

Dunsbury Park, Plot 400

Phase 1 Desk Study



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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';



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- 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.



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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

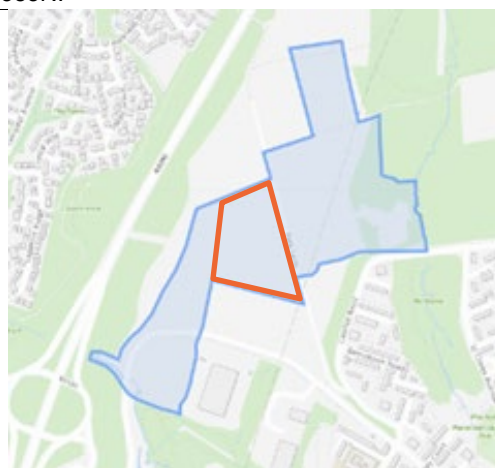


Figure 2-2: Aerial image

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.

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



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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.



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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			



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Reference	Location	Stratigraphic Name	Description
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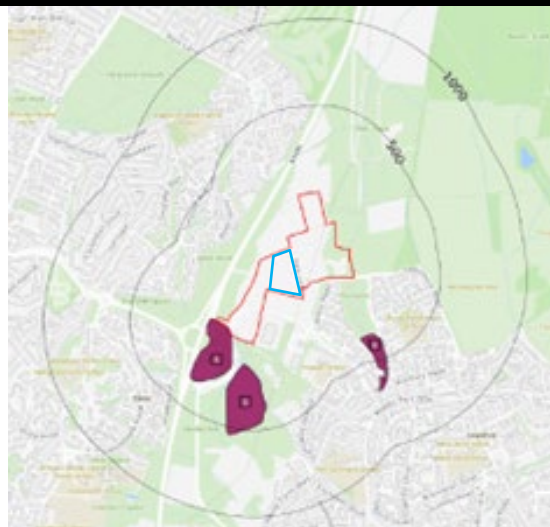


Figure 2-6: Artificial Made Ground (Reproduced with permission from Groundsure)



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

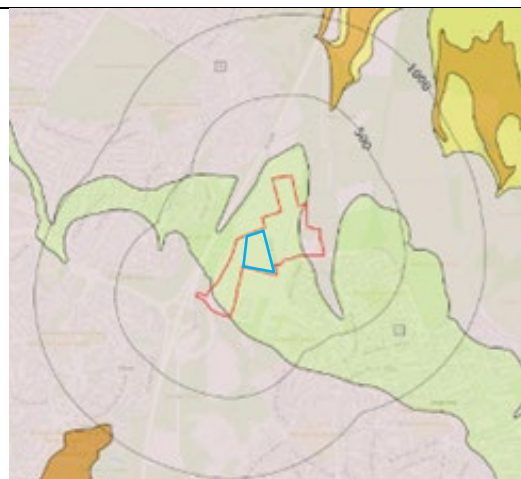


Figure 2-8: Solid geology (Reproduced with permission from Groundsure)

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.

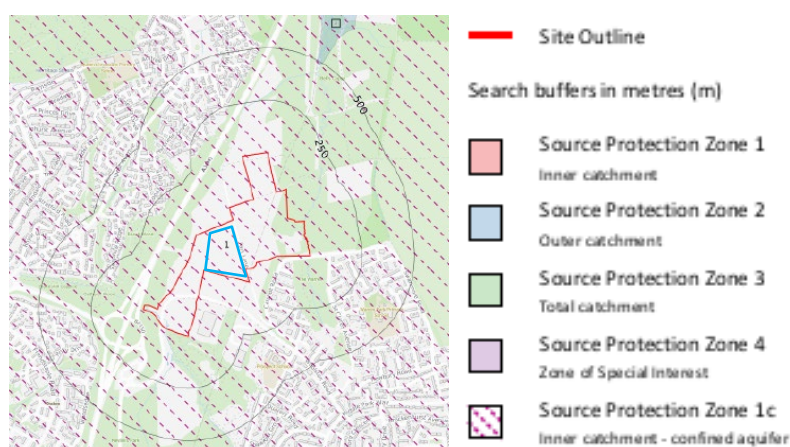


Figure 2-9: Abstractions and source protection zones

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



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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.



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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.



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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.



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4 Outline Conceptual Site Model and Preliminary Risk Assessment

Table 4-1: Consequences versus probability assessment

		Consequence			
Probability		Severe	Medium	Mild	Minor
	High Likelihood	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Low risk	Very low risk
	Low Likelihood	Moderate risk	Low risk	Low risk	Very low risk
	Unlikely	Low risk	Very low risk	Very low risk	Very low risk
	No Linkage	No risk			



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4 Outline Conceptual Site Model and Preliminary Risk Assessment

Table 4-2: Outline Conceptual Site Model

Source	Pathway	Receptor	Probability	Consequence	Risk Level	Comment	
Made Ground, associated with historical landfill and current earthworks (metals, metalloids, PAH, hydrocarbons) (S01).	Ingestion, inhalation or direct contact (P01)	Site users (R01)	Likely	Medium	Moderate	Made Ground and "inert" landfill materials anticipated to be in some areas across the site and its composition is currently unknown.	Contact with these materials is likely in areas of Public Open Space. Mitigation measures will be required to break the SPR linkage.
	Inhalation of fugitive dust (P01)	Neighbours (R01)	Low likelihood	Medium	Low		The risk of significant generation of dust is likely only during site development process and can therefore be controlled.
	Leaching through unsaturated zone (P06)	Groundwater (R03)	Low likelihood	Medium	Low	The site has not been developed and no contamination is expected to be significant to water bodies.	
	Surface run-off.	Aquatic ecosystems (R08)	Low likelihood	Medium	Low		
	Base flow from contaminated groundwater (P11)	Surface water (R04)	Low likelihood	Medium	Low		
	Root uptake (P05)	Soft landscape planting (R05) Habitat Creation Area (R06)	Unlikely	Mild	Very Low	Made Ground is anticipated across some areas of the site. Whilst root uptake is possible in areas of Public Open Space (POS) and Habitat Creation area, the concentrations of metals are not expected to be significantly elevated with regard to plant growth.	
Made Ground below the site associated with	Inhalation of fugitive dust (P01)	Site users (R01)	Likely	Medium to Severe	Moderate to High	Composition of Made Ground / landfill is	Contact with these materials is likely in



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Source	Pathway	Receptor	Probability	Consequence	Risk Level	Comment
historical landfills and current earthworks (asbestos) (S01)						unknown. Therefore, general contamination may be present.
		Neighbours (R01)	Low likelihood	Medium to Severe	Moderate	gardens and areas of Public Open Space. Mitigation measures will be required to break the SPR linkage. The risk of significant generation of dust is likely only during site development process and can therefore be controlled. Suppression should be included in control measures. If ACM is present on site, works to be undertaken in accordance with CAR 2012.
Made Ground associated with historical landfill and current earthworks hydrocarbons) (S01)	Direct contact (P02)	Water supply pipes (R02)	Low likelihood	Medium	Low	There are landfills in some areas across the site containing unknown fill materials. Landfill noted to accept "inert" materials.
Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill and earthworks below the site (S02)	Migration, build up and asphyxiation (P03)	Site users (R01)	Likely	Medium to Severe	Moderate to High	Made ground and landfill composition is unknown and significant concentrations of ground gas including carbon dioxide, methane and others may be present. Ground gas monitoring is recommended for the designing mitigation measures if required.
		Neighbours (R01)		Medium	Moderate	
Ground gases (carbon dioxide and methane) from organic materials in the Made Ground /	Migration, build up and explosion (P03)	Buildings on site (R02)	Likely	Medium to Severe	Moderate to High	
		Buildings on adjacent sites (R02)				



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Source	Pathway	Receptor	Probability	Consequence	Risk Level	Comment
landfill and earthworks below the site (S02)						
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 hydro-carbons (S03).	Ingestion, inhalation or direct contact (P01)	Site users (R01)	Low Likelihood	Medium	Low	Low likelihood to pose a risk due to the significant time elapsed since these activities took place.
	Inhalation of fugitive dust (P01)	Neighbours (R01)	Low likelihood	Medium	Low	
	Leaching through unsaturated zone (P06)	Groundwater (R03)	Low likelihood	Medium	Low	
	Surface run-off.	Aquatic ecosystems (R08)	Low likelihood	Medium	Low	
	Base flow from contaminated groundwater (P11)	Surface water (R04)	Low likelihood	Medium	Low	
	Ingestion, inhalation or direct contact (P01)	Site users (R01)	Low likelihood	Medium	Low	
	Inhalation of fugitive dust (P01)	Neighbours (R01)	Low likelihood	Medium	Low	
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).	Ingestion, inhalation or direct contact (P01)	Site users (R01)	Low likelihood	Medium	Low	Construction of the A3(M) likely involved excavation of natural soils and is considered unlikely to have a significant impact on the site.
	Inhalation of fugitive dust (P01)	Neighbours (R01)	Low likelihood	Medium	Low	
	Leaching through unsaturated zone (P06)	Groundwater (R03)	Low likelihood	Medium	Low	
	Surface run-off.	Aquatic ecosystems (R08) Surface water (R04)	Low Likelihood	Medium	Low	
Hydrocarbon vapours from potential VOC and petroleum hydrocarbon spillages/leaks from	Ingestion, inhalation or direct contact (P01)	Site users (R01)	No linkage	-	No risk	The tank was located at 110m N off-site and it was only recorded on historical mapping in 1970. It is not considered to pose a risk as there is no pathway between source.
		Neighbours (R01)	No linkage	-	No risk	
	Direct contact	Water supply pipes (R02)	No linkage	-	No risk	



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Source	Pathway	Receptor	Probability	Consequence	Risk Level	Comment
unspecified tank located at 110m N of the site. (S05).	Leaching through unsaturated zone.	Groundwater (R03)	No linkage	-	No risk	In terms of migration via leaching to the unsaturated zone, as it lies over London Clay Formation and this comprises generally cohesive soils, of unproductive strata, there is no link between source and receptor; therefore, risk level is considered negligible. Furthermore, the A3(M) is present at low elevation between the former tank and the site.



5 Preliminary development constraints

Based on the Desk Study information presented above, preliminary development constraints with regards to the development of the site, are presented in Table 5-1.

It should be noted that these recommendations are based on the limited data available from the Desk Study and Hydrock's experience. All preliminary development constraint comments are subject to review and change in the light of the site investigation, assessment and design.

Table 5-1: Preliminary development constraints / recommendations

Element	Potential constraint and recommendation
Site Preparation, Earthworks and Groundworks	<p>Topsoil and any organic Made Ground should be removed from beneath all earthworks, buildings and hardstanding areas. This will generate significant volumes of Topsoil, which will need to be accommodated as part of the proposed development.</p> <p>Obstructions are likely in the landfilled area and may require breaking equipment or heavy-duty plant to remove them.</p> <p>Excavations should be readily achievable using standard plant.</p> <p>Excavations are likely to be stable in the short to medium term. However, collapse of excavation faces in the coarse soils is to be anticipated.</p> <p>Water seepages into excavations is possible. However, significant seepages are unlikely and should be adequately controlled by sump pumping.</p> <p>Excavated soils should be suitable for reuse, if required, subject to chemical testing, earthworks testing and testing in accordance with the British Standard for Topsoil.</p> <p>Excavated soils generally should be suitable for reuse, subject to testing and placement in accordance with a suitable Specification.</p> <p>Some management of soils and remediation will be required with regards to the Made Ground (if present).</p>
Foundations	<p>Strip or trench fill foundations may be appropriate across the majority of the site, founding on the firm or stiffer clays of the London Clay Formation, or medium dense and denser coarse soils within Bognor Sand Member. It is currently considered that the Head Deposits are unlikely to be suitable founding strata, though in-situ testing may prove otherwise. If significant Made Ground is present, traditional foundations may not be feasible.</p> <p>Deepening will be required where construction is in close proximity to trees or locally due to low strength soils. If deepening due to trees means that the foundation depth is >2.5m bgl piling or ground improvement may be required.</p>
Floor Slabs	<p>To be confirmed following appropriate ground investigation. However, if the near surface soils are found to be of medium volume change potential or higher, suspended ground floor slabs would be required.</p>



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5 Preliminary development constraints

Roads	Assume an equilibrium design CBR value of 2.5% on natural clays, sand or earthworks fill. If Made ground is left in place a CBR of <2.5% is recommended.
Soakaways	Soakaway drainage is unlikely to be a viable drainage solution in the Head Deposits or London Clay. However, this will depend on the actual clay content of the soil within the Head Deposits (which will dictate infiltration rate) and water levels. Soakaway drainage may be possible within unsaturated granular soils of the Bognor Sand Formation.
Buried Concrete	Assume a Design Sulfate Class DS- 1 and ACEC Class AC-1 (equivalent to Design Chemical Class DC-2 for a 50-year design); however, this will ultimately depend upon the results of testing. Pyritic strata of the Bognor Sand and London Clay Formation may require a higher DS and ACEC design parameters.
Water Supply Pipework	Likely, based on existing data, to be standard pipework but confirmation should be sought from the water supply company, following completion of intrusive works.
Remediation	Significant, pervasive contamination is not anticipated (historical landfill noted as “inert”) and more likely to be in the form of ‘hotspots’ (if present). If so, localised hotspot removal will be required. This material may be able to be treated and reused on site, or will need to be disposed of off-site. Any Asbestos Containing Materials encountered will need to be disposed of off-site. A Materials Management Plan will be required for the earthworks.
Protection from Ground Gases	Radon protective measures are unlikely to be required. The requirement for ground gas protection measures will be confirmed following the ground investigation, installation of boreholes and gas monitoring programme
Waste Disposal	Topsoil is potentially classified as non-hazardous waste. However, this is dependent upon the organic matter in the soil and if >6% organics could be classified as hazardous waste if disposed. Made Ground soils will need to be tested to determine waste classification. Natural uncontaminated soils are likely to be suitable to be disposed of at an inert landfill.



6 Recommendations for Further Work

6.1 Ground Investigation Objectives

In order to confirm the actual risks to receptors and confirm the ground conditions with respect to potential geotechnical and geo-environmental risks, an appropriate intrusive investigation will need to be undertaken. This investigation will need to:

- determine the depth and distribution of Made Ground and natural strata across the site;
- determine the soil strength/density profile beneath the site;
- determine the depth/level of groundwater beneath the site;
- determine the ground gas concentrations beneath the site;
- determine CBRs to inform pavement design;
- assess trench stability, over break potential and 'dig-ability';
- allow soil infiltration rate testing;
- allow sampling for chemical and geotechnical laboratory testing;
- allow soil classification to allow geotechnical characterisation and determine suitability for reuse of soils within earthworks;
- obtain information in terms of Aggressive Chemical Environment for Concrete Class (ACEC Class).

Provision of a detailed UXO risk assessment is recommended prior to any intrusive investigation works.

Following investigation, assessment will be required to:

- update the Ground Model;
- update the Geotechnical Risk Register;
- provide Geotechnical Design recommendations;
- update the Conceptual Site Model (CSM), including identification of plausible pollution linkages;
- undertake generic quantitative risk assessment of potential chemical contaminants to establish 'suitability for use' under the current planning regime;
- discuss potential environmental liabilities associated with land contamination (soil, water and gas); and
- provide outline mitigation recommendations to ensure the site is 'suitable for use'.

6.2 Geotechnical conclusions

The following plausible geotechnical risks are identified.

- Variable Made Ground - settlement or differential settlement of foundations, floor slabs, roads and infrastructure elements.
- Low strength, compressible ground – risk of shear failure and excessive settlement of foundations, roads and infrastructure elements.
- Shrinkage/swelling of clay – settlement/heave of foundations, especially where located within the influence of trees and vegetation.



Phase 1 Desk Study

6 Recommendations for Further Work

- Variable lateral and vertical changes in ground conditions – underlying geology may be variable in depth and composition and pose design implications.
- Attack of buried concrete by aggressive ground conditions – the development site may contain Made Ground and potentially sulfate bearing soils.
- Shallow groundwater – surface watercourses are present on the site's southern and eastern boundaries and the site is recorded to be at a moderate to high risk of groundwater flooding. The groundwater conditions are likely to fluctuate seasonally.
- Running sands, loose Made Ground and shallow groundwater, leading to difficulty with excavation due to trench instability.
- Instability of slopes and impact on foundations, floor slabs, roads and infrastructure and construction plant.
- Potential for obstructions and the risk of instability of excavations with the impact on construction staff, vehicles and plant operators.
- Earthworks – Low bearing capacity or settlement of new fill and impact on foundations, floor slabs, roads and infrastructure and construction plant.
- Potential for unforeseen ground conditions and the risks associated with limited data.

These plausible risks require further investigation and assessment (see Section 7).

6.3 Geoenvironmental conclusions

Based on historical and current land uses, it is unlikely that the site would be classified as Contaminated Land under Part 2A of the EPA 1990.

The overall risk from land contamination at the site is considered to be low with some specific moderate and potentially high risks for the current development. The site is largely Greenfield historically; however, historical landfills and current earthworks / construction works indicate contamination may exist. This would need to be confirmed by appropriate intrusive investigation, testing and assessment of the results of the investigation.

The possible pollutant linkages (for risk levels of moderate or greater) on an unremediated redeveloped site, as determined by the desk study and walk-over, are summarised in Table 6-1:

Table 6-1: Possible Contaminant Linkages (for Risk Levels of Moderate or Greater)

Source(s)	Receptor(s)
Made Ground, associated with historical landfills and current earthworks/ construction works, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S01).	Site users Neighbours
Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill and Earthworks (S02).	Site Users Neighbours Buildings

These possible pollutant linkages require further investigation and assessment (see recommendations below).



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Phase 1 Desk Study

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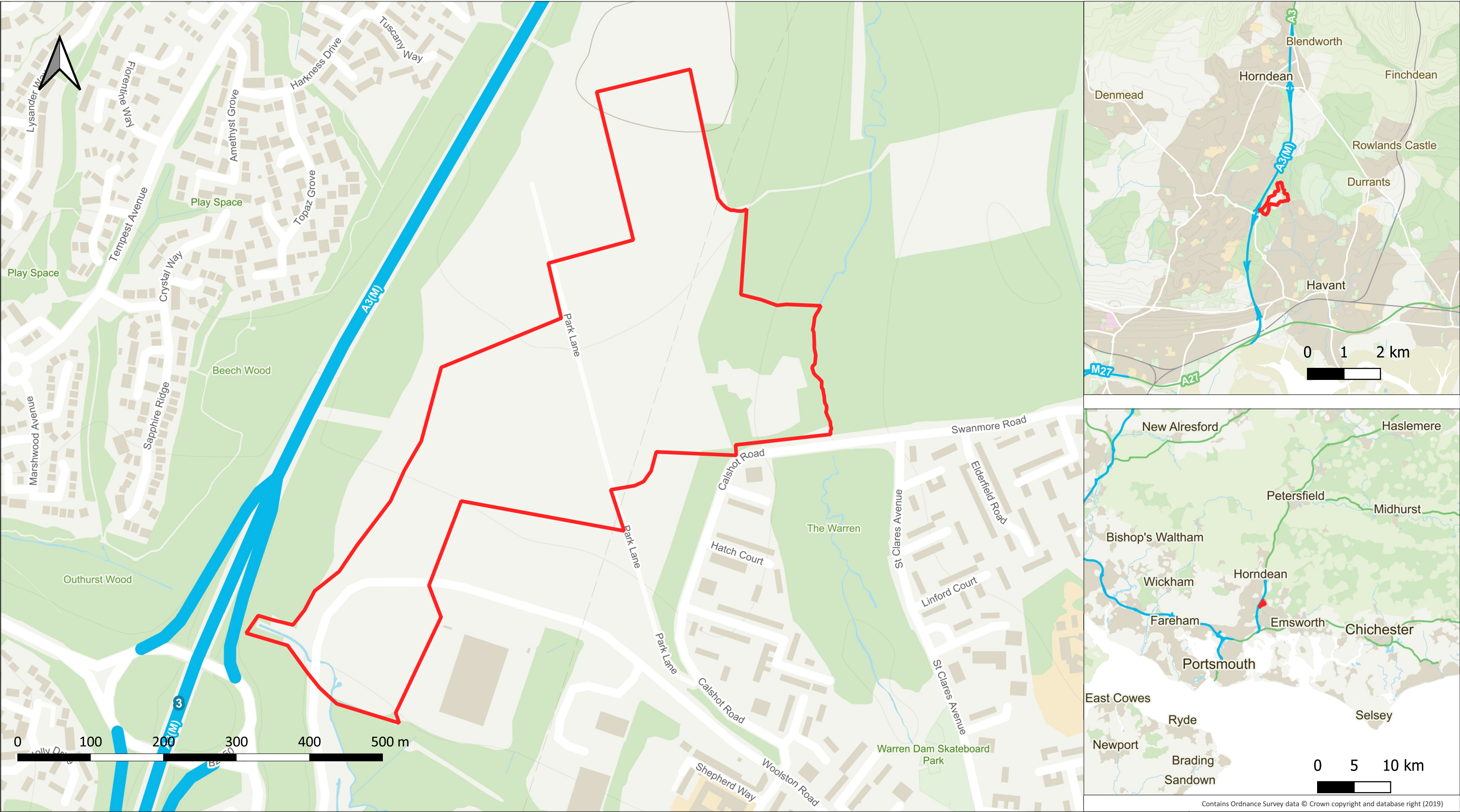


Appendices



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

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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

Appendix B Field reconnaissance photographs





Figure 1: Looking W from entrance to Plot 400



Figure 2: Looking N from entrance to Plot 400



Figure 3: Looking S towards Fitzwygram Way



Figure 4: Historic / unfinished service runs at plot entrance



Figure 5: Looking W along lower plateau with Plot 500 in distance. Note empty IBC



Figure 6: Looking E along lower level of plot



Figure 7: Looking NE, note 3m high soil bund



Figure 8: Monitoring well at base of soil bund



Figure 9: Looking S over soil bund towards Plot 4



Figure 10: Looking S parallel to E boundary of plot. Note developed Plot 500 to immediate right.



Figure 11: Looking N along boundary in northern stockpile area



Figure 12: Looking S from northern stockpile area



Figure 13: Looking SE across soil stockpiles. Note extensive revegetation



Figure 14: Ponding water between soil stockpiles



Figure 15: Looking S along eastern boundary



Figure 16: Heras fencing and pea gravel stockpile along eastern boundary



Figure 17: Disturbed possibly burnt area outside boundary fencing



Figure 18: Possible service trace

Appendix C Historical Ordnance Survey Maps



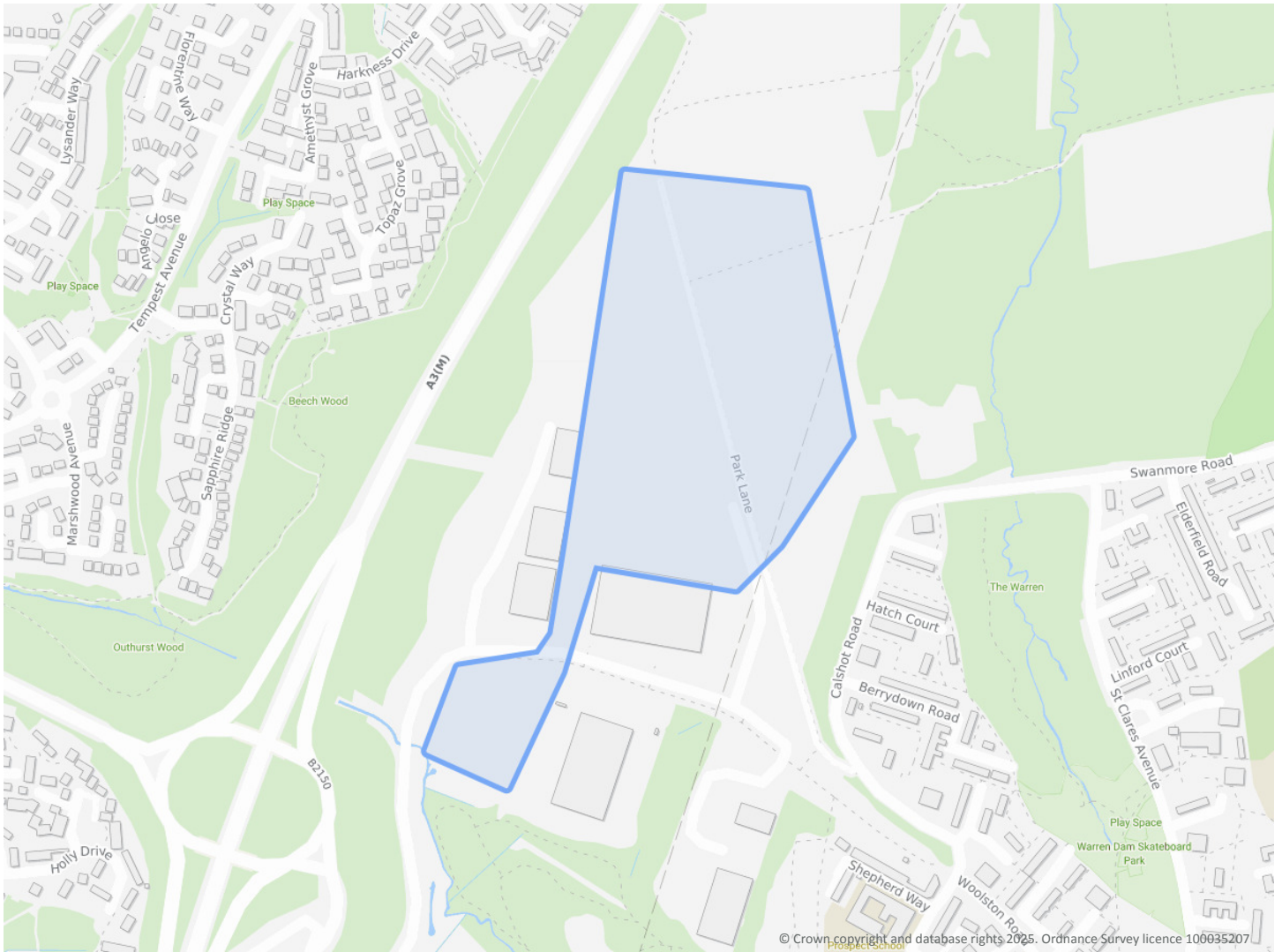
DUNSBURY PARK, FITZWYGRAM WAY, HAVANT, HAMPSHIRE, PO9 4EE

Order Details

Date: 17/09/2025
Your ref: 333701960
Our Ref: GS-U4V-2GK-WES-N1B

Site Details

Location: 470041 109406
Area: 14.59 ha
Authority: [Havant Borough Council](#) ↗



Summary of findings

[p. 2 >](#)

Aerial image

[p. 9 >](#)

OS MasterMap site plan

N/A: >10ha

[Insight User Guide](#) ↗

Contact us with any questions at:

info@groundsure.com ↗

01273 257 755

Summary of findings

Page	Section	Past land use >	On site	0-50m	50-250m	250-500m	500-2000m
14 >	1.1 >	Historical industrial land uses >	0	1	14	3	-
15 >	1.2 >	Historical tanks >	1	0	0	0	-
16 >	1.3 >	Historical energy features >	0	0	1	6	-
16	1.4	Historical petrol stations	0	0	0	0	-
17	1.5	Historical garages	0	0	0	0	-
17	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped >	On site	0-50m	50-250m	250-500m	500-2000m
18 >	2.1 >	Historical industrial land uses >	0	2	18	4	-
19 >	2.2 >	Historical tanks >	1	0	0	0	-
20 >	2.3 >	Historical energy features >	0	0	3	26	-
21	2.4	Historical petrol stations	0	0	0	0	-
21	2.5	Historical garages	0	0	0	0	-
Page	Section	Waste and landfill >	On site	0-50m	50-250m	250-500m	500-2000m
22	3.1	Active or recent landfill	0	0	0	0	-
22	3.2	Historical landfill (BGS records)	0	0	0	0	-
23	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
23 >	3.4 >	Historical landfill (EA/NRW records) >	1	0	0	0	-
23	3.5	Historical waste sites	0	0	0	0	-
23	3.6	Licensed waste sites	0	0	0	0	-
24 >	3.7 >	Waste exemptions >	0	0	0	1	-
Page	Section	Current industrial land use >	On site	0-50m	50-250m	250-500m	500-2000m
25 >	4.1 >	Recent industrial land uses >	1	2	12	-	-
26 >	4.2 >	National Geographic Database (NGD) - Current or recent tanks >	0	0	2	-	-
27	4.3	Current or recent petrol stations	0	0	0	0	-
27	4.4	Electricity cables	0	0	0	0	-
27	4.5	Gas pipelines	0	0	0	0	-



27	4.6	Sites determined as Contaminated Land	0	0	0	0	-
27	4.7	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
28	4.8	Regulated explosive sites	0	0	0	0	-
28	4.9	Hazardous substance storage/usage	0	0	0	0	-
28	4.10	Historical licensed industrial activities (IPC)	0	0	0	0	-
28	4.11	Licensed industrial activities (Part A(1))	0	0	0	0	-
28	4.12	Licensed pollutant release (Part A(2)/B)	0	0	0	0	-
29	4.13	Radioactive Substance Authorisations	0	0	0	0	-
29 >	4.14 >	<u>Licensed Discharges to controlled waters</u> >	0	0	0	2	-
29	4.15	Pollutant release to surface waters (Red List)	0	0	0	0	-
30	4.16	Pollutant release to public sewer	0	0	0	0	-
30	4.17	List 1 Dangerous Substances	0	0	0	0	-
30	4.18	List 2 Dangerous Substances	0	0	0	0	-
30 >	4.19 >	<u>Pollution Incidents (EA/NRW)</u> >	0	0	1	0	-
31	4.20	Pollution inventory substances	0	0	0	0	-
31	4.21	Pollution inventory waste transfers	0	0	0	0	-
31	4.22	Pollution inventory radioactive waste	0	0	0	0	-
Page	Section	<u>Hydrogeology</u> >	On site	0-50m	50-250m	250-500m	500-2000m
32 >	5.1 >	<u>Superficial aquifer</u> >	Identified (within 500m)				
34 >	5.2 >	<u>Bedrock aquifer</u> >	Identified (within 500m)				
36 >	5.3 >	<u>Groundwater vulnerability</u> >	Identified (within 50m)				
38	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
39	5.5	Groundwater vulnerability- local information	None (within 0m)				
40 >	5.6 >	<u>Groundwater abstractions</u> >	0	0	0	0	19
44 >	5.7 >	<u>Surface water abstractions</u> >	0	0	0	0	1
45	5.8	Potable abstractions	0	0	0	0	0
45	5.9	Source Protection Zones	0	0	0	0	-
45 >	5.10 >	<u>Source Protection Zones (confined aquifer)</u> >	1	0	0	0	-
Page	Section	<u>Hydrology</u> >	On site	0-50m	50-250m	250-500m	500-2000m



46 >	6.1 >	Water Network (OS MasterMap) >	1	4	14	-	-
48 >	6.2 >	Surface water features >	1	2	8	-	-
48 >	6.3 >	WFD Surface water body catchments >	1	-	-	-	-
49 >	6.4 >	WFD Surface water bodies >	0	1	0	-	-
49	6.5	WFD Groundwater bodies	0	-	-	-	-
Page	Section	River and coastal flooding >	On site	0-50m	50-250m	250-500m	500-2000m
50 >	7.1 >	Risk of flooding from rivers and the sea >	High (within 50m)				
51	7.2	Historical Flood Events	0	0	0	-	-
51	7.3	Flood Defences	0	0	0	-	-
51	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
51	7.5	Flood Storage Areas	0	0	0	-	-
52 >	7.6 >	Flood Zone 2 >	Identified (within 50m)				
53 >	7.7 >	Flood Zone 3 >	Identified (within 50m)				
Page	Section	Surface water flooding >					
54 >	8.1 >	Surface water flooding >	1 in 30 year, 0.3m - 1.0m (within 50m)				
Page	Section	Groundwater flooding >					
56 >	9.1 >	Groundwater flooding >	High (within 50m)				
Page	Section	Environmental designations >	On site	0-50m	50-250m	250-500m	500-2000m
57	10.1	Sites of Special Scientific Interest (SSSI)	0	0	0	0	0
58	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
58	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
58	10.4	Special Protection Areas (SPA)	0	0	0	0	0
58	10.5	National Nature Reserves (NNR)	0	0	0	0	0
59 >	10.6 >	Local Nature Reserves (LNR) >	0	0	0	0	1
59 >	10.7 >	Designated Ancient Woodland >	0	0	1	4	30
61	10.8	Biosphere Reserves	0	0	0	0	0
61	10.9	Forest Parks	0	0	0	0	0
61	10.10	Marine Conservation Zones	0	0	0	0	0
61	10.11	Green Belt	0	0	0	0	0



61	10.12	Proposed Ramsar sites	0	0	0	0	0
62	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
62	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
62	10.15	Nitrate Sensitive Areas	0	0	0	0	0
62 >	10.16 >	Nitrate Vulnerable Zones >	1	0	0	0	1
64 >	10.17 >	SSSI Impact Risk Zones >	1	-	-	-	-
65	10.18	SSSI Units	0	0	0	0	0
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
66	11.1	World Heritage Sites	0	0	0	-	-
66	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
66	11.3	National Parks	0	0	0	-	-
66	11.4	Listed Buildings	0	0	0	-	-
67	11.5	Conservation Areas	0	0	0	-	-
67	11.6	Scheduled Ancient Monuments	0	0	0	-	-
67	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations >	On site	0-50m	50-250m	250-500m	500-2000m
68 >	12.1 >	Agricultural Land Classification >	Grade 4 (within 250m)				
69 >	12.2 >	Open Access Land >	0	0	1	-	-
69 >	12.3 >	Tree Felling Licences >	1	0	16	-	-
70 >	12.4 >	Environmental Stewardship Schemes >	1	0	0	-	-
70	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations >	On site	0-50m	50-250m	250-500m	500-2000m
71 >	13.1 >	Priority Habitat Inventory >	0	5	31	-	-
73	13.2	Habitat Networks	0	0	0	-	-
73	13.3	Open Mosaic Habitat	0	0	0	-	-
73	13.4	Limestone Pavement Orders	0	0	0	-	-
Page	Section	Geology 1:10,000 scale >	On site	0-50m	50-250m	250-500m	500-2000m
74 >	14.1 >	10k Availability >	Identified (within 500m)				
76 >	14.2 >	Artificial and made ground (10k) >	0	1	1	1	-



77 >	14.3 >	Superficial geology (10k) >	2	1	1	2	-
78	14.4	Landslip (10k)	0	0	0	0	-
79 >	14.5 >	Bedrock geology (10k) >	3	2	1	3	-
80	14.6	Bedrock faults and other linear features (10k)	0	0	0	0	-
Page	Section	Geology 1:50,000 scale >	On site	0-50m	50-250m	250-500m	500-2000m
81 >	15.1 >	50k Availability >	Identified (within 500m)				
82 >	15.2 >	Artificial and made ground (50k) >	0	1	1	1	-
83 >	15.3 >	Artificial ground permeability (50k) >	0	1	-	-	-
84 >	15.4 >	Superficial geology (50k) >	1	0	1	0	-
85 >	15.5 >	Superficial permeability (50k) >	Identified (within 50m)				
85	15.6	Landslip (50k)	0	0	0	0	-
85	15.7	Landslip permeability (50k)	None (within 50m)				
86 >	15.8 >	Bedrock geology (50k) >	2	0	0	0	-
87 >	15.9 >	Bedrock permeability (50k) >	Identified (within 50m)				
87	15.10	Bedrock faults and other linear features (50k)	0	0	0	0	-
Page	Section	Boreholes >	On site	0-50m	50-250m	250-500m	500-2000m
88 >	16.1 >	BGS Boreholes >	0	2	18	-	-
Page	Section	Natural ground subsidence >					
90 >	17.1 >	Shrink swell clays >	Low (within 50m)				
92 >	17.2 >	Running sands >	Low (within 50m)				
94 >	17.3 >	Compressible deposits >	Very low (within 50m)				
96 >	17.4 >	Collapsible deposits >	Very low (within 50m)				
97 >	17.5 >	Landslides >	Low (within 50m)				
99 >	17.6 >	Ground dissolution of soluble rocks >	Negligible (within 50m)				
Page	Section	Mining and ground workings >	On site	0-50m	50-250m	250-500m	500-2000m
101 >	18.1 >	BritPits >	0	0	1	0	-
102 >	18.2 >	Surface ground workings >	9	2	20	-	-
103	18.3	Underground workings	0	0	0	0	0
104	18.4	Underground mining extents	0	0	0	0	-



104	18.5	Historical Mineral Planning Areas	0	0	0	0	-
104 >	18.6 >	Non-coal mining >	0	0	1	2	2
105	18.7	JPB mining areas	None (within 0m)				
105	18.8	The Coal Authority non-coal mining	0	0	0	0	-
105	18.9	Researched mining	0	0	0	0	-
106	18.10	Mining record office plans	0	0	0	0	-
106	18.11	BGS mine plans	0	0	0	0	-
106	18.12	Coal mining	None (within 0m)				
106	18.13	Brine areas	None (within 0m)				
106	18.14	Gypsum areas	None (within 0m)				
107	18.15	Tin mining	None (within 0m)				
107	18.16	Clay mining	None (within 0m)				
Page	Section	Ground cavities and sinkholes	On site	0-50m	50-250m	250-500m	500-2000m
108	19.1	Natural cavities	0	0	0	0	-
108	19.2	Mining cavities	0	0	0	0	0
108	19.3	Reported recent incidents	0	0	0	0	-
108	19.4	Historical incidents	0	0	0	0	-
Page	Section	Radon >					
110 >	20.1 >	Radon >	Less than 1% (within 0m)				
Page	Section	Soil chemistry >	On site	0-50m	50-250m	250-500m	500-2000m
112 >	21.1 >	BGS Estimated Background Soil Chemistry >	13	6	-	-	-
113	21.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
113	21.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-
Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
114	22.1	Underground railways (London)	0	0	0	-	-
114	22.2	Underground railways (Non-London)	0	0	0	-	-
114	22.3	Railway tunnels	0	0	0	-	-
114	22.4	Historical railway and tunnel features	0	0	0	-	-
114	22.5	Royal Mail tunnels	0	0	0	-	-



115	22.6	Historical railways	0	0	0	-	-
115	22.7	Railways	0	0	0	-	-
115	22.8	Crossrail 2	0	0	0	0	-
115	22.9	HS2	0	0	0	0	-