



Ground Appraisal Report

Tottenham Hale, London

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Version History

This report has been prepared by Apex Consulting Engineers with reasonable skill, care and diligence, within the best practice and guidance current at the time of issue, within the scope of works which have been agreed with the client.

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The report is written in the context of the development proposals submitted to Apex by the Client as part of the appointment. Any changes to the development proposals may necessitate significant revisions to this report.

The report (including appendices) should be read in its entirety. Apex cannot be held responsible for any sections of this report being taken out of context. This includes information submitted separately via download link (i.e. full copies of environmental search data from Envirocheck) which are not included as part of the main PDF due to their file size.

Intrusive investigation only allows observation and assessment of ground across a small portion of the total site area. Therefore, it is possible that significant features may not have been encountered during the investigation, despite appropriate design and planning. Apex cannot accept for conditions not revealed by the exploratory holes. Any interpretation of strata between or below exploratory holes is for guidance only and Apex hold no responsibility as to its accuracy.

It should be noted that groundwater levels are susceptible to seasonal and other variations; this should be borne in mind when considering observations/measurements associated with groundwater contained in this Report.

Apex reserve the right to amend this Report in the light of further information that may become available.

Revision	Date	Notes	Prepared by	Checked by	Approved by
001	2024/04/29	First Issue	M Thompson	W Ballance	M Thompson
002	2024/07/24	Updated with gas monitoring results	M Thompson	W Ballance	M Thompson
003	2024/08/24	Updated following comments	M Thompson	-	M Thompson

EXECUTIVE SUMMARY

Category	Comments
Site location	Central Tottenham Hale, north London. NGR: TQ 342 895 Postcode: N17 9LB
Description	Series of residential/commercial buildings with a central courtyard.
Proposed Development	Demolition of the existing buildings and re-development a 24-storey purpose-built student accommodation block with basement.
History	The site has formerly been occupied by residential housing; at some point, the north-eastern dwellings were converted into shops. The majority of the housing was demolished by the 1950s when the current warehouse is first shown; the remainder of the houses look to have been demolished by the 1990s.
Environmental Setting	Mapped geology comprises Alluvium and Thames Gravel, with London Clay below. The site lies within a groundwater Source Protection Zone II, associated with the chalk aquifer at depth. No landfills are present within influencing distance.
Ground conditions	Made ground is present to between 1.2m and 1.8m, with Alluvium and Thames Gravel below to a maximum of 5.6m. Solid geology below comprises London Clay to c. 21m with Lambeth Group clays below. Calcrete was encountered within the Lambeth Group from c. 27m. Sub-artesian groundwater has been identified within the Lambeth Group, resting at c.2.2m, confined by the London Clay above. A shallower groundwater body is present within the Thames Gravel, Alluvium & made ground which looks to be in hydraulic continuity between these strata, resting at between c. 2.1m and 2.4m.
Contamination	Elevated concentrations of metals, asbestos and PAH were encountered by Westlakes within the made ground. The majority of the made ground will be removed as part of basement construction or be isolated beneath the proposed buildings. Where residual made ground remains below any proposed soft landscaping, 600mm of clean soil cover will be required.
Hazardous gas	No protection measures against ground gas nor radon are required.
Foundations	A piled foundation solution is required. Pile design will need to take account of sub-artesian groundwater within the Lambeth Group, along with presence of calcrete at c. 27m.
Drainage	Given the ground conditions encountered, use of soakaways is not considered feasible; alternative SUDs options should be considered.
UXO	A detailed risk assessment was commissioned by Westlakes for their ground investigation phase which concluded that no mitigation measures were needed to enable investigation. The risk assessment should be revised to account for the proposed construction (i.e. piling works).
Further works	The following additional works are recommended: - Post-demolition site investigation within the footprint of existing buildings including trial pitting with chemical analysis on samples of made ground recovered, and cable percussion boreholes to verify deep ground conditions in areas yet to be investigated. - Updating this report when the supplementary investigations are complete. - Production of a Remediation Strategy once remediation options are finalised and after the post-demolition site investigation.

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1. INTRODUCTION

1.1 Background & proposed development

This report has been prepared for RG Group.

It is understood that proposals include the demolition of existing structures to enable the development of a 24-storey purpose-built student accommodation block with basement.

1.2 Previous reports

Apex have been provided with copies of the following reports relating to this site:

- *29-33 The Hale, Tottenham Hale Phase 2 Geo-environmental Ground Investigation Report* (ref. 2013-001-001) dated 20/04/2022 issued by Westlakes Environmental Ltd.

It is understood that RG Group has reliance on this report and therefore the scope of works agreed is intended to supplement existing data.

A review of the work previously carried out is included in Section 6.

This report is an updated version of Apex's Ground Appraisal Report (ref. 1305-ACE-GEO-GA-001 dated April 2024) and now includes a Gas Risk Assessment following completion of monitoring along with additional groundwater data.

The purpose of this report is to enable an assessment of ground-related deep and shallow geotechnical risks associated with RG Group's proposed development at Tottenham Hale.

1.3 Scope of works

In summary, the agreed scope of works included:

- Review of existing 3rd party information
- Ground investigation (3no. cable percussion boreholes to a maximum depth of 30mbgl. installed with groundwater monitoring pipes)
- Laboratory analysis (geotechnical analysis)
- Interpretation of findings and recommendations in relation to foundations and infrastructure

At this stage, a ground investigation is only possible within external site areas as the majority of the site is still in use. Additional works post demolition will be required to enable refinement of recommendations contained within this report.

The Westlakes Report provided contains information on shallow ground conditions and contamination. No further investigation into contamination risks was included

as part of Apex's scope of work, with the main focus being on ascertaining deep ground conditions for geotechnical design.

1.4 Sources of information

This report includes findings from a number of external sources including Landmark Information Group, British Geological Survey, Local Authority, and 3rd party reports, as well as our own local knowledge and experience.

1.5 Report limitations

The Foreword to this report and the appended guidance notes on Apex's procedures and definitions (Appendix A) should be read in conjunction with the main text.

Existing 3rd party reports and information provided by others has been referred to in good faith as being accurate. Apex do not accept any liability for inaccuracies in third party information.

2. LOCATION AND DESCRIPTION

2.1 Site location

A location plan is included as Drawing 001 in Appendix B. The site is situated on the west corner of The Hale, Tottenham Hale.

2.2 Site description

The site comprises a series of buildings with a central courtyard.

The north-western buildings are residential-type brick built 2-storey structures, formerly used as shops (29-31 The Hale), with pigeon sheds to the east.

The south-western building is a 2-storey brick-built warehouse used as a clothing shop. The south-eastern buildings are concrete/timber sheds, which look to have been used as garages with a miscellany of automobile parts inside, including waste oil containers, car seats and cars.

The clothing warehouse and sheds used as garages in the south have corrugated cement roofs; possibly asbestos-containing.

The "courtyard" is surfaced in concrete hardstand, used for vehicle access and parking.

Access is provided via a gap between the clothing warehouse and 31 The Hale off The Hale.

The site is reasonably flat, lying at between 8.4m AOD and 8.6m AOD.

Given the site's location in central London, reference has been made to the Transport for London's Property Asset Register Public Web Map; an extract of which is shown below:



The above shows the presence of TfL's Road Network on The Hale to the west and freehold land north and west. A London Underground Zone of influence is shown c. 50m south-east associated with the Victoria Line, but no tunnels or zones of influence are recorded beneath the site.

Site details are summarised in the table below, with a selection of photographs overleaf.

CATEGORY	DETAILS
Location	Central Tottenham Hale, north London
NGR	TQ 342 895
Nearest postcode	N17 9LB
Area	990m ²
Current use	Current and former shops
Surrounding land	North – Rough vegetation with Hale Road & The Hale East – Hale Road with housing and high-rise buildings beyond South – High rise development West – The Hale road with residential flats beyond



Photo 1: looking north-east from the centre

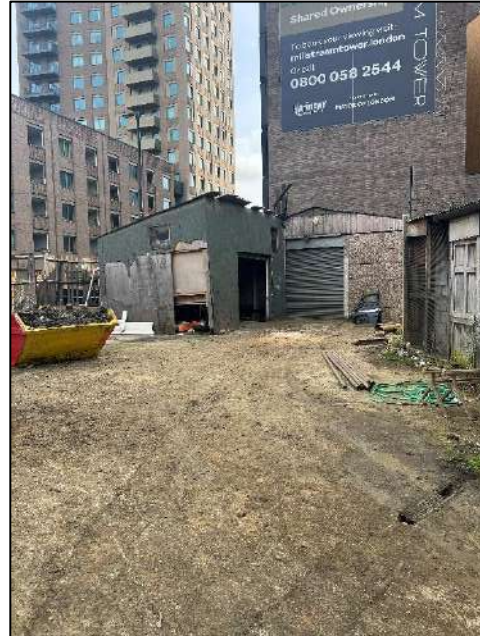


Photo 2: looking south-east from the centre



Photo 3: Access off The Hale

3. ENVIRONMENTAL CONTEXT

3.1 General

Information pertinent to the site's environmental setting has been reviewed from various sources (see Section 1.4), most notably with respect to: mining, radon gas, geology, groundwater & surface water quality, landfills and flooding.

A full copy of the 3rd party data obtained as part of this investigation is available electronically; key extracts are presented in the appendices. Key findings are summarised below:

CATEGORY	DETAILS
Geology	Made ground – None mapped, but likely Drift – Enfield Silt Member (sandy clay and silt) Solid – London Clay Faults – None mapped
Mining	The site lies beyond the Coal Authority's defined coalfields; no other significant risks associated with mining have been identified.
Radon	Within the 1km grid square where the site lies, <1% of homes are above the radon action level. No radon protection measures are required.
Groundwater	Aquifers – Drift (Enfield Silt Member & Kempton Park Gravel) and Solid (London Clay) – Unproductive Strata Site lies in a groundwater Source Protection Zone II . Nearest abstraction – 253m east associated with dewatering for Wates Construction. Two other dewatering abstractions in the same area. Nearest Potable abstraction is 698m west for Thames Water, used as public water supply . Discharge consents – none within 500m
Surface water	Nearest watercourse – 422m east; Pymmes Brook. Nearest discharge consent – 445m east discharging sewage to freshwater (culvert). Revoked in 1990, not of significance to site. Nearest abstraction – None of significance to site. Pollution incidents – numerous at c. 400m east and beyond associated with Pymmes Brook/River Lee Navigation. Not of significance to site.
Landfill	None within 500m. A linear feature is shown as “potentially infilled land” 200m north, likely associated with a backfilled stream or similar. Given its distance and limited lateral extent, it is not considered to pose a significant risk of gas generation.
Flooding	The site lies in Flood Zone 2. A Flood Risk Assessment is required. Groundwater flooding – The site is not in an area considered susceptible to groundwater flooding. Surface water flooding – The site is not in an area considered susceptible to surface water flooding.
Unexploded ordnance (UXO)	Based on a review of Zetica's online Risk Maps utility, the site is considered to be at high risk from UXO. Further details are given in Section 5.
Other	An obsolete fuel station entry is shown 69m east.

4. SITE HISTORY

4.1 General

Historical OS maps (included within the Envirocheck report) provide a record of key changes at the site and surrounding areas over the past c. 150 years, dating back to 1864. It should be noted that not all changes will be shown on the plans, so some previous historical features may exist for which there is no record.

4.2 Map review

Key extracts from the historical plans are shown below, along with a description of features identified. A full set of the historical plans is available electronically upon request.

A summary of the key changes on/close to the site is given the table below:

DATE	ON-SITE FEATURES	OFF-SITE FEATURES
1864	Structures (likely residential) shown in south-west, and two residential structures in the north-west in roughly the same location as 29-31 The Hale.	Water Works c.100m south-east. Railway line c.180m east. Road to the west (same location as The Hale); surrounding areas are predominantly residential. Woodland to the north-east associated with Hale Farm.
1896	Structures in the south-east and north-east more clearly shown.	Woodland to the north-east no longer shown. Significant development to the east, south-west and north-west in the surrounding area with residential housing; road to the west now labelled "The Hale". Water works re-labelled as "Pumping Station (Tottenham Water Works" with filter beds also shown. Additional pumping station shown 360m south-east.
1913	Residential structures shown in the north-east. Residential housing now covers the whole site.	Residential houses immediately south no longer shown, pub now 20m south. Braid & Bootlace Factory, Woolen Factory and Pencil Factory shown 50m, 115m and 120m respectively. School 150m north-west. Boot & Shoe Factory 110m south. Neo-Cyclostyle Works and Printing Works c. 200m south. Water works and pumping stations no longer shown.
1936	No significant changes.	Braid & Bootlace Factory and Woolen Factory now shown as Printing Ink & Varnish Factory and Dry Batter Factory respectively. The former has numerous associated "tanks" marked and a chimney. Additional structures shown immediately east and south. Expansion of the Neo-Cyclostyle Works. Bicycle Factory and Sewing & Cotton Factory shown 210m south-east.

DATE	ON-SITE FEATURES	OFF-SITE FEATURES
1955	Residential housing in the south-west replaced with warehouse labelled as “33” in the same location and layout as the current clothing shop warehouse.	Printing and Stationary Works shown immediately south-east. Neo-Cyclostyle Works now labelled “Duplicating Machine Works”. Engineering Works and Motor Vehicle Service & Repair Depot 100m south-east. Enterprise Works (Printing Works) 170m south-east. Garage 90m south-east and 180m west. Water colling tower 60m north. Cannon Works (rubber) 220m north-east.
1961-65	Warehouse in the south-east labelled “works”.	Many of the factories mentioned above now just labelled “works”. Some changes to the residential housing to the west with housing replaced with flats and alterations to the road layouts.
1989	No significant changes.	Further changes to the road layouts and buildings in the surrounding area. Buildings shown against the site boundary to the south. Works 50m north replaced with Ashley House. School no longer shown. Electric substation 33m south-east.
1991	Residential buildings in the east no longer shown, site is as per current layout.	Many of the works buildings 100m south no longer shown; replaced with retail park. Road layout around the site altered to match existing. Buildings to the south-east no longer shown.
1992	No significant changes.	Building immediately south now labelled as “depot”. With Tottenham Hale Business Centre beyond. Additional building shown immediately south-east.
2024	Slight expansion of buildings on site shown.	Buildings to the east & south-east now replaced with Ferry Island North Apartments, Millstream Tower and Premier Inn.

The site has formerly been occupied by residential housing; at some point, the north-eastern dwellings were converted into shops. The majority of the housing was demolished by the 1950s when the current warehouse is first shown; the remainder of the houses look to have been demolished by the 1990s.

5. UXO

5.1 Introduction

The site is shown as being at ‘high’ risk from UXO based on Zetica’s online Risk Maps. Therefore, a UXO Risk Assessment has been carried out by Zetica, contained within Westlakes’ report.

5.2 Summary of findings

Zetica's UXO report concludes that the site is at Low risk from UXO: *"there is no positive evidence that UXO is present, but its occurrence cannot be totally discounted"*.

No further action is recommended by Zetica in the context of ground investigations (boreholes or excavations). It is recommended that the risk assessment be updated to include proposed piling and construction works.

6. REVIEW OF THIRD-PARTY REPORTS

6.1 Introduction

Apex have been provided with copies of the following third-party report relating to this site:

- *29-33 The Hale, Tottenham Hale Phase 2 Geo-environmental Ground Investigation Report* (ref. 2013-001-001) dated 20/04/2022 issued by Westlakes Environmental Ltd.

Key points from Westlake's report, pertinent to the site's current proposed development, are discussed below.

6.2 Scope

Westlake's information includes a review of a Desk Study by Aecom (a copy of which has not been provided). The intrusive investigation is summarised below:

Date	Exploratory holes	Base depths	Remarks
March 2022	Window sample boreholes WS1 to WS6 (inc. WS4A)	2.8m to 3.45m	SPTs at approximately 1m intervals. Monitoring wells in 3 boreholes with response zones spanning made ground/natural ground.

Laboratory testing included:

- 10 samples for pH & metals and SOM
- 5 samples for speciated TPH & BTEX, VOC and SVOCs
- 12 samples for asbestos, with 2 for quantification
- 10 samples for BRE Suite

No geotechnical analysis was undertaken.

6.3 Ground conditions

In summary, ground conditions encountered by Westlakes were as follows:

- Hardstanding to between 0.08m and 0.16m
- Made Ground to between 1.2m and 1.6m
- Enfield Silt Member to between 2.0m and 2.4m
- Kempton Park Gravels to the base of each borehole (max. depth reached 3.45m)

Descriptions of the above strata are included in the Ground Conditions section (Section 9) which also includes Apex's findings.

Groundwater strikes were noted between 2.1m and 2.44m, with subsequent monitoring by Westlakes yielding results of between 2.29m and 2.38m.

6.4 Contamination

Elevated concentrations of the following contaminants were identified by Westlakes:

- Arsenic in 1 sample of made ground
- Lead in 8 samples of made ground
- Asbestos (chrysotile and crocidolite) in 2 samples of made ground at quantifications of <0.001%.
- PAH compounds in 3 samples of made ground

Screening values used by Westlakes assume a residential end-use without home grown produce.

No significant risks are highlighted by Westlakes, with made ground ultimately being isolated below the proposed building or removed from site as part of a proposed basement. Where made ground remains below any proposed landscaping, a 450mm clean soil cover is recommended by Westlakes.

No significant risks are identified by Westlakes in relation to controlled waters, including the Source Protection Zone.

Further discussion is given in Sections 13 and 15.

6.5 Gas

Based on the one round of monitoring carried out by Westlakes, they suggest no protection measures are needed, but that additional monitoring is required to confirm this; Apex agree with this. This is discussed further in Section 12.

6.6 Comments

The Westlakes report is a shallow ground investigation only, focusing on contamination risks. No deep geotechnical investigation was carried out.

As mentioned by Westlakes, further gas monitoring is recommended (a minimum of 6 visits over 2 months) to confirm the need for any protection measures.

Apex generally agree with the remediation recommendations given by Westlakes with the exception of the clean cover requirement. Given the presence of elevated metals, PAH and asbestos identified; a minimum of 600mm should be adopted in any areas of proposed landscaping where made ground remains.

Apex agree that, following removal of the majority of the made ground for the proposed basement, there is no significant risk to controlled waters.

However, much of the site was not accessible at the time of Westlakes' investigation. Therefore, a post-demolition investigation including trial pitting and additional chemical analysis, is recommended. This should include within the footprint of current buildings once demolished, most notably, where evidence of car maintenance/repairs has been identified (in the south).

7. CONCEPTUAL SITE MODEL

7.1 Introduction & planning

With respect to ground conditions and pollution, National Planning Policy Framework (NPPF 2021) Section 183 states that planning policies should ensure that:

- a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);
- after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the environmental protection act 1990; and
- adequate site investigation information, prepared by a competent person, is available to inform these assessments.

7.2 Contamination risks

A conceptual site model has been prepared based on all the information reviewed. A visual version is included in Appendix B as Drawing 003. Key sources, pathways and receptors are summarised below:

SOURCE	PATHWAY	SEVERITY	PROBAB- ILITY	RISK RATING	REMARKS
RECEPTOR: Human health (End-users, site workers)					
Made ground associated with past developments	Ingestion, dermal contact, inhalation of dust	Moderate	Very low	Low	Made ground has been found to contain elevated concentrations of metals, PAHs and asbestos. Possible ACM was also identified on site in the form of roofs. However, the majority of made ground will be removed to accommodate proposed basement, or be isolated beneath areas of proposed hardstanding.
Spillage/ leakage of fuels	Inhalation of vapours, ingestion, dermal contact, inhalation of dust	Moderate	Low	Low to moderate	Evidence of fuel use/storage has been highlighted in the site walkover. Additional investigation beneath current buildings is required to confirm risks.

SOURCE	PATHWAY	SEVERITY	PROBAB- ILITY	RISK RATING	REMARKS
RECEPTOR: Controlled waters (Source Protection Zone II, surface waters)					
Made ground associated with past developments	Leaching of mobile contaminants	High	Very low	Low	The nearest surface watercourse is of significant distance from site (>400m) and is unlikely to be at significant risk due to its distance from site. However, contamination could travel along the groundwater identified at c. 2m by Westlakes to other off-site receptors. The underlying geology is mapped as London Clay and is anticipated to c. 20m depth. Therefore, any contamination present in the made ground/on site will be “blocked” from reaching the Principal Aquifer below by the London Clay. Investigation is required to confirm the thickness of the London Clay.
Spillage/leakage of fuels					

The proposed change in use and the potential for ground contamination warrants an intrusive ground contamination assessment, in accordance with the requirements of the NPPF.

7.3 Geotechnical risks

The conceptual site model has also been used to inform potential geotechnical risks, as outlined below:

ISSUE	REMARKS
Drift deposits – Enfield Silt Member & Kempton Park Gravel	These deposits are anticipated to c. 6m and may contain loose/soft ground, unsuitable as a bearing stratum for the proposed building.
Bedrock – London Clay & Lambeth Group	London Clay anticipated to c. 20m with the Lambeth Group beyond. Proposed foundations (piles) will likely terminate in these strata.
Former uses	The site’s history and current use includes residential dwellings, a warehouse & garages. Obstructions such as relict foundations and service runs are likely to be present.
Sulphate attack	BRE testing is required to confirm concrete mixes appropriate to the geology’s chemical characteristics.

7.4 Proposed ground investigation

A ground investigation is required in order to resolve uncertainties highlighted by the conceptual site model. Specifically, the investigation should enable:

- Assessment of the nature, thickness and lateral distribution of made ground
- Contamination risk assessment via inspection and sampling of made ground (and natural soils where appropriate)
- Assessment of the risks of hazardous gas
- Assessment of the geotechnical properties of the substrata in order to inform foundation design
- Assessment of geotechnical risks including the presence/absence of significant obstructions, stability of excavations and depth of groundwater.

8. GROUND INVESTIGATION

Following completion of the desk study phase, a ground investigation was undertaken between 12th and 20th March 2024. All works were supervised by a suitably experienced Geo-Environmental Engineer from Apex.

Given the site's ongoing use, no further investigation within areas inaccessible to Westlakes during their investigation, is possible at this stage. Consequently, no further investigation of shallow ground conditions and contamination assessment was carried out by Apex. It is anticipated that this will be done at a later stage, either post-vacation or post-demolition.

Apex's investigation focussed on geotechnical risks and additional gas monitoring to enable the Gas Risk Assessment to be completed.

8.1 Fieldwork

Fieldwork undertaken is summarised in the table below:

Technique	Depths	Remarks/justification
Cable Percussion BHs 01 to 03	Between 27.14m and 30.19m	SPTs undertaken. Hand vanes and U100 samples taken in suitable material.
Monitoring wells (3 no.)	Various	Monitoring wells installed in the Thames Gravel (aka. Kempton Park Gravel) at 2.0m to 5.5m and 2.5m to 4.0m in BHs 1 and 3 respectively. A deeper well was installed in BH2 from 20.0m to 22.0m to target water strikes encountered during drilling.

9. GROUND CONDITIONS

For a full record of the ground conditions encountered in each exploratory hole, please refer to the logs in Appendix E.

The typical ground types encountered are described below, and include the findings of Westlakes' investigation:

9.1 Made ground

Made ground strata have been categorised (where possible) into 2 main ground 'types' based on their appearance, location on site, and likely origins, as identified during logging and through review of the desk study phase.

It should be noted however that made ground is often heterogeneous by nature and therefore made ground conditions may vary significantly between exploratory hole locations.

The following strata were encountered:

- **CONCRETE:** Found at surface level in all locations to a maximum depth of between 0.12m and 0.15m. Typically comprises weak grey concrete of 60% aggregate and 10% small voids. In Westlakes' report, the concrete is described as "sometimes reinforced".
- **MADE GROUND:** Encountered in all boreholes from below concrete to a between 1.30m and 1.80m. Heterogenous in composition with the ratio of primary, secondary and tertiary constituents varying throughout the stratum it typically comprises clayey gravelly fine to coarse SAND with occasional cobbles (locally a gravelly CLAY). Gravels and cobbles are angular to rounded up to 210mm including brick, flint, coal, concrete, pottery, sandstone. Rare fragments of metal, clinker and plastic were also noted.

9.2 Natural ground

The following strata were encountered:

- **ALLUVIUM:** Encountered in all locations from below made ground to between 2.0m and 2.4m. Typically comprises soft laminated silty slightly sandy clay where sand is fine to medium. Referred to as the Enfield Silt Member in Westlakes' report.
- **THAMES GRAVEL:** Encountered in all locations from below the Alluvium to a between 4.3m and 5.6m. Typically comprises yellowish brown very sandy sub-angular to rounded fine to coarse flint and chert GRAVEL where sand is fine to coarse (locally very gravelly SAND). Typically becomes more clayey with depth. Referred to as Kempton Park Gravels in Westlakes' report.
- **LONDON CLAY:** Encountered in all locations from below Thames gravel to a between 20.6m and 20.8m. Typically comprises a profile of firm becoming very stiff, medium becoming extremely high strength, blueish grey occasionally sandy CLAY where sand is fine.

- **LAMBETH GROUP:** Encountered in all locations below the London clay to the base of each borehole (between 27.14m and 30.19m, base not proven). Typically comprises a sequence of:
 - stiff green mottled blue and yellow silty sandy CLAY where sand is fine; over,
 - stiff yellow mottled greenish blue speckled red silty sandy CLAY where sand is fine to medium; over,
 - very stiff greenish blue speckled red and white sandy CLAY with common calcium carbonate and calcrete nodules, sand is fine to medium.
- **CALCRETE:** Nodules of calcrete were common from 27m in all boreholes; however, a bed was encountered in BH3 from 27.3m to 27.6m. Typically comprises strong greyish white calcrete.

9.3 Evidence of contamination

No visual/olfactory evidence of organic contamination was noted in any of the boreholes.

9.4 Stability, groundwater and obstructions

Obstructions

No significant obstructions were encountered during the ground investigation by Apex. Westlakes' borehole WS4 was terminated at 0.75m upon discovery of cables from 0.6m to 0.75m

Obstructions should be anticipated beneath the existing site buildings; further obstructions may be present associated with former residential housing on site.

Groundwater

EXP HOLE.	DEPTHS	STRATUM	REMARKS
BHs 1 to 3 (Apex)	Unknown	Thames Gravel	Water added during drilling; unable to accurately determine water strikes.
BH2 (Apex)	21.0m	Lambeth Group	
WS1 (Westlakes)	2.26m	Alluvium	
WS2 (Westlakes)	2.10m	Alluvium	
WS3 (Westlakes)	2.30m	Thames Gravel	
WS4A (Westlakes)	2.33m	Thames Gravel	
WS5 (Westlakes)	2.44m	Thames Gravel	
WS6 (Westlakes)	2.40m	Thames Gravel	

Groundwater was monitored by Westlakes, with a resting depth of between 2.29m and 2.38m.

Groundwater monitoring was undertaken across 6 visits as part of the gas monitoring programme; results are summarised below; data from Westlakes' window sample boreholes is shown in blue.

EXP HOLE.	RESPONSE ZONE	STRATUM	DEPTH TO WATER
BH1	2.0m to 5.5m	Thames Gravel	1.12m - 2.31m
BH2	20.0m to 22.0m	London Clay & Lambeth Group	2.22m - 2.42m
BH3	2.5m to 4.0m	Thames Gravel	1.98m - 2.28m
WS03	0.5m to 2.5m	Made ground, Alluvium & Thames Gravel	2.22m - 2.37m
WS04A	0.5m to 2.5m		2.15m - 2.34m
WS05	0.5m to 2.5m		2.14m - 2.34m

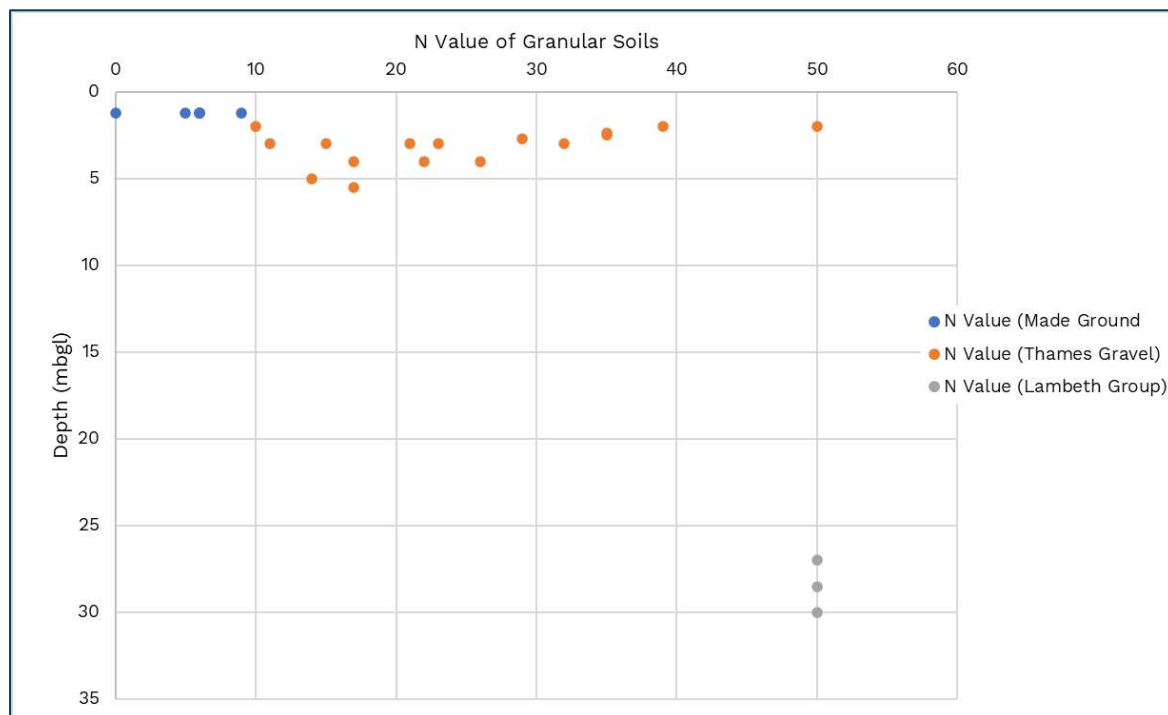
The above shows the presence of sub-artesian groundwater within the Lambeth Group, resting at between 2.22m and 2.42m, confined by the London Clay above. A shallower groundwater body is present within the Thames Gravel, Alluvium & made ground which looks to be in hydraulic continuity between these strata.

10. GEOTECHNICAL TESTING (FIELD TESTS)

10.1 Density of granular soils

During drilling, SPTs were undertaken at c. 1m intervals to 5m, and at 1.5m intervals thereafter.

SPT results within granular soils are summarised in the plot below, and include the SPTs undertaken by Westlakes:



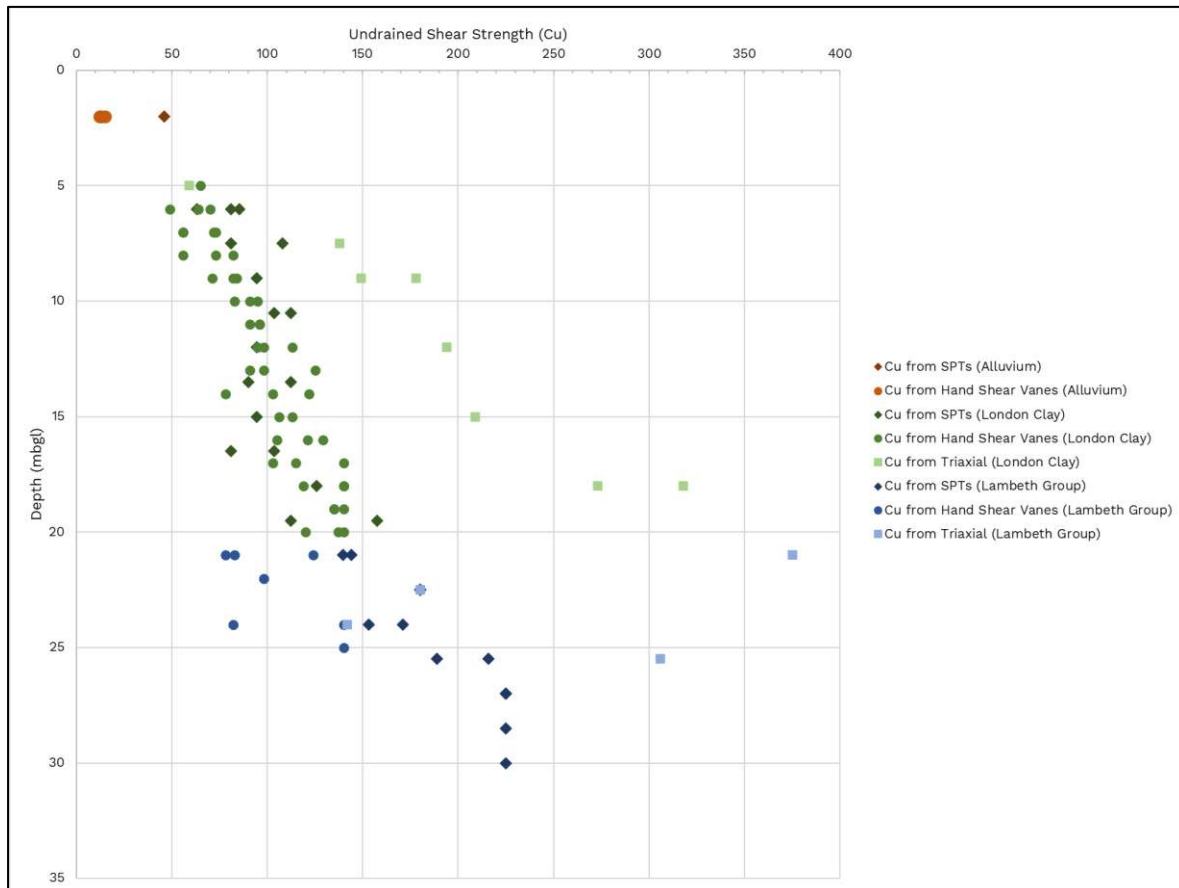
The above shows the Made Ground to be very loose to loose, and the Thames Gravel to typically lie within the Medium Dense range (N value of 10-30). Some higher blow counts were noted in the Thames Gravel; however, these are likely associated with cobbles and are not considered representative of the stratum's density.

The SPTs undertaken within granular lenses of the Lambeth Group all recorded N Values of >50 (refusal), suggesting very dense material.

10.2 Undrained shear strength (C_u)

Where performed within a clay soil, SPT 'N' values have been equated to a C_u value by multiplying by a factor of 4.5 for London Clay and Lambeth Group (based on correlation after Stroud¹).

Results are plotted on the graph overleaf along with undrained shear strength values taken from laboratory tests (see Section 11.4) and hand-vane tests.



The above shows a clear increase in undrained shear strength within the London Clay and Lambeth Group with depth.

¹ The standard penetration test in insensitive clays and soft rocks – Stroud M.A. (1975)

11. GEOTECHNICAL TESTING (LABORATORY TESTS)

Samples taken during the investigation have been delivered to a UKAS accredited laboratory and scheduled for the following geotechnical tests:

Material	No. samples	Analysis scheduled
Made Ground	3	BRE Suite C
Alluvium	2	BRE Suite C Moisture content & Atterberg Limits Particle size distribution
Thames Gravel	2	Particle size distribution
	3	BRE Suite C
London Clay	4	BRE Suite C
	6	Moisture content & Atterberg Limits
	9	Undrained unconsolidated shear strength
Lambeth Group	3	Particle size distribution
	4	Moisture content & Atterberg Limits BRE Suite C Undrained unconsolidated shear strength

A full copy of the results, as received from the laboratory, is included in Appendix F.

11.1 pH & soluble sulphate

In accordance with BRE SD1² and the site's conceptual model, samples were analysed for pH, water-soluble sulphate, chloride, nitrate, & magnesium

Results are summarised below and take into account equivalent chloride, nitrate and magnesium values where appropriate.

Material	pH range (Design value)	Water soluble sulphate range (mg/l)(Design value)
Made Ground	8.8 – 10.9 (10.9)	80.5 – 326.0 (326)
Alluvium	8.1	54.3 – 68.4 (68.4)
Thames Gravel	8.6 – 8.8 (8.8)	13.3 – 21.9 (21.9)
London Clay	7.9 – 8.5 (8.5)	286.0 – 754.0 (754)
Lambeth Group	8.3 – 9.4 (9.4)	145.0 – 775.0 (775)

Design values calculated in accordance with guidance contained within BRE SD1² relating to the number of samples tested per strata. Ground beneath this site is not considered likely to be 'disturbed' such that significant oxidation of any sulphide would occur. Therefore, assessment of total potential sulphate has not been carried out.

² BRE Special Digest 1 Concrete in aggressive ground 2005

The site is considered to be brownfield with a mobile groundwater regime.

Based on the above, sub-surface concrete in contact with

- Made Ground, Alluvium and Thames Gravel should be designed assuming a Design Sulphate class of DS-1 and Aggressive Chemical Environment of Concrete of AC-1 and for
- London Clay & Lambeth Group, this should be revised to DS-2, AC-2.

The above results are in line with the same classifications given for the Made Ground, Alluvium and Thames Gravel by Westlakes.

11.2 Atterberg limits

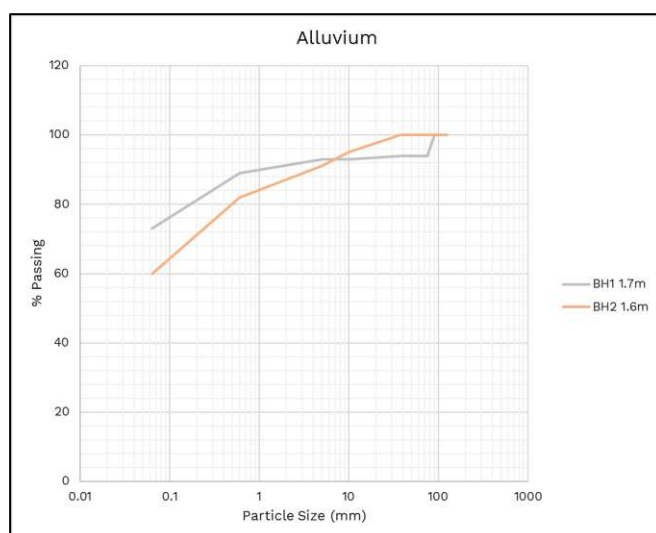
Results of Atterberg limit testing is summarised by stratum in the table below:

Material	Moisture content	Modified plasticity indices	Volume change potential
Alluvium	47 to 55	22.9 to 24.0	Medium
London Clay	56 to 76	33.7 to 39.4	Medium
Lambeth Group	47 to 72	27.3 to 49	Medium

Plasticity indices have been modified in accordance with NHBC Chapter 4.2³.

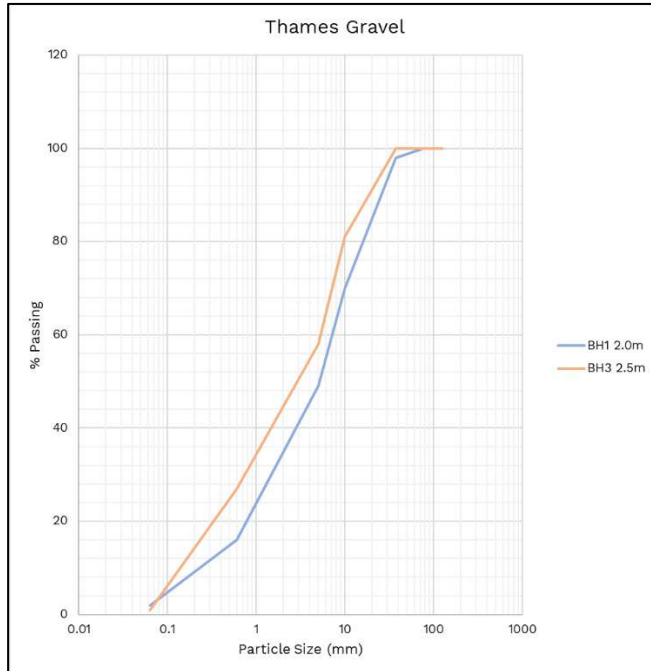
11.3 Particle size distribution (PSD)

PSD tests were carried out on 8 samples to aid engineering observations and help classify materials encountered on site. Results of the testing are summarised in the plots below for the Alluvium, Thames Gravel and Lambeth Group.

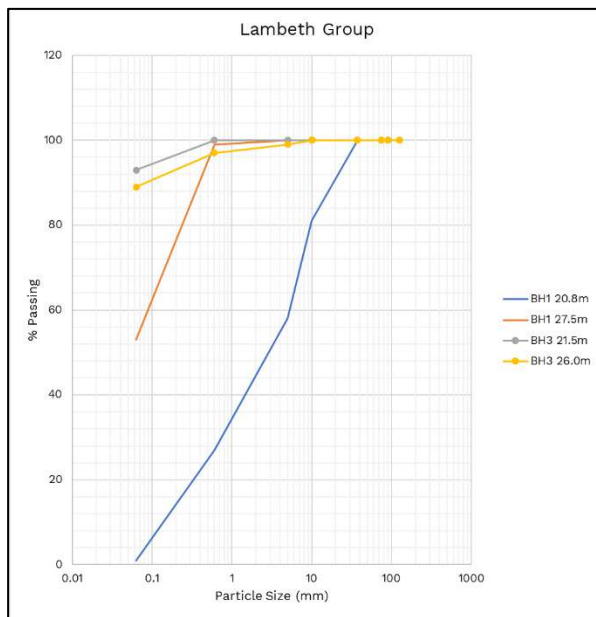


Typically a slightly gravelly, sandy CLAY.

³ NHBC Standards 2023



Typically a slightly clayey, very sandy GRAVEL.



Varies between a slightly gravelly slightly sandy CLAY and a slightly gravelly sandy CLAY.

11.4 Undrained, unconsolidated triaxial tests (undrained shear strength)

Undrained, unconsolidated triaxial tests are carried out at a cell pressure equating to the sample's overburden pressure. This test is carried out as undrained to as to assess the worst-case scenario during loading (i.e. before an increase in effective stress and therefore an increase in strength).

Results are summarised in the table overleaf and have been included on the graph on page 22 along with readings from hand vanes and SPTs.

Sample	Undrained shear strength (kPa)	Strength term
London Clay	59 to 318	Medium to extremely high strength
Lambeth Group	142 to 375	High to extremely high strength

12. HAZARDOUS GAS

12.1 General

No significant sources of hazardous gas have been identified during the desk study phase.

Whilst made ground underlies the site, it is of limited thickness and does not contain significant amounts of potentially putrescible material.

However, Westlakes began gas monitoring as part of their investigation, therefore it was considered prudent to complete the gas monitoring with a further 6 visits programmed over 2 months.

In accordance with BS8576⁴ and CIRIA C665⁵, risks associated with hazardous gas are considered to be very low. In accordance with BS8485⁶, the proposed development is classified as a Type B building.

12.2 Investigation & risk assessment

As part of Westlakes' ground investigation, monitoring wells were installed within 3 boreholes (WS03, WS04A and WS05). Apex's boreholes BH1 to BH3 were installed with monitoring wells, primarily to assess groundwater levels; however, these were monitored on one occasion for ground gasses. On the remaining 5 visits, Westlakes' window sample boreholes were monitored.

Gas monitoring was undertaken in line with the Guidance Note appended to this report.

On-site measurements of atmospheric pressure ranged from 999mb to 1014mb, being below 1000mb on 2 out of 6 visits.

The atmospheric pressure trend in the 48 hours prior to each monitoring visit was also recorded; the trends were as follows:

- Visit 1 – Falling
- Visit 2 – Falling
- Visit 3 – Rising
- Visit 4 – Rising
- Visit 5 – Rising
- Visit 6 – Fluctuating

⁴ Guidance on investigations for ground gas (2013)

⁵ Assessing the risks posed by hazardous ground gases to buildings (2007)

⁶ Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (2019).

Results are summarised in the table below:

EXP HOLE.	RESPONSE ZONES (m)	HIGHEST READINGS			STRATUM
		Peak CH ₄ (% vol)	Peak CO ₂ (% vol)	Steady flow (lt/hr)	
BH01	2.0m to 5.5m	0.1	0.7	0.0	Thames Gravel
BH02	20.0m to 22.0m	0.1	0.7	0.2	London Clay & Lambeth Group
BH03	2.5m to 4.0m	0.1	0.7	0.0	Thames Gravel
WS03	0.5m to 2.5m	0.2	0.8	0.0	Made ground, Alluvium & Thames Gravel
WS04A	0.5m to 2.5m	0.2	1.0	0.0	
WS05	0.5m to 2.5m	0.1	4.5	-0.1	

In addition, oxygen, hydrogen sulphide, carbon monoxide and PID readings were taken; key points are summarised below:

- Minimum oxygen readings ranged from 14.5 to 20.7%vol.
- Peak PID readings ranged from <0.1 to 1.4ppm
- Peak H₂S readings were all <1ppm
- Peak CO readings typically ranged from <1 to 2ppm but were higher in WS04A during visit 4 (up to 37ppm).

Where no flow was detected, a default of 0.1lt/hr has been assumed.

Gas Screening Values have been calculated for CH₄ and CO₂ only, using both steady flows and maximum (peak) concentrations; these are as follows:

Gas Screening Value (GSV) CH ₄	Gas Screening Value (GSV) CO ₂	Characteristic Situation (CS) based on GSV
0.0004	0.009	CS1

Assuming worst case scenarios of the highest concentrations in any borehole and the highest steady flow readings in any borehole, Gas Screening Values fall into CS1 category (Very Low Hazard Potential).

In addition to GSVs, results should be reviewed to check if “typical maximum concentrations” of CO₂ and CH₄ are above the threshold for a CS1 classification. No readings above the threshold values for CO₂ (5% vol) nor CH₄ (1% vol) were detected in any of the monitoring by Apex or Westlakes.

No significant PID readings (which are a screening tool for potential volatile contaminants) were detected (maximum of 1.4ppm).

Whilst higher readings of CO were detected in WS04A on visit 4, this appears to be an isolated occurrence, and is not considered a significant risk given the absence of flow.

12.3 Protection measures

Assuming a gas characterization of CS1 and a Type B building, no additional protection measures are required.

12.4 Radon

No radon protection measures are required.

13. REVISED CONCEPTUAL SITE MODEL

13.1 Geotechnical

The exploratory hole logs and geotechnical testing shows the site to be underlain by the following sequence:

Strata	Depth to base range (average)	Remarks
Made Ground	1.2m to 1.8m (1.4m)	Typically very loose to loose granular soils.
Alluvium	2.0m to 2.4m (2.1m)	Soft sandy CLAY
Thames Gravel	4.3m to 5.6m (5.0m)	Typically medium dense SAND AND GRAVEL.
London Clay	20.6m to 20.8m (20.7m)	Medium strength, becoming very-extremely high strength CLAY.
Lambeth Group	>30.2m	High to extremely high strength sandy CLAY. Bands of calcrete noted within the Lambeth Group.

Groundwater monitoring to date suggests two groundwater bodies are present, with water resting at c. 2.2m in the Thames Gravel/Alluvium. In addition, the water strike noted within BH2 in the Lambeth Group has risen and is resting at c. 2.3m, suggesting sub-artesian conditions.

13.2 Contamination

A summary of the contamination encountered by Westlakes is given in Section 6. Additional investigation is required at post-demolition stage prior to further refinement of the conceptual model in relation to contamination.

Commentary regarding risks to controlled waters is given in Section 16.

No significant risk of hazardous gas has been identified; no protection measures are required.

14. WASTE AND MATERIALS MANAGEMENT

14.1 Materials Management Plan

The required remediation (removal of made ground as part of basement excavation, and import of materials for landscaping) will necessitate provision of a Materials Management Plan (MMP), which should be prepared by the remediation contractor.

It is essential that groundworkers involved in the excavation and handling of materials beneath the site are adequately briefed on the importance good materials management (i.e. not mixing soils from different waste types).

In particular, the made ground and any hydrocarbon impacted soils should be kept separate from other materials.

Any natural soils excavated as part of site preparatory works (i.e. below the basement, for drainage etc) should also be kept separate from all other made ground strata.

14.2 Waste classification

Assessment of any material proposed for off-site disposal should be undertaken in accordance with WM3⁷. At the heart of this guidance is the need to accurately characterise sub-populations of waste via appropriate sampling (ideally when stockpiled). Waste classification should never be determined on the basis of individual sample test results.

Waste Acceptance Criteria (WAC) testing should only be required where material is likely to be disposed of as 'hazardous' based on the WM3 assessment.

Asbestos

In accordance with WM3, soils which contain >0.1% asbestos will be regarded as hazardous waste.

In addition, any soils which contain visible fragments of potentially asbestos-containing materials will be regarded as hazardous waste (if the fragments contain >0.1% asbestos), unless all such fragments can be removed by hand-picking prior to disposal.

Conclusion

Contractors involved in the removal of waste from site should assess the data within Westlakes' report in order to make their own assessment with respect to appropriate waste codes and disposal routes.

⁷ Technical Guidance WM3 – Guidance on the classification and assessment of waste – Environment Agency (2015)

15. QUALITATIVE RISK ASSESSMENT - GROUNDWATER

As noted in Section 3, this site lies within a Source Protection Zone (SPZ) II, associated with abstraction wells for potable supply.

Logs for the abstraction wells are not available online, but water within the region is typically abstracted from the deep chalk aquifer, which is often in hydraulic continuity with the overlying Thanet Sands.

BGS boreholes within the vicinity of the nearest abstraction wells for the potable supply (c. 700m west) show the depth of the London Clay to be 32m, and the to the Thanet Sands and chalk to be 50m and 53m respectively. However, the SPZ is associated with abstraction wells further afield at 1.4km south-east. BGS logs from within this area do not extend as deep, but again show the London Clay to be c. 30m deep.

The investigation by Apex has shown that the London Clay extends beneath this site to c. 20m, with Lambeth Group (predominantly a clay, with granular lenses) to >30m. The water within this stratum is under sub-artesian pressure, resting at c. 2.3m depth.

Monitoring to date (see Section 9) shows groundwater within the Lambeth Group lying at c. 18m beneath the site, with no groundwater observed in the London Clay. Resting water within the Thames Gravel/Alluvium is around 2.2m.

Given the significant thickness of clay between the source of contamination on site (made ground) and the underlying deep aquifer, risks of leaching of any mobile contamination are considered negligible. In addition, the majority of made ground is likely to be removed to accommodate the proposed basement, further reducing the risks by source removal.

Given the above, risks to the underlying SPZ II are considered negligible at this stage. Once pile design has been finalised, this risk assessment should be revisited.

16. FOUNDATIONS

16.1 General

Foundation recommendations given below assume ground levels will not differ significantly from current levels.

Access was not possible within the footprint of the buildings on site. Once demolition is complete, additional investigation should be carried out to verify ground conditions prior to finalising foundation design.

Given the anticipated loadings of the proposed structure, piled foundations will be required, and will need to extend through made ground and superficial deposits, into competent strata below of adequate bearing capacity.

16.2 Piling

The following should be regarded as preliminary advice only. Specialist piling contractors should be requested to provide appropriate pile designs for the proposed development. It is recommended that RG circulate this Report to contractors at an early stage. If required, Apex can undertake pile design.

It is anticipated that piles will need to extend into the London Clay/Lambeth Group to achieve adequate capacity and that a CFA or Bored cast in-situ pile will be the most appropriate pile type for the site.

It should be noted that calcrete was encountered in all boreholes from c. 27m.

Such material may pose a risk to piling operations and could necessitate pre-boring of pile locations where encountered. Further advice should be sought from the piling contractor.

Given the presence of calcrete, it may be more economical to limit pile lengths to above 27m but utilise additional piles/wider piles to avoid having to bore into this material.

Preliminary estimates indicate that 750mm diameter piles at 27m depth will achieve capacities of c.1,800kN.

Preliminary pile capacities will continue to be calculated in conjunction with the structural team at Apex to enable progression of initial design.

Significant obstructions associated with current and past buildings are anticipated, including foundations, floor slabs and possible service runs.

Removal of these obstructions should be undertaken prior to piling. This would be achieved by turnover of made ground with subsequent removal and crushing of obstructions. The resultant excavations should then be backfilled with engineered fill in to enable provision of a piling mat, which should be designed in accordance with BRE guidance⁸. Where removal of deep obstructions is not possible, they should be uncovered and surveyed during demolition in order that impacts on the proposed pile locations can be assessed.

Pile design should be undertaken in accordance with the Environment Agency's guidance booklet "Piling into Contaminated Sites".

Groundwater

Piling contractors should be aware of the potential for sub-artesian groundwater within the Lambeth Group, which may cause construction issues on site.

16.3 Sub-surface concrete

As discussed in Section 11.1, sub-surface concrete should be designed assuming a Design Sulphate class of DS-1 and Aggressive Chemical Environment of Concrete

⁸ Working platforms for tracked plant (BR 470) – BRE (2004)

of AC-1 and for the Made Ground, Alluvium and Thames Gravel. For the London Clay & Lambeth Group, this should be revised to DS-2, AC-2.

Designated mixes should be specified by the structural engineer taking into account soil chemistry long with other structural considerations.

17. BASEMENT FLOOR

Given the presence of cohesive deposits, the base of the excavation for the basement may experience some softening and heave due to the release of pressure caused by removal of the ground above.

This should be factored into basement floor design. Mitigation may include the following:

- Blinding with a layer of concrete to minimise softening effects
- Over-digging the base of the excavation and, prior to placement of the floor slab, place a layer of rolled inert granular material providing a suitable foundation for the slab.
- Use of void formers beneath the ground floor slab, helping to absorb any residual heave of the clay after placement of the final floor finish.

Floor slab design will also need to account for groundwater pressures within the Thames Gravel, depending on final basement levels.

18. PREPARATORY WORKS & CONSTRUCTION ISSUES

18.1 Excavations

Obstructions are anticipated beneath the site, which may require breaking out where they conflict with the line of excavations for service runs, foundations etc.

Stability of excavations in made ground should be expected to be poor and may necessitate shoring.

Inflows of groundwater should be anticipated from c. 2.0m within the made ground/alluvium/Thames Gravel deposits. In order to enable basement construction, a piled wall will be required, with piles extending into the London Clay below. Where the basement floor slab is cast within the London Clay, the comments made in Section 17 should be borne in mind.

If the basement slab is to be cast within the Thames Gravel, significant pumping or dewatering may be required to enable safe construction.

18.2 Site turnover

Turnover of made ground is recommended as part of site preparatory works. This would enable removal of obstructions prior to piling, enable provision of a piling mat, improve stability of excavations for services etc, as well identify any additional areas of grossly contaminated soils.

18.3 Drainage and new water supplies

Based on the ground conditions encountered, soakaways will not provide a suitable means of water disposal at this site. Alternative SUDs should be considered.

Alternative methods of surface water disposal should be explored (in line with the hierarchy defined within the Planning Practice Guidance):

- Attenuated discharge to a surface water body;
- To a public surface water sewer;
- To a highway drain, or other private drainage system; or
- To a combined sewer where there are absolutely no other options, and only where agreed in advance with the relevant sewage undertaker.

Where new water mains are to be laid, UKWIR testing will be required in order to confirm pipe construction materials, as detailed in UKWIR report 10/WM/03/21⁹. This should ideally be carried post-earthworks and after any remediation.

18.4 Existing services

Underground electricity services include electricity, gas, water, sewer, telecoms and fibre optic. This list is not exhaustive.

Consultation is required with service providers in order to ascertain any restrictions or easements required, along with feasibility of diversion (where required).

19. CONCLUSIONS AND RECOMMENDATIONS

19.1 Background & proposed development

The site comprises a series of residential/commercial buildings with a central courtyard in Tottenham, north London.

Proposals include demolition of the existing buildings and re-development a 24-storey purpose-built student accommodation block with basement.

19.2 Ground conditions

The site is underlain by made ground to between 1.2m and 1.8m, with Alluvium and Thames Gravel below to a maximum of 5.6m.

Solid geology below comprises London Clay to c. 21m with Lambeth Group clays below. Calcrete was encountered within the Lambeth Group from c. 27m.

Sub-artesian groundwater has been identified within the Lambeth Group, resting at c.2.2m, confined by the London Clay above. A shallower groundwater body is

⁹ Guidance for the selection of water supply pipes to be used in brownfield sites – UK Water Industry Research (2011)

present within the Thames Gravel, Alluvium & made ground which looks to be in hydraulic continuity between these strata, resting at between c. 2.1m and 2.4m.

19.3 Contamination and remediation

No further assessment of contamination was carried out by Apex. Within Westlakes' investigation, the made ground was found to contain elevated concentrations of metals, asbestos and PAHs.

As noted by Westlakes, post-development, the majority of the made ground will have been removed to accommodate the proposed basement, and any remaining made ground will be isolated beneath the proposed building. Therefore, made ground will be suitably isolated from end-users.

Where residual made ground remains below any proposed soft landscaping, 600mm of clean soil cover will be required to block potential contamination pathways between the made ground and site end-users.

Given the substantial thickness of London Clay beneath the site, and the presence of sub-artesian groundwater within the Lambeth Group, together with the comments above, risks to the underlying Principal Aquifer (Source Protection Zone II) are considered negligible.

Further assessment of contamination should be undertaken once access is available within the current building footprints at post-demolition stage.

19.4 Hazardous gas

No significant risks in relation to hazardous gas have been identified; no protection measures are required.

No radon protection measures are required.

19.5 Foundations

A piled foundation solution is required. Pile design will need to take account of the presence of sub-artesian groundwater within the Lambeth Group, along with presence of calcrete from c. 27m depth.

19.6 Drainage

Given the ground conditions encountered, use of soakaways is not considered feasible; alternative SUDs options should be considered.

19.7 Flooding

The site lies in Flood Zone 2. A Flood Risk Assessment is required.

19.8 UXO

Zetica's UXO report concludes that the site is at Low risk from UXO: *"there is no positive evidence that UXO is present, but its occurrence cannot be totally discounted"*.

No further action is recommended by Zetica in the context of ground investigations (boreholes or excavations). It is recommended that the risk assessment be updated to include proposed piling and construction works.

19.9 Further works

The following additional works are recommended in light of this investigation:

- Post-demolition site investigation within the footprint of existing buildings including trial pitting with chemical analysis on samples of made ground recovered, and cable percussion boreholes to verify deep ground conditions in areas yet to be investigated.
- Updating this report when the supplementary investigations are complete.
- Production of a Remediation Strategy once remediation options are finalised and after the post-demolition site investigation.



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Appendix A – Guidance Notes

Guidance Note A – Preliminary Ground Appraisal (Desk Study)

1. INTRODUCTION

Information sources typically utilised as part of Apex's Preliminary Ground Appraisal (Desk Study) are presented below, along with details on the various issues assessed as part of this phase of investigation.

2. SOURCES OF INFORMATION

The following resources are used to form a conceptual site model and thereby enable identification of risks (both geotechnical and contamination) which may require further assessment as part of an intrusive phase of investigation. Where additional resources have been used, these are referred to in the report's main text.

British Geological Survey

Resources used include:

- BGS' online 'Geology of Britain' viewer
- Online borehole scans
- Mapping sheets (1:50,000 and 1:10,000 scale)
- Geological memoirs to accompany mapping sheets

The above are used to inform the conceptual site model with regards to anticipated ground conditions (including the presence of made ground, drift deposits and bedrock). In addition, BGS resources help inform of likely risks of ground movement associated with mining (e.g., coal, ironstone, sandstone, quarrying etc), and subsidence (e.g., soluble rocks such as limestone and gypsum).

Coal Authority

Resources include:

- Interactive map viewer – this provides an initial 'screen' as to likely mining risks as it determines whether or not the site lies in a Development High Risk Area, a Development Low Risk Area, or lies beyond the CA's defined coalfields.
- Consultant's Mining Report – this includes information on any likely shallow coal mining; recorded mining beneath the site; presence of mine entries, coal outcrops, opencasts which could affect surface stability, and future planned mining. Where issues are highlighted, these are discussed in further detail in the main report's text.
- Additional resources such as abandonment plans, mine entry datasheets and subsidence reports etc might be reviewed on a site-by-site basis.

The above, combined with other resources outlined in this guide, is used to inform risks associated with mining including the likelihood of shallow mine workings

which could cause subsidence, presence of deep made ground (e.g. opencasts) and risks associated with hazardous gas generation.

Landmark Information Group – “Envirocheck” report

This includes information from a wide range of sources, but most notably the Environment Agency, Local Authorities and BGS. Key information reviewed by Apex as part of the Desk Study phase includes:

- Historical OS plans. These typically date back to the mid-19th Century and are reviewed in order to assess past land use which in turn informs the conceptual site model in terms of geotechnical risk and contamination risk. These may also be used to inform risks of unexploded ordnance (UXO) for example, if the site is within an urban setting and/or has past military use.
- Location of landfills, most notably those within 250m of the site to inform risks of gas migration and possible leaching of contaminants.
- Aquifer designations of the underlying geological strata (split between superficial (drift) deposits and bedrock) and categorised as one of the following:
 - Principal Aquifers – typically with high water storage capacity (karstic or intergranular). Major water supply and/or river base flow support.
 - Secondary Aquifers:
 - Secondary A – support water supply at a regional scale
 - Secondary B – limited storage of water supply
 - Secondary Undifferentiated – variable nature of rock type means it cannot be identified solely as A or B.
 - Unproductive strata: little/no permeability; insignificant in terms of water supply/supporting base flow to rivers.
- Presence of Groundwater Source Protection Zones: maps within the Envirocheck report show areas designated as SPZ 1, 2 or 3 based on proximity to groundwater source (e.g. abstraction boreholes, wells, springs etc). Where no shading is shown on the Envirocheck maps, no SPZ is present. Where present, SPZs are discussed in the main text in more detail.
- Nearby surface waters (hydrology) including:
 - Distance and direction to the nearest surface waters
 - Quality of the surface water
- Flood risks including:
 - Flood Zones 1, 2 and 3 associated with flooding from Rivers and Sea, including any areas benefitting from flood defences (see definitions below).
 - Flood Zone 1 – land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding
 - Flood Zone 2 – land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.
 - Flood Zone 3 – land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or

greater annual probability of flooding from the sea (>0.5%) in any year.

- Potential for Groundwater Flooding, split into areas where there is:
 - No shading (no/minimal risk)
 - Limited potential for groundwater flooding to occur
 - Potential for groundwater flooding of property situated below ground level
 - Potential for groundwater flooding to occur at surface
- For groundwater and surface water:
 - Licensed abstractions which could affect/be affected by the site
 - Records of pollution incidents
 - Licensed discharge consents

In addition to the above, the Envirocheck report is screened to look for any additional information pertinent to ground contamination. The 'checklist' of key information used in our assessment is given here:

<https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm/lcrm-stage-1-risk-assessment1>

Zetica's online Risk Maps

This online resource, combined with review of historical plans, is used to help determine whether or not is likely to be at risk from UXO. Where risks are identified, Apex recommend further assessment by a UXO specialist.

Site walkover

As part of a desk study, Apex typically carry out a site walkover. Features which are looked out for include:

- Evidence of contamination/sources of contamination (eg, fuel tanks, machinery storage, staining, spillage etc)
- Mining risks highlighted in the desk study (eg, location of shafts, quarry highwalls)
- Nature of buildings on site (including: evidence of damage, presence of potential ACM, current use)
- Topography (eg, presence of retaining walls, steep slopes, evidence of movement)
- Surface waters (eg, field drains, ditches, springs, evidence of contamination within them)
- Current land use

In addition to the above, on operational sites, Apex will conduct interviews with site users/staff where possible to gain more insight into the former and current processes taking place (including details of waste generated, location of key features such as fuel tanks, materials storage etc).

¹ Land Contamination Risk Management (8th October 2020)

3. CONCEPTUAL SITE MODEL

The above information sources enable formulation of the Conceptual Site Model (CSM). This forms the basis of the contamination risk assessment by using the Source-Pathway-Receptor principal: identification of contamination sources, identification of receptors (most notably human health, waters and vegetation) and pathways between the two. This model is used in the context of each site's proposed development in to assess whether a significant risk exists, and therefore if further assessment (intrusive investigation) is warranted.

As well as contamination risks, the CSM is also used to identify any geotechnical risks which might affect the proposed development (for example, presence of obstructions, deep made ground, mining issues).

Where further assessment is required, the CSM is used as a basis to design the ground investigation.

Guidance Note B – Fieldwork

1. UK GUIDANCE

Ground investigation fieldwork undertaken by Apex Consult (SY) Ltd is done so in general accordance with UK guidance. Most notably, in planning and carrying out ground investigation fieldwork, the following documents are referred to: BS5930:2015¹; BS10175²; LCRM³, BS8004⁴, BS1377-9⁵.

2. GROUND INVESTIGATION DESIGN

Locations

Locations of exploratory holes are selected after formulation of the site's conceptual site model, which looks at geotechnical and contamination risks. Positions of exploratory holes are selected in order to resolve uncertainties highlighted by the conceptual model (for example, checking for obstructions associated with a former builder or to enable sampling close to a former fuel tank, etc). In addition, hole locations are selected to gain a general view of the strata across the site to enable refinement of the conceptual site model.

On site, positions may be altered due to access constraints or risks posed by service runs. Further exploratory holes might be advanced to enable delineation of features such as grossly contaminated soils, poor ground, etc.

Techniques

The following techniques are typically utilised depending on ground conditions and site constraints:

- Trial pitting – used wherever possible as this allows better quality representative sampling and a more thorough inspection of the ground (stability, ease of excavations, etc) than techniques such as windowless sampling. Limited to around 3-4m depth or presence of bedrock. Hand shear vane tests are carried out in cohesive soils throughout trial pitting to enable assessment of undrained shear strength.
- Windowless sampling – typically used where access constraints prevent trial pitting and/or to enable installation of monitoring wells to up to c. 5m depth. Limited to around 3-4m depth or presence of bedrock. Where appropriate, standard penetration tests (SPTs) might be carried out in granular soils. Whilst hand-vane tests can be carried out, they are considered less reliable than those within trial pits due to the disturbance caused during drilling.
- Cable percussion boreholes – Used where geotechnical parameters and detailed inspection of ground conditions are required from depths greater than can be reached with trial pitting/window sampling techniques. SPTs

¹ Code of practice for ground investigations (2015+A1:2020)

² Investigation of potentially contaminated sites – code of practice (2011 + A2:2017)

³ Land Contamination Risk Management (8th October 2020)

⁴ Code of practice for foundations (2015+A1:2020)

⁵ Methods of test for soils for civil engineering purposes. In-situ tests (1990)

are typically undertaken at c. 1m intervals to allow assessment of the density of granular soils and/or estimation of undrained shear strength of cohesive soils. Within cohesive soils, SPTs are usually alternated with collection of UT100 samples (undisturbed samples). Depending on ground conditions, use of dynamic sampling or rotary drilling with a casing system (for example, Odex/Duplex drilling) gives similar results, but might be considered more appropriate. This is discussed with the drilling contractor prior to fieldwork.

- Rotary open-hole drilling – typically used in coal mining investigations to look at the depth and thickness of underlying coal seams (and/or evidence of mineworking's). Generally, at least 3 holes are taken to c. 30m depth below rockhead in all coal mining investigations, with additional boreholes drilled to the depths of the targeted coal seams.
- Rotary core drilling – this is utilised where detailed information (fracture spacing, RQD TCR values) is needed from bedrock, usually for pile design. Rotary coring also enables recovery of rock samples for strength tests such as point load index and unconfined compressive strength (UCS).

During drilling, installations to monitor for hazardous gas and/or groundwater might be installed as per the Engineer's instructions.

Other ground investigation techniques (such as hand-excavated inspection pits, CPTs, etc) might be utilised on certain sites depending on ground conditions and redevelopment proposals.

3. SAMPLING

Usually, at least one sample is taken from each stratum encountered in each exploratory hole, with particular attention paid to made ground deposits within the uppermost 1m. Unless stated otherwise, samples taken are representative of the stratum encountered at a given depth. In trial pitting, this involves taking samples from around the side walls of the entire trial pit (where possible) and not from a specific point. Where a 'spot' sample is required (for example, a sample of lens of ash & clinker or oily fill), this is clearly denoted on the sample by an "★" and in the Engineer's notebook.

Samples are collected in containers appropriate for their proposed analysis, as dictated by laboratory requirements. Typically, this means that the following containers are needed for soils:

- For chemical analysis: 50ml glass jar, 500ml glass jar, and 500ml plastic tub
- For geotechnical analysis on disturbed samples: 500ml plastic tub, and bulk bags

Once collected, all samples scheduled for chemical analysis are stored in cool boxes at c. 4°C. Samples scheduled for asbestos ID are 'double bagged' (i.e., plastic tubs stored within a plastic bulk bag).

If groundwater sampling is required, typically 2 x 1 litre glass bottled, and 2 x 50ml glass vials will be collected from each sample point. However, specific instructions regarding containers will be discussed with the laboratory.

4. ENGINEERING SUPERVISION & LOGGING

During fieldwork, full time engineering supervision is required. The Engineer logs the ground conditions in general accordance with BS 5930 including observations on groundwater, stability, ease of excavation, and any visual/olfactory evidence of organic contamination.

Guidance Note D – Geotechnical Testing & Assessment

The following geotechnical analysis is commonly undertaken by Apex. All testing is done in accordance with the specified methods outlined in BS1377:1990.

Any additional testing not listed below and/or deviations from set procedures will be stated in the report's main text.

1. UNDRAINED, UNCONSOLIDATED TRIAXIAL TESTING

The above is frequently scheduled on undisturbed samples (ideally UT100s) as a method of assessing undrained shear strength of cohesive soils in the worst-case scenario (i.e. during loading, where excess pore pressure has not dissipated, meaning effective strength is at its lowest).

Where possible, tests are scheduled on a single 100mm diameter specimen as opposed to 3no. 38mm diameter sub-specimens to minimise the risk of sample disturbance.

Samples are typically scheduled for analysis at a confining pressure roughly equal to overburden pressure.

2. OEDOMETER (CONSOLIDATION) TESTS

This testing is undertaken to enable assessment of consolidation settlement in clays for a given load. This is usually done for cohesive soils other than those which are over-consolidated and/or where significant ground surcharge is anticipated.

Samples are scheduled to include 4 loading pressures and one unloading pressure. In accordance with BS1377, the initial pressure is determined by the soil's origin and strength and where possible, the scale of pressures should include at least one which is equal to (or greater than) the likely maximum pressure to be imposed on the soil.

The results are used to give typical coefficient of volume compressibility (m_v) values for ground types across a range of depths. This is used in settlement calculations and might be used by others in pile design for example.

3. ATTERBERG LIMITS

Atterberg Limits testing is carried out on samples of cohesive soils to help determine minimum foundation depths including the impact of any tree influence, requirements for heave precaution etc.

The test involves determination of the Liquid and Plastic Limits of cohesive soils using the rolling thread test cone penetrometer method.

Results received are modified by Apex in line with BRE Special Digest 240¹ and NHBC Chapter 4.2² in order to determine a soil's volume change potential (aka. shrinkability). Data is typically grouped into ground types and average shrinkability values are used for each type. However, where a significant number of samples of yield results in a higher shrinkability category to that of the average, the ground type is conservatively assigned the higher shrinkability category.

This may also be used in conjunction with Particle Size Distribution tests (PSDs) to determine whether a particular soil/sample should be classed as potentially shrinkable or not. This is done by looking at the 'fines' content (%< 63µm) from the PSD test along with the modified plasticity indices. Where the soil contains <35% fines and/or has a modified PI value of <10%, it can be regarded as non-shrinkable (in accordance with NHBC Chapter 4.2).

4. Sulphate and pH

Samples are scheduled for pH and water-soluble sulphate analysis in order to determine the Aggressive Chemical Environment for Concrete (ACEC) classification along with the Design Sulphate (DS) class in accordance with the requirements of BRE SD1³.

Where groundwater samples are available, sulphate results from groundwater may be used in addition to soil results.

On all sites, pH and water-soluble sulphate analysis is scheduled on each ground type. On brownfield sites, testing for nitrate and chloride is also undertaken. These are converted to equivalent sulphate values ($\text{NO}_3 \times 0.77$ and $\text{Cl} \times 1.35$) and are added to the water-soluble sulphate results for each sample.

Where sulphate readings are >3,000mg/l, magnesium concentrations are also considered.

Where there is a risk of pyrite (iron sulphide) within the ground (as identified by the desk study), total sulphur and total sulphate may also be scheduled in order to determine the "total potential sulphate (TPS)". However, the risks to concrete associated with pyrite need only be considered where ground is 'disturbed'. Examples include colliery spoil or cut slopes. For a typical shallow foundation within in-situ natural soils, pyrite should not present a significant risk.

Results are used to determine the highest water-soluble sulphate (or TPS where risks of pyrite need to be considered) and lowest pH for each soil type. Where >10 samples for each soil type are available, the mean of the highest/lowest 20% of values for water-soluble sulphate/pH are used respectively.

The results from the above are used to determine the ACEC and DS classes for static and mobile groundwater using Tables C1 (for greenfield sites) and C2 (for brownfield sites) of BRE SD1. Where flowing groundwater is identified (eg springs), additional consideration of carbon dioxide may be required.

¹ Low-rise buildings on shrinkable soils (1993)

² Building Near trees - NHBC Standards (2021)

³ Concrete in aggressive ground - third edition (2005)

Guidance Note E – Hazardous Gas

1. RADON

Radon is a naturally occurring radioactive gas formed by underlying uranium and radium containing bedrock. Where radon is able to migrate into buildings, it can pose a risk to human health.

An Action Level for radon has been determined by Public Health England (PHE) as an annual average concentration in the home of 200 Bqm⁻³. A Target Level of 100 Bqm⁻³ was also determined for preventative action in new homes and as a remedial target in existing homes.

To assess radon risk, Apex refer to the PHE website which splits the UK into 1km grid squares. Each square is given a “maximum radon potential”, which corresponds to the percentage of homes in that grid square estimated to be above the radon Action Level. The categories are: <1%, 1-3%, 3-5%, 5-10%, 10-30% and >30%.

Radon protection measures are detailed in BRE Report BR211¹ which refers to ‘Basic’ and ‘Full’ measures. Building Regulations requires measures in radon affected areas as follows:

- **Basic** – in areas with a maximum radon potential of >3%, but less than 10%
- **Full** – in areas with a maximum radon potential of >10%

It should be noted however that PHE’s advice is to include basic measures in all homes where the maximum radon potential is >1%.

The Action and Target levels should also be applied to schools and non-residential structures where occupancy is greater than 2,000 hours per year.

Where this is a significant radon risk, Apex may also use higher-resolution radon risk maps from BGS to determine areas of higher/lower risks within a given 1km grid square.

2. OTHER GASSES

Hazardous gasses pose a potential risk of explosion, asphyxiation or poisoning in new structures.

Conceptual site model

Gas risks are considered by Apex as part of the conceptual site model (see Note A – Preliminary Ground Appraisal). Potential sources may include landfills (most notably those within 250m); backfilled historical features (e.g. ponds, quarries, clay pits, railway cuttings); spillages of volatile contaminants; naturally occurring geological deposits (e.g. coal, peat, limestone); mineworkings; significant depths of made ground.

¹ Radon: guidance on protection measures for new buildings – BRE Report 211 (2015)

The main hazardous gasses generated by degradation of materials (such as in the case of landfills, backfilled features, organic-deposits and made ground) are carbon dioxide and methane, along with depleted oxygen. These pose a risk of asphyxiation and potential explosion where they accumulate within buildings. Mineworkings also pose a significant risk of methane and carbon monoxide generation.

As part of the conceptual site model, migration pathways for hazardous gasses are assessed. These may include natural fissures, cavities, fractures, fault lines and movement along any permeable strata. Man-made features such as service runs, shafts and tunnels may also create preferential migration pathways. Low permeability layers (e.g. clay) and groundwater levels may also influence gas flow.

Investigation

Depending on the level of risk, as determined by the conceptual site model (see above), an intrusive gas investigation may be required.

Where this is the case, gas monitoring wells are placed across the investigation area. Wells are located to target the potential gas source, and their response zones are carefully installed within specific strata to enable robust assessment of gas risk. UK Guidance including BS8576² and CIRIA C665³ is referred to help determine the number of wells and monitoring frequency.

Monitoring typically involves measurement of:

- Peak and steady gas flow
- Peak and steady carbon dioxide and methane concentrations
- Minimum oxygen concentration
- Groundwater level and base of well

Where groundwater levels are above the well response zone, wells are bailed and re-monitored within the same visit. Concentrations of hydrogen sulphide, carbon monoxide and volatiles (using a photo-ionisation detector) may also be monitored on some sites.

At least one monitoring visit (ideally more) should be undertaken during, or immediately after, periods of falling atmospheric pressure, as well as during periods of low pressure (<1000mb).

Interpretation

Results are used to calculate a gas screening value (GSV):

$$\text{GSV} = \text{gas concentration (\%)} / 100 \times \text{flow rate (ltr/hr)}$$

Typically, GSVs are determined using the maximum recorded steady concentration of a given gas in any borehole and the maximum recorded flow rate in any borehole. However, on some sites it may be deemed appropriate to zone the site based on gas risk, and/or to use peak readings. This is discussed on site-specific basis within the final Gas Risk Assessment.

² Guidance on investigations for ground gas - British Standards (2013)

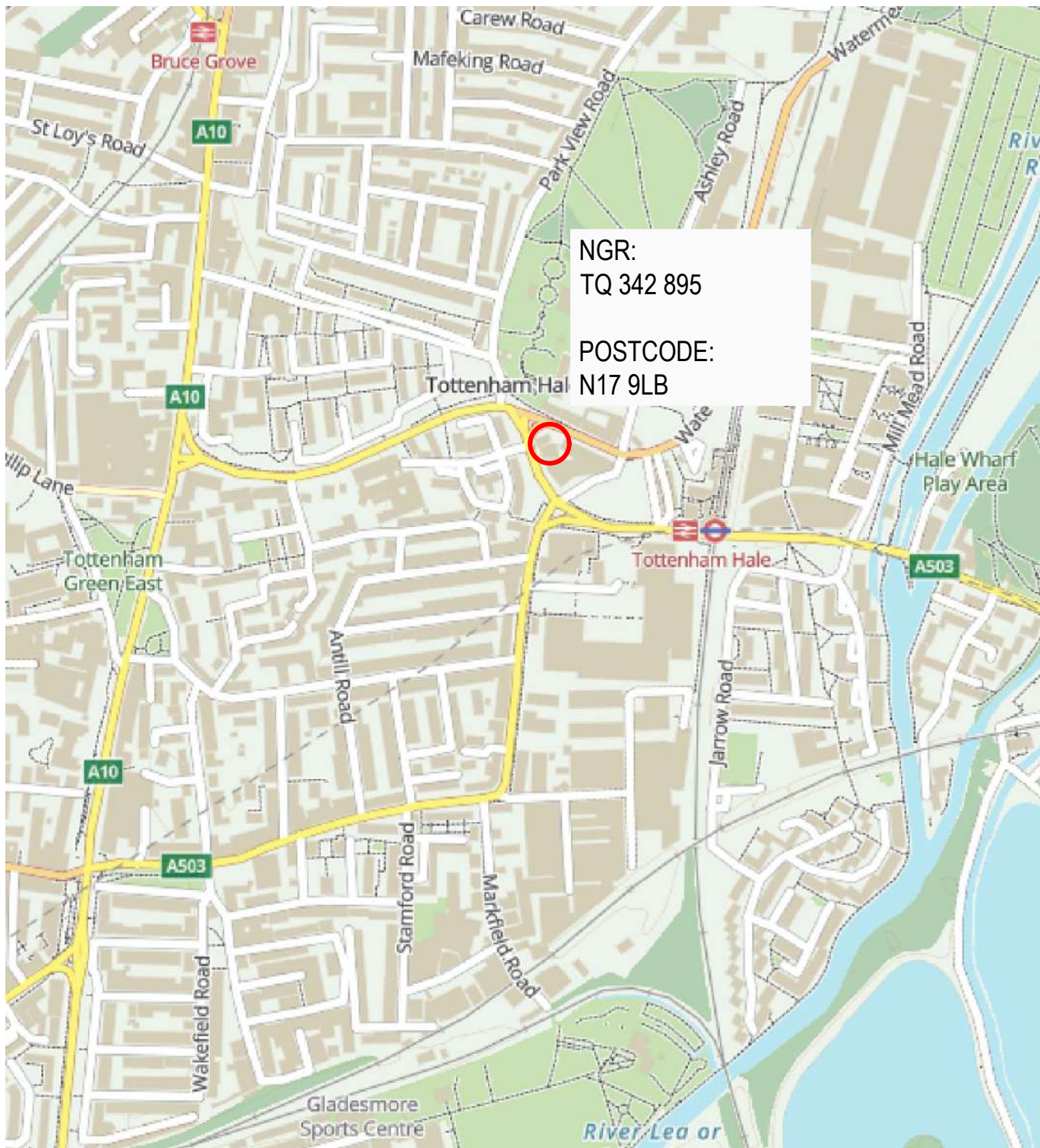
³ Assessing the risks posed by hazardous ground gases to buildings - CIRIA (2007)

Guidance on the level of protection required based on GSVs and typical maximum readings throughout monitoring are given in Wilson & Card⁴; CIRIA C665 and BS8576.

Monitoring results, combined with the guidance above are used to determine appropriate gas protection measures for the proposed structures. As part of this assessment, other factors such as the required foundations and floor slabs (as determined by the geotechnical site constraints) are considered to ensure a feasible solution is recommended.

⁴ Reliability and Risk in Gas Protection Design – Wilson SA and Card GB (1999)

Appendix B – Drawings



Project

TOTTENHAM HALE, LONDON

Title

001 - SITE LOCATION PLAN

Job No.

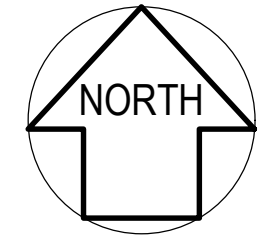
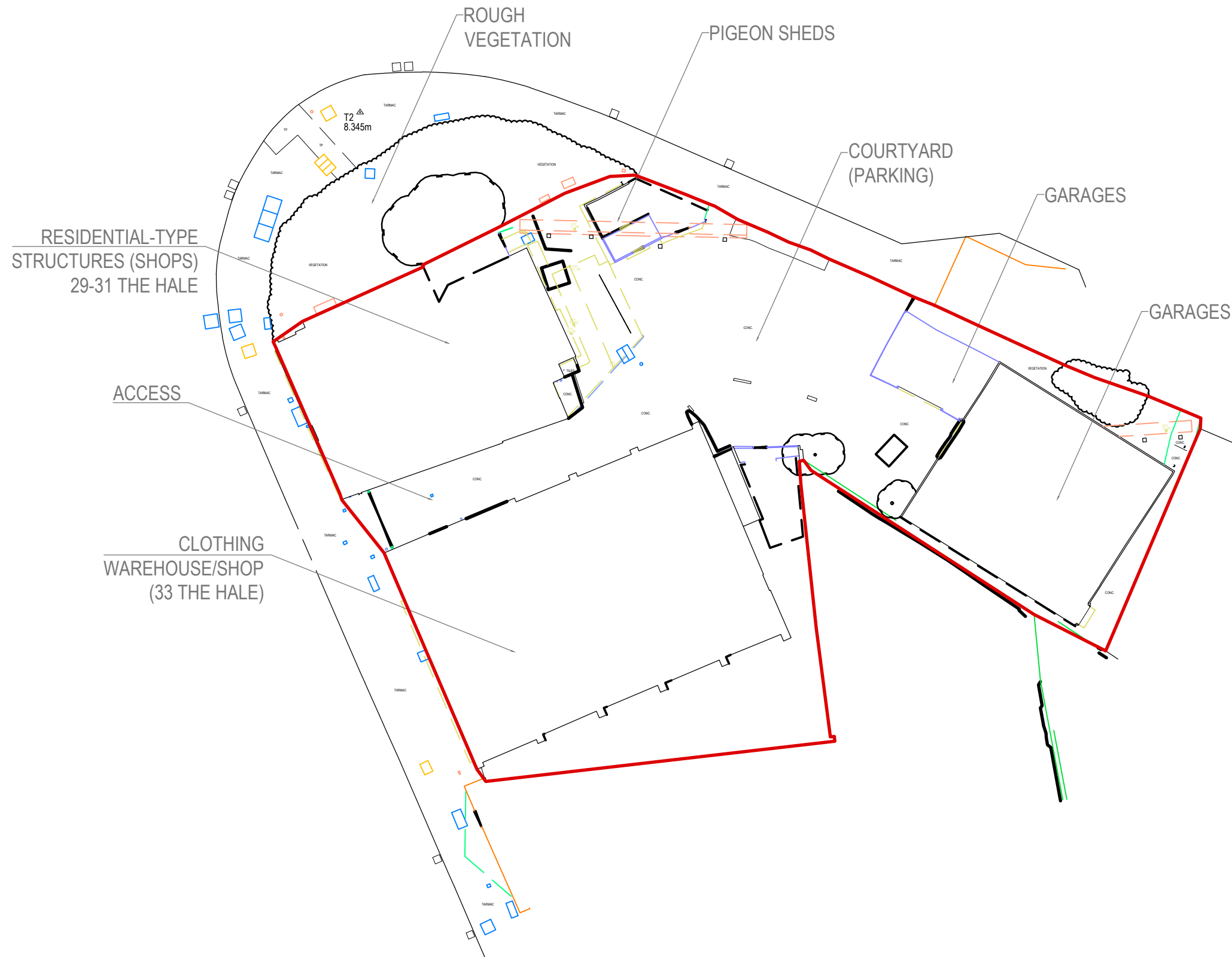
1305

A4



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Apex Consulting Engineers is the trading name of Tier Consult (SY) Limited



— APPROXIMATE SITE BOUNDARY

Client



Project

TOTTENHAM HALE

Scale

1:250 @ A3

Date

APRIL 2024

Title

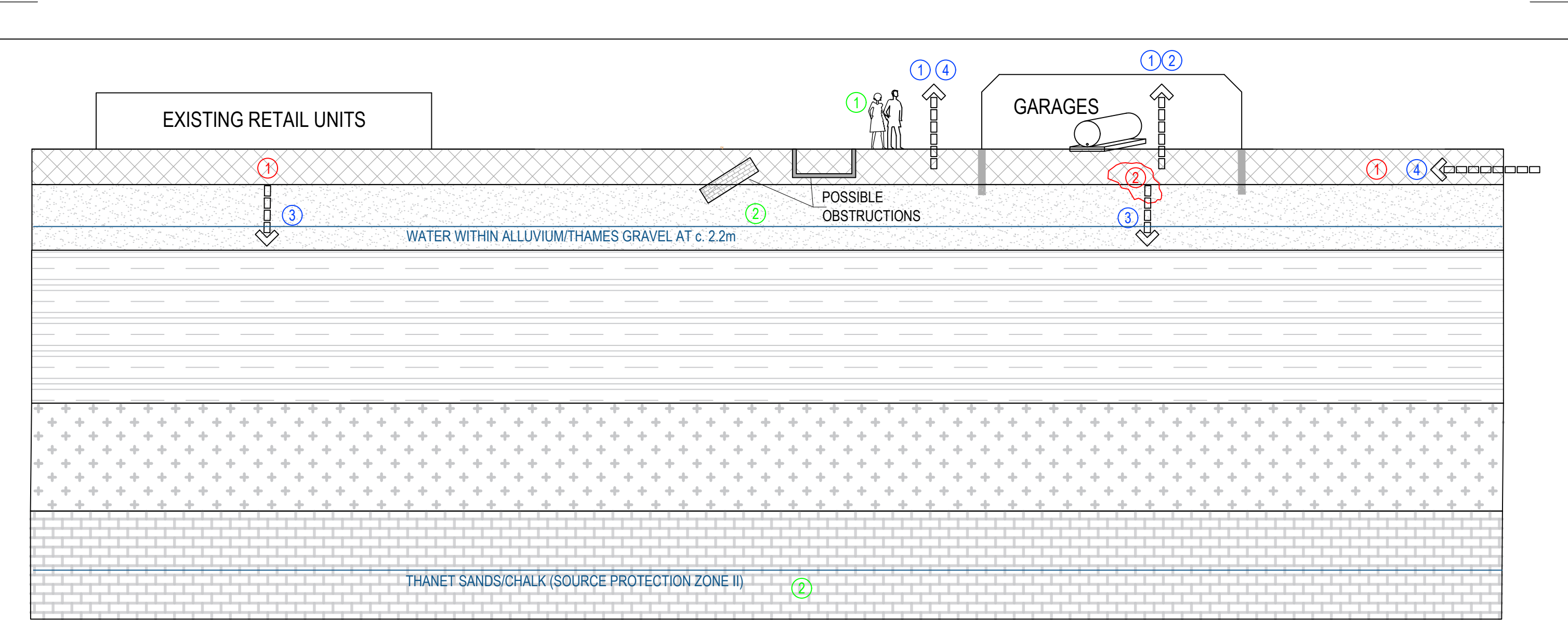
002 - SITE FEATURES

A3



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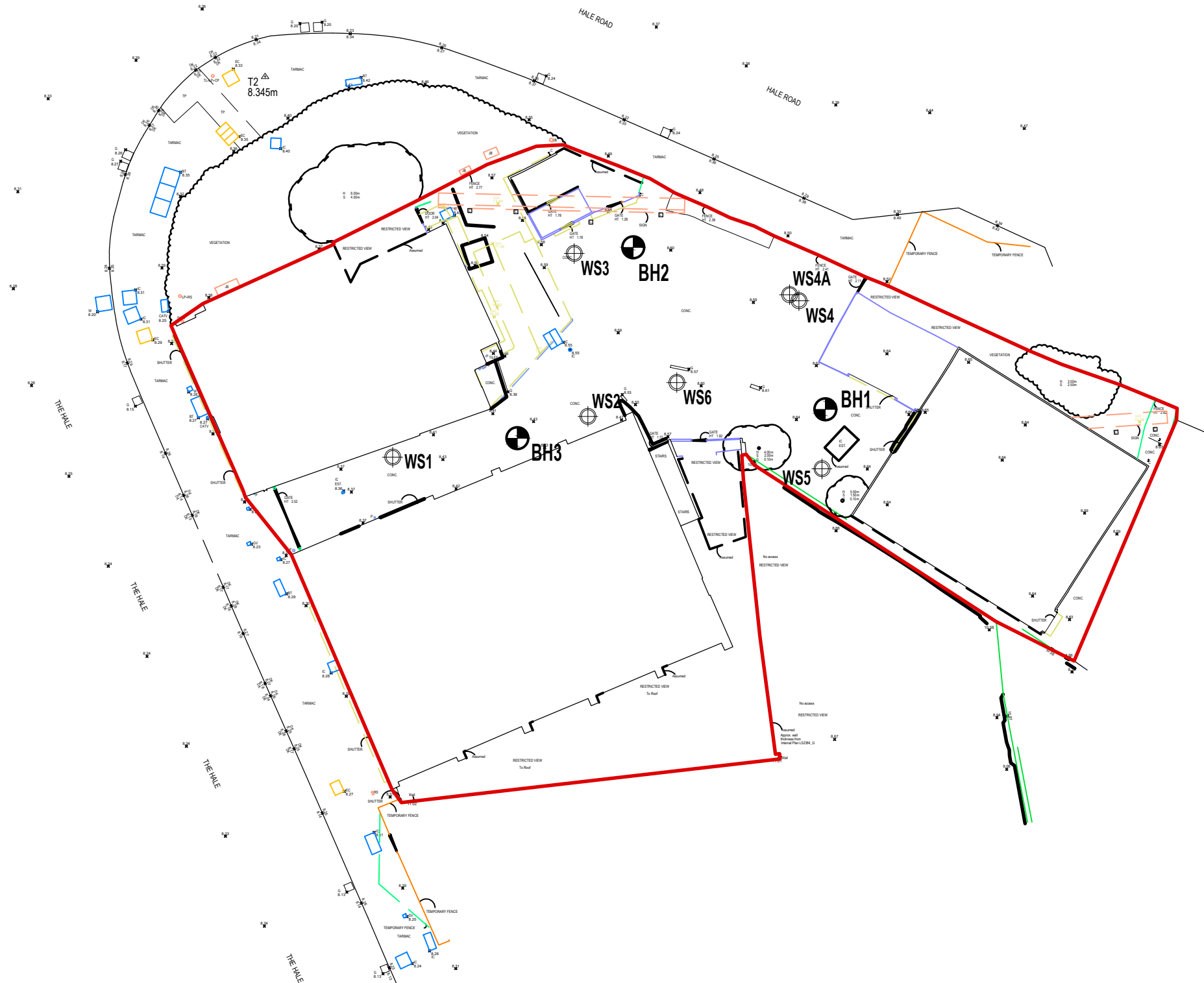
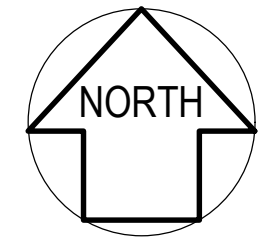


GROUND TYPES	SOURCES	PATHWAYS	RECEPTORS
 MADE GROUND	① MADE GROUND (including inorganics, PAH & asbestos identified by Westlakes)	① DERMAL CONTACT, INGESTION, INHALATION OF DUST	① HUMAN HEALTH
 ALLUVIUM/THAMES GRAVEL	② SPILLAGE/ LEAKAGE (areas used for car maintenance)	② VOLATILISATION	② GROUNDWATER
 LONDON CLAY		③ LEACHING	
 LAMBETH GROUP		④ GAS MIGRATION	
 CHALK BEDROCK			

NOTE: FURTHER REFINEMENT REQUIRED FOLLOWING RECOMMENDED POST-DEMOLITION TRIAL PITTING & CHEMICAL ANALYSIS

Client	Project	Scale
	TOTTENHAM HALE, LONDON	Not to scale
	Title	Date
	005 - CONCEPTUAL SITE MODEL	APRIL 2024

A3



-  BOREHOLE LOCATION (APEX 2024)
-  WINDOW SAMPLE LOCATION (WESTLAKES 2022)*
-  APPROXIMATE SITE BOUNDARY

*NOTE - Not surveyed in, taken from overlay of Westlakes drawing

Client  A3	Project TOTTENHAM HALE Title EXPLORATORY HOLE LOCATIONS	Scale 1:250 @ A3 Date APRIL 2024
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Appendix C – Search Extracts

Envirocheck[®] Report:

Datasheet

Order Details:

Order Number:

343014274_1_1

Customer Reference:

1305

National Grid Reference:

534270, 189580

Slice:

A

Site Area (Ha):

0.11

Search Buffer (m):

1000

Site Details:

14, Hale Road

LONDON

N17 9LB

Client Details:

Mr M Thompson

Apex Consulting Engineers Ltd

Unit 3 Acres Hill Business Park

2 Acres Hill Lane

Sheffield

South Yorkshire

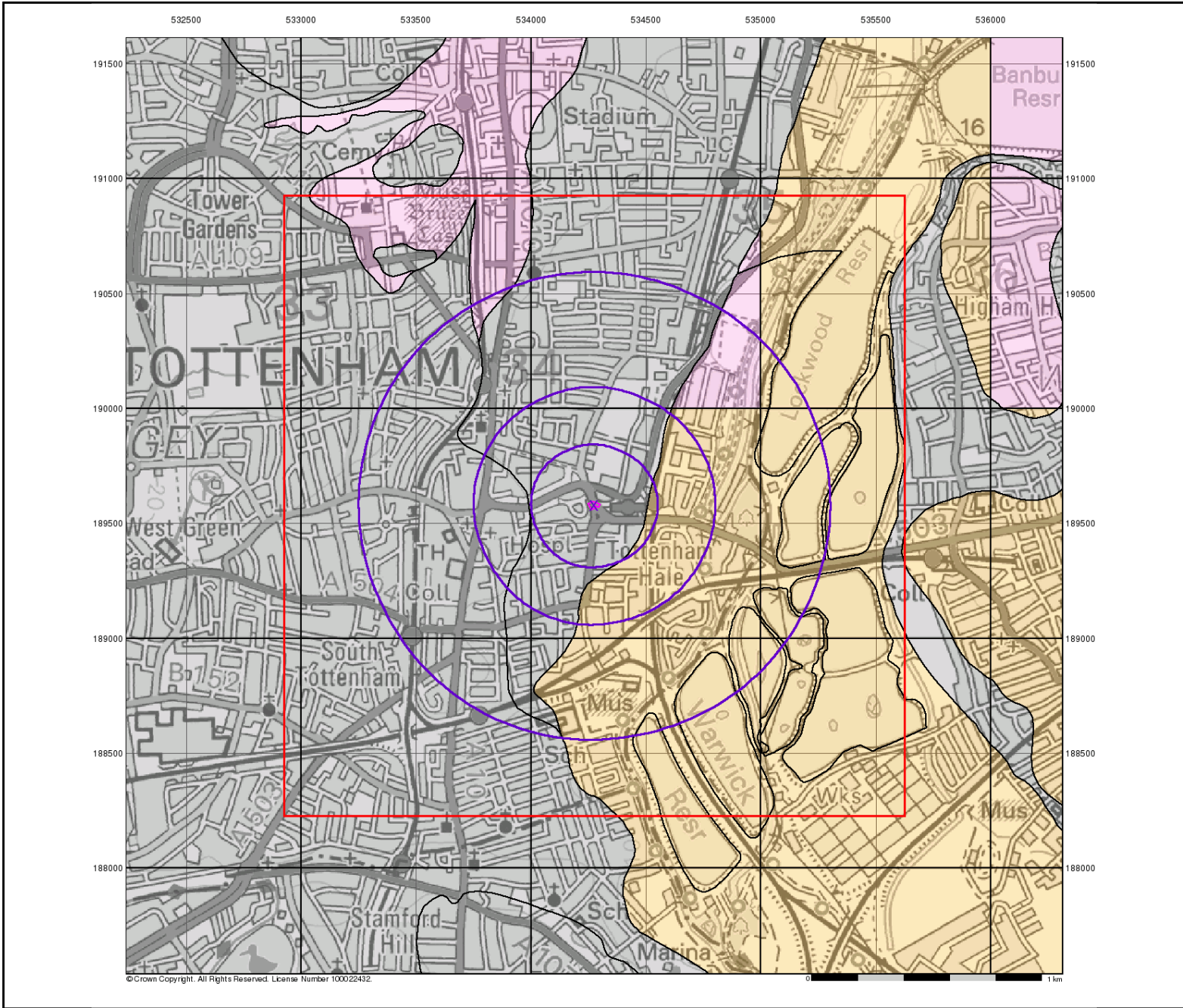
S9 4LR

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Agency & Hydrological					
BGS Groundwater Flooding Susceptibility					n/a
Contaminated Land Register Entries and Notices					
Discharge Consents	pg 1			1	14
Prosecutions Relating to Controlled Waters			n/a	n/a	n/a
Enforcement and Prohibition Notices					
Integrated Pollution Controls					
Integrated Pollution Prevention And Control	pg 4			1	
Local Authority Integrated Pollution Prevention And Control					
Local Authority Pollution Prevention and Controls	pg 4			1	11
Local Authority Pollution Prevention and Control Enforcements					
Nearest Surface Water Feature	pg 6			Yes	
Pollution Incidents to Controlled Waters	pg 6			11	22
Prosecutions Relating to Authorised Processes					
Registered Radioactive Substances					
River Quality	pg 12			4	
River Quality Biology Sampling Points	pg 12				1
River Quality Chemistry Sampling Points	pg 13			2	
Substantiated Pollution Incident Register	pg 14			6	5
Water Abstractions	pg 16			3	3 (*32)
Water Industry Act Referrals					
Groundwater Vulnerability Map	pg 25	Yes	n/a	n/a	n/a
Groundwater Vulnerability - Soluble Rock Risk			n/a	n/a	n/a
Groundwater Vulnerability - Local Information			n/a	n/a	n/a
Bedrock Aquifer Designations	pg 25	Yes	n/a	n/a	n/a
Superficial Aquifer Designations	pg 25	Yes	n/a	n/a	n/a
Source Protection Zones	pg 25	1		1	2
Extreme Flooding from Rivers or Sea without Defences	pg 26	Yes	Yes	n/a	n/a
Flooding from Rivers or Sea without Defences				n/a	n/a
Areas Benefiting from Flood Defences				n/a	n/a
Flood Water Storage Areas				n/a	n/a
Flood Defences				n/a	n/a
OS Water Network Lines	pg 26			13	31

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Waste					
BGS Recorded Landfill Sites					
Historical Landfill Sites	pg 32				1
Integrated Pollution Control Registered Waste Sites					
Licensed Waste Management Facilities (Landfill Boundaries)					
Licensed Waste Management Facilities (Locations)	pg 32		2		4
Local Authority Landfill Coverage		1	n/a	n/a	n/a
Local Authority Recorded Landfill Sites					
Potentially Infilled Land (Non-Water)					
Potentially Infilled Land (Water)	pg 33		1	2	9
Registered Landfill Sites					
Registered Waste Transfer Sites	pg 34		2		4
Registered Waste Treatment or Disposal Sites	pg 36				3
Hazardous Substances					
Control of Major Accident Hazards Sites (COMAH)					
Explosive Sites					
Notification of Installations Handling Hazardous Substances (NIHHS)					
Planning Hazardous Substance Consents					
Planning Hazardous Substance Enforcements					

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Geological					
BGS 1:625,000 Solid Geology	pg 38	Yes	n/a	n/a	n/a
BGS Estimated Soil Chemistry	pg 38				Yes
BGS Recorded Mineral Sites					
BGS Urban Soil Chemistry	pg 38		Yes	Yes	Yes
BGS Urban Soil Chemistry Averages	pg 41	Yes			
CBSCB Compensation District			n/a	n/a	n/a
Coal Mining Affected Areas			n/a	n/a	n/a
Mining Instability			n/a	n/a	n/a
Man-Made Mining Cavities					
Natural Cavities					
Non Coal Mining Areas of Great Britain				n/a	n/a
Potential for Collapsible Ground Stability Hazards	pg 41	Yes		n/a	n/a
Potential for Compressible Ground Stability Hazards	pg 41		Yes	n/a	n/a
Potential for Ground Dissolution Stability Hazards				n/a	n/a
Potential for Landslide Ground Stability Hazards	pg 41	Yes		n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 42		Yes	n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 42	Yes	Yes	n/a	n/a
Radon Potential - Radon Affected Areas			n/a	n/a	n/a
Radon Potential - Radon Protection Measures			n/a	n/a	n/a
Industrial Land Use					
Contemporary Trade Directory Entries	pg 43		32	115	269
Fuel Station Entries	pg 79		1		1
Points of Interest - Commercial Services	pg 79		8	20	57
Points of Interest - Education and Health					
Points of Interest - Manufacturing and Production	pg 86		10	8	70
Points of Interest - Public Infrastructure	pg 94		7	3	31
Points of Interest - Recreational and Environmental	pg 97		1	7	28
Gas Pipelines					
Underground Electrical Cables	pg 100			4	19

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Sensitive Land Use					
Ancient Woodland					
Areas of Adopted Green Belt	pg 103			1	2
Areas of Unadopted Green Belt					
Areas of Outstanding Natural Beauty					
Environmentally Sensitive Areas					
Forest Parks					
Local Nature Reserves					
Marine Nature Reserves					
National Nature Reserves					
National Parks					
Nitrate Sensitive Areas					
Nitrate Vulnerable Zones	pg 103		1		
Ramsar Sites	pg 103				1
Sites of Special Scientific Interest	pg 103				1
Special Areas of Conservation					
Special Protection Areas	pg 103				1
World Heritage Sites					



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Groundwater Vulnerability

General
Specified Site Specified Buffer(s) Bearing Reference Point

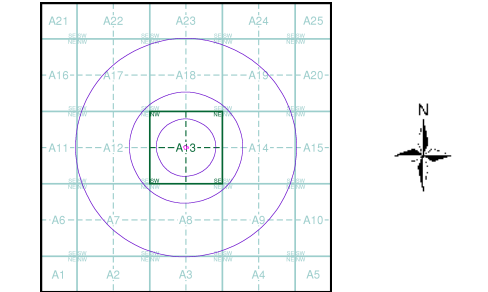
Slice Map ID

Agency and Hydrological

Bedrock Aquifers	Superficial Aquifers
High Vulnerability, Principal Aquifer	High Vulnerability, Principal Aquifer
High Vulnerability, Secondary Aquifer	High Vulnerability, Secondary Aquifer
Medium Vulnerability, Principal Aquifer	Medium Vulnerability, Principal Aquifer
Medium Vulnerability, Secondary Aquifer	Medium Vulnerability, Secondary Aquifer
Low Vulnerability, Principal Aquifer	Low Vulnerability, Principal Aquifer
Low Vulnerability, Secondary Aquifer	Low Vulnerability, Secondary Aquifer

Unproductive Aquifer
Soluble Rock

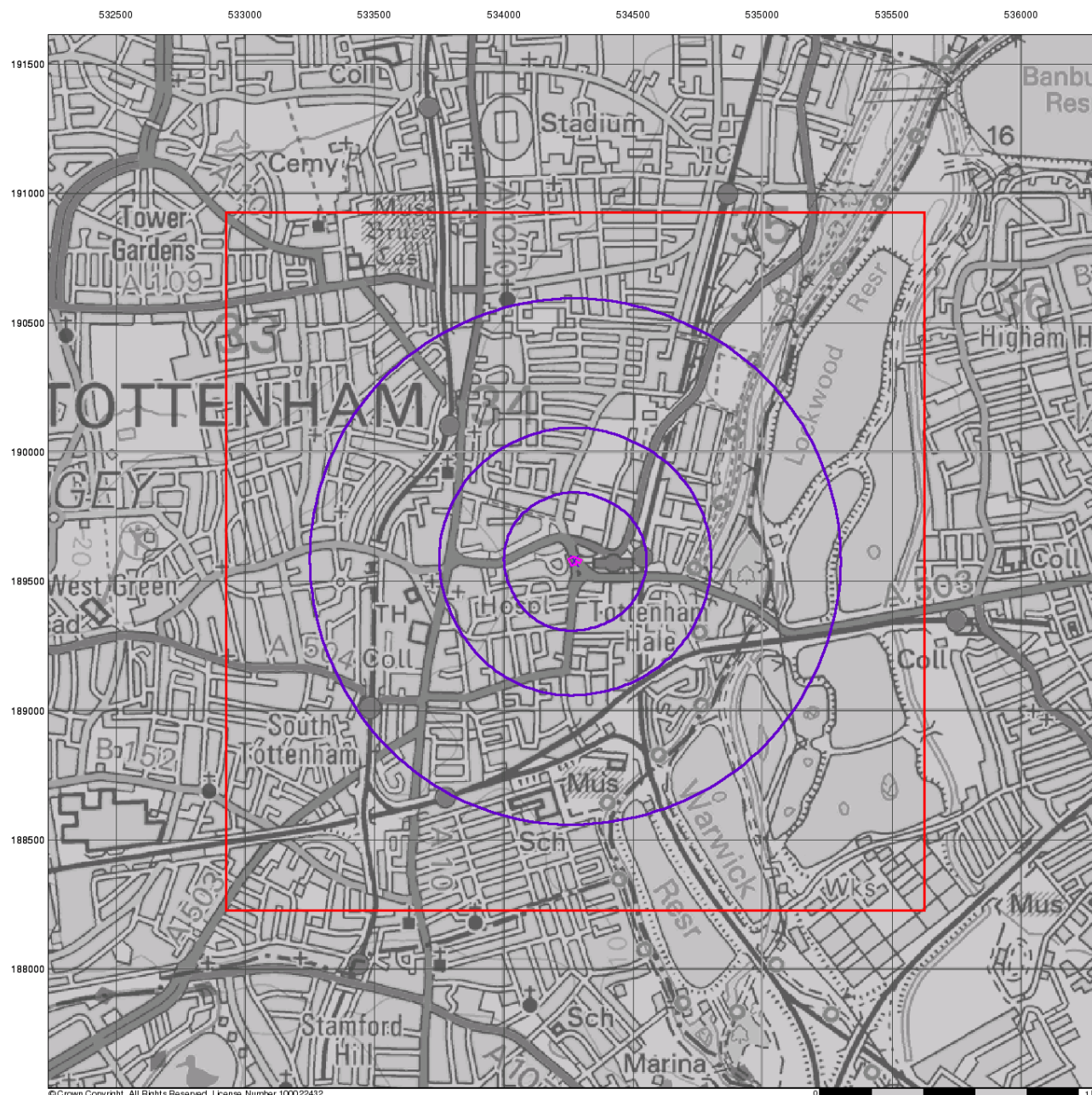
Site Sensitivity Context Map - Slice A



Order Details
Order Number: 343014274_1_1
Customer Ref: 1305
National Grid Reference: 534270, 189580
Slice: A
Site Area (Ha): 0.11
Search Buffer (m): 1000

Site Details
14, Hale Road, LONDON, N17 9LB

Landmark®
INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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0 1 km

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Bedrock Aquifer Designation

General

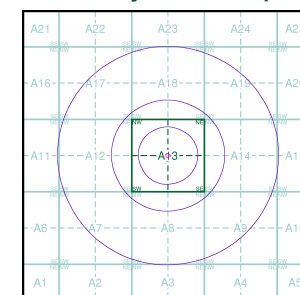
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A



Order Details

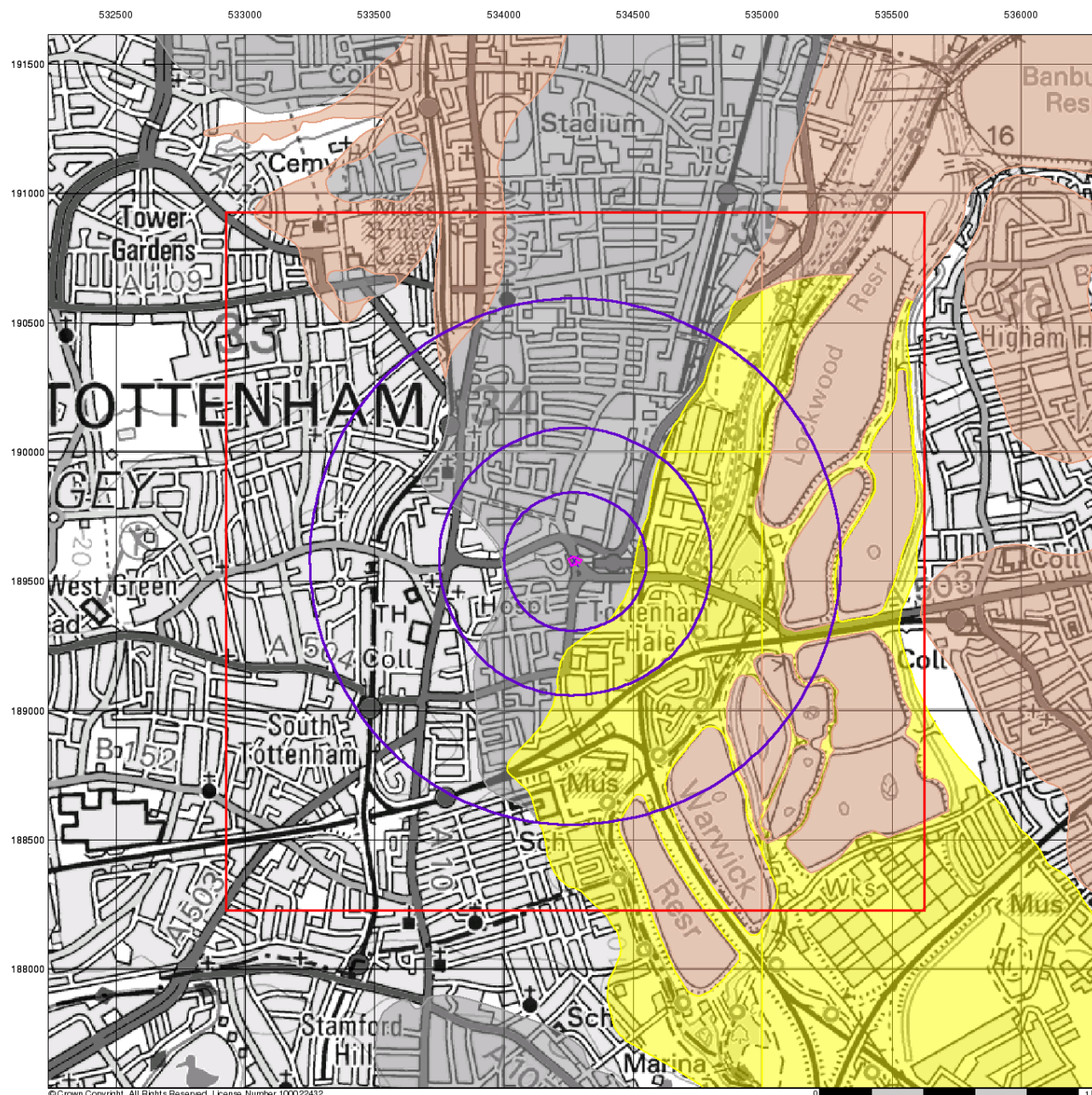
Order Number: 343014274_1_1
 Customer Ref: 1305
 National Grid Reference: 534270, 189580
 Slice: A
 Site Area (Ha): 0.11
 Search Buffer (m): 1000

Site Details

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0 1 km

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Superficial Aquifer Designation

General

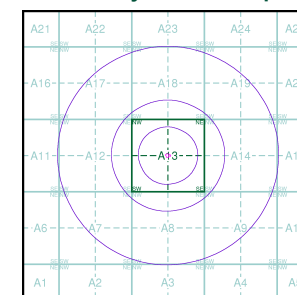
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A



Order Details

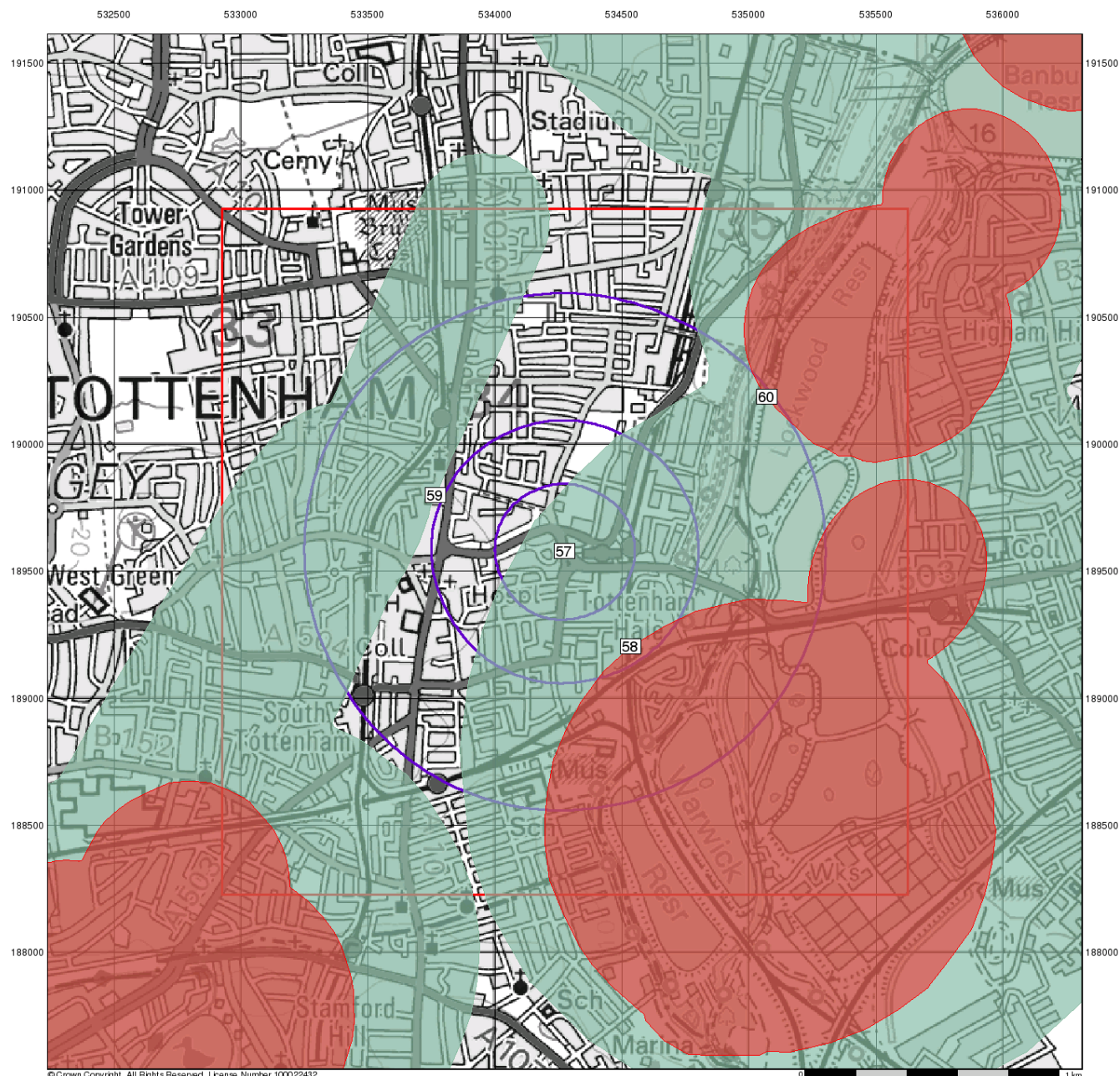
Order Number: 343014274_1_1
 Customer Ref: 1305
 National Grid Reference: 534270, 189580
 Slice: A
 Site Area (Ha): 0.11
 Search Buffer (m): 1000

Site Details

14, Hale Road, LONDON, N17 9LB

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Source Protection Zones

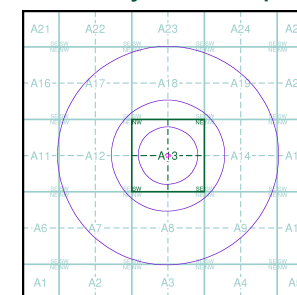
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)

Site Sensitivity Context Map - Slice A



Order Details

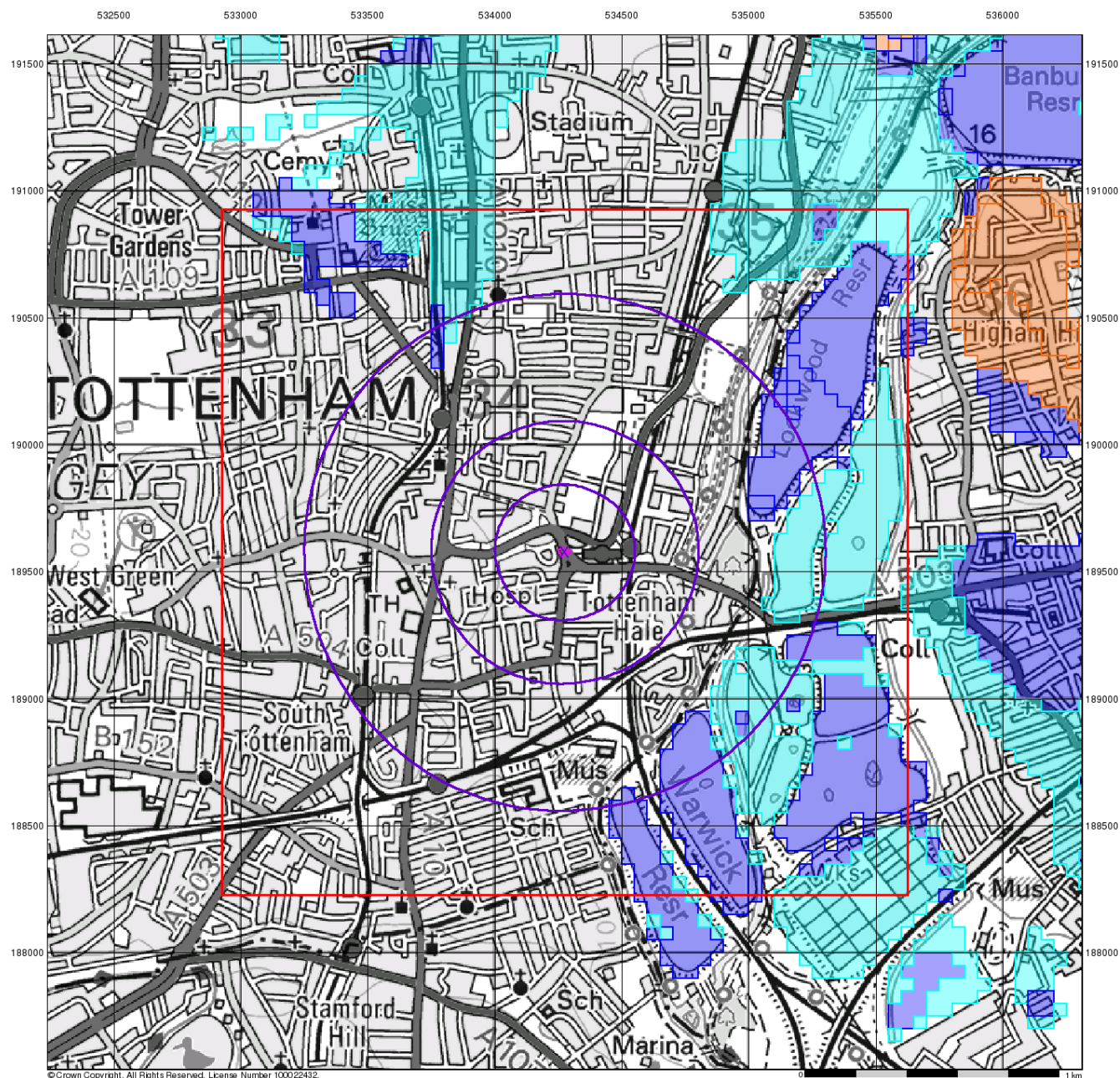
Order Number: 343014274_1_1
 Customer Ref: 1305
 National Grid Reference: 534270, 189580
 Slice: A
 Site Area (Ha): 0.11
 Search Buffer (m): 1000

Site Details

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BGS Flood GFS Data

-  Specified Site
  Specified Buffer(s)
  Bearing Reference Point

- Limited Potential for Groundwater Flooding to Occur
■ Potential for Groundwater Flooding of Property Situated Below Ground Level
■ Potential for Groundwater Flooding to Occur at Surface

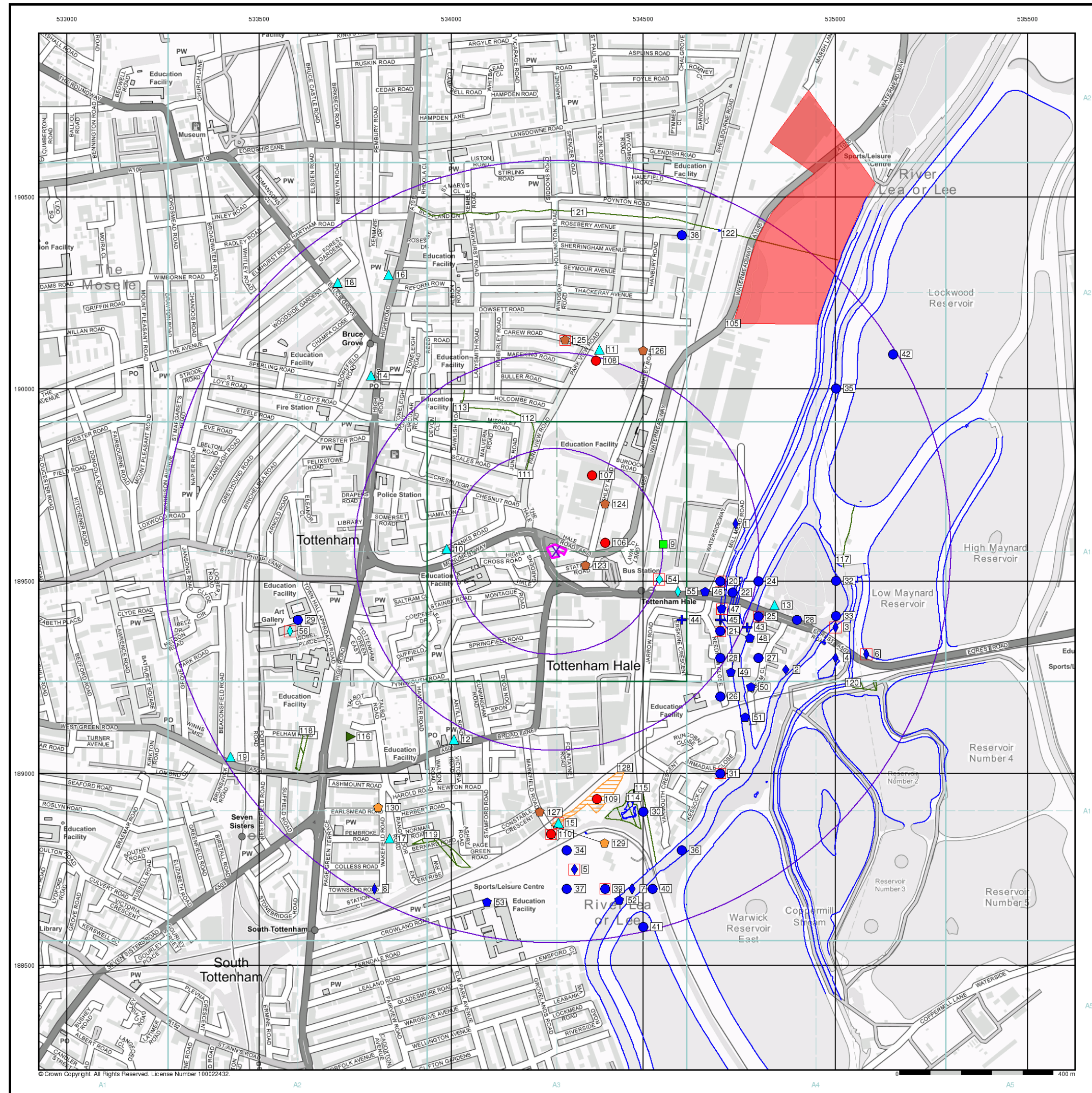
Site Sensitivity Context Map - Slice A



Order Details

Site Details

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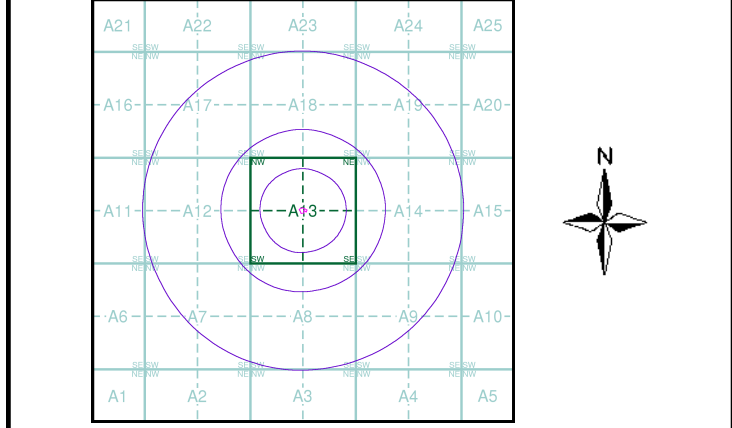
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- General**
 - Specified Site
 - Specified Buffer(s)
 - Bearing Reference Point
 - Map ID
 - Several of Type at Location
- Agency and Hydrological**
 - Contaminated Land Register Entry or Notice (Location)
 - Contaminated Land Register Entry or Notice
 - Discharge Consent
 - Enforcement or Prohibition Notice
 - Integrated Pollution Control
 - Integrated Pollution Prevention Control
 - Local Authority Integrated Pollution Prevention and Control
 - Local Authority Pollution Prevention and Control
 - Local Authority Pollution Prevention and Control Enforcement
 - Pollution Incident to Controlled Waters
 - Prosecution Relating to Authorised Processes
 - Prosecution Relating to Controlled Waters
 - Registered Radioactive Substance
 - River Network or Water Feature
 - River Quality Sampling Point
 - Substantiated Pollution Incident Register
 - Water Abstraction
 - Water Industry Act Referral
- Waste**
 - BGS Recorded Landfill Site (Location)
 - BGS Recorded Landfill Site
 - EA Historic Landfill (Buffered Point)
 - EA Historic Landfill (Polygon)
 - Integrated Pollution Control Registered Waste Site
 - Licensed Waste Management Facility (Landfill Boundary)
 - Licensed Waste Management Facility (Location)
 - Local Authority Recorded Landfill Site (Location)
 - Local Authority Recorded Landfill Site
 - Potentially Infilled Land (Non-water)
 - Potentially Infilled Land (Non-water)
 - Potentially Infilled Land (Non-water)
 - Potentially Infilled Land (Water)
 - Potentially Infilled Land (Water)
 - Potentially Infilled Land (Water)
 - Registered Landfill Site (Location)
 - Registered Landfill Site (Point Buffered to 100m)
 - Registered Landfill Site (Point Buffered to 250m)
 - Registered Waste Transfer Site (Location)
 - Registered Waste Transfer Site
 - Registered Waste Treatment or Disposal Site (Location)
 - Registered Waste Treatment or Disposal Site
- Hazardous Substances**
 - COMAH Site
 - Explosive Site
 - NIHHS Site
 - Planning Hazardous Substance Consent
 - Planning Hazardous Substance Enforcement
- Geological**
 - BGS Recorded Mineral Site

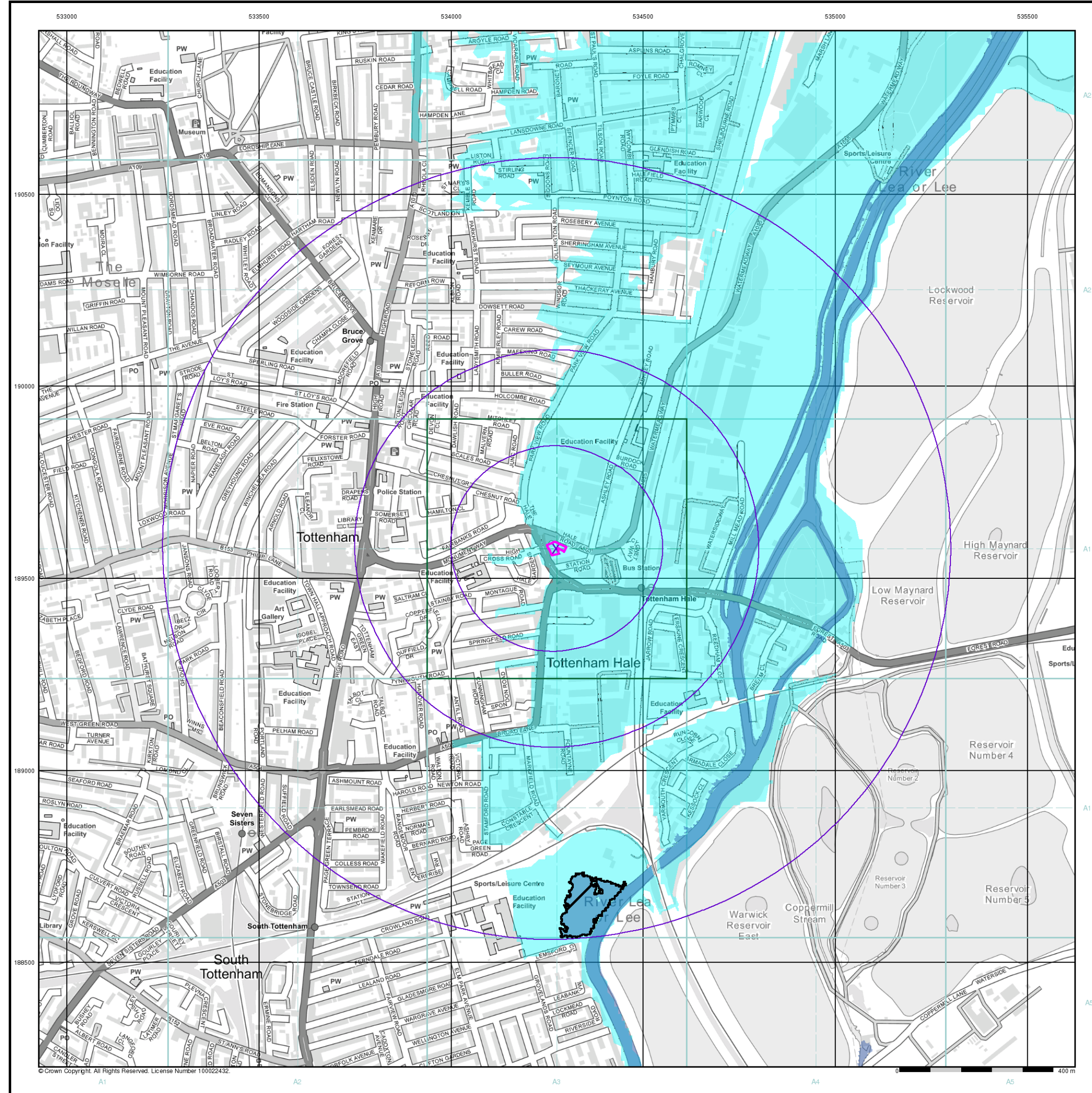
Site Sensitivity Map - Slice A



Order Details
Order Number: 343014274_1_1
Customer Ref: 1305
National Grid Reference: 534270, 189580
Slice: A
Site Area (Ha): 0.11
Search Buffer (m): 1000

Site Details
14, Hale Road, LONDON, N17 9LB

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General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Agency and Hydrological (Flood)

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Flood Map - Slice A

Order Details

Order Number:	343014274_1_1
Customer Ref:	1305
National Grid Reference:	534270, 189580
Slice:	A
Site Area (Ha):	0.11
Search Buffer (m):	1000

Site Details

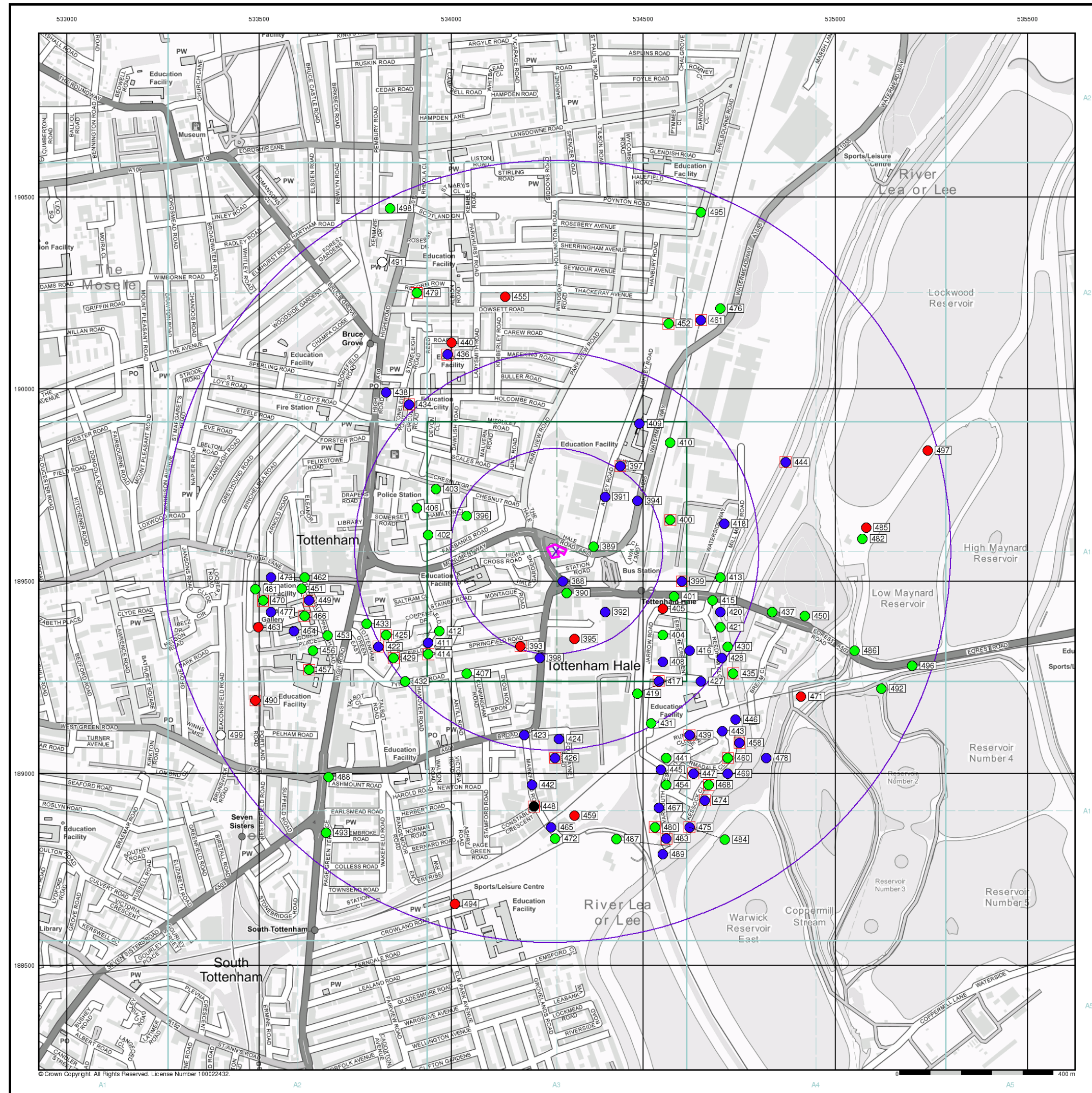
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General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

Agency and Hydrological (Boreholes)

- BGS Borehole Depth 0 - 10m
- BGS Borehole Depth 10 - 30m
- BGS Borehole Depth 30m +
- Confidential
- Other

For Borehole information please refer to the Borehole .csv file which accompanied this slice.

A copy of the BGS Borehole Ordering Form is available to download from the Support section of www.envirocheck.co.uk.

Borehole Map - Slice A

Order Details

Order Number:	343014274_1_1
Customer Ref:	1305
National Grid Reference:	534270, 189580
Slice:	A
Site Area (Ha):	0.11
Search Buffer (m):	1000

Site Details

14, Hale Road, LONDON, N17 9LB

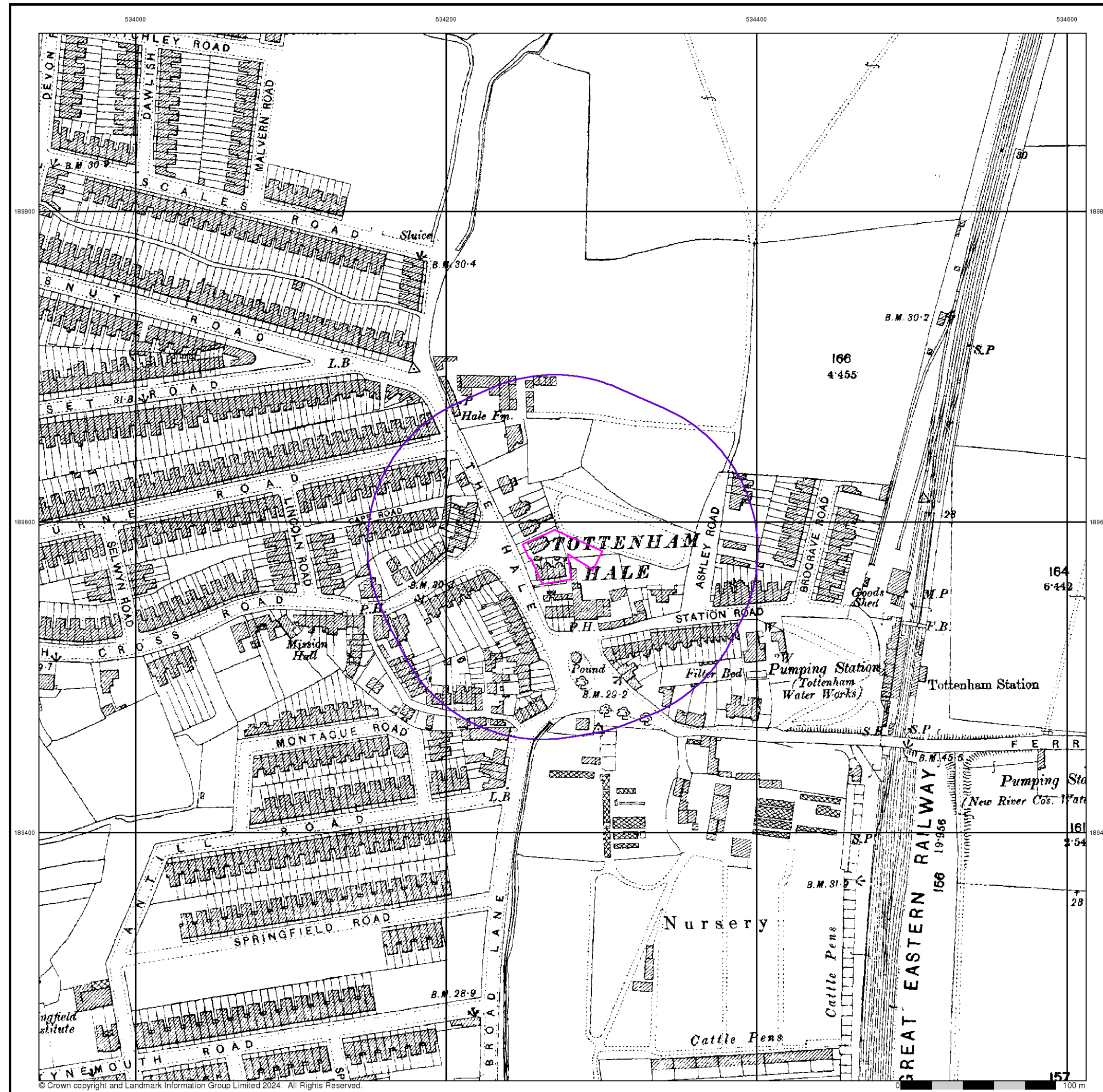
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Appendix D – Historical Plans



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London

Published 1896

Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

013_00

1896

1:2,500

Historical Map - Segment A13

A21	A22	A23	A24	A25
A16	A17	A18	A19	A20
A11	A12	A13	A14	A15
A6	A7	A8	A9	A10
A1	A2	A3	A4	A5

N

Order Details

Order Number: 343014274_1_1

Customer Ref: 1305

National Grid Reference: 534270, 189580

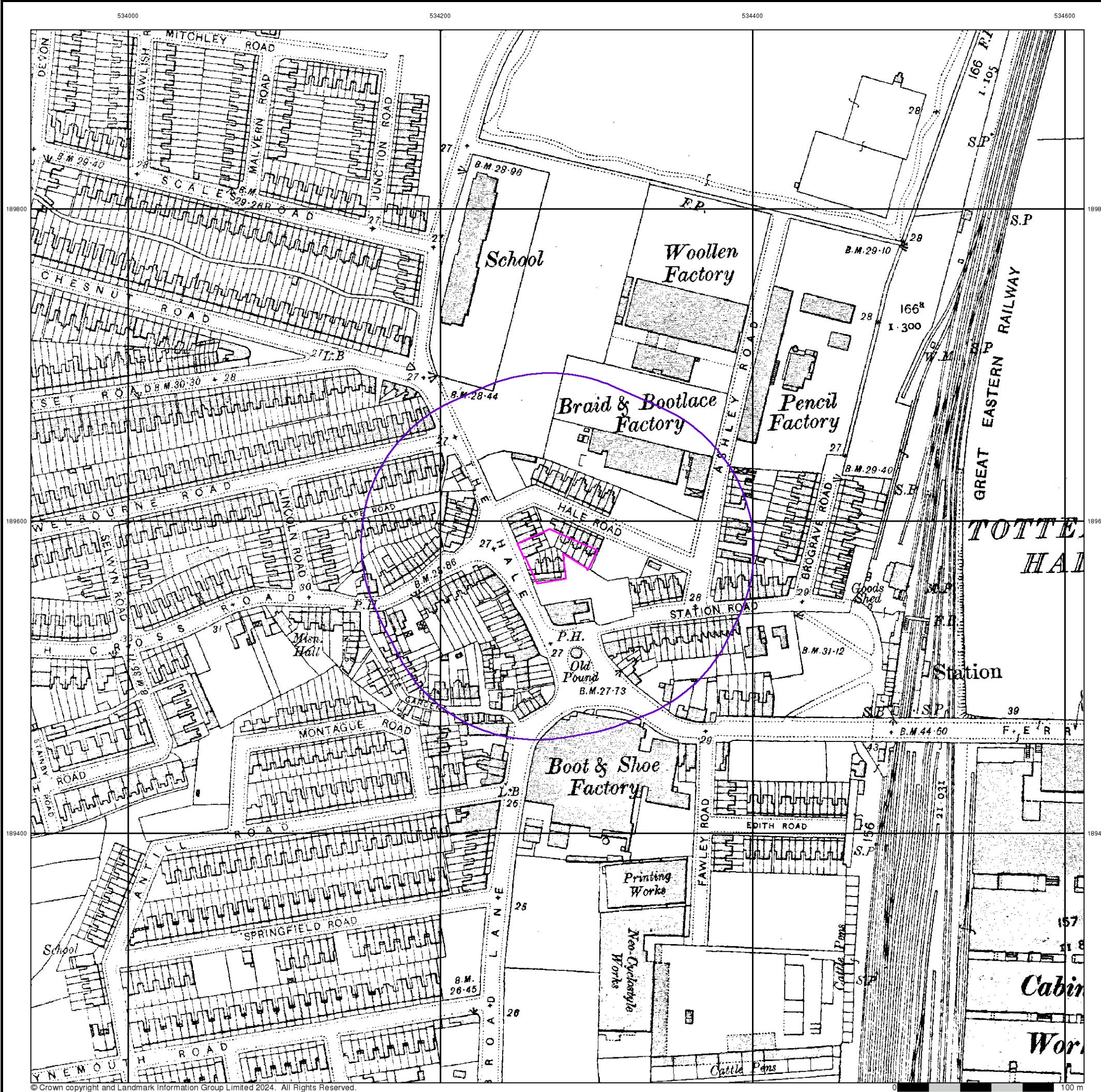
Slice: A

Site Area (Ha): 0.11

Search Buffer (m): 100

Site Details

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Essex

Published 1915
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

077_07
1915
1:2,500

Historical Map - Segment A13

A21	A22	A23	A24	A25
A16	A17	A18	A19	A20
A11	A12	A13	A14	A15
A6	A7	A8	A9	A10
A1	A2	A3	A4	A5

Order Details

Order Number:	343014274_1_1
Customer Ref:	1305
National Grid Reference:	534270, 189580
Slice:	A
Site Area (Ha):	0.11
Search Buffer (m):	100

Site Details

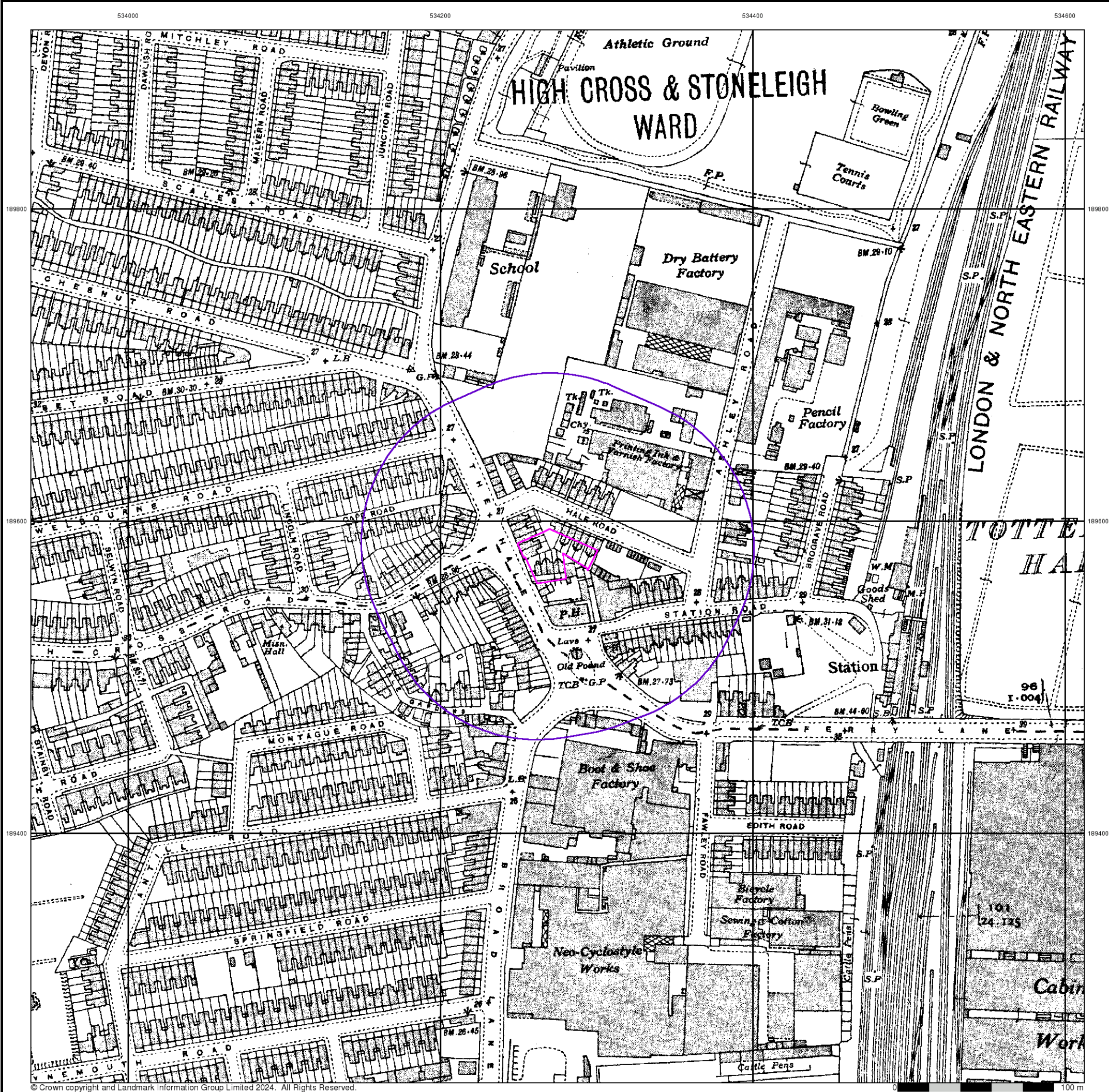
14, Hale Road, LONDON, N17 9LB

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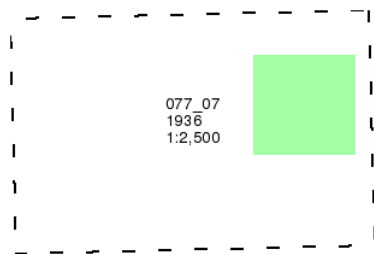
Essex

Published 1936

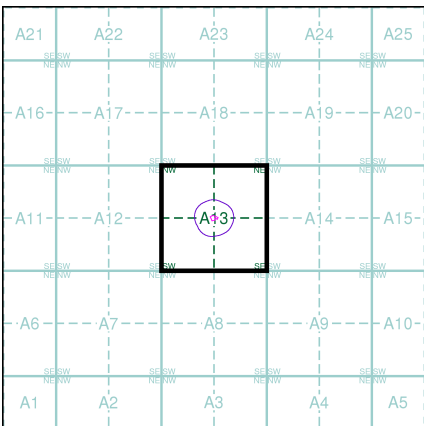
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 343014274_1_1
Customer Ref: 1305
National Grid Reference: 534270, 189580
Slice: A
Site Area (Ha): 0.11
Search Buffer (m): 100

Site Details

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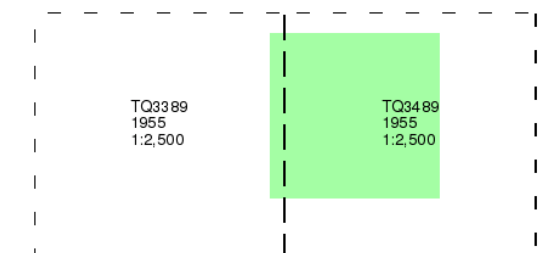
Additional SIMs

Published 1955

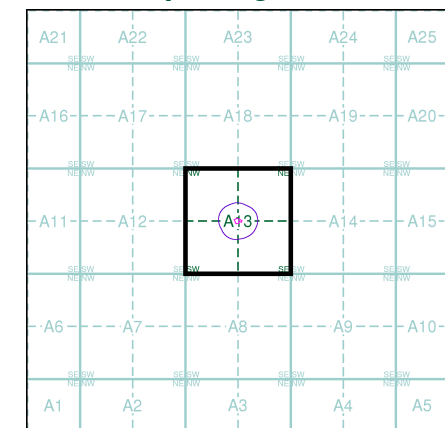
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

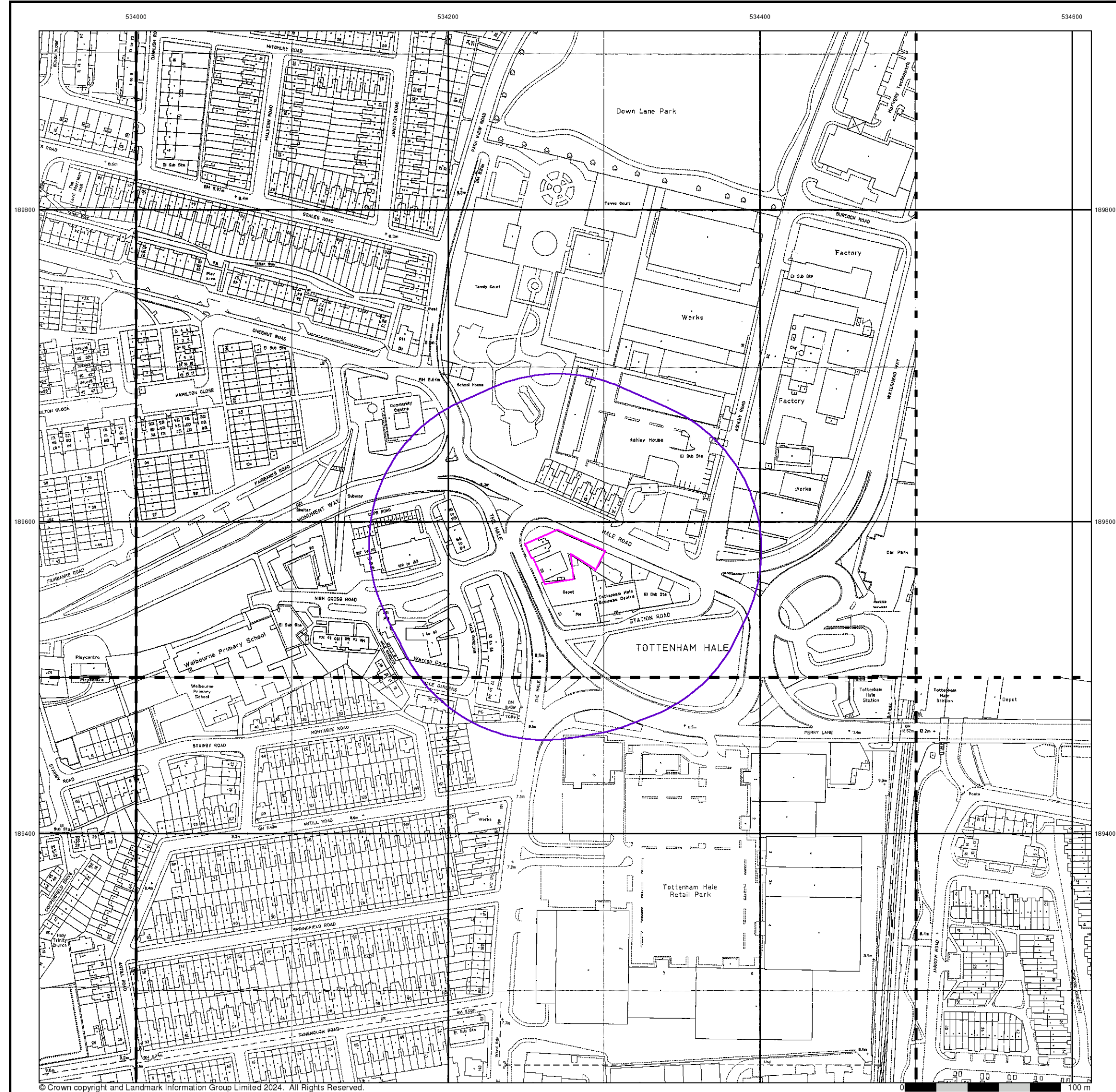
Order Number: 343014274_1_1
Customer Ref: 1305
National Grid Reference: 534270, 189580
Slice: A
Site Area (Ha): 0.11
Search Buffer (m): 100

Site Details

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Large-Scale National Grid Data

Published 1992 - 1994

Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

TQ3389NE 1994 1:1,250	TQ3489NW 1992 1:1,250	
TQ3389SE 1992 1:1,250	TQ3489SW 1994 1:1,250	TQ3489SE 1994 1:1,250

Historical Map - Segment A13

Order Details

Order Number: 343014274_1_1
Customer Ref: 1305
National Grid Reference: 534270, 189580
Slice: A
Site Area (Ha): 0.11
Search Buffer (m): 100

Site Details

14, Hale Road, LONDON, N17 9LB

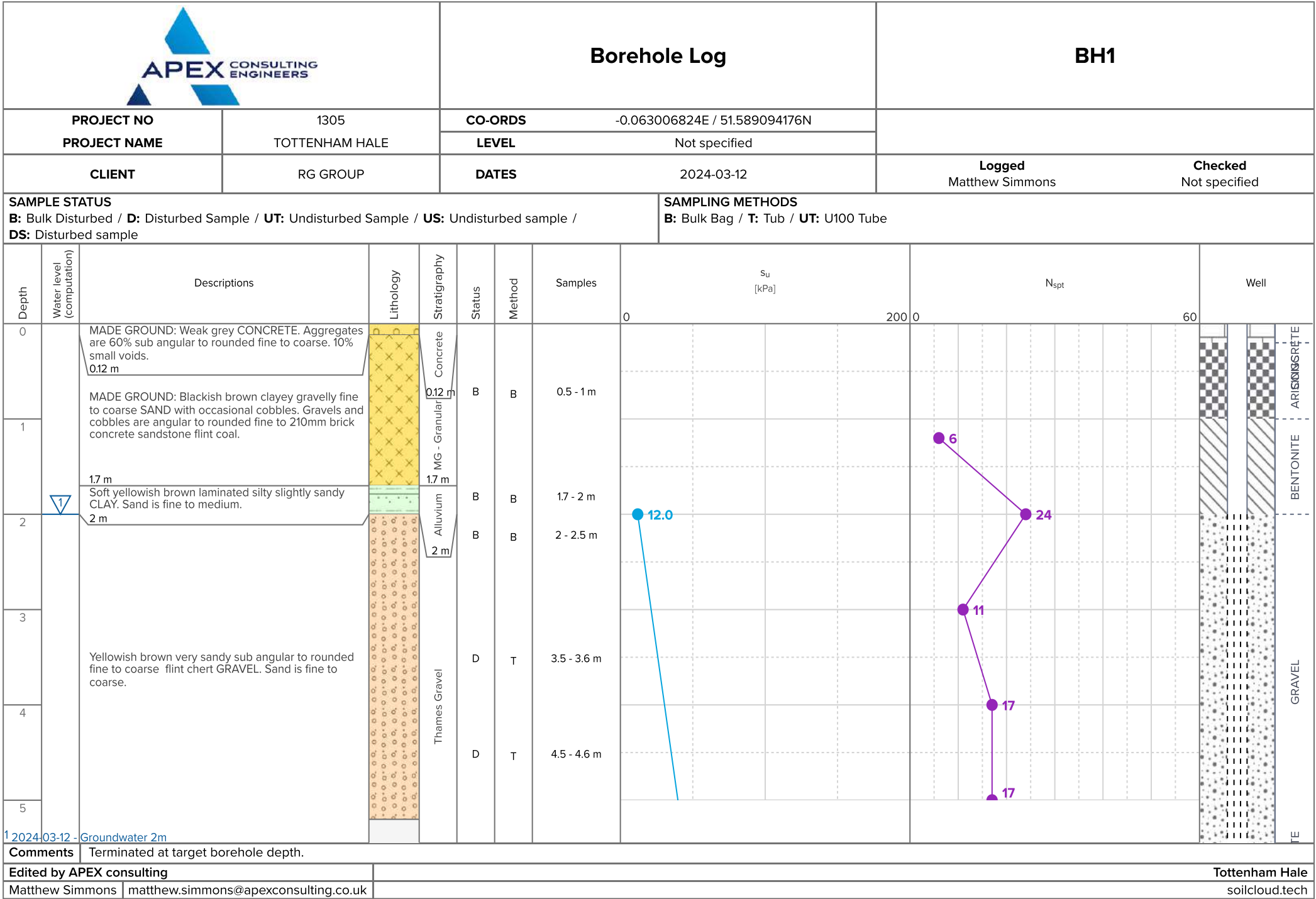
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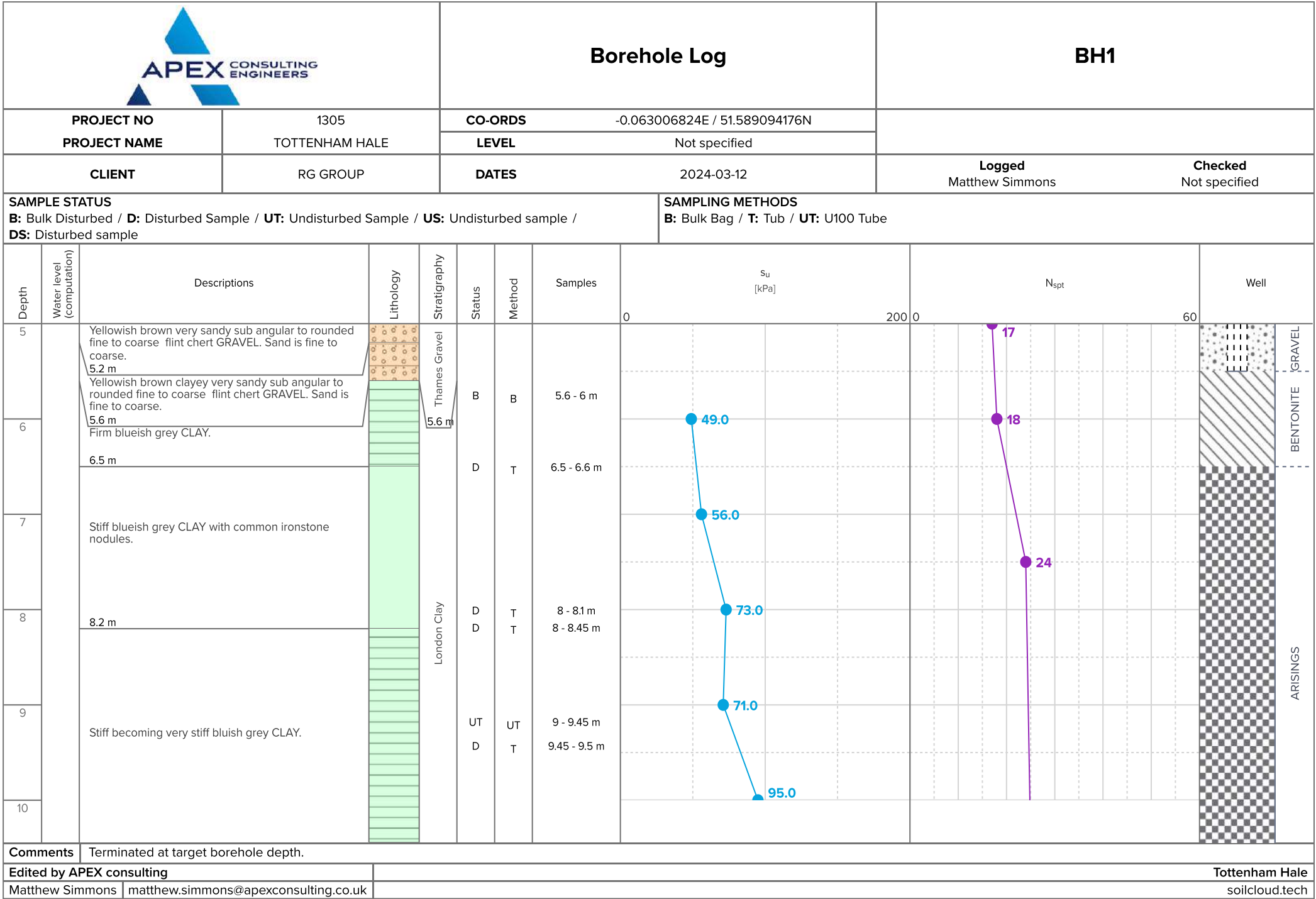
INFORMATION GROUP

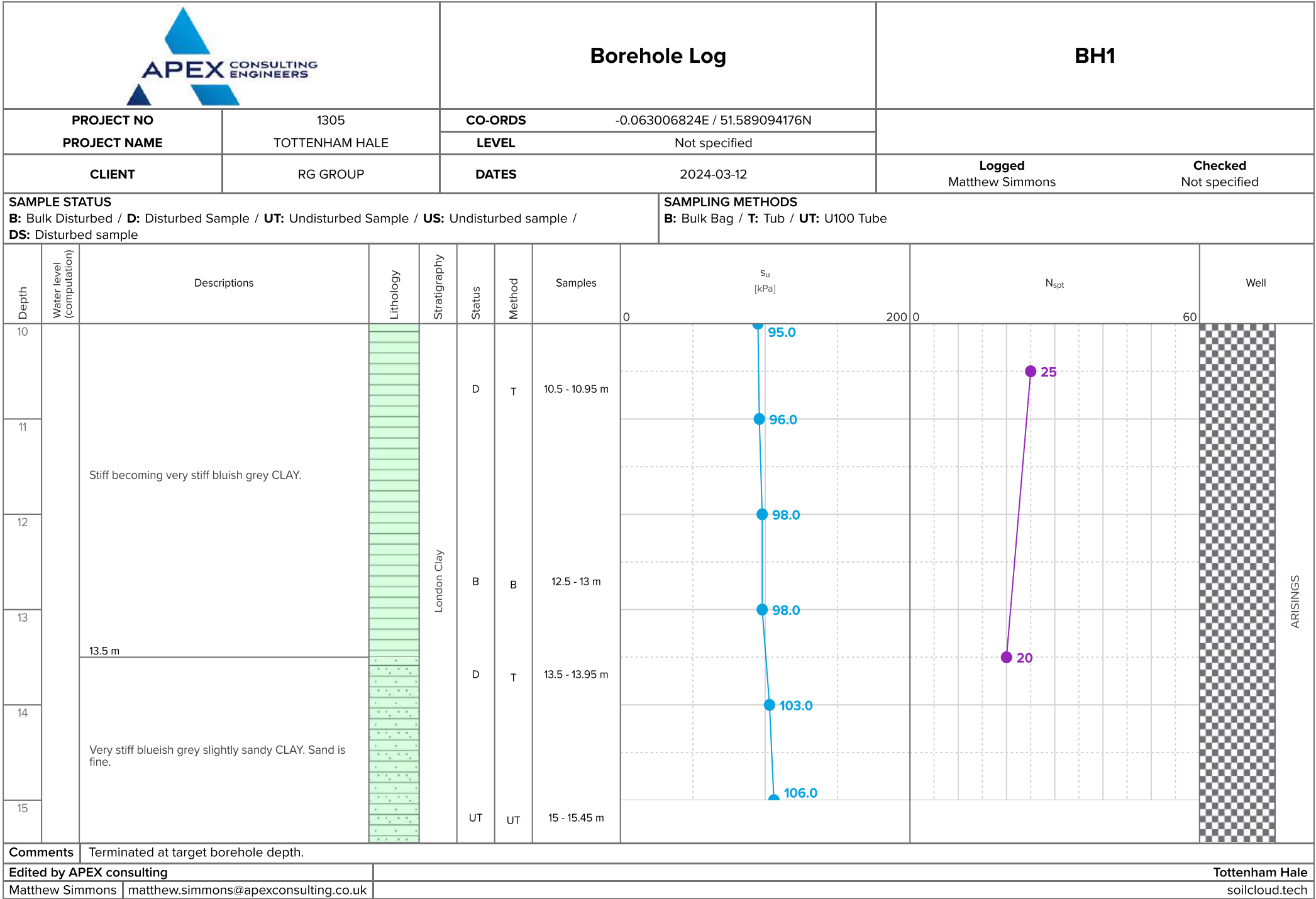
Tel: 0844 844 9952
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Web: www.envirocheck.co.uk

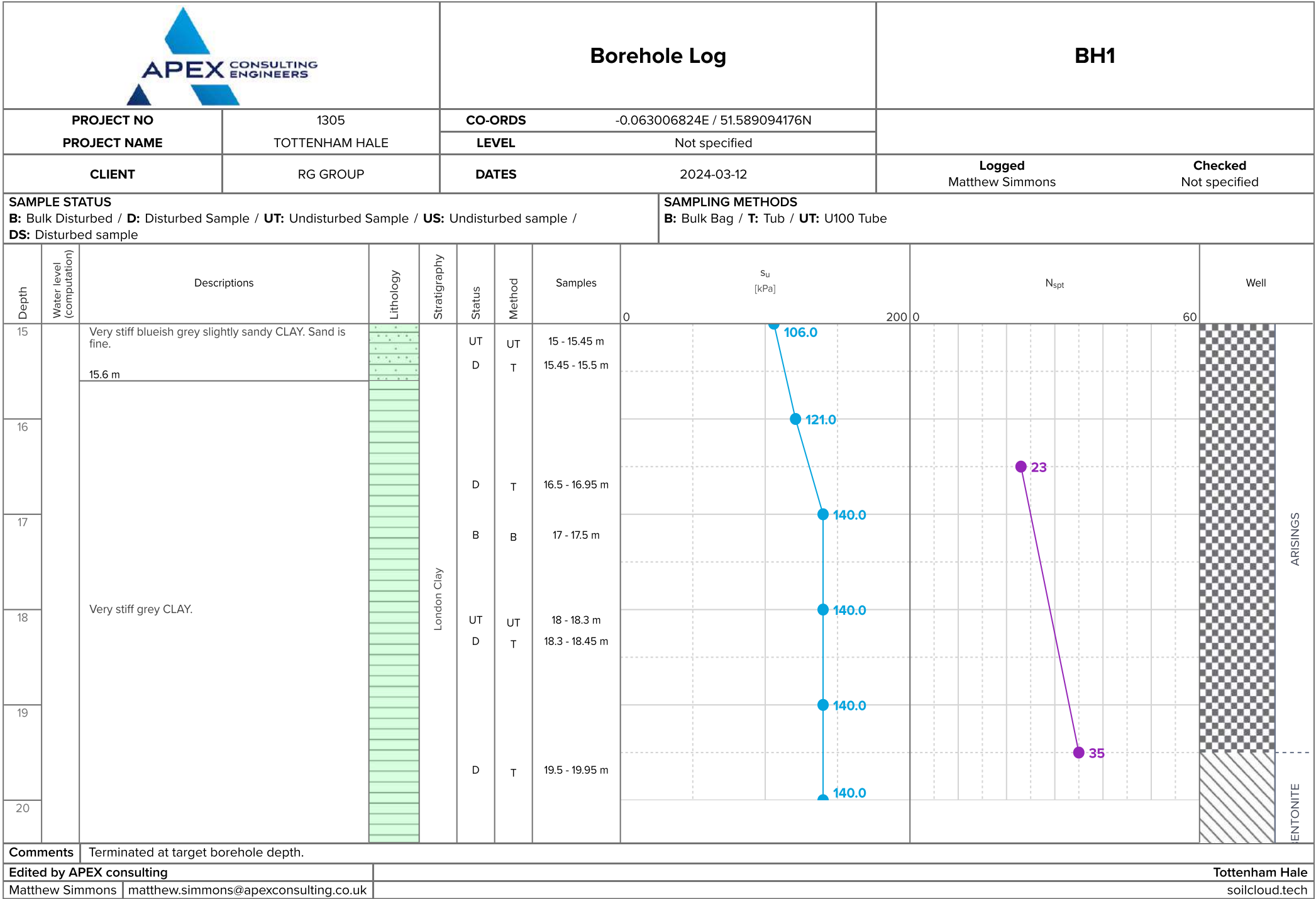
A Landmark Information Group Service v50.0 16-Apr-2024 Page 20 of 23

Appendix E – Ground Investigation Data

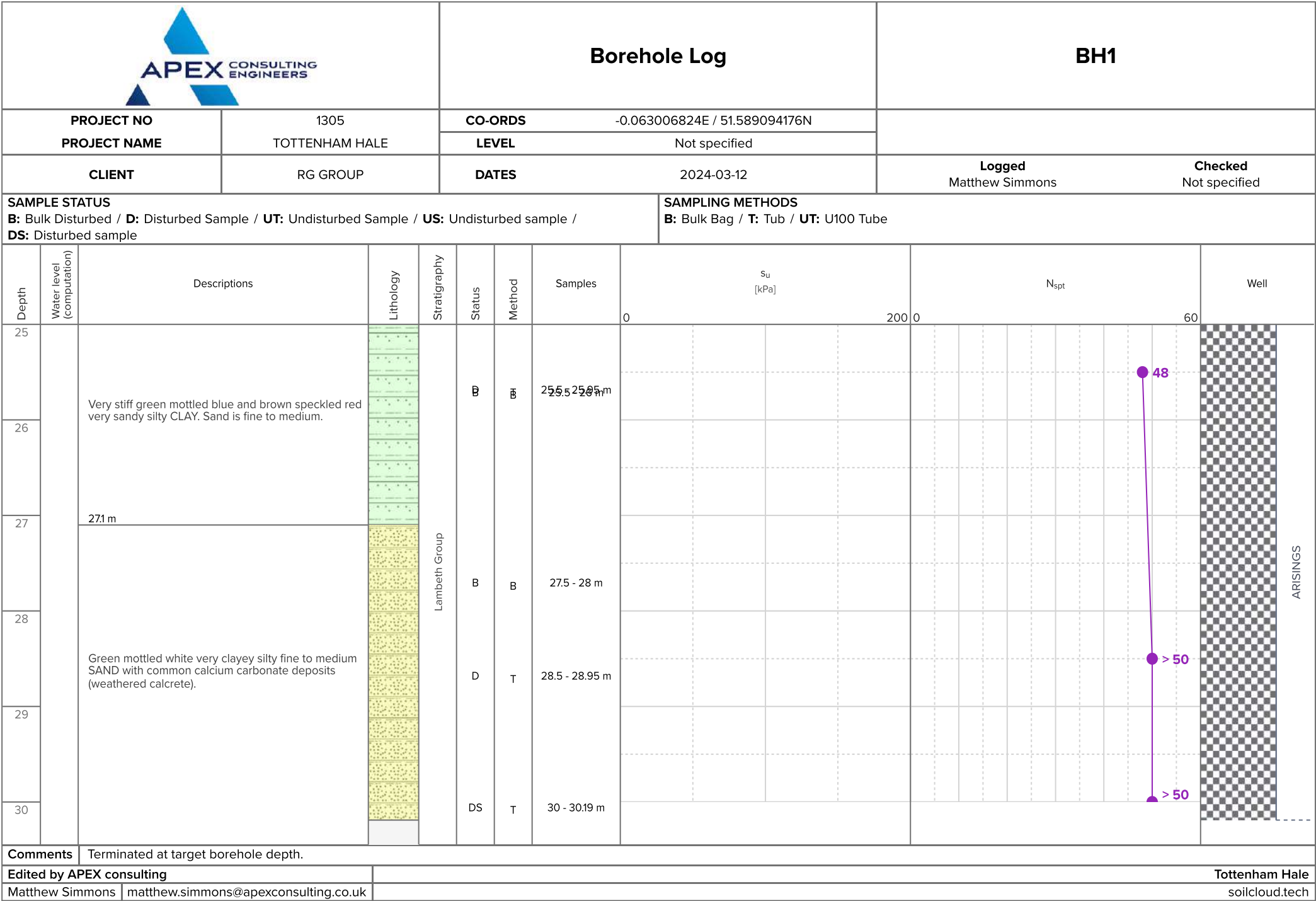




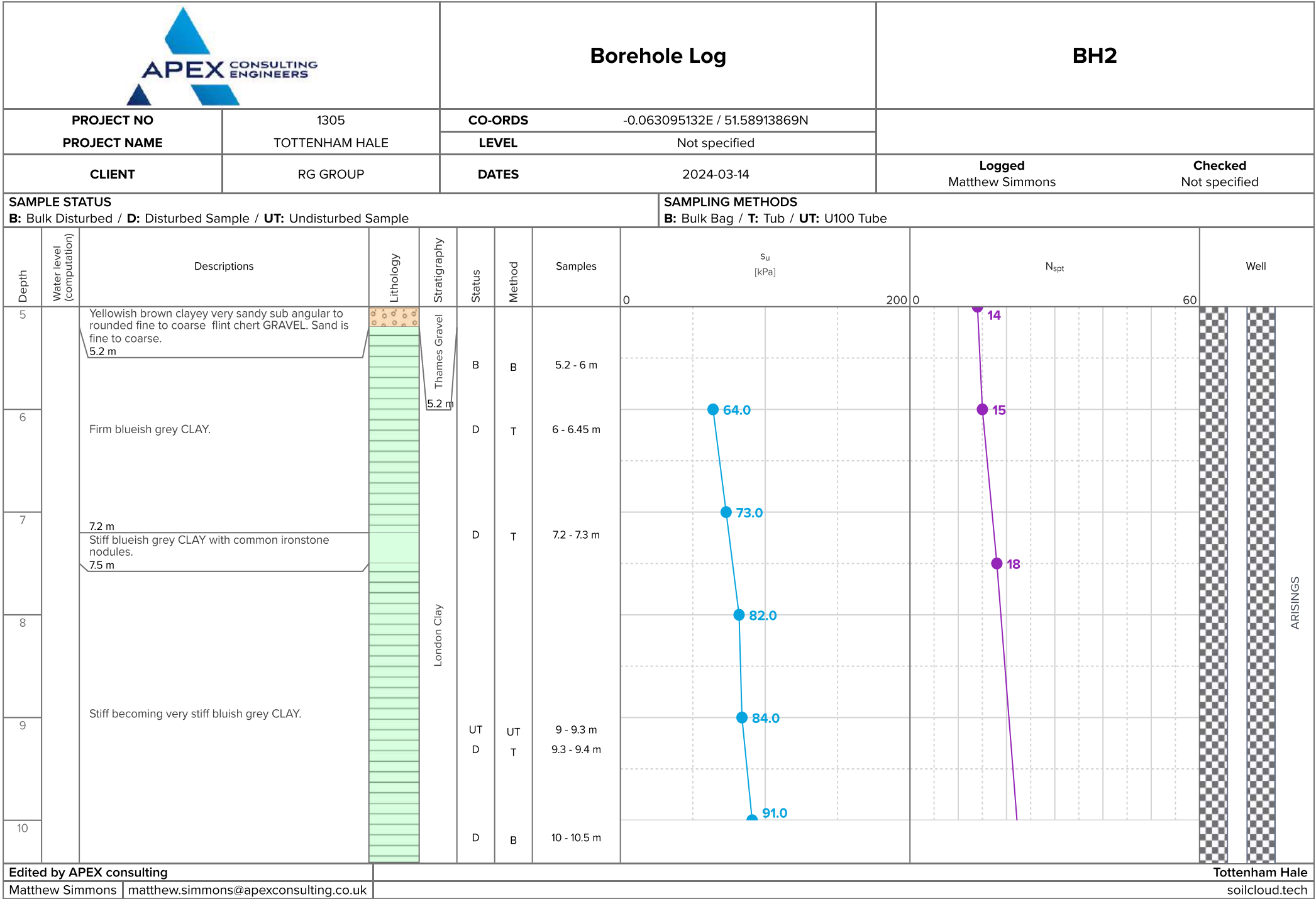


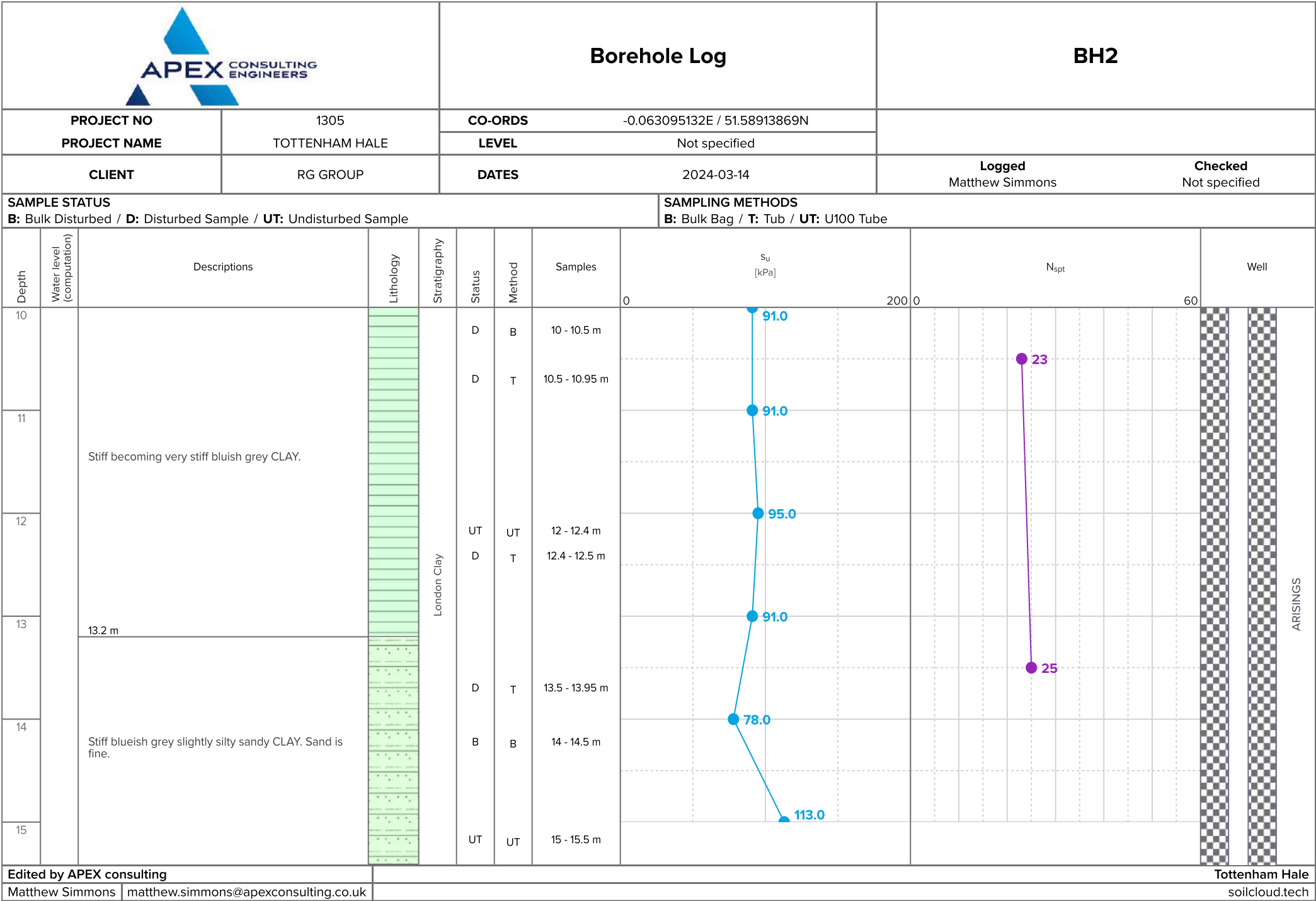


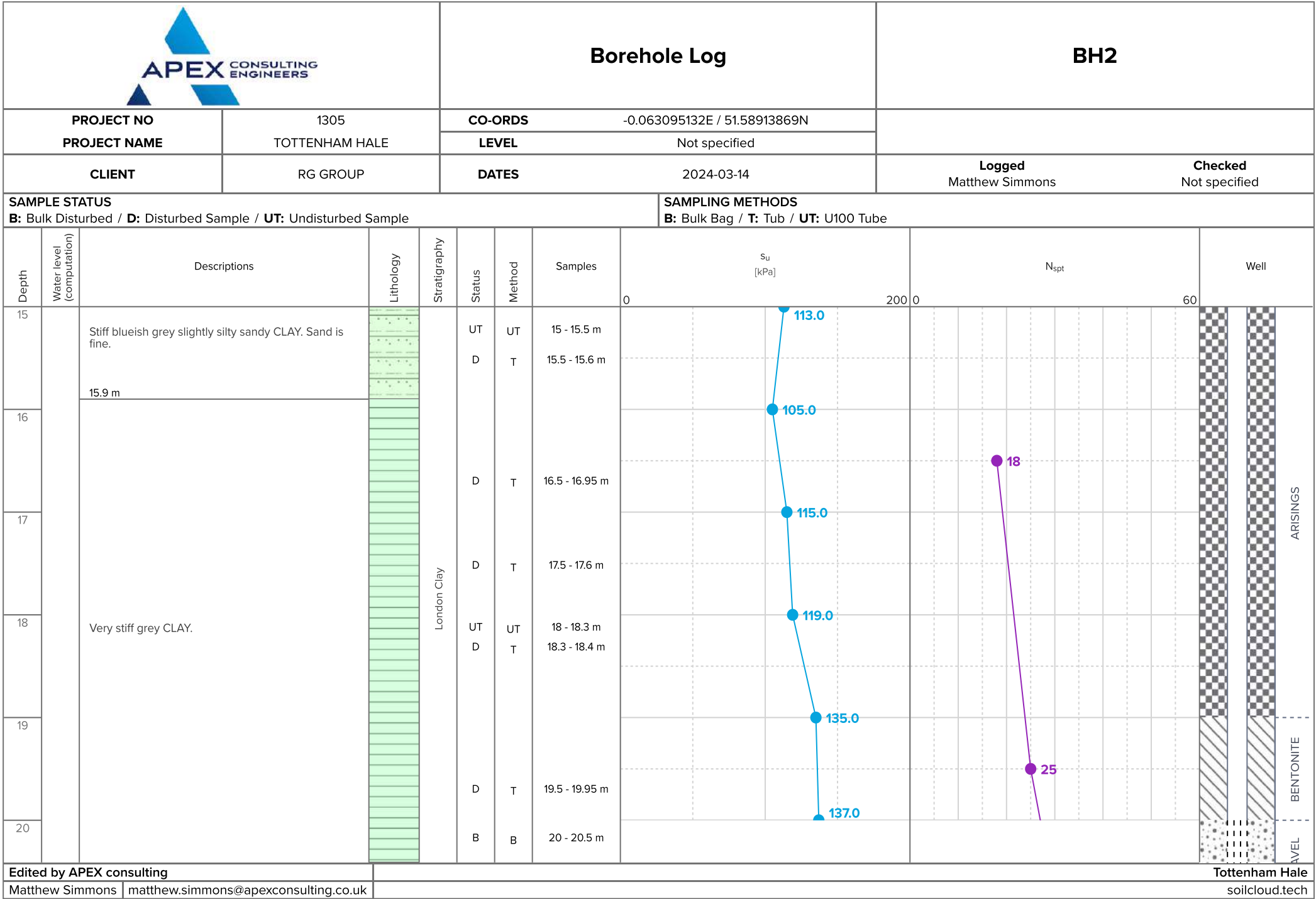
				Borehole Log				BH1						
PROJECT NO PROJECT NAME		1305 TOTTENHAM HALE		CO-ORDS		-0.063006824E / 51.589094176N								
				LEVEL		Not specified								
CLIENT		RG GROUP		DATES		2024-03-12		Logged Matthew Simmons		Checked Not specified				
SAMPLE STATUS						SAMPLING METHODS								
B: Bulk Disturbed / D: Disturbed Sample / UT: Undisturbed Sample / US: Undisturbed sample / DS: Disturbed sample						B: Bulk Bag / T: Tub / UT: U100 Tube								
Depth	Water level (computation)	Descriptions	Lithology	Stratigraphy	Status	Method	Samples	Su [kPa]		N _{spt}		Well		
20		Very stiff grey CLAY.		London Clay				0	200	0	60		BENTONITE	
		20.8 m			B	B	20.8 - 21 m							
21		Firm to stiff grey silty sandy CLAY with occasional shell fragments. Sand is fine to medium.			US	UT	21 - 21.45 m							
		21.3 m		Lambeth Group	B	B	21.3 - 22 m						ARISINGS	
22														
					D	T	22.5 - 22.95 m							
23		Very stiff green mottled blue and brown speckled red very sandy silty CLAY. Sand is fine to medium.			D	T	23 - 23.1 m							
24					UT	UT	24 - 24.45 m							
25														
Comments		Terminated at target borehole depth.												
Edited by APEX consulting				Tottenham Hale										
Matthew Simmons				matthew.simmons@apexconsulting.co.uk								soilcloud.tech		

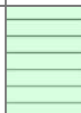
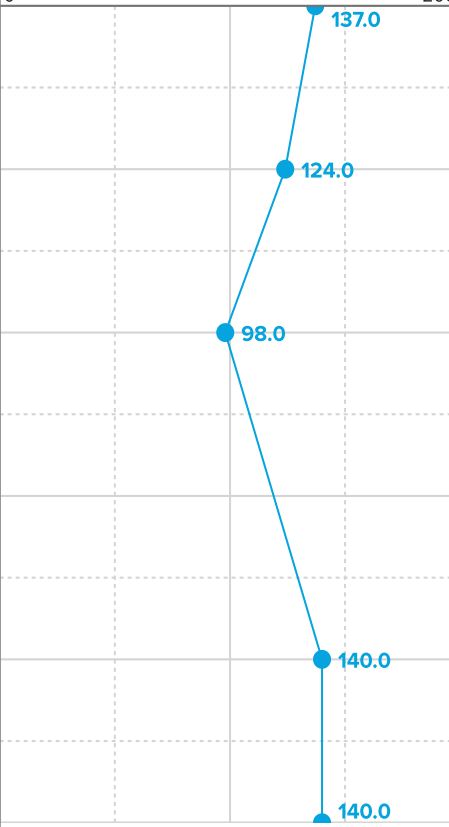
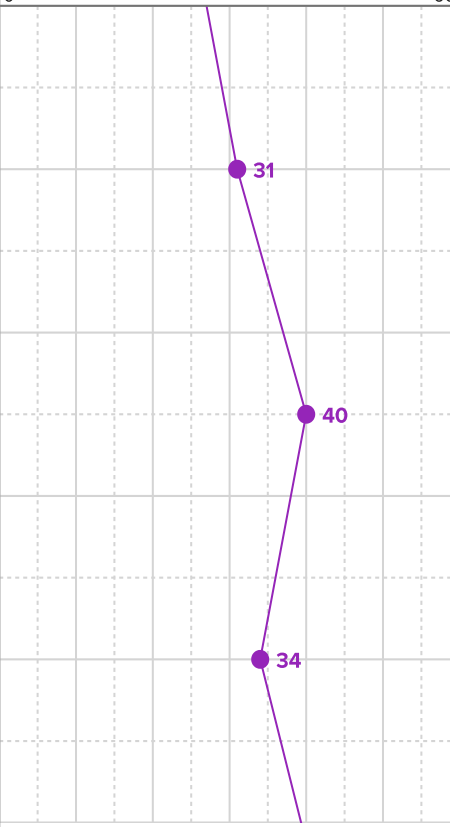
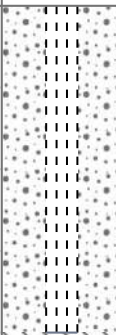


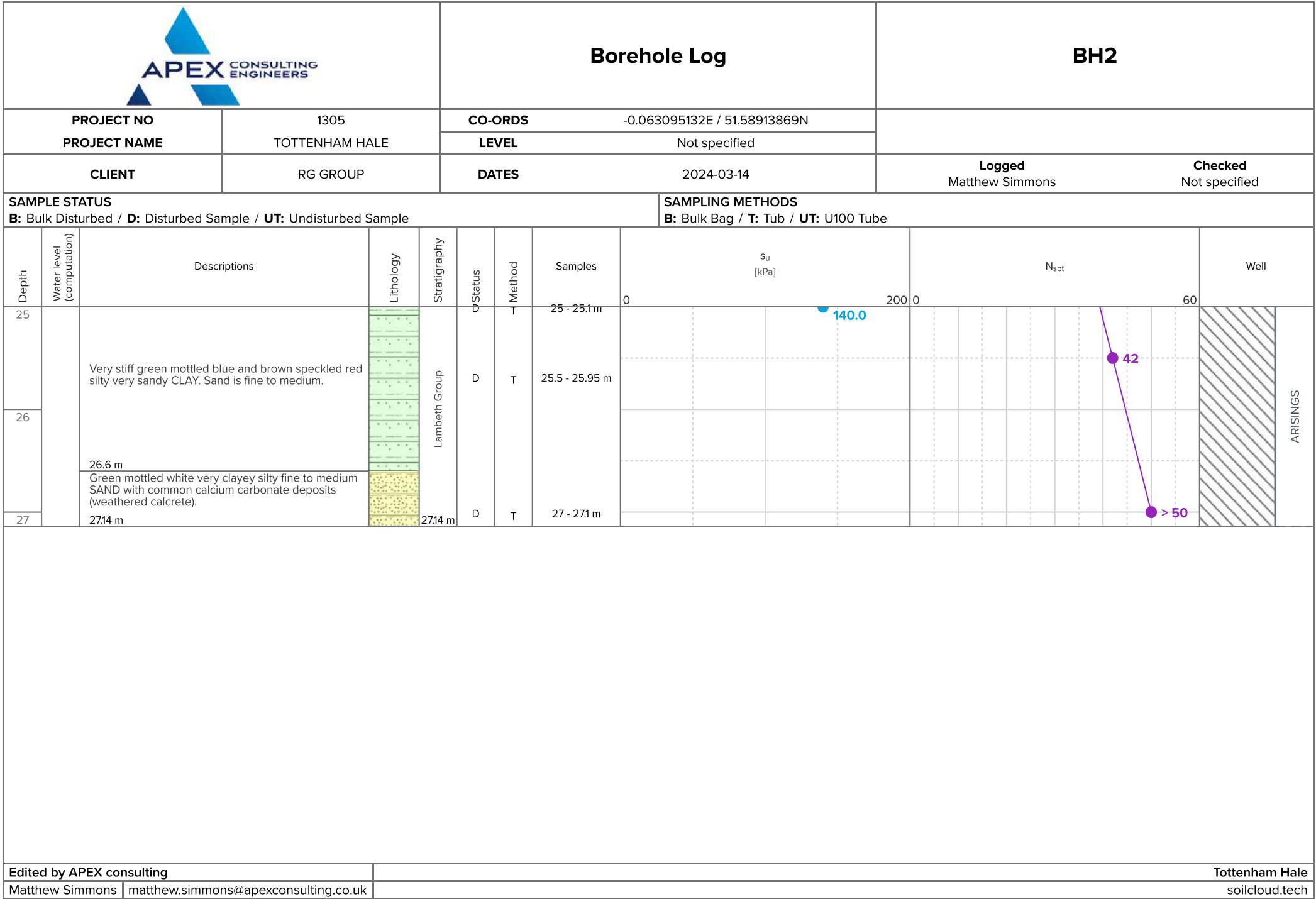
				Borehole Log				BH2					
PROJECT NO		1305		CO-ORDS		-0.063095132E / 51.58913869N							
PROJECT NAME		TOTTENHAM HALE		LEVEL		Not specified							
CLIENT		RG GROUP		DATES		2024-03-14		Logged Matthew Simmons		Checked Not specified			
SAMPLE STATUS						SAMPLING METHODS							
B: Bulk Disturbed / D: Disturbed Sample / UT: Undisturbed Sample						B: Bulk Bag / T: Tub / UT: U100 Tube							
Depth	Water level (computation)	Descriptions	Lithology	Stratigraphy	Status	Method	Samples	S _u [kPa]	N _{spt}	Well			
0		MADE GROUND: Weak grey CONCRETE. Aggregates are 60% sub angular to rounded fine to coarse. 10% small voids. 0.12 m		Concrete	B	B	0.4 - 1 m				ARISING&CONCRETE		
1		MADE GROUND: Blackish brown clayey gravelly fine to coarse SAND with occasional cobbles. Gravels and cobbles are angular to rounded fine to 210mm brick concrete sandstone flint coal. 1.6 m		MG - Granular									
		Soft yellowish brown laminated silty slightly sandy CLAY. Sand is fine to medium.		Alluvium	B	B	1.6 - 2 m				BENTONITE		
2		2.1 m											
				Thames Gravel	B	B	2.6 - 3 m				ARISING		
3													
4		Yellowish brown clayey very sandy sub angular to rounded fine to coarse flint chert GRAVEL. Sand is fine to coarse.			D	T	4.5 - 4.6 m						
5													
1 2024-03-14 - Groundwater 2.1m Edited by APEX consulting Matthew Simmons matthew.simmons@apexconsulting.co.uk												Tottenham Hale soilcloud.tech	

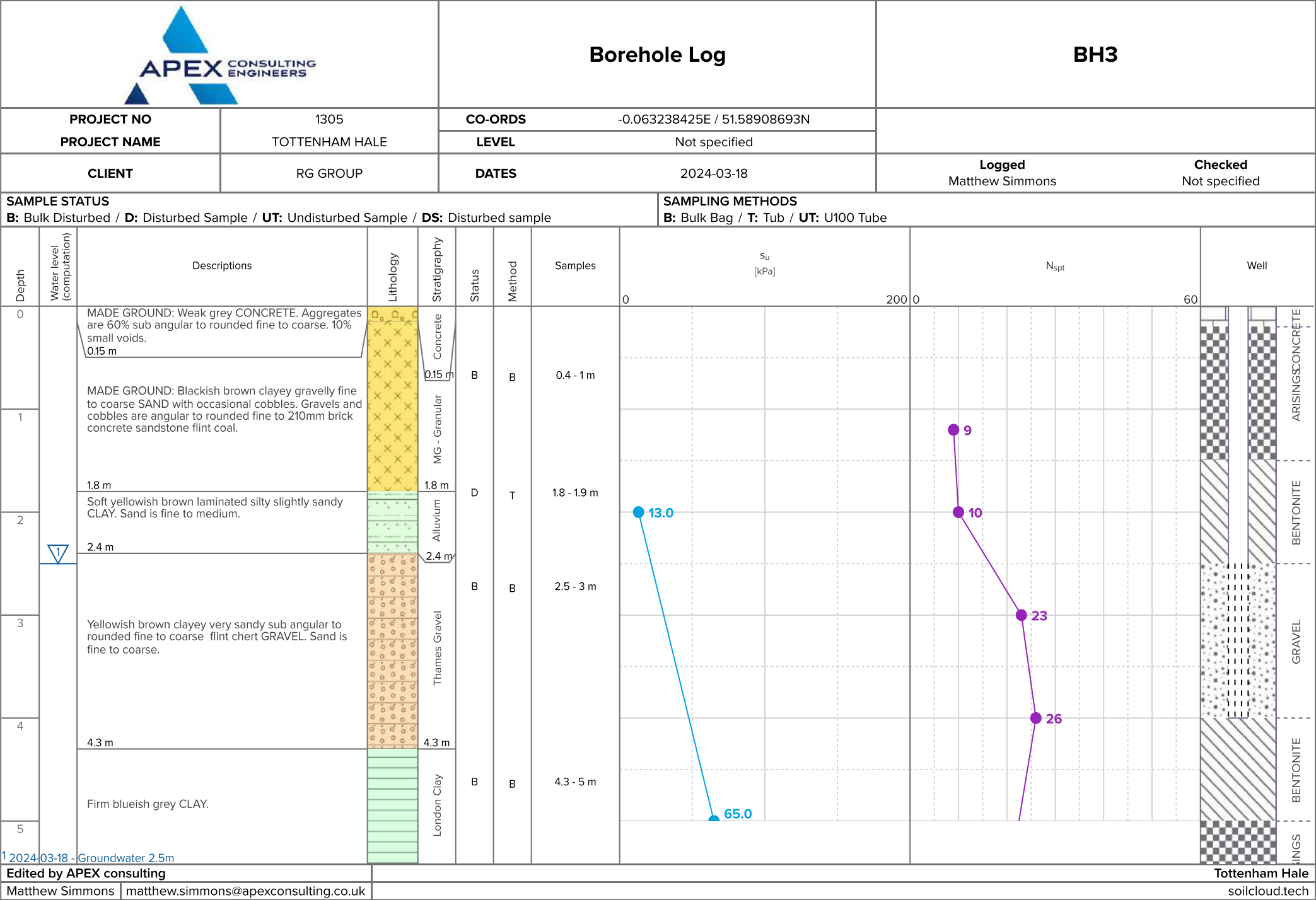


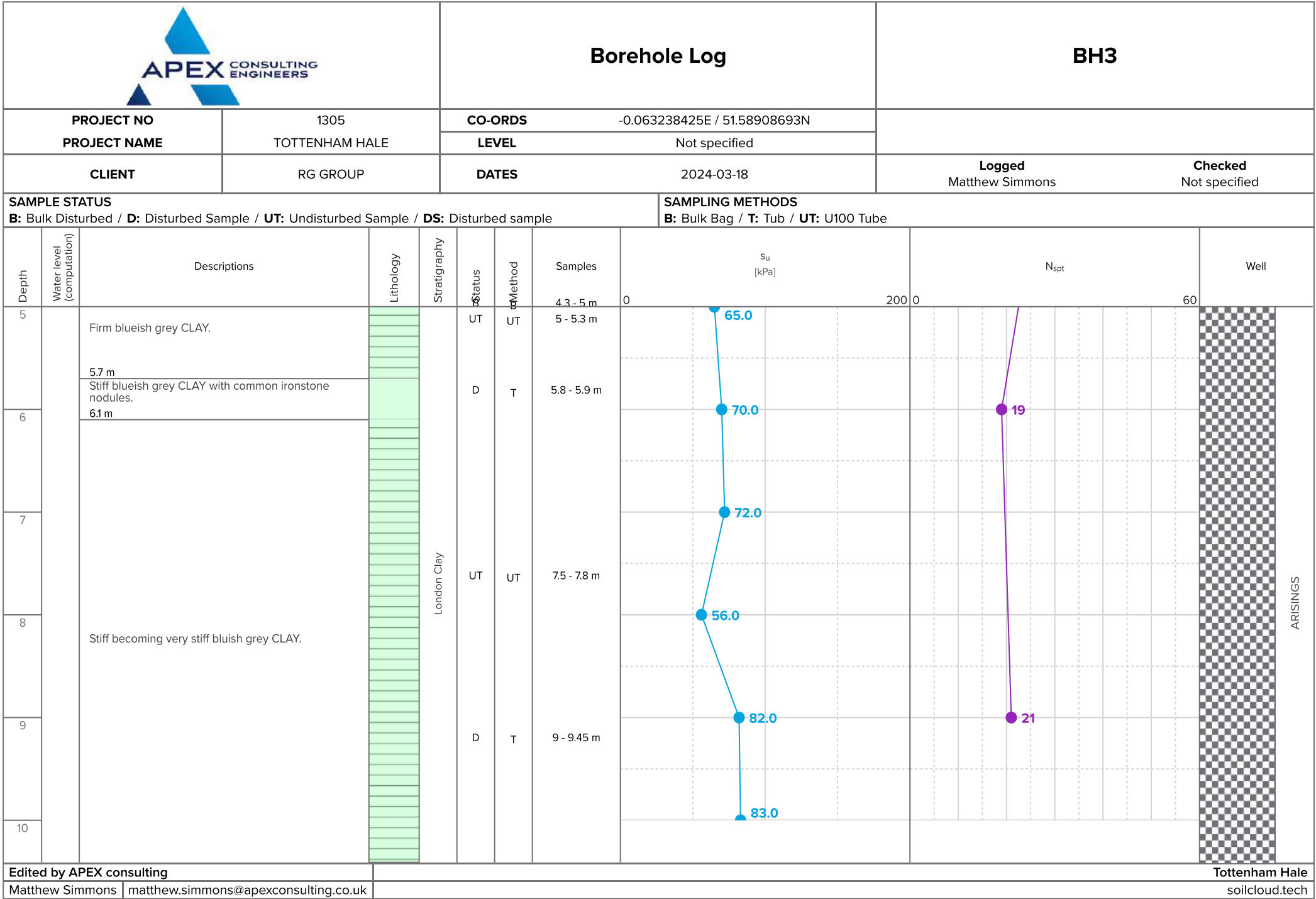


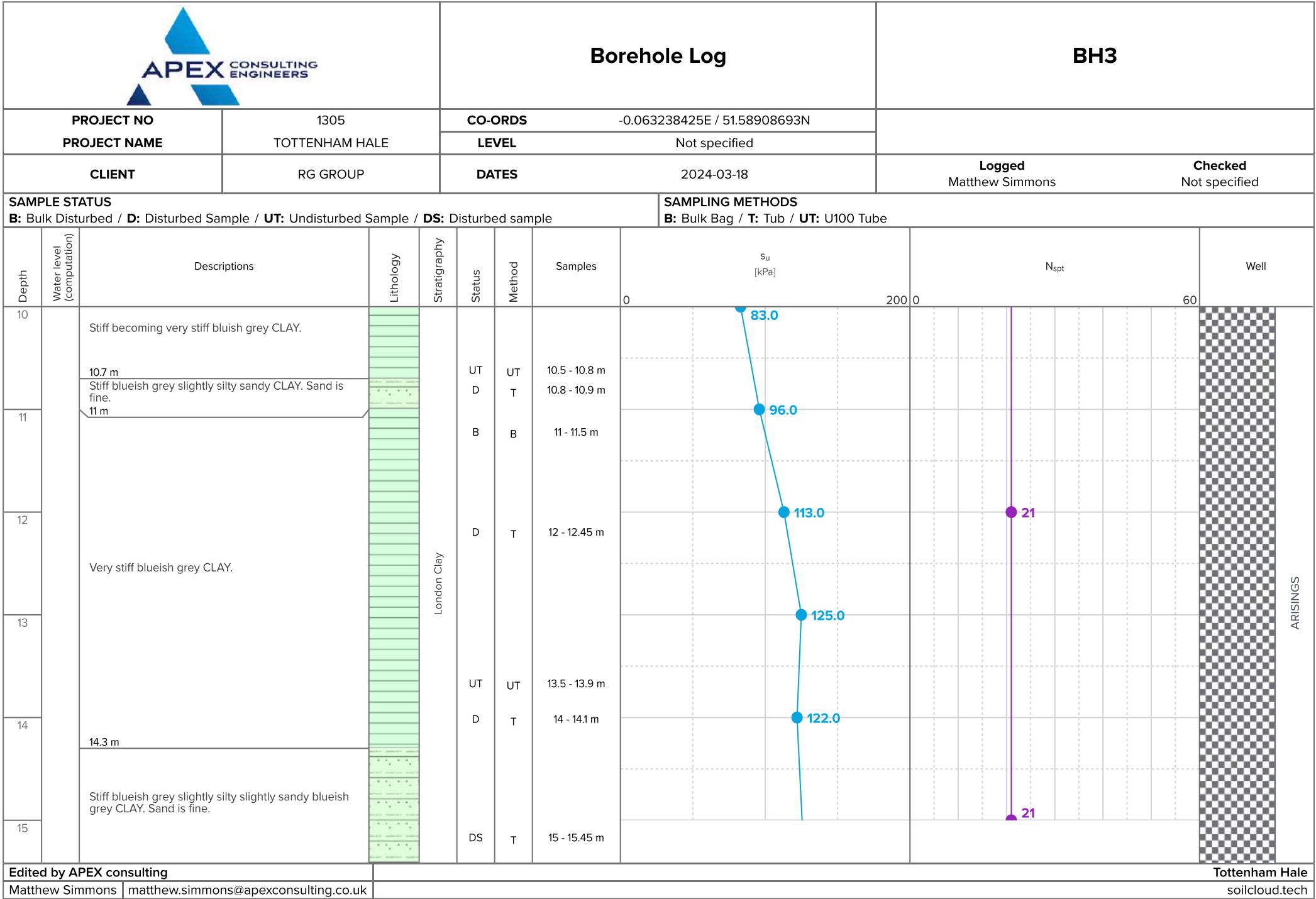


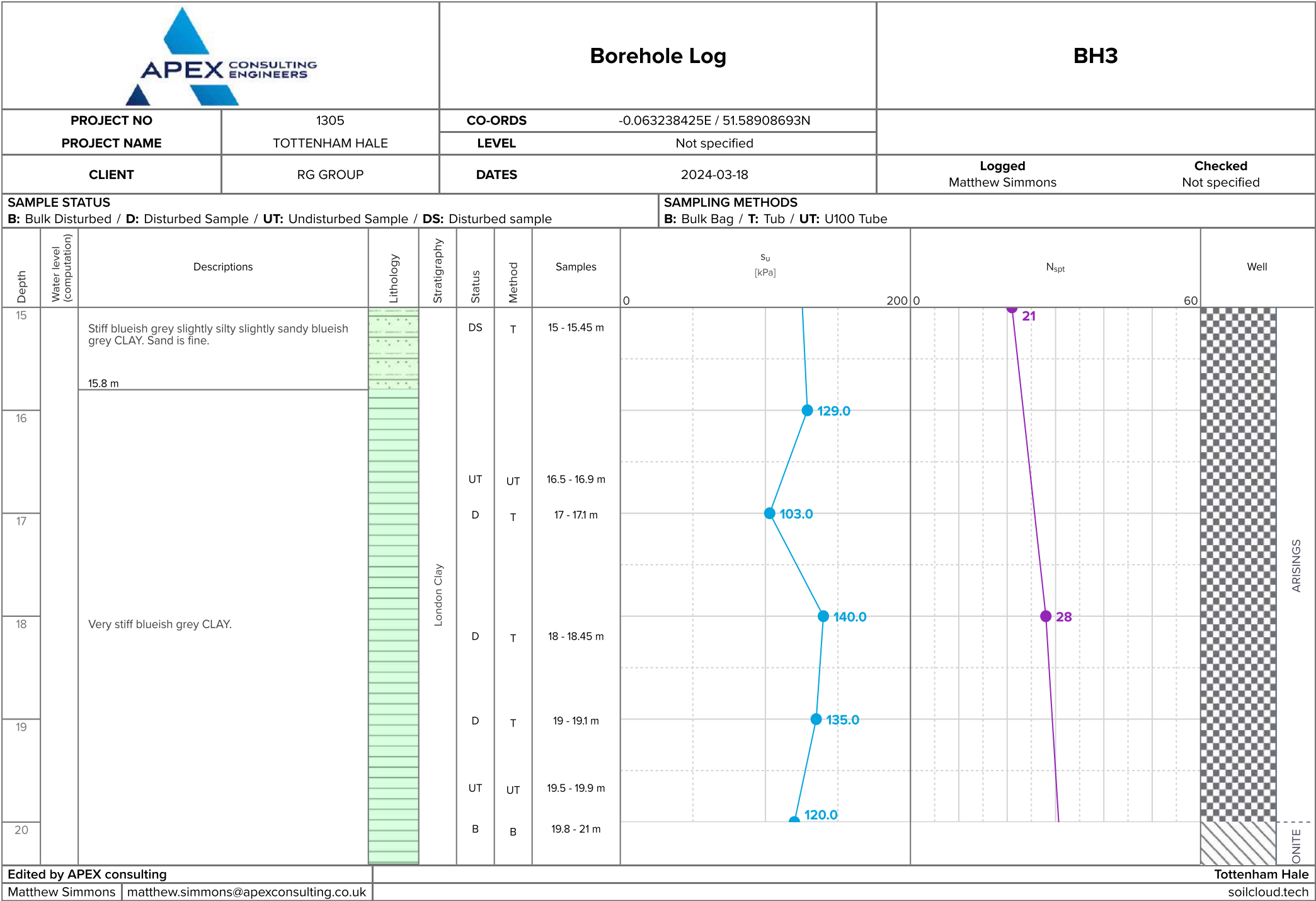
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PROJECT NO PROJECT NAME		1305 TOTTENHAM HALE		CO-ORDS		-0.063095132E / 51.58913869N								
				LEVEL		Not specified								
CLIENT		RG GROUP		DATES		2024-03-14		Logged Matthew Simmons		Checked Not specified				
SAMPLE STATUS						SAMPLING METHODS								
B: Bulk Disturbed / D: Disturbed Sample / UT: Undisturbed Sample						B: Bulk Bag / T: Tub / UT: U100 Tube								
Depth	Water level (computation)	Descriptions	Lithology	Stratigraphy	Status	Method	Samples	Su [kPa]	Nspt	Well				
20	1	Very stiff grey CLAY.		London Clay	B	B	20 - 20.5 m				GRAVEL			
21		20.7 m			D	T	21 - 21.45 m							
22		Firm to stiff grey silty sandy CLAY with occasional shell fragments. Sand is fine to medium.		Lambeth Group	B	B	21.7 - 22 m				ARISINGS			
		22.2 m			D	T	22 - 22.1 m							
23		Very stiff green mottled blue and brown speckled red silty very sandy CLAY. Sand is fine to medium.			D	T	22.5 - 22.95 m							
					B	B	23.5 - 24 m							
24					D	T	24 - 24.45 m							
25	D		T	25 - 25.1 m										
1 2024-03-15 - Water strike 21m														
Edited by APEX consulting										Tottenham Hale				
Matthew Simmons matthew.simmons@apexconsulting.co.uk										soilcloud.tech				

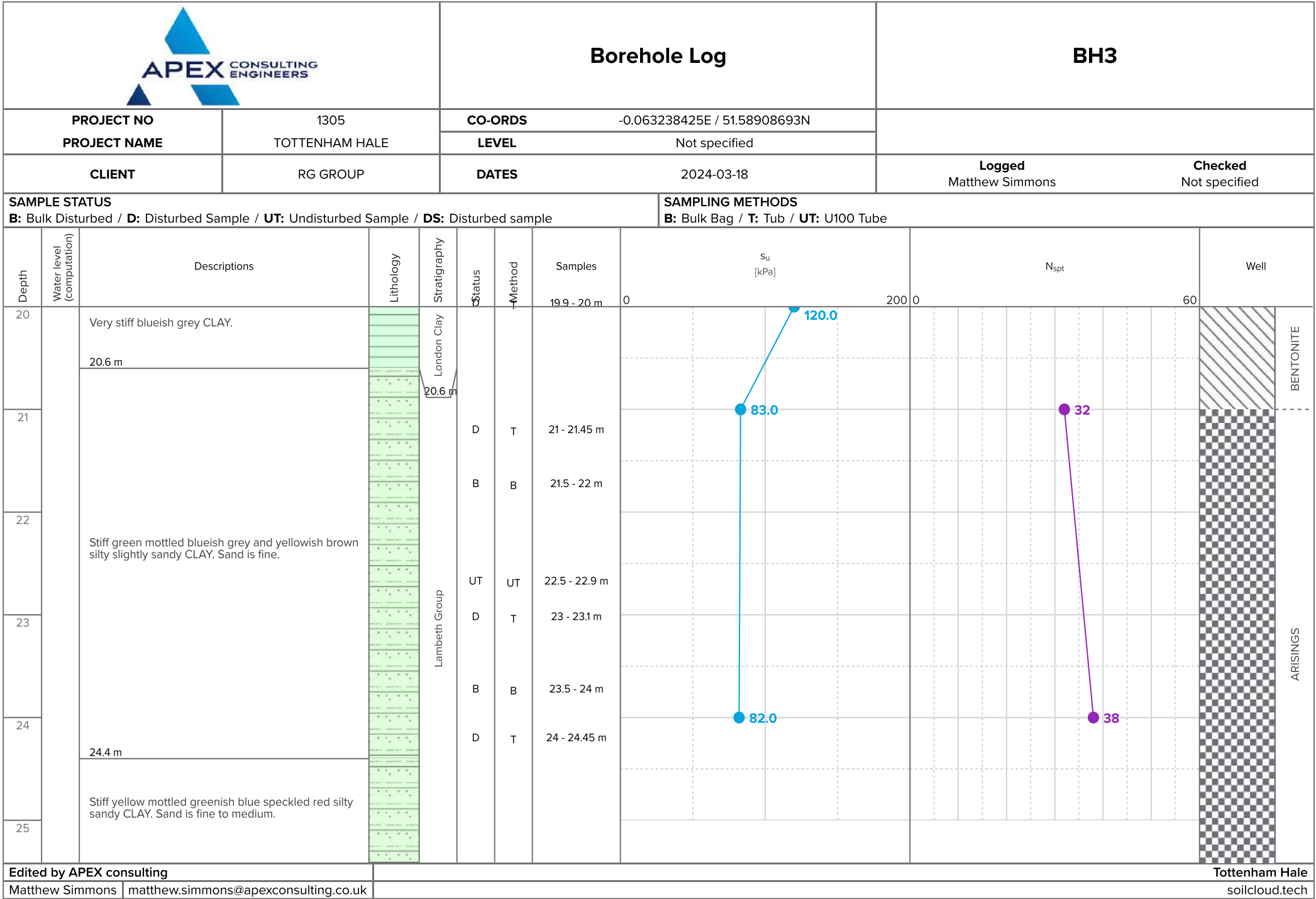


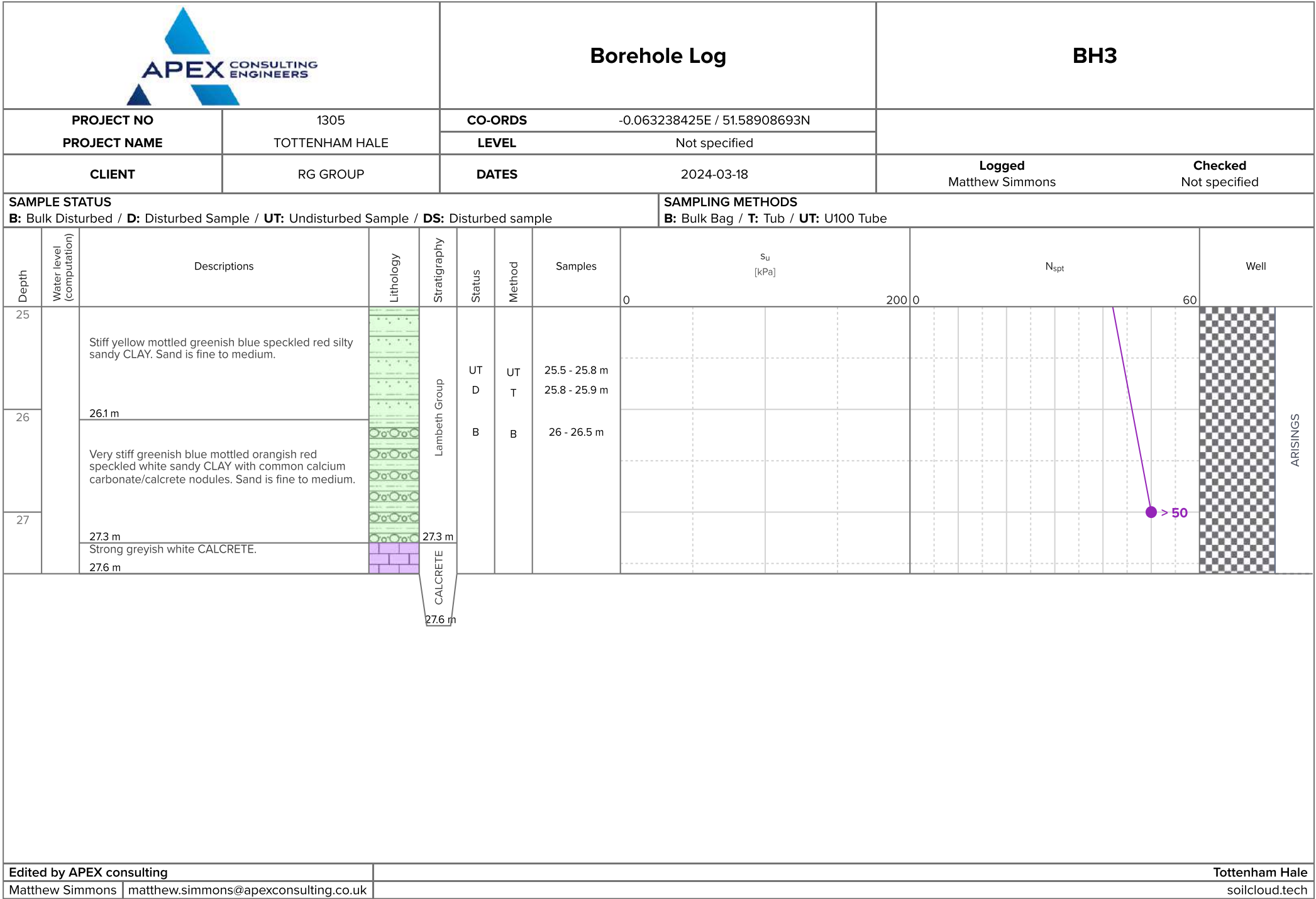












Appendix F – Geotechnical Laboratory Results

Client: Apex Consulting Engineers Ltd
Client Address: Unit 3, Acres Hill Business Park, 2 Acres Hill Lane,
Sheffield, South Yorkshire,
S9 4LT
Contact: Matthew Thompson
Site Address: Tottenham Hale, London
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 12/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

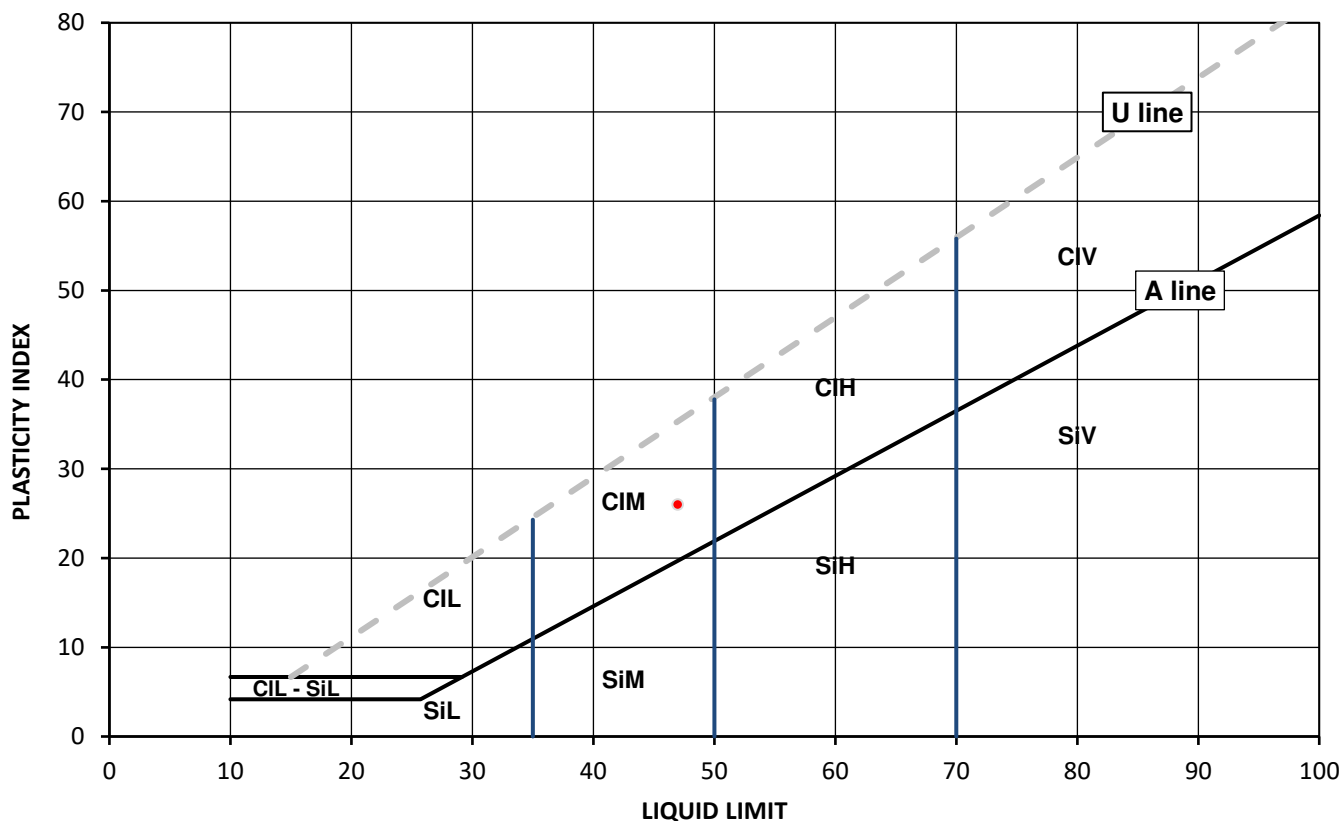
Test Results:

Laboratory Reference: 161676
Hole No.: BH1
Sample Reference: 2
Sample Description: Yellowish brown slightly gravelly slightly sandy CLAY

Depth Top [m]: 1.70
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested after washing to remove >0.425mm; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
26.0	47	21	26	0.19	0.81	88



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

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Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist

for and on behalf of i2 Analytical Ltd

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S9 4LT
Contact: Matthew Thompson
Site Address: Tottenham Hale, London
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 14/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

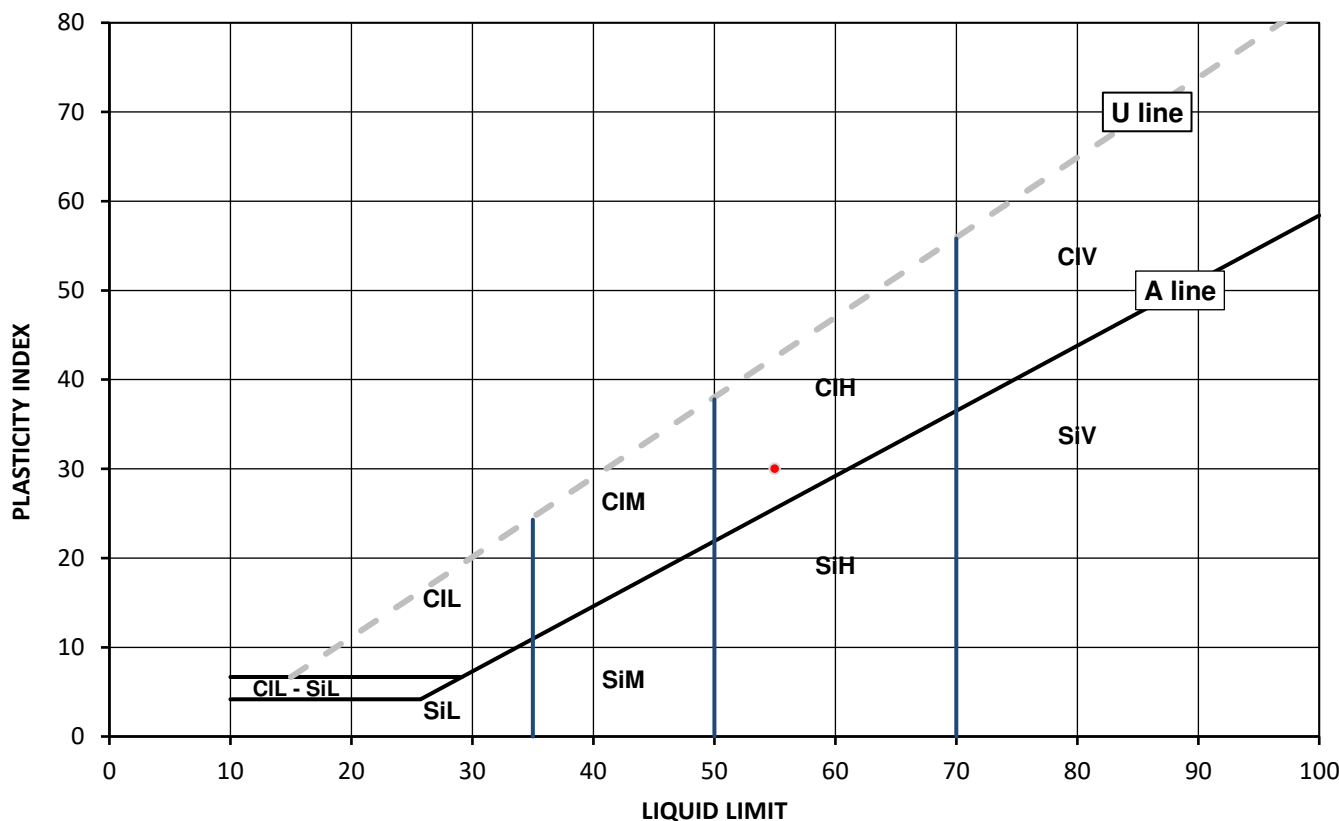
Test Results:

Laboratory Reference: 161677
Hole No.: BH2
Sample Reference: 2
Sample Description: Yellowish brown slightly gravelly slightly sandy CLAY

Depth Top [m]: 1.60
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested after washing to remove >0.425mm; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
28.7	55	25	30	0.13	0.87	80



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

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Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 12/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

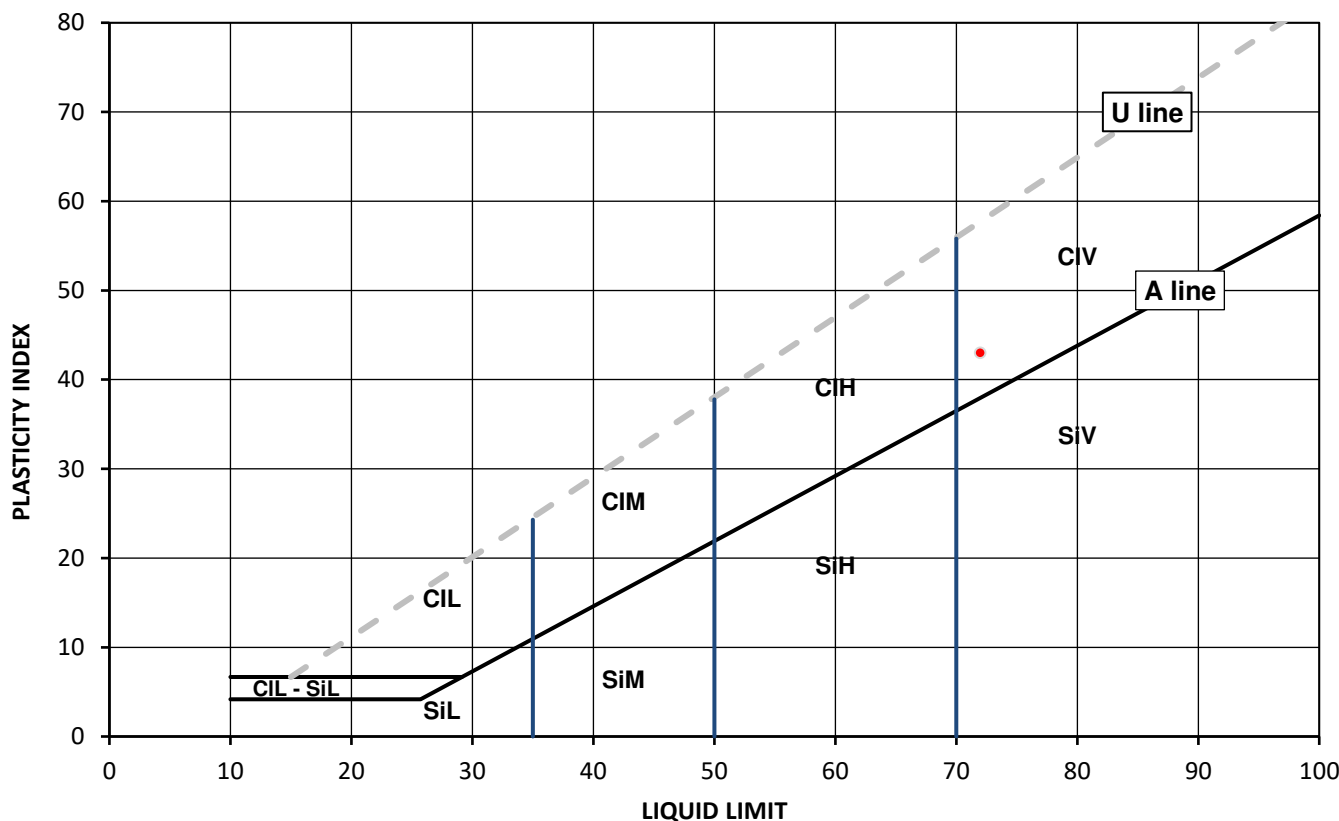
Test Results:

Laboratory Reference: 161680
Hole No.: BH1
Sample Reference: 6
Sample Description: Dark grey slightly gravelly CLAY

Depth Top [m]: 5.60
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested after washing to remove >0.425mm; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
28.4	72	29	43	-0.02	1.02	90



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

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Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 12/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

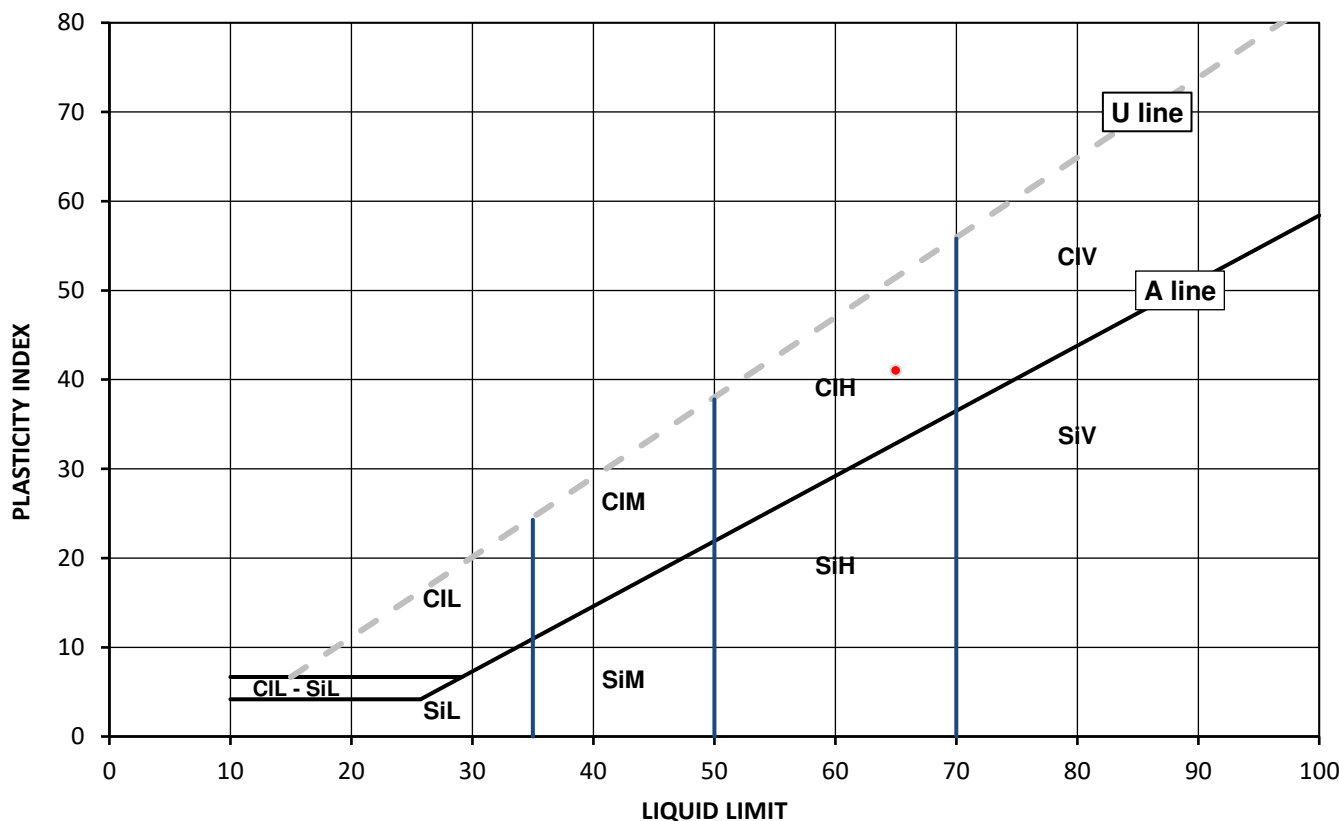
Test Results:

Laboratory Reference: 161682
Hole No.: BH1
Sample Reference: 12
Sample Description: Grey slightly gravelly CLAY

Depth Top [m]: 12.50
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested after washing to remove >0.425mm; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
30.4	65	24	41	0.15	0.85	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

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Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 13/03/2024
Date Received: 19/03/2024
Date Tested: 18/04/2024
Sampled By: Not Given

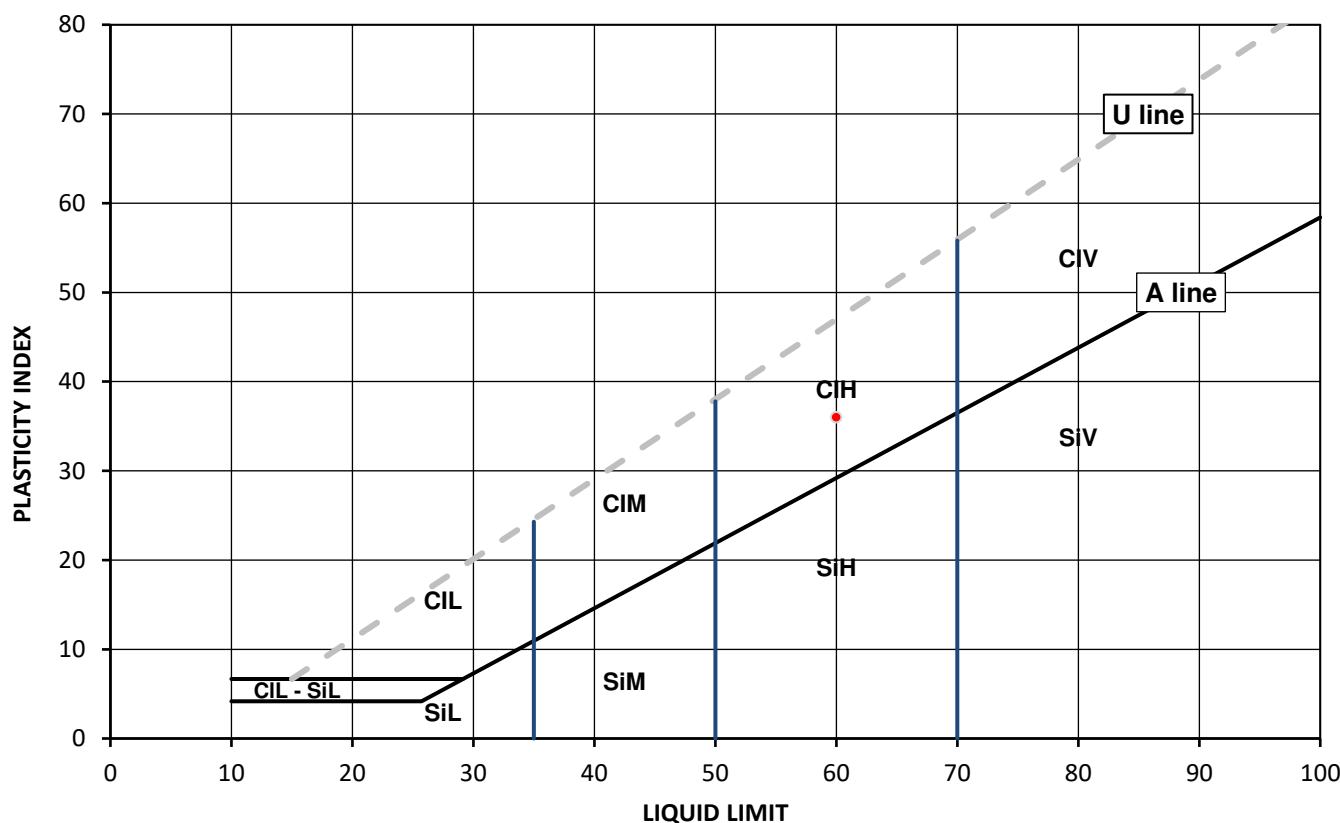
Test Results:

Laboratory Reference: 161683
Hole No.: BH1
Sample Reference: 13
Sample Description: Dark grey CLAY

Depth Top [m]: 15.00
Depth Base [m]: Not Given
Sample Type: U

Sample Preparation: Tested in natural condition; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
21.4	60	24	36	-0.08	1.08	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

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Contact: Matthew Thompson
Site Address: Tottenham Hale, London

Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 13/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

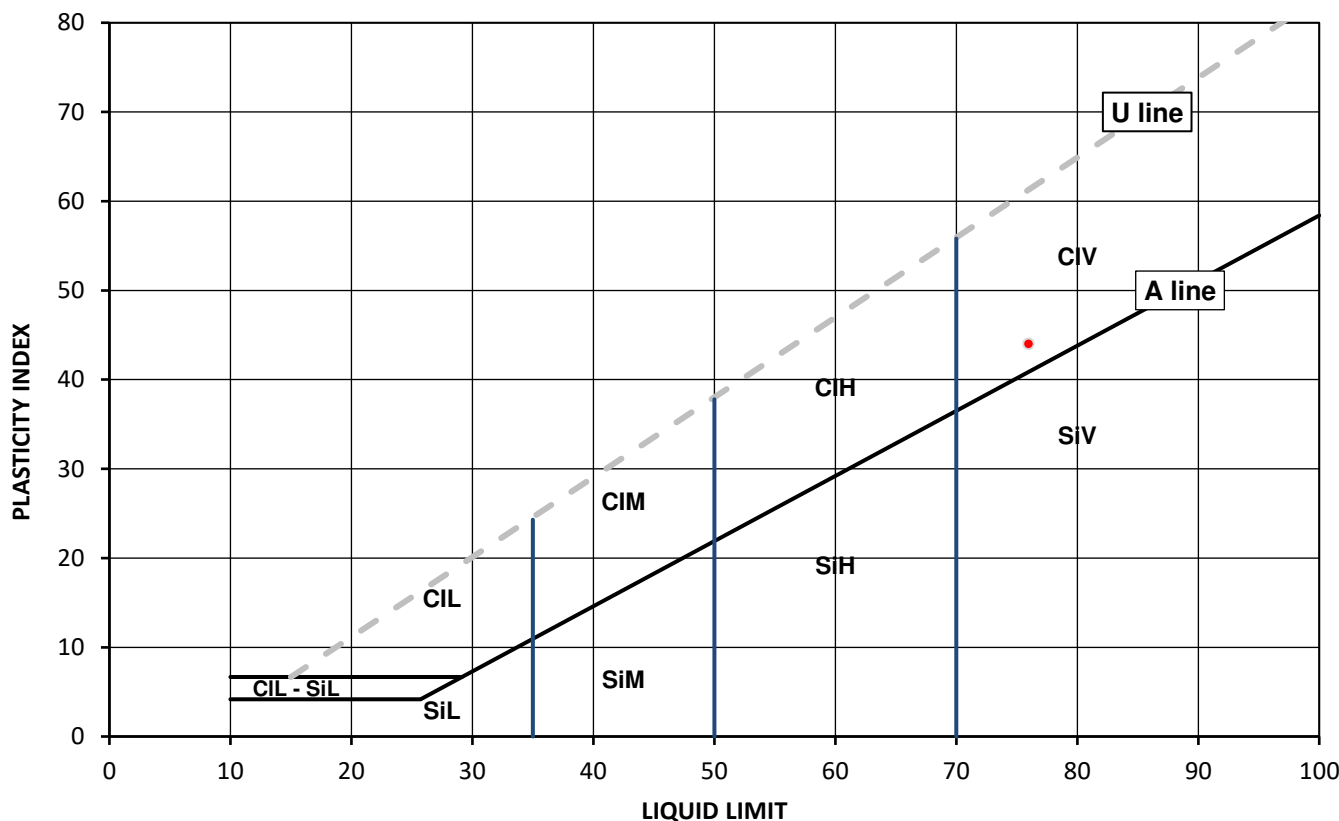
Test Results:

Laboratory Reference: 161684
Hole No.: BH1
Sample Reference: 15
Sample Description: Dark grey slightly gravelly CLAY

Depth Top [m]: 17.00
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested after >0.425mm removed by hand; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
35.0	76	32	44	0.07	0.93	96



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

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Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 14/03/2024
Date Received: 19/03/2024
Date Tested: 10/04/2024
Sampled By: Not Given

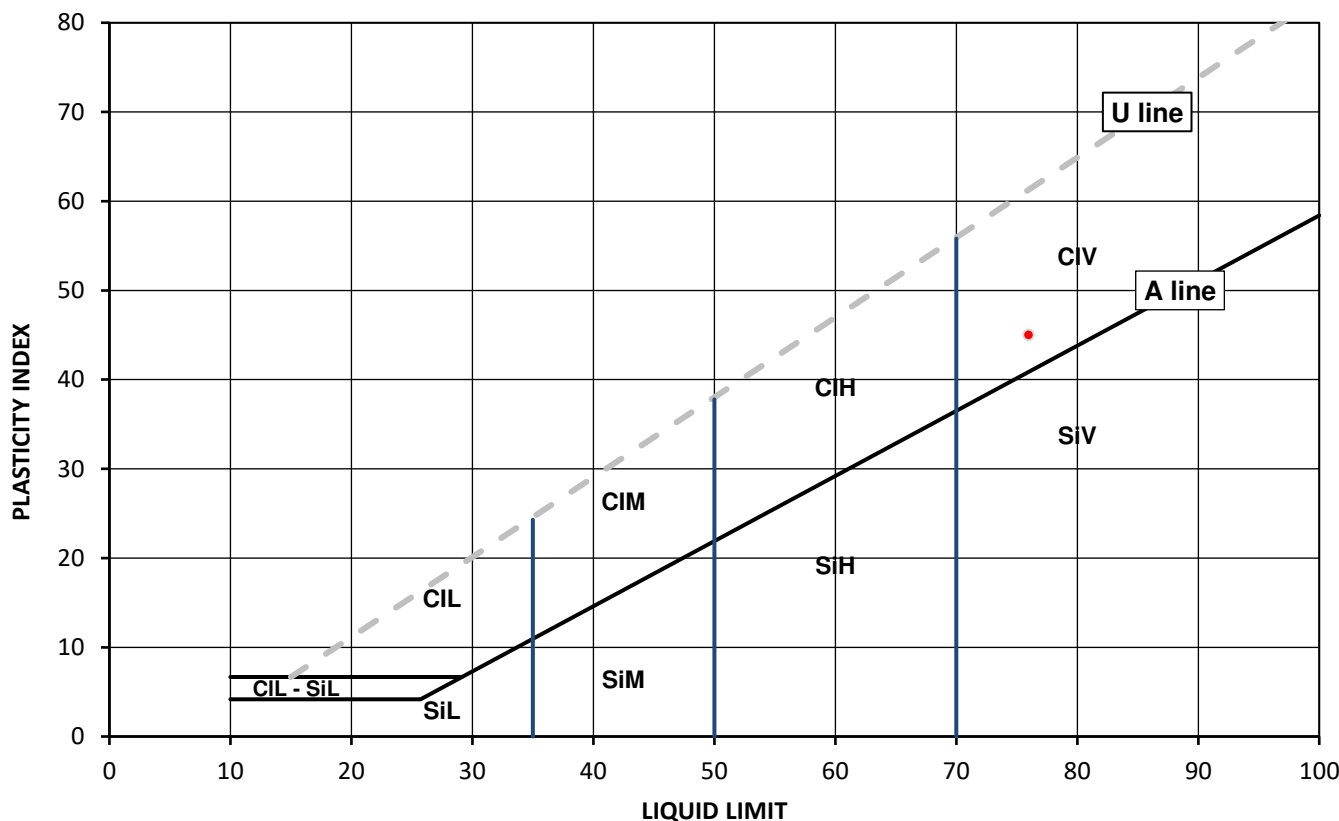
Test Results:

Laboratory Reference: 161688
Hole No.: BH2
Sample Reference: 11
Sample Description: Dark grey CLAY

Depth Top [m]: 12.40
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested in natural condition; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
28.7	76	31	45	-0.04	1.04	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

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Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 15/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

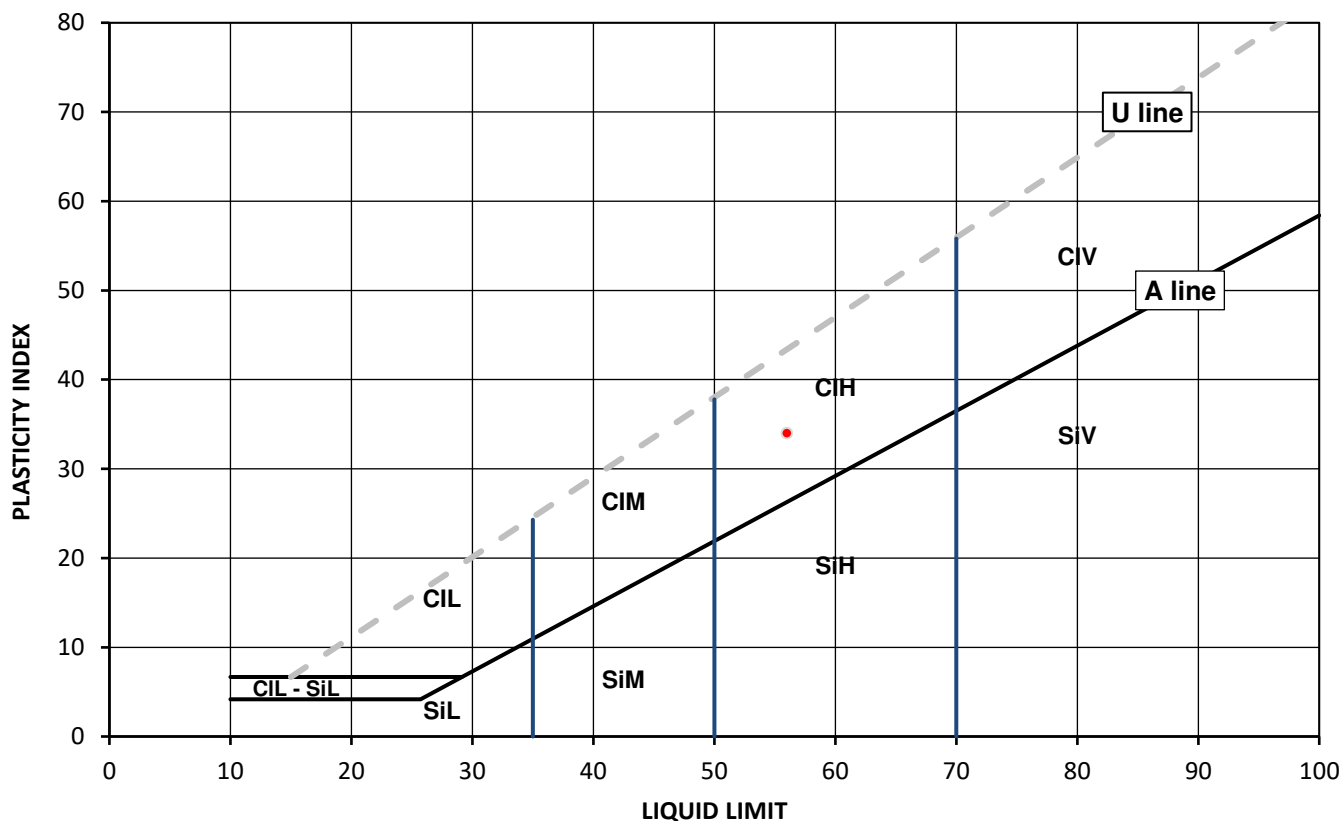
Test Results:

Laboratory Reference: 161691
Hole No.: BH2
Sample Reference: 18
Sample Description: Dark grey slightly gravelly slightly sandy CLAY

Depth Top [m]: 20.00
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested after washing to remove >0.425mm; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
27.6	56	22	34	0.18	0.82	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

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Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 13/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

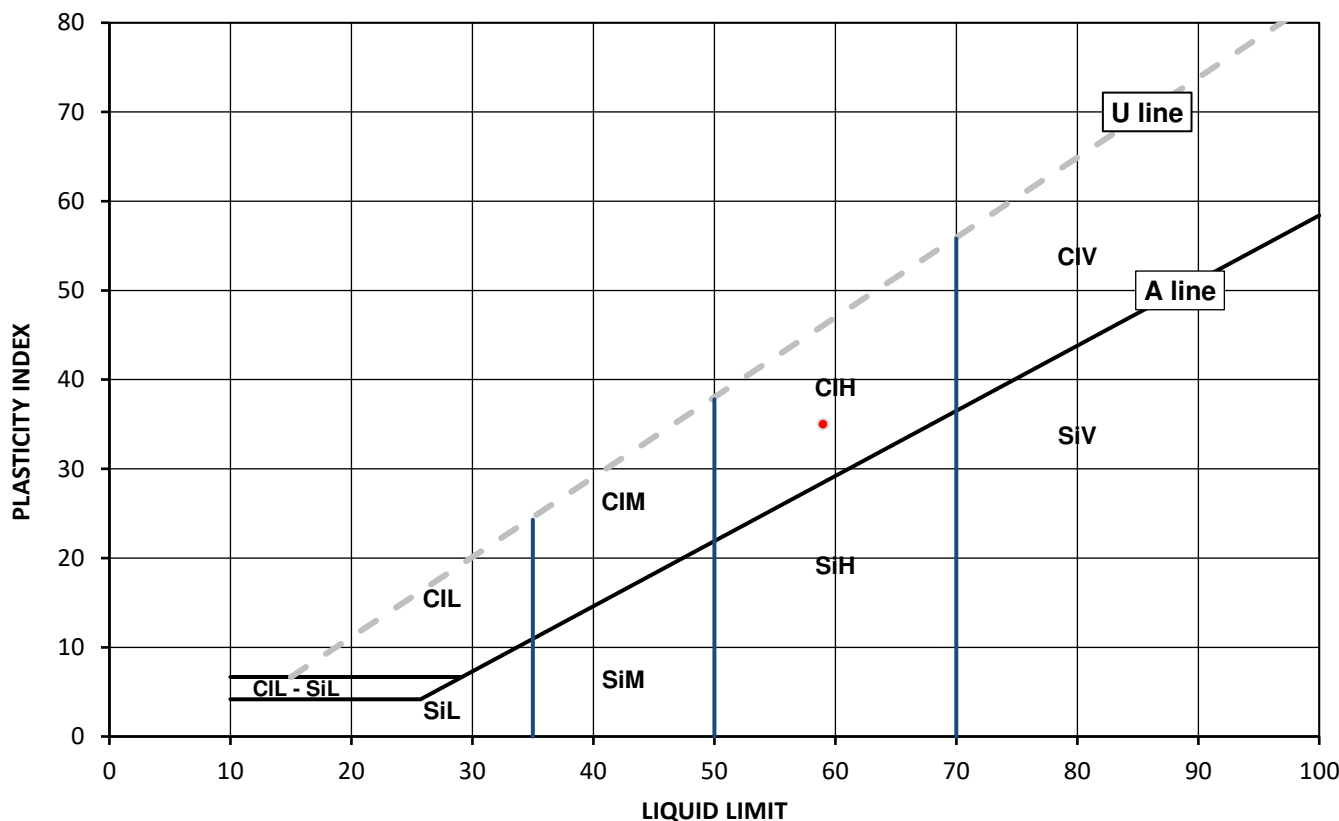
Test Results:

Laboratory Reference: 161695
Hole No.: BH1
Sample Reference: 18
Sample Description: Dark grey slightly sandy CLAY

Depth Top [m]: 20.80
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested in natural condition; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
30.7	59	24	35	0.20	0.80	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

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Site Address: Tottenham Hale, London

Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 13/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

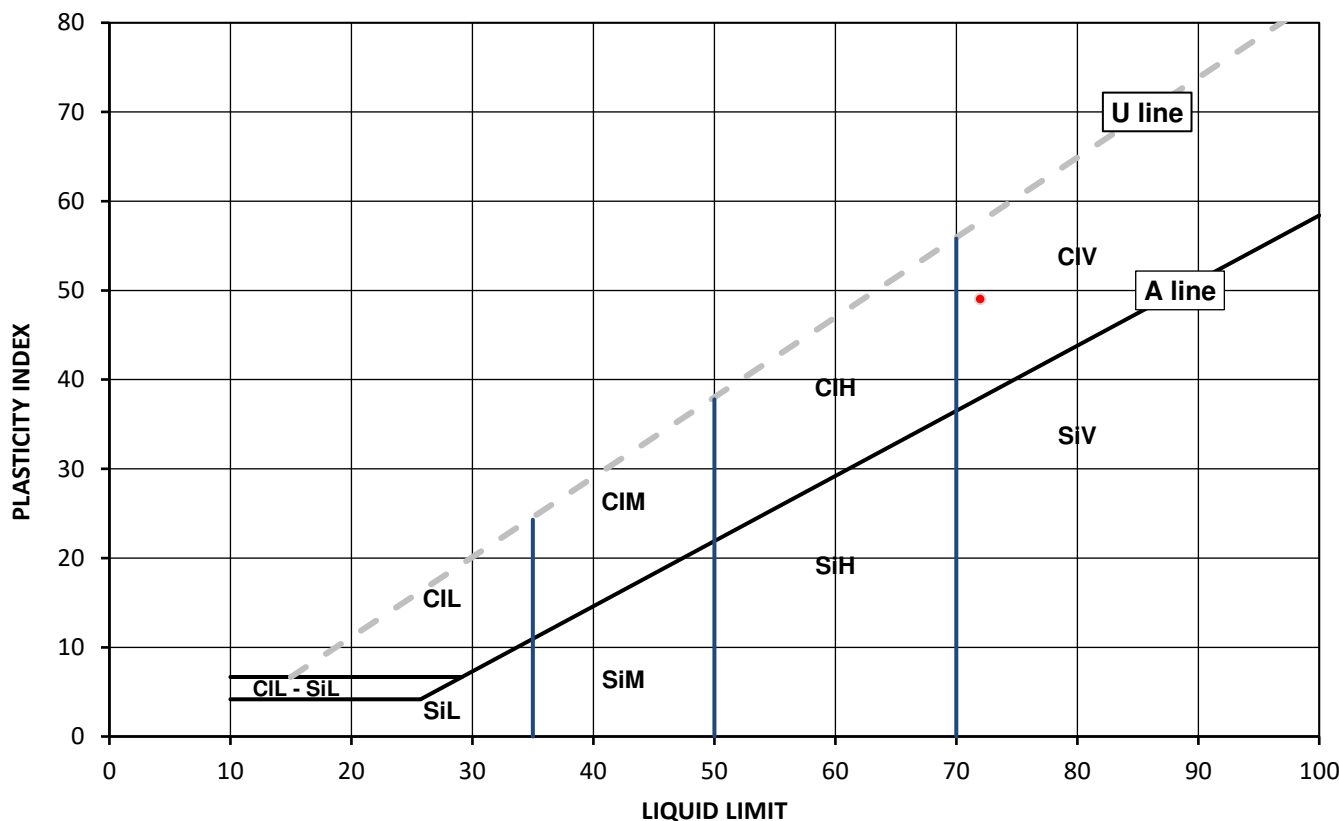
Test Results:

Laboratory Reference: 161698
Hole No.: BH1
Sample Reference: 25
Sample Description: Grey sandy CLAY with fragments of chalk

Depth Top [m]: 27.50
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested in natural condition; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
16.9	72	23	49	-0.12	1.12	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

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Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 19/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

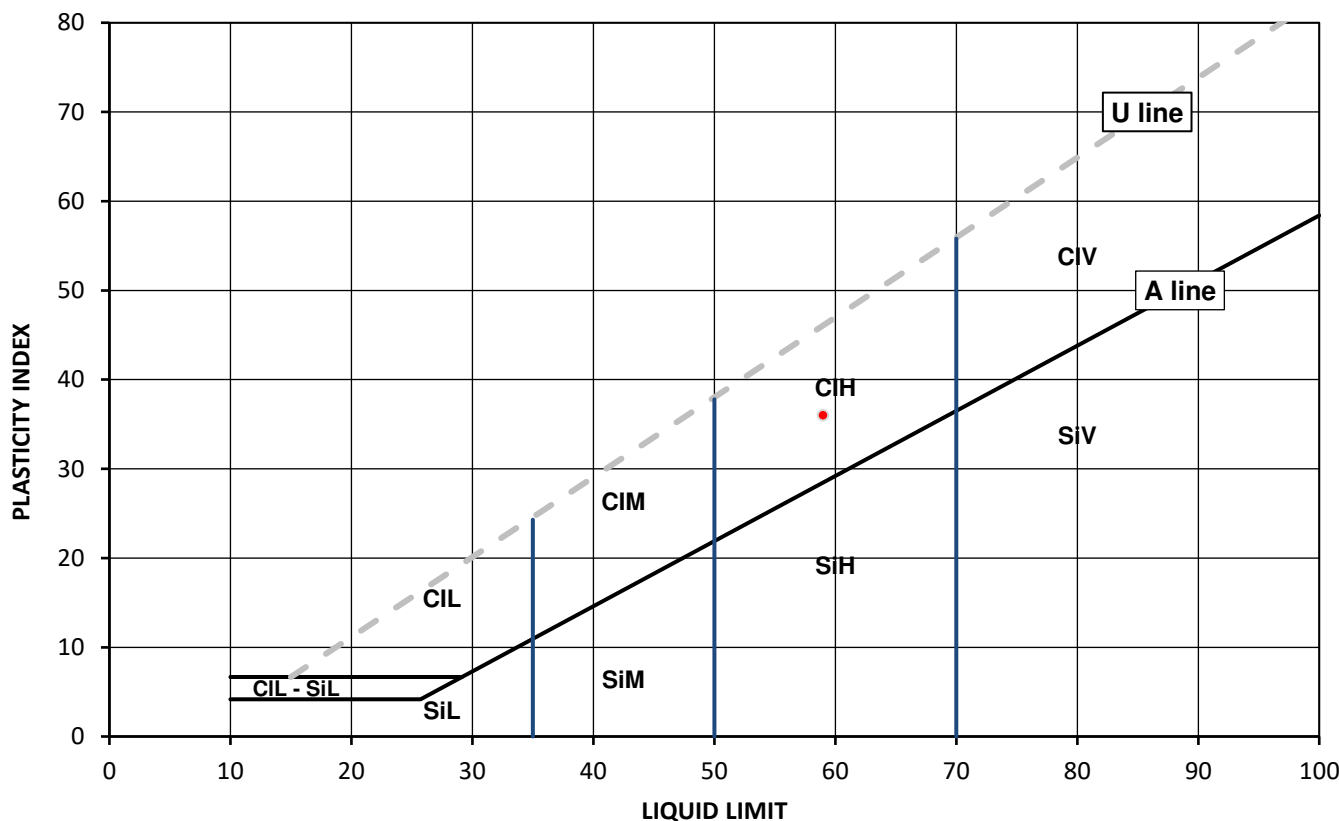
Test Results:

Laboratory Reference: 161699
Hole No.: BH3
Sample Reference: 19
Sample Description: Dark grey slightly sandy CLAY

Depth Top [m]: 21.50
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested after >0.425mm removed by hand; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
27.3	59	23	36	0.11	0.89	97



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

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Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 19/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

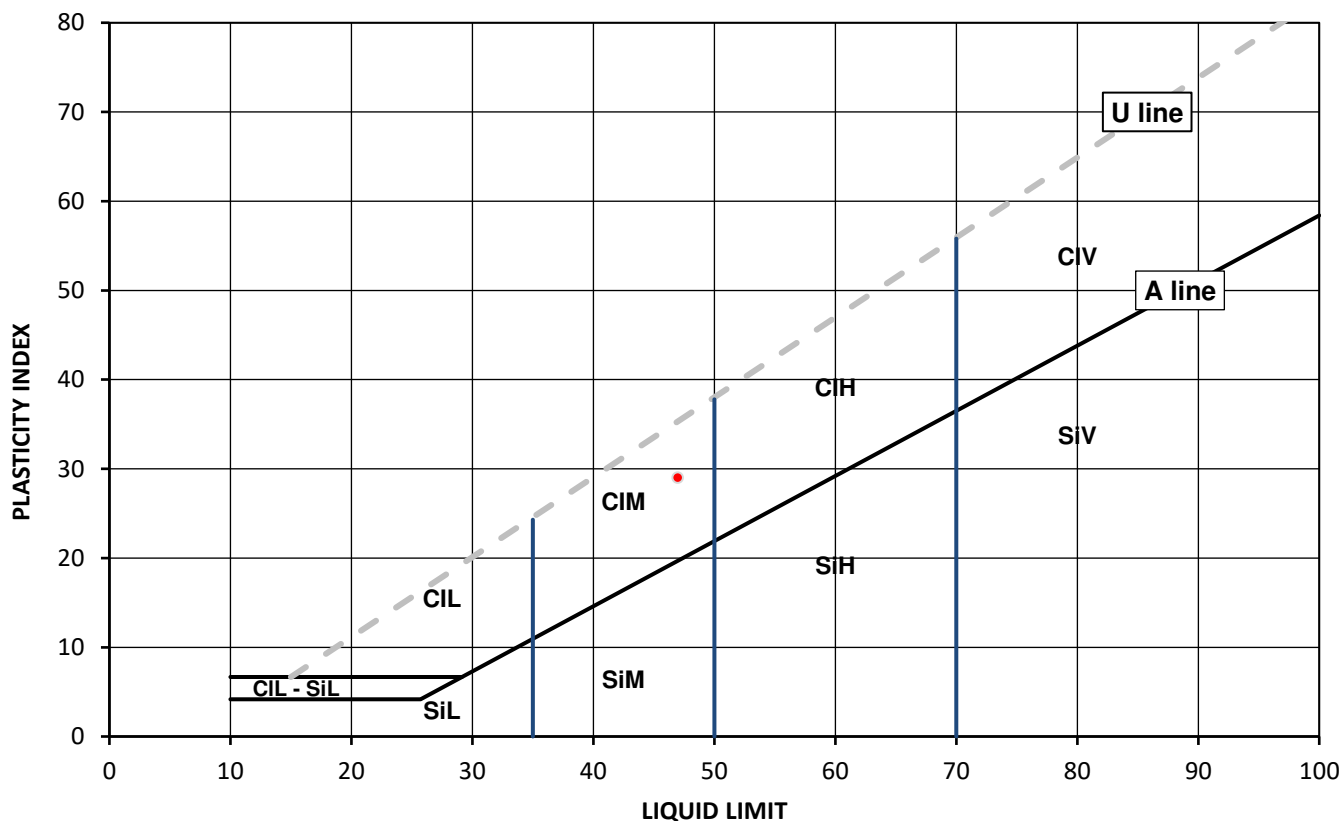
Test Results:

Laboratory Reference: 161702
Hole No.: BH3
Sample Reference: 25
Sample Description: Grey slightly gravelly slightly sandy CLAY with fragments of chalk

Depth Top [m]: 26.00
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested after washing to remove >0.425mm; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
27.3	47	18	29	0.31	0.69	94



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

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for and on behalf of i2 Analytical Ltd



4041



SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022 cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test,
BS 1377-2:2022, cl 5.2 and 6

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Client: Apex Consulting Engineers Ltd
Client Address: Unit 3, Acres Hill Business Park, 2 Acres Hill Lane,
Sheffield, South Yorkshire, S9 4LT
Contact: Matthew Thompson
Site Address: Tottenham Hale, London

W by BS EN 17892-1: 2014; Correlation Factor by Clayton C.R.I and Jukes
A.W (1978)

Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 12/03 - 15/03/2024
Date Received: 19/03/2024
Date Tested: 09/04 - 18/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	W	Liquid & Plastic Limit							Density		
		Reference	Depth Top	Depth Base	Type				% Passing 425um	WL*	Correlation Factor	Wp	Ip	Cone type	Sample Preparation	bulk	dry	PD
			m	m					%	%		%	%			Mg/m3	Mg/m3	Mg/m3
161676	BH1	2	1.70	Not Given	B	Yellowish brown slightly gravelly slightly sandy CLAY	Atterberg 4 Point	26.0	88	47	-	21	26	80g/30 deg	W / I			
161677	BH2	2	1.60	Not Given	B	Yellowish brown slightly gravelly slightly sandy CLAY	Atterberg 4 Point	28.7	80	55	-	25	30	80g/30 deg	W / I			
161680	BH1	6	5.60	Not Given	B	Dark grey slightly gravelly CLAY	Atterberg 4 Point	28.4	90	72	-	29	43	80g/30 deg	W / I			
161682	BH1	12	12.50	Not Given	B	Grey slightly gravelly CLAY	Atterberg 4 Point	30.4	99	65	-	24	41	80g/30 deg	W / I			
161683	BH1	13	15.00	Not Given	U	Dark grey CLAY	Atterberg 4 Point	21.4	100	60	-	24	36	80g/30 deg	N / I			
161684	BH1	15	17.00	Not Given	B	Dark grey slightly gravelly CLAY	Atterberg 4 Point	35.0	96	76	-	32	44	80g/30 deg	R / I			
161688	BH2	11	12.40	Not Given	D	Dark grey CLAY	Atterberg 4 Point	28.7	100	76	-	31	45	80g/30 deg	N / I			
161691	BH2	18	20.00	Not Given	B	Dark grey slightly gravelly slightly sandy CLAY	Atterberg 4 Point	27.6	99	56	-	22	34	80g/30 deg	W / I			
161695	BH1	18	20.80	Not Given	B	Dark grey slightly sandy CLAY	Atterberg 4 Point	30.7	100	59	-	24	35	80g/30 deg	N / I			
161698	BH1	25	27.50	Not Given	B	Grey sandy CLAY with fragments of chalk	Atterberg 4 Point	16.9	100	72	-	23	49	80g/30 deg	N / I			

Note: # Non accredited; NP - Non plastic; N - Tested in natural condition, R - Tested after >0,425mm removed by hand, W - Tested after washing to remove >425mm; I - The water content in the sample was increased ,
D - The water content in the sample was decreased; * - One point liquid limit corrected as per the report Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Comments:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist

for and on behalf of i2 Analytical Ltd

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4041



SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022 cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test,
BS 1377-2:2022, cl 5.2 and 6

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Test results

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		Reference	Depth Top	Depth Base	Type				% Passing 425um	WL*	Correlation Factor	Wp	Ip	Cone type	Sample Preparation	bulk	dry	PD	
			m	m															Mg/m3
161699	BH3	19	21.50	Not Given	B	Dark grey slightly sandy CLAY	Atterberg 4 Point	27.3	97	59	-	23	36	80g/30 deg	R / I				
161702	BH3	25	26.00	Not Given	B	Grey slightly gravelly slightly sandy CLAY with fragments of chalk	Atterberg 4 Point	27.3	94	47	-	18	29	80g/30 deg	W / I				

Note: # Non accredited; NP - Non plastic; N - Tested in natural condition, R - Tested after >0,425mm removed by hand, W - Tested after washing to remove >425mm; I - The water content in the sample was increased ,
D - The water content in the sample was decreased; * - One point liquid limit corrected as per the report Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

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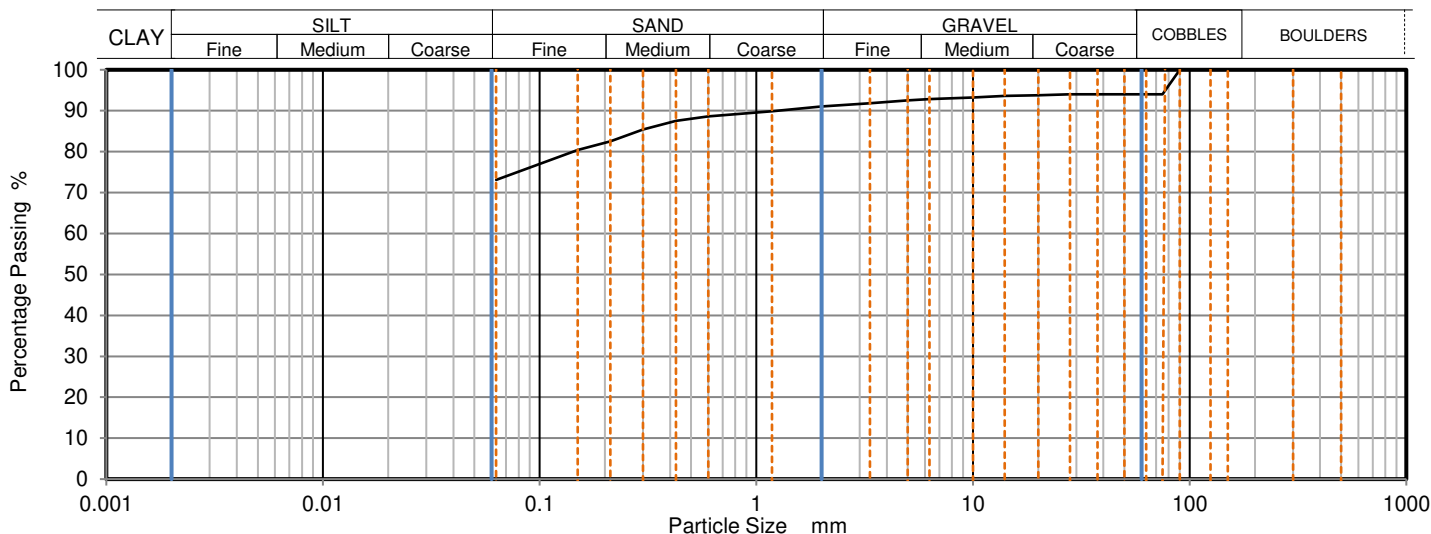
Client: Apex Consulting Engineers Ltd
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Contact: Matthew Thompson
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Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 12/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

Test Results:

Laboratory Reference: 161676
Hole No.: BH1
Sample Reference: 2
Sample Description: Yellowish brown slightly gravelly slightly sandy CLAY
Sample Preparation: Sample was quartered, oven dried at 106.4 °C and broken down by hand.

Depth Top [m]: 1.70
Depth Base [m]: Not Given
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	94		
63	94		
50	94		
37.5	94		
28	94		
20	94		
14	94		
10	93		
6.3	93		
5	93		
3.35	92		
2	91		
1.18	90		
0.6	89		
0.425	88		
0.3	85		
0.212	83		
0.15	80		
0.063	73		

Sample Proportions	% dry mass
Very coarse	6.00
Gravel	3.00
Sand	18.00
Fines <0.063 mm	73.00

Grading Analysis	
D100	mm 90
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

Remarks:

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S9 4LT

Contact:

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Site Address:

Tottenham Hale, London

Testing carried out at

i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference:

1305

Job Number:

24-012298-1

Date Sampled:

14/03/2024

Date Received:

19/03/2024

Date Tested:

09/04/2024

Sampled By:

Not Given

Test Results:

Laboratory Reference:

161677

Hole No.:

BH2

Sample Reference:

2

Sample Description:

Yellowish brown slightly gravelly slightly sandy CLAY

Sample Preparation:

Sample was quartered, oven dried at 106.4 °C and broken down by hand.

Depth Top [m]:

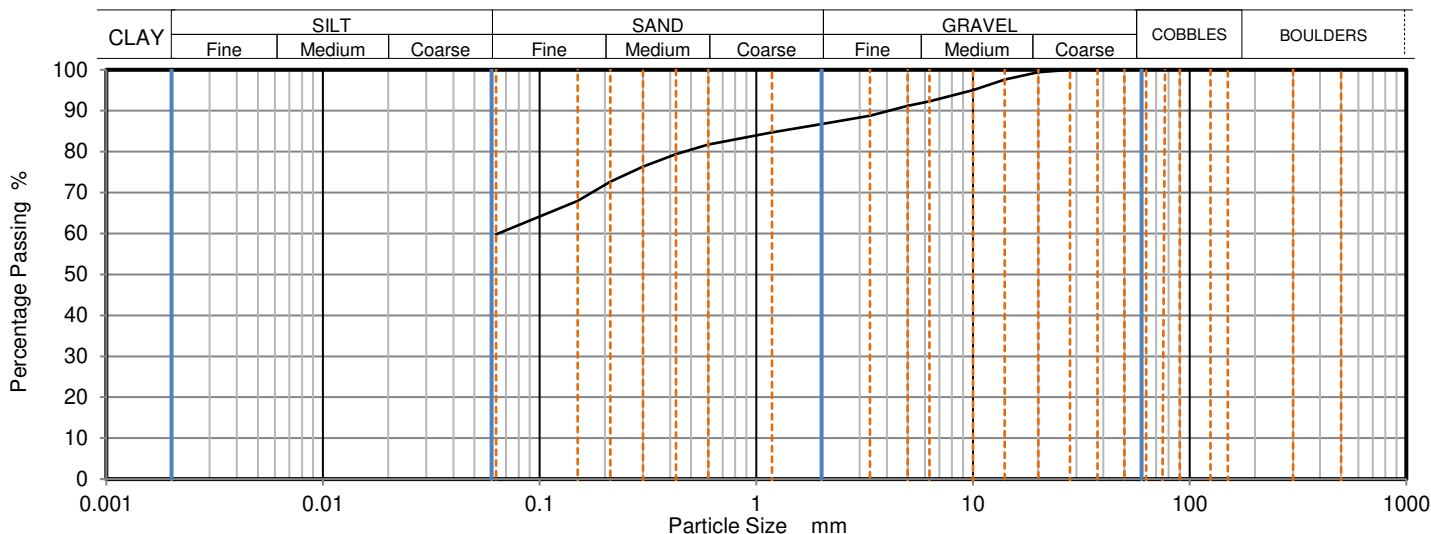
1.60

Depth Base [m]:

Not Given

Sample Type:

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	99		
14	98		
10	95		
6.3	92		
5	91		
3.35	89		
2	87		
1.18	85		
0.6	82		
0.425	79		
0.3	76		
0.212	73		
0.15	68		
0.063	60		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	13.00
Sand	27.00
Fines <0.063 mm	60.00

Grading Analysis		
D100	mm	28
D60	mm	0.0644
D30	mm	
D10	mm	
Uniformity Coefficient		1
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

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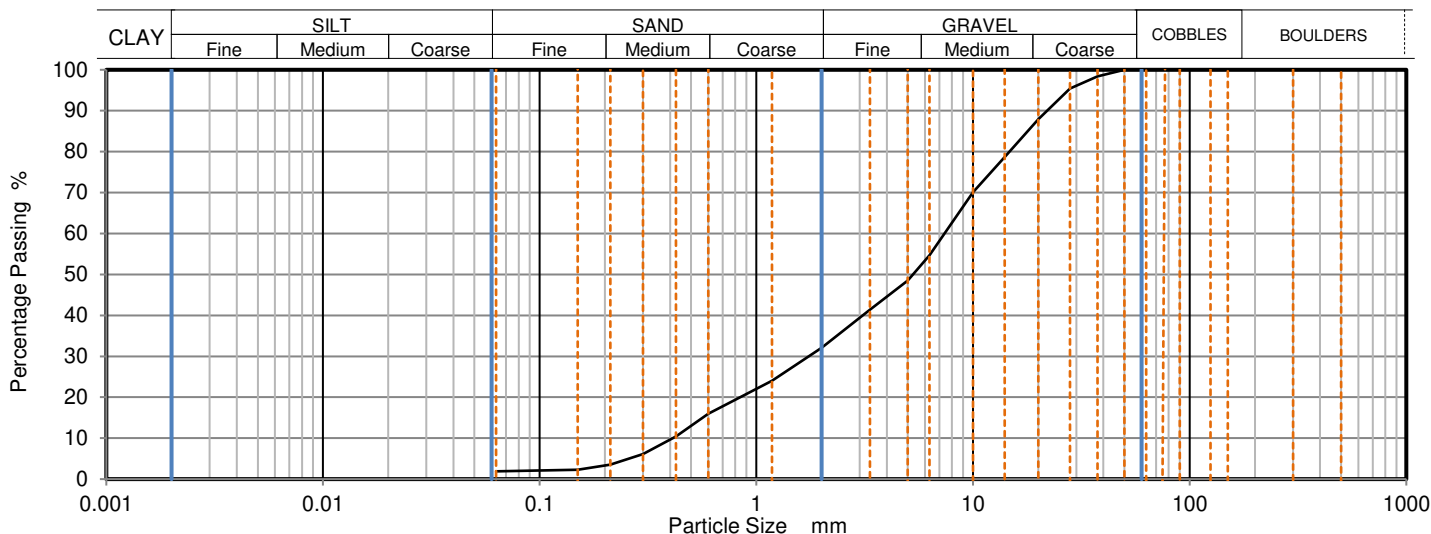
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 12/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

Test Results:

Laboratory Reference: 161678
Hole No.: BH1
Sample Reference: 3
Sample Description: Yellowish brown very sandy slightly clayey GRAVEL
Sample Preparation: Sample was quartered, oven dried at 106.4 °C and broken down by hand.

Depth Top [m]: 2.00
Depth Base [m]: Not Given
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	98		
28	95		
20	88		
14	79		
10	70		
6.3	55		
5	49		
3.35	41		
2	32		
1.18	24		
0.6	16		
0.425	10		
0.3	6		
0.212	4		
0.15	2		
0.063	2		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	68.00
Sand	30.00
Fines <0.063 mm	2.00

Grading Analysis		
D100	mm	50
D60	mm	7.38
D30	mm	1.74
D10	mm	0.411
Uniformity Coefficient		18
Curvature Coefficient		1

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

Remarks:

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Testing carried out at

i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference:

1305

Job Number:

24-012298-1

Date Sampled:

18/03/2024

Date Received:

19/03/2024

Date Tested:

09/04/2024

Sampled By:

Not Given

Test Results:

Laboratory Reference:

161679

Hole No.:

BH3

Sample Reference:

3

Sample Description:

Yellowish brown very gravelly SAND

Sample Preparation:

Sample was quartered, oven dried at 106.4 °C and broken down by hand.

Depth Top [m]:

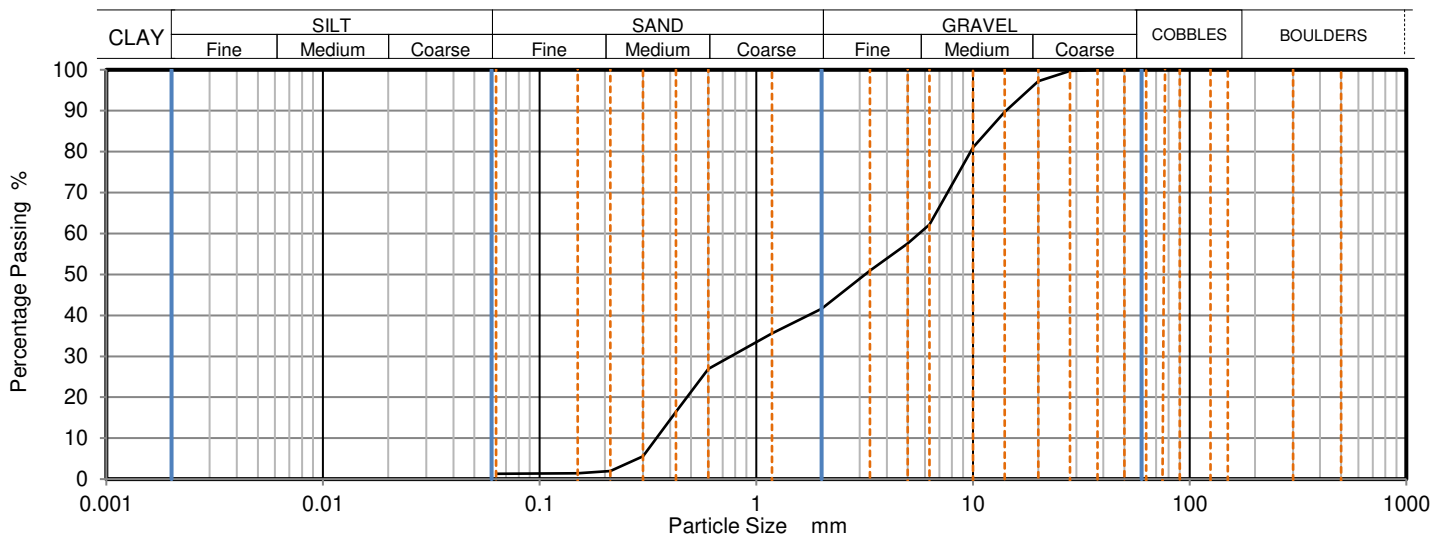
2.50

Depth Base [m]:

Not Given

Sample Type:

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	97		
14	90		
10	81		
6.3	62		
5	58		
3.35	51		
2	42		
1.18	36		
0.6	27		
0.425	16		
0.3	6		
0.212	2		
0.15	1		
0.063	1		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	59.00
Sand	40.00
Fines <0.063 mm	1.00

Grading Analysis		
D100	mm	37.5
D60	mm	5.63
D30	mm	0.764
D10	mm	0.346
Uniformity Coefficient		16
Curvature Coefficient		0.3

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

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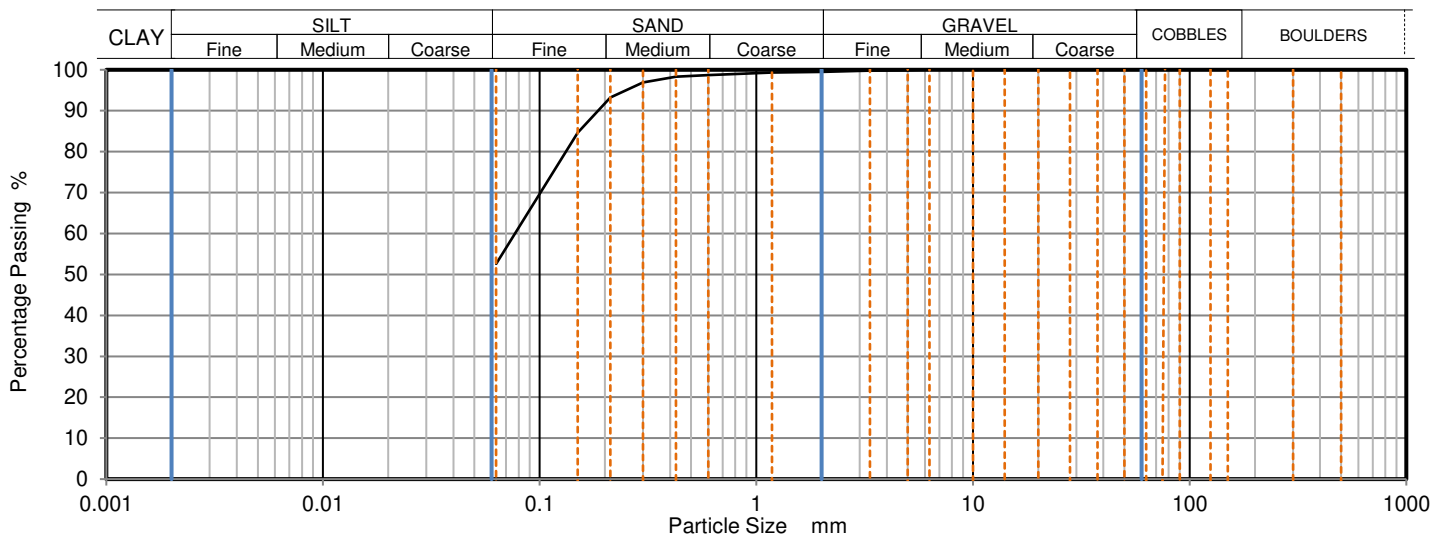
Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 13/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 161698
Hole No.: BH1
Sample Reference: 25
Sample Description: Grey sandy CLAY with fragments of chalk
Sample Preparation: Sample was quartered, oven dried at 106.4 °C and broken down by hand.

Depth Top [m]: 27.50
Depth Base [m]: Not Given
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99		
0.425	98		
0.3	97		
0.212	93		
0.15	85		
0.063	53		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	1.00
Sand	46.00
Fines <0.063 mm	53.00

Grading Analysis		
D100	mm	6.3
D60	mm	0.077
D30	mm	
D10	mm	
Uniformity Coefficient		1.2
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

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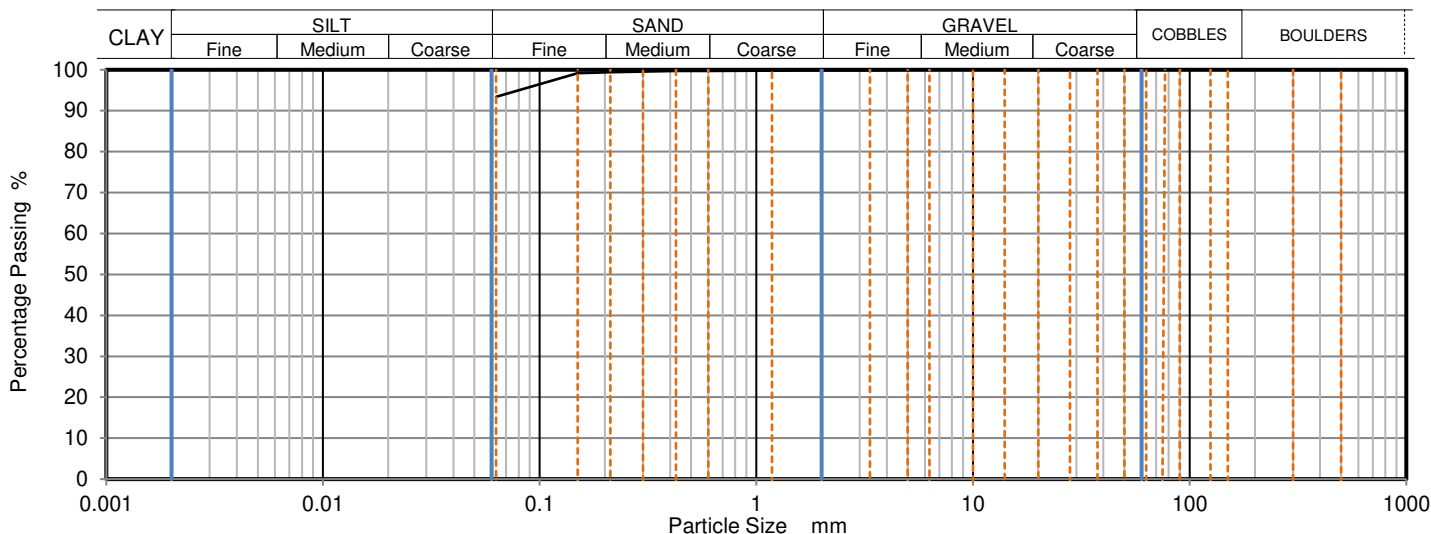
Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 19/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 161699
Hole No.: BH3
Sample Reference: 19
Sample Description: Dark grey slightly sandy CLAY
Sample Preparation: Sample was quartered, oven dried at 106.4 °C and broken down by hand.

Depth Top [m]: 21.50
Depth Base [m]: Not Given
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	99		
0.15	99		
0.063	93		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.00
Sand	7.00
Fines <0.063 mm	93.00

Grading Analysis	
D100	mm 10
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

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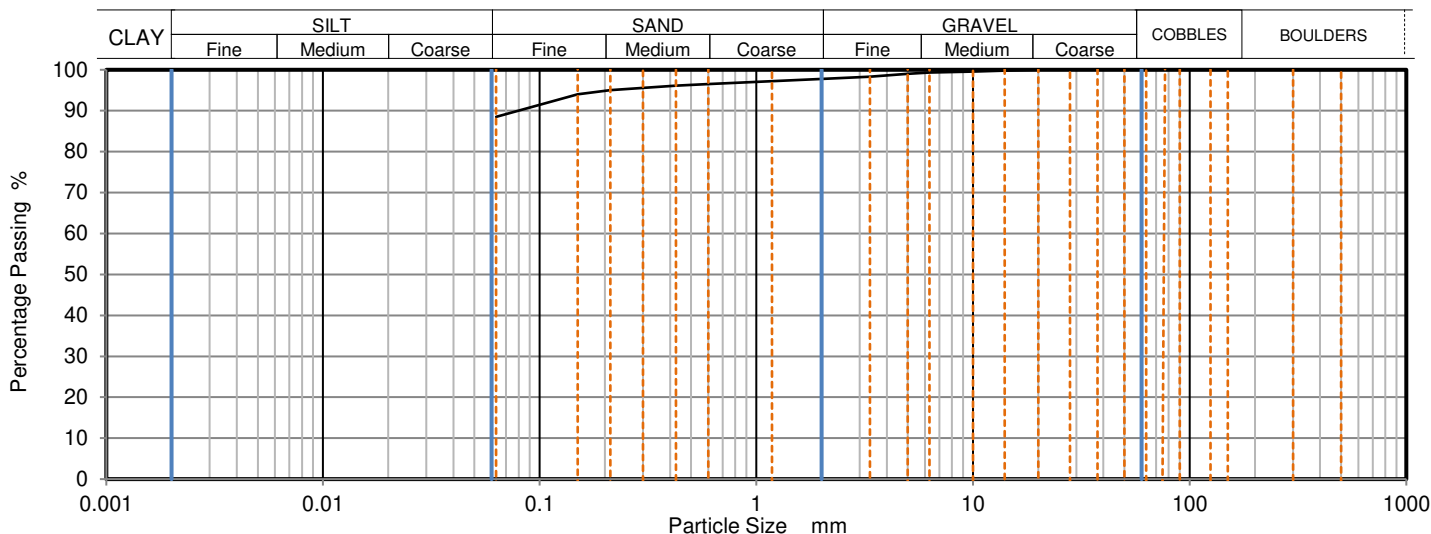
Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 19/03/2024
Date Received: 19/03/2024
Date Tested: 09/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 161702
Hole No.: BH3
Sample Reference: 25
Sample Description: Grey slightly gravelly slightly sandy CLAY with fragments of chalk
Sample Preparation: Sample was quartered, oven dried at 106.4 °C and broken down by hand.

Depth Top [m]: 26.00
Depth Base [m]: Not Given
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5	99		
3.35	98		
2	98		
1.18	97		
0.6	97		
0.425	96		
0.3	96		
0.212	95		
0.15	94		
0.063	89		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	2.00
Sand	10.00
Fines <0.063 mm	88.00

Grading Analysis		
D100	mm	20
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

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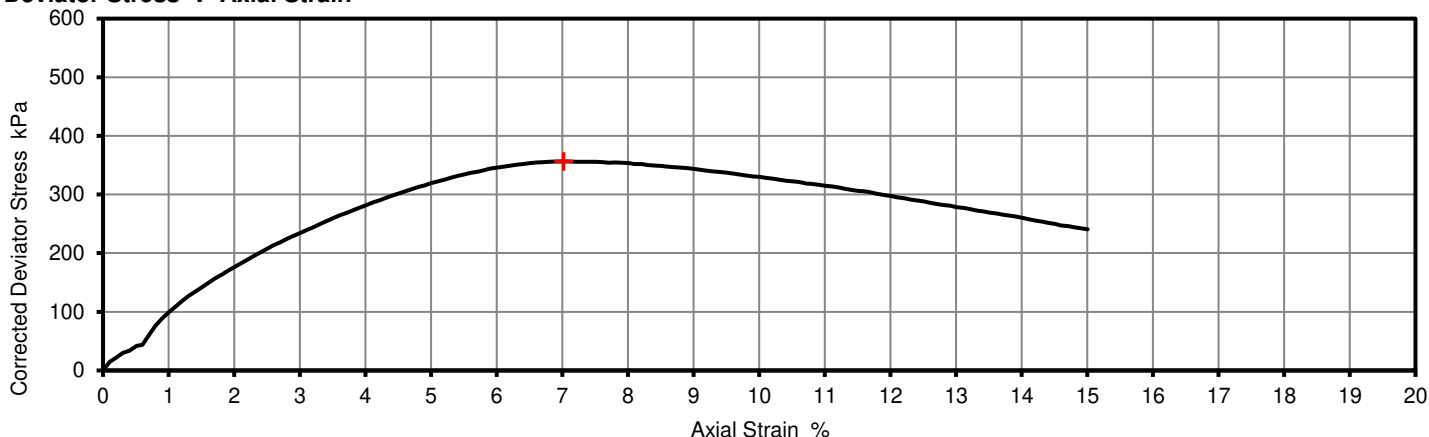
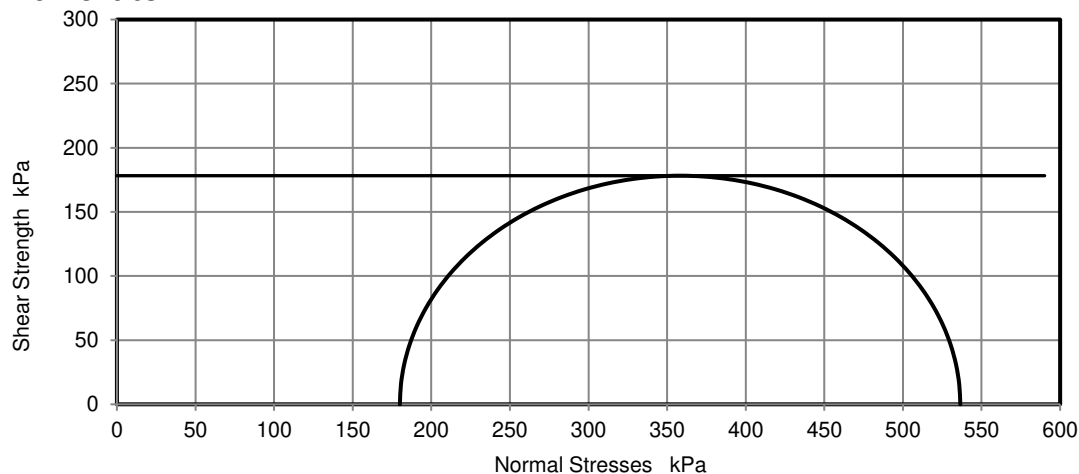
Test Results:

Laboratory Reference: 161681
Hole No.: BH1
Sample Reference: 9
Sample Description: Dark grey CLAY
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

Depth Top [m]: 9.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Depth within Sample	- m
Length	197.20 mm
Diameter	103.88 mm
Length Prior to Shearing	197.20 mm
Bulk Density	1.96 Mg/m ³
Initial Water Content	27.9 %
Final Water Content	28.7 %
Dry Density	1.53 Mg/m ³

Rate of Strain	2.00 %/min
Cell Pressure	180 kPa
Axial Strain at Failure	7.0 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	356 kPa
Undrained Shear Strength, c_u	178 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Brittle
Membrane Thickness	0.27 mm
Membrane Correction	1.05 kPa

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample



Note: Deviator stress corrected for area change and membrane effects.

Remarks:

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Date Sampled: 13/03/2024
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Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

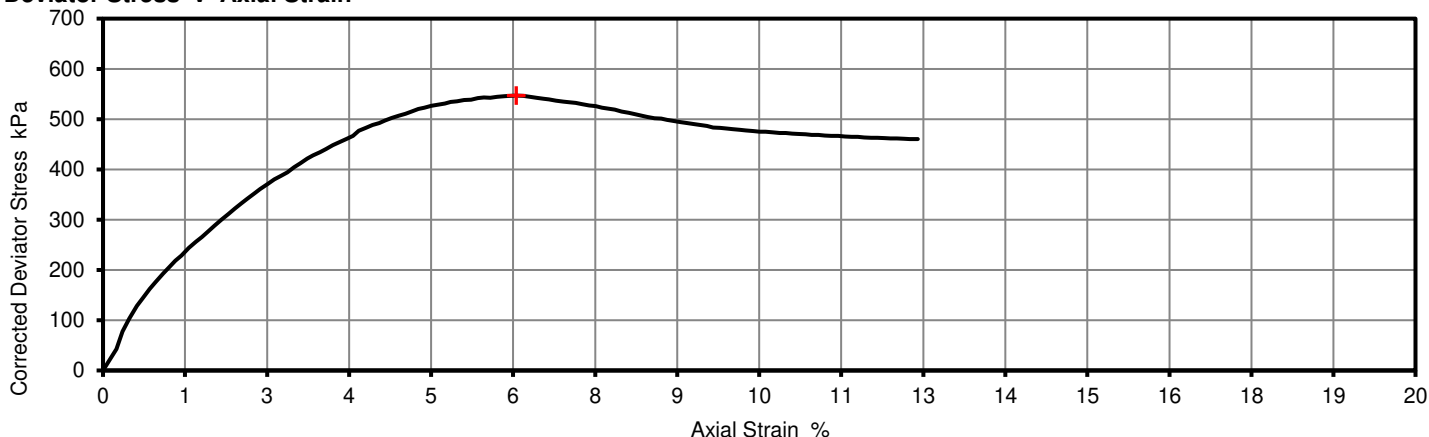
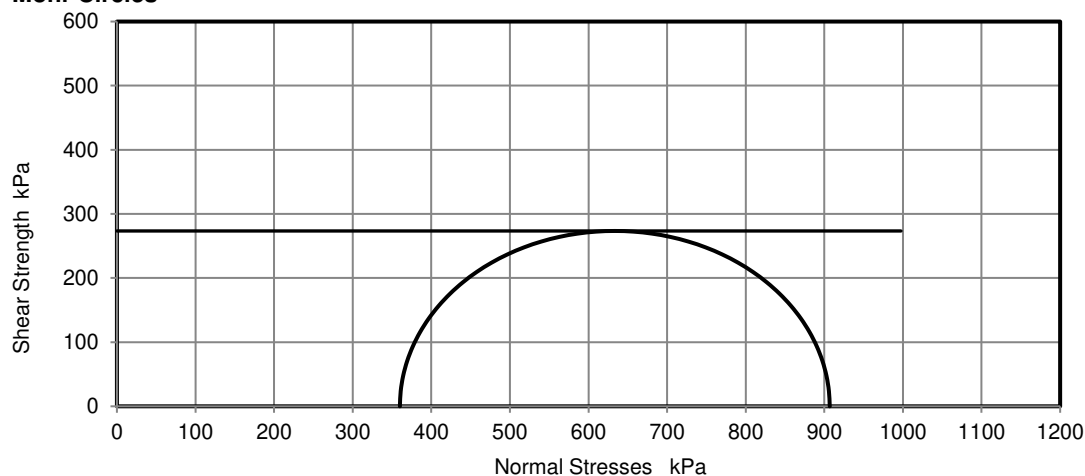
Test Results:

Laboratory Reference: 161685
Hole No.: BH1
Sample Reference: 16
Sample Description: Dark grey CLAY
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

Depth Top [m]: 18.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Depth within Sample	- m
Length	204.09 mm
Diameter	103.70 mm
Length Prior to Shearing	204.09 mm
Bulk Density	2.01 Mg/m ³
Initial Water Content	20.5 %
Final Water Content	21.1 %
Dry Density	1.67 Mg/m ³

Rate of Strain	2.00 %/min
Cell Pressure	360 kPa
Axial Strain at Failure	6.3 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	547 kPa
Undrained Shear Strength, cu	273 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Brittle
Membrane Thickness	0.27 mm
Membrane Correction	0.95 kPa

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample



Note: Deviator stress corrected for area change and membrane effects.

Remarks:

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Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist

for and on behalf of i2 Analytical Ltd

Client: Apex Consulting Engineers Ltd
Client Address: Unit 3, Acres Hill Business Park, 2 Acres Hill Lane,
Sheffield, South Yorkshire,
S9 4LT
Contact: Matthew Thompson
Site Address: Tottenham Hale, London

Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 14/03/2024
Date Received: 19/03/2024
Date Tested: 19/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

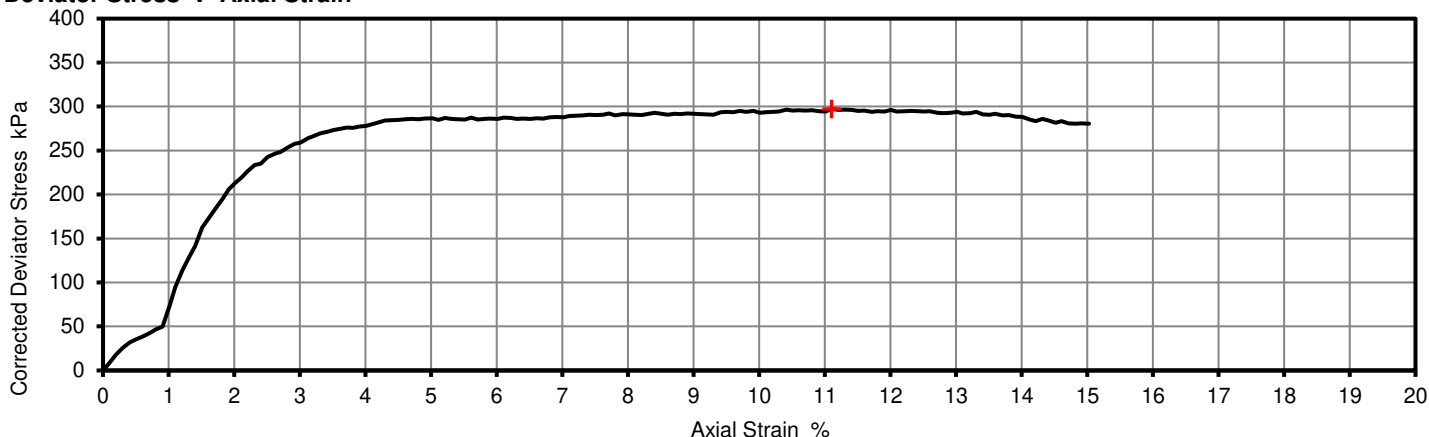
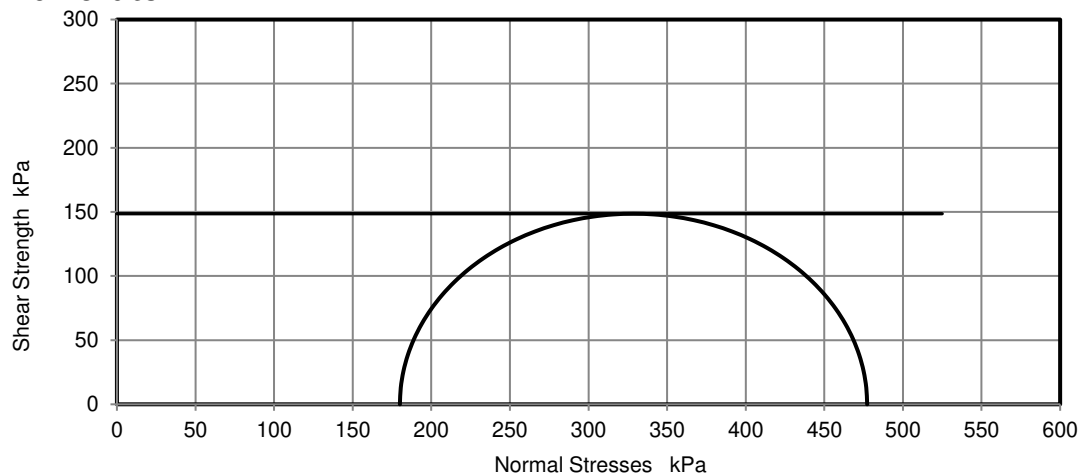
Test Results:

Laboratory Reference: 161686
Hole No.: BH2
Sample Reference: 7
Sample Description: Dark grey CLAY
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

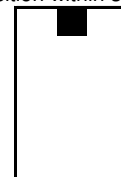
Depth Top [m]: 9.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Depth within Sample	- m
Length	76.13 mm
Diameter	37.34 mm
Length Prior to Shearing	76.13 mm
Bulk Density	2.02 Mg/m ³
Initial Water Content	28.3 %
Final Water Content	27.0 %
Dry Density	1.57 Mg/m ³

Rate of Strain	2.00 %/min
Cell Pressure	180 kPa
Axial Strain at Failure	11.1 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	297 kPa
Undrained Shear Strength, c_u	149 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Brittle
Membrane Thickness	0.21 mm
Membrane Correction	3.58 kPa

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample



Note: Deviator stress corrected for area change and membrane effects.

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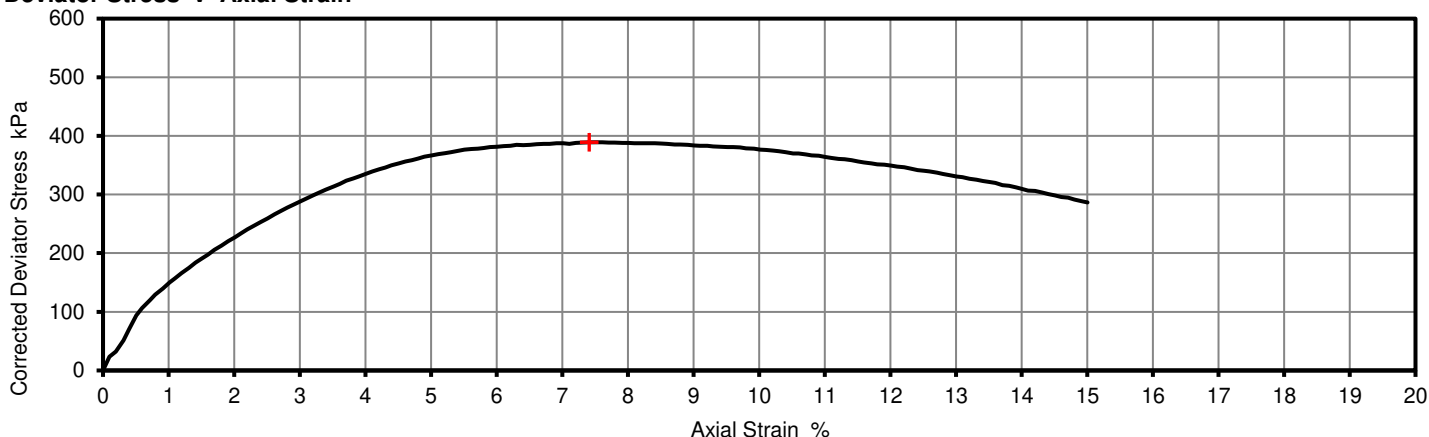
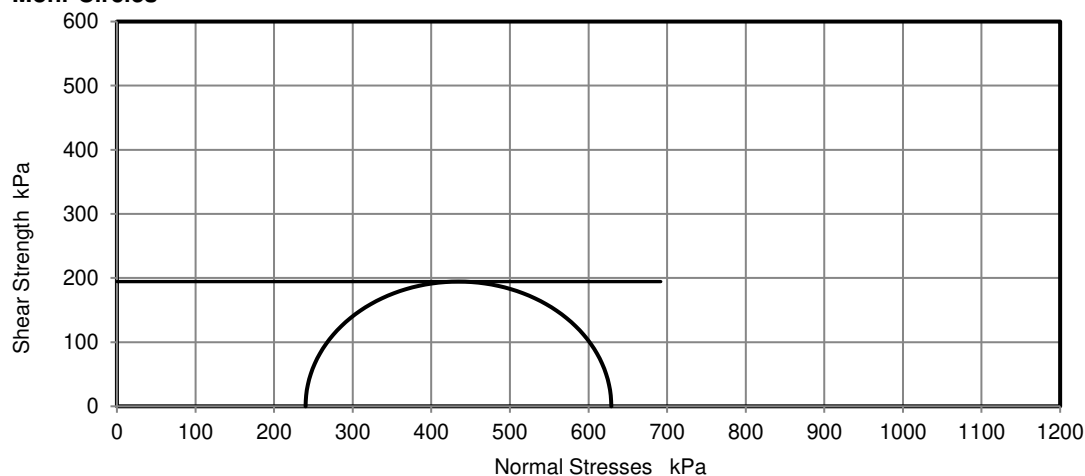
Test Results:

Laboratory Reference: 161687
Hole No.: BH2
Sample Reference: 10
Sample Description: Dark grey CLAY
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

Depth Top [m]: 12.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Depth within Sample	- m
Length	193.18 mm
Diameter	103.54 mm
Length Prior to Shearing	193.17 mm
Bulk Density	1.99 Mg/m ³
Initial Water Content	27.7 %
Final Water Content	26.9 %
Dry Density	1.56 Mg/m ³

Rate of Strain	2.00 %/min
Cell Pressure	240 kPa
Axial Strain at Failure	7.4 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	389 kPa
Undrained Shear Strength, cu	194 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$ f
Mode of Failure	Brittle
Membrane Thickness	0.30 mm
Membrane Correction	1.24 kPa

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample



Note: Deviator stress corrected for area change and membrane effects.

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Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 15/03/2024
Date Received: 19/03/2024
Date Tested: 19/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

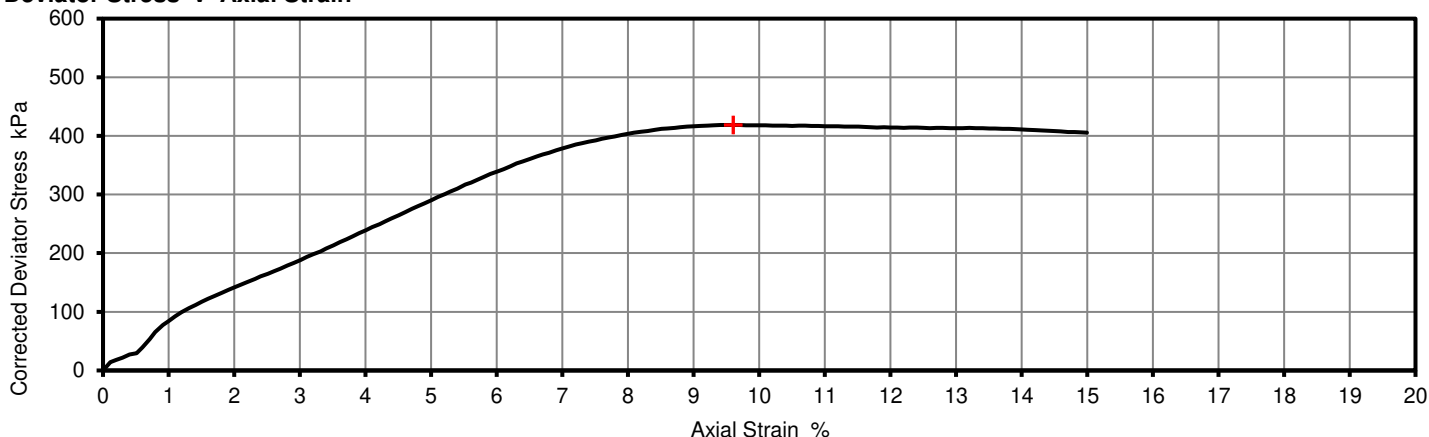
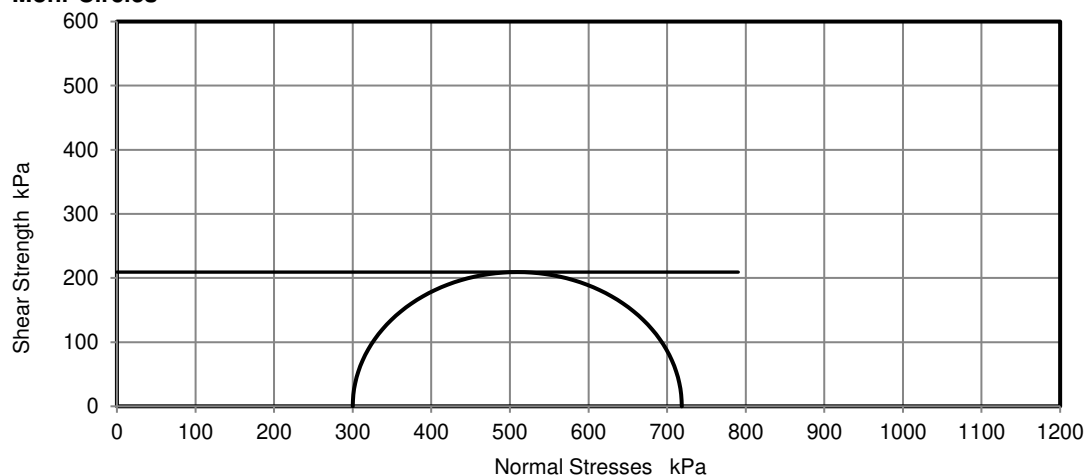
Test Results:

Laboratory Reference: 161689
Hole No.: BH2
Sample Reference: 13
Sample Description: Dark grey CLAY
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

Depth Top [m]: 15.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Depth within Sample	- m
Length	200.82 mm
Diameter	103.65 mm
Length Prior to Shearing	200.82 mm
Bulk Density	2.03 Mg/m ³
Initial Water Content	22.8 %
Final Water Content	21.7 %
Dry Density	1.66 Mg/m ³

Rate of Strain	2.00 %/min
Cell Pressure	300 kPa
Axial Strain at Failure	9.6 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	419 kPa
Undrained Shear Strength, c_u	209 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Compound
Membrane Thickness	0.26 mm
Membrane Correction	1.39 kPa

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample



Note: Deviator stress corrected for area change and membrane effects.

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UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Tested in Accordance with: BS EN ISO 17982-8:2018,
BS 1377-2 Cl. 28:2022i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Apex Consulting Engineers Ltd
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Test Results:

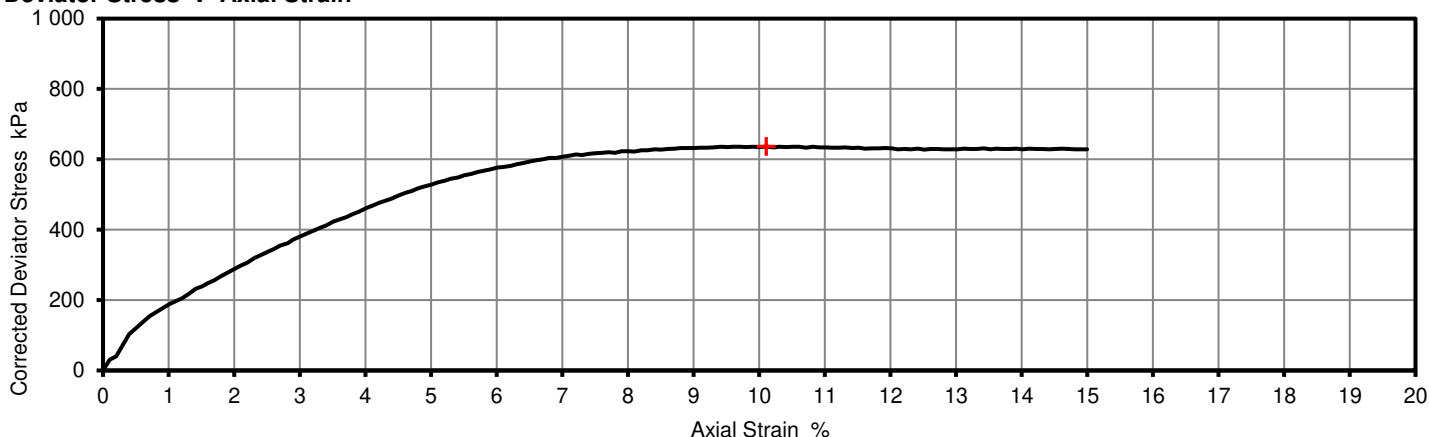
Laboratory Reference: 161690
Hole No.: BH2
Sample Reference: 16
Sample Description: Dark grey CLAY
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

Depth Top [m]: 18.00
Depth Base [m]: Not Given
Sample Type: U

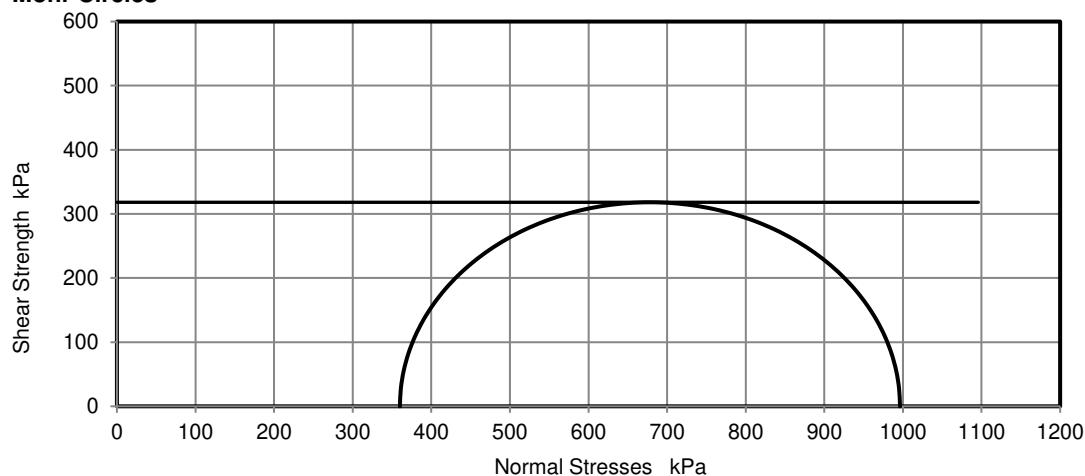
Test Number	1
Depth within Sample	- m
Length	100.04 mm
Diameter	49.97 mm
Length Prior to Shearing	100.03 mm
Bulk Density	2.05 Mg/m ³
Initial Water Content	21.1 %
Final Water Content	20.5 %
Dry Density	1.69 Mg/m ³

Rate of Strain	2.00 %/min
Cell Pressure	360 kPa
Axial Strain at Failure	10.1 %
Deviator Stress, ($\sigma_1 - \sigma_3$)f	636 kPa
Undrained Shear Strength, cu	318 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$ f
Mode of Failure	Compound
Membrane Thickness	0.21 mm
Membrane Correction	2.45 kPa

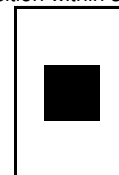
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects.

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Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 18/03/2024
Date Received: 19/03/2024
Date Tested: 19/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

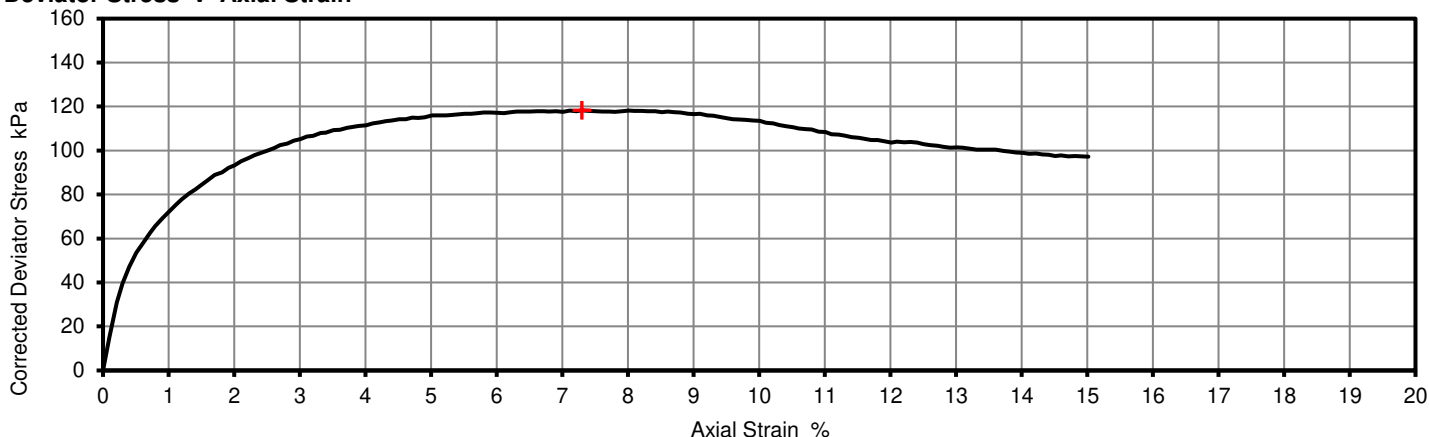
Laboratory Reference: 161692
Hole No.: BH3
Sample Reference: 5
Sample Description: Brownish grey CLAY
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

Depth Top [m]: 5.00
Depth Base [m]: Not Given
Sample Type: U

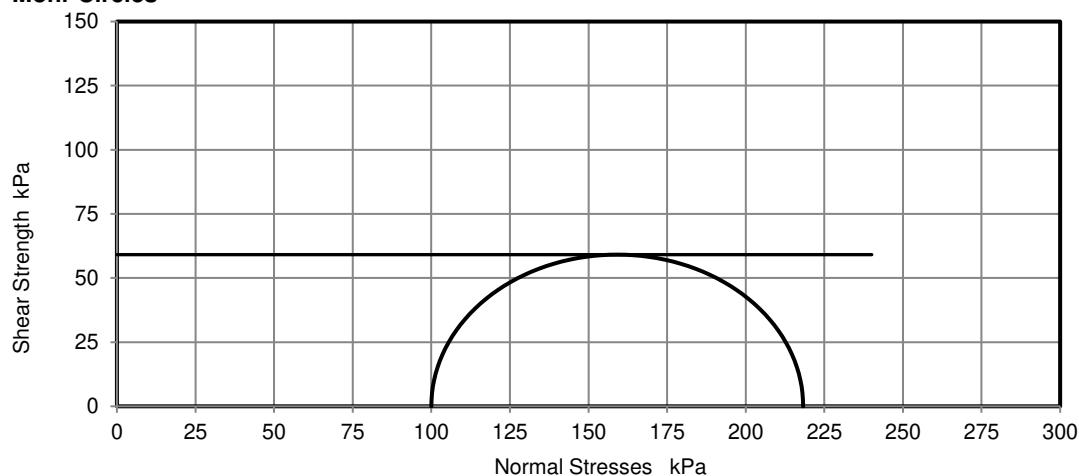
Test Number	1
Depth within Sample	- m
Length	197.34 mm
Diameter	103.48 mm
Length Prior to Shearing	197.33 mm
Bulk Density	1.95 Mg/m3
Initial Water Content	31.7 %
Final Water Content	30.9 %
Dry Density	1.48 Mg/m3

Rate of Strain	2.00 %/min
Cell Pressure	100 kPa
Axial Strain at Failure	7.3 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	118 kPa
Undrained Shear Strength, cu	59 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$ f
Mode of Failure	Brittle
Membrane Thickness	0.29 mm
Membrane Correction	1.18 kPa

Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects.

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Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 18/03/2024
Date Received: 19/03/2024
Date Tested: 19/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

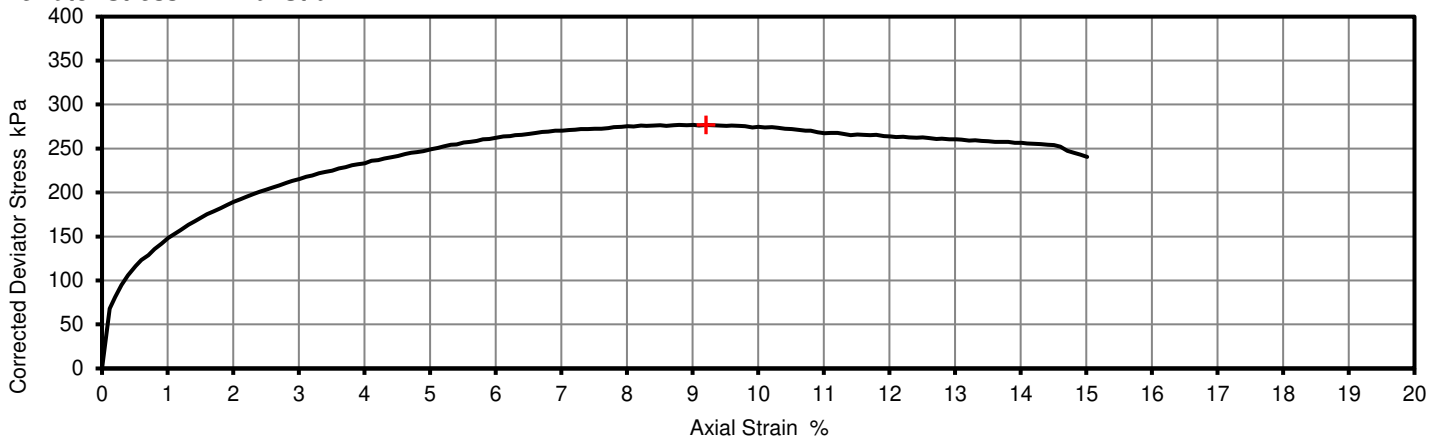
Test Results:

Laboratory Reference: 161693
Hole No.: BH3
Sample Reference: 7
Sample Description: Dark grey slightly gravelly CLAY
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

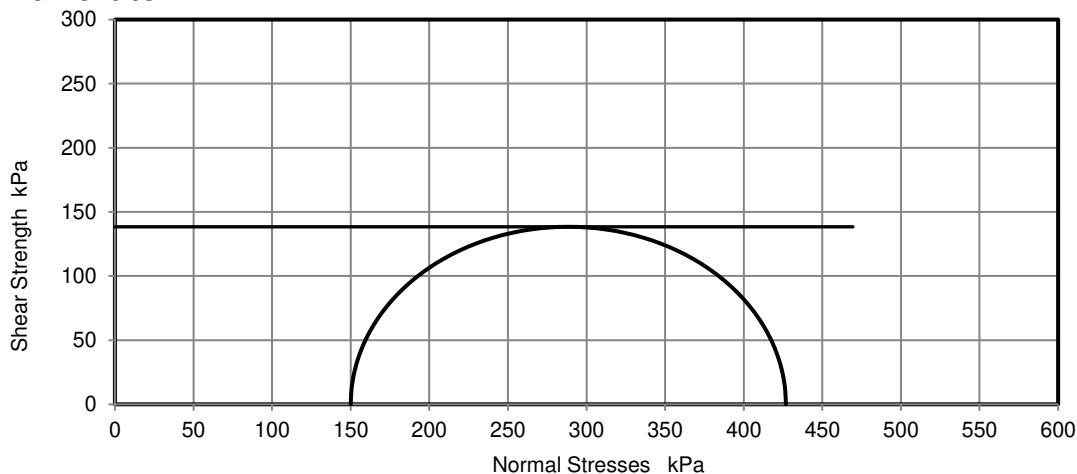
Depth Top [m]: 7.50
Depth Base [m]: Not Given
Sample Type: U

Test Number	1	Rate of Strain	2.00	%/min
Depth within Sample	-	Cell Pressure	150	kPa
Length	138.84	Axial Strain at Failure	9.2	%
Diameter	69.44	Deviator Stress, ($\sigma_1 - \sigma_3$)f	277	kPa
Length Prior to Shearing	138.82	Undrained Shear Strength, cu	138	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$ f
Bulk Density	2.00	Mode of Failure	Brittle	
Initial Water Content	26.9	Membrane Thickness	0.24	mm
Final Water Content	25.9	Membrane Correction	1.84	kPa
Dry Density	1.58			

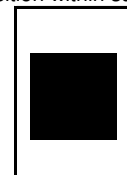
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects.

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Sampled By: Not Given

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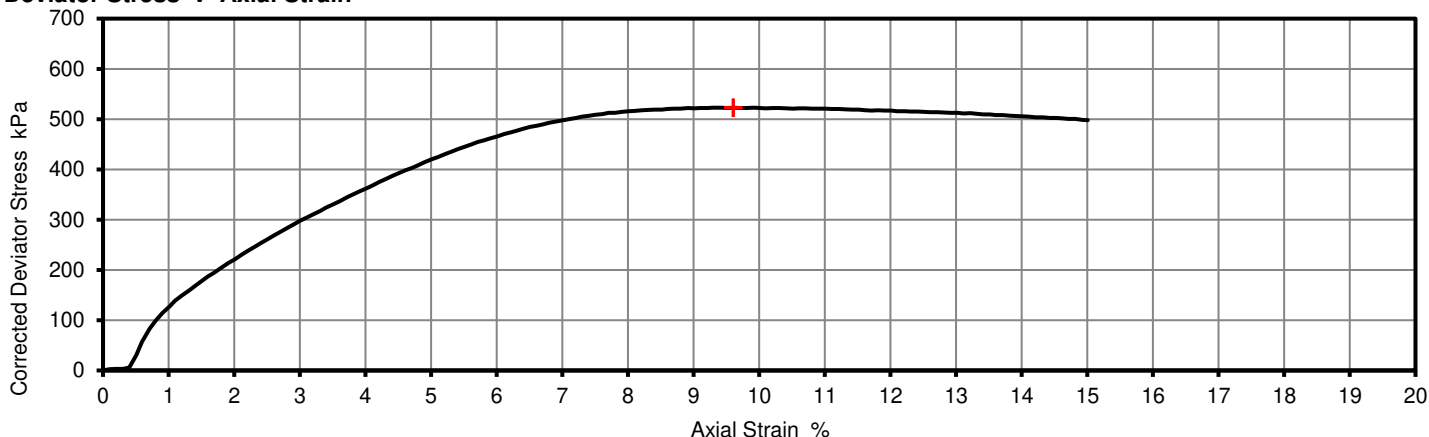
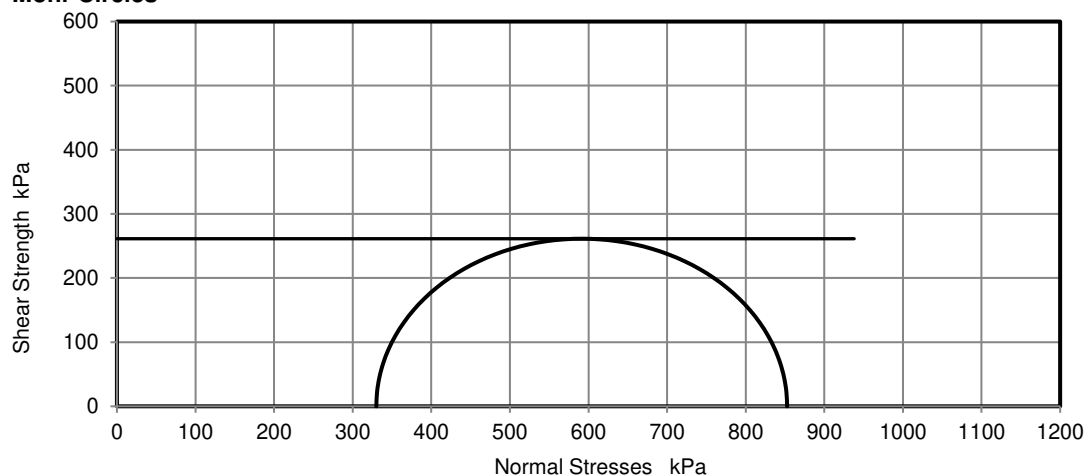
Test Results:

Laboratory Reference: 161694
Hole No.: BH3
Sample Reference: 13
Sample Description: Dark grey CLAY
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

Depth Top [m]: 16.50
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Depth within Sample	- m
Length	205.00 mm
Diameter	103.45 mm
Length Prior to Shearing	204.98 mm
Bulk Density	2.05 Mg/m3
Initial Water Content	23.6 %
Final Water Content	22.6 %
Dry Density	1.66 Mg/m3

Rate of Strain	2.00 %/min
Cell Pressure	330 kPa
Axial Strain at Failure	9.6 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	523 kPa
Undrained Shear Strength, c_u	261 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Brittle
Membrane Thickness	0.28 mm
Membrane Correction	1.50 kPa

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample



Note: Deviator stress corrected for area change and membrane effects.

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Date Tested: 19/04/2024
Sampled By: Not Given

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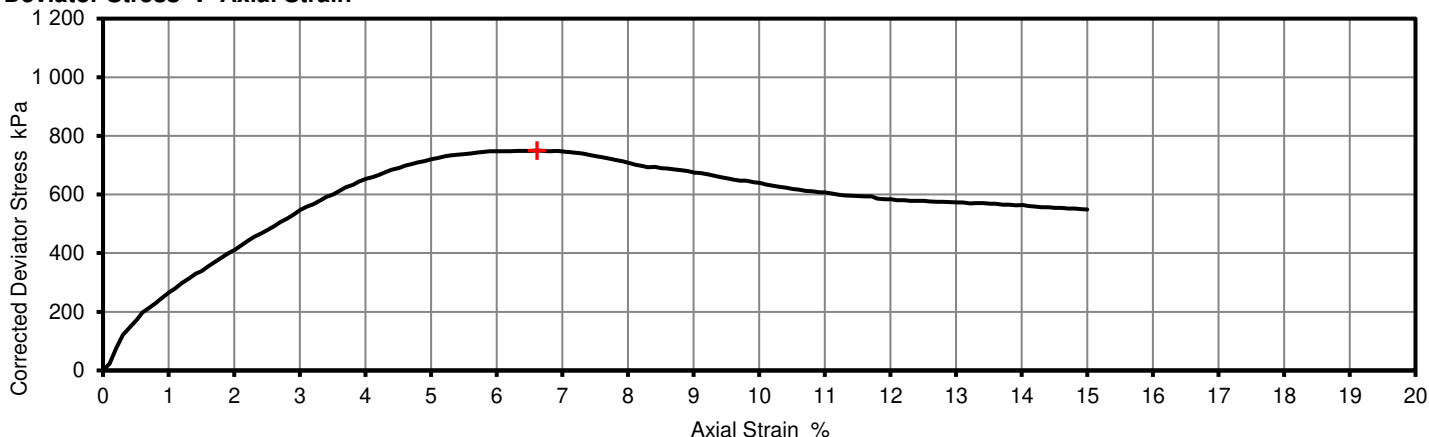
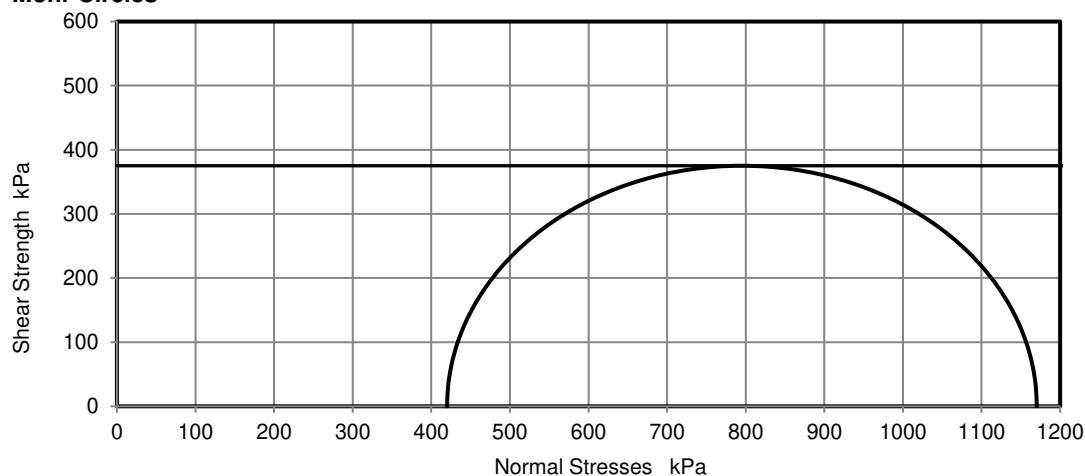
Test Results:

Laboratory Reference: 161696
Hole No.: BH1
Sample Reference: 19
Sample Description: Dark grey CLAY
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

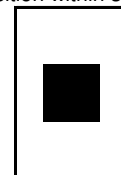
Depth Top [m]: 21.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Depth within Sample	- m
Length	100.08 mm
Diameter	50.00 mm
Length Prior to Shearing	100.08 mm
Bulk Density	2.07 Mg/m3
Initial Water Content	20.6 %
Final Water Content	19.9 %
Dry Density	1.72 Mg/m3

Rate of Strain	2.00 %/min
Cell Pressure	420 kPa
Axial Strain at Failure	6.6 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	750 kPa
Undrained Shear Strength, c_u	375 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Brittle
Membrane Thickness	0.21 mm
Membrane Correction	1.60 kPa

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample



Note: Deviator stress corrected for area change and membrane effects.

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Date Sampled: 13/03/2024
Date Received: 19/03/2024
Date Tested: 19/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

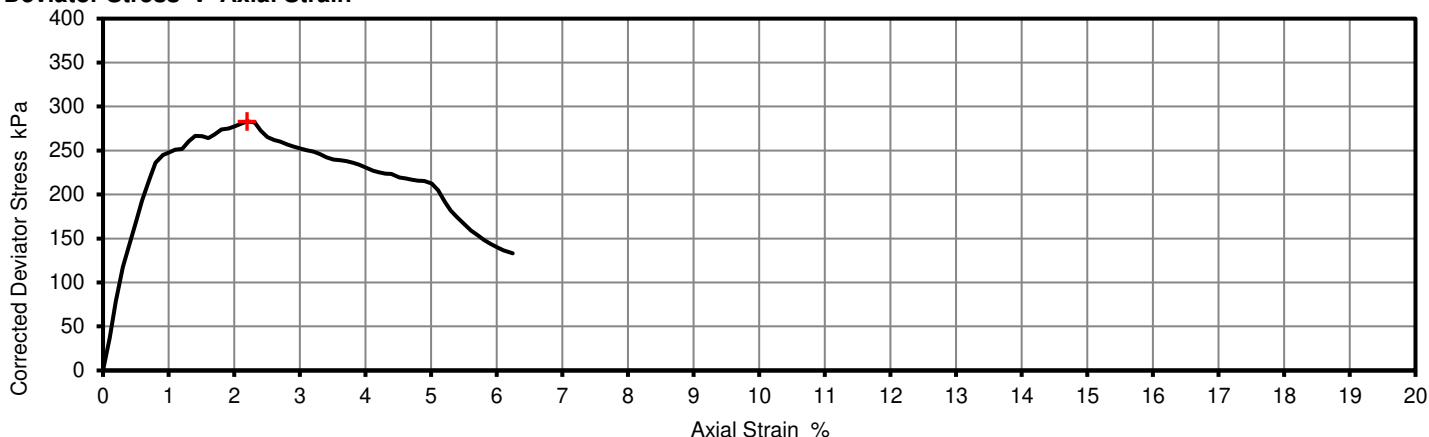
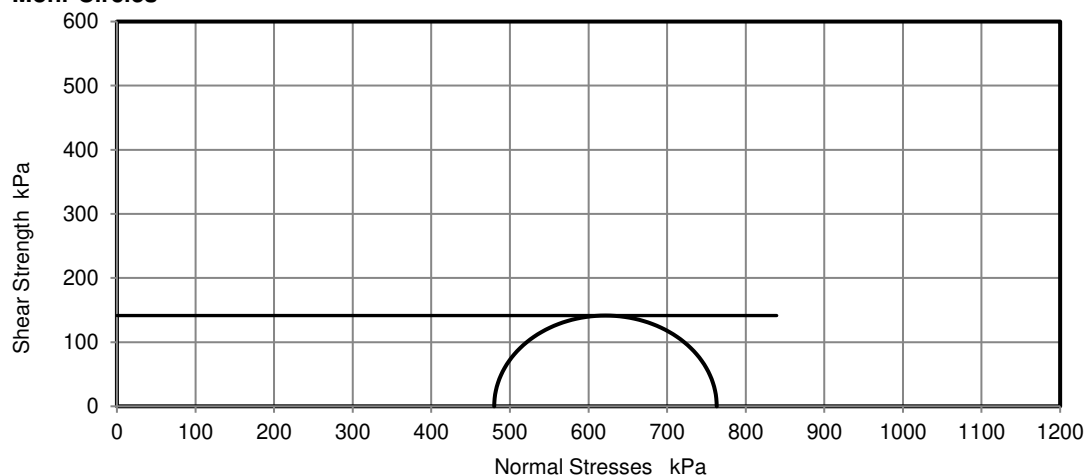
Test Results:

Laboratory Reference: 161697
Hole No.: BH1
Sample Reference: 22
Sample Description: Grey CLAY
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

Depth Top [m]: 24.00
Depth Base [m]: Not Given
Sample Type: U

Test Number	1
Depth within Sample	- m
Length	192.70 mm
Diameter	102.87 mm
Length Prior to Shearing	192.69 mm
Bulk Density	2.00 Mg/m3
Initial Water Content	26.6 %
Final Water Content	26.5 %
Dry Density	1.58 Mg/m3

Rate of Strain	2.00 %/min
Cell Pressure	480 kPa
Axial Strain at Failure	2.2 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	283 kPa
Undrained Shear Strength, c_u	142 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Brittle
Membrane Thickness	0.28 mm
Membrane Correction	0.34 kPa

Deviator Stress v Axial Strain**Mohr Circles**

Position within sample



Note: Deviator stress corrected for area change and membrane effects.

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Job Number: 24-012298-1
Date Sampled: 19/03/2024
Date Received: 19/03/2024
Date Tested: 19/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

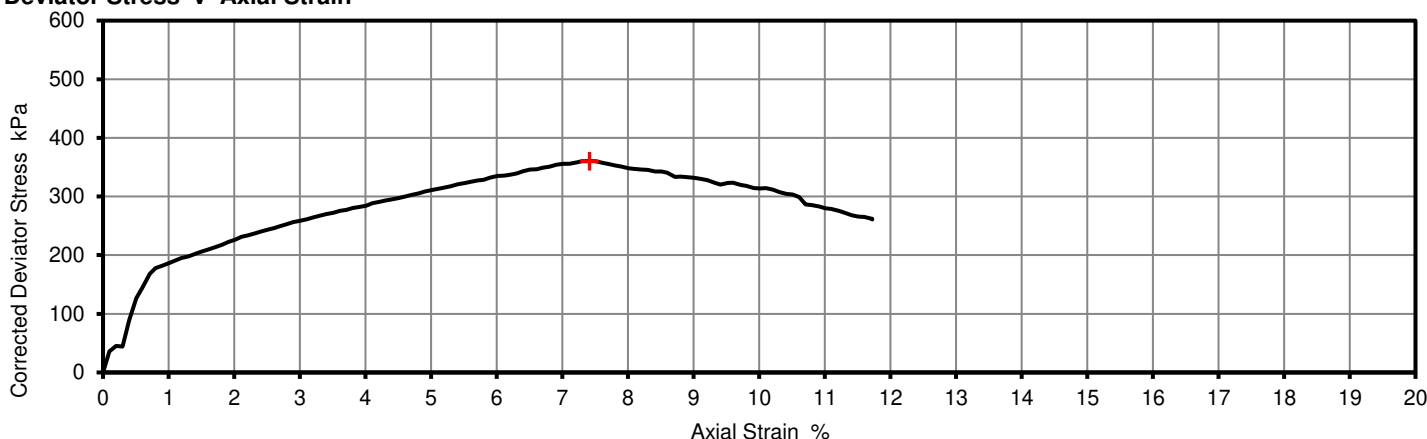
Laboratory Reference: 161700
Hole No.: BH3
Sample Reference: 20
Sample Description: Grey CLAY
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

Depth Top [m]: 22.50
Depth Base [m]: Not Given
Sample Type: U

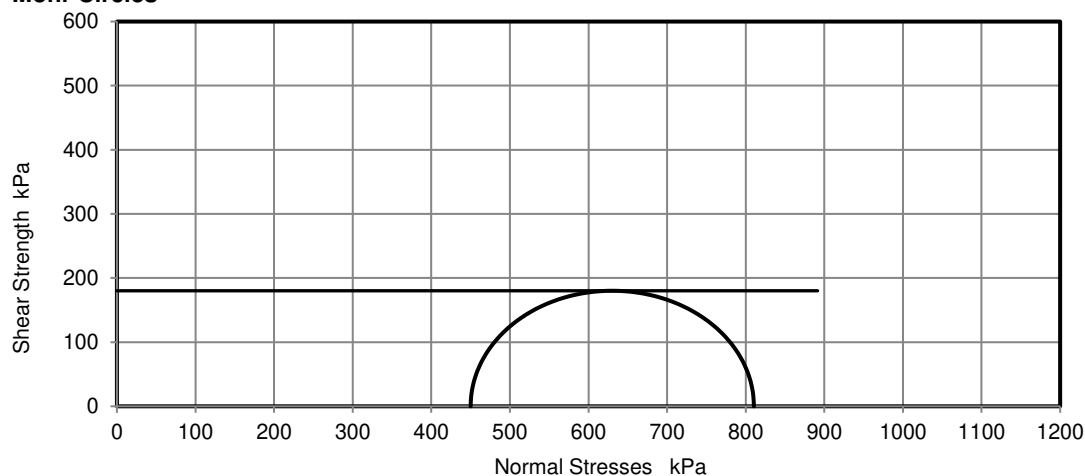
Test Number	1
Depth within Sample	- m
Length	205.27 mm
Diameter	103.48 mm
Length Prior to Shearing	205.26 mm
Bulk Density	2.04 Mg/m ³
Initial Water Content	24.8 %
Final Water Content	24.7 %
Dry Density	1.64 Mg/m ³

Rate of Strain	2.00 %/min
Cell Pressure	450 kPa
Axial Strain at Failure	7.4 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	360 kPa
Undrained Shear Strength, c_u	180 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Brittle
Membrane Thickness	0.29 mm
Membrane Correction	1.20 kPa

Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects.

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed:
Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist

for and on behalf of i2 Analytical Ltd

Client: Apex Consulting Engineers Ltd
Client Address: Unit 3, Acres Hill Business Park, 2 Acres Hill Lane,
Sheffield, South Yorkshire,
S9 4LT
Contact: Matthew Thompson
Site Address: Tottenham Hale, London

Client Reference: 1305
Job Number: 24-012298-1
Date Sampled: 19/03/2024
Date Received: 19/03/2024
Date Tested: 19/04/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

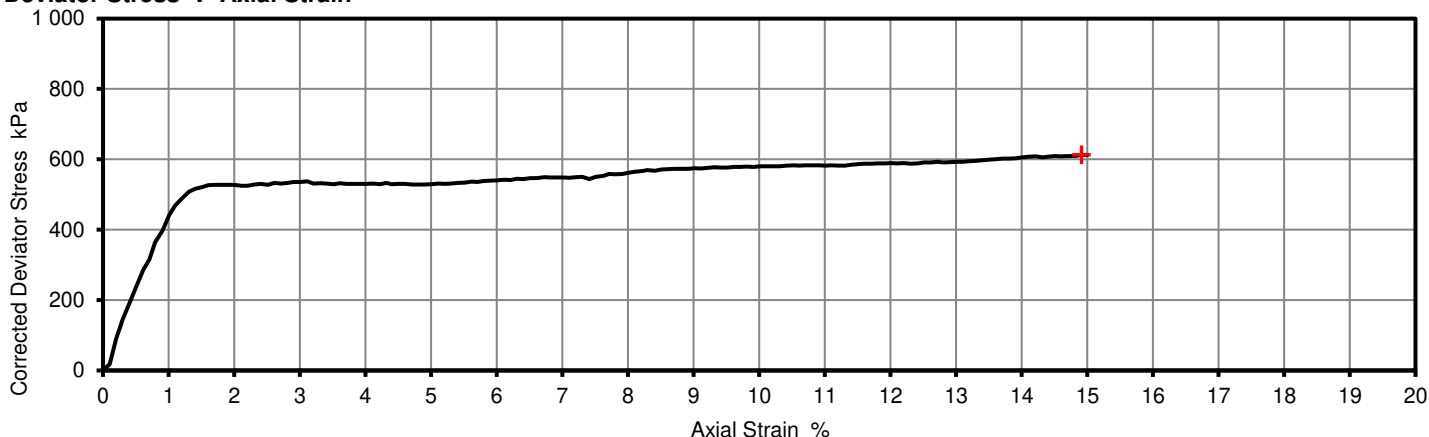
Laboratory Reference: 161701
Hole No.: BH3
Sample Reference: 23
Sample Description: Light brown CLAY with fragments of chalk
Sample Preparation: Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.

Depth Top [m]: 25.50
Depth Base [m]: Not Given
Sample Type: U

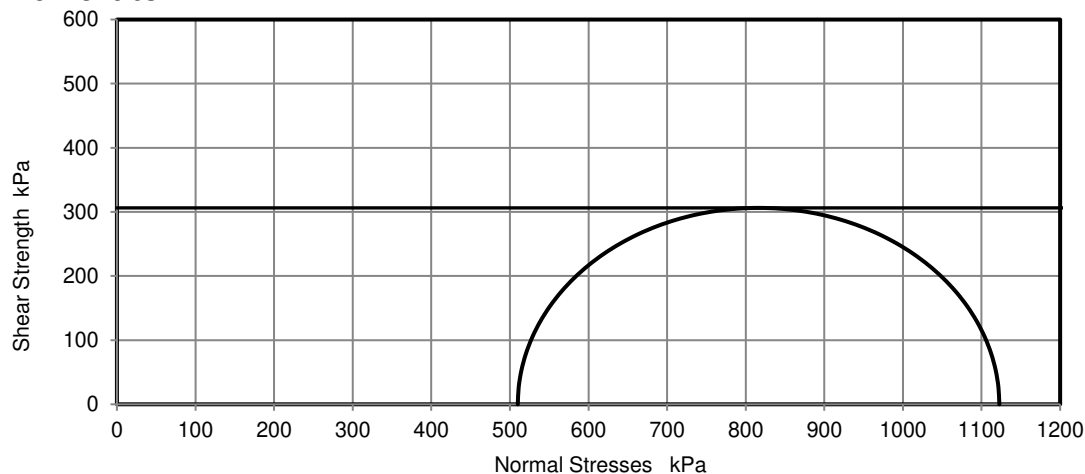
Test Number	1
Depth within Sample	- m
Length	100.48 mm
Diameter	50.17 mm
Length Prior to Shearing	99.19 mm
Bulk Density	2.13 Mg/m ³
Initial Water Content	17.2 %
Final Water Content	16.7 %
Dry Density	1.81 Mg/m ³

Rate of Strain	2.00 %/min
Cell Pressure	510 kPa
Axial Strain at Failure	14.9 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	613 kPa
Undrained Shear Strength, c_u	306 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Brittle
Membrane Thickness	0.20 mm
Membrane Correction	3.43 kPa

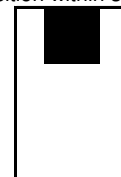
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects.

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist

for and on behalf of i2 Analytical Ltd



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Unit 3, Acres Hill Business Park
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e: Matthew.Thompson@apexconsulting.co.uk

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Business Park,
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t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 24-012301

Project / Site name:	Tottenham Hale, London	Samples received on:	19/03/2024
Your job number:	1305	Samples instructed on/ Analysis started on:	02/04/2024
Your order number:		Analysis completed by:	10/04/2024
Report Issue Number:	1	Report issued on:	15/04/2024
Samples Analysed:	16 soil samples		

Signed:

Joanna Wawrzeczko
Senior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

Analytical Report Number: 24-012301
Project / Site name: Tottenham Hale, London

Lab Sample Number	161705	161706	161707	161708	161709
Sample Reference	BH1	BH2	BH3	BH1	BH2
Sample Number	1	1	1	2	2
Depth (m)	0.50	0.40	0.40	1.70	1.60
Date Sampled	12/03/2024	14/03/2024	18/03/2024	12/03/2024	14/03/2024
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	23	16	21	20	21
Total mass of sample received	kg	0.1	NONE	0.4	0.4	0.4	0.5	0.5

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8.8	10.9	8.9	8.1	8.1
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	160	650	270	140	110
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	80.5	326	134	68.4	54.3
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	15	76	17	5.5	4.9
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	5.2	19	6.2	15	7.7
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	3.2	11	3.7	9.1	4.7

Heavy Metals / Metalloids

Magnesium (leachate equivalent)	mg/l	2.5	NONE	2.8	< 2.5	3.4	3.6	2.7
Magnesium (water soluble)	mg/kg	5	NONE	5.5	< 5.0	6.9	7.3	5.4

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 24-012301
Project / Site name: Tottenham Hale, London

Lab Sample Number	161710	161711	161712	161713	161714
Sample Reference	BH1	BH2	BH3	BH1	BH2
Sample Number	3	3	3	12	5
Depth (m)	2.00	2.60	2.50	12.50	5.20
Date Sampled	12/03/2024	14/03/2024	18/03/2024	12/03/2024	14/03/2024
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	3.2	4.3	5.8	21	21
Total mass of sample received	kg	0.1	NONE	0.6	0.5	0.5	0.4	0.5

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8.8	8.7	8.6	8	7.9
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	44	27	27	1300	570
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	21.9	13.7	13.6	673	286
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	1.1	1.9	1.5	18	14
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	< 2.5	2.7	43	13
Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	< 5.0	5.4	87	26

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 24-012301
Project / Site name: Tottenham Hale, London

Lab Sample Number				161715	161716	161717	161718	161719
Sample Reference				BH2	BH3	BH1	BH1	BH3
Sample Number				18	10	18	25	19
Depth (m)				20.00	11.00	20.80	27.50	21.50
Date Sampled				15/03/2024	18/03/2024	13/03/2024	13/03/2024	19/03/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	21	22	20	14	18
Total mass of sample received	kg	0.1	NONE	0.3	0.5	0.5	0.5	0.5

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8.3	8.5	8.3	9.2	8.9
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1500	1100	1600	290	900
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	754	540	775	145	448
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	27	22	24	5.2	22
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (leachate equivalent)	mg/l	2.5	NONE	39	28	38	3.5	14
Magnesium (water soluble)	mg/kg	5	NONE	77	56	76	7	27

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 24-012301
Project / Site name: Tottenham Hale, London

Lab Sample Number				161720
Sample Reference				BH3
Sample Number				25
Depth (m)				26.00
Date Sampled				19/03/2024
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	

Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	18
Total mass of sample received	kg	0.1	NONE	0.4

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	9.4
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	460
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	228
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	11
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	< 2.0
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0

Heavy Metals / Metalloids

Magnesium (leachate equivalent)	mg/l	2.5	NONE	6.1
Magnesium (water soluble)	mg/kg	5	NONE	12

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 24-012301
Project / Site name: Tottenham Hale, London

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
161705	BH1	1	0.5	Brown loam and clay with gravel and vegetation
161706	BH2	1	0.4	Brown loam and clay with gravel and vegetation
161707	BH3	1	0.4	Brown loam and clay with gravel and vegetation
161708	BH1	2	1.7	Brown clay and sand with gravel
161709	BH2	2	1.6	Brown clay and sand with gravel
161710	BH1	3	2	Brown sand with gravel
161711	BH2	3	2.6	Brown sand with gravel
161712	BH3	3	2.5	Brown sand with gravel
161713	BH1	12	12.5	Brown clay and sand
161714	BH2	5	5.2	Brown clay
161715	BH2	18	20	Brown clay
161716	BH3	10	11	Brown clay
161717	BH1	18	20.8	Brown clay
161718	BH1	25	27.5	Brown clay and sand with gravel and chalk
161719	BH3	19	21.5	Brown clay and sand
161720	BH3	25	26	Brown clay and sand

Analytical Report Number : 24-012301
Project / Site name: Tottenham Hale, London

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES	In-house method based on TRL 447	L038B	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction	L078B	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser	In-house method	L082B	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

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

Appendix G – Gas & groundwater monitoring results

				Ground Gas and PID Monitoring Results																		
Project ID:		GL26508		Client:		Apex Consulting Engineers			Equipment		Model / Serial Number										Manufacturer's Calibration Date	
Date:		08/04/2024		Location:		Apex Consulting Engineers			Gas Analyser:		GA5000 / G504267										23/09/2023	
Weather conditions:		Cloudy and dry							PID:		Tiger Handheld VOC Detector / T-113655										13/06/2023	
Pump Running Time (Purge): Standard 30 secs. Pump Running Time (Monitoring): Standard 180 secs. Flow Details: 5 sec average for 1 min.									Details: "<" indicates reading is under the detection limit. ">" indicates reading is over the upper limit. "**" level to be determined.													
Field engineer(s): A. Strand				Remarks: Unable to undertake test at BH3 due to the pipe not having a gas tap.																		
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Air Temp (°C)	Atmospheric Pressure 48Hrs Prior to	Atmospheric Pressure 24Hrs Prior to	Atmospheric Pressure 3Hrs Prior to	Atmospheric Pressure When Monitored (mB)	Relative Pressure (mB)	Peak PID (ppm)	Stable PID (ppm)	Methane (%)	Peak Methane (%)	Methane LEL (%)	Carbon Dioxide (%)	Oxygen (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Flow (l/hr)	Sample Ref	Remarks	
BH1	PIPE1 (50mm)	08/04/2024	14:35:00	16.3	998	1005	1002	999	-0.12	0.2	1.0	0.1	0.1	2	0.2	20.4	<1	<1	0.0			
			14:35:15							1.0		0.1			0.7	16.4	<1	<1	0.0			
			14:35:30							1.0		0.1			0.7	14.8	<1	<1	0.0			
			14:35:45							1.0		0.1			0.7	14.6	<1	<1	0.0			
			14:36:00							1.0		0.1			0.7	14.6	<1	<1	0.0			
			14:36:30							1.0		0.1			0.7	14.5	<1	<1	0.0			
			14:37:00							1.0		0.1			0.7	14.5	<1	<1	0.0			
			14:37:30							1.0		0.1			0.7	14.5	<1	<1	0.0			
			14:38:00							1.0		0.1			0.7	14.5	<1	<1	0.0			
BH2	PIPE1 (50mm)	08/04/2024	14:45:00	16.3	998	1005	1002	999	0.51	0.2	1.4	0.1	0.1	2	0.7	14.7	<1	<1	0.1			
			14:45:15							1.3		0.1			0.7	17.5	<1	<1	0.3			
			14:45:30							1.4		0.1			0.7	18.2	<1	<1	0.3			
			14:45:45							1.4		0.1			0.7	18.3	<1	<1	0.2			
			14:46:00							1.4		0.1			0.7	18.3	<1	<1	0.2			
			14:46:30							1.4		0.1			0.7	18.3	<1	<1	0.3			
			14:47:00							1.4		0.1			0.7	18.3	<1	<1	0.2			
			14:47:30							1.4		0.1			0.7	18.3	<1	<1	0.2			
			14:48:00							1.4		0.1			0.7	18.3	<1	<1	0.2			

				Groundwater Monitoring Results																										
Project ID:		GL26508		Client: Apex Consulting Engineers						Weather conditions:				Cloudy and dry																
Date:		08/04/2024		Location: Apex Consulting Engineers						Ground conditions:				-																
¹ = All (m) depth measurements are recorded as meters from the top of the installation cover.										² = I: Inertial, S: Submersible, B: Bailer, P: Peristaltic Pump.				³ = Purge volume standardisation: 50mm standpipe = 6 x water column, 35mm = 3.5 x water column, 19mm = 1 x water column.																
Field engineer(s): A. Strand				Remarks:																										
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Surface Elevation (maOD)	LNAPL Depth ¹ (mbgl)	LNAPL Depth (maOD)	Water Level ¹ (mbgl)	Water Level (maOD)	DNAPL Depth ¹ (mbgl)	DNAPL Depth (maOD)	Depth to base ¹ (mbgl)	Depth to base (maOD)	Barometric Pressure (mB)	Air Temp (°C)	Downhole Temp (°C)	pH	Electrical Conductivity (µS/cm)	DO (%)	Redox Potential (mV)	Resistivity (Ohm-cm)	Salinity (psu)	Density (g/cm³)	TDS (ppt)	Water Pressure (psi)	Sampling Method ² (I, S, B, P)	Water Column (m)	Purged Volume ³ (L)	Sample Ref	Comments: (e.g. problems encountered, standpipe conditions, unusual odours, colour, turbidity, sheens)	
BH1	PIPE1 (50mm)	08/04/2024	14:25:00				2.20				5.06															2.86				
BH2	PIPE1 (50mm)	08/04/2024	14:45:00				2.30				21.06																18.76			
BH3	PIPE1 (50mm)	08/04/2024	14:55:00				2.18				3.99																1.81			

				Ground Gas and PID Monitoring Results																					
Project ID:		GL26508		Client:		Apex Consulting Engineers						Equipment		Model / Serial Number						Manufacturer's Calibration Date					
Date:		19/04/2024		Location:		Apex Consulting Engineers						Gas Analyser:		GA5000 / G504267						23/09/2023					
Weather conditions:		Cloudy and dry						PID:		Tiger Handheld VOC Detector / T-113655						13/06/2023									
Pump Running Time (Purge): Standard 30 secs. Pump Running Time (Monitoring): Standard 180 secs. Flow Details: 5 sec average for 1 min.											Details: "<" indicates reading is under the detection limit. ">" indicates reading is over the upper limit. "*" level to be determined.														
Field engineer(s):				A. Strand				Remarks:																	
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Air Temp (°C)	Atmospheric Pressure 48Hrs Prior to Monitoring (mB)	Atmospheric Pressure 24Hrs Prior to Monitoring (mB)	Atmospheric Pressure 3Hrs Prior to Monitoring (mB)	Atmospheric Pressure When Monitored (mB)	Relative Pressure (mB)	Peak PID (ppm)	Stable PID (ppm)	Methane (%)	Peak Methane (%)	Methane LEL (%)	Carbon Dioxide (%)	Oxygen (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Flow (l/hr)	Sample Ref	Remarks				
WS03		19/04/2024	16:10:00	10.4	1011	1017	1012	1016	0.27	<0.1	0.1	0.2	0.2	4	0.2	21.1	<1	<1	0.0						
			16:10:15							0.2		0.2			0.2	21.2	<1	<1	0.0						
			16:10:30							0.2		0.2			0.2	21.2	<1	<1	0.0						
			16:10:45							0.1		0.2			0.2	21.2	<1	<1	0.0						
			16:11:00							0.1		0.2			0.2	21.2	<1	<1	0.0						
			16:11:30							0.1		0.2			0.3	21.0	<1	<1	0.0						
			16:12:00							0.1		0.2			0.4	20.4	<1	<1	0.0						
			16:12:30							0.1		0.2			0.5	20.8	<1	<1	0.0						
			16:13:00							0.1		0.2			0.5	20.7	<1	<1	0.0						
WS04A		19/04/2024	15:50:00	10.4	1011	1018	1012	1014	0.84	0.1	<0.1	0.1	0.1	2	0.3	20.4	N/R	<1	0.0						
			15:50:15							0.1		0.1			0.4	20.5	1	<1	0.0						
			15:50:30							0.1		0.1			0.5	20.4	<1	<1	0.0						
			15:50:45							0.1		0.1			0.5	20.3	<1	<1	0.0						
			15:51:00							<0.1		0.1			0.5	20.3	<1	<1	0.0						
			15:51:30							<0.1		0.1			0.5	20.2	<1	<1	0.0						
			15:52:00							<0.1		0.1			0.5	20.2	<1	<1	0.0						
			15:53:00							<0.1		0.1			0.5	20.2	<1	<1	0.0						
WS05		19/04/2024	15:46:00	10.4	1011	1018	1012	1014	-0.02	<0.1	0.3	0.1	0.1	2	0.2	20.7	<1	<1	0.0						
			15:46:15							0.6		0.1			0.9	16.1	<1	<1	0.0						
			15:46:30							0.6		0.1			0.9	14.7	<1	<1	0.0						
			15:46:45							0.6		0.1			0.9	14.6	<1	<1	0.0						
			15:47:00							0.5		0.1			0.9	14.5	<1	<1	0.0						
			15:47:30							0.4		0.1			0.9	14.5	<1	<1	0.0						
			15:48:00							0.4		0.1			0.9	14.5	<1	<1	0.0						
			15:48:30							0.3		0.1			0.9	14.5	<1	<1	0.0						
			15:49:00							0.3		0.1			0.9	14.5	<1	<1	0.0						

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[illegible]

				Ground Gas and PID Monitoring Results																				
Project ID:		GL26508		Client:		Apex Consulting Engineers					Equipment		Model / Serial Number										Manufacturer's Calibration Date	
Date:		29/04/2024		Location:		Tottenham Hale					Gas Analyser:		GA5000 / G504267										23/09/2023	
Weather conditions:		Cloudy and dry									PID:		Tiger Handheld VOC Detector / T-113655										13/06/2023	
Pump Running Time (Purge): Standard 30 secs. Pump Running Time (Monitoring): Standard 180 secs. Flow Details: 5 sec average for 1 min.																	Details: "<" indicates reading is under the detection limit. ">" indicates reading is over the upper limit. "***" level to be determined.							
Field engineer(s): A. Strand						Remarks:																		
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Air Temp (°C)	Atmospheric Pressure 48Hrs Prior to Monitoring (mB)	Atmospheric Pressure 24Hrs Prior to Monitoring (mB)	Atmospheric Pressure 3Hrs Prior to Monitoring (mB)	Atmospheric Pressure When Monitored (mB)	Relative Pressure (mB)	Peak PID (ppm)	Stable PID (ppm)	Methane (%)	Peak Methane (%)	Methane LEL (%)	Carbon Dioxide (%)	Oxygen (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Flow (l/hr)	Sample Ref	Remarks			
WS03	PIPE1 (50mm)	29/04/2024	15:05:00	17.2	1000	1005	1011	1012	0.09	0.3	<0.1	0.2	0.2	4	0.2	20.6	<1	<1	0.0					
			15:05:15							0.5		0.2			0.2	20.7	<1	<1	0.0					
			15:05:30							0.4		0.2			0.2	20.7	<1	<1	0.0					
			15:05:45							0.3		0.2			0.2	20.7	<1	<1	0.0					
			15:06:00							0.2		0.2			0.2	20.7	<1	<1	0.0					
			15:06:30							0.1		0.2			0.2	20.7	<1	<1	0.0					
			15:07:00							0.1		0.1			0.2	20.7	<1	<1	0.0					
			15:07:30							<0.1		0.1			0.2	20.8	<1	<1	0.0					
WS04A	PIPE1 (50mm)	29/04/2024	15:08:00							<0.1		0.1			0.2	20.8	<1	<1	0.0					
			15:40:00	16.3	1000	1005	1012	1012	1.45	0.8	0.2	0.1	0.1	2	0.1	20.3	1	<1	0.0					
			15:40:15							0.6		0.1			0.5	19.5	2	<1	0.0					
			15:40:30							0.5		0.1			0.5	19.4	1	<1	0.0					
			15:40:45							0.4		0.1			0.5	19.4	1	<1	0.0					
			15:41:00							0.4		0.1			0.5	19.3	<1	<1	0.0					
			15:41:30							0.3		0.1			0.5	19.4	<1	<1	0.0					
			15:42:00							0.3		0.1			0.5	19.4	<1	<1	0.0					
WS05	PIPE1 (50mm)	29/04/2024	15:42:30							0.2		0.1			0.6	19.4	<1	<1	0.0					
			15:43:00							0.2		0.1			0.6	19.4	<1	<1	0.0					
			15:55:00	16.6	999	1005	1011	1013	-0.05	0.1	0.3	0.1	0.1	2	2.4	18.7	<1	<1	0.0					
			15:55:15							0.4		0.1			2.5	17.9	<1	<1	0.0					
			15:55:30							0.4		0.1			2.6	17.8	<1	<1	0.0					
			15:55:45							0.4		0.1			2.6	17.8	<1	<1	0.0					
			15:56:00							0.4		0.1			2.6	17.8	<1	<1	0.0					
			15:56:30							0.3		0.1			2.6	17.8	<1	<1	0.0					
			15:57:00						0.3		0.1			2.6	17.6	<1	<1	0.0						
			15:57:30							0.3		0.1			2.6	17.8	<1	<1	0.0					
			15:58:00							0.3		0.1			2.6	17.8	<1	<1	0.0					

				Groundwater Monitoring Results																									
Project ID:		GL26508		Client:		Apex Consulting Engineers						Weather conditions:		Cloudy and dry															
Date:		29/04/2024		Location:		Tottenham Hale						Ground conditions:		-															
¹ = All (m) depth measurements are recorded as meters from the top of the installation cover.										² = I: Inertial, S: Submersible, B: Bailer, P: Peristaltic Pump.						³ = Purge volume standardisation: 50mm standpipe = 6 x water column, 35mm = 3.5 x water column, 19mm = 1 x water column.													
Field engineer(s):				A. Strand		Remarks:																							
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Surface Elevation (maOD)	LNAPL Depth ¹ (mbgl)	LNAPL Depth (maOD)	Water Level ¹ (mbgl)	Water Level (maOD)	DNAPL Depth ¹ (mbgl)	DNAPL Depth (maOD)	Depth to base ¹ (mbgl)	Depth to base (maOD)	Readings:										Sampling Method ² (I, S, B, P)	Water Column (m)	Purged Volume ³ (L)	Sample Ref	Comments: (e.g. problems encountered, standpipe conditions, unusual odours, colour, turbidity, sheens)		
													Barometric Pressure (mB)	Air Temp (°C)	Downhole Temp (°C)	pH	Electrical Conductivity (µS/cm)	DO (%)	Redox Potential (mV)	Resistivity (Ohm-cm)	Salinity (psu)	Density (g/cm³)						TDS (ppt)	Water Pressure (psi)
BH1	PIPE1 (50mm)	29/04/2024	16:15:00		N/E		2.09		N/E		5.03													2.94					
BH2	PIPE1 (50mm)	29/04/2024	15:20:00		N/E		2.22		N/E		20.98													18.76					
BH3	PIPE1 (50mm)	29/04/2024	15:00:00		N/E		2.12		N/E		3.99													1.87					
WS03	PIPE1 (50mm)	29/04/2024	15:05:00		N/E		2.22		N/E		2.40													0.18					
WS04A	PIPE1 (50mm)	29/04/2024	15:40:00		N/E		2.15		N/E		2.43													0.28					
WS05	PIPE1 (50mm)	29/04/2024	15:55:00		N/E		2.14		N/E		2.58													0.44					

				Ground Gas and PID Monitoring Results																			
Project ID:		GL26508		Client:		Apex Consulting Engineers				Equipment		Model / Serial Number										Manufacturer's Calibration Date	
Date:		20/05/2024		Location:		Tottenham Hale				Gas Analyser:		GA5000 / G504267										23/09/2023	
Weather conditions:		Sunny and dry		Pump Running Time (Purge): Standard 30 secs. Pump Running Time (Monitoring): Standard 180 secs. Flow Details: 5 sec average for 1 min.						PID:		Tiger Handheld VOC Detector / T-113655										13/06/2023	
Field engineer(s): A. Strand										Remarks: Details: "<" indicates reading is under the detection limit. ">" indicates reading is over the upper limit. "***" level to be determined.													
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Air Temp (°C)	Atmospheric Pressure 48Hrs Prior to Monitoring (mB)	Atmospheric Pressure 24Hrs Prior to Monitoring (mB)	Atmospheric Pressure 3Hrs Prior to Monitoring (mB)	Atmospheric Pressure When Monitored (mB)	Relative Pressure (mB)	Peak PID (ppm)	Stable PID (ppm)	Methane (%)	Peak Methane (%)	Methane LEL (%)	Carbon Dioxide (%)	Oxygen (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Flow (l/hr)	Sample Ref	Remarks		
WS03	PIPE1 (50mm)	20/05/2024	12:05:00	20.0	1010	1011	1012	1013	-0.02	<0.1	<0.1	0.1	0.1	2	0.2	20.3	<1	<1	0.0				
			12:05:15							0.4		0.1			0.7	19.7	<1	<1	0.0				
			12:05:30							0.4		0.1			0.7	19.3	<1	<1	0.0				
			12:05:45							0.4		0.1			0.7	19.3	<1	<1	0.0				
			12:06:00							0.3		0.1			0.7	19.3	<1	<1	0.0				
			12:06:30							0.2		0.1			0.7	19.3	<1	<1	0.0				
			12:07:00							<0.1		0.1			0.7	19.3	<1	<1	0.0				
			12:07:30							<0.1		0.1			0.7	19.3	<1	<1	0.0				
WS04A	PIPE1 (50mm)	20/05/2024	12:08:00						<0.1		0.1			0.7	19.3	<1	<1	0.0					
			11:45:00	19.7	1010	1011	1012	1012	0.14	0.1	<0.1	0.1	0.2	4	0.2	20.2	37	<1	0.0				
			11:45:15							<0.1		0.2			0.2	19.0	30	<1	0.0				
			11:45:30							<0.1		0.1			0.8	18.8	20	<1	0.0				
			11:45:45							<0.1		0.1			0.8	18.7	13	<1	0.0				
			11:46:00							<0.1		0.1			0.8	18.7	8	<1	0.0				
			11:46:30							<0.1		0.1			0.8	18.7	3	<1	0.0				
			11:47:00							<0.1		0.1			0.8	18.7	<1	<1	0.0				
WS05	PIPE1 (50mm)	20/05/2024	11:47:30						<0.1		0.1			0.8	18.7	<1	<1	0.0					
			11:48:00							<0.1		0.1			0.8	18.7	<1	<1	0.0				
			12:20:00	20.9	1010	1011	1012	1012	0.63	0.1	0.3	0.1	0.1	2	0.2	20.5	<1	<1	0.0				
			12:20:15							0.3		0.1			3.2	16.2	<1	<1	0.0				
			12:20:30							0.3		0.1			3.5	15.2	<1	<1	0.0				
			12:20:45							0.3		0.1			3.3	15.1	<1	<1	0.0				
			12:21:00							0.3		0.1			3.3	15.1	<1	<1	0.0				
			12:21:30							0.3		0.1			3.3	15.1	<1	<1	0.0				
			12:22:00						0.3		0.1			3.3	15.1	<1	<1	0.0					
			12:22:30							0.3		0.1			3.3	15.1	<1	<1	0.0				
			12:23:00							0.3		0.1			3.3	15.1	<1	<1	0.0				

				Groundwater Monitoring Results																							
Project ID:		GL28508		Client:		Apex Consulting Engineers				Weather conditions:		Sunny and dry															
Date:		20/05/2024		Location:		Tottenham Hale				Ground conditions:		-															
¹ = All (m) depth measurements are recorded as meters from the top of the installation cover.						² = I: Inertial, S: Submersible, B: Bailer, P: Peristaltic Pump.				³ = Purge volume standardisation: 50mm standpipe = 6 x water column, 35mm = 3.5 x water column, 19mm = 1 x water column.																	
Field engineer(s): A. Strand						Remarks:																					
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Surface Elevation (maOD)	LNAPL Depth ¹ (mbgl)	LNAPL Depth (maOD)	Water Level ¹ (mbgl)	Water Level (maOD)	DNAPL Depth ¹ (mbgl)	DNAPL Depth (maOD)	Depth to base ¹ (mbgl)	Depth to base (maOD)	Readings:										Sampling Method ² (I, S, B, P)	Water Column (m)	Purged Volume ³ (L)	Sample Ref	Comments: (e.g. problems encountered, standpipe conditions, unusual odours, colour, turbidity, sheens)
													Barometric Pressure (mB)	Air Temp (°C)	Downhole Temp (°C)	pH	Electrical Conductivity (µS/cm)	DO (%)	Redox Potential (mV)	Resistivity (Ohm-cm)	Salinity (psu)	Density (g/cm³)					
BH1	PIPE1 (50mm)	20/05/2024	11:40:00		N/E		2.26		N/E		5.01													2.75			
BH2	PIPE1 (50mm)	20/05/2024	11:55:00		N/E		2.39		N/E		21.01													18.62			
BH3	PIPE1 (50mm)	20/05/2024	12:00:00		N/E		2.25		N/E		3.96													1.71			
WS03	PIPE1 (50mm)	20/05/2024	12:05:00		N/E		2.37		N/E		2.42													0.05			
WS04A	PIPE1 (50mm)	20/05/2024	11:45:00		N/E		2.31		N/E		2.42													0.11			
WS05	PIPE1 (50mm)	20/05/2024	12:20:00		N/E		2.32		N/E		2.57													0.25			

				Ground Gas and PID Monitoring Results																					
Project ID:		GL26508		Client:		Apex Consulting Engineers				Equipment		Model / Serial Number										Manufacturer's Calibration Date			
Date:		30/05/2024		Location:		Tottenham Hale				Gas Analyser:		GA5000 / G504267										23/09/2023			
Weather conditions:		Cloudy and wet								PID:		Tiger Handheld VOC Detector / T-113655										13/06/2023			
Pump Running Time (Purge): Standard 30 secs. Pump Running Time (Monitoring): Standard 180 secs. Flow Details: 5 sec average for 1 min.											Details: "<" indicates reading is under the detection limit. ">" indicates reading is over the upper limit. "***" level to be determined.														
Field engineer(s):				C. Robinson				Remarks:																	
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Air Temp (°C)	Atmospheric Pressure 48Hrs Prior to	Atmospheric Pressure 24Hrs Prior to	Atmospheric Pressure 3Hrs Prior to	Atmospheric Pressure When Monitored (mB)	Relative Pressure (mB)	Peak PID (ppm)	Stable PID (ppm)	Methane (%)	Peak Methane (%)	Methane LEL (%)	Carbon Dioxide (%)	Oxygen (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Flow (l/hr)	Sample Ref	Remarks				
WS03	PIPE1 (50mm)	30/05/2024	11:05:00	14.1	1009	1005	1005	1007	-0.05	<0.1	<0.1	<0.1	<0.1	<2	0.8	20.8	<1	<1	0.0						
			11:05:15							<0.1		<0.1			0.8	20.7	<1	<1	0.0						
			11:05:30							0.3		<0.1			0.8	20.3	<1	<1	0.0						
			11:05:45							0.3		<0.1			0.8	20.2	<1	<1	0.0						
			11:06:00							0.1		<0.1			0.8	20.1	<1	<1	0.0						
			11:06:30							<0.1		<0.1			0.8	20.1	<1	<1	0.0						
			11:07:00							<0.1		<0.1			0.8	20.1	<1	<1	0.0						
			11:07:30							<0.1		<0.1			0.8	20.1	<1	<1	0.0						
			11:08:00							<0.1		<0.1			0.8	20.1	<1	<1	0.0						
WS04A	PIPE1 (50mm)	30/05/2024	11:34:00	14.2	1009	1005	1005	1007	-0.07	0.1	<0.1	<0.1	<0.1	<2	0.6	20.7	<1	<1	0.0						
			11:34:15							<0.1		<0.1			0.6	20.4	<1	<1	0.0						
			11:34:30							<0.1		<0.1			0.6	20.4	<1	<1	0.0						
			11:34:45							<0.1		<0.1			0.6	20.3	<1	<1	0.0						
			11:35:00							<0.1		<0.1			0.6	20.3	<1	<1	0.0						
			11:35:30							<0.1		<0.1			0.7	20.2	<1	<1	0.0						
			11:36:00							<0.1		<0.1			0.7	20.1	<1	<1	0.0						
			11:36:30							<0.1		<0.1			0.8	20.0	<1	<1	0.0						
			11:37:00							<0.1		<0.1			0.8	20.0	<1	<1	0.0						
WS05	PIPE1 (50mm)	30/05/2024	12:06:00	13.3	1008	1005	1005	1007	0.14	0.2	0.1	<0.1	<0.1	<2	4.5	18.9	<1	<1	0.0						
			12:06:15							0.2		<0.1			4.4	18.8	<1	<1	0.0						
			12:06:30							0.3		<0.1			4.4	15.4	<1	<1	0.0						
			12:06:45							0.2		<0.1			4.5	15.0	<1	<1	0.0						
			12:07:00							0.3		<0.1			4.5	15.0	<1	<1	0.0						
			12:07:30							0.2		<0.1			4.5	14.9	<1	<1	0.0						
			12:08:00							0.2		<0.1			4.5	14.9	<1	<1	0.0						
			12:08:30							0.1		<0.1			4.5	14.9	<1	<1	0.0						
			12:09:00							0.1		<0.1			4.5	14.9	<1	<1	0.0						

				Groundwater Monitoring Results																							
Project ID:		GL28508		Client:		Apex Consulting Engineers					Weather conditions:		Sunny and dry / Cloudy and wet														
Date:		30/05/2024		Location:		Tottenham Hale					Ground conditions:		-														
¹ = All (m) depth measurements are recorded as meters from the top of the installation cover.										² = I: Inertial, S: Submersible, B: Bailer, P: Peristaltic Pump.				³ = Purge volume standardisation: 50mm standpipe = 6 x water column, 35mm = 3.5 x water column, 19mm = 1 x water column.													
Field engineer(s): C. Robinson										Remarks:																	
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Surface Elevation (maOD)	LNAPL Depth ¹ (mbgl)	LNAPL Depth (maOD)	Water Level ¹ (mbgl)	Water Level (maOD)	DNAPL Depth ¹ (mbgl)	DNAPL Depth (maOD)	Depth to base ¹ (mbgl)	Depth to base (maOD)	Readings:										Sampling Method ² (I, S, B, P)	Water Column (m)	Purged Volume ³ (L)	Sample Ref	Comments: (e.g. problems encountered, standpipe conditions, unusual odours, colour, turbidity, sheens)
													Barometric Pressure (mB)	Air Temp (°C)	Downhole Temp (°C)	pH	Electrical Conductivity (µS/cm)	DO (%)	Redox Potential (mV)	Resistivity (Ohm-cm)	Salinity (psu)	Density (g/cm³)					
BH1	PIPE1 (50mm)	30/05/2024	10:47:00		N/E		1.12		N/E		4.97													3.85			
BH2	PIPE1 (50mm)	30/05/2024	10:48:00		N/E		2.33		N/E		20.92													18.59			
BH3	PIPE1 (50mm)	30/05/2024	10:50:00		N/E		1.98		N/E		3.98													2.00			
WS03	PIPE1 (50mm)	30/05/2024	11:18:00		N/E		2.29		N/E		2.44													0.15			
WS04A	PIPE1 (50mm)	30/05/2024	11:44:00		N/E		2.22		N/E		2.45													0.23			Pipe flooded. Purged and left 1hr prior to monitoring.
WS05	PIPE1 (50mm)	30/05/2024	12:13:00		N/E		2.20		N/E		2.59													0.39			

				Ground Gas and PID Monitoring Results																		
Project ID:		GL26508		Client:		Apex Consulting Engineers					Equipment		Model / Serial Number							Manufacturer's Calibration Date		
Date:		14/06/2024		Location:		Tottenham Hale					Gas Analyser:		GA5000 / G504267							23/09/2023		
Weather conditions:		Cloudy and dry									PID:		Tiger Handheld VOC Detector / T-113655							13/06/2023		
Pump Running Time (Purge): Standard 30 secs. Pump Running Time (Monitoring): Standard 180 secs. Flow Details: 5 sec average for 1 min.											Details: "<" indicates reading is under the detection limit. ">" indicates reading is over the upper limit. "***" level to be determined.											
Field engineer(s): C. Robinson						Remarks:																
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Air Temp (°C)	Atmospheric Pressure 48Hrs Prior to	Atmospheric Pressure 24Hrs Prior to	Atmospheric Pressure 3Hrs Prior to	Atmospheric Pressure When Monitored (mB)	Relative Pressure (mB)	Peak PID (ppm)	Stable PID (ppm)	Methane (%)	Peak Methane (%)	Methane LEL (%)	Carbon Dioxide (%)	Oxygen (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Flow (l/hr)	Sample Ref	Remarks	
WS03	PIPE1 (50mm)	14/06/2024	12:49:00	16.1	1017	1009	998	1000	0.36	<0.1	<0.1	<0.1	<0.1	<2	0.4	20.8	<1	<1	0.0			
			12:49:15							0.1		<0.1			0.7	20.5	<1	<1	0.0			
			12:49:30							<0.1		<0.1			0.7	20.4	<1	<1	0.0			
			12:49:45							<0.1		<0.1			0.7	20.4	<1	<1	0.0			
			12:50:00							<0.1		<0.1			0.7	20.4	<1	<1	0.0			
			12:50:30							<0.1		<0.1			0.7	20.4	<1	<1	0.0			
			12:51:00							<0.1		<0.1			0.7	20.4	<1	<1	0.0			
			12:52:00							<0.1		<0.1			0.7	20.4	<1	<1	0.0			
WS04A	PIPE1 (50mm)	14/06/2024	11:29:00	17.7	1018	1010	998	999	0.09	0.1	<0.1	<0.1	<0.1	<2	0.2	20.9	<1	<1	0.0			
			11:29:15							<0.1		<0.1			1.0	20.2	<1	<1	0.0			
			11:29:30							<0.1		<0.1			1.0	19.9	<1	<1	0.0			
			11:29:45							<0.1		<0.1			1.0	19.9	<1	<1	0.0			
			11:30:00							<0.1		<0.1			1.0	19.9	<1	<1	0.0			
			11:30:30							<0.1		<0.1			1.0	19.9	<1	<1	0.0			
			11:31:00							<0.1		<0.1			0.9	19.9	<1	<1	0.0			
			11:32:00							<0.1		<0.1			0.9	19.8	<1	<1	0.0			
WS05	PIPE1 (50mm)	14/06/2024	11:48:00	18.9	1018	1010	998	999	-0.02	0.1	<0.1	<0.1	<0.1	<2	0.2	20.5	<1	<1	0.0			
			11:48:15							0.1		<0.1			4.4	16.3	<1	<1	-0.1			
			11:48:30							<0.1		<0.1			4.5	15.6	<1	<1	-0.1			
			11:48:45							<0.1		<0.1			4.5	15.5	<1	<1	-0.1			
			11:49:00							<0.1		<0.1			4.5	15.4	<1	<1	-0.1			
			11:49:30							<0.1		<0.1			4.5	15.4	<1	<1	-0.1			
			11:50:00							<0.1		<0.1			4.5	15.3	<1	<1	-0.1			
			11:51:00							<0.1		<0.1			4.5	15.2	<1	<1	-0.1			

				Groundwater Monitoring Results																									
Project ID:		GL26508		Client:		Apex Consulting Engineers						Weather conditions:		Sunny and dry / Cloudy and dry															
Date:		14/06/2024		Location:		Tottenham Hale						Ground conditions:		-															
¹ = All (m) depth measurements are recorded as meters from the top of the installation cover.										² = I: Inertial, S: Submersible, B: Bailer, P: Peristaltic Pump.					³ = Purge volume standardisation: 50mm standpipe = 6 x water column, 35mm = 3.5 x water column, 19mm = 1 x water column.														
Field engineer(s): C. Robinson										Remarks:																			
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Surface Elevation (maOD)	LNAPL Depth¹ (mbgl)	LNAPL Depth (maOD)	Water Level¹ (mbgl)	Water Level (maOD)	DNAPL Depth¹ (mbgl)	DNAPL Depth (maOD)	Depth to base¹ (mbgl)	Depth to base (maOD)	Readings:												Sampling Method² (I, S, B, P)	Water Column (m)	Purged Volume¹ (L)	Sample Ref	Comments: (e.g. problems encountered, standpipe conditions, unusual odours, colour, turbidity, sheens)
													Barometric Pressure (mB)	Air Temp (°C)	Downhole Temp (°C)	pH	Electrical Conductivity (µS/cm)	DO (%)	Redox Potential (mV)	Resistivity (Ohm-cm)	Salinity (psu)	Density (g/cm³)	TDS (ppt)	Water Pressure (psi)					
BH1	PIPE1 (50mm)	14/06/2024	11:25:00		N/E		2.25		N/E		4.99														2.74				
BH2	PIPE1 (50mm)	14/06/2024	12:00:00		N/E		2.40		N/E		19.90														17.50				
BH3	PIPE1 (50mm)	14/06/2024	12:03:00		N/E		2.25		N/E		4.00														1.75				
WS03	PIPE1 (50mm)	14/06/2024	12:57:00		N/E		2.37		N/E		2.45														0.08				
WS04A	PIPE1 (50mm)	14/06/2024	11:39:00		N/E		2.31		N/E		2.45														0.14				
WS05	PIPE1 (50mm)	14/06/2024	11:56:00		N/E		2.31		N/E		2.60														0.29				