



**Updated Phase I and II
Contamination
Investigation & Risk
Assessment Report**

Project Name: Harpenden Lane, Redbourn

Location: Harpenden Lane, Redbourn,
Hertfordshire

Client: Martin Grant Homes and Kearns Land

Project ID: JN1847

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SUMMARY

The site in Redbourn, Hertfordshire, which extends 3.8 ha, comprises a field. The site can be divided, approximately, into two sections; northern and southern. The northern field was previously developed and now is overgrown with shrubs and trees, whilst the southern field comprises light shrubs, trees and grass.

Geological records indicate the site to be underlain by Alluvium (Secondary A Aquifer) over Lewes Nodular Chalk and Seaford Chalk Formation (Principal Aquifer). The site is located in a SPZ III.

A desk study was carried out and indicates that the site has a history of agricultural use with the northern section having included a residential property, a nursery (including glasshouses) and various outbuildings. These structures are no longer on site. Just to the north of these, off-site, were another residential property, a dairy and an electrical sub-station. The southern section has always been a field. The River Ver runs north/south in the eastern part of the site.

An Unexploded Ordnance (UXO) risk assessment was outside the requested scope of this report. Geotechnical issues were also outside the requested scope, although some preliminary soakage testing was carried out.

A single phase of intrusive investigation was carried out comprising JCB excavated trial pits and hand augers. Whilst all areas were accessed during the field work, the land to the east of the river and site centre could only be accessed with hand digging equipment. This was supplemented by sampling of the River Ver.

The soils encountered on site differed in the northern/eastern and southern sections, due to the historic activity in the former. The northern and eastern sections comprised Made Ground over a Gravel. The southern field comprised natural sequences of Topsoil over gravelly Clay, over sandy Gravel.

Groundwater was encountered in all of the trial pit locations at depths of 0.4m bgl to 1.0m bgl.

Excavations will require de-watering due to the high water table.

There is evidence of soil contamination in the form of arsenic, BaP and lead, in particular, in the Made Ground. Suspected asbestos was also identified in some demolition rubble in the northern part of the site, although was not identified in any of the soils screened or noted in the trial holes. The presence of contamination may affect the classification of waste soils, or the potential for their re-use. The surface water samples analysed were free from contamination.

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

Some remediation would be required in the northern part of the site to facilitate a residential development.

As with any site, areas of contamination not identified during investigation works may come to light during the course of redevelopment. Accordingly, a discovery strategy must be in place during the redevelopment to ensure that any hitherto unknown contamination is identified and dealt with in an appropriate manner. Depending on the nature of any such contamination, it may prove necessary to reassess the remedial strategy for the site. The presence of contamination may affect the classification of waste soils, or the potential for their re-use. This report has also been updated to include a preliminary waste section.

A formal remediation strategy and verification plan should be agreed with the regulatory authorities prior to commencement of any remedial works.

The investigation was conducted and this report has been prepared for the sole internal use and reliance of Martin Grant Homes and Kearns land and their appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The findings and opinions conveyed via this investigation report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

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For and on behalf of Southern Testing Laboratories Limited

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A INTRODUCTION

1 Authority

Our authority for carrying out this work is contained in a letter of appointment sent by Oliver Baker on behalf of Martin Grant Homes dated 22nd November 2023.

2 Location

The site is located 0.3 km to the east of Redbourn Town Hall in Hertfordshire. The approximate National Grid Reference of the site is TL 11063 12463. The site location is indicated on Figure 1 within Appendix A.

3 Proposed Construction

It is proposed to develop a 3.8 ha site with housing. Layouts are not known at this time.

For the purposes of the contamination risk assessment, the proposed development land use is classified as Residential with consumption of Homegrown Produce CLEA Model Ref [1] / C4SL Report Ref [2].

The gas sensitivity of the proposed development is therefore rated as High CIRIA C665 Ref [3].

4 Object

This is a Phase 1 Desk Study and Walkover and Phase II contamination (risk estimation and evaluation) investigation (Tier 1). Geotechnical issues were also outside the requested scope, although some preliminary soakage testing was carried out.

The object of the investigation was to assess the likely nature and extent of soil, groundwater and soil gas contamination on the site.

5 Scope

This report presents our desk study findings, exploratory hole logs and chemical test results and our interpretation of these data.

A UXO risk assessment was not within the scope of this investigation, nor were any geotechnical issues.

As with any site there may be differences in soil conditions between exploratory hole positions.

This report is not an engineering design and the figures and calculations contained in the report should be used by the Engineer, taking note that variations will apply, according to variations in design loading, in techniques used, and in site conditions. Our figures therefore should not supersede the Engineer's design.

The ground/site investigation has been completed with reference to BS 5930 Ref [4] and BS 10175 Ref [5].

This updated report now includes a section on preliminary waste classification of soils.

The findings and opinions conveyed via this investigation report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

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The recommendations contained in this report are made in respect of the particular context of the investigation as described in the report and may not be appropriate to alternative development schemes. This report should be considered in its entirety and Southern Testing Laboratories Ltd accepts no responsibility for and excludes liability in respect of any omission or alteration made by others, and any use of the report for any purpose other than that for which it was produced.

Detailed information on the proposed development, such as detailed final layout, loadings and serviceability limits was not provided. Accordingly, where geotechnical design advice is provided it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules.

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

B DESK STUDY AND WALKOVER SURVEY

6 Desk Study

A desk study has been carried out. Reference has been made to the following information sources.

- Online Geological Maps Ref [6] & Ref [7]
- Online Hydrogeological Maps Ref [8]
- Aerial Photographs
- Historical Ordnance Survey Maps
- Environmental Databases
- BGS Online Historical Borehole Records Ref [9]
- Search on Local Authority Planning Portal for planning history
- Environment Agency / Gov.UK Website Flood Risk Ref [10]
- UK Radon Ref [11] and BRE Radon Ref [12]
- Google Earth (for old aerial photographs)

The environmental databases search report compiled for this desk study contains site-specific environmental data drawn from data sets that comprise publicly available information together with data from third parties, some of which is under review. Accordingly, Southern Testing Laboratories Limited does not warrant its accuracy, reliability or completeness.

The full report is included in Appendix E and F, a summary of the salient features is included in the following sections of this report.

6.1 Geology

The British Geological Survey Map No 239 Hertford, indicates that the site geology consists of Alluvium & River Terrace over Lewes Nodular Chalk and Seaford Chalk Formation.

6.1.1 Alluvium

Alluvium is, geologically speaking, a recent deposit found in association with streams, rivers and other watercourses. It usually consists of soft clays and silts and often has a high organic content. Lenses and bands of peat are commonly found. It is inherently variable and rapid lateral transitions in soil type should be anticipated.

6.1.2 River Terrace

River Terrace Gravels are of fluvial origin and consist of sheets of gravel and sand. Some variability in soils is to be expected at junctions with the various terraces as river banks existed there. The remains of these former river banks can be soft and silty or contain clay.

6.1.3 Lewes Nodular Chalk

The Lewes Chalk is characteristically hard, nodular, locally iron stained and flinty. Marl seams, up to 0.1m thick, occur throughout, but are especially conspicuous in the lower beds. Layers of nodular flints are regularly spaced throughout in succession, becoming distinctly carious in the higher part. At some horizons these flints almost interlock to produce laterally continuous bands.

6.1.4 Seaford and New Haven Chalk Formation

The Seaford and New Haven Chalk are firm white chalk with conspicuous semi-continuous nodular and tabular flint seams. Hardgrounds and thin marls are known from the lowest beds. Some flint nodules are large to very large.

6.2 Historical Borehole Records

A search of historic exploratory hole records, both from the online British Geological Survey database [9] and Southern Testing in-house records, revealed that there are no records within 1km of site.

The nearest borehole, just over 1km to the south-east, records the chalk at 7.3m bgl.

6.3 Geological Hazards and Mining Activities

Data from various sources relating to potential geological hazards at the site are summarized below. The Hazard Potentials listed for the BGS data are as presented in the Envirocheck report, derived from various generic BGS sources, **which are not considered as site-specific**. It is important that this information is considered in context of the actual site topography, ground conditions encountered during future investigation, and development proposals.

Data Source	Hazard	Hazard Potential to Site	Remarks
BGS	Potential for Collapsible Ground Stability Hazard	Yes	Very low risk.
	Potential for Compressible Ground Stability Hazard	Yes	Moderate risk, probably due to the alluvium mapped.
	Potential for Ground Dissolution Stability Hazard	Yes	Very low risk. A low risk is mapped 11m to the north-west.
	Potential for Landslide Ground Stability Hazard	Yes	Very low risk.
	Potential for Running Sand Ground Stability Hazard	Yes	Low risk.
	Potential for Swelling or Shrinkage Clay Ground Stability Hazard	Yes	Very low risk.
	Shallow Mining Hazard	No	None recorded within 500m of site.
	BGS recorded mineral site	Yes	Redbourn former opencast Chalk Pit 141m to the north-east of the site.
ARUP [Ref [13]]	Mining Instability	Yes	Conclusive Rock mining on site. Deneholes are local issue in Redbourn – no specific details.
CSS [Ref [14]] KURG [Ref [15]]	Underground Openings	No	None within 996m of site.
PBA	Natural & Mining Cavities	No	None within 920m of site.

6.4 Radon Risk

With reference to the Envirocheck report, UK Radon Ref [11] and BRE Radon Ref [12] guidance: no radon protection is required on this site

6.5 Hydrology and Hydrogeology

Data from the Environment Agency and other information relating to controlled waters is summarised below.

Data		Remarks	Possible Hazard to/from Site (Y/ N)
Aquifer Designation	Superficial Deposits	Secondary Aquifer – A	Y
	Bedrock	Principal Aquifer	Y
Groundwater Vulnerability		Bedrock Principal Aquifer is designated as highly vulnerable.	Y
Abstractions	Surface Water	None recorded within 1km of site.	N
	Groundwater	81m to the south: Mr W A Goldring: General Farming and Domestic ground water abstraction permit.	Y
Source Protection Zones		Zone III (Total Catchment)	Y
Surface Watercourses		The River Ver runs north to south in the eastern part of the site.	Y
Groundwater Flood Risk		There is potential for ground water flooding to occur on site.	Y
Surface Water Flood Risk*		The site is shown within/adjacent to an area mapped as being at risk.	Y
Marine / Fluvial Flood Risk*		The site is shown within/adjacent to an area mapped as being at risk.	Y
Reservoir Flood Risk*		The site is not shown within/adjacent to an area mapped as being at risk.	N
Discharge Consents		Hertfordshire Count Council: Gypsy Site Waterend Lane 79m to the south-west. The discharge of other matter into the River Ver. Revoked in 1996.	N

Hydrogeological Map 14 infers water table in the chalk at around 92m AOD with gentle gradient down to the SE.

** These sections are provided for information only, this report does not constitute a formal flood risk assessment and specialist advice should be sought in relation to potential flooding issues.*

6.6 Historical Ordnance Survey Maps

Copy extracts of historical Ordnance Survey plans dating from 1878 to 2023 were obtained and are presented in Appendix E. A summary of the salient features is presented below.

1878 Map:

On site: The site comprises two undeveloped fields with some trees on the western, southern and eastern boundaries. Some trees also separate the two fields in the northern portion of the site, running west to east. A small river, running north to south, is located in the eastern section of the site; this is also tree-lined. A public footpath is located in the northern part of the site.

Off site: To the south-west of the site is the village of Redbourn which is a collection of residential properties with associated roads. To the north-west of site is an agricultural field that backs onto a road. To the sites west, is another field that backs onto a railway, approximately 60m away, which runs north-east to south-west.

1898 Map:

On site: There are no significant changes to the site, although the trees are no longer mapped.

Off site: To the sites north-east, approximately 120m away, a small chalk pit is now shown.

1899 1:10,560 Map:

The smaller scale map shows that there are two additional chalk pits off-site, although not within proximity. One is to the north-east approximately 400m away and one to the south-east approximately 250m away. Additional pits are noted 1km to the north and south of site. The railway station for the railway line exists approximately 260m south of site. In Redbourn itself, there is a gas works 250m to the south-east and a silk factory 300m to the south-east.

1925 and 1938 Maps:

On site: There is no significant change to the site.

Off site: There are no significant changes.

1950/51 Map:

On site: Generally there are no significant changes to the site, although two small buildings are now shown in the northern part of the site.

Off site: Further residential development is shown to the west (close to the northern part of the site).

1960 Map:

On site: Generally there are no significant changes to the site, although another building, possibly a glasshouse, is now shown in the northern part of the site.

Off site: There are no significant changes.

1971 Map:

On site: The southern and middle portions remain approximately the same, although there is an enclosure and possible small outbuilding in the central part of the site.

The northern section has now been significantly developed, with a residential property (Verside), a poultry farm and a large nursery (with greenhouses). A Foot Bridge is annotated over the River Ver.

Off site: To the immediate north is another residential property (Verbridge), a dairy and an electrical sub-station. There has also been further residential development in the area and the chalk pit to the north-east is no longer mapped, presumed infilled. Another Verside and

1979-1986 Map:

On site: There is no significant change to the site.

Off site: The railway to the east is no longer shown, being replaced by a major road (A583), in cutting, with a large roundabout just to the north-east of the site.

1989 and 1992 Map: There are no significant changes shown on site or off site, although there are fewer poultry farm buildings shown in the northern part of the site.

1999 Map:

On site: Many of the structures in the northern of the site are no longer visible on the satellite image, with the area starting to look heavily vegetated.

Off site: To the south-east of the site, a new small residential development is in the process of being constructed.

2006 and 2023 Maps: On the latest map, no structures are shown on site other than a possible central outbuilding.

6.7 Environmental Databases

Data Source	Distance (m)	Direction	Details	Possible Hazard to Site (Y/N)
Current Industrial Land Use	116m	NW	Ram-Parts: Hydraulic Engineers: Inactive.	N
	165m	SW	Flair Building Ltd: Air Conditioning & Refrigeration Contractors: Inactive.	N
	165m	SW	Changing Views: Soft Furnishings – Manufacturers: inactive.	N
	188m	SW	Redbourn Hardware: Hardware: Inactive.	N
	186m	SW	Instalectric Contractors Ltd: Mechanical Engineers: Inactive.	N
Current and Historical Landfills	-	-	None recorded within 1km of site.	N
Infilled Land (Non-water)	146	NE	Unknown filled ground 146m to the north-east in 1993	N
Infilled Land (water)	75	SW	Unknown filled pond/stream 146m to the south-west in 1960	N
Waste Management Facilities	-	-	None recorded within 300m	N
Fuel Sites	660m	S	Shell Redbourn: Petrol station: Open.	N
Pollution Incidents	66m	SW	Category 3 Minor incident involving unknown pollutant: June 1990.	N
IPPC/LAPPC Authorisations	660m	S	Shell Service Station.	N
Hazardous Substances Consents	-	-	None within 1km of site.	N
Sensitive Land Uses	0m	SE	Adopted green belt.	Y
	0m	SE	Nitrate vulnerable zone.	Y

The site setting is very sensitive, being underlain by both Secondary and Principal Aquifers, in a SPZ III, with a surface water receptor running through site. It is also in an area of adopted green belt and a nitrate vulnerable zone.

The contamination risk is greatest in the northern part of the site where some development was located from around the 1950s/1960's until the end of the last century. The southern part of the site has been a field since the earliest mapping (at least) and represents a low risk.

Off-site, very little of note has been identified. There is an infilled chalk pit around 120m to the north-east, but this feature is very small and appears to have been infilled around 1960 (not 1993 as indicated by the database). On this basis, given the size of the feature and the 50 years that have elapsed, it is not considered a viable source of land gas.

6.8 Planning Application History

<https://www.stalbans.gov.uk/view-and-track-planning-applications> 14/11/23

A search of the St Albans City & District Council Planning portal revealed no planning applications for the site.

6.9 Ground Gas Risk

No major source of ground gas risk has been identified.

6.10 UXO Risk Management

The possibility of unexploded ordnance (UXO) being encountered on a site falls within the category of a potentially significant risk and should be addressed as a legal duty under the Construction (Design and Management) Regulations by the Client as early as possible in a project.

The CIRIA publication C681 Ref [16] has been developed to provide a consistent framework for the management of potential risks posed by UXO during site investigation and groundwork phases of construction. The process adopts a tiered approach, divided into four distinct stages; Preliminary risk assessment, Detailed risk assessment, Risk mitigation and Implementation.

The agreed scope of work did not allow for either a preliminary or detailed UXO risk assessment. However, Zetica provide a free preliminary UXO risk assessment online and this indicated a low risk for the site.

7 Site Walkover Survey

7.1 General Site Description and Boundaries

The site is located to the south of Harpenden Lane and to the east of Ver road in Redbourn. It is moderately vegetated with semi-mature to mature trees, grass, shrubs and bushes. The boundaries of the site to the east are marked by a barbed wire fence, to the south by a wired fence, to the east by a 4 foot high wooden fence that becomes a 6 foot wooden fence where it separates site from the residential gardens. In the north, the site boundary is also marked by 6 foot high wooden fences.

7.2 Topography and Drainage

There is a general slope on the site from west to east with the highest point in the north-western corner and lowest in the south-eastern corner. There is a river on site (River Ver) which has created the valley that the site is located on. Slight slopes exist against site boundaries and the riverbank.

7.3 Vegetation

The vegetation on the site varies from north to south. There is a metal barbed wire fence across the middle of the site; to the north of this are semi-mature to mature trees, up to 15-20m in height. To the south of the fence, is grass, small shrubs, and occasional bushes with semi-mature trees located near the banks of the river and on the western/southern boundaries.

7.4 Buildings and Land Use on Site and Nearby

There are currently no structures on site, although there is evidence of where buildings were located in the north. To the north of site is a road with agricultural land beyond, to the west is a residential housing estate, to the east is further agricultural land, a road and a plant nursery. To the south is more fallow land surrounding a derelict property of unknown use.

7.5 Inaccessible Site Areas

All areas of the site were accessible by foot during the course of the walkover. Machine access was restricted in some areas.

7.6 Site Photographs

A series of photographs is included in Appendix D.

C PRELIMINARY SITE MODELS

8 Conceptual Engineering Geological Ground Model

From the desk study information and walkover undertaken at this site the following conceptual ground model has been formulated.

Data Source	Comments
Geology	The mapped geology comprises fluvial deposits over chalk.
Former Site Use	Some Made Ground and defunct infrastructure is anticipated in the north of the site.
Groundwater	Aquifer water table at 92m AOD. River Ver on site - shallow groundwater may be encountered.
Surface Water	There is a river that runs through the site, north to south, in the east (River Ver).
Potential Geo-hazards	Poor ground bearing and swelling potential associated with alluvium. Residual risk of subsidence associated with natural dissolution and mining of chalk.

9 Conceptual Site Model

In the context of this report, the conceptual model summarises the potential pollutant linkages identified for the site and forms the basis of the risk assessment for the site. The preliminary model comprises the potential sources of contamination, receptors that could be harmed and exposure pathways identified from the desk study and walkover survey. These potential linkages form the basis upon which the investigation is designed and reported.

9.1 Potential Sources of Contamination

The site has a history of agricultural and partial light commercial use and is located within an SPZ III area.

A few potentially contaminative uses have been identified, both on site and in the locality.

Potential contaminants associated with these uses have been compiled from our experience of such sites.

9.1.1 On-Site Sources

Potential Source	Potential Contaminants
Made ground from demolished structures in the North	Asbestos, PAHs, and heavy metals
Commercial use in the north	Asbestos, Petroleum Hydrocarbons and heavy metals
Agricultural	Pesticides

The contamination risk in the southern part of the site, which has remained agricultural land, is considered very low. In the north, where the buildings were located, the contamination risk is considered to be moderate at this stage; some Made Ground is anticipated in relation to the construction and demolition work carried out and activities such as glasshouses may have included oil or coal fired boilers. The range of contaminants associated with these are presented in the table below.

Historic agricultural use may have included pesticide use although, in our experience, whilst some residual impact is not uncommon, the impact is usually not significant.

9.1.2 Off-Site Sources

The site may be impacted by contamination migrating from beyond the site boundary. The following potential off-site sources have been identified.

Potential Source	Distance from Site Boundary	Direction	Potential Contaminants	Likely hazard to Site
Former railway	60m	E	Petroleum hydrocarbons, PAH, Metals	Very Low
Dairy and sub-station	5m	N	Hydrocarbons, metals, PAH and PCBs	Low to very low
Chalk pit	120m	NE	Land gas	Very Low

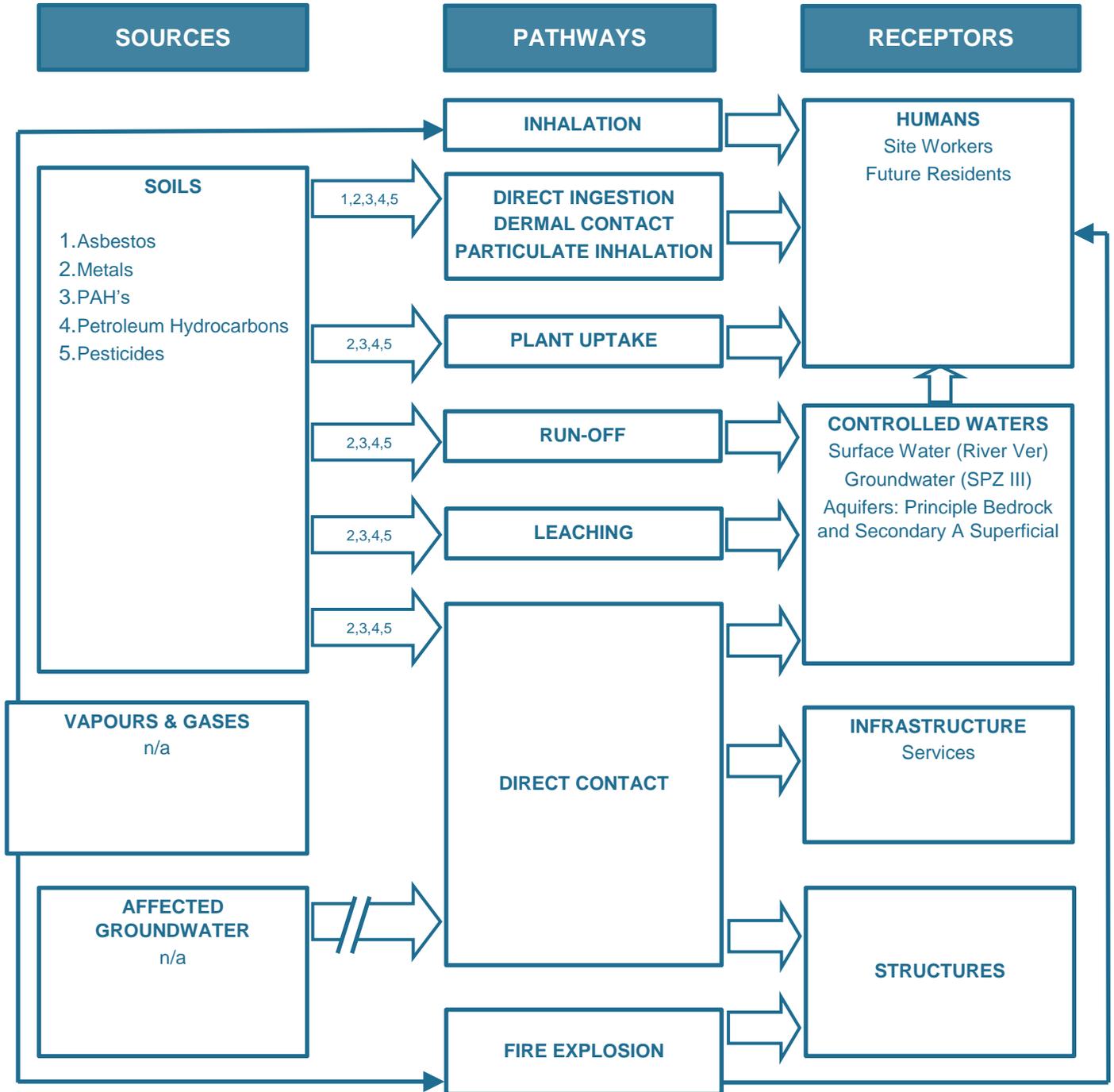
The former railway is a potential historic source of petroleum hydrocarbons, PAHs and heavy metals, although this was subsequently redeveloped with a road in the 1980's and any risk is considered very low.

As discussed, the chalk pit around 120m to the north-east was very small and likely backfilled around 1970. Given the time that has elapsed, this is not considered a viable gas source.

Just to the north of the site was another residential property, with a dairy and sub-station. These are not considered a significant risk to the site; PCBs are not mobile contaminants.

9.2 Pollutant Linkages and Conceptual Site Model Summary

The following diagram shows the potential pollutant linkages identified for the site and summarises the preliminary conceptual model:



// Denotes potential pollutant linkage not complete.

10 Conclusions and Recommendations

10.1 Risk of Soil Contamination

Given the site history, and current use of the site, there is a very low risk of significant contamination in the south of the site. However, there is a moderate risk given the construction and demolition undertaken in the north, as well as the commercial use of this part of the site (including glasshouses).

10.2 Risk of Groundwater Contamination

The aquifer classifications for the superficial and bedrock deposits are a Secondary A and Principle Aquifers respectively; the site lies inside a source protection zone III (SPZ) for public drinking water. A river also runs through the site which represents a sensitive potential receptor.

However, despite the sensitive setting in terms of groundwater and surface water, significant mobile contaminants are not anticipated at this stage.

10.3 Risk from Ground Gases

No potential gas risk has also been identified either on site or locally. As such, no further assessment of land gas risk is considered necessary.

11 Recommendations

The conceptual model is based upon both the historic and current uses of the site. Some investigation is recommended, including general screening of the site topsoil to assess the suitability for reuse within the proposed development.

D GROUND INVESTIGATION

12 Strategy and Method

The strategy adopted for the intrusive investigation comprised the following:

Activity / Method	Purpose	Max Depth Range (mbgl)	Installations / Notes
HA 1-13	To access areas for contamination testing that were inaccessible to the mini excavator or JCB 3CX	0.2 / 0.85	
TP1-22 JCB 3CX	Trial pits to investigate the shallow ground conditions and collect samples for contamination testing; also to allow for an assessment of soakage potential, using the BRE365 method, in selected pits.	0.5 / 1.0	BRE365 Soakage tests (gravel filled) in TPs 2,5,9 and 13

The exploratory hole locations are shown on Figure 2 in Appendix A.

In-situ test and sampling methods descriptions employed are given in Appendix B, together with the test results.

13 Weather Conditions

The fieldwork was carried out between 12th December and 14th December 2023, at which time the weather was generally cool and slightly drizzly.

14 Soils as Found

The soils encountered are described in detail on the attached exploratory hole logs (Appendix A). The northern half of the site and east of the river had shallow made ground over the wet fluvial sub-grades, the southern field being topsoil

Depth (m)	Soil Type	Description	
GL – 0.1/1.0m	TOPSOIL / MADE GROUND	100-300mm of Dark brown friable silty sandy gravelly clay TOPSOIL.	Dark brown friable silty sandy gravelly clay. Gravels consisted of fine to medium sub-angular brick, glass, plastic and porcelain.
0-.3/0.7m	CLAY	Soft dark brown silty very sandy gravelly CLAY. Gravels consist of fine to medium sub-angular flint. <i>[Replaced by made ground in north]</i>	
-1.0m+	GRAVEL	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of sub-angular flint and sub-rounded sandstone.	

14.1 Visual and Olfactory Evidence of Contamination

There was no evidence of significant contamination in the trial holes, although Made Ground was encountered in all trial holes in the northern and eastern parts of the site. This material can be the source of a general range of contaminants as presented in the Conceptual Model.

In addition, a large pile a demolition debris was located between TP 20 and 21 and this included what appeared to be asbestos containing material.

These occurrences are discussed in Section E.

15 Groundwater Observations

Groundwater was observed in majority of exploratory holes ranging from 0.4m bgl to 1.0m bgl, generally being encountered at a shallower depth nearer the river.

16 Soakaways

Four shallow soakage tests were carried out across the site, at the locations shown on the attached site plan Figure 2, Appendix A. The full results of the soakage tests are presented within Appendix B.

The infiltration rate from each trial hole is summarised in the table below. The soakage rate in this report is expressed as $\ell/m^2/\text{minute}$, which is a convenient rate to use. The BRE use a unit of m/sec, which is the value in $\ell/m^2/\text{minute}$ divided by 60,000.

Test ID	Test Depth (mbgl)	Design Infiltration Rate	
		$\ell/m^2/\text{minute}$	m/sec
TP2	0.3m	0.577	9.61×10^{-6}
		7.44	
		6.33	
TP5	0.65m	41.86	3.09×10^{-4}
		19.8	
		18.57	
TP9	0.7m	44.84	4.00×10^{-4}
		26.07	
		24.00	
TP13	0.8m	16.59	2.15×10^{-4}
		12.90	
		15.33	

Results appear fair to good (the Design Infiltration Rate is normally taken as the lowest of the three tests), however the groundwater is very high and storage capacity severely limited.

16.1 General Guidance on Design of Soakaways

Any soakaway scheme may require the approval of the Environment Agency, Building Control and, where applicable, the adopting Highways Authority.

Soakaways are used to store the immediate surface water run-off from hard surfaced areas, such as roof or car parks, and allow for efficient infiltration into the adjacent soil. They should be designed to discharge their stored water sufficiently quickly to provide the necessary capacity to receive run-off from a subsequent storm. The time taken for discharge depends upon the soakaway shape and size, and the surrounding soil's infiltration characteristics.

Groundwater levels can vary considerably from season to season and year to year, often rising in wet or winter weather, and falling in periods of drought. As such, a high groundwater table may affect the storage capacity of soakaways. In addition, it should be noted that an unsaturated zone may be required between the base of soakaways and the groundwater table, by the Environment Agency. Longer term monitoring may be required to establish actual groundwater levels as part of the planning approval process.

The design of soakaways can be square, circular (conventional) or trench excavations, and may be rubble filled, perforated precast concrete ring units, plastic cells or any similar structure that collects rainwater and run-off and allow discharge directly into the ground. Depending on the geological conditions, and depth at which suitable infiltration is achieved, soakaways can also be deep bored.

Long-term maintenance and inspection must be considered during the design and construction process. Maintenance of silt traps, gully pots and interceptors will improve the long-term performance of soakaways. The use of wet well chambers within the soakaway system can further assist in pollutant trapping and extending the operating life of soakaways.

Generally, roof and surface run-off should not significantly impact on groundwater quality and, subject to appropriate approvals from the Environment Agency, could be discharged directly to soakaways. However, although again subject to approvals from the Environment Agency, paved surface run-off for larger trafficked areas should generally be passed through a suitable form of oil interception device prior to discharge to the soakaway.

Care must be taken to ensure that the discharge of large volumes of surface run-off into the soil does not disrupt the existing sub-surface drainage patterns. Similarly in areas of sloping topography, consideration should be given to the siting of soakaways to avoid potential discharge and/or flooding of down slope areas.

E DISCUSSION OF GEOENVIRONMENTAL TEST RESULTS AND RECOMMENDATIONS

17 Analytical Framework

There is no single methodology that covers all the various aspects of the assessment of potentially contaminated land and groundwater. Therefore, the analytical framework adopted for this investigation is made up of a number of procedures, which are outlined below. All of these are based on a Risk Assessment methodology centred on the identification and analysis of Source – Pathway – Receptor linkages.

The CLEA model Ref [1], provides a methodology for quantitative assessment of the long-term risks posed to human health by exposure to contaminated soils. Toxicological data is used to calculate a Soil Guideline Value (SGV) for an individual contaminant, based on the proposed site use; these represent minimal risk concentrations and may be used as screening values.

In the absence of any published SGVs for certain substances, Southern Testing have derived or adopted Tier 1 screening values for initial assessment of the soil, based on available current UK guidance including the LQM/ClEH S4UL's Ref [17] and CL:AIRE Soil Generic Assessment Criteria Ref [18]. In addition, in 2014, DEFRA Ref [19] published the results of a research programme to develop screening values to assist decision making under Part 2A of the Environmental Protection Act.

Category 4 screening levels were published for 6 substances, with reference to human health risk only. This guidance includes revisions of the CLEA exposure parameters, presenting parameters for public open space land use scenarios, and also of the toxicological approach. The screening levels represent a low risk scenario, based on a 'Low Level of Toxicological Concern' rather than the 'Minimal Risk' of CLEA, and the analytical results of this investigation may be considered relative to these levels.

Site-specific assessments are undertaken wherever possible and/or applicable.

CLEA requires a statistical treatment of the test results to take into account the normal variations in concentration of potential contaminants in the soil and allow comparisons to be made with published guidance.

The results of any groundwater analyses are compared to relevant quality criteria, e.g. Environmental Quality Standards (EQS) or Drinking Water Standards (DWS).

Ground gases are assessed in accordance with the guidance given in CIRIA C665 Ref [3] and BS8485 Ref [20].

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based upon them. Their validity should be confirmed at the time of site development.

18 Site Investigation – Soils

18.1 Sampling Regime

The number of sample locations was limited and was partly targeted at potential sources of contamination and also intended to provide general coverage.

18.2 Testing

The potential for contamination by asbestos, PAH, heavy metals, Petroleum Hydrocarbons and pesticides was identified in the preliminary conceptual model. Therefore, the following tests were selected.

Test Suite	Number of Samples	Soil Tested
ST Pesticide and Herbicide Screening	10	Made Ground and Natural
STC Suite 2 (Asbestos, heavy metals and speciated PAHs)	20	Made Ground and Natural
STC Suite 3 (Asbestos, heavy metals and speciated PAHs and Petroleum hydrocarbons)	12	Made Ground and Natural
Preliminary Waste Classification Suites	2	Made Ground
WAC Tests	2	Made Ground

The test results are presented in full in Appendix C. A summary and discussion of the significance of the results and identified contamination sources is given below.

18.3 Test Results and Identified Contamination Sources

18.3.1 General Contaminants

The results of the key contaminant tests have been analysed in accordance with the CLEA methodology. The samples have been grouped into three populations comprising Topsoil, Natural Soil and Made Ground. For each parameter in each population the sample mean is calculated and compared to a Tier 1 screening value. If the sample mean exceeds the screening value, the soil may be regarded as contaminated and further assessment may be required. If neither the sample mean nor any single value exceeds the screening value, the soil may be regarded as not contaminated, though further confirmatory assessment may be required.

Where any single parameter value exceeds the screening value but the sample mean does not, further statistical analysis may be applied to that parameter if the available data is suitable. Such analysis would include an assessment of the Normality of the distribution of the data, consideration of the presence of outliers, and the calculation of a UCL estimate of the mean.

Summary data is presented in the tables below and the laboratory analysis is included in Appendix C. The screening values and source notes are presented in Table 1 “Tier 1 Screening Values” at the front of Appendix C.

Topsoil

Contaminants	Units	No of Samples Tested	Range	Sample Mean	Residential with Home-grown Produce Consumption Tier 1 Screening Values
Arsenic (As)	mg/kg	6	6 - 9.6	7.3	37
Cadmium (Cd)	mg/kg	6	<0.2 - 0.4	0.30	11
Trivalent Chromium (CrIII)*	mg/kg	6	14 - 25	20	910
Hexavalent Chromium (CrVI)	mg/kg	6	<1.8	1.8	6
Lead (Pb)	mg/kg	6	54 - 73	63	200
Mercury (Hg)	mg/kg	6	<0.3 - 1.2	0.45	7.6-11
Selenium (Se)	mg/kg	6	<1	1.0	250
Nickel (Ni)	mg/kg	6	7.9 - 14	11	130
Copper (Cu)	mg/kg	6	15 - 29	22	2,400
Zinc (Zn)	mg/kg	6	38 - 62	50	3,700
Benzo(a)pyrene (BaP)	mg/kg	6	<0.05 - 0.2	0.06	1.7-2.4
Total Cyanide (CN)	/	/	/	/	/
Acidity (pH values)	Units	6	5.4 - 8.5	7.0	/
Soil Organic Matter	%	6	4.2 - 11	6.2	/

* Assumed as Total Cr minus CrVI

The Topsoil samples tested, all recovered from the southern field, reported all of the determinants analysed for at concentrations below the tier 1 screening value for a residential with home-grown produce land-use.

This concurs with the site history and the observations made during sampling.

Natural Soil

Contaminants	Units	No of Samples Tested	Range	Sample Mean	Residential with Home-grown Produce Consumption Tier 1 Screening Values
Arsenic (As)	mg/kg	10	2.2 - 23	10	37
Cadmium (Cd)	mg/kg	10	<0.2 - 0.6	0.27	11
Trivalent Chromium (CrIII)*	mg/kg	10	10 - 67	25	910
Hexavalent Chromium (CrVI)	mg/kg	10	<1.8	1.8	6
Lead (Pb)	mg/kg	10	10 - 300	72	200
Mercury (Hg)	mg/kg	10	<0.3 - 1.1	0.38	7.6-11
Selenium (Se)	mg/kg	10	<1	1.0	250
Nickel (Ni)	mg/kg	10	5.3 - 34	17	130
Copper (Cu)	mg/kg	10	6.6 - 62	23	2,400
Zinc (Zn)	mg/kg	10	18 - 140	55	3,700
Benzo(a)pyrene (BaP)	mg/kg	10	<0.05 - 1.1	0.21	1.7-2.4
Naphthalene	mg/kg	20	<0.05 - 0.17	0.06	2.3-13
Acidity (pH values)	Units	10	6.7 - 8.2	7.4	/
Soil Organic Matter	%	9	0.6 - 9.6	4.7	/

* Assumed as Total Cr minus CrVI

The natural soil samples tested were also free from significant contamination.

Made Ground:

Contaminants	Units	No of Samples Tested	Range	Sample Mean	Residential with Home-grown Produce Consumption Tier 1 Screening Values
Arsenic (As)	mg/kg	18	4.8 - 77	24	37
Cadmium (Cd)	mg/kg	18	<0.2 - 0.9	0.34	11
Trivalent Chromium (CrIII)*	mg/kg	18	10 - 280	48	910
Hexavalent Chromium (CrVI)	mg/kg	18	<1.8	1.8	6
Lead (Pb)	mg/kg	18	47 - 1600	469	200
Mercury (Hg)	mg/kg	18	<0.3 - 5	1.1	7.6-11
Selenium (Se)	mg/kg	18	<1 - 1.1	1.0	250
Nickel (Ni)	mg/kg	18	6.8 - 120	35	130
Copper (Cu)	mg/kg	18	15 - 440	103	2,400
Zinc (Zn)	mg/kg	18	28 - 1300	346	3,700
Benzo(a)pyrene (BaP)	mg/kg	18	0.05 - 6.8	1.2	1.7
Acidity (pH values)	units	18	5.8 - 9.1	7.4	/
Soil Organic Matter	%	16	3.2 - 15	7.3	/

* Assumed as Total Cr minus CrVI

The Made Ground samples analysed were often impacted with lead, with 50% of the samples tested having concentrations equal to or exceeding the screening value of 200 mg/kg. An average concentration of 469 mg/kg was reported with a maximum concentration of 1,600 mg/kg. There was no obvious source of the lead in the Made Ground observed, but former nursery sites are often impacted with heavy metals and PAHs.

One of the samples analysed also reported an elevated concentration of Arsenic, 60 mg/kg, with some of the samples also reporting a slightly elevated concentration of BaP. As discussed, this impact is not uncommon in Made Ground.

18.3.2 Asbestos Containing Materials

No asbestos containing materials were detected in the samples analysed. However, a large pile of demolition debris was located between TP20 and TP21 and what appeared to be asbestos containing material was noted (potentially asbestos coated tiles) which will need to be removed to a suitable tip.

There could well be similar demolition rubble elsewhere on site and, it should also be noted, that the exploratory holes are of small size relative to the area investigated and the investigation was constrained by hard cover at times. Therefore, the samples obtained may not reflect the full composition of the soils on the site, and there is always the potential for pockets of asbestos or for asbestos containing materials to be present, which have not been detected in the sampling.

It is also our experience that asbestos containing materials are quite often encountered in buried pockets and beneath slabs (sometimes adhering to the concrete) on older sites. It is, therefore, advised that further examination is carried out in trial pits, when suitable access is available.

18.3.3 Organic Contaminants

The following tables summarise the results of the analysis for TPH.

Hydrocarbon Substance or Fraction	Measured Concentrations in mg/kg ($\mu\text{g}/\text{kg}$)				
	HA2 @ 0.2m	HA7 @ 0.3m	HA9 @ 0.5m	HA10 @ 0.28m	HA12 @ 0.4m
BTEX					
Benzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Xylenes	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MTBE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aliphatics					
EC5-EC6	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
>EC6-EC8	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
>EC8-EC10	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
>EC10-EC12	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>EC12-EC16	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
>EC16-EC35	<16	<16	<16	<16	<16
Aromatics					
EC5-EC7 (Benzene)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
>EC7-EC8 (Toluene)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
>EC8-EC10	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
>EC10-EC12	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>EC12-EC16	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
>EC16-EC21	< 10	< 10	< 10	79	< 10
>EC21-EC35	< 10	< 10	11	87	< 10

Hydrocarbon Substance or Fraction	Measured Concentrations in mg/kg (µg/kg)				
	TP4 @ 0.2m	TP11 @ 0.1m	TP17 @ 0.2m	TP19 @ 0.2m	TP20 @ 0.4m
BTEX					
Benzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Xylenes	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MTBE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aliphatics					
EC5-EC6	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
>EC6-EC8	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
>EC8-EC10	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
>EC10-EC12	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>EC12-EC16	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
>EC16-EC35	<16.0	<16.0	<16.0	<16.0	<16.0
Aromatics					
EC5-EC7 (Benzene)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
>EC7-EC8 (Toluene)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
>EC8-EC10	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
>EC10-EC12	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>EC12-EC16	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
>EC16-EC21	< 10	< 10	25	< 10	< 10
>EC21-EC35	< 10	< 10	43	< 10	< 10

Most of the samples tested for TPH reported concentrations below detection limits and those that were above detection values were only very minor and well below any human health guidelines.

This concurs with the visual and olfactory evidence.

18.3.4 Pesticide and Herbicides

Twenty samples, were tested for a wide range of pesticides and herbicide compounds. In our experience, some minor residual impact is not uncommon for agricultural soils in the UK. Specifically low-level DDE and DDT impact is relatively normal. DDT is an organochlorine pesticide and DDE is a daughter product of this chemical, following some degradation.

Of the twenty samples analysed, one recorded a very minor concentration of DDE: 58 µg/kg. For the other pesticides and herbicides tested for, all other results were below detection limits.

We have undertaken a number of risk assessments relating to DDT/DDE/DDD in soils. Even using the most stringent of risk assessment parameters, using data derived by the California Environmental Protection Agency (Office of Environmental Health Hazard Assessment), the concentrations measured are about ten times lower than those considered a risk to human health.

On this basis, the soils tested are not considered to be contaminated with pesticides or herbicides.

19 Site Investigation – Surface water

19.1 Sampling Regime

The aim was to assess whether the soil contamination identified in the northern part of the site was impacting the surface water receptor running through the eastern part of the site (The River Ver). Two samples were taken, as depicted on the plan in Appendix A.

19.2 Testing

The potential for contamination by asbestos, PAH, heavy metals and Petroleum Hydrocarbons was identified in the preliminary conceptual model. Therefore, the following tests were selected.

Test Suite	Number of Samples	Soil Tested
STC Suite 3 (heavy metals and speciated PAHs and Petroleum hydrocarbons)	2	Surface Water

The test results are presented in full in Appendix C. A summary and discussion of the significance of the results and identified contamination sources is given below.

19.3 Test Results and Identified Contamination Sources

19.3.1 General Contaminants

Summary data is presented in the tables below and the laboratory analysis is included in Appendix C.

Surface Water

Contaminants	Units	No of Samples Tested	Range	Sample Mean	Environmental Quality Standard (µg/l)	UK Drinking Quality Standard (µg/l)
Arsenic (As)	ug/l	2	6 - 9.6	7.3	50	10
Cadmium (Cd)	ug/l	2	<0.2 - 0.4	0.30	5	5
Trivalent Chromium (CrIII)*	ug/l	2	14 - 25	20	50	50
Hexavalent Chromium (CrVI)	ug/l	2	0.19 - 0.23	0.21	-	-
Lead (Pb)	ug/l	2	0.20	2	4	10
Mercury (Hg)	ug/l	2	<0.05	0.05	1	1
Selenium (Se)	ug/l	2	<0.6	0.60	/	10
Nickel (Ni)	ug/l	2	<0.5 - 0.6	0.55	50	20
Copper (Cu)	ug/l	2	2.3 - 2.6	2.5	1	2000
Zinc (Zn)	ug/l	2	3.2 - 3.6	3.4	10.9	/
Benzo(a)pyrene (BaP)	ug/l	2	<0.01	0.01	0.00017	0.01
Acidity (pH values)	/	2	7.4- 7.8	7.6	/	/

* Assumed as Total Cr minus CrVI

The water samples tested, recovered from the northern and southern section of the River Ver, reported all of the determinants analysed for at concentrations below the available drinking water standards. Although the results for copper exceed the stringent EQS value, this standard is based on bioavailability and not all of the total concentration, which is minimal, will be available.

20 Summary of Identified Contamination

The natural soil on site appear to be uncontaminated, as is the Topsoil in the southern field and the River Ver.

The Made Ground, encountered in the northern and eastern parts of the site is contaminated with lead with an average concentration of 443 mg/kg relative to the screening value of 200 mg/kg for residential with home grown produce. This material was also, at times, impacted with BaP and, to a lesser extent, arsenic.

21 Risk Evaluation

The object of the risk evaluation is to assess the pollution linkages for specific contaminant groups considered in the conceptual model, identify any unacceptable risks and, therefore establish whether there is a need for further investigation and/or remedial action.

The risks are considered in the context of the specific development proposals for the site and, therefore, the conclusions may not be appropriate for alternative schemes.

21.1 Lead, BaP and Arsenic

There are elevated concentrations of lead, and to a lesser extent BaP and arsenic, within the Made Ground in the northern and eastern sections of the site.

21.2 Revised Conceptual Model

The preliminary site model has been refined in light of the findings of this investigation and is summarised below.

Metals	Petroleum Hydrocarbons	PAH	Pesticides and Herbicides	Asbestos	Pathways	Receptors
Y	N	P	N	Y	Ingestion/inhalation of contaminated soil & dust	Human Health
Y	N	N	N	n/a	Dermal contact with contaminated soil & dust	
n/a	N	N	n/a	n/a	Inhalation of vapours or gases	
N	n/a	N	N	n/a	Uptake into edible fruit and vegetables	
N	N	N	N	n/a	Surface water run-off into surface water features	Water Environment
N	N	N	N	n/a	Migration through ground into surface water or groundwater	
N	N	N	N	n/a	Off-site migration of contaminated groundwater	
N	N	N	N	n/a	Vegetation on site growing in contaminated soil	Flora and Fauna
P	N	N	N	n/a	Aquatic life in affected waters	
N	N	Y	N	n/a	Contact with contaminated soils	Building materials / buried services
N	N	N	N	n/a	Fire or explosion	

Key:

- Y Pollutant linkage likely
- N Pollutant linkage not likely
- P Pollutant linkage possible
- n/a Pathway not applicable to contaminant

21.3 Relevant Pollutant Linkages

A number of Relevant Pollutant Linkages for which remedial action will be required have been identified in the revised conceptual model, as follows.

Contaminant / Source	Pathways	Receptor
Lead in Made Ground	Ingestion/inhalation	Site/Construction Workers Future residents
Asbestos in Demolition Rubble	Ingestion/inhalation	Site/Construction Workers Future residents
BaP in Made Ground	Direct Contact	Services

Potential pollutant linkages have also been identified for lead and PAH's in relation to the construction workers and end users, with a potential risk from the organic contamination identified to new service pipes. The asbestos identified was in a stockpile, so this can be removed from site, prior to construction, to mitigate the risk.

22 Discussion and Conclusions

On the basis of the investigation and testing to date the following conclusions can be made.

1. The Topsoil tested from the southern field was free from significant contamination.
2. The Made Ground observed in the northern and eastern parts of the site was found to be contaminated with lead, in particular, and BaP at times; one of the samples tested reported an elevated concentration of arsenic. Some remediation will be required where gardens coincide with Made Ground. At this stage, allow for 600mm of clean cover in private gardens.
3. The natural samples analysed were free from significant contamination which suggests that the contamination in the Made Ground isn't mobile and a risk to the groundwater. Some surface water sampling is recommended to assess whether this is being impacted by the Made Ground on site, although the risk is considered low at this stage.
4. The River Ver does not appear to be impacted from the contamination on site, which concurs with the immobile contamination identified in the soil during the investigation.
5. As discussed, the levels of lead recorded are generally high and considered a risk to the end-users and contractors. The contractors should be provided with the contamination results for their own health and safety review. It is anticipated, however, that good basic site practices, such as providing washing facilities and wearing the appropriate PPE will mitigate the risk. This should, however, be confirmed by the contractors as part of their health and safety assessment.
6. A single piece of suspected asbestos containing roof tiles was noted in rubble around TP20 in the north of site and this stockpile should be removed by appropriately qualified contractors to a suitable tip. Other areas of similar rubble, should be anticipated.
7. Protecta-Line pipes should be allowed for at this stage, in areas of Made Ground.

As with any site, areas of contamination not identified during site investigation works may come to light in the course of redevelopment, including further demolition rubble elsewhere on site. Accordingly, a discovery strategy must be in place during the redevelopment to ensure that any hitherto unknown contamination is identified and dealt with in an appropriate manner. Depending on the nature of any such contamination, it may prove necessary to reassess the remedial strategy for the site

A formal remediation strategy and verification plan should be agreed with the regulatory authorities prior to commencement of any remedial works. Some further investigation may be requested in the north of the site, where access was restricted at times.

23 General Guidance

Allowance should be made for experienced verification of any remedial works.

It may be that specific local requirements apply to this site, of which we are not aware at this time.

In general terms, the workforce and general public should be protected from contact with contaminated material. There is a range of relevant documents published by the Health and Safety Executive, and organisations such as CIRIA, and the BRE.

F WASTE DISPOSAL

24 Introduction

The Landfill Directive, introduced to the UK via the Landfill Regulations (England and Wales) 2002 aims to reduce reliance on landfill as a disposal option. The Regulations include updated Waste Acceptance Criteria (WAC) as limit values for waste destined to various classes of landfill. The developer has a statutory responsibility under the Duty of Care Regulations of the Environmental Protection Act 1990 to ensure that contaminated soil and water is disposed of offsite to a suitably licensed waste management facility in a safe and approved manner.

To comply with the Duty of Care, all wastes taken off site, in solid or liquid form, must be handled by a registered waste carrier and be accompanied by a consignment note that describes the waste.

25 Preliminary Waste Classification and WAC Analysis

If arisings from the constructions works are intended for disposal, then there is a requirement to determine prior to disposal whether these would classify as:

- Hazardous
- Non hazardous

The current relevant waste legislation and technical guidance (WM3 v1.2.GB Oct 2021) on the assessment and classification of hazardous waste, sets out the requirement for classification and provides the basis for the methodology employed to ensure compliance with the regulations. This report sets out to fulfil the requirements of basic characterisation.

Waste classification indicates whether the material is hazardous or non-hazardous. If material is classified as non-hazardous, there is a choice of sending the material to a non-hazardous or an inert landfill (subject to meeting inert waste acceptance levels based on WAC analysis). Where the waste is classified as hazardous, WAC analysis will be required to demonstrate that the concentrations meet the acceptance levels for hazardous landfill or stable non-reactive hazardous (SNRH) landfill.

The List of Wastes (England) Regulations 2005 shows those wastes that are absolute entries (i.e. hazardous waste regardless of their concentration) and mirror entries (hazardous waste only if hazardous substances are present above the specified threshold concentrations). Section 17 of the List of Wastes relates to Construction and Demolition Wastes (including Excavated Soil from Contaminated Sites, stones and dredging spoil). Contaminated soil is a "mirror entry", and is not automatically assigned a hazardous or non-hazardous nature.

Instead, an assessment of the composition of the soil is undertaken to determine the concentrations of hazardous substances, and the waste classified accordingly. The assessment of contaminated soil to determine whether it is hazardous waste is dependent on the presence of "hazardous substances" exceeding particular thresholds.

26 Results of the Preliminary Assessment

The waste classification assessment has been undertaken using the results of the chemical analyses on the samples analysed. The classification of the materials was conducted using the concentration of each identified substance attributed to its 'worst-case' compound (where relevant), as per Environment Agency (EA) document WM3 v1.2.BG (2021) and The Classification, Labelling and Packaging of Substances and Mixtures Regulation 1272/2008 (CLP). The assessment was carried out using the HazWaste Online Toolkit. The details of the waste classification are presented in Appendix C.

The results of the chemical analysis carried out indicate that the recorded concentrations for PAHs, metals and TPH in the soils were generally low, with only one exceedance above the hazardous waste threshold recorded in TP20, in relation to elevated lead. No visible pieces or fibres of asbestos were recorded.

A summary of the assessment results is presented below:

Sample Location	Sample Depth (m bgl)	Material	Classification	EWC	Hazardous Properties
HA1	0.5m	Natural	Non-Hazardous	17 05 04	n/a
HA2	0.2m	Made Ground	Non-Hazardous	17 05 04	n/a
HA4	0.2m	Made Ground	Non-Hazardous	17 05 04	n/a
HA7	0.3m	Made Ground	Non-Hazardous	17 05 04	n/a
HA8	0.15m	Made Ground	Non-Hazardous	17 05 04	n/a
HA9	0.5m	Natural	Non-Hazardous	17 05 04	n/a
HA10	0.28m	Natural	Non-Hazardous	17 05 04	n/a
HA11	0.2m	Made Ground	Non-Hazardous	17 05 04	n/a
HA12	0.4m	Natural	Non-Hazardous	17 05 04	n/a
HA13	0.2m	Made Ground	Non-Hazardous	17 05 04	n/a
TP1	0.15m	Topsoil	Non-Hazardous	17 05 04	n/a
TP2	0.2m	Natural	Non-Hazardous	17 05 04	n/a
TP3	0.5m	Natural	Non-Hazardous	17 05 04	n/a
TP4	0.2m	Topsoil	Non-Hazardous	17 05 04	n/a
TP5	0.15m	Topsoil	Non-Hazardous	17 05 04	n/a
TP8	0.15m	Topsoil	Non-Hazardous	17 05 04	n/a
TP9	0.5m	Natural	Non-Hazardous	17 05 04	n/a
TP11	0.1m	Topsoil	Non-Hazardous	17 05 04	n/a
TP11	0.3m	Natural	Non-Hazardous	17 05 04	n/a
TP13	0.1m	Topsoil	Non-Hazardous	17 05 04	n/a
TP15	0.4m	Made Ground	Non-Hazardous	17 05 04	n/a
TP15	0.7m	Natural	Non-Hazardous	17 05 04	n/a
TP16	0.35m	Made Ground	Non-Hazardous	17 05 04	n/a
TP17	0.1m	Made Ground	Non-Hazardous	17 05 04	n/a
TP17	0.5m	Made Ground	Non-Hazardous	17 05 04	n/a
TP18*	0.4m	Made Ground	Non-Hazardous	17 05 04	n/a
TP19	0.2m	Made Ground	Non-Hazardous	17 05 04	n/a
TP20*	0.1m	Made Ground	Non-Hazardous	17 05 04	n/a
TP20	0.4m	Natural	Non-Hazardous	17 05 04	n/a
TP21	0.15m	Made Ground	Non-Hazardous	17 05 04	n/a
TP21	0.8m	Made Ground	Non-Hazardous	17 05 04	n/a
TP22	0.1m	Made Ground	Hazardous	17 05 03	HP7

*WAC analysis also carried out on these samples.

Based on the results of the chemical analysis with the exception of the made ground from TP22, the topsoil, natural soils and wider Made Ground soils are classified as Non-Hazardous with EWC code 17 05 04. The Made Ground in TP22 is classified as Hazardous with EWC code 17 05 03, due to hazard property HP7, carcinogenic. This report is presented in Appendix C.

27 Results of Waste Acceptance Criteria (WAC) Analysis

Waste Acceptance Criteria Analysis was also carried out on the two samples, (Made Ground TP18 @ 0.4m, TP20 @ 0.1m. The results of the WAC analysis are summarised below:

Made Ground (TP18 at 0.4m)

The WAC results indicate that the material should be disposed of as **Non-Hazardous** waste, due to the TOC/LOI content.

Made Ground (TP20 at 0.1m)

The WAC results indicate that the material should be disposed of as **Non-hazardous** waste, as it fails the inert criteria for TOC.

28 Recommendations

The chemical analyses undertaken in the course of this investigation have been used to carry out a preliminary waste classification of the materials on site. This report should be forwarded to waste receiving sites for their final decision. Additional testing and Waste Acceptance Criteria (WAC) testing may be needed for confirmation of material's classification.

If more significant contamination is encountered during the construction works, this may affect the waste classification.

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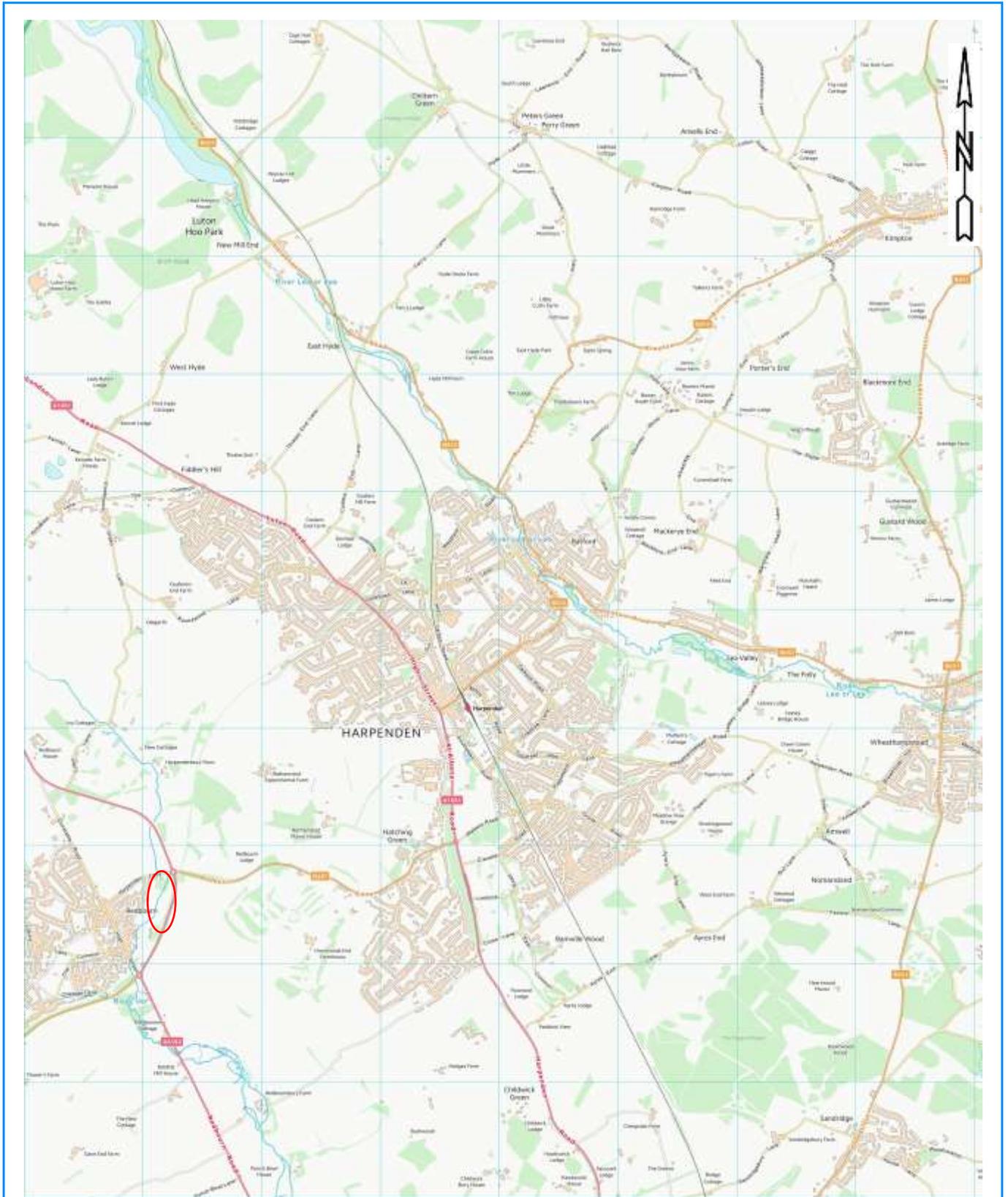
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APPENDIX A

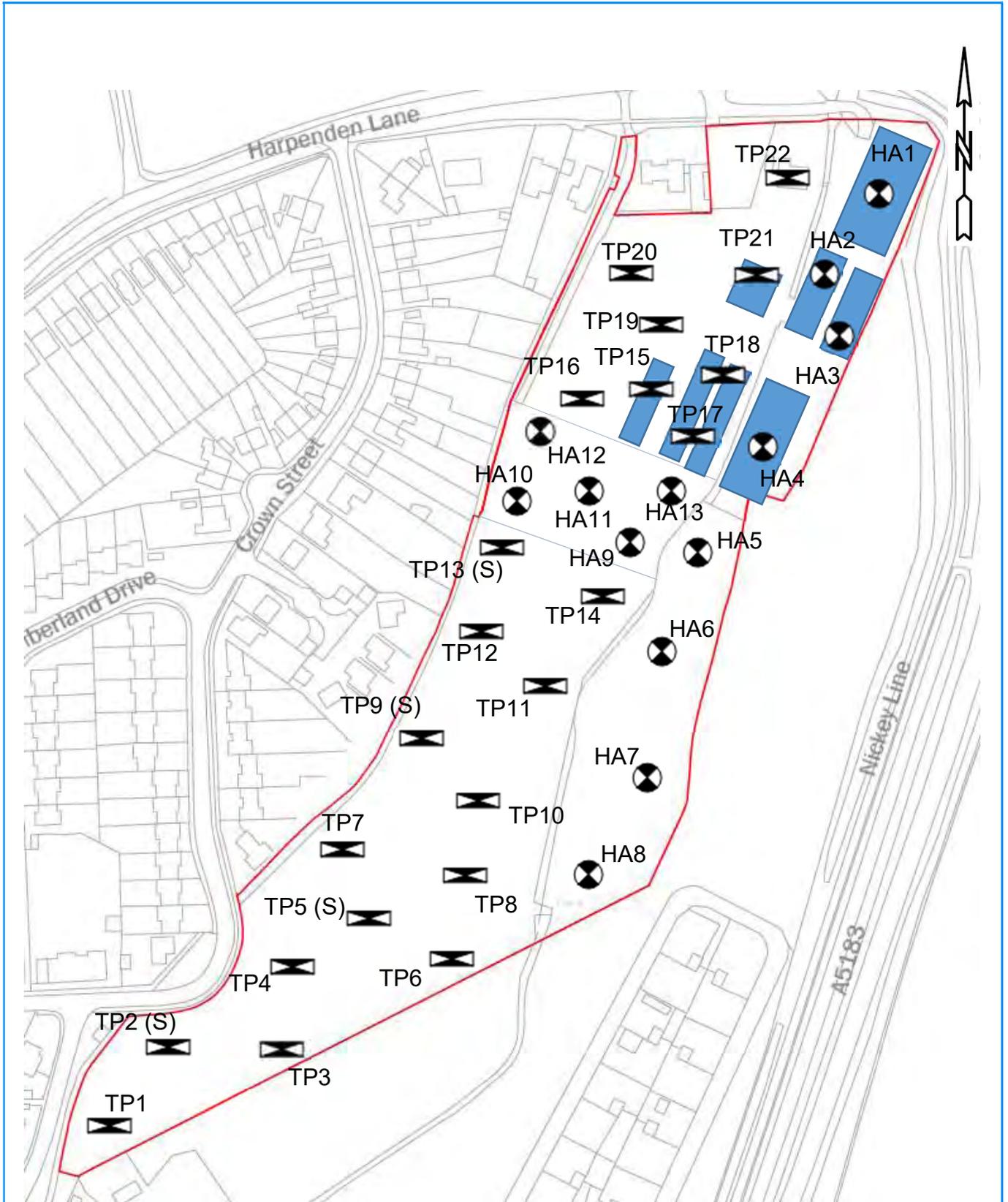
Site Plans and Exploratory
Hole Logs





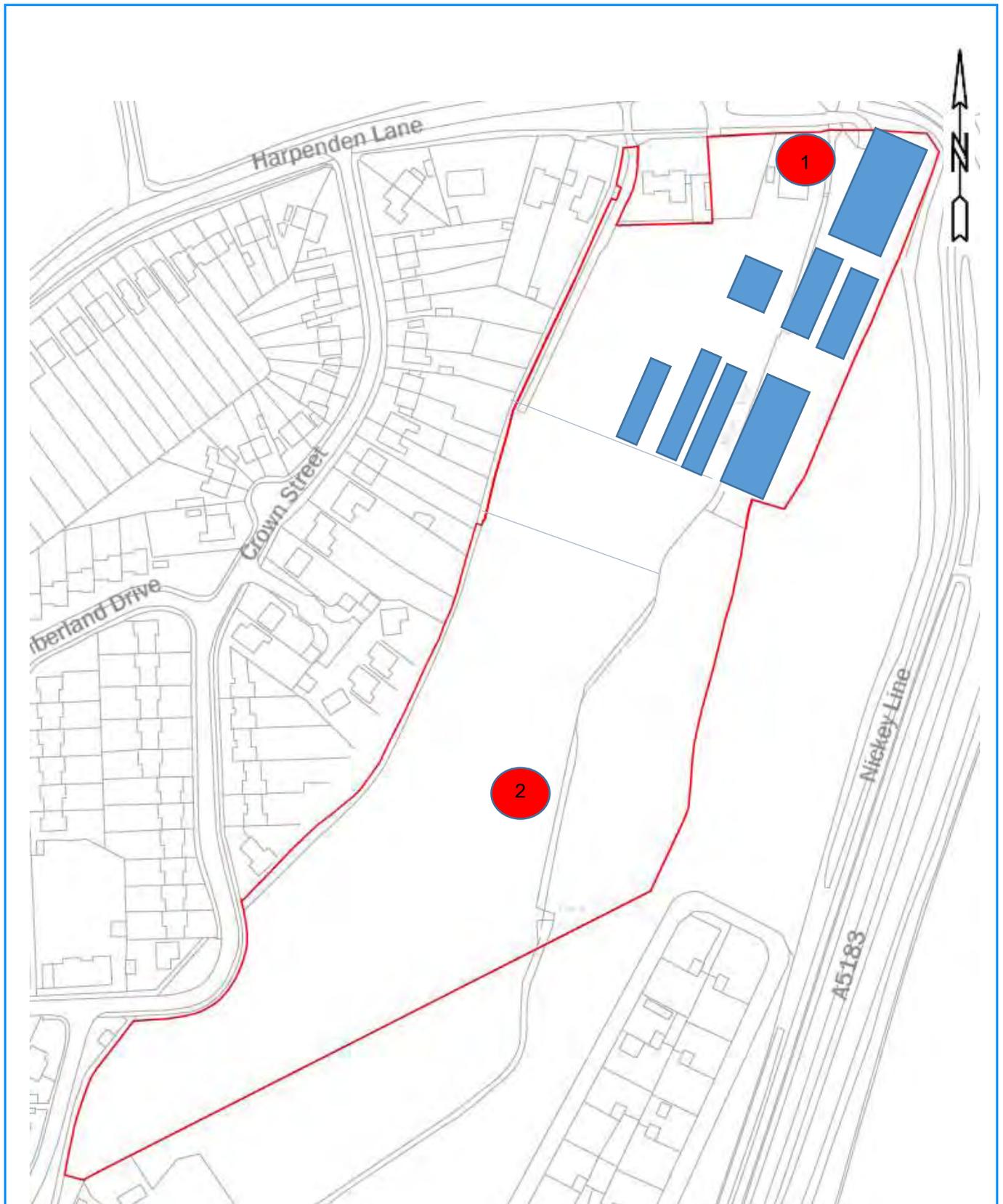
Contains Ordnance Survey Data © Crown Copyright and Database Right 2023

Site:	Harpenden Lane, Redbourn	Project ID	JN1847
Figure 1	Site Location Plan	Date:	15/11/23



NB: Positions of exploratory holes / test positions are only indicative unless dimensioned.

Site:	Harpenden Lane, Redbourn	Project ID	JN1847
Figure 1	Proposed Fieldwork Location Plan	Date:	06/11/2023



NB: Positions of exploratory holes / test positions are only indicative unless dimensioned.

Site:	Harpenden Lane, Redbourn	Project ID	JN1847
Figure 1	Surface Water Sample Location Plan	Date:	06/03/2024

Key to Exploratory Hole Logs, Plans and Sections

Backfill Symbols		Pipe Symbols		Principal Soil Types		Principal Rock Types		Drilling Records	
Arisings		Plain Pipe		Topsoil		Mudstone		Water Strike	
Concrete		Slotted Pipe		Made Ground		Claystone		Depth Water Rose	
Blacktop		Piezometer		Clay		Siltstone		Total Core Recovery (%) [TCR]	
Bentonite		Piezometer Tip		Silt		Sandstone		Solid Core Recovery (%) [SCR]	
Gravel Filter		Filter Tip		Sand		Limestone		Rock Quality Index (%) [RQI]	
Sand Filter		Extensometer		Gravel		Chalk		Fracture Index (fractures / m) [FI]	
		Inclinometers		Peat					

All soil and rock descriptions are in general accordance with BS5930 2015, BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003. Chalk descriptions are also based on CIRIA C574 and "Logging the Chalk – R.N. Mortimer 2015". The Geology Code is only provided where a positive identification of the sample strata has been made.

Location / Method Identifiers	
BH	Borehole (undefined)
CP	Cable Percussive
RC	Rotary Core
RO	Rotary Open Hole
ODC	Rotary Odex/Symmetrix drilling cased
CP+RC	Cable Percussive to Rotary Core
SNC	Sonic
CFA	Continuous Flight Auger
FA	Flight Auger
VC	Vibro Core
WLS+RC	Windowless (Dynamic) Sampler to Rotary Core
WLS	Windowless Sampler
WS	Window Sampler
HA	Hand Auger
C	Road / Pavement Core
IP	Inspection Pit (Hand Excavation)
TP	Trial Pit (Machine Excavated)
OP	Observation Pit (Supported Excavation Hand or Machine)

In-situ Test Location / Method	
DP	Dynamic Probe
CPT	Cone Penetration Test
CBR	In-situ CBR Test
DCP	CBR using Dynamic Cone Penetrometer
CBRT	CBR using TRL Probe
PB	Plate Bearing Test
SPT (S)	Standard Penetration Test (Split Barrel Sampler)
SPT (C)	Standard Penetration Test (Solid Cone)
N	SPT Result
-/-	Blows/Penetration (mm) after seating drive
-*/-	Total Blows / Penetration (mm)
()	Extrapolated Value
PPT	Perth Penetration (In-House Method - Equivalent N Value)
HP / UCS	Strength from Hand Penetrometer (kN/m ²)
IVN	Strength from Hand Vane ((kN/m ²) P = peak, R = residual)
PID	Photo Ionisation Detector (ppm)
MEXE	Mexi-Cone CBR (%)

Samples / Test Type	
B	Bulk Sample
BLK	Block Sample
C	Core Sample
CBRS	CBR Mould Sample
D	Small Disturbed Sample
ES	Environmental Sample (Soil)
EW	Environmental Sample (Water)
GS	Environmental Sample (Gas)

Samples / Test Type	
SPTLS	Standard Penetration Test Split Barrel Sample
TW	Thin Wall Push In Sample (e.g. Shelby Sampler)
U	Undisturbed Open Drive Sample (blows to take)
UT	Thin Wall Undisturbed Open Drive Sample (blows to take)
W	Water Sample (Geotechnical)
SP	Sample from Stockpile
P	Piston Sample
AMAL	Amalgamated Sample

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

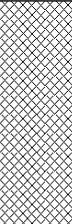
LM

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Well	Water Strikes	Samples and Insitu Testing			Progress		Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type/Fl	Results	Window Run					
		0.20	ES				(0.30)		MADE GROUND composed of grey-brown, silty, gravelly CLAY, with rootlets. Gravels consist of medium to coarse and cobble-sized, angular to subangular flint, brick, glass and pot fragments.	
						0.30	-0.30		Medium dense, grey-brown, silty, clayey, GRAVEL. Gravels consist of medium to coarse and cobble-sized, angular to subangular flint.	
		0.50	ES			0.50	-0.50		End of Borehole at 0.50m	

Remarks:

Hand auger terminated due to the presence of gravel.

Status:

FINAL

Log Print Date and Time:

08/01/2024 03:41

Log Approved By:

AM

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

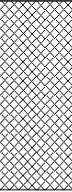
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Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Well	Water Strikes	Samples and Insitu Testing			Progress		Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type/Fl	Results	Window Run					
		0.20	ES			0.25 0.25	(0.25) (0.25)		MADE GROUND composed of slightly gravelly, silty CLAY, with rootlets. Gravels consist of fine to medium, subangular, flint, brick, glass and metal fragments.	
									CONCRETE surface hit. End of Borehole at 0.25m	

Remarks:

Hand auger terminated due to the presence of concrete surface.

Status:

FINAL

Log Print Date and Time:

08/01/2024 03:41

Log Approved By:

AM

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

LM

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Well	Water Strikes	Samples and Insitu Testing			Progress	Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type/Fl	Results	Window Run				
		0.20	ES						MADE GROUND composed of dark grey-brown, silty, gravelly CLAY, with rootlets. Gravels consist of fine to medium, subangular flint, glass and brick fragments.
					0.30 0.30	(0.30)			CONCRETE surface hit. End of Borehole at 0.30m

Remarks:

Hand auger terminated due to the presence of concrete.

Status:

FINAL

Log Print Date and Time:

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Log Approved By:

AM

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

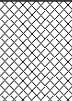
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Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Well	Water Strikes	Samples and Insitu Testing			Progress	Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type/Fl	Results	Window Run				
		0.10	ES			(0.15)		MADE GROUND composed of grey-brown, silty, gravelly CLAY, with rootlets. Gravels consist of fine to medium and cobble-sized, subangular flint, glass and brick fragments.	
						0.15	-0.15		Medium dense, grey-brown, silty, very clayey GRAVEL. Gravels consist of medium to coarse and cobble-sized, angular to subangular flint.
						0.25	-0.25		End of Borehole at 0.25m

Remarks:

Hand auger terminated due to the presence of gravel.

Status:

FINAL

Log Print Date and Time:

08/01/2024 03:41

Log Approved By:

AM

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

Logger:

0.00

LM

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Well	Water Strikes	Samples and Insitu Testing			Progress		Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type/Fl	Results	Window Run					
		0.10	ES				(0.35)		MADE GROUND composed of dark grey-brown, silty, gravelly CLAY, with rootlets. Gravels consist of fine to medium subangular flint, glass and brick fragments.	
		0.30	ES			0.35	-0.35		Medium dense, grey-brown, silty, very clayey GRAVEL. Gravels consist of medium to coarse and cobble-sized, angular to subangular flint.	
						0.45	-0.45		End of Borehole at 0.45m	

Remarks:

Hand auger terminated due to the presence of gravel.

Status:

FINAL

Log Print Date and Time:

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Log Approved By:

AM

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

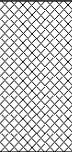
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Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Well	Water Strikes	Samples and Insitu Testing			Progress		Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type/Fl	Results	Window Run					
		0.15	ES			0.20	(0.20)		MADE GROUND composed of grey-brown silty, gravelly CLAY, with rootlets. Gravels consist of fine to coarse and occasional cobble-sized, subangular flints, brick and glass fragments.	
						0.20	-0.20		Medium dense, grey-brown, silty, very clayey GRAVEL. Gravels consist of medium to coarse and cobble-sized, angular to subangular flint.	
						0.30	-0.30		End of Borehole at 0.30m	

Remarks:

Hand auger terminated due to the presence of gravel.

Status:

FINAL

Log Print Date and Time:

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Log Approved By:

AM

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

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Logger:

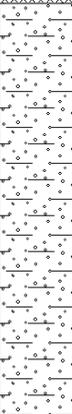
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Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Well	Water Strikes	Samples and Insitu Testing			Progress	Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type/Fl	Results	Window Run				
		0.10	ES			(0.30)		MADE GROUND composed of grey-brown, silty, gravelly CLAY, with rootlets. Gravels consist of fine to medium and cobble-sized, subangular to subrounded flint, blacktop and brick fragments.	
		0.50	ES			(0.55)		Stiff to firm, grey-brown, silty, sandy, gravelly CLAY, with rootlets. Gravels consist of fine to medium and cobble-sized, subangular flint.	
	▼					0.85	-0.85		End of Borehole at 0.85m

Remarks:

Groundwater struck at 0.56m. Hand auger terminated due to the presence of gravel.

Status:

FINAL

Log Print Date and Time:

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Log Approved By:

AM

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

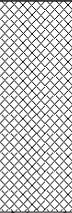
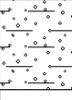
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Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Well	Water Strikes	Samples and Insitu Testing			Progress	Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type/Fl	Results	Window Run				
		0.10	ES			(0.28)		MADE GROUND composed of grey-brown, silty, gravelly CLAY, with rootlets. GRAVELS consist of fine to medium and cobble-sized, subangular flint and brick fragments.	
		0.28	ES			0.28	-0.28 (0.12)		Medium dense, grey-brown, silty, sandy, clayey GRAVEL, with rootlets. Gravels consist of fine to medium and cobble-sized, subangular flint.
						0.40	-0.40		End of Borehole at 0.40m

Remarks:

Hand auger terminated due to the presence of gravel.

Status:

FINAL

Log Print Date and Time:

08/01/2024 03:41

Log Approved By:

AM

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

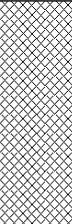
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Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Well	Water Strikes	Samples and Insitu Testing			Progress	Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type/Fl	Results	Window Run				
		0.20	ES				(0.30)		MADE GROUND composed of grey-brown, silty, gravelly CLAY, with rootlets. GRAVELS consist of fine to medium and cobble-sized flint and brick fragments.
					0.30	-0.30	(0.10)		Medium dense, grey-brown, silty, sandy, clayey GRAVEL, with rootlets. Gravels consist of fine to medium and cobble-sized, subangular flint.
					0.40	-0.40			End of Borehole at 0.40m

Remarks:

Hand auger terminated due to the presence of gravel.

Status:

FINAL

Log Print Date and Time:

08/01/2024 03:41

Log Approved By:

AM

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

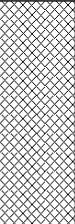
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Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Well	Water Strikes	Samples and Insitu Testing			Progress	Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type/Fl	Results	Window Run				
		0.10	ES			(0.30)		MADE GROUND composed of grey-brown, silty, gravelly CLAY, with rootlets. Gravels are composed of medium to coarse and cobble-sized, subangular, flint, brick, pot and glass fragments.	
		0.40	ES			-0.30 (0.10) -0.40		Medium dense, grey-brown, silty, sandy, clayey GRAVEL, with rootlets. Gravels consist of fine to medium and cobble-sized, subangular flint.	
								End of Borehole at 0.40m	

1

2

Remarks:

Hand auger terminated due to the presence of gravel.

Status:

FINAL

Log Print Date and Time:

08/01/2024 03:41

Log Approved By:

AM

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

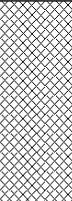
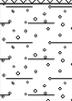
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Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Well	Water Strikes	Samples and Insitu Testing			Progress	Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type/Fl	Results	Window Run				
		0.20	ES			(0.27)		MADE GROUND composed of grey-brown, silty, gravelly CLAY, with rootlets. Gravels are composed of medium to coarse and cobble-sized, subangular, flint, brick, pot and glass fragments.	
						0.27	-0.27		Medium dense, grey-brown, silty, sandy, clayey GRAVEL, with rootlets. Gravels consist of fine to medium and cobble-sized, subangular flint.
						0.40	-0.40		End of Borehole at 0.40m

1

2

Remarks:

Hand auger terminated due to the presence of gravel.

Status:

FINAL

Log Print Date and Time:

08/01/2024 03:41

Log Approved By:

AM

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.15	ES		-0.20	(0.20)		0.20	Dark brown black friable silty sandy gravelly clayey TOPSOIL. Gravels consist of fine to medium subangular flint.
			-0.30	(0.10)		0.30	Soft brown silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular flint.
0.50	ES		-0.60	(0.30)		0.60	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
Pit terminated at 0.60m							

1
2
3
4

Pit Dimension (m)		Pit Stability:	Sides of pit began to collapse due to ground water at 0.6m bgl.		Water Strikes		
Width:		Weather:			Depth (m)	Date/Time	Remarks
Length:		Remarks:					
Depth:	0.60	Trial pit terminated due to ground water flooding the pit and causing instability.					
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM		

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

JoW

Project Name:

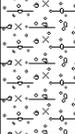
Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description	
Depth (m bgl)	Type	Results						
0.05	ES		-0.10	(0.10)		0.10	Dark brown black silty very sandy gravelly clayey TOPSOIL. Gravels consist of fine to medium subangular flint and subrounded sandstone. Soft dark brown silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular flint and subrounded sandstone. Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.	
0.20	ES		-0.30	(0.20)		0.30		
0.40	ES			(0.50)				
			-0.80			0.80		
							Pit terminated at 0.80m	

Pit Dimension (m)		Pit Stability:	The pit was stable to a depth of 0.8m bgl.		Water Strikes		
Width:		Weather:			Depth (m)	Date/Time	Remarks
Length:		Remarks: Trial pit terminated as the soakage test conducted needed to be above the ground water table.			0.50	13/12/2023 00:00:00	
Depth:	0.80						
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM		

				Start - End Date: 12/12/2023		Project ID: JN1847		Hole Type: TP		TP03 Sheet 1 of 1	
Client: Martin Grant Homes				Co-ordinates:				Level (m AOD) 0.00		Logger: JoW	
Project Name: Harpenden Lane, Redbourn				Location: Land off Harpenden Lane, Redbourn							
Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description				
Depth (m bgl)	Type	Results									
0.10	ES		-0.20	(0.20)		0.20	Brown friable silty sandy gravelly clayey TOPSOIL. Gravels consist of fine to medium subangular flints.				
0.50	ES		-0.60	(0.40)		0.60	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.				
							Pit terminated at 0.60m				
Pit Dimension (m)		Pit Stability:		Trial pit terminated due to ground water flooding the pit and causing instability.			Water Strikes				
		Weather:					Depth (m)	Date/Time	Remarks		
Width:		Remarks:					0.50	12/12/2023 00:00:00			
Length:		Trial pit terminated due to ground water flooding the pit and causing instability.									
Depth:	0.60										
Status:		FINAL		Log Print Date and Time:		08/01/2024 03:41		Log Approved By:		AM	

Client:

Martin Grant Homes

Co-ordinates:
Level (m AOD)
Logger:

0.00

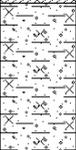
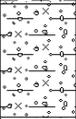
JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.20	ES		-0.30	(0.30)		0.30	Dark brown black friable silty sandy gravelly clayey TOPSOIL. Gravels consist of fine to medium subangular flint.
0.50	ES		-0.70	(0.40)		0.70	Soft dark brown silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular flint.
0.90	ES		-1.00	(0.30)		1.00	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
							Pit terminated at 1.00m

Pit Dimension (m)		Pit Stability:	Pit was stable to a depth of 1.0m bgl.		Water Strikes		
Width:		Weather:			Depth (m)	Date/Time	Remarks
Length:		Remarks:			0.80	14/12/2023 00:00:00	
Depth:	1.00						
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM		

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

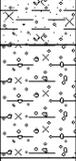
JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.15	ES		-0.20	(0.20)		0.20	Dark brown black silty very sandy gravelly clayey TOPSOIL. Gravels consist of fine to medium subangular flint.
0.30	ES			-0.40		(0.20)	0.40
0.70	ES		-0.70	(0.30)		0.70	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
Pit terminated at 0.70m							

Pit Dimension (m)		Pit Stability:	The pit was stable to a depth of 0.7m bgl.		Water Strikes			
Weather:					Depth (m)	Date/Time	Remarks	
Width:		Remarks: Trial pit terminated early so the soakage test could be conducted above the ground water.						
Length:								
Depth:	0.70							
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM			

				Start - End Date:		Project ID:		Hole Type:		TP06		
				14/12/2023		JN1847		TP		Sheet 1 of 1		
Client:			Martin Grant Homes				Co-ordinates:		Level (m AOD)		Logger:	
Project Name:			Harpenden Lane, Redbourn				Location:		0.00		JoW	
Location:			Land off Harpenden Lane, Redbourn									
Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description					
Depth (m bgl)	Type	Results										
0.10	ES		-0.20	(0.20)		0.20	Dark brown black friable silty sandy gravelly clayey TOPSOIL. Gravels consist of fine to medium subangular flint.					
0.25	ES		-0.40	(0.20)		0.40	Soft brown silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular flint.					
			-0.50	(0.10)		0.50	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.					
							Pit terminated at 0.50m					
Pit Dimension (m)			Pit Stability:			Trial pit terminated due to ground water flooding the pit and causing instability.			Water Strikes			
Weather:						Depth (m)		Date/Time		Remarks		
Width:						0.70		14/12/2023 00:00:00				
Length:												
Depth:			0.50									
Status:			FINAL			Log Print Date and Time:		08/01/2024 03:41		Log Approved By:		
										AM		

Client:

Martin Grant Homes

Co-ordinates:
Level (m AOD)
Logger:

0.00

JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.15	ES		-0.30	(0.30)		0.30	Dark brown black friable silty sand gravelly clayey TOPSOIL. Gravels consist of fine to medium subangular flint.
0.40	ES		-0.50	(0.20)		0.50	Soft dark brown silty very sandy gravelly CLAY. Gravels consist of fine to medium flint and subrounded sandstone
1.00	ES		-1.00	(0.50)		1.00	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
							Pit terminated at 1.00m

Pit Dimension (m)		Pit Stability:	The pit was stable to a depth of 1.0m bgl		Water Strikes		
Width:		Weather:			Depth (m)	Date/Time	Remarks
Length:		Remarks: Ground water encountered at 0.9m bgl.			0.90	14/12/2023 00:00:00	
Depth:	1.00						
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM		

Client:

Martin Grant Homes

Co-ordinates:
Level (m AOD)
Logger:

0.00

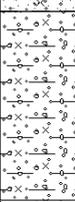
JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.15	ES		-0.30	(0.30)		0.30	Brown friable silty sandy gravelly clayey TOPSOIL. Gravels consist of fine to medium subangular flint.
0.40	ES		-0.50	(0.20)		0.50	Soft to firm dark brown silty sandy gravelly CLAY. Gravels consist of fine to medium subangular flint.
0.70	ES		-1.00	(0.50)		1.00	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
							Pit terminated at 1.00m

Pit Dimension (m)		Pit Stability:	The pit was stable to a depth of 1.0m bgl.		Water Strikes		
		Weather:			Depth (m)	Date/Time	Remarks
Width:		Remarks: Groundwater encountered at 0.8m bgl.			0.80	12/12/2023 00:00:00	
Length:							
Depth:	1.00						
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM		

Client:

Martin Grant Homes

Co-ordinates:
Level (m AOD)
Logger:

0.00

JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.10	ES		-0.20	(0.20)		0.20	Dark brown black silty very sandy gravelly clayey TOPSOIL. Gravels consist of fine to medium subangular flint.
0.30	ES		-0.50	(0.30)		0.50	Soft brown silty sandy gravelly CLAY. Gravels consist of fine to medium subangular flint.
0.60	ES		-0.70	(0.20)		0.70	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
Pit terminated at 0.70m							

Pit Dimension (m)		Pit Stability:	The pit was stable to a depth of 0.7m bgl.		Water Strikes			
		Weather:			Depth (m)	Date/Time	Remarks	
Width:		Remarks: The trial pit terminated early as the soakage test needed to be conducted above the ground water.						
Length:								
Depth:	0.70							
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM			

				Start - End Date: 14/12/2023		Project ID: JN1847		Hole Type: TP		TP10 Sheet 1 of 1	
Client: Martin Grant Homes				Co-ordinates:		Level (m AOD): 0.00		Logger: JoW			
Project Name: Harpenden Lane, Redbourn				Location: Land off Harpenden Lane, Redbourn							
Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description				
Depth (m bgl)	Type	Results									
0.05			-0.10	(0.10)		0.10	Dark brown black silty sandy gravelly CLAY. Gravels consist of fine to medium subangular flint.				
			-0.30	(0.20)		0.30	Soft dark brown silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular flint.				
				(0.30)			Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.				
0.60			-0.60			0.60	Pit terminated at 0.60m				
Pit Dimension (m)		Pit Stability: Trial pit terminated due to ground water flooding the pit and causing instability.		Water Strikes							
Width:		Weather:		Depth (m)			Date/Time		Remarks		
Length:		Remarks: Trial pit terminated due to ground water flooding the pit and causing instability.		0.40			14/12/2023 00:00:00				
Depth: 0.60											
Status: FINAL		Log Print Date and Time: 08/01/2024 03:41		Log Approved By:		AM					

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.10	ES		-0.20	(0.20)		0.20	Dark brown black friable silty sandy gravelly CLAY. Gravels consist of fine to medium subangular flint.
0.30	ES		-0.35	(0.15)		0.35	Soft cream brown silty very sandy very gravelly CLAY. Gravels consist of fine to coarse subangular flint and subrounded gravel.
			-0.50	(0.15)		0.50	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
Pit terminated at 0.50m							

Pit Dimension (m)		Pit Stability:	Trial pit terminated due to ground water flooding the pit and causing instability.		Water Strikes	
Width:		Weather:		Depth (m)	Date/Time	Remarks
Length:		Remarks:	Trial pit terminated due to ground water flooding the pit and causing instability.		0.35	14/12/2023 00:00:00
Depth:	0.50					
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM	

Client:

Martin Grant Homes

Co-ordinates:
Level (m AOD)
Logger:

0.00

JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.20	ES		-0.20	(0.20)		0.20	Black brown friable silty sandy gravelly clayey TOPSOIL. Gravels consist of fine to medium subangular flint and subrounded sandstone.
0.40	ES			(0.80)			Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
			-1.00			1.00	Pit terminated at 1.00m

Pit Dimension (m)		Pit Stability:	Trial pit was stable to a depth of 1.0m bgl.		Water Strikes		
		Weather:			Depth (m)	Date/Time	Remarks
Width:		Remarks: Groundwater encountered at 0.8m bgl.			0.80	12/12/2023 00:00:00	
Length:							
Depth:	1.00						
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM		

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

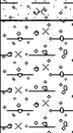
JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.10	ES		-0.20	(0.20)		0.20	Dark brown black silty sandy gravelly clayey TOPSOIL. Gravels consist of fine to medium subangular flint.
0.30	ES		-0.50	(0.30)		0.50	soft to firm dark brown silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular flint and subrounded sandstone.
0.80	ES		-0.80	(0.30)		0.80	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
Pit terminated at 0.80m							

Pit Dimension (m)		Pit Stability:	Trial pit terminated due to ground water flooding the pit and causing instability.		Water Strikes		
		Weather:			Depth (m)	Date/Time	Remarks
Width:		Remarks:					
Length:		Trial pit terminated due to ground water flooding the pit and causing instability.					
Depth:	0.80						
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM		

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

Logger:

0.00

JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.10	ES		-0.20	(0.20)		0.20	DARK brown friable silty sandy gravelly clayey TOPSOIL. Gravels consist of fine to medium subangular flint.
0.25	ES		-0.30	(0.10)		0.30	Soft dark brown silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular flint and subrounded sandstone.
			-0.60	(0.30)		0.60	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
Pit terminated at 0.60m							

Pit Dimension (m)		Pit Stability:	Trial pit terminated due to ground water flooding the pit and causing instability.		Water Strikes	
Width:		Weather:		Depth (m)	Date/Time	Remarks
Length:		Remarks:	Trial pit terminated due to ground water flooding the pit and causing instability.		0.50	14/12/2023 00:00:00
Depth:	0.60					
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM	

Client:

Martin Grant Homes

Co-ordinates:
Level (m AOD)
Logger:

0.00

JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.40	ES		-0.50	(0.50)		0.50	MADE GROUND composed of dark brown black silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular brick, glass and porcelain.
0.70	ES		-1.00	(0.50)		1.00	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
							Pit terminated at 1.00m

Pit Dimension (m)		Pit Stability:	The trial pit was stable to a depth of 1.0m bgl.		Water Strikes			
		Weather:			Depth (m)	Date/Time	Remarks	
Width:		Remarks:						
Length:								
Depth:	1.00							
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM			

Client:

Martin Grant Homes

Co-ordinates:
Level (m AOD)
Logger:

0.00

JoW

Project Name:

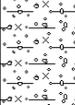
Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.25	ES		-0.35	(0.35)		0.35	MADE GROUND composed of dark brown black silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular brick.
0.90	ES		-1.00	(0.65)		1.00	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
							Pit terminated at 1.00m

Pit Dimension (m)		Pit Stability:	The trial pit was stable to 1.0m bgl.		Water Strikes			
		Weather:			Depth (m)	Date/Time	Remarks	
Width:		Remarks:						
Length:								
Depth:	1.00							
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM			

				Start - End Date: 12/12/2023		Project ID: JN1847		Hole Type: TP		TP17 Sheet 1 of 1	
				Client: Martin Grant Homes				Co-ordinates:		Level (m AOD): 0.00	
Project Name: Harpenden Lane, Redbourn				Location: Land off Harpenden Lane, Redbourn							
Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description				
Depth (m bgl)	Type	Results									
0.10	ES		-0.70	(0.70)		0.70	MADE GROUND composed of dark brown black silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular glass, brick, plastic and porcelain.				
0.50	ES						-1.00	(0.30)		1.00	Loose cream brown silty clayey sandy fine to cobbly GRAVEL. Gravels consist of subangular flint and subrounded sandstone.
0.85	ES		Pit terminated at 1.00m								
Pit Dimension (m)			Pit Stability: The trial pit was stable to a depth of 1.0m bgl.			Water Strikes					
Weather:						Depth (m)	Date/Time	Remarks			
Width:			Remarks: Ground water at 0.8m bgl.			0.70	12/12/2023 00:00:00				
Length:											
Depth:	1.00										
Status: FINAL			Log Print Date and Time: 08/01/2024 03:41			Log Approved By:			AM		

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

Logger:

0.00

JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.10	ES		-0.20	(0.20)		0.20	MADE GROUND composed of dark brown black silty very sandy gravelly CLAY with rootlets. Gravels consist of fine to medium subangular glass, plastic and porcelain.
0.40	ES			(0.80)		1.00	MADE GROUND composed of black brown silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular glass, brick and porcelain.
							Pit terminated at 1.00m

Pit Dimension (m)		Pit Stability:	The trial pit was stable to a depth of 1.0m bgl.		Water Strikes			
		Weather:			Depth (m)	Date/Time	Remarks	
Width:		Remarks:						
Length:								
Depth:	1.00							
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41		Log Approved By:	AM		

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

Logger:

0.00

JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.20	ES		-0.30	(0.30)		0.30	MADE GROUND composed of dark brown black silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular brick and porcelain.
0.60	ES		-1.00	(0.70)		1.00	Loose cream brown silty very clayey sandy fine to coarse GRAVEL. Gravels consist of fine to cobbly subangular flint and subrounded sandstone.
							Pit terminated at 1.00m

Pit Dimension (m)		Pit Stability:	The trial pit was stable to a depth of 1.0m bgl.		Water Strikes			
		Weather:			Depth (m)	Date/Time	Remarks	
Width:		Remarks:						
Length:								
Depth:	1.00							
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM			

Client:

Martin Grant Homes

Co-ordinates:

Level (m AOD)

0.00

Logger:

JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.10	ES		-0.20	(0.20)		0.20	MADE GROUND composed of dark brown black silty very sandy gravelly CLAY. Gravels consist of fine to medium subangular brick, glass and porcelain.
0.40	ES			(0.80)		1.00	Loose cream brown silty clayey very sandy fine to coarse GRAVEL. Gravels consist of subangular flint with occasional cobbles.
							Pit terminated at 1.00m

Pit Dimension (m)		Pit Stability:	The pit was stable to a depth of 1.0m bgl.		Water Strikes		
Width:		Weather:		Depth (m)	Date/Time	Remarks	
Length:		Remarks: Groundwater encountered at 1.0m bgl.			1.00	12/12/2023 00:00:00	
Depth:	1.00						
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM		

Client:

Martin Grant Homes

Co-ordinates:
Level (m AOD)
Logger:

0.00

JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.15	ES			(1.00)			MADE GROUND composed of dark brown black silty very gravelly fine to coarse SAND. Gravels consist of fine to medium subangular porcelain, brick and glass.
0.80	ES		-1.00			1.00	

Pit Dimension (m)		Pit Stability:	The trial pit was a stable to a depth of 1.0m bgl.		Water Strikes		
Width:		Weather:			Depth (m)	Date/Time	Remarks
Length:		Remarks: Groundwater encountered at 0.8m bgl.			0.80	12/12/2023 00:00:00	
Depth:	1.00						
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:	AM		

Client:

Martin Grant Homes

Co-ordinates:
Level (m AOD)
Logger:

0.00

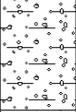
JoW

Project Name:

Harpenden Lane, Redbourn

Location:

Land off Harpenden Lane, Redbourn

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m bgl)	Type	Results					
0.10	ES		-0.35	(0.35)		0.35	MADE GROUND composed of dark brown black friable silty very sand gravelly CLAY. Gravels consist of fine to medium subangular brick, glass, plastic, porcelain and flint.
0.50	ES		-0.70	(0.35)		0.70	MADE GROUND composed of light brown silty very clayey gravelly fine to coarse SAND. Gravels consist of fine to coarse subangular brick, glass and flint.
0.90	ES		-1.00	(0.30)		1.00	Loose cream brown silty clayey very sandy GRAVEL. Gravels consist of fine to cobbly subangular flint and subrounded sandstone.
Pit terminated at 1.00m							

Pit Dimension (m)		Pit Stability:	Water Strikes	
Width:		Weather:	Depth (m)	Date/Time
Length:		Remarks: Groundwater encountered at 0.8m bgl.	0.80	12/12/2023 00:00:00
Depth:	1.00		Remarks	
Status:	FINAL	Log Print Date and Time:	08/01/2024 03:41	Log Approved By:
				AM



APPENDIX B

**Field Sampling and In-Situ
Test Methods and Results**

B

Soil and Rock Descriptions

All soil and rock descriptions are in general accordance with BS5930 Ref [4].

Anthropogenic soils ('made ground' or 'fill') describe materials which have been placed by man and can be divided into those composed of reworked natural soils and those composed of or containing man-made materials. 'Fill' is used to describe material placed in a controlled manner and 'made ground' is used to describe materials placed without strict engineering control.

The classification of materials such as topsoil is based on visual description only and should not be interpreted to mean that the material complies with criteria used in BS 3882 Ref [25].

Chalk descriptions are based on CIRIA C574 Ref [26] and Mortimore Ref [27].

The geology code is only provided on logs where a positive identification of the sample strata has been made.

Trial Pits and Trenches

Trial pits and trenches are unsupported excavations, mechanically excavated by machine to the required depth to enable visual examination, in situ testing and sampling as required from outside the excavation.

Disturbed Samples

Disturbed samples were taken from exploratory holes in general accordance with BS 5930 [4] and BS EN ISO 22475-1 Ref [28] as required and stored in appropriately labelled containers. Details of the type, size and depth of sample will be recorded within the exploratory hole record. Such samples can be regarded as being between Class 5 up to Class 3 quality depending upon their method of sampling.

Open-tube Samples

Open-tube samples were taken within cohesive soils in general accordance with BS 5930 [4] and BS EN ISO 22475-1 Ref [28]. Details of the type, size and depth of sample will be recorded within the exploratory hole record. The open-tube samples were sealed with wax and had end caps fitted before transport from site. Open tube samples are typically of Class 2 or Class 1 quality depending upon the soil type, sampling technique and sampler used.

Environmental Samples

Environmental samples were taken from the boreholes at regular intervals in the made ground and natural soils as indicated on the exploratory hole logs. The sampling strategy was in general accordance with BS10175 Ref [5] and BS ISO 18400 Refs [29], [30], [31], [32] & [33].

These samples were collected and stored in glass jars or plastic pots and transferred to the laboratory in cool boxes as appropriate to the proposed laboratory testing.

Soakage Tests (after BRE DG365 2016)

The BRE DG365 Ref [18] paper on soakaway design allows for the design of trench soakaways as well as traditional square and circular soakaways.

The test to measure the soil infiltration rate is carried out in pits which are excavated to the full depth of the proposed soakaway. The trial pits are filled and allowed to drain to empty or near empty, three times, on the same day or on consecutive days. Water levels are recorded against time. Where the sides are unstable the pit should be filled with granular material to provide stability during the test.

Calculated soakage rates are expressed as l/m²/minute, which is a convenient rate to use. The BRE use a unit of m/sec, which is the value in l/m²/minute divided by 60,000.

Soakage Test (after NHBC Standards Chapter 5.3)

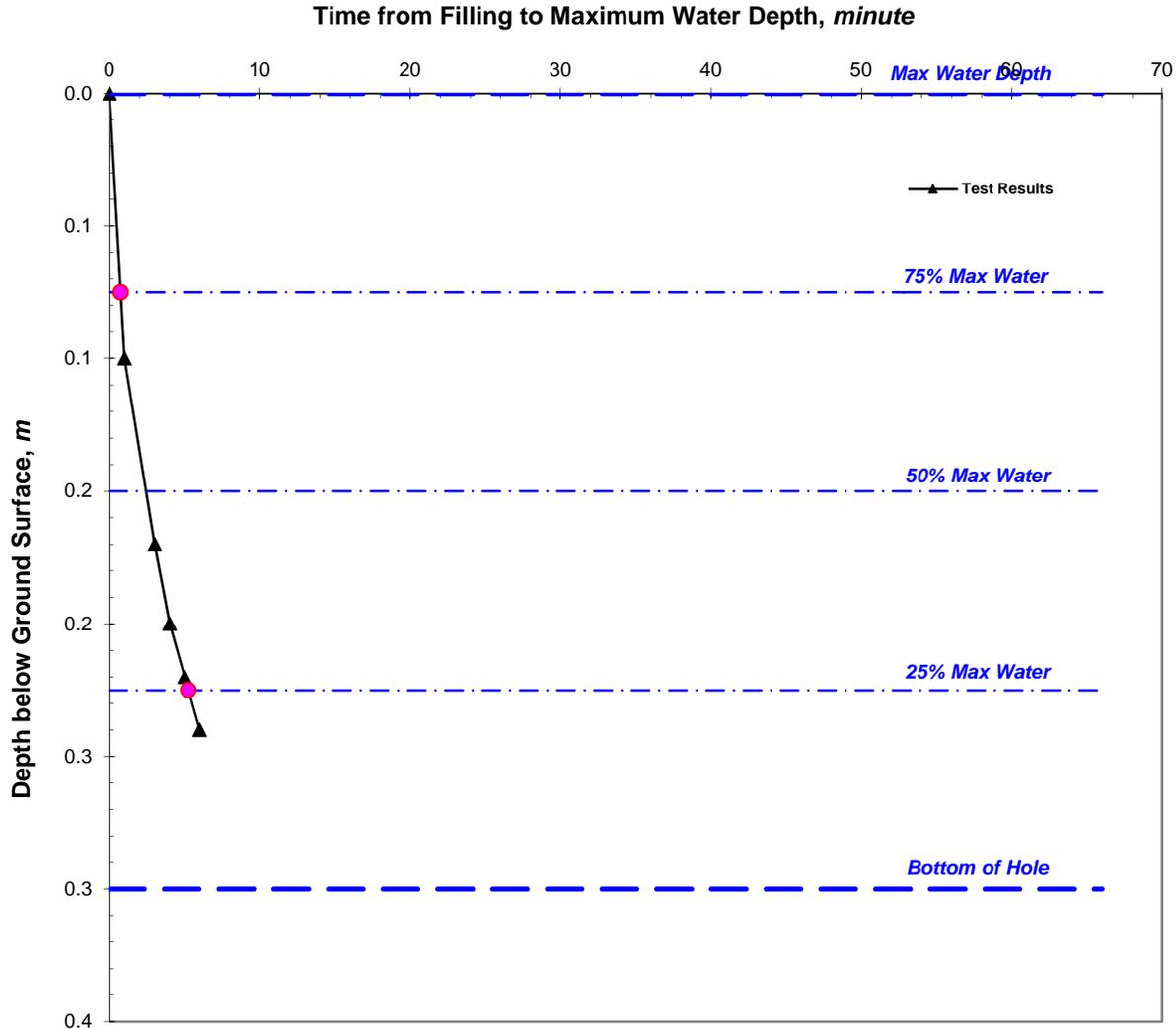
The above test Ref [34] refers to small-scale soakage tests that can be performed in areas with restricted access e.g. occupied houses, or where disturbance is to be kept to a minimum. The aim is to measure the time it takes for a set quantity of water to drain from a standard sized excavation. The results from which are used to design a soakaway chamber. However, if the test results prove inconclusive, it may be advisable to retest the soils using the larger scale BRE DG365 test method Ref [18].

The procedure involves drilling a 150 mm diameter hole to a depth of 1.5m or more. Perforated casing is installed in the hole with a sand filter surround. Water is added to a depth of 300 mm, and a record kept of the falling water level.

The test result is expressed as the time in minutes for the water level to drop the full 300 mm, and required soakaway sizes and depths are obtained from graphs in NHBC 5.3. If the water does not completely soak away in the time available then a graphical plot of water level versus logarithm of time is prepared. The test time is then obtained by extrapolation.

BRE Digest DG365 Soakage Test

Test Hole No: 2
 Test No: Test No 1 (Initial)



Pit Length, m	1.100	Depth to Water at Start of Test, m	0.000
Pit Width, m	0.450	Max Water Dropdown during Test, m	0.240
Depth to Pit Base, m	0.300	Total Soakage Test Time, min	66.0
Depth to Top of Permeable Soils, m	0.200	Mean Internal Discharge Area, m ²	0.799
Depth to Groundwater Surface, m	0.300	Discharge Rate, litre/min	0.460
Depth to Top of Granular Fill, m	0.000	Soakage Rate, litre/m ² /min	0.577
Voids Assumed for Granular Fill, %	40%	BRE Soil Infiltration Rate, m/sec	9.61E-06

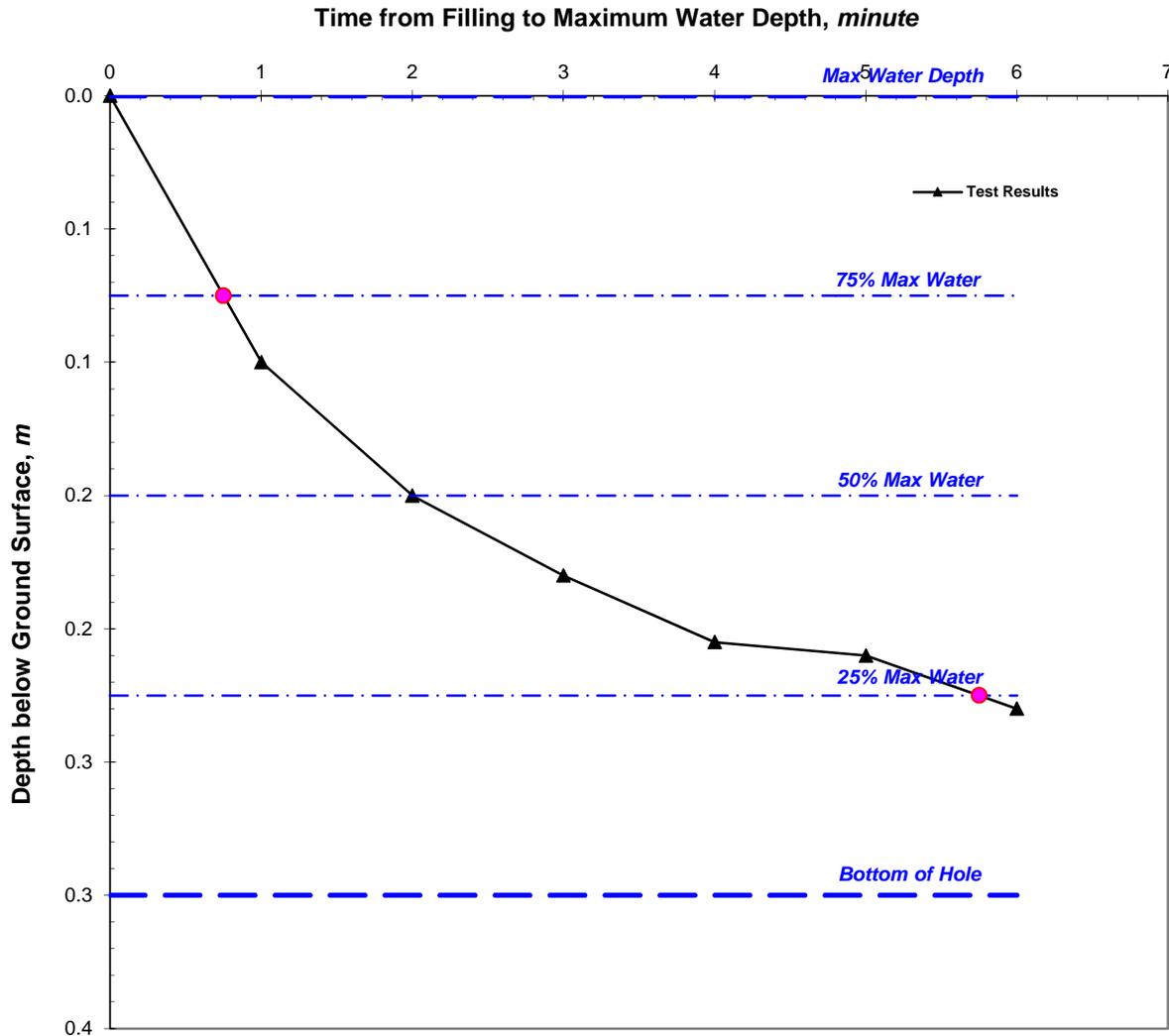
Comments:

Pit was nearly emptied at finish of test.

Client: Martin Grant Homes Limited	Job No: JN1847	Test Date: 13/Dec/2023
Site: Land off Harpenden Lane, Redbourn	Tested By: PB	Engineer: JoW Fig. S1

BRE Digest DG365 Soakage Test

Test Hole No: 2
 Test No: Test No 2 (Repeated)



Pit Length, m	1.100	Depth to Water at Start of Test, m	0.000
Pit Width, m	0.450	Max Water Dropdown during Test, m	0.230
Depth to Pit Base, m	0.300	Total Soakage Test Time, min	6.0
Depth to Top of Permeable Soils, m	0.200	Mean Internal Discharge Area, m ²	0.799
Depth to Groundwater Surface, m	0.300	Discharge Rate, litre/min	5.940
Depth to Top of Granular Fill, m	0.000	Soakage Rate, litre/m ² /min	7.44
Voids Assumed for Granular Fill, %	40%	BRE Soil Infiltration Rate, m/sec	1.24E-04

Comments:
Pit was nearly emptied at finish of test.

Client: Martin Grant Homes Limited	Job No: JN1847	Test Date: 13/Dec/2023
Site: Land off Harpenden Lane, Redbourn	Tested By: PB	Engineer: JoW Fig. S2