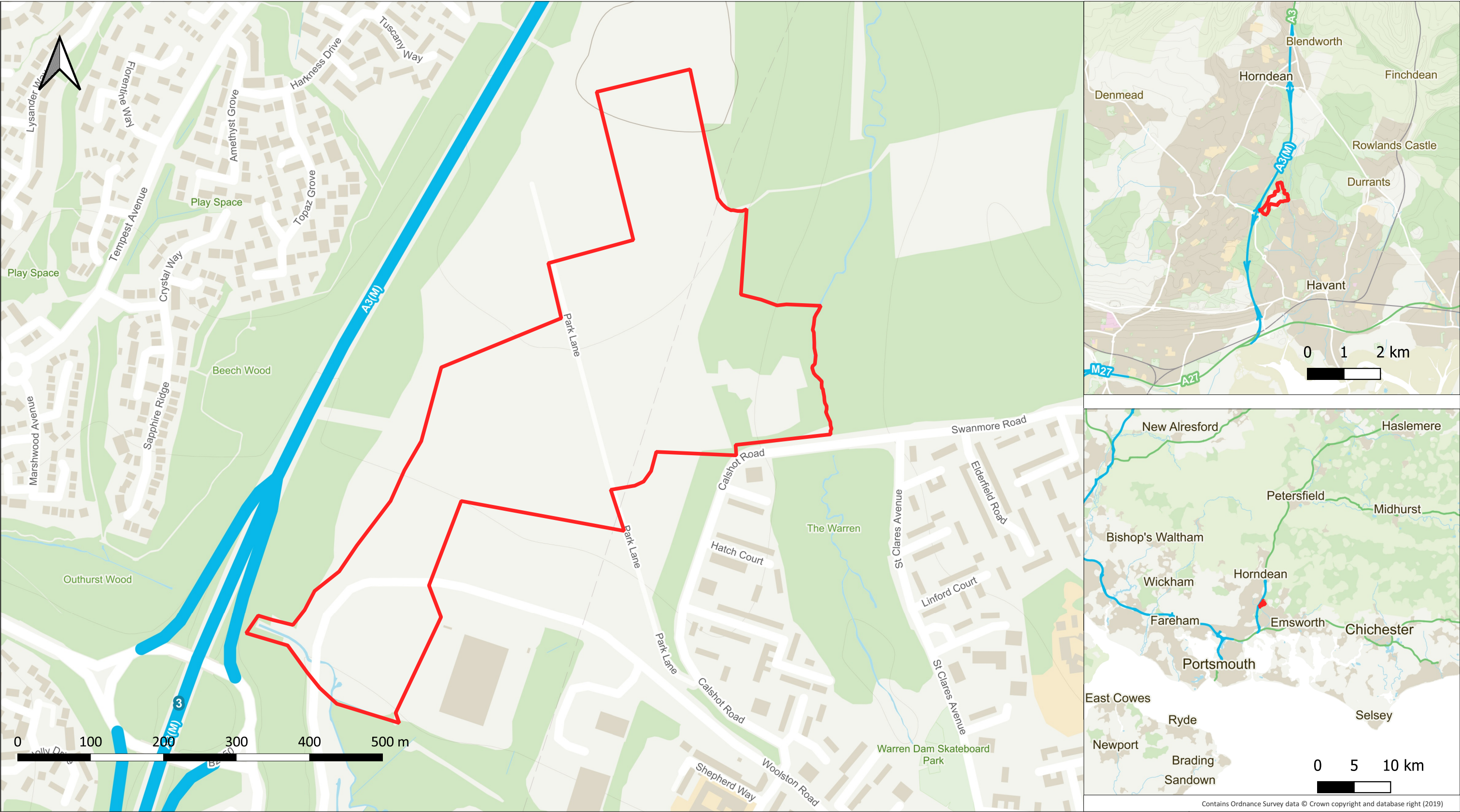


Appendices



Appendix A Drawings





KEY PLAN

Site Boundary

NOTES

REVISIONS				
P01	FIRST ISSUE EXAMPLE			
	DRAWN BY YP	CHECKED BY AJ	APPROVED BY AJ	03/06/2021
REV.	REVISION NOTES/COMMENTS			
	DRAWN BY YP	CHECKED BY AJ	APPROVED BY AJ	03/06/2021



White Building
1-4 Cumberland Place
Southampton
Hampshire
SO15 2NP
Tel: +44(0)2382140907
www.hydrock.com

CLIENT

Portsmouth City Council

PROJECT

DUNSBURY PARK, PORTSMOUTH

TITLE Site Location Plan	
HYDROCK PROJECT NO. 19453-GELO	SCALE @ A3 1:1
PURPOSE OF ISSUE SUITABLE FOR INFORMATION	STATUS S2
DRAWING NO. 19453-HYD-XX-XX-DR-GE-1001	REVISION P01



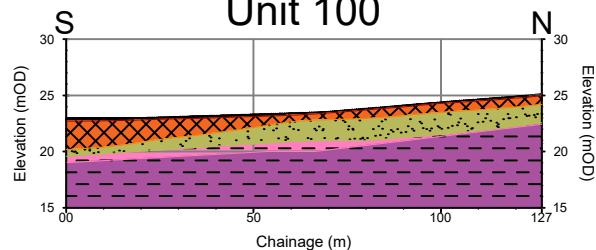
KEY		NOTES				Hydrock		TITLE	
<div>Key:</div> <div><div><div></div><div>BH##</div><div>Borehole</div></div><div><div></div><div>WS##</div><div>Windowless sampler borehole</div></div><div><div></div><div>TP##</div><div>Trial pit - mechanically excavated</div></div><div><div></div><div>TP##</div><div>Trial pit - hand dug pit</div></div></div>						CLIENT		EXPLORARY HOLE LOCATION PLAN - Plots 100, 400, 600 and 700	
						PORTSMOUTH CITY COUNCIL		HYDROCK PROJECT NO. 19453-GELO	
						PROJECT		SCALE @ A3 NTS	
						DUNSBUY PARK		PURPOSE OF ISSUE SUITABLE FOR INFORMATION	
								STATUS S2	
								DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 19453-HYD-XX-XX-DR-GE-1004	
								REVISION P2	

OS NORTH

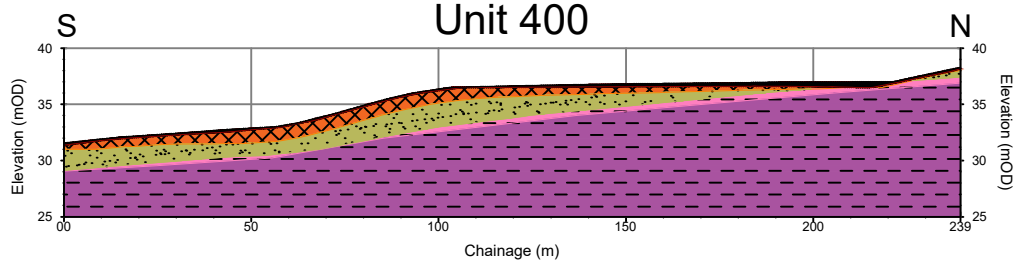


Scale 1:10000

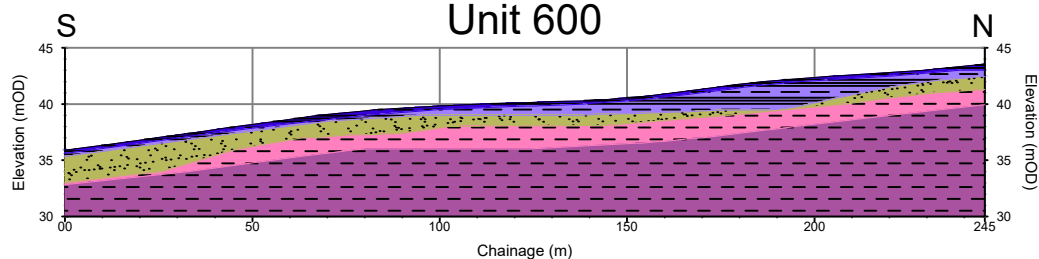
Unit 100



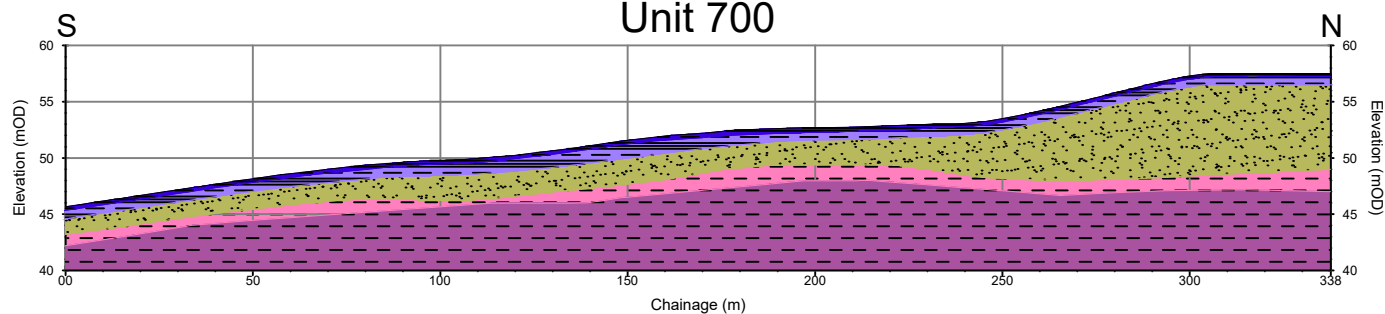
Unit 400



Unit 600



Unit 700



Key:



Borehole

BH##



Windowless sampler borehole

WS##



Trial pit - mechanically excavated

TP##



Top soil



Head



Surface Made ground



Made ground



Bognor sand member

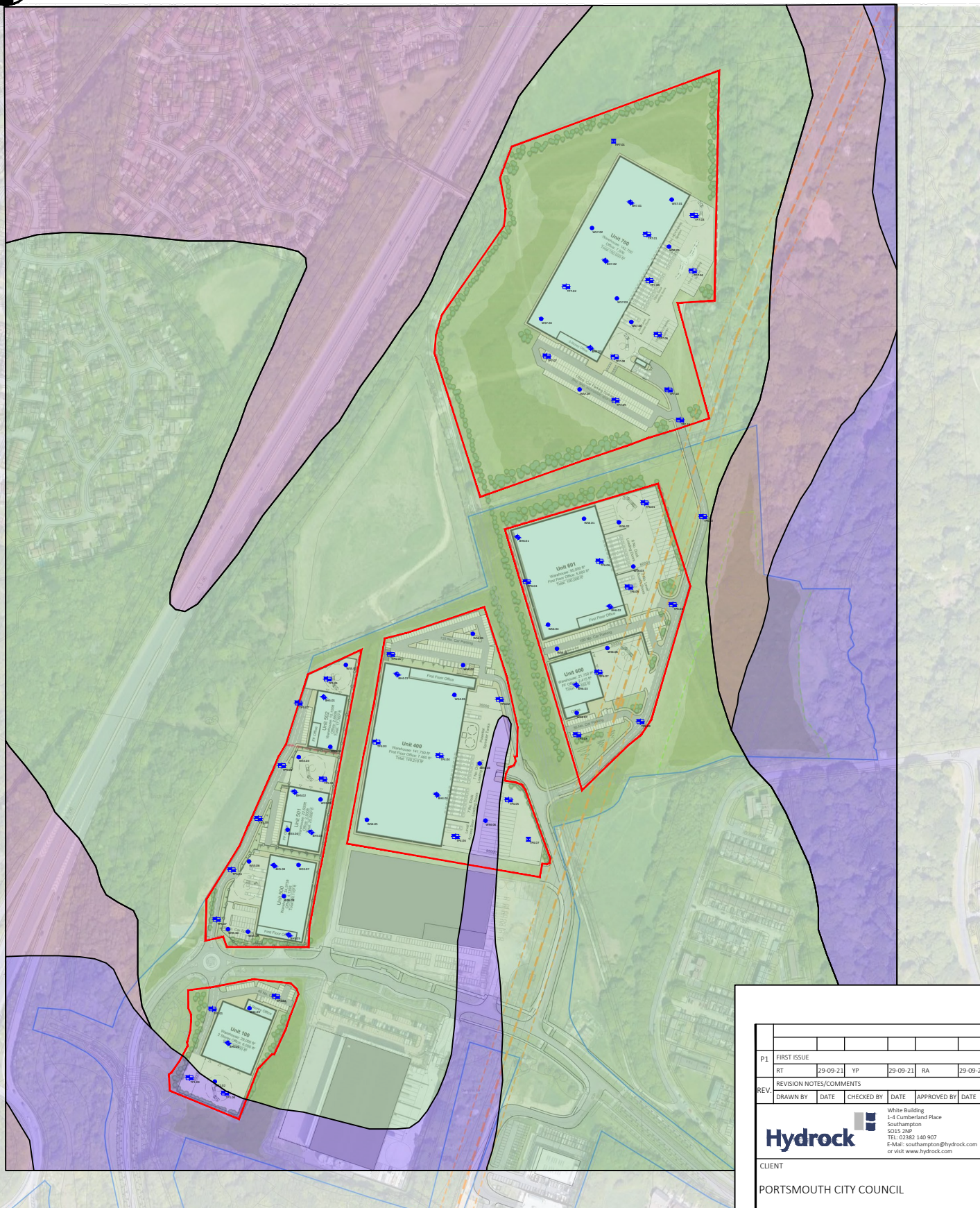


London Clay weathered



London Clay

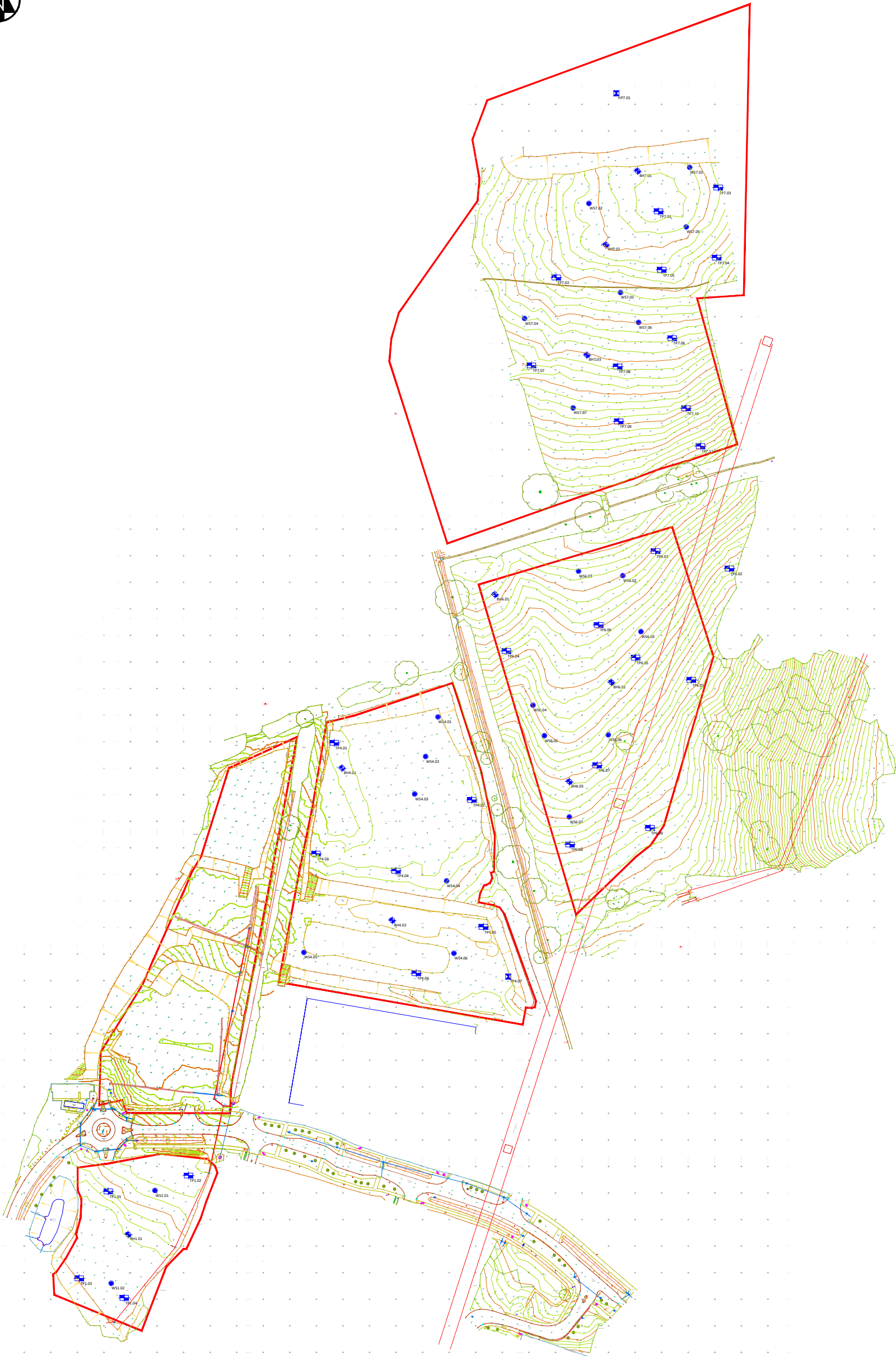
P1	FIRST ISSUE				
S2	RT	28-09-21	YP	28-09-21	RA
REV.	REVISION NOTES/COMMENTS				
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY
White Building 1-4 Cumberland Place Southampton SO15 2NP TEL: 02382 140 907 E-Mail: southampton@hydrock.com or visit www.hydrock.com					
CLIENT					
PORTSMOUTH CITY COUNCIL					
PROJECT					
DUNSBUY PARK					
TITLE					
INDICATIVE CROSS SECTIONS Plots 100, 400, 600s and 700					
HYDROCK PROJECT NO. 19453			SCALE @ A4 1:2000		
PURPOSE OF ISSUE SUITABLE FOR INFORMATION					STATUS S2
DRAWING NO. (PROJECT - ORIGINATOR VOLUME LEVEL TYPE ROLE NUMBER) 19453-HYD-XX-XX-DR-GE-1005					REVISION P1



Key:

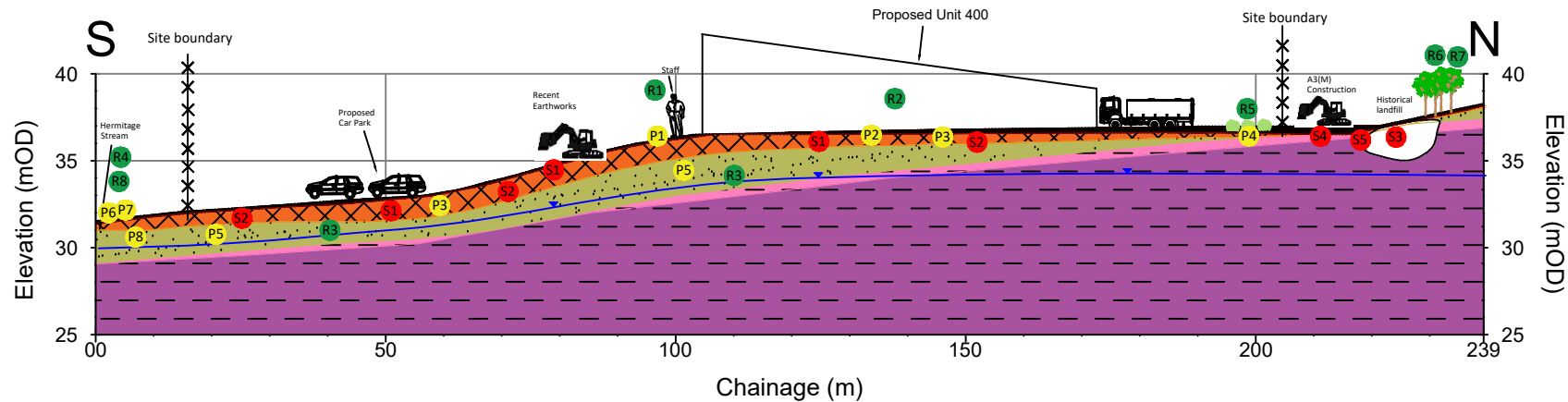
- | | |
|--|--|
|  Borehole |  Head |
|  Windowless sampler borehole |  Bognor sand member |
|  Trial pit - mechanically excavated |  London Clay |
|  Trial pit - hand dug pit | |

P1	FIRST ISSUE				
RT	29-09-21	YP	29-09-21	RA	29-09-21
REVISION NOTES/COMMENTS					
REV	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY
<div>  <div> White Building 1-4 Cumberland Place Southampton SO15 2NP TEL: 02382 140 907 E-Mail: southampton@hydrock.com or visit www.hydrock.com </div> </div>					
CLIENT					
PORTSMOUTH CITY COUNCIL					
PROJECT					
DUNSBRURY PARK					
TITLE					
GEOLOGICAL MAP - BGS					
HYDROCK PROJECT NO. 19453			SCALE @ A4 1:5000		
PURPOSE OF ISSUE SUITABLE FOR INFORMATION					STATUS S2
DRAWING NO. (PROJECT - ORIGINATOR/VOLUME LEVEL-TYPE-ROLE-NUMBER) 19453-HYD-XX-XX-DR-GE-1007					REVISION P1



KEY:		NOTES			<div>Hydrock</div>	TITLE EXISTING SITE PLAN Plots 100, 400, 600 and 700
<div>BH##</div> Borehole						
<div>WS##</div> Windowless sampler borehole						
<div>TP##</div> Trial pit - mechanically excavated						
<div>HP##</div> Trial pit - hand dug pit						
					CLIENT PORTSMOUTH CITY COUNCIL	
					PROJECT DUNSBURY PARK	

Unit 400



NOTE
1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

3. This drawing is indicative only.

Potential on-site sources of contamination

- Made Ground, associated with historical landfill activities and current earthworks/construction works, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S1).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / earthworks and Head Deposits (S2).

Potential off-site sources of contamination

- Made Ground, associated with landfill, historical mining activities (old clay pit, brick and tile works), possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S3).
- Made Ground, associated with earthworks for the construction of A3 (M) in the west boundary on the site, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S4).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / backfilled clay pits/brick works. (S5).
- Hydrocarbon vapours from potential VOC and petroleum hydrocarbon spillages/leaks from unspecified tank located at 110m N of the site. (S6).

Potential receptors

- People (neighbours, site end users) (R1).
- Development end use (buildings, utilities) (R2).
- Groundwater: Secondary A aquifer status of the Bognor Sand Member (R3).
- Surface water: on-site Hermitage Stream in the south east area of the site and an unnamed stream on the eastern boundary of the site (R4).
- Soft landscaping areas (R5)
- Ecology: Habitat Creation Area at the west side of the site (R6).
- Ecology: Designated Ancient and Seminal Woodland / Ancient Replanted Woodland in the surrounding areas of the site (R7).
- Aquatic ecosystem in the Hermitage Stream (R8).

Potential pathways

- Ingestion, skin contact, inhalation of dust and outdoor air by people (P1).
- Direct contact with substances deleterious to building materials (P2).
- Ground gas (Methane, carbon dioxide, etc.) ingress via permeable soils and/or construction gaps (P3).
- Root uptake by plant (P4).
- Migration of contaminant via leachate migration through the unsaturated zone in Bognor Sand Member (P5).
- Surface water via overland flow (P6).
- Surface water, via drainage discharge (P7).
- Surface water via base flow from groundwater (P8).
- VOC and petroleum hydrocarbon vapour ingress via permeable soils and/or construction gaps (P9).

P1	FIRST ISSUE				
S2	YP	02-03-23	AJ	02-03-23	AJ
REV.	REVISION NOTES/COMMENTS				
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY
 <div>White Building 1-4 Cumberland Place Southampton SO15 2NP TEL: 02382 140 907 E-Mail: southampton@hydrock.com or visit www.hydrock.com</div>					
CLIENT					
Portsmouth City Council					
PROJECT					
Dunsbury Park					
TITLE					
Conceptual Site Model - Plot 400					
HYDROCK PROJECT NO. 19453			SCALE @ A4 NTS		
PURPOSE OF ISSUE SUITABLE FOR INFORMATION					STATUS S2
DRAWING NO. 19453-HYD-XX-XX-DR-GE-1013B					REVISION P1

Appendix B Previous Desk Study



Dunsbury Park, Plot 400

Phase 1 Desk Study



Prepared for:
Portsmouth City Council

Date:
12 January 2026

Prepared by:
Yacklin Panza MSc Beng FGS
Luke Evans BSC FGS

Project/File:
02010-STN-XX-XX-RP-GE-1000

Document control sheet

Issued by	Stantec Hydrock Limited Great Suffolk Yard 127-131 Great Suffolk Street London SE1 1PP UNITED KINGDOM stantec.com	+44(0) 203 8468456 stantec.com
Client	Portsmouth City Council	
Project name	Dunsbury Park, Plot 400	
Title	Phase 1 Desk Study	
Doc ref	02010-STN-XX-XX-RP-GE-1000	
Project number	02010	
Status	S2	
Date	12/01/2026	

Document production record

Issue number	P01	Name
Prepared by	Yacklin Panza MSc Beng FGS	
Updated by	Luke Evans BSc FGS	
Checked by	Andrew James BSc CGeol FGS RoGEP David Meredith MSc BSc FGS	
Approved by	Kat Barker MSci CGeol FGS RoGEP	

Document revision record

Issue number	Status	Date	Revision details
P01	S2	12/01/2026	Revision of original desk study, updated Groundsure and Stantec template

Stantec Hydrock Limited has prepared this report in accordance with the instructions of the above named client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.



Table of Contents

Document control sheet	i
1 Introduction	1
1.1 Terms of reference	1
1.2 Project background and Objectives	1
1.3 Available information	1
1.4 Regulatory context and guidance	3
1.5 Uncertainties and limitations	3
1.5.1 Site-specific comments	3
1.5.2 General comments	3
2 Desk study and field reconnaissance	5
2.1 Site referencing	5
2.2 Site Description and field reconnaissance survey	5
2.3 Data sources	7
2.4 Site history	8
2.4.1 Site history summary	9
2.5 Published Geology	10
2.6 Hydrogeology	12
2.6.1 Aquifer Designations	12
2.6.2 Groundwater source protection zones and groundwater vulnerability	13
2.6.3 Groundwater levels, recharge, and flow	14
2.6.4 Groundwater quality	14
2.6.5 Groundwater flooding	14
2.7 Hydrology	14
2.7.1 Surface Water Quality	15
2.7.2 Surface Water Flooding	15
2.8 Mining and mineral extraction	15
2.9 Waste management	16
2.10 Regulatory information	16
2.11 Natural Soil Chemistry	18
2.12 Radon	18
2.13 Unexploded ordnance	18
2.14 Environmental and Agricultural Designations	18
3 Ground hazards	19
3.1 Natural ground instability	19
3.2 Preliminary geotechnical hazard identification	19
3.3 Potential development elements affected	21
4 Outline Conceptual Site Model and Preliminary Risk Assessment	22
4.1 Introduction	22
4.2 Potential contaminants	22
4.2.1 Potential on-site sources of contamination	22
4.2.2 Potential off-site sources of contamination	22
4.3 Potential receptors	22
4.4 Potential pathways	23
4.5 Summary of potential contaminant linkages	23
5 Preliminary development constraints	29
6 Recommendations for Further Work	31
6.1 Ground Investigation Objectives	31
6.2 Geotechnical conclusions	31
6.3 Geoenvironmental conclusions	32
7 References	33



Phase 1 Desk Study

Table of Contents

List of Tables

Table 2-1: Site referencing information	5
Table 2-2: Site description	6
Table 2-3: Site history	8
Table 2-4: Published Geological Sequence	10
Table 2-5: BGS archive borehole logs	11
Table 2-6: Aquifer system	13
Table 2-7: Surface water features	14
Table 2-8: Active licenced surface water discharges	14
Table 2-9: Other surface water information	14
Table 2-10: Mining and mineral extraction	15
Table 2-11: Waste management sites	16
Table 2-12: Regulatory information within 500m of the site	16
Table 2-13: Natural Soil Chemistry	18
Table 2-14: Environmental and Agricultural Designations	18
Table 3-1: Preliminary geotechnical hazard identification	20
Table 4-1: Consequences versus probability assessment	24
Table 4-2: Outline Conceptual Site Model	25
Table 5-1: Preliminary development constraints / recommendations	29
Table 6-1: Possible Contaminant Linkages (for Risk Levels of Moderate or Greater)	32

List of Figures

Figure 2-1: Site location	5
Figure 2-2: Aerial image	5
Figure 2-3: Looking N at from the access track from Fitzwygram Way	7
Figure 2-4: Looking W towards Plot 500	7
Figure 2-5: Looking S across Plot 400 stockpiles	7
Figure 2-6: Artificial Made Ground (Reproduced with permission from Groundsure)	11
Figure 2-7: Superficial Deposits. (Reproduced with permission from Groundsure)	11
Figure 2-8: Solid geology (Reproduced with permission from Groundsure	11
Figure 2-9: Abstractions and source protection zones	13

List of Appendices

Appendix A Drawings

Appendix B Field reconnaissance photographs

Appendix C Historical Ordnance Survey Maps

Appendix D Desk study research information



1 Introduction

1.1 Terms of reference

Please note that for the purpose of this report, any reference to Hydrock should be regarded as Hydrock, now Stantec.

In April 2021, Hydrock Consultants Limited (Hydrock) was commissioned by Avison Young on behalf of Portsmouth City Council (the Client) to undertake a Phase 1 Desk Study at the site known as Dunsbury Park, Fitzwygram Way, Havant, Hampshire, postcode PO9 4EE, comprising approximately 21 ha of land located adjacent to junction 3, east of the A3(M).

In October 2025 Stantec was commissioned to update and re-issue the Dunsbury Park reporting, with previously combined reports split on a plot by plot basis. This report concerns Plot 400 only.

An updated Groundsure report was commissioned as part of this process and is presented within the relevant appendices.

The site is currently open land covered by grass/scrub vegetation and mature trees predominantly limited to field boundaries with several footpaths crossing the area. A recently built roundabout and main access road (Fitzwygram way) is located in the south west area of the site. Park Lane comprises a bridleway/bicycle path and traverses the central area of the site orientated approximately northwest to southeast.

Hydrock understands the proposed development is to comprise the continued construction of new industrial B1/B2/B8 units with a combined floor area of approximately 45,000 sq. m. (470,000 sq. ft.), including associated site infrastructure works. A proposed development layout (Bam designs 'Dunsbury Park Masterplan' Drawing DHF-BMD-MP-XX-DR-A-10014-S2-P19), is presented in Appendix A.

The original works have been undertaken in accordance with Hydrock's proposal Ref (19453-HYD-XX-ZZ-FP-CS-0002 dated 12th April 2021) and the Client's instructions to proceed (confirmation letter sent via email dated 28/04/2021 from Matthew Evans – Portsmouth City Council).

The updating works have been undertaken in accordance with Stantec proposal Ref (21082025-STN-FP-ACGEO-0003-01_) and the Clients instructions to proceed.

1.2 Project background and Objectives

The works have been commissioned as part of the due diligence process and to inform detailed design.

The objective of the Phase 1 Desk Study is to formulate an outline Conceptual Ground Model of the site to identify key geo-environmental and geotechnical risks to the proposed development.

1.3 Available information

The following have been provided to Hydrock by the Client for use in the preparation of this report:

- Avison Young. March 2021. 'Project Brief Dunsbury Park Portsmouth PO9 4EE';



Phase 1 Desk Study

1 Introduction

- Bam design. 17th May 2017. 'Dunsbury Park Masterplan'. Drawing reference: DHF-BMD-MP-XX-DR-A-10014-S2-P19.
- Bam design. 11th May 2017. 'Dunsbury Park – Site infrastructure: External works Eastern access road construction details'. Drawing reference: DHF-BMD-ZZ-XX-DR-S-20511 RD.
- Bam design. October 2014. 'Dunsbury Hill Farm – Below ground drainage strategy'. Drawing reference: 4330.
- Royal Haskoning DHV. December 2014. 'Dunsbury Hill Farm – Adoptable Highway Works. General arrangements'. Drawing reference: PB2348-100-01 to 04.
- Royal Haskoning DHV. December 2014. 'Dunsbury Hill Farm – Adoptable Highway Works. Proposed visibility splays'. Drawing reference: PB2348-101-01 to 05.
- Royal Haskoning DHV. December 2014. 'Dunsbury Hill Farm – Setting out'. Drawing reference: PB2348-110-01 to 04.
- Royal Haskoning DHV. October 2014. 'Dunsbury Hill Farm – Proposed Drainage'. Drawing reference: PB2348-500-01 to 04.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Statutory undertakers'. Drawing reference: PB2348-510-01 to 04.
- Royal Haskoning DHV. December 2014. 'Dunsbury Hill Farm – Pavement construction'. Drawing reference: PB2348-700-01 to 04.
- Royal Haskoning DHV. December 2014. 'Dunsbury Hill Farm – road markings, signage and lighting'. Drawing reference: PB2348-1200-01 to 05.
- Royal Haskoning DHV. December 2014. 'Dunsbury Hill Farm – Adoptable Highway Works. Proposed road sign schedules'. Drawing reference: PB2348-1210-01 to 02.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge – General arrangement plan, section and setting out plan'. Drawing reference: PB2348-1710-01 to 02.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge – Abutment foundation details'. Drawing reference: PB2348-1720-01 to 16.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge – Bridge Deck general arrangement. Drawing reference: PB2348-1730-01 to 07.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge –Kerb drainage and waterproofing details'. Drawing reference: PB2348-1740-01 to 06.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge – gas protection slab plan and sections'. Drawing reference: PB2348-1750-01 to 02.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge – stream realignment general arrangements'. Drawing reference: PB2348-1760-01 to 10.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge – Gabion wall adjacent to gas main protection slabs general arrangements '. Drawing reference: PB2348-1770-01.

It is assumed that the Client has commissioned or obtained assignment of the above documents and Hydrock and Hydrock is entitled to full reliance upon their contents.

The following documents have been reviewed by Hydrock from publicly available sources for use in the preparation of this report:

- Havant Borough Council. Ordnance Survey Map. Havant Borough Conservation areas. Recovered from <https://www.havant.gov.uk/conservation-areas-and-listed-buildings/details-conservation-areas>.



Hydrock acknowledge that these documents are not assigned to The Client, and these have been used for information purposes only. No formal reliance has been placed upon their contents.

1.4 Regulatory context and guidance

The geo-environmental section of this report is written in broad agreement with BS 10175:2011+A2:2017, 'Land Contamination: Risk Management' (LCRM, 2020) and the AGS (2006) 'Good Practice Guidelines for Site Investigations'. The methods used follow a risk-based approach, with the first stage being a Phase 1 desk study and field reconnaissance (this report), with the potential geo-environmental risk assessed qualitatively in future report(s) using the 'source-pathway-receptor contaminant linkage' concept to assess risk as introduced in the Environmental Protection Act 1990 (EPA, 1990).

The geotechnical section of this report is prepared in general accordance with BS EN 1997 (EC7) and BS 8004:2015. This report forms the Preliminary Sources Study Report (PSSR) as defined by DMRB CD622.

Where relevant the NHBC Standards (2021), have also been applied.

Remaining uncertainties and recommendations for further work are listed in Section 5 and Section 7.

1.5 Uncertainties and limitations

1.5.1 Site-specific comments

At the time of the walkover, access to the Plot 400 area was not possible as it was being used as a part of the BAM construction site. Potential sources of contamination may exist in or around this area, or within heavily overgrown areas.

At the time of the updated walkover, this area was accessible and the report has been updated to reflect this.

1.5.2 General comments

Stantec has updated and prepared this report in accordance with the instruction of Portsmouth District Council, by e-mail dated September 2025 under the terms of appointment for Stantec, for the sole and specific use of the Client and parties commissioned by them to undertake work where reliance is placed on this report. Any third parties who use the information contained herein do so at their own risk. Hydrock shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared or for use of the report by any parties not defined in Stantecs appointment.

This report details the findings of work carried out in May to June 2021 and revisited in October 2025. The report has been prepared by Stantec on the basis of available information obtained during the study period. Although every reasonable effort has been made to gather all relevant information, not all potential environmental constraints or liabilities associated with the site may have been revealed.

Groundwater data are only representative of the dates on which they were obtained and both levels and quality may vary.



Phase 1 Desk Study

1 Introduction

Information provided by third parties has been used in good faith and is taken at face value; however, Hydrock cannot guarantee its accuracy or completeness.

The work has been carried out in general accordance with recognised best practice. Unless otherwise stated, no assessment has been made for the presence of radioactive substances or unexploded ordnance. Where the phrase 'suitable for use' is used in this report, it is in keeping with the terminology used in planning control and does not imply any specific warranty or guarantee offered by Hydrock.

The non-specialist UXO screening has been undertaken for the purposes of ground investigation only (i.e. low risk activity in accordance with CIRIA Report C681). Further assessment should be undertaken with regards to other higher risk activities e.g. construction.

Please note that notwithstanding any site observations concerning the presence or otherwise of archaeological sites, asbestos-containing materials or invasive weeds, this report does not constitute a formal survey of these potential constraints and specialist advice should be sought.

Any site boundary line depicted on plans does not imply legal ownership of land.



2 Desk study and field reconnaissance

2.1 Site referencing

The site is referenced in Table 2-1 and the location is indicated in Figure 2-1 and Figure 2-2. The approximate Plot 400 location is outlined in orange.

Table 2-1: Site referencing information

Item	Description
Site name	Dunsbury Park
Site address	Fitzygram Way, Havant, Hampshire, PO9 4EE
Site location	The site is located at the east of A3 (M), adjacent to junction 3, approximately 8 miles north of Portsmouth. The National Grid Reference of the approximate centre of the site is 470044E, 109383N.



Figure 2-1: Site location

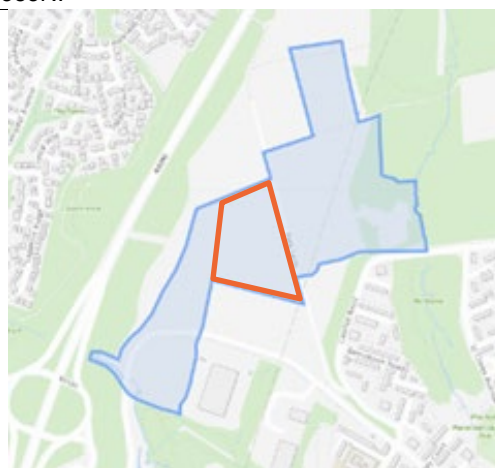


Figure 2-2: Aerial image

A site location plan (Hydrock Drawing 19453-HYD-XX-XX-DR-GE-1001) is presented in Appendix A.

2.2 Site Description and field reconnaissance survey

The original field reconnaissance survey was undertaken on 1st June 2021 to visually assess potential geotechnical hazards, contaminant sources and receptors. The weather during the field reconnaissance survey was sunny and warm. This has been updated with the findings of an additional reconnaissance visit on 11th September 2025.

A basic site description is presented in Table 2-2 and selected photographs are presented in Figure 2-3 to Figure 2-5. Additional photographs are presented in Appendix B.

Table 2-2: Site description

Item	Description
Site access	The site was accessed from Fitzwygram Way.
Site area	The site is irregular in shape and has an area of approximately 7 ha.
Elevation, topography and any geomorphic features	<p>The site is set at various levels and has a history of landfilling activities and earthworks. A number of large earth mounds have been constructed in and around the site.</p> <p>Area drops down sharply towards southern boundary. Beyond is a watercourse (Hermitage Stream) flowing beneath a bridge comprising Fitzwygram Way approximately 5-10m lower than Plot 100 area.</p>
Present land use	<p>Dunsbury Park comprises a commercial development that is partway through construction. Plot 200 is completed and occupied by Fat Face, Plots 3a and 3b are completed and occupied by DPD and Volkswagen. The majority of the main infrastructure has been installed including access via the A3(M) comprising Fitzwygram Way which terminates west of Woolston Road.</p> <p>Plot 500 has been redeveloped into three units which are understood to be occupied.</p> <p>Remaining areas designated for development includes Unit 400. It is currently unoccupied and undeveloped.</p> <p>Plot 400 is unoccupied and can be divided into two separate areas, a lower area to the south and an elevated plateau to the north which occupies the majority of the plot.</p> <p>Access is via hardstanding from Fitzwygram Road with the site currently fenced with concrete vehicle barriers in place.</p> <p>The southern area as shown in Figure 2-4 is largely level with the exception of a linear soil bund approximately 3m high. A number of empty IBS of unknown origin were noted to be present. Two historic Hydrock boreholes could also be located.</p> <p>The upper plateau has been extensively modified since the original walkover in 2021 having been utilised as a stockpile area for materials won from the development of Plot 500. These soil stockpiles are now largely grass covered and areas of ponded water were noted.</p> <p>Park Lane traverses south east to north west and forms the eastern boundary of Plot 400, separating it from Plot 600 and is used as a bicycle path and bridleway with no access for plant/motor vehicles. Park Lane gently slopes up to the north. Public footpaths and bridleways are present in various parts of the site.</p>
Surface cover and vegetation	<p>Trees and hedges denote the majority of site boundaries. Much of the vegetation within plot areas is scrub or grass. Plot 400 has been subject to several phases of earthworks, with the lower slopes showing the remains of a gravel / engineered fill platform and the northern plateau stockpiled soils derived from Plot 500, now grassed over.</p> <p>Trees are predominantly deciduous including oak and a variety of other species.</p>
General site sensitivity	The site is within a generally commercial area with residential to the east and west beyond the A3(M).
Site boundaries and surrounding land	The site is bounded to the south by Fitzwygram Way and units including Fatface. and to the west by the recently developed Plot 500. To the north are further undeveloped areas. Residential properties are present to the east beyond woodland.

Phase 1 Desk Study

2 Desk study and field reconnaissance

Relevant photographs during the site walkover are shown below. The remaining photographs are presented in Appendix B.



Figure 2-3: Looking N at from the access track from Fitzwygram Way



Figure 2-4: Looking W towards Plot 500



Figure 2-5: Looking S across Plot 400 stockpiles

2.3 Data sources

A number of desk study sources have been used to assemble the following information. These are presented in Appendix D and include:

- Updated third party environmental report 9Groudnsure report reference GS-U4V-2GK-WES-N1B)
- Third-party environmental report (Groundsure report, reference HYD-7919293);
- Historical Ordnance Survey mapping;



- BGS Archive Records;
- Zetica UXB Risk Maps (<https://zeticauxo.com/downloads-and-resources/risk-maps/>);

2.4 Site history

A study of historical Ordnance Survey maps (Appendix C) has been undertaken to identify any former land uses at the site and surrounding areas which may have geotechnical or geo-environmental implications for the proposed development. The key findings are summarised in Table 2-3.

Table 2-3: Site history

Reference	Key Features on-site	Key features off-site
OS Map ¹ 1859: 1:2,500	The site comprises an open land surrounded by trees.	Brick and tile works at 125m S of the site. Clay pit and brick kiln at 100m NE. Dunsbury Hill Farm buildings with pond 25m NW.
OS Map 1867: 1:10,560	Site named as Dunsbury Hill and comprises an open land with a road traversing south east to north west through the approximate centre of the site.	Surrounding area was covered by coniferous and deciduous trees. A clay pit was noted at 95m E of the site. Brick kiln at 155m E of the site.
OS Map 1897: 1:2,500	The road in the central area of the site is shown as Park Lane.	Footpath from W to E within the northern area of the site. The Warren Woodland was noted adjacent to the E boundary of the site. Well was noted in the NE. Middle Park Farm in SE.
OS Map 1931: 1:10,560	No significant changes within the site boundary.	Dunsbury Hill Farm identified at the NW of the site.
OS Map 1933: 1:10,560		Unspecified pit at 46m E of the site. Pond now present over former brick and tile works to S.
OS Map 1939: 1:2,500		Unspecified pit at 75m E of the site. Unspecified pit at 351m S of the site.
OS Map 1963: 1:10,560	Hermitage stream running west to east in the southern area of the site.	Neville's Park on the SW. Drain was noted along S boundary. Residential developments at E boundary. Small ponds noted at E and W sides of the site. Unidentified tank at 110 W. Electricity substation at 167m SE, 175m E and 334m SE of the site.
OS Map 1970 – 1973 1:1,250		
OS Map 1980: 1:1,250	Weir installed at Hermitage stream.	Slopes noted across the W boundary of the site for the construction of A3 (M).

¹ Ordnance Survey Historical Map Information provided by Groundsure



Phase 1 Desk Study

2 Desk study and field reconnaissance

Reference	Key Features on-site	Key features off-site
		Hulbert road built at the S of the site. A3 (M) built on W side of the site. Deciduous trees (Beech wood).
OS Map 1985 1:1,250	No significant changes within the site boundary.	Significant increase in residential developments noted on W side of A3 (M). Electricity substation at 319m NW of the site.
Google Earth© Imagery 1999 ²	Site remained undeveloped.	Significant increase in residential development of the surrounding areas of the site.
Google Earth© Imagery 2005 ³	Evidence of possible earthworks/ landfill activities on site.	No significant changes.
Google Earth© Imagery 2016 ⁴	Roundabout and Fitzwygram Way built in the southern area of the site linking Hulbert Road (west) and Woolston Road (east)	Industrial unit at the S boundary of the site (comprising Plot 2 currently let by Fat Face).
Google Earth© Imagery 2019 ⁵	Evidence of possible earthworks/ landfill activities on site.	Industrial unit at the SW of the site (comprising Plot 3a and 3b currently let by Breeze Van Centre Portsmouth and DPD Courier Service. Plot 4 is currently under construction by BAM).
Google Earth© Imagery 2023	Largely unchanged	Completion of Plot 4 development, with construction of one large unit occupied by Biopure Technology
Google Earth© Imagery 2023 & Hydrock Project	Stockpiling of materials derived from Plot 500.	Development of Plot 500 into three development plateaus, industrial units and associated parking and hardstanding

2.4.1 Site history summary

In summary, the site has remained predominantly undeveloped until approximately 2014 onwards, with the exception of the road traversing roughly across the centre of the site, which was first noted in 1867, later named as Park Lane (1897). A footpath was noted across the northern area of the site.

Portsmouth City Council has been engaged in development of infrastructure since 2014 (including site roads, site levelling/plateaus and utility connections). The construction of the roundabout and main road infrastructure (Fitzwygram Way) at the south boundary of the site appeared to be completed in 2016. Currently, Plot 4 has been developed and occupied by a manufacturer identified as Biopure Technology and Plot 500 also into three separate units.

With regards the surrounding areas, some features such as a clay pit, brick and tile works and brick kiln were noted within 200m of the site between 1859 and 1867. In 1970s the construction of residential developments across the area started and continued to increase until 1985. Earthworks were noted along the west boundary of the site between 1980 and 1991 related to the construction of A3 (M).

One historical tank record was noted to the west of the site in 1970 over 100m away. No historical records related to historical garages or military land was identified within 500m of the site during the

² ©The Geoinformation Group, image date: 1//1999.

³ ©The Geoinformation Group, image date: 1/1/2005.

⁴ ©The Geoinformation Group, image date: 11/09/2016.

⁵ ©The Geoinformation Group, image date: 23/07/2019.



Phase 1 Desk Study

2 Desk study and field reconnaissance

desk study research. Eight records of electricity substations were identified within 167m to 500m of the site between 1970 and 1993. One record of a gas governor was identified at 478m west of the site between 1984 and 1992.

Of principal importance since the initial issue of this report has been the import of soils derived from Plot 500 and stockpiled on the northern elevated plateau part of the site.

2.5 Published Geology

The general geology of the site area is shown on the 1:10,000 and 1:50,000 British Geological Survey (BGS) map extracts reproduced as part of the Groundsure report and is summarised in Table 2-4. Extracts from the map are shown in Figure 2-6 to Figure 2-8. The red line represents the wider Dunsbury Park and the blue line represents the approximate Plot 400 area.

Table 2-4: Published Geological Sequence

Reference	Location	Stratigraphic Name	Description
Artificial Ground/Topsoil			
Artificial Ground is indicated to be present on site and in the surrounding 343m, generally to the South. The Made Ground was described as undifferentiated artificial deposits.			
Superficial Deposits (Figure 2.8)			
1, 2, 3	On site	Head	Clay, Silt, Sand and Gravel
5	224m NE		
Solid Geology (Figure 2.9)			
1	On site	Bognor Sand Member (Eocene Epoch)	Comprising the majority of the site area, glauconitic bioturbated or cross-bedded fine- and medium-grained sands, partially cemented.
2	On site	London Clay Formation (Ypresian Age)	Encountered at the south and north east boundaries of the site. Comprises blue-grey or grey-brown bioturbated or poorly laminated slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay.
3	469m NE	Lambeth Group (Thanetian/Ypresian Age)	Vertically and laterally variable sequences mainly of clay, some silty or sandy, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate.
Figures			



Phase 1 Desk Study
2 Desk study and field reconnaissance

Reference	Location	Stratigraphic Name	Description
-----------	----------	--------------------	-------------

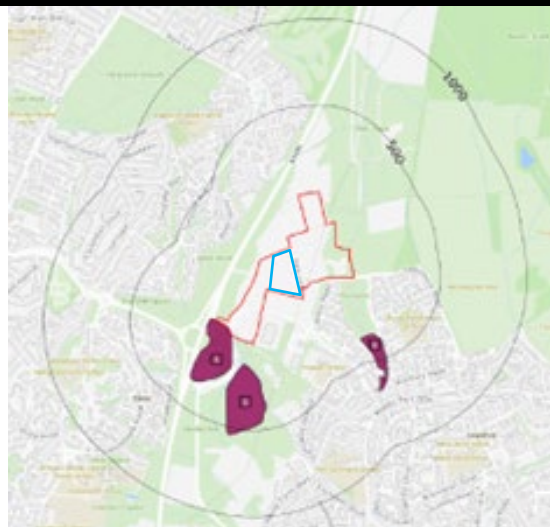


Figure 2-6: Artificial Made Ground (Reproduced with permission from Groundsure)



Figure 2-7: Superficial Deposits. (Reproduced with permission from Groundsure)

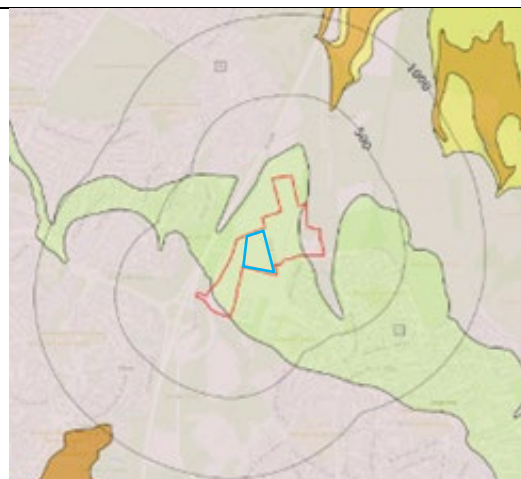


Figure 2-8: Solid geology (Reproduced with permission from Groundsure)

A number of borehole logs from the BGS archive (through GeoIndex) have been reviewed. Selected relevant records are summarised in Table 2-5.

Table 2-5: BGS archive borehole logs

Reference	Location	Strata and Groundwater Observations
SU60NE113	Within the southern boundary	Brown sandy CLAY between ground level and 0.60m below ground level (bgl); Head deposits comprising mottled grey silty sandy CLAY between 0.60m and 2.1m bgl;

Reference	Location	Strata and Groundwater Observations
		<p>Grey organic SILT between 2.10m and 2.40m bgl (probable Head Deposits); and</p> <p>Silty sandy fine to medium GRAVEL between 2.40m and 3.35m bgl (probable Bognor Sand Member).</p> <p>Groundwater recorded at 2.40m bgl.</p>
SU60NE317	30m SW	<p>Fill material comprising firm to stiff multicolour mottled to dark grey sandy clay with rare gravel of flint and chalk between ground level and 8.00m bgl (Made Ground);</p> <p>Firm to stiff brown and grey mottled CLAY between 8.0m and 9.0m bgl (probably London Clay Formation);</p> <p>Dense grey SAND between 9.0m and 13.0m bgl (probably London Clay Formation);</p> <p>Stiff grey CLAY between 13.0 and 16.20m bgl (probably London Clay Formation);</p> <p>Strong grey CLAYSTONE between 16.20 to 16.63m bgl (probably London Clay Formation).</p> <p>Groundwater encountered at 9.0m bgl.</p>
SU60NE45	38m W	<p>Firm Brown silty CLAY from ground level to 0.83m bgl;</p> <p>Light brown grey mottled CLAY between 0.83m to 2.0m bgl (possible London CLAY Formation);</p> <p>Dark grey SILT between 2.0m bgl to 6.24m bgl (possible London CLAY Formation);</p> <p>Grey SILTSTONE between 6.24m and 7.14m bgl (possible London CLAY Formation);</p> <p>Dark grey friable silty CLAY with fossils between 7.14m to 15.0m bgl (possible London CLAY Formation).</p> <p>Groundwater encountered at 3.00m bgl.</p>
SU60NE60	105m NE	<p>Firm mottled grey brown sandy CLAY between ground level and 2.00m bgl;</p> <p>Brown clayey fine SAND between 2.00m and 4.40m bgl (possible Bognor Member);</p> <p>Stiff grey sandy CLAY between 4.40m and 15.00m bgl (possible London Clay Formation);</p> <p>Very stiff becoming hard fissured grey silty CLAY with occasional shell fragments between 15.00 and 30.0m bgl (possible London Clay Formation).</p> <p>Groundwater was encountered at 4.0m, 6.0m, 9.0m and 12.0m bgl.</p>

2.6 Hydrogeology

2.6.1 Aquifer Designations

Based on the inferred geological sequence presented in Section 2.5 and the Environment Agency's interactive aquifer designation map, the aquifer system presented in Table 2-6 applies. Additional information on the hydraulic characteristics of the geological units has been abstracted from Allen et al (1997) and Jones et al (2000).



Table 2-6: Aquifer system

Stratum	Aquifer Designation	Comments
Artificial Ground		
Made Ground	Unclassified	Artificial ground not included in the classification system. Likely to be moderate to high porosity because of unconsolidated nature, but permeability could be constrained to low to moderate because of poor sorting and clay content.
Superficial Deposits		
Head Deposits	Secondary Undifferentiated Aquifer	Intergranular permeability. Dominated by moderate to high permeability layers of sand and gravel, interbedded with low permeability clay. Groundwater flow is likely to be variable and discontinuous as water migrates around low permeability areas.
Solid Geology		
Bognor Sand Member	Secondary A	Intergranular permeability. Dominated by high permeability fine to medium grained sands.
London Clay Formation	Unproductive	Due to its clayey nature, the majority of the London Clay Formation is of little significance as an aquifer.

There are no recorded active licensed groundwater abstractions within 2000m of the site.

2.6.2 Groundwater source protection zones and groundwater vulnerability

The site is within a Zone 1c (Inner) groundwater Source Protection Zone (SPZ1c – inner catchment, confined aquifer), see Figure 2-9.

There is one record of Zone 2 Source Protection Zone (SPZ2 – outer catchment) located at 486m NE of the site boundary.

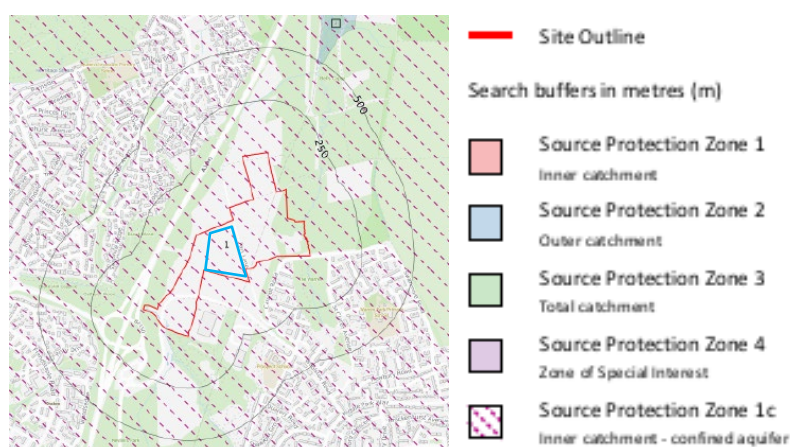


Figure 2-9: Abstractions and source protection zones

2.6.3 Groundwater levels, recharge, and flow

Shallow groundwater is likely to be present within the Artificial Made Ground / Head Deposits, and it is likely to flow towards Hermitage Stream on the southern boundary of the site.

Information from the BGS Hydrogeological Maps and supporting data from BGS historical boreholes indicate groundwater levels within the Bognor Sand Member are likely to be in the order of 2.40 – 4.00m bgl. The groundwater within the sandy clay layers of the London Clay Formation was recorded between 3.0 and 12.0m bgl, and it is likely to be confined by cohesive strata.

2.6.4 Groundwater quality

There are no records related to groundwater quality within site boundary. Down gradient, the East Hants Chalk groundwater body is encountered, which forms parts of the Southeast groundwater catchment area, and its current (2019 cycle 2) overall status under the Water Framework Directive is 'poor'.

2.6.5 Groundwater flooding

The environmental data report indicates a moderate risk of groundwater flooding within the majority of the site area with some high-risk zones in the south and the east due to the presence of surface water features.

2.7 Hydrology

The surface water features in the vicinity of the site are listed in Table 2-7 to Table 2-9.

Table 2-7: Surface water features

Feature	Location	Flow direction
Unnamed surface watercourse (flowing south)	On site (East boundary)	South
Hermitage Stream (flowing south east)	On site (South boundary)	Southeast
Unnamed surface watercourse	225m N	N/A

Table 2-8: Active licenced surface water discharges

Location	Details
1558m NE	Direct spray irrigation License number: 11/42/36.1/3CA Original start date: 03/07/1987 Expiry date: N/R

Table 2-9: Other surface water information



Item	Details
Surface water quality	Reference to the Environment Agency web site shows the site is located within the catchment of the East Hampshire Rivers, with the specific river water body being the Hermitage Stream - source to confluence with Langstone Harbour. The current (2019 cycle 2) overall status under the Water Framework Directive is 'moderate'.
Surface water flooding	The desk study information indicates the majority of the proposed development is in Flood Zone 1 (with a low probability of flooding from rivers or the sea). However, a partial area of the east boundary is considered as Flood Zone 2 (1 in 1000 (0.1%) chance of flooding each year) and Flood Zone 3 (with a 1 in 100 (1%) or greater chance of flooding each year from rivers) No further consideration of flood risk is undertaken in this report. Specialist flood risk advice should be sought with regard to drainage and flooding.

2.7.1 Surface Water Quality

Reference to the Environment Agency web site shows the site is located within the catchment of the East Hampshire Rivers, with the specific river water body being the Hermitage Stream - source to confluence with Langstone Harbour. The current (2019 cycle 2) overall status under the Water Framework Directive is 'moderate'.

2.7.2 Surface Water Flooding

The desk study information indicates the majority of the proposed development is in Flood Zone 1 (with a low probability of flooding from rivers or the sea). However, a partial area of the east boundary is considered as Flood Zone 2 (1 in 1000 (0.1%) chance of flooding each year) and Flood Zone 3 (with a 1 in 100 (1%) or greater chance of flooding each year from rivers)

No further consideration of flood risk is undertaken in this report. Specialist flood risk advice should be sought with regard to drainage and flooding.

2.8 Mining and mineral extraction

The Groundsure report indicates that some evidence of surface mineral works within 250m from the site boundary. There are 6 entries related to chalk mining. These are summarised in Table 2-10.

Table 2-10: Mining and mineral extraction

Location relative to site	Mining activity
Surface Mining and surface groundworks	
122m E	A surface mineral working (Brit Pit). Status: Ceased.
Between 23m and 30m W	Pond, possibly related to old surface mining.
Between 84m and 95m E	Pond, possibly related to old surface mining, previously noted as old clay pit.
124m S	Brick and Tile Works
155m E	Brick Kiln
Between 28m to 211m W	Surface works in the west area of the site (Cuttings) related to construction of A3 (M)
Underground Mining	
On site	Small scale chalk mining may have occurred*



Location relative to site	Mining activity
Between 166m N to 916m N	Small scale and sporadic chalk mining.
*given the anticipated depth of chalk beneath the site this is considered unlikely.	

2.9 Waste management

There is one historical landfill record which covers a large proportion of the east and northern area of the site, as listed in Table 2-11.

Table 2-11: Waste management sites

Site Name	Location	Details
Dunsbury Hill Farm	Cowplain, Hampshire	Waste Licence: Yes Site Reference: 13/3, FHA17 Waste Type: Inert Licence Holder: Gleeson Civil Engineering Limited Operational dates: Not recorded

2.10 Regulatory information

Information in the GroundSure Report (Appendix D), relating to various regulatory controls has been reviewed, with a summary presented below in Table 2-12.

Table 2-12: Regulatory information within 500m of the site

Regulatory Data	Location	Details	Potential Risk	Comment
Waste exemptions	456m NW	Reference: WEX039750 Category: Using waste exemption Description: Use of waste in construction	No	Due to its distance from the site
	465m NW	Site: 8 The Westbrook Centre. PO78SE Reference: EPR/VF0101TS/A001 Category: Treating waste exemption Description: Sorting and de-naturing of controlled drugs for disposal.	No	Due to its distance from the site
	466m NW	Site: 8 The Westbrook Centre. PO78SE Reference: WEX135747 Category: Storing waste exemption Description: Storage of waste in a secure place.	No	Due to its distance from the site



Phase 1 Desk Study
2 Desk study and field reconnaissance

Regulatory Data	Location	Details	Potential Risk	Comment
Discharge Consents	219m N	Two entries on the site known as: Rambles Way. PO7 8RE Effluent Type: Sewage discharges –water company. Permit Number: A01276 Receiving Water: Unnamed tributary of River Wallington Status: New consent Issue date: 28/05/2007 Effective Date: 28/05/2007 Revocation Date: -	Yes	May flow into the unnamed surface watercourse on the eastern site boundary.
Registered radioactive substances	N/A	No entries on registered radioactive substances were recorded within 500m of the site.	No	-
Control of major accident hazards sites (COMAH)	N/A	No entries on registered COMAH sites were recorded within 500m of the site.	No	-
Local Authority Pollution Prevention and Controls	N/A	No entries on registered pollutant release were recorded within 500m of the site.	No	-
Pollution Incidents	101m S	March 2004, sewage materials. Water impact Category 2 – significant incident. Land and air impact Category 3 – minor incident.	No	Event took place over 17 years ago.
	421m SE	December 2002, contaminated water (firefighting run off), Water and air impact Category 3 – minor incident.	No	Due to its distance from the site the Category 3 classification of the incident.
Trade Directory Entries	On site	2 entries on electrical features (Electricity Pole and Pylon)	No	Features considered unlikely to represent a significant risk based on type.
	Between 49m and 221m	9 entries on Electrical features (including substations, poles and pylon)	No	Due to its distance to the site.
	225m S	Gas governor	No	Due to its distance to the site.
Fuel Station Entries	N/A	No entries on registered fuel stations were recorded within 500m of the site.	No	-



2.11 Natural Soil Chemistry

Information contained within the Groundsure report (Appendix D) gives indicative (estimated) concentration values for the natural soils at the site for a selection of Contaminants of Potential Concern (CoPC). These have been reproduced in Table 2-13.

Table 2-13: Natural Soil Chemistry

Element	Arsenic	Cadmium	Chromium	Lead	Nickel
Concentration (mg/kg)	15	1.8	60 - 90	100	15 - 30

2.12 Radon

The radon risk is reported in the Groundsure report. The guidance indicates that the site is not in a Radon Affected Area (less than 1% of homes are above the action level). Therefore, no radon protection measures are required.

2.13 Unexploded ordnance

In general accordance with CIRIA Report C681 (Stone et al 2009) a non-specialist UXO screening exercise has been undertaken for the purposes of ground investigation.

Based on UXO risk mapping available at <https://zeticauxo.com/downloads-and-resources/risk-maps/>, the majority of the site is classified as low risk with regards to UXO. However, due to its proximity to a moderate to high-risk area of UXO, a specialist UXO risk assessment in accordance with CIRIA Report C681 is recommended. The UXO risk map is presented in Appendix D.

2.14 Environmental and Agricultural Designations

There are 39 entries related to areas with environmental designations within 2000m from the site boundary. There are 3 entries related to agricultural land, one open access land record and one environmental and countryside stewardship schemes record. These are summarised in Table 2-14.

Table 2-14: Environmental and Agricultural Designations

Location	Site Classification	Name/ Description
1677m N	Local Nature Reserves (LNR)	Hazleton Common LNR
176m NE	Ancient & Semi-Natural Woodland	Bells Copse
Between 200 to 1825m		20 entries labelled as Unknown
223m E		Cabbagefield Row
418m S		Bushy Lease
755m NW		The Queens Inclosure
927m E		Round Wood
1403m SE		Great Copse
1659m E		Hammond's Lands Copse
1914m E		Wakeford's Copse
438m NE	Ancient Replanted Woodland	Bells Copse
Between 753m to 1762m		5 entries labelled as Unknown



Location	Site Classification	Name/ Description
831m NE		Forest Of Bere
907m NW		The Queens Inclosure
On site	Nitrate vulnerable zones	Chichester, Langstone and Portsmouth Harbours Eutrophic NVZ (TraC) – Eutrophic water
469m N		Hampshire Chalk - groundwater
On site (centre)	Agricultural land Grade 3	Good to moderate quality agricultural land.
On site (north and south)	Agricultural land Grade 4	Poor quality agricultural land. Land
141m NE	Non agricultural	-
71m E	Section 16 Dedicated Land	Open access land SEE/13852
On site	Environmental Stewardship Schemes	Entry Level plus Higher Level Stewardship from 01/10/2013 to 30/09/2023
223m E	Countryside Stewardship Schemes	Countryside Stewardship (Higher Tier) from 01/01/2017 to 31/12/2026

3 Ground hazards

3.1 Natural ground instability

The majority of the site lies within Bognor Sand Member, and the risk of shrink swell clay is negligible to low due to its likely non-plastic condition. However, trees and hedges are present around the site boundaries and sporadically across the site and the presence of cohesive deposits of the London Clay Formation within the north and south boundaries of the site may be affected by potential for shrink-swell ground movements in clays as a result of changes in moisture content from removal or growth of trees. This can pose a significant risk of shrink swell clays. Head Deposits containing cohesive soils may also represent a potential shrink swell risk.

The Groundsure reports indicates risk of running sands, landslides, compressible and collapsible deposits within site boundary is very low to low. However, due to the unknown composition and extend of the made ground, risk of running sands can not be discounted. No soluble rocks were identified within the site boundary although will be present at depth beneath the London Clay Formation and subsequently the Lambeth Group; it is considered that the risk of ground dissolution is negligible at the site.

3.2 Preliminary geotechnical hazard identification

Potential geotechnical hazards have been assessed in accordance with the general requirements of ICE/DETR Document 'Managing Geotechnical Risk' and the HE documents HD 41/15 and CD 622. The following pages set out the identified geotechnical risks and hazards which are associated with the proposed development and establish the approach which is to be taken to manage the risks including the geotechnical input and analysis.

Table 3-1 is a preliminary assessment of possible geotechnical hazards at the site at Desk Study stage. This information is used to assist with site investigation design.



Phase 1 Desk Study

3 Ground hazards

Table 3-1: Preliminary geotechnical hazard identification

Hazard	Hazard Plausible	Hazard Unlikely	Comment
Uncontrolled Made Ground (variable strength and compressibility).	X		Artificial made ground and fill material is anticipated to be on site with variable strength and composition.
Soft / loose compressible ground (low strength and high settlement potential).	X		Of specific note the stockpiled materials derived from Plot 500
Shrink swell of the clay fraction of soils under the influence of vegetation.	X		London Clay Formation is expected to be encountered in the north and south areas of the site. Moreover, the presence of mature trees can pose a risk of shrink swell.
Variable lateral and vertical changes in ground conditions.	x		The site is set at various levels and Made Ground and historical landfill may be variable in composition and thickness and this may pose implications to foundation design.
High sulfates present in the soils.	X		Sulfates may be present in soils at the site.
Adverse chemical ground conditions, (e.g. expansive slag).		X	The site has not been previously developed. Therefore, no adverse chemical ground conditions are expected.
Obstructions.	X		The site has not been previously developed. However, obstructions may be present due to the historical landfill activities and possible import of materials from Plot 500
Existing below ground structures to remain (on or off-site tunnels, foundations, basements, and adjacent sub-structures).		X	The site has not been previously developed. Therefore, existing below ground structures are not anticipated.
Shallow groundwater.	X		Shallow groundwater may be present within the Artificial Made Ground / Head Deposits. Groundwater was recorded to be present within the Bognor Sand Member between 2.40 – 4.00m bgl, and at 3.0m bgl within London Clay Formation in BGS borehole data.
Changing groundwater conditions.	X		Phreatic levels can fluctuate seasonally.
Risk from erosion.		X	Steep slopes were seen in the vicinity of the power lines in the east and also on the western boundary of Units 500 to 502, however this is not relevant to Plot 400.
Risk from flooding.		X	The majority of the site is within Flood Zone 1 (with a low probability of flooding from rivers or the sea). Therefore, risk from flooding is considered low.
Running sands and / or loose Made Ground, leading to difficulty with excavation and collapse of side walls.	X		Artificial Made Ground and fill material is anticipated to be on site with variable strength and composition.



Phase 1 Desk Study

3 Ground hazards

Hazard	Hazard Plausible	Hazard Unlikely	Comment
Mining.		X	No significant mining activities were identified within the site boundary or surrounding areas.
Slope stability issues – general slopes.	X		The site level is variable and there are some steep slopes and large earth mounds on and around site. General slopes and retaining walls likely to be required.
Slope stability issues – retaining walls.	X		
Earthworks – settlement (due to placement of fill on soft / loose ground).	X		
Earthworks – poor bearing capacity of new fill.	X		
Earthworks – unsuitability of site won material to be reused as fill.	X		
Solution features in Chalk.		X	Chalk geology is present at depth beneath the site below the London Clay Formation and Lambeth Group.
Cavities in the Superficial Deposits due to solution features.		X	Local geology is unlikely to suffer from dissolution.
Dissolution (associated with “wet rock head”).		X	
Brine extraction.		X	Unlikely. Brine extraction is not recorded at the site.

3.3 Potential development elements affected

Development elements potentially affected by geotechnical hazards are:

- Buildings – foundations.
- Buildings – floor Slabs
- Roads and pavements.
- Services.
- General slopes.
- Retaining walls.
- Public open spaces (POS).
- Construction staff, vehicles and plant operators.
- Concrete below ground.

Health and safety risks to site Contractors and maintenance workers have not been assessed during these works and will need to be considered separately during design.

The above plausible geotechnical hazards and development elements affected have been carried forward for investigation and assessment.



4 Outline Conceptual Site Model and Preliminary Risk Assessment

4.1 Introduction

The outline Conceptual Model (oCM) incorporates evidence from the site walkover, the Desk Study and previous investigations carried out at the site. The formulation of an outline Conceptual Model is a key component of the LCRM methodology. The oCM incorporates a ground model of the site physical conditions and an exposure model of the possible contaminant linkages; it forms the basis for Generic Quantitative Risk Assessment (GQRA) in accordance with current guidelines.

4.2 Potential contaminants

For the purpose of this assessment the potential contaminants have been separated according to whether they are likely to have originated from an on-site or off-site source.

4.2.1 Potential on-site sources of contamination

- Made Ground, associated with historical landfill activities and current earthworks/construction works, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S01).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill and Earthworks (S02).

4.2.2 Potential off-site sources of contamination

- Made Ground, associated with historical mining activities (old clay pit, brick and tile works), possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S03).
- Made Ground, associated with earthworks for the construction of A3 (M) in the west boundary on the site, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S04).
- Made Ground associated with earthworks for the construction of Plot 500. This has been combined with the existing S04.
- Hydrocarbon vapours from potential VOC and petroleum hydrocarbon spillages/leaks from unspecified tank located at 110m N of the site. (S05).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / backfilled clay pits/brick works. (S06).

4.3 Potential receptors

The following potential receptors in relation to the proposed land use have been identified.

- People (neighbours, site end users) (R01).
- Development end use (buildings, utilities and landscaping) (R02).
- Groundwater: Secondary A aquifer status of the Bognor Sand Member (R03).



- Surface water: on-site Hermitage Stream in the south east area of the site and an unidentified stream on the eastern boundary of the site (R04).
- Soft landscaping areas (R05)
- Ecology: Habitat Creation Area at the west side of the site (R06).
- Ecology: Designated Ancient and Seminatural Woodland / Ancient Replanted Woodland in the surrounding areas of the site (R07).
- Aquatic ecosystem in the Hermitage Stream (R08).

4.4 Potential pathways

The following potential pathways have been identified.

- Ingestion, skin contact, inhalation of dust and outdoor air by people (P01).
- Direct contact with substances deleterious to building materials (P02).
- Ground gas (Methane, carbon dioxide, etc.) ingress via permeable soils and/or construction gaps (P03).
- VOC and petroleum hydrocarbon vapour ingress via permeable soils and/or construction gaps (P04).
- Root uptake by plant (P05).
- Migration of contaminant via leachate migration through the unsaturated zone in Bognor Sand Member (P06).
- Surface water via overland flow (P07).
- Surface water, via drainage discharge (P08).
- Surface water via base flow from groundwater (P09).

Health and safety risks to site development contractors and maintenance workers have not been assessed as part of this study and will need to be considered separately.

4.5 Summary of potential contaminant linkages

Table 4-2 lists the plausible contaminant linkages which have been identified. These are considered as potentially unacceptable risks in line with guidelines published in CLR 11 and additional risk assessment is required.

Source – Pathway – Receptor Linkages have been assessed in general accordance with guidance in CIRIA Report C552 (Rudland et al 2001) but with the addition of a 'no linkage' category.

It should be noted that whilst the risk assessment process undertaken in this report may identify potential risks to site demolition and redevelopment workers, consideration of occupational health and safety issues is beyond the scope of this report and need to be considered separately in the Construction Phase Health and Safety Plan.