations of services are given for the purposes of indicating constraints to the site investigation only. Reference should be made to original utility plans and HSG47 for locating of services within the site.
4. All marked site features shown on this drawing are given for indicative purposes only. This drawing should not be underlaid in isolation to determine proposed development layouts. Reference should be made to the accompanying report for commentary on the potential location of these features including coordinates if available and any further works required to locate features if required.

REVISION		BY	DATE
0	For Information	GH	1/12/2024
A	>>	>>	>>
B	>>	>>	>>
C	>>	>>	>>
D	>>	>>	>>

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CLIENT

Network Space

SITE

**Shaw Lane,
Carlton**

DRAWING TITLE

**Indicative
Contamination
Constraints Plan**

DRAWING NO.	REVISION NO.
C10271/07	0
DRAWN BY	APPROVED BY
AEC	GH

DATE	SCALE	PAPER SIZE
January 2025	1:2000	A3

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISIONS OR ERRORS

N

KEY: EXISTING SERVICES

- SITE BOUNDARY
- TELECOMS BT (EXG)
- TELECOMS BT OVERHEAD LINES (EXG)
- WATER MAINS (EXG)
- WATER TRUNK MAINS (EXG)
- FOUL WATER SEWER RUN (EXG)
- SURFACE WATER SEWER RUN (EXG)
- SEWER EASEMENT (EXG)
- COMBINED SEWER (EXG)
- COMBINED WATER RSING MAIN (EXG)
- NATIONAL GRID CABLES (EXG)
- LV ELECTRICITY CABLES (EXG) (LESS THAN 1kV)
- HV ELECTRICITY CABLES (EXG) (1000 TO 6600 (6kV))
- HV 11kV ELECTRICITY CABLES (EXG) (WEIGHED 11kV CABLES)
- EHV ELECTRICITY CABLES (EXG) (ABOVE 22kV)
- STREET LIGHTING LV ELECTRICITY CABLES (EXG)
- GAS (EXG)
- GAS LOW PRESSURE(EXG)
- GAS MEDIUM PRESSURE (EXG)
- GAS HIGH PRESSURE (EXG)
- VIRGIN MEDIA TELECOMS (EXG) (DUCT)
- DUCTS (EXG)
- LEVEL 3, GLOBAL CROSSING (UK) LTD, GLOBAL CROSSING PEC and FIBERNET UK LTD (EXG)
- VERIZONE (EXG)
- ZAYO (EXG)

Cronk Hill
LOW GROMOHILL LANE (TRACK)
Path (um)
Pools Bridge
Track
The Goodwin Yard
Conveyors
L Twr
Tanks
WD
Pond
Path (um)
Barnsley Canal (Disused)
Recreation Ground
Allotment Gardens
SHAW LANE BRIDGE (NETWORK RAIL REFERENCE TJC-188A) LOW BRIDGE 4.8m 16'-0" PRIORITY WEST -->
Shaw Viaduct
POLE MOUNTED TRANSFORMER
BUS STOP
POLE MOUNTED TRANSFORMER
Pumping Station
SEWAGE WORKS
Sewage Works
ENTRANCE CARLTON COLLIERY RESTORATION
TRANS PENNINE TRAIL

REV	DESCRIPTION	BY	CHK	APP	DATE
P1	ISSUED FOR INFORMATION	OC	APF	APP	??/??/19

network space

QUAY WEST at MediaCity UK
TRAFFORD WHARF ROAD
TRAFFORD PARK
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TEL: +44 (0)161 872 3223
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Project: A112913

SHAW LANE
BARNSLEY

Drawing Title:

CONSTRAINTS PLAN

Scale @ A0	Drawn Date	Checked Date	Approved Date
1:1000	OC 15/11/12	APF ??/??/19	APF ??/??/19

Project No.	Office	Type	Drawing No.	Revision
A112913	81	C	AC-2701	P1

WYG Group Ltd.

FILENAME : P:\CS_PROJECTS_112000\A112913_NETWORK SPACE SHAW LANE\1_DRAWINGS\CURRENT DRAWINGS\INFRASTRUCTURE\A112913_AC-2701_CONSTRAINTS PLAN.DWG | PLOTTED BY : TONY.FOX | PLOTTED DATE : 22 March 2019 10:06:58



NETWORK SPACE | SHAW LANE, CARLTON

Indicative Masterplan

network space

spawforths

CLIENT: Network Space
SCALE: not to scale
DATE: 03 January 2023
REVISION: A - Issue for comment
FILE NAME: P0-MP-SPA-P3921-5IL-1000-0002
PSD: PR-MASTERPLAN.PSD



N

KEY

NETWORK SPACE 7.571Ha

Red Line Boundary

When printing feed this edge first

0m 10 20 30 40 50 60 70 80 90 100

1:1000

Revision | A Drawn | EH Reviewed | DK Date | July 2021

planners | urbanists | architects

spawforths

Junction 41 Business Court, Thorpe Road, East Ardsley, Leeds, West Yorkshire, WF3 2AB
T: 01924 873873 www.spawforths.co.uk mail@spawforths.co.uk

ISSUED

Client Name
Network Space

Project Title
Shaw Lane

Drawing Title
Red Line Boundary

Drawn By	Reviewed By	Scale @ A1	Date
EH	DK	1:1000	July 2021

Drawing No.

PROJECT NO.	COMPANY	ZONE	LEVEL	TYPE	ROLE	NUMBER	Revision
P3921	SPA	XX	ZZ	M2	A	10 001	A

File Path P3921-DG-LIVE-CURRENT-10-001

Important notice:
Do not scale off this drawing. Critical dimensions should be checked on site prior to works commencing. Dimensional conflicts should be brought to the company's attention as soon as they become apparent. Failure to do so could render the contractor liable for subsequent losses. Copyright in this drawing and any work executed from this drawing remains the property of Spawforths.

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APPENDIX B
Desk Study Information

GeoReports

British Geological Survey

Nicole Haslam
Sirius Group
Russell House
Littleburn Industrial Estate
Langley Moor
Durham
DH7 8HJ

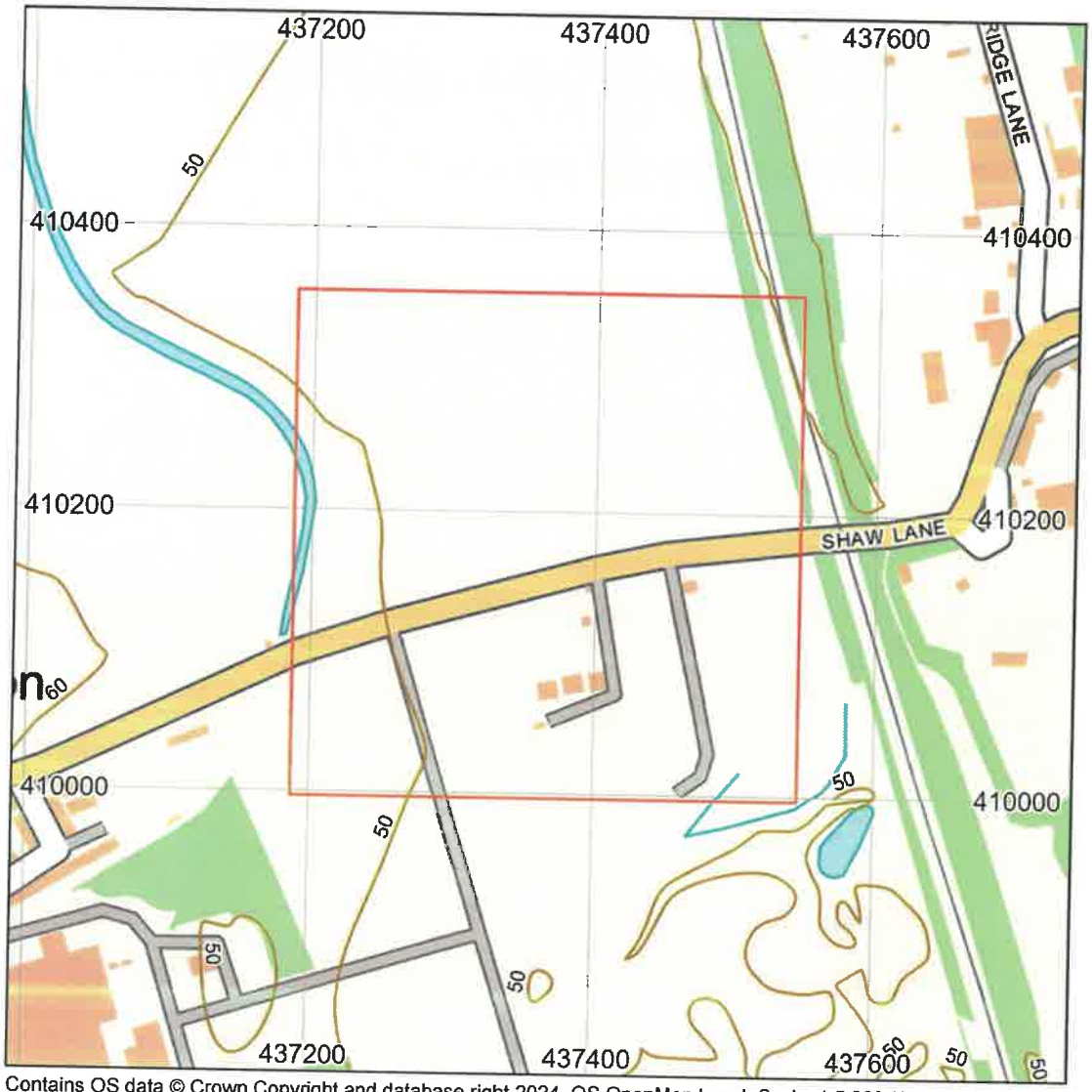
Radon Report

Advisory report on the requirement for radon protective measures in new buildings, conversions and extensions to existing buildings. The report also indicates whether a site is located within a radon Affected Area

Report Id: *BGS_340356/57034*

Client reference: 24904.C10271.AC

Search location



Contains OS data © Crown Copyright and database right 2024. OS OpenMap Local: Scale: 1:5 000 (1cm = 50 m)
Search location indicated in red

This report describes a site located at National Grid Reference 437366, 410176. Note that for sites of irregular shape, this point may lie outside the site boundary. Where the client has submitted a site plan the assessment will be based on the area given.

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Radon Report: UK

When extensions are made to existing buildings in high radon areas, or new buildings are constructed in these areas, the Building Regulations for England, Wales, Scotland and Northern Ireland require that protective measures are taken against radon entering the building.

This report provides information on whether radon protective measures are required. Depending on the probability of buildings having high radon levels, the Regulations may require either:

1. No protective measures
2. Basic protective measures
3. Full protective measures

This is an advisory report on the requirement for radon protective measures in new buildings, conversions and extensions. The report also indicates whether a site is located within a radon Affected Area

Requirement for radon protective measures

The determination below follows advice in *BR211 Radon: Guidance on protective measures for new buildings (2023 edition), which also provides guidance on what to do if the* result *indicates that protective measures are required.*

Is the property in an area where radon protective measures are required for new buildings or extensions to existing ones as described in publication BR211 (2023 edition) Radon: Guidance on protective measures for new buildings?

NO RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

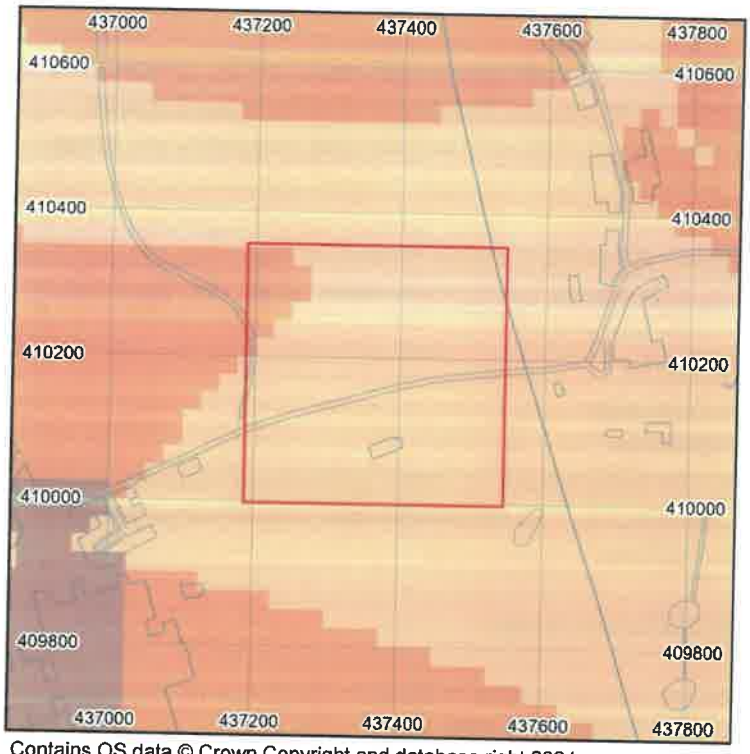
More details of the protective measures required are available in *BR211 Radon: Guidance on protective measures for new buildings (2023 Edition)*.

Whether or not the radon level in a building is above or below the radon Action Level can only be established by having the building tested. The UKHSA provides a radon testing service which can be accessed at www.ukradon.org or by telephone (01235 822622).

If you require further information or guidance, you should contact your local authority building control officer or approved inspector.

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Radon Affected Area



% Homes estimated to be at or above the action level
0-1%
1-3%
3-5%
5-10%
10-30%
30-100%

Contains OS data © Crown Copyright and database right 2024
Scale: 1:10 000 (1cm = 100 m)
Search area indicated in red

Is the property in a radon Affected Area as defined by the UK Health Security Agency (UKHSA) and if so what percentage of homes are estimated to be at or above the Action Level? YES

Additional Information

THE PROPERTY IS IN A RADON AFFECTED AREAS WHERE 1 TO 3% OF HOMES ARE ESTIMATED TO BE AT OR ABOVE THE ACTION LEVEL.

The UKHSA recommends a radon 'Action Level' of 200 Becquerels per cubic metre of air (Bq m^{-3}) for the annual average of the radon gas concentration in a home. Where 1% or more of homes are estimated to be at or above the Action Level the area should be regarded as a radon Affected Area.

This report informs you whether the property is in a radon Affected Area and the percentage of homes that are estimated to be at or above the radon Action Level at this location. Being in an Affected Area does not necessarily mean there is a high radon level within the property; the only way to determine the radon level is to carry out a radon measurement.

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The UKHSA advises that radon gas should be measured in all properties within radon Affected Areas and that homes with radon levels at or above the Action Level (200 Bq m^{-3}) should be remediated. Householders with levels between the Target Level (100 Bq m^{-3}) and Action Level should seriously consider reducing their radon level, especially if they are at greater risk, such as if they are current or ex smokers. Whether or not a home is in fact above or below the Action Level or Target Level can only be established by having the building tested. The UKHSA provides a validated radon testing service which can be accessed at www.ukradon.org.

The information in this report provides an answer to one of the standard legal enquiries on house purchase in England and Wales, known as Law Society CON29 Enquiries of the Local Authority (2016); 3.14 Radon Gas: Do records indicate that the property is in a "Radon Affected Area" as identified by the UKHSA. The data can also be used to advise house buyers and sellers in Scotland and Northern Ireland.

If you are buying a new build property in a Radon Affected Area, you should ask the builder whether radon protective measures were incorporated in the construction of the property.

If you are buying a currently occupied property in a radon Affected Area, you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were at or above the radon Action Level and if so, whether remedial measures were installed, radon levels were re-tested, and if the results of re-testing confirmed the effectiveness of the measures.

Further information on radon is available from the UKHSA at www.ukradon.org.

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What is radon?

Radon is a naturally occurring radioactive gas, which is produced by the radioactive decay of radium which, in turn, is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks, although the amount varies from place to place. Radon released from rocks and soils is quickly diluted in the atmosphere. Concentrations in the open air are normally very low and do not present a hazard. Radon that enters enclosed spaces such as some buildings (particularly basements), caves, mines, and tunnels may reach high concentrations in some circumstances. The construction method and degree of ventilation will influence radon levels in individual buildings. A person's exposure to radon will also vary according to how particular buildings and spaces are used.

Inhalation of the radioactive decay products of radon gas increases the chance of developing lung cancer. If individuals are exposed to high concentrations for significant periods of time, there may be cause for concern. In order to limit the risk to individuals, the Government has adopted an Action Level for radon in homes of 200 becquerels per cubic metre (Bq m^{-3}). The Government advises householders that, where the radon level is at or above the Action Level, measures should be taken to reduce the concentration.

Radon in workplaces

The Ionising Radiation Regulations 2017 require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293)**: Radon in the workplace.** BRE publications may be obtained from the BRE Bookshop, Tel: 01923 664262, email: bookshop@bre.co.uk website: www.brebookshop.com

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Contact Details

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- Although samples and records are maintained with all reasonable care, there may be some deterioration in the long term.
- The most appropriate techniques for copying original records are used, but there may be some loss of detail and dimensional distortion when such records are copied.
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Ordnance Survey

Report issued by
BGS Enquiry Service

APPENDIX C
Risk Assessment Methodology

Qualitative Risk Assessment Methodology

The approach adopted by Sirius for the qualitative assessment of risk is based upon that given in Annex 4 of NHBC-Environment Agency-CIEH "Guidance for the Safe Development of Housing on Land Affected by Contamination" (2008) and is consistent with other current guidance.

The risk posed by viable contaminant linkages is based upon the consideration of both:

a) the magnitude of the potential consequence (i.e. its severity); and,

b) the probability (likelihood) of that consequence being realised.

The classifications used in this report for consequence and probability are given in Tables 1 and 2, respectively. The derived risk classifications are defined in Table 3.

Where there is no viable contaminant linkage there is no potential risk.

Table 1. Classification of Consequence

Classification	Definition
Severe	Contaminant concentrations at the receptor that are likely to result in "significant harm" to human health (as defined in Part 2A of the Environmental Protection Act 1990). Major pollution of controlled waters that could have persistent and/or extensive effects on water quality, for example fish kills, closure of an abstraction, or substantial deterioration in quality of the receiving water body. Major impact on receptor amenity value or major damage to agriculture or commerce. Major damage to an ecosystem that is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.
Medium	Elevated concentrations at the receptor that might result in "significant harm" to human health (as defined in Part 2A of the Environmental Protection Act 1990). A pollution incident that has significant effect on water quality or abstraction potential. An incident that has a marked effect on receptor amenity value, agriculture or commerce. Damage to an ecosystem that may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.

Classification	Definition
Mild	Potential human health impact at the receptor point but unlikely to be classified as "significant harm" (as defined in Part 2A of the Environmental Protection Act 1990). Pollution of water that will have a small or short-lived effect on water quality and marginal effects on its amenity or resource value or its use in agriculture or commerce. Minor or short-lived damage to ecosystems, which is unlikely to result in a substantial adverse change Minor damage to crops, buildings or property
Minor	No potential measurable detrimental human health impacts at the receptor point. Impact on water that will have no or minimal effect on water quality or use. No or minor and easily repairable effects on buildings, structures and services.

Table 2. Classification of Probability

Classification	Definition
High	An impact is already occurring or is very likely in the short-term and almost inevitable over the long-term.
Medium	It is probable that an event would occur. This is not inevitable but possible in the short-term and likely over the long-term.
Low	Circumstances are possible under which an event could occur. However, it is by no means certain that an event will take place, even over the long-term.
Unlikely	Circumstances are such that it is improbable that an event would occur even over the very long-term.

Table 3. Risk Classification

	Consequence			
Probability	***Severe***	***Medium***	***Mild***	***Minor***
High	Very High	High	Moderate	Low
Medium	High	Moderate	Low to Moderate	Low
Low	Moderate	Low to Moderate	Low	Very Low
Unlikely	Low to Moderate	Low	Very Low	Negligible

Table 4 provides a context for interpretation of the risk classification categories. The definitions provided are based on those given in CIRIA (2001) "Contaminated Land Risk Assessment. A Guide to Good Practice", Report C552.

Table 4. Interpretation of Risk Classification Categories

Risk Classification	Definition
Very High	There is a high probability that severe harm to one or more identified receptors could occur or there is evidence that this is already happening. This risk is likely to result in a substantial liability. Urgent investigation and remediation are likely to be required.
High	Harm is likely to be caused to one or more identified receptors. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required and remedial works may be necessary in the short-term and are likely over the longer term.
Moderate	It is possible that harm could be caused to one or more identified receptors. However, it is relatively unlikely that such harm would be severe. Investigation is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low	It is possible that harm could be caused to one or more identified receptors but it is likely that this harm, if realised, would normally be mild. No further investigation is considered necessary to assess risk or environmental liability but investigations could be undertaken if desired to confirm 'baseline' conditions for the purposes of liability management. Remedial works are unlikely to be required.
Very Low	There is a low probability that harm could be caused to one or more identified receptors. In the event of such harm being realised, it is likely to be mild, at worst. No further investigation is considered necessary to assess risk or environmental liability but investigations could be undertaken if desired to confirm 'baseline' conditions for the purposes of liability management. Remedial works are very unlikely to be required.
Negligible	It is unlikely that harm could be caused to one or more identified receptors. In the event of harm being realised, it is likely to be minor. No further investigation is considered necessary to assess risk or environmental liability. Remedial works are not expected.

APPENDIX D
Fieldwork Information

TRIAL PIT RECORD

TP No. **HDP101**
Sheet 1 of 1

Site: Shaw Lane, Carlton
Contract No: C10271
Client: Network Space
Date: 22/11/2024
Method: Hand Digging Tools
Scale: 1:25
Logged By: CP
Checked By: GH

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
				TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY with rare rootlets. Gravel is angular to subrounded fine to coarse of sandstone, quartzite, brick and ceramic.	0.30	43.89		
				Firm light orangish brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	0.45	43.74		
				End of trial pit at 0.45m				

1
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Remarks and Groundwater Observations

1. Pit excavated with hand digging tools. 2. Pit remained stable during excavation. 3. Pit remained dry during excavation. 4. Pit completed upon encountering natural strata. 5. Backfilled with arisings on completion. 6. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 44.19
Easting: 437432.68
Northing: 410203.98

Fig No.
HDP101

TRIAL PIT RECORD

TP No. **HDP102**
Sheet 1 of 1

Site: Shaw Lane, Carlton	Contract No: C10271
Client: Network Space	Date: 22/11/2024
Method: Hand Digging Tools	Scale: 1:25
	Logged By: CP — Checked By: GH

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
				TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY with rare rootlets. Gravel is angular to subrounded fine to coarse of sandstone, quartzite, brick and ceramic.				
				POSSIBLE MADE GROUND: Friable light greyish brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of sandstone, mudstone and quartzite.	0.30	45.07		
				End of trial pit at 0.55m	0.55	44.82		

1
2
3
4
5

Remarks and Groundwater Observations

1. Pit excavated with hand digging tools. 2. Pit remained stable during excavation. 3. Pit remained dry during excavation. 4. Pit completed upon encountering natural strata. 5. Backfilled with arisings on completion. 6. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 45.37
Easting: 437413.06
Northing: 410280.52

Fig No.
HDP102

TRIAL PIT RECORD

TP No. **HDP103**
Sheet 1 of 1

Site: Shaw Lane, Carlton
Contract No: C10271
Client: Network Space
Date: 22/11/2024
Method: Hand Digging Tools
Scale: 1:25
Logged By: CP
Checked By: GH

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
				TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY with rare rootlets. Gravel is angular to subrounded fine to coarse of sandstone, quartzite, brick and ceramic.				
				Firm light brownish grey mottled orange slightly sandy slightly gravelly CLAY with a low cobble content of subrounded quartzite.. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	0.35 0.60	45.55 45.30		
				End of trial pit at 0.60m				

1
2
3
4
5

Remarks and Groundwater Observations

1. Pit excavated with hand digging tools. 2. Pit remained stable during excavation. 3. Pit remained dry during excavation. 4. Pit completed upon encountering natural strata. 5. Backfilled with arisings on completion. 6. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 45.90
Easting: 437400.32
Northing: 410327.83

Fig No.
HDP103

TRIAL PIT RECORD

TP No. **SA101**
Sheet 1 of 1

Site: Shaw Lane, Carlton
Contract No: C10271
Client: Network Space
Date: 30/10/2024
Method: 13 Tonne 360 Excavator with 600mm toothed bucket.
Scale: 1:25
Logged By: CP
Checked By: GH

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
				TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.25	42.83		
		56.0 58.0 69.0		Firm medium strength light orangish brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	1.90 2.00	41.18 41.08		
				End of trial pit at 2.00m				

1
2
3
4
5

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Pit remained dry during excavation. 3. Installed with slotted pipe and backfilled with gravel on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 43.08
Easting: 437511.98
Northing: 410207.07

Fig No.
SA101

TRIAL PIT RECORD

TP No. **SA102**
Sheet 1 of 1

Site: Shaw Lane, Carlton
Contract No: C10271
Client: Network Space
Date: 30/10/2024
Method: 13 Tonne 360 Excavator with 600mm toothed bucket.
Scale: 1:25
Logged By: CP
Checked By: GH

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
				TOPSOIL: Friable dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.				
				MADE GROUND: Friable light brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, brick and ceramic.	0.30	45.59		
		48.0 66.0 77.0	1	Firm medium strength light grey mottled dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	1.00	44.89		
			2	End of trial pit at 2.00m	2.00	43.89		
			3					
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Slow inflow of groundwater below 1.00m bgl. 3. Installed with slotted pipe and backfilled with gravel on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 45.89
Easting: 437360.98
Northing: 410197.92

Fig No. SA102

TRIAL PIT RECORD

TP No. **SA103**
Sheet 1 of 1

Site: Shaw Lane, Carlton
Contract No: C10271
Client: Network Space
Date: 30/10/2024
Method: 13 Tonne 360 Excavator with 600mm toothed bucket.
Scale: 1:25
Logged By: CP
Checked By: GH

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
				TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.				
		41.0 52.0 56.0		Firm medium strength dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	0.35	45.85		
		67.0 74.0 75.0		Firm medium strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	1.20	45.00		
				End of trial pit at 2.10m	2.10	44.10		

1
2
3
4
5

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Pit remained dry during excavation. 3. Installed with slotted pipe and backfilled with gravel on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.20
Easting: 437219.46
Northing: 410374.86

Fig No.
SA103

TRIAL PIT RECORD

TP No. **TP101** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 28/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Friable dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.	0.25	46.24		
ES	0.50			MADE GROUND: Friable dark grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic with rare wood.	0.90	45.59		
D	1.00	39.0 40.0 46.0	1	POSSIBLE MADE GROUND: Firm low to medium strength light grey slightly sandy CLAY. Sand is fine to medium with a weak organic odour. High plasticity (field description).	1.20	45.29		
D	1.40	61.0 70.0 79.0	2	Firm medium to high strength light brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	2.10	44.39		
D	2.20	52.0 61.0 67.0	3	Firm medium strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	3.40	43.09		
				Extremely weak MUDSTONE. Recovered as dark grey slightly clayey angular to subangular fine to coarse GRAVEL of mudstone.	3.70	42.79		
			4	End of trial pit at 3.70m				
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Pit remained dry during excavation. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.49

Easting: 437333.58

Northing: 410259.02

Fig No. TP101

TRIAL PIT RECORD

TP No. **TP102** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 28/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
				TOPSOIL: Friable dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.				
				MADE GROUND: Friable dark brown mottled grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.	0.30	45.88		
ES	0.50							
			1					
				Soft to firm low to medium strength dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	1.20	44.98		
		34.0						
ES	1.40	34.0						
		47.0						
				Firm medium strength light brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. Intermediate plasticity (laboratory description).	1.60	44.58		
		59.0						
D	1.80	60.0						
D	1.80	66.0						
			2					
			3					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	3.00	43.18		
				End of trial pit at 3.20m	3.20	42.98		
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Slow inflow of groundwater below 2.10m bgl. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.18

Easting: 437336.62

Northing: 410309.71

Fig No. TP102

TRIAL PIT RECORD

TP No. **TP103** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 28/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Friable dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.				
				MADE GROUND: Friable dark brown mottled grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.	0.30	46.09		
			1					
D	1.20	31.0 32.0 36.0 59.0 67.0 74.0		Soft to firm low strength dark grey mottled brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	1.10	45.29		
				Firm medium strength light brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	1.30	45.09		
		58.0 71.0 72.0	2	Firm medium strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	1.90	44.49		
			3					
				Extremely weak MUDSTONE. Recovered as dark grey mottled black angular to subangular fine to coarse GRAVEL of mudstone and rare coal.	3.20	43.19		
				End of trial pit at 3.70m	3.70	42.69		
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Slow inflow of groundwater below 3.60m bgl. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.39

Easting: 437310.09

Northing: 410311.39

Fig No. TP103

TRIAL PIT RECORD

TP No. **TP104** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 28/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Friable dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.	0.30	46.64		
B	0.50 - 1.00			MADE GROUND: Friable dark grey slightly sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete and brick.				
B	0.50 - 1.00							
			1					
		51.0 56.0 58.0		Firm medium strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	1.20	45.74		
D	1.90	69.0 74.0 74.0	2	Firm medium strength light orangish brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	1.70	45.24		
			3					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	3.10	43.84		
				End of trial pit at 3.50m	3.50	43.44		
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Slow inflow of groundwater below 3.40m bgl. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.94

Easting: 437291.63

Northing: 410288.24

Fig No. TP104

TRIAL PIT RECORD

TP No. **TP105** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 28/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket. | Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
				TOPSOIL: Friable dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.				
				MADE GROUND: Friable dark greyish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete and brick.	0.30	47.03		
ES	0.50							
				Firm medium strength light grey mottled orange slightly sandy slightly gravelly CLAY with rare rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	0.80	46.53		
		49.0 50.0 55.0	1					
				Below 1.30m bgl, sandy and gravelly. Low plasticity (laboratory description).				
D	1.40							
D	1.40							
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	1.60	45.73		
			2					
				End of trial pit at 2.60m	2.60	44.73		
			3					
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Medium inflow of groundwater below 2.50m bgl. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 47.33

Easting: 437227.51

Northing: 410311.20

Fig No. TP105

TRIAL PIT RECORD

TP No. **TP106** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 28/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket. | Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Friable dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.	0.30	46.55		
B	0.50 - 1.00			MADE GROUND: Friable dark brown sandy gravelly CLAY with a low cobble and boulder content of angular to subangular concrete and brick. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic with rare plastic.				
B	0.50 - 1.00							
			1					
		50.0 61.0 67.0		POSSIBLE MADE GROUND: Firm medium strength light brownish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	1.40	45.45		
				Between 1.80 to 1.90m bgl, band of soft to firm dark grey slightly sandy clay with many rootlets.				
D	1.90				1.90	44.95		
		47.0 48.0 50.0	2	Firm medium strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
			3					
D	3.80							
				End of trial pit at 3.90m	3.90	42.95		
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Slow inflow of groundwater below 2.80m bgl. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.85

Easting: 437244.33

Northing: 410344.23

Fig No. TP106

TRIAL PIT RECORD

TP No. **TP107** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 28/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Friable dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite and brick with rare glass.				
					0.30	46.26		
D	0.50			Firm light grey mottled orange slightly sandy CLAY. Sand is fine to coarse. High plasticity (field description).				
					0.60	45.96		
		100.0 72.0 81.0		Firm medium to high strength light orangish brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
			1					
					1.80	44.76		
			2	Extremely weak MUDSTONE. Recovered as dark grey slightly sandy angular to subangular fine to coarse GRAVEL of mudstone. Sand is fine to medium.				
					2.40	44.16		
				Extremely weak SANDSTONE. Recovered as light orangish brown slightly sandy angular to subangular fine to coarse GRAVEL of sandstone. Sand is fine to medium.				
					2.80	43.76		
				End of trial pit at 2.80m				
			3					
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Pit remained dry during excavation. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.56

Easting: 437186.72

Northing: 410338.83

Fig No. TP107

TRIAL PIT RECORD

TP No. **TP108** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 29/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
				TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.				
ES	0.50	51.0 55.0 56.0		Firm medium strength light greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	0.40	45.74		
D	1.50		1	Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	1.80	44.34		
			2	End of trial pit at 2.60m	2.60	43.54		
			3					
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Pit remained dry during excavation. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.14

Easting: 437261.59

Northing: 410403.13

Fig No. TP108

TRIAL PIT RECORD

TP No. **TP109** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 29/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.30	46.27		
D	0.50	51.0 71.0 72.0		Firm medium strength light greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
			1					
			2	Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	1.90	44.67		
				End of trial pit at 2.40m	2.40	44.17		
			3					
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Pit remained dry during excavation. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.57

Easting: 437325.81

Northing: 410434.90

Fig No. TP109

TRIAL PIT RECORD

TP No. **TP110** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 29/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.				
					0.30	47.08		
		51.0 56.0 58.0		Firm medium strength light greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. Low plasticity (laboratory description).				
D D	1.00 1.00		1					
				Below 1.40m bgl, friable.				
					1.60	45.78		
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.				
			2					
				End of trial pit at 2.40m	2.40	44.98		
			3					
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Pit remained dry during excavation. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 47.38

Easting: 437373.80

Northing: 410453.44

Fig No. TP110

TRIAL PIT RECORD

TP No. **TP111** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 29/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Friable dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic with rare plastic.				
B D	0.40 - 0.90 0.40 - 0.90			MADE GROUND: Dark brown mottled orange gravelly slightly clayey fine to coarse SAND with a low cobble content of angular to subangular sandstone. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic with rare plastic.	0.30	45.50		
				At 0.50m bgl, angular concrete boulder (up to 1100 x 700mm diameter).				
			1	*Between 1.00 to 1.10m bgl, band of soft dark brown slightly sandy clay with many rootlets.*				
D	1.20	29.0 36.0 37.0		Soft to firm low strength light grey sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	1.10	44.70		
			2					
				Extremely weak SANDSTONE. Recovered as light orangish brown angular to subangular fine to coarse GRAVEL of sandstone.	2.20	43.60		
				End of trial pit at 2.90m	2.90	42.90		
			3					
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Slow inflow of groundwater below 2.00m bgl. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 45.80

Easting: 437390.34

Northing: 410372.53

Fig No. TP111

TRIAL PIT RECORD

TP No. **TP112** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 29/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
				TOPSOIL: Friable dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.30	45.90		
ES	0.50			MADE GROUND: Friable dark brown slightly sandy gravelly CLAY with a low cobble content of angular to subangular concrete and brick and a low boulder content of angular concrete (up to 350 x 200mm diameter). Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic with rare wood.				
			1					
					1.20	45.00		
		60.0 64.0 66.0		POSSIBLE MADE GROUND: Firm medium strength light greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
D	1.75			*Between 1.70 to 1.85m bgl, band of soft dark grey slightly sandy clay with many rootlets.*				
					1.85	44.35		
		51.0 57.0 66.0	2	Firm medium strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
			3					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	3.50	42.70		
				End of trial pit at 3.90m	3.90	42.30		
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Slow inflow of groundwater below 1.20m bgl. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.20

Easting: 437341.82

Northing: 410380.57

Fig No. TP112

TRIAL PIT RECORD

TP No. **TP113** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 29/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket. | Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Friable dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic with rare plastic.	0.30	46.02		
				MADE GROUND: Friable dark brown slightly sandy gravelly CLAY with a low cobble content of angular to subangular concrete and brick and a low boulder content of angular concrete (up to 350 x 200mm diameter). Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic with rare wood.				
			1					
				Between 1.30 to 1.50m bgl, band of soft dark grey slightly sandy CLAY with many rootlets.				
D	1.60	67.0 67.0 70.0		Firm medium strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	1.50	44.82		
			2					
			3					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	3.60	42.72		
				End of trial pit at 3.90m	3.90	42.42		
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Medium to fast inflow of groundwater below 1.40m bgl. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment. .

GL (m AOD) 46.32

Easting: 437302.40

Northing: 410383.42

Fig No. TP113

TRIAL PIT RECORD

TP No. **TP114** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 29/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.30	47.21		
D	0.50	48.0 60.0 64.0		Firm medium strength light greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	0.90	46.61		
		54.0 59.0 72.0	1	Firm medium strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
				Below 1.50m bgl, rare gravel of coal.				
			2					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	2.20	45.31		
			3	End of trial pit at 3.00m	3.00	44.51		
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Pit remained dry during excavation. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 47.51

Easting: 437445.49

Northing: 410487.14

Fig No. TP114

TRIAL PIT RECORD

TP No. **TP115** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 29/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.30	46.13		
B	0.50 - 1.00			Firm high strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (laboratory description).				
B	0.50 - 1.00							
		78.0	1					
		82.0						
		96.0						
D	1.50							
D	1.50							
			2					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	2.20	44.23		
				End of trial pit at 2.80m	2.80	43.63		
			3					
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Slow inflow of groundwater below 2.70m bgl. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.43

Easting: 437459.83

Northing: 410428.25

Fig No. TP115

TRIAL PIT RECORD

TP No. **TP116** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 29/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
				TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.				
ES	0.50			Firm medium strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	0.40	45.89		
		64.0 69.0 79.0	1					
			2					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	2.30	43.99		
			3					
				End of trial pit at 3.20m	3.20	43.09		
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Pit remained dry during excavation. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.29

Easting: 437455.55

Northing: 410397.12

Fig No. TP116

TRIAL PIT RECORD

TP No. **TP117** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 30/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket. | Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.25	45.19		
D	0.50	48.0		Firm to stiff medium strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. Intermediate plasticity (laboratory description).				
D	0.50	48.0						
		51.0						
			1	*Below 1.10m bgl, friable.*				
			2	Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	2.10	43.34		
			3	End of trial pit at 3.20m	3.20	42.24		
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Pit remained dry during excavation. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 45.44

Easting: 437470.61

Northing: 410327.33

Fig No. TP117

TRIAL PIT RECORD

TP No. **TP118** Sheet 1 of 1

Site: Shaw Lane, Carlton

Contract No: C10271

Client: Network Space

Date: 30/10/2024

Method: 13 Tonne 360 Excavator with 600mm toothed bucket.

Scale: 1:25

Logged By: CP | Checked By: GH

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	Vane Results (kN/m2) {}{ppm}	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Backfill
ES	0.20			TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.25	44.16		
B	0.50 - 1.00	45.0		Firm medium strength light orangish brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
B	0.50 - 1.00	68.0 69.0						
			1					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	1.70	42.71		
			2					
				End of trial pit at 2.50m	2.50	41.91		
			3					
			4					
			5					

Remarks and Groundwater Observations

1. Pit remained stable during excavation. 2. Pit remained dry during excavation. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 44.41

Easting: 437485.24

Northing: 410263.98

Fig No. TP118

WINDOW SAMPLING RECORD

BH No. **WS101** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 31/10/2024

Method: Tracked Windowless Sampler Rig | Scale: 1:25

Logged By: CP | Checked By: GH

Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
ES	0.20			TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.				
					0.30	46.51		
D	0.50	48.0 49.0 62.0		Firm medium strength light orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
		N=6 (1,2/1,2,1,2)	1					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	1.70	45.11		
		N=50 (7,8/13,13,14,10)	2	End of Borehole at 2.00m	2.00	44.81		
			3					
			4					
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 2.00m bgl. 2. No groundwater encountered. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.81m AOD

Easting: 437447.16

Northing: 410443.26

Fig No. WS101

WINDOW SAMPLING RECORD

BH No. **WS102**
Sheet 1 of 1

Site: Shaw Lane, Carlton
Contract No: C10271
Client: Network Space
Date: 31/10/2024
Method: Tracked Windowless Sampler Rig
Scale: 1:25
Logged By: CP
Checked By: GH
Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
ES	0.20	60.0 60.0 71.0		TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic with rare glass.	0.25	45.39		
D	1.00	N=12 (3,2/3,3,3,3)	1	Firm medium strength light orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
		50 (8,10/50 for 210mm)	2	Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	1.90 2.00	43.74 43.64		
				End of Borehole at 2.00m				
			3					
			4					
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 2.00m bgl. 2. No groundwater encountered. 3. 50mm gas / groundwater monitoring well installed. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD)
45.64m AOD
Easting:
437479.67
Northing:
410341.02

Fig No.
WS102

WINDOW SAMPLING RECORD

BH No. **WS103** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 31/10/2024

Method: Tracked Windowless Sampler Rig | Scale: 1:25

Logged By: CP | Checked By: GH

Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.				
					0.30	44.05		
ES	0.50			Firm to stiff medium strength light orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. Intermediate plasticity (laboratory description).				
ES	0.50							
		49.0						
		61.0						
		71.0	1					
		N=14						
		(3,3/3,3,4,4)						
					1.70	42.65		
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.				
		50 (9,10/50 for 210mm)	2		2.00	42.35		
				End of Borehole at 2.00m				
			3					
			4					
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 2.00m bgl. 2. No groundwater encountered. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 44.35m AOD

Easting: 437494.25

Northing: 410268.48

Fig No. WS103

WINDOW SAMPLING RECORD

BH No. **WS104**
Sheet 1 of 1

Site: Shaw Lane, Carlton
Contract No: C10271
Client: Network Space
Date: 31/10/2024
Method: Tracked Windowless Sampler Rig
Scale: 1:25
Logged By: CP
Checked By: GH
Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
ES	0.20			TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.				
				Firm medium strength light orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	0.30	42.90		
		56.0 60.0 61.0						
D	0.90							
		N=14 (3,3/3,3,4,4)	1					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	1.80	41.40		
		N=50 (7,9/50 for 230mm)	2	End of Borehole at 2.00m	2.00	41.20		
			3					
			4					
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 2.00m bgl. 2. No groundwater encountered. 3. 50mm gas / groundwater monitoring well installed. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD)
43.20m AOD
Easting:
437505.08
Northing:
410204.12

Fig No.
WS104

WINDOW SAMPLING RECORD

BH No. **WS105**
Sheet 1 of 1

Site: Shaw Lane, Carlton
Contract No: C10271
Client: Network Space
Date: 31/10/2024
Method: Tracked Windowless Sampler Rig
Scale: 1:25
Logged By: CP
Checked By: GH
Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.				
				MADE GROUND: Friable dark brown mottled grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.30	45.37		
ES	0.50							
				Firm to stiff medium to high strength light orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (laboratory description).	0.80	44.87		
		N=8 (1,1/2,2,2,2)	1					
D	1.50	69.0 70.0						
D	1.50	81.0						
		N=24 (4,3/5,6,6,7)	2	*Below 2.00m bgl, friable.*				
				Very weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	2.30	43.37		
		50 (25 for 115mm/50 for 125mm)	3	End of Borehole at 3.00m	3.00	42.67		
			4					
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 3.00m bgl. 2. No groundwater encountered. 3. 50mm gas / groundwater monitoring well installed. 4. Co-ordinates and elevations surveyed in using GPS survey equipment. .

GL (m AOD) 45.67m AOD
Easting: 437365.24
Northing: 410219.78

Fig No. WS105

WINDOW SAMPLING RECORD

BH No. **WS106** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 31/10/2024

Method: Tracked Windowless Sampler Rig | Scale: 1:25

Logged By: CP | Checked By: GH

Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.				
					0.30	45.79		
ES	0.50			MADE GROUND: Friable dark brown mottled grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.				
		N=7 (3,1/1,2,2,2)	1	POSSIBLE MADE GROUND: Soft to firm dark grey slightly sandy CLAY with many rootlets. Sand is fine to medium. High plasticity (field description).	1.00	45.09		
					1.30	44.79		
D	1.50	46.0 50.0 52.0		Firm medium strength dark grey mottled light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
		N=26 (2,2/3,5,9,9)	2	Extremely weak weathered COAL. Recovered as dark black slightly clayey angular to subangular GRAVEL of coal.	2.00	44.09		
					2.70	43.39		
				Very weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.				
		50 (25 for 70mm/50 for 40mm)	3	End of Borehole at 3.00m	3.00	43.09		
			4					
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 3.00m bgl. 2. Groundwater encountered at 1.60m bgl. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.09m AOD

Easting: 437344.67

Northing: 410289.80

Fig No. WS106

WINDOW SAMPLING RECORD

BH No. **WS107** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 31/10/2024

Method: Tracked Windowless Sampler Rig | Scale: 1:25

Logged By: CP | Checked By: GH

Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
ES	0.20			TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.				
ES	0.60			MADE GROUND: Friable dark brown mottled grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.30	46.42		
		N=5 (1,1/1,1,1,2)	1					
				Firm medium strength light grey mottled brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone, quartzite. High plasticity (field description).	1.10	45.62		
D	1.50	54.0 71.0 72.0						
		N=9 (2,1/2,2,2,3)	2					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	2.60	44.12		
		N=50 (2,3/50 for 275mm)	3	End of Borehole at 3.00m	3.00	43.72		
			4					
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 3.00m bgl. 2. No groundwater encountered. 3. 50mm gas / groundwater monitoring well installed. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.72m AOD

Easting: 437304.92

Northing: 410291.28

Fig No. WS107

WINDOW SAMPLING RECORD

BH No. **WS108** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 01/11/2024

Method: Tracked Windowless Sampler Rig | Scale: 1:25

Logged By: CP | Checked By: GH

Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
ES	0.20			TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite and brick.				
		48.0 62.0 62.0		Firm medium strength light orangish brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	0.30	46.68		
D	1.00	N=13 (2,3/3,3,4,3)	1					
		N=15 (3,2/3,4,4,4)	2					
		N=10 (3,2/2,3,2,3)	3					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	3.20	43.78		
		N=50 (5,4/50 for 275mm)	4	End of Borehole at 4.00m	4.00	42.98		
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 4.00m bgl. 2. No groundwater encountered. 3. 50mm gas / groundwater monitoring well installed. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.98m AOD

Easting: 437375.77

Northing: 410438.10

Fig No. WS108

WINDOW SAMPLING RECORD

BH No. **WS109** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 01/11/2024

Method: Tracked Windowless Sampler Rig | Scale: 1:25

Logged By: CP | Checked By: GH

Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.				
				MADE GROUND: Friable dark brown mottled grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.30	45.90		
ES	0.50							
				Firm to stiff medium strength light grey mottled orange slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone, quartzite. Intermediate plasticity (laboratory description).	0.70	45.50		
		N=11 (2,1/2,2,3,4)	1					
		49.0						
		56.0						
D	1.50	71.0						
D	1.50							
		N=19 (2,2/3,4,5,7)	2					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	2.40	43.80		
		N=60 (25 for 125mm/60 for 235mm)	3	End of Borehole at 3.00m	3.00	43.20		
			4					
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 3.00m bgl. 2. No groundwater encountered. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.20m AOD

Easting: 437331.07

Northing: 410392.87

Fig No. WS109

WINDOW SAMPLING RECORD

BH No. **WS110**
Sheet 1 of 1

Site: Shaw Lane, Carlton
Contract No: C10271
Client: Network Space
Date: 01/11/2024
Method: Tracked Windowless Sampler Rig
Scale: 1:25
Logged By: CP
Checked By: GH
Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
ES	0.20			TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, brick and ceramic.	0.30	45.97		
		70.0 71.0 74.0		Firm medium strength light orangish brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
D	0.80							
		N=13 (2,1/2,3,4,4)	1					
		N=50 (8,7/50 for 265mm)	2	Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	1.90 2.00	44.37 44.27		
				End of Borehole at 2.00m				
			3					
			4					
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 2.00m bgl. 2. No groundwater encountered. 3. 50mm gas / groundwater monitoring well installed. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD)
46.27m AOD
Easting:
437285.07
Northing:
410421.68

Fig No.
WS110

WINDOW SAMPLING RECORD

BH No. **WS111** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 01/11/2024

Method: Tracked Windowless Sampler Rig | Scale: 1:25

Logged By: CP | Checked By: GH

Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				TOPSOIL: Friable dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete and brick.				
				MADE GROUND: Friable dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.30	46.32		
ES	0.50							
		N=8 (4,3/2,2,2,2)	1	Soft to firm low to medium strength light orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	0.90	45.72		
		36.0 39.0 46.0						
D D	1.80 1.80			Firm to stiff medium strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. Intermediate plasticity (laboratory description).	1.60	45.02		
		N=10 (2,2/2,2,3,3)	2					
		48.0 54.0 56.0						
		N=35 (4,4/7,8,9,11)	3					
				Very weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	3.10	43.52		
		50 (25 for 50mm/50 for 40mm)		End of Borehole at 3.70m	3.70	42.92		
			4					
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 3.70m bgl. 2. No groundwater encountered. 3. 50mm gas / groundwater monitoring well installed. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.62m AOD

Easting: 437252.32

Northing: 410378.01

Fig No. WS111

WINDOW SAMPLING RECORD

BH No. **WS112** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 01/11/2024

Method: Tracked Windowless Sampler Rig | Scale: 1:25

Logged By: CP | Checked By: GH

Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
ES	0.20			TOPSOIL: Friable dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete and brick.	0.25	45.97		
				MADE GROUND: Friable dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.75	45.47		
D	0.90	48.0 49.0 56.0 N=8 (2,1/2,2,2,2)	1	Firm medium strength light orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
		N=50 (4,4/50 for 245mm)	2	End of Borehole at 2.00m	2.00	44.22		
			3					
			4					
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 2.00m bgl. 2. No groundwater encountered. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.22m AOD

Easting: 437208.57

Northing: 410354.43

Fig No. WS112

WINDOW SAMPLING RECORD

BH No. **WS113** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 01/11/2024

Method: Tracked Windowless Sampler Rig | Scale: 1:25

Logged By: CP | Checked By: GH

Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				TOPSOIL: Friable dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete and brick.	0.25	46.41		
ES	0.40			MADE GROUND: Friable dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.75	45.91		
		49.0 56.0 57.0 N=9 (2,2/3,2,2,2)	1	POSSIBLE MADE GROUND: Firm medium strength light grey mottled brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).				
D	1.90	N=9 (2,1/2,2,2,3)	2	POSSIBLE MADE GROUND: Soft dark grey slightly sandy CLAY with many rootlets and weak organic odour. Sand is fine to medium. High plasticity (field description).	1.80	44.86		
		39.0 51.0 54.0		Firm low to medium strength light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticty (field description).	2.10	44.56		
				Between 2.60m to 2.90m bgl, sandy.				
		N=15 (2,2/2,4,4,5)	3					
				Very weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	3.40	43.26		
		50 (25 for 50mm/50 for 60mm)	4	End of Borehole at 4.00m	4.00	42.66		
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 4.00m bgl. 2. No groundwater encountered. 3. 50mm gas / groundwater monitoring well installed. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.66m AOD

Easting: 437277.64

Northing: 410330.91

Fig No. WS113

WINDOW SAMPLING RECORD

BH No. **WS114** Sheet 1 of 1

Site: Shaw Lane, Carlton | Contract No: C10271

Client: Network Space | Date: 01/11/2024

Method: Tracked Windowless Sampler Rig | Scale: 1:25

Logged By: CP | Checked By: GH

Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
ES	0.20			TOPSOIL: Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, brick and ceramic.				
				MADE GROUND: Friable dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.30	45.82		
		N=8 (2,2/2,1,3,2)	1	Firm to stiff medium strength light grey mottled orange slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. Intermediate plasticity (laboratory description).	0.90	45.22		
		58.0						
		62.0						
		64.0						
D	1.50							
D	1.50							
		N=12 (2,1/3,2,3,4)	2					
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	2.30	43.82		
		N=32 (6,4/7,7,9,9)	3					
		N=50 (14,10/50 for 235mm)	4	End of Borehole at 4.00m	4.00	42.12		
			5					

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 4.00m bgl. 2. No groundwater encountered. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD) 46.12m AOD

Easting: 437329.45

Northing: 410341.93

Fig No. WS114

WINDOW SAMPLING RECORD

BH No. **WS115**
Sheet 1 of 1

Site: Shaw Lane, Carlton
Contract No: C10271
Client: Network Space
Date: 01/11/2024
Method: Tracked Windowless Sampler Rig
Scale: 1:25
Logged By: CP
Checked By: GH
Driller: RP Drilling

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				TOPSOIL: Soft dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.				
				MADE GROUND: Friable dark brown mottled grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone, quartzite, concrete, brick and ceramic.	0.30	45.80		
				Firm light orangish brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and quartzite. High plasticity (field description).	0.85	45.25		
				Below 1.00m bgl, light grey.				
				Extremely weak MUDSTONE. Recovered as light grey angular to subangular fine to coarse GRAVEL of mudstone.	2.20	43.90		
				End of Borehole at 3.00m	3.00	43.10		

1
2
3
4
5

Remarks and Groundwater Observations:

1. Borehole completed upon refusal at 3.00m bgl. 2. No groundwater encountered. 3. Backfilled with arisings on completion. 4. Co-ordinates and elevations surveyed in using GPS survey equipment.

GL (m AOD)
46.10m AOD
Easting:
437348.96
Northing:
410328.66

Fig No.
WS115

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	RP05
Test Date:	16/05/2024
Report Date:	16/05/2024
File Name:	RP05.spt
Test Operator:	JL

Instrumented Rod Data

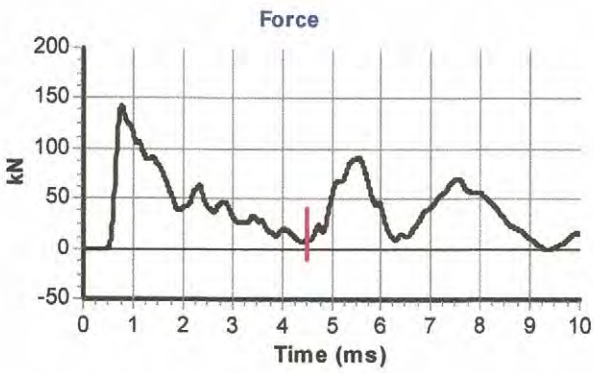
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.4
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	72572
Accelerometer No.2:	72572

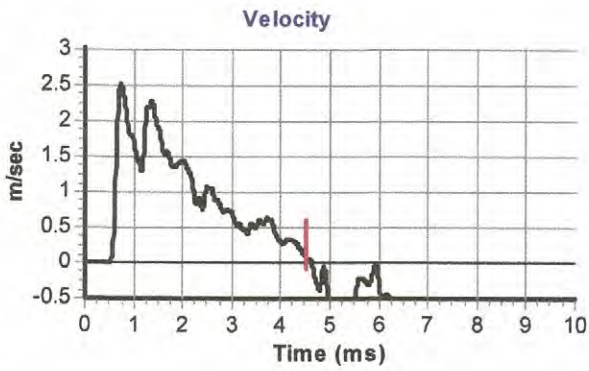
SPT Hammer Information

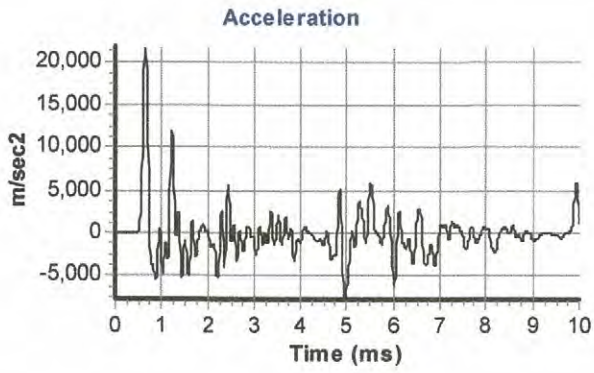
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

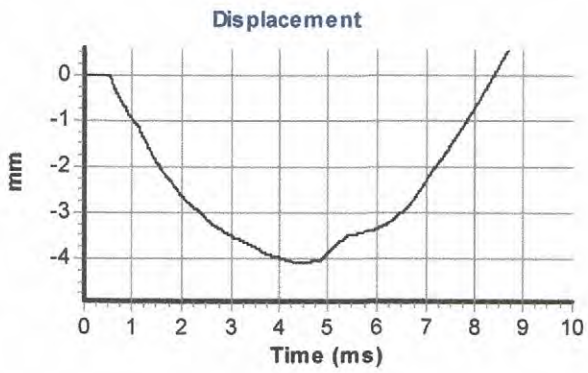
Comments / Location

R P DRILLING - 89430









Calculations

Area of Rod A (mm2):	957
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	311

Energy Ratio E_r (%): **66**

Signed: J.LOCK

Title: FITTER

The recommended calibration interval is 12 months

SPTMAN ver.1.93 All rights reserved, Testconsult ©2010

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007			
Client:	Network Space		
Site:	Shaw Lane, Carlton		
Job No:	C10271	Test No:	SA101 Test 1

CALCULATION OF SOIL INFILTRATION RATE

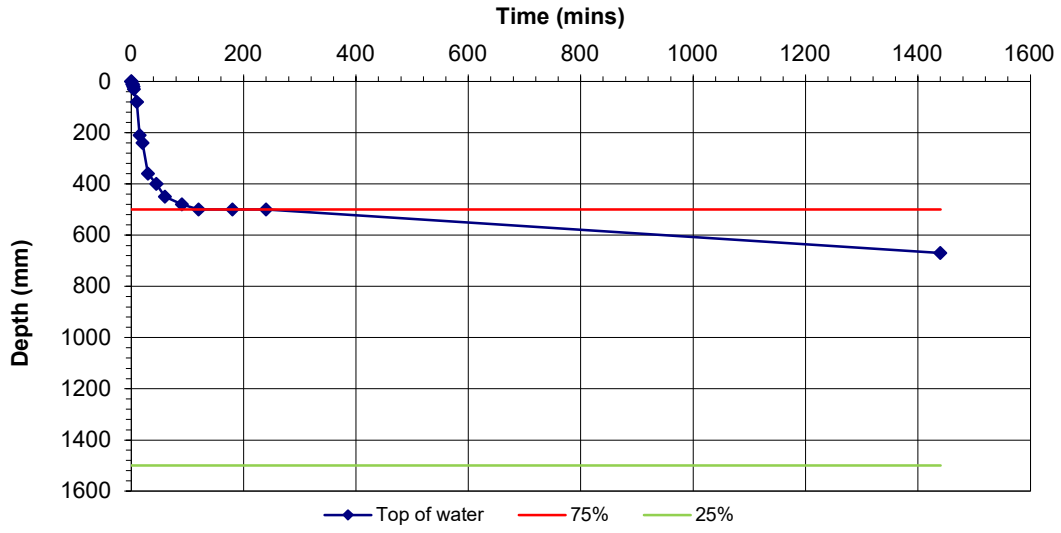
Time (min)	Depth (mm)
0	0
1	0
2	10
3	10
4	20
5	30
10	80
15	210
20	240
30	360
45	400
60	450
90	480
120	500
180	500
240	500
1440	670

Size of Soakaway		
Length (m) =	2.30	
Width (m) =	0.70	
Depth (m) =	2.00	

Depth at start of test (mm)=	0mm
Depth of trial pit (mm)=	2000mm
75% effective depth (mm)=	500mm
50% effective depth =	1000mm
25% effective depth =	1500mm
Base area of pit (m^2) =	1.610
Effective area of loss 50% (m^2) =	7.610
Volume outflow 75 - 25% (m^3) =	1.610

From the graph:	
tp 75 (min) =	200
tp 25 (min) =	NA

Soil infiltration rate, f, (m/s) =	NA	Normal test
Input by:	CP	Date: 01/11/2025
Checked by:	GH	Date: 01/11/2025



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007			
Client:	Network Space		
Site:	Shaw Lane, Carlton		
Job No:	C10271	Test No:	SA102 Test 1

CALCULATION OF SOIL INFILTRATION RATE

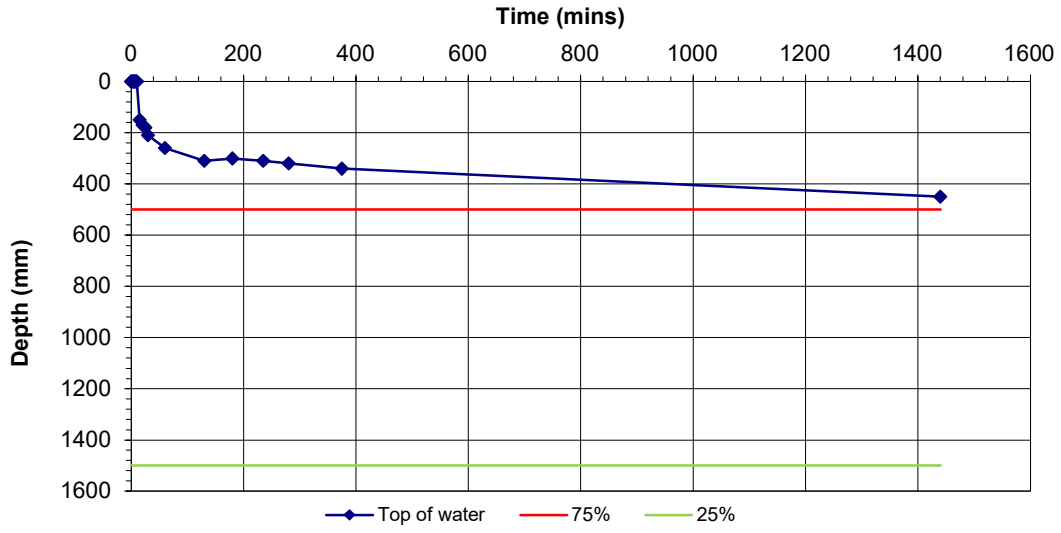
Time (min)	Depth (mm)
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
15	150
20	170
25	180
30	210
60	260
130	310
180	300
235	310
280	320
375	340
1440	450

Size of Soakaway		
Length (m) =	2.30	
Width (m) =	0.70	
Depth (m) =	2.00	

Depth at start of test (mm)=	0mm
Depth of trial pit (mm)=	2000mm
75% effective depth (mm)=	500mm
50% effective depth =	1000mm
25% effective depth =	1500mm
Base area of pit (m^2) =	1.610
Effective area of loss 50% (m^2) =	7.610
Volume outflow 75 - 25% (m^3) =	1.610

From the graph:	
tp 75 (min) =	NA
tp 25 (min) =	NA

Soil infiltration rate, f, (m/s) =	NA	Normal test
Input by:	CP	Date: 01/11/2025
Checked by:	GH	Date: 01/11/2025



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007			
Client:	Network Space		
Site:	Shaw Lane, Carlton		
Job No:	C10271	Test No:	SA103 Test 1

CALCULATION OF SOIL INFILTRATION RATE

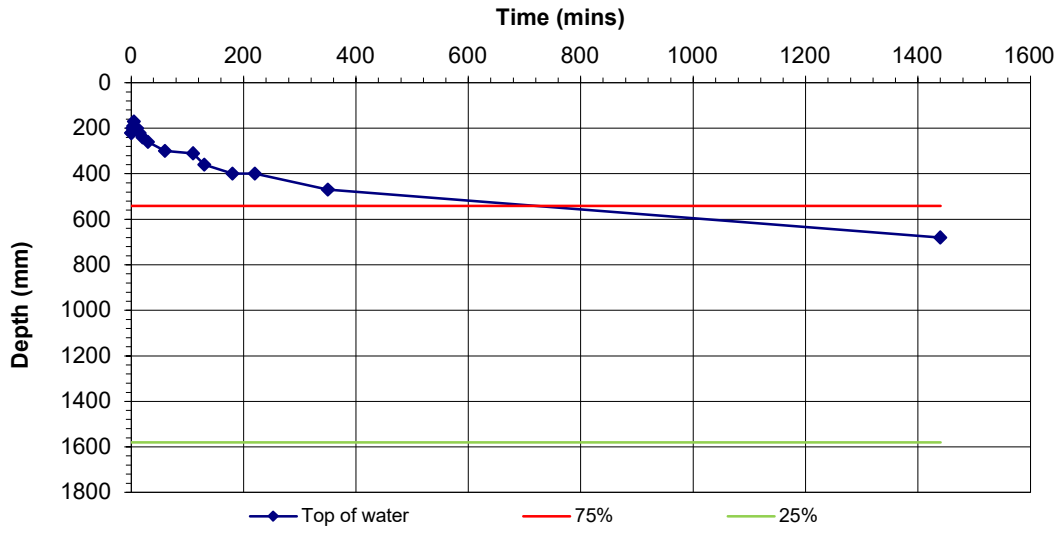
Time (min)	Depth (mm)
0	220
1	220
2	200
3	200
4	190
5	170
10	200
15	220
20	240
30	260
60	300
110	310
130	360
180	400
220	400
350	470
1440	680

Size of Soakaway		
	Length (m) =	2.40
	Width (m) =	0.70
	Depth (m) =	2.10

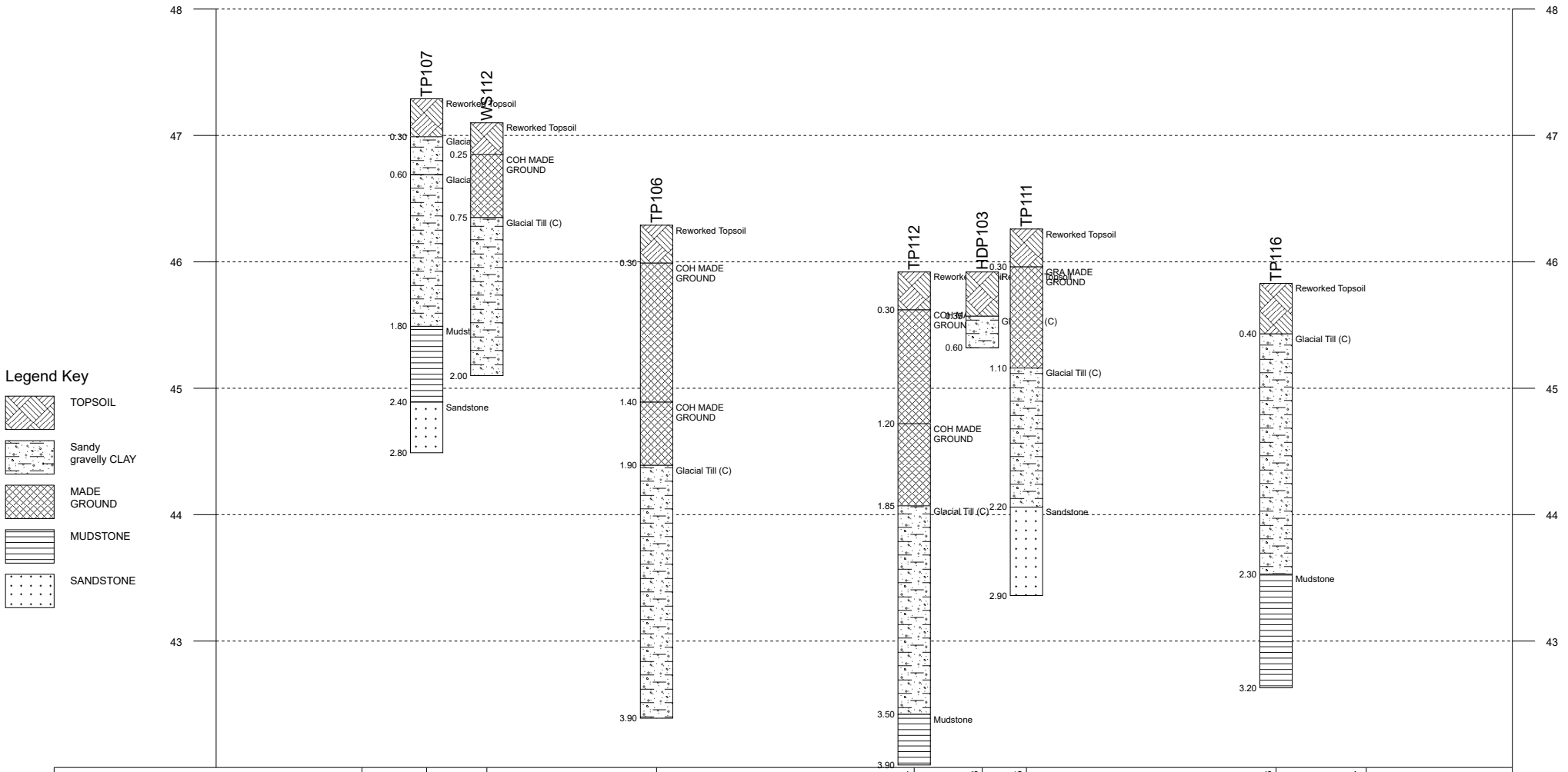
Depth at start of test (mm)=	22mm
Depth of trial pit (mm)=	2100mm
75% effective depth (mm)=	542mm
50% effective depth =	1061mm
25% effective depth =	1581mm
Base area of pit (m^2) =	1.680
Effective area of loss 50% (m^2) =	8.122
Volume outflow 75 - 25% (m^3) =	1.746

From the graph:	
tp 75 (min) =	700
tp 25 (min) =	NA

Soil infiltration rate, f, (m/s) =	NA	Normal test
Input by:	CP	Date: 01/11/2025
Checked by:	GH	Date: 01/11/2025

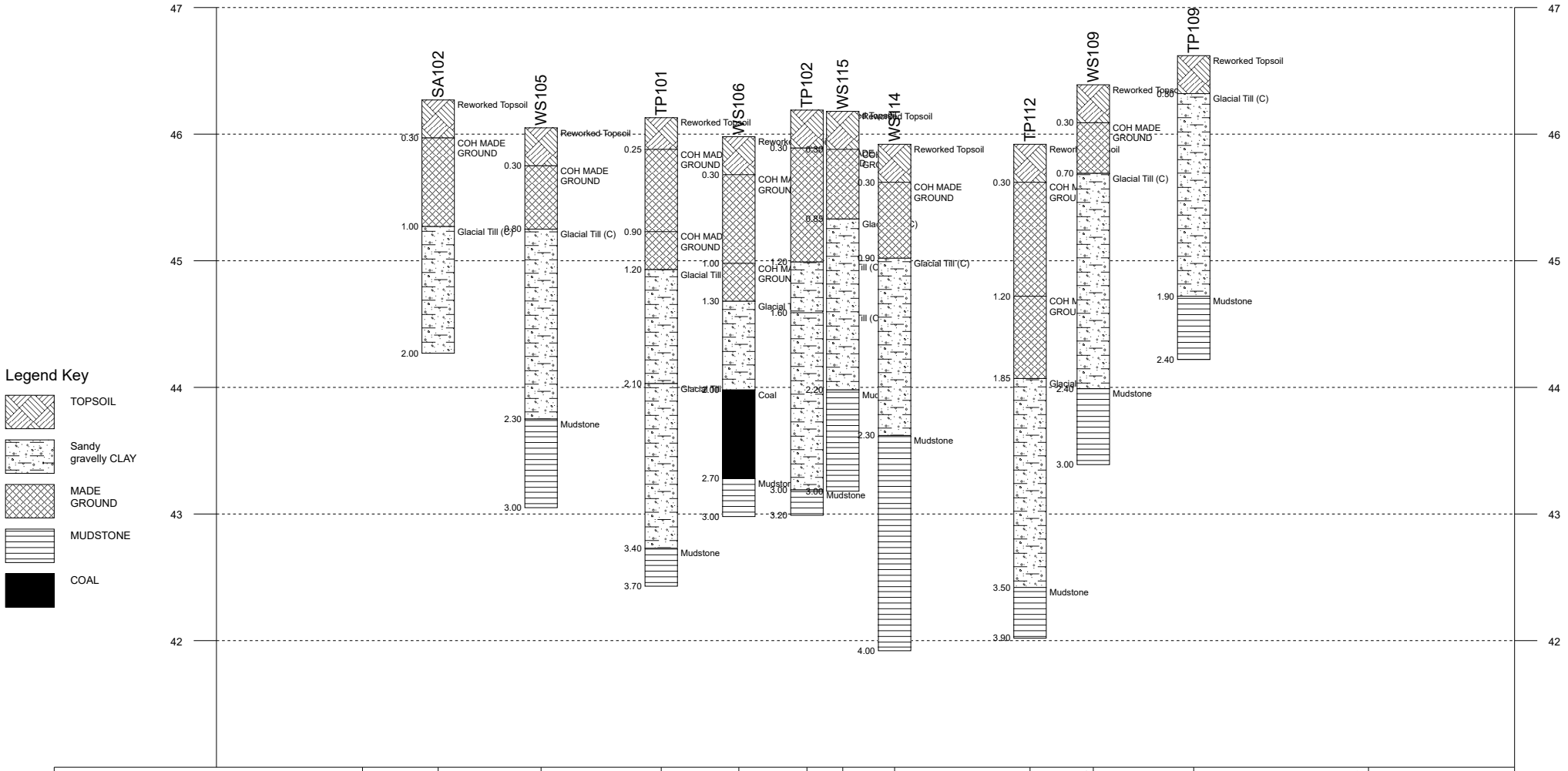


Project Id: C10271	Title: Section line 1
Project Title: Shaw Lane, Carlton	Vertical Scale: 1:46
Location: Barnsley	Horizontal Scale: 1:1918
Client: Network Space	Engineer: CP



| | | |

Project Id: C10271	Title: Section line 3
Project Title: Shaw Lane, Carlton	Vertical Scale: 1:46
Location: Barnsley	Horizontal Scale: 1:1906
Client: Network Space	Engineer: CP



Legend Key

- TOPSOIL
- Sandy gravelly CLAY
- MADE GROUND
- MUDSTONE
- COAL

Chainage (m)	0.00	24.75	58.41	97.72	123.10	145.38	157.11	174.06	218.36	239.05	271.90	329.07
Offset (m)		3.57	0.31	10.73	2.83	10.60	6.71	15.92	0.70	16.37	12.04	
Elevation (mAOD)		46.27	46.05	46.13	45.98	46.19	46.18	45.92	45.92	46.39	46.62	

APPENDIX E
Geotechnical Laboratory Test Results

The Testing Lab PLC
Unit 2 James Road
Adwick-le-Street
Doncaster
DN6 7HH

Document Transmittal Sheet

To

Sirius Geotechnical Ltd
4245 Park Approach
Leeds
LS15 8GB

Despatch Date 22/11/2024

Issue Number 1

Issuer Name M Athorne

Issuer Signatory M. AM

Report Remarks

Date of Sample Receipt: 07/11/2024

Start Date of Test: 07/11/2024

Date of Issue of report: 22/11/2024

Note: Test carried out at TTL laboratory facility as detaied in contact information

Project Name:
Shaw Lane, Carlton

Project No:
J291207

Details of Report Contents

*Tests in the following list marked * are not UKAS accredited*

ITEM	Sheet Nos	Comments
Document Transmittal sheet / Contents	page(s) 1 to 1	

TESTS	Sheet Nos	Authoriser Signatory
Index Properties - Summary of Results	INDX 1 to 1	M. AM
California Bearing Ratio - single test	CBR 1 to 5	M. AM
End of Report		

Total number of pages in this report 7

The results contained in this report relate only to samples received in the laboratory and are tested 'as received' unless otherwise stated.Opinions and interpretations expressed in this report are outside the scope of accreditation.
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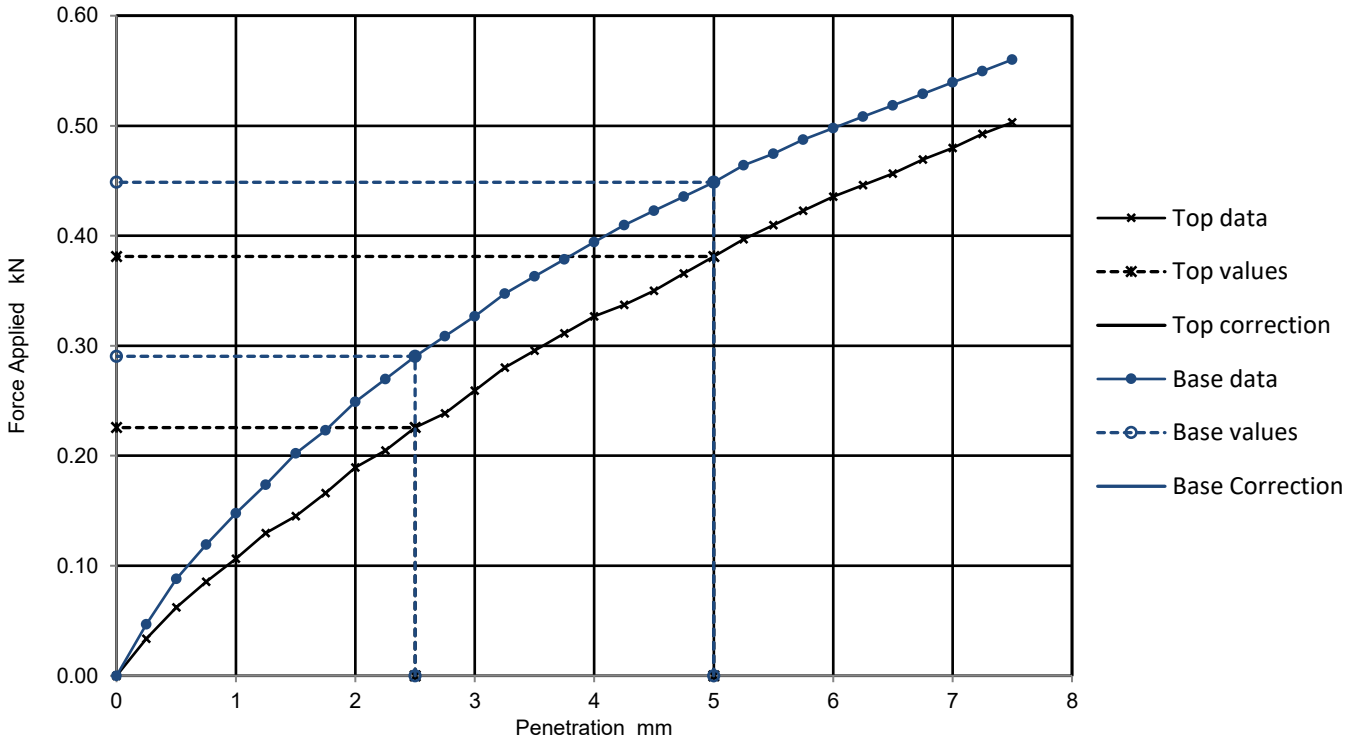
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GQF-008-36 Issue 01 - Oct 22	**California Bearing Ratio (CBR)**			Job Ref	J291207
				Borehole/Pit No.	TP104
Project Name	Shaw Lane, Carlton			Sample No.	
Soil Description	Dark brown mottled grey slightly sandy CLAY			Depth m	0.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Specimen Description				KeyLAB ID	TTLP2024110751
Test Method	BS1377 : Part 4 : 1990, clause 7			CBR Test Number	1

Specimen Preparation

Condition	REMOULDED			Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer			Period of soaking	days
				Time to surface	days
				Amount of swell recorded	mm
Material retained on 20mm sieve removed		0	%	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density	1.72	Mg/m3	Surcharge applied	8 kg
	Dry density	1.22	Mg/m3		5 kPa
	Moisture content	41.4	%		

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	1.7	1.9	1.9	2.1	40.1
BASE	No	2.2	2.2	2.2		42.8

Remarks

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CBR