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Flood Risk Assessment
for
Observer Park, Arborfield

for:

Tungsten Dev Co 4 Limited

Date	Issued	Revision
06 June 2025	Issued	A
30 July 2025	Site Plan updated	B

Reference: 64120-01

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CONTENTS

1.	Executive Summary	3
2.	Introduction	3
3.	Site Location and Description	4
4.	Development	4
5.	Analysis of Risk	5
6.	Surface Water Drainage System	7
7.	Geology	8
8.	Conclusions	9

APPENDICES

Appendix I	Site Plans
Appendix II	Fluvial Flood Map
Appendix III	Surface Water Flood Map
Appendix IV	Reservoir Flood Map
Appendix V	Groundwater Flood Map
Appendix VI	Sewer Flooding Incidents Table
Appendix VII	Topographical Survey
Appendix VIII	Ground Investigation Report
Appendix IX	Thames Water Pre-Planning Enquiry and Records
Appendix X	General Conditions

1. EXECUTIVE SUMMARY

1.1. The site lies within flood zone 1, as shown within the Environment Agency (EA) extent of flooding maps (Appendix II). This means that the site is at a very low risk of fluvial flooding.

1.2. The risk from surface water flooding across the site can be characterised as very low, with any areas at risk from flooding up to the 1 in 1000-year flood event accounting for less than 10% of the site.

1.3. The site is located outside the maximum extent of reservoir flooding; therefore, the risk of reservoir flooding is deemed to be very low. The risk from groundwater flooding is deemed to be low.

1.4. To reduce the risk of surface water flooding in the areas at a low and medium risk, an appropriate drainage system should be installed across the areas of hardstanding. In addition, consideration should be given to the topography of the hardstanding areas, to prevent water from pooling and direct surface water into the drainage system.

2. INTRODUCTION

2.1. This flood risk assessment has been prepared on behalf of Tungsten Dev Co 4 Ltd to address the flooding risk for the proposed construction of 7 commercial units, together with areas of hardstanding (yards, roads and car parking) and soft landscaping. A proposed site plan is appended.

2.2. The purpose of the report is to establish the level of risk that exists for a flooding event to affect the site. Any increased flood risks to the surrounding area following the construction of the proposed development will be identified. The report will also outline measures that can reasonably be put in place to reduce the effects, should flooding occur, to acceptable levels based on the identified risk.

2.3. This assessment generally follows the principles as laid down in National Planning Policy Framework (NPPF) and PPS25. Although PPS25 has been superseded by the NPPF, it still contains measures that are recognised as needing to be addressed.

2.4. The general conditions contained in Appendix IX are applied to this report and it should be read and construed accordingly.

3. SITE DESCRIPTION AND LOCATION

3.1. The site is located to the west of Observer Way (A327) and south of the Reading Road, Arborfield, Berkshire. The British National Grid metre coordinates for the approximate centre of the site are easting: 475018, northing: 167211.

3.2. The site occupies an area of approximately 2.99ha. Levels generally are relatively flat where the commercial units are proposed, with levels along the proposed access road generally falling from South to North. Levels where units are being proposed are generally around 49.100m AOD with levels to the end of the access road joining Reading Road being around 47.600m AOD. The topographical can be found in Appendix VII.

3.3. The site's current land use at the time of writing is greenfield land.

3.4. Summary details of the site boundaries and adjacent land use are:

Boundary	Boundary Construction	Adjacent Land Use	Proximal Land Use
North	Fence	Commercial/Industrial	Highway (Reading Rd)
East	Fence	Forest/Greenfield	Residential/Agriculture
South	Fence	Highway (A327)	Agriculture
West	Fence	Highway (A327)	Agriculture

3.5. A site location plan is included in Appendix I.

4. DEVELOPMENT

4.1. It is proposed to construct 7 commercial units, together with areas of hardstanding (yards, roads and car parking) and soft landscaping. A proposed site plan can be found in Appendix I.

4.2. The proposed development is classified as a less vulnerable development by the Flood Risk Vulnerability Classification (Annex 3) in the NPPF. Therefore, in line with the flood risk vulnerability and flood zone compatibility table (table 3) in the NPPF, the development is appropriate on a flood zone 1 site.

5. ANALYSIS OF RISK

5.1. The source pathway receptor model will be used to analyse the likely risk of flooding affecting the site and the development. The sources will be investigated and their risk of affecting the development assessed. Those that have a low or negligible risk of affecting the site will not need to be considered further.

5.2. Sources with a medium or high risk of affecting the site will be considered further in terms of their pathway to the site. Where possible the pathway risk to the receptors will be reduced from medium or high risk to low or negligible risk.

5.3. The residual medium or high risks to the receptors will be managed to ensure that the users of the development and their possessions and property are not at a greater than low risk of being affected.

5.4. The possible sources of flooding within mainland England are generally taken to be:

- Fluvial (rivers)
- Tidal (sea or estuary)
- Groundwater
- Pluvial (surface water flooding)
- Sewers
- Infrastructure failure

5.5. Fluvial Flooding: The River Loddon is located over 800m northwest of the site. With reference to the appended EA fluvial flood map (Appendix II), the site lies within flood zone 1 and is, therefore, at a very low risk of fluvial flooding.

5.6. Tidal Flooding: The site is over 60km from the sea and over 47m above sea level. The risk of tidal flooding affecting the site is negligible.

5.7. Groundwater Flooding: In accordance with the Wokingham Borough Council Strategic Flood Risk Assessment (SFRA), the site is located on the border of an area where groundwater has a less than 25% susceptibility to cause flooding and a 25-50% area. Additionally, the top end of site (the access road to be replaced) according to the SFRA could be considered to be within an area where ground water is between 0.025 and 0.5m. Both SFRA conclusions are supported by the fact that groundwater flooding is considered to be at a medium-low risk using Defra mapping – refer to appendix V for all groundwater mapping. Boreholes sunk within site found groundwater within the river terrace deposits between 0.9m and 2.2m below ground level. Based on this and the former points made, ground water flood risk should be taken into consideration on this site. For the ground investigation report, refer to Appendix VIII.

5.8. Surface Water Runoff (Pluvial Flooding): With reference to the EA surface water flood map (Appendix III), the risk from surface water flooding across the site can be characterised as very low, with any areas at risk from flooding up to the 1 in 1000-year flood event accounting for less than 10% of the site.

5.9. The areas at a risk of surface water flooding in the 1 in 30-year event and upwards account for less than 10% of the site. There are two main areas of the site at a risk of surface water flooding through the 30-year, 100-year and 1000-year storm events (making them high risk), with other smaller areas around the site being at risk also. The two main at-risk areas of the site are towards the western site boundary. The topographic survey shows that the areas at risk of surface water flooding are within the flatter areas of the site, likely due to the water not being able to run off to any kind of drainage measure.

5.10. Reading Road to the north is at risk of surface water flooding. The EA medium risk scenario map shows it is anticipated to be affected by below 300mm of flood water, the extent of which is contained to the eastern side of the proposed access; therefore, safe access and egress are achievable by foot and vehicles during a flood event.

5.11. To reduce the risk of surface water flooding in concentrated areas of high risk, an appropriate drainage system should be installed across the areas of hardstanding. Consideration should be given to the topography of the hardstanding areas to prevent water pooling and direct surface water into the drainage system. Without the presence of the flat spots currently present on site, the risk of flooding will be reduced significantly.

5.12. Sewer Flooding: With reference to the Wokingham Borough Council SFRA, the site is located in an area with 172 sewer flooding incidents between 2000-2022 (refer to Appendix VI). Currently, it is proposed that the surface water sewer discharges into the nearby watercourse, whilst downstream of the planned foul discharge point the Thames Water owned sewer is to undergo a capacity upgrade (refer to Appendix IX). Based on the information available, the risk of sewer flooding is deemed to be low.

5.13. Infrastructure: If water mains proximal to the site were to burst, water would be likely to flow north towards Reading Road past the proposed site entrance and east along the road. Existing site levels within the area of the proposed site entrances are above road level; therefore, providing site levels are either higher than or the same as existing levels, flood water is unlikely to enter the site. With reference to the map for reservoir flooding (Appendix IV), the site is located outside the maximum extent of flooding from reservoirs. Based on the above, there is a low risk of infrastructure flooding affecting the site.

5.14. Pathways: Based on the above analysis, surface water flooding is deemed the most likely cause of flooding. However, groundwater should also be taken into consideration.

5.15. Receptors: The receptors will include the users of the site and the surrounding properties. Given the level of risk of flooding from all sources, the development of the site will not increase the flood risk to the surrounding area.

5.16. The outcome of the above analysis is as follows:

Source	Risk	Population at Risk	Mitigation Measures	Residual Risk
Fluvial	Very low	Site users	None required	Very low
Tidal	Negligible	N/A	None required	Negligible
Groundwater	Medium	Site users	Avoid infiltration drainage measures	Medium
Surface water runoff (pluvial flooding)	Very low with areas of low to high risk	Site users	Install appropriate drainage solution, contour hardstanding	Very low
Sewer flooding	Low	Site users	None required	Low
Infrastructure	Very low	Site users	None required	Very low

5.17. To reduce the risk of surface water flooding in the areas at a low and medium risk, an appropriate drainage system should be installed across the areas of hardstanding. In addition, consideration should be given to the topography of the hardstanding areas, to prevent water from pooling and direct surface water into the drainage system.

5.18. To reduce the risk of groundwater flooding, infiltration measures will not be utilised so as to not locally increase groundwater levels and subsequently increase the flood risk on and off the site. Water is to be discharged at a reduced rate to the nearest watercourse. This way the development is no more vulnerable, from the perspective of groundwater flooding, than the existing buildings adjacent to the site and in the local area.

6. SURFACE WATER DRAINAGE SYSTEM

6.1. The proposed development should utilise a sustainable drainage (SuDS) design in accordance with the NPPF. The hierarchy of SuDS designs to be considered is:

- Discharge rainwater into a soakaway
- Discharge rainwater into nearby watercourse
- Attenuate rainwater by storing in tanks and releasing gradually over time
- Discharge rainwater into surface water sewers
- Discharge rainwater into combined sewers

6.2. Based on current site levels, flood exceedance would flow from the access road to Reading Road and the flat areas would likely hold the water to a degree in line with the EA flood mapping. It is recommended that the proposed topography of the site is carefully considered to direct flood exceedance away from the site into the existing highway surface water drainage system surrounding the site.

7. GEOLOGY

7.1. Within the accuracy of the available geological information (British Geological Survey (BGS) Geology of Britain at a scale of 1:50,000) the 'solid' geology beneath the site is indicated to comprise the London Clay formation, described as slightly calcareous, silty to very silty clay. Superficial deposits beneath the site are said to be made up of river terrace deposits (with no description available on Geoindex).

7.2. Historical boreholes sunk within the vicinity of the site have recorded a topsoil underlain by river terrace deposits described as clayey sandy gravel to 2.5m below ground level over a layer of London Clay described as firm and grey to a depth of 3.8m before the borehole log is stopped. Given the confirmation of the presence of London Clay in the local vicinity, the soils beneath the site are anticipated to have a low permeability.

7.3. A geo-environmental assessment was carried out at the site in May 2024, and gives the ground conditions as made ground followed by river terrace deposits (both clays and sands) all underlain by London Clay. Groundwater was encountered within the river terrace deposits and further groundwater monitoring has been recommended. For further information with regards to borehole testing and groundwater refer to Appendix VIII.

7.4. The site is located in Source Protection Zone 3, with approximately half of the access road (the northern half) lying within Source Protection Zone 2. The end of the access road joining Reading Road is approximately 400m away from Source Protection Zone 1.

7.5. Based on the underlying strata and the risk presented by groundwater, soakaways will not be viable, and BRE 365 testing would not be required to the determine the feasibility of soakaways.

8. CONCLUSIONS

8.1. The site lies within flood zone 1, as shown within the EA's extent of flooding maps (Appendix II). This means that the site is at a very low risk of fluvial flooding.

8.2. With reference to the EA surface water flood map (Appendix III), the risk from surface water flooding across the majority of the site is considered to be very low. There are two main areas of the site at an elevated risk of surface water flooding. These are located towards the western site boundary within the main area of site. The areas at an elevated risk of surface water flooding account for less than 10% of the site.

8.3. To reduce the risk of surface water flooding for the smaller areas discussed that are at a high risk of flooding from surface water, an appropriate drainage system should be installed across the areas of hardstanding. In addition, consideration should be given to the topography of the hardstanding areas, to prevent water from pooling and direct surface water into the drainage system.

8.4. Reading Road to the north is also at risk of surface water flooding. The EA surface water medium risk scenario map shows that Reading Road is anticipated to be affected by below 300mm of flood water, the extent of which is contained to the eastern side of the proposed access; therefore, safe access and egress is achievable by foot and vehicles during a flood event.

8.5. The site is located outside the maximum extent of reservoir flooding; therefore, the risk of reservoir flooding is deemed to be very low.

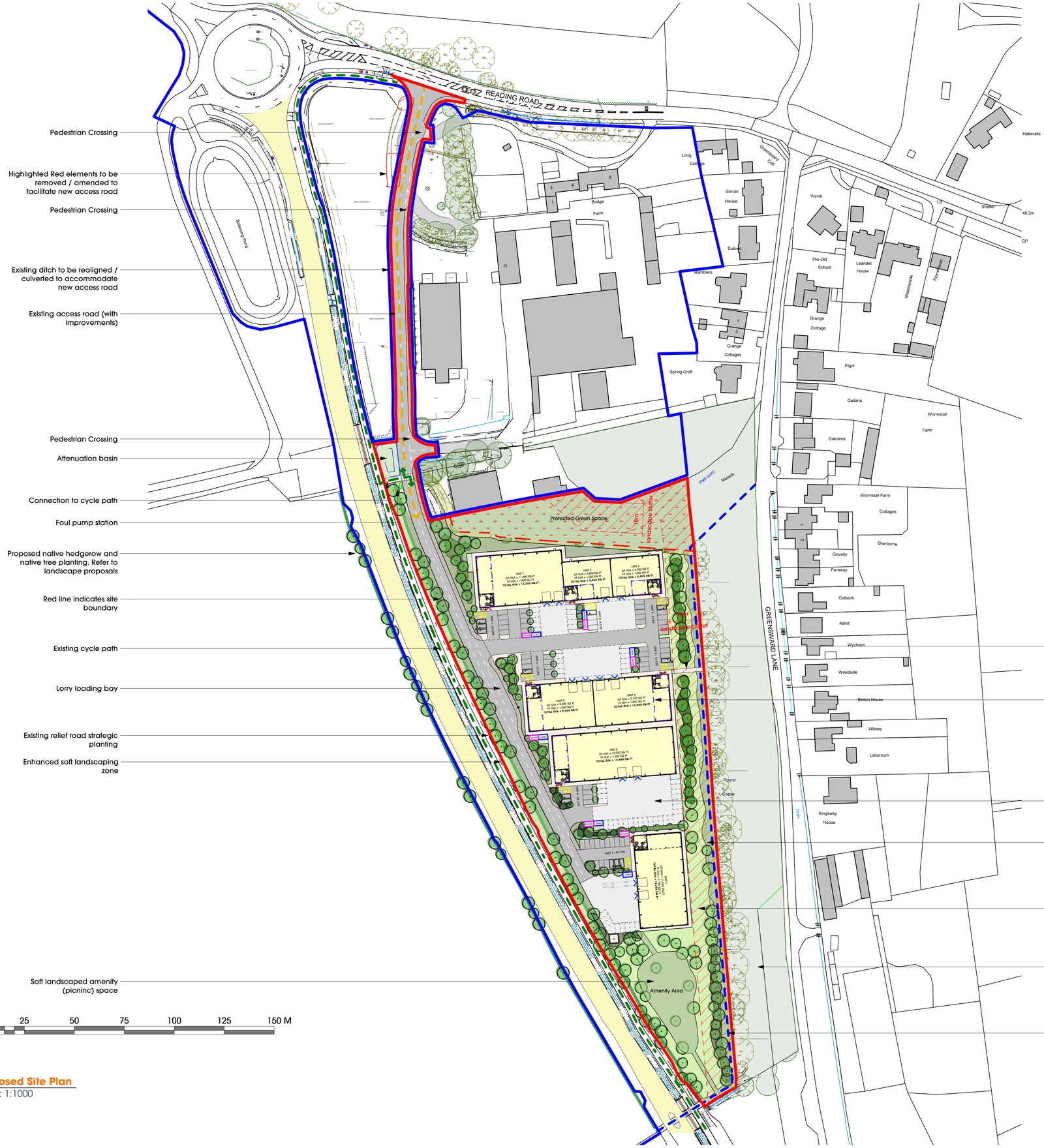
8.6. Flood risk from groundwater is considered to be medium, as such, to not further increase the risk of groundwater flooding the use of infiltration drainage should be avoided. Additionally, using an appropriate drainage system to move surface water offsite (at a reasonable rate) will mitigate elevating existing groundwater levels above their existing state.

8.7. The proposed development is classified as a less vulnerable development by the Flood Risk Vulnerability Classification (Annex 3) in the NPPF. Therefore, in line with the flood risk vulnerability and flood zone compatibility table (Table 3) in the NPPF, the development is appropriate on a flood zone 1 site.

8.8. Mitigation measures are recommended to prevent the elevation of flood risk, and in some cases reduce it. First, an appropriate drainage system installed across the areas of hardstanding, with consideration given to the topography of the hardstanding areas to prevent water from pooling and direct surface water into the drainage system. Secondly, infiltration measures should be avoided to prevent elevating groundwater flood risk.

APPENDIX I

SITE PLANS



1 **Proposed Site Plan**
Scale: 1:1000

N

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DO NOT SCALE!
ALL DIMENSIONS SHOULD BE CHECKED ON SITE BEFORE WORK COMMENCES

SITE LAYOUT KEY

- Boundary Line
- Cycle Path
- Access From A327
- Existing Footpath (FP22)
- A327 road adjacent
- Proposed Pathways
- Mezzanine level
- Covered bicycle parking
- Bin store
- Foul pumping station
- Unit pedestrian entry
- Unit vehicular entry
- New tree planting

Rev.	Date	Description	Drawn
K	23/07/25	Substaion added for reserved matters.	LA
J	01/07/25	Unit floor plans coordinated withe site plan	LA
H	11/12/2024	Unit 6 loading bays repositioned to coordinate with ADC tracking drawing	PH
G	09/12/2024	Hedgerow to Western edge of Observer Way reinstated, coordinated with landscaping scheme	PH
F	02/12/2024	Existing trees adjacent entrance amended following discussion with planning consultant	PH
E	02/12/2024	Updated to incorporate latest landscaping scheme received 29.11.24	PH
D	02/12/2024	Landscaping scheme amended to include specialist consultant information	DW

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Client
Tungsten Properties

Project
Observer Park, Arborfield, Reading

Drawing Title
Illustrative Masterplan

Date 20/08/2024
Status PLANNING
Scale 1:1000 Size A1
Drawn PH Checked DW
Job no. 3389 Dwg no. P403 Rev. K

APPENDIX II

FLUVIAL FLOOD MAP

Flood map for planning

Your reference	Location (easting/northing)	Created
Unspecified	**475012/167246**	**11 April 2025 10:05**

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following**:

- bigger than 1 hectare (ha)
- in an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

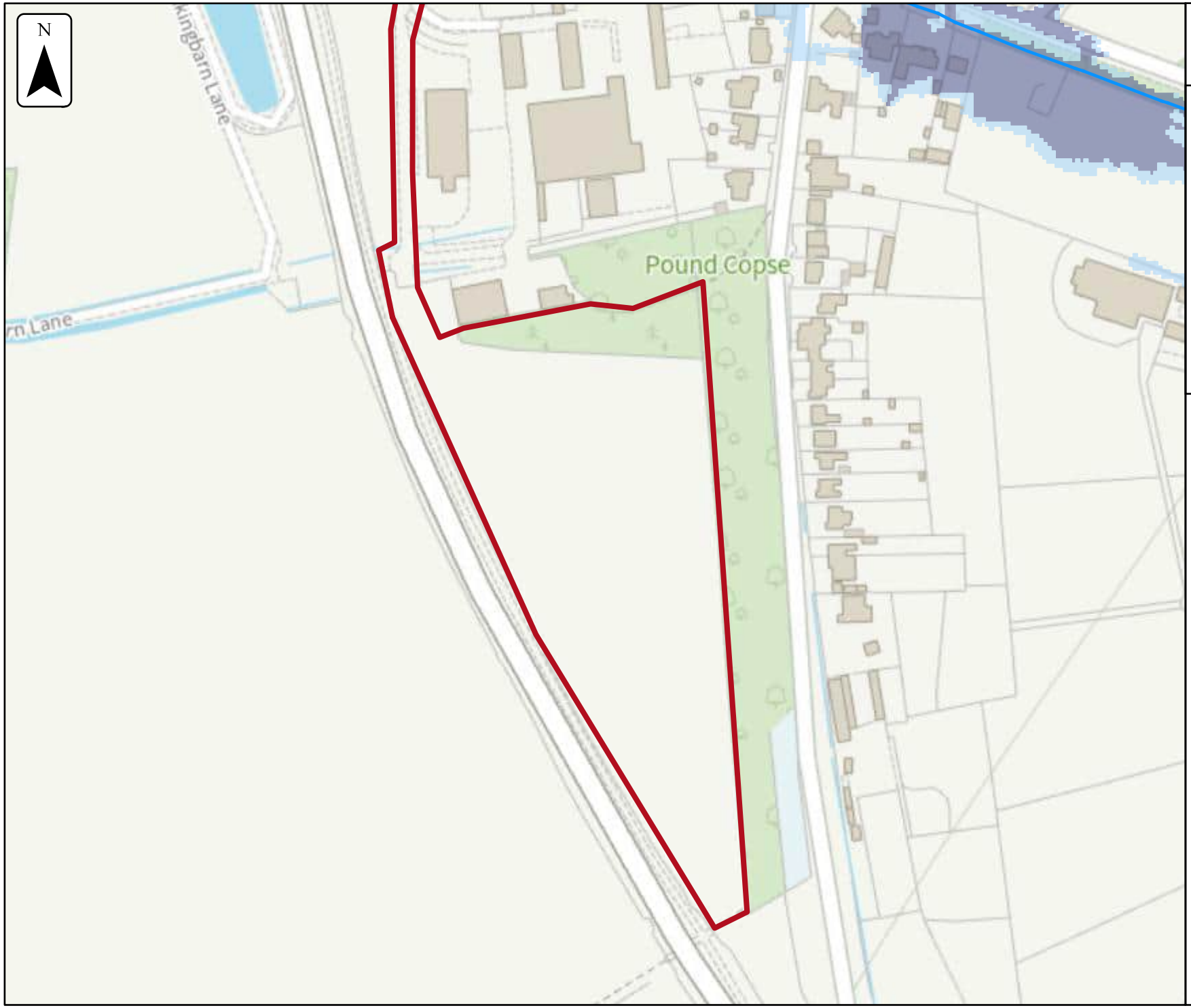
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2025 AC0000807064. https://flood-map-for-planning.service.gov.uk/os-terms



Environment Agency

Flood map for planning

Your reference
Unspecified

Location (easting/northing)
475012/167246

Scale
1:2,500

Created
11 Apr 2025 10:05

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60 m

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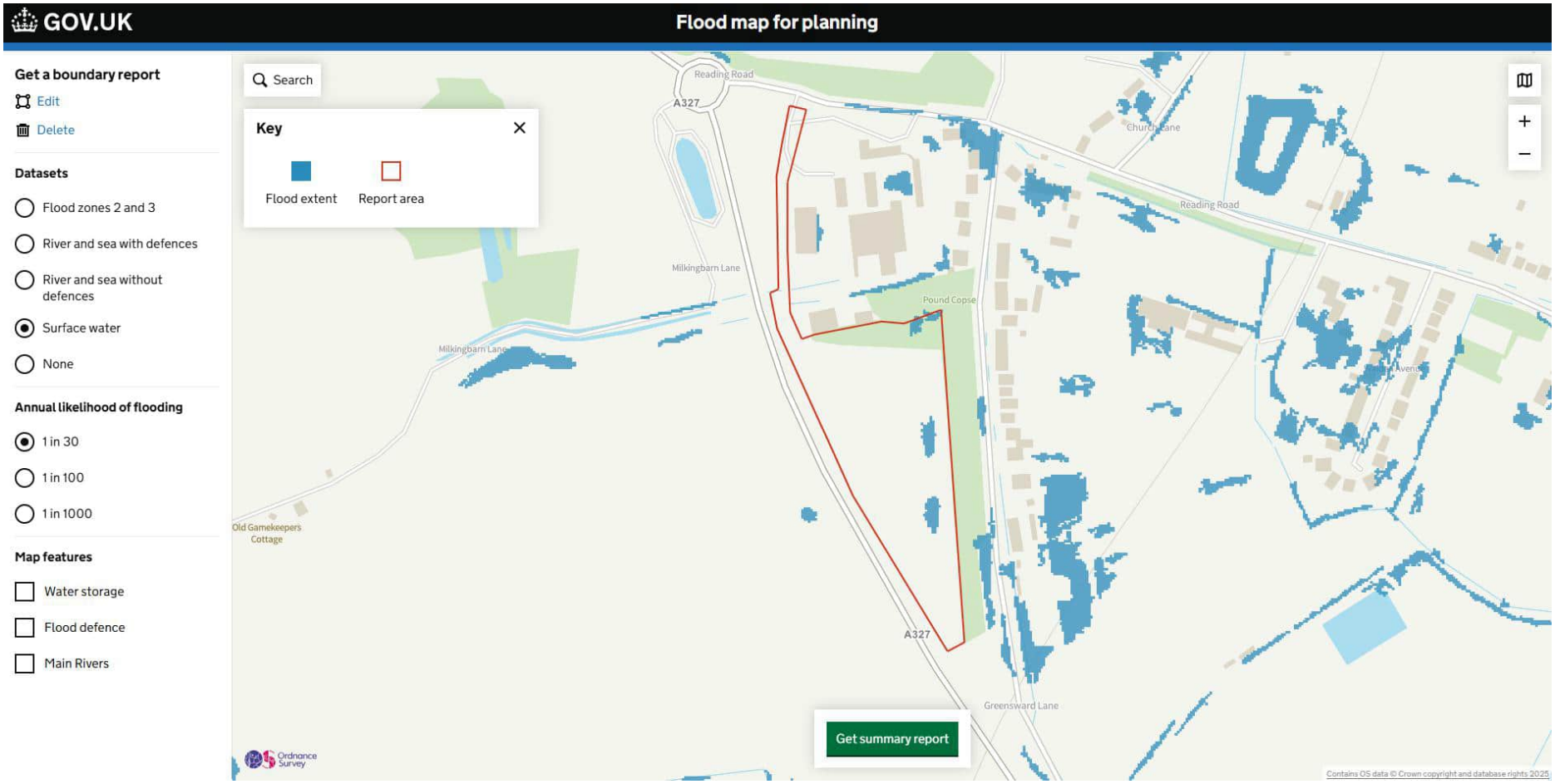
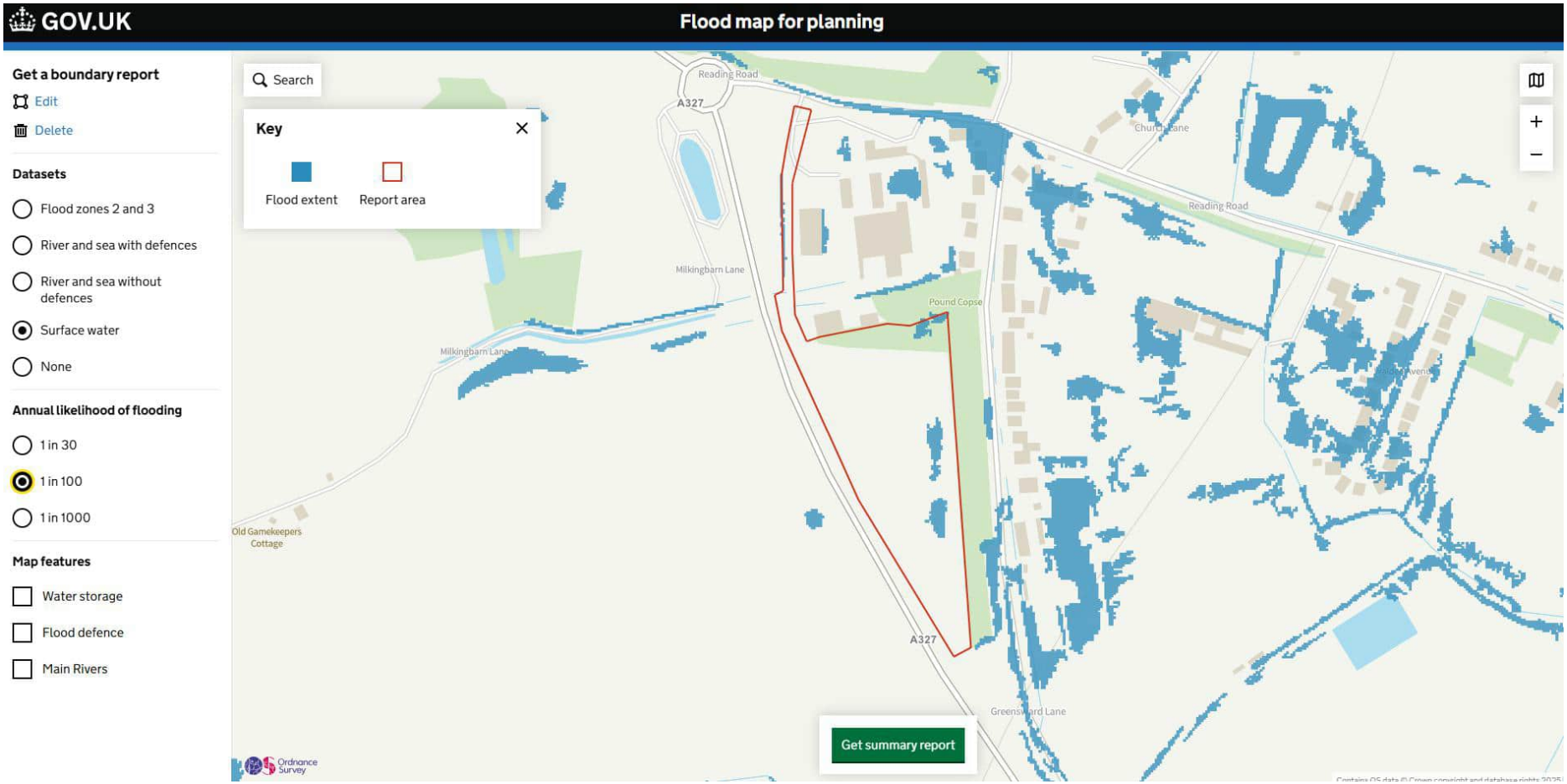
APPENDIX III

SURFACE WATER FLOOD MAP



Source: https://flood-map-for-planning.service.gov.uk/map



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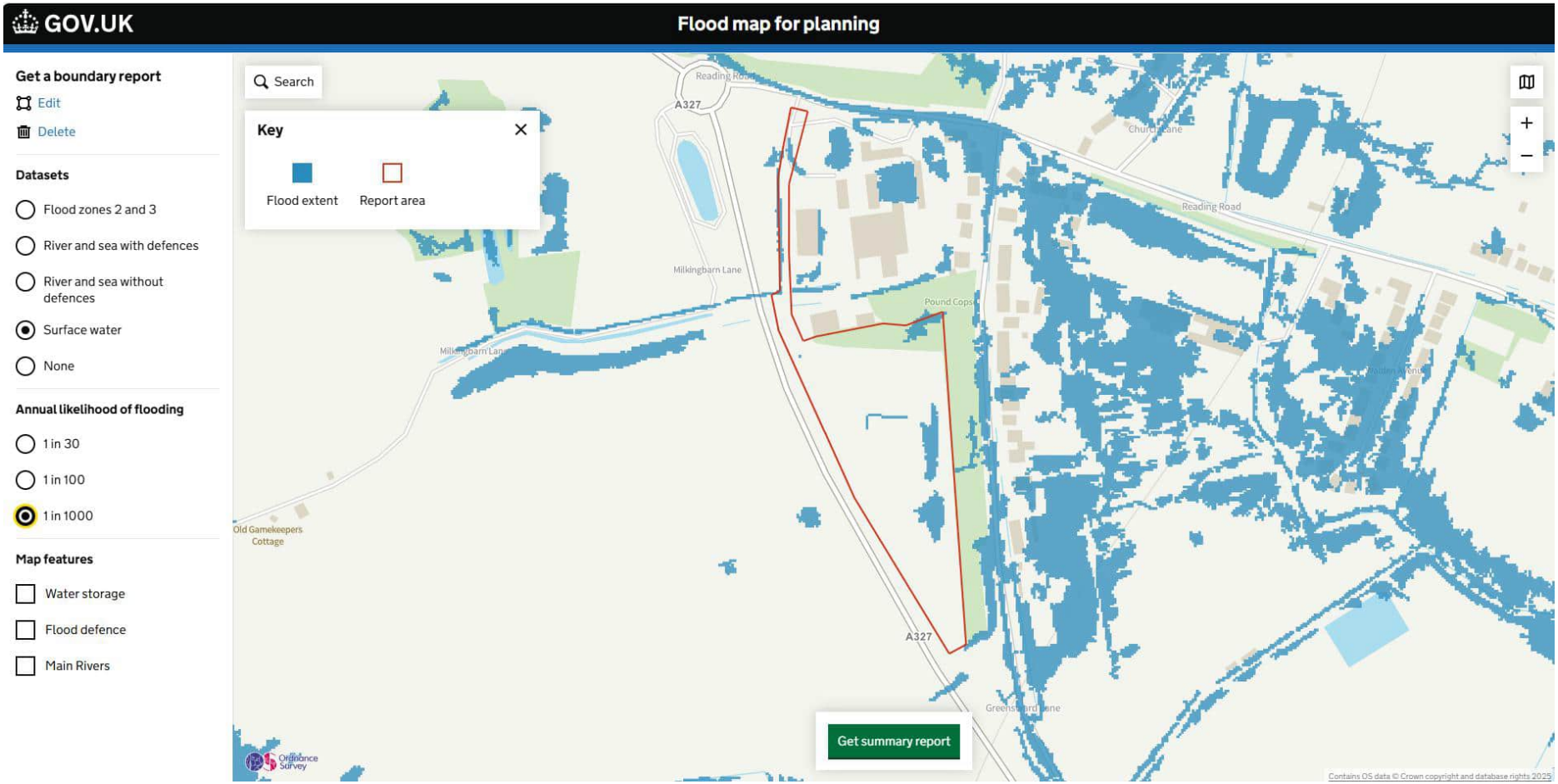
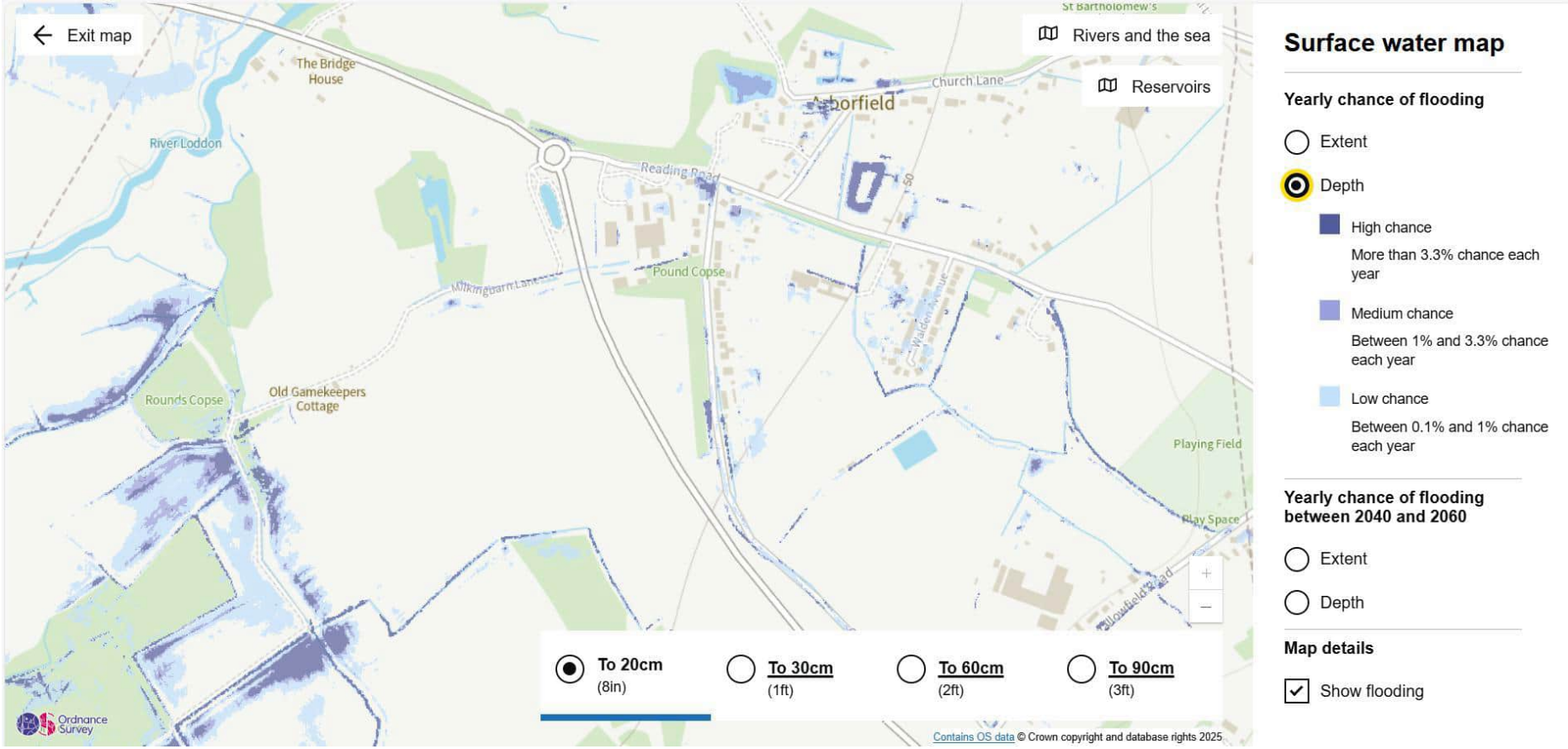


Source: https://flood-map-for-planning.service.gov.uk/map

https://check-long-term-flood-risk.service.gov.uk/map



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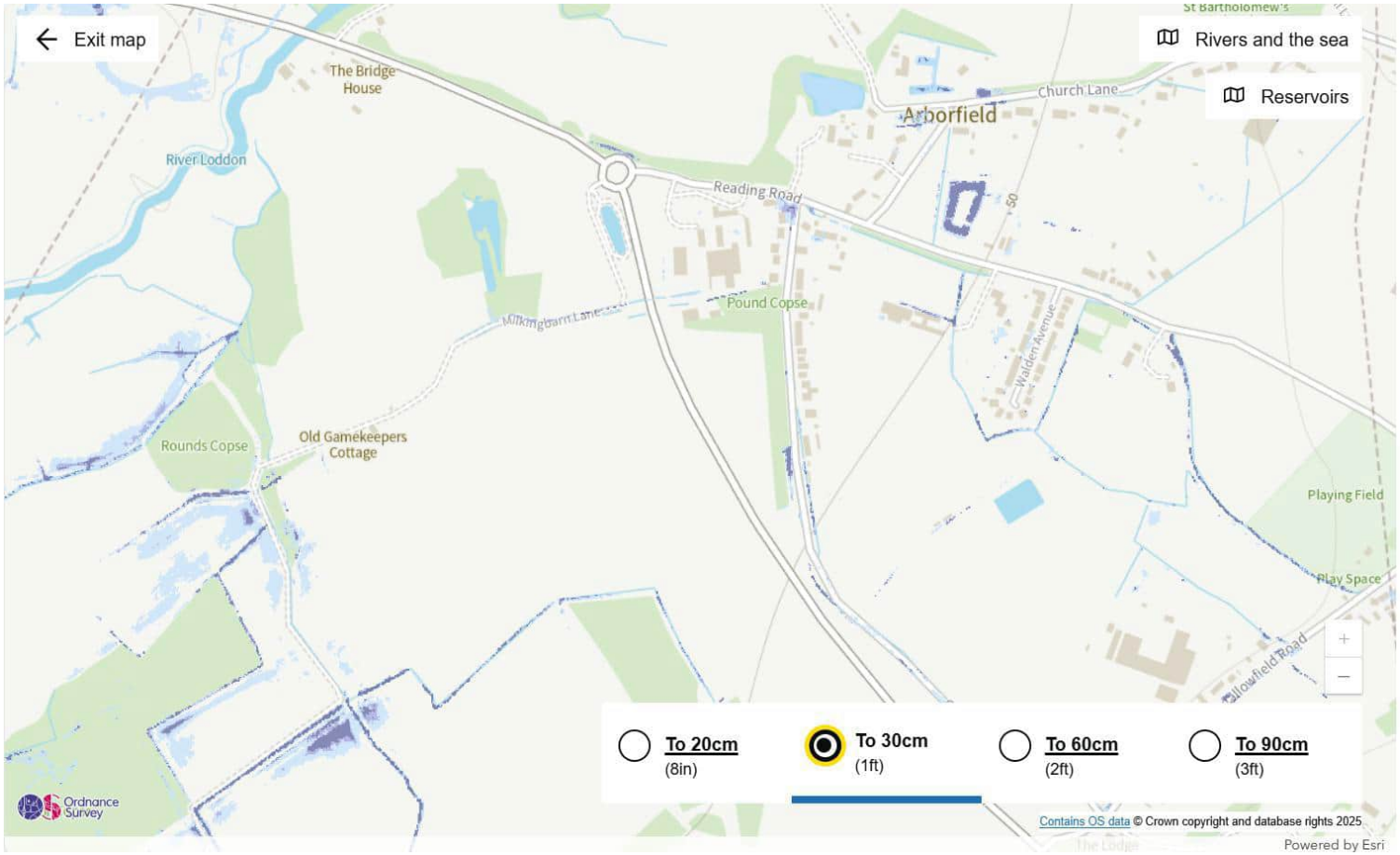


Surface water map

Yearly chance of flooding

- ○ Extent
- ◉ Depth
  - High chance: More than 3.3% chance each year
  - Medium chance: Between 1% and 3.3% chance each year
  - Low chance: Between 0.1% and 1% chance each year

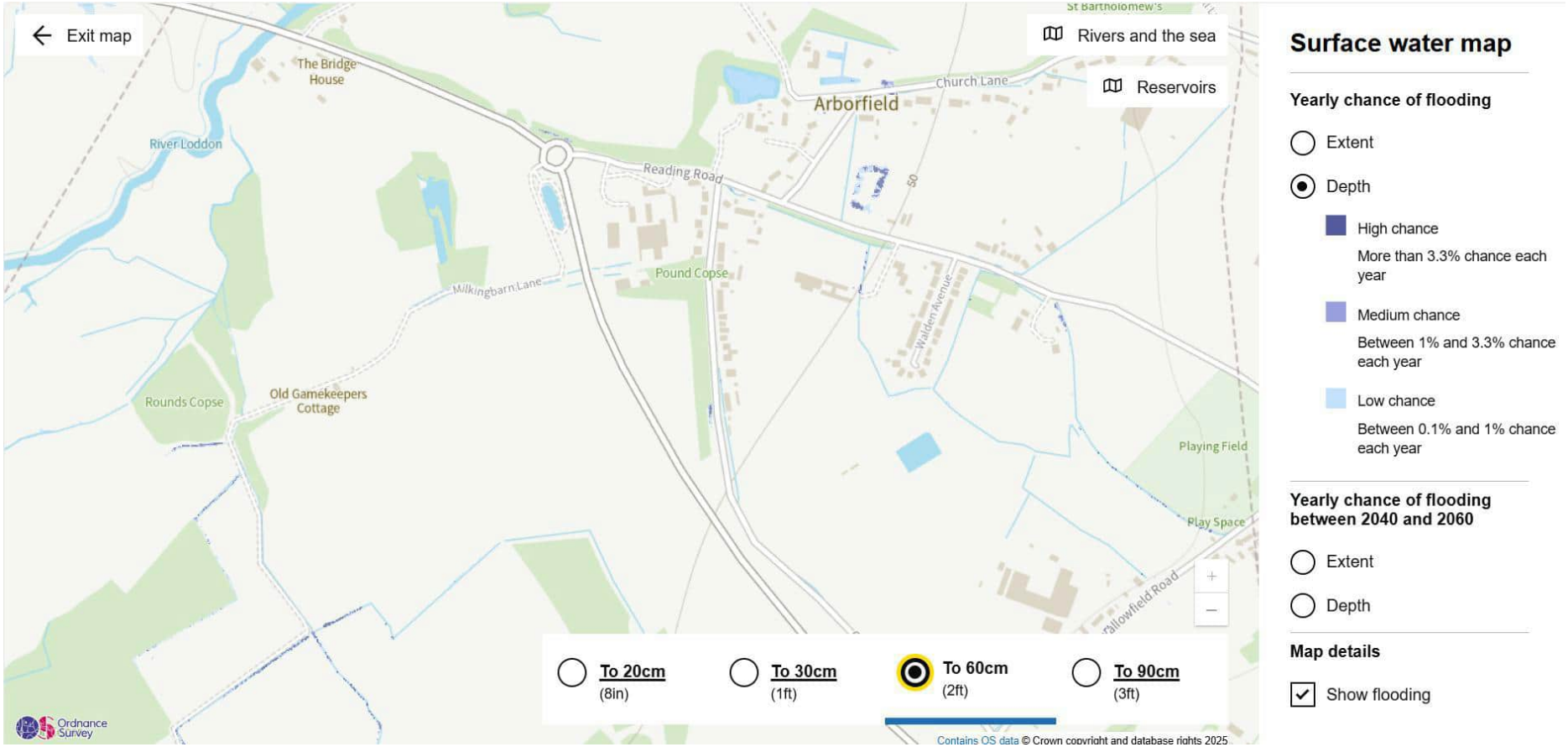
Yearly chance of flooding between 2040 and 2060

- ○ Extent
- ○ Depth

Map details

- ☑ Show flooding

https://check-long-term-flood-risk.service.gov.uk/map



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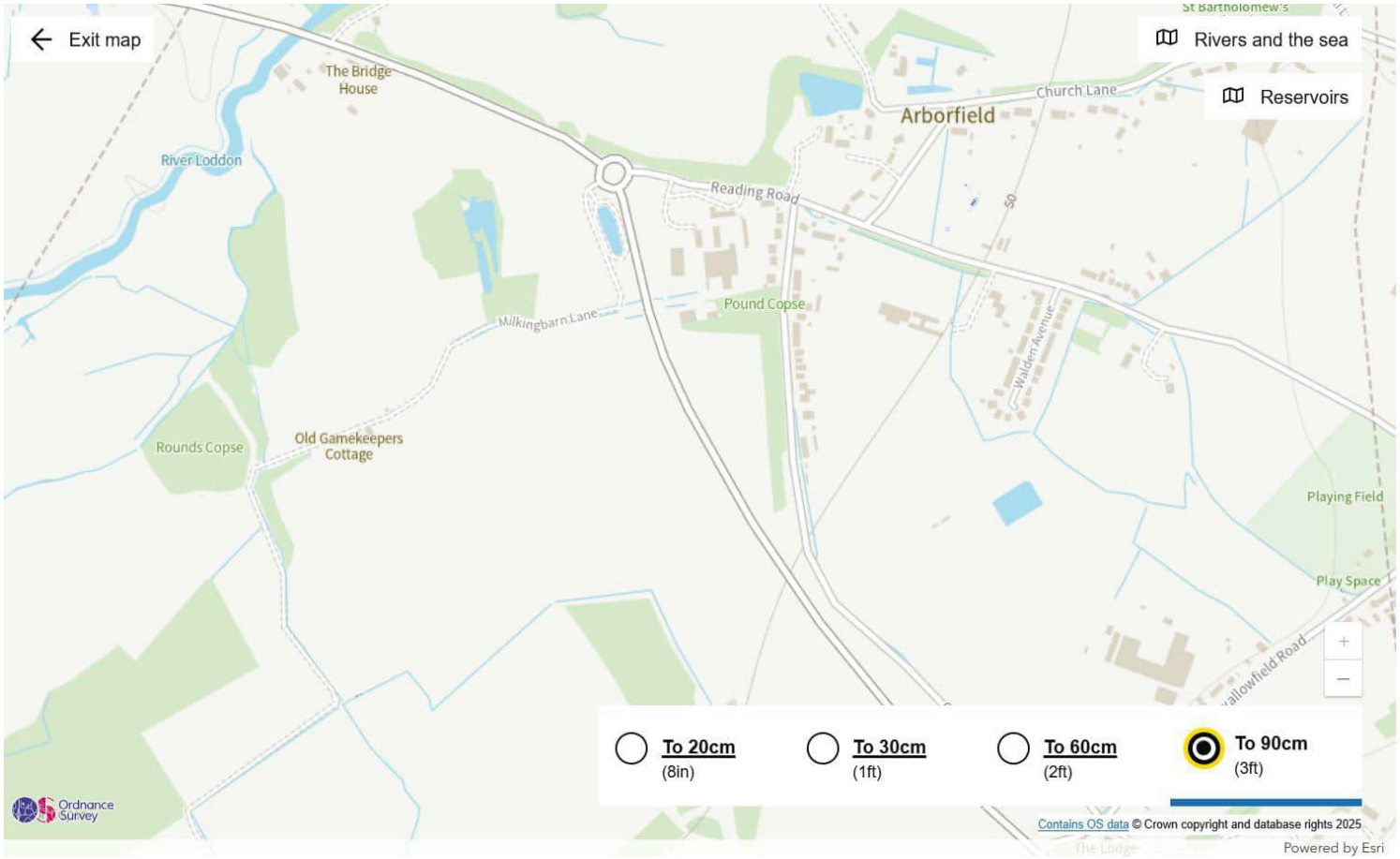


Surface water map

Yearly chance of flooding

- ○ Extent
- ◉ Depth
  - High chance: More than 3.3% chance each year
  - Medium chance: Between 1% and 3.3% chance each year
  - Low chance: Between 0.1% and 1% chance each year

Yearly chance of flooding between 2040 and 2060

- ○ Extent
- ○ Depth

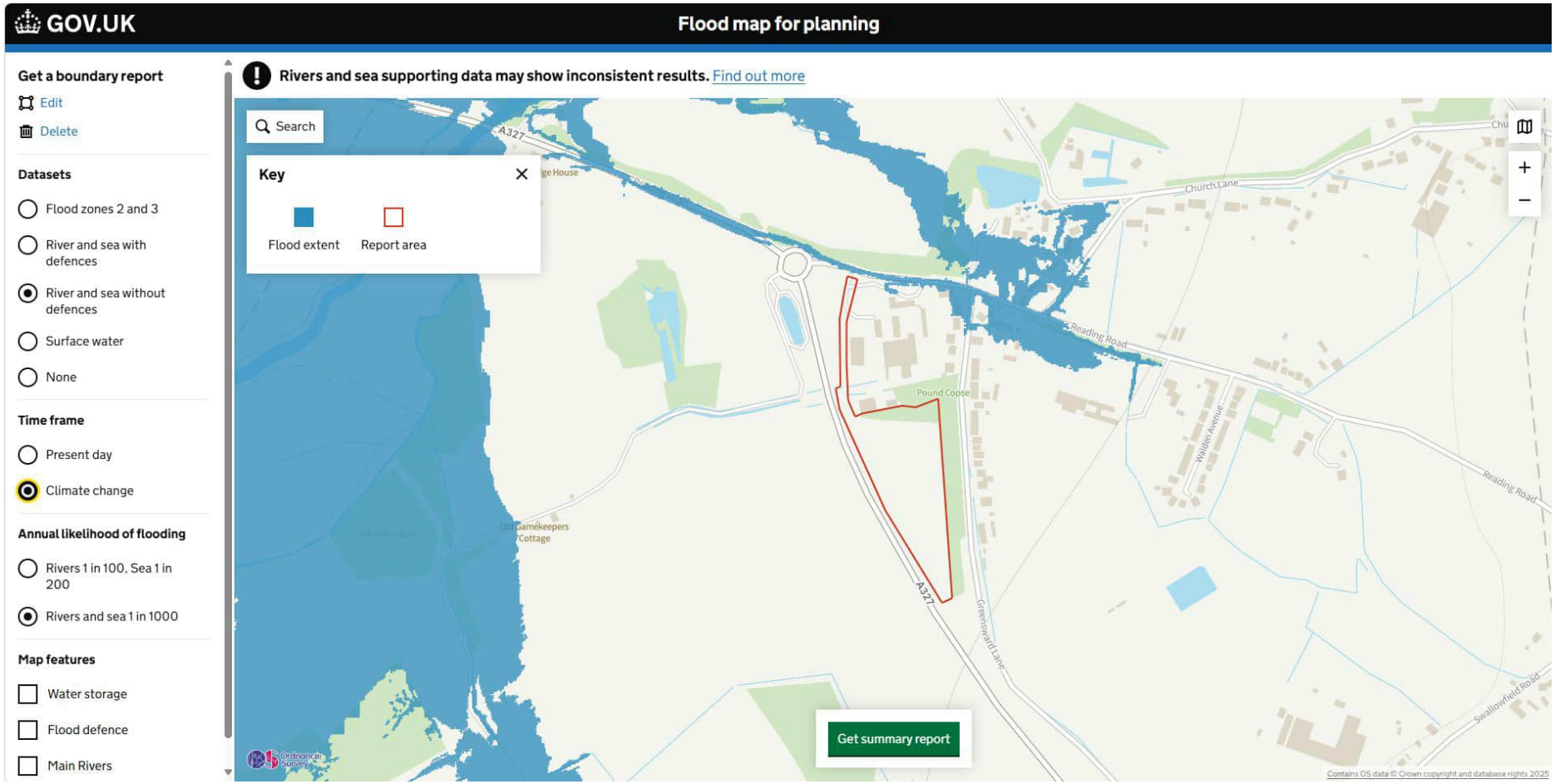
Map details

- ☑ Show flooding

https://check-long-term-flood-risk.service.gov.uk/map

APPENDIX IV

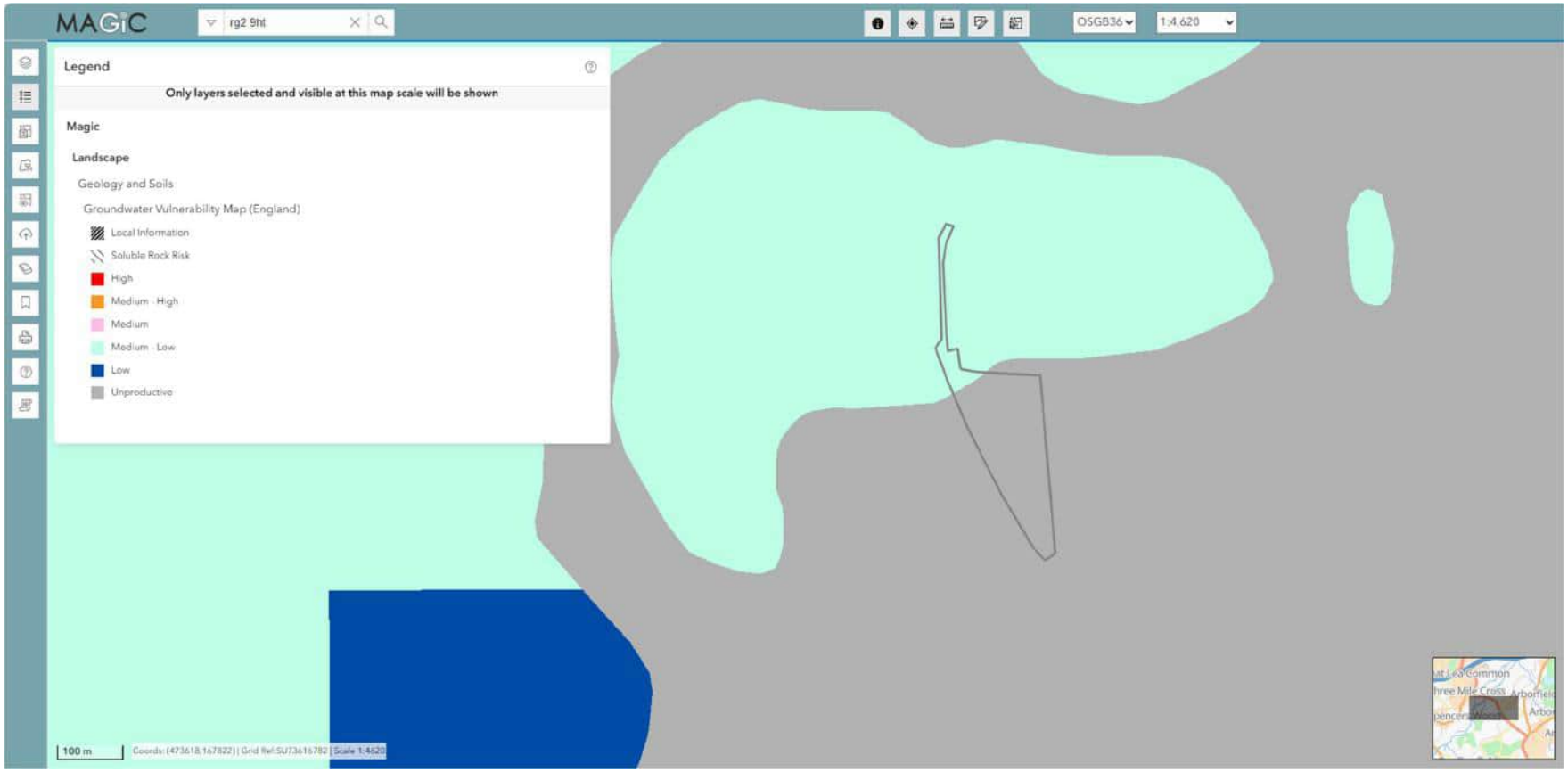
RESERVOIR FLOOD MAP



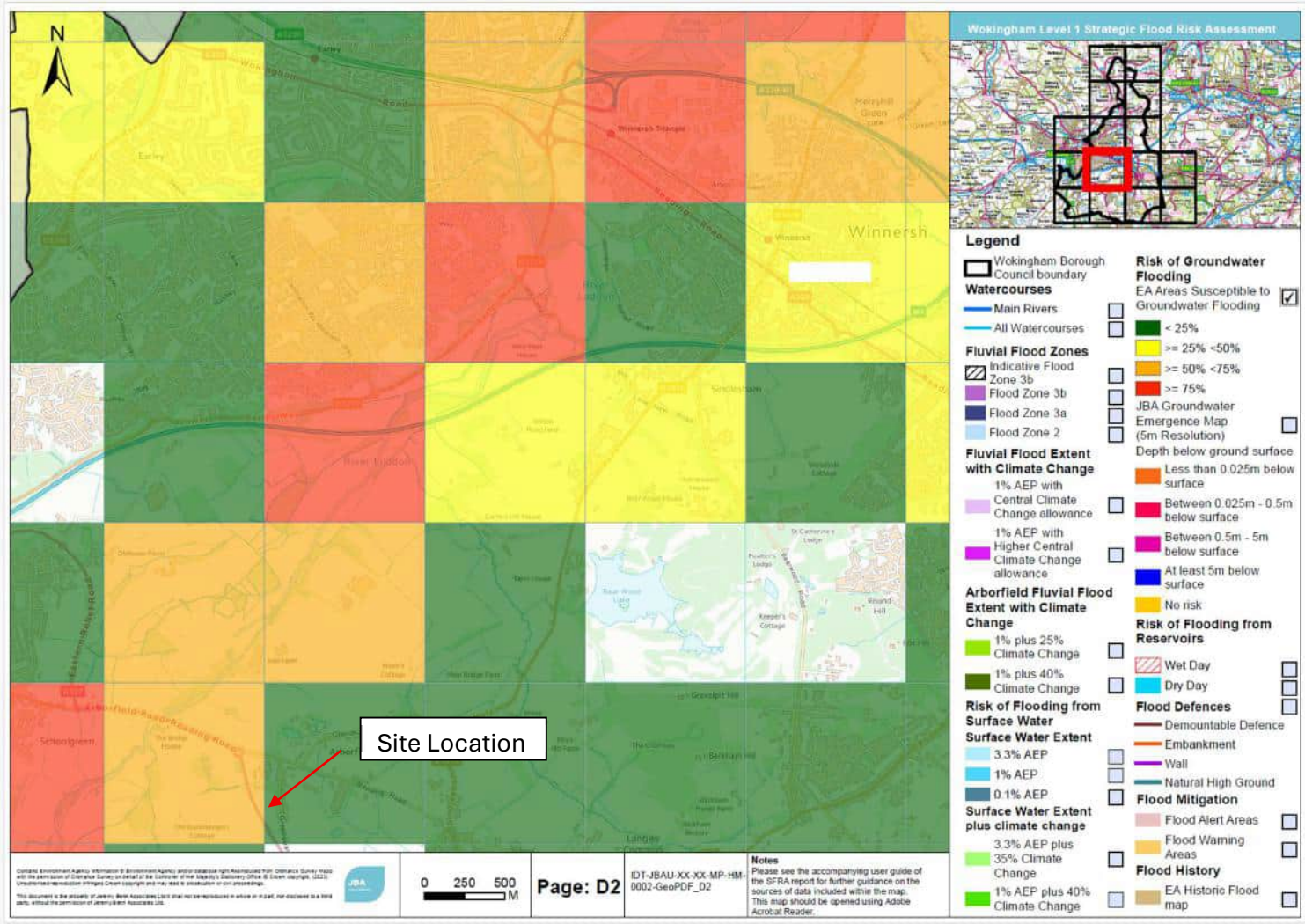
https://flood-map-for-planning.service.gov.uk/map

APPENDIX V

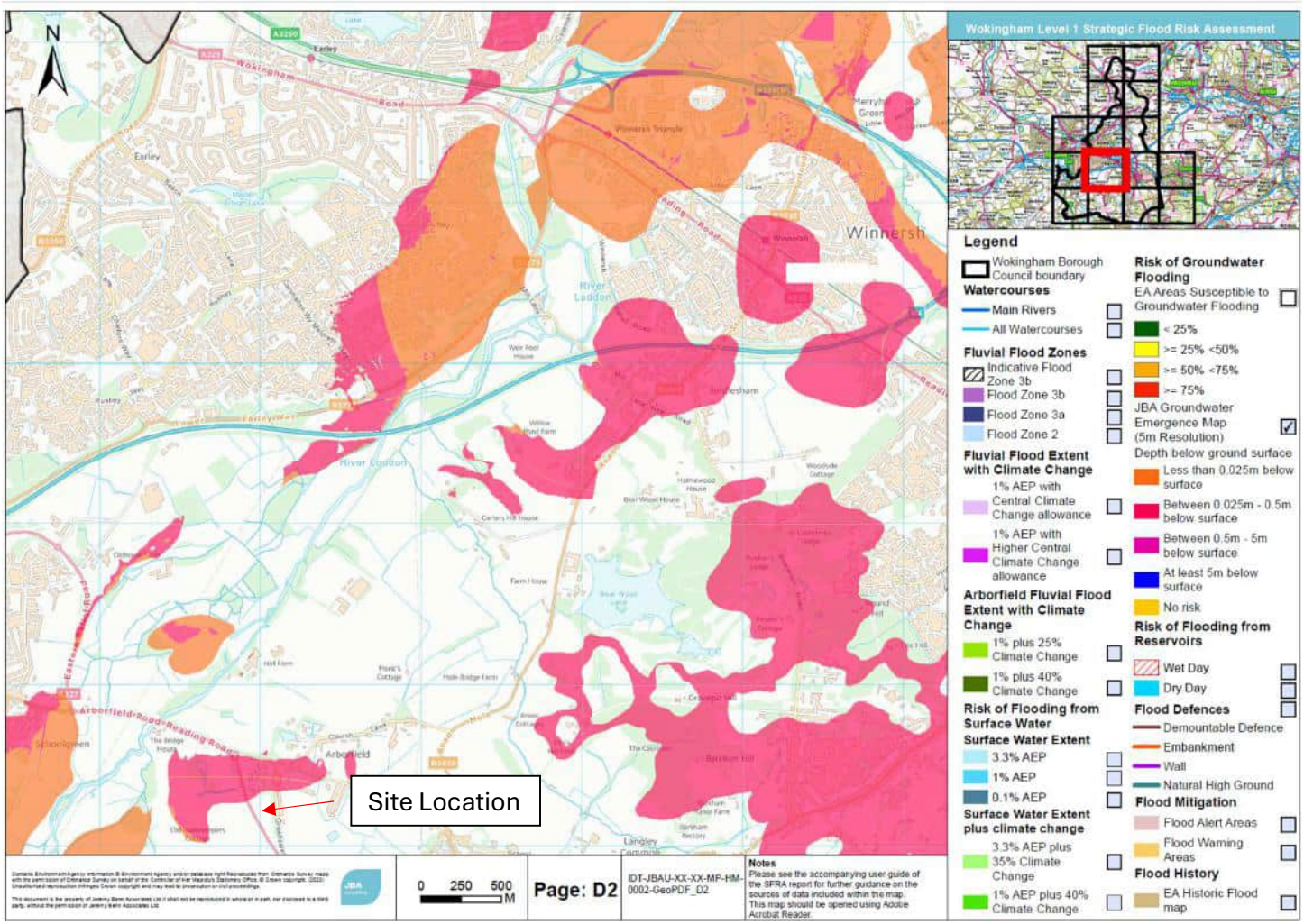
GROUNDWATER FLOOD MAP



https://magic.defra.gov.uk/MagicMap.html



https://www.wokingham.gov.uk/planning-policy/evidence-studies



https://www.wokingham.gov.uk/planning-policy/evidence-studies

APPENDIX VI

SEWER FLOODING INCIDENTS TABLE

Table 5-3: Sewer flooding incidents recorded by Thames Water (January 2000-May 2022)

Postcode	Number of recorded incidents 2022	Number of recorded incidents 2021	Number of recorded incidents 2020	Number of recorded incidents 2019	Number of recorded incidents from 2000-2019	Total flooding incidents
RG10 0	0	1	4	2	63	**70**
RG10 8	0	0	0	0	2	**2**
RG10 9	0	5	5	4	94	**108**
RG2 8	0	0	0	0	10	**10**
RG2 9	1	7	10	6	148	**172**
RG27 0	0	0	0	0	5	**5**
RG4 6	0	1	2	0	33	**36**
RG40 1	0	0	0	0	1	**1**
RG40 2	0	0	0	0	3	**3**
RG40 4	0	2	1	1	47	**51**

Source: Wokingham Borough Council Strategic Flood Risk Assessment (May 2023)

APPENDIX VII

TOPOGRAPHICAL SURVEY

NOTES

1. Contractors must check all dimensions on site. Only figured dimensions are to be worked from. Discrepancies must be reported to the Architect or Engineer before proceeding. © This drawing is copyright.

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KEY

SURVEY STATION — STNA E=515598.801 N=235434.304 H=65.094

BANKING — TOP / BOTTOM

DITCH

HEDGE SPREADS SHOWN TO SCALE

FOLIAGE

TREES — SPREAD & TRUNK SHOWN TO SCALE H=HEIGHT

TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.

GATE — GP / KD

ROAD WITH GULLY AND KERB DFFLET DROPPED KERB — G

KERB

TRACK

VERGE

FENCE

WALL

OVERHEAD ELECTRIC — TP

OVERHEAD TELECOM — TP

BUILDING

MAJOR CONTOUR INTERVAL — 25.00

MINOR CONTOUR INTERVAL — 24.75

SPOT LEVEL + 127.13

BORE HOLE Bor

TRIAL PIT Tpt

SEWER DETAILS

SEWERS FDUL	
SEWERS STORM	
COVER LEVEL	MHCL=
INVERT LEVEL	IL=
BACKDROP INVERT	BDIL=
SOAKAWAY	SA
CATCHPIT INVERT	CPIL=
SOFFIT LEVEL	SL=

NOTE: INVERTS, PIPE SIZES, CONNECTIONS SHOWN ARE OBTAINED FROM SURFACE INVESTIGATIONS AND AUDIBLE METHODS ONLY. ALL SEWER ROUTES ARE PRESUMED TO BE STRAIGHT BETWEEN CHAMBERS.

GENERAL ABBREVIATIONS

AIR CONDITIONING UNIT	AC
AIR VALVE	AV
BACK DROP	BD
BIN	Bin
BRICK	BK
BOLLARD	Bol
BUS STOP	Bus
BT INSPECTION COVER	BT
CABLE TV COVER	CATV
COVER LEVEL	CL
CONTROL BOX	CB
DROP KERB	DK
ELECTRIC SUBSTATION	E.S.S
ELECTRICITY COVER	Elc
ELECTRICITY POLE	EP
EARTH ROD	ER
FIRE HYDRANT	FH
FLAGPOLE	FGP
FLOOR LEVEL	FFL
FOOTBRIDGE	FB
FOUL WATER SEWER	FWS
GAS VALVE	GV
GATE POST	GP
GULLY	GY
INSPECTION COVER	ICCL
INVERT LEVEL	INV
KERB OFFLET	KO
LAMP POST	LP
POST BOX	PB
MANHOLE	MHCL
MARKER POST	Mkr
MILESTONE	MS
ORDNANCE SURVEY BENCH MARK	OSBM
RAINWATER PIPE	RWP
RODDING EYE	RE
ROAD SIGN	RS
SERVICE VALVE	SV
STOP COCK	SC
STORM WATER SEWER	SWS
TELEGRAPH POLE	TP
TRAFFIC LIGHT	TL
TROUGH	TR
TV POINT	TV
UNABLE TO LIFT	UTL
VENT PIPE	VP
WATER LEVEL	WRLV
WATER METER	WM
WATER VALVE	WV
WASH OUT	WO

FENCE ABBREVIATIONS

BARBED WIRE FENCE	BWF
CHAINLINK FENCE	CLF
CHESTNUT PALING	CPF
CLOSE BOARDED FENCE	CBF
CORRUGATED IRON FENCE	CIF
CRASH BARRIER	CRF
ELECTRIC FENCE	ELF
HAND RAIL FENCE	HRF
IRON RAILINGS	IRF
KNEE RAIL FENCE	KRF
LARCHLAP FENCE	LLF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK PROOF FENCE	SPF
TIMBER PANEL FENCE	TPF
WIRE MESH FENCE	WMF

WALL ABBREVIATIONS

BLOCK WALL	BLW
BRICK WALL	BRW
CONCRETE WALL	CNW
RETAINING WALL	RTW
SANDBAG WALL	SDW
SLEEPER WALL	SLW
STONE WALL	STW

ORDINATE SYSTEM GRID AND LEVELS TO OS GPS NETWORK
SCALE FACTOR = 1.000

CONTROL TABLE: LINKED TO NATIONAL GPS NETWORK SF=1.000

Name	Easting	Northing	Height
STNA	475059.376	167042.225	49.721
STNB	475019.118	167188.880	49.371
STNC	474982.415	167173.873	48.870
STND	474947.760	167248.372	48.483
STNE	474906.804	167348.945	47.856
STNF	474920.173	167362.291	48.132
STNG	474909.436	167417.887	47.756
STNH	474882.865	167460.597	47.815
STNJ	474913.466	167491.703	47.639
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STNL	474944.205	167540.909	47.864
STNM	474868.721	167547.491	47.907
STNN	474965.798	167371.594	48.327
STNP	474926.177	167404.328	47.511
STNQ	474951.495	167546.236	47.697

NEAREST MAJOR TREES IN WOODLAND SURVEYED

NEAREST MAJOR TREES IN WOODLAND SURVEYED

NEAREST MAJOR TREES IN WOODLAND SURVEYED

EXTENT OF GROUP OF HOLLY TREES CANOPY

NEAREST MAJOR TREES IN WOODLAND SURVEYED

NEW LANDSCAPED PLANTING

WILDLIFE HIGHWAY IN FENCE

NEW LANDSCAPED PLANTING

NEW LANDSCAPED PLANTING

NEW LANDSCAPED PLANTING

NEW LANDSCAPED PLANTING

A327

Pound Copse

SCALE 1:200

REV	DESCRIPTION	DRN	CHD	DATE

■ PRELIMINARY ☐ INFORMATION ☐ TENDER
☐ CONSTRUCTION ☐ AS BUILT

SCALE	1:200 @ A0	DATE	APRIL 2022
DRAWN	NC	CHK	NC
DRAWING NO.	18959-7-851	REV	-
TITLE	LAND OFF READING ROAD ARBORFIELD		
DETAILS	TOPOGRAPHIC SURVEY SHEET 1 of 6		

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KEY

SURVEY STATION — STNA E=515598.801 N=235434.354 H=65.094

BANKING — TOP / BOTTOM

DITCH

HEDGE SPREADS SHOWN TO SCALE

FOLIAGE

TREES — SPREAD & TRUNK SHOWN TO SCALE H=HEIGHT

TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.

GATE — GP / KD

ROAD WITH GULLY AND KERB OFFLET DROPPED KERB — G

KERB

TRACK

VERGE

FENCE

WALL

OVERHEAD ELECTRIC — TP

OVERHEAD TELECOM — TP

BUILDING

MAJOR CONTOUR INTERVAL — 25.00

MINOR CONTOUR INTERVAL — 24.75

SPOT LEVEL + 127.13

BORE HOLE Bor

TRIAL PIT Tpt

SEWER DETAILS

SEWERS FOUL

SEWERS STORM

COVER LEVEL MHCL=

INVERT LEVEL IL=

BACKDROP INVERT BDIL=

SOAKAWAY SA

CATCHPIT INVERT CPIL=

SOFFIT LEVEL SL=

NOTE: INVERTS, PIPE SIZES, CONNECTIONS SHOWN ARE OBTAINED FROM SURFACE INVESTIGATIONS AND AUDIBLE METHODS ONLY. ALL SEWER ROUTES ARE PRESUMED TO BE STRAIGHT BETWEEN CHAMBERS.

GENERAL ABBREVIATIONS

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FOUL WATER SEWER	FWS
GAS VALVE	GV
GATE POST	GP
GULLY	GY
INSPECTION COVER	ICCL
INVERT LEVEL	INV
KERB OFFLET	KO
LAMP POST	LP
POST BOX	PB
MANHOLE	MHCL
MARKER POST	Mkr
MILESTONE	MS
ORDNANCE SURVEY BENCH MARK	OSBM
RAINWATER PIPE	RWP
RODDING EYE	RE
ROAD SIGN	RS
SERVICE VALVE	SV
STOP COCK	SC
STORM WATER SEWER	SWS
TELEGRAPH POLE	TP
TRAFFIC LIGHT	TL
TROUGH	TR
TV POINT	TV
UNABLE TO LIFT	UTL
VENT PIPE	VP
WATER LEVEL	WRLV
WATER METER	WM
WATER VALVE	WV
WASH OUT	WO

FENCE ABBREVIATIONS

BARBED WIRE FENCE	BWF
CHAINLINK FENCE	CLF
CHESTNUT PALING	CPF
CLOSE BOARDED FENCE	CBF
CORRUGATED IRON FENCE	CIF
CRASH BARRIER	CRF
ELECTRIC FENCE	ELF
HAND RAIL FENCE	HRF
IRON RAILINGS	IRF
KNEE RAIL FENCE	KRF
LARCHLAP FENCE	LLF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK PROOF FENCE	SPF
TIMBER PANEL FENCE	TPF
WIRE MESH FENCE	WMF

WALL ABBREVIATIONS

BLOCK WALL	BLW
BRICK WALL	BRW
CONCRETE WALL	CNW
RETAINING WALL	RTW
SANDBAG WALL	SDW
SLEEPER WALL	SLW
STONE WALL	STW

ORDINATE SYSTEM GRID AND LEVELS TO OS GPS NETWORK
SCALE FACTOR = 1.000

CONTROL TABLE: LINKED TO NATIONAL GPS NETWORK SF=1.000

Name	Easting	Northing	Height
STNA	475059.376	167042.225	49.721
STNB	475019.118	167188.880	49.371
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STNG	474909.436	167417.887	47.756
STNH	474882.865	167460.597	47.815
STNJ	474913.466	167491.703	47.639
STNK	474929.259	167530.464	47.523
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STNN	474965.798	167371.594	48.327
STNP	474926.177	167404.328	47.511
STNQ	474951.495	167548.236	47.697

REV	DESCRIPTION	DRN	CHD	DATE
■	PRELIMINARY	☐	INFORMATION	☐	TENDER
☐	CONSTRUCTION	☐	AS BUILT		

SCALE	1:200 @ A0	DATE	APRIL 2022
DRAWN	NC	CHK	NC
DRAWING NO.	18959-7-852	REV	-
TITLE	LAND OFF READING ROAD ARBORFIELD		
DETAILS	TOPOGRAPHIC SURVEY SHEET 2 of 6		

SCALE 1:200

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KEY

SURVEY STATION — STNA E=515598.801 N=235434.354 H=65.094

BANKING — TOP / BOTTOM

DITCH

HEDGE SPREADS SHOWN TO SCALE

FOLIAGE

TREES — SPREAD & TRUNK SHOWN TO SCALE H=HEIGHT

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GATE — GP

ROAD WITH GULLY AND KERB DFFLET DROPPED KERB — KD / G

KERB

TRACK

VERGE

FENCE

WALL

OVERHEAD ELECTRIC — TP

OVERHEAD TELECOM — TPL

BUILDING

MAJOR CONTOUR INTERVAL 25.00

MINOR CONTOUR INTERVAL 24.75

SPOT LEVEL + 127.13

BORE HOLE Bor

TRIAL PIT Tpt

SEWER DETAILS

SEWERS FDUL	
SEWERS STORM	
COVER LEVEL	MHCL=
INVERT LEVEL	IL=
BACKDROP INVERT	BDIL=
SOAKAWAY	SA
CATCHPIT INVERT	CPIL=
SOFFIT LEVEL	SL=

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GULLY	GY
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KERB DFFLET	KD
LAMP POST	LP
POST BOX	PB
MANHOLE	MHCL
MARKER POST	Mkr
MILESTONE	MS
ORDNANCE SURVEY BENCH MARK	OSBM
RAINWATER PIPE	RWP
RODDING EYE	RE
ROAD SIGN	RS
SERVICE VALVE	SV
STOP COCK	SC
STORM WATER SEWER	SWS
TELEGRAPH POLE	TP
TRAFFIC LIGHT	TL
TROUGH	TR
TV POINT	TV
UNABLE TO LIFT	UTL
VENT PIPE	VP
WATER LEVEL	WRLV
WATER METER	WM
WATER VALVE	WV
WASH OUT	WO

FENCE ABBREVIATIONS

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LARCHLAP FENCE	LLF
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ORDINATE SYSTEM GRID AND LEVELS TO OS GPS NETWORK
SCALE FACTOR = 1.000

CONTROL TABLE: LINKED TO NATIONAL GPS NETWORK SF=1.000

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STNF	474920.173	167362.291	48.132
STNG	474909.436	167417.887	47.756
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REV	DESCRIPTION	DRN	CHD	DATE

■ PRELIMINARY ☐ INFORMATION ☐ TENDER
☐ CONSTRUCTION ☐ AS BUILT

SCALE	1:200 @ A0	DATE	APRIL 2022
DRAWN	NC	CHK	NC
DRAWING NO.	18959-7-853	REV	-

TITLE: LAND OFF READING ROAD ARBORFIELD

DETAILS: TOPOGRAPHIC SURVEY SHEET 3 of 6

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ONLINE: mail@woodshardwick.com | woodshardwick.com

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SCALE 1:200

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KEY

SURVEY STATION — STNA E=515598.801 N=235434.394 H=65.094

BANKING — TOP / BOTTOM

DITCH

HEDGE SPREADS SHOWN TO SCALE

FOLIAGE

TREES — SPREAD & TRUNK SHOWN TO SCALE H=HEIGHT

TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.

GATE — GP / KO

ROAD WITH GULLY AND KERB OFFLET — DROPPED KERB

KERB

TRACK

VERGE

FENCE

WALL

OVERHEAD ELECTRIC — TP

OVERHEAD TELECOM — TP

BUILDING

MAJOR CONTOUR INTERVAL 25.00

MINOR CONTOUR INTERVAL 24.75

SPOT LEVEL + 127.13

BORE HOLE Bor

TRIAL PIT Tpt

SEWER DETAILS

SEWERS FOUL

SEWERS STORM

COVER LEVEL MHCL=

INVERT LEVEL IL=

BACKDROP INVERT BDIL=

SOAKAWAY SA

CATCHPIT INVERT CPIL=

SOFFIT LEVEL SL=

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GENERAL ABBREVIATIONS

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AIR VALVE	AV
BACK DROP	BD
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BOLLARD	Bol
BUS STOP	Bus
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CABLE TV COVER	CATV
COVER LEVEL	CL
CONTROL BOX	CB
DROP KERB	DK
ELECTRIC SUBSTATION	E.S.S
ELECTRICITY COVER	Elc
ELECTRICITY POLE	EP
EARTH ROD	ER
FIRE HYDRANT	FH
FLAGPOLE	FGP
FLOOR LEVEL	FFL
FOOTBRIDGE	FB
FOUL WATER SEWER	FWS
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GATE POST	GP
GULLY	GY
INSPECTION COVER	ICCL
INVERT LEVEL	INV
KERB OFFLET	KO
LAMP POST	LP
POST BOX	PB
MANHOLE	MHCL
MARKER POST	Mkr
MILESTONE	MS
ORDNANCE SURVEY BENCH MARK	OSBM
RAINWATER PIPE	RWP
RODDING EYE	RE
ROAD SIGN	RS
SERVICE VALVE	SV
STOP COCK	SC
STORM WATER SEWER	SWS
TELEGRAPH POLE	TP
TRAFFIC LIGHT	TL
TROUGH	TR
TV POINT	TV
UNABLE TO LIFT	UTL
VENT PIPE	VP
WATER LEVEL	WRLV
WATER METER	WM
WATER VALVE	VV
WASH OUT	WO

FENCE ABBREVIATIONS

BARBED WIRE FENCE	BWF
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ORDINATE SYSTEM GRID AND LEVELS TO OS GPS NETWORK
SCALE FACTOR = 1.000

CONTROL TABLE: LINKED TO NATIONAL GPS NETWORK SF=1.000			
Name	Easting	Northing	Height
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REV	DESCRIPTION	DRN	CHD	DATE
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SCALE	1:200 @ A0	DATE	APRIL 2022
DRAWN	NC	CHK	NC
DRAWING NO.	18959-7-854	REV	-
TITLE	LAND OFF READING ROAD ARBORFIELD		
DETAILS	TOPOGRAPHIC SURVEY SHEET 4 of 6		

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SCALE 1:200

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KEY

SURVEY STATION — STN A E=515598.801 N=376454.394 H=65.004

BANKING — TOP / BOTTOM

DITCH

HEDGE SPREADS SHOWN TO SCALE

FOLIAGE

TREES — SPREAD & TRUNK SHOWN TO SCALE; HEIGHT

TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS

GATE — GP

ROAD WITH GULLY AND KERB OFFLET — KO

DROPPED KERB — DK

KERB

TRACK

VERGE

FENCE

WALL

OVERHEAD ELECTRIC — OHE

OVERHEAD TELECOM — OHT

BUILDING — 25.00

MAJOR CONTOUR INTERVAL — 25.00

MINOR CONTOUR INTERVAL — 24.75

SPOT LEVEL — + 127.13

BORE HOLE — Bor

TRIAL PIT — Tp1

SEWER DETAILS

SEWERS FOUL

SEWERS STORM

COVER LEVEL — MHCL=

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SOAKAWAY — SA

CATCHPIT INVERT — CPIL=

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EARTH ROD	ER
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FLAGPOLE	FSP
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FOUL WATER SEWER	FWS
GAS VALVE	GV
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GUY	GUY
INSPECTION COVER	ICCL
INVERT LEVEL	INV
KERB OFFLET	KO
LAMP POST	LP
MANHOLE	MH
MANGLE	MAGL
MARKER POST	Mkr
MILEPOST	MP
MONUMENTED SURVEY BENCH MARK	OSBM
RAINWATER PIPE	RWP
RODDING EYE	RE
ROAD SIGN	RS
SERVICE VALVE	SV
STOP COCK	SC
STORM WATER SEWER	SWS
TELEGRAPH POLE	TP
TRAFFIC LIGHT	TL
TROUGH	TR
TURN POINT	TP
UNDERPASS TO LIFT	UTL
VENT PIPE	VP
WATER LEVEL	WRLV
WATER METER	WM
WATER VALVE	WV
WATER TANK	WT

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POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK PROOF FENCE	SPF
TIMBER PANEL FENCE	TPF
VMC MESH FENCE	VMF

WALL ABBREVIATIONS

BLOCK WALL	BLW
BRICK WALL	BRW
CONCRETE WALL	CW
RETAINING WALL	RTW
SANDBAG WALL	SBW
SLEEPER WALL	SLW
STONE WALL	STW

ORDINATE SYSTEM GRID AND LEVELS TO OS GPS NETWORK SCALE FACTOR = 1.000

CONTROL TABLE: LINKED TO NATIONAL GPS NETWORK SF=1.000

Name	Easting	Northing	Height
STNA	475059.376	167042.225	49.721
STNB	475019.118	167188.890	49.371
STNC	474982.415	167173.873	48.870
STND	474956.904	167148.840	48.699
STNE	474956.904	167148.840	47.699
STNF	474920.173	167362.291	48.132
STNG	474909.436	167417.857	47.708
STNH	474882.865	167460.597	47.815
STNI	474859.298	167520.464	47.523
STNK	474839.239	167530.464	47.523
STNL	474844.205	167540.909	47.864
STNM	474868.731	167547.481	47.567
STNN	474905.756	167371.594	48.321
STNO	474911.196	167364.284	48.567
STNQ	474851.495	167546.256	47.667

REV	DESCRIPTION	DRN	CHD	DATE
■	PRELIMINARY □ INFORMATION □ TENDER			
□	CONSTRUCTION □ AS BUILT			

SCALE	1:200 @ A0	DATE	APRIL 2022
DRAWN	NC	CHK	NC
DRAWING NO.	18959-7-855	REV	-

TITLE: LAND OFF READING ROAD ARBORFIELD

DETAILS: TOPOGRAPHIC SURVEY SHEET 5 of 6

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SCALE 1:200

NOTES

1. Contractors must check all dimensions on site. Only figured dimensions are to be worked from. Discrepancies must be reported to the Architect or Engineer before proceeding. © This drawing is copyright.

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KEY

SURVEY STATION — STNA E=515598.801 N=235434.354 H=65.094

BANKING — TOP / BOTTOM

DITCH

HEDGE SPREADS SHOWN TO SCALE

FOLIAGE

TREES — SPREAD & TRUNK SHOWN TO SCALE ##HEIGHT

TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.

GATE — GP / KD

ROAD WITH GULLY AND KERB DFFLET DROPPED KERB

KERB

TRACK

VERGE

FENCE

WALL

OVERHEAD ELECTRIC — EP

OVERHEAD TELECOM — TEL

BUILDING

MAJOR CONTOUR INTERVAL 25.00

MINOR CONTOUR INTERVAL 24.75

SPOT LEVEL + 127.13

BORE HOLE Bor

TRIAL PIT Tpt

SEWER DETAILS

SEWERS FDUL

SEWERS STORM

COVER LEVEL MHCL=

INVERT LEVEL IL=

BACKDROP INVERT BDIL=

SOAKAWAY SA

CATCHPIT INVERT CPIL=

SOFFIT LEVEL SL=

NOTE: INVERTS, PIPE SIZES, CONNECTIONS SHOWN ARE OBTAINED FROM SURFACE INVESTIGATIONS AND AUDIBLE METHODS ONLY. ALL SEWER ROUTES ARE PRESUMED TO BE STRAIGHT BETWEEN CHAMBERS.

GENERAL ABBREVIATIONS

AIR CONDITIONING UNIT	AC
AIR VALVE	AV
BACK DROP	BD
BIN	Bin
BRICK	BK
BOLLARD	Bol
BUS STOP	Bus
BT INSPECTION COVER	BT
CABLE TV COVER	CATV
COVER LEVEL	CL
CONTROL BOX	CB
DROP KERB	DK
ELECTRIC SUBSTATION	E.S.S
ELECTRICITY COVER	Elc
ELECTRICITY POLE	EP
EARTH ROD	ER
FIRE HYDRANT	FH
FLAGPOLE	FGP
FLOOR LEVEL	FFL
FOOTBRIDGE	FB
FDUL WATER SEWER	FWS
GAS VALVE	GV
GATE POST	GP
GULLY	GY
INSPECTION COVER	ICCL
INVERT LEVEL	INV
KERB DFFLET	KD
LAMP POST	LP
POST BOX	PB
MANHOLE	MHCL
MARKER POST	Mkr
MILESTONE	MS
ORDNANCE SURVEY BENCH MARK	OSBM
RAINWATER PIPE	RWP
RODDING EYE	RE
ROAD SIGN	RS
SERVICE VALVE	SV
STOP COCK	SC
STORM WATER SEWER	SWS
TELEGRAPH POLE	TP
TRAFFIC LIGHT	TL
TROUGH	TR
TV POINT	TV
UNABLE TO LIFT	UTL
VENT PIPE	VP
WATER LEVEL	WRLV
WATER METER	WM
WATER VALVE	WV
WASH OUT	WO

FENCE ABBREVIATIONS

BARBED WIRE FENCE	BWF
CHAINLINK FENCE	CLF
CHESTNUT PALING	CPF
CLOSE BOARDED FENCE	CBF
CORRUGATED IRON FENCE	CIF
CRASH BARRIER	CRF
ELECTRIC FENCE	ELF
HAND RAIL FENCE	HRF
IRON RAILINGS	IRF
KNEE RAIL FENCE	KRF
LARCHLAP FENCE	LLF
POST AND RAIL FENCE	PRF
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STNG	474909.436	167417.887	47.756
STNH	474882.865	167460.597	47.815
STNJ	474913.466	167491.703	47.639
STNK	474929.259	167530.464	47.523
STNL	474944.205	167540.909	47.864
STNM	474868.721	167547.491	47.907
STNN	474965.798	167371.594	48.327
STNP	474926.177	167404.328	47.511
STNQ	474951.495	167546.236	47.697

SCALE 1:500

REV	DESCRIPTION	DRN	CHD	DATE

■ PRELIMINARY ☐ INFORMATION ☐ TENDER
☐ CONSTRUCTION ☐ AS BUILT

SCALE	1:500 @ A0	DATE	APRIL 2022
DRAWN	NC	CHK	NC
DRAWING NO.	18959-7-856	REV	-

TITLE: LAND OFF READING ROAD ARBORFIELD

DETAILS: TOPOGRAPHIC SURVEY SHEET 6 of 6 (TEXT @1-200)

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APPENDIX VIII

GROUND INVESTIGATION REPORT

PRP environmental

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northampton@prp.uk.com
www.prp.uk.com

Phase II & Geotechnical Ground Investigation Report

for Proposed Commercial Development

at Observer Park, Arborfield Reading

On behalf of:

Angle Property (Arborfield) LLP
c/o Carbide Properties Ltd
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4 Penman Way
Grove Park
Enderby
Leicester
LE19 1SY

Report Reference:	R 64065-03
Revision	
Issue:	Final
Date	7 May 2024

CONTENTS

1 INTRODUCTION 4

1.1. Proposed Development 4
1.2. Summary and Clarification of Brief 4
1.3. Terms of Reference 5
1.4. General Limitations of Reporting 5

2 SUMMARY OF INFORMATION 6

2.1. Previous Reports 6
2.2. Review of Phase I Report 6
2.3. Recommendations 8
2.4. Planning Conditions 8

3 FIELDWORK 9

3.1. Site Features & Constraints 9
3.2. Scope of Works 9
3.3. Rationale for Locations 10

4 GROUND CONDITIONS IDENTIFIED 11

4.1. Summary of Geology 11

5 GEOTECHNICAL ASSESSMENT & ASSOCIATED RISKS 13

5.1. Stratigraphic Interpretation and Geotechnical Assessment 13
5.2. Matrix of Geotechnical Results 18
5.3. Ground Water/Infiltration 18
5.4. Ground Improvement/Earthworks 18
5.5. Concrete Classification 19
5.6. Foundations 20
5.7. Ground Floor Slabs 21
5.8. Access Road & Parking 21
5.9. Further Geotechnical Assessment 22

6 GEOCHEMICAL TESTING RATIONALE AND SCHEDULE 23

7 ANALYSIS OF GEOCHEMICAL RESULTS 24

7.1. Soil Testing 24
7.2. Asbestos Content 24
7.3. Ground Gas Assessment 25
7.4. Waste Acceptance Criteria (WAC) 25
7.5. Further Geochemical Assessment 26

8 GENERIC QUALITATIVE RISK ASSESSMENT FOR LAND CONTAMINATION 27

8.1. Updated Source - Pathway - Receptor Linkages Risk Assessment 27
8.2. Requirement for Further Assessment 34

9 OVERVIEW OF RECOMMENDATIONS 35

9.1. Geotechnical Constraints 35
9.2. Contamination 36
9.3. Health & Safety/General Measures to be Adopted During Works 37

APPENDICES

A Drawings

B Engineer's Stratigraphic Logs

C Geotechnical Laboratory Results

D Geochemical Analysis and Laboratory Results

E Assessment of Analysis of Contamination

F Explanation of Risk Assessment

G PRP Terms of Reporting

H National Guidance & Bibliography

Please note that all the above contents are actively linked to the appropriate section within this report.

1 INTRODUCTION

This Ground Investigation Report (GIR) was instructed by the Client, Carbide Properties Ltd, by email, dated 13/03/2024, on behalf of Angle Property (Arborfield) LLP, and has been prepared by PRP, Consulting Engineers. The subject of this report is the land to the south of Bridge Farm, situated between the A327 and Greensward Lane, to the west of Arborfield, and throughout this report this area will be referred to as the "Site", differentiating it from other sites.

1.1. Proposed Development

The proposed development comprises the construction of a number of commercial units, along with associated enabling groundworks, access point, hardstanding areas, and utility infrastructure. At the time of writing this report, the proposed development is as outlined on the HTC Architect's drawing *Proposed Site Plan*, reference 3389 F401 A, dated 14/02/2024, which is presented in Appendix A.

The general layout may be subject to minor changes throughout the planning, design and development process. As ground investigations are considered pre-works and this report assesses the potential ground conditions at the Site, any minor changes to the development layout for the same end-use will not alter the findings of this report and will therefore not require any amendment to and reissue thereof unless a fundamental change of end-use category is enacted.

With respect to the proposed development, the Site should be assessed in the context of the 'commercial' end-use risk assessment criteria outlined by the LQM CIEH S4UL (suitable for use limits) and Defra C4SL (category 4 screening levels).

1.2. Summary and Clarification of Brief

The scope for the on-site intrusive investigation was outlined by emailed letter, reference KLH/E14164-02, dated 29/02/2024. Please refer to Section 3.1 for any restrictions particular to this Site; general reporting limitations are outlined below in Section 1.4.

In accordance with the Client's specific objectives and requirements, the purpose of the ground investigation is to:

- assess the physical characteristics of the underlying strata to inform tender submissions and earthworks design, foundations and floor slabs design, and to advise on potential exceptional or geotechnically difficult ground conditions that may have an influence on the development as far as is reasonably possible.
- assess and confirm the chemical condition of the underlying strata, as highlighted by the pQRA referenced below in Section 2.1 and in line with current guidance and legislation, as indicated in Section 1.3, pertaining to the potential for exposure to contamination and consequential impact on human health and the wider environment, both during the development stages and on completion of the works.
- provide a Stage I, Tier 2 generic quantitative risk assessment (GQRA) for contaminated land and briefly outline any further targeted investigation requirement, should it be deemed necessary.

- include, where appropriate and able, a Stage 1, Tier 3 (detailed) site-specific assessment criterion (SSAC) where a generic assessment criterion has been exceeded, thus superseding the GQRA for that or those particular substances in accordance with the current guidance.
- provide a summary of requirements to be considered in the design of any mitigation or remedial measures, where necessary and appropriate to the proposed development scheme.

1.3. Terms of Reference

This GIR includes a Phase II quantitative assessment for land contamination and constitutes a Stage 1, Tier 2 risk assessment, as defined by UK LCRM guidance 2022, and is in general accordance with PRP's terms listed in Appendix G with reference to the guidance listed in Appendix H.

Where appropriate it also takes account of the requirements of the National Planning Policy Framework (NPPF) and has been written to ensure that the Client complies with their obligations under the current UK contaminated land legislative regime.

However, acceptance of this report must be gained from the Local Planning Authority before any commencement of works on the Site as defined by the planning conditions issued by the Regulatory Planning Authority.

1.4. General Limitations of Reporting

PRP do not undertake surveys of flora or fauna. Any such surveys should be undertaken by specifically qualified professionals, these include, but are not restricted to, ecology, invasive plant species, and arboriculture.

PRP do not consider or assess the archaeological potential of soils beneath the Site.

PRP are not UXO specialists and do not undertake any research or investigations pertaining to the presence of explosives or any other military associated hardware.

This report should also be read in conjunction with the information, advice and reports obtained from the sources listed in Section 2. Aspects of this report may include an assessment of data previously reported on, as referenced in Section 2.1. Responsibility for permission to rely on such data is with the Client. PRP are not responsible for the validity of third-party data, and assume all to be an accurate reflection of the Site conditions.

An assessment of flood potential or drainage capacity at the Site is beyond the scope of this report. For a full assessment of site-specific potential for flooding and drainage, a flood risk and drainage strategy report should be undertaken, which may be informed by, and include data that was recovered during the ground investigation presented within this and other ground investigation reports. PRP do offer this service if required.

A structural survey of any existing buildings or structures that may be, or have previously been, present at the Site, or an assessment of asbestos containing materials (ACM) is beyond the scope of this report and, if appropriate to the Site, should be considered separately and undertaken by appropriate personnel. PRP do offer these services if required.

2 SUMMARY OF INFORMATION

2.1. Previous Reports

Although it was clear from the Site reconnaissance survey that an intrusive investigation has been undertaken since the area was used as a construction compound, no resultant report was forwarded to PRP for assessment to aid the design of the ground investigation.

To date, the following reports relating to the in-ground environment at the Site and immediately surrounding area have been produced by or submitted to PRP for assessment:

- *Phase I (pQRA) Desk Study Report*, reference 64065-01, dated 08/04/2024, produced by PRP.

2.2. Review of Phase I Report

2.2.1. Preliminary Contamination Assessment

The Site is undeveloped former woodland; later cleared for arable use. With the construction of the adjacent (west) A327 Observer Way, the Site was used as the construction compound thus indicating potential for Made Ground near to surface. The historical maps indicate cleared land (non-wooded) nearby was known to be marshy ground, which is borne out by the coverage of marshland grasses now prolific across the Site.

A substantial amount of material has been tipped within the Site along the northern boundary. Whilst this is likely the arisings of the Topsoil scrape for the A327 development, there is clearly other material mixed within, including demolition debris. This may be inert waste, however, there do not appear to be any recorded licenses for this material albeit that the works contractor and local authority should have the appropriate documentation; without access to this or previous ground investigation information, inert and uncontaminated arisings cannot be assumed. With the RTD being classified as minor (secondary A) aquifer and the Site being within a Zone 2 GSPZ, potential vulnerability to this source must be considered.

Other than that outlined above, there is little apparent on the Site that would be considered a source of contamination, either current or historical, that might present a significant risk of significant harm to the receptors.

Ground gas impact is unlikely due to a lack of source, with the underlying strata not predisposed to producing an adequately impacting quantity that would be detrimental to human health, therefore ground gas is not considered to present any significant risk of significant harm to the Site receptors and ground gas monitoring is not considered necessary.

As part of the preparatory works, Topsoil will be removed from the development areas exposing the bare earth, which may cause fugitive dust, particularly during dry periods, which although unlikely to be chemically toxic, can still impact the human respiratory system as well as being a nuisance to the adjacent road users and local businesses and residents.

Beyond the Site, there are no historical activities or land uses that raise concern for in-ground contamination. Whilst the impact from vehicles using the adjacent A327 may impact the Site through accidents, the risk of such an event is considered very low.

Based on our assessment of the available data and inspection of the local area, there is little presence of any visible above-ground or viable in-ground contamination sources that would impact the Site or present significant risk of significant harm to environmental, building and human receptors.

2.2.2. Preliminary Geotechnical Assessment

With consideration of the underlying natural geology, desk research indicates the need for ground improvement would be unlikely, however, confirmation of this would result from a ground investigation.

Made Ground beyond 1mbegl is not anticipated at the Site; it is assumed that the tipped materials in the north of the Site will be removed prior to development. Assessment of Made Ground would form part of a Phase II ground investigation.

According to the desktop data reviewed, the Site has not been developed, and therefore, no associated in-ground structures (foundations) are anticipated.

According to the BGS data, the underlying stratum across the Site is London Clay, however, in the northwest corner, this is likely to be overlain with River Terrace Deposits.

The use of superficial soakaway pits will likely not be viable at this Site due to the previous indications of marshland and underlying impermeable stratum. The historical removal of Pound Copse from across the Site has undoubtedly resulted in a diminished natural dewatering afforded by the presence of trees, therefore the Site was always likely to transition to marshy ground. This is evident from the number of semi-permanent water-logged areas; the proliferation of marsh grasses indicates this to be a regular occurrence. The underlying London Clay is all but impermeably thus any surface water has nowhere to dissipate apart from by evaporation or very slow infiltration by fracture flow. The presence of drains and balancing ponds in the wider area supports this hypothesis.

The underlying stratum, London Clay, may present moderate to high sulphate concentrations; SO_4 causes ionic exchange within the cement mix, leading to the production of ettringite, gypsum or, less commonly, thaumasite. This can cause expansion and softening of the concrete leading to structural failure. Therefore, appropriate testing for sulphates and pH must be undertaken and assessed in accordance with BRE SD1. Should high sulphates or acidic conditions be established at the Site, this is simply rectified with an appropriately specified concrete mix in accordance with BRE SD1 and BS 8500 Parts 1 & 2.

The combination of deciduous trees on the east and north boundaries, and underlying fine (clayey) soils requires consideration for risk of volume change with variation in moisture content, which can result in lifting and movement of in-ground elements if not appropriately designed for where proposed structures are within zones of root influence. Assessment for this would form part of a geotechnical ground investigation.

Where trees are to be maintained, a root protection zone must be observed, which must be cordoned to ensure it remains a no-dig area and free of plant to ensure retention of healthy root systems.

2.3. Recommendations

Following a review of the available desk study information a preliminary ground investigation involving a number of dynamic sampler holes is recommended to depths of around 5mbegl (if achievable); the London Clay usually increases in strength quite quickly with depth.

With no meaningful depth of Made Ground anticipated and the River Terrace Deposits indicated in the northwest corner only, the weathered fraction of the underlying London Clay is easily sampled by this modality of investigation, offering little resistance, therefore, this is seen to be the most cost effective method of data collection at this stage. This method allows for the retrieval of samples for both geotechnical and contamination testing if appropriately recovered, gives an indication of the soil strength through *in situ* testing, and allows for the installation of monitoring wells, if required.

It will allow for better understanding of likely foundation requirements and whether further (deeper and more expensive) investigation is required with larger plant. However, should the previous ground investigation GIR be available, a greater understanding of the Site will be enabled and a better targeted investigation may be designed.

2.4. Planning Conditions

No planning permission conditions have been indicated to PRP and it is therefore assumed that this has not yet been sought.

The standard requirements that all LPAs must consider for contaminated land assessment are always pre-commencement, meaning that the finalised GIR and RS (if required) must be signed off by the LPA before any groundworks or founding can commence on Site. It is best practice within the industry that tender packs should include these signed off reports otherwise (a) there is a risk that additional investigation is required before the LPA will sign off, and (b) contractors will not have an appreciation of the ground conditions for which they are expected to tender.

Following completion of any remedial works, validation of the measures undertaken and the production of a verification report must be submitted to the LPA. Depending on the form of remediation undertaken, validation of the measures is often undertaken following construction completion, but must always be signed-off prior to hand-over/occupation. The verification report should also detail imported materials and waste certificates for any materials removed from Site.

In the event that further investigative works or monitoring are deemed necessary to ensure the safe progression of the proposed development and its end-users, additional investigation or monitoring must be undertaken unhindered and will always be pre-commencement unless special dispensation is agreed upon in writing with the LPA.

All submission of reports to the LPA for scheme approval and condition discharge is the responsibility of the planning consultant.

3 FIELDWORK

3.1. Site Features & Constraints

The Site is roughly triangular shaped, covering an area of around 2.8ha, and appears to be topographically reasonable level. Boundaries to the north and east are defined by tree plantation, known as “Pound Copse”, comprising a variety of predominately broad-leaf deciduous of varying maturity. A public footpath traverses the Site along the eastern and southern boundaries.

Along the northern boundary, within the Site, tipped material likely originating from the Topsoil scrape for the A327 construction mixed with other demolition debris; the exact contents of this cannot be ascertained during this investigation due to being overgrown and unsafe to traverse. A little way into the Site is a mound of waste comprising a number of pallets, wood, tree cuttings, and plastic.

Although the Site appears to be greenfield, brick fragments are evident in the Topsoil across much of the north of the Site. At the time of the investigation, the ground was waterlogged with much of the Site unable to be walked across, however, it is clear from the coverage of marshland grasses and reeds that this is a common, if not permanent situation.

3.2. Scope of Works

The purpose of a Phase II investigation is to assess the potential for in-ground contamination or naturally derived toxic substances within the accessible near-surface soils at concentrations that may have the potential to cause significant risk of significant harm to human receptors within the remit of the end-use classification, the proposed design and those undertaking the site works, as well as considering the wider environmental and proposed in-ground structural receptors. In addition, the geotechnical properties of the underlying strata have been assessed with reference to foundation and floor slab design or other geotechnical design elements, such as earthworks, ground improvements, or retaining structures.

The intrusive fieldwork element was undertaken over three days; Monday to Wednesday, 25th to 27th March 2024, with locations set out by PRP being considered carefully and in line with the constraints outlined so far in this report and the historical findings. Where there was no observed source of contamination or geotechnical influence, locations were chosen with reference to the proposed scheme and the risks outlined by the Phase I report, as referenced in Section 2.1.

A site-specific utility plan for the Site was not provided by the Client, however, prior to borehole advancement, the immediate area was CAT scanned to check for unexpected or unmapped utilities carrying an electrical signal.

During borehole advancement, SPTs (soil penetration tests) were to be undertaken at metre intervals to assess the strength and compaction qualities of the underlying soils with depth. Where a location cannot be advanced to full depth due to any other situation than refusal, dynamic probing is to be undertaken to full depth.

Due to the high saturation of the underlying soils, no *in situ* falling head tests were carried out for percolation assessment. No monitoring wells were installed due to the collapsed ground; although no ground gas is anticipated, the monitoring of groundwater would have been useful.

Small, disturbed samples were recovered from the near-surface materials and placed in amber glass jars or plastic tubs, as necessary, and taken to a laboratory for contamination testing. A sampling methodology in line with the current guidance and based on a random stratified non-targeted approach was used as no visual evidence of contamination was present. Further rationale of the specific testing undertaken is given in Section 6.

Stratigraphic logging of the tubes recovered during dynamic sampling was undertaken in accordance with BS5930:2015. Samples for geotechnical testing were recovered from the various stratigraphic types directly from the continuous tubes once logging was completed.

3.3. Rationale for Locations

In addition to a wider assessment for potential contamination, the locations were positioned as follows as true to the proposed development layout as possible with consideration given for accessibility due to ground softness and saturation:

Location	Relationship to Proposed	Rationale
WS01	Access route	Assess depth of Made Ground. Assess geoenvironmental. Assess for subbase.
WS02	Footprint of Unit 1.	Assess depth of Made Ground. Assess geoenvironmental. Assessment for foundation design.
WS03	Footprint of Unit 4.	Assess geoenvironmental. Assessment for foundation design.
WS04	Yard slab/parking.	Assess depth of Made Ground. Assess geoenvironmental. Assess for subbase.
WS05	Undeveloped area.	Assess geoenvironmental.
WS06	Footprint of Unit 7.	Assess geoenvironmental. Assessment for foundation design.
WS07	Footprint of Unit 6.	Assess geoenvironmental. Assessment for foundation design.
WS08	Yard slab/parking.	Assess depth of Made Ground. Assess geoenvironmental. Assess for subbase.
WS09	Footprint of Unit 3.	Assess depth of Made Ground. Assess geoenvironmental. Assessment for foundation design.
WS10	Yard slab/parking.	Assess depth of Made Ground. Assess for subbase.
WS11	Footprint of Unit 2.	Assess depth of Made Ground. Assess geoenvironmental. Assessment for foundation design.

4 GROUND CONDITIONS IDENTIFIED

According to the BGS online database, the underlying natural strata across the area investigated is recorded as the London Clay Formation apart from the northeast corner, where this is recorded as being overlain with River Terrace Deposits.

4.1. Summary of Geology

The geology encountered during the ground investigation is fully detailed in the stratigraphic logs presented in Appendix B. Below is a synopsis of those findings.

Strata	Description	Top Depth (mbegl)	Base Depth (mbegl)	Thickness (m)
Surface Topsoil (Made Ground)	All bar WS01 Grass over saturated, soft, organic-rich, placed Topsoil: generally comprising a soft, dark brown, peaty clay with occasional to slightly flint-dominated gravel with fine brick fragments. Strong eutrophic odour. Sometimes with straw mixed at base.	GL	0.20 – 0.90	0.20 – 0.90
Surface Backfill (Made Ground)	WS01 only Grass over firm, grey-brown clay containing fragments of concrete and brick, with gravel of flint and sandstone	GL	0.20	0.20
Made Ground	WS01, WS03 Large concrete and brick fragments in clay matrix.	0.20	0.30	0.10
	WS02 only Firm, grey-brown or clay containing fragments of concrete and brick, with gravel of flint and sandstone	0.45	0.70	0.25
River Terrace Deposits	All bar WS08, WS09, WS10, WS11 Soft to firm, olive and brown, becoming lighter with depth, slightly gravelly, sandy, silty, CLAY.	0.30 – 1.50	0.60 – 2.00	0.15 – 1.40
	WS08 Soft, saturated (running), yellowish brown SILT.	0.40	0.80	0.40
	Loose to dense, saturated and locally running, orangish brown, slightly clayey, slightly silty variably gravelly, medium grained SAND. Gravel of flint and sandstone.	0.40 – 2.00	0.90 – 3.00^{+} $^{+}$Beyond depth of boreholes	0.20 – 2.20^{+} $^{+}$Beyond depth of boreholes
London Clay Formation	WS01, WS03, WS07 Very soft, dark grey, silty CLAY. Dynamic probing indicated increase in strength with depth.	2.60 – 2.80	3.00^{+} Beyond depth of boreholes	0.20^{+} – 0.40^{+} Beyond depth of boreholes
Groundwater	The surface soils were saturated. Water strikes were recorded within the RTD at between 0.9m and 2.2mbegl with all strikes indicating slight rising to between 0.35m and 1.9mbegl by the end of sampling. On casing removal, water rose further to between 0.18m and 1.5mbegl, which may be due to lateral inundation.			

All locations terminated prior to instructed depth due to wall collapse from water inundation, therefore follow-on dynamic probing was undertaken as indicated on the table below.

Location	WS01	WS02	WS03	WS04	WS05	WS06	WS07	WS08	WS09	WS10	WS11
Instructed Depth	4m	5m	4m	6m	5m	6m	5m	4m	5m	4m	5m
Achieved Depth	2.4m	1.9m	2.6m	1.60m	1.4m	1.9m	2.5m	1.6m	1.7m	1.6m	1.7m
DP Depth	6m	6m	6m	6m	5m	6m	5m	6m	5m	5m	6m

The natural geological succession revealed was generally in accordance with the published geological data, however, the superficial River Terrace Deposits clearly extends across the entire Site rather than being confined to the northwest corner.

The presence of the coarser River Terrace Deposits across the Site, in conjunction with the level of ground saturation prevented deeper penetration of the dynamic sampler holes and recovery of the samples from greater depths.

5 GEOTECHNICAL ASSESSMENT & ASSOCIATED RISKS

A programme of testing was instructed to determine the geotechnical properties of the near-surface soils following assessment of the stratigraphic logs.

Laboratory based geotechnical testing was undertaken by Soil Property Testing (SPT) of Huntingdon in accordance with the requirements of BS1377:1990. SPT follow a Quality Audit system which has been designed to ensure continual compliance to BSEN ISO/IEC 17025:2005. The laboratory is regularly audited by UKAS and holds accreditation for specific tests identified; full details of their UKAS schedule may be found on their website.

In addition to the *in situ* standard penetration tests (SPT) undertaken, the following laboratory-based geotechnical tests were scheduled:

Quantity:	Test:
6	Moisture Content
3	Atterberg (plasticity)
4	Particle Size Distribution (PSD)
3	Particle Size Distribution (PSD) with fines separation by hydrometer
16	Sulphate/pH (include 4 BRE Suite B: greenfield with pyrite)

The resultant data is presented in Appendix C.

An assessment of the geotechnical risks associated with the Site and proposed development, as seen during the initial site reconnaissance survey and the intrusive ground investigation, has been considered in general accordance with the guidance outlined in the DMRB CD 622 (2020) document 'Managing Geotechnical Risk' (formerly HD22/08, BD10/97, HA120/08).

This assessment considers the degree of risk attached to various ground related elements of the proposed development posed by common ground related problems, and identifies suitable measures to control the risk to an acceptable level should it be deemed appropriate; If present, these are discussed as part of the geotechnical design recommendations outlined below.

5.1. Stratigraphic Interpretation and Geotechnical Assessment

Made Ground was recorded to depths of between 0.2m and 0.9mbegl and, in the form of placed Topsoil, generally comprised an organic-rich medium with a strong eutrophic (anoxic) odour, which was often mixed with straw presumable to form a stabilising matrix within this very soft material. At the base of this material, a thin layer of “hard core” was encountered in WS01 and WS03 (western boundary) giving evidence of previous use as a construction compound. In WS01 and WS02, a clayey backfill was present, which contained concrete and brick fragments.

It should be noted that the placed Topsoil cannot be used in any engineered capacity due to its inherent low strength and high organic content. It can however be reused in areas of soft landscaping with a low angle of slope unless seeded meshing is incorporated.

Contrary to BGS records, the natural River Terrace Deposits (RTD) was encountered across the entire Site as a cyclic variably gravelly, variably sandy CLAY, generally defined by its yellowish and greenish colouring, interbedded with clayey, variably gravelly SAND. However, locally this included elements of running sand or silt. Figure 1 below, shows a wide range in strength within the natural RTD, through comparison with the logs (Appendix B) it can be seen that the lower strength relates to the finer clay-dominated deposits having much lower strength and the higher strengths to the sands and gravels.

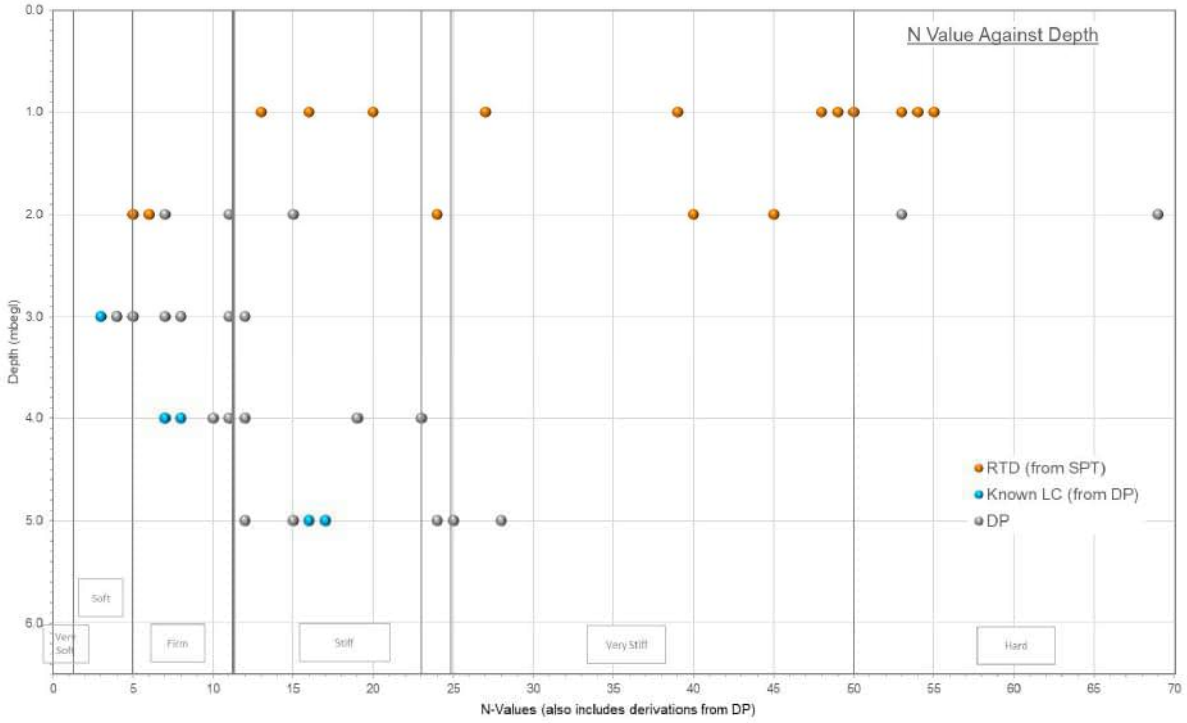


Figure 1: N Value against Depth

Also shown in Figure 1 is the low strength of the underlying London Clay (LC). As previously noted, the ground surface was water-logged across much of the Site, which appears to be a common, if not permanent, situation. This saturation has a softening impact on the surface of the clay, which itself acts as an aquiclude (capable of absorbing water slowly but cannot transport it, therefore acts as a confining bed relative to the RTD overburden). This hypothesis is supported by the increase in strength within the LC with depth. Therefore, it would be recommended that some form of ground improvement that is compatible with the level of groundwater/surface water should be considered.

As noted earlier, the saturation of the soils caused collapse within the dynamic sampling holes, therefore dynamic probing (DP) was used to ascertain the interface between RTD and LD and to assess the soil strength at depth. Figure 1 shows a comparable strength drawn from the DP data at equivalent depths to where SPTs would have been undertaken; interpretation of this indicates that most of the DP data was drawn from the LC. The table below is an extract from the DP data from each location where LC was not encountered through dynamic sampling (shaded blue were encountered by dynamic sampling). This shows a likely RTD/LC interface in the majority of locations (represented by the blue line); full DP data is presented with the logs in Appendix B.

From this data, it can be concluded that LC was encountered from between 2.2m and 3.1mbegl; data recovered from WS02, WS04, and WS06 is inclusive as the collapsed material would be very loose, therefore, a clear distinction between that and LC is not apparent. However, it can be assumed that the interface between the two strata would likely fall within the range indicated above. Location WS05 is the further position southward and therefore it would be reasonable to interpret this as likely having the shallowest RTD overburden.

Depth (mbegl)	Blow count per 100mm										
	WS01	WS02	WS03	WS04	WS05	WS06	WS07	WS08	WS09	WS10	WS11
2.0 – 2.1				3	8			15	18	13	8
2.1 – 2.2				3	8			17	14	11	16
2.2 – 2.3				2	4			18	8	6	21
2.3 – 2.4				2	2			18	4	3	24
2.4 – 2.5				2	1			17	1	2	23
2.5 – 2.6				5	1			12	2	1	23
2.6 – 2.7				5	1			7	1	1	24
2.7 – 2.8				3	1			4	2	1	24
2.8 – 2.9				2	2			2	2	2	20
2.9 – 3.0				3	3			2	2	1	14
3.0 – 3.1		2		3	2	1		2	3	2	8
3.1 – 3.2		1		3	3	1		2	2	2	3
3.2 – 3.3		2		3	4	1		2	3	2	2
3.3 – 3.4		1		3	4	2		3	4	3	1
3.4 – 3.5		2		2	4	1		9	4	3	1
3.5 – 3.6		1		3	4	1		4	4	3	2

According to the current guidance, shrinkable soils are those containing more than 35% fine particles and having a modified plasticity index of 10% or greater. Fine particles are defined as those having a nominal diameter less than 60µm (i.e., clay and silt particles).

The British Soil Plasticity Classification is drawn from the liquid limit, and gives an indication of the potential for moisture absorbency before the soil reaches saturation.

Atterberg limit (plasticity) tests are undertaken on samples with a reasonable clay content (i.e., >30%). The modified plasticity is in accordance with the current standards, which considers the percentage passing through the 425µm sieve (fine particles and any medium and fine grained sand particles with a nominal diameter of less than 425µm as outlined by BS1377). The results are shown in the table below, with all samples recovered from the London Clay.

Location	Depth	LL (%)	PL (%)	PI (%) LL-PL	MC (%)	Passing 425µm (%)	Modified PI (%)	Potential for Volume Change	British Soil Plasticity Classification
WS01	2.6 – 3.0	59	21	**38**	27.4	0	N/A	Medium	High
WS03	2.8 – 3.0	54	20	**34**	27.4	0	N/A	Medium	High
WS07	2.85 – 3.0	55	21	**34**	32.9	0	N/A	Medium	High

The results confirm that the samples tested have a plasticity index (PI) of between 34% and 38%, with no modification necessary (indicating a homogenous fine soil). The results show that the underlying London Clay is of high plasticity and, in accordance with the classification guidance, with medium potential for volume change with variations in moisture content, therefore, **for design purposes, medium volume change potential must be adopted**.

Location	Depth: (m)	LL (%)	PL (%)	PI (%)	MC (%)	MC<0.4LL	LI (MC-PL)/PI	LI<0
WS01	2.6 – 3.0	59	21	**38**	27.4	×	0.17	×
WS03	2.8 – 3.0	54	20	**34**	27.4	×	0.22	×
WS07	2.85 – 3.0	55	21	**34**	32.9	×	0.35	×

In terms of desiccation of the underlying fine soil as a result of tree influence, reference has been made to BRE 412, which indicates that the likelihood of desiccation can be ascertained by comparing the liquidity index to zero, and by considering the relationship between moisture content and liquid limit. However, an apparent desiccation profile can also present as a result of over-consolidated deposits or reworked soils yet to return to porewater equilibrium.

The above results clearly show the fine soils to be in a plastic state although the moisture content recorded is closest to the plastic limit but, as anticipated due to the high saturation level across the Site, with no indication of dewatering within the soil matrix, however, this may change once the Site has been drained in preparation for development.

A number of trees are present around the Site perimeter to the north (mostly hawthorn) and west, which range in size, maturity and species, but predominately broad leaf deciduous. There are elements of the development that may be within zones of root influence and must therefore be appropriately designed for to reflect the potential constraints in accordance with the current guidance. This will still apply even where trees have been removed, to allow for porewater pressure equilibrium within fine soils (which can take decades), particular where high water demand tree species are removed.

Where trees are to be maintained, a cordoned root protection zone must be observed to protect the tree and underlying root expanse to ensure it remains a no-dig area and free of weight, such as plant or construction materials, to ensure retention of the healthy root system.

The moisture content of the samples tested was recorded at between 21% and 23.7% near surface and between 21.4% and 32.9% in the London Clay. **Figure 2** below shows that moisture content is within a relatively narrow band, regardless of stratum or depth; this is reflective of the high saturation state of the soils encountered across the Site.

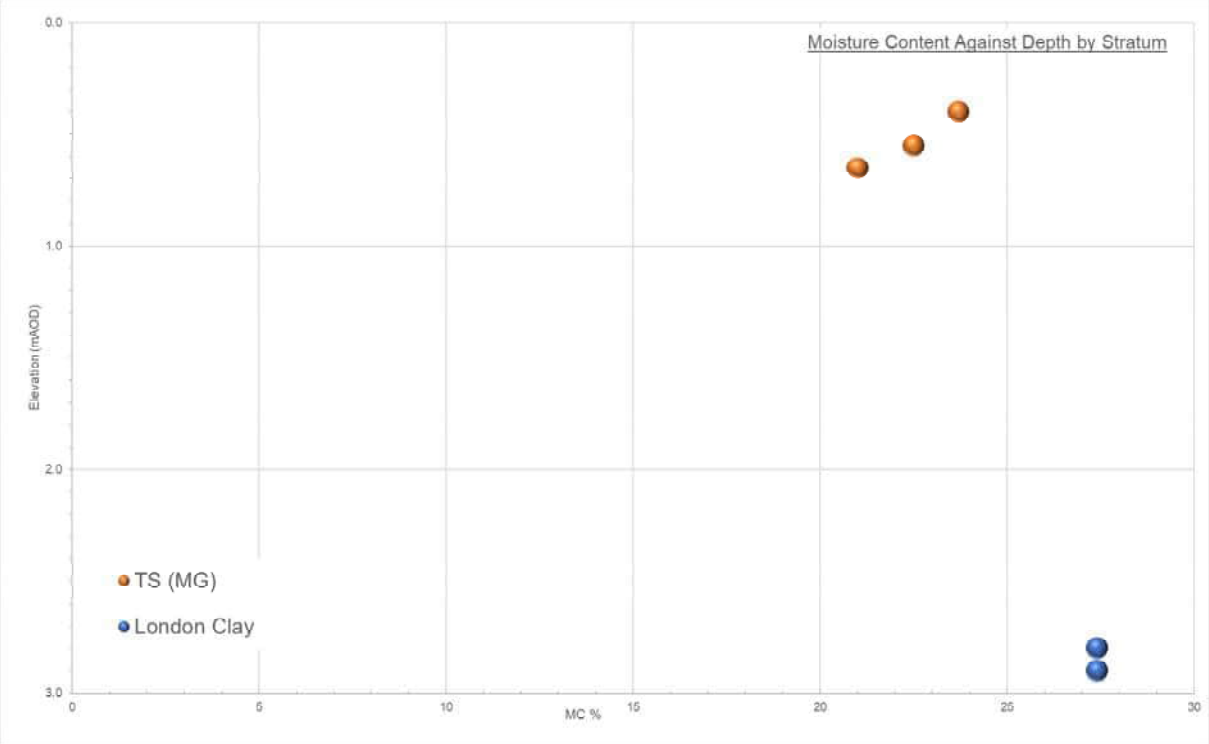


Figure 2: NMC against Depth by Stratum

Particle size distribution (PSD) tests were undertaken on samples recovered from coarser soils to assess the fine content. Soil with a 35% or greater fines content (i.e., silt and clay particles of less than 63µm diameter) is considered to have the engineering properties of fine soils. Of the samples tested, the results from the PSD tests show a well-graded SAND and GRAVEL with finer beds/inclusions of clayey SAND. However, the cyclic nature of the River Terrace Deposits must be appreciated, which includes local inclusions of clayey material as well as running sand and silt. That being said, no element of the RTD is fine to any substantial depth to be subject to volume change with variation in moisture content.

Stratum	No. of Tests	Clay	Silt	Fines	Sand	Gravel
RTD (clay)	1	17%	21%	38%	53%	9%
RTD (S&G)	6	3 - 5 Mean: 4%	2 - 4 Mean: 3%	5 - 25 Mean: 10.6%	34 – 51 Mean: 41.6%	34% - 61% Mean: 47.6%

For the natural (moist) sandy gravel, an angle of repose of no more than 25-30° should be assumed.

5.2. Matrix of Geotechnical Results

Stratum	MC (%)	Plasticity	NHBC Vol. Change Risk	PSD	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Concrete Design
MG (saturated)	21 – 23.7				12-15 (assumed)		DC-3z
RTD Clay (saturated)				38% fines	20 (assumed)	18.5±1.5 (assumed)	DC-1
RTD S&G (saturated)				10% fines (mean)	21.5 (assumed)	19.5±1.5 (assumed)	DC-1
LC (firm)	21.4 – 32.9	High	Medium	100% fines	18 (assumed)		DC-1*

Where noted as assumed, data has been taken from generic tables associated with the soil type. Asterix denotes reference should be made to the notes within the relevant section below.

5.3. Ground Water/Infiltration

An important factor when considering the geotechnical parameters and competencies across a site is the groundwater regime, as it affects the behaviour of the underlying strata, and therefore, the in-ground design elements.

As indicated in the section above, the moisture content of the soil ranged between 21% and 23.7% for the near surface material and between 21.4% and 32.9% in the London Clay.

Falling heads were not undertaken during the ground investigation due to the surface saturation level. In addition, further water strikes were recorded in all dynamic sampler holes, as indicated in Section 4.1 with water levels at near surface by the end of sampling in many cases.

As indicated above and within the Desk Study Report, the flora across the Site suggests the area is regularly, if not permanently, holding areas of surface water/marshy ground. This would therefore deny the use of soakaways. However, as previously reported upon, a drainage gully is present to the northwest of the Site, to which surface water could drain. Additionally, swales are constructed in the wider area, which would mitigate against overwhelming the drainage ditch.

It is recommended that appropriate drainage feasibility and design be undertaken separately.

5.4. Ground Improvement/Earthworks

No geotechnical structures, such as retain walls or earth bunds, are proposed for the development, therefore, the only apparent earthworks would be the scrape-back for the construction areas. As the logs indicate, material unsuitable for any engineered use ranges in depth from 0.2m to 0.9mbegl, however, reuse in landscaped areas would be suitable due to the high organic content.

Additionally, the material tipped along the northern boundary should be removed. It would be beneficial if this were sorted and could be repurposed within the development rather than removing from Site. However, with the potential quantity of material to be scraped back plus any excavation for swales required to alleviate surface water drainage, removal from Site of some material may be unavoidable.

It is clear from the logs and low strength soils that some form of ground improvement will be required, however, the presence of water at the Site prohibits some modalities. It is likely that the most efficient form would be to install VSC (vibro stone columns) to depths of around 6mbegl around the structural footprints. Discussions with a specialist contractor would be recommended as soon as possible; we have contacted Vibro Menard for feasibility assessment their comments are as follows:

> *Reviewing the site investigation for this scheme, the ground seems to be quite dense in most of the areas with only very shallow made ground layer to be treated.*
>
> *However, looking at WS01 and WS04 where they both have low NSPT values of 5 - 6, and the logs have stopped at 2-3 meters as they collapse from the water level, which leaves some uncertainty in the viability of the technique as such logs with low NSPT values, could lead to bulging failure of the stone columns.*
>
> *We note that these values might have been low because of the high water level and not the stiffness of the layer itself, and to clarify the water has no effects on the viability of the VSC technique, we use different installation methods to cope with the high water table and install our columns as required, hence there isn't any issue with the water table being high and we still can achieve the required criteria as normal.*
>
> *I would first ask you for the location plan of these logs and if WS01 & WS04 are within the footprints of the proposed structure.*
>
> *In the case that they are**, we would offer ground improvement by Vibro Stone Columns (VSC) subject to further site investigation by Cone Penetration Tests (1 day of CPTs) to be done within the footprints of the proposed structure to confirm the viability of the technique and clear out any doubt/uncertainty there may be.** Alternatively, should VSCs not be suitable, we can offer ground improvement by Controlled Modulus Columns (CMCs).*

5.5. Concrete Classification

Sulphates and acidity are assessed to ensure the correctly designed concrete mix for in-ground components of the proposed development. High sulphates can cause concrete to expand and degrade to a gelatinous consistency, thus negating structural integrity over time. Acidic conditions act to "dissolve" the cement mix main constituent. Although the Site is undeveloped, it is assumed brownfield due to the previous use as a construction compound and subsequent imported Topsoil material.

The results below show the summation of testing from both the geotechnical and geochemical laboratories:

Stratum	Results (nr.)	SO_4 conc^n range (mg/l)	Total SO_4 (%)	pH range	Sulphate Class	ACEC	Concrete Design
Made Ground	5	20 - 100	0.03%	**5.1** – 8.2	DS-1	AC-3z	DC-3z
RTD Clay	3	128 - 159	0.042%	6 – 6.8	DS-1	AC-1	DC-1
RTD Sand	4	29.3 - 100	0.015%	6.3 – 7.2	DS-1	AC-1	DC-1
London Clay	3	260 – 370		6.7 – 7.2	DS-1	AC-1	DC-1*

The table above shows that in-ground structures within the natural soils can use DC-1 for concrete design. The breakdown of individual locations can be viewed on the analysis presented in Appendix D, the emboldened numbers in the table above denote the considered exceedances.

The acidic content with the Made Ground was encountered in two locations: WS04 and WS07 which lie on an west-east line across the Site, being the southern end of proposed unit 6. However, this elevation in acidity is undoubtedly associated with the organic content within the near-surface materials, which will be removed prior to development as part of the pre-construction earthworks.

Additionally, it should be noted that only the surface material from LC was tested, it is likely that sulphate content will increase with depth due to some beds within the LC known to contain selenite crystals.

The concrete class shown above should be adopted for the building foundations and other below-ground concrete elements and is based on a structural life span of up to 100 years, determined using a mobile groundwater model, however, the **London Clay at greater depths should be tested as it may increase the concrete requirement to DC-2**.

5.6. Foundations

Made Ground, disturbed ground and general fill material are unsuitable for founding within since they may consolidate excessively and differentially when subjected to a structural load. Made Ground was recorded to depths of between 0.2m and 0.9mbegl and comprised highly organic, soft Topsoil with straw and fine demolition debris material mixed within.

As discussed in Section 5.1, the strength of the natural RTD at 1mbegl is generally of sufficient strength, however, the presence of near surface and surface water means a diminished bearing pressure. Additionally, the natural bedrock, LC, is located at depths of between 2.2m and 3.1mbegl, and due to the soil saturation, has been greatly softened to depths of around 4.5m to 5mbegl, which demonstrates firm to stiff material, however, deepening will be likely for units 5 and 6 (WS07) to around 6mbegl.

London Clay is known for the presence of selenite within some beds; this is a sulphur-based crystalline mineral. Sulphate can react with in-ground concrete elements; this can easily be mitigated by using an appropriate concrete mix, as outlined in the previous section. Although the limited testing (Section 5.5) indicates DC-1 concrete requirements, an increase in sulphate content should be anticipated with depth in the LC, which may require DC-2 concrete design.

As indicated in Section 5.4, ground improvement is recommended, likely by VSC. Required bearing pressures for the portal frame structures will be in the region of 125kPa, with FoS, a minimum of 175kPa should be sought through ground strengthening.

On completion of the ground improvement works, pad foundations should be founded at 1mbegl.

Inflows are to be expected in all excavations and dewatering techniques will likely be required at all times of the year. Therefore, temporary formwork to excavations may also be required to prevent the collapse of excavation sides; this will be particularly relevant during periods of rainfall.

5.7. Ground Floor Slabs

As discussed in Section 5.1, unsuitable soils were proven to depths of between 0.2m and 0.9mbegl, however, once striped back from the development areas, this will not impact floor slabs or yard slabs. Note the acidity (see Section 5.5) within this material, undoubtedly due to the high organic content. Ground floors should be constructed as ground bearing slabs in commercial units, therefore the Made Ground must be removed prior to proof rolling the sub-formation.

Laboratory test results indicate that the near-surface coarse (coarse RTD) fraction of the soil at 1mbegl can be considered medium-dense to very dense (N-values of 13 to 55), however, softer areas of clay-dominated material (WS01, WS02, WS06) may require excavation with additional granular material incorporated.

As indicated in Section 5.3, ground improvement is likely in order to increase the soil strength beneath the footprint of the proposed structures. This will reduce any potential effects of differential settlement due to the variable strength within the current underlying soils.

Assuming this is the case, commercial ground floor slabs should be constructed as ground bearing and designed in accordance with TR34. It is recommended that plate bearing tests be undertaken on the proof-rolled formation, post-groundworks, to determine the value for the Modulus of Sub-grade Reaction, k. This can only be undertaken after the sub-formation has been exposed, and only once preparatory groundworks (reprofiling and ground improvement) have been completed.

However, following ground improvement, should any spots of superficial soft material be encountered, these must be removed prior to proof rolling the sub-formation, and all floor slabs should be constructed on properly installed 2000-gauge damp proof membrane; **Characteristic Situation 1** can be assumed due to lack of viable source for gas.

5.8. Access Road & Parking

The structural design of the access road and areas of hard-standing is based on the strength of the subgrade (natural ground) which is assessed on the California Bearing Ratio (CBR) scale.

With regards to the natural coarse (granular) sands and gravel of the RTD, approximate CBR values for the subgrade can be estimated on the basis of the superficial arisings' strength and plasticity ascertained from the intrusive investigation, and with reference to *Structural Design of Bituminous Roads* – TRRL Report LR1132, Appendix C (indicates a CBR of 40). *In situ* CBR values tend to give unreliable results because of the influence of the moisture content on the materials. In practice, the correlation given in TRRL Report 1132 is usually more appropriate than direct determination of the CBR.

In all situations, the stratum revealed at formation level should be trimmed and proof rolled, using suitable plant, where soft spots are identified, these should be excavated and backfilled with compacted 6F5/6F2 granular capping, alternatively large cobbles of natural good quality stone should be rolled in and compacted to refusal.

5.9. Further Geotechnical Assessment

Further assessment is recommended as sample assessment was undertaken only to between 2m and 3mbegl, particularly in light of the likelihood for increased sulphates with depth in the London Clay, which may determine that in-ground concrete elements require DC-2. This will also allow for installation of groundwater monitoring stand pipes.

For design of appropriate groundworks/improvement, the current data outlined above is likely to be sufficient. However, it is recommended that contact be made with a specialist contractor, PRP have reached out to Vibro Menard for a feasibility assessment for VSC to around 6m with localised deepening for Units 5 and 6 likely to be required. However, this would require confirmation by CPT testing.

6 GEOCHEMICAL TESTING RATIONALE AND SCHEDULE

Laboratory testing to determine the environmental properties of the near surface soils was undertaken by i2 of Watford and, where shown in the results, MCERTS accreditation has been provided. i2 follow a quality audit system which has been designed to ensure continual compliance to BSEN ISO/IEC 17025:2005 and the laboratory is also regularly audited by UKAS and holds accreditation for specific tests identified.

No visible evidence of contamination was present at surface, however, Made Ground was identified, which contained demolition debris. Testing was therefore undertaken with the aim of confirming the presence or absence in the underlying strata of a broad spectrum of metal, transition and non-metal compounds, including organics, that may present significant risk of significant harm to the critical human receptor and wider environment, in accordance with the current UK guidance and the pQRA presented in the Phase I report.

Testing of the recovered soil samples was scheduled as outlined below. If asbestos is identified in any of the samples, quantification is automatically undertaken in order that we can properly assess the likely risk to human receptors. Samples submitted for asbestos tested were recovered from adjacent areas to the tipped material along the northern boundary as this would be the most likely area to encounter it, if present, due to the inclusion of some demolition debris.

As excavation is expected to be undertaken as part of the construction for foundations and service trenches, samples were tested with respect to Waste Assessment Criteria (WAC) to ensure correct disposal regime and tax levy are applied.

It should be noted that the tipped material along the norther boundary was not sampled due to unsafe accessibility.

Quantity:	Test:		
9	General Environment Suite – Soil		
	Soil Organic Matter (%)	pH	Sulphate (Total)
	Arsenic (Total)	Beryllium (Total)	Boron (Water Soluble)
	Cadmium (Total)	Chromium (Total)	Hexavalent Chromium
	Copper (Total)	Lead (Total)	Mercury (Total)
	Nickel (Total)	Selenium (Total)	Vanadium (Total)
	Zinc (Total)		
	Phenols (Total Monohydric)	Cyanide (Total)	Sulphide
	Speciated Polycyclic Aromatic Hydrocarbons (PAH) Fractions (USEPA16)		
	Monoaromatics & Oxygenates	CWG TPH (Total Petroleum Hydrocarbons)	
4	Asbestos Screen & ID		
4	BRE (Greenfield with pyrite) Suite		
3	WAC (Waste Acceptance Criteria)		

The results are presented in Appendix D.

7 ANALYSIS OF GEOCHEMICAL RESULTS

7.1. Soil Testing

For the purpose of risk assessment, the LQM/CIEH S4UL (suitable for use level) or, where not published by LQM, the Defra C4SL (category 4 screening level) has been assumed and is noted on the quantitative analysis of results presented in Appendix D.

For a full commentary on the criteria for contamination assessment used by PRP, please refer to Appendix E.

All analyses are against the generic criteria concentrations set for '**commercial**' end-use. This category is deemed to be the most appropriate for the proposed end-use and represents the maximum concentrations for the substances assessed; i.e., which do not represent elevated levels of risk to human targets by any pathway in accordance with the development area type.

However, as outlined within EPA: Part 2A of the Statutory Guidance (2012 Defra), "3.29: generic acceptance values relating to human health risk assessment represent cautious estimates of levels of contaminants in soil at which there is considered to be no risk to heath or, at most, a minimal risk to health.", i.e., depending on the proposed end-use, any exceedance should be seen as a flag for further scrutiny and discussion rather than an automatic need for remedial measures. Academic computational assessment aside, there is little risk from in-ground soil contamination with a lack of viable source. However, even low concentrations not normally considered for end-use must be considered during construction as site workers are considered the most vulnerable receptor at this stage albeit with short-term exposure. Should a generic assessment criterion be exceeded, where possible, a DQRA (detailed qualitative risk assessment) will be undertaken in the form as outlined in the discussion below for the particular compound in question, and where appropriate or possible, a SSAC (site specific assessment criterion) modelled, using EA CLEA, and will be indicated on the analyses included in Appendix D.

7.1.1. Discussion of Results

The SOM% was recorded at between 0.3% and 6.7%, with a mean average of 2.5%, therefore, the most stringent criteria of 1% on the hydrocarbon compounds was assumed.

Of the 9 soil samples recovered during the ground investigation and submitted for testing, no exceedances of the end-use criteria were established and therefore no significant risk of significant harm to human health or the wider environment can be assumed.

7.2. Asbestos Content

The likely impact to the end-user, should the presence of asbestos be proven is considered negligible as remedial measures would be employed to protect the end-user. The main receptor at risk is considered to be the site worker during the demolition, earthworks, and construction phases as they will be exposed to the soils until any hard surfacing or cover system has been constructed.

According to HSG 248, published 2021, *7.21 … Air monitoring has shown that airborne fibre concentrations rarely exceed the LoQ and are unlikely to exceed the control limit unless the work is*

disturbing relatively high percentages (>1%) of unbound asbestos in dry soil. Where there is mostly bound asbestos in soils, below a mass concentration of 0.1% w/w, airborne fibre concentrations are unlikely to exceed the LoQ for personal sampling. When the soil is damp or wet, airborne emissions of asbestos will be suppressed and wind dilution and dispersion of any emissions will also reduce worker and bystander exposures.

The *JIWG (CAR-Soil) Industry Guide on the Control of Asbestos Regulation 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials* indicates the following concentration descriptors:

- ≥0.1% wt/wt is defined as a large quantity
- ≥0.05% to <0.1% wt/wt is defined as a moderate quantity
- ≥0.01% to <0.05% wt/wt is defined as a low quantity
- ≥0.001% to <0.01% wt/wt is defined as a very low quantity.

This guidance is for site workers, and in this case, this is the most likely receptor group to be affected by any in-ground contamination at a site, if present.

7.2.1. Discussion of Results

There was no visual evidence of asbestos presence at the Site, and no source was identified during the Tier 1 assessment. This is supported with no asbestos identified in any of the samples submitted for laboratory testing. Therefore, no significant risk of significant harm to the critical human receptor or wider environmental receptors is considered to be present due to asbestos.

7.3. Ground Gas Assessment

Ground gas was not identified as a risk by the pQRA presented in the Phase I report due to there being no known source. The ground investigation did not reveal material readily associated with the production of ground gas at impactful concentrations to humans and therefore, post-ground investigation monitoring was not considered necessary for the progression of the development.

According to the online page UKradon.org, managed by PHE, the Site is located within an area where less than 1% of properties are above the action level.

This is indicative of low risk and, under England & Wales Building Control Regulations, no radon protection measures are necessary for this commercial development.

7.4. Waste Acceptance Criteria (WAC)

As indicated in Section 6, a total of 3 soil samples were recovered during the ground investigation and tested with respect to Waste Assessment Criteria (WAC) testing. The results of those tests are as follows:

- WS01 0.10m – 0.20mbegl (MG) Non-hazardous (slightly elevated SO_4)
- WS03 1.20m – 1.30mbegl (RTD) Inert
- WS04 0.70m – 0.80mbegl (RTD) Inert

pH has no limit for inert or hazardous waste landfill, however, for waste acceptance as stable non-reactive hazardous waste in non-hazardous landfill (SNRHW) the pH must be above 6. If any parameter is outside of inert but below the threshold for SNRHW (as is Molybdenum in this case), then the pH must meet the limit of 6.

From the limited testing undertaken, the results suggest that the natural soils will be inert waste classification. However, Made Ground, comprising backfill, Topsoil (placed), tipped material, and compound surfacing it likely to be a combination of inert and stable non-reactive hazardous waste classification. Due to the extent of Made Ground across the Site, it is recommended that WAC testing is undertaken as required and sampled from the stockpiles to be removed. These are for material to be removed from Site to a waste processor facility; these are not a reflection of the end-use criteria for material remaining at Site. The WAC certificates are presented in Appendix D.

It is therefore recommended that any material requiring removal from Site should be stockpiled for further testing, which can be undertaken by the groundworks contractor as and when required. It is recommended (and good practise) that stockpiles are stored on an impermeable membrane. The resultant WAC certificates should then be supplied to the receiving party; copies of which must be retained for inclusion in the validation process as outlined within the planning conditions.

It is the responsibility of the Principal Contractor to ensure that testing undertaken is adequate (of appropriate frequency to m^3 of material being removed) and in accordance with the current guidance (Guidance: Disposal of Waste to Landfill, updated 2023), however, it must also be noted that some LPAs supply area-specific guidance which override the national guidance and must be adhered to.

In all cases, Waste Transfer Tickets (pink tickets) must always be retained for presentation within a verification report, should one be requested as proof of due and correct process at the end of the development phase in order that the local regulatory authority can discharge all planning conditions.

7.5. Further Geochemical Assessment

In the event that arisings require removal from Site, further WAC testing should be undertaken as outlined above.

As previously indicated, the tipped material along the northern boundary was not sampled for testing. Should this material require removal from Site, WAC testing should be undertaken, as outlined above.

8 GENERIC QUALITATIVE RISK ASSESSMENT FOR LAND CONTAMINATION

Following completion of the Stage 1, Tier 1 preliminary qualitative risk assessment, as presented in the Phase I report, and analysis of results gained from the ground investigations (Section 7), a Stage 1, Tier 2 generic quantitative risk assessment for land contamination can be presented. Current guidance on the assessment of contaminated land requires the risk to human health, to buildings and to the wider environment to be reviewed using a source-pathway-receptor linkage relationship. If each of these elements is present, the pollution linkage provides a potential risk to the identified receptors and conversely, if one of these is missing, the model fails to be realised, thereby rendering the risk either '**Negligible**' if present but below criterion, or "**NR**" if no evidence of presence, and thereby no risk, due to the failure of the source-pathway-source model (i.e., an element is absent).

This model is set in the context of the proposed development of the Site for '**commercial**' end-use, based on assessment for a 21-y-o adult, and updates the pQRA presented in the Phase I report as discussed in Section 2.2.

8.1. Updated Source - Pathway - Receptor Linkages Risk Assessment

Made Ground was observed to depths of between 0.2m and 0.9mbegl, as discussed in Section 5.1, and being mostly of organic-rich Topsoil with fine demolition arisings and straw in places. The Site was saturated at the time of investigation, with surface water sitting in most areas. Underlying the imported Topsoil is the natural River Terrace Deposits (RTD), comprising variably gravelly, clayey SAND with inclusions of clay-dominated material. The coarse material of the RTD and the high water levels establish potential pathways of in-ground lateral migration and surface saltation. The Site is currently an area of undeveloped land, however, it has previously been used as the construction compound for the adjacent A327. However, on completion, the Site will be dominated by hard landscaping with no additional soft landscaped areas.

As discussed in Section 7.1, no minor exceedances of the assessment criteria in relation to the end-use categorisation were proven, and therefore no significant risk of significant harm to the critical human or the wider environmental receptors is present.

Likewise, the risk of impact to groundwork and construction workers is considered negligible in relation to short-term exposure, with the most plausible pathway being through direct contact (consumption). This can easily be overcome using standard good working practices and PPE, including hand washing prior to eating.

As discussed in Section 7.2, no asbestos fibres were identified from the ground investigation.

Following on from the previous reports for the Site, as referenced in Section 2.1, and the current GI data, the likelihood of risk of contamination or harm to human, environmental, or in-ground structural receptors can be further assessed, as outlined below. Individual sources are often impossible to separate and have therefore been combined by contaminant type. For an explanation of the risk categories identified within the matrix, please refer to Appendix F.

Source (Type and location)	Receptor	Pathway	Initial Assessment from Desk Study Information			Proposed Investigation/Comments	Hazard Linkage	Revised Risk	Proposed Remediation /Management	Residual Risk
			Severity	Prob.	Risk					
Onsite: Toxic & phytotoxic **heavy metals** and **transitions** within the MG or shallow soils: Most likely identified sources/compounds: **Tipped materials Compound MG Imported TS**	Site workers (short-term/ acute exposure)	Direct contact (ingestion/dermal)	Minor	Low	Negligible	**No source identified.** Although unlikely to be anything other than inert, the tipped material is yet to be fully assessed. However, this material is likely to be either be removed from Site or redistributed and used within the development, which comprises a total hard surfacing thereby rendering any pathway blocked. Therefore, negligible risk is assumed. No evidence of toxic substances within the surface materials across the Site.	No	Negligible	None required.	None
		Dust inhalation	Minor	Low	Negligible					
		Vapour inhalation			NR					
	Future site users (long-term/ chronic exposure)	Direct contact (ingestion/dermal)	Minor	Unlikely	Negligible					
		Dust inhalation	Minor	Unlikely	Negligible					
		Vapour inhalation			NR					
	Controlled water (surface)	Migration by surface run-off	Minor	Low	Negligible					
		In-ground lateral migration	Minor	Unlikely	Negligible					
	Controlled water (aquifer)	In-ground vertical migration	Minor	Unlikely	Negligible					
	Plants	Root uptake	Minor	Unlikely	Negligible					
Onsite: Toxic & phytotoxic non-metals and solvents within the MG or shallow soils: Most likely identified sources/compounds: **Tipped materials Compound MG Imported TS**	Site workers (short-term/ acute exposure)	Direct contact (ingestion/dermal)	Minor	Low	Negligible	**No source identified.** Although unlikely to be anything other than inert, the tipped material is yet to be fully assessed. However, this material is likely to be either be removed from Site or redistributed and used within the development, which comprises a total hard surfacing thereby rendering any pathway blocked. Therefore, negligible risk is assumed. No evidence of toxic substances within the surface materials across the Site.	No	Negligible	None required.	None
		Dust inhalation	Minor	Low	Negligible					
		Vapour inhalation	Minor	Low	Negligible					
	Future site users (long-term/ chronic exposure)	Direct contact (ingestion/dermal)	Minor	Unlikely	Negligible					
		Dust inhalation	Minor	Unlikely	Negligible					
		Vapour inhalation	Minor	Unlikely	Negligible					
	Controlled water (surface)	Migration by surface run-off	Minor	Low	Negligible					
		In-ground lateral migration	Minor	Unlikely	Negligible					
	Controlled water (aquifer)	In-ground vertical migration	Minor	Unlikely	Negligible					
	Plants	Root uptake	Minor	Unlikely	Negligible					

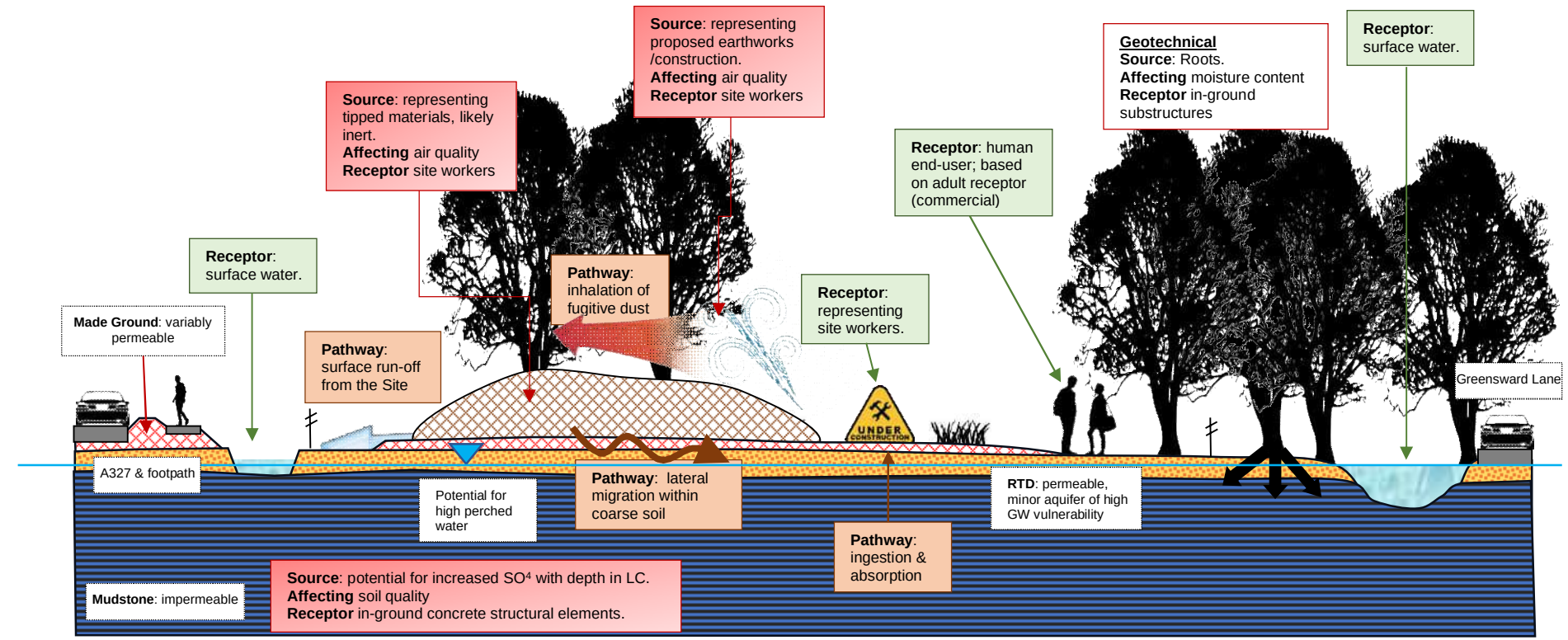
Source (Type and location)	Receptor	Pathway	Initial Assessment from Desk Study Information			Proposed Investigation/Comments	Hazard Linkage	Revised Risk	Proposed Remediation /Management	Residual Risk
			Severity	Prob.	Risk					
Onsite: Petroleum hydrocarbon compounds (**TPH**) (petrol, oil, diesel), Polyaromatic Hydrocarbons (**PAH**) (coal, clinker, coke) and associated volatile organic compounds (**VOC**s) within the MG or shallow soils. Most likely identified compounds of: **None identified**.	Site workers (short-term/ acute exposure)	Direct contact (ingestion/dermal)	Minor	Unlikely	Negligible	**No source identified**.	No	Negligible	None required.	None
		Dust inhalation	Minor	Unlikely	Negligible					
		Vapour inhalation	Minor	Unlikely	Negligible					
	Future site users (long-term/ chronic exposure)	Direct contact (ingestion/dermal)	Minor	Unlikely	Negligible					
		Dust inhalation	Minor	Unlikely	Negligible					
		Vapour inhalation	Minor	Unlikely	Negligible					
	Controlled water (surface)	Migration by surface run-off	Minor	Unlikely	Negligible					
		In-ground lateral migration	Minor	Unlikely	Negligible					
	Controlled water (aquifer)	In-ground vertical migration	Minor	Unlikely	Negligible					
	Plants	Root uptake	Minor	Unlikely	Negligible					
	In-ground utilities	Direct contact with construction materials	Minor	Unlikely	Negligible					
	Building substructure		Minor	Unlikely	Negligible					
Onsite: Polychlorinated Biphenyls **(PCBs)** within Made Ground or shallow soils. **None identified**.	Site workers (short-term/ acute exposure)	Direct contact (ingestion/dermal)			NR	**No source identified**.	No	Negligible	None required.	None
		Dust inhalation			NR					
		Vapour inhalation			NR					
	Future site users (long-term/ chronic exposure)	Direct contact (ingestion/dermal)			NR					
		Dust inhalation			NR					
		Vapour inhalation			NR					
	Controlled water (surface)	Migration by surface run-off			NR					
		In-ground lateral migration			NR					
	Controlled water (aquifer)	In-ground vertical migration			NR					
	Plants	Root uptake			NR					

Source (Type and location)	Receptor	Pathway	Initial Assessment from Desk Study Information			Proposed Investigation/Comments	Hazard Linkage	Revised Risk	Proposed Remediation /Management	Residual Risk
			Severity	Prob.	Risk					
Onsite: Ground gas. **None identified**.	Site workers (short-term/ acute exposure)	Vapour inhalation	Minor	Unlikely	Negligible	No source of ground gas identified onsite that could constitute a significant risk of significant harm to any on-site receptor.	No	Negligible	None required.	None
	Future site users (long-term/ chronic exposure)	Vapour inhalation	Minor	Unlikely	Negligible					
Onsite: Residual **asbestos** from previous structures near or at surface. **None identified**.	Site workers (short-term/ acute exposure)	Inhalation of fugitive dust	Minor	Low	Negligible	**No source identified**.	No	Negligible	None required.	None
	Future site users (long-term/ chronic exposure)	Inhalation of fugitive dust	Minor	Unlikely	Negligible					
Onsite (Geotechnical): Aggressive substances (**pH, SO_4** conditions) within Made Ground	In-ground utilities	Direct contact with utilities conduits.	Minor	Unlikely	Negligible	High acidity within the imported TS across the Site due to high organic content. However, material will be removed from area.	No	Negligible	None required.	None
	Building substructure	Direct contact with in-ground construction materials	Minor	Unlikely	Negligible					
Onsite (Geotechnical): Aggressive substances (**pH, SO_4** conditions) within natural soils	In-ground utilities	Direct contact with utilities conduits.	Mild	Low	Low	Although the underlying LC was determined to be DC-1, only the top on the unit was tested. LC known to contact selenite in some beds therefore sulphate like to increase with depth. **Recommend** further testing or assume DC-2.	Potentially	Low	Recommend further testing or assume DC-2 as a preventative.	Negligible
	Building substructure	Direct contact with in-ground construction materials	Mild	Low	Low					

Source (Type and location)	Receptor	Pathway	Initial Assessment from Desk Study Information			Proposed Investigation/Comments	Hazard Linkage	Revised Risk	Proposed Remediation / Management	Residual Risk
			Severity	Prob.	Risk					
Offsite: Toxic & phytotoxic **heavy metals** and **transitions** migrating to Site from offsite historical /current processes. **None identified**.	Site workers (short-term/ acute exposure)	Direct contact (ingestion/dermal)	Minor	Unlikely	Negligible	**No source identified.**	No	Negligible	None required.	None
		Dust inhalation	Minor	Unlikely	Negligible					
		Vapour inhalation			NR					
	Future site users (long-term/ chronic exposure)	Direct contact (ingestion/dermal)	Minor	Unlikely	Negligible					
		Dust inhalation	Minor	Unlikely	Negligible					
		Vapour inhalation			NR					
	Controlled water (surface)	Migration by surface run-off			NR					
		In-ground lateral migration			NR					
	Controlled water (aquifer)	In-ground vertical migration	Minor	Unlikely	Negligible					
	Plants	Root uptake	Minor	Unlikely	Negligible					
Offsite: Toxic & phytotoxic **non-metals** and **solvents** migrating to Site from offsite historical/current processes. **None identified**.	Site workers (short-term/ acute exposure)	Direct contact (ingestion/dermal)	Minor	Unlikely	Negligible	**No source identified.**	No	Negligible	None required.	None
		Dust inhalation	Minor	Unlikely	Negligible					
		Vapour inhalation	Minor	Unlikely	Negligible					
	Future site users (long-term/ chronic exposure)	Direct contact (ingestion/dermal)	Minor	Unlikely	Negligible					
		Dust inhalation	Minor	Unlikely	Negligible					
		Vapour inhalation	Minor	Unlikely	Negligible					
	Controlled water (surface)	Migration by surface run-off			NR					
		In-ground lateral migration			NR					
	Controlled water (aquifer)	In-ground vertical migration	Minor	Unlikely	Negligible					
	Plants	Root uptake	Minor	Unlikely	Negligible					

Source (Type and location)	Receptor	Pathway	Initial Assessment from Desk Study Information			Proposed Investigation/Comments	Hazard Linkage	Revised Risk	Proposed Remediation / Management	Residual Risk
			Severity	Prob.	Risk					
Offsite: Petroleum hydrocarbons (**TPH**) (petrol, oil, diesel), Poly Aromatic Hydrocarbons (**PAHs**) (coal, clinker, coke, tar) and associated volatile organic compounds (**VOC**s) within the Made Ground or shallow soils from offsite processes. **None identified**.	Site workers (short-term/ acute exposure)	Direct contact (ingestion/dermal)			NR	**No source identified.**	No	NR	None required.	None
		Dust inhalation			NR					
		Vapour inhalation			NR					
	Future site users (long-term/ chronic exposure)	Direct contact (ingestion/dermal)			NR					
		Dust inhalation			NR					
		Vapour inhalation			NR					
	Controlled water (surface)	Migration by surface run-off			NR					
		In-ground lateral migration			NR					
	Controlled water (aquifer)	In-ground vertical migration			NR					
	Plants	Root uptake			NR					
Offsite: Polychlorinated Biphenyls **(PCBs)** from adjacent site locations within MG or shallow soils. **None identified**.	Site workers (short-term/ acute exposure)	Direct contact (ingestion/dermal)			NR	**No source identified.**	No	NR	None required.	None
		Dust inhalation			NR					
		Vapour inhalation			NR					
	Future site users (long-term/ chronic exposure)	Direct contact (ingestion/dermal)			NR					
		Dust inhalation			NR					
		Vapour inhalation			NR					
	Controlled water (surface)	Migration by surface run-off			NR					
		In-ground lateral migration			NR					
	Controlled water (aquifer)	In-ground vertical migration			NR					
	Plants	Root uptake			NR					

MG: Made Ground
TS: Topsoil
NR: No risk (missing element from S-P-R model)



Preliminary Conceptual Site Model (Potential Current Condition)

(Graphical Representation)

Not To Scale

Notes:

This model should be read in conjunction with the relevant risk matrix and report.

For clarity, this model only highlights the significant pollutant linkages potentially present.

This model is a sketch diagram and does not represent relative locations or dimensions of identified features.

8.2. Requirement for Further Assessment

During works there is potential for fugitive dust to be blown from the soil surface, particularly under dry and windy weather conditions. Although proven uncontaminated or toxic, fugitive dust can impact on general wellbeing and is at best, a nuisance. Therefore, dampening of exposed soils should be undertaken throughout all works phases as a courtesy to the surrounding land users.

Of the areas investigated and laboratory testing undertaken, neither the results nor quantified risk assessment identified significant risk of significant harm to the receptors, however, a 'negligible' risk **does not mean that contamination or the impact of such will definitely be absent from the Site** (as outlined by the risk assessment matrix presented in Appendix F), and site workers should be mindful of this.

Only the top of the London Clay was sampled and tested due to collapsed dynamic sampler holes. London Clay is known to contain selenite-bearing beds. Although the testing undertaken resulted in a concrete class DC-1, sulphate may increase with depth. It is therefore recommended that either further testing be undertaken to establish adequate concrete class or assume DC-2 as a preventative measure.

Should any soils be revealed during enabling/construction works that are in any way different to those revealed during the ground investigation outlined in this report, then excavation must cease immediately, and samples must be taken for analysis by the PRP geotechnical engineer. This applies to the type of soils as well, as it may impact the foundation design. This may result in additional remedial measures being required on site before enabling/construction works can be continued. In the event that contamination is proven, consultation with the Contaminated Land Officer of the Local Planning Authority must be sought to establish an acceptable remediation strategy for which verification may be required.

9 OVERVIEW OF RECOMMENDATIONS

Based on the findings of the ground investigation at the Site, the following is recommended:

9.1. Geotechnical Constraints

The following is a brief synopsis of Section 5.

Made Ground was detected across the Site, in the form of a soft, organic-rich imported Topsoil, which contained fine demolition debris and straw mixed within, recorded to depths of between 0.2m and 0.90mbegl. In some places, a thin layer of demolition crush was encountered at the base of this soft ground, a remnant of the former construction compound.

It should be noted that the imported Topsoil across the Site has no engineered capacity and can be used only for soft landscaping areas, of which, none are presented on the proposed site plan shown in Appendix A.

The natural River Terrace Deposits (RTD) were recorded as a variable gravelly, clayey SAND of substantial strength, interbedded with weaker clay or silt dominated material, which often exhibited running behaviour. This material was recorded to extend across the entire Site, which contradicts the BGS records, which indicates RTD restricted to the northwest corner, however, BGS stratal boundaries are only indicative based on the information they possess at the time of mapping.

The underlying bedrock, London Clay was recorded in three boreholes from depths of between 2.6m and 2.8mbegl as a very soft silty CLAY, however, advancement of the dynamic sampling was curtailed by hole collapse due to saturated soils in all location. As a result, dynamic probing was undertaken to depths of between 5m and 6mbegl, interpretation of which indicated the top of the London Clay from between 2.2m and 3.1mbegl also as a very soft material, however it also indicated an increase in strength with depth (Section 5.1).

LC presented with medium volume change potential with variation in moisture content. This may impact units close to the northern (hawthorn) and eastern (various deciduous) boundaries where part of the structures may be within root influence zones. However, due to the saturated nature of the soils, no dewatering process was evident, however, this may change once the Site has been drained (Section 5.1).

Additional to ground saturation, there were many areas of ponding at surface. Further water strikes were recorded at between 0.9m and 2.2mbegl, which rose to between 0.18m and 1.5mbegl on removal of casing (Section 4.1), prohibiting the use of soakaways for surface water drainage. The flora across the ponded areas indicates that near-surface or at surface water is at least a common occurrence. Swales have been constructed in the wider area and a drainage ditch is located to the northwest of the Site entrance. **It is recommended that appropriate drainage feasibility and design be undertaken** (Section 5.3).

As discussed in Section 5.4, **ground improvement is recommended** for the footprint of the proposed structures, which must be compatible with the high soil water content. It is likely that the

most efficient form would be VSC to depths of around 6mbegl with deepening likely to be required for Units 4 - 6. PRP has reached out to Vibro Menard for a feasibility assessment, their extensive response is included within Section 5.4, where **they recommend further investigation by CPT**, albeit that the dynamic probing proved increase in strength with depth.

Section 5.5 shows that DC-1 can be adopted for in-ground concrete structures within the natural soils, however, only the surface of the London Clay was tested. It is likely that sulphate content will increase with depth due to some beds within the LC known to contain selenite crystals, **therefore either further testing should be undertaken on samples recovered from within the London Clay or assumed DC-2 as a preventative method**.

As indicated in Section 5.4, ground improvement is recommended, likely by VSC. Required bearing pressures for founding the portal frame structures will be in the region of 125kPa, with FoS, a minimum of 175kPa should be sought through ground strengthening (Section 5.6). On completion of the ground improvement works, pad foundations should be founded at 1mbegl.

Once the Topsoil (Made Ground) has been stripped from the development areas, the underlying RTD sands and gravels are of adequate strength to support ground bearing slabs. Commercial ground floor slabs should be constructed as ground bearing and designed in accordance with TR34. It is r**ecommended that plate bearing tests be undertaken on the proof-rolled formation, post-groundworks, to determine the value for the Modulus of Sub-grade Reaction, k.** This can only be undertaken after the sub-formation has been exposed, and only once preparatory groundworks (reprofiling and ground improvement) have been completed (Section 5.7).

With regards to the natural granular RTD, approximate CBR values of 40 can be adopted once the soft overburden has been removed (Section 5.7).

Further assessment is recommended as sample assessment was undertaken only to between 2m and 3mbegl, particularly in light of the likelihood for increased sulphates with depth in the London Clay, which may determine that in-ground concrete elements require DC-2. This will also allow for installation of groundwater monitoring stand pipes. However, as indicated above, with VSC founding will likely be at 1mbgl therefore within DC-1 tolerances.

9.2. Contamination

In line with the proposed development and of the area assessed, no exceedances where proven in accordance with the LQM/CIEH S4UL and Defra C4SL criteria as outlined in Section 7.1.

It should however be noted that, although likely to be inert material, the tipped material along the northern boundary was not sampled due to unsafe accessibility.

No asbestos was identified in any of the samples submitted for laboratory testing. Therefore, no significant risk of significant harm to the critical human receptor or wider environmental receptors is considered to be present due to asbestos (Section 7.2).

No radon protection measures are required for this commercial development. Ground gas monitoring was not undertaken due to lack of apparent source and a CS-1 has been assumed (Section 7.3).

For arisings due for removal from Site, WAC testing indicated the imported Topsoil/Made Ground to be non-hazardous and the natural soils to be inert. Due to the limited testing regime, it is recommended that any material to be removed from Site should be stockpiled and further tested, which can be undertaken by the groundworks contractor as and when required. The resultant WAC certificates should then be supplied to the receiving party (Section 7.4).

During works fugitive dust may be produce from the soil surface, particularly under dry and windy weather conditions. Although not necessarily contaminated or toxic, fugitive dust can impact on general wellbeing and is at best, a nuisance. Therefore, dampening of exposed soils should be undertaken throughout all works phases as a courtesy to the surrounding land users.

In addition to the recommendations outlined above, should any soils be revealed during enabling/construction works that are different in any way to those revealed during the ground investigation outlined in this report, then excavation must cease immediately, and samples must be taken for analysis by PRP. This may result in remedial measures being required on site before enabling/construction works can continue, which must be priorly agreed with the Local Planning Authority (Section 8.2).

9.3. Health & Safety/General Measures to be Adopted During Works

Dampening of exposed soils should be undertaken during dry periods.

No excavation should be entered into unless the sides are appropriately supported (battened or temporary propping of the trench sides) in accordance with current best practice and as accepted by the Health and Safety Executive which is published in “Health and Safety in Construction (HSG 150)” which is available to download from *www.hse.gov.uk*. It is good practice that any excavation is not entered unless absolutely necessary.

The soils across the Site were saturated at the time of investigation, with many areas of surface ponding. Surface water collecting in excavations, as demonstrated with the collapsed dynamic sampler holes, will likely destabilise the bearing strata and any excavation sides. In these circumstances, and if appropriate surface water drainage measures are yet to be installed, should water be seen to sit within the excavations, the use of a small submersible pump should be sufficient to keep water levels sufficiently low to enable concrete or services to be placed in the excavations.

Inflows are to be expected in all excavations and dewatering techniques will likely be required at all times of the year. Therefore, temporary formwork to excavations may also be required to prevent the collapse of excavation sides; this will be particularly relevant during periods of rainfall.

Karen Holton, BSc, FGS, IOSH
Senior Geotechnical Engineer

Barry Smith, B.Eng. C.Eng. M.I.Struct.E. FGS
Director

APPENDIX A

Drawings

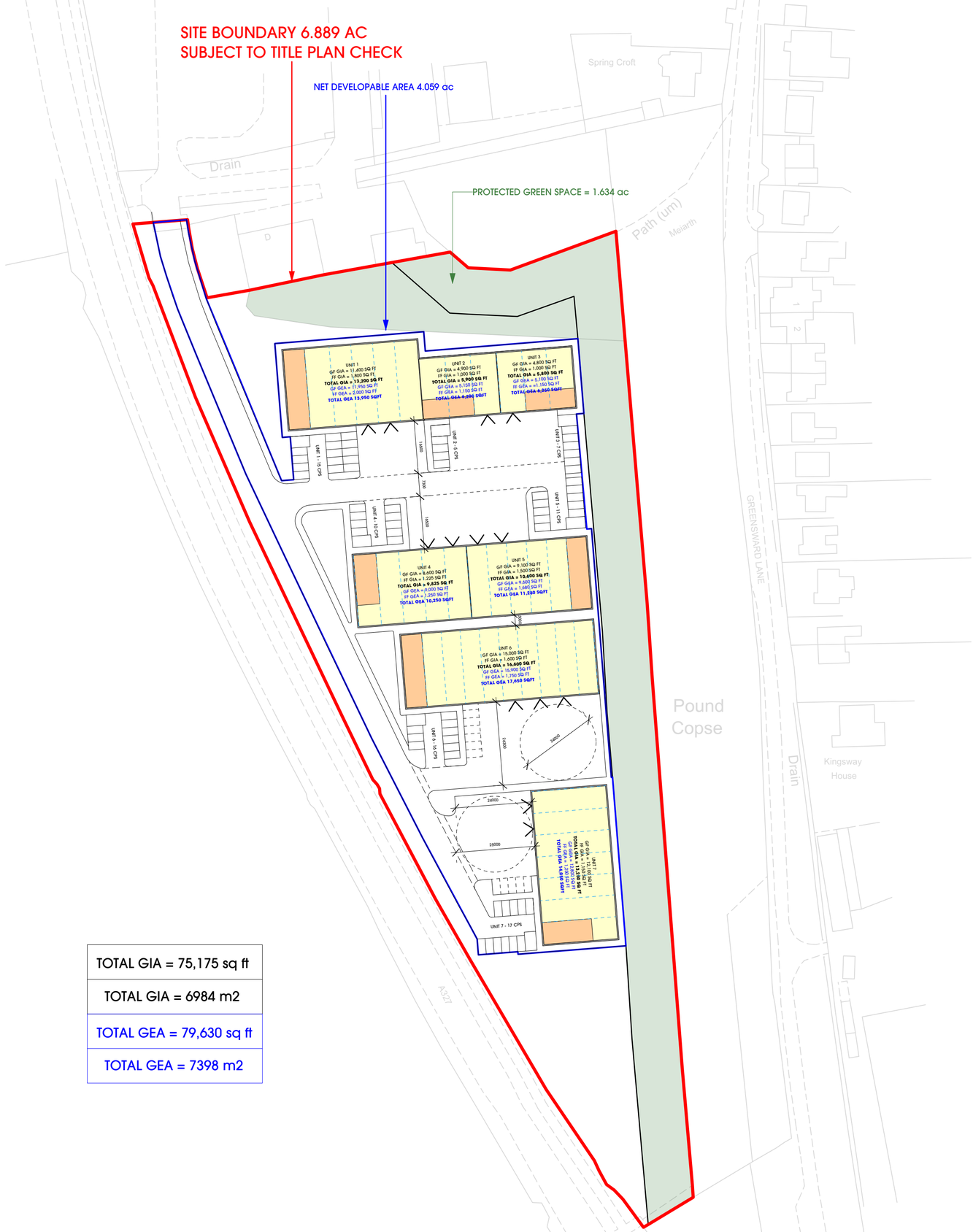
Drawing Number:	Drawing Title:
3389 F401 A	Proposed Site Plan, HTC Architects, 14/02/2024.
64065 SK02 P1	Borehole Location Plan, PRP Engineers

THIS DRAWING IS COPYRIGHT, AND REMAINS THE PROPERTY OF HTC ARCHITECTS. IT MUST NOT BE REPRODUCED, USED, DISCLOSED OR TRANSMITTED TO THIRD PARTIES IN ANY FORM, IN WHOLE OR IN PART, WITHOUT PRIOR WRITTEN PERMISSION.

DO NOT SCALE!
ALL DIMENSIONS SHOULD BE CHECKED ON SITE BEFORE WORK COMMENCES

BOUNDARY SUBJECT TO TITLE PLAN CHECK

SUBJECT TO REVIEW OF LEVELS AND FALLS



TOTAL GIA = 75,175 sq ft
TOTAL GIA = 6984 m2
TOTAL GEA = 79,630 sq ft
TOTAL GEA = 7398 m2

Rev.	Date	Description	Drawn
C	28/02/24	FF areas reduced	AB
B	28/02/24	GEA's added	DE
A	27/02/24	Updated to show 3m gap between Unit 4/5 and 6	DE

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York Place Studio
8 Britannia Street
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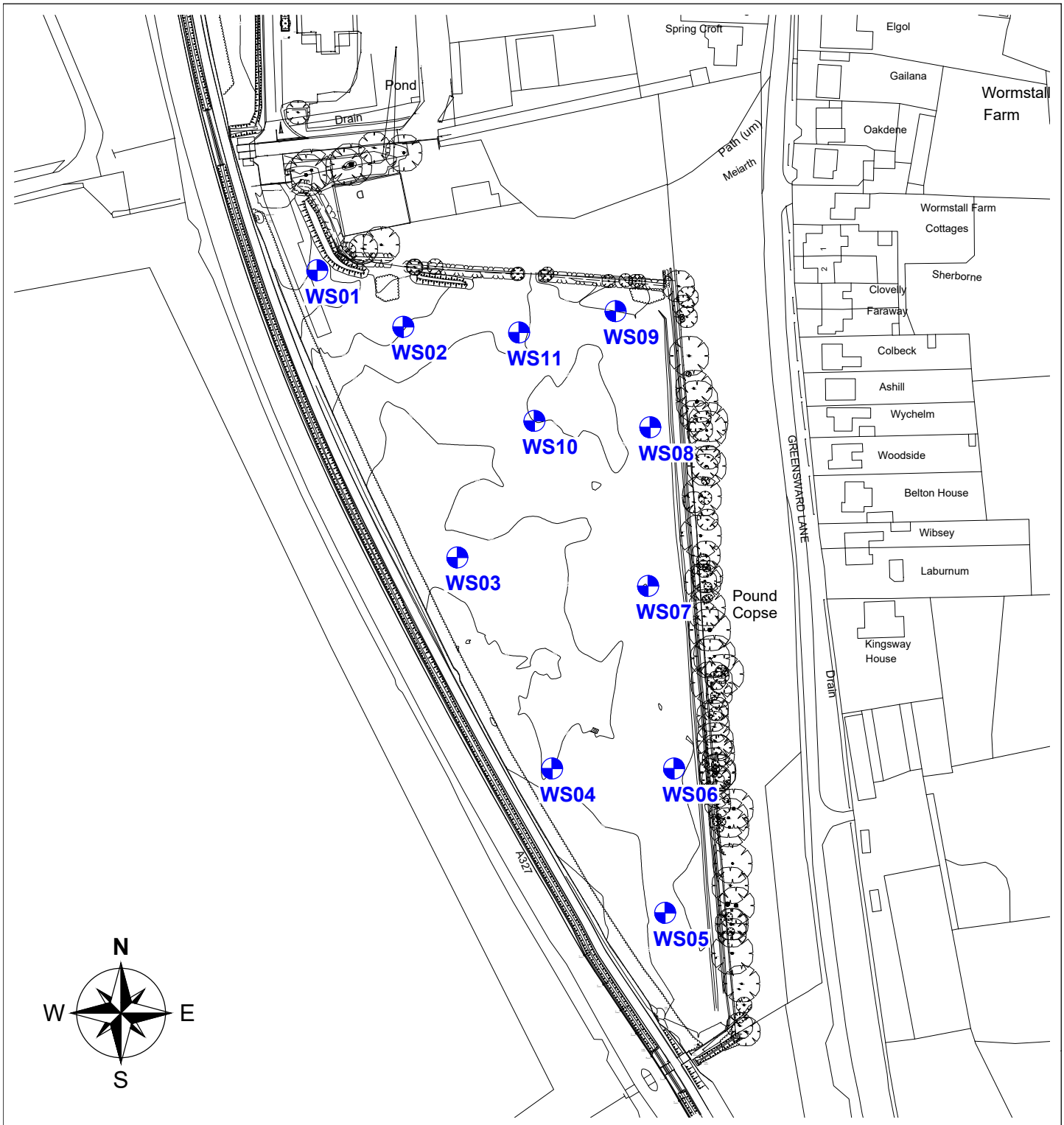
T:(0113) 244 3457
W: www.htcarchitects.co.uk
E: info@htcarchitects.co.uk

client
Tungsten Properties

project
Observer Park, Arborfield, Reading

drawing title
Proposed Site Plan

date Feb 2024
status Feasibility
scale 1:1000 @ A2
drawn DE checked DW
job no. 3389 dwg no. F403 rev. C



Project: Observer Park, Reading	Title: Borehole Location Plan

PRP
consulting engineers & surveyors

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Brixworth
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Telephone: 01604 889 870
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engineering excellence | creating advantage

Status: **PRELIMINARY**

Engineer:	KH	Date:	March 2024
Drawn:	GF	Scales @ A4:	1:2000
Checked:	BMS		
Project No:	64065	Drg No: SK02	Rev: P1

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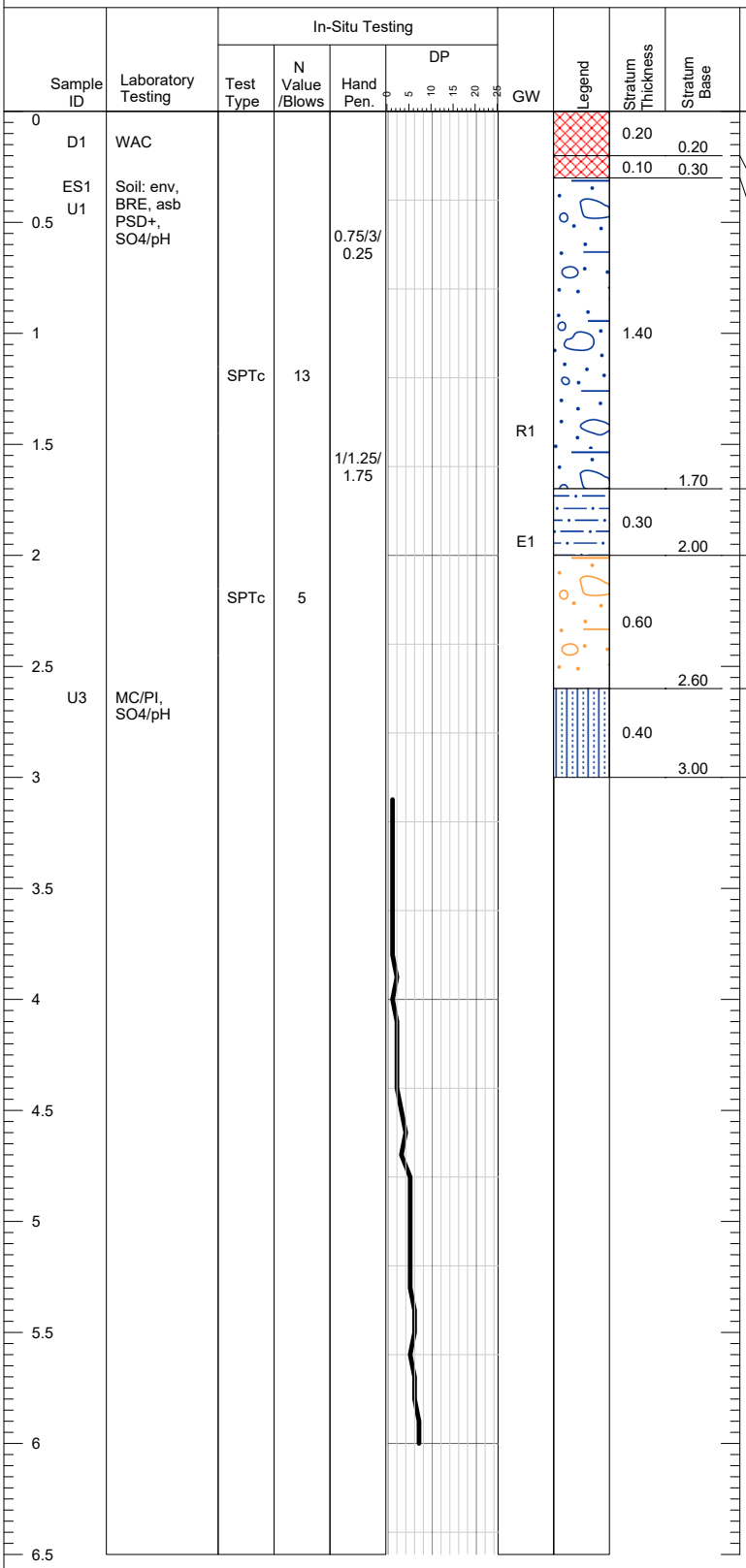
APPENDIX B

Engineer's Stratigraphic Logs

PROJECT NAME:	**Observer Park**		
SITE LOCATION:	**Arborfield, Reading**		
CLIENT:	**Carbide Properties Ltd**	JOB NO.:	**64065**
START DATE:	**26/03/2024**	EASTING:	**474934**
END DATE:	**26/03/2024**	NORTHING:	**167317**
BOREHOLE ID:	**WS01**		
TOTAL DEPTH:	**3mbgl + DP to 6m**		

MEASURING POINT: **Ground Level** DATUM ELEVATION (if available):



DESCRIPTION

Depth	Description	% Recovery	Installation
0.00 – 0.30	Grass over firm, grey-brown clay backfill containing fragments of concrete and brick (fine to cobble) and gravel of flint and sandstone (fine to coarse, subangular to rounded), and abundant roots and rootlets. MADE GROUND of large concrete and brick fragments in clay matrix.	U1 100%	
0.30 – 1.70	Firm, wet, olive and locally brown, becoming lighter with depth, slightly gravelly, sandy, silty CLAY. Gravel of fine to coarse and occasional nodule, subrounded to angular fragments of flint. Localised inclusions of slightly clayey, green, fine grained SAND (RTD).	U2 100%	
1.70 – 2.00	Soft, wet, olive, slightly silty, sandy CLAY (RIVER TERRACE DEPOSIT).		
2.00 – 2.60	Loose, saturated and washed out (running), orange, slightly clayey, gravelly, medium grained SAND. Gravel of fine flint and coarse sandstone (RTD).	U3 60%	
2.60 – 3.00	Very soft, wet, dark grey, slightly silty CLAY (LONDON CLAY FORMATION).		

OTHER COMMENTS:
Water encountered at 1.9m with 1m casing. At end of sampling, water at 1.6m which rose to 1.4m on removal of casing.
Hole collapsed at 2.4m with dynamic probing continuation from 3m.

IN SITU KEY:
SPTc (cone)
SPT (spoon)
FH (falling head)

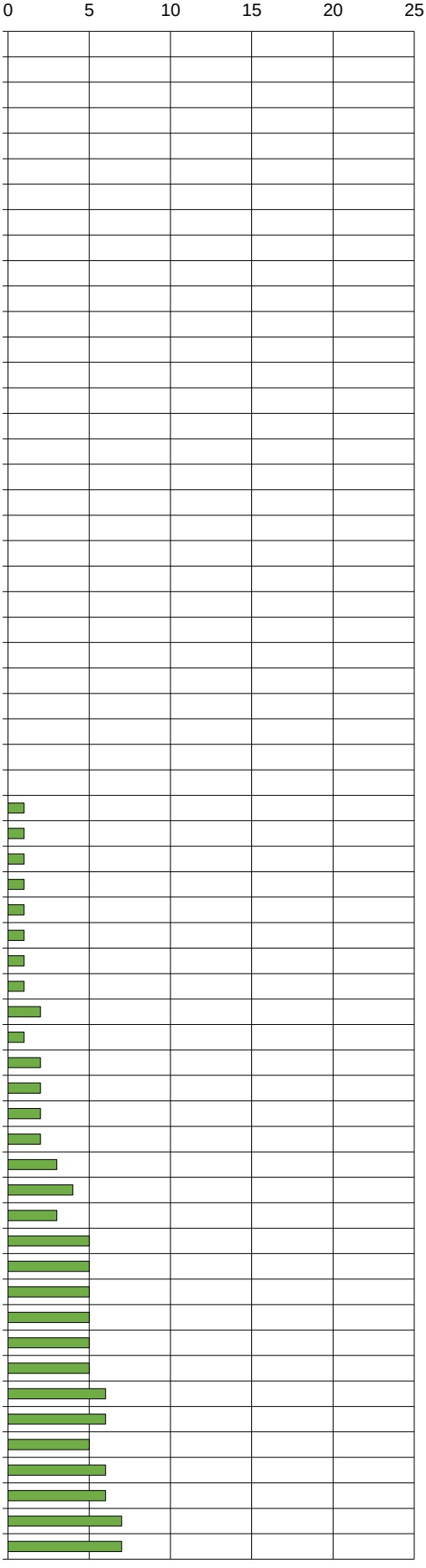
EQUIPMENT/MODALITY:
Archway Lite DS

GW ENCOUNTERED: **Y** GW INFLOW RATE: **Seepage** INSTALLATION: **None**

LOGGED: KLH CHECKED: KLH

Date	26/03/2024	Site:	Observer Park, Arborfield	Borehole Number	WS01
Job Number	64065				

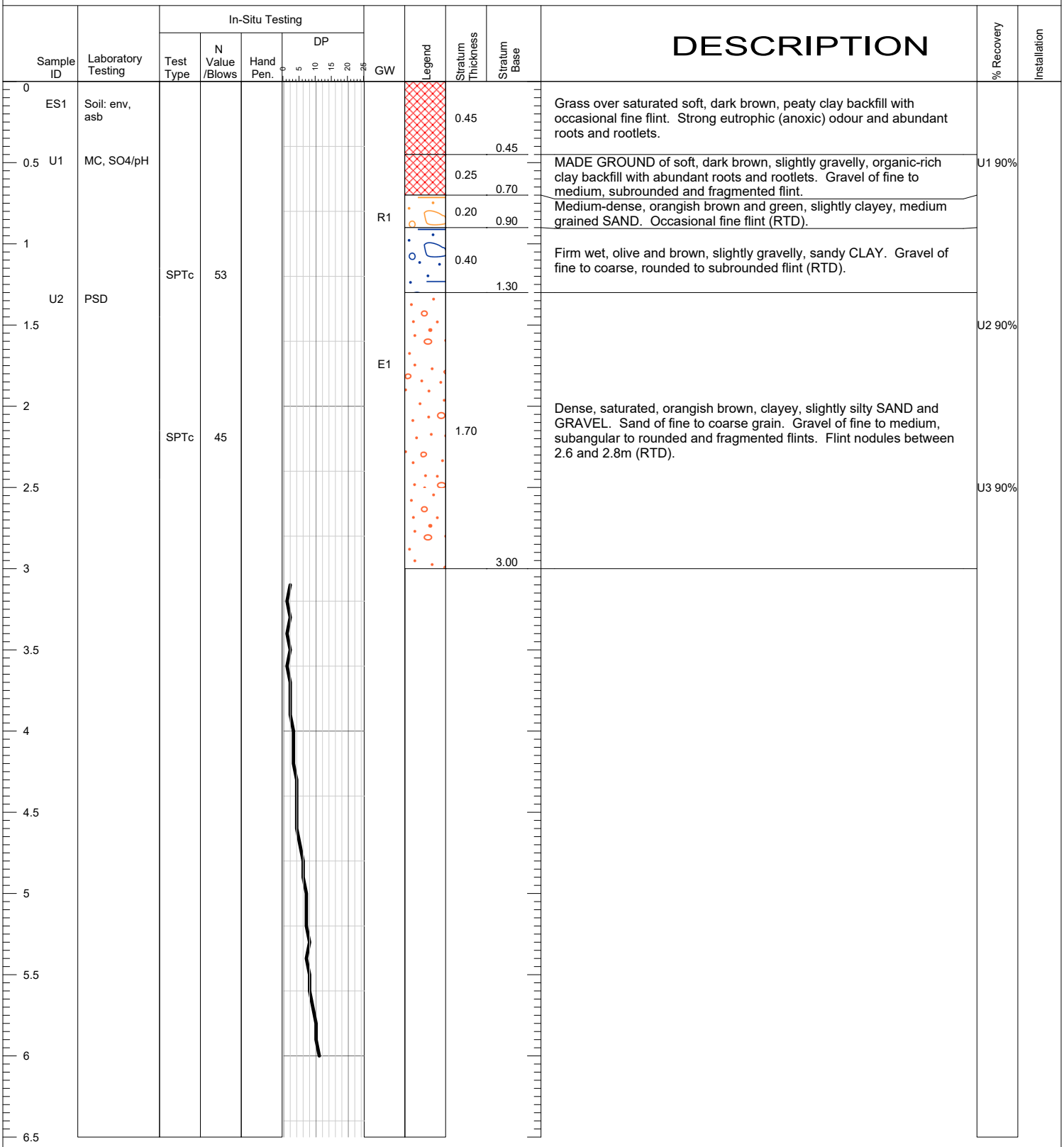
Depth (m)	N100 Blows	Comments
0.0 - 0.1		
0.1 - 0.2		
0.2 - 0.3		
0.3 - 0.4		
0.4 - 0.5		
0.5 - 0.6		
0.6 - 0.7		
0.7 - 0.8		
0.8 - 0.9		
0.9 - 1.0		
1.0 - 1.1		
1.1 - 1.2		
1.2 - 1.3		
1.3 - 1.4		
1.4 - 1.5		Water at end (casing removed)
1.5 - 1.6		
1.6 - 1.7		
1.7 - 1.8		
1.8 - 1.9		Water strike
1.9 - 2.0		
2.0 - 2.1		
2.1 - 2.2		
2.2 - 2.3		
2.3 - 2.4		
2.4 - 2.5		BH Collapsed from
2.5 - 2.6		
2.6 - 2.7		London Clay transition.
2.7 - 2.8		
2.8 - 2.9		
2.9 - 3.0		
3.0 - 3.1	1	
3.1 - 3.2	1	
3.2 - 3.3	1	
3.3 - 3.4	1	
3.4 - 3.5	1	
3.5 - 3.6	1	
3.6 - 3.7	1	
3.7 - 3.8	1	
3.8 - 3.9	2	
3.9 - 4.0	1	
4.0 - 4.1	2	
4.1 - 4.2	2	
4.2 - 4.3	2	
4.3 - 4.4	2	
4.4 - 4.5	3	
4.5 - 4.6	4	
4.6 - 4.7	3	
4.7 - 4.8	5	
4.8 - 4.9	5	
4.9 - 5.0	5	
5.0 - 5.1	5	
5.1 - 5.2	5	
5.2 - 5.3	5	
5.3 - 5.4	6	
5.4 - 5.5	6	
5.5 - 5.6	5	
5.6 - 5.7	6	
5.7 - 5.8	6	
5.8 - 5.9	7	
5.9 - 6.0	7	



Remarks

Hammer Weight 63.5 kg

PROJECT NAME:	**Observer Park**				
SITE LOCATION:	**Arborfield, Reading**				
CLIENT:	**Carbide Properties Ltd**			JOB NO.:	**64065**
START DATE:	**26/03/2024**	EASTING:	**474973**	BOREHOLE ID:	**WS02**
END DATE:	**26/03/2024**	NORTHING:	**167279**	TOTAL DEPTH:	**3mbgl + DP to 6m**
MEASURING POINT:	**Ground Level**	DATUM ELEVATION (if available):			



OTHER COMMENTS:

Water encountered at 1.7m with 1m casing. At end of sampling, water at 0.95m which rose to 0.8m on removal of casing.
Hole collapsed at 1.9m with dynamic probing continuation from 3m.

IN SITU KEY:
SPTc (cone)
SPT (spoon)
FH (falling head)

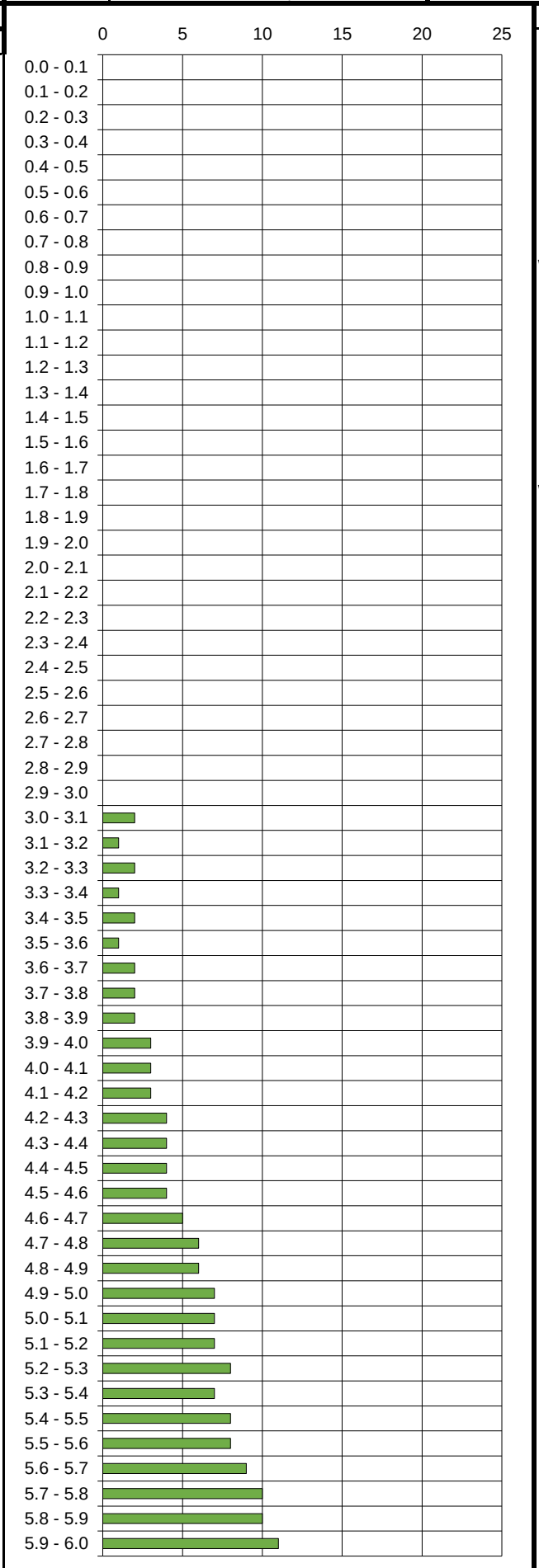
EQUIPMENT/MODALITY:
Archway Lite DS

GW ENCOUNTERED: **Y** GW INFLOW RATE: **Seepage** INSTALLATION: **None**

LOGGED: KLH CHECKED: KLH

Date	26/03/2024	Site:	Observer Park, Arborfield	Borehole Number	WS02
Job Number	64065				

Depth (m)	N100 Blows	Comments
0.0 - 0.1		
0.1 - 0.2		
0.2 - 0.3		
0.3 - 0.4		
0.4 - 0.5		
0.5 - 0.6		
0.6 - 0.7		
0.7 - 0.8		
0.8 - 0.9		Water at end (casing removed)
0.9 - 1.0		
1.0 - 1.1		
1.1 - 1.2		
1.2 - 1.3		
1.3 - 1.4		
1.4 - 1.5		
1.5 - 1.6		
1.6 - 1.7		
1.7 - 1.8		Water strike
1.8 - 1.9		
1.9 - 2.0		BH Collapsed from
2.0 - 2.1		
2.1 - 2.2		
2.2 - 2.3		
2.3 - 2.4		
2.4 - 2.5		
2.5 - 2.6		
2.6 - 2.7		
2.7 - 2.8		
2.8 - 2.9		
2.9 - 3.0		
3.0 - 3.1	2	Likely London Clay transition.
3.1 - 3.2	1	
3.2 - 3.3	2	
3.3 - 3.4	1	
3.4 - 3.5	2	
3.5 - 3.6	1	
3.6 - 3.7	2	
3.7 - 3.8	2	
3.8 - 3.9	2	
3.9 - 4.0	3	
4.0 - 4.1	3	
4.1 - 4.2	3	
4.2 - 4.3	4	
4.3 - 4.4	4	
4.4 - 4.5	4	
4.5 - 4.6	4	
4.6 - 4.7	5	
4.7 - 4.8	6	
4.8 - 4.9	6	
4.9 - 5.0	7	
5.0 - 5.1	7	
5.1 - 5.2	7	
5.2 - 5.3	8	
5.3 - 5.4	7	
5.4 - 5.5	8	
5.5 - 5.6	8	
5.6 - 5.7	9	
5.7 - 5.8	10	
5.8 - 5.9	10	
5.9 - 6.0	11	

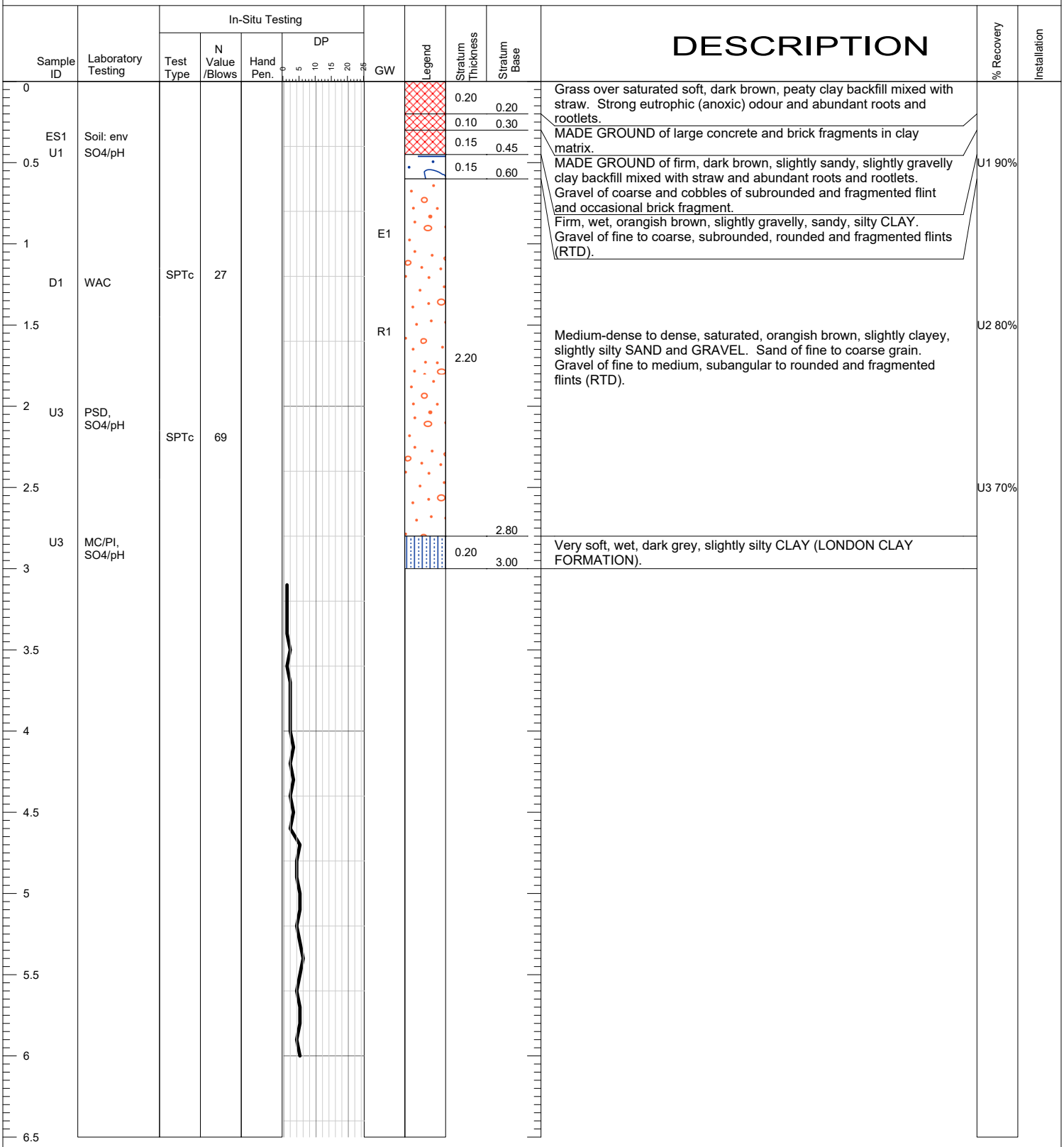


Remarks

Hammer Weight 63.5 kg

PROJECT NAME:	**Observer Park**		
SITE LOCATION:	**Arborfield, Reading**		
CLIENT:	**Carbide Properties Ltd**	JOB NO.:	**64065**
START DATE:	**25/03/2024**	EASTING:	**474997**
END DATE:	**25/03/2024**	NORTHING:	**167210**
BOREHOLE ID:	**WS03**		
TOTAL DEPTH:	**3mbgl + DP to 6m**		

MEASURING POINT: **Ground Level** DATUM ELEVATION (if available):



OTHER COMMENTS:

Water encountered at 0.9m with 2m casing. At end of sampling, water at 1.9m which rose to 1.5m on removal of casing.
Hole collapsed at 2.6m with dynamic probing continuation from 3m.

IN SITU KEY:
SPTc (cone)
SPT (spoon)
FH (falling head)

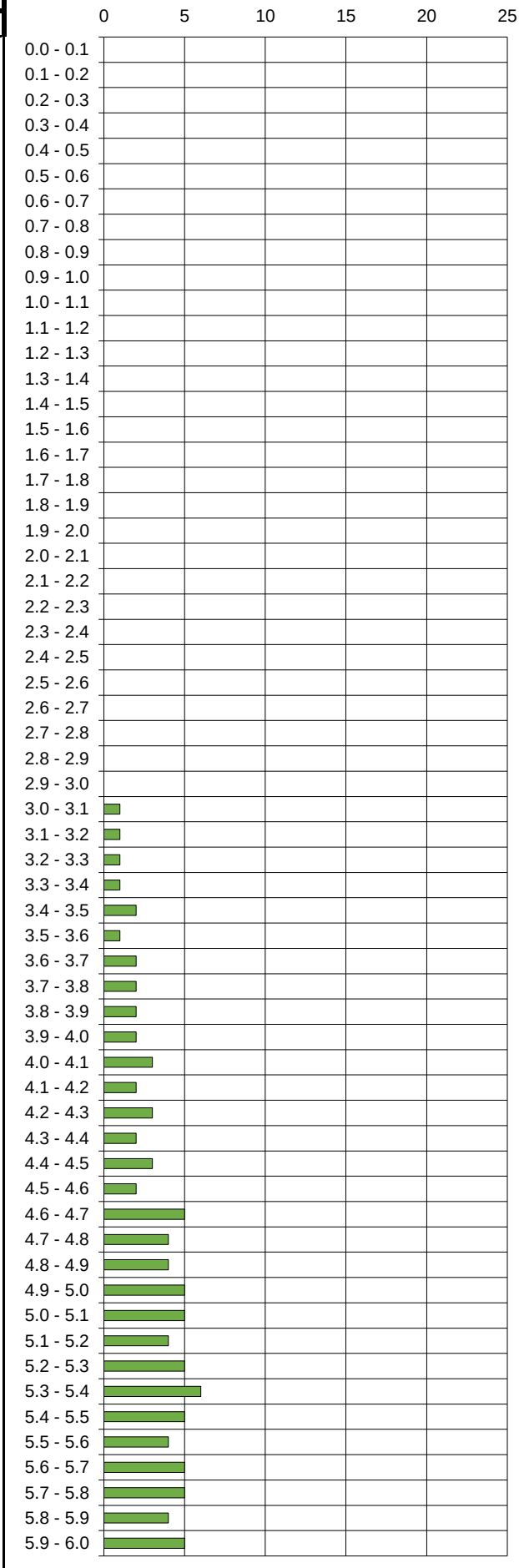
EQUIPMENT/MODALITY:
Archway Lite DS

GW ENCOUNTERED: **Y** GW INFLOW RATE: **Seepage** INSTALLATION: **None**

LOGGED: KLH CHECKED: KLH

Date	25/03/2024	Site:	Observer Park, Arborfield	Borehole Number	WS03
Job Number	64065				

Depth (m)	N100 Blows
0.0 - 0.1	
0.1 - 0.2	
0.2 - 0.3	
0.3 - 0.4	
0.4 - 0.5	
0.5 - 0.6	
0.6 - 0.7	
0.7 - 0.8	
0.8 - 0.9	
0.9 - 1.0	
1.0 - 1.1	
1.1 - 1.2	
1.2 - 1.3	
1.3 - 1.4	
1.4 - 1.5	
1.5 - 1.6	
1.6 - 1.7	
1.7 - 1.8	
1.8 - 1.9	
1.9 - 2.0	
2.0 - 2.1	
2.1 - 2.2	
2.2 - 2.3	
2.3 - 2.4	
2.4 - 2.5	
2.5 - 2.6	
2.6 - 2.7	
2.7 - 2.8	
2.8 - 2.9	
2.9 - 3.0	
3.0 - 3.1	1
3.1 - 3.2	1
3.2 - 3.3	1
3.3 - 3.4	1
3.4 - 3.5	2
3.5 - 3.6	1
3.6 - 3.7	2
3.7 - 3.8	2
3.8 - 3.9	2
3.9 - 4.0	2
4.0 - 4.1	3
4.1 - 4.2	2
4.2 - 4.3	3
4.3 - 4.4	2
4.4 - 4.5	3
4.5 - 4.6	2
4.6 - 4.7	5
4.7 - 4.8	4
4.8 - 4.9	4
4.9 - 5.0	5
5.0 - 5.1	5
5.1 - 5.2	4
5.2 - 5.3	5
5.3 - 5.4	6
5.4 - 5.5	5
5.5 - 5.6	4
5.6 - 5.7	5
5.7 - 5.8	5
5.8 - 5.9	4
5.9 - 6.0	5



Comments

Water strike

Water at end (casing removed)

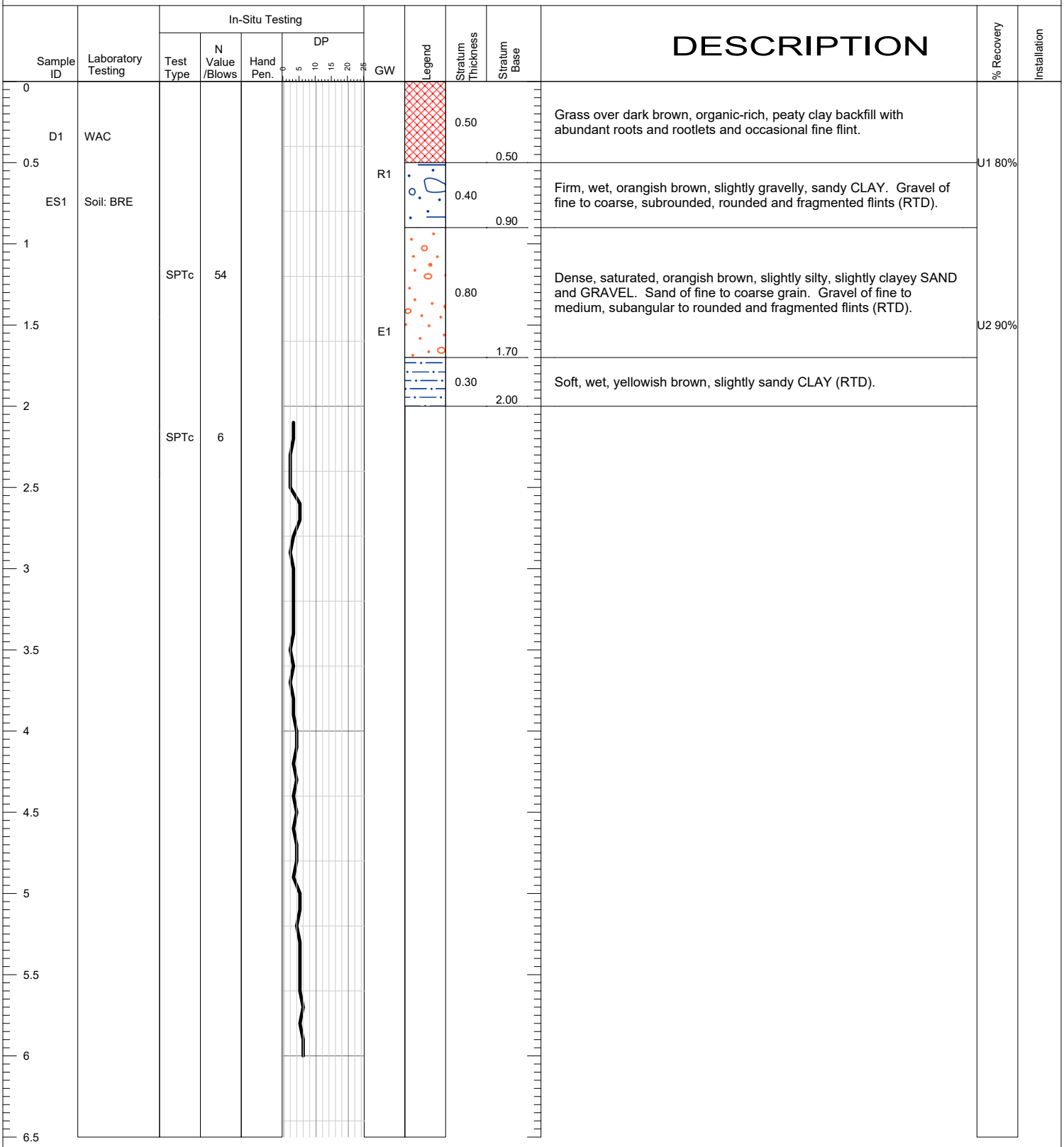
BH Collapsed from London Clay transition.

Remarks

Hammer Weight 63.5 kg

PROJECT NAME:	**Observer Park**		
SITE LOCATION:	**Arborfield, Reading**		
CLIENT:	**Carbide Properties Ltd**	JOB NO.:	**64065**
START DATE:	**25/03/2024**	EASTING:	**475016**
END DATE:	**25/03/2024**	NORTHING:	**167141**
BOREHOLE ID:	**WS04**		
TOTAL DEPTH:	**2mbgl + DP to 6m**		

MEASURING POINT: **Ground Level** DATUM ELEVATION (if available):



OTHER COMMENTS:

Water encountered at 1.5m with 1m casing. At end of sampling, water at 0.7m which rose to 0.53m on removal of casing.
Hole collapsed at 1.6m with dynamic probing continuation from 2m.

IN SITU KEY:
SPTc (cone)
SPT (spoon)
FH (falling head)

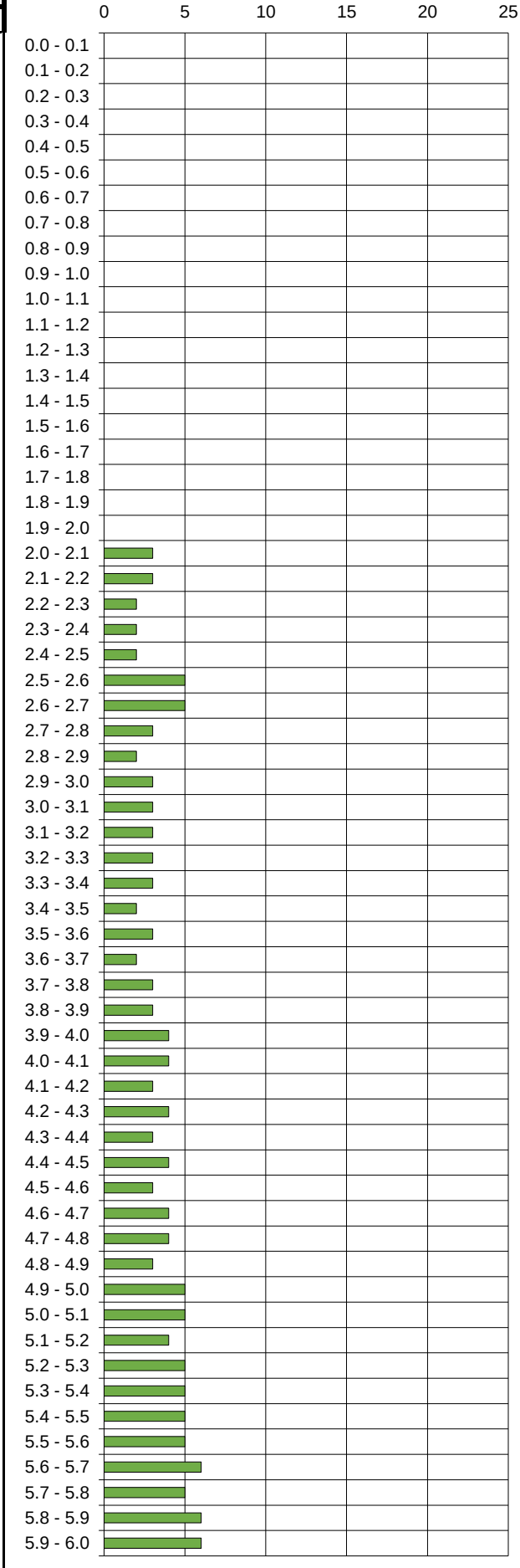
EQUIPMENT/MODALITY:
Archway Lite DS

GW ENCOUNTERED: **Y** GW INFLOW RATE: **Seepage** INSTALLATION: **None**

LOGGED: KLH CHECKED: KLH

Date	25/03/2024	Site:	Observer Park, Arborfield	Borehole Number	WS04
Job Number	64065				

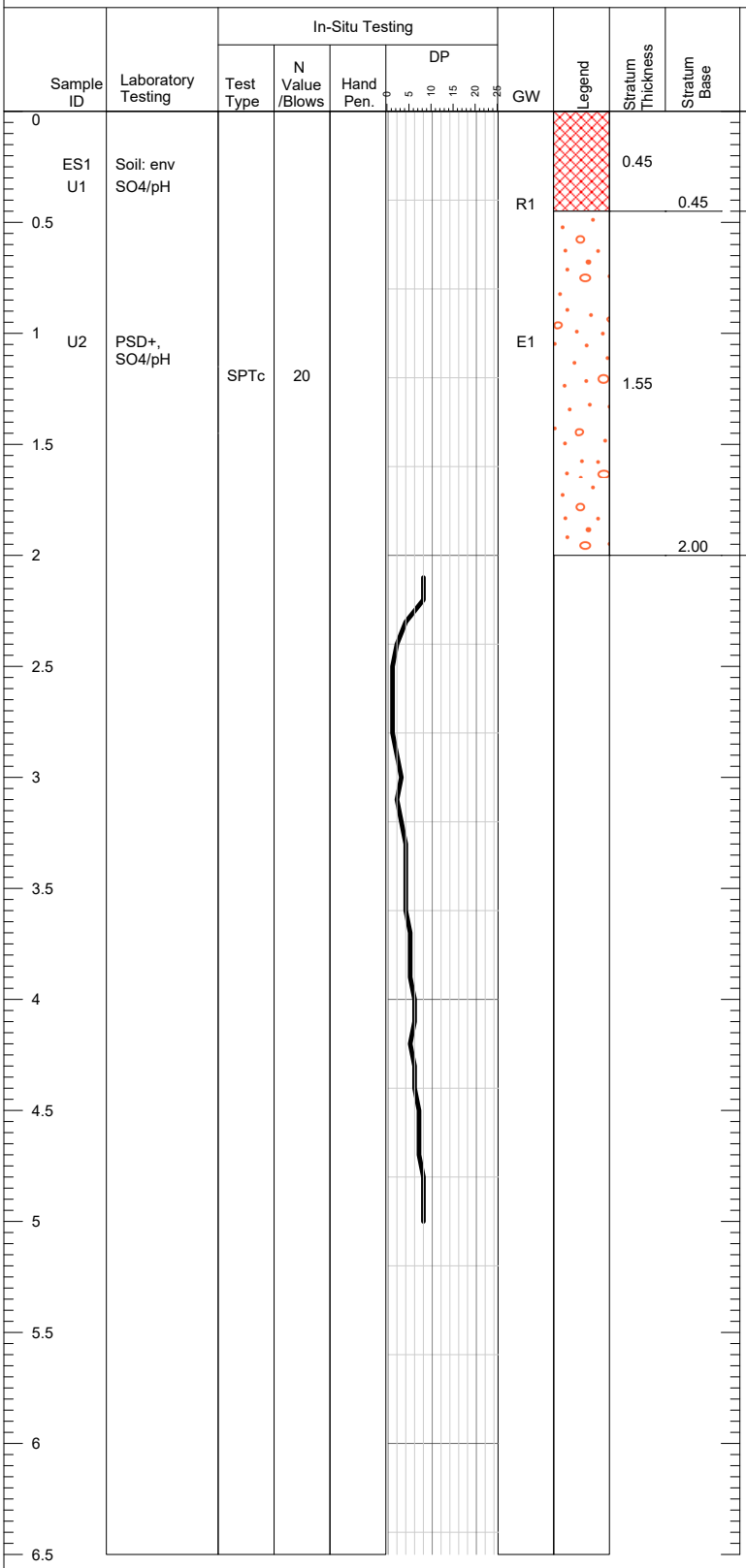
Depth (m)	N100 Blows	Comments
0.0 - 0.1		
0.1 - 0.2		
0.2 - 0.3		
0.3 - 0.4		
0.4 - 0.5		
0.5 - 0.6		Water at end (casing removed)
0.6 - 0.7		
0.7 - 0.8		
0.8 - 0.9		
0.9 - 1.0		
1.0 - 1.1		
1.1 - 1.2		
1.2 - 1.3		
1.3 - 1.4		
1.4 - 1.5		
1.5 - 1.6		Water strike
1.6 - 1.7		BH Collapsed from
1.7 - 1.8		
1.8 - 1.9		
1.9 - 2.0		
2.0 - 2.1	3	
2.1 - 2.2	3	
2.2 - 2.3	2	
2.3 - 2.4	2	
2.4 - 2.5	2	
2.5 - 2.6	5	
2.6 - 2.7	5	
2.7 - 2.8	3	
2.8 - 2.9	2	Likely London Clay transition.
2.9 - 3.0	3	
3.0 - 3.1	3	
3.1 - 3.2	3	
3.2 - 3.3	3	
3.3 - 3.4	3	
3.4 - 3.5	2	
3.5 - 3.6	3	
3.6 - 3.7	2	
3.7 - 3.8	3	
3.8 - 3.9	3	
3.9 - 4.0	4	
4.0 - 4.1	4	
4.1 - 4.2	3	
4.2 - 4.3	4	
4.3 - 4.4	3	
4.4 - 4.5	4	
4.5 - 4.6	3	
4.6 - 4.7	4	
4.7 - 4.8	4	
4.8 - 4.9	3	
4.9 - 5.0	5	
5.0 - 5.1	5	
5.1 - 5.2	4	
5.2 - 5.3	5	
5.3 - 5.4	5	
5.4 - 5.5	5	
5.5 - 5.6	5	
5.6 - 5.7	6	
5.7 - 5.8	5	
5.8 - 5.9	6	
5.9 - 6.0	6	



Remarks

Hammer Weight 63.5 kg

PROJECT NAME:	**Observer Park**				
SITE LOCATION:	**Arborfield, Reading**				
CLIENT:	**Carbide Properties Ltd**			JOB NO.:	**64065**
START DATE:	**27/03/2024**	EASTING:	**175056**	BOREHOLE ID:	**WS05**
END DATE:	**27/03/2024**	NORTHING:	**167108**	TOTAL DEPTH:	**2mbgl + DP to 5m**
MEASURING POINT:	**Ground Level**	DATUM ELEVATION (if available):			



OTHER COMMENTS:

Water encountered at 1m with 1m casing. At end of sampling, water at 0.45m which rose to 0.38m on removal of casing.
Hole collapsed at 1.4m with dynamic probing continuation from 2m.

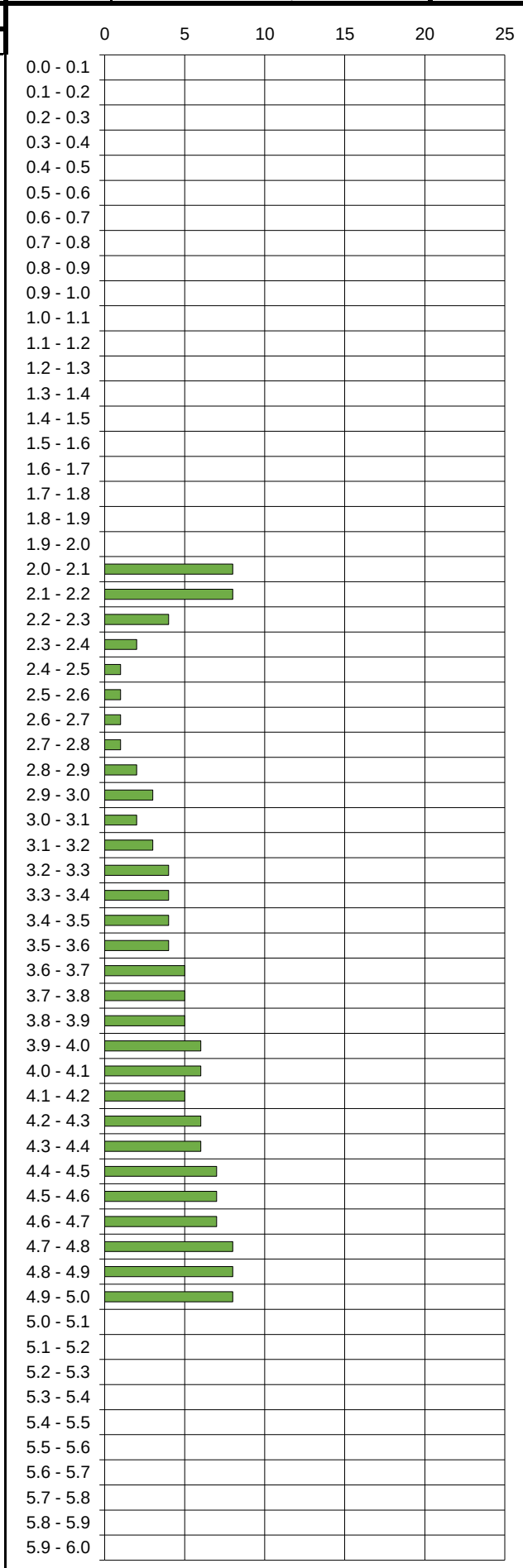
IN SITU KEY:
SPTc (cone)
SPT (spoon)
FH (falling head)

EQUIPMENT/MODALITY:
Archway Lite DS

GW ENCOUNTERED:	**Y**	GW INFLOW RATE:	**Seepage**	INSTALLATION:	**None**

LOGGED: KLH CHECKED: KLH

Date	27/04/2024	Site:	Observer Park, Arborfield	Borehole Number	WS05
Job Number	64065				



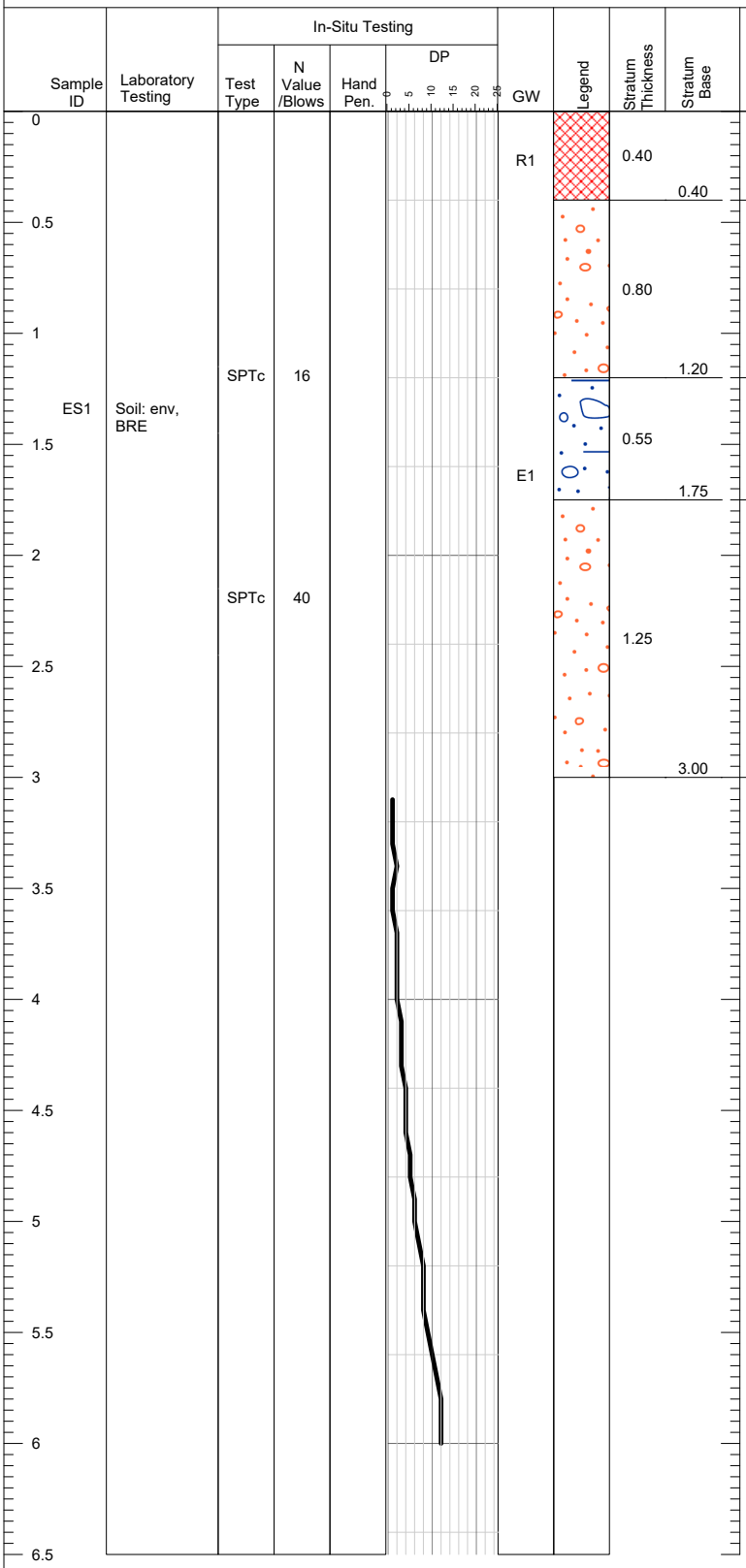
Depth (m)	N100 Blows	Comments
0.0 - 0.1		
0.1 - 0.2		
0.2 - 0.3		
0.3 - 0.4		Water at end (casing removed)
0.4 - 0.5		
0.5 - 0.6		
0.6 - 0.7		
0.7 - 0.8		
0.8 - 0.9		
0.9 - 1.0		
1.0 - 1.1		Water strike
1.1 - 1.2		
1.2 - 1.3		
1.3 - 1.4		
1.4 - 1.5		BH Collapsed from
1.5 - 1.6		
1.6 - 1.7		
1.7 - 1.8		
1.8 - 1.9		
1.9 - 2.0		
2.0 - 2.1	8	
2.1 - 2.2	8	
2.2 - 2.3	4	
2.3 - 2.4	2	
2.4 - 2.5	1	Likely London Clay transition.
2.5 - 2.6	1	
2.6 - 2.7	1	
2.7 - 2.8	1	
2.8 - 2.9	2	
2.9 - 3.0	3	
3.0 - 3.1	2	
3.1 - 3.2	3	
3.2 - 3.3	4	
3.3 - 3.4	4	
3.4 - 3.5	4	
3.5 - 3.6	4	
3.6 - 3.7	5	
3.7 - 3.8	5	
3.8 - 3.9	5	
3.9 - 4.0	6	
4.0 - 4.1	6	
4.1 - 4.2	5	
4.2 - 4.3	6	
4.3 - 4.4	6	
4.4 - 4.5	7	
4.5 - 4.6	7	
4.6 - 4.7	7	
4.7 - 4.8	8	
4.8 - 4.9	8	
4.9 - 5.0	8	
5.0 - 5.1		
5.1 - 5.2		
5.2 - 5.3		
5.3 - 5.4		
5.4 - 5.5		
5.5 - 5.6		
5.6 - 5.7		
5.7 - 5.8		
5.8 - 5.9		
5.9 - 6.0		

Remarks

Hammer Weight 63.5 kg

PROJECT NAME:	**Observer Park**		
SITE LOCATION:	**Arborfield, Reading**		
CLIENT:	**Carbide Properties Ltd**	JOB NO.:	**64065**
START DATE:	**27/03/2024**	EASTING:	**475062**
END DATE:	**27/03/2024**	NORTHING:	**167141**
BOREHOLE ID:	**WS06**		
TOTAL DEPTH:	**3mbgl + DP to 6m**		

MEASURING POINT: **Ground Level** DATUM ELEVATION (if available):



DESCRIPTION

Description	% Recovery	Installation
Grass over saturated soft, dark brown, peaty clay backfill with occasional fine flint. Strong eutrophic (anoxic)odour and abundant roots and rootlets.		
Loose to medium-dense, saturated, orangish brown, clayey, silty SAND and GRAVEL. Sand of fine to coarse grain. Gravel of fine to medium, subangular to rounded and fragmented flints (RTD).	U1 90%	
Firm, wet, olive and orangish brown, slightly gravelly, slightly sandy, silty CLAY. Gravel of fine to coarse, rounded to subrounded flint (RTD).	U2 90%	
Medium-dense to dense, saturated, orangish brown, clayey, silty SAND and GRAVEL. Sand of fine to coarse grain. Gravel of fine to medium, subangular to rounded and fragmented flints (RTD).	U3 70%	

OTHER COMMENTS:

Water encountered at 1.6m with 1m casing. At end of sampling, water at 0.38m which rose to 0.18m on removal of casing.
Hole collapsed at 1.9m with dynamic probing continuation from 3m.

IN SITU KEY:
SPTc (cone)
SPT (spoon)
FH (falling head)

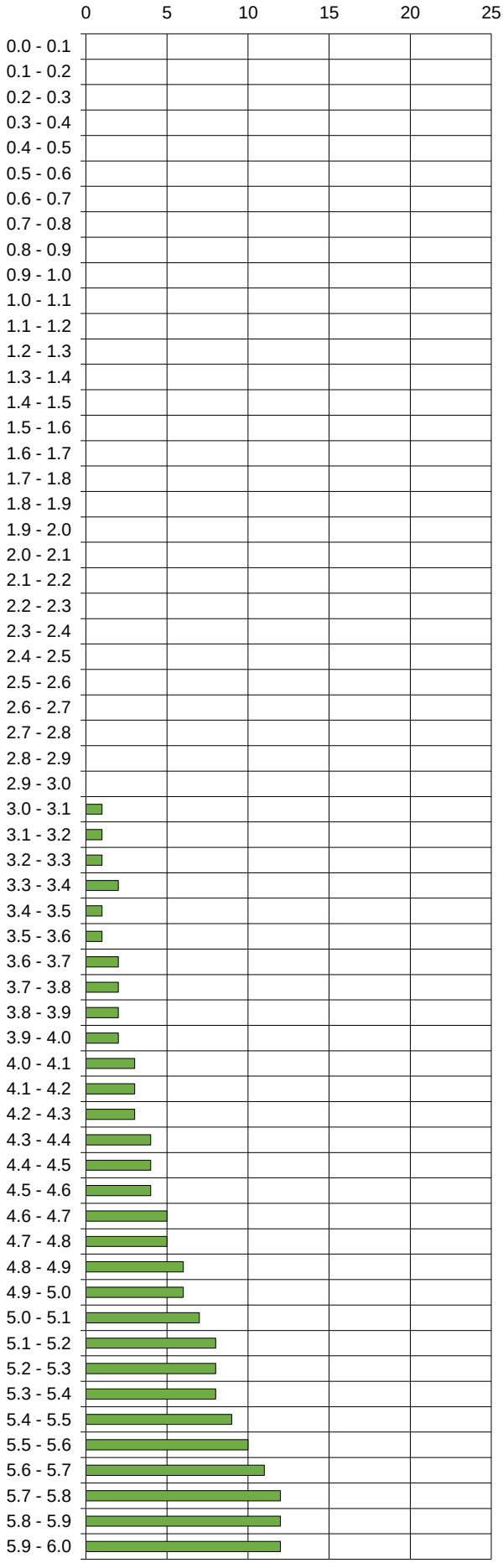
EQUIPMENT/MODALITY:
Archway Lite DS

GW ENCOUNTERED: **Y** GW INFLOW RATE: **Seepage** INSTALLATION: **None**

LOGGED: KLH CHECKED: KLH

Date	27/04/2024	Site:	Observer Park, Arborfield	Borehole Number	WS06
Job Number	64065				

Depth (m)	N100 Blows	Comments
0.0 - 0.1		
0.1 - 0.2		Water at end (casing removed)
0.2 - 0.3		
0.3 - 0.4		
0.4 - 0.5		
0.5 - 0.6		
0.6 - 0.7		
0.7 - 0.8		
0.8 - 0.9		
0.9 - 1.0		
1.0 - 1.1		
1.1 - 1.2		
1.2 - 1.3		
1.3 - 1.4		
1.4 - 1.5		
1.5 - 1.6		Water strike
1.6 - 1.7		
1.7 - 1.8		
1.8 - 1.9		
1.9 - 2.0		BH Collapsed from
2.0 - 2.1		
2.1 - 2.2		
2.2 - 2.3		
2.3 - 2.4		
2.4 - 2.5		
2.5 - 2.6		
2.6 - 2.7		
2.7 - 2.8		
2.8 - 2.9		
2.9 - 3.0		
3.0 - 3.1	1	Likely London Clay transition.
3.1 - 3.2	1	
3.2 - 3.3	1	
3.3 - 3.4	2	
3.4 - 3.5	1	
3.5 - 3.6	1	
3.6 - 3.7	2	
3.7 - 3.8	2	
3.8 - 3.9	2	
3.9 - 4.0	2	
4.0 - 4.1	3	
4.1 - 4.2	3	
4.2 - 4.3	3	
4.3 - 4.4	4	
4.4 - 4.5	4	
4.5 - 4.6	4	
4.6 - 4.7	5	
4.7 - 4.8	5	
4.8 - 4.9	6	
4.9 - 5.0	6	
5.0 - 5.1	7	
5.1 - 5.2	8	
5.2 - 5.3	8	
5.3 - 5.4	8	
5.4 - 5.5	9	
5.5 - 5.6	10	
5.6 - 5.7	11	
5.7 - 5.8	12	
5.8 - 5.9	12	
5.9 - 6.0	12	



Remarks

Hammer Weight 63.5 kg

PROJECT NAME:	**Observer Park**		
SITE LOCATION:	**Arborfield, Reading**		
CLIENT:	**Carbide Properties Ltd**	JOB NO.:	**64065**
START DATE:	**25/03/2024**	EASTING:	**475050**
END DATE:	**25/03/2024**	NORTHING:	**167190**
BOREHOLE ID:	**WS07**		
TOTAL DEPTH:	**3mbgl + DP to 5m**		

MEASURING POINT: **Ground Level** DATUM ELEVATION (if available):

Sample ID	Laboratory Testing	In-Situ Testing: Test Type	N Value /Blows	Hand Pen.	DP	GW	Legend	Stratum Thickness	Stratum Base	DESCRIPTION	% Recovery	Installation
								0.40	0.40	Grass over saturated soft, dark brown, peaty clay backfill with occasional fine flint. Strong eutrophic (anoxic) odour and abundant roots and rootlets.		
ES1 U1	Soil: env MC, SO4/pH							0.50	0.90	MADE GROUND of firm, dark brown, peaty silt backfill with occasional fine flint. Organic odour and abundant roots and rootlets.	U1 90%	
U2	PSD+	SPTc	39			R1		0.60	1.50	Medium-dense to dense, saturated, orangish brown, slightly clayey, slightly silty, very sandy GRAVEL. Sand of fine to coarse grain. Gravel of fine to medium, subangular to rounded and fragmented flints (RTD).	U2 100%	
								0.45	1.95	Firm, wet, grey, silty CLAY with occasional fine and medium flint (RTD).		
		SPTc	24			E1		0.80	2.75	Medium-dense, saturated, orangish brown, clayey, silty SAND and GRAVEL. Sand of fine to coarse grain. Gravel of fine to medium, subangular to rounded and fragmented flints (RTD).	U3 70%	
U£	MC/PI, SO4/pH							0.25	3.00	Very soft, wet, dark grey, slightly silty CLAY (LONDON CLAY FORMATION).		

OTHER COMMENTS:

Water encountered at 2.2m with 1m casing. At end of sampling, water at 1.13m which rose to 0.9m on removal of casing.
Hole collapsed at 2.5m with dynamic probing continuation from 3m.

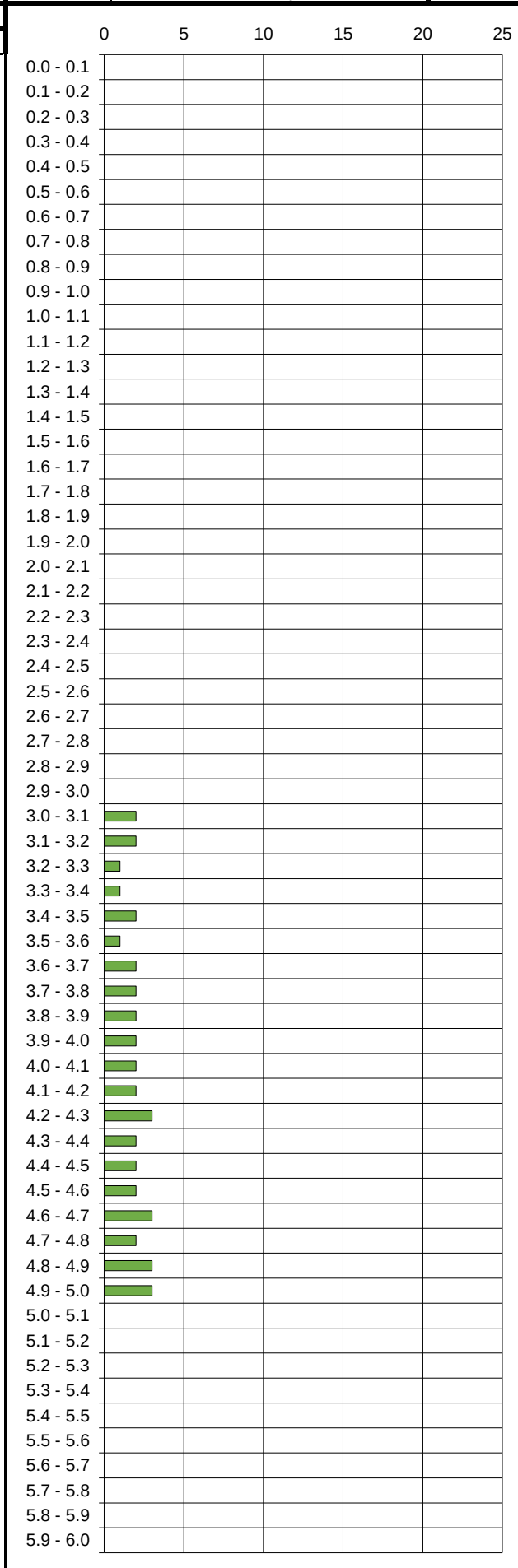
IN SITU KEY:
SPTc (cone)
SPT (spoon)
FH (falling head)

EQUIPMENT/MODALITY:
Archway Lite DS

GW ENCOUNTERED: **Y** GW INFLOW RATE: **Seepage** INSTALLATION: **None**

LOGGED: KLH CHECKED: KLH

Date	25/03/2024	Site:	Observer Park, Arborfield	Borehole Number	WS07
Job Number	64065				



Depth (m)	N100 Blows	Comments
0.0 - 0.1		
0.1 - 0.2		
0.2 - 0.3		
0.3 - 0.4		
0.4 - 0.5		
0.5 - 0.6		
0.6 - 0.7		
0.7 - 0.8		
0.8 - 0.9		
0.9 - 1.0		Water at end (casing removed)
1.0 - 1.1		
1.1 - 1.2		
1.2 - 1.3		
1.3 - 1.4		
1.4 - 1.5		
1.5 - 1.6		
1.6 - 1.7		
1.7 - 1.8		
1.8 - 1.9		
1.9 - 2.0		
2.0 - 2.1		
2.1 - 2.2		
2.2 - 2.3		Water strike
2.3 - 2.4		
2.4 - 2.5		
2.5 - 2.6		BH Collapsed from
2.6 - 2.7		
2.7 - 2.8		London Clay transition.
2.8 - 2.9		
2.9 - 3.0		
3.0 - 3.1	2	
3.1 - 3.2	2	
3.2 - 3.3	1	
3.3 - 3.4	1	
3.4 - 3.5	2	
3.5 - 3.6	1	
3.6 - 3.7	2	
3.7 - 3.8	2	
3.8 - 3.9	2	
3.9 - 4.0	2	
4.0 - 4.1	2	
4.1 - 4.2	2	
4.2 - 4.3	3	
4.3 - 4.4	2	
4.4 - 4.5	2	
4.5 - 4.6	2	
4.6 - 4.7	3	
4.7 - 4.8	2	
4.8 - 4.9	3	
4.9 - 5.0	3	
5.0 - 5.1		
5.1 - 5.2		
5.2 - 5.3		
5.3 - 5.4		
5.4 - 5.5		
5.5 - 5.6		
5.6 - 5.7		
5.7 - 5.8		
5.8 - 5.9		
5.9 - 6.0		

Remarks

Hammer Weight 63.5 kg

PROJECT NAME: **Observer Park**

SITE LOCATION: **Arborfield, Reading**

CLIENT: **Carbide Properties Ltd**

JOB NO.: **64065**

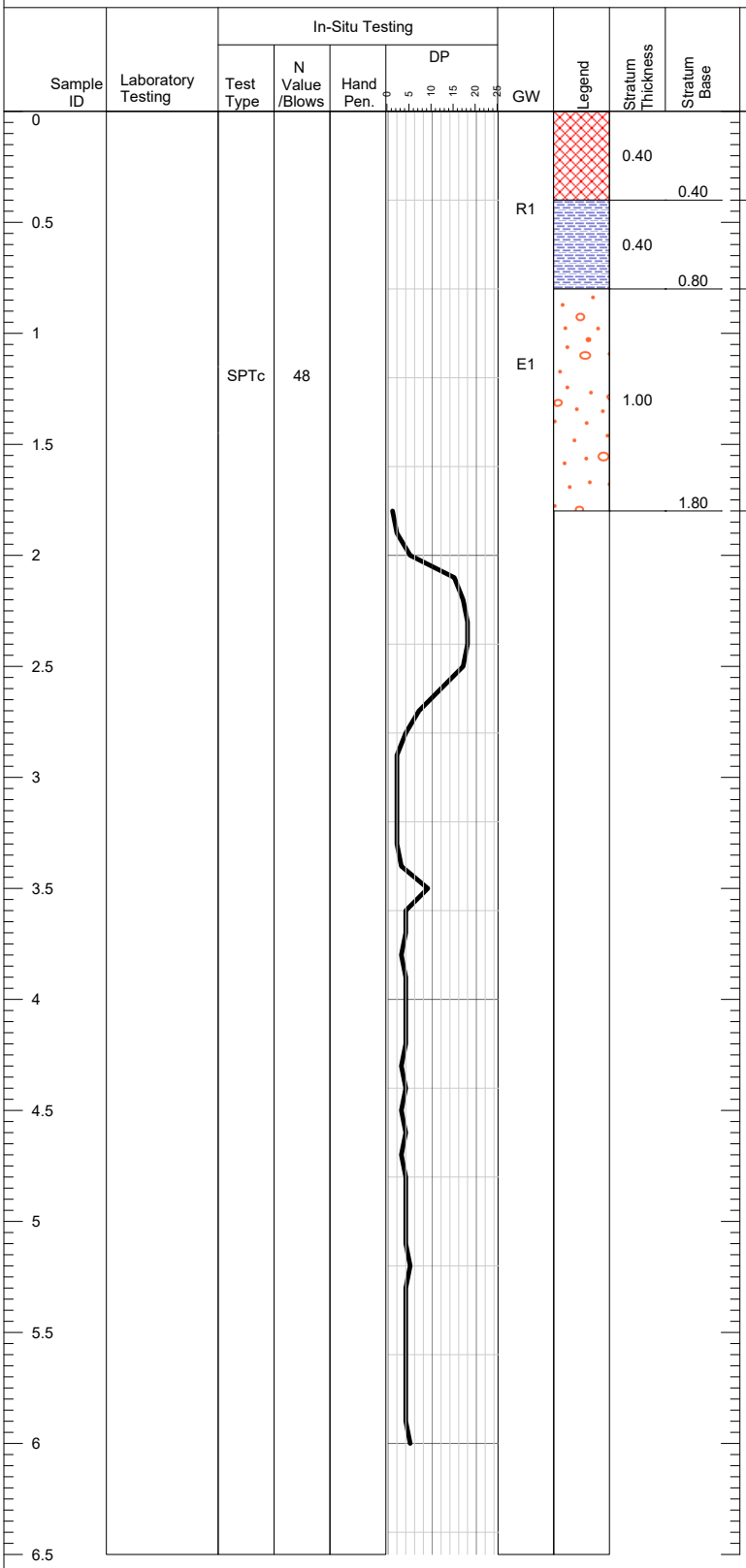
START DATE: **27/03/2024** EASTING: **475055**

END DATE: **27/03/2024** NORTHING: **167246**

BOREHOLE ID: **WS08**

TOTAL DEPTH: **2mbgl + DP to 6m**

MEASURING POINT: **Ground Level** DATUM ELEVATION (if available):



DESCRIPTION

Grass over saturated soft, dark brown, peaty clay backfill with occasional fine flint. Strong eutrophic (anoxic) odour and abundant roots and rootlets.

Soft, saturated (running), yellowish brown SILT (RTD).

Medium-dense to dense, saturated, orangish brown, clayey, silty SAND and GRAVEL with occasional band of green sand. Sand of fine to coarse grain. Gravel of fine to medium, subangular to rounded and fragmented flints (RTD).

% Recovery: U1 100%; U2 60%

Installation

OTHER COMMENTS:

Water encountered at 1.1m with 1m casing. At end of sampling, water at 1.1m which rose to 1m on removal of casing.
Hole collapsed at 1.6m with dynamic probing continuation from 1.8m.

IN SITU KEY:
SPTc (cone)
SPT (spoon)
FH (falling head)

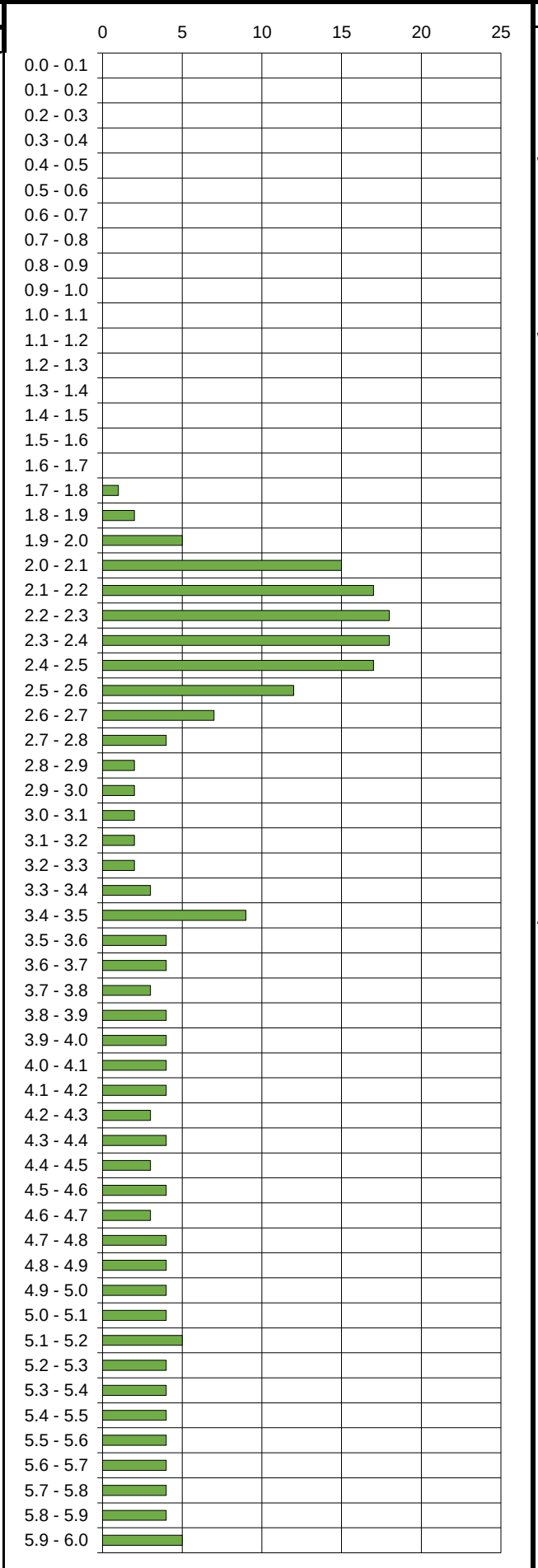
EQUIPMENT/MODALITY:
Archway Lite DS

GW ENCOUNTERED: **Y** GW INFLOW RATE: **Seepage** INSTALLATION: **None**

LOGGED: KLH CHECKED: KLH

Date	27/03/2024	Site:	Observer Park, Arborfield	Borehole Number	WS08
Job Number	64065				

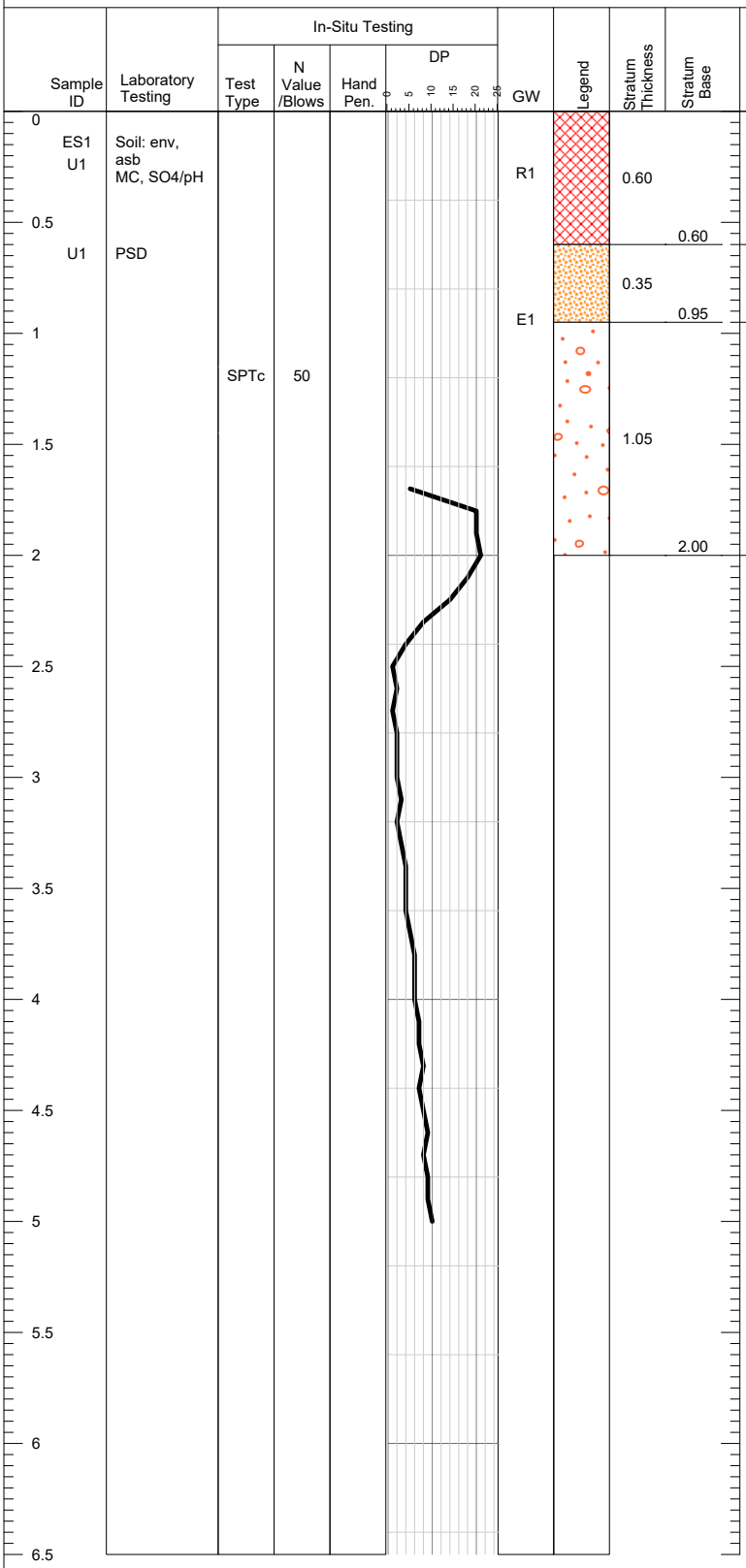
Depth (m)	N100 Blows	Comments
0.0 - 0.1		
0.1 - 0.2		
0.2 - 0.3		
0.3 - 0.4		
0.4 - 0.5		Water at end (casing removed)
0.5 - 0.6		
0.6 - 0.7		
0.7 - 0.8		
0.8 - 0.9		
0.9 - 1.0		
1.0 - 1.1		
1.1 - 1.2		Water strike
1.2 - 1.3		
1.3 - 1.4		
1.4 - 1.5		
1.5 - 1.6		
1.6 - 1.7		BH Collapsed from
1.7 - 1.8	1	
1.8 - 1.9	2	
1.9 - 2.0	5	
2.0 - 2.1	15	
2.1 - 2.2	17	
2.2 - 2.3	18	
2.3 - 2.4	18	
2.4 - 2.5	17	
2.5 - 2.6	12	
2.6 - 2.7	7	
2.7 - 2.8	4	Likely London Clay transition.
2.8 - 2.9	2	
2.9 - 3.0	2	
3.0 - 3.1	2	
3.1 - 3.2	2	
3.2 - 3.3	2	
3.3 - 3.4	3	
3.4 - 3.5	9	Anomaly, possible stone.
3.5 - 3.6	4	
3.6 - 3.7	4	
3.7 - 3.8	3	
3.8 - 3.9	4	
3.9 - 4.0	4	
4.0 - 4.1	4	
4.1 - 4.2	4	
4.2 - 4.3	3	
4.3 - 4.4	4	
4.4 - 4.5	3	
4.5 - 4.6	4	
4.6 - 4.7	3	
4.7 - 4.8	4	
4.8 - 4.9	4	
4.9 - 5.0	4	
5.0 - 5.1	4	
5.1 - 5.2	5	
5.2 - 5.3	4	
5.3 - 5.4	4	
5.4 - 5.5	4	
5.5 - 5.6	4	
5.6 - 5.7	4	
5.7 - 5.8	4	
5.8 - 5.9	4	
5.9 - 6.0	5	



Remarks

Hammer Weight 63.5 kg

PROJECT NAME:	**Observer Park**		
SITE LOCATION:	**Arborfield, Reading**		
CLIENT:	**Carbide Properties Ltd**	JOB NO.:	**64065**
START DATE:	**26/03/2024**	EASTING:	**475041**
END DATE:	**26/03/2024**	NORTHING:	**167290**
BOREHOLE ID:	**WS09**		
TOTAL DEPTH:	**2mbgl + DP to 5m**		
MEASURING POINT:	**Ground Level**	DATUM ELEVATION (if available):	



OTHER COMMENTS:

Water encountered at 0.9m with 1m casing. At end of sampling, water at 0.35m which rose to 0.24m on removal of casing.
Hole collapsed at 1.7m with dynamic probing continuation from 1.7m.

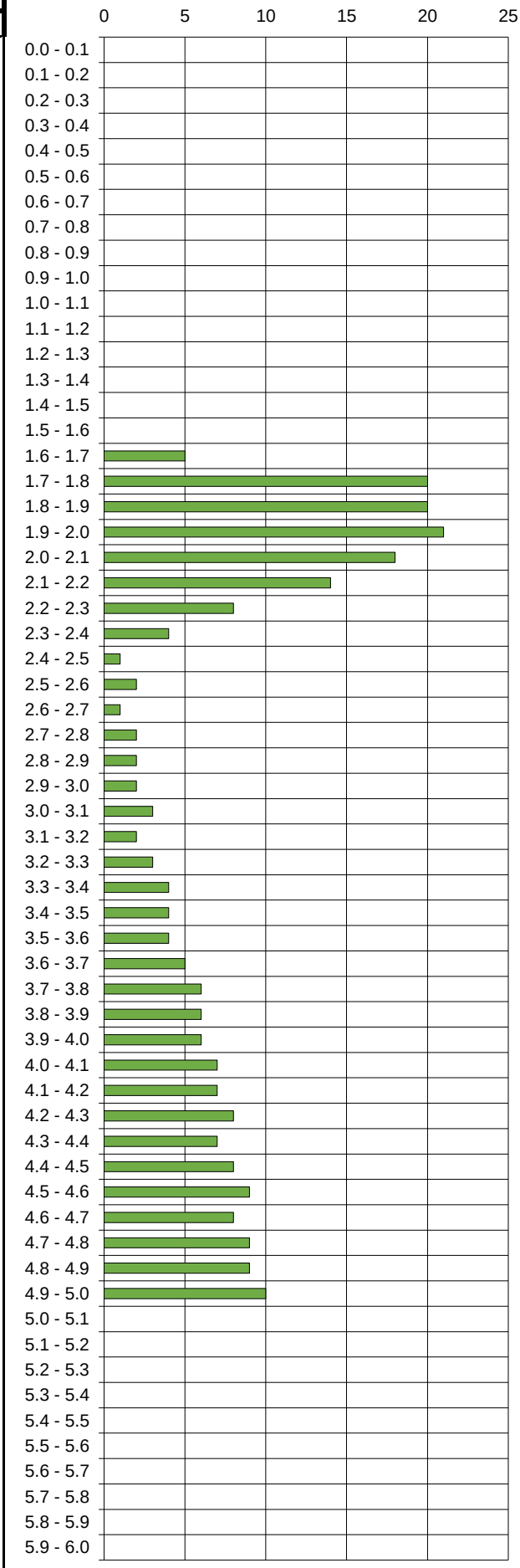
IN SITU KEY:
SPTc (cone)
SPT (spoon)
FH (falling head)

EQUIPMENT/MODALITY:
Archway Lite DS

GW ENCOUNTERED:	**Y**	GW INFLOW RATE:	**Seepage**	INSTALLATION: **None**	LOGGED: KLH CHECKED: KLH

Date	26/03/2024	Site:	Observer Park, Arborfield	Borehole Number	WS09
Job Number	64065				

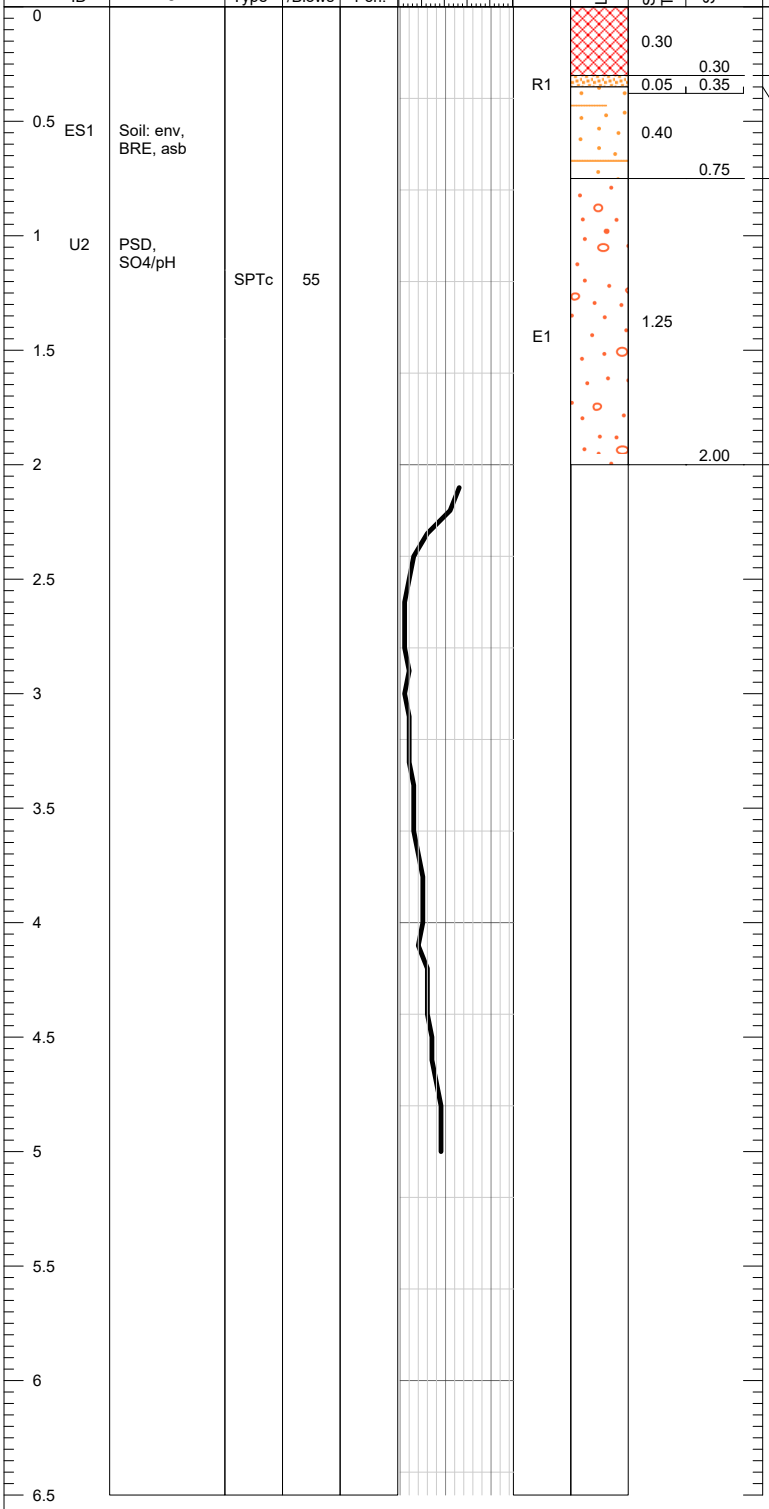
Depth (m)	N100 Blows	Comments
0.0 - 0.1		
0.1 - 0.2		
0.2 - 0.3		Water at end (casing removed)
0.3 - 0.4		
0.4 - 0.5		
0.5 - 0.6		
0.6 - 0.7		
0.7 - 0.8		
0.8 - 0.9		
0.9 - 1.0		Water strike
1.0 - 1.1		
1.1 - 1.2		
1.2 - 1.3		
1.3 - 1.4		
1.4 - 1.5		
1.5 - 1.6		
1.6 - 1.7	5	
1.7 - 1.8	20	BH Collapsed from
1.8 - 1.9	20	
1.9 - 2.0	21	
2.0 - 2.1	18	
2.1 - 2.2	14	
2.2 - 2.3	8	
2.3 - 2.4	4	Likely London Clay transition.
2.4 - 2.5	1	
2.5 - 2.6	2	
2.6 - 2.7	1	
2.7 - 2.8	2	
2.8 - 2.9	2	
2.9 - 3.0	2	
3.0 - 3.1	3	
3.1 - 3.2	2	
3.2 - 3.3	3	
3.3 - 3.4	4	
3.4 - 3.5	4	
3.5 - 3.6	4	
3.6 - 3.7	5	
3.7 - 3.8	6	
3.8 - 3.9	6	
3.9 - 4.0	6	
4.0 - 4.1	7	
4.1 - 4.2	7	
4.2 - 4.3	8	
4.3 - 4.4	7	
4.4 - 4.5	8	
4.5 - 4.6	9	
4.6 - 4.7	8	
4.7 - 4.8	9	
4.8 - 4.9	9	
4.9 - 5.0	10	
5.0 - 5.1		
5.1 - 5.2		
5.2 - 5.3		
5.3 - 5.4		
5.4 - 5.5		
5.5 - 5.6		
5.6 - 5.7		
5.7 - 5.8		
5.8 - 5.9		
5.9 - 6.0		



Remarks

Hammer Weight 63.5 kg

PROJECT NAME:	**Observer Park**		
SITE LOCATION:	**Arborfield, Reading**		
CLIENT:	**Carbide Properties Ltd**	JOB NO.:	**64065**
START DATE:	**25/03/2024**	EASTING:	**475012**
END DATE:	**25/03/2024**	NORTHING:	**167251**
BOREHOLE ID:	**WS10**		
TOTAL DEPTH:	**2mbgl + DP to 5m**		
MEASURING POINT:	**Ground Level**	DATUM ELEVATION (if available):	



OTHER COMMENTS:

Water encountered at 1.4m with 1m casing. At end of sampling, water at 0.35m which rose to 0.3m on removal of casing.
Hole collapsed at 1.6m with dynamic probing continuation from 2m.

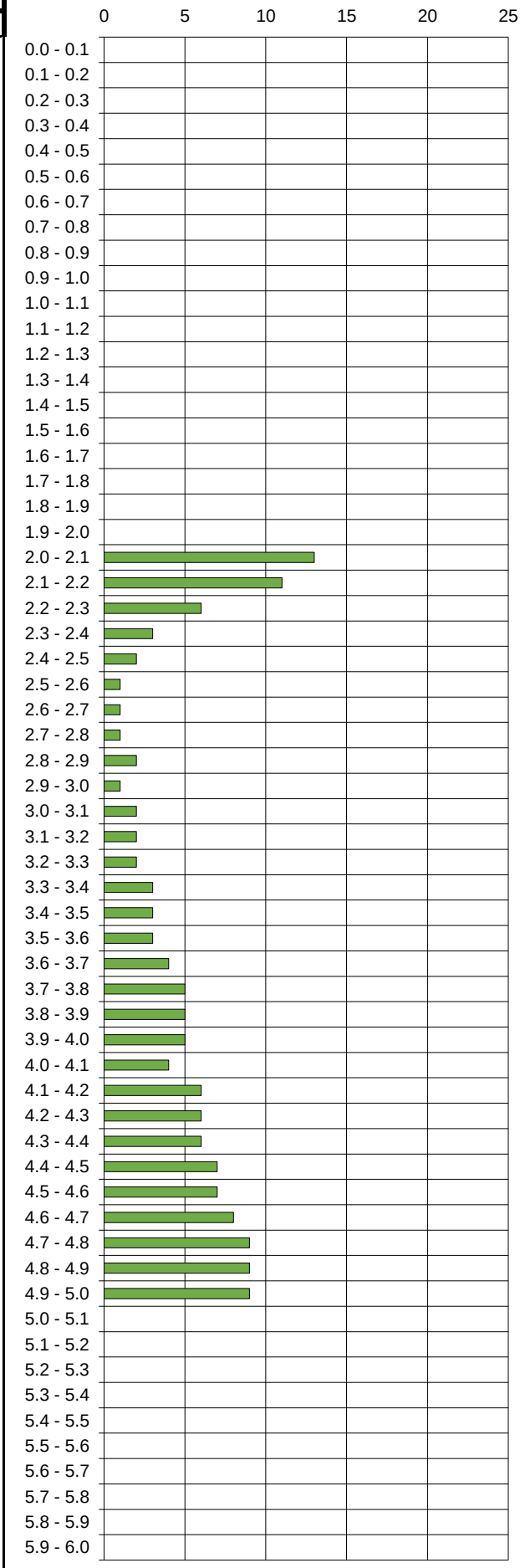
IN SITU KEY:
SPTc (cone)
SPT (spoon)
FH (falling head)

EQUIPMENT/MODALITY:
Archway Lite DS

GW ENCOUNTERED:	**Y**	GW INFLOW RATE:	**Seepage**	INSTALLATION: **None**	LOGGED: KLH CHECKED: KLH

Date	25/03/2024	Site:	Observer Park, Arborfield	Borehole Number	WS10
Job Number	64065				

Depth (m)	N100 Blows	Comments
0.0 - 0.1		
0.1 - 0.2		
0.2 - 0.3		
0.3 - 0.4		Water at end (casing removed)
0.4 - 0.5		
0.5 - 0.6		
0.6 - 0.7		
0.7 - 0.8		
0.8 - 0.9		
0.9 - 1.0		
1.0 - 1.1		
1.1 - 1.2		
1.2 - 1.3		
1.3 - 1.4		
1.4 - 1.5		Water strike
1.5 - 1.6		
1.6 - 1.7		BH Collapsed from
1.7 - 1.8		
1.8 - 1.9		
1.9 - 2.0		
2.0 - 2.1	13	
2.1 - 2.2	11	
2.2 - 2.3	6	
2.3 - 2.4	3	Likely London Clay transition.
2.4 - 2.5	2	
2.5 - 2.6	1	
2.6 - 2.7	1	
2.7 - 2.8	1	
2.8 - 2.9	2	
2.9 - 3.0	1	
3.0 - 3.1	2	
3.1 - 3.2	2	
3.2 - 3.3	2	
3.3 - 3.4	3	
3.4 - 3.5	3	
3.5 - 3.6	3	
3.6 - 3.7	4	
3.7 - 3.8	5	
3.8 - 3.9	5	
3.9 - 4.0	5	
4.0 - 4.1	4	
4.1 - 4.2	6	
4.2 - 4.3	6	
4.3 - 4.4	6	
4.4 - 4.5	7	
4.5 - 4.6	7	
4.6 - 4.7	8	
4.7 - 4.8	9	
4.8 - 4.9	9	
4.9 - 5.0	9	
5.0 - 5.1		
5.1 - 5.2		
5.2 - 5.3		
5.3 - 5.4		
5.4 - 5.5		
5.5 - 5.6		
5.6 - 5.7		
5.7 - 5.8		
5.8 - 5.9		
5.9 - 6.0		

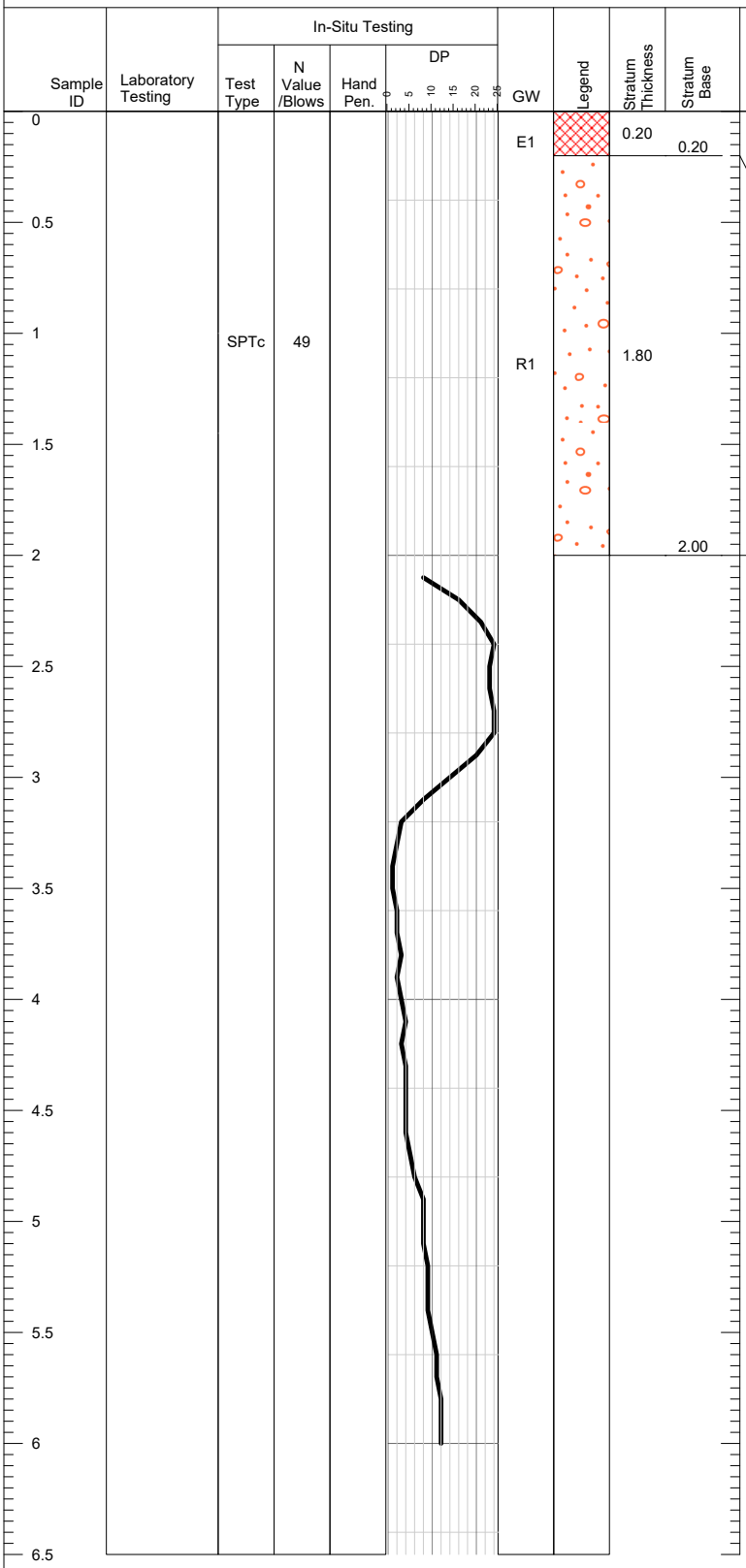


Remarks

Hammer Weight 63.5 kg

PROJECT NAME:	**Observer Park**		
SITE LOCATION:	**Arborfield, Reading**		
CLIENT:	**Carbide Properties Ltd**	JOB NO.:	**64065**
START DATE:	**26/03/2024**	EASTING:	**475005**
END DATE:	**26/03/2024**	NORTHING:	**167279**
BOREHOLE ID:	**WS11**		
TOTAL DEPTH:	**2mbgl + DP to 6m**		

MEASURING POINT: **Ground Level** DATUM ELEVATION (if available):



DESCRIPTION

Grass over firm, grey-brown clay backfill containing fragments of concrete and brick (fine to cobble) and gravel of flint and sandstone (fine to coarse, subangular to rounded), and abundant roots and rootlets.

Medium-dense to dense, saturated, orangish brown, clayey, silty SAND and GRAVEL with occasional band of green sand. Sand of fine to coarse grain. Gravel of fine to medium, subangular to rounded and fragmented flints (RTD).

% Recovery: U1 90%; U2 90%

Installation

OTHER COMMENTS:

Water encountered at 1.1m with 1m casing. At end of sampling, water at 0.6m which rose to 0.38m on removal of casing.
Hole collapsed at 1.7m with dynamic probing continuation from 2m.

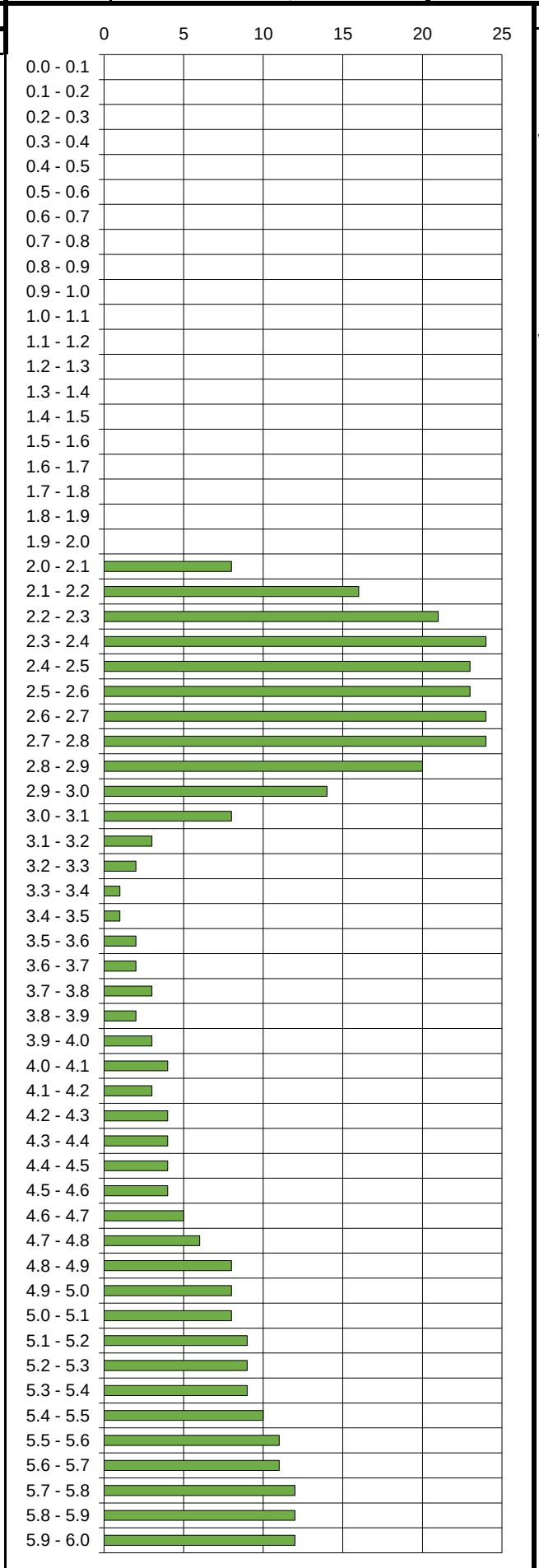
IN SITU KEY:
SPTc (cone)
SPT (spoon)
FH (falling head)

EQUIPMENT/MODALITY:
Archway Lite DS

GW ENCOUNTERED: **Y** GW INFLOW RATE: **Seepage** INSTALLATION: **None**

LOGGED: KLH CHECKED: KLH

Date	25/03/2024	Site:	Observer Park, Arborfield	Borehole Number	WS11
Job Number	64065				



Depth (m)	N100 Blows	Comments
0.0 - 0.1		
0.1 - 0.2		
0.2 - 0.3		
0.3 - 0.4		Water at end (casing removed)
0.4 - 0.5		
0.5 - 0.6		
0.6 - 0.7		
0.7 - 0.8		
0.8 - 0.9		
0.9 - 1.0		
1.0 - 1.1		
1.1 - 1.2		Water strike
1.2 - 1.3		
1.3 - 1.4		
1.4 - 1.5		
1.5 - 1.6		
1.6 - 1.7		
1.7 - 1.8		BH Collapsed from
1.8 - 1.9		
1.9 - 2.0		
2.0 - 2.1	8	
2.1 - 2.2	16	
2.2 - 2.3	21	
2.3 - 2.4	24	
2.4 - 2.5	23	
2.5 - 2.6	23	
2.6 - 2.7	24	
2.7 - 2.8	24	
2.8 - 2.9	20	
2.9 - 3.0	14	
3.0 - 3.1	8	
3.1 - 3.2	3	Likely London Clay transition.
3.2 - 3.3	2	
3.3 - 3.4	1	
3.4 - 3.5	1	
3.5 - 3.6	2	
3.6 - 3.7	2	
3.7 - 3.8	3	
3.8 - 3.9	2	
3.9 - 4.0	3	
4.0 - 4.1	4	
4.1 - 4.2	3	
4.2 - 4.3	4	
4.3 - 4.4	4	
4.4 - 4.5	4	
4.5 - 4.6	4	
4.6 - 4.7	5	
4.7 - 4.8	6	
4.8 - 4.9	8	
4.9 - 5.0	8	
5.0 - 5.1	8	
5.1 - 5.2	9	
5.2 - 5.3	9	
5.3 - 5.4	9	
5.4 - 5.5	10	
5.5 - 5.6	11	
5.6 - 5.7	11	
5.7 - 5.8	12	
5.8 - 5.9	12	
5.9 - 6.0	12	

Remarks

Hammer Weight 63.5 kg

APPENDIX C

Geotechnical Laboratory Results

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 18/04/2024

UKAS TESTING 0998

Contract	**Observer Park**
Serial No.	**44496_1**

Client:

PRP UK Ltd

Catherine House
Old Harborough Road
Brixworth
Northampton
NN6 9BX

Soil Property Testing Ltd

15, 16, 18 Halcyon Court, St Margaret's Way,
Stukeley Meadows, Huntingdon,
Cambridgeshire, PE29 6DG

Tel: 01480 455579
Email: enquiries@soilpropertytesting.com
Website: www.soilpropertytesting.com

Samples Submitted By:

PRP UK Ltd

Samples Labelled:

Observer Park

Approved Signatories:

☑ **J.C. Garner B.Eng (Hons) FGS**
Technical Director & Quality Manager

☐ **W. Johnstone**
Materials Lab Manager

Date Received: 04/04/2024

Samples Tested Between: 04/04/2024 **and** 18/04/2024

Remarks:

For the attention of Karen Holton
Your Reference No: 64065

Notes:

1. All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary.
2. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
3. Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory.
4. This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.
5. The results within this report only relate to the items tested or sampled.

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 18/04/2024

UKAS TESTING 0998

Contract	**Observer Park**		
Serial No.	**44496_1**	**Target Date**	18/04/2024
Scheduled By	PRP UK Ltd		
Schedule Remarks			

Bore Hole No.	Type	Sample Ref.	Top Depth	Particle Size Distribution (BS1377)	Sulphate Content/pH Value	Water Content (BSEN)	Liquid/Plastic Limits														Sample Remarks
WS01	U	1	0.30	1	1																
WS01	U	3	2.60		1	1	1														
WS02	U	1	0.45		1	1															
WS02	U	2	1.30	1																	
WS03	U	1	0.30		1																
WS03	U	3	2.50	1	1																
WS03	U	3	2.80		1	1	1														
WS05	U	1	0.10		1																
WS05	U	2	1.00	1	1																
WS07	U	1	0.40		1	1															
WS07	U	2	1.00	1																	
WS07	U	3	2.85		1	1	1														
WS09	U	1	0.10		1	1															
WS09	U	1	0.60	1																	
WS10	U	2	1.00	1	1																
Totals				**7**	**12**	**6**	**3**														**End of Schedule**

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 18/04/2024

UKAS TESTING 0998

Contract	**Observer Park**
Serial No.	**44496_1**

SUMMARY OF WATER CONTENT

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Description	Remarks
WS01	2.60 - 3.00	U	3	**27.4**	Firm dark grey CLAY.	
WS02	0.45 - 0.70	U	1	**22.5**	Very dark greyish brown slightly gravelly slightly sandy slightly organic silty CLAY with rare recently active and decayed roots. Gravel is brown, black and white fine to coarse angular to sub rounded chert.	
WS03	2.80 - 3.00	U	3	**27.4**	Firm dark grey CLAY.	
WS07	0.40 - 0.90	U	1	**21.0**	Soft mottled light bluish grey, orangish brown and olive yellow slightly gravelly slightly sandy silty CLAY with occasional recently active and decayed roots. Gravel is brown, black and white fine to coarse angular to sub rounded chert.	
WS07	2.85 - 3.00	U	3	**32.9**	Soft dark grey CLAY with rare orange silt partings and rare shell traces.	
WS09	0.10 - 0.60	U	1	**23.7**	Very dark brownish grey slightly gravelly slightly sandy silty CLAY with occasional recently active and decayed roots. Gravel is brown, black and white fine to coarse angular to sub rounded chert.	

Method Of Preparation: BS EN ISO: 17892-1: 2014
Method of Test: BS EN ISO: 17892-1: 2014
Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:

Remarks to Include: Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110C

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 18/04/2024

UKAS TESTING 0998

Contract	**Observer Park**
Serial No.	**44496_1**

SUMMARY OF WATER CONTENT, LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasti-city Index (%)	Liquid-ity Index	Sample Preparation				Description	Class
									Method	Ret'd 0.425mm (%)	Corr'd W/C <0.425mm	Curing Time (hrs)		
WS01	2.60 - 3.00	U	3	**27.4**	59	21	38	0.17	From Natural	0 (A)		24	Firm dark grey CLAY.	CH
WS03	2.80 - 3.00	U	3	**27.4**	54	20	34	0.22	From Natural	0 (A)		24	Firm dark grey CLAY.	CH
WS07	2.85 - 3.00	U	3	**32.9**	55	21	34	0.35	From Natural	0 (A)		24	Soft dark grey CLAY with rare orange silt partings and rare shell traces.	CH

Method Of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:4.2
Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:3.2, 4.4, 5.3, 5.4
Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:

Table Notation: Ret'd 0.425mm: (A) = Assumed, (M) = Measured

TEST REPORT

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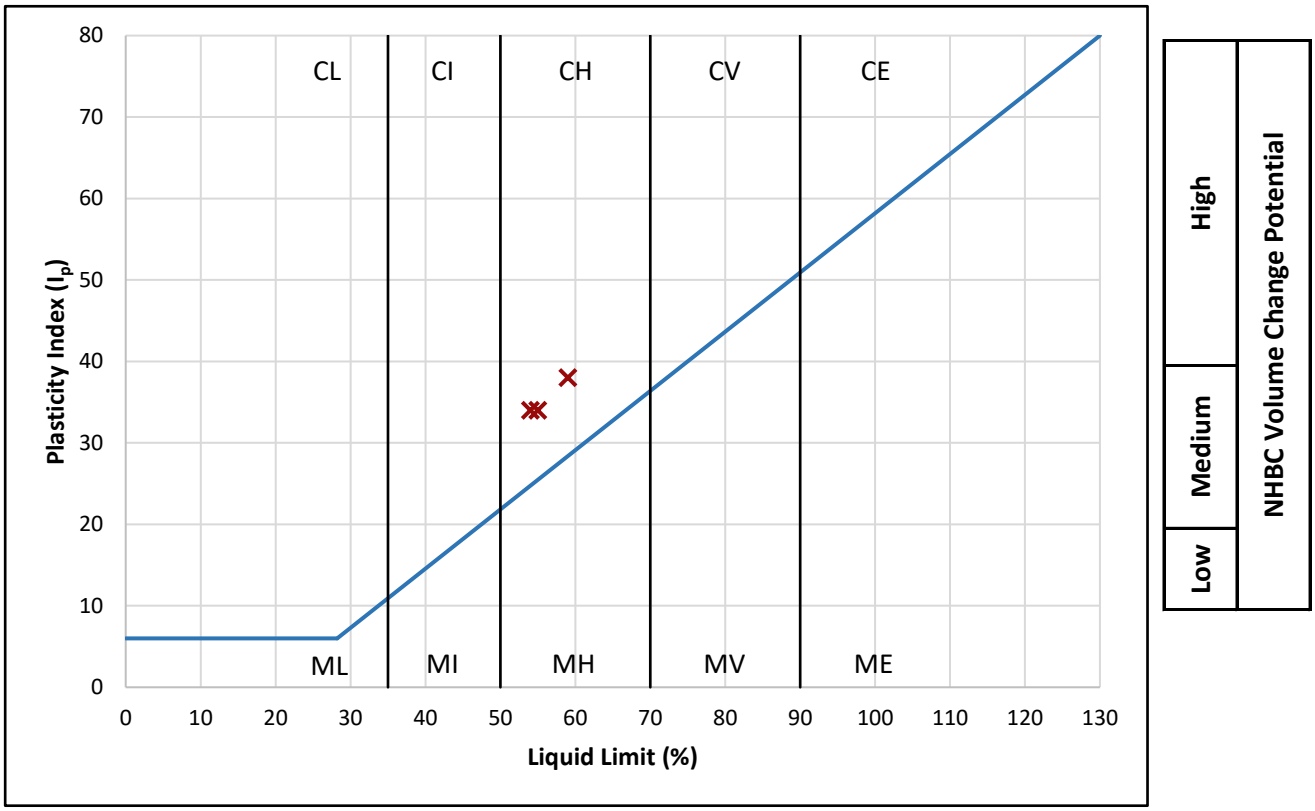
UKAS TESTING 0998

Contract	**Observer Park**
Serial No.	**44496_1**

PLOT OF PLASTICITY INDEX AGAINST LIQUID LIMIT USING CASAGRANDE CLASSIFICATION CHART

Plasticity				
Low	Medium	High	Very High	Extremely High



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS 1377: Part 2: 1990: 4.2
Method of Test:	BS1377: Part 2: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index

TEST REPORT

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DATE ISSUED: 18/04/2024

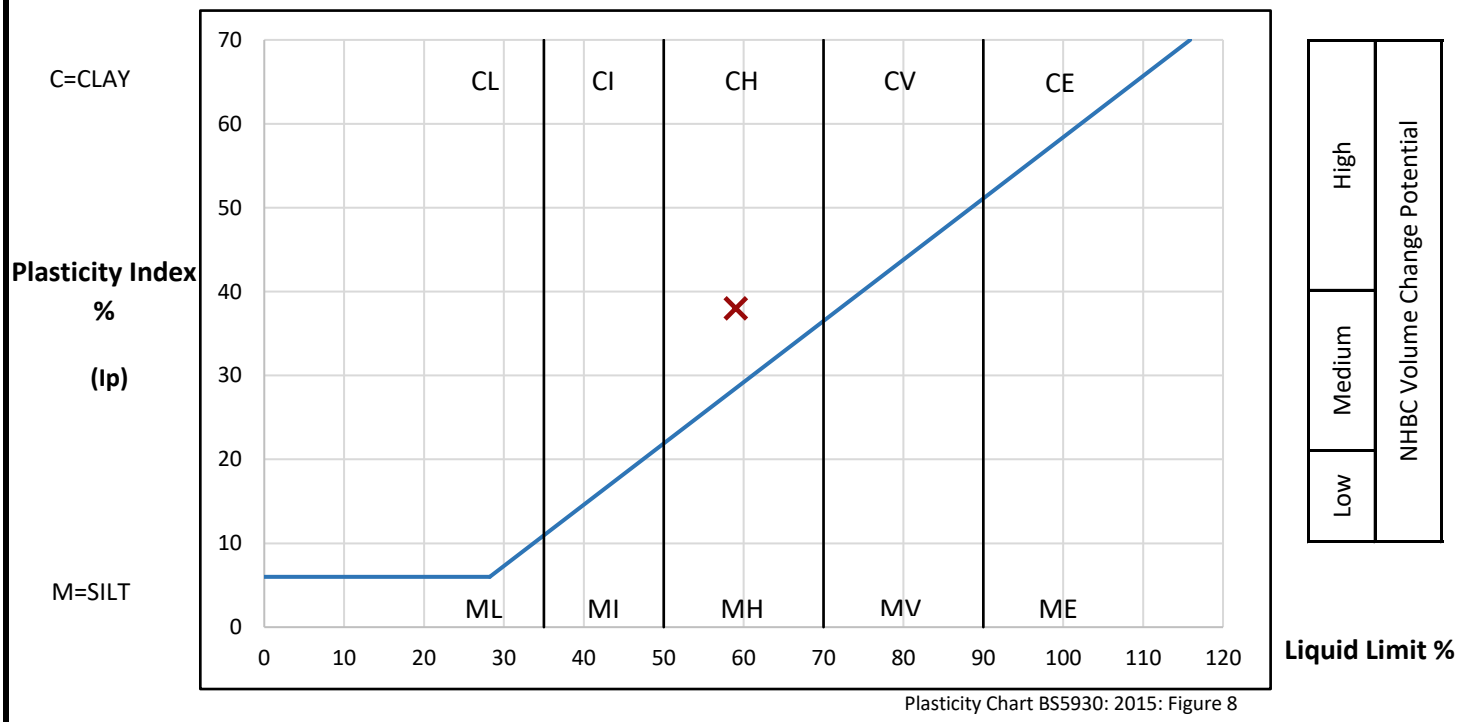
UKAS TESTING 0998

Contract	**Observer Park**
Serial No.	**44496_1**

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS01	2.60 - 3.00	U	3	27.4	Firm dark grey CLAY.	

PREPARATION			Liquid Limit	59 %
Method of preparation		From natural	Plastic Limit	21 %
Sample retained 0.425mm sieve	(Assumed)	0 %	Plasticity Index	38 %
Corrected water content for material passing 0.425mm			Liquidity Index	0.17
Sample retained 2mm sieve	(Assumed)	0 %	NHBC Modified (I'p)	n/a
Curing time	24 hrs	Clay Content Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	

TEST REPORT

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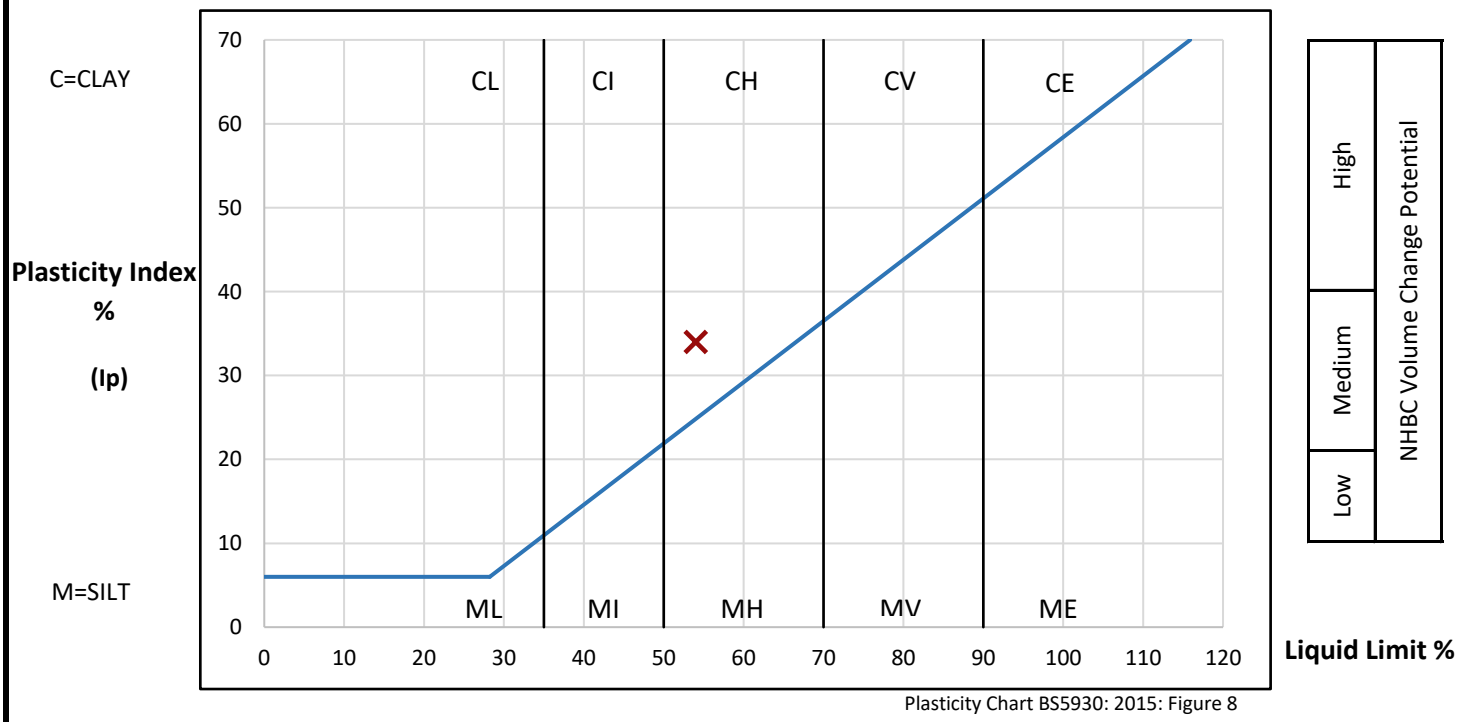
UKAS TESTING 0998

Contract	**Observer Park**
Serial No.	**44496_1**

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS03	2.80 - 3.00	U	3	27.4	Firm dark grey CLAY.	

PREPARATION			Liquid Limit	54 %
Method of preparation		From natural	Plastic Limit	20 %
Sample retained 0.425mm sieve	(Assumed)	0 %	Plasticity Index	34 %
Corrected water content for material passing 0.425mm			Liquidity Index	0.22
Sample retained 2mm sieve	(Assumed)	0 %	NHBC Modified (I'p)	n/a
Curing time	24 hrs	Clay Content Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	

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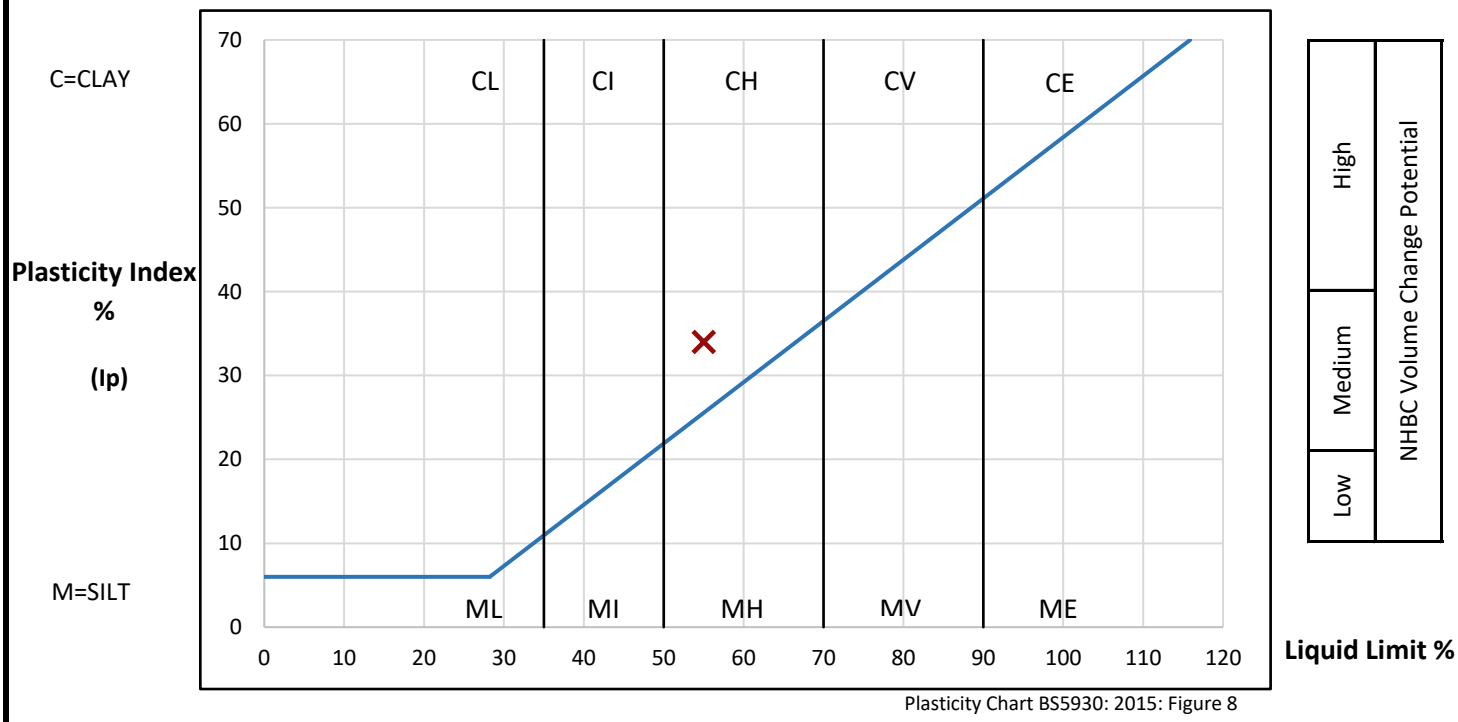
UKAS TESTING 0998

Contract	**Observer Park**
Serial No.	**44496_1**

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS07	2.85 - 3.00	U	3	32.9	Soft dark grey CLAY with rare orange silt partings and rare shell traces.	

PREPARATION					
Method of preparation	From natural			Liquid Limit	55 %
Sample retained 0.425mm sieve	(Assumed)	0 %		Plastic Limit	21 %
Corrected water content for material passing 0.425mm				Plasticity Index	34 %
Sample retained 2mm sieve	(Assumed)	0 %		Liquidity Index	0.35
Curing time	24 hrs	Clay Content	Not analysed	NHBC Modified (I'p)	n/a
				Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	

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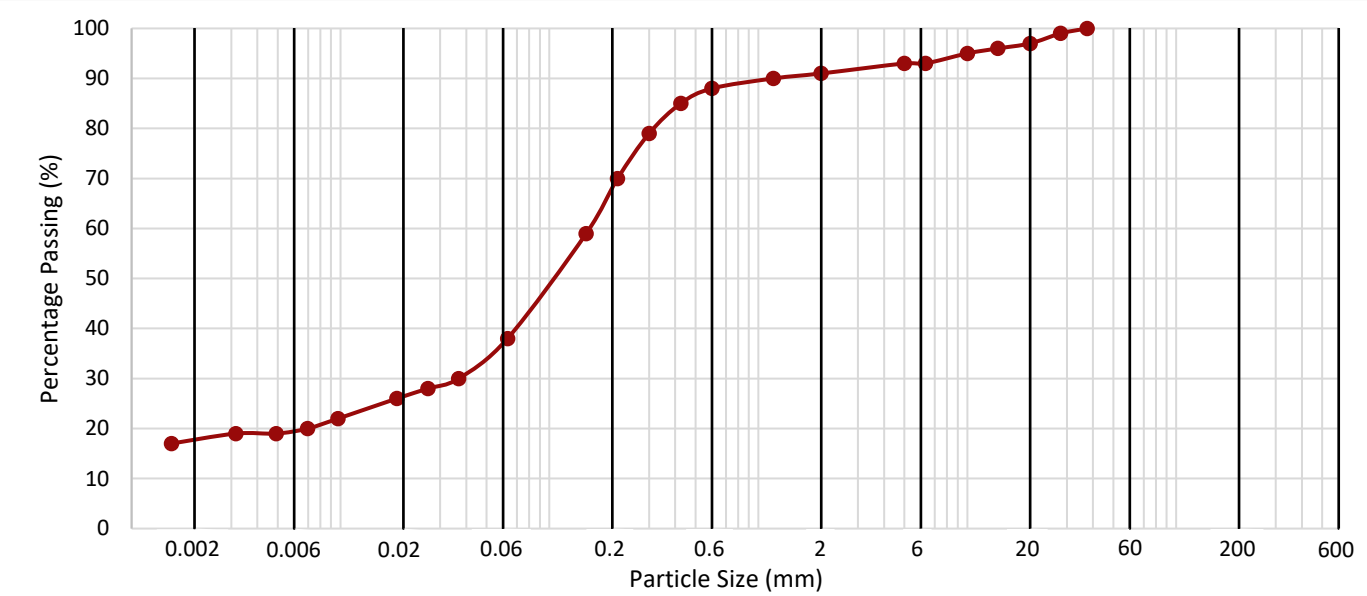
UKAS TESTING 0998

Contract	**Observer Park**
Serial No.	**44496_1**

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
WS01	0.30 - 1.00	U	1	Pale olive and locally brown slightly gravelly sandy silty CLAY. Gravel is brown, black and white angular to rounded chert and rare brown and white quartzite and chalk.	

Method of Test:	Wet Sieve + Hydrometer	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)
	0.0368	30	21
	0.0262	28	
	0.0186	26	
	0.0097	22	Clay by Dry Mass (%)
	0.0070	20	
	0.0049	19	
	0.0032	19	17
	0.0016	17	

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	91	53
1.18	90	
0.600	88	
0.425	85	
0.300	79	
0.212	70	
0.150	59	
0.063	38	

Fines By Dry Mass (%)	
<0.063mm	38

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		9
125		
90		
63		
50		
37.5	100	
28	99	
20	97	
14	96	
10	95	
6.3	93	
5	93	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test: BS1377: Part 2: 1990: 9.2,9.5
Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:

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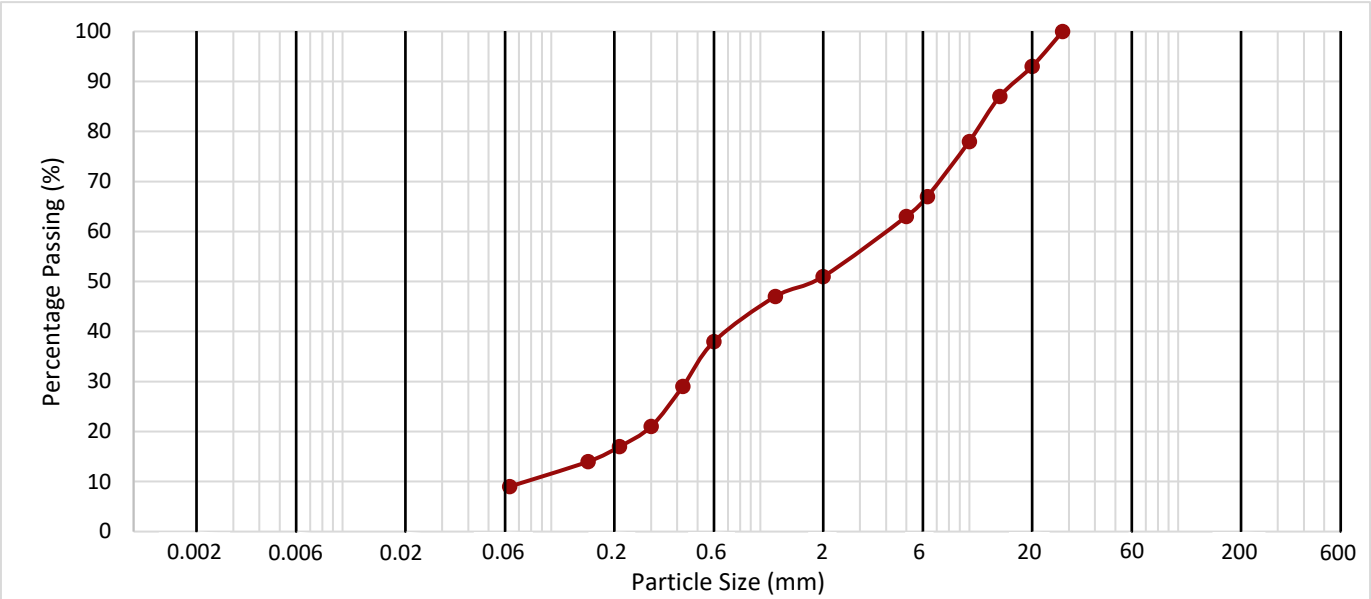
Serial No.	**44496_1**

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
WS02	1.30 - 2.00	U	2	Brown, black and white sub angular to sub rounded chert and rare light brown sandstone clayey slightly silty very sandy GRAVEL. Sand is brown.	

Method of Test:	Wet Sieve	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)	Clay by Dry Mass (%)

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	51	42
1.18	47	
0.600	38	
0.425	29	
0.300	21	
0.212	17	
0.150	14	
0.063	9	

Fines By Dry Mass (%)	
<0.063mm	9

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		49
125		
90		
63		
50		
37.5		
28	100	
20	93	
14	87	
10	78	
6.3	67	
5	63	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test: BS1377: Part 2: 1990: 9.2
Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:

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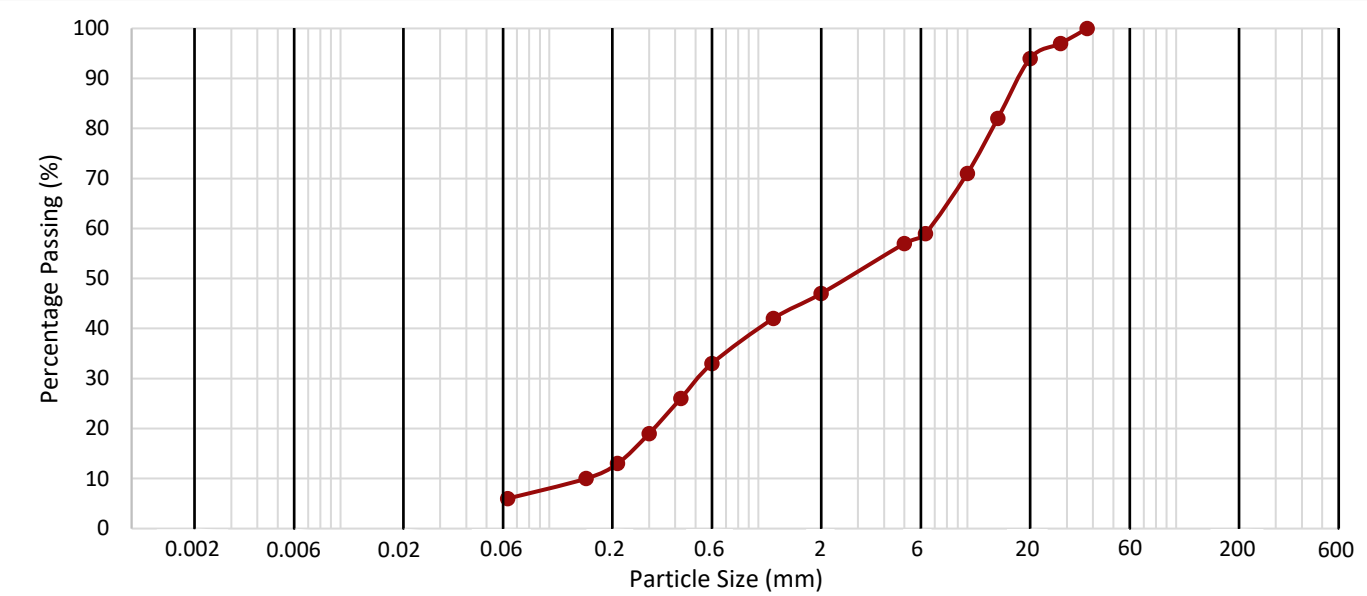
Contract	**Observer Park**
Serial No.	**44496_1**

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
WS03	2.50 - 2.80	U	3	Brown, black and white sub angular to sub rounded chert and rare yellowish brown sandstone slightly clayey slightly silty very sandy GRAVEL. Sand is brownish yellow.	

Method of Test:	Wet Sieve	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer	Particle Size (mm)	Passing (%)	**Silt by Dry Mass (%)**
			Clay by Dry Mass (%)

Sieve Size (mm)	Passing (%)	**Sand By Dry Mass (%)**
2.00	47	**41**
1.18	42	
0.600	33	
0.425	26	
0.300	19	
0.212	13	
0.150	10	
0.063	6	

Fines By Dry Mass (%)	
<0.063mm	**6**

Sieve Size (mm)	Passing (%)	**2mm+ By Dry Mass (%)**
300		**53**
125		
90		
63		
50		
37.5	100	
28	97	
20	94	
14	82	
10	71	
6.3	59	
5	57	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test: BS1377: Part 2: 1990: 9.2
Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:

TEST REPORT

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DATE ISSUED: 18/04/2024

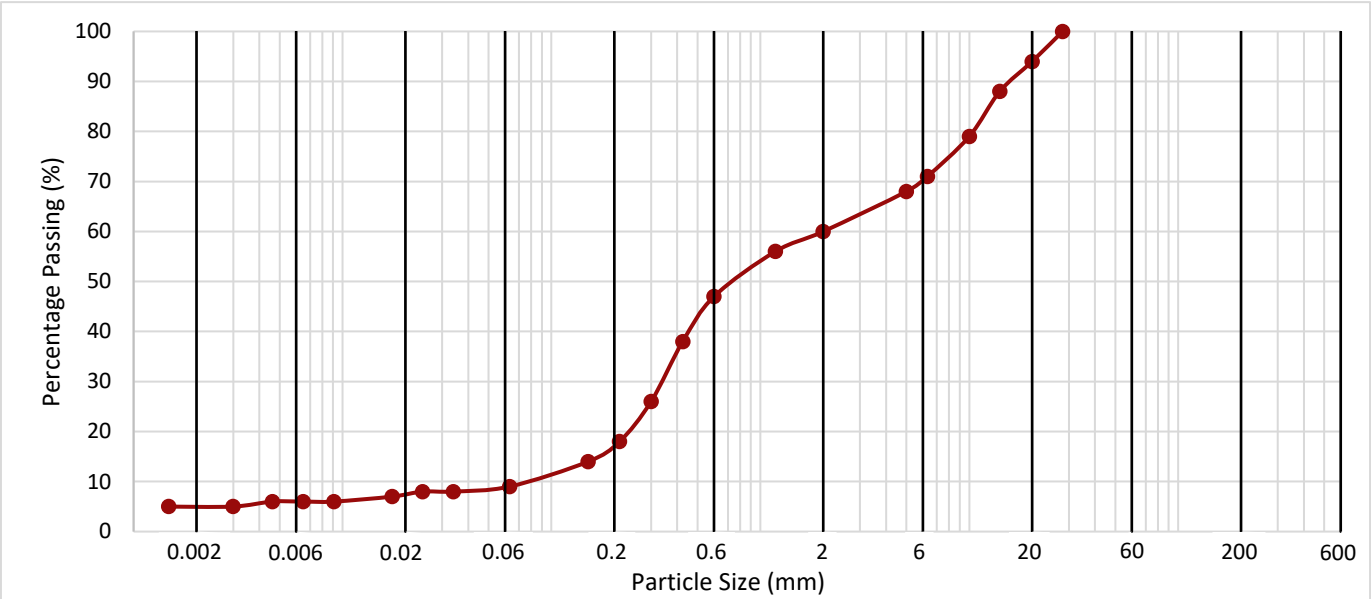
UKAS TESTING 0998

Contract	**Observer Park**
Serial No.	**44496_1**

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
WS05	1.00 - 2.00	U	2	Yellowish brown clayey slightly silty very gravelly SAND. Gravel is brown, black and white sub angular to sub rounded chert and rare yellowish brown sandstone.	

Method of Test:	Wet Sieve + Hydrometer	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)
	0.0339	8	4
	0.0242	8	
	0.0173	7	
	0.0091	6	Clay by Dry Mass (%)
	0.0065	6	
	0.0046	6	
	0.0030	5	5
	0.0015	5	

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	60	51
1.18	56	
0.600	47	
0.425	38	
0.300	26	
0.212	18	
0.150	14	
0.063	9	

Fines By Dry Mass (%)	
<0.063mm	9

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		40
125		
90		
63		
50		
37.5		
28	100	
20	94	
14	88	
10	79	
6.3	71	
5	68	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test: BS1377: Part 2: 1990: 9.2,9.5
Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:

TEST REPORT

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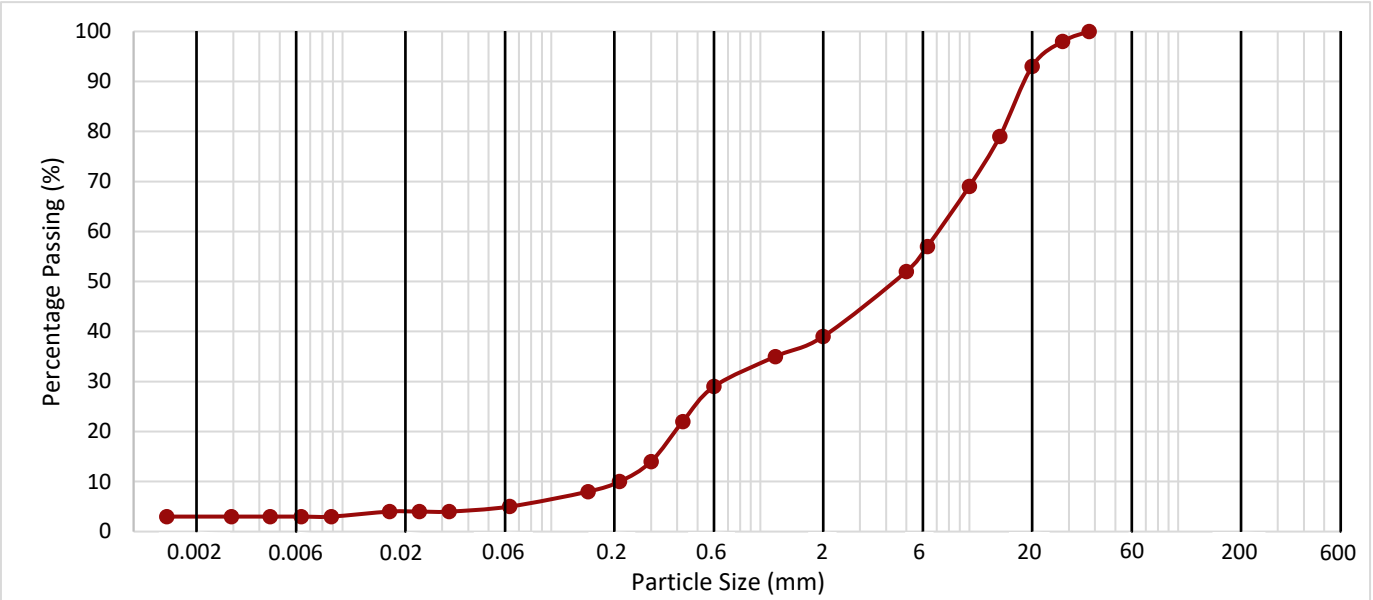
UKAS TESTING 0998

Contract	**Observer Park**
Serial No.	**44496_1**

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
WS07	1.00 - 1.50	U	2	Brown, black and white angular to sub rounded chert and rare light brown sandstone slightly clayey slightly silty very sandy GRAVEL. Sand is brownish yellow.	

Method of Test:	Wet Sieve + Hydrometer	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)
	0.0324	4	2
	0.0233	4	
	0.0168	4	
	0.0088	3	Clay by Dry Mass (%)
	0.0063	3	
	0.0045	3	
	0.0029	3	3
	0.0014	3	

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	39	34
1.18	35	
0.600	29	
0.425	22	
0.300	14	
0.212	10	
0.150	8	
0.063	5	

Fines By Dry Mass (%)	
<0.063mm	5

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		61
125		
90		
63		
50		
37.5	100	
28	98	
20	93	
14	79	
10	69	
6.3	57	
5	52	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test: BS1377: Part 2: 1990: 9.2,9.5
Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:

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DATE ISSUED: 18/04/2024

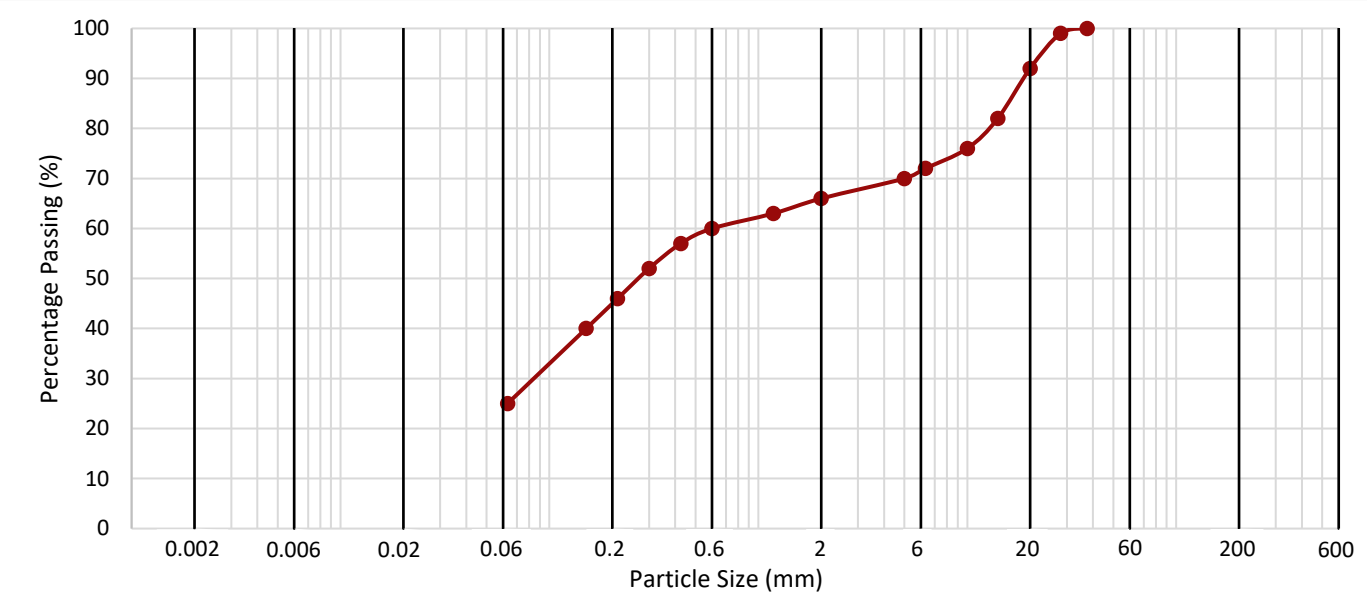
UKAS TESTING 0998

Contract	**Observer Park**
Serial No.	**44496_1**

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
WS09	0.60 - 0.95	U	1	Greyish brown slightly gravelly sandy silty CLAY/ very clayey SAND. Gravel is brown, black and white angular to sub rounded chert.	Description based on possible engineering behaviour.

Method of Test:	Wet Sieve	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)
			Clay by Dry Mass (%)

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	66	41
1.18	63	
0.600	60	
0.425	57	
0.300	52	
0.212	46	
0.150	40	
0.063	25	

Fines By Dry Mass (%)	
<0.063mm	25

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		34
125		
90		
63		
50		
37.5	100	
28	99	
20	92	
14	82	
10	76	
6.3	72	
5	70	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test: BS1377: Part 2: 1990: 9.2
Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 18/04/2024

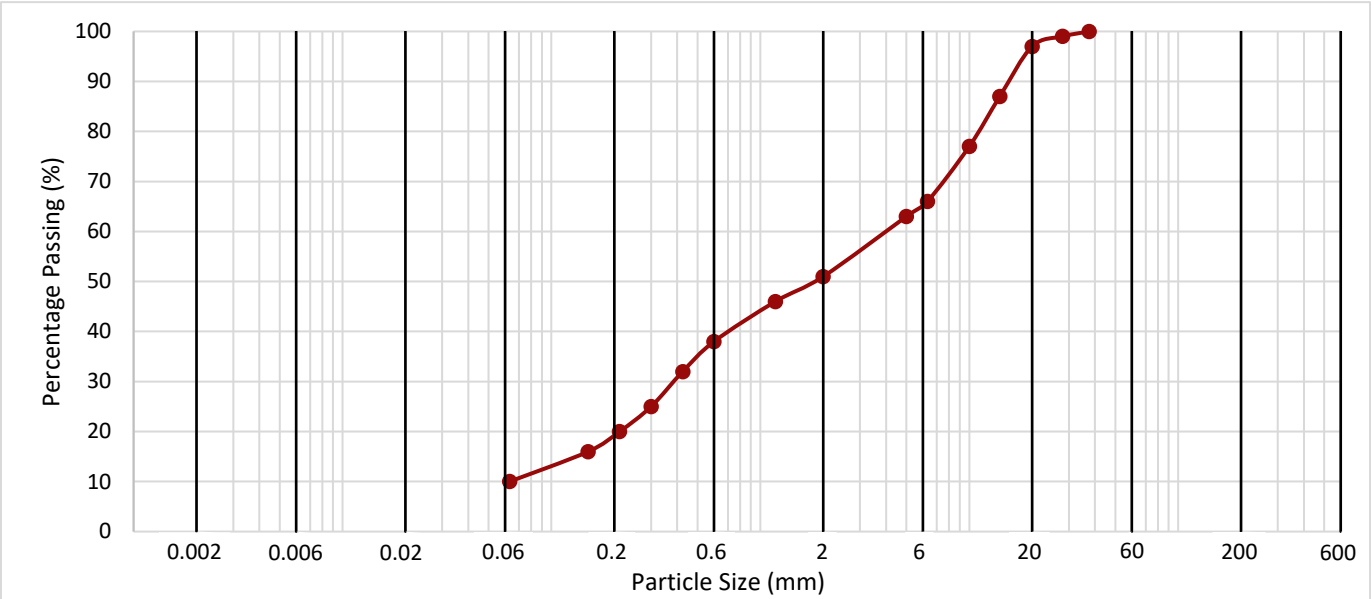
UKAS TESTING 0998

Contract	**Observer Park**
Serial No.	**44496_1**

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
WS10	1.00 - 2.00	U	2	Brown, black and white angular to sub rounded clayey slightly silty very sandy GRAVEL. Sand is yellowish brown.	

Method of Test:	Wet Sieve	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)	Clay by Dry Mass (%)

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	51	41
1.18	46	
0.600	38	
0.425	32	
0.300	25	
0.212	20	
0.150	16	
0.063	10	

Fines By Dry Mass (%)	
<0.063mm	10

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		49
125		
90		
63		
50		
37.5	100	
28	99	
20	97	
14	87	
10	77	
6.3	66	
5	63	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test: BS1377: Part 2: 1990: 9.2
Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 18/04/2024

Contract:	**Observer Park**
Serial No:	**44496_1**

DETERMINATION OF THE SULPHATE CONTENT AND pH OF SOIL AND GROUNDWATER

Borehole / Pit No.	Depth (m)	Sample		Conc. of Soluble SO3		Calc'd Conc. Of SO4 (g/L)	pH Value	% Sample Passing 2mm Sieve	Description	Remarks
		Type	Ref.	Water Soluble 2:1 (g/L)	Ground Water (g/L)					
WS01	0.30 - 1.00	U	1	0.12		0.15	6.0	91	Pale olive and locally brown slightly gravelly sandy silty CLAY. Gravel is brown, black and white angular to rounded chert and rare brown and white quartzite and chalk.	
WS01	2.60 - 3.00	U	3	0.26		0.31	7.2	100	Firm dark grey CLAY.	
WS02	0.45 - 0.70	U	1	0.08		0.09	7.1	73	Very dark greyish brown slightly gravelly slightly sandy slightly organic silty CLAY with rare recently active and decayed roots. Gravel is brown, black and white fine to coarse angular to sub rounded chert.	
WS03	0.30 - 0.45	U	1	0.08		0.10	7.3	82	Soft light olive brown slightly gravelly slightly sandy silty CLAY with rare recently active roots. Gravel is brown, black, white and red fine to coarse angular to sub rounded brick and chert.	
WS03	2.50 - 2.80	U	3	0.06		0.07	7.2	47	Brown, black and white sub angular to sub rounded chert and rare yellowish brown sandstone slightly clayey slightly silty very sandy GRAVEL. Sand is brownish yellow.	
WS03	2.80 - 3.00	U	3	0.22		0.26	7.2	100	Firm dark grey CLAY.	
WS05	0.10 - 0.45	U	1	0.02		0.02	6.3	57	Dark greyish brown slightly sandy gravelly slightly organic silty CLAY with frequent recently active and decayed roots. Gravel is brown, black and white fine to coarse angular to sub rounded chert.	
WS05	1.00 - 2.00	U	2	0.04		0.05	6.7	60	Yellowish brown clayey slightly silty very gravelly SAND. Gravel is brown, black and white sub angular to sub rounded chert and rare yellowish brown sandstone.	

Method of Preparation:	BS1377: Part 1: 2016: 8.5, BS1377: Part 3: 1990: 5.3 Soil/Water Extract, 5.4 Groundwater
Method of Test:	BS1377: Part 3: 1990: 5.5
Type of Sample Key:	U= Undisturbed, B= Bulk, D= Disturbed, J= Jar, W= Water, SPT= Split Spoon Sample, C= Core Cutter
Comments:	**Test not UKAS accredited**
Remarks to Include:	Sample disturbance, loss of moisture, variation from test procedure, location, and origin of test specimen within original sample. Oven drying temperature if not 105-110C.

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 18/04/2024

Contract:	**Observer Park**
Serial No:	**44496_1**

DETERMINATION OF THE SULPHATE CONTENT AND pH OF SOIL AND GROUNDWATER

Borehole / Pit No.	Depth (m)	Sample		Conc. of Soluble SO3		Calc'd Conc. Of SO4 (g/L)	pH Value	% Sample Passing 2mm Sieve	Description	Remarks
		Type	Ref.	Water Soluble 2:1 (g/L)	Ground Water (g/L)					
WS07	0.40 - 0.90	U	1	0.06		0.07	5.1	95	Soft mottled light bluish grey, orangish brown and olive yellow slightly gravelly slightly sandy silty CLAY with occasional recently active and decayed roots. Gravel is brown, black and white fine to coarse angular to sub rounded chert.	
WS07	2.85 - 3.00	U	3	0.31		0.37	7.2	100	Soft dark grey CLAY with rare orange silt partings and rare shell traces.	
WS09	0.10 - 0.60	U	1	0.06		0.07	6.6	84	Very dark brownish grey slightly gravelly slightly sandy silty CLAY with occasional recently active and decayed roots. Gravel is brown, black and white fine to coarse angular to sub rounded chert.	
WS10	1.00 - 2.00	U	2	0.08		0.10	6.7	51	Brown, black and white angular to sub rounded clayey slightly silty very sandy GRAVEL. Sand is yellowish brown.	

Method of Preparation:	BS1377: Part 1: 2016: 8.5, BS1377: Part 3: 1990: 5.3 Soil/Water Extract, 5.4 Groundwater
Method of Test:	BS1377: Part 3: 1990: 5.5
Type of Sample Key:	U= Undisturbed, B= Bulk, D= Disturbed, J= Jar, W= Water, SPT= Split Spoon Sample, C= Core Cutter
Comments:	**Test not UKAS accredited**
Remarks to Include:	Sample disturbance, loss of moisture, variation from test procedure, location, and origin of test specimen within original sample. Oven drying temperature if not 105-110C.

APPENDIX D

Land Use Criteria Analysis & Contamination Testing Laboratory Results

- Criteria Analysis for Soil
- Laboratory Results
- WAC Certificates

		Hole Identifier			WS01			WS02		WS03				WS04	WS05			WS06	WS07		
		Sample Identifier			ES1	U1	U3	ES1	U1	ES1	U1	U3	U3	ES1	ES1	U1	U2	ES1	ES1	U1	U3
		Date Sampled			02/04/2024	26/03/2024		02/04/2024	26/03/2024	02/04/2024	25/03/2024			02/04/2024	02/04/2024	27/03/2024		02/04/2024	02/04/2024	25/03/2024	
		Sample Depth (mbgl)			0.3 - 0.4	0.3 - 1.0	2.6 - 3.0	0.1 - 0.2	0.45 - 0.7	0.3 - 0.4	0.3 - 0.45	2.5 - 2.8	2.8 - 3.0	0.7 - 0.8	0.2 - 0.3	0.1 - 0.45	1.0 - 2.0	1.3 - 1.4	0.4 - 0.5	0.4 - 0.9	2.85 - 3.0
	Determinand	Assessment Criteria Source	Detec Limit (mg/kg)	Assessment Criteria (mg/kg) (Commercial)	Diamictic CLAY (RTD)	Diamictive CLAY (RTD)	Silty CLAY (LC)	MG (peaty TOPSOIL)	MG (peaty BACKFILL)	MG (clay backfill)	MG (clay backfill)	Slightly clayey S&G (RTD)	Silty CLAY (LC)	MG (peaty TOPSOIL)	MG (peaty TOPSOIL)	MG (peaty TOPSOIL)	Slightly clayey S&G (RTD)	Slightly clayey S&G (RTD)	MG (peaty backfill)	MG (peaty backfill)	Silty CLAY (LC)
Metals/Transition Metals	**Group A : In-organic Contaminants Hazardous to Human Health**																				
	Arsenic - Inorganic	CL:AIRE C4SL	1	640	9.1			8.3		13				45	6			11	5.6		
	Beryllium - Total	LQM/CIEH S4UL	0.06	12	0.53			0.42		0.53				0.78	0.2			1	0.24		
	Boron - Total	LQM/CIEH S4UL	1	240000	4.8			6.2		8.8				9.4	4			8.8	4.2		
	Cadmium - Total	LQM/CIEH S4UL	0.2	190	0.02			0.2		0.2				0.2	0.2			0.2	0.2		
	Chromium - VI	LQM/CIEH S4UL	1.8	33	1.8			1.8		1.8				1.8	1.8			1.8	1.8		
	Chromium - Total (III)	LQM/CIEH S4UL	1	8600	17			17		25				34	12			28	11		
	Copper - Total	LQM/CIEH S4UL	1	68000	3.6			6.7		12				9.5	9.4			9.9	6		
	Lead - Total	CL:AIRE C4SL	1	2300	11			15		18				8.4	21			7.7	12		
	Mercury - Inorganic	LQM/CIEH S4UL	0.3	1100	0.3			0.3		0.3				0.3	0.3			0.3	3		
	Nickel - Total	LQM/CIEH S4UL	1	980	4.9			6.7		8.7				9.4	4.7			23	3.8		
	Selenium - Total	LQM/CIEH S4UL	1	12000	1			1		1				1	1			1	1		
	Vanadium - Total	LQM/CIEH S4UL	1	9000	31			26		39				73	16			43	17		
	Zinc - Total	LQM/CIEH S4UL	1	730000	34			40		49				22	23			25	16		
Non-Metals	**Non Metals:**																				
	Phenols - Monohydric (SOM dependent: @ 1%)	LQM/CIEH S4UL	1	440	1			1		1				1	1			1	1		
	Cyanide - Free	Dutch Int	1	20	1			1		1				1	1			1	1		
	Sulphide	ICRCL	1	1000	1			1		2.8				1	1			1	1		
	Organics : Hazardous to Health																				
Polycyclic Aromatic Hydrocarbons	* Napthalene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	190	0.05			0.05		0.05				0.05	0.05			0.05	0.05		
	Acenaphthylene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	83000	0.05			0.05		0.05				0.05	0.05			0.05	0.05		
	Acenaphthene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	84000	0.05			0.05		0.05				0.05	0.05			0.05	0.05		
	Fluorene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	63000	0.05			0.05		0.05				0.05	0.05			0.05	0.05		
	* Phenanthrene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	22000	0.05			0.05		0.24				0.05	0.05			0.05	0.05		
	* Anthracene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	520000	0.05			0.05		0.09				0.05	0.05			0.05	0.05		
	* Fluoranthene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	23000	0.05			0.05		0.84				0.05	0.07			0.07	0.07		
	Pyrene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	54000	0.05			0.05		0.81				0.05	0.05			0.05	0.05		
	* Benzo[a]anthracene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	170	0.05			0.05		0.56				0.05	0.05			0.05	0.05		
	* Chrysene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	350	0.05			0.05		0.55				0.05	0.05			0.05	0.05		
	Benzo[b]fluoranthene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	44	0.05			0.05		0.73				0.05	0.05			0.05	0.05		
	* Benzo[k]fluoranthene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	1200	0.05			0.05		0.38				0.05	0.05			0.05	0.05		
	* Benzo[a]pyrene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	35	0.05			0.05		0.63				0.05	0.05			0.05	0.05		
	* Indeno[123-cd]pyrene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	500	0.05			0.05		0.36				0.05	0.05			0.05	0.05		
	Dibenzo[ah]anthracene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	3.5	0.05			0.05		0.05				0.05	0.05			0.05	0.05		
	* Benzo[ghl]perylene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	3900	0.05			0.05		0.39				0.05	0.05			0.05	0.05		
	Total (US EPA 16) PAH (sum of 10*)	DUTCH INT	0.8	40	0.5			0.05		4.09				0.5	0.52			0.52	0.52		
Total Petroleum Hydrocarbons (Fuel/Oil) (TPH)	C5 - C6 (SOM dependent: @ 1%)	LQM/CIEH GAC	0.02	3200	0.02			0.02		0.02				0.02	0.02			0.02	0.02		
	C6 - C8 (SOM dependent: @ 1%)	LQM/CIEH GAC	0.02	7800	0.02			0.02		0.02				0.02	0.02			0.02	0.02		
	C8-C10 (SOM dependent: @ 1%)	LQM/CIEH GAC	0.05	2000	0.05			0.05		0.05				0.05	0.05			0.05	0.05		
	C10-C12 (SOM dependent: @ 1%)	LQM/CIEH GAC	1	9700	1			1		1				1	1			1	1		
	C12-C16 (SOM dependent: @ 1%)	LQM/CIEH GAC	2	59000	2			2		2				2	2			2	2		
	C16-C21 (SOM dependent: @ 1%)	LQM/CIEH GAC	8	800000	8			8		8				8	8			8	8		
	C21-C35 (SOM dependent: @ 1%)	LQM/CIEH GAC	8	800000	8			8		8				8	8.1			8	8		
	C5-C7 (Benzene) (SOM dependent: @ 1%)	LQM/CIEH GAC	0.01	26000	0.01			0.01		0.01				0.01	0.01			0.01	0.01		
	C7 - C8 (Toluene) (SOM dependent: @ 1%)	LQM/CIEH GAC	0.01	56000	0.01			0.01		0.01				0.01	0.01			0.01	0.01		
	C8-C10 (SOM dependent: @ 1%)	LQM/CIEH GAC	0.05	3500	0.05			0.05		0.05				0.05	0.05			0.05	0.05		
	C10-C12 (SOM dependent: @ 1%)	LQM/CIEH GAC	1	16000	1			1		1				1	1			1	1		
	C12-C16 (SOM dependent: @ 1%)	LQM/CIEH GAC	2	36000	2			2		2				2	2			2	2		
	C16-C21 (SOM dependent: @ 1%)	LQM/CIEH GAC	10	28000	10			10		10				10	10			10	10		
	C21-C35 (SOM dependent: @ 1%)	LQM/CIEH GAC	10	28000	10			10		11				10	10			10	10		
BTEX (VOCs)	Benzene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.005	27	0.005			0.005		0.005				0.005	0.005			0.005	0.005		
	Ethylbenzene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.005	5700	0.005			0.005		0.005				0.005	0.005			0.005	0.005		
	MTBE (SOM dependent: @ 1%)	CL:AIRE C4SL	0.005	7900	0.005			0.005		0.005				0.005	0.005			0.005	0.005		
	Toluene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.005	56000	0.005			0.005		0.005				0.005	0.005			0.005	0.005		
	M&P Xylene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.005	5900	0.005			0.005		0.005				0.005	0.005			0.005	0.005		
	O-Xylene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.005	6600	0.005			0.005		0.005				0.005	0.005			0.005	0.005		
	BRE SD1 - Brownfield : mobile (groundwater)				**Sulphate Design Class: DS-1 / Aggressive Chemical Environmental : AC-3z / Concrete Design Class: DC-3z (consider zoning)**																
	pH	BRE SD1		5.5	6.8	6	7.2	6.3	7.1	8.2	7.3	7.2	7.2	5.4	6.6	6.3	6.7	6.3	6.4	5.1	7.2
	Total Sulphate as SO_4. %	BRE SD1		0.24%	0.042%									0.030%				0.015%			
	Sulphate (H_2O soluble) - mg/l	BRE SD1	1.25	500	159	150	310		90		100	70	260	38.3		20	50	29.3		70	370
	Others:																				
	Soil Organic Matter (%)	None	0.1	None	1.4%			3.7%		1.2%				0.7%	5.3%			0.3%	2.7%		
	Moisture Content (%)	None	0.01	None	12%			20%		13%				15%	21%			11%	17%		
	Asbestos ID	None		None	ND			ND		-				-	-			-	-		
	Asbestos Quantification	None		None																	

		Hole Identifier			WS09		WS10					
		Sample Identifier			ES1	U1	ES1	U2				
		Date Sampled			02/04/2024	26/03/2024	02/04/2024	25/03/2024				
		Sample Depth (mbgl)			0.1 - 0.2	0.1 - 0.6	0.5 - 0.6	1.0 - 2.0				
	Determinand	Assessment Criteria Source	Detec Limit (mg/kg)	Assessment Criteria (mg/kg) (Commercial)	MG (peaty TOPSOIL)	MG (peaty TOPSOIL)	Diamictic CLAY (RTD)	Slightly clayey S&G (RTD)				
Metals/Transition Metals	**Group A : In-organic Contaminants Hazardous to Human Health**											
	Arsenic - Inorganic	CL:AIRE C4SL	1	640	5.8		11		US_{95} =	20.426	T =	2.340
	Beryllium - Total	LQM/CIEH S4UL	0.06	12	0.18		0.4		US_{95} =	0.646	T =	1.507
	Boron - Total	LQM/CIEH S4UL	1	240000	4		8.5		US_{95} =	7.972	T =	1.140
	Cadmium - Total	LQM/CIEH S4UL	0.2	190	0.2		0.2		US_{95} =	0.217	T =	0.333
	Chromium - VI	LQM/CIEH S4UL	1.8	33	1.8		1.8		US_{95} =	1.800	T =	#DIV/0!
	Chromium - Total (III)	LQM/CIEH S4UL	1	8600	12		19		US_{95} =	24.396	T =	1.573
	Copper - Total	LQM/CIEH S4UL	1	68000	13		5.3		US_{95} =	10.337	T =	1.217
	Lead - Total	CL:AIRE C4SL	1	2300	22		7.1		US_{95} =	17.113	T =	1.308
	Mercury - Inorganic	LQM/CIEH S4UL	0.3	1100	0.3		0.3		US_{95} =	1.158	T =	2.667
	Nickel - Total	LQM/CIEH S4UL	1	980	4.6		6.2		US_{95} =	11.682	T =	2.225
	Selenium - Total	LQM/CIEH S4UL	1	12000	1		1		US_{95} =	1.000	T =	#DIV/0!
	Vanadium - Total	LQM/CIEH S4UL	1	9000	15		34		US_{95} =	43.968	T =	1.769
	Zinc - Total	LQM/CIEH S4UL	1	730000	32		20		US_{95} =	35.598	T =	1.625
Non-Metals	**Non Metals:**											
	Phenols - Monohydric (SOM dependent: @ 1%)	LQM/CIEH S4UL	1	440	1		1		US_{95} =	1.000	T =	#DIV/0!
	Cyanide - Free	Dutch Int	1	20	1		1		US_{95} =	1.000	T =	#DIV/0!
	Sulphide	ICRCL	1	1000	1		1		US_{95} =	1.572	T =	2.667
	Organics : Hazardous to Health											
Polycyclic Aromatic Hydrocarbons	* Napthalene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	190	0.05		0.05		US_{95} =	0.050	T =	#DIV/0!
	Acenaphthylene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	83000	0.05		0.05		US_{95} =	0.050	T =	#DIV/0!
	Acenaphthene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	84000	0.05		0.05		US_{95} =	0.050	T =	#DIV/0!
	Fluorene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	63000	0.05		0.05		US_{95} =	0.050	T =	#DIV/0!
	* Phenanthrene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	22000	0.05		0.05		US_{95} =	0.110	T =	2.667
	* Anthracene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	520000	0.05		0.05		US_{95} =	0.063	T =	2.667
	* Fluoranthene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	23000	0.07		0.07		US_{95} =	0.310	T =	2.621
	Pyrene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	54000	0.05		0.05		US_{95} =	0.292	T =	2.667
	* Benzo[a]anthracene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	170	0.05		0.05		US_{95} =	0.212	T =	2.667
	* Chrysene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	350	0.05		0.05		US_{95} =	0.209	T =	2.667
	Benzo[b]fluoranthene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	44	0.05		0.05		US_{95} =	0.266	T =	2.667
	* Benzo[k]fluoranthene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	1200	0.05		0.05		US_{95} =	0.155	T =	2.667
	* Benzo[a]pyrene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	35	0.05		0.05		US_{95} =	0.234	T =	2.667
	* Indeno[123-cd]pyrene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	500	0.05		0.05		US_{95} =	0.149	T =	2.667
	Dibenzo[ah]anthracene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	3.5	0.05		0.05		US_{95} =	0.050	T =	#DIV/0!
	* Benzo[ghl]perylene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.05	3900	0.05		0.05		US_{95} =	0.158	T =	2.667
	Total (US EPA 16) PAH (sum of 10*)	DUTCH INT	0.8	40	0.52		0.52		US_{95} =	1.617	T =	1.907
Total Petroleum Hydrocarbons (Fuel/Oil) (TPH)	Aliphatics											
	C5 - C6 (SOM dependent: @ 1%)	LQM/CIEH GAC	0.02	3200	0.02		0.02		US_{95} =	0.020	T =	#DIV/0!
	C6 - C8 (SOM dependent: @ 1%)	LQM/CIEH GAC	0.02	7800	0.02		0.02		US_{95} =	0.020	T =	#DIV/0!
	C8-C10 (SOM dependent: @ 1%)	LQM/CIEH GAC	0.05	2000	0.05		0.05		US_{95} =	0.050	T =	#DIV/0!
	C10-C12 (SOM dependent: @ 1%)	LQM/CIEH GAC	1	9700	1		1		US_{95} =	1.000	T =	#DIV/0!
	C12-C16 (SOM dependent: @ 1%)	LQM/CIEH GAC	2	59000	2		2		US_{95} =	2.000	T =	#DIV/0!
	C16-C21 (SOM dependent: @ 1%)	LQM/CIEH GAC	8	800000	8		8		US_{95} =	8.000	T =	#DIV/0!
	C21-C35 (SOM dependent: @ 1%)	LQM/CIEH GAC	8	800000	8		8		US_{95} =	8.032	T =	2.667
	Aromatics											
	C5-C7 (Benzene) (SOM dependent: @ 1%)	LQM/CIEH GAC	0.01	26000	0.01		0.01		US_{95} =	0.010	T =	#DIV/0!
	C7 - C8 (Toluene) (SOM dependent: @ 1%)	LQM/CIEH GAC	0.01	56000	0.01		0.01		US_{95} =	0.010	T =	#DIV/0!
	C8-C10 (SOM dependent: @ 1%)	LQM/CIEH GAC	0.05	3500	0.05		0.05		US_{95} =	0.050	T =	#DIV/0!
	C10-C12 (SOM dependent: @ 1%)	LQM/CIEH GAC	1	16000	1		1		US_{95} =	1.000	T =	#DIV/0!
	C12-C16 (SOM dependent: @ 1%)	LQM/CIEH GAC	2	36000	2		2		US_{95} =	2.000	T =	#DIV/0!
	C16-C21 (SOM dependent: @ 1%)	LQM/CIEH GAC	10	28000	10		10		US_{95} =	10.000	T =	#DIV/0!
	C21-C35 (SOM dependent: @ 1%)	LQM/CIEH GAC	10	28000	10		10		US_{95} =	10.318	T =	2.667
BTEX (VOCs)	Benzene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.005	27	0.005		0.005		US_{95} =	0.005	T =	#DIV/0!
	Ethylbenzene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.005	5700	0.005		0.005		US_{95} =	0.005	T =	#DIV/0!
	MTBE (SOM dependent: @ 1%)	CL:AIRE C4SL	0.005	7900	0.005		0.005		US_{95} =	0.005	T =	#DIV/0!
	Toluene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.005	56000	0.005		0.005		US_{95} =	0.005	T =	#DIV/0!
	M&P Xylene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.005	5900	0.005		0.005		US_{95} =	0.005	T =	#DIV/0!
	O-Xylene (SOM dependent: @ 1%)	LQM/CIEH S4UL	0.005	6600	0.005		0.005		US_{95} =	0.005	T =	#DIV/0!
	BRE SD1 - Brownfield : mobile (groundwater)											
	pH	BRE SD1		5.5	6.6	6.6	6.8	6.7				
	Total Sulphate as SO_4 : %	BRE SD1		0.24%			0.041%					
	Sulphate (H_2O soluble) - mg/l	BRE SD1	1.25	500		70	128	100				
	Others:											
	Soil Organic Matter (%)	None	0.1	None	6.7%		0.5%					
	Moisture Content (%)	None	0.01	None	13%		8%					
	Asbestos ID	None		None	ND		ND					
	Asbestos Quantification	None		None								

1% SOM is assumed unless SOM% dictates other.

Statistical assessment in accordance with CLR7, 2002.

NB Where site-specific soil screening values (SSSV) given, based on Environment Agency CLEA methodology.

Above lowest BRE SD1 category	
Not Detected	ND
Result greater than the GAC	
LoD higher than criterion	
Statistical Outlier	

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Analytical Report Number : 24-012521

Project / Site name:	Observer Park	**Samples received on:**	04/04/2024
Your job number:	64065	**Samples instructed on/ Analysis started on:**	04/04/2024
Your order number:	64065	**Analysis completed by:**	10/04/2024
Report Issue Number:	1	**Report issued on:**	15/04/2024
Samples Analysed:	9 soil samples		

Signed: JSzwagrak

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

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

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

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

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

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

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 24-012521
Project / Site name: Observer Park
Your Order No: 64065

Lab Sample Number				162679	162680	162681	162682	162683
Sample Reference				WS01	WS02	WS03	WS04	WS05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.40	0.10-0.20	0.30-0.40	0.70-0.80	0.20-0.30
Date Sampled				02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Time Taken				0900	0900	0900	0900	0900
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	12	20	13	15	21
Total mass of sample received	kg	0.1	NONE	0.4	0.4	0.3	0.4	0.3
Asbestos								
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A	KWB	KWB	-	-	-
General Inorganics								
pH (L099)	pH Units	N/A	MCERTS	6.8	6.3	8.2	5.4	6.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO_4	%	0.005	MCERTS	0.042	-	-	0.03	-
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	320	-	-	77	-
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	159	-	-	38.3	-
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	2.8	< 1.0	< 1.0
Total Sulphur	mg/kg	50	MCERTS	240	-	-	150	-
Total Sulphur	%	0.005	MCERTS	0.024	-	-	0.015	-
Organic Matter (automated)	%	0.1	MCERTS	1.4	3.7	1.2	0.7	5.3
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.24	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.09	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.84	< 0.05	0.07
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.81	< 0.05	0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.56	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.55	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	0.73	< 0.05	0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	0.38	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.63	< 0.05	0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.36	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.39	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	< 0.80	5.63	< 0.80	< 0.80

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 24-012521
Project / Site name: Observer Park
Your Order No: 64065

Lab Sample Number				162679	162680	162681	162682	162683
Sample Reference				WS01	WS02	WS03	WS04	WS05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.40	0.10-0.20	0.30-0.40	0.70-0.80	0.20-0.30
Date Sampled				02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Time Taken				0900	0900	0900	0900	0900
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.1	8.3	13	45	6
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.53	0.42	0.53	0.78	0.2
Boron (total)	mg/kg	1	MCERTS	4.8	6.2	8.8	9.4	4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	17	17	25	34	12
Copper (aqua regia extractable)	mg/kg	1	MCERTS	3.6	6.7	12	9.5	9.4
Lead (aqua regia extractable)	mg/kg	1	MCERTS	11	15	18	8.4	21
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	4.9	6.7	8.7	9.4	4.7
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	31	26	39	73	16
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	34	40	49	22	23
Petroleum Hydrocarbons								
TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	8.1
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL	mg/kg	10	NONE	< 10	< 10	< 10	< 10	< 10
TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	< 10	11	< 10	< 10
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	< 10	< 10	11	< 10	< 10
VOCs								
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

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

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Analytical Report Number: 24-012521
Project / Site name: Observer Park
Your Order No: 64065

Lab Sample Number				162684	162685	162686	162687
Sample Reference				WS06	WS07	WS09	WS10
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.30-1.40	0.40-0.50	0.10-0.20	0.50-0.60
Date Sampled				02/04/2024	02/04/2024	02/04/2024	02/04/2024
Time Taken				0900	0900	0900	0900
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	17	13	7.7
Total mass of sample received	kg	0.1	NONE	0.4	0.3	0.4	0.5
Asbestos							
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	-	-	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	-	-	KWB	KWB
General Inorganics							
pH (L099)	pH Units	N/A	MCERTS	6.3	6.4	6.6	6.8
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO_4	%	0.005	MCERTS	0.015	-	-	0.041
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	59	-	-	260
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	29.3	-	-	128
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphur	mg/kg	50	MCERTS	83	-	-	160
Total Sulphur	%	0.005	MCERTS	0.008	-	-	0.016
Organic Matter (automated)	%	0.1	MCERTS	0.3	2.7	6.7	0.5
Total Phenols							
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs							
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH							
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	< 0.80	< 0.80	< 0.80

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Analytical Report Number: 24-012521
Project / Site name: Observer Park
Your Order No: 64065

Lab Sample Number				162684	162685	162686	162687
Sample Reference				WS06	WS07	WS09	WS10
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.30-1.40	0.40-0.50	0.10-0.20	0.50-0.60
Date Sampled				02/04/2024	02/04/2024	02/04/2024	02/04/2024
Time Taken				0900	0900	0900	0900
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Heavy Metals / Metalloids							
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	5.6	5.8	11
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1	0.24	0.18	0.4
Boron (total)	mg/kg	1	MCERTS	8.8	4.2	4	8.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	11	12	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	9.9	6	13	5.3
Lead (aqua regia extractable)	mg/kg	1	MCERTS	7.7	12	22	7.1
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	3.8	4.6	6.2
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	43	17	15	34
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	25	16	32	20
Petroleum Hydrocarbons							
TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL	mg/kg	10	NONE	< 10	< 10	< 10	< 10
TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	< 10	< 10	< 10	< 10
VOCs							
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0

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

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 24-012521
Project / Site name: Observer Park

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
162679	WS01	None Supplied	0.30-0.40	Brown sandy clay
162680	WS02	None Supplied	0.10-0.20	Brown loam and clay with gravel and vegetation
162681	WS03	None Supplied	0.30-0.40	Brown loam and clay with gravel and vegetation
162682	WS04	None Supplied	0.70-0.80	Brown sandy clay with gravel
162683	WS05	None Supplied	0.20-0.30	Brown loam and clay with gravel and vegetation
162684	WS06	None Supplied	1.30-1.40	Brown sandy clay with gravel
162685	WS07	None Supplied	0.40-0.50	Brown sandy clay with gravel
162686	WS09	None Supplied	0.10-0.20	Brown loam and clay with gravel and vegetation
162687	WS10	None Supplied	0.50-0.60	Brown sandy clay with gravel

Analytical Report Number : 24-012521
Project / Site name: Observer Park

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode	In-house method	L010	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES	In-house method	L038B	D	MCERTS
Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080	W	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS

Analytical Report Number : 24-012521
Project / Site name: Observer Park

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 24-012489

Project / Site name:	Observer Park	**Samples received on:**	04/04/2024
Your job number:	64065	**Samples instructed on/ Analysis started on:**	04/04/2024
Your order number:	64065	**Analysis completed by:**	15/04/2024
Report Issue Number:	1	**Report issued on:**	15/04/2024
Samples Analysed:	3 soil samples - 3 2stage samples		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

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Waste Acceptance Criteria Analytical Results

Report No:	**24-012489**						
					Client:	**PRPLTD**	
Location	**Observer Park**						
Lab Reference (Sample Number)	162595				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	02/04/2024				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS01 D1						
Depth (m)	0.10-0.20						
Solid Waste Analysis							
TOC (%)**	1.4				3%	5%	6%
Loss on Ignition (%) **	3.4				--	--	10%
BTEX (µg/kg)**	< 5.0				6000	--	--
Sum of PCBs (mg/kg)**	< 0.007				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	5.32				100	--	--
pH (units)**	7.5				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	2.0				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 3 preparation utilising end over end leaching procedure)	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic *	< 0.0020	< 0.0020		< 0.020	0.5	2	25
Barium *	0.074	0.033		0.39	20	100	300
Cadmium *	0.00013	< 0.00010		< 0.0010	0.04	1	5
Chromium *	< 0.00060	0.0032		0.028	0.5	10	70
Copper *	0.047	0.040		0.41	2	50	100
Mercury *	< 0.00070	< 0.0007		< 0.0070	0.01	0.2	2
Molybdenum *	0.014	0.0042		0.055	0.5	10	30
Nickel *	0.0050	0.0035		0.037	0.4	10	40
Lead *	< 0.0017	0.0063		0.054	0.5	10	50
Antimony *	0.0040	< 0.0020		< 0.020	0.06	0.7	5
Selenium *	< 0.0050	< 0.0050		< 0.050	0.1	0.5	7
Zinc *	0.019	0.018		0.18	4	50	200
Chloride *	7.2	< 4.0		20	800	15000	25000
Fluoride*	0.55	0.49		4.9	10	150	500
Sulphate *	1300	110		2600	1000	20000	50000
TDS*	1100	190		3100	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.16	< 0.13		< 0.50	1	-	-
DOC	24.1	12		139	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.6						
Dry Matter (%)	85						
Moisture (%)	15						
Stage 1							
Volume Eluate L2 (litres)	0.337						
Filtered Eluate VE1 (litres)	0.23						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation

** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Waste Acceptance Criteria Analytical Results

Report No:	**24-012489**						
					Client:	**PRPLTD**	
Location	**Observer Park**						
Lab Reference (Sample Number)	162596				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	02/04/2024				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS03 D1						
Depth (m)	1.20-1.30						
Solid Waste Analysis							
TOC (%)**	0.2				3%	5%	6%
Loss on Ignition (%) **	1.6				--	--	10%
BTEX (µg/kg)**	< 5.0				6000	--	--
Sum of PCBs (mg/kg)**	< 0.007				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.85				100	--	--
pH (units)**	5.5				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	-15				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 3 preparation utilising end over end leaching procedure)	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic *	< 0.0020	< 0.0020		< 0.020	0.5	2	25
Barium *	0.023	0.0034		0.061	20	100	300
Cadmium *	0.00015	< 0.00010		< 0.0010	0.04	1	5
Chromium *	0.00087	< 0.00060		< 0.0060	0.5	10	70
Copper *	0.032	0.0042		0.080	2	50	100
Mercury *	< 0.00070	< 0.0007		< 0.0070	0.01	0.2	2
Molybdenum *	< 0.0014	< 0.0014		< 0.014	0.5	10	30
Nickel *	0.019	0.0020		0.044	0.4	10	40
Lead *	< 0.0017	< 0.0017		< 0.017	0.5	10	50
Antimony *	0.0027	< 0.0020		< 0.020	0.06	0.7	5
Selenium *	< 0.0050	< 0.0050		< 0.050	0.1	0.5	7
Zinc *	0.035	0.012		0.15	4	50	200
Chloride *	4.1	< 4.0		< 15	800	15000	25000
Fluoride*	0.11	< 0.050		0.40	10	150	500
Sulphate *	48	8.2		140	1000	20000	50000
TDS*	92	16		260	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.16	< 0.13		< 0.50	1	-	-
DOC	4.74	3.0		32.8	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.6						
Dry Matter (%)	89						
Moisture (%)	11						
Stage 1							
Volume Eluate L2 (litres)	0.327						
Filtered Eluate VE1 (litres)	0.24						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

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Waste Acceptance Criteria Analytical Results

Report No:	**24-012489**						
					Client:	**PRPLTD**	
Location	**Observer Park**						
Lab Reference (Sample Number)	162597				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	02/04/2024				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS04 D1						
Depth (m)	0.70-0.80						
Solid Waste Analysis							
TOC (%)**	2.8				3%	5%	6%
Loss on Ignition (%) **	5.8				--	--	10%
BTEX (µg/kg)**	< 5.0				6000	--	--
Sum of PCBs (mg/kg)**	< 0.007				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.85				100	--	--
pH (units)**	7.6				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	0.51				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 3 preparation utilising end over end leaching procedure)	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic *	0.0040	< 0.0020		< 0.020	0.5	2	25
Barium *	0.014	0.0044		0.050	20	100	300
Cadmium *	< 0.00010	< 0.00010		< 0.0010	0.04	1	5
Chromium *	0.0039	0.0018		0.020	0.5	10	70
Copper *	0.087	0.067		0.68	2	50	100
Mercury *	< 0.00070	< 0.0007		< 0.0070	0.01	0.2	2
Molybdenum *	0.0053	0.0014		0.017	0.5	10	30
Nickel *	0.0051	0.0024		0.026	0.4	10	40
Lead *	0.012	0.0031		0.037	0.5	10	50
Antimony *	< 0.0020	< 0.0020		< 0.020	0.06	0.7	5
Selenium *	< 0.0050	< 0.0050		< 0.050	0.1	0.5	7
Zinc *	0.019	0.010		0.11	4	50	200
Chloride *	< 4.0	< 4.0		16	800	15000	25000
Fluoride*	0.31	0.29		2.9	10	150	500
Sulphate *	9.5	2.3		28	1000	20000	50000
TDS*	53	22		240	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.16	< 0.13		< 0.50	1	-	-
DOC	28.7	20		202	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.5						
Dry Matter (%)	85						
Moisture (%)	15						
Stage 1							
Volume Eluate L2 (litres)	0.318						
Filtered Eluate VE1 (litres)	0.12						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

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Analytical Report Number : 24-012489
Project / Site name: Observer Park

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
162595	WS01	D1	0.10-0.20	Brown loam and clay with gravel and vegetation
162596	WS03	D1	1.20-1.30	Brown sand with gravel
162597	WS04	D1	0.70-0.80	Brown loam and clay with gravel and vegetation

Analytical Report Number : 24-012489
Project / Site name: Observer Park

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20°C in soil	Determination of pH in soil by addition of water followed by electrometric measurement	In-house method	L005B	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L023B	D	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with hexane followed by GC-MS	In-house method based on USEPA 8082	L027B	D	MCERTS
TDS in WAC leachate (BS EN 12457-3 Prep)	Determination of total dissolved solids in leachate by electrometric measurement	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L031B	W	ISO 17025
Fluoride in WAC leachate (BS EN 12457-3 Prep)	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L033B	W	ISO 17025
DOC in WAC leachate (BS EN 12457-3 Prep)	Determination of dissolved organic carbon in leachate by TOC/DOC NDIR analyser	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L037B	W	NONE
Metals in WAC leachate (BS EN 12457-3 Prep)	Determination of metals in leachate by acidification followed by ICP-OES	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed	L039B	W	ISO 17025
Sulphate in WAC leachate (BS EN 12457-3 Prep)	Determination of sulphate in leachate by acidification followed by ICP-OES	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed	L039B	W	ISO 17025
Preparation WAC leachate		In-house method	L043B	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance	L046B	W	NONE
Loss on ignition of soil @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	In-house method	L047	D	MCERTS
Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS	In-house method	L076B/L088	D/W	NONE

Analytical Report Number : 24-012489
Project / Site name: Observer Park

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Phenol Index in WAC leachate (BS EN 12457-3 Prep)	Determination of monohydric phenols in leachate by continuous flow analyser	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025
Chloride in WAC leachate (BS EN 12457-3 Prep)	Determination of Chloride colorimetrically by discrete analyser	In-house based on MEWAM Method ISBN 0117516260	L082B	W	ISO 17025

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Sample Deviation Report

Analytical Report Number : 24-012489
Project / Site name: Observer Park

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
WS01	D1	S	162595	b	BTEX and/or Volatile organic compounds in soil	L073B	b
WS01	D1	S	162595	b	PCB's By GC-MS in soil	L027B	b
WS01	D1	S	162595	b	Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in soil	L064B	b
WS01	D1	S	162595	b	Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil	L076B/L088	b
WS03	D1	S	162596	b	BTEX and/or Volatile organic compounds in soil	L073B	b
WS03	D1	S	162596	b	PCB's By GC-MS in soil	L027B	b
WS03	D1	S	162596	b	Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in soil	L064B	b
WS03	D1	S	162596	b	Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil	L076B/L088	b
WS04	D1	S	162597	b	BTEX and/or Volatile organic compounds in soil	L073B	b
WS04	D1	S	162597	b	PCB's By GC-MS in soil	L027B	b
WS04	D1	S	162597	b	Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in soil	L064B	b
WS04	D1	S	162597	b	Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil	L076B/L088	b

APPENDIX E

Assessment of Analysis of Contamination

UK Guidance

In the UK, the principal numerical criteria used to assess the results of geochemical testing of soil samples for potential contaminants and their significance to human health were the Soil Guideline Values (SGVs). These were published by the Department for the Environment, Food and Rural Affairs (DEFRA) in their Contaminated Land Research Reports Nos. 7-10 inclusive and were accompanied by the Research and Development (R&D) Publications (TOX and SGV series) also published by DEFRA in collaboration with and the Environment Agency (2002).

Additionally, between 2002 and 2005, Contaminated Land Exposure Assessment (CLEA) UK (beta) software was released along with briefing notes 1 to 4.

In 2006, DEFRA released “Soil Guideline Values - The Way Forward” in an attempt to clarify matters.

In August 2008, the EA published a revised CLEA framework guidance in SR2, 3 and 4, along with CLEA v1.03 (beta software), this software was a testing version and comments upon its usefulness were requested. The original SGVs were withdrawn together with CIR7-10, however, the accompanying TOX reports remained valid.

SGVs had been formulated to represent a combination of authoritative scientific and policy judgements. The scientific information includes human toxicological information on the health effects of different contaminants, and judgement on what is regarded as an “unacceptable risk”.

Soil is only one source of contaminant exposure, and its effects need to be kept in proportion with total exposure from all sources.

Generic SGVs must be capable of use over a wide range of soil conditions and types of site. They are based on the underlying, albeit incomplete, science of contaminant behaviour, human activity patterns, and contaminant toxicology. Although these make the derivation of generally applicable criteria difficult, use of "worst-case" scenarios is more likely to result in impracticable or over-conservative criteria.

The SGVs are designed to generate a consistent approach to the investigation of contaminated land as well assisting with focusing resources on situations that require a more detailed assessment. Only the first of the R&D publications addressing individual contaminants, have so far been published, and these will be added to in due course. As indicated above, some of these publications have already been withdrawn, whilst some have been revised. Guidance on additional organic contaminants, in particular, is yet to be published.

DEFRA is actively promoting a site-specific risk assessment methodology to support professional judgement resulting in a site-specific assessment criterion (SSAC) for individual compounds. The Contaminated Land Exposure Assessment Model (CLEA) was originally detailed in CLR10 and is described in the conceptual exposure models for each standard land use used to derive the SGVs,

this was replaced by SR3 in August 2008 and then revised again in January 2009. The CLEA model itself was revised in January 2009 to v1.04 and a handbook (SR4) was also issued.

In late 2009, the LQM/CIEH (Land Quality Management/Chartered Institute of Environmental Health) Generic Assessment Criteria for Human Health Risk Assessment Second Edition was published, which provides Generic Assessment Criteria (GAC) values for the 'common' contaminants based upon the principles published by the EA and uses the CLEA model to define values.

Category 4 Screening Levels (C4SLs) were prepared by DEFRA under the Research Project SP1010 and published initially in 2013 as an interim report, with the final (revision 2) issued in 2014.

In early 2015, LQM/CIEH S4ULs ("suitable 4 use levels") for Human Health Risk Assessment was published providing clarification on S4ULs to be used for the assessment of risk posed to human health by contaminants in soil. Concentrations of contaminants above these levels indicate that further assessment of risk is required and not necessarily that a problem exists.

Contamination in near surface soils should be considered with respect to water supply pipes; initially risk guidance was supplied by Water Regulations Advisor Scheme (WRAS) but these have recently been replaced with guidance produced by United Kingdom Water Industry Research (UKWIR), however, some local water authorities still use the old guidance. For the purposes of this report, it is assumed that all water supply pipes will be in MDPE however, if other types of pipes are used then lower threshold values may be appropriate.

Contamination Assessment

Each determinant, for which a published SGV/GAC exists, has a mean and standard deviation calculated followed by "T-test" statistical calculation (Mean Value and Maximum Value Tests). Reference is then made to the SGV for the individual determinant in order to assess the level of risk posed.

Assessment of the geochemical environment is based on guidance given in "Guidance on Comparing Soil Contamination Data with a Critical Concentration" (CIEH and Contaminated Land: Application in Real Environments [CL:aire], May 2008), SR2, 3 and 4 inclusive, SGVs and Human Toxicity (TOX) R&D Reports (EA, 2002 to 2005).

The samples recovered from site were found to be relevant, sufficient, reliable and transparent based upon the requirements indicated within "Guidance on Comparing Soil Contamination Data with a Critical Concentration". As the Site is being assessed under the planning scenario, the critical question that needs to be answered is "Is there sufficient evidence that the true mean concentration of substance X (U) is less than the critical concentration (Cc)?"

Mean concentration of a determinant based on a low number of samples may be a poor indicator of the true mean (population) for the site as a whole. A subsequent remediation strategy based on comparison of such a sample mean against SGV may not be sufficiently health protective. Therefore, the Mean Value Test allows a statement to be made with a given level of confidence (usually 95%) that the population mean is less than the SGV and considers the number of samples analysed.

The calculated values of the upper confidence level of the sample group (US95) may be compared with the SGV or GAC, and if it is less, then the Mean Value Test has been passed and the site may be considered as not presenting a significant possibility of harm to human health within the context of Part IIA of the Environment Protection Act. Where a result shows the concentration to be less than the limit of detection adopted for the analysis, the value of the limit of detection has been used in the calculation.

The calculation is based on the following equation:

$$US^{95} = x + \frac{t.s}{\sqrt{n}}$$

Where:

- x is the mean.
- t is a statistical function based on sample size.
- s is standard deviation.
- n is the number of samples.

Using the t-tables included in CLR7, the value of "t" for four samples (n=4) is 2.353 and that for sixteen samples, is 1.753. The results of the statistical analysis are given below. It should be noted that the SGVs given in the table include the SGVs, as cited in CLR8, and also a series of "hybrid" SGVs adopted for the analysis. These have been derived from the upper limit of concentrations for natural (uncontaminated) soils found within the United Kingdom.

The Maximum Value Test is used to determine whether the maximum value of a determinant from a set of analyses is likely to have come from the same population as other concentrations for that determinant, or whether it is a statistical outlier (hot spot).

If the value of "t" is smaller than some critical value, determined from statistical tables and based on the number of samples, the maximum value may be accepted (at the prescribed level of confidence) as a member of the underlying population from which the other results were drawn.

If "t" is greater than the critical value, the maximum value is treated as an outlier. This may indicate a hot spot of contamination requiring additional investigation in order to reveal its extent. The Maximum Value Test uses the relationship:

$$T = \frac{y_{max} - Y}{Sy}$$

Where:

- y_{max} is the log of the maximum value of a population.
- Y is the mean value of the logs of the population.
- Sy is the standard deviation from the mean of the logs of the population.

For all hydrocarbon analysis values derived above, the soil organic matter (SOM) has been assumed to be 1%, giving an worst-case scenario, were not otherwise proven by laboratory testing.

APPENDIX F

In accordance with Environment Agency publication CLR 11 '*Model Procedures for the Management of Land Contamination*', now superseded by LCRA 2022, a quantitative risk assessment for contaminated land has been developed for the Site.

The risk assessment has been carried out using the risk model defined and outlined in the following table. Potential sources have been identified from the desk study information as well as guidance provided in EA publication CLR 8 '*Potential Contaminants for the Assessment of Land*'. Hazard linkages were determined by the ground investigation and the risk re-assessed on the basis of the viability of the linkage. If the hazard linkage is confirmed, then remediation or management solutions will be proposed to ensure that no unacceptable risk remains following development.

	Category	Definition
Potential Severity	**Severe**	Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters.
	Medium	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures.
	Mild	Pollution of non-sensitive waters, minor damage to buildings or structures.
	Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non-sensitive ecosystems or species.
Probability of Risk	**High Likelihood**	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor.
	Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term.
	Low Likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so.
	Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable.

		Potential severity			
		Severe	**Medium**	**Mild**	**Minor**
Probability of Risk	**High Likelihood**	**Very High**	**High**	Moderate	Moderate/Low
	Likely	**High**	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/Low	Low	Negligible
	Unlikely	Moderate/Low	Low	Negligible	Negligible

APPENDIX G

1. This report has been prepared and written specifically for the Client named in the introduction and is exclusively for their benefit. No reliance may be placed in the contents of this report by any third party except with the express agreement of the original Client and the written agreement of PRP. Such written agreement may require the payment of an additional fee.
2. The *Recommendations* section of this report only provides an overview of the guidance and should not be specifically relied upon in their own right but should be considered in relation to the whole report and the development described in this report.
3. This report has been prepared and written in the context of the proposals for the development of the site, as stated by the Client, and will not be valid in a differing context. Furthermore, new information, improved practices, or legislation may necessitate alterations to the report in whole or in part after its submission. Therefore, with any change in circumstances or after the expiry of one year from the date of this report, it should be referred to us for re-assessment.
4. The assessment and interpretation of contamination and associated risks are based upon the scope of the work described in the fee proposal and agreed with the Client, the report may not be sufficient to fully address the contamination or allow a detailed remediation scheme to proceed without further investigation or analysis.
5. Any assessments made in this report are based on the ground conditions and as revealed by the test pits and/or boreholes together with the results of any field or laboratory testing undertaken and where appropriate other relevant data which may have been obtained for the site. The sources of such information are detailed in this report and while PRP use only such sources as are believed to be reliable, PRP will not be liable for the authenticity or reliability of information obtained from others.
6. Notwithstanding that factual reports from third-parties concerning asbestos or mould of any kind may have been included for information purposes in this report, PRP will have no liability whatsoever for any claim or claims arising related to asbestos or mould of any kind.
7. There may also be special conditions appertaining to the site which were not revealed by the investigation and which will not, therefore, have been considered in this report. Any assessments may be subject to amendment in the light of additional information becoming available.
8. Whilst an opinion may be expressed or implied in this report on possible configurations of strata between or beyond test pit or borehole locations, or on the possible presence of features based on either visual, verbal or published evidence, this is for guidance only and no liability can be accepted for the accuracy of such opinions.
9. Comments on groundwater conditions will have been based on observations made only at the time of the investigation unless otherwise stated. It should be noted, however, that groundwater levels vary due to seasonal and other effects.
10. This report is not a site categorisation, and hazards could occur which have not been detected.
11. Where data has been provided or is made available to PRP and this has been used in the report, it has been assumed that the information is correct. No responsibility can be accepted by PRP for inaccuracies within the data supplied.
12. The copyright in this report and other related plans and documents prepared by PRP is owned by them and no such report, plan or document may be reproduced, published or adapted without their written consent. Complete copies of the report may however be made and distributed by the Client as an expedient in dealing with matters related to its commission.
13. This report has been prepared solely for the Client's purposes in obtaining planning permission and discharge of the planning conditions related to the proposed development indicated in the report. The discharge of these conditions does not constitute that the site could be determined under Part IIA of the Environmental Protection Act 1990.

APPENDIX H

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APPENDIX IX

THAMES WATER PRE-PLANNING ENQUIRY AND SEWER RECORDS

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2022_4671380

0 15 30 60 90 120 Meters

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified before any works are undertaken. Crown copyright Reserved

Scale:	1:2649
Width:	525m
Printed By:	tlove
Print Date:	12/07/2022
Map Centre:	474994,167467
Grid Reference:	SU7467SE

Comments:

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2022_4671380

0 15 30 60 90 120 Meters

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified before any works are undertaken. Crown copyright Reserved

Scale:	1:2649
Width:	525m
Printed By:	tlove
Print Date:	12/07/2022
Map Centre:	474994,167467
Grid Reference:	SU7467SE

Comments:

ALS/ALS Standard/2022_4671380

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
1301	48.6	46.46
1202	49.12	47.58
2502	47.38	45.1
1504	47.5	45.4
1502	47.71	44.43
2501	47.41	44.98
1201	48.94	46.92
261A		
161C		

REFERENCE	COVER LEVEL	INVERT LEVEL
1401	47.81	45.96
1505	47.29	45.43
2401		
1402	47.84	45.06
1503	47.51	44.68
2603	47.7	45.63
2701	48.03	46.14
151A		
161D		

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified before any works are undertaken. Crown copyright Reserved

Caroline Gower

Mayer Brown Ltd
Lion House
147 Oriental Road
Woking
Surrey
GU22 8AR

Wastewater pre-planning
Our ref DS6098066

25 September 2022

Pre-planning enquiry: Capacity concerns

Dear Caroline,

Thank you for providing information on your development at Greenwards Lane, Arborfield, Berks, RG2 9HT.

Proposed: Construction of 6025m2 of commercial space on the area of previously greenfield land at the above location and proposed foul water discharge via pump at 5l/s into 150mm diameter foul water public sewer located in Greenwards Lane.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

We've assessed your foul water proposals and concluded that our sewerage network does not have sufficient capacity to accommodate foul water flows from the proposed development.

In order to ensure we make the appropriate upgrades – or 'off-site reinforcement' – to serve the remainder of your development, we'll need to carry out modelling work, design a solution and build the necessary improvements. This work is done at our cost.

Once we've begun modelling, we may need to contact you to discuss changing the connection point for capacity reasons. Please note that we'll pay the cost of covering any extra distance if the connection needs to be made at a point further away than the nearest practicable point of at least the same diameter.

How long could modelling and reinforcement take?

Typical timescales for a development of your size are:

Modelling: 8 months
Design: 6 months
Construction: 6 months
Total: 20 months

If the time you're likely to take from planning and construction through to first occupancy is longer than this, we'll be able to carry out the necessary upgrades in time for your development. If it's shorter, please contact me on the number below to discuss the timing of our activities.

What do you need to tell us before we start modelling?

We will only carry out modelling once we're confident that your development will proceed. In order to have this confidence, we'll need to know that you **own the land and have either outline or full planning permission**. Please email this information to us as soon as you have it.

If you'd like us to start modelling work ahead of this point, we can do this if you agree to underwrite the cost of modelling and design. That means we'll fund the work – but you agree to pay the cost if you don't achieve first occupancy within five years.

If the modelling shows we need to carry out reinforcement work, then before we start construction we'll need you to supply us with notification that you've confirmed your F10 – Notification of construction project - submission to the Health and Safety Executive.

Surface Water

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2) rainwater infiltration to ground at or close to source
3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4) rainwater discharge direct to a watercourse (unless not appropriate)
5) controlled rainwater discharge to a surface water sewer or drain
6) controlled rainwater discharge to a combined sewer.

Where connection to the public sewerage network is required to manage surface water flows we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

Please see the attached 'Planning your wastewater' leaflet for additional information.

What do I need to do next?

If you've satisfied the points above, then you should compare your own timeline with the typical timescales we've suggested for our activities. If the time you're likely to take from planning and construction through to first occupancy is **more** than the total time we're likely to take, we'll be able to carry out the necessary upgrades in time for your development.

If it's **less** than this, you might want to ask us to start modelling earlier – in which case we'll require you to underwrite the cost, as noted above.

If you've any further questions, please contact me on 0800 009 3921.

Yours sincerely

Maria Merchan
Adoption Engineer
Developer Services – Adoptions Engineer, Sewer Adoptions Team

APPENDIX X

GENERAL CONDITIONS

1. This report has been prepared and written specifically for the client named in the introduction and is exclusively for his/her/their benefit. No reliance may be placed in the contents of this report by any third party except with the express agreement of the original client and the written agreement of PRP. Such written agreement may require the payment of an additional fee.

2. This report has been prepared and written in the context of the proposals for the development of the site as stated by the client and will not be valid in a differing context. Furthermore, new information, improved practices, or legislation may necessitate alteration to the report in whole or in part after its submission. Therefore, with any change in circumstances or after the expiry of one year from the date of this report, it should be referred to us for re-assessment.

3. There may also be special conditions appertaining to the site which were not revealed by the investigation and which will not, therefore, have been taken into account in this report. Any assessments may be subject to amendment in the light of additional information becoming available.

4. Whilst an opinion may be expressed or implied in this report on possible configurations or on the possible presence of features based either visual, verbal or published evidence, this is for guidance only and no liability can be accepted for the accuracy of such opinions.

5. Comments on groundwater conditions will have been based on observations made only at the time of any investigation or published data unless otherwise stated. It should be noted, however, that groundwater levels vary due to seasonal and other effects.

6. This report is not a site categorisation, and hazards could occur which have not been detected.

7. The copyright in this report and other related plans and documents prepared by PRP is owned by them and no such report, plan or document may be reproduced, published or adapted without their written consent. Complete copies of the report may however be made and distributed by the client as an expedient in dealing with matters related to its commission.

8. Where indicated reliance has been placed on data supplied by the environment agency and the strategic flood risk assessment for the area available at the time of writing this report. No liability can be entertained by PRP if this data later proves to be inaccurate or in any way incomplete.