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Ground Investigation Report

Proposed Commercial Development

Baldock Industrial Estate

May 2025



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Non-technical Summary

Topic	Commentary
Site description	The site comprises part of a former industrial estate, which was destroyed by fire in 2023.
Development proposals	The development comprises the demolition of the remaining building and the construction of a new building with the same footprint.
Ground conditions	Hardstanding is present from surface across the site. Made Ground of variable composition is present to a maximum depth of 1.45m, with Chalk Formation below. The Chalk comprises coarse, structureless chalk to around 2-3m depth with more competent chalk (likely Grade A) below. Groundwater has been recorded at approximately 15m below ground level during monitoring.
Foundation and slab solution	In accordance with CIRIA C574, an allowable bearing pressure of 225kN/m² is applicable for observed ground conditions at likely formation depth. At these imposed stress levels the total settlement is unlikely to exceed 0.2% of the foundation width. Based on observations to date, the risk of dissolution is considered low, however it is recommended that this assessment is updated following further works on site.
Chemical contamination and remedial requirements	Measured concentrations of chemical contaminants are not considered to pose a risk to identified receptors at the site. Further investigation is however required following the demolition of fire damaged buildings to investigate the possibility of contamination beneath the building from previous site uses. Asbestos containing material (cement) has been observed within Made Ground and fibres recorded within soils in the north of the site. As hardstanding is proposed across the entire site the risk to end users and adjacent users following redevelopment is considered to be low. Mitigation measures are recommended to protect construction operatives during earthworks. The installation of protective barrier-pipes in below ground water infrastructure located within Made Ground soils is recommended, unless service trenches are over-dug and backfilled with suitable clean materials.
Radon, gas risk and protection measures	No gas or radon protective measures are considered necessary.
Waste characterisation	Made Ground not containing visible ACMs are provisionally classified as non hazardous, whilst ACM impact Made Ground is classified as hazardous waste. Clean soils, not impacted by artificial contamination are classified as non hazardous waste.
Recommendation for further works	Further investigation is required to inform the risk assessments and confirm suitable remedial options and waste assessments. This includes: 1. Investigation of soils underlying the existing footprint. 2. Additional asbestos testing to inform risk assessment and waste categorization. 3. Exposure and delineation of the low level hydrocarbon contamination encountered in TP02. 4. PAH/coal tar testing of existing asphalt.

1 Introduction

1.1 Scheme Outline

- 1.1.1 The development comprises the demolition and reconstruction of the existing building.
- 1.1.2 The report is based on the project proposals and information outlined above; should the scheme change then it will be necessary to review the conclusions and recommendations presented in this report.

1.2 Brief

- 1.2.1 This report has been prepared following instructions received from our Client, Gateley Smithers Purslow Limited. The overall brief of works is to:
- i) Undertake a ground investigation at the site to establish the prevailing ground conditions and identify potential abnormal development constraints. A second stage of investigation is required following demolition to investigate soils underlying the building.
 - ii) Support the planning application by assessing the potential risks from contamination at the site.
 - iii) Assess potential contamination onsite to inform the construction phase/waste classification.
 - iv) Determine geotechnical parameters and provide a geotechnical appraisal for the scheme.
- 1.2.2 The objectives of this report are outlined below:
- i) Review and summarise desk study information.
 - ii) Undertake a land contamination Tier 1 preliminary risk assessment.
 - iii) Summarise the intrusive investigation works undertaken and associated laboratory testing.
 - iv) Present a ground model summarising the ground and groundwater conditions at the site including relevant geotechnical parameters.
 - v) Provide a geotechnical appraisal for the project and highlight key geotechnical issues that may impact upon the proposed scheme.
 - vi) Undertake a land contamination Tier 2 generic quantitative risk assessment.
 - vii) Provide recommendations to inform an Options Appraisal and Remediation Strategy, should they be required.
 - viii) Undertake a general assessment of potential contamination risks which may affect the development.
 - ix) Provide a waste characterisation assessment of soils at the site for potential disposal to landfill.

1.3 Definition of Scope

- 1.3.1 The phasing and scope of the ground investigation works is broadly defined by the following documents.

Title	Document Reference	Publisher	Investigation Scope
Code of practice for ground investigations	BS 5930: 2015	British Standards Institution	Phase 1: Desk study Phase 2: Preliminary investigation

Title	Document Reference	Publisher	Investigation Scope
Eurocode 7 — Geotechnical design Part 2: Ground investigation and Testing	BS EN 1997-2: 2007	British Standards Institution	Preliminary Investigation
Investigation of potentially contaminated sites – Code of practice	BS 10175: 2011+A2:2017	British Standards Institution	Preliminary Investigation (desk study) Exploratory Investigation
Land contamination risk management	Online resource, updated April 2021	Environment Agency	Stage 1 Risk Assessment: Tier 1: Preliminary risk assessment Tier 2: Generic quantitative risk assessment

Table 1:A: Definition of investigation scope

1.4 Limitations

- 1.4.1 Soiltechnics disclaims any responsibility to our Client and others in respect of any matters outside the scope of this report. This report has been prepared with reasonable skill, care and diligence in accordance with the terms of our contract, taking account of the resources, investigations and testing devoted to it by agreement with our Client. This report is confidential to our Client and Soiltechnics accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known. Any such party relies upon the report at their own risk.

2 Desk Study

2.1 Sources of Information

2.1.1 Reference has been made to the following sources of information:

- An Envirocheck Report and historical map records, presented as Appendix N.
- British Geological Survey (BGS) GeoIndex – Onshore database.
- BGS Sheet 221 (Scale 1:50 000) – *Hitchin* (1995).
- Ordnance Survey OpenData
- Coal Authority Development and Specific Risk databases.
- Environment Agency open-source databases
- Google mapping services
- Interrogation of search engines for anecdotal information on the site history and other readily available online resources.

2.2 Site Description

2.2.1 The site lies within Baldock, approximately 0.3km south of the town centre. The post code for the site is SG7 6NG.

2.2.2 An aerial image showing the approximate site boundary is presented below, followed by a table summarising the key site features. A site plan is provided within Appendix A.

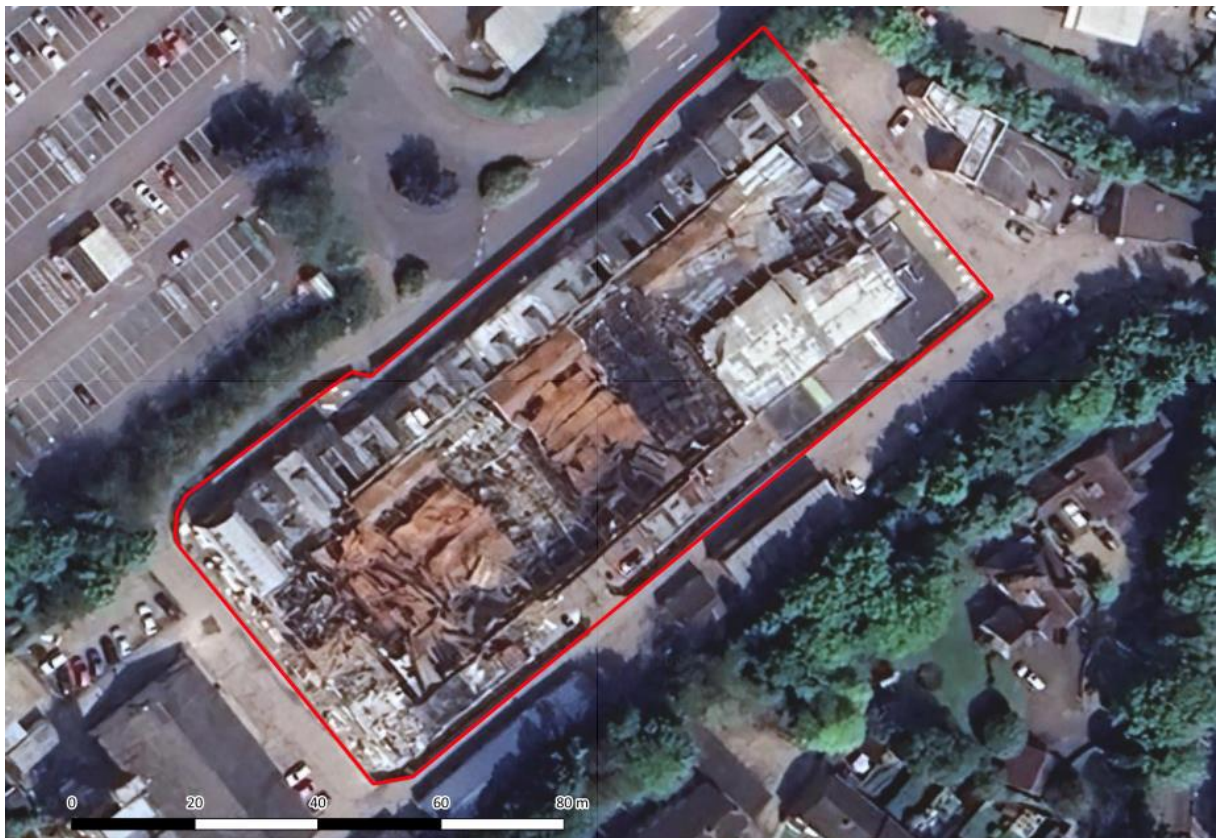


Figure 2-A: Aerial photograph and approximate site boundary

Theme	Feature
Current site use	The site comprises a series of former commercial units, which have been subject to substantial fire damage and are currently disused.
Local area land use	Adjacent sites are occupied by commercial and residential properties. Specifically, a Tesco is located beyond the northern site boundary, with associated refueling station to the northeast.
Topography	The topography of the surrounding area generally falls to the north, towards the River Ivel some 6km from the site. The site itself is relatively level.
Buildings, surfacing and other permanent features	A centrally located building occupies the majority of the site, with peripheral areas surfaced in asphalt formerly used for access and parking.
Boundary features	All site boundaries are defined by wooden hoarding.
Vegetation	No significant vegetation is present within the site boundary.
On-site / adjacent surface water features	None observed.
Asbestos containing material (ACM) in buildings	An asbestos report was provided and highlighted multiple sources of asbestos within the building.
ACMs on site	Multiple suspected ACMs were observed in surface debris.
Potential sources of contamination	Fire damaged building materials and general debris present across the site. Although buildings were unoccupied, signs indicated various former uses including various engineering companies and vehicle servicing. Ash from the fire was observed at surface.
Evidence for ground instability	None observed.

Table 2:A: Site description

- 2.2.3 The observations provided above are made by a Geoenvironmental Engineer, who is not a specialist in asbestos surveying or invasive weed identification. Any associated comments are intended for use by this report only, and not for any other purpose.

2.3 Environmental Designations

- 2.3.1 The site is not reported to be within or in close proximity to any areas of designated sensitive land use, such as a Ramsar Site, Site of Special Scientific Interest (SSSI), or Special Area of Conservation.

2.4 Planning Records

- 2.4.1 A search of online planning records held for the site and adjacent properties by North Hertfordshire District Council reveals the majority of the applications held are associated with the construction of extensions, change of use and redevelopment of individual units. None of the applications appear to hold information relating to contamination or ground conditions or contain information pertinent to this assessment.

2.5 Previous Reports

- 2.5.1 Soiltechnics are not aware of any previous ground investigation reports undertaken at the site.
- 2.5.2 A Fire Investigation Report was provided by the client. This report did not suggest the use of foams or the use of any potentially hazardous methods of extinguishing the fire.

2.6 Site History

- 2.6.1 The site was recorded as open fields until the 1950s when a building, recorded as an 'Electronics Research Laboratory', was recorded covering the majority of site. The building was replaced with a block of individual industrial/commercial units in the 1970s. In 2023 a fire occurred at the site, which damaged all of the buildings, which remain disused.
- 2.6.2 A chronological summary of the site's history is provided below.

Date	On-site	Off-site
1880s	The site is recorded as an open field which extends beyond all site boundaries.	Heath Farm is recorded 130m to the northeast.
1920s	No significant change.	Photographic material works recorded 30m to the north.
1930s	No significant change.	Unnamed square structure recorded immediately beyond the site's northern boundary. Photographic material works to the north now recorded as Bondor (hosiery) works.
1950s to 1960s	Building recorded on site covering the majority of the site.	Expansion of the hosiery factory, which now borders the site to the north.
1970s	Site recorded as 'Electronics Research Laboratory'.	No significant change.
1980s	Building appears to have either been replaced or reconfigured and is now recorded as a block of individual industrial/commercial units. Site recorded as an industrial estate.	Factory buildings immediately north are demolished and a store is constructed 30m to the north. Electricity substation is recorded 10m south of the site.
1990s to present day	No significant change but site is recorded as an industrial estate. Online street view indicates the site is occupied by an MOT centre, various engineers, a plumbing suppliers, vehicle servicing and a tool makers. A fire occurred in 2023, which damaged buildings on site.	No significant change.

Table 2:B: Summary of site history

2.7 Regulatory Enquiries

- 2.7.1 Soiltechnics have contacted Local Authority Building Control and understand that to the best of their knowledge no significant problems associated with failure of foundations are apparent in the area around the site and soakaways are commonly used in the area.

2.7.2 Soiltechnics have contacted the Local Authority Environmental Health department to request any pertinent information they may hold for the site or surrounding area. The Local Authority have requested a fee to undertake a search of their records. As an Envirocheck Report has already been obtained which includes searches of several regulatory databases, commissioning the Local Authority search is not considered necessary to complete the desk study and preliminary risk assessment in this instance.

2.7.3 A copy of all regulatory correspondence is presented in Appendix M.

2.8 Anticipated Geology

2.8.1 Based on a review of available records, the site is anticipated to be underlain by the Holywell Nodular Chalk Formation and New Pit Chalk Formation. Based on the previous development of the site, a veneer of Made Ground is anticipated.

2.8.2 A summary of the anticipated geology underlying the site is summarised as follows:

Stratum	Bedrock / superficial	Anticipated thickness (m)	Typical description
Made Ground	-	1-2	Unknown. Could contain demolition rubble. Likely variable composition
Holywell Nodular Chalk Formation and New Pit Chalk Formation	Bedrock	>100	Chalk with flints

Table 2:C: Summary of anticipated geology at the site

2.9 Hydrogeology and Groundwater Sensitivity

2.9.1 The general hydrogeological profile of the site is provided in the table below.

Stratum	Aquifer Designation	Stratum Thickness (m)	Groundwater commentary
Made Ground	-	1-2	Perched groundwater may be encountered.
Holywell Nodular Chalk Formation and New Pit Chalk Formation	Principal Aquifer	>100	Groundwater anticipated to be encountered around 14m depth.

Table 2:D: Preliminary hydrogeological model

2.9.2 The site is located within a Source Protection Zone I (Inner Zone) likely associated with two active abstraction points, some 830m and 870m to the southwest, used for public water supply. It is anticipated that these wells are abstracting from the Principal Aquifer within the Holywell Nodular Chalk Formation and New Pit Chalk Formation,.

2.10 Hydrology and Surface Water Sensitivity

2.10.1 The nearest surface water feature is an ornamental pond associated with a leisure centre, recorded ~530m northwest of the site. No rivers, streams or other significant surface waters are recorded within 750m of the site.

2.10.2 There are no active surface water abstraction licenses down-gradient of the site.

2.11 Flood Risk

- 2.11.1 The site falls within a Flood Zone 1 area. This designation indicates there is less than a 0.1% chance of flooding from rivers or the sea in any year.
- 2.11.2 The southeastern edge of the site is recorded in an area with the potential for surface water flooding during a 1 in 30 year flood event. While the southwest and northeastern boundaries are recorded in an area with the potential for surface water flooding during a 1 in 100 year flood event.
- 2.11.3 The site is recorded in an area shown to have a limited potential for groundwater flooding.
- 2.11.4 It should be noted that this information does not constitute a site-specific Flood Risk Assessment and one may be required for the scheme.

2.12 Non-Mining Ground Instability Hazard

- 2.12.1 The Envirocheck Report includes hazard ratings due to natural ground instability, which have been derived by the BGS. These hazards have been summarised in the table below.

Hazard	Hazard Potential
Collapsible ground	Very low
Compressible ground	No hazard
Ground dissolution	No hazard
Landslide	No hazard
Running sand	No hazard
Shrinking or swelling clay	No hazard

Table 2:E: Non-mining ground stability hazards

2.13 Quarrying and Mining

- 2.13.1 The site falls outside of a Coal Mining Reporting Area.
- 2.13.2 There are no historical quarries or active mineral sites recorded within close proximity of the site.

2.14 Landfill and Infilled Ground

- 2.14.1 No records of landfill sites, infilled ground or mineral sites are held within 250m of the site.

2.15 Recent Industrial Activity

- 2.15.1 There are no regulated facilities or activities in the vicinity of the site under IPPC and no registered radioactive substances. However, there is one entry under Local Authority Pollution Prevention Controls (LAPPC) recorded 46m northeast. This is associated with a petrol station.
- 2.15.2 There are 18 Contemporary Trade Directory entries associated with site itself. These are all largely associated with manufacturing, engineering and garage services. Given the age of the industrial estate, there is also the possibility that records of potentially contaminating activities occurring on site are incomplete.
- 2.15.3 31 Contemporary Trade Directory entries are held within 250m. Within 100m of the site, entries that are considered to be potential sources of contamination include furniture restorers, metal finishing services, manufacturers, as well as the petrol station detailed above.

- 2.15.4 As the site is not located in close proximity to a watercourse, records held of discharge consents and pollution incidents to controlled waters are not considered relevant to this desk study.
- 2.15.5 There is one discharge consent to land or groundwaters within 500m of the site: A soakaway at Tesco's some 100m to the north.
- 2.15.6 A substantiated pollution incident is recorded on site, associated with the fire on site in July 2023. The water impact is recorded as Category 3 (minor incident) and the air and land impacts are listed as Category 2 (significant incidents) associated with smoke pollutants and firefighting run-off.

2.16 Radon

- 2.16.1 The site is in an area where the above ground Radon Affected Area status is classed as a Lower Probability Radon Area.

2.17 Underground Infrastructure

- 2.17.1 Copies of all utility plans obtained are presented as Appendix L. The plans are provided for information only and should not be relied upon to be accurate. In addition, it is worth noting that the public utility plans provided by the asset owners typically exclude private service runs.
- 2.17.2 The site was previously a commercial premises, and it is therefore assumed to be serviced by a range of mains utilities.

2.18 Unexploded Ordnance (UXO) Hazard Screen

- 2.18.1 A preliminary risk review has been undertaken by a UXO specialist to assess the risk of encountering UXO during ground investigation works undertaken by Soiltechnics only and to identify any precautionary measures required. It should be noted that the risk assessment has not been carried out fully in accordance with CIRIA report C785 'Unexploded Ordnance (UXO) A guide for the construction Industry'.
- 2.18.2 The risk review concluded that there is a credible risk of encountering UXO during the ground investigation.

3 Tier 1 Preliminary Contamination Risk Assessment

3.1 Objectives

- 3.1.1 The objective of this preliminary risk assessment (PRA) is to determine the suitability of the site for the proposed redevelopment and end users, in terms of the risk from contamination. The assessment comprises the following steps:
- Identify potential contaminant linkages (PCLs) between sources, pathways and receptors.
 - To provide data to assist in the design of potential exploratory and detailed intrusive investigations and to give an early indication of possible remedial requirements, if necessary.

3.2 Evaluation Criteria

- 3.2.1 The following assessment is undertaken within the legislative framework of the planning system. Therefore, the assessment needs to identify if land contamination could pose an unacceptable risk to human health or the environment, within the context of the proposed development site. In the context of the existing site use, as a minimum, land should not be capable of being determined as 'contaminated land' under Part IIA of the Environmental Protection Act 1990.
- 3.2.2 The risk criteria for the proposed development is based on a 'minimal risk' approach, whereas under the existing land use a designation of 'contaminated land' would only apply if there is a significant possibility of significant harm (SPOSH).

3.3 Methodology

- 3.3.1 The objectives listed above are achieved by utilising the information presented within the desk study to develop an initial conceptual site model (iCSM) and identification of potential unacceptable risks. Depending upon the outcome of the Tier 1 assessment, it may be necessary to undertake a Tier 2 generic quantitative risk assessment (GQRA).
- 3.3.2 An iCSM relies upon the identification and assessment of PCLs. A contaminant linkage comprises of three key components:
- Source – a contaminant or pollutant that is in, on or under the land and that has the potential to cause harm or pollution.
 - Pathway – Current and post-development routes by which a receptor is, or could be, affected by a contaminant.
 - Receptor – Something that could be adversely affected by a contaminant, for example a person (current and proposed end users or neighbours), controlled waters and ecosystems.
- 3.3.3 The Tier 1 risk assessment has been produced with reference to the following guidance:
- ['Land contamination risk management'](#) (EA, 2021).
 - BS 10175:2011+A2:2017 'Investigation of potentially contaminated sites – Code of Practice'.
 - CIRIA C552 'Contaminated land risk assessment- a guide to good practice', 2001.
 - BS EN ISO 21365:2020 'Soil quality – Conceptual site models for potentially contaminated sites'
 - BS 8576:2013 'Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOC)'.

3.4 Source Assessment

3.4.1 The table below summarises identified sources based on the findings of the desk study. Where appropriate, further discussion has been provided in the paragraphs which follow.

Potential Sources	Contaminant(s) of concern	Detail	Viable source?
On-site sources			
Historical electronics research laboratory	Various inorganic and organic compounds.		Y
Recent engineering works and other manufacturers (joinery, tool makers etc.)	Various inorganic compounds, metals, fuels and oils, PAHs, semi-volatile and volatile organic compounds (SVOCs & VOCs)	Various activities carried out historically, with potential for use and storage of a wide range of contaminants, including fuels, oils and solvents. Contaminants from historical site uses could also cause aggressive ground conditions.	Y
Recent vehicle service centres	Metals, acids, asbestos, hydrocarbons, solvents and PAHs		Y
Asphalt	Coal tar/PAHs	Coal tar may be present within asphalt due to current surfacing dating from before 1980s.	Y
Made Ground	Metals, PAH, asbestos	The site has undergone some redevelopment or reconfiguration. At this stage, it is assumed that some Made Ground is potentially present locally. The nature of the Made Ground is unknown and therefore it could include demolition type material which could be a source of elevated metals, PAH or asbestos.	Y
	Permanent ground gases (CH ₄ and CO ₂)	Made Ground deposits are not expected to be of significant thickness or to contain high levels of putrescible material.	N
Fire incident and resulting damage	Asbestos/ Asbestos containing material (ACM)	Suspected ACMs have been observed within surface debris following the fire damage. However, the site is fully surfaced with hardstanding which remains intact and therefore considered unlikely to be a source of asbestos contamination to underlying soils	N
	Metals, PAHs, dioxins and furans, PFAS, hydrocarbons, VOCs, SVOCs.	Fire damage to buildings and their contents could result in a range of contaminants.	Y
Carbonate rich deposits (chalk)	Permanent ground gases (CO ₂)	Carbonate rich materials can generate carbon dioxide due to natural geochemical and weathering processes. Typically, volumes generated are low and do not pose a viable risk for developments.	N
UXO and bomb damage	Metals, PAH and explosives	Preliminary risk review suggests medium potential for UXO on site. There is risk of explosive chemicals residing within the soils where they did not fully combust, along with residual chemicals which may have leached from unexploded ordnance.	Y

Potential Sources	Contaminant(s) of concern	Detail	Viable source?
Natural Ground	Radon	The site is recorded as being in a Lower Probability Radon Area and no radon protection measures are therefore required.	N
	Pyrite and sulphates	Pyrite is unlikely to be present within chalk deposits.	N
Off-site sources			
Substation 10m south	PCBs	Construction is indicated to be post-1976 and is therefore unlikely to be a significant PCB source.	N
Petrol station located 46m northeast	Petroleum hydrocarbons (TPH), volatile organics compounds (VOC)	Station contains underground tanks and refuelling activities which are considered a possible source of contamination.	Y
Historical photographic works 30m north.	Metals, inorganics, acids/alkalis, hydrocarbons, PCBs, SVOCs.	Located down gradient of the site and therefore unlikely contamination from this industry would feasibly be a source of contamination to the subject site.	N
Historical hosiery factory to the north.	Metals, inorganics, chlorinated solvents and hydrocarbons.	Factory extended up to the site boundary and therefore could be a potential source of contamination to the subject site.	Y
Various current/historical commercial activities within close proximity of the site.	Various inorganic compounds, metals, fuels and oils, PAHs, semi-volatile and volatile organic compounds (SVOCs & VOCs)	Buildings to the west and south are commercial/industrial and have been in use since ~1970s. Potential for various activities to have been undertaken, which could be a source of contamination.	Y

Table 3:A: Contamination source assessment

3.5 Receptor Assessment

3.5.1 The following table summarises the identified receptors based on current site conditions and our understanding of the proposed end use:

Receptor Category	Principal Receptor	Receptor present?	Detail
Human health	Users of the current site	No	Site is currently unoccupied.
	End user of the developed site	Yes	To be developed into commercial/industrial units.
	Construction operatives and other site investigators	Yes	Site to be developed.
	Adjacent site users and off-site members of the public	Yes	Public footpath present adjacent to site.
Controlled waters	Surface waters	No	Surface waters are remote from the site, in excess of 500m distance.
	Groundwater	Yes	Principal Aquifer at depth within the chalk and site within a source protection zone.
Sensitive ecosystems and species	Current site	No	Site is not currently within, or proposed to form, a designated environmentally sensitive area (e.g. SSSI, RAMSAR, AONB, SPA, SAC)
	Developed site	No	
Property	Soft landscaping (current)	No	No vegetation is present within the site.
	Soft landscaping (proposed)	No	No vegetation is proposed.
	Building materials	Yes	Contaminants from site uses may cause aggressive ground conditions.

Table 3:B: Receptor assessment

3.6 Pathway Assessment

3.6.1 The following table summarises the generic human health pathway assessment for the site, assuming a range of contaminant sources within the underlying soils. Source-specific pathways are considered within the iCSM in subsequent report sections.

Human Health Exposure Pathway	Commercial land use with minimal soft landscaping (proposed)	Construction operatives	Adjacent Site Users
Ingestion, inhalation and dermal contact with soils and dusts	x	✓	✓ (inhalation only)
Ingestion, inhalation and dermal contact with site derived dusts indoors	x	✓	x
Ingestion of home-grown vegetables	x	x	x
Inhalation of vapours in outside spaces	✓	✓	✓
Intrusion and inhalation of vapours indoors	✓	✓	x
Accumulation and Inhalation of ground gas in enclosed structures	✓	✓	x
Permeation into below-ground drinking water pipes	✓	x	x

Table 3:C: Generic pathway assessment

- 3.6.2 The following table summarises generic pathways for the site which could be viable for the identified controlled water receptors, given our understanding of the hydrogeological model and assuming a range of contaminants in the sub-surface.

Controlled Water Exposure Pathways	Commercial land use with no soft landscaping (current)	Commercial land use with no soft landscaping (proposed)	Mechanism
Site characteristics			
Leaching via infiltration through unsurfaced areas, and surface run-off	✗	✗	Mobilisation
Leaching via infiltration through cracks/joints in hardstanding areas and drainage infrastructure	✓	✓	Mobilisation
Leaching via saturation from groundwater flooding and shallow/perched groundwater bodies	✓	✓	Mobilisation
Infiltration through sustainable drainage systems	✗	✗	Mobilisation
Preferential lateral pathways (e.g. underground services)	✓	✓	Migration
Preferential vertical pathways (e.g. piling, vibro-stone columns)	✗	✗	Migration
Hydrogeological characteristics			
Vertical migration through permeable strata into shallow aquifers and perched groundwater bodies	✗	✗	Migration
Vertical migration through permeable strata into sensitive aquifers at depth	✓	✓	Migration
Lateral migration within shallow and perched groundwater bodies into surface waters	✗	✗	Migration

Table 3:D: Generic pathway assessment

3.7 Initial Conceptual Site Model (iCSM)

- 3.7.1 The table below presents our approach to the assessment of risks associated with PCLs. The categories below are based upon the definitions within CIRIA C552 (2001), with the addition of a 'negligible likelihood' scenario, which is to be used where there is no realistic scenario in which harm could occur.
- 3.7.2 The initial conceptual site model (iCSM) is presented within the following tables overleaf.

		Consequence of harm			
		Severe	Medium	Mild	Minor
Probability of harm	High likelihood	Risk: Very high (high – severe)	Risk: High (high – medium)	Risk: Moderate (high – mild)	Risk: Moderate/Low (high – minor)
	Likely	Risk: High (likely – severe)	Risk: Moderate (likely – medium)	Risk: Moderate/Low (likely – mild)	Risk: Low (likely – minor)
	Low Likelihood	Risk: Moderate (low – severe)	Risk: Moderate/Low (low – medium)	Risk: Low (low – mild)	Risk: Very low (low – minor)
	Unlikely	Risk: Moderate/Low (unlikely – severe)	Risk: Low (unlikely – medium)	Risk: Very low (unlikely – mild)	Risk: Very low (unlikely – minor)
	Negligible Likelihood	Risk: Low (negligible – severe)	Risk: Very Low (negligible – medium)	Risk: Very Low (negligible – mild)	Risk: Negligible (negligible – minor)

Table 3:E: ICSM risk ratings

RECEPTOR: PROPOSED END USERS

Potential Source	Contaminants of Concern	Pathway	Tier 1 Risk Assessment (probability of harm x consequence)	Discussion
Historical electronics research laboratory	Various inorganic and organic compounds.	Inhalation of vapours	Risk: Moderate/Low (likely – mild)	Site will be fully surfaced in buildings/hardstanding therefore pathways to end users are restricted to vapours. Historical and recent site uses have the potential to be a source of organic contaminants, which could be a source of vapours. Contamination likely to be most concentrated around/close to any interceptors or drainage routes, though could have migrated vertically to water. The pathway to proposed end users will be restricted by commercial floor construction (likely concrete floor slabs) and new damp protection, albeit exposure risk cannot be fully discounted.
Recent engineering works and other manufacturers (joinery, tool makers etc.)	Various inorganic compounds, metals, fuels and oils, PAHs, semi-volatile and volatile organic compounds (SVOCs & VOCs)	Inhalation of vapours	Risk: Moderate/Low (likely – mild)	
Recent vehicle service centres	Metals, acids, asbestos, hydrocarbons, solvents and PAHs	Inhalation of vapours	Risk: Moderate/Low (likely – mild)	
Asphalt	Coal tar/PAHs	Inhalation of vapours	Risk: Low (unlikely – medium)	Based on development proposals, it is likely all existing asphalt will be removed from the site during redevelopment and replaced with new surfacing. New surfacing will illuminate pathway to end users between any residual/buried asphalt on site and end users.
Made Ground	Metals, PAH	Inhalation of vapours	Risk: Low (unlikely – medium)	Although there could be metals and PAHs within the Made Ground at elevated concentrations, these contaminants are not volatile and therefore do not pose a risk from vapours.
	Asbestos	Inhalation of particulates	Risk: Low (unlikely – medium)	Potential for asbestos to be present within Made Ground. However, site will be fully surfaced in buildings/hardstanding and thus there are no exposure pathways to end users following redevelopment.

RECEPTOR: PROPOSED END USERS

Fire incident and resulting damage	Metals, PAHs, dioxins and furans, PFAS. Hydrocarbons, VOCs, SVOCs.	Inhalation of vapours	Risk: Low (likely - minor)	Due to the uses of the site at the time of the fire, there are likely to have been stored chemicals on site, including fuels, oils and potentially solvents. Migration of contamination to underlying soils would be restricted by buildings/hardstanding but potential for some contamination to have migrated locally through cracks and drainage and impacted the underlying soils. Drainage runs were also noted on site and there is a risk of contaminants entering drainage and entering soils through any cracks in the pipework. However, in consideration of the mechanism to enter the ground, any localised contamination entering the ground through damaged surfacing or drainage will be significantly diluted. The risk of concentrated gross contamination sufficient to generate a significant vapour risk is thus, overall, considered low. <i>Appropriate removal of surface and fire damage debris is outside the scope of this report though should be carried out by a competent contractor and records maintained.</i>
Petrol station located 46m northeast	Petroleum hydrocarbons (TPH), volatile organics compounds (VOC)	Inhalation of vapours	Risk: Low (low – mild)	The petrol station will contain high volumes of stored underground fuel. Subject to the condition and maintenance of the off site tanks/refuelling systems it must be assumed at this stage that there is a potential for hydrocarbons to have escaped into the ground. The station is of relatively modern construction, so the extent of escape contamination (if any) is anticipated to be relatively low. The direction of any resulting plume would be subject to investigation, however the groundwater is anticipated to be at around 14m depth, so migration will initially be largely vertical. The resulting plume will be located at depth, with a substantial unsaturated zone and concreted floor slab between a possible plume and the site users. Further, there has been no reported evidence of vapour nuisance/exposure during recent site use. In view of the above, the presence of a contamination source capable of being a significant risk to end users of the site, via the identified exposure routes, is considered low likelihood.
Historical hosiery factory to the north.	Metals, inorganics, chlorinated solvents and hydrocarbons.	Inhalation of vapours	Risk: Low (low – mild)	Potential for use of contaminants off site which could have resulted in escaped contamination into ground/groundwater. The direction of any resulting plume would be subject to investigation however the groundwater is

RECEPTOR: PROPOSED END USERS

Various current/historical commercial activities within close proximity of the site.	Various inorganic compounds, metals, fuels and oils, PAHs, semi-volatile and volatile organic compounds (SVOCs & VOCs)		anticipated to be at around 14m depth, so migration will initially be largely vertical and any plume located at depth, with a substantial unsaturated zone above, as well as largely concreted floor slab between a possible plume and the site users. Further, there has been no reported evidence of vapour nuisance/exposure during recent site use. In view of the above, the presence of a contamination source capable of being a significant risk to identified end users of the site, via the identified exposure routes, is considered low likelihood.
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Table 3:F: iCSM – proposed end users

RECEPTOR: CONSTRUCTION WORKERS

Potential Source	Contaminants of Concern	Pathway	Tier 1 Risk Assessment (probability of harm x consequence)	Discussion
Historical Electronics research laboratory	Various inorganic and organic compounds.	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Moderate/Low (likely – mild)	High levels of highly toxic contaminants not anticipated. Potential for localised contaminants to have impacted the underlying ground from historical and more recent site uses. Exposure to such soils/contaminants is anticipated during any earthworks. Short term duration exposure risk to construction operatives will likely be mitigated by adopting appropriate PPE and hygiene precautions on site.
Recent engineering works and other manufacturers (joinery, tool makers etc.)	Various inorganic compounds, metals, fuels and oils, PAHs, semi-volatile and volatile organic compounds (SVOCs & VOCs)	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Moderate/Low (likely – mild)	
Recent vehicle service centres	Metals, acids, asbestos, hydrocarbons, solvents and PAHs	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Moderate/Low (likely – mild)	
Asphalt	Coal tar/PAH	Ingestion, inhalation and contact with soils and dusts	Risk: Moderate/Low (likely – mild)	Could potentially be present at surface and thus pose a risk to construction workers. The short term duration exposure risk to construction operatives will likely be mitigated by adopting appropriate PPE and hygiene precautions on site.
Made Ground	Metals, PAH	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Low (unlikely – medium)	No gross contamination of high-risk contaminants anticipated (e.g. cyanide, benzene, and vinyl chloride). Standard PPE and hygiene protocols for working on brownfield sites are likely to be sufficient to the mitigate risk.

RECEPTOR: CONSTRUCTION WORKERS				
	Asbestos	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Moderate (likely – medium)	Some Made Ground is anticipated to be present on site. If present, asbestos in soils can present an acute risk to construction workers, particularly during the enabling works phases. Very low and trace concentrations often pose a low risk if appropriate controls are put in place.
Fire incident and resulting damage	Metals, PAHs, dioxins and furans, PFAS, hydrocarbons, VOCs, SVOCs.	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Low (low – mild)	Due to the uses of the site at the time of the fire, there are likely to have been stored chemicals on site, including fuels, oils and potentially solvents. Migration of contamination to underlying soils would be restricted by buildings/hardstanding but potential for some contamination to have migrated locally through cracks and drainage. The risk of concentrated gross contamination sufficient to pose an acute risk to construction workers being encountered during the earthworks phases is considered low. Standard PPE and hygiene protocols for working on brownfield sites are likely to be sufficient to mitigate risk. <i>Appropriate removal of surface and fire damage debris is outside the scope of this report though should be carried out by a competent contractor and records maintained.</i>
Petrol station located 46m northeast	Petroleum hydrocarbons (TPH), volatile organics compounds (VOC)	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Very low (unlikely – mild)	Contamination from off-site sources could be present in groundwater, although this is anticipated to be at depths of ~14m and is therefore considered unlikely to be at concentrations capable of migrating to surface and posing an acute risk to construction operatives.
Historical hosiery factory to the north.	Metals, inorganics, chlorinated solvents and hydrocarbons.	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Very low (unlikely – mild)	
Various current/historical commercial activities within close proximity of the site.	Various inorganic compounds, metals, fuels and oils, PAHs, semi-volatile and volatile organic compounds (SVOCs & VOCs)	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Very low (unlikely – mild)	

Table 3:G: iCSM – acute exposure to construction workers

RECEPTOR: ADJACENT SITE USERS FOLLOWING COMPLETION

Potential Source	Contaminants of Concern	Pathway	Tier 1 Risk Assessment (probability of harm x consequence)	Discussion
All identified potential contaminant sources	Metals, PAHs, TPH, (S)VOCs, Asbestos	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Low (unlikely – medium)	Based on the exposure pathways that would be present from the developed site, and on the anticipated levels of contamination, it is considered unlikely that a pollutant linkage could pose an unacceptable risk to off-site receptors.

Table 3:H: iCSM – chronic exposure to adjacent site users

RECEPTOR: ADJACENT SITE USERS DURING THE CONSTRUCTION PHASE

Potential Source	Contaminants of Concern	Pathway	Tier 1 Risk Assessment (probability of harm x consequence)	Discussion
Historical Electronics research laboratory	Various inorganic and organic compounds.	Inhalation of soils, dusts and vapours	Risk: Low (unlikely – medium)	Inorganic contaminants are considered unlikely to be presence at concentrations capable of posing an acute risk to adjacent site users. Organic vapours will typically degrade rapidly in aerobic environments. Based upon the anticipated contaminant types and levels, the chance of a pollutant linkage causing harm is considered unlikely
Recent engineering works and other manufacturers (joinery, tool makers etc.)	Various inorganic compounds, metals, fuels and oils, PAHs, semi-volatile and volatile organic compounds (SVOCs & VOCs)	Inhalation of soils, dusts and vapours	Risk: Low (unlikely – medium)	
Recent vehicle service centres	Metals, acids, asbestos, hydrocarbons, solvents and PAHs	Inhalation of soils, dusts and vapours	Risk: Low (unlikely – medium)	
Asphalt	Coal tar/PAH	Inhalation of soils, dusts and vapours	Risk: Low (low – mild)	Short term duration works unlikely to pose a risk to adjacent site users during removal works. Good working practices for site work such as dust mitigation will further mitigate risk.
Made Ground	Metals, PAH	Inhalation of soils, dusts and vapours	Risk: Low (unlikely – medium)	Considered unlikely to be presence at concentrations capable of posing an acute risk to adjacent site users.

RECEPTOR: ADJACENT SITE USERS DURING THE CONSTRUCTION PHASE

	Asbestos	Inhalation of soils, dusts and vapours	Risk: Moderate/Low (low – medium)	Potential risk associated with generation of air-borne asbestos fibres and dust during main construction earthworks phase. Whilst there is a low likelihood of harm occurring due to the effect of fresh-air dilution, the risk cannot be discounted at this stage.
Fire incident and resulting damage	Metals, PAHs, dioxins and furans, PFAS,	Inhalation of soils, dusts and vapours	Risk: Low (likely - minor)	Localised contamination may be present within the ground but is likely to have been significantly diluted. The risk of concentrated gross contamination sufficient to pose an acute risk to adjacent users during construction works generated from the fire incident is considered low.
	Hydrocarbons, VOCs, SVOCs.	Inhalation of soils, dusts and vapours	Risk: Low (likely - minor)	
Petrol station located 46m northeast	Petroleum hydrocarbons (TPH), volatile organics compounds (VOC)	Inhalation of soils, dusts and vapours	Risk: Low (unlikely – medium)	Contamination from off-site sources could be present in groundwater, although this is anticipated to be at depths of ~14m and is considered unlikely to be at concentrations capable of posing an acute risk during the construction phase.
Historical hosiery factory to the north.	Metals, inorganics, chlorinated solvents and hydrocarbons.	Inhalation of soils, dusts and vapours	Risk: Low (unlikely – medium)	
Various current/historical commercial activities within close proximity of the site.	Various inorganic compounds, metals, fuels and oils, PAHs, semi-volatile and volatile organic compounds (SVOCs & VOCs)	Inhalation of soils, dusts and vapours	Risk: Low (unlikely – medium)	

Table 3:1: *iCSM – acute exposure to adjacent site users*

RECEPTOR: CONTROLLED WATERS				
Potential Source	Contaminants of Concern	Pathway	Tier 1 Risk Assessment (probability of harm x consequence)	Discussion
All on site industrial/commercial activities	Various inorganic compounds, metals, fuels and oils, PAHs, semi-volatile and volatile organic compounds (SVOCs & VOCs)	Leaching and lateral migration (Groundwater)	Risk: Low (low – mild)	Groundwater is anticipated to be at ~15m depth. Surface hardstanding will have prevented the infiltration of rainwater/surface water into/through the ground and thus will have prevented the mobilisation of potential shallow, leachable contaminants from the Made Ground or recent industrial activities toward the aquifer at depth. Potential for low level escape contamination through damaged drainage infrastructure, though overall likely to be low level contamination.
Made Ground	Metals, PAH	Leaching and lateral migration (Groundwater)		Contamination release from historical site use as the result of poor practices is possible, and could have resulted in NAPL release into the environment. There is no evidence to indicate a significant impact on waters sourced at the site, however, testing of groundwater for the presence of dissolved phase contamination would be prudent to confirm low risk. Continuation of positively drained hardstanding and inspection of any drainage route infrastructure which is to remain on site and in use is recommended to further limit the risk to waters following redevelopment.
Fire incident and resulting damage	Metals, PAHs, dioxins and furans, PFAS, Hydrocarbons, VOCs, SVOCs.	Leaching and lateral migration (Groundwater)	Risk: Low (low – mild)	Potential for some localised contamination to have migrated through any cracks in the surfacing/drainage infrastructure and have impacted the soils below. Such contamination is anticipated to have been diluted and not at concentrations to present a significant risk to waters. EA record the incident impact as a Category 3, minor incident to waters. Testing of groundwater would be prudent to confirm low risk. Continuation of positively drained hardstanding and inspection of any drainage route infrastructure which is to remain on site and in use is recommended to further limit the risk to waters following redevelopment.
All off-site sources	Inorganics, TPH, VOC, chlorinated solvents	Leaching and lateral migration (Groundwater)	-	Risk to controlled waters from off site sources is outside the brief of this investigation.

Table 3.J: iCSM – controlled waters risk

RECEPTOR: PROPERTY				
Potential Source	Contaminants of Concern	Pathway	Tier 1 Risk Assessment (probability of harm x consequence)	Discussion
All on site sources	Acids, sulphates	Direct contact	Risk: Moderate/Low (low – medium)	Aggressive ground conditions due to historical industrial activities is a possibility.

Table 3:K: iCSM – Property

3.7.3 The risk to identified receptors from the proposed developments under the planning regime are assessed under a ‘minimal risk’ approach. Whereas, the risk to receptors under the current and continued use of the site is dealt with under the regulatory framework of the Part IIA regime, where Soiltechnics consider if there is a reasonable chance of a ‘significant potential of significant harm’ (SPOSH) occurring. This is not equivalent to a due diligence assessment for the continued use of the site to aid in determining potential contaminated land liabilities or land valuations.

3.7.4 The following table sets out the risk to current users considering a SPOSH approach:

Receptor	Potential Source	Contaminants of Concern	Pathway	Preliminary Assessment: Is their reasonable evidence of SPOSH?	Discussion
Human Health (Current and adjacent site users)	All potential contaminant sources identified above	Various Contaminants	Inhalation, ingestion and contact with soils, dusts and vapours.	No	Whilst potential contamination sources have been identified, Soiltechnics have not encountered any evidence which indicates there could be a significant possibility of significant harm to human health occurring from contamination on site.
Controlled Waters (Surface water and groundwater)	All potential contaminant sources identified above	Various Contaminants	Mobilisation and migration	No	Whilst potential contamination sources have been identified, Soiltechnics have not encountered any evidence which indicates there could be a significant possibility of significant harm to controlled waters occurring from contamination on site.
Ecosystems	All potential contaminant sources identified above	Various Contaminants	Direct contact and root uptake	No	The site does not fall within a relevant designation for environmentally sensitive land (e.g. SSSI, NRA, Ramsar).
Property	All potential contaminant sources identified above	Various Contaminants	Various pathways	No	Through undertaking the desk study, no evidence of potentially significant harm occurring to property has been identified.

Table 3:L: iCSM – current site risks (part IIA)

3.8 Preliminary Risk Assessment Conclusions and Recommendations

- 3.8.1 In summary, the PRA has not highlighted any potential contaminant linkages (PCL) which could pose a significant possibility of significant harm under the current land use. In terms of the proposed development scheme, a minimal risk approach applies, and PCLs have been identified which require further consideration.
- 3.8.2 In particular the industrial heritage of the site and potential for Made Ground deposits could give rise to a wide range of contaminants. Further intrusive investigation works are recommended to further refine the assessment and to determine if any remedial measures are necessary.
- 3.8.3 The assessment has concluded that there is no credible PCL associated with permanent ground gases or radon which could affect the site; however, an intrusive phase of investigation is required to determine if any gas protection measures are required to protect against the potential risk from vapour intrusion.
- 3.8.4 Based upon our current understanding of the site, there is no requirement to conduct ground gas monitoring in future intrusive investigation phases.
- 3.8.5 Overall, each PCL identified as posing a risk of 'Moderate/Low' or higher should be considered as part of an intrusive Tier 2 generic quantitative risk assessment (GQRA). The following table summarises the principal receptors at risk which require further investigation to support the proposed development.

Receptor Category	Principal Receptor	PCL Present Requiring Further Investigation?
Human health	Current site users	No
	Proposed site users (soils, dusts, and vapour)	Yes – vapour risk
	Proposed site users (permanent ground gas)	No
	Proposed site users (radon)	No
	Adjacent site users and off-site members of the public (during the long-term use of the site)	No
	Adjacent site users and off-site members of the public (during the construction phase)	Yes – possible asbestos exposure
	Construction operatives	Yes – possible asbestos exposure
Controlled waters	Surface waters	No
	Groundwater	No
Property	Soft landscaping (current)	No
	Soft landscaping (proposed)	No
	Potable infrastructure	Yes – direct contact pathway
	Building materials	Yes – direct contact exposure

Table 3:M: Receptors at risk under the proposed scheme

4 Ground Investigation

4.1 Objectives

- 4.1.1 The ground investigation scope and location of exploratory holes was determined by Soiltechnics Ltd, based upon our overall brief outlined in Section 1.
- 4.1.2 The objectives of the fieldwork were to:
- i) Establish ground and groundwater conditions at the site.
 - ii) Obtain samples for subsequent laboratory testing.
 - iii) Install groundwater monitoring wells and undertake a programme of monitoring visits.

4.2 Fieldwork Summary

- 4.2.1 Fieldwork was undertaken between the 20th and 24th January 2025.
- 4.2.2 A summary of the works completed is set out in the table below, along with the location of the exploratory logs. Photographic records of the trial pits and rock core are presented in Appendix D, and the exploratory hole location plan is presented within Appendix A.

Exploratory Hole Logs	Method	Qty	Final Depth Range (m bgl)	Comments
Appendix B	Hand Pits	1	0.75	TP01 Terminated due to the presence of a service.
		1	1.00	TP02 Terminated due to the presence of concrete at the base of the trial pit.
Appendix C	Rotary core boreholes	4	19.00 – 19.20	BH01 to BH04 Boreholes terminated at scheduled depth.

Table 4:A: Summary of fieldwork undertaken

- 4.2.3 All soils encountered were described in accordance with BS EN ISO 14688 “Identification and Classification of soil”. Chalk was described in accordance with CIRIA C574 ‘Engineering in chalk’.

4.3 Unexploded Ordnance (UXO)

- 4.3.1 The site was assessed to have a credible risk of encountering UXO and the works were supervised by a UXO specialist.
- 4.3.2 No ferrous anomalies or items of possible UXO were observed during fieldwork.

4.4 Sampling

- 4.4.1 During the fieldwork, sampling of soil and rock for geotechnical purposes has been undertaken in accordance with BS EN ISO 22475-1 “Geotechnical Investigation and testing – sampling by drilling and excavation and groundwater measurements”.
- 4.4.2 Samples collected for chemical analysis have been taken and handled in accordance with BS ISO 18400-105:2017 “Soil quality — Sampling Part 105: Packaging, transport, storage and preservation of samples”.

- 4.4.3 Various sampling and sub-sampling methodologies have been adopted as appropriate, with the primary aim of obtaining the highest quality sample class practicable.
- 4.4.4 Untested chemical and geotechnical samples will be held for a period of 4 weeks from the date of the first report issue, after which they will be disposed of.

4.5 In-situ Testing

- 4.5.1 The following table summarises the field testing carried out. The results are summarised on individual exploratory hole logs where appropriate and detailed within the Appendices indicated.

Tests	Qty	Applicable standard / guidance	Location of Results
Standard penetration test (SPT)	21	BS EN ISO 22476-3	Included within logs Detailed in Appendix E

Table 4:B: Summary of field testing undertaken

4.6 Monitoring Installations

- 4.6.1 Instrumentation installed within exploratory holes during the fieldwork are shown on the logs within Appendix C and are summarised below:

Installation type	Target Stratum	Response zone (m)	Qty	Exploratory hole ID
Groundwater well	Holywell Nodular Chalk Formation and New Pit Chalk Formation	4.00 – 19.00	1	BH01
		4.00 – 19.00	1	BH02
		4.00 – 19.00	1	BH03
		4.00 – 19.00	1	BH04

Table 4:C: Summary of monitoring installations

4.7 Monitoring Visits and Groundwater Sampling

- 4.7.1 A summary of the groundwater spot monitoring visits undertaken is outlined in the table below. Results of the post fieldwork monitoring are presented in Appendix F.
- 4.7.2 Overall, four monitoring visits were undertaken over a period of 3 weeks.

Date	Purpose
03/02/2025	Groundwater spot monitoring
11/02/2025	
19/02/2025	

Table 4:D: Summary of post fieldwork spot monitoring

- 4.7.3 Groundwater sampling undertaking during the return visits are summarised below.

Date	Purge Method	Sampling Method	Locations Sampled
03/02/2025	Bailer sampling (x3 well volumes)	Bailer sampling (high volume, high flow)	BH02 & BH03

Table 4:E: Summary of groundwater sampling undertaken

4.8 Investigation Constraints

- 4.8.1 Due to fire damage the footprint of the building could not be investigated.

5 Laboratory testing

5.1 Overview

- 5.1.1 Samples obtained from exploratory holes were sent to independent accredited laboratories for geotechnical and chemical testing.

5.2 Geotechnical Testing

- 5.2.1 The geotechnical testing schedule was prepared by Soiltechnics using a targeted and judgemental approach, based upon the scheme proposals and our initial understanding of the ground conditions.
- 5.2.2 Geotechnical laboratory test results are presented in Appendix G, and the total number of geotechnical tests undertaken is summarised below:

Qty	Test
2	Moisture content
2	Atterberg limits
5	Intact dry density and saturation moisture content for chalk
4	Uniaxial compressive strength
5	Point load
4	BRE SD1 Suite D

Table 5:A: Summary of geotechnical laboratory testing

5.3 Chemical Testing

- 5.3.1 The chemical testing schedule was prepared by Soiltechnics using a targeted and judgemental approach, based upon the initial conceptual site model and fieldwork observations. This is further elaborated on within subsequent report sections.
- 5.3.2 Chemical laboratory test results are presented in Appendix H, and the total number of chemical tests undertaken is summarised below:

Sample Type	Qty	Testing	Suite Name
Soils	3	Metals, cyanides, PAHs, phenol	ST Suite 1
	9	Metals, cyanides, PAHs, TPH CWG, (S)VOCs & inorganics	ST Suite 17
	2	Asbestos screening	-
	1	Asbestos bulk identification	-
	2	Full WAC Suite (2-stage leachate)	-
Water	2	Metals, cyanides, PAHs, TPH CWG, (S)VOCs & inorganics	ST Suite 17

Table 5:B: Summary of chemical laboratory testing

6 Ground Investigation Findings

6.1 Ground Conditions

- 6.1.1 Ground conditions encountered were relatively consistent across the site and were broadly in line with those anticipated from the desk study.
- 6.1.2 The tables below present our generalised interpretation of geological and hydrogeological conditions at the site.
- 6.1.3 Further detail about the ground conditions encountered is provided in the relevant sub-sections below.

Stratum	Brief description	Top depth range (m bgl)	Thickness (m)
Hard surfacing	Asphalt and concrete cover	G.L.	0.05 - 0.2
Made Ground	Variable, brown, sandy, gravelly clay and sand and gravel. Gravels of flint, asphalt, brick and occasional, possible asbestos containing material.	0.05 - 0.2	0.2 – 1.3 (where proven)
Chalk Formation	Structureless chalk composed of brown to off-white sandy clayey gravel.	0.4 - 1.5	1.05 – 2.9
	Weak, low to medium density cream to off-white chalk with occasional black specs. Fractures are very closely to closely spaced.	1.9 - 2.9	Not proven (>17)

Table 6:A: Ground condition summary

Type	Stratum	Groundwater model depth (m)	Comments
Water table	Chalk Formation	15	Fluctuations in water depth within chalk anticipated.

Table 6:B: Hydrogeological model

6.2 Made Ground

- 6.2.1 Made Ground of various compositions was encountered.
- 6.2.2 In BH01 to the southeast, soft to firm, greyish brown to brown, sandy, gravelly clay with low cobble content was encountered underlying asphalt and concrete surfacing, to a maximum depth of 1.45m. In the northwest (vicinity of BH03) surface asphalt was underlain with, dark brown, sandy gravel of flint, brick and asphalt to a maximum depth of 0.25m. Assorted gravelly sand and clay was recorded below this to 0.7m in BH03 and >0.75m in TP01. Possible asbestos containing material was observed in BH03 between 0.5-0.7m depth and in TP01 between 0.05-0.35m depth.
- 6.2.3 In the west (vicinity of BH04), Made Ground extended to 1.5m depth. Surfacing asphalt extended onto a coarse gravel subbase, and a buried concrete layer (0.15m thick) was present below this. Underlying Made Ground again comprised an assortment of gravelly sands and clays. A slight hydrocarbon odour was recorded from 0.85m depth in TP02, but was not identified in BH02.
- 6.2.4 Photographs of the Made Ground are presented below.



Figure 6-A: Made Ground within the inspection pit at BH02.



Figure 6-B: Made Ground excavated from TP01.

6.3 Holywell Nodular Chalk Formation and New Pit Chalk Formation

- 6.3.1 Chalk was encountered in all exploratory hole locations, underlying the Made Ground. Structureless chalk composed of brown to off-white sandy clayey gravel with low to medium content was encountered to depths between 1.9m and 2.9m, after which the chalk became more competent. At depth the Chalk was weak, low density, cream to off-white with occasional black specs. Fractures appeared very closely to closely spaced. The base of the chalk was not proven with the maximum depth achieved being 19m.
- 6.3.2 Photographs of the chalk encountered are presented below.



Figure 6-C: Structureless chalk encountered in BH03.



Figure 6-D: Structured chalk encountered in BH04.

6.4 Groundwater

6.4.1 A summary of the groundwater level data obtained during the fieldworks phase is presented below.

Exploratory hole ID	Groundwater observation
BH01	Water level measured at 15.48m depth at the end of drilling.
BH02	Water level measured at 15.03m depth at the end of drilling.
BH03	Water level measured at 7.01m depth at the end of drilling.
BH04	Water level measured at 15.39m depth at the end of drilling.

Table 6-C: Summary of groundwater observations during the fieldworks

6.4.2 A summary of the groundwater level data obtained during the monitoring phase is presented below, and is detailed within Appendix F.

Targeted strata / Aquifer	Exploratory hole ID	Instrument Type(s)	Range of water depth during monitoring period (m bgl)
Holywell Nodular Chalk Formation and New Pit Chalk Formation	BH01	Well	15.45 – 15.70
	BH02	Well	15.06 – 15.24
	BH03	Well	15.26 – 15.47
	BH04	Well	15.11 – 15.36

Table 6-D: Summary of groundwater monitoring visits

6.4.3 Groundwater levels are expected to vary seasonally and in response to recent weather conditions. Long term monitoring would provide a reasonable quantification of such variation.

6.5 Evidence of Possible Contamination

6.5.1 The table below summarises the potential contamination noted during the ground investigation works.

Exploratory hole ID	Depth of observation (m bgl)	Stratum	Description
TP01	0.05 - 0.35	Made Ground	Suspected asbestos containing material, (fragment of cement board), observed in Made Ground.
TP02	0.85 – 1.00	Made Ground	Slight hydrocarbon odour, extending to buried concrete at base of pit.
BH03	0.50 – 0.70	Made Ground	Suspected asbestos containing material, (fragment of cement board), observed in Made Ground.

Table 6:E: Summary of potential contamination noted during the investigation works

6.6 Obstructions and Instability

6.6.1 The table below summarises the obstructions and instability encountered that affected the progress of the investigation works.

Exploratory hole ID	Strata / Area	Depth range (m bgl)	Issue	Description
TP01	Made Ground	0.75	Obstruction	100mm diameter metal pipe at base of pit.
TP02	Made Ground	1.00	Obstructions	Concrete at base of pit.

Table 6:F: Summary of obstructions and instability encountered during the investigation works

7 Geotechnical Discussion

7.1 Scheme Overview

- 7.1.1 The following assessments are made on the investigatory data presented in the preceding sections of this report and are made with reference to the specific nature of the development. Should scheme proposals change then it is recommended that the validity of the conclusions of this report in relation to the revised scheme are checked.
- 7.1.2 The project will comprise the construction of a new building with the same footprint and construction as the existing building.

7.2 Geotechnical Category

- 7.2.1 In accordance with BS EN1997-1:2004 + A1:2013 (Eurocode 7), the project is designated as Geotechnical Category 2. This category includes projects with *conventional types of structures and foundations with no exceptional risk, or difficult ground or loading conditions*. Furthermore, *routine design procedures* are appropriate.
- 7.2.2 It should be noted that this Report does not constitute a Geotechnical Design Report (GDR) as defined in Eurocode 7. Accordingly, a GDR should be prepared by the designer during the detailed design phase

7.3 Key Geotechnical Issues

- 7.3.1 The base of the Made Ground has not been fully penetrated locally, and buried obstructions have been encountered throughout. All Made Ground/buried obstructions will need to be penetrated by new foundations which could result in locally deepened footings.
- 7.3.2 Another geotechnical issue that may impact the scheme and will therefore need to be appropriately managed during the lifecycle of the project is possible dissolution features, which is discussed below.
- 7.3.3 Reference has been made to CIRIA report C574 Engineering in Chalk. That report indicates that the presence of dissolution features should be expected on all calcium carbonate rich chalk sites. The Holywell Nodular Chalk Formation And New Pit Chalk Formation is considered rich in calcium carbonate and therefore dissolution features could be anticipated.
- 7.3.4 Dissolution features pose a hazard to foundations because of the presence of one or more of the following features, which are generally located above the groundwater table:
- i) Large variations in intact chalk horizon
 - ii) Loose chalk or superficial deposits infilling pipes
 - iii) Cavities or caves within the chalk
 - iv) Dissolution widened discontinuities in the chalk affecting its load carrying capacity
- 7.3.5 The risk that these hazards present to a building relates to its vulnerability, which in turn relates to the foundation type. A building on shallow spread type foundations and ground bearing floors is more vulnerable than piled foundations extending through the base of these features supporting a suspended ground floor slab. A qualitative risk assessment has been undertaken and summarised below:

Item	Observation / enquiry	Assessed risk
Surface features	None observed	Low
Variation in density of near surface soils	Relatively modern Made Ground across the site recorded at depths no more than 2m thick. Chalk observed directly below the Made Ground with similar composition across the site. Comparatively low SPT results recorded at very shallow depth in BH02 only, quickly becoming higher and with remaining shallow chalk deposits including in BH02 showing good SPT results and recovery.	Low
Variation in intact chalk horizon	Made Ground considered of artificial origin/placement. Chalk observed directly below the Made Ground with little variation observed.	Low
Adverse movement in nearby buildings	None observed. No known incidents of such movement.	Low
Envirocheck database	Recorded as 'no hazard'.	Low

Table 7.A: Qualitative risk assessment of dissolution features

7.3.6 Based on the above, the risk of the site being subject to dissolution features is considered low. ***It is recommended that this section is updated following further works across the site, including beneath the footprint of the remaining building which will inform the assessments made above.***

7.3.7 It is also noted that there is a substantial unsaturated zone within the chalk and so whilst the risk from dissolution on site is currently considered low, it cannot be fully discounted at this stage (due to the limited coverage of investigation on site) and measures are recommended to avoid concentrated ingress of water in the design phase. Further, although the risk is considered low, there remains a residual risk that dissolution features could be encountered in the construction phase, identified by voiding or locally loose soil. Accordingly, it is recommended that formation levels be inspected by a suitably competent geotechnical engineer.

7.4 Building Foundation Strategy

7.4.1 In view of the key geotechnical issues discussed above and anticipated loadings, pad and strip foundations are considered suitable for the project, subject to inspection by a suitably competent geotechnical engineer.

7.4.2 A raft or piled foundation could also be used, which would provide a lower risk scenario in view of the dissolution potential at the site, and further information on these solutions can be provided on request.

7.4.3 ***It is also recommended that this assessment be reviewed following further works on site (beneath the building footprint) which will further inform the dissolution risk potential and thus the most viable/recommended foundation solution.***

7.5 Pad and Strip Foundations

7.5.1 The Chalk Formation soils at likely formation level are not considered shrinkable and thus their volume will not be influenced by the water demands of the variety of trees at the site. Accordingly, and in isolation of other considerations affecting foundation depth, foundations should extend a minimum of 0.75m below ground level.

- 7.5.2 Made Ground was encountered across the site and will be present as the result of grubbing out existing footings and possibly localised service routes. All foundations should extend through Made Ground and into the underlying, natural Chalk deposits by a minimum of 0.3m. All formation levels should be inspected by a suitably qualified Geotechnical Engineer prior to pouring concrete.
- 7.5.3 Based on the considerations outlined above it is anticipated that the proposed foundations will be formed on Chalk at depths in the range of approximately 0.75-2m depth, subject to local conditions. Chalk is not specifically covered in BS EN1997-1:2004 + A1:2013 or BS 8004:2015. Therefore, CIRIA C574 and in-situ testing has been used to prescribe allowable bearing pressures, which is approximate to serviceability limit state.
- 7.5.4 The chalk is low density Grade Dc at formation level. Accordingly, an allowable bearing pressure of 225 kN/m² is recommended for strip and pad foundations based on CIRIA C574. At these imposed stress levels the total settlement is unlikely to exceed 0.2% of the foundation width.
- 7.5.5 It should be noted that foundation design is iterative. Accordingly, a final check of ultimate and serviceability limit states should be undertaken following confirmation of foundation size and loads. It is recommended that care is taken when removing existing foundations and buried features, to prevent the requirement for over deepening new foundations.

7.6 Industrial Floor Slab

- 7.6.1 In new internal areas where bulk items, racking or heavy equipment will be housed, a suitable slab will be required. Due to the condition of the fire-damaged building, exploratory investigations were limited to the perimeter of the proposed development and therefore the thickness and compaction of Made Ground in the proposed footprint is not fully known. On the assumption that ground conditions are consistent under the former building with the perimeter it is anticipated that a ground bearing floor slab will be founded on Made Ground.
- 7.6.2 Due to the variable nature of Made Ground, the unknown and potentially variable thickness of Made Ground under the former buildings and the potential for additional Made Ground to be created during demolition of foundations, the following assessment should be considered preliminary and will require review upon completion of further ground investigation.
- 7.6.3 For the purposes of this assessment, it is assumed that each bay will be ~6m x 6m and will exist in isolation. The UDL is assumed to be up to 30kPa based on experience from such schemes, but this should be re-assessed when design loads are known.
- 7.6.4 Based on a scenario where the 1m of Made Ground below the slab formation is excavated, sorted and unsuitable material removed, including any cohesive material, and replaced with a suitable granular fill, which achieves compaction equivalent to an SPT N Value of 20 (medium dense), total settlement is estimated to be in the order of 10mm (which would occur relatively quickly given the solely granular nature of the soils).
- 7.6.5 It is recommended that rolling of the existing Made Ground prior to placement of sub-base is undertaken to identify any areas of significantly reduced strength/density. Any such soft areas should be excavated and replaced with a coarse fill. Where encountered, cohesive Made Ground should be excavated and infilled with a coarse fill.

7.7 Drainage

- 7.7.1 Concentrated ingress of water into Chalk can initiate new dissolution features, particularly in low density Chalk, and destabilise loose backfill of existing ones. For this reason and following recommendations contained in CIRIA report C574 'Engineering in Chalk', soakaways should be sited away from foundations for structures, roads or railways, as indicated below:
- In areas where dissolution features are known to be prevalent, soakaways should be avoided if at all possible, but if unavoidable, should be sited at least 20m away from any foundations.
 - Where chalk is of low density, or its density is not known, soakaways should be sited at least 10m away from any foundations.
 - Where chalk is of medium density (or higher) the closest part of the soakaway should be at least 5m away from buildings.
- 7.7.2 The Chalk was generally encountered as low to medium density and therefore for the purpose of soakaway design it is recommended that they are sited a minimum of 10m from foundations. Additionally, it is recommended that trench type soakaways are adopted to minimise the risk of promoting the formation of dissolution features. These requirements may preclude the viability of soakaways in which case an alternative solution may be required.
- 7.7.3 Further, the Chalk is designated as a principal aquifer. Accordingly, the Environment Agency and Local Authority must be consulted when planning soakaway installations where chalk underlies the site.

7.8 Aggressiveness of the Ground to Buried Concrete

- 7.8.1 The aggressiveness of the ground with respect to buried concrete has been assessed in accordance with Building Research Establishment Special Digest 1: Concrete in Aggressive Ground Third Edition (2005).
- 7.8.2 The site is interpreted to be a brownfield site where pyrite is unlikely to be present.
- 7.8.3 Laboratory testing has been undertaken on soil samples obtained from the investigation works.
- 7.8.4 The classification of the strata is tabulated below:

Stratum	Disturbed / Undisturbed	Design sulphate class	Aggressive chemical environment for concrete class
Made Ground	Disturbed	DS-1	AC-1
Holywell Nodular Chalk Formation and New Pit Chalk Formation	Disturbed	DS-1	AC-1
	Undisturbed	DS-1	AC-1

Table 7:B: Summary of the aggressiveness of the ground to buried concrete

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

7.9 Constructability

- 7.9.1 Under most standard contracts it is the responsibility of the Contractor to design, construct and maintain temporary works. Accordingly, the following discussion is provided for information only.

- 7.9.2 Groundwater is not anticipated to be encountered during excavations to form spread foundations. Excavation sides are anticipated to be stable in the short term. However, some overbreak of the Made Ground and other more granular deposits may occur.
- 7.9.3 In the event that a soft area is located in the course of foundation excavations then a suitably experienced Geotechnical Engineer should be consulted for an assessment of ground conditions.
- 7.9.4 It is recommended that foundation excavations are inspected by a suitably competent engineer to confirm the low risk of dissolution features on site. Any abnormalities or evidence of infilled features or voids will warrant reconsideration of the foundation solution and potentially a change to piling or raft foundation. An alternative to derisk the foundation solution would be to undertake investigations in foundation locations prior to the construction phase.
- 7.9.5 Chalk can deteriorate rapidly in wet/adverse weather and use of a contractor familiar and competent is working with chalk is recommended. In any case it is recommended that foundation concrete be poured as soon as practicable after excavation to prevent deterioration of the chalk. Where this is difficult due to sequencing and the requirement for engineer inspection, exposed surfaces should be protected from water ingress. It may be necessary to create a working platform of granular material or geotextile in areas of exposed Chalk at surface.
- 7.9.6 Variation in the Made Ground depth has been observed on site, likely from former developments and more variation could be present in areas not currently investigated. Consideration to the design implication for locally variable foundation depth requirements is required.

8 Tier 2 Generic Quantitative Risk Assessment

8.1 Objectives

8.1.1 The objective of this generic quantitative risk assessment (GQRA) is to further assess the potential contaminant linkages (PCLs) identified by the preliminary risk assessment using the following:

- The findings of the intrusive site investigation and resulting site specific ground and hydrogeological model.
- Laboratory analysis of soils and groundwater.
- Monitoring of ground gases and vapours.

8.2 Fieldwork Observations

8.2.1 A slight hydrocarbon odour was observed in one location within the Made Ground in the west of the site. The extent of the contamination has not been delineated at this stage, though was not observed in the adjacent borehole. The hydrocarbon is likely associated with the former use of the site (recent engineering works), which is discussed in the initial CSM and so does not represent an additional source of contamination.

8.3 Laboratory Testing Rationale

8.3.1 Laboratory testing has been scheduled by targeting potential contaminant linkages identified within the iCSM and observations made during fieldworks. The sampling and testing strategy is based on a judgemental approach.

8.3.2 The testing of the general Made Ground deposits was undertaken across various locations to gain spatial coverage over the site and to characterise the strata encountered. Testing included broad suites of analysis due to the potential for unknown contamination to be present.

8.4 Generic Assessment Criteria

8.4.1 Assessment of laboratory test data has been carried out using published generic assessment criteria (GACs). The GACs act as screening values to provide a 'trigger' to an assessor that soil concentrations above these limits might present an unacceptable risk.

8.4.2 Various GAC sources are used within this report. Key assumptions are made in the derivation of screening values in regard to their use and application, and exposure modelling is based on precautionary national scenarios. This generic approach can result in an overly conservative assessment; therefore, the assessor is required to review the outcome of the GQRA screening in the context of the site specific CSM and identified potential contaminant linkages.

8.4.3 Asbestos does not currently have published GACs which can be used for generic assessment purposes, at this stage a present / absent trigger limit has been adopted.

8.4.4 Specific details regarding the published GAC sources chosen and any parameter refinements made are summarised within Appendix I, along with the order of preference where multiple GAC sources are available. The exposure models adopted are discussed in the relevant sections below.

8.5 Human Health GQRA (Soils and Vapour)

8.5.1 The results of the human health screening assessment for soils and vapours are detailed in Appendix I. The following table outlines the exposure models adopted, along with summarising the outcome of each screening assessment.

Receptor	Exposure Model	Outcome
All human health receptors	Presence of asbestos	Fragments of cemented ACM observed (chrysotile) during fieldworks. Loose asbestos fibres/clumps detected in 1 of 3 tests undertaken in the Made Ground, quantified at 0.001%.
Proposed users	Commercial/Industrial	No exceedances
Controlled Water	Drinking water	No exceedances
Construction operatives	Acute occupational exposure (assumed no PPE worn)	No exceedances.
Adjacent site users and the public	Acute off-site public exposure during construction phase	No exceedances.

Table 8:A: Human health GQRA models and outcomes

8.5.2 The table below summarises the instances where contaminants have exceeded the generic screening criteria.

Receptor	Strata	Contaminant	Locations & Depths	Test Result / Range (mg/kg)	GAC (mg/kg)
All human health receptors	Made Ground	Visible ACMs	TP01 at 0.30m	Cement - Chrysotile	N/A
		Asbestos fibres	TP01 at 0.75m	Fibres/clumps - Chrysotile (0.001%)	N/A

Table 8:B: Human health GQRA exceedances

8.6 Proposed Site Users Risk Assessment (Soils and Vapour)

- 8.6.1 Asbestos is present in the north of the site, however hardstanding is proposed across the entire footprint. Therefore, no pathway is present.
- 8.6.2 All reported concentrations of chemical contaminants are below the relevant generic assessment criteria for human health receptors. This includes the area of slight hydrocarbon odours in TP02. Notably however, the extent of the hydrocarbon contamination observed in TP02 has not been fully determined. Exposure and confirmation of the extent of such contamination is recommended in future works phases, which will inform a detailed, site wide risk assessment.
- 8.6.3 Based on testing to date, ground conditions at the site are considered to present a low risk to proposed site users, **however, there was limited access to the site as the result of the fire damaged building and further investigation is proposed to fully investigate the site. Further works should include investigation of soils underlying the current building and close to TP02.**

8.7 Construction Workers Risk Assessment

- 8.7.1 Asbestos was largely absent across the site; however it was detected within Made Ground in the north of the site as fragments and fibres at trace concentrations (0.001%) and occasional occurrences of broken, bound ACM materials (tiles and cement).

- 8.7.2 A risk assessment has been undertaken using the JIWG Decision Support Tool (see Appendix J), and at the concentrations/types recorded, the tool suggests an overall hazard to construction operatives rating of medium.
- 8.7.3 The presence of asbestos fibres and ACM fragments on site will thus require consideration in the construction phase health and safety plan. Based on testing and observations to date it is anticipated that ACM/asbestos fibres could be present throughout the Made Ground on site, though confirmation and reassessment during later phases of works is recommended. At this stage, localised and enhanced personal decontamination facilities should be incorporated into the construction phase plan. In addition use of EN140 type RPE with P3 filter half mask considered, as well as manual/localised dust suppression, particularly when working in areas of coarse grained Made Ground. Furthermore, good working practices for working on brownfield sites and for dust mitigation should be adhered to at all times, including.
- Asbestos awareness training.
 - A watching brief during enabling works.
 - A site-specific asbestos awareness briefing as part of the site inductions.
 - Establishing an appropriate action plan in the event of encountering unexpected contamination and suspected asbestos containing materials.
 - Control of material movements to minimise dust generation, for example by reducing drop heights and ensuring buckets are not over-loaded.
 - If unavoidable dusts are being generated, materials should be dampened down and the use of RPE considered.
 - Blading or covering short-term stockpiles.
 - Covering or seeding long-term stockpiles.
- 8.7.4 With the exception of asbestos, the risk posed to construction workers from contaminants in the ground is considered low and providing standard PPE and hygiene protocols are maintained for working on brownfield sites, no further special precautions are required for the rest of the site.
- 8.7.5 **This will be updated following the next phase of investigation after the demolition of the site. Additional testing will be undertaken to refine the assessment and recommendations.**

8.8 Adjacent Site Users Risk Assessment

- 8.8.1 One of the four samples tested detected asbestos fibres at 0.001% and ACM has been observed elsewhere on site. Risk assessments have been undertaken using the JIWG Decision Support Tool (see Appendix J) for both the adjacent commercial suite users and residential use to the south. Based on conditions recorded to date, there is not considered to be a significant risk to off-site receptors during the construction phase. Whilst no special precautions are therefore required in this respect, the measures outlined in 8.7.3 such as controlling dust generation will further minimise this risk.
- 8.8.2 **This will be reassessed and updated following the next phase of investigation.**

8.9 Controlled Waters GQRA

- 8.9.1 The results of the GQRA screening for controlled waters are detailed in Appendix I. The following table outlines the exposure models adopted, along with the outcome of each assessment.

Receptor	Exposure Model	Outcome
Groundwaters	Drinking water guidelines	No exceedances

Table 8:C: Controlled water GQRA models and outcomes

8.10 Controlled Waters Risk Assessment

- 8.10.1 No evidence of NAPL was observed in soils on site nor any significant contamination considered likely to present a source of contamination to waters underlying the site. In addition, all recorded concentrations of the chemicals tested from water samples, including a broad suite of inorganics and organics, were below their relevant screening criteria. The presence of hardstanding will further prevent infiltration of water and leachate generation from residual shallow soils. Overall, the risk to waters from ground conditions at the site is considered low.
- 8.10.2 **This assessment will however be reconsidered and updated if necessary following the next phase of investigation.**

8.11 Ground Gas Risk Assessment

- 8.11.1 No viable sources were identified in the initial CSM. The exploratory works found that the depth of Made Ground deposits did not exceed 1.5m depth (where penetrated) and were primarily composed of general fill materials with low putrescible content. It is considered that such deposits would not produce elevated concentrations of ground gas at volumes sufficient enough to pose a viable risk to the development, and therefore no ground gas monitoring was necessary.
- 8.11.2 Due to the absence of a significant actively generating ground gas source, it is considered very unlikely that ground gases could migrate into the proposed structures on site at sufficient speed and volume to pose any viable risk. A CS-1 classification applies.
- 8.11.3 There is possibility of depleted oxygen in trenches therefore monitoring of any subsurface excavations requiring person entry is recommended during the construction phase, as is good practice.

8.12 Water Supply Pipes

- 8.12.1 A full site investigation as set out in the UK Water Industry Research (UKWIR) document 'Guidance for the selection of Water supply pipes to be used in Brownfield sites' has not been undertaken.
- 8.12.2 The UKWIR document advises a trigger concentration of 0.125mg/kg for the 'extended VOC (volatile organic compounds) suite', which includes the PAH (polycyclic aromatic hydrocarbons) suite that has been included in the soil analysis during this investigation.
- 8.12.3 The maximum summed concentration of PAH congeners from individual samples obtained from the site at likely pipe depths (0.50m to 1.50m bgl) exceeds the trigger concentration of 0.125mg/kg in all samples tested within this depth, and on this basis the installation of protective barrier-pipes in below ground water infrastructure is recommended as a precaution, unless service trenches are over-dug and backfilled with suitable clean materials.

8.12.4 In all instances, it is advised to consult the water company for advice to determine if protective pipe is necessary or if further assessment and investigation works are warranted. Irrespective of the assessment made here, water companies may insist on barrier pipe being installed. Once the initial consultation has taken place, Soiltechnics can support you in any further assessments that may be required.

8.13 Updated Conceptual Site Model (uCSM)

8.13.1 Following on from the discussions above, an updated conceptual site model has been tabulated overleaf.

8.13.2 The table below presents our approach to the assessment of risks associated with potential contaminant linkages. The categories are based upon the definitions within CIRIA C552 (2001), with the addition of a 'negligible likelihood' scenario, which is to be used where there is no realistic scenario in which harm could occur.

		Consequence of harm			
		Severe	Medium	Mild	Minor
Probability of harm	High likelihood	Risk: Very high (high – severe)	Risk: High (high – medium)	Risk: Moderate (high – mild)	Risk: Moderate/Low (high – minor)
	Likely	Risk: High (likely – severe)	Risk: Moderate (likely – medium)	Risk: Moderate/Low (likely – mild)	Risk: Low (likely – minor)
	Low Likelihood	Risk: Moderate (low – severe)	Risk: Moderate/Low (low – medium)	Risk: Low (low – mild)	Risk: Very low (low – minor)
	Unlikely	Risk: Moderate/Low (unlikely – severe)	Risk: Low (unlikely – medium)	Risk: Very low (unlikely – mild)	Risk: Very low (unlikely – minor)
	Negligible Likelihood	Risk: Low (negligible– severe)	Risk: Very Low (negligible– medium)	Risk: Very Low (negligible– mild)	Risk: Negligible (negligible– minor)

Table 8:D: CSM risk ratings

RECEPTOR: PROPOSED END USERS				
Potential Source	Contaminants of Concern	Pathway	Tier 2 Risk Assessment (probability of harm x consequence)	Discussion
Historical electronics research laboratory	Various inorganic and organic compounds.	Inhalation of vapours	Risk: Moderate/Low (likely – mild)	No soft landscaping proposed to risk limited to inhalation of vapours. No gross contamination capable of causing a vapour risk was exposed during site works and no exceedances were identified during laboratory testing, suggesting a low risk. However site coverage is minimal and so the risk cannot be fully discounted at this stage. Further testing is to be carried out beneath the footprint of the building to fully understand and characterize the risk
Recent engineering works and other manufacturers (joinery, tool makers etc.)	Various inorganic compounds, metals, fuels and oils, PAHs, semi-volatile and volatile organic compounds (SVOCs & VOCs)	Inhalation of vapours	Risk: Moderate/Low (likely – mild)	
Recent vehicle service centres	Metals, acids, asbestos, hydrocarbons, solvents and PAHs	Inhalation of vapours	Risk: Moderate/Low (likely – mild)	

Table 8:E: uCSM – Proposed end users

RECEPTOR: CONSTRUCTION WORKERS				
Potential Source	Contaminants of Concern	Pathway	Tier 2 Risk Assessment (probability of harm x consequence)	Discussion
Historical electronics research laboratory	Various inorganic and organic compounds	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Low (low – mild)	No gross contamination observed/exposed during site works and no exceedances were identified during laboratory testing, suggesting a low risk.
Recent engineering works and other manufacturers (joinery, tool makers, etc.)	Various inorganic compounds, metals, fuels and oils, PAHs, semi-volatile and volatile organic compounds (SVOCs & VOCs)	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Low (low – mild)	Risk will be further reduced by adopting standard hygiene precautions on site. However site coverage is minimal and it is recommend this is reviewed following further investigation works beneath the footprint of the building on site.

RECEPTOR: CONSTRUCTION WORKERS				
Recent vehicle service centres	Metals, acids, asbestos, hydrocarbons, solvents and PAHs	Ingestion, inhalation and contact with soils, dusts and vapours	Risk: Low (low – mild)	
Asphalt	Coal tar/PAH	Ingestion, inhalation and contact with soils dusts and vapours	Risk: Low (low – mild)	Could potentially be present at surface and thus pose a risk to construction workers. The short term duration exposure risk to construction operatives will be mitigated by adopting appropriate PPE and hygiene precautions on site. Testing of surfacing recommended as part of next phase of works to enable refinement of risk (and inform waste categorization).
Made Ground	Asbestos fibres and ACMs	Inhalation of dusts	Risk: Moderate (likely – medium)	Fragments of asbestos containing material and asbestos fibers were identified within the Made Ground. Further testing recommended to establish if the ACM/asbestos is present site wide. At this stage it is anticipated that asbestos could be present in soils across the site and accordingly special precautions are recommended which are outlined in Error! Reference source not found..

Table 8:F: uCSM – acute exposure to construction workers

RECEPTOR: ADJACENT SITE USERS DURING THE CONSTRUCTION PHASE				
Potential Source	Contaminants of Concern	Pathway	Tier 2 Risk Assessment (probability of harm x consequence)	Discussion
Made Ground	Asbestos	Inhalation of dusts	Risk: Low (unlikely – medium)	Fragments of asbestos containing material and asbestos fibers were identified within the Made Ground. Using the JIWG Decision Support Tool there is not considered to be a significant risk to off-site receptors, and no special precautions are required. Measures to protect construction operatives (such as dust suppression) will further mitigate risk.

Table 8:G: uCSM – acute exposure to adjacent site users

RECEPTOR: CONTROLLED WATERS				
Potential Source	Contaminants of Concern	Pathway	Tier 2 Risk Assessment (probability of harm x consequence)	Discussion
All identified sources	Various inorganic compounds, metals, fuels and oils, PAHs, semi-volatile and volatile organic compounds (SVOCs & VOCs)	Leaching and vertical migration (Groundwater)	Risk: Low (low – mild)	No significant contamination observed/recorded on site. Site to be covered in hardstanding which will limit infiltration and leachate generation potential from shallow soils. No exceedances were identified during laboratory testing. Overall risk is considered low, but assessment will be refined following exposure and testing within the central areas of the site.

Table 8:H: uCSM – controlled waters risk

RECEPTOR: PROPERTY				
Potential Source	Contaminants of Concern	Pathway	Tier 1 Risk Assessment (probability of harm x consequence)	Discussion
All on site sources	Acids, sulphates	Direct contact	Risk: Low (unlikely – medium)	No exceedances were identified during laboratory testing, concrete class assessment provided in Section 7.

Table 8:I: uCSM – property

8.14 Risk Assessment Conclusions

- 8.14.1 Ground conditions exposed and tested to date generally present a low risk to identified receptors, based on site development proposals with the exception of construction operatives whereby asbestos/ACM in the Made Ground requires consideration and mitigation measures during the construction phase. These are set out in paragraph 8.7.3 above.
- 8.14.2 However, areas of the site which have not been investigated (below the building footprint) remain an area of risk and further works are proposed to further inform the risk.
- 8.14.3 Confirmation of the extent and concentration of hydrocarbons in shallow soils in the vicinity of TP02, and testing the asphalt to confirm the presence of coal tar are also recommended to inform the risk assessment.
- 8.14.4 **This section will be updated following the next phase of investigation.**

8.15 Unexpected and Previously Unencountered Contamination

- 8.15.1 With the development of any site, there is a residual risk of contamination being found that is unexpected or has not been encountered during investigation or other siteworks.
- 8.15.2 Should any previously unencountered and unexpected contamination be encountered, works should be temporarily halted and Soiltechnics informed. The Consultant should then assess the situation to determine what remedial action is required and inform the Local Authority at the earliest opportunity.
- 8.15.3 It is often a requirement of Local Authority planning conditions that the building/demolition contractor has a contamination discovery/contingency strategy in place for dealing with unexpected contamination. Soiltechnics are pleased to provide advice on such a strategy if required.

9 Soil and Waste Management

9.1 Sustainability

- 9.1.1 Where possible, disposal of soils to landfill should be avoided in preference for more sustainable alternatives. Such alternatives are set out below and rely on appropriate planning and design.
- 9.1.2 Soiltechnics can provide additional support and guidance to assist in overall material management and soil waste minimisation upon request.

9.2 Waste Hierarchy

- 9.2.1 Under the Waste Regulations, there is a requirement to apply (where reasonable) the waste management hierarchy, which is summarised below. Within the hierarchy, soil disposal to landfill should be limited to the necessary minimum.

Stage (in order of preference)	Example application
Prevention / Reduce	Design, planning, Site Waste Management Plans (SWMP).
Reuse	Reuse of soils under exemption, permit or Materials Management Plan (MMP), sorting at the point of excavation, screening of excavated material.
Recycling	Recycling aggregate, waste segregation, screening and sorting.
Recovery	Remediation works, transfer to a Soil Treatment Facility
Pre-treatment	Non-hazardous and hazardous soils do not need to be treated, where such treatment would not reduce the volume of waste.
Disposal	If the waste hierarchy steps outline above are followed, the remaining waste can be disposed of to a landfill without any further treatment.

Table 9.A: Waste management hierarchy

9.3 Liability of Waste Management

- 9.3.1 Part III of the Finance Act was amended in 2018 to extend the scope of landfill tax to cover any site (not exclusively landfills) operating without an appropriate environmental permit, exemption, or MMP.
- 9.3.2 These changes have given HMRC the powers to work with the Environment Agency to identify non-compliant sites and pursue and penalise the person(s) illegally disposing of waste, and anyone who knowingly facilitates the disposal. This includes sites filling site-won soils which are surplus to requirement.

9.4 Materials Management

- 9.4.1 In terms of the development, where reasonably practicable, landfill disposal should be minimised through the reuse of site-won materials on site, or off-site transfer of surplus soils to other development schemes or Soil Treatment Facilities. Early consideration of the site's overall material balance at the design stage is also critical in reducing the need for off-site disposal, limiting costs, and increasing the overall sustainability of the development.
- 9.4.2 Where Made Ground soils are to be reused onsite or materials transferred between sites, a Materials Management Plan (MMP) or Waste Exemption is recommended.

- 9.4.3 The process of an MMP allows soils that are suitable for reuse and have a certainty of use to not be considered a waste, and therefore not fall under the waste regulations. This scheme is self-regulated within the industry and is supported in principle by the Environment Agency.

9.5 Waste Characterisation Governance

- 9.5.1 The classification of soils for disposal to landfill is undertaken in accordance with WM3 (v1.2GB), and a Waste Acceptance Criteria assessment (WAC) undertaken in accordance with the limits in Annex II of the Landfill Directive (Directive 1999/31/EC).

9.6 Waste Populations

- 9.6.1 Based on the site observations, development proposals and laboratory results, the following potential waste populations have been identified for preliminary assessment purposes. It is recommended that this is reassessed following further works on site where additional wastes streams may be identified:

Potential Waste Population	Description
Granular Made Ground without visible ACM (observed in the northwest)	Dark brown to orangish brown sand and gravel of flint, chalk, brick and asphalt.
Granular Made Ground, with visible fragments of ACM (northwest only).	Dark brown sandy gravel of flint, brick, asphalt and broken ACM (cement) fragments.
Cohesive Made Ground (present across site)	Dark brown sandy gravelly clay. Gravel is flint, brick and chalk.
Hydrocarbon impacted soils in the vicinity of TP02 (further exposure needed to confirm extent)	Dark brown slightly sandy gravelly clay with slight hydrocarbon odours. Gravel is concrete and glass.
Clean naturally occurring soils	Natural, uncontaminated clays and sands.

Table 9:B: Potential waste populations

9.7 Sampling and Testing

- 9.7.1 The hazardous waste classification assessment has been undertaken by adopting the maximum recorded concentration of each compound from all the samples tested within the identified waste population, as outlined in WM3, Approach D.
- 9.7.2 For the Waste Acceptance Criteria (WAC) assessment, representative composite samples were obtained from the main waste streams by combining soils from multiple exploratory holes. These are as follows:
- WAC01: Granular Made Ground **without visible ACM** (observed in the northwest)
 - WAC02: Cohesive Made Ground
- 9.7.3 The rate of testing has been chosen to provide a preliminary waste categorisation only.

9.8 Waste Characterisation

- 9.8.1 Where testing has been carried out, the waste classification assessment sheets are enclosed within Appendix K, and a summary of the findings is presented in the table below.

Observations from the fieldwork indicate that the underlying natural soils are not impacted by contamination, and therefore are considered suitable for disposal as non-hazardous waste in an inert landfill site without the requirement for further testing.

Potential Waste Population	Hazardous Classification (LoW code)	Landfill Classification	Comments
Granular Made Ground without visible ACM (observed in the northwest)	Non-hazardous (17-05-04)	Non hazardous	Cannot be instantly sent to inert landfill due to elevated total organic carbon exceeding inert waste landfill parameter, however, dissolved organic carbon meets criteria so consultation with waste operator required and they may accept waste in inert landfill. Trace asbestos fibres recorded in one location, below hazardous waste threshold, but conformation of acceptance required by operator. More testing recommended to provide robust assessment and confirm no more than trace concentrations within waste stream.
Granular Made Ground, with visible fragments of ACM (northwest only).	Hazardous waste: 17-06-05* and 17-05-03*	Asbestos waste cell	Understood to be associated with granular Made Ground only. However, further testing is required to understand extent of the contamination.
Cohesive Made Ground	Non-hazardous (17-05-04)	Inert	-
Hydrocarbon impacted soils in the vicinity of TP02	Non-hazardous (17-05-04)	WAC testing not undertaken	Exposure and delineation of impacted soils recommended along with further testing to provide robust assessment.
Clean, uncontaminated, natural materials	Non-hazardous (17-05-04)	Inert	Chalk formation not impacted by contamination is considered non-hazardous and inert without any testing required.

Table 9.C: Waste characterisation summary

- 9.8.2 Any hazardous waste that must be landfilled and cannot meet the WAC limits, even after treatment, is a 'problematic waste'. If you need to dispose of problematic waste to landfill you must complete a problematic waste stream request proforma, by contacting the Environment Agency.

9.9 Managing Reclaimed Asphalt

- 9.9.2 Asphalt bound using coal tar contains high PAHs and is classified as hazardous waste. Testing is recommended to confirm the PAH concentrations and thus the potential for coal tar on site which will inform disposal and reuse options for such materials.
- 9.9.3 **This section will be updated following the next stage of investigation.**

9.10 Application of Advice

- 9.10.1 There is no obligation on any waste operator to accept our waste characterisation assessments. Landfill operators may consider your waste to fall under a different classification and/or may require additional testing of waste soils prior to acceptance. It is therefore recommended that this report along with the chemical results is provided to the preferred facility to confirm (or otherwise) it can accept the waste. It is strongly recommended to do this at the earliest opportunity for any soils which contain asbestos fibres at concentrations below hazardous waste levels, as some waste operators insist on disposal to an asbestos waste cell on a presence/absence basis, which deviates from the approaches outlined in WM3.
- 9.10.2 It is recommended that more intensive asbestos testing is carried out in the next phase of works to confirm extent of asbestos impacted Made Ground.
- 9.10.3 It should be noted that there remains the potential for unexpected or previously unencountered contamination to be encountered. Any such materials intended for waste disposal should be segregated and tested to determine the appropriate classification and disposal route.

9.11 Minimising Hazardous Waste

- 9.11.1 Due to the high costs associated with disposal of asbestos containing wastes, Soiltechnics recommend that the development is designed with a view to limiting as far as possible the removal of these materials. Often, there is the potential to reuse such materials in low-risk areas of the development, such as below hardstanding.

10 Recommendations for Further Works

10.1.1 The following table summarises the additional works which should be undertaken prior to commencement of any construction works and in support of the planning conditions.

Aspect	Delivered By	Description	Necessity
Further exploratory investigations	Soiltechnics	Further investigation is required to inform the risk assessments and confirm suitable remedial options and waste assessments. This includes: - Investigation of soils underlying the existing footprint. - Additional asbestos testing to inform risk assessment and waste categorization. - Exposure and delineation of the hydrocarbon contamination encountered in TP02. - PAH/coal tar testing of existing asphalt.	REQUIRED
Updated geotechnical assessment	Soiltechnics	Following the further exploratory works above, it is recommended that the geotechnical appraisal is updated, with particular reference to the dissolution risk assessment and foundation option solution.	RECOMMENDED
Discovery Strategy	Principal Contractor	The Principal Contractor should have a discovery strategy in place in the event of exposing unexpected or previously unencountered contamination. Soiltechnics should be informed at the earliest opportunity to undertake an assessment, and to inform the Local Authority as appropriate.	RECOMMENDED

Table 10-A: Recommended further works (pre-commencement)

Appendix A Drawings



Key:

- Site Boundary
- Hand Excavated Trial Pit
- Rotary Borehole
- Monitoring Well Installation
- Photos

Notes

1) Base image provided by Google.

2) All drawn features are approximate.

Contains OS data © Crown copyright [and database right] [2024]
Map data © 2024 Google

A	Feb 2025	First issue
REV	DATE	COMMENT ON VARIATION

soiltechnics
environmental • geotechnical • building fabric

PROJECT
Baldock Industrial Estate

TITLE
Exploratory Hole Location Plan

DRAWING No.
STW6825-D01-A

Appendix B Exploratory Hole Logs: Trial Pits

Key to legends

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

Note: Composite soil types are signified by combined symbols.

Key to 'test results' and 'sampling' columns

Test result		Sampling	
Depth	Records depth that the test was carried out (i.e.: at 2.10m or between 2.10m and 2.55m)	From (m) To (m)	Records depth of sampling
	PP – Pocket penetrometer result reported as an equivalent undrained shear strength (kN/m ²) by applying a factor of 50.		D Disturbed sample
			B Bulk disturbed sample
			ES Environmental sample
Result	SV – Hand held shear vane result reported as an undrained shear strength (kN/m ²). Where multiple readings are taken at the same level the average value is shown on the log. * Signifies that instrument limit reached.	Type	W Water sample
			U Undisturbed thick-walled sample 100mm diameter sampler
			UT Undisturbed thin walled sample 100mm diameter sampler
			UTF Failed undisturbed sample

Water observations

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

▼ Water level observed after specified delay in drilling

∇ Water strike

Density

Density recorded in brackets determined by qualitative field assessment or inferred from density testing and soil descriptions from across the site (i.e.: [Medium dense]).

[illegible]

Notes Terminated at 0.75m due to presence of 100mm diameter metal pipe in base of pit.	Groundwater observations		Title	Dimensions (w x l)	Date(s)
	Strike (m)	Comments	Trial pit record	0.30m x 0.30m	20/01/2025 - 01/01/1970
			Method Hand excavated	Plant used Hand tools	Sheet number Sheet 1 of 1
			Level (m OD) 74.80	Logged by SH/WL	Revision A
			Co-ordinates 524691E, 233315N	Status FINAL	TP01
No groundwater strike recorded					

STRATA				WATER STRIKES	IN SITU TESTING		SAMPLING		
DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)	LEGEND		TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
Asphalt (ASPHALT)	0.05 0.10	74.51 74.46					0.30		ES
[Medium dense] dark brown sandy fine to coarse subrounded to angular GRAVEL. Grave is flint, brick, and asphalt. (MADE GROUND)	0.25	74.31							
Concrete (CONCRETE)	0.45	74.11							
[Medium dense] light grey gravelly fine to coarse SAND. Gravel is fine to coarse subrounded to angular flint asphalt and brick. (MADE GROUND)	0.70	73.86							
[Medium dense] light brown gravelly fine to coarse SAND with occasional cobbles of concrete and brick. Gravel is subrounded to angular flint. (MADE GROUND)	0.85	73.71							
...between 0.50m and 0.70m depth, cobble of brick in south eastern face of pit.	0.90	73.56							
Firm light greyish brown slightly sandy gravelly CLAY. Gravel is fine to coarse subrounded to angular flint and chalk. (MADE GROUND)									
Dark brown slightly sandy gravelly CLAY. Gravel is fine to coarse subrounded to subangular flint concrete and glass. Slight hydrocarbon odour throughout. (MADE GROUND)									
TRIAL PIT TERMINATED AT 1.00m									
					</				

Notes Terminated at 1.00m due to concrete obstruction at the base of the pit.	Groundwater observations		Title	Dimensions (w x l)	Date(s)
	Strike (m)	Comments	Trial pit record	0.30m x 0.30m	20/01/2025 - 01/01/1970
			Method Hand excavated	Plant used Hand tools	Sheet number Sheet 1 of 1
			Level (m OD) 74.56	Logged by SH/WL	Revision A
			Co-ordinates 524617E, 233256N	Status FINAL	TP02
No groundwater strike recorded					

Appendix C Exploratory Hole Logs: Boreholes

Key to legends

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

Note: Composite soil types are signified by combined symbols.

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

Test result		Sample/core recovery	
Depth	Records depth that the test was carried out (i.e.: at 2.10m or between 2.10m and 2.55m)	Run No.	Records depth and number of the abstracted core ³
Result	PP – Pocket penetrometer result reported as an equivalent undrained shear strength (kN/m ²) by applying a factor of 50.	Total Core Recovery (TCR) %	Ratio of core recovered (solid and non-intact) to length of core run
	SV – Hand held shear vane result reported as an undrained shear strength (kN/m ²). Where multiple readings are taken at the same level the average value is shown on the log.	Solid Core Recovery (SCR) %	Ratio of solid, cylindrical, pieces of rock core recovered to length of core run
	* Signifies that instrument limit reached.	Rock Quality Designation (RQD) %	Ratio of core pieces longer than 100mm to length of core run
	SPT – Standard Penetration Test result (N value uncorrected) ^{1,2,3}	Fracture Index (FI)	Inverse of fracture spacing, per metre, over arbitrary length
	SPT(c) – Standard Penetration Test result (solid cone) (N value) (uncorrected) ^{1,2,3}	D	Disturbed sample
	* Signifies that the test was terminated before full penetration was achieved.	B	Bulk disturbed sample
	UT – Undisturbed sample 100mm diameter sampler with number of blows of driving equipment required to obtain sample	ES	Environmental sample
		SPTLS	SPT liner sample
		W	Water sample
		C	Core sample

Note 1: Total seating blows recorded in brackets.

Note 2: Casing depth records depth of casing.

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

Water observations

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

-  Water level observed after specified delay in drilling
-  Water strike

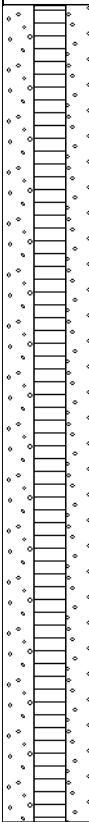
Installation details

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

INSTALL	STRATA				WATER STRIKES	CORING					SPT TESTING				OTHER IN SITU TESTING		SAMPLING		
	DESCRIPTION	DEPTH (m)	REDUCED LVL (mOD)	LEGEND		DEPTH (m)	TCR (%)	SCR (%)	RQD (%)	FI	TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
	Asphalt. (ASPHALT)	0.02	74.84								S 2.00	(6) 28	0.00	1.81			0.50	2.00	ES
	Concrete. (CONCRETE)	0.18	74.68														0.60		L
	Soft greyish brown very gravelly CLAY with low cobble content of flint Gravel is fine to coarse subrounded to subangular flint and chalk. (MADE GROUND)	1.45	73.41			0.60 - 2.00	90										1.00		D
	Structureless CHALK composed of off-white slightly sandy slightly clayey fine to coarse angular to subrounded GRAVEL with medium cobbles content. Clasts are weak to moderately weak low to medium density off-white chalk. Matrix is light brown becoming off-white. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - Grade Dc)	2.50	72.36			2.00 - 2.50	100										2.00	2.50	C
																	2.00	2.45	C
																	2.50	2.70	B
																	2.50	4.00	C
																	3.30		C
																	4.00	5.50	C
										15							5.50	7.00	C
	Weak low to medium density cream with occasional black specs CHALK. Fractures are closely spaced planar rough partly open to open and infilled with cream silt sized comminuted chalk. Grey wispy marls present from 8.00m depth. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - low to medium density, Grade B3) ...at 3.00m depth, orange staining present along discontinuities.					2.50 - 4.00	100	45	30		C 5.50	(15) 46	2.00	1.43					
						4.00 - 5.50	90	6	6										
						5.50 - 7.00	95	55	15										
						7.00 - 8.50	100	60	6										
	...between 6.00m and 7.20m depth, orange staining present along discontinuities.										C 8.50	(9) 50*	2.00	4.90					
	...at 8.00m depth, grey marls present					8.50 - 10.00	95	60	40	8							8.00		C
																	8.50	10.00	C
																	8.70		C
																	9.40		C

CONTINUED ON NEXT SHEET.

Notes Inspection pit excavated to 1.20m depth. UXO specialist in attendance. Use of water flush masked any groundwater strikes however, the water level was recorded at 15.48m depth at the end of drilling.	Groundwater observations						Title		Date(s)
	Strike (m)	5mins	10mins	15mins	20mins	Comments	Borehole record		23/01/2025 - 24/01/2025
							Method Rotary borehole	Plant used Comacchio 205	Sheet number Sheet 1 of 2
							Level (m OD) 74.86	Logged by SH/WL	Revision A
							Co-ordinates 524674E, 233238N	Status FINAL	BH01
	No groundwater strike recorded								

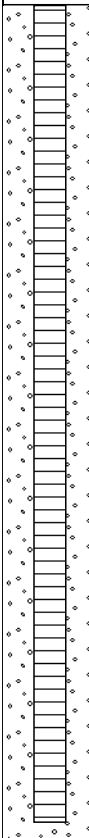
INSTALL	STRATA				WATER STRIKES	CORING					SPT TESTING				OTHER IN SITU TESTING		SAMPLING									
	DESCRIPTION	DEPTH (m)	REDUCED LVL (mOD)	LEGEND		DEPTH (m)	TCR (%)	SCR (%)	RQD (%)	FI	TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE							
	Structureless CHALK composed of slightly sandy slightly silty fine to coarse subangular to angular GRAVEL. Clasts are weak low to medium density cream to off-white chalk with occasional black specks matrix is cream to off-white. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - Grade Dc) Weak low to medium density cream with occasional black specs CHALK. Fractures are very closely to closely spaced planar rough open and clean. Occasional gravels of flint between 12.07m and 12.20m depth. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - low to medium density, Grade A3) ...between 11.70m and 13.20m depth, orange staining present along discontinuities.	11.20	63.66			10.00 - 11.50	95	45	10	8	C 11.50	(24) 50*	2.00	6.86			10.00 10.00	11.50	C ES							
		11.70	63.16			11.50 - 13.00	98	86	6	10						11.00	11.20	B								
																11.50	13.00	C								
						13.00 - 14.50	95	60	28	6	C 14.50	(16) 50*	2.00	14.41			13.00	14.50	C							
																	14.50	16.00	C							
						14.50 - 16.00	100	46	29	6	C 17.50	(25)* 50*	2.00	15.38			16.00	17.50	C							
																	16.40	16.60	B							
						16.00 - 17.50	95	28	25	11							17.50	19.00	C							
																	18.00		ES							
						17.50 - 19.00	100	70	38	5							18.90	19.00	B							
	BOREHOLE TERMINATED AT 19.00m	19.00	55.86																							

Notes Inspection pit excavated to 1.20m depth. UXO specialist in attendance. Use of water flush masked any groundwater strikes however, the water level was recorded at 15.48m depth at the end of drilling.	Groundwater observations						Title Borehole record		Date(s) 23/01/2025 - 24/01/2025	
	Strike (m)	5mins	10mins	15mins	20mins	Comments	Method Rotary borehole		Plant used Comacchio 205	
							Level (m OD) 74.86		Logged by SH/WL	
							Co-ordinates 524674E, 233238N		Status FINAL	
	No groundwater strike recorded								BH01	

INSTALL	STRATA				WATER STRIKES	CORING					SPT TESTING				OTHER IN SITU TESTING		SAMPLING		
	DESCRIPTION	DEPTH (m)	REDUCED LVL (mOD)	LEGEND		DEPTH (m)	TCR (%)	SCR (%)	RQD (%)	FI	TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
	ASPHALT (ASPHALT)	0.05	74.68														0.50		ES
	CONCRETE (CONCRETE)	0.20	74.53														1.20	1.65	D L
	Firm brown slightly sandy gravelly CLAY. Gravel is fine to coarse subrounded to angular flint and chalk. (MADE GROUND)	0.40	74.33								S 1.20	(1) 6	0.00	Dry			1.20	2.70	
	Structureless CHALK composed of slightly sandy slightly clayey fine to coarse subrounded to angular GRAVEL with low cobble content. Clasts are weak to moderately weak low to medium density off-white chalk. Matrix is light brown becoming off-white. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - Grade Dc)	1.90	72.83			1.20 - 2.70	100	45	6								2.70	4.20	C C
	Weak low to medium density cream with brown staining CHALK. Fractures are closely to medium spaced striated stepped tight and clean. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - low to medium density, Grade A2-A3)					2.70 - 4.20	100	90	45	5							4.20	5.70	C
	Weak low to medium density cream with black specs CHALK. Fractures are closely to medium spaced rough stepped open and clean. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - low to medium density, Grade B2-B3)	5.00	69.73			4.20 - 5.70	95	80	75		C 4.20	(15) 48	4.20	1.21			5.00		C
	Weak low to medium density cream with black specs CHALK. Fractures are closely to medium spaced rough stepped open and clean. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - low to medium density, Grade B2-B3)					5.70 - 7.20	100	90	75	3							5.70	7.20	C C
	Weak low to medium density cream CHALK. Fractures are closely to medium spaced rough planar open and clean. Grey wispy marls present from 8.20m depth. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - low to medium density, Grade B2-B3)	7.10	67.63			7.20 - 8.70	100	100	50		C 7.20	(6) 30	2.70	2.87			7.20	8.70	C
	...at 8.20m depth, grey marls present					8.70 - 10.20	95	95	85	6							8.00		C D
										3							8.70	10.20	C

CONTINUED ON NEXT SHEET.

Notes Inspection pit excavated to 1.20m depth. UXO specialist in attendance. Use of water flush masked any groundwater strikes however, the water level was recorded at 15.03m depth at the end of drilling.	Groundwater observations						Title Borehole record		Date(s) 20/01/2025 - 21/01/2025
	Strike (m)	5mins	10mins	15mins	20mins	Comments			
							Method Rotary borehole	Plant used Comacchio 205	Sheet number Sheet 1 of 2
							Level (m OD) 74.73	Logged by SH/WL	Revision A
							Co-ordinates 524724E, 233293N	Status FINAL	BH02
	No groundwater strike recorded								

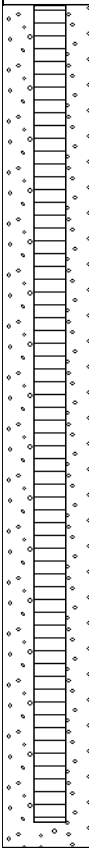
INSTALL	STRATA				WATER STRIKES	CORING					SPT TESTING				OTHER IN SITU TESTING		SAMPLING												
	DESCRIPTION	DEPTH (m)	REDUCED LVL (mOD)	LEGEND		DEPTH (m)	TCR (%)	SCR (%)	RQD (%)	FI	TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE										
	...at 12.70m depth, coarse subangular gravels of flint present. Strong medium density cream CHALK. Fractures are medium spaced striated stepped partly open and clean. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - medium density, Grade B2)	13.00	61.73			8.70 - 10.20	95	95	85	3	C 10.20	(12) 35	2.70	3.71			10.20	11.70	C										
						10.20 - 11.70	100	100	60		C 13.20	(12) 43	2.70	Dry			11.00	13.20	C										
						11.70 - 13.20	100	95	83								11.50 11.70		ES C										
																	12.50		C										
						13.20 - 14.70	100	100	92								13.20		14.70	C									
																	14.00		C										
						14.70 - 16.20	95	90	70								14.70		16.20	C									
																	15.75		ES										
						16.20 - 17.70	93	87	50		C 16.20	(14) 36	2.70	14.61			16.20 16.50	17.70	C C										
																	17.70 - 19.20	88	85	61	17.70 18.00	19.20	C D						
						5																							
						3																							
	BOREHOLE TERMINATED AT 19.20m	19.20	55.53																										

Notes Inspection pit excavated to 1.20m depth. UXO specialist in attendance. Use of water flush masked any groundwater strikes however, the water level was recorded at 15.03m depth at the end of drilling.	Groundwater observations						Title Borehole record		Date(s) 20/01/2025 - 21/01/2025
	Strike (m)	5mins	10mins	15mins	20mins	Comments			
							Method Rotary borehole	Plant used Comacchio 205	Sheet number Sheet 2 of 2
							Level (m OD) 74.73	Logged by SH/WL	Revision A
							Co-ordinates 524724E, 233293N	Status FINAL	BH02
	No groundwater strike recorded								

INSTALL	STRATA				WATER STRIKES	CORING					SPT TESTING				OTHER IN SITU TESTING		SAMPLING			
	DESCRIPTION	DEPTH (m)	REDUCED LVL (mOD)	LEGEND		DEPTH (m)	TCR (%)	SCR (%)	RQD (%)	FI	TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE	
	ASPHALT (MADE GROUND)	0.05	74.76													0.80	2.30	L		
	[Medium dense] dark brown sandy fine to coarse subrounded to angular GRAVEL. Gravel comprises flint, brick, and asphalt. (MADE GROUND)	0.25	74.56														1.50	2.30	ES B	
	[Medium dense] light brown gravelly fine to coarse SAND with medium cobble content of brick. Gravel is fine to coarse subrounded to angular flints, brick, metal, and asphalt. (MADE GROUND)	0.50	74.31														2.30	2.75	D C	
	Firm brown slightly sandy gravelly CLAY. Gravel is fine to coarse subrounded to angular flint, brick, concrete and possible asbestos containing material. (MADE GROUND)	0.70	74.11																	
						0.80 - 2.30	100	0	0		S 2.30	(14) 50	0.00	Dry						
						2.30 - 2.50	0	0	0											
						2.50 - 4.00	87	70	0	16										
	Structureless CHALK composed of sandy slightly clayey medium to coarse subrounded to angular GRAVEL. Clasts are very weak to weak low density off-white chalk. Matrix is off-white and brown. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - Grade Dc)	2.30	72.51								C 4.00	(9) 50*	2.50	1.03			4.00	5.50	C	
						4.00 - 5.50	100	60	29	10										
	Very weak to weak low to medium density cream with occasional black speckling CHALK. Fractures are extremely to very closely spaced undulating smooth open and infilled with comminuted chalk. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - low density, Grade C5)	4.40	70.41														5.50	7.00	C	
	...between 2.50m and 3.00m depth, occasional gravels of flint present.					5.50 - 7.00	95	93	8	12										
	Weak low to medium density cream with occasional black specks CHALK. Fractures are closely spaced rough undulating open and infilled with cream comminuted chalk. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - low to medium density, Grade C4)	5.60	69.21								C 7.00	(7) 39	2.50	2.22						
	...between 4.70m and 5.00m depth, orange staining present along discontinuities.																8.40		D	
	...at 8.20m depth, grey marls present.					8.50 - 10.00	95	86	20	7										

CONTINUED ON NEXT SHEET.

Notes Inspection pit excavated to 0.80m depth. UXO specialist in attendance. Use of water flush masked any groundwater strikes however, the water level was recorded at 7.01m depth at the end of drilling.	Groundwater observations						Title		Date(s)
	Strike (m)	5mins	10mins	15mins	20mins	Comments	Borehole record		22/01/2025 - 01/01/1970
							Method Rotary borehole	Plant used Comacchio 205	Sheet number Sheet 1 of 2
							Level (m OD) 74.81	Logged by SH/WL	Revision A
							Co-ordinates 524690E, 233314N	Status FINAL	BH03
	No groundwater strike recorded								

INSTALL	STRATA				WATER STRIKES	CORING					SPT TESTING				OTHER IN SITU TESTING		SAMPLING				
	DESCRIPTION	DEPTH (m)	REDUCED LVL (mOD)	LEGEND		DEPTH (m)	TCR (%)	SCR (%)	RQD (%)	FI	TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE		
	Weak low to medium density cream with occasional black specks CHALK. Fractures are closely to medium spaced rough planar partly open and infilled with comminuted chalk. Grey wispy marls present from 8.20m depth. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - low to medium density, Grade B3) ...at 11.40m depth, cobble of flint present.	12.00	62.81			10.00 - 11.50	95	60	30	7	C 10.00	(6) 38	2.50	4.57			11.00		D		
	Strong medium density cream with orange staining and occasional black specs CHALK. Fractures are closely spaced rough stepped open and clean. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - medium density, Grade A3)					11.50 - 13.00	100	95	60		C 13.00	(6) 42*	2.50	5.11			13.00		ES		
						13.00 - 14.50	100	80	50								14.40		D		
						14.50 - 16.00	100	98	85								15.75		D		
	19.28	55.53				16.00 - 17.50	95	93	50	5	C 16.00	(25) 50*	2.50	6.82			17.00		D		
						17.50 - 19.00	100	93	40		C 19.00	(15) 50*	2.50	7.01			18.00		ES		
		BOREHOLE TERMINATED AT 19.28m	19.28	55.53								C 19.00	(15) 50*	2.50		7.01					

Notes Inspection pit excavated to 0.80m depth. UXO specialist in attendance. Use of water flush masked any groundwater strikes however, the water level was recorded at 7.01m depth at the end of drilling.	Groundwater observations						Title Borehole record		Date(s) 22/01/2025 - 01/01/1970
	Strike (m)	5mins	10mins	15mins	20mins	Comments			
							Method Rotary borehole	Plant used Comacchio 205	Sheet number Sheet 2 of 2
							Level (m OD) 74.81	Logged by SH/WL	Revision A
							Co-ordinates 524690E, 233314N	Status FINAL	BH03
	No groundwater strike recorded								

INSTALL	STRATA				WATER STRIKES	CORING					SPT TESTING				OTHER IN SITU TESTING		SAMPLING		
	DESCRIPTION	DEPTH (m)	REDUCED LVL (MOD)	LEGEND		DEPTH (m)	TCR (%)	SCR (%)	RQD (%)	FI	TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
	Asphalt (MADE GROUND)	0.05 0.10 0.25 0.30 0.70	74.00 73.95 73.80 73.75 73.35														0.25 0.50	0.30	ES ES
	[Medium dense] dark brown sandy fine to coarse subrounded to angular GRAVEL. Gravel is asphalt. (MADE GROUND)	1.10	72.95														1.00 1.20	2.50	ES L
	CONCRETE (MADE GROUND)	1.50	72.55														1.50		ES
	Orangish brown gravelly fine to coarse SAND. Gravel is fine to coarse subrounded flint. (MADE GROUND)					1.20 - 2.50	86	0	0								2.00	2.50	B
	Firm light greyish brown slightly sandy gravelly CLAY. Gravel is fine to coarse subrounded to angular flint and chalk. (MADE GROUND)	2.90	71.15								S 2.50	(14) 50*	2.50	1.76			2.50 2.50	2.92 4.00	D C
	Dark brown slightly sandy gravelly CLAY. Gravel is fine to coarse subrounded to subangular flint, brick and chalk. (MADE GROUND)	4.00	70.05			2.50 - 4.00	70	8	0	>25									
	Structureless CHALK composed of sandy slightly clayey medium to coarse subrounded to angular GRAVEL. Clasts are very weak to weak low density off-white chalk. Matrix is off-white and brown. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - Grade Dc)					4.00 - 5.50	95	63	36								4.00	5.50	C
	Structureless CHALK composed of slightly sandy slightly clayey medium to coarse GRAVEL with low cobbles content. Clasts are weak to moderately weak low to medium density off-white chalk. Matrix is light brown becoming off-white. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - Grade Dc)					5.50 - 7.00	80	67	10	11	C 5.50	(5) 26	2.50	1.51			5.50	7.00	C
	Weak low to medium density cream with occasional black specks CHALK. Fractures are extremely close to very closely spaced striated stepped open and infilled with comminuted chalk. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - low to medium density, Grade CS)					7.00 - 8.50	100	96	45								7.00	8.50	C
	...at 6.10m depth, orange staining present along discontinuities. ...at 6.40m depth, infilled comminuted chalk. ...at 9.00m depth, grey marls present																7.50	7.70	B
																	8.10	8.30	B
						8.50 - 10.00	88	75	9		C 8.50	(12) 50*	2.50	1.39			8.50	10.00	C

CONTINUED ON NEXT SHEET.

Notes Inspection pit excavated to 1.20m depth. UXO specialist in attendance. Use of water flush masked any groundwater strikes however, the water level was recorded at 15.39m depth at the end of drilling.	Groundwater observations						Title Borehole record		Date(s) 21/01/2025 - 22/01/2025
	Strike (m)	5mins	10mins	15mins	20mins	Comments			
							Method Rotary borehole	Plant used Comacchio 205	Sheet number Sheet 1 of 2
							Level (m OD) 74.05	Logged by SH/WL	Revision A
							Co-ordinates 524607E, 233247N	Status FINAL	BH04
	No groundwater strike recorded								

INSTALL	STRATA				WATER STRIKES	CORING					SPT TESTING				OTHER IN SITU TESTING		SAMPLING								
	DESCRIPTION	DEPTH (m)	REDUCED LVL (mOD)	LEGEND		DEPTH (m)	TCR (%)	SCR (%)	RQD (%)	FI	TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE						
	Weak low to medium density cream with occasional black specks CHALK. Fractures are closely spaced rough stepped open and clean. Grey wispy marls present from 9.00m depth. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - low to medium density, Grade B3) ...at 11.80m depth, occasional gravels of flint present. ...between 11.90m and 12.50m depth, orange staining present along discontinuities. ...at 12.50m depth, occasional gravels of flint present. Strong medium density cream with occasional black specks CHALK. Fractures are medium spaced rough planar partly open and clean. (HOLYWELL NODULAR CHALK FORMATION AND NEW PIT CHALK FORMATION (UNDIFFERENTIATED) - medium density, Grade B2)		13.00	61.05		10.00 - 11.50	100	98	53	5	C 11.50	(25)* 50*	2.50	1.80			10.00 10.10	11.50 10.30	C B						
						11.50 - 13.00	98	90	42								10.80 11.10	B							
						13.00 - 14.50	100	100	88								11.50 13.00	C ES							
						14.50 - 16.00	88	67	30	2	C 14.50	(22) 29	2.50	1.88			14.50 15.20	16.00	C D						
						16.00 - 17.50	100	98	20								16.00 16.20	C D							
						17.50 - 19.00	90	75	20	6	C 17.50	(25) 50*	2.50	15.38			17.50 17.50	19.00	C ES						
							</																		

Notes Inspection pit excavated to 1.20m depth. UXO specialist in attendance. Use of water flush masked any groundwater strikes however, the water level was recorded at 15.39m depth at the end of drilling.	Groundwater observations						Title Borehole record		Date(s) 21/01/2025 - 22/01/2025
	Strike (m)	5mins	10mins	15mins	20mins	Comments			
							Method Rotary borehole	Plant used Comacchio 205	Sheet number Sheet 2 of 2
							Level (m OD) 74.05	Logged by SH/WL	Revision A
							Co-ordinates 524607E, 233247N	Status FINAL	BH04
	No groundwater strike recorded								

Appendix D Photographic Records

P1: Photograph showing north of site looking southwest



P2: Photograph showing north of site looking northeast



Title

Photographic records of ground investigation

Photo sheet number

P1

Appendix

D

P3: Photograph showing south of site looking northeast



P4: Photograph showing northeastern corner of the site



Title

Photographic records of ground investigation

Photo sheet number

P1

Appendix

D

P5: Photograph showing southwestern corner of the site



P6: Photograph showing inspection pit from BH01



Title

Photographic records of ground investigation

Photo sheet number

P1

Appendix

D

P7: Photograph showing recovery from BH01 between 1.2m and 2.5m



P8: Photograph showing recovery from BH01 between 2.5m and 4.0m



P9: Photograph showing recovery from BH01 between 4.0m and 5.5m



P10: Photograph showing recovery from BH01 between 5.5m and 7.0m



Title

Photographic records of ground investigation

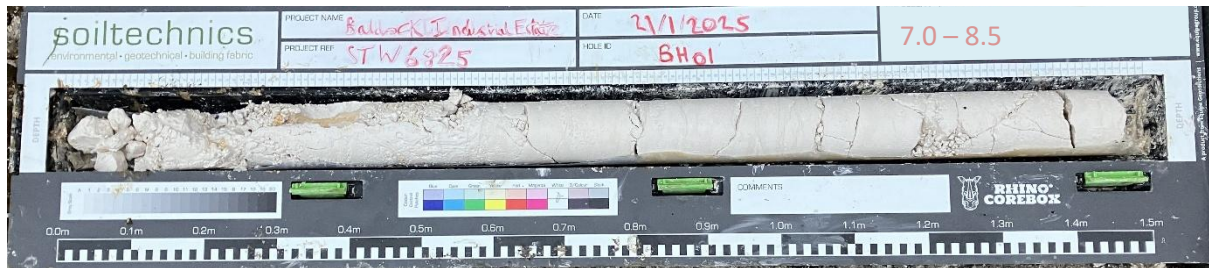
Photo sheet number

P1

Appendix

D

P11: Photograph showing recovery from BH01 between 7.0m and 8.5m



P12: Photograph showing recovery from BH01 between 8.5m and 10.0m



P13: Photograph showing recovery from BH01 between 10.0m and 11.5m



P14: Photograph showing recovery from BH01 between 11.5m and 13.0m



Title	Photo sheet number	Appendix
Photographic records of ground investigation	P1	D

P15: Photograph showing recovery from BH01 between 13.0m and 14.5m



P16: Photograph showing recovery from BH01 between 14.5m and 16.0m



P17: Photograph showing recovery from BH01 between 16.0m and 17.5m



P18: Photograph showing recovery from BH01 between 17.5m and 19.0m



Title

Photographic records of ground investigation

Photo sheet number

P1

Appendix

D

P19: Photograph showing inspection pit from BH02



P20: Photograph showing recovery from BH02 between 2.7m and 5.7m



P21: Photograph showing recovery from BH02 between 5.7m and 7.2m



Title

Photographic records of ground investigation

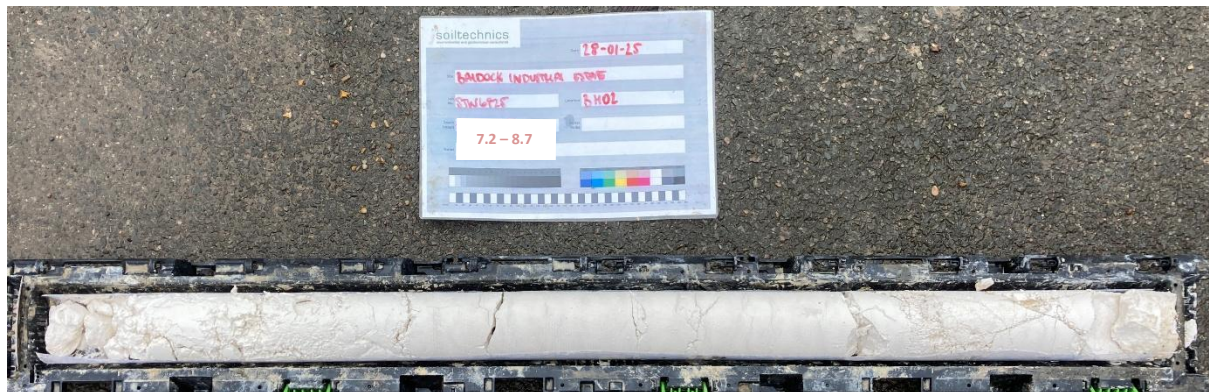
Photo sheet number

P1

Appendix

D

P22: Photograph showing recovery from BH02 between 7.2m and 8.7m



P23: Photograph showing recovery from BH02 between 8.7m and 10.2m



P24: Photograph showing showing recovery from BH02 between 10.2m and 11.7m



P25: Photograph showing recovery from BH02 between 11.7m and 13.2m



Title	Photo sheet number	Appendix
Photographic records of ground investigation	P1	D

P26: Photograph showing recovery from BH02 between 13.2m and 14.7m



P27: Photograph showing recovery from BH02 between 14.7m and 16.2m



P28: Photograph showing recovery from BH02 between 16.2m and 17.7m



P29: Photograph showing recovery from BH02 between 17.7m and 19.2m



Title	Photo sheet number	Appendix
Photographic records of ground investigation	P1	D