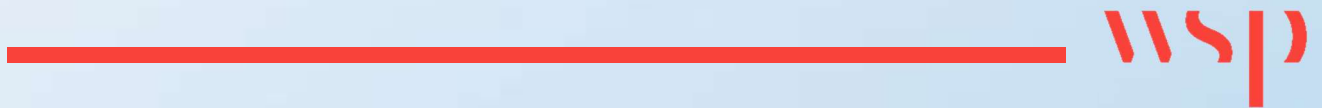


Appendix D

OMNIA GEOPHYSICAL SITE INVESTIGATION REPORT





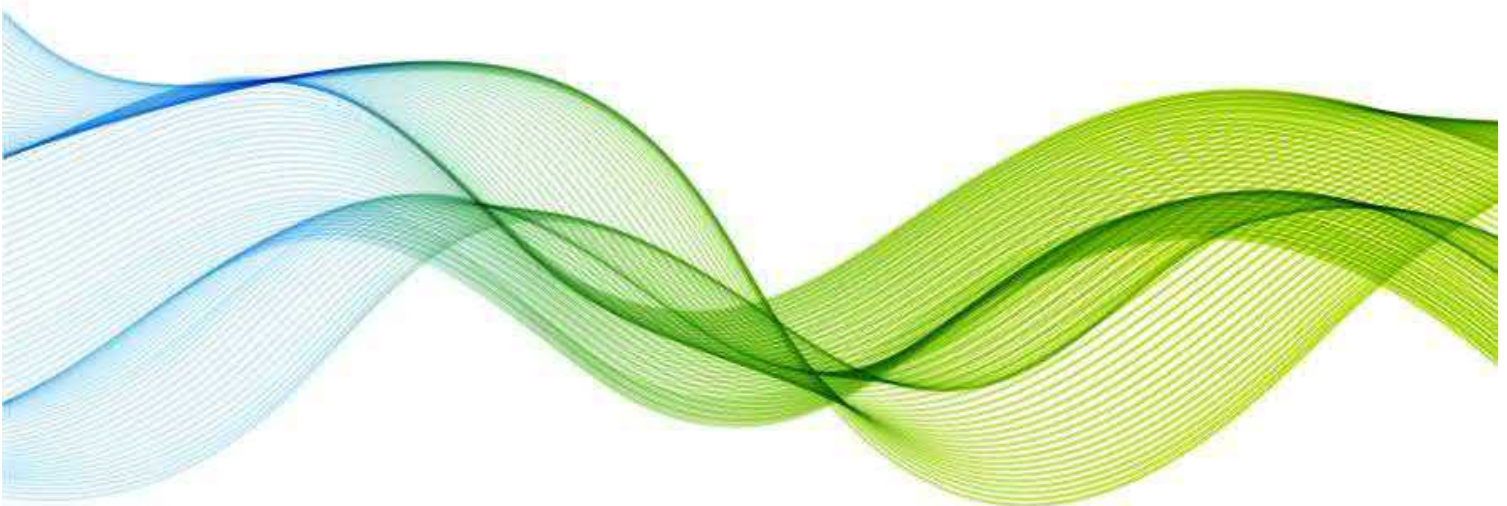
**Phase II
Geo-Environmental Site Assessment**

Land south of Nine Mile Ride, Finchampstead, Reading, RG40 3QD

*Prepared for:
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May 2023

Omnia ref: A12057/1.0



ISO Accredited Certification (UKAS)



QUALITY ASSURANCE

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May 2023					
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Air Quality

Executive Summary	
Site Address	Land south of Nine Mile Ride, Finchampstead, Reading, RG40 3QD
National Grid Reference	480159, 164793
Site Area	Approximately 1.9ha
Current Site Use	The site consists of two (2no.) residential houses with associated parking and private gardens within the northern extent of the site. The central and southern extents of the site are configured as mature woodland.
Revised Conceptual Site Model	
Elevated concentrations of Arsenic, Benzo(b)Fluoranthene, and Benzo(a)Pyrene, have been identified within the north-eastern extent of the site. As proposed soft landscaping is proposed on-site, an active pollution pathway remains. Further works are required to investigate the lateral extent of the identified contaminants.	
Preliminary Ground Gas Classification	
The site is provisionally classified as CS-1 under BS 8485(2015)+A1(2019). It is considered that ground gas protection measures are not required on the site.	
However, this assessment should be treated as preliminary until additional ground gas monitoring has been undertaken during the summer months and monitoring data free from the impact of shallow groundwater has been obtained.	
Concrete Classification	
The Camberley Sand Formation is classified under the BRE Special Digest (2005) threshold as DS-1, AC-2z for natural ground conditions. The Windlesham Formation is classified under the BRE Special Digest (2005) threshold as DS-1, AC-2z for natural ground conditions.	
Soakaway Testing	
The site may prove suitable for conventional shallow soakaway design within the locations of SA201 and SA201. It is recommended that the calculated infiltration rates are provided to a suitability qualified drainage engineer. The application of soakaway drainage will ultimately be dependent on the specific requirements of the development. All soakaways should be designed in accordance with BRE Special Digest 365-Soakaway Design.	
Geotechnical Assessment	
<u>Geology</u> Ground conditions during the intrusive works were broadly in line with the published BGS mapping. No superficial deposits were encountered. The solid geology comprised the Camberley Sand Formation (recovered as slightly silty SAND) centrally and to the south, with deposits attributed to the Windlesham Formation (recovered as Clays and Sands) within the northern extent of the site where the Camberley Sand is not mapped. <u>Shallow Foundations</u> At this stage it is considered that bearing capacities at depths from 1.00-2.00m bgl are potentially suitable for shallow foundations for standard low-rise housing units bearing into the Windlesham Formation and/or Camberley Sand Formation, providing minimum allowable bearing capacities of 100-500kN/m² for granular soils. Where cohesive soils have been encountered within the Windlesham Formation, SPT equivalent undrained shear strengths of between 108kN/m² and 225kN/m² were determined, indicating medium to high strength material respectively. Based on an undrained shear strength of 108kN/m², the cohesive Windlesham deposits are expected to provide a presumed bearing value of 200-400kN/m² for a traditional strip foundation of 1.00m. <u>Deep Foundations</u> Preliminary pile calculations show pile lengths of 5.00-8.00m of varying diameters may provide bearing resistances of between 73kN/m² and 346kN/m². <u>NHBC Chapter 4.2</u> A minimum foundation depth of 1.00m bgl is anticipated for a High Volume Change soil within the Windlesham Formation outside the zone of tree influence, in accordance with NHBC. Where foundations are likely to be within the influence of trees foundation depths will require locally deepening.	

Groundwater

Shallow groundwater (<1m bgl) has been identified on site during intrusive works and return monitoring visits. Consideration should be given that if groundwater is below the base of the foundation at a depth of less than the width of the proposed foundation, then groundwater can significantly reduce the bearing capacity of fine-grained soils.

Recommendations

Environmental

Following the Tier 1 Human Health Risk assessment, elevated concentrations of Arsenic and PAH have been identified in the vicinity of locations within the north-eastern extent of the site. An active pollution pathway is considered to have the potential to remain active within areas of proposed soft landscaping and private gardens. It is therefore recommended that a delineation exercise be undertaken in the vicinity of locations WS104 and WS105 to investigate the lateral extent of elevated concentrations of Arsenic and PAHs, to determine the requirement for, and extent of, remedial works.

If during the development stage any evidence of contamination is identified, works should be halted, and contact made with a suitably qualified Environmental Consultant. As determined appropriate by the Consultant, further investigation and sampling may be required to determine the appropriate actions. Upon completion contact should be made with the regulator to achieve sign off of the works.

Geotechnical

It is recommended that a detailed foundation design report is produced for the site once detailed design has been finalised and detailed loadings are known.

Foundation design should be completed by a suitably qualified Structural Engineer, with specific consideration given to areas of variable soil strength.

Where possible foundations should be placed in strata of similar bearing or variable ground conditions compensated for accordingly to avoid potential differential settlement. Subject to regulatory requirements, the potential requirement exists to calculate bearing capacities and undertake settlement analysis for foundations through production of a Geotechnical Design Report (GDR) which would provide calculations to EC7.

TABLE OF CONTENTS

Quality Assurance	ii
Table of Contents.....	iv
1 INTRODUCTION	7
1.1 Background	7
1.2 Proposed Development	7
1.3 Objectives	7
1.4 Sources of Information	8
1.5 Limitations	8
1.6 Confidentiality	8
2 SITE SETTING	9
2.1 Site Details	9
2.2 Current Site Use	9
2.2.1 Site Description	9
2.2.2 Hazardous Materials Storage	10
2.2.3 Potential Asbestos Containing Material (PACM)	10
2.2.4 Waste Storage	10
2.2.5 Tree Species	10
2.2.6 Potential Invasive Species	10
2.3 Surrounding Area	10
3 SITE INVESTIGATION	12
3.1 General	12
3.2 Scope Adjustments	13
3.3 Laboratory Analysis	13
3.4 Ground Gas and Groundwater Monitoring	14
4 GROUND AND GROUNDWATER CONDITIONS	15
4.1 Summary of Ground Conditions	15
4.1.1 Topsoil	15
4.1.2 Bedrock Deposits	15
4.1.3 Groundwater Conditions	16
4.2 Laboratory Classification Analysis	16
4.2.1 Soil Plasticity	16
4.2.2 Particle Size Distribution Analysis	17
4.2.3 Bulk and Dry Density	18
4.2.4 pH and Sulphate	18
4.3 In-Situ Testing	19
4.3.1 Standard Penetration Tests (SPT)	19
4.4 Soil Infiltration Testing – Falling Head Permeability Test	19
4.5 Permeability Testing – Falling Head Tests within Installed Boreholes	21
4.5.1 Ground Gas	21
5 TIER 1 QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT	23
5.1 Human Health Risk Assessment	23
5.1.1 Heavy Metals	24
5.1.2 PAH	25
5.2 Discussion of Tier 1 Results	25
5.3 Controlled Waters Assessment	26
5.4 Preliminary Ground Gas Assessment	26

5.5.1	BS 8485(2015)+A1(2019) – Type A Building – Private Ownership with no Building Management Controls	27
5.5.2	BS 8485(2015)+A1(2019) – Type B Building – Private Ownership with Central Building Management	27
6	REVISED CONCEPTUAL SITE MODEL	28
7	GEOTECHNICAL ASSESSMENT	29
7.1	Proposed Development	29
7.2	Site Preparation	29
7.3	Ground Profile	29
7.4	Foundations Assessment	30
7.4.1	In Situ-Testing	30
7.4.2	Shear Strength	31
7.4.3	Shallow Foundation Bearing Capacities	32
7.5	Deep Foundation Assessment	33
7.6	Groundwater Levels	34
7.7	Building Near Trees	34
7.7.1	NHBC Minimum Depth to Foundations	34
7.7.2	Lateral pressure and heave	35
7.8	Shallow Excavations	36
7.9	Ground Floor Slabs	36
7.10	Concrete Durability	36
7.11	Discussion	36
8	CONCLUSIONS AND RECOMMENDATIONS	37
	APPENDIX I - LIMITATIONS	39
	APPENDIX II – GLOSSARY	41
	APPENDIX III - DRAWINGS	44
	APPENDIX IV - PHOTOGRAPHS	45
	APPENDIX V - EXPLORATORY HOLE LOGS	50
	APPENDIX VI - CHEMICAL ANALYSIS CERTIFICATES	51
	APPENDIX VII - ORIGIN OF GAC VALUES	52
	APPENDIX VIII - GEOTECHNICAL ANALYSIS CERTIFICATES	53
	APPENDIX IX – SOIL INFILTRATION TEST CERTIFICATES	54
	APPENDIX X – FALLING HEAD TEST PERMEABILITY CERTIFICATES	55

Tables

Table 2-1 Site Details	9
Table 2-2 Land Use	11
Table 3-1 Site Investigation Summary	12
Table 4-1. Summary of Groundwater Conditions	16
Table 4-2. Summary of Soil Plasticity	17
Table 4-3. Summary of Particle Size Distribution (Wet Sieve)	17
Table 4-4 Summary of Particle Size Distribution (Sedimentation)	18
Table 4-5. Summary of Bulk and Dry Density	18
Table 4-6. Summary of pH and Sulphate Data	18
Table 4-7. Summary of Soil Infiltration Testing	19
Table 4-8 Falling Head Testing Permeability Rate Summary	21
Table 4-9. Summary of Ground Gas and Groundwater Monitoring Results	22
Table 5-1. Summary of Inorganic and Hydrocarbon Toxicity Assessment for a Residential End Use with	

Home Grown Produce	23
Table 6-1 Revised Conceptual Site Model	28
Table 7-1 Summary of site ground conditions	29
Table 7-2. Pile Resistances bearing– Augered Pile	33
<i>Table 7-3 Minimum depth of foundations (after NHBC 2021)</i>	35
Table 7-4 New tree planting (after NHBC 2021)	35

1 INTRODUCTION

1.1 Background

Omnia have been commissioned by Kingacre Estates Limited to undertake a Phase II Geo-Environmental Investigation at the site of Land south of Nine Mile Ride, Finchampstead, Reading, RG40 3QD, in order to obtain Geo-Environmental and Geotechnical information to assist with the sale of the above referenced site.

The site has been subject to three (3no.) phases of intrusive works by Omnia throughout April and May 2023. These are summarised below:

First Phase under Fee Proposal Ref: A12057/230405/L1 dated 7th April 2023

Initial intrusive works comprising five (5no.) window sample boreholes, nine (9no.) shallow hand pits and two (2no.) soakaway test pits were undertaken on the 13th - 14th and 19th – 21st April 2023.

Second Phase under Fee Proposal Ref: A12057-1/230418/L1 dated 19th April 2023

Two (2no.) deeper boreholes were advanced within the rear gardens of the properties on site, with the aim of providing further geotechnical information to assist with potential piling on the site. This phase of works was undertaken on 2nd – 5th May 2023.

Third Phase under Fee Proposal Ref: A12057/230405/L1 dated 10th May 2023

Additional infiltration testing was required on site. The works comprised falling head tests within installed window sample boreholes, and two (2no.) further soakaway test pits undertaken as far south as possible. This phase of works was undertaken on the 15th and 17th – 19th May 2023.

A site location plan is presented as Figure 1.0 within Appendix III.

1.2 Proposed Development

It is understood that Kingacre Estates Limited (KEL) are currently looking to sell the subject site with residential redevelopment plans proposed by the prospective purchaser. Review of the proposed development plan indicates that plans include the demolition of the two (2no.) existing dwellings on site, and the construction of twenty-eight (28no.) residential units and a block of four (4no.) flats, all with associated private gardens, areas of public open space and infrastructure.

A preliminary proposed development site layout is presented as Figure 2.0 (Appendix III).

1.3 Objectives

The objectives of the Phase II Geo-Environmental Site Assessment are to:

- Undertake a site walkover and inspection, including interviews with site representatives if available;
- Undertake an assessment of the near surface through intrusive site investigation.
- Assess the implications of any potential environmental risks, liabilities and development

constraints associated with the site in relation to the future use of the site and in relation to off-site receptors;

- Provide a factual and interpretative report relating to the site and provide recommendations on any potential development issues with consideration of residential and environmental receptors;
- Provide general geotechnical characterisation, including outline recommendations for foundation options and engineering parameters; and,
- Provide soil infiltration certificates and soil design infiltration rates (if applicable).

1.4 Sources of Information

Background information was sought from the following sources:

- British Geological Survey (BGS) map for the site (Reading, Sheet 268, Solid and drift Edition at a scale of 1:50,000, 2000);
- Environment Agency flood designations, aquifer designations and groundwater source protection zones (<https://magic.defra.gov.uk/MagicMap.aspx>) [Accessed: 2023/05/17];
- British Standard BS10175:2011+A2:2017 – Investigation of Potentially Contaminated Sites – Code of Practice;
- British Standard BS5930:2015+A1:2020 – *Code of Practice for Ground Investigations*;
- British Standard BS1377-9:1990 Incorporating Amendment No. 1 – *Methods of Test for Soils for Civil Engineering Purposes – Part 9: In-situ Tests*;
- British Standard BS8485:2015+A1:2019 – *Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings*;
- CIRIA Publication C665 (2007). *Assessing Risks Posed by Hazardous Ground Gases to Buildings*;
- BRE Special Digest 1 (2005). *Concrete in Aggressive Ground*;
- Tomlinson, M.J. (2001). *Foundation Design and Construction*. 7th Edition. Pearson Prentice;
- NHBC Standards. Chapter 4.2 – *Building Near Trees* (2023); and,
- British Standard BS8004:2015 - *Code of Practice for Foundations*.

1.5 Limitations

The limitations of this report are presented in Appendix I.

1.6 Confidentiality

Omnia has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Omnia; a charge may be levied against such approval.

2 SITE SETTING

2.1 Site Details

Table 2-1 Site Details

Site Address	Land south of Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD
National Grid Reference	480159, 164793
Site Area	Approximately 1.9ha

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location plan is presented as Figure 1.0 (Appendix III).

2.2 Current Site Use

2.2.1 Site Description

The area of investigation is located approximately 1.6km northwest of Finchampstead Village Centre and was irregular in shape, covering an area of approximately 1.9ha. The site was accessed via two (2no.) separate access routes from the northern edge of site, which connects to Nine Mile Ride (B3430). The northern extent of the site consists of two (2no.) residential dwellings with associated driveways situated to the north of the properties, and associated gardens surrounding the houses. The remainder of the site (central and southern extents) comprised a dense area of woodland, which was accessed via the gardens of the two (2no.) properties.

House 1 (238 Nine Mile Ride)

Accessed via a gated driveway off of Nine Mile Ride, was a two (2no.) storey brick-built residential dwelling, with a single-storey garage on the eastern side of the house. The roof tiles were identified on both the garage and the house as ceramic, and timber framed porch was noted.

A gravel driveway/parking area was situated north of the property, and the gardens surrounded the property to the south and west. Centrally located within the garden was a pond approximately 1.00 x 1.00m (LxW).

One access route which led to the rear garden was through a narrow-paved passage (1.77m wide), which ran along the eastern side of the garage. There was a change in elevation of approximately 1.50m from the house to the rear garden. The western garden area was accessed via a paved footpath off the driveway to the west.

Boundaries to this property consisted of mature deciduous trees in all compass directions, with the addition of dense hedgerows on the eastern boundary between the two (2no.) properties.

House 2 (240 Nine Mile Ride)

Accessed via a private driveway off of Nine Mile Ride was a second brick-built two (2no.) storey residential dwelling with a slate roof. A detached single-storey garage was located to the northwest of the house. The driveway/parking area consisted of a tarmac surface, which was noted to be in good visual condition.

To the south of the property was a private garden, which was accessed via a passageway to the east of the house.

Boundaries to this property consisted of mature deciduous trees in all compass directions, with the addition of dense hedgerows on the western boundary between the two (2no.) properties.

Internal access into the two residential dwellings was not possible as they were occupied during the site investigation works.

Woodland Area

The remainder of the site boundary (central and southern extents) consisted of dense woodland. Trees typically comprised semi-mature to mature deciduous and coniferous trees ranging between 4-10m tall. The trees were mostly deciduous, however several pine trees were noted.

The woodland areas were accessible from both the rear gardens of the properties.

Relevant photographs from the site walk-over survey are in Appendix IV.

2.2.2 Hazardous Materials Storage

No hazardous materials storage was noted during the site walkover.

2.2.3 Potential Asbestos Containing Material (PACM)

Whilst there were no obvious signs of PACM noted during the site walkover, the exact ages of the buildings are unknown, and could pre-date the year 2000. They are therefore considered to have the potential to contain Asbestos Containing Materials (ACMs) within the building fabric. It is recommended that an asbestos survey is undertaken in accordance with the Control of Asbestos Regulations (2012) prior to the commencement of any refurbishment or demolition works.

2.2.4 Waste Storage

No waste storage was noted during the site walkover, but it is assumed that the properties are serviced by the local authority domestic waste collection service.

2.2.5 Tree Species

Deciduous trees, with few coniferous, were identified around the boundaries of the houses and within the woodland area. These were noted as being semi-mature to mature ranging between 4-10m tall.

2.2.6 Potential Invasive Species

During the site walkover no obvious signs of potential invasive species were identified.

2.3 Surrounding Area

The site is situated within a predominantly residential area. The surrounding land uses are summarised in Table 2-2 below:

Table 2-2 Land Use

Direction	Land Use
North	Nine Mile Ride (B3430), residential housing beyond
East	Residential housing
South	Woodland with sparse residential housing and open fields beyond
West	Woodland with residential housing beyond

3 SITE INVESTIGATION

3.1 General

A ground investigation was designed based on the clients' requirements as set out in the fee proposals listed within Section 1.1, taking into consideration the proposed site development as shown in Figure 2.0 (Appendix III).

All phases of exploratory fieldwork were conducted over thirteen (13no.) working days, with the first phase commencing on 13th April 2023. The intrusive works comprised the following:

Table 3-1 Site Investigation Summary

Proposal Reference	Potential Source/Rationale	Location Hole	Type	Maximum Depth (m bgl)	Borehole Response Zone (m bgl)
A12057/230405/L1 dated 7 th April 2023 (Works undertaken 13-14 th and 19-21 st April 2023)	To collect shallow soil samples within the dense woodland for chemical analysis.	HP101	Hand Pitting	0.60	N/A
		HP102		0.60	
		HP103		0.30	
		HP104		0.60	
		HP105		0.60	
		HP106		0.61	
		HP107		0.60	
		HP108		0.60	
		HP109		0.70	
	To investigate the geology on site, undertake in-situ SPT testing for geotechnical data, and for the collection of chemical and geotechnical samples for subsequent analysis.	WS101		2.20	
		WS104		2.50	
	To investigate the geology on site, undertake in-situ SPT testing for geotechnical data, and for the collection of chemical and geotechnical samples for subsequent analysis.	WS102	Windowless Sample drilling	3.00	0.60-2.60
		WS103		3.00	1.60-3.00
	To install monitoring wells to facilitate follow on ground gas monitoring in order to undertake a ground gas assessment of the site.	WS105		1.80	0.60-1.80
	To facilitate soakaway testing in order to provide design soil infiltration rates (if possible), and provide commentary on the feasibility of shallow soakaways on site.	SA101	Trial Pitting	1.60	N/A
		SA102		2.00	

Proposal Reference	Potential Source/Rationale	Location Hole	Type	Maximum Depth (m bgl)	Borehole Response Zone (m bgl)
A12057-1/ 230418/L1 dated 19 th April 2023 (Works undertaken 2-5 th May 2023)	To undertake deeper boreholes on site in order to investigate the geology, carry out in-situ SPT testing and to collect geotechnical samples in order to undertake a geotechnical assessment of the site.	BH101	Cable Percussive Drilling (GeoTool)	10.00	N/A
		BH102		9.00	
A12057/230405/L1 dated 10 th May 2023 (Works undertaken 15 th and 17-19 th May 2023)	To facilitate additional soakaway testing as far south as practicable, with the aim of targeting the Camberley Sand Formation to assess the feasibility of shallow soakaways within this section of the site.	SA201	Mechanical Excavator	1.40	N/A
		SA202		1.20	

3.2 Scope Adjustments

- Locations SA101 and SA102 were undertaken within the northwest extent of the site due to access constraints;
- The target depth for WS101-WS105 was 5.00m bgl, however these were all terminated <5.00m bgl due to SPT refusals whilst drilling; and,
- The target depth for BH101 and BH102 was 15.00m bgl, however due to barrel/SPT refusals boreholes were terminated at 10.00 and 9.00m bgl respectively.

The exploratory hole locations are illustrated on Figure 3.0 (Appendix III). The ground conditions encountered are indicated on the exploratory hole logs, which are provided in Appendix V.

3.3 Laboratory Analysis

Selected soil samples were submitted for a range of chemical analysis including:

- Asbestos Identification;
- CLEA Heavy Metals;
- Speciated Polycyclic Aromatic Hydrocarbons (PAH);
- Banded Gasoline Range Organics (GRO);
- Banded Extractable Petroleum Hydrocarbons (EPH);
- pH and Soluble Sulphate 2:1;
- Total Cyanide;
- Phenol; and,
- Total Organic Content.

Element Materials Technology of Deeside undertook the analytical work in accordance with UKAS accreditation where applicable and the laboratory analysis certificates are presented as Appendix VI and discussed in Section 5.

Selected soil samples were submitted to I2 Analytical for a range of geotechnical testing, in accordance with UKAS methodology where applicable, comprising:

- Moisture Content;
- Plasticity Index;
- pH;
- Sulphate (as SO₄) – Water soluble (Greenfield Pyrite Absent Suite);
- Atterberg Limits;
- Particle Size Distribution via the Wet Sieve Method; and,
- Particle Size Distribution via Sedimentation.

The geotechnical analysis certificates are presented in Appendix VIII.

3.4 Ground Gas and Groundwater Monitoring

Concentrations of methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂) were measured using an infrared gas analyser (GA5000), calibrated to a reference standard (before and after each survey) and gas flow rates were measured using an internal flow pod.

Gas concentrations were recorded at thirty second intervals until gas concentrations stabilised for three (3no.) consecutive readings (a minimum of ninety seconds) at each location, at which point the maximum concentrations of CH₄ and CO₂, together with the lowest concentration of O₂ were recorded.

Groundwater monitoring was undertaken using an electronic dip tape to record the depth to groundwater. Ground gas and groundwater results are presented in Section 4.5.1 and discussed in Section 5.3.

4 GROUND AND GROUNDWATER CONDITIONS

4.1 Summary of Ground Conditions

British Geological Survey (BGS) map for the site (Reading, Sheet 268, Solid and drift Edition at a scale of 1:50,000, 2000) indicates that there are no superficial deposits on site. The bedrock geology consists of the Camberley Sand Formation (Sand) across the majority of the site (central and south), overlying the Windlesham Formation (Sand, Silt and Clay), which is site wide. This is shown within Figure 4.0 presented in Appendix III.

The geology encountered on site generally corresponds with that highlighted within BGS Mapping.

4.1.1 Topsoil

Topsoil was identified from the ground surface within all of twenty (20no.) locations across the site. Topsoil was encountered to a maximum observed depth of 0.30mbgl (SA103, BH102) and typically comprised brown and grey slightly silty fine to coarse SAND with occasional roots and rootlets. Within locations WS103, WS104 and BH101 the Topsoil was described as slightly gravelly. Gravel was fine to medium subangular to rounded flint.

4.1.2 Bedrock Deposits

4.1.2.1 Camberley Sand Formation

Deposits attributed to the locally mapped Camberley Sand Formation were encountered within thirteen (13no.) positions (HP101-HP109, WS105, BH102 and SA201-SA202). These locations were located centrally and to the south, broadly in line with the published BGS mapping referenced above. The Camberley Sand Formation was encountered directly below Topsoil, between 0.10m (HP102) and 4.95mbgl (BH102) with a maximum recorded thickness of 4.65m (BH102). The deposits generally comprised:

- Light brown slightly silty fine to coarse SAND;
- Greyish brown slightly silty fine to coarse SAND;
- Orangish brown and dark brown silty fine to coarse SAND.

Locations HP102 and HP104 identified dark brown staining within the recovery.

4.1.2.2 Windlesham Formation

Deposits attributed to the Windlesham Formation were encountered within eight (8no.) positions (WS101-WS104, SA101-SA102 and BH101-BH102). These positions were located within the northern extent of the site, where the Camberley Sand is not mapped.

The Windlesham Formation was encountered directly beneath Topsoil within the north of the site, and beneath the Camberley Sand Formation at location BH102. The formation was encountered at a minimum depth of 0.15mbgl (WS101) and up to 10.00mbgl (BH101) with a maximum recorded thickness of 9.70m (BH101).

Deposits generally comprised:

- Bluish green clayey fine to coarse SAND;

- Orangish brown clayey fine to coarse SAND;
- Firm grey CLAY;
- Firm to stiff orangish brown sandy CLAY.

The base of the Windlesham Formation was not proven during this investigation.

4.1.3 Groundwater Conditions

Groundwater strikes and seepages were encountered during the investigation as summarised in Table 4-1:

Table 4-1. Summary of Groundwater Conditions

Location	Depth (m bgl)	Strata	Type of Water Strike
HP102	0.58 rising to 0.50 after 20 minutes	Camberley Sand Formation	Strike – slow inflow
HP104	0.60	Camberley Sand Formation	Seepage
HP106	0.60 rising to 0.58 after 20 minutes	Camberley Sand Formation	Strike – slow inflow
WS101	1.40	Windlesham Formation	Seepage – slow inflow
WS102	1.40	Windlesham Formation	Seepage – slow inflow
WS103	1.40	Windlesham Formation	Seepage – slow inflow
WS104	1.50 rising to 1.20 after 20 minutes	Windlesham Formation	Strike – slow to medium inflow
SA102	2.00m rising to 1.85 after 20 minutes	Windlesham Formation	Strike – slow inflow
BH102	3.00	Camberley Sand Formation	Seepage
	4.95		Wet recovery – assumed locally perched water above clay

A review of Table 4-1 suggests that groundwater beneath the site is shallow. This is consistent with the number of mapped surface water drainage ditches and mapped areas of surface water “issues” in close proximity to the subject site. Therefore, consideration should be given to the potential for shallow groundwater to be encountered during groundworks.

4.2 Laboratory Classification Analysis

Soil classification testing, including Atterberg Limits, Moisture Content, Particle Size Distribution and pH and Sulphate results are summarised in Table 4-2 – Table 4-6 with analysis certificates presented in Appendix VIII.

4.2.1 Soil Plasticity

Eight (8no.) samples taken from cohesive deposits across the site were submitted to the laboratory for laboratory plasticity analysis. The results of this analysis have been summarised in Table 4-2 below.

Table 4-2. Summary of Soil Plasticity

Location	Depth (m bgl)	Geology*	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Percentage passing 425µm sieve	Modified Plasticity Index	Plasticity	Volume Change Potential
WS101	1.90-2.00	WF	32	67	33	34	100	34	High	Medium
WS103	1.70-1.80	WF	29	53	25	28	100	28	High	Medium
SA101	0.80-1.50	WF	26	57	22	35	100	35	High	Medium
SA102	1.50-2.00	WF	30	49	24	25	100	25	Medium	Medium
BH101	5.90-6.00	WF	33	80	27	53	100	53	Very High	High
	6.60-6.70	WF	18	55	23	32	82	26.2	High	Medium
	7.30-7.40	WF	20	40	18	22	100	22	Medium	Medium
BH102	6.90-7.00	WF	20	48	17	31	100	31	Medium	Medium

*WF = Windlesham Formation

The results presented in Table 4-2 indicate that the fine-grained soils on site (Windlesham Formation) have shown to be of medium to very high plasticity with medium to high volume change potential.

4.2.2 Particle Size Distribution Analysis

Ten (10no.) soil samples were submitted to the laboratory for Particle Size Distribution (PSD) analysis via the wet sieve method, with the results presented below in Table 4-3. The results are typically consistent with the on-site observations and descriptions.

Table 4-3. Summary of Particle Size Distribution (Wet Sieve)

Location	Depth (m bgl)	Geology	Granulometric Composition (%)				
			Laboratory Description	Fines (<0.063mm)	Sand	Gravel	Cobbles
WS105	1.50-1.80	CSF	Yellowish Brown SAND	9	91	0	0
SA101	0.80-1.50	WF	Greenish grey clayey SAND	37	63	0	0
BH101	2.70-3.00	WF	Yellowish brown SAND	7	93	0	0
	8.50-9.00	WF	Yellowish brown clayey SAND	28	72	0	0
	9.50-9.70	WF	Yellowish brown clayey SAND	33	67	0	0
BH102	2.50-2.90	CSF	Brownish grey SAND	13	87	0	0
	4.60-4.90	CSF	Greyish brown clayey SAND	21	79	0	0
	5.40-5.60	WF	Greenish grey clayey SAND	30	70	1	0

Location	Depth (m bgl)	Geology	Granulometric Composition (%)				
			Laboratory Description	Fines (<0.063mm)	Sand	Gravel	Cobbles
	7.80-7.90	WF	Yellowish brown clayey SAND	34	65	0	0
	8.50-8.70	WF	Yellowish brown clayey SAND	27	73	0	0

*WF = Windlesham Formation; CSF = Camberley Sand Formation

One (1no.) soil sample was submitted to the laboratory for Particle Size Distribution (PSD) analysis via the sedimentation methodology, with the results presented below in Table 4-4.

Table 4-4 Summary of Particle Size Distribution (Sedimentation)

Location	Depth (m bgl)	Geology	Laboratory Description	Granulometric Composition (%)				
				Clay	Silt	Sand	Gravel	Cobbles
BH101	6.60-6.70	WF	Brown sandy CLAY	28	35	26	11	0

WF = Windlesham Formation

4.2.3 Bulk and Dry Density

Three (3no.) soil samples were submitted to the laboratory for bulk and dry density analysis, with the results presented below in Table 4-5.

Table 4-5. Summary of Bulk and Dry Density

Location	Depth (m bgl)	Moisture Content (%)	Density (Mg/m ³)	
			Bulk Density	Dry Density
BH101	2.70-3.00	22.5	1.67	1.36
BH102	4.60-4.90	25.1	1.70	1.36
BH102	5.40-5.60	28.0	2.01	1.57

4.2.4 pH and Sulphate

Chemical analysis for pH and soluble sulphate content are summarised in Table 4-6 below with analysis certificates presented as Appendix VIII.

Table 4-6. Summary of pH and Sulphate Data

Location	Depth (m bgl)	SO ₄ in 2:1 water / soil (mg/l)	pH Value
Camberley Sand Formation			
WS105	1.50-1.80	7.4	4.6
BH102	1.60-2.00	<1.3	5.2
BH102	2.50-2.90	<1.3	5.3
BH102	4.60-4.90	3.3	5.3
Windlesham Formation			
WS101	1.90-2.00	14.7	4.1
WS103	1.70-1.80	31.4	4.5
SA101	0.80-1.50	19.5	4.0
BH101	2.70-3.00	<1.3	5.6
BH101	7.30-7.40	9	5.1
BH101	9.50-9.70	7.6	4.8

Location	Depth (m bgl)	SO ₄ in 2:1 water / soil (mg/l)	pH Value
BH102	6.90-7.00	15.5	4.7

Camberley Sand Formation

Due to the size of the dataset (<5 samples), characteristic pH and SO₄ values were calculated using the highest measured sulphate concentrations and the lowest measured pH value as stated in the BRE Special Digest (2005) producing a site characteristic value for sulphate of 7.4 mg/l and a pH value of 4.6.

The Camberley Sand Formation is therefore classified under the BRE Special Digest (2005) threshold as DS-1, AC-2z for natural ground conditions.

Windlesham Formation

Due to the size of the dataset (5-9 samples), characteristic pH and SO₄ values were calculated using the mean of the highest two measured sulphate concentrations and the mean of the lowest two measured pH value as stated in the BRE Special Digest (2005) producing a site characteristic value for sulphate of 25.5 mg/l and a pH value of 4.05.

The Windlesham Formation is therefore classified under the BRE Special Digest (2005) threshold as DS-1, AC-2z for natural ground conditions.

4.3 In-Situ Testing

4.3.1 Standard Penetration Tests (SPT)

Standard Penetration Tests (SPT) were carried out in all boreholes in accordance with techniques outlined in BS1377, to assess the strength/density of the underlying strata. The 'N' value (number of blows per 300mm penetration) was recorded for each test. The results of these in-situ tests, including full blow counts, are presented on the borehole logs within Appendix V.

4.4 Soil Infiltration Testing – Falling Head Permeability Test

In-situ soil infiltration testing was undertaken in general accordance with BRE DG365 – *Soakaway Design* within the near surface at locations SA101 and SA102 within the first phase of intrusive works, and within locations SA201 and SA202 during the third phase of intrusive works. Soil Infiltration test certificates are presented as Appendix IX and summarised in Table 4-7 below.

Table 4-7. Summary of Soil Infiltration Testing

Location	Test Number	Pit Dimensions (L x W x D)	Depth to fill (m bgl)	Strata Type	Duration of test (hrs:mm)	Soil Infiltrations Rate (m/s)
SA101	1	2.40x0.35x1.60	0.60	SILT	49:02	N/A
SA102*	1	2.20x0.35x2.00	0.87	SILT	49:52	2.54 x 10 ⁻⁷
SA201	1	1.00x0.30x1.30	0.38	SAND	21:39	2.48 x 10 ⁻⁶
	2	1.00x0.30x1.30	0.31		24:05	2.29 x 10 ⁻⁶
	3	1.00x0.30x1.25	0.44		06:38	N/A
SA202	1	1.00x0.30x1.20	0.20	SAND	17:22	2.96 x 10 ⁻⁶

Location	Test Number	Pit Dimensions (L x W x D)	Depth to fill (m bgl)	Strata Type	Duration of test (hrs:mm)	Soil Infiltrations Rate (m/s)
	2	1.00x0.30x1.20	0.40		04:30	6.17×10^{-6}
	3	1.00x0.30x1.20	0.26		05:30	5.35×10^{-6}

Data from Test 1 of SA102 has been extrapolated to provide an **indicative infiltration rate due to the test reaching the 75% effective storage depth intercept and proximity to reaching the 25% effective storage depth intercept.*

SA101-SA102

Testing was undertaken at SA101 over a duration of 2,942 minutes (49hrs, 2 minutes) and SA102 over a duration of 2,992 minutes (49hrs, 52 minutes).

For SA101, the required 25% effective storage depth intercept was not reached, and as such the test was considered to be unsuccessful and a soil infiltration rate could not be calculated.

For SA102, due to the proximity of the test reaching its 25% effective storage depth, the data was extrapolated using a line of best fit for the linear part of the graph to provide an indicative soil infiltration rate. Extrapolation indicates that the 25% depth intercept would have been reached within 8095 minutes (134 hours, 55minutes). The indicative soil infiltration rate calculated was 2.54×10^{-7} m/s.

By reference to published data (Carter and Bentley, 1981), the above results indicate low permeability with poor drainage conditions. Therefore, it is considered unlikely that soils in the vicinity of Locations SA101 and SA102 will prove suitable for traditional soakaway drainage without specialised design.

SA201-SA202

Three (3no.) tests were undertaken in SA201 and SA202 over durations of between 270 minutes (4hours 30 minutes) and 1,445 minutes (24 hours 5 minutes).

For Tests 1-2 within SA201, the required 25% and 75% effective storage depths were reached, providing soil infiltration rates of 2.48×10^{-6} m/s and 2.29×10^{-6} m/s respectively. Test 3 was run for 6 hours 38 minutes, but in this test the required intercept depths were not reached and so a third soil infiltration rate could not be calculated.

For Tests 1-3 within SA202, the required 25% and 75% effective storage depths were reached, providing soil infiltration rates of between 6.17×10^{-6} m/s and 2.96×10^{-6} m/s.

By reference to published data (Carter and Bentley, 1981), the results of tests undertaken within SA201-SA202 are indicative of low permeability with good drainage conditions.

Given the above results, the soils in the vicinity of SA201 and SA202 may prove suitable for conventional soakaway design. It is recommended that the calculated infiltration rates are provided to a suitability qualified drainage engineer. The application of soakaway drainage will ultimately be dependent on the specific requirements of the development. All soakaways should be designed in accordance with BRE Special Digest 365-Soakaway Design.

The variation in results is likely due to the positioning of the soakaway test pit locations, with SA101-SA102 advanced within the Windlesham Formation in the northwest of the site, SA201-SA202 undertaken within the Camberley Sand Formation to the south of the on-site residential properties.

4.5 Permeability Testing – Falling Head Tests within Installed Boreholes

In order to provide further permeability data, falling head tests were undertaken in general accordance with BS 5930:1999+A1:2010 Para 25.4. Testing was undertaken on Monday 15th May 2023 in locations WS102, WS103 and WS105.

The permeability test certificates, including full time and depth data, are included within Appendix X.

Table 4-8 Falling Head Testing Permeability Rate Summary

Omnia Location Ref:	Test No.	Test Duration (Mins)	Test Interval (m bgl)	Geological Formation	Permeability Rate (k)
					m/s
WS102	Test 1	358	0.60-2.60	Windlesham Formation	5.43×10^{-6}
WS103	Test 1	386	1.60-3.00	Windlesham Formation	N/A
WS105	Test 1	43	0.60-1.80	Camberley Sand Formation	5.17×10^{-6}
	Test 2	60			4.23×10^{-6}
	Test 3	60			3.04×10^{-6}

A review of Table 4-8 indicates that the results of the falling head permeability tests yielded permeability rates of 5.43×10^{-6} m/s for the Windlesham Formation (WS102). A rate was not calculated for WS103 due to slow drainage during the testing period.

The results of the falling head permeability tests yielded permeability rates ranging from 3.04×10^{-6} to 5.17×10^{-6} m/s for the Camberley Sand Formation (WS105).

It is recommended that the calculated permeability rates are provided to a suitability qualified drainage engineer. The application of soakaway drainage will ultimately be dependent on the specific requirements of the development. All soakaways should be designed in accordance with BRE Special Digest 365-Soakaway Design.

4.5.1 Ground Gas

Three (3no.) ground gas and groundwater monitoring visits have been undertaken across three (3no.) monitoring wells at the site between 24/04/2023 and 19/05/2023. The results of the gas and groundwater monitoring are presented in Table 4-9 overleaf.

Table 4-9. Summary of Ground Gas and Groundwater Monitoring Results

Well	Date	CH ₄ Peak %v/v	CH ₄ Steady %v/v	CH ₄ GSV l/hr	CO ₂ Peak %v/v	CO ₂ Steady %v/v	CO ₂ GSV l/hr	O ₂ %v/v	Atmos (mb)	Atmos. Dynamic	Flow (l/hr)	Depth to Base (m bgl)	Depth to Water (m bgl)
WS102	21/04/2023	0.4	0.4	0.0004	3.7	2.1	0.0037	19.2	1003	Rising	<0.1	2.65	0.90
	28/04/2023*	<0.1	<0.1	0.0001	2.1	2.1	0.0021	18.5	1002	Rising	0.1	1.96	0.85
	05/05/2023*	<0.1	<0.1	0.0001	2.1	2.1	0.0021	17.8	1005	Falling	0.1	1.88	1.10
WS103	21/04/2023*	0.4	0.4	0.0004	3.6	0.6	0.0036	6.8	1002	Rising	<0.1	2.90	1.19
	28/04/2023*	<0.1	<0.1	0.0001	0.7	0.7	0.0007	20.1	1001	Rising	0.1	2.90	0.82
	05/05/2023*	<0.1	<0.1	0.0001	0.7	0.7	0.0007	19.9	1005	Falling	0.1	3.02	1.43
WS105	21/04/2023	Access not permitted											
	28/04/2023	<0.1	<0.1	0.0001	1.5	1.5	0.0015	19.7	1002	Rising	0.1	1.80	Dry
	05/05/2023	Access not permitted											
	15/05/2023	<0.1	<0.1	0.0001	1.9	1.9	0.0019	19.3	1011	Rising	0.1	1.80	Dry
	19/05/2023	<0.1	<0.1	0.0001	1.9	1.9	0.0019	19.1	1017	Falling	<0.1	1.71	Dry

*Please note, monitoring well was bailed prior to gas monitoring.

5 TIER 1 QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

Omnia has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils pose an unacceptable level of risk to the identified receptors.

5.1 Human Health Risk Assessment

At a Tier 1 stage the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published by the EA (Contaminated Land Exposure Assessment (CLEA) Soil Guideline Values (SGV)) and where absent, Generic Assessment Criteria (GACs) published by LQM/CIEH Suitable for Use Levels (S4UL) 2015. Based on the proposed development comprising residential dwellings with private gardens and areas of public open space, Omnia has adopted screening values for a residential end use with home grown produce. The origin of the GAC values are presented within Appendix VII.

The results of this comparison have been summarised within Table 5-1.

Table 5-1. Summary of Inorganic and Hydrocarbon Toxicity Assessment for a Residential End Use with Home Grown Produce

Determinant	Units	GAC	n	MC	Loc. of Ex (m bgl)	Pathway	Assessment
Inorganic (Metals)							
Arsenic	mg/kg	37	8	39.5	WS105 (0.60-1.20)	1	Further Assessment Required
Beryllium	mg/kg	1.7	8	0.5	N/A	1	No Further Action
Boron	mg/kg	290	8	1.2	N/A	1	No Further Action
Cadmium	mg/kg	11	8	0.3	N/A	1	No Further Action
Chromium (III)	mg/kg	910	8	123.4	N/A	1	No Further Action
Chromium VI	mg/kg	6	8	<0.3	N/A	1	No Further Action
Copper	mg/kg	2,400	8	19	N/A	1	No Further Action
Lead	mg/kg	200	8	25	N/A	1	No Further Action
Mercury	mg/kg	40	8	0.1	N/A	4	No Further Action
Nickel	mg/kg	180	8	6.3	N/A	1	No Further Action
Selenium	mg/kg	250	8	<1	N/A	1	No Further Action
Zinc	mg/kg	3,700	8	293	N/A	1	No Further Action
Vanadium	mg/kg	410	8	43	N/A	1	No Further Action
General (Inorganics)							
Total Cyanide	mg/kg	50	8	<0.5	N/A	1	No Further Action
Asbestos	%	<0.001% Chrysotile	8	NAD	N/A	6	No Further Action
(General Organics)							
Phenol	mg/kg	280	8	<0.15	N/A	1	No Further Action
Polycyclic Aromatic Hydrocarbons (PAH)							
Naphthalene	mg/kg	2.3	8	<0.04	N/A	4	No Further Action
Acenaphthylene	mg/kg	170	8	0.17	N/A	1	No Further Action
Acenaphthene	mg/kg	210	8	<0.05	N/A	1	No Further Action
Fluorene	mg/kg	170	8	<0.04	N/A	1	No Further Action
Phenanthrene	mg/kg	95	8	0.46	N/A	1	No Further Action
Anthracene	mg/kg	2,400	8	0.25	N/A	1	No Further Action
Fluoranthene	mg/kg	280	8	3.15	N/A	1	No Further Action
Pyrene	mg/kg	620	8	2.92	N/A	1	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	8	2.04	N/A	1	No Further Action
Chrysene	mg/kg	15	8	2.12	N/A	1	No Further Action

Determinant	Units	GAC	n	MC	Loc. of Ex (m bgl)	Pathway	Assessment
Benzo(b)Fluoranthene	mg/kg	2.6	8	3.07	WS104 (0.00-0.22)	1	Further Assessment Required
Benzo (k)Fluoranthene	mg/kg	77	8	1.2	N/A	1	No Further Action
Benzo(a)Pyrene	mg/kg	2.2	8	2.44	WS104 (0.00-0.22)	1	Further Assessment Required
Indeno(123-cd)Pyrene	mg/kg	27	8	1.32	N/A	1	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24	8	<0.04	N/A	1	No Further Action
Benzo(ghi)Perylene	mg/kg	320	8	1.18	N/A	1	No Further Action
Banded Total Petroleum Hydrocarbons (TPH)							
TPH EC 4-6**	mg/kg	42	8	<0.1	N/A	4	No Further Action
TPH EC >6-8**	mg/kg	100	8	0.2	N/A	4	No Further Action
TPH EC >8-10**	mg/kg	27	8	<5	N/A	4	No Further Action
TPH EC >10-12**	mg/kg	74	8	<10	N/A	4	No Further Action
TPH EC >12-16**	mg/kg	140	8	<10	N/A	4	No Further Action
TPH EC >16-21**	mg/kg	260	8	35	N/A	2	No Further Action
TPH EC >21-35**	mg/kg	1,100	8	810	N/A	1	No Further Action
TPH EC >35-44**	mg/kg	1,100	8	123	N/A	1	No Further Action

Notes

Main Exposure Pathways: 1 = Ingestion of Soil & Indoor Dust, 2 = Consumption of Homegrown Produce & Attached Soil; 3 = Dermal Contact (Indoor & Outdoor); 4 = Inhalation of Vapour (Indoor & Outdoor); 5 = Inhalation of Dust (Indoor & Outdoor), 6 = Inhalation of Fibres

Abbreviations: GAC = General Assessment Criteria, n = number of samples, MC = Maximum Concentration; Loc of Ex = Location of Exceedance.

Total cyanide Tier 1 GAC is taken from the Dutch Intervention Value (2010) for complex cyanide.

** The Tier 1 GAC for the banded hydrocarbon fraction is derived from the CIEH/S4UL assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. Omnia has utilised the lowest of the aliphatic and aromatic chain lengths in order to adopt a conservative approach, which is considered satisfactory for the protection of human health.

(sol) – GAC presented exceeds the solubility saturation limit.

(vap) – GAC presented exceeds the vapour saturation limit.

Referring to Table 5-1 above, the result of this direct comparison indicates that there have been exceedances of the following determinants above the adopted Tier 1 screen criteria within two (2no.) of locations:

- Arsenic – WS105 @ 0.60-1.20m bgl;
- Benzo(b)Fluoranthene – WS104 @ 0.00-0.22m bgl; and,
- Benzo(a)Pyrene – WS104 @ 0.00-0.22m bgl.

5.1.1 Heavy Metals

5.1.1.1 Arsenic

Concentrations of Arsenic marginally exceeded the adopted Tier 1 screening criteria of 37mg/kg have been identified within one (1no.) location, WS105 at depth of 0.60-1.20m bgl, where a concentration of 39.5mg/kg was identified within the natural soils of the Camberley Sand Formation.

The main exposure pathway for Arsenic is via the ingestion of soil and indoor dust.

A review of the proposed layout suggests that this location is beneath a proposed building footprint, but in close proximity to an area of proposed soft landscaping. At this stage, Omnia have not been provided with proposed finished Ground Levels and as such, it is considered that the identified concentrations have the potential to present a significant risk to human health within proposed areas of soft landscaping and private gardens; where an active exposure pathway is considered likely to remain present post-development.

5.1.2 PAH

5.1.2.1 Benzo(b)Fluoranthene

Concentrations of Benzo(b)Fluoranthene exceeding the adopted Tier 1 screening criteria of 2.6mg/kg have been identified within one (1no.) location at WS104 at a depth of 0.00-0.22m bgl where a concentration of 3.07mg/kg was identified within the Topsoil.

5.1.2.2 Benzo(a)Pyrene

Concentrations of Benzo(a)Pyrene marginally exceeding the adopted Tier 1 screening criteria of 2.2mg/kg have been identified within one (1no.) location at WS104 at a depth of 0.00-0.22m bgl where a concentration of 2.44mg/kg was identified within the Topsoil.

The main exposure pathway for Benzo(b)Fluoranthene and Benzo(a)Pyrene is via the ingestion of soil and indoor dust. A review of the proposed site layout indicates that location WS104 is located within a proposed private garden. As set out above, Omnia have not been provided with proposed finished Ground Levels and as such the identified concentrations are considered to have the potential to present a significant risk to human health within proposed areas of soft landscaping and private gardens; where an active exposure pathway is considered likely to remain present post-development.

5.2 Discussion of Tier 1 Results

Location WS104 was advanced adjacent to the driveway of 240 Nine Mile Ride, between the detached garage and the house. As such it is considered that the elevated PAH concentrations within the Topsoil (0.00 – 0.22m bgl) are likely associated with historical and current vehicle use on and around this section of the site.

Location WS105 was advanced within the rear garden of 240 Nine Mile Ride. The elevated Arsenic within the natural soils of WS105 (0.60 – 1.20m bgl) may be attributed to locally naturally elevated Arsenic concentrations within the soils of this area. However, further soil sampling of Camberley Sand Soils would be required to investigate this further.

At this stage, it is recommended that further investigation is undertaken within these areas (WS104 and WS105) to determine the lateral extent of shallow soils impacted by the elevated concentrations.

Once this has been completed, and subject to the findings of the additional works remedial works may be required within areas of proposed soft landscaping. Any remedial works, which would likely be restricted to the implementation of a clean cover system within the affected areas, should be detailed within a standalone Remediation Method Statement (RMS), which should be submitted to and agreed by the local authority prior to commencement of works.

5.3 Controlled Waters Assessment

The site is considered to present a low-moderate risk to controlled waters for the following reasons:

- Shallow groundwater strikes were encountered during site works within a number of locations, with the shallowest at 0.58m bgl within HP102 in the south of the site;
- Both bedrock geologies (Camberley Sand Formation and Windlesham Formation) are classified as Secondary A Aquifers;
- Bedrock deposits typically comprised granular soils;
- No superficial cover onsite;
- Elevated concentrations of Arsenic, Benzo(b)Fluoranthene, and Benzo(a)Pyrene are considered to present a low mobility risk and are localised to the northwest; and,
- No significant concentrations of mobile contaminants have been identified within shallow soils beneath the site.

5.4 Preliminary Ground Gas Assessment

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report C665 (*Assessing risks posed by hazardous ground gases to buildings*, 2007). However, it is recommended that the full ground gas assessment and any recommended protection measures are agreed with the local authority prior to the adoption of any protection measures on-site. Furthermore, the installation of any gas protection measures should be validated by a suitably qualified engineer.

The results of the ground gas monitoring and calculated Gas Screening Values (GSVs) are presented in Table 4-9.

Three (3no.) ground gas monitoring visits have been undertaken at locations WS102, WS103 and WS105. CH₄ concentrations were recorded to a maximum concentration of 0.4% v/v at locations WS102 and WS103. CO₂ concentrations were recorded to a maximum of 3.7% v/v at location WS102. Ground gas flow rates were recorded across the site, with a maximum flow rate of 0.1l/hr recorded at all locations.

In accordance with the methodology outlined within the CIRIA publication C665, Omnia have utilised the results of the ground gas monitoring surveys to calculate a tentative Gas Screening Value (GSV). The maximum GSV calculated for methane was 0.0004l/hr whilst the maximum GSV for carbon dioxide was 0.0037l/hr.

It is understood that the proposed development is for a residential end use through the construction of thirty-two (32no.) dwellings comprising a mix of semi-detached, terraced and apartment buildings, with associated private gardens, communal soft landscaping, and access infrastructure.

Therefore, the proposed development is composed of low-rise residential dwellings assessed under BS8485(2015)+A1(2019) classed as a **Type A** building, and a managed apartment building with central building management assessed under BS8485(2015)+A1(2019) classed as a **Type B** building.

At this stage, due to high groundwater levels resulting in sealed borehole response zones and a requirement for locations to be purged of water prior to the commencement of ground gas monitoring, it is recommended that the following ground gas assessment is considered as preliminary only.

It is recommended that additional ground gas monitoring is undertaken during the summer months when it is anticipated that groundwater levels will be lower and will facilitate ground gas monitoring which is free from the effects of sealed response zones. Upon the completion of additional monitoring rounds the following ground gas assessment will be updated and the report issued as final.

5.5.1 BS 8485(2015)+A1(2019) – Type A Building – Private Ownership with no Building Management Controls

Guidance set out in BS 8485(2015)+A1(2019), which is equivalent to the Characteristic Situations of the modified Wilson & Card classification established in CIRIA Publication C665, stipulates a site characteristic GSV of <0.07 l/hr, with typical permissible concentrations of 1%v/v (CH₄) and 5% v/v (CO₂), for classification as Characteristic Situation 1 (CS-1); a very low hazard potential.

The maximum concentration of CH₄ was 0.4% with a GSV of 0.0004l/hr and for CO₂ a maximum concentration of 3.7% v/v and a GSV of 0.0037l/hr. Both GSVs therefore fall below the maximum permissible GSV of 0.16l/hr (CH₄) and 0.78l/hr (CO₂) for a **Characteristic Situation 1 (CS-1)** classification.

5.5.2 BS 8485(2015)+A1(2019) – Type B Building – Private Ownership with Central Building Management

Guidance set out in BS 8485(2015)+A1(2019), which is equivalent to the Characteristic Situations of the modified Wilson & Card classification established in CIRIA Publication C665, stipulates a site characteristic GSV of <0.07 l/hr, with typical permissible concentrations of 1%v/v (CH₄) and 5% v/v (CO₂), for classification as Characteristic Situation 1 (CS-1); a very low hazard potential.

The maximum concentration of CH₄ was 0.4% with a GSV of 0.0004l/hr and for CO₂ a maximum concentration of 3.7% v/v and a GSV of 0.0037l/hr. Both GSVs therefore fall below the maximum permissible GSV of 0.16l/hr (CH₄) and 0.78l/hr (CO₂) for a **Characteristic Situation 1 (CS-1)** classification.

Given the identified **CS-1 classification** for both assessments, no gas protection measures are required on the site.

As set out above, it is recommended that this ground gas assessment is considered as preliminary until further ground gas monitoring has been undertaken during the drier summer months, at which point his assessment will be updated and issued as final.

6 REVISED CONCEPTUAL SITE MODEL

Following completion of the Tier 1 Risk Assessment, potential pollution pathways remain on site. These are summarised in the Revised Conceptual Site Model presented in Table 6-1 below.

Table 6-1 Revised Conceptual Site Model

Source	Potential Migration Pathway	Potential Receptors	Discussion of Pollutant Linkage
Elevated concentration of Arsenic within WS105 @ 0.60-1.20m bgl	Ingestion of Soil & Indoor Dust	Future Site Users	Shallow soils from the Camberley Sand Formation are considered to have the potential to pose a significant risk to human health within areas of proposed soft landscaping and private gardens where an exposure pathway is considered likely to remain active post-development. At this stage it is recommended that further investigation is undertaken in areas where elevated concentrations have been identified (WS105) to determine the lateral extent of shallow soils impacted by elevated concentrations of Arsenic. Once this has been completed remediation may be required within the areas of future soft landscaping. Remedial works should be detailed within a standalone Remediation Method Statement (RMS) which should be submitted to and agreed by the local authority prior to commencement of works.
Elevated concentrations of PAH within WS104 @ 0.00-0.22m bgl	Ingestion of Soil & Indoor Dust	Future Site Users	Near surface soils from the Topsoil are considered to have the potential to pose a significant risk to human health within areas of proposed soft landscaping and private gardens where an exposure pathway is considered likely to remain active post-development. At this stage it is recommended that further investigation is undertaken in areas where elevated concentrations have been identified (WS104) to determine the lateral extent of shallow soils impacted by elevated concentrations of PAH. Once this has been completed remediation may be required within the areas of future soft landscaping. Remedial works should be detailed within a standalone Remediation Method Statement (RMS) which should be submitted to and agreed by the local authority prior to commencement of works.

7 GEOTECHNICAL ASSESSMENT

Please note, that due to access constraints, intrusive works for geotechnical investigation were limited to the northern extent of the site (driveway and gardens associated with the residential properties on the site) only.

7.1 Proposed Development

It is understood that the proposed development consists of a residential end use comprising thirty-two (32no.) dwellings comprising a mix of semi-detached, terraced and apartment buildings, with associated private gardens, communal soft landscaping, and access infrastructure.

A preliminary proposed development site layout is presented as Figure 2.0 (Appendix III).

7.2 Site Preparation

The site should be cleared of any vegetation below the areas of proposed development and stripped in accordance with [Series 200 of Specification of Highway Works](#).

Any roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting voids in-filled with suitable compacted material. This should also be undertaken for any redundant or re-routed services.

7.3 Ground Profile

Based on the findings on the current ground investigation, ground conditions at the site comprise Topsoil overlying bedrock of Camberley Sand Formation in the southern extent of the site and Windlesham Formation in the northern extent of the site to the full depth of the ground investigation, discussed in section 4.1 Site ground conditions are summarised in Table 7-1.

Table 7-1 Summary of site ground conditions

Borehole	Topsoil Thickness (m)	Bedrock		Groundwater (m bgl)
		Camberley Sand Formation Thickness (m)	Windlesham Formation Thickness (m)	
HP101	0.20	0.40	-	-
HP102	0.10	0.50	-	0.58
HP103	0.12	0.18	-	-
HP104	0.12	0.48	-	0.60
HP105	0.10	0.50	-	-
HP106	0.10	0.51	-	0.60
HP107	0.10	0.50	-	-
HP108	0.10	0.50	-	-
HP109	0.20	0.50	-	-
WS101	0.15	-	1.85	1.40
WS102	0.20	-	2.80	1.40
WS103	0.20	-	2.80	1.40
WS104	0.22	-	2.28	1.50
WS105	0.10	1.70	-	-
SA101	0.20	-	1.40	-
SA102	0.30	-	1.70	2.00
BH101	0.30	-	9.70	-

Borehole	Topsoil Thickness (m)	Bedrock		Groundwater (m bgl)
		Camberley Sand Formation Thickness (m)	Windlesham Formation Thickness (m)	
BH102	0.30	4.65	4.05	3.00 and 4.95
SA201	0.05	1.35	-	-
SA202	0.20	1.00	-	-

7.4 Foundations Assessment

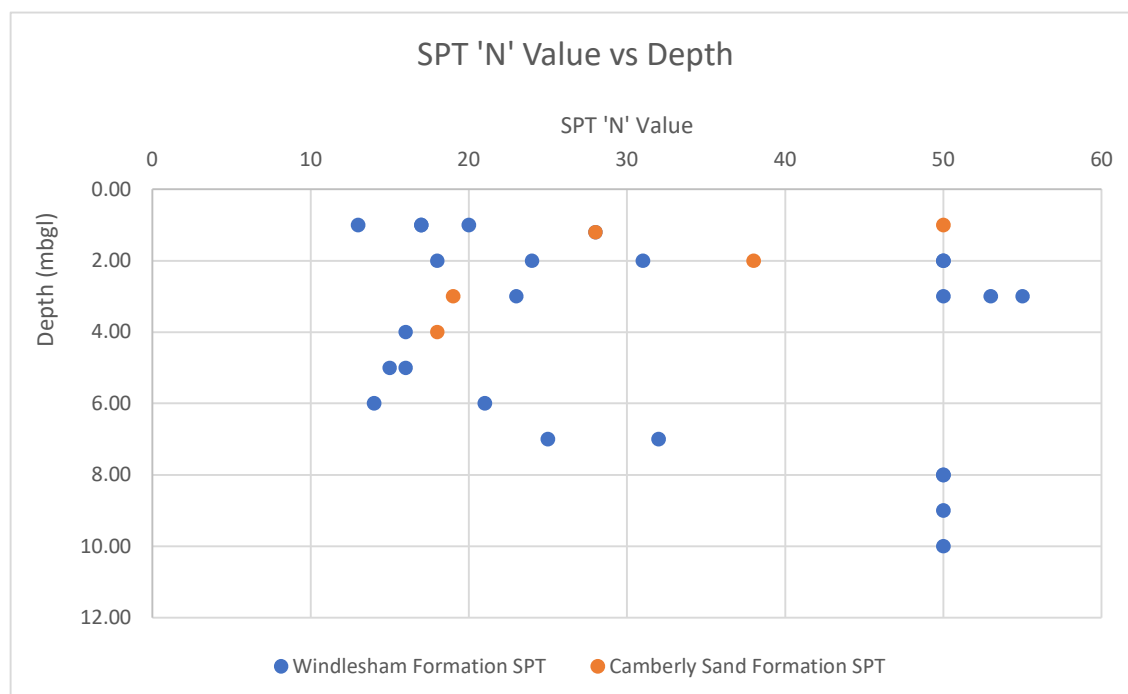
The following geotechnical assessment has been undertaken based on in-situ testing, laboratory analysis, and descriptions on the underlying geology. Foundation depths presented are indicative only based on a minimum presumed bearing value for a particular foundation type. Line loadings have not been made available such that the final depth and type of foundation required following design could vary.

It is considered that Topsoil would not form a suitable founding stratum due to characteristic variability and the associated potential for differential settlement. As such it is recommended that loads are transferred through the Topsoil to a depth at which competent geology, sufficient to support the proposed load, is encountered.

7.4.1 In Situ-Testing

Standard Penetration Testing (SPT) was undertaken throughout the fine-grained and coarse-grained Camberley Sand Formation in the southern extent of the site and Windlesham Formation in the northern extent of the site. The results are presented in Graph 7-1 below:

Graph 7-1 SPT vs Depth



The SPT data shows an increase in N-value with depth from N=13 at 1.00mbgl to N>50 from 8.00mbgl for the Windlesham Formation.

7.4.2 Shear Strength

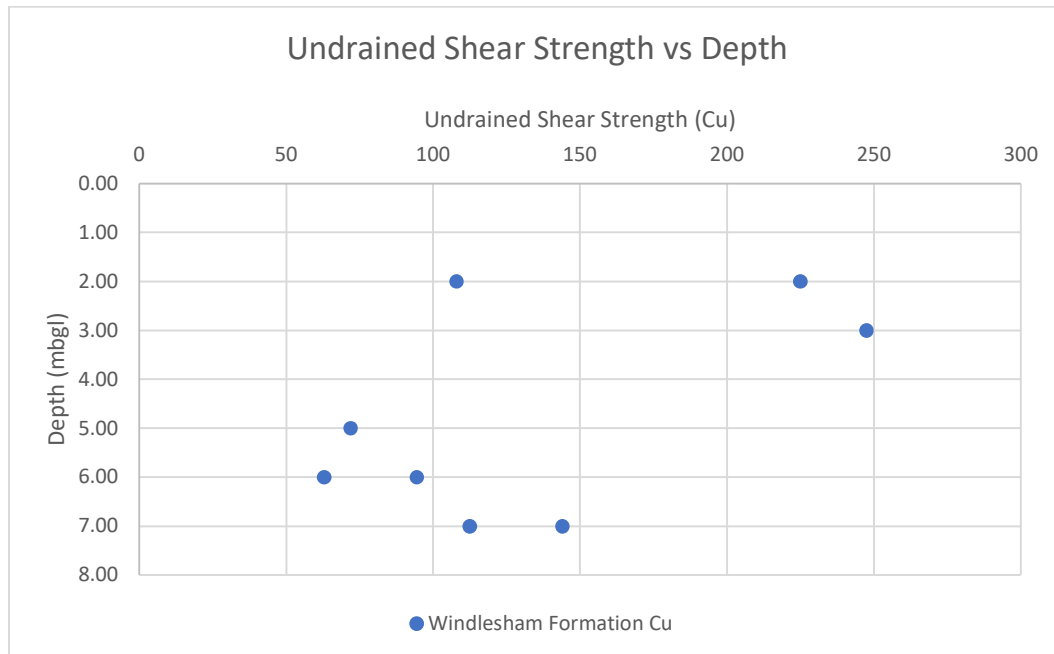
SPT equivalent undrained shear strengths of the fine-grained Windlesham Formation have been determined by using the widely accepted empirical relationship, where f_1 is based on the correlation factor based on the plasticity index of the soil (Stroud, 1974):

$$C_u = f_1 \times SPTN$$

Using a correlation factor of 4.5 gives characteristic undrained shear strengths (C_{uk}) of between 63kN/m² (2.00m bgl) and 248 kN/m² (3.00m bgl) as represented in Graph 7-2 below.

It should be noted that cohesive/ fine grained material was only identified >1.00m bgl within locations WS101, WS103, BH101 and BH102, both positions are within the north to north-western extent of the site.

Graph 7-2 Undrained Shear Strength vs Depth



7.4.3 Shallow Foundation Bearing Capacities

7.4.3.1 Windlesham Formation

The shallow natural strata of the Windlesham Formation was found to the north of the site, the strata comprised both cohesive and granular deposits, with positions WS101, WS103, BH101 and BH102 with recording cohesive deposits from a minimum depth of 2.00mbgl.

The indicative assessment below has differentiated between cohesive and granular soils for each depth due to the differing assessment methods, however it is recommended for the purposes of preliminary design that the most conservative bearing capacity for a given foundation depth is adopted due to the variability at the site.

It is recommended that a detailed foundation design report is produced for the site once the proposed development plan and structural loadings are confirmed.

Indicative Bearing Capacity at 1.00m bgl – 1.20m bgl

At a depth of 1.00 – 1.20m bgl SPT N values within granular soils of the Windlesham Formation were recorded ranging from N=13 (WS102) to N=28 (BH101), indicating medium-dense materials.

Adopting a conservative N=13 value, the granular soils of the Windlesham Formation is considered to provide a presumed bearing value of 150-500kN/m² for a traditional strip foundation of 1.00m width.

Indicative Bearing Capacity at 2.00m bgl

At a depth of 2.00m bgl within the granular soils of the Windlesham Formation SPT N values were recorded between N=18 (WS104) and N=50 (BH101), indicating medium-dense material.

Adopting a conservative N=18 value, the granular soils of the Windlesham Formation are expected to provide a presumed bearing value of 150-500kN/m² for a traditional strip foundation of 1.00m width.

For the cohesive Windlesham deposits, SPT results ranged from N=24 (WS103) to N=50 (WS101) corresponding to undrained shear strengths of 108kN/m² to 225kN/m², indicating medium to high strength material respectively.

Based on an undrained shear strength of 108kN/m², the cohesive Windlesham deposits is expected to provide a presumed bearing value of 200-400kN/m² for a traditional strip foundation of 1.00m.

Should deeper traditional foundations be required, Omnia recommend that in accordance with *NHBC Standards (2021) 4.3 – Strip and trench fill foundations*, if trench fill foundations are deeper than 2.50mbgl, the foundation will require to be designed by an engineer in accordance with Technical Requirement R5.

7.4.3.2 Camberley Sand Formation

Indicative Bearing Capacity at 1.00m bgl – 1.20m bgl

At a depth of 1.00 – 1.20m bgl SPT N values within granular soils of the Camberley Sand Formation were recorded ranging from N=28 (BH102) to N=50 (WS105), indicating medium-dense to dense materials respectively.

Adopting a conservative N=28 value, the granular soils of the Camberley Sand Formation is considered to provide a presumed bearing value of 150-500kN/m² for a traditional strip foundation of 1.00m width.

Indicative Bearing Capacity at 2.00m bgl

At a depth of 2.00m bgl, an SPT N value of N=38 (BH102) was recorded within the granular soils of the Camberley Sand Formation indicating dense materials. Adopting this N=38 value, is considered to provide a presumed bearing value of 500-800kN/m² for a traditional strip foundation of 1.00m width.

7.5 Deep Foundation Assessment

Where near surface bearing capacities are considered insufficient for the anticipated structural loads, piled foundations should be considered. Depending on foundation column load requirements, a choice of pile lengths and diameters can be designed to bear into the Windlesham Formation. The proven ground conditions would indicate that continuous flight auger (CFA) piles could be employed to provide a suitable foundation solution although this is for discussion purposes only. Where groundwater and/or unstable ground conditions are encountered, casing should be considered for CFA piles.

Given the properties of the strata beneath the site, indicative values for single axially loaded piles have been determined using the relationships presented in BS EN 1997-2.

Although higher carrying capacities are often achieved by driven piles, the use of driven piles can cause environmental issues (noise and vibration). Therefore, the initial axial resistance calculations have been carried out on augered piles.

The ULS axial resistances of 0.30, 0.45 and 0.60m diameter augered piles of varying length have been determined for the ground model presented in Table 7-2.

The ground model is based on the observations of the deep boreholes (BH101 and BH102) in which granular deposits of the Camberley Sand Formation overlie cohesive deposits of the Windlesham Formation, further underlain by granular deposits of the Windlesham Formation.

Table 7-2. Pile Resistances bearing– Augered Pile

Pile Diameter (m)	Pile Length (m)	Pile Resistance (kN)			
		MG	Skin Friction (Rsd)	End Bearing (Rbd)	Total Axial Resistance (kN)
0.30	5.00	No input in Axial Resistance	41	31	73
	6.50		65	23	87
	8.00		80	46	126
0.45	5.00	No input to Axial Resistance	62	70	132
	6.50		97	51	148
	8.00		120	104	224

0.60	5.00	No input to Axial Resistance	83	124	207
	6.50		129	91	220
	8.00		160	186	346

The above pile axial resistances are indicative only and are subject to design. A detailed piled foundation design will be required once the pile layout is finalised by a piling contractor and structural engineer.

It is recommended that early discussions with an experienced piling contractor is undertaken to clarify the pile diameters. Once the pile cap, positions and diameters are known further pile group analysis may be required.

Subject to NHBC, regulatory and/or design requirements, the potential may exist to calculate bearing capacities and settlement for foundations in accordance with EC7 through production of a Geotechnical Design Report (GDR).

7.6 Groundwater Levels

Groundwater was encountered within several locations across the site, with the shallowest encountered at 0.58m bgl (HP102). Resting groundwater between 0.82m bgl (WS103) and 1.43m bgl (WS103) was encountered during subsequent monitoring of water levels.

Consideration should be given that if groundwater is below the base of the foundation at a depth of less than the width of the proposed foundation, then groundwater can significantly reduce the bearing capacity of fine-grained soils.

As this is a Ground Investigation Report (GIR) the effects of groundwater on the bearing capacity of shallow foundations have not been taken into account. Should design values be required, this may be provided by production of a Geotechnical Design Report (GDR) which would provide calculations to current guidance, UK National Annex to EC7.

7.7 Building Near Trees

7.7.1 NHBC Minimum Depth to Foundations

The cohesive soils on site have been shown via laboratory analysis to generally be of medium to high plasticity and medium volume change potential, however very high plasticity soils and high-volume change soils were encountered within BH101 (5.90-6.00m bgl). Modified plasticity indices range from 22% to 53%, therefore in order to be conservative, the cohesive soils of the Windlesham Formation have been assessed as High Volume Change Potential.

NHBC guidance offers two foundation depth scenarios dependant on future planting regimes for High Volume Change Soils which utilises Tables 4 and 5 of NHBC Chapter 4.2 – Building Near Trees, summarised in Table 7-3 and Table 7-4 below.

Table 7-3 Minimum depth of foundations (after NHBC 2021)

Volume change potential	(A) Minimum foundation depth (m) (allowing for restricted new planting)	(B) Minimum foundation depth (m) (where planting is outside the zone of influence of trees)
High	1.50	1.00
Medium	1.25	0.90
Low	1.00	0.75

Table 7-4 New tree planting (after NHBC 2021)

Water demand	No tree planting zone for column A in Table 7-2	No tree planting zone / zone of influence for column B in Table 7-2
High	1.0 x mature height	1.25 x mature height
Moderate	0.5 x mature height	0.75 x mature height
Low	0.2 x mature height	0.50 x mature height

NHBC guidance indicates a minimum foundation depth of 1.00m bgl for high volume change soils outside of the zone of tree influence (Column B, Table 7-2), which is dependent on the tree species but may be up to 1.25 x mature tree height. Foundation depths will need to be increased within the zones of influence of existing or recently removed trees, as set out by NHBC Guidance (Chapter 4.2 – Building near Trees).

7.7.2 Lateral pressure and heave

Due to the majority of the soil profile observed as sand, the removal of the trees for the development, specifically plot 8 – 22, should not result in long term strength changes as groundwater should readily dissipate. However, changes in groundwater may have an effect on bearing capacity set out within section 7.5.

Where foundations are more than 1.50m deep in clays, within the influence of trees which are to remain or be removed, and may be subject to heave, they should be protected by voids, void formers or compressible materials to be take into account the effects of lateral swelling of soils. Minimum thicknesses of voids are set out in Table 7 of NHBC Chapter 4.2 – Building Near Trees.

Guidance is set out in NHBC the basic requirement is that compressible material or void former should be installed on the inside faces of external foundation walls. With piled foundation additional voids are required below ring beams. Position of heave precautions are set out in Table 8 of NHBC Chapter 4.2 – Building Near Trees.

Groundwater levels should be observed throughout the vegetation clearance and construction period, as increases in groundwater level may have an effect on the design of the foundations.

7.8 Shallow Excavations

The majority of excavations undertaken during the site works were noted to be stable. Although it should be noted that if the trial pitting works were undertaken during a period of heavy rainfall, it is recommended that special construction techniques are utilised, when necessary, when excavating foundations, such as dewatering and pit stabilisation.

7.9 Ground Floor Slabs

Due to the Medium to High Volume Change Potential of the soil, it is considered that ground bearing floor slabs are not suitable for adoption and therefore a suspended floor slab should be adopted in accordance with NHBC Chapter 5.2 to mitigate against the effects of differential settlement.

If levels were to be changed on site requiring steps in the substructure, further consideration could be given to the adoption of ground bearing floor slabs, with reference to NHBC Standards (2011) 5.1 – *Substructure and ground bearing floors*.

7.10 Concrete Durability

As set out in Section 4.6.6 the site has been classified under the BRE Special Digest (2005) thresholds as **DS-1, AC-2z** for both the Camberley Sand Formation and Windlesham Formation.

7.11 Discussion

At this stage it is considered that bearing capacities at depths from 1.00-2.00m bgl are potentially suitable for shallow foundations for standard low-rise housing units bearing into the Windlesham Formation and/or Camberley Sand Formation, providing minimum allowable bearing capacities of 100-500kN/m² for granular soils.

A minimum foundation depth of 1.00m bgl is anticipated for a High Volume Change soil within the fine-grained soils of the Windlesham Formation outside of the zone of tree influence, in accordance with NHBC. Where foundations are likely to be within the influence of trees foundation depths will require locally deepening. The extent to which they should be deepened should be in accordance with NHBC guidance, Chapter 4.2 – Building Near Trees (Tables 4 and 5).

Should loadings exceed those set out above then alternative founding solutions may need to be explored. Preliminary pile bearing capacities are supplied above.

It is recommended that a detailed foundation design report is produced for the site once detailed design has been finalised and detailed loadings are known.

Subject to regulatory requirements, the potential requirement exists to calculate bearing capacities and undertaken settlement analysis for foundations through production of a Geotechnical Design Report (GDR) which would provide calculations to current guidance, UK National Annex to EC7. Foundation design should be completed by a suitably qualified Structural Engineer, with specific consideration given to the variability in soil strengths.

8 CONCLUSIONS AND RECOMMENDATIONS

Revised Conceptual Site Model
Elevated concentrations of Arsenic, Benzo(b)Fluoranthene, and Benzo(a)Pyrene, have been identified within the north-eastern extent of the site. As proposed soft landscaping is proposed on-site, an active pollution pathway remains. Further works are required to investigate the lateral extent of the identified contaminants.
Preliminary Ground Gas Classification
The site is provisionally classified as CS-1 under BS 8485(2015)+A1(2019). It is considered that ground gas protection measures are not required on the site.
However, this assessment should be treated as preliminary until additional ground gas monitoring has been undertaken during the summer months and monitoring data free from the impact of shallow groundwater has been obtained.
Concrete Classification
The Camberley Sand Formation is classified under the BRE Special Digest (2005) threshold as DS-1, AC-2z for natural ground conditions. The Windlesham Formation is classified under the BRE Special Digest (2005) threshold as DS-1, AC-2z for natural ground conditions.
Soakaway Testing
The site may prove suitable for conventional shallow soakaway design within the locations of SA201 and SA201. It is recommended that the calculated infiltration rates are provided to a suitability qualified drainage engineer. The application of soakaway drainage will ultimately be dependent on the specific requirements of the development. All soakaways should be designed in accordance with BRE Special Digest 365-Soakaway Design.
Geotechnical Assessment
<u>Geology</u> Ground conditions during the intrusive works were broadly in line with the published BGS mapping. No superficial deposits were encountered. The solid geology comprised the Camberley Sand Formation (recovered as slightly silty SAND) centrally and to the south, with deposits attributed to the Windlesham Formation (recovered as Clays and Sands) within the northern extent of the site where the Camberley Sand is not mapped. <u>Shallow Foundations</u> At this stage it is considered that bearing capacities at depths from 1.00-2.00m bgl are potentially suitable for shallow foundations for standard low-rise housing units bearing into the Windlesham Formation and/or Camberley Sand Formation, providing minimum allowable bearing capacities of 100-500kN/m² for granular soils. Where cohesive soils have been encountered within the Windlesham Formation, SPT equivalent undrained shear strengths of between 108kN/m² and 225kN/m² were determined, indicating medium to high strength material respectively. Based on an undrained shear strength of 108kN/m², the cohesive Windlesham deposits are expected to provide a presumed bearing value of 200-400kN/m² for a traditional strip foundation of 1.00m. <u>Deep Foundations</u> Preliminary pile calculations show pile lengths of 5.00-8.00m of varying diameters may provide bearing resistances of between 73kN/m² and 346kN/m². <u>NHBC Chapter 4.2</u> A minimum foundation depth of 1.00m bgl is anticipated for a High Volume Change soil within the Windlesham Formation outside the zone of tree influence, in accordance with NHBC. Where foundations are likely to be within the influence of trees foundation depths will require locally deepening. <u>Groundwater</u> Shallow groundwater (<1m bgl) has been identified on site during intrusive works and return monitoring visits. Consideration should be given that if groundwater is below the base of the foundation at a depth of less than the width of the proposed foundation, then groundwater can significantly reduce the bearing capacity of fine-grained soils.

Recommendations

Environmental

Following the Tier 1 Human Health Risk assessment, elevated concentrations of Arsenic and PAH have been identified in the vicinity of locations within the north-eastern extent of the site. An active pollution pathway is considered to have the potential to remain active within areas of proposed soft landscaping and private gardens. It is therefore recommended that a delineation exercise be undertaken in the vicinity of locations WS104 and WS105 to investigate the lateral extent of elevated concentrations of Arsenic and PAHs, to determine the requirement for, and extent of, remedial works.

If during the development stage any evidence of contamination is identified, works should be halted, and contact made with a suitably qualified Environmental Consultant. As determined appropriate by the Consultant, further investigation and sampling may be required to determine the appropriate actions. Upon completion contact should be made with the regulator to achieve sign off of the works.

Geotechnical

It is recommended that a detailed foundation design report is produced for the site once detailed design has been finalised and detailed loadings are known.

Foundation design should be completed by a suitably qualified Structural Engineer, with specific consideration given to areas of variable soil strength.

Where possible foundations should be placed in strata of similar bearing or variable ground conditions compensated for accordingly to avoid potential differential settlement. Subject to regulatory requirements, the potential requirement exists to calculate bearing capacities and undertake settlement analysis for foundations through production of a Geotechnical Design Report (GDR) which would provide calculations to EC7.

APPENDIX I - LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between Omnia and the Client as indicated in Section 1.2.
 2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information.
 3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination, which are enforced, by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
 4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
 5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
 6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
 7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.
 8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
 9. Omnia cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by Omnia is owned by them, and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by Omnia in this connection without their explicit written agreement there to by Omnia.
 10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.
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APPENDIX II – GLOSSARY

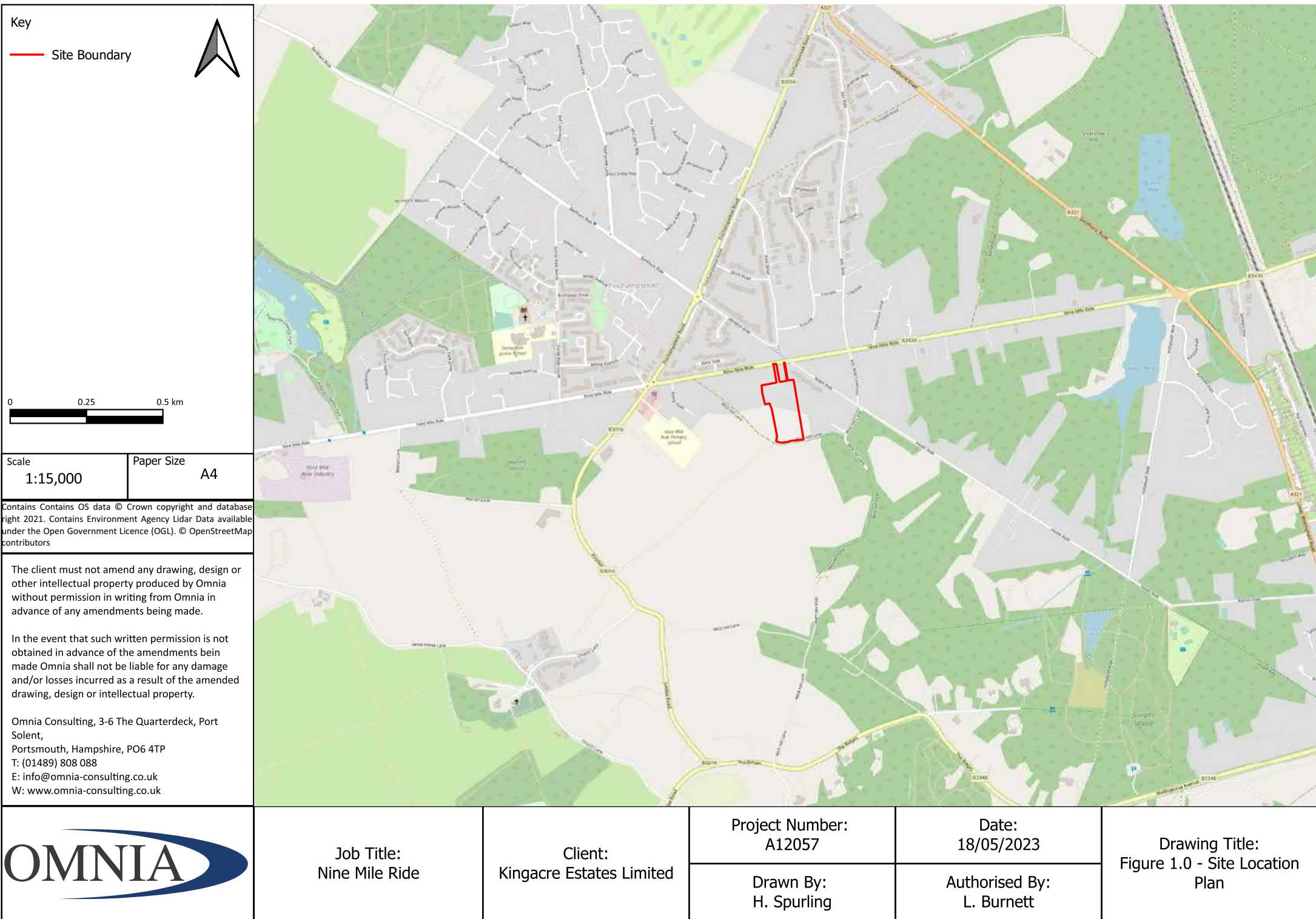
AST	Above Ground Storage Tank
BGS	British Geological Survey
BSI	British Standards Institute
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CIEH	Chartered Institute of Environmental Health
CIRIA	Construction Industry Research Association
CLEA	Contaminated Land Exposure Assessment
CSM	Conceptual Site Model
DNAPL	Dense Non-Aqueous Phase Liquid (Chlorinated Solvents, PCB)
DWS	Drinking Water Standard
EA	Environment Agency
EQS	Environmental Quality Standard
GAC	General Assessment Criteria
GL	Ground Level
GSV	Gas Screening Value
HCV	Health Criteria Value
ICSM	Initial Conceptual Site Model
LNAPL	Light Non-Aqueous Phase Liquid (Petrol, Diesel, Kerosene)
ND	Not Detected
LMRL	Lower Method Reporting Limit
NR	Not Recorded
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Poly-Chlorinated Biphenyl
PID	Photo-Ionisation Detector
QA	Quality Assurance
SGV	Soil Guideline Value
SPH	Separate Phase Hydrocarbon
TPH (CWG)	Total Petroleum Hydrocarbon (Criteria Working Group)
SPT	Standard Penetration Test
SVOC	Semi Volatile Organic Compound
UST	Underground Storage Tank
VCCS	Vibro Concrete Columns
VOC	Volatile Organic Compound
WTE	Water Table Elevation

UNITS

M	Metres
KM	Kilometres
%	Percent
%V/V	Percent Volume in Air
MB	Milli Bars (Atmospheric Pressure)
L/HR	Litres Per Hour
µG/L	Micrograms Per Litre (Parts Per Billion)
PPB	Parts Per Billion
MG/KG	Milligrams Per Kilogram (Parts Per Million)
PPM	Parts Per Million
MG/M ³	Milligram Per Metre Cubed
M BGL	Metres Below Ground Level
M BCL	Metres Below Cover Level

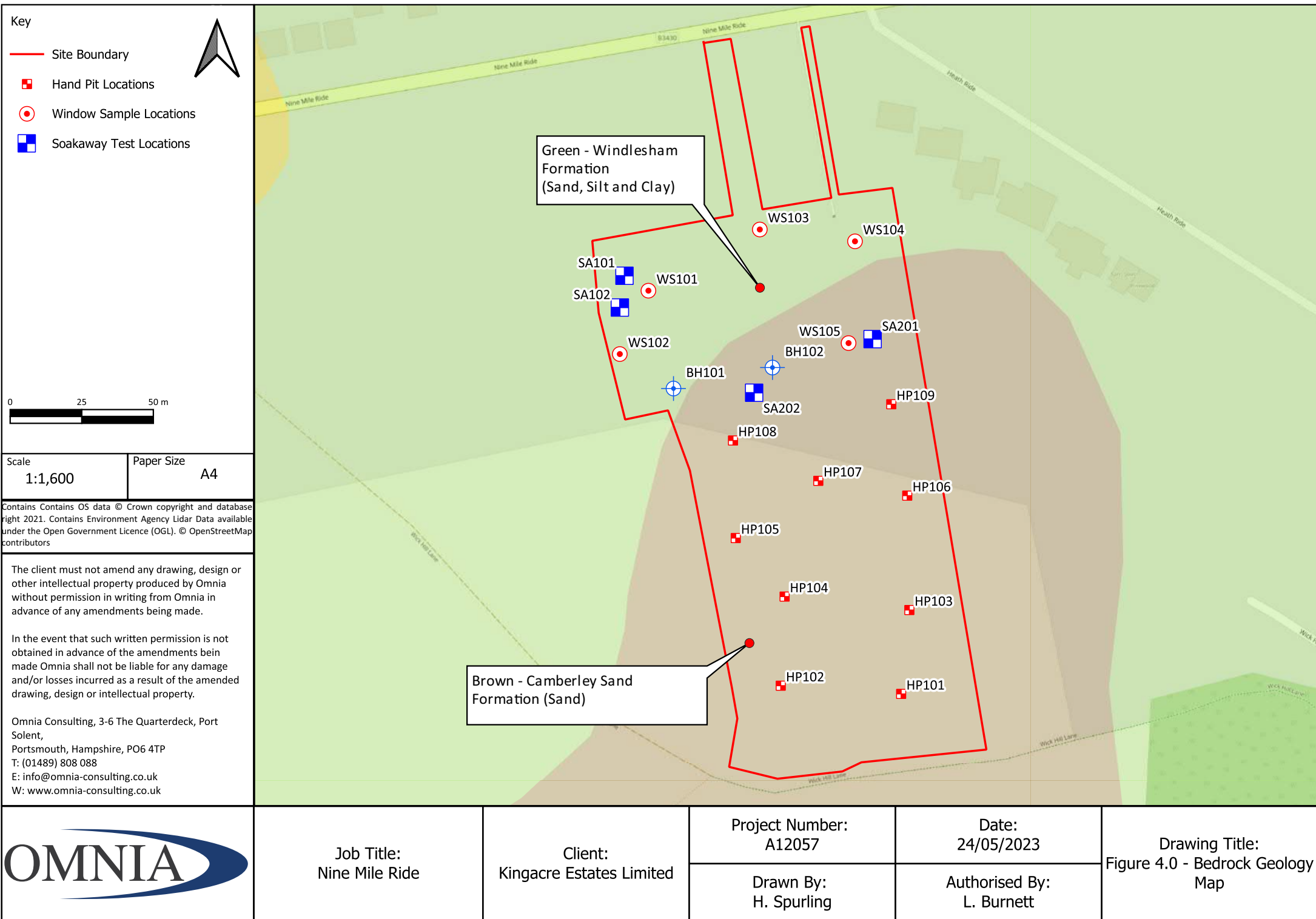
MAOD	Metres Above Ordnance Datum (Sea Level)
KN/M ²	Kilo Newtons Per Metre Squared
µM	Micrometre

APPENDIX III - DRAWINGS









APPENDIX IV - PHOTOGRAPHS



Photograph 4 – SA102 Trial pit, Windlesham Formation at the base.



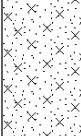
Photograph 5 – HP109 recovery, Topsoil left of hole and Camberley Sand Formation to the right of the Hand pit.

APPENDIX V - EXPLORATORY HOLE LOGS

				Trial Pit Log			Trialpit No HP101 Sheet 1 of 1		
Project Name: Nine Mile Ride				Project No. A12057		Co-ords: 480206.00 - 164678.00 Level:		Date 13/04/2023	
Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD				Dimensions (m):		0.25 		Scale 1:20	
Client: Kingacre Estates Limited				Depth 0.60		0.25 		Logged JR	

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.00 - 0.20	ES				 Brown slightly silty fine to coarse SAND with frequent tree roots and rootlets. [TOPSOIL]	1 2 3 4
				0.20		 Light brown slightly silty fine to coarse SAND with occasional angular fine flint gravel and black fine to coarse sand bands. [CAMBERLEY SAND FORMATION]	
				0.60		End of pit at 0.60 m	

Remarks:		1. Position scanned with calibrated CAT & 'Genny' prior to excavation. 2. No groundwater encountered.		
Stability:		STABLE		

				Trial Pit Log			Trialpit No HP102 Sheet 1 of 1		
Project Name: Nine Mile Ride				Project No. A12057		Co-ords: 480158.00 - 164686.00 Level:		Date 13/04/2023	
Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD				Dimensions (m):		0.26		Scale 1:20	
Client: Kingacre Estates Limited				Depth 0.60				Logged JR	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.10 - 0.50	ES		0.10			Brown slightly silty fine to coarse SAND with frequent roots and rootlets. [TOPSOIL]		
							Greyish brown slightly silty fine to coarse SAND with occasional rootlets. [CAMBERLEY SAND FORMATION]		
				0.50			Between 0.45m and 0.50m dark grey silty fine to coarse SAND.		
				0.60			Orangeish brown and dark brown staining silty fine to coarse SAND. [CAMBERLEY SAND FORMATION]		
							End of pit at 0.60 m		
1 2 3 4									
Remarks: - Position scanned with calibrated CAT & 'Genny' prior to excavation. - Groundwater encountered at 0.58m after 20 minutes rose to 0.50m bgl.									
Stability: STABLE									



				Trial Pit Log			Trialpit No HP103 Sheet 1 of 1		
Project Name: Nine Mile Ride				Project No. A12057		Co-ords: 480200.00 - 164711.00 Level:		Date 13/04/2023	
Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD				Dimensions (m):		0.25 		Scale 1:20	
Client: Kingacre Estates Limited				Depth 0.30		0.25 		Logged JR	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.00 - 0.12	ES		0.12			Brown slightly silty fine to coarse SAND with frequent tree roots and rootlets. [TOPSOIL]		
				0.30					
							End of pit at 0.30 m		
1 2 3 4									
Remarks: 1. Position scanned with calibrated CAT & 'Genny' prior to excavation. 2. No groundwater encountered.									
Stability: STABLE									



				Trial Pit Log				Trialpit No HP104 Sheet 1 of 1	
Project Name: Nine Mile Ride				Project No. A12057		Co-ords: 480160.00 - 164716.00 Level:		Date 13/04/2023	
Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD						Dimensions (m): 0.25 0.25		Scale 1:20	
Client: Kingacre Estates Limited						Depth 0.60		Logged JR	

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
▼	0.12 - 0.55	ES		0.12			Brown slightly silty fine to coarse SAND with frequent tree roots and rootlets. [TOPSOIL] Grey slightly silty fine to coarse SAND with occasional tree roots and rootlets. [CAMBERLEY SAND FORMATION]	1 4
				0.55				
				0.60				
							End of pit at 0.60 m	

Remarks:

- Position scanned with calibrated CAT & 'Genny' prior to excavation.
- Groundwater seepage at 0.60m bgl.

Stability: STABLE



				Trial Pit Log			Trialpit No HP105 Sheet 1 of 1		
Project Name: Nine Mile Ride				Project No. A12057		Co-ords: 480142.00 - 164740.00 Level:		Date 13/04/2023	
Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD				Dimensions (m):		0.25 		Scale 1:20	
Client: Kingacre Estates Limited				Depth 0.60		0.25 		Logged JR	

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10 - 0.60	ES		0.10		 Brown slightly silty fine to coarse SAND with frequent roots and rootlets. [TOPSOIL]	
				0.60		 Light brownish grey and orangeish brown very clayey fine to coarse SAND with rare rounded medium flint gravel. [CAMBERLEY SAND FORMATION]	
							End of pit at 0.60 m

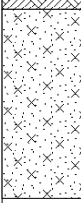
Remarks:		1. Position scanned with calibrated CAT & 'Genny' prior to excavation. 2. No groundwater encountered.	
Stability:		STABLE	



				Trial Pit Log			Trialpit No HP106 Sheet 1 of 1		
Project Name: Nine Mile Ride				Project No. A12057		Co-ords: 480202.00 - 164756.00 Level:		Date 13/04/2023	
Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD				Dimensions (m):		0.25		Scale 1:20	
Client: Kingacre Estates Limited				Depth 0.61				Logged JR	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.10			Brown slightly silty fine to coarse SAND with frequent roots and rootlets. [TOPSOIL]		
				0.50			Light grey slightly silty gravelly SAND. Gravel is subangular to rounded fine to coarse flint. [CAMBERLEY SAND FORMATION]		
	0.50 - 0.61	ES		0.61			Orange and light brown silty gravelly fine to coarse SAND with rare clay pockets. Gravel is subangular to rounded fine to medium flint. [CAMBERLEY SAND FORMATION]		
							End of pit at 0.61 m		
1 2 3 4									
Remarks: - Position scanned with calibrated CAT & 'Genny' prior to excavation. - Groundwater encountered at 0.60m after 20 minutes rose to 0.58m bgl.									
Stability: STABLE									

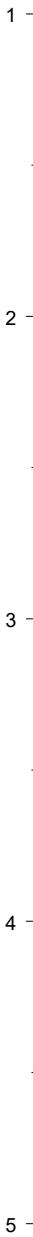




				Trial Pit Log			Trialpit No HP108 Sheet 1 of 1		
Project Name: Nine Mile Ride				Project No. A12057		Co-ords: 480138.00 - 164773.00 Level:		Date 13/04/2023	
Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD				Dimensions (m):		0.26		Scale 1:20	
Client: Kingacre Estates Limited				Depth 0.60				Logged JR	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.00 - 0.10	ES		0.10			Brown slightly silty fine to coarse SAND with frequent tree roots and rootlets. [TOPSOIL]		
	0.10 - 0.60	B							
				0.60			Grey and orangeish grey silty fine to coarse SAND. [CAMBERLEY SAND FORMATION]		
							End of pit at 0.60 m		
1 2 3 4									
Remarks: 1. Position scanned with calibrated CAT & 'Genny' prior to excavation. 2. No groundwater encountered.									
Stability: STABLE									

				Trial Pit Log			Trialpit No HP109 Sheet 1 of 1		
Project Name: Nine Mile Ride				Project No. A12057		Co-ords: 480195.00 - 164785.00 Level:		Date 13/04/2023	
Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD				Dimensions (m):		0.25		Scale 1:20	
Client: Kingacre Estates Limited				Depth 0.70				Logged JR	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.00 - 0.20	ES					Brown slightly silty slightly gravelly fine to coarse SAND with frequent tree roots and rootlets. [TOPSOIL]		
				0.20			Orangeish brown and slightly grey silty fine to coarse SAND with occasional rootlets and rare angular fine flint gravel. [CAMBERLEY SAND FORMATION]		
				0.70			End of pit at 0.70 m		
									1
									2
									3
									4
Remarks: 1. Position scanned with calibrated CAT & 'Genny' prior to excavation. 2. No groundwater encountered.									
Stability: STABLE									

				Borehole Log			Borehole No. WS101 Sheet 1 of 1	
Project Name: Nine Mile Ride				Project No. A12057		Co-ords: 480110.58 - 164827.33		Hole Type WS
Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD				Level: 78.22		Scale 1:25		
Client: Kingacre Estates Limited				Dates: 14/04/2023 - 14/04/2023		Logged By JR		

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.40	ES		0.15	78.07	 Brown slightly silty fine to coarse SAND with frequent roots and rootlets. [TOPSOIL]		
		0.60 - 1.20	ES		0.52	77.70	 Brownish grey silty fine to coarse SAND. [WINDLESHAM FORMATION]		
		1.00		N=17 (2,3/3,4,5,5)					 Orangeish brown and greenish brown clayey fine to coarse SAND with rare subangular to subrounded fine flint gravel and rootlets. [WINDLESHAM FORMATION]
		1.30 - 1.50	B		1.30	76.92	 Green clayey fine to coarse SAND. [WINDLESHAM FORMATION]		
		1.90 - 2.00 2.00	D	N=50 (2,2/6,8,17,19)	1.80 2.00	76.42 76.22	 Orangeish brown mottled grey lightly sandy CLAY. [WINDLESHAM FORMATION]		
End of borehole at 2.00 m									

Remarks

- Position scanned with calibrated CAT & 'Genny' prior to excavation.
- Water seepage at 1.40m bgl, after 20 minutes water level at 1.80m bgl.
- Location terminated at 2.00m bgl after SPT refusal.





Borehole Log

Borehole No.

WS102

Sheet 1 of 1

Project Name: Nine Mile Ride

Project No.
A12057

Co-ords: 480099.50 - 164803.27

Hole Type
WS

Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD

Level: 82.56

Scale
1:25

Client: Kingacre Estates Limited

Dates: 14/04/2023 - 14/04/2023

Logged By
JR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30 - 0.60	ES		0.20	82.36		Brown slightly silty fine to coarse SAND with frequent roots and rootlets. [TOPSOIL]	
		1.00		N=13 (4,4/4,3,3,3)				Grey silty fine to coarse SAND with occasional rootlets. [WINDLESHAM FORMATION]	1
		1.50 - 1.60	D		1.68	80.88		At 1.20m and 2.00m bgl poor recovery, 70% recovered.	
		2.00		N=31 (5,5/6,7,9,9)	2.00	80.56		Green slightly clayey slightly silty fine to coarse SAND. [WINDLESHAM FORMATION]	2
		2.90 - 3.00 3.00	D	N=53 (10,11/14,14,13,12)	2.80 3.00	79.76 79.56		Orangeish brown slightly clayey slightly silty fine to coarse SAND. [WINDLESHAM FORMATION]	
								Green slightly clayey slightly silty fine to coarse SAND. [WINDLESHAM FORMATION]	3
								Barrel refused at 3.00m followed by SPT refusal. End of borehole at 3.00 m	
									4
									5

Remarks

- Position scanned with calibrated CAT & 'Genny' prior to excavation.
- Water seepage at 1.40m bgl, after 20 minutes water level at 1.85m bgl.
- Location terminated at 3.00m bgl due to SPT refusal.





Borehole Log

Borehole No.

WS103

Sheet 1 of 1

Project Name: Nine Mile Ride

Project No.
A12057

Co-ords: 480143.68 - 164842.39

Hole Type
WS

Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD

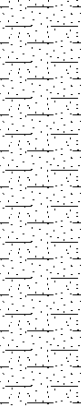
Level: 83.63

Scale
1:25

Client: Kingacre Estates Limited

Dates: 14/04/2023 - 14/04/2023

Logged By
JR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.20	ES		0.20	83.43		Greyish brown slightly silty fine to coarse SAND with occasional angular to rounded fine gravel of flint. [TOPSOIL]	
		0.50 - 1.20	ES					Orangeish brown clayey fine to coarse SAND. [WINDLESHAM FORMATION]	
		1.00		N=17 (2,3/3,4,5,5)					1
								Between 1.10m and 1.60m bgl SAND becomes greenish brown.	
		1.70 - 1.80	D		1.60	82.03		Firm orangeish brown mottled grey slightly sandy CLAY. Sand is fine to coarse.	
		1.80 - 2.00	D		1.70	81.93		[WINDLESHAM FORMATION]	
		2.00		N=24 (2,3/6,5,6,7)	1.80	81.83		Firm dark brownish red mottled brown slightly sandy CLAY. Sand is fine to medium.	2
								[WINDLESHAM FORMATION]	
		2.20 - 2.30	D					Firm orangeish brown mottled brownish grey slightly sandy CLAY. Sand is fine to medium.	
								[WINDLESHAM FORMATION]	
		2.90 - 3.00	D						
		3.00		N=55 (7,11/12,16,15,12)	3.00	80.63		End of borehole at 3.00 m	3
									4
									5

Remarks

- Position scanned with calibrated CAT & 'Genny' prior to excavation.
- Water seepage at 1.40m bgl, after 20 minutes water level at 1.50m bgl.
- Location terminated at 3.00m bgl due to SPT refusal.



				Borehole Log			Borehole No. WS104 Sheet 1 of 1	
Project Name: Nine Mile Ride				Project No. A12057		Co-ords: 480180.37 - 164840.95		Hole Type WS
Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD				Level: 79.19		Scale 1:25		
Client: Kingacre Estates Limited				Dates: 14/04/2023 - 14/04/2023		Logged By JR		

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.22	ES		0.22	78.97	 Brown and grey slightly silty slightly gravelly fine to coarse SAND. Gravel is subangular to rounded fine to medium flint. [TOPSOIL]  Grey silty fine to coarse SAND with occasional rootlets. [WINDLESHAM FORMATION]		
		0.80 - 1.20	ES		0.80	78.39	 Orangeish brown and grey silty fine to coarse SAND with occasional pockets of brown clay. [WINDLESHAM FORMATION] <u>SPT refusal at 1.00m bgl.</u> Poor recovery between 1.00m and 2.00m bgl, 65% recovered as orangish brown slightly silty slightly clayey fine to coarse SAND. <u>Barrel refusal at 1.80m bgl.</u> Poor recovery between 2.00m and 2.50m bgl, 50% recovered as orangeish brown and green silty slightly clayey fine to coarse SAND. <u>Barrel refusal at 2.50m bgl.</u> End of borehole at 2.50 m	1	
		1.00		N=20 (2,3/4,5,5,6)					
		1.50 - 2.00	B						
		2.00 2.00 - 2.50	B	N=18 (4,3/4,5,5,4)					
		2.50		50 (12,15/50 for 225mm)	2.50	76.69		2	
								3	
								4	
								5	

Remarks

- Position scanned with calibrated CAT & 'Genny' prior to excavation.
- Water strike at 1.50m bgl, after 20 minutes water level at 1.20m bgl.
- Location terminated at 2.50m bgl due to SPT refusal.





Borehole Log

Borehole No.

WS105

Sheet 1 of 1

Project Name: Nine Mile Ride

Project No.
A12057

Co-ords: 480178.88 - 164807.54

Hole Type
WS

Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD

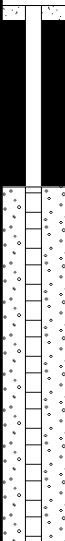
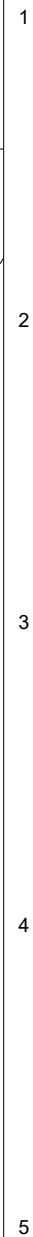
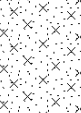
Level: 81.76

Scale
1:25

Client: Kingacre Estates Limited

Dates: 14/04/2023 - 14/04/2023

Logged By
JR

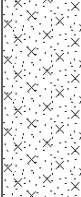
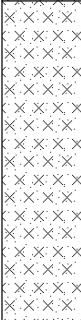
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.60	ES	50 (5,6/50 for 225mm)	0.10	81.66		Brown slightly silty fine to coarse SAND with frequent roots and rootlets. [TOPSOIL]	
		0.60 - 1.20	ES		0.60	81.16		Greyish brown slightly silty fine to coarse SAND with occasional rootlets. [CAMBERLEY SAND FORMATION]	
		1.00						Orangeish brown and grey slightly silty fine to coarse SAND with occasional clay pockets. [CAMBERLEY SAND FORMATION]	
		1.50 - 1.80	B		1.44	80.32		Yellowish orange and light brown slightly silty fine to coarse SAND. [CAMBERLEY SAND FORMATION]	
					1.80	79.96		Barrel refusal at 1.80m bgl. End of borehole at 1.80 m	

Remarks

- Position scanned with calibrated CAT & 'Genny' prior to excavation.
- No groundwater encountered.
- Location terminated at 1.80m bgl due to barrel refusal and subsequent SPT refusal (N=70 over 300mm).

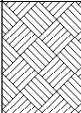
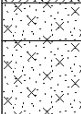
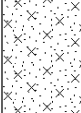
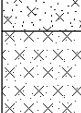


				Trial Pit Log			Trialpit No SA101 Sheet 1 of 1		
Project Name: Nine Mile Ride				Project No. A12057		Co-ords: 480107.00 - 164832.00 Level:		Date 18/04/2023	
Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD				Dimensions (m):		2.4 		Scale 1:20	
Client: Kingacre Estates Limited				Depth 1.60		0.35 		Logged JR	

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.20			Brown slightly silty fine to coarse SAND with frequent roots and rootlets. [TOPSOIL]	1
	0.50 - 0.70	B					Grey slightly silty fine to coarse SAND. [WINDLESHAM FORMATION]	
	0.80 - 1.50	B		0.75			Green mottled yellowish orange very sandy SILT. Sand is fine to coarse. [WINDLESHAM FORMATION]	
	1.50 - 1.60	B		1.60			End of pit at 1.60 m	
								2
								3
								4

Remarks: 1. Position scanned with calibrated CAT & 'Genny' prior to excavation. 2. No groundwater encountered.		
Stability: Stable		

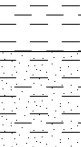
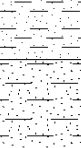
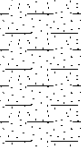
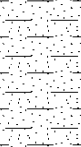
				Trial Pit Log			Trialpit No SA102 Sheet 1 of 1		
Project Name: Nine Mile Ride				Project No. A12057		Co-ords: 480108.00 - 164817.00 Level:		Date 18/04/2023	
Location: Nine Mile Ride, Finchampstead, Wokingham, RG40 3QD				Dimensions (m):		2.2 		Scale 1:20	
Client: Kingacre Estates Limited				Depth 2.00		0.35 		Logged JR	

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
▼	0.50 - 0.90	B		0.30			Brown and grey slightly silty fine to coarse SAND with occasional roots and rootlets. [TOPSOIL]	1
				0.40			Orangeish brown slightly silty fine to coarse SAND with occasional rootlets. [WINDLESHAM FORMATION] Grey silty fine to coarse SAND. [WINDLESHAM FORMATION]	
	0.90 - 1.30	B		0.97		Soft green mottled orangeish brown very sandy SILT. Sand is fine to coarse. [WINDLESHAM FORMATION]		
	1.50 - 2.00	B		2.00		End of pit at 2.00 m	2	
								3
								4

Remarks: 1. Position scanned with calibrated CAT & 'Genny' prior to excavation. 2. Groundwater encountered at 2.00m after 20 minutes rose to 1.85m bgl.		
Stability: Stable		

					Borehole Log			Borehole No. BH101 Sheet 1 of 2		
Project Name: Nine Mile Ride					Project No. A12057-1		Co-ords: 480120.00 - 164793.00		Hole Type BH	
Location: Land at and to the rear of Nine Mile Ride, Finchampstead, RG40 3QD					Level:		Scale 1:26			
Client: Kingacre Estates					Dates: 02/05/2023 - 03/05/2023		Logged By JR			
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
					0.30			Grey slightly silty fine to coarse SAND with occasional rounded fine gravel of flint. [TOPSOIL]		
		0.52 - 0.62	D		0.52			Orangeish brown and light brown fine to coarse SAND. [WINDLESHAM FORMATION]		
		1.20		N=28 (2,4/6,6,8,8)			Light brown and brownish orange fine to coarse SAND with occasional pockets of coarse orange sand. [WINDLESHAM FORMATION]			
		1.70 - 2.00	B				Between 1.10m and 1.70m bgl SAND becomes light brown and slightly silty.			
		2.00		N=50 (9,11/50 for 260mm)	2.00		Between 1.70m and 2.00m bgl SAND is orangish brown and greenish grey.			
		2.70 - 3.00	B				Orangeish brown slightly silty fine to coarse SAND with occasional orange fine to coarse sand bands. [WINDLESHAM FORMATION]			
		3.00		N=23 (4,5/6,7,6,4)						
		3.60 - 4.00	B		3.58			Bluish green silty fine to coarse SAND with frequent clay laminations. [WINDLESHAM FORMATION]		
		4.00		N=16 (2,2/3,3,4,5)	4.12			Light grey fine to coarse SAND. [WINDLESHAM FORMATION]		
		5.00		N=15 (2,3/3,3,4,5)	4.56			Green and orangeish brown silty fine to coarse SAND with grey clay laminations. [WINDLESHAM FORMATION]		
							Between 4.95m and 5.40m bgl SAND is green, orangeish			
Continued on next sheet										
Remarks 1. Position scanned with calibrated CAT & 'Genny' prior to excavation. 2. No Groundwater encountered. 3. Borehole terminated at 10.00m bgl due to three repeated SPT refusals and a barrel refusal.										
										

					Borehole Log			Borehole No. BH101 Sheet 2 of 2		
Project Name: Nine Mile Ride					Project No. A12057-1		Co-ords: 480120.00 - 164793.00		Hole Type BH	
Location: Land at and to the rear of Nine Mile Ride, Finchampstead, RG40 3QD					Level:		Scale 1:26		Logged By JR	
Client: Kingacre Estates					Dates: 02/05/2023 - 03/05/2023					

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		5.40 - 5.90	B		5.40		 brown and bluish red. No recovery between 5.00m and 5.21m bgl.		
		5.90 - 6.00	D	N=14 (2,2/2,3,5,4) HVP=88 HVR=31	5.90		 Bluish green clayey fine to coarse SAND. [WINDLESHAM FORMATION]		
		6.00					 Firm grey CLAY. [WINDLESHAM FORMATION] Between 6.10m and 6.20m bgl CLAY is soft to firm Between 6.20m and 6.43m bgl CLAY is firm to stiff.	6	
		6.60 - 6.70	D	HVP=93 HVR=31	6.43		 Firm to stiff brownish orange mottled reddish grey CLAY with occasional bands of fine to medium orange SAND. [WINDLESHAM FORMATION] Between 6.58m and 7.15m bgl CLAY becomes very stiff.		
		7.00		N=25 (7,5/6,6,6,7) HVP=36 HVR=8	7.15		 Firm greyish brown mottled brownish orange sandy CLAY. Sand is fine to medium. [WINDLESHAM FORMATION]	7	
		7.30 - 7.40	D				 Brownish orange clayey fine to coarse SAND with frequent interbedded clay bands. [WINDLESHAM FORMATION]		
		8.00		N=50 (8,10/50 for 285mm)	7.70		 Between 8.00m and 10.00m bgl slightly clayey SAND.	8	
		8.50 - 9.00	B				 Between 9.00m and 10.00m bgl occasional interbedded clay bands.	9	
		9.00		N=50 (6,10/50 for 275mm)					
		9.50 - 9.70	B						
		10.00		N=50 (9,10/50 for 230mm)	10.00		End of borehole at 10.00 m	10	

Remarks

- Position scanned with calibrated CAT & 'Genny' prior to excavation.
- No Groundwater encountered.
- Borehole terminated at 10.00m bgl due to three repeated SPT refusals and a barrel refusal.



				Borehole Log			Borehole No. BH102 Sheet 1 of 2	
Project Name: Nine Mile Ride				Project No. A12057-1		Co-ords: 480153.00 - 164800.00		Hole Type BH
Location: Land at and to the rear of Nine Mile Ride, Finchampstead, RG40 3QD				Level:		Scale 1:25		
Client: Kingacre Estates				Dates: 04/05/2023 - 04/05/2023		Logged By JR		

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30		 Brown and grey slightly silty fine to coarse SAND with frequent rootlets. [TOPSOIL]	1	
		0.60 - 1.20	B			 Light brown and orangeish brown slightly silty fine to medium SAND. [CAMBERLEY FORMATION]			
		1.20			N=28 (3,4/5,7,8,8)			2	
		1.60 - 2.00	B						
		2.00			N=38 (5,8/10,9,10,9)			3	
		2.50 - 2.90	B						
		3.00			N=19 (2,4/4,4,5,6)			4	
		3.00 - 3.80	B						
4.00			N=18 (2,2/4,3,5,6)			5			
4.60 - 4.90	B			4.65	 Yellowish orange and green fine to coarse SAND. [CAMBERLEY FORMATION]				
5.00			N=16 (2,2/3,3,5,5)	4.95					

Continued on next sheet

Remarks
 1. Position scanned with calibrated CAT & 'Genny' prior to excavation.
 2. Ground water encountered at 3.00m bgl as very slow seepage and didn't rise. Lots of water came out the barrel at 4.95m which is potentially perched water above the clay.
 3. Hole terminated at 9.00m bgl due to SPT refusal and barrel refusal.



				Borehole Log			Borehole No. BH102 Sheet 2 of 2	
Project Name: Nine Mile Ride				Project No. A12057-1		Co-ords: 480153.00 - 164800.00		Hole Type BH
Location: Land at and to the rear of Nine Mile Ride, Finchampstead, RG40 3QD				Level:		Scale 1:25		
Client: Kingacre Estates				Dates: 04/05/2023 - 04/05/2023		Logged By JR		

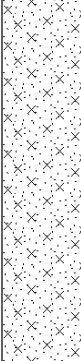
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
				HVP=54 HVR=23	5.20		Firm grey CLAY. [WINDLESHAM FORMATION]	6	
			HVP=54 HVR=21				Dark bluish green clayey fine to coarse SAND interbedded with occasional grey clay. [WINDLESHAM FORMATION]		
	5.40 - 5.60	D		5.80		Firm to stiff grey CLAY. [WINDLESHAM FORMATION]			
	5.80 - 5.90	D							
	6.00		N=21 (2,2/5,5,5,6)						
	6.40 - 6.50	D		6.73		Stiff orangeish brown mottled grey CLAY with occasional reddish brown mottling. [WINDLESHAM FORMATION] <i>6.80m to 7.60m bgl CLAY is interbedded with reddish orange mudstone.</i>	7		
	6.90 - 7.00	D							
	7.00		N=32 (6,5/5,7,9,11)						
7.80 - 7.90	D		7.60		Yellowish orange slightly clayey fine to coarse SAND. [WINDLESHAM FORMATION]	8			
8.00		N=50 (8,12/50 for 255mm)							
8.50 - 8.70	D		9.00		<i>8.40m to 8.60m bgl SAND is orange and light grey.</i> End of borehole at 9.00 m	9			
								10	

Remarks

- Position scanned with calibrated CAT & 'Genny' prior to excavation.
- Ground water encountered at 3.00m bgl as very slow seepage and didn't rise. Lots of water came out the barrel at 4.95m which is potentially perched water above the clay.
- Hole terminated at 9.00m bgl due to SPT refusal and barrel refusal.



				Trial Pit Log			Trialpit No SA201 Sheet 1 of 1		
Project Name: Nine Mile Ride				Project No. A12057-2		Co-ords: 480189.00 - 164809.00 Level:		Date 17/05/2023	
Location: Nine Mile Ride, Finchampstead						Dimensions (m): 1		Scale 1:20	
Client: Kingacre Estates Limited						Depth 1.40		Logged HS	

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.05			Dark brown fine to medium SAND with frequent rootlets. [TOPSOIL]
				0.20			Grey fine to coarse SAND with frequent rootlets. [CAMBERLEY SAND FORMATION]
				0.40			Brown fine to coarse SAND with frequent rootlets. [CAMBERLEY SAND FORMATION]
				1.40			Orangeish brown and grey silty fine to coarse SAND. [CAMBERLEY SAND FORMATION]
							End of pit at 1.40 m

Remarks: 1. Cleared by calibrated Cable Avoidance Tool. 2. No Groundwater encountered.



Stability: Stable

