Hampshire Water Transfer and Water Recycling Project

Environmental Statement – Appendix 16.1 Mineral Safeguarding Assessment

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1 Introduction

1.1.1 This Mineral Safeguarding Assessment accompanying the Environmental Statement (ES) Chapter 16 Resources and waste management, Volume I (Document reference 6.1, DCO Volume 6) has been prepared for the Hampshire Water Transfer and Water Recycling Project (hereafter referred to as the 'Proposed Development'). The requirement for a Mineral Safeguarding Assessment arises because a proportion of the land within the Order Limits coincides with the Mineral Consultation Areas (MCA) as identified by Hampshire County Council (HCC) on their Online Policies Map [1].

1.2 Mineral safeguarding legislation, policy and guidance

1.2.1 The following section sets out the relevant policy and guidance that has informed the need for and content of this Mineral Safeguarding Assessment.

1.2.2 There is no legislation relevant to the assessment of likely significant effects on resources.

1.2.3 In May 2022, the Secretary of State (SoS) made a Direction under Section 35(1) of the Planning Act 2008 [2] (PA 2008) confirming the Proposed Development as a Project of National Significance for which an application for Development Consent Order (DCO) is required.

National policy

1.2.4 The National Policy Statement for Water Resources Infrastructure (2025) (NPSWRI) [3] sets out the government's planning policies for the development of nationally significant infrastructure projects for water resources in England.

1.2.5 In relation to mineral supply Paragraph 4.10.16 of the NPSWRI states:

"The applicant should identify and assess any impacts the proposed project may have for mineral safeguarded areas (or other minerals supply aspects) with the relevant Mineral Planning Authority."

1.2.6 Paragraph 4.10.28 of the NPSWRI states:

"Where the development has an impact on a mineral safeguarding area, the Secretary of State must ensure that the applicant has put forward appropriate mitigation or compensation measures to safeguard mineral resources."

1.2.7 The National Planning Policy Framework (2025) (NPPF) [4] sets out the government's planning policies for England and how they are expected to be applied, with the aim of the planning system being to contribute to the achievement of sustainable development. Within the NPPF are various policies relating to the use and protection of mineral resources, with the aim of ensuring that there are sufficient minerals available.

1.2.8 Paragraph 223 of the NPPF states that planning policies should:

"b) so far as practicable, take account of the contribution that substitute or secondary and recycled materials and minerals waste would make to the supply

of materials, before considering extraction of primary materials, whilst aiming to source minerals supplies indigenously;

c) safeguard mineral resources by defining Mineral Safeguarding Areas and Mineral Consultation Areas; and adopt appropriate policies so that known locations of specific minerals resources of local and national importance are not sterilised by non-mineral development where this should be avoided (whilst not creating a presumption that the resources defined will be worked);

d) set out policies to encourage the prior extraction of minerals, where practical and environmentally feasible, if it is necessary for non-mineral development to take place;"

1.2.9 Paragraph 226(f) of the NPPF requires the maintenance of a seven-year landbank for sand and gravel and at least ten years for crushed rock, whilst ensuring that the capacity of operations to supply a wide range of materials is not compromised. Paragraph 227(c) footnote 81, requires reserves of at least 25 years for brick clay.

National guidance

1.2.10 In April 2019 the Mineral Products Association and the Planning Officers' Society published a Mineral Safeguarding Practice Guidance document [5]. Paragraph 4.22 states that:

"in order to demonstrate compliance with mineral safeguarding policies, developers will be required to provide sufficient information to enable the Minerals Planning Authority and Local Planning Authority to consider the potential effect of non-exempt development in MSAs/MCAs on mineral safeguarding, and the viability of prior extraction of mineral ahead or in conjunction with the non-mineral development."

1.2.11 Paragraph 4.23 goes on to state that *"such information should be in the form of a Minerals Resource Assessment."*

1.2.12 The guidance document includes detailed information on the requirements of Minerals Resource/Safeguarding Assessments. Paragraph 4.24 states that the required information includes: the type of mineral resource thought to be present, and the economic value and viability of the mineral and potential options for prior extraction. The guidance document also sets out matters to be addressed in Mineral Resource Assessments, which includes a review of constraints to mineral extraction and a detailed list of requirements is provided in Annex 1 of the guidance document. The guidance document has been considered in the preparation of this Minerals Safeguarding Assessment. Some of the information, as described within the guidance document, e.g. economic value of the mineral, cannot be provided without additional site investigation works, due to the linear nature of the Proposed Development.

1.2.13 Paragraph 4.37 of the guidance document states:

"The maximum amount of extraction should be encouraged to minimise the amount of resource sterilised and with associated potential financial benefits to the site owner and developer."

1.2.14 Paragraph 4.39 proceeds to state that:

"It may be concluded that only a portion of material may be extracted, prior to and during the development, through site preparation and incidental to groundworks. This may be suitable for on-site use but also some may require to be exported. Incidental extraction of small amounts of mineral, for example as part of site preparation or digging of foundations, is likely to be considered as ancillary to or even enabling of the non-minerals development and not normally require separate/standalone planning permission for mineral extraction. Use of materials on-site, and export of excess, could be addressed through the terms of the permission and associated conditions or legal agreements."

Local policy

1.2.15 The Hampshire Minerals and Waste Plan (2013) (HMWP) [6] outlines the local policies and approach to mineral safeguarding in Hampshire. The HMWP aims to secure an adequate and steady supply of indigenous minerals needed to support sustainable growth, whilst encouraging the recycling of suitable materials to minimise the requirement for new primary extraction.

1.2.16 The HMWP identifies Mineral Safeguarding Areas (MSA) as areas that include viable resources of aggregates and are defined so that proven resources of aggregates are not sterilised by non-mineral development. The MSA does not provide a presumption for these resources to be worked.

1.2.17 The HMWP also identifies Mineral Consultation Areas (MCA) which are areas identified to ensure consultation between the relevant district or borough planning authority, the minerals industry and the Minerals and Waste Planning Authorities before certain non-mineral planning applications made within the area are determined. The Minerals Consultation Area includes safeguarded mineral resources and safeguarded minerals extraction sites and is presented on ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6).

1.2.18 Alongside the HMWP, HCC has published a Supplementary Planning Document (SPD) [7] which has been produced to provide additional guidance on the implementation of the HMWP policies (it does not contain any new policies and as a guidance document it is not given the same weight legally in decision-making as the HMWP). This document outlines what is included within a MCA which are as follows:

1. Mineral resources in the MSA that are considered to be economically viable (and thereafter any updates based on newly available information)
2. Minerals and waste sites allocated in the HMWP
3. Minerals infrastructure identified for safeguarding through Policy 16 (Safeguarding - mineral infrastructure)
4. Waste infrastructure identified for safeguarding through Policy 26 (Safeguarding - waste infrastructure)
5. Potential sites and areas identified for safeguarding for wharf and rail depots safeguarding through Policy 34 (Safeguarding potential minerals and waste wharf and rail depot infrastructure)

1.2.19 Policy 15 Safeguarding – mineral resources, of the HMWP states:

"Hampshire's sand and gravel (sharp sand and gravel and soft sand), silica sand and brick-making clay are safeguarded against the needless sterilisation by non-minerals development, unless 'prior extraction' takes place. Safeguarded mineral resources are defined by a Mineral Safeguarding Area illustrated on the Policies Map.

Development without prior extraction of mineral resources in the Mineral Safeguarding Area may be permitted if: -

It can be demonstrated that the sterilisation of mineral resources will not occur; or

It would be inappropriate to extract mineral resources at that location, with regards to the other policies in the Plan; or

The development would not pose a serious hindrance to mineral development in the vicinity; or

The merits of the development outweigh the safeguarding of the mineral."

1.2.20 The supporting text to Policy 15 paragraph 6.20 states:

"Where a planning application is made for non-mineral development within the MCA, the district or borough council should consult the relevant MPA on the application. Any non-mineral proposal falling within the MCA will require exploratory work prior to its development, in order to investigate further the mineral resource that may be present and the potential for its extraction."

1.2.21 In reference to Policy 15 of the HMWP, Section 2.3 SPD states the following:

"Policy 15 (Safeguarding - mineral resources) of the HMWP provides the policy framework for mineral resource safeguarding in Hampshire. However it is important to note that safeguarding relates to the long term conservation of resources and infrastructure, necessary to secure a steady and adequate supply of minerals for future generations and is likely to remain relevant beyond the Plan period (2013 - 2030)."

1.2.22 Paragraph 1.3 of the SPD states the following:

"Non-minerals-or-waste development can 'sterilise' mineral resources (make them inaccessible for potential extraction) or prejudice the operation of existing or proposed minerals or waste management sites ('infrastructure'). This can be either:

directly, for example by building over land that contains minerals; or

indirectly, through the introduction of sensitive land uses in close proximity to these resources or sites".

1.2.23 Policy 20 Local land-won aggregates of the HMWP outlines how a steady supply of sand and gravel will be achieved for at least seven years from the adoption on the Plan:

1. *Extraction from remaining reserves listed within the HMWP*
2. *Extensions to existing sites listed in the HMWP*
3. *New sand and gravel extractions sites outlined in the HMWP*
4. *Proposals for new sites outside the areas identified in Policy 20*

1.2.24 For proposals outside the areas identified in Policy 20, the HMWP states they will be supported where:

"b. the development is for the extraction of minerals prior to a planned development"

1.2.25 Policy 22 Brick-making clay of the HMWP outlines how a supply of locally extracted brick-making clay for use in Hampshire's remaining brickworks will enable the maintenance of a landbank of at least 25 years of brick-making clay. This will be achieved by the following:

1. *The extraction of remaining reserves at the listed site in the HMWP*
2. *Extension of existing or former brick-clay making extraction sites at the sites listed in the HMWP*
3. *Clay extraction outside of the listed sites*

1.2.26 Policy 22 states clay extraction outside the sites identified could take place where:

"a. it can be demonstrated that the sites identified in Policy 22 (2) are not deliverable; and
b. there is a demonstrated need for the development; and/or
c. the extraction of brick-making clay is incidental to the extraction of local land-won aggregate at an existing sand and gravel quarry."

2 Methodology

2.1 Overview

2.1.1 The methodology for the assessment is based on the framework that is set out in Policy 15 of the HMWP. This Mineral Safeguarding Assessment focuses on evaluating the potential impact of the permanent construction effects from the Proposed Development on the potential for extraction of future mineral resources. The permanent construction effects in the context of the mineral safeguarding is the physical presence of any permanent built structure. The impact of this permanent construction effect is the potential sterilisation of mineral resources.

2.1.2 The Proposed Development boundary is defined for the purpose of this assessment as the Order Limits. The components of the Proposed Development are outlined in ES Chapter 3 Description of Proposed Development, Volume I (Document reference 6.1, DCO Volume 6). As detailed in ES Chapter 3 Description of Proposed Development, Volume I (Document reference 6.1, DCO Volume 6), the Havant Thicket Reservoir is to be constructed under a separate planning application and its operation would form part of the Proposed Development, and therefore it is considered to be existing infrastructure for the purpose of the baseline within this assessment and ES Chapter 16 Resources and waste management, Volume (Document reference 6.1, DCO Volume 6). Therefore, the impact of the Havant Thicket Reservoir on mineral receptors has not been assessed. Where the Havant Thicket Reservoir coincides with a mineral receptor, the underlying mineral resources is considered to be already sterilised.

Study area

2.1.3 This section describes the spatial scope (the area which may be impacted) for the assessment as it applies to the minerals safeguarding assessment.

2.1.4 The study area is not limited to the Order Limits, as it is recognised that the Proposed Development could result in indirect sterilisation of areas beyond the Order Limits as described in ES Chapter 3 Description of Proposed Development, Volume I (Document reference 6.1, DCO Volume 6), through the fragmentation of mineral resources. This assessment has therefore defined the study area as the land within the Order Limits and a distance of 400m on either side of the Order Limits.

2.1.5 The Hampshire Authorities Minerals Planning documentation does not specify a recommended buffer distance around mineral workings to reduce the risk of incompatible development occurring close to a viable resource. However, the Somerset Minerals Plan [8] recommends a buffer distance for higher output aggregate quarries of 400m. As such a distance of 400m either side of the Order Limits has been assessed. This distance is considered to be suitable for capturing the potential indirect sterilisation of land either side of the Order Limits for instances where the Proposed Development passes in the vicinity of constraints and the boundary of mineral receptors. The study area is shown on ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.1, DCO Volume 6).

High level Mineral Safeguarding Areas and Mineral Consultation Areas review

2.1.6 The assessment begins with identifying the parts of the Proposed Development that are located within an MSA/MCA.

Environmental and physical constraints review

2.1.7 Following the identification of the parts of the MSAs/MCAs which are located within the study area, environmental and physical features that are considered to be constraints which may prevent future mineral extraction developments were defined.

2.1.8 The extraction of mineral resources faces various constraints that limit the potential for quarrying or mining activities. These factors not only hinder the ability to extract minerals, but also affect the process of obtaining consent for extraction.

2.1.9 In order to assess the potential for future mineral extraction activities, a comprehensive review was conducted to identify any limitations or constraints that could impede such developments. The purpose of this part of the assessment is to identify areas where it is unlikely that a future mineral extraction activity would be permitted due to existing constraints being present. Any mineral resources beneath existing constraints are considered to be already sterilised without the presence of the Proposed Development.

2.1.10 For additional information on each constraint, see section 4 of this report, and ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6).

2.1.11 Where the Havant Thicket Reservoir coincides with a mineral receptor, the underlying mineral resources are considered to be already sterilised.

Geological site setting

2.1.12 A high-level review of the underlying geology across the entire Proposed Development has been conducted. This has been informed by targeted ground investigations which have allowed for the characterisation of current ground conditions within the Order Limits. Due to the size and nature of the Proposed Development these investigations have been split into the following phases:

1. Phase 0: 10 boreholes to depths of 60m below-ground level (bgl) within the area of the Budds Farm Wastewater Treatment Works (WTW) and Water Recycling Plant (WRP) site.

   Phase 1: 19 boreholes to depths between 30 and 110m bgl and 15 machine excavated trial pits within key areas of tunnelling sections of the pipeline.
2. Phase 2: 40 boreholes to a maximum depth of 30m bgl focusing on the linear part of the pipeline route (including locations where trenchless construction would be undertaken along the Proposed Development route within Sections F, G, H, J, K, L and M) and potential sources of contamination.
3. Phase 3a, b and c: 175 ground investigation locations including boreholes and trial pits.

2.1.13 For additional details on the Ground Investigation see ES Chapter 11 Land quality and ground conditions, Volume I (Document reference 6.1, DCO Volume 6).

2.1.14 The geological site setting was also informed by a Geotechnical and Geo-Environmental Desk Study (see ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), publicly available resources from the British Geological Survey (BGS) online Geology of Britain Viewer [9], ES Chapter 11 Land quality and ground conditions, Volume I (Document reference 6.1, DCO Volume 6), and ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6).

Minerals assessment

2.1.15 Following the identification of the environmental and physical constraints, a review of the geological data available within the study area has been undertaken. The review considers the areas which are not assumed to be physically constrained and are located within a MCA (locations shown on ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6)).

2.1.16 The minerals assessment undertaken in section 6 is informed by geological data. The geological data is sourced from the BGS GeoIndex Onshore Viewer [10] (borehole logs used in the assessment can be found in Annex A), and the Proposed Development ground investigations for additional details see ES Chapter 11 Land quality and ground conditions, Volume I (Document reference 6.1, DCO Volume 6).

2.1.17 All available information from geo-environmental interpretive reports produced following the completed ground investigation phases has been used to inform this Appendix and are appended to the ES, see ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6).

2.1.18 The encountered ground conditions summarised in the Geo-environmental interpretive reports obtained from trial pitting and borehole drilling provided a description of materials underlying the Proposed Development and was used to assess the presence of the mineral resources. A summary of the Ground Investigation (GI) data review carried out is presented in Annex B.

2.1.19 ES Figure 16.3 Mineral Safeguarded Assessment: Borehole logs, Volume III (Document reference 6.3, DCO Volume 6) shows the location of the ground investigation boreholes and trial pits.

2.1.20 The findings of the minerals assessment have then been used to determine where the Proposed Development may result in the sterilisation of underlying mineral resources as a result of permanent construction effects due to the location coinciding with all of the following:

1. Area where mineral resource is potentially present (MSA/MCA)
2. An area which is considered currently to not have any existing constraints to mineral extraction (unconstrained)
3. Geological data indicates there to be minerals present

Needs assessment

2.1.21 A needs assessment has been conducted to fulfil the Policy 15 from the HMWP [6] Condition as follows;

"Development without prior extraction of mineral resources in the Mineral Safeguarding Area may be permitted if: -
…The merits of the development outweigh the safeguarding of the mineral."

2.1.22 The needs assessment compares the need of the Proposed Development with the need for mineral resources. To determine the need for mineral resources a review of HCC monitoring documents has been conducted to determine the mineral landbank supply.

Approach to mineral safeguarding

2.1.23 Using the information gathered in the above assessment phases, the most appropriate approach to mineral safeguarding for the Proposed Development has been determined in line with Policy 15 outlined in the HMWP.

2.2 Limitations and assumptions

2.2.1 This section provides a description of the assumptions and limitations to the minerals safeguarding assessment.

2.2.2 The HMWP has defined MCAs which includes safeguarded mineral resources and safeguarded minerals extraction sites and is presented on ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6).

2.2.3 Within the Glossary of the HWMP for MCA it states *"The Hampshire Mineral Consultation Area covers the same areas as the Mineral Safeguarding Area".* For the purpose of this assessment we have assumed that the MSAs cover the same area as the MCA.

2.2.4 This assessment has been conducted using the geological information that is available to date. Ground Investigations have been undertaken but are limited to within the boundaries of the Order Limits. The ground investigation information reviewed was from summarised ground conditions presented in ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6). The study area for the assessment extends to 400m either side of the Order Limits. For areas located outside of the Order Limits but within the study area BGS publicly available information [9] [10] has been used.

2.2.5 The Proposed Development route alignment has been refined since the GI works were carried out, and several GI locations completed during Phase 2 GI works are now outside of the current Order Limits and more than 7km either side of the Order Limits, in particular in Sections F and G. Geo-environmental and geotechnical data collected at these locations were not further discussed in the individual Section GIRs due to the distance from the current route alignment. These were not reviewed as part of the MSA.

2.2.6 It has been assumed that any underlying mineral resource beneath the Proposed Development would be considered sterilised for the duration of the construction and operation.

3 High-Level Mineral Safeguarding Area review

3.1.1 For the purpose of this Mineral Safeguarding Assessment, the Proposed Development, the pipeline for which would be approximately 35km long, has been divided into sections. Details of the sections are outlined in ES Chapter 3 Description of Proposed Development, Volume I (Document reference 6.1, DCO Volume 6).

3.1.2 The mineral resources which HCC have safeguarded are sharp sand and gravel, soft sand, silica sand, and brick clay. The clay resources in Hampshire play an important role in supplying two local brickworks at Michelmersh and Selborne.

3.1.3 Paragraph 223(c) of the NPPF requires HCC to define MCAs. The HMWP MCA comprises safeguarded mineral resources (as outlined in 3.1.1), allocated minerals and waste sites and safeguarded minerals and waste infrastructure. Within paragraph 2.32 of HCC has published a Supplementary Planning Document (SPD) [7] on Safeguarding, it states that the MCA includes the following buffers:

1. 250m around safeguarded mineral resources
2. 250m around minerals and waste infrastructure in rural areas
3. 100m around minerals and waste infrastructure in urban areas (and including areas directly opposite sites where the sites are adjacent to a water body)

3.1.4 Within the Glossary of the HWMP for MCA it states *"The Hampshire Mineral Consultation Area covers the same areas as the Mineral Safeguarding Area".* For the purpose of this assessment we have assumed that the MSAs cover the same area as the MCA.

3.1.5 This stage of the review aims to identify areas of the Proposed Development, which are within an MSA as identified in the HWMP [6].

3.1.6 This review has indicated that the Proposed Development intersects a MSA for Brick Clay, Superficial Sand and Gravel, and Soft Sand.

3.1.7 The Proposed Development also passes within the boundary of areas which have been safeguarded for waste management infrastructure or mineral processing.

3.1.8 An overview of MSAs in relation to the individual sections of the Proposed Development is set out in Table 3-1 and illustrated on ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6). Where the Proposed Development intersects a safeguarded mineral or waste infrastructure site, this has also been identified within Table 3-1.

3.1.9 This assessment does not include an assessment of the Portsmouth Water pipeline between the WRP site and the Havant Thicket Reservoir. The Proposed Development would utilise the Portsmouth Water pipelines which are subject to a separate planning consent. The Proposed Development will also make use of the existing Eastney Long Sea Outfall (LSO). As this feature is already present, an assessment of the area covered by the outfall has not been included. The location of the outfall is shown on Sheet 6 and 7 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6).

Table 3-1 Pipeline sections relating to Mineral Safeguarded Areas

Proposed Development Section	Mineral Safeguarded Area	ES Figure 16.1 Sheet Reference
WRP site	Located within a Superficial Sand and Gravel MSA.	ES Figure 16.1, Sheet 2
Pipelines between Budds Farm WTW and the WRP site	Located within a Superficial Sand and Gravel MSA.	ES Figure 16.1, Sheet 2
Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works		
Section D: The WRP site to Portsdown Hill	Western extent located within a Brick Clay MSA.	ES Figure 16.1, Sheet 2
Section E: Portsdown Hill to Boarhunt	Located within a Brick Clay MSA.	ES Figure 16.1, Sheet 3
Section F: Boarhunt to Crockerhill	Partially located within a Superficial Sand and gravel MSA, a Soft Sand MSA and a Brick Clay MSA.	ES Figure 16.1, Sheet 3
Section G: Crockerhill to Wickham	Located within a Soft Sand MSA and a Superficial Sand and Gravel MSA.	ES Figure 16.1, Sheet 4
Section H: Wickham to Shedfield	Predominantly located within a Soft Sand MSA and partially located within a Superficial Sand and Gravel MSA.	ES Figure 16.1, Sheet 4
Section J: Shedfield to the River Hamble	Predominantly located within a Soft Sand MSA and smaller sections located within a Superficial Sand and Gravel MSA.	ES Figure 16.1, Sheet 4
Section K: The River Hamble to Lower Upham	Located within a Superficial Sand and Gravel MSA. Temporary access roads to the temporary construction compounds are located within a Brick Clay MSA.	ES Figure 16.1, Sheet 4 and 5
Section L: Lower Upham to Brambridge	Partially located within a Brick Clay MCA and a Superficial Sand and Gravel MCA.	ES Figure 16.1, Sheet 5
Section M: Brambridge to Otterbourne Water Supply Works (WSW) (including the Invasive Non-Native Species Treatment plant (INNS) at Otterbourne WSW)	Located within a Superficial Sand and Gravel MCA and partially within a Brick Clay MCA.	ES Figure 16.1, Sheet 5

4 Environmental and physical constraints review

4.1.1 The presence of the following features are considered to be constraints to mineral extraction in the study area, any underlying minerals are therefore considered to be sterilised:

1. Residential properties
2. Ecological constraints – including Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar Sites, Sites of Special Scientific Interest (SSSI), Sites of Importance for Nature Conservation (SINC), National Nature Reserves (NNR), Ancient Woodland sites, Local Nature Reserves (LNR), Priority Habitats, and Local Wildlife Sites (LWS)
3. Landscape constraints – including National Landscapes (formerly known as Areas of Outstanding Natural Beauty) and National Parks
4. Heritage constraints – including Listed buildings, Scheduled monuments, Conservation areas, and Registered parks and gardens
5. Public Rights of Way (PRoW)
6. Adopted highways (specifically OS Open road and local roads)
7. Railways
8. Utilities – including Southern Water wastewater and clean water pipes, Portsmouth Water clean water pipes and raw waste pipelines, gas pipelines and underground and overhead cables
9. Watercourses
10. Flood zones

4.1.2 Some of these features may also have an associated buffer zone. These are laid out in sections 4.2 to 4.11.

4.1.3 The environmental and physical constraints (and buffer areas where applicable) have been mapped and are shown on ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6).

4.2 Residential properties

4.2.1 Section 5.15 of the HMWP states:

"It is standard practice in Hampshire for operational mineral extraction and inert waste recycling sites to have a minimum buffer zone of 100 metres, where appropriate, from the nearest sensitive human receptors, such as homes and schools".

4.2.2 Based on the above, a 100m buffer has been placed around all residential properties that are located within the study area. This data was accessed on 28 February 2023 from Ordnance Survey. The land within the 100m is unlikely to be permitted for future mineral extraction developments. The 100m buffer around residential properties is shown on ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6).

4.3 Ecological constraints

4.3.1 The NPPF requires that planning decisions should be protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils.

4.3.2 Policy 3 of the HMWP [6], Protection of habitats and species, requires that minerals development should not have a significant adverse effect on, and where possible, should enhance, restore or create designated or important habitats and species.

4.3.3 Based on the above guidance, international designations (SACs, SPAs, and Ramsar sites), national designations (SSSIs, NNRs, and Ancient Woodland sites), and local designations (SINC, LNRs, Priority Habitats, and LWS) have been included within the constraints review. Details of these designated sites are provided in ES Chapter 8 Terrestrial and freshwater biodiversity, Volume I (Document reference 6.1, DCO Volume 6) and their locations can be found on ES Figure 8.1 Statutory designated sites within the Order Limits plus a 2km buffer, Volume III (Document reference 6.3, DCO Volume 6) and ES Figure 8.2 Internationally designated sites within the Order Limits plus a 5km buffer, Volume III (Document reference 6.3, DCO Volume 6).

4.3.4 Due to the nature of ecological designations having varying habitats and species, restrictions on mineral extraction will vary from site to site, meaning no buffer has been applied in this instance. However, it is important to note that the application of a buffer could potentially identify a wider area of constraint surrounding these ecological designations therefore increasing the area that could be interpreted as being already sterilised for mineral extraction. According to Policy 3 of the HMWP [6], sites designated by international legislation are given the highest level of statutory protection in that, generally, development cannot be permitted if it may have adverse effects on the integrity of the sites, in accordance with the Habitat Regulations.

4.3.5 On this basis, international and national designations have been indicated as areas where mineral extraction would be restricted while local designations have been flagged as a consideration for mineral extraction.

4.3.6 Any mineral which is underlying existing internationally and nationally ecologically designated sites is therefore considered to already be sterilised. For local designations any underlying mineral is not considered to be sterilised but it is recognised as a potential inhibiting factor to a mineral extraction development.

4.4 Landscape constraints

4.4.1 Paragraph 189 of the NPPF [4] states that great weight should be given to conserving and enhancing landscape and scenic beauty in National Parks, the Broads and National Landscapes, which have the highest status of protection in relation to these issues.

4.4.2 Policy 4 of the HMWP [6], Protection of the designated landscape, states that major minerals and waste development will not be permitted in designated landscape areas, including the South Downs National Park, except in exceptional circumstances.

4.4.3 On this basis, National Landscapes and National Parks have been included within the constraints review with no buffer. See ES Chapter 13 Landscape and visual,

Volume I (Document reference 6.1, DCO Volume 6), for the location and additional details on designated landscape areas. There are no National Landscapes within any sections of the Proposed Development. Though the Order limits are not located within a national park, there are instances where mineral receptors located within the 400m study area either side of the Order Limits are located within the South Downs National Park.

4.5 Heritage constraints

4.5.1 Policy 7 of the HMWP [6], Conserving the historic environment and heritage, requires that any development protects and, wherever possible, enhances Hampshire's historic environment and heritage assets, including both designated and non-designated, and the settings of these sites.

4.5.2 Listed Buildings, Scheduled Monuments, Conservation Areas, and Registered Parks and Gardens have been considered as constraints for this review, however, no buffer has been applied. This is because HMWP Policy 7 states that minerals and waste development can play a positive role in promoting archaeological investigations and protecting heritage assets, however, this should be considered on a site-by-site basis. ES Figure 7.3 Designated heritage assets within the extended study area, Volume III (Document reference 6.3, DCO Volume 6) shows the locations of all designated heritage assets.

4.6 Public rights of way

4.6.1 Policy 5 of the HMWP [6], Protection of the countryside, states where minerals or waste developments are located close to, or would directly impact a statutory PRoW footpath network, measures should be put in place to protect or divert the route. ES Figure 17.3 Social infrastructure and Public Rights of Way, Volume III (Document reference 6.3, DCO Volume 6) shows the locations of PRoWs.

4.6.2 Due to the above, PRoW have been identified as a consideration for mineral extraction but would not preclude future mineral developments. All PRoW features have therefore been mapped, however, underlying mineral resources cannot be considered to already be sterilised.

4.7 Adopted highways

4.7.1 Adopted highways specifically OS Open Roads and local roads have been identified as physical constraints which would likely sterilise underlying mineral resources for future mineral extraction developments. In addition, Policy 12 Managing Traffic of the HMWP [6], states that the impact of its (the mineral development) generated traffic should be reduced and that highway improvements are required to mitigate significant adverse impacts on highway safety, pedestrian safety, highway capacity, and environment and amenities. As such, a 10m buffer has been placed around all roads within the study area.

4.7.2 Any underlying mineral resource located within the 10m buffer is unlikely to extracted as part of future mineral developments.

4.8 Railways

4.8.1 Policy 16 of the HMWP [6], Safeguarding – minerals infrastructure, requires that the following should be safeguarded: rail heads, rail links to quarries and handling and processing facilities for bulk transport by rail.

4.8.2 Based on this, a 10m buffer has been placed around railways which are safeguarded under the HMWP. It has been assumed that it would be unlikely that proposals for a mineral extraction development would be granted within 10m of a railway.

4.9 Utilities

4.9.1 Policy 10 of the HMWP [6], Protecting public health, safety and amenity, requires that mineral developments should not cause an unacceptable impact on public strategic infrastructure, with water, electricity, and gas networks mentioned. There are various utility assets in the area that may restrict future mineral extraction opportunities. A 10m buffer has been placed around the existing utilities within the study area and any mineral located within the 10m buffer is therefore considered to already be sterilised from extraction via a mineral development.

4.9.2 There are no National Grid Gas Pipelines that pass through any MSAs beneath the Proposed Development.

4.9.3 In terms of utilities, the following have been included within this review:

1. Southern Water Wastewater Pipelines
2. Southern Water Clean Water Pipelines
3. Portsmouth Water Raw Waste Pipeline
4. Portsmouth Water Clean Water Pipelines
5. Grid Gas Utilities

4.10 Watercourses

4.10.1 Policy 10 of the HMWP [6], Protecting public health, safety and amenity, requires that mineral developments should not release emissions to water and must not cause an unacceptable impact on coastal, surface or groundwaters.

4.10.2 A 10m buffer has therefore been placed around watercourses located within the study area (see ES Figure 19.1 Surface water features, Volume III (Document reference 6.3, DCO Volume 6)). To allow for sufficient protection it has been assumed that it would be unlikely that proposals for a mineral extraction development would be granted within 10m of watercourses.

4.10.3 Any underlying mineral resource located within the 10m buffer is unlikely to be extracted as part of future mineral developments. For additional details on the water environment see ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6) and for the location of surface water features see ES Figure 19.1 Surface water features, Volume III (Document reference 6.3, DCO Volume 6).

4.11 Flood zones

4.11.1 Paragraph 170 of the NPPF states, *"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future)*".

4.11.2 Policy 11 of the HMWP, Flood risk and prevention, requires that risk of flooding should not increase due to mineral extraction. Therefore, minerals underlying land located within Flood Zone 3 are considered to be sterilised as there would be significant risks associated with the permitting of a mineral extraction development within a high-risk area. Flood zones 2 will also be considered but underlying mineral is not considered to be sterilised. For additional details on the identified Flood Zones see ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6) and ES Figure 19.9 Fluvial and coastal flood risk, Volume III (Document reference 6.3, DCO Volume 6).

5 Geological site setting

5.1.1 The Geotechnical and Geo-Environmental Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)) and ES Chapter 11 Land quality and ground conditions, Volume I (Document reference 6.1, DCO Volume 6) has been used to inform this section of the report. This section summarises the desk study in relation to the Proposed Development and has been supplemented using the BGS online Geology of Britain Viewer [9]. The stratigraphy of the Proposed Development as outlined in the Geotechnical and Geo-Environmental Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)) is summarised in Table 5-1.

Table 5-1 Summary of stratigraphy

Age	Group	Formation	Subdivision (where applicable)
Quaternary		Alluvium	N/A
		Head Deposits	
		River Terrace Deposits	
		Clay-with-flints Formation	
Tertiary	Bracklesham Group	Earnley Sand Formation	N/A
		Wittering Formation	
	Thames Group	London Clay Formation	Whitecliff Sand Member/Durley Sand Member
			Portsmouth Sand Member
			Bognor Sand Member
		Harwich Formation	Swanscombe Member
			Oldhaven Member
	Lambeth Group	Reading Formation	Upper Mottled Clay
			Lower Mottled Clay
Upper Cretaceous	White Chalk Subgroup	Portsdown Chalk Formation	N/A
		Culver Chalk Formation	Spetisbury Chalk Member
			Tarrant Chalk Member
		Newhaven Chalk Formation	
		Seaford Chalk Formation	
		Lewes Nodular Chalk Formation	

5.2 Superficial deposits

5.2.1 The main superficial deposits across the area of the Proposed Development include:

1. Alluvium is expected within river valleys and streams along the River Itchen, River Hamble and River Meon. Alluvium is a general term for unconsolidated detrital material deposited by a river or stream, normally soft to firm compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. Alluvium is expected across Sections F, G, J to M inclusive.
2. Head deposits are widely distributed across the Proposed Development, located in linear layers, often infilling minor chalk valleys, extending from upslopes of the downs, down to the margins of Alluvium floodplain. Head deposits are comprised of poorly sorted stratified deposits formed by hill wash and soil creep compromising variable gravel, sand, silt, clay, locally with lenses of peat and organic material.
3. River Terrace Deposits are expected on floodplains and estuaries in coastal settings. Many different terraces feature across the routes with varying compositions that comprise gravel, sand and clay are expected in parts of Sections F, G, K and M.
4. Clay-with-flints is only noted within Section M surrounding Head deposits at Otterbourne WSW. It comprises reddish orange to orange clay with nodules and rounded gravel of flint derived from Tertiary formations below. Yellow fine to medium grained sand and reddish-brown silt beds are also encountered.

5.3 Bedrock geology

5.3.1 The geological mapping indicates that there are multiple geological groups encountered throughout the Proposed Development such as the Bracklesham Group, Thames Group, Lambeth Group and Chalk Group (upper part - White Chalk Subgroup only). A summary of the bedrock geology is as follows:

1. Bracklesham Group deposits consist of Wittering Formation across Sections G, H and J, generally comprising greyish brown laminated clay deposits with wavy to lenticular bedded sand interbedded with clay and rare glauconitic sand (total thickness 25-65m).
2. Thames Group deposits consist of London Clay Formation, which is noted in between the WRP site and Bedhampton Springs and Sections D, G, H, K and L. London Clay Formation generally comprises bioturbated or poorly laminated, over consolidated blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay (total thickness 77-120m). It also includes thin beds of shells and fine sand partings or beds of sand such as Bognor Sand Member, Portsmouth Sand Member, Whitecliff Sand Member and the Durley Sand Member, all of which are generally glauconitic and fine to medium grained sand. The Bognor Sand Member, Portsmouth Sand Member and Whitecliff Sand Member are recorded in between the WRP site and Bedhampton Springs and Sections D, G, H, and J.
3. Lambeth Group deposits consist of the Reading Formation, which is noted from Sections D, E, F, G, K. L and M. Reading Formation generally comprises

vertically and laterally variable sequences mainly of over consolidated clay, often mottled and some silty or sandy clays (total thickness 30-35m).

4. Underlying the Lambeth group is the White Chalk Subgroup; this comprises the oldest of all the geological units expected across the Proposed Development. In general, it is the uppermost formations of the White Chalk Subgroup that crop out within Sections D, E, F, G and M (Portsdown, Spetisbury and Tarrant Chalk Formations near Boarhunt and Culver Formation in the north-west by Otterbourne). In the south-east part of the Proposed Development near Havant, the White Chalk Subgroup has not been separately differentiated by BGS into formations, though it is expected that in this area (e.g. around Budds Farm) the deeper Newhaven, Seaford and/or Lewes Nodular Chalk Formations may crop/sub-crop out. These formations are characterised as chalk with discrete mar seams, nodular chalk, sponge-rich and flint seams throughout (total thickness 190-290m).

5.4 Artificial geology

5.4.1 A variety of artificial ground is recorded by the BGS on site underlying the Proposed Development at the WRP site and Sections D and H – M inclusive.

5.4.2 The most common is Made Ground underlying roads, surrounding towns and village areas:

1. South of Havant, Bedhampton in underlying the WRP site
2. At the A3(M) south-east of Waterlooville
3. At Winters Hill and west of Bishop's Waltham in Section K
4. To the north of Crowdhill, at Fisher's Pond
5. Colden Common all in Section L

5.4.3 Infilled ground is recorded by the BGS:

1. South of Havant, Bedhampton in underlying the WRP site
2. Section H at Shirrell Heath
3. Section M, west of Highbridge, where the Proposed Development crosses at the River Itchen and north of Kiln Lane

5.4.4 Worked ground is recorded by the BGS:

1. South-west of Waltham at Sandy Lane next to Section J
2. Section M west of Highbridge

5.4.5 There are also several parts of the Proposed Development where artificial ground is encountered. Additional details are available in the Geotechnical and Geo-Environmental Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II) (Document reference 6.2, DCO Volume 6)).

5.5 Hydrogeology

Aquifers

5.5.1 The Geotechnical and Geo-Environmental Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6))

provides an assessment of hydrogeology for each of the main formations. For additional details on hydrogeology see ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6).

5.5.2 Head deposits are classified by the Environment Agency (EA) as a Secondary Aquifer (Undifferentiated). This is a classification assigned where it has not been possible to attribute to either category A or B. Secondary A Aquifers are generally capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers, whereas Secondary B Aquifers are mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like fissures.

5.5.3 The EA has classified alluvium and river terrace deposits as Secondary Aquifers.

5.5.4 Clay-With-Flint Formation and Thames Group deposits are classified as mainly unproductive stratum (London Clay Formation), though beds of sand (e.g. Bognor Sand Member/Whitecliff Sand Member) are considered to be Secondary A Aquifers.

5.5.5 Bracklesham Group and Lambeth Group have been designated as Secondary A bedrock Aquifers.

5.5.6 The chalk bedrock is classified as a Principal Aquifer, characterised by layers with high intergranular and/or fracture permeability capable of a high level of water storage. They may support water supply and/or river base flow at a strategic scale.

Source Protection Zones

5.5.7 The location of the Source Protection Zones (SPZs) has been identified using the Department for Environment, Food and Rural Affairs (Defra) Magic Map application [11] and can be viewed in ES Figure 19.8 Water resources, Volume III (Document reference 6.3, DCO Volume 6).

5.5.8 In the north-west from Colden Common to Otterbourne in Sections L and M.A SPZ 1 is the 50-day travel time of pollutants to source within a 50m default minimum radius. In Section F west of Boarhunt to Albany Farm and in Sections L and M from Fisher's Pond to Colden Common, the site is within a groundwater SPZ 2 (Outer Zone). A SPZ 2 is defined by a 400-day travel time from a point below the water table to provide delay, dilution, and attenuation of slowly degrading pollutants.

5.5.9 In Sections E and F, west of Boarhunt and surrounding Albany Business Centre to Crockerhill is within a groundwater SPZ 3 (Total Catchment). A SPZ 3 is the area around a supply source within which all the groundwater ends up at the abstraction point.

5.6 Hydrology

5.6.1 The Proposed Development crosses the following surface water bodies:

1. The River Itchen in the north-west of the Proposed Development adjacent to Kiln Lane between Colden Common and Otterbourne WSW (within Section M: Brambridge to Otterbourne WSW).
2. Bow Lake at Fishers Pond (within Section L: Lower Upham to Brambridge).

3. A lake approximately 250m long approximately 750m north-east of Wintershill (within Section K: The River Hamble to Lower Upham).
4. The River Hamble south-west of Bishop's Waltham (within Section K: The River Hamble to Lower Upham).
5. The River Meon approximately 130m north-west of Mayles Lane to the north of Knowle (within Section G: Crockerhill to Wickham).
6. Wallington River north-west of Whitedell Lane approximately 1km north-east of the M27 motorway (within Section F: Boarhunt to Crockerhill).
7. Watercourses to the west of Purbrook Heath and to the west of Waterlooville, which continues east to adjacent Hermitage Stream (within the Pipelines between Budds Farm WTW and the WRP site).

5.6.2 Additional information on hydrology is detailed in ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6), and the location of the surface water bodies are shown on ES Figure 19.1 Surface water features, Volume III (Document reference 6.3, DCO Volume 6).

6 Minerals assessment

6.1 The Water Recycling Plant site

6.1.1 This section of the Proposed Development is partially located within a MSA for Superficial Sand and Gravel as shown on Sheet 2 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6). This is related to Alluvium. However, a review of historical reports and information provided by both the EA and Havant Borough Council (HBC) indicates that this area comprises a former landfill (Harts Farm Way) that had been restored to grassland and is fringed with woodland. A hard-surfaced former access road/yard is present in the centre of the WRP site connected to Harts Farm Way to the south by an access road.

6.1.2 As the historic landfill was known to be present ground investigations were conducted resulting in the drilling of 28 exploratory borehole logs in the 'West Cell' of the landfill and 33 in the 'East Cell' of the landfill. A summary of the geology encountered from the exploratory borehole logs are shown in Table 6-1 and Table 6-2 and additional information regarding the landfill can be found in ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6).

6.1.3 Any underlying mineral resources beneath the existing landfill are already considered to be sterilised because it is likely that it would be uneconomical to remove the overlying landfill to access the underlying mineral resources. Therefore, the Proposed Development is unlikely to result in the sterilisation of mineral resources in this area.

6.2 Pipelines between Budds Farm Wastewater Treatment Works and the Water Recycling Plant site

6.2.1 The Pipelines between Budds Farm WTW and the WRP site are partially located within a Superficial Sand and Gravel MSA (Alluvium) as shown on Sheet 2 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6). As outlined in section 6.1, the underlying land on the western side of the watercourse has been identified as a former landfill. The underlying geology is summarised in Table 6-1 and Table 6-2 and additional information regarding the landfill can be found in ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6) .

6.2.2 The Pipelines then pass beneath a watercourse to connect to Budds Farm WTW in the west. This area is also designated in the HMWP as a safeguarded site for mineral infrastructure. The safeguarding of the site ensures that non-mineral developments will not preclude the operation of the mineral infrastructure site. The location of Budds Farm WTW is within an area which has been safeguarded for wastewater treatment as shown on Sheet 2 of ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6).

6.2.3 Due to the combination of the aforementioned factors, it is unlikely that a future mineral extraction development would be permitted in this location and the underlying mineral resource is considered to be already sterilised. Therefore, the Proposed Development is unlikely to result in the sterilisation of mineral resources in this area.

Table 6-1 Summary of geology encountered during ground investigation in the West Cell of the historic landfill

Stratum	Depth to top – metres below-ground level (m bgl)	Depth to base – m bgl	Thickness – m	Notes
Cover soils	Ground level	1.30 to 3.50. Typically, between 2.00 and 3.00	1.50 to 3.50	Encountered at all exploratory hole locations.
Landfill waste	1.30 to 3.50	8.20 to 11.50 (where full thickness proven)	4.70 to 9.00 (where full thickness proven)	Encountered at all exploratory hole locations.
Alluvium	8.20 to 10.70	11.10 to 13.00 (where full thickness proven)	1.60 to 3.30 (where full thickness proven)	Encountered at four exploratory hole locations only (RO101, RO107,CP02A and CP04).
River Terrace/Raised Marine Deposits	8.90 to 11.50	11.10 to 13.00 (where full thickness proven)	1.60 to 3.30 (where full thickness proven)	Encountered at four exploratory hole locations only (RO102, RO103, RO108 and CP01).
Lewes Nodular Chalk Formation	11.10 to 13.00	Proven to a maximum depth of 35.00 in CP01 and CP02A	Proven to a maximum thickness of 22.00 in CP01 and CP02A	Encountered at all exploratory holes where full thickness of superficial deposits was proven.

Table 6-2 Summary of geology encountered during ground investigation in the East Cell of the historic landfill

Stratum	Depth to top – m bgl	Depth to base – m bgl	Thickness – m	Notes
Cover soils	Ground level	0.90 to more than 4.00. Typically between 0.90 and 1.50	0.90 to more than 4.00. Typically between 0.90 and 1.50	Encountered at all exploratory hole locations except TP05.
Landfill waste	0.00 to 4.00	8.20 to 16.65 (where full thickness proven)	6.80 to 15.15 (where full thickness proven)	Encountered at all exploratory hole locations.

Stratum	Depth to top – m bgl	Depth to base – m bgl	Thickness – m	Notes
Alluvium/River Terrace/Raised Marine Deposits	8.20 to 10.70	10.50 to 14.00 (where full thickness proven)	0.90 to 5.80 (where full thickness proven)	Encountered at eight exploratory hole locations (RO14, RO105, RO109, CP03, CP06, DS101, DS102 and DS103).
Lewes Nodular Chalk Formation	10.50 to 16.60	Proven to a maximum depth of 65.25 in BHRP01	Proven to a maximum of 48.60 in BHRP01	Encountered at all exploratory holes where full thickness of superficial deposits was proven.

6.3 Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works

Section D: The Water Recycling Plant site to Portsdown Hill

6.3.1 Section D is located between the WRP site and Widley Farm. The majority passes through an area which has not been designated as a MSA (and is therefore outside of the scope of this assessment). The central section passes through a Minerals and Waste Safeguarded Site, which has been designated under the HMWP. This site is currently safeguarded for use as a waste site for the purpose of aggregate recycling.

6.3.2 The most western part of Section D skirts on the boundary of a Brick Clay MSA as shown on Sheet 2 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6). The Brick Clay MSA relates to Lambeth Group (Reading Formation). This stratum was not encountered based on the available GI information, confirming that it is unlikely to extent into the site. There are existing constraints to mineral extraction already present in this area including adopted highways and it is within the 100m residential buffer as shown on Sheet 2 and 3 of ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6). The combination of the existing constraints would make it unlikely that this area would be permitted for future mineral extraction development, however there are locations where the potential for mineral extraction cannot be ruled out.

6.3.3 Based on the available GI information (Boreholes BH301 and BH301A) (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)). Topsoil described as soft slightly gravelly silt with abundant rootlets and gravel of flint and chalk, was encountered to a maximum depth of 0.16m bgl.

6.3.4 Head Deposits underlay Topsoil, and comprised of silty gravelly Sands and silty sandy Gravel, with gravels comprising of chalk, sandstone and flint to a depth of 0.60m bgl.

6.3.5 Underlying the Head Deposits is the White Chalk Subgroup (Culver, Newhaven and Seaford Formations) which were encountered to a maximum depth of 100.30m bgl.

6.3.6 The available GI information indicated the absence of Alluvium which is related to the Superficial Sand and Gravel MSA. However, granular Head Deposits were encountered, comprising sand and silty sandy gravel. The exploratory hole locations are shown on Sheet 2 and 3 of ES Figure 16.3 Mineral Safeguarded Assessment: Borehole logs, Volume III (Document reference 6.3, DCO Volume 6).

6.3.7 Parts of Section D (as shown on Sheet 2 and 3 of ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6)) are located within the 100m buffer from residential properties and there are a number of Priority Habitats and adopted highways located within the Order Limits and the vicinity. This area is already considered to be sterilised due to the presence of the existing constraints.

Section E: Portsdown Hill to Boarhunt

6.3.8 Section E is located from Widley and travels westwards across open fields and roads to the south of Boarhunt. As shown on Sheet 3 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6), the majority of Section E is located within a Brick Clay MSA. This MSA relates to Lambeth Group (Reading Formation).

6.3.9 Based on the Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), superficial deposits are absent for the majority of the Section E apart from localised areas of Head Deposits in north to south running linear layers, often infilling minor chalk valleys, extending from upslopes of the Downs down to the margins of Alluvium floodplain. Head Deposits are comprised of poorly sorted stratified deposits, formed by hill wash, and soil creep, comprising variably gravel, sand, silt, clay, locally with lenses of peat and organic material.

6.3.10 Where Superficial deposits are absent, Lambeth Group and White Chalk Subgroup bedrock outcrop. Lambeth Group bedrock consists of the Reading Formation (Undifferentiated), noted in the east of Section E. This generally comprises vertically and laterally variable sequences mainly of over-consolidated clay, often mottled with some silty or sandy clays (total thickness 30–35m).

6.3.11 Mapping shows the majority of site to underlain at ground level by White Chalk Subgroup (Portsdown Chalk Formation). Geological conditions for Section E between Southwick and Portsdown Hill, as well the majority of the arable fields in the Section (lengths vary between 0.4–1.3km), do not indicate the presence of superficial deposits.

6.3.12 London Clay bedrock, which overlies the Lambeth Group, is within close proximity to areas of the pipeline in the east of Section E, and mainly comprises bioturbated

or poorly laminated, blue-grey or grey-brown, over consolidated silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay.

6.3.13 Based on publicly available geological information for this Section, two boreholes were identified within 250m of the Order Limits and therefore these are not representative of the entire pipeline section, which are summarised in Table 6-3 and their locations are shown on Sheet 3 of ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6). One borehole indicated the presence of a mix of clays with the other indicating mixture sand and chalk within the Reading Formation.

6.3.14 Between Widley Farm and Mill Lane Section E follows the direction of the existing Portsmouth Water Pipeline within the Brick Clay MSA. The existing Portsmouth Water Pipeline is considered to be a physical constraint to mineral extraction developments. Due to the proximity of the Pipeline (see Sheet 3 of ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6)), it is unlikely that mineral extraction development would be proposed. This part of Section E would therefore not sterilise underlying mineral resources.

6.3.15 Across the remainder of Section E there are relatively few environmental and physical constraints to future mineral extraction with the exceptions of adopted highways and dispersed housing. There is a risk that the presence of the Proposed Development could preclude future mineral extraction developments from being consented (Sheet 3 of ES Figure 16.2 Mineral constraints, Volume III, (Document reference 6.3, DCO Volume 6)). The Proposed Development therefore may result in the sterilisation of mineral resources.

6.3.16 Overall the geological information accessed from the GI works (ES Appendix 11.2 Ground investigation reports, Volume II, (Document reference 6.2, DCO Volume 6)), concurs with the anticipated geology based on the Desk Study information and the localised presence of Lambeth Group clays as part of the Brick Clay MSA. The exploratory hole locations are shown on Sheet 3 of ES Figure 16.3 Mineral Safeguarded Assessment: Borehole logs, Volume III (Document reference 6.3, DCO Volume 6). The findings of the ground investigation works are summarised in Table 6-4.

Table 6-3 Summary of British Geological Survey borehole logs located within 250m of the Order Limits in Section E

BH ref	NGR		Topsoil	Reading Formation	Upper Chalk	Middle Chalk
SU60NW5*	SU 63930 07370	Thickness (m)	n/r	18.29	249.94	45.72
		Description	-	Yellow and red mottled clays with flints. Ochreous and green mottled clays, red and green clays	Red and green clays with pebbles, white chalk (discoloured), chalk with flints	Pale grey marly chalk, few flints
SU60NW140	SU 63730 07580	Thickness (m)	n/r	38.50	11.50	-
		Description	-	Sand	Chalk and OCC Flints	-

n/r – Not Recorded

*Due to the large depth of the borehole log, only the first three strata levels have been summarised.

Table 6-4 Summary of ground conditions based on GI locations within the Order Limits in Section E

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
Topsoil	Grass over sandy gravelly CLAY, SILT or SAND. Sand is fine to coarse. Gravel is fine to coarse.	0.20–0.60	2E3000RC 2E3001RC 2E3002RC 3E3019DS 3E3020DS 3E3021DS 3E3022HP 3E3023TP 3E3028HP 3E3035DS 3E3036DS 3E3038HP 3E3100DS 3E3101TP 3E3102TP 3E3103HP 3E3104HP 3E3105HP 3E3106TP 3E3107HP 3E3109HP 3E3110DS 3E3111HP 3E3112TP 3E3113HP 3E3114DS 3E3119HP 3E7501IT 3E7502IT 3E7503IT 3E7504IT 3E7505IT 3E7506IT 3E7507IT 3E7508IT
Made Ground	Soft to firm brown mottled red/grey gravelly CLAY. Gravel is chert and chalk.	1.40	3E3023TP

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
	Soft to firm greyish brown slightly sandy gravelly silty CLAY with rare, desiccated wood fragments. Gravel of chert and chalk.	>2.30	3E3023TP
	Soft to firm orangish brown mottled red and grey and gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse of chert and chalk.	4.90	3E3115DS
	White sandy silty fine GRAVEL of very weak to weak CHALK	>1.55	3E3115DS
Head Deposits	Very soft to stiff sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse of flint/chert and chalk	0.15 - 1.35	3E3019DS 3E3021DS 3E3022HP 3E3034HP 3E3102TP
	Soft greyish brown gravelly clayey SILT. Gravel is fine to coarse of weak low-density chalk and chert.	0.25 – 0.50	3E3036DS 3E3103HP 3E3104HP 3E3105HP 3E3106TP 3E3107HP 3E3110DS 3E3111HP 3E3113HP 3E3119HP
Lambeth Group	Stiff yellowish mottled red fissured slightly gravelly CLAY. Gravel of flint. (undifferentiated).	>2.40	3E3102TP
	Soft orangish red mottled slightly sandy CLAY.	0.40 - >0.60	3E3103HP 3E3104HP 3E3105HP
White Chalk Subgroup	Very weak low density, white CHALK recovered as gravelly SILT with local low to high cobble content (Dm)	>3.80	3E3019DS 3E3036DS 3E3038HP
	CHALK recovered as gravelly silty fine to coarse SAND. Gravel is fine to coarse of flint and very weak white chalk (Dm)	0.85	3E3109HP
	White CHALK consisting of sandy silty GRAVEL. Sand is fine to coarse. Gravel is fine to coarse with very weak to weak white chalk (Dc).	>2.90	3E3020DS 3E3021DS 3E3028HP 3E3035DS 3E3100DS 3E3101TP 3E3106TP 3E3108TP 3E3110DS 3E3112TP 3E3113HP 3E3114DS

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
			3E7501IT 3E7502IT 3E7503IT 3E7504IT 3E7505IT 3E7506IT 3E7507IT 3E7508IT
	White CHALK recovered as white silty sandy GRAVEL of weak low density white with rare black specks chalk. Very weak to weak, medium to high density, white unstained CHALK with grey rounded nodular flints. CIRIA Grade B2/B3 Chalk	1.00 - 10.40	2E3000RC 2E3001RC 2E3002RC
	Very weak medium density, locally weak high density, white locally slightly yellow stained CHALK with frequent nodular flints. CIRIA Grade B2/B3 Chalk	>29.30	2E3000RC 2E3002RC
	Very weak to weak low density white mottled yellowish orange CHALK. Discontinuities 0-10° and 70-80° closely spaced, undulating, smooth to rough with silt infilling. Possible CIRIA Grade C3	>1.60	3E7501IT 3E7502IT 3E7503IT 3E7504IT 3E7505IT 3E7506IT 3E7507IT
	Moderately weak high density white CHALK. Discontinuities: 75 - 80° close to medium spacing tight infilled with sand. Frequent coarse gravel and cobble sized flint with white cortex. Possible CIRIA Grade A2.	>0.50	3E7508IT
	CHALK recovered as white soft to firm gravelly sandy SILT. Sand is fine to coarse. Gravel is very weak white chalk (unable to determine CIRIA grade)	>1.90	3E3110DS 3E3114DS

Section F: Boarhunt to Crockerhill

6.3.17 Section F is located between Boarhunt and Forest Lane. This section passes through a Superficial Sand and Gravel MSA between White Dell Lane and the western extent of the section, a Brick Clay MSA (Lambeth Group) between the River Wallington and Forest Lane and a Soft Sand MSA between Forest Lane and the western extent of the section as shown on Sheet 3 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume (Document reference 6.3, DCO Volume 6).

6.3.18 Based on the Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), superficial deposits across Section F are mapped near to the River Wallington (Alluvium, River Terrace Deposits and Head Deposits), Albany Business Centre (Head Deposits) and at the north-western end by Ravenswood House (River Terrace Deposits), all of which are underlain by White Chalk Subgroup bedrock. Section F has highly variable topography, and Head Deposits would comprise a mixture of solifluction (hillwash) materials of different origins, and also perhaps cryoturbation (from repeated freezing and thawing cycles).

6.3.19 Where superficial deposits are absent, the Lambeth Group, White Chalk Subgroup and London Clay Formation outcrop as bedrock. The Lambeth Group and London Clay Formation are not overlain by superficial deposits along the route of Section F. The White Chalk Subgroup dominates as bedrock, except in the north of the section around Crockerhill.

6.3.20 The part of Section F located within the Brick Clay MSA passes through or within proximity to above and below-ground environmental and physical constraints. These constraints comprise residential properties and their 100m buffer (see Sheet 3 and 4 of ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6)), Portsmouth Water Pipeline, Priority Habitats and ancient woodland (see ES Chapter 8 Terrestrial and freshwater biodiversity, Volume I (Document reference 6.1, DCO Volume 6)). Section F also passes within the boundary of a site which is designated as a Safeguarded Waste Site in the HMWP (see Sheet 3 and 4 of ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6)).

6.3.21 Though there are constraints present along Section F and within the vicinity, there are parts of this section which pass through areas that contain no constraints for mineral extraction. Therefore, the granting of a mineral extraction development in this location cannot be ruled out. Consequently, there is a risk that parts of section F could sterilise mineral resources in parts of this section as shown on Sheet 3 and 4 of ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6).

6.3.22 Based on the geological information accessed from the GI works (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), the eastern ground conditions generally encountered correspond with the published geology with Alluvium, and White Chalk Subgroup being present. The encountered western ground conditions generally varied with the published geology with no Alluvium or Bracklesham Group being present. However, the Lambeth Group was generally encountered in this area. The exploratory hole

locations are shown on Sheet 3 and 4 of ES Figure 16.3 Mineral Safeguarded Assessment: Borehole logs, Volume III (Document reference 6.3, DCO Volume 6).

6.3.23 Based on the Desk Study, River Terrace Deposits (RTD) were noted as primarily granular. In the GI, RTD was not definitively encountered. In the GI, Head Deposits were variable as predicted by the Desk Study. Head Deposits (Clay) and/or Alluvium (Clay) is more extensive than mapped. With regards to bedrock, Lambeth Group clays were encountered, confirming the presence of clay as part of the Brick Clay MSA. The Bracklesham Group was not encountered within the Soft Sand MSA. Refer to Table 6-5 for a summary of the encountered ground conditions.

Table 6-5 Summary of ground conditions based on GI locations within the Order Limits in Section F

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
Topsoil	Grass over soft dark brown sandy gravelly CLAY with roots and rootlets/Gravel is of chert, chalk, and rare brick/Dark brown slightly clayey gravelly SAND with occasional flint cobbles and frequent rootlets. Gravel is of flint.	0.15–0.35	2F3501DS 2F3502SA 2F3503SA 2F3504DS 2F3505DS 2F3512RC 2F3513DS 2F3514DS 2F3515DS 2F3537DS 3F3517DS 3F3519HP 3F3521HP 3F3524DR 3F3601HP 3F3602HP 3F7509IT 3F7510IT 3F7512IT 3W8556DS 3W8558SA 3W8559TP 3W8563TP 3W8567SA
Made Ground	Soft greyish brown slightly sandy slightly gravelly CLAY. Gravel includes red brick with occasional timber fibres and fragments of metal and rubber (<75mm), flint and chalk.	1.50	2F3500DS
	Firm brown sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse chert, chalk and brick.	0.28–3.20	3F3517DS 3F3523DR 3W8558SA
	Loose brown clayey SAND.	2.10	3W8567SA
Alluvium	Soft greyish brown slightly sandy slightly gravelly CLAY. Gravel includes red brick with occasional timber fibres and fragments of metal and rubber (<75mm), flint and chalk.	0.40–3.20	2F3500DS 2F3501DS 2F3503SA 2F3537DS
Head Deposits	Firm locally stiff reddish brown sandy gravelly CLAY with cobbles of flint. Gravel is of flint and chalk/Loose brown clayey gravelly SAND with occasional flint cobbles and rare flint boulders. Gravel is of flint and chalk.	0.30–2.20	2F3502SA 2F3504DS 2F3512RC 2F3513DS 2F3514DS 2F3515DS
	Soft to firm locally stiff brown sandy, silty, gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of chert. Occasional cobbles.	0.10–5.97	3F3519HP 3F3521HP 3F3523DR 3F3524DR 3F3601HP 3F3602HP 3F7509IT 3F7510IT 3F7512IT 3F7513IT 3W8553DS 3W8554DS 3W8559TP 3W8563TP

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
London Clay Formation	Firm to stiff brown and grey sandy CLAY.	0.90–5.60	3W8559TP 3W8567SA
Lambeth Group	Firm to stiff reddish yellowish brown gravelly sandy CLAY.	2.10–5.10	3W8556DS 3W8558SA
	Medium dense brown clayey SAND.	1.10	3W8558SA
White Chalk Subgroup	Possible structureless CHALK recovered as white silty sandy gravel. Possibly CIRIA grade Dc.	0.15	2F3504DS
	Probable very weak medium density CHALK. Possibly CIRIA grade B4.	1.65	2F3504DS
	CHALK recovered as white putty (silt)/Light brownish white CHALK recovered as sandy silty chalk GRAVEL with occasional flint cobbles (CIRIA grade not possible to determined).	0.90–18.30	2F3500DS 2F3501DS 2F3502SA 2F3503SA 2F3504DS 2F3505DS 2F3512RC 2F3513DS 2F3514DS 2F3515DS 2F3537DS
	Very weak to weak very low to medium density white and brown stained CHALK recovered as sandy silty GRAVEL or gravelly SILT. Sand is fine to coarse. Gravel is angular to subangular fine to coarse chalk and flint. Occasional cobbles of chalk and flint.	0.75–5.50	3F3519HP 3F7512IT 3F7513IT 3W8553DS 3W8554DS 3W8558SA
	Recovered as a combination of CHALK recovered as SILT/GRAVEL/COBBLES with frequent angular fine to coarse flint fragments.	1.14–14.15	3F3517DS 3F3523DR 3F3524DR
	Fractured very weak medium density white CHALK with black flint. Occasional brown staining. Fossils.	3.68	3F3524DR
	Fractured white medium dense CHALK with flint nodules, some brown staining.	1.12	3F3523DR
	Very weak medium to high density white CHALK with widely spaced flint nodules, fossils. At 3F3523DR, from 27.03m weak	10.82–16.08	3F3523DR 3F3524DR

Section G: Crockerhill to Wickham

6.3.24 Section G is located between Forest Lane and the A334. Section G passes through a Soft Sand MSA and a Superficial Sand and Gravel MSA as shown on Sheet 4 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6). The Soft Sand MSA relates to Bracklesham Group (Earnley Sand Formation and Wittering Formation - undifferentiated).

6.3.25 The first part of Section G passes through a MSA for Soft Sand between Forest Lane and Tanfield Lane. The majority of this part of Section G is located in undeveloped farmland and is therefore in a location that does not contain environmental and physical constraints for the consenting of future mineral developments. However, there are environmental and physical constraints within the vicinity, which are considered to be constraints as shown on Sheet 4 of ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6). These include residential properties and Priority Habitats. Despite this, there is a risk that the presence of the Proposed Development could preclude future mineral extraction developments from being developed. There is a risk that parts of Section G could sterilise underlying mineral resources.

6.3.26 The second part of Section G located within a Superficial Sand and Gravel MSA is situated between the Castle Farm Lane and the A334. The majority of Section G passes beneath the Wickham Park Golf Course. Within the boundary of the golf course there are no known environmental and physical constraints for mineral extraction developments. There is a risk that this Part of Section G could preclude future mineral extraction developments being consented and therefore sterilise safeguarded mineral resources.

6.3.27 Between Wickham Park Golf Course and A334 the Pipeline between the WRP site and Otterbourne WSW passes through a corridor between the 100m buffer that has been placed around the residential properties. Due to the proximity to existing environmental and physical constraints, it is unlikely that this part of Section G would preclude future mineral extraction developments being consented and therefore is unlikely to sterilise safeguarded mineral resources.

6.3.28 Based on the Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), superficial deposits across Section G comprise Alluvium, Head Deposits and River Terrace Deposits. Superficial deposits are not present along some areas of the Pipeline between the WRP site and Otterbourne WSW through Section G between Forest Lane and west of A32 (Hoad's Hill) east of Titchfield Lane and Tanfield Lane.

6.3.29 These superficial deposits are underlain by the bedrock, which its sequence decreases with age from south-east to north-west. London Clay Formation at Mayles Lane nearest to the River Meon crossing and A32 (Hoad's Hill) crossing is the oldest, with strata becoming progressively younger to Earnley Sand Formation in the north-west, near to Titchfield Lane and Wickham Park Golf Club.

6.3.30 Artificial Made Ground, consisting of dug gravel pits, was indicated to be present by BGS mapping within the west of Wickham Park Golf Club.

6.3.31 One historic borehole (BGS Ref: SU51SE5 approximately 150m north-west of the pipeline route) was drilled in 1895 (records reviewed in 1976) was considered of relevance to the pipeline route. The top 27.4m bgl of the borehole has no geological information as it was an old well. At 27.4m bgl, the borehole encountered sandy clay, clayey sand, and clay of the Bracklesham Beds (now referred to as Bracklesham Group). The Bracklesham Group includes both Earnley Sand Formation and Wittering Formation, which aligns with the geological mapping.

6.3.32 Based on the geological information accessed from the GI works (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), Made Ground was not mapped, but was encountered in some exploratory hole locations (3G4037DS, 3G4038DS, 3W8534DS, 3W8536SA and 3W8539HP) to a maximum of 2.2m bgl.

6.3.33 At exploratory hole locations 3W8529SA, 3W8530SA, 3W8536SA Wittering Formation is encountered prior to London Clay Formation - Whitecliff Sand Member (WHI) though only London Clay Formation and WHI bedrock is mapped at the location. The Wittering Formation encountered is related to the Soft Sand MSA.

6.3.34 Based on published geological information, River Terrace Deposits are shown to be predominantly fine grained, but were mapped as gravel, sand and silt. The presence of granular deposits as part of the Wittering Formation confirmed the Soft Sand MSA, while Earnley Sand Formation is typically silty sand and sandy silt, but is found to be sandy clay/clayey sand in Section G.

6.3.35 The GI aligns with the historical BGS borehole. The exploratory hole locations are shown on Sheet 4 of ES Figure 16.3 Mineral Safeguarded Assessment: Borehole logs, Volume III (Document reference 6.3, DCO Volume 6). Table 6-6 summarises the encountered ground conditions.

Table 6-6 Summary of ground conditions based on GI locations within the Order Limits in Section G

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
Topsoil	Very soft to soft dark brown gravelly sandy CLAY/SILT/clayey SAND with rootlets. Sand is fine to coarse. Gravel is fine to coarse flint.	0.05 – 0.50	2G4000SA 2G4001SA 3G4023HP 3G4024DS 3G4102SA 3H4600SA 3G4106SA 3G7525IT 3G7530IT 3W8526HP 3W8527HP 3W8528HP 3W8529SA 3W8530SA 3W8532HP 3W8535SA 3W8538HP 3W8560HP
Made Ground	Soft to firm dark brown sandy gravelly CLAY. Sand is fine to coarse/Dark grey sandy subangular fine to medium GRAVEL locally with cobbles of flint. Gravel is subrounded to subangular to subrounded fine to medium of tarmacadam, brick, chalk are rare charcoal.	0.25 – 1.20	2G4000SA 2G4002DS 2G4003DS 2G4004DS 3G4037DS 3G4038DS
	Soft to firm dark brown sandy gravelly CLAY. Sand is fine to coarse/Dark grey sandy subangular fine to medium GRAVEL locally with cobbles of flint. Gravel is subrounded to subangular to subrounded fine to medium of tarmacadam, brick, chalk are rare charcoal, ceramic and metal.	0.35 – 2.20	3W8534DS 3W8536SA 3W8539DS
Alluvium	Yellowish brown gravelly clayey SAND with rare rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	0.45	2G4001SA
Head Deposits	Firm sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint.	0.25 – 2.20	2G4000SA 2G4003DS 3W8526HP 3W8527HP 3W8528HP 3W8531HP 3W8532HP 3W8535SA
River Terrace Deposits	Firm (locally stiff) brownish red sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse flint and chert. Cobbles are very angular to angular of chert.	0.15 – 5.30	2G4000SA 2G4001SA 2G4002DS 3G4022DS 3G4037DS 3G4038DS 3G4102SA 3H4600SA 3G4105SA 3G4106SA 3W8536SA

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
	Grey sandy clayey GRAVEL locally with cobbles of angular flint. Sand is coarse. Gravel is subrounded to subangular medium to coarse chert/Dense orangish brown silty gravelly SAND with pockets of reddish brown clay. Gravel is fine to coarse angular to subangular of flint.	0.20 – 2.10	2G4004DS 3G4022DS 3G4024DS 3H4600SA 3G4105SA 3G4106SA 3G7525IT 3G7530IT 3W8526HP 3W8534DS 3W8536SA 3W8538HP 3W8539DS
Earnley Sand Formation	Firm grey, orange sandy locally gravelly CLAY. Sand is medium to coarse. Gravel is subangular to well-rounded fine to coarse of chert.	0.55 – 0.90	2G4002DS 2G4003DS 2G4004DS 3G4023HP 3G4105SA
	Medium dense and dense yellowish grey mottled orange locally greyish blue mottled orange clayey fine SAND with occasional pockets of soft clay.	0.95 - >24.60	3G4024DS 3G4037DS 3G4038DS 3G4105SA 3G4106SA 3W8534DS
Wittering Formation	Firm to very stiff locally soft laminated orangish brown and bluish grey CLAY locally with pockets fine to medium sand and medium dense to very dense yellowish brown/orange and black speckled silty SAND.	1.80 - 9.10	2G4002DS 2G4003DS 2G4004DS 3G4102SA 3H4600SA 3G4105SA 3G4106SA 3W8529SA 3W8530SA 3W8535SA
	Grey gravelly CLAY locally with cobbles/Greenish grey gravelly SAND. Both gravel and cobbles of rounded flint.	0.20 – 1.95	3W8529SA 3W8530SA
	Firm to stiff grey sandy CLAY. Sand is fine to coarse.	1.05	3W8529SA
London Clay Formation	Stiff to very stiff grey CLAY with abundant gypsum crystals.	7.35 – >10.00	2G4001SA 3G4102SA 3H4600SA 3W8535SA
	Soft to firm orangish brown with rare mottling slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is angular medium to coarse of chert.	0.95	3W8560HP
London Clay Formation –	Dense to very dense orangish brown fine to medium silty SAND.	0.40 – >16.85	3W8528HP 3W8529SA 3W8530SA 3W8532HP 3W8535SA 3W8536SA

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
Whitecliff Sand Member			
Lambeth Group	Stiff brownish red and grey gravelly CLAY. Gravel is angular to subangular fine flint.	2.00	2G4000SA
	Stiff to very stiff reddish brown mottled grey CLAY with sand lenses.	9.10 - >15.50	2G4000SA 2G4001SA

Section H: Wickham to Shedfield

6.3.36 Section H is located between A334 at Wickham through to the B2177. The southern part of the section between the A334 and Pricketts Hill passes through a Superficial Sand and Gravel MSA. Between Blind Lane and the B2177, Section H passes through a Soft Sand MSA (Earnley Sand Formation/Wittering Formation) as shown on Sheet 4 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6).

6.3.37 Based on the Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), Head Deposits underlie Section H, between approximately the Pricketts Hill road crossing and around 200m south-east of the trenchless construction at High Street, Shirrell Heath. River Terrace Deposits are encountered between A334, Blind Lane and Mill Lane.

6.3.38 London Clay Formation bedrock crops out east of the route. Bedrock is shown to comprise Wittering Formation (clay and sand) between A334, Blind Lane and northwards to Pricketts Hill. To the north of Pricketts Hill Road, the London Clay Formation has a distinct mapped member, Whitecliff Sand Member, that outcrops for approximately 170m in a northern direction. The London Clay Formation continues north to within approximately 80m to 400m south-east of Nightingale Crescent, transitioning back to its distinct Whitecliff Sand Member around the trenchless construction, which also crops out north-west along the pipe route towards Gamblins Lane.

6.3.39 Only one borehole was identified within 250m of the Order Limits and therefore is not representative of the entire pipeline Section H which is summarised in Table 6-7 and the location shown on Sheet 4 and 5 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6). The borehole log shows the presence of strata that predominantly comprises clay rather than soft sand.

6.3.40 In general, based on the GI works carried out (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)) ground conditions encountered in the exploratory holes match that predicted by the geological mapping, however there were several instances where mapping was incorrect (Wittering Formation was encountered comprising sandy clay, sandy silty clay and glauconitic sand). The granular deposits as part of the Wittering Formation confirmed the soft sand MSA. The exploratory hole locations are shown on Sheet 4 and 5 of ES Figure 16.3 Mineral Safeguarded Assessment: Borehole logs, Volume III (Document reference 6.3, DCO Volume 6). The encountered ground conditions are summarised in Table 6-8.

6.3.41 As shown on Sheet 4 and 5 of ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6), the majority of Section H is located within 100m of residential properties and therefore it is unlikely that future mineral extraction developments will be permitted in this area. In addition, Section H is also dissected by existing adopted highways.

6.3.42 Based on the presence of the environmental and physical constraints, it is unlikely that this part of Section H would preclude future mineral extraction developments

being consented and therefore is unlikely to sterilise safeguarded mineral resources.

Table 6-7 Summary of British Geological Survey borehole logs located within 250m of the Order Limits in Section H

BH ref	NGR		Topsoil	Head Deposits		London Clay Formation				Reading Formation		White Chalk Subgroup Middle Chalk	
SU51SE153	SU 57330 12010	Top of strata (mbgl)	0.00	1.00	3.00	12.00	24.00	48.00	55.00	75.00	101.00	104.00	180.00
		Description		Orangish brown CLAY with silt. Dark	Dark Brownish grey CLAY	Grey CLAY with shells	Grey CLAY	Grey CLAY with shells	Grey CLAY	Grey, green, red and various coloured clays	Flint band with pebbles	Grey CHALK with flint	CHALK (cleaner) with lots of flint

Table 6-8 Summary of ground conditions based on GI locations within the Order Limits in Section H

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
Topsoil	Very soft to soft dark brown sandy gravelly CLAY locally SILT with frequent rootlets/Dark brown slightly gravelly clayey or silty SAND with abundant rootlets. Gravel is of flint and chert.	0.15 – 0.42	2H4500DR 2H4501DR 2H4502DS 2H4503DS 3H4507HP 3H4511HP 3H4513HP 3H4514HP 3H4515HP 3H4600SA 3G4102SA2 3H4602HP 3H4603HP
Made Ground	Dark brown gravelly silty SAND. Sand is medium to coarse. Gravel is subangular to subrounded medium chert and brick.	0.25 – 0.40	3H4517SA 3H4606HP
Head Deposits	Orangish brown gravelly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to medium chert.	0.30	3H4514HP
	Soft to firm light yellowish brown sandy gravelly CLAY, with low cobble content. Sand is fine to coarse. Gravel and cobbles are of flint.	0.55 – 3.80	2H4500DR 2H4503DS 3H4513HP 3H4514HP

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
River Terrace Deposits	Soft to firm brown sand clayey gravelly CLAY/clayey GRAVEL. Gravel is subangular to subrounded fine to coarse chert.	0.70 – 3.65	3H4600SA 3G4102SA 3H4602HP
Wittering Formation	Orangish brown sandy CLAY. Sand is fine.	0.85 – 0.95	3H4507HP 3H4511HP
	Firm to stiff orange, grey sandy silty CLAY. Sand is fine to coarse. Rare gypsum crystals.	7.75	3H4600SA
	Dense to very dense greenish brown glauconitic SAND. Sand is fine to coarse.	0.15 – 9.10	3H4600SA 3G4102SA 3H4602HP
London Clay Formation	Stiff orangish brown and light brownish grey silty CLAY/Very stiff dark grey silty CLAY with occasional partings or lenses of grey silt and fine sand.	5.03 – 26.50	2H4500DR 2H4501DR
	Stiff to very stiff locally firm brown gravelly sandy CLAY. Sand is fine. Gravel is subangular to rounded medium to coarse chert.	7.35 – 10.90	3H4517SA 3J5002SA 3H4600SA 3G4102SA
	Very stiff to hard grey gravelly sandy SILT. Gravel is subrounded to rounded medium to coarse chert. (Gravel bed).	0.85	3H4517SA
London Clay Formation – Whitecliff Sand Member	Dense to very dense (locally loose within 2H4503DS at 4 m bgl) light greyish brown clayey fine to coarse SAND, locally with thick lamination to very thin beds and lenses/pockets of firm grey clay.	1.50 – 6.30	2H4500DR 2H4501DR 2H4502DS 2H4503DS
	Medium dense to very dense brown clayey silty gravelly SAND. Sand is fine to medium. Gravel is subangular to subrounded fine chert.	0.95 – 7.45	3H4515HP 3H4517SA 3J5002SA 3H4603HP 3H4606HP

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
London Clay Formation - Possible D/C basal bed	Dense black well-rounded medium and coarse GRAVEL of flint with a matrix of grey locally shelly clay.	1.50	2H4500DR
London Clay Formation - Possible Portsmouth Sand Member	Dense grey clayey SAND.	2.00	3J5002SA

Section J: Shedfield to the River Hamble

6.3.43 Section J is located between the B2177 and the B3035. The Proposed Development is located within a Soft Sand MSA (Wittering Formation) between the B2177 and between Curdridge Lane and the B3035. Additionally, the end of Section J passes through a Superficial Sand and Gravel MSA within the northern construction compound area as shown on Sheet 4 of ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6). There are no publicly available borehole logs for this part of the Section J to confirm the presence of underlying mineral resources.

6.3.44 It should also be noted that in addition to this, the northern compound area is within a site that has been safeguarded for mineral processing activities as shown on Sheet 4 and 5 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6).

6.3.45 Based on the Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), Head Deposits partly underlie Section J approximately between Winchester Road (B2177) and 420m north-west towards the southern end of Little Bull Lane and crop out approximately 70m south-east of Curdridge Lane. Alluvium is predicted across an approximate 60m width of ground (likely in turn underlain by Head Deposits) approximately 15m east of Little Bull Lane. River Terrace Deposits are mapped at surface until the boundary at Botley Road (B3035).

6.3.46 The strata of the London Clay Formation, London Clay Formation - Whitecliff Sand Member (WHI) and Wittering Formation crop out on route.

6.3.47 The ground investigation works carried out (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), indicated that in general ground conditions encountered in the exploratory holes match the superficial deposit on the geological mapping.

6.3.48 The bedrock encountered as part of the ground investigations is consistent with the one recorded on the geological maps, except that: London Clay Formation – Sand was mapped where exploratory holes 3J5025HP, 3J5026HP and 3J5029HP were excavated however sand deposits were not encountered within the top 1.2m. The London Clay Formation strata with clay only was encountered.

6.3.49 Made Ground (landfill materials) was encountered to 3.8m bgl in relation to two historic landfill sites: Ash House Landfill at exploratory hole locations 3J5014TP, 3J5015SA and 3J5016TP up to 6.00m bgl and land at Rossgarth Landfill at exploratory hole locations 3J5004DS and 3J5007DS up to a maximum of 3.6m bgl. This would mean that any underlying mineral resources in those locations are already sterilised.

6.3.50 The loose to medium dense sand of the Wittering Formation recorded at exploratory hole 3J5027DS, confirmed the presence of the Soft Sand MSA, however, the encountered extents were significantly less than the MSA area. The exploratory hole locations are shown on Sheet 5 of ES Figure 16.3 Mineral Safeguarded Assessment: Borehole logs, Volume III (Document reference 6.3, DCO Volume 6). The encountered ground conditions are summarised in Table 6-9.

6.3.51 A large portion of Section J is located in areas with only minimal and dispersed environmental and physical constraints that would preclude future mineral extraction developments. These include small watercourses, residential properties and adopted highways.

6.3.52 Part of Section J passes through land where planning permission was sought for the development of a soft sand quarry (application no. 20/01483/HCS) which was refused by HCC on the following grounds:

1. Adverse visual and amenity impacts.
2. Contradiction of Policy 2 (Climate change mitigation and adaptation).
3. The proposals were unable to demonstrate that the development can protect local amenity and can protect water quality and surface water drainage and cause no additional flood risk.
4. The location of the site does not have a safe and suitable access to the highway network and does not include suitable mitigation measures to mitigate any likely significant adverse effects on highway safety.

6.3.53 Based on the reasoning outlined above, it is unlikely that the opening of a quarry would take place within this location despite the area being relatively unconstrained.

Table 6-9 Summary of ground conditions based on GI locations within the Order Limits in Section J

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
Topsoil	Very soft to soft dark brown CLAY/SAND	0.20– 0.35	3J5002SA 3J5003HP 3J5004DS 3J5012HP 3J5013HP 3J5017HP 3J5023HP 3J5024HP 3J5025HP 3J5027DS 3J5028DS 3J5029HP 3J5101H P 3J5102HP
Made Ground	Soft dark grey mottled black sandy gravelly locally organic CLAY. Gravel is brick, glass, ceramic, chert.	0.25– 3.60	3H4517SA 3J5004DS 3J5007DS
	Brown gravelly SAND. Gravel of concrete and brick/Gravelly CLAY.	0.25–0.45	3J5014TP 3J5015SA 3J5016TP 3J5026HP
	Firm orangish brown sandy gravelly CLAY. Gravel is chert and rare brick/Gravelly SAND.	0.70–1.15	3J5014TP 3J5015SA 3J5016TP
	Fragments of glass, plastic bags, wood, cloth, rubber, metal, paper within a soft brown gravelly CLAY and grey sandy GRAVEL matrix	1.80–3.60	3J5014TP 3J5015SA 3J5016TP
	Grey/brown gravelly SAND. Gravel is weak sandstone, chert with occasional wood, glass and metal fragments.	0.80–1.20	3J5014TP 3J5015SA
Head Deposits	Soft (locally very soft) to firm light yellowish brown sandy gravelly CLAY, with low cobble content.	0.55–3.00	3J5003HP 3J5004DS 3J5007DS 3J5028DS
Wittering Formation	Soft to firm mottled grey and orangish brown sandy CLAY. At 3J5027DS, loose to medium dense sand.	0.85–4.20	3J5017HP 3J5027DS
London Clay Formation	Stiff (locally soft) light brownish grey CLAY/Very stiff dark grey CLAY with occasional partings or lenses of grey silt and fine sand.	0.40– >10.60	3H4517SA 3J5002SA 3J5012HP 3J5013HP 3J5015SA 3J5023HP 3J5024HP 3J5025HP 3J5026HP 3J5028DS 3J5029HP 3J5101HP 3J5102HP

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
London Clay Formation – Whitecliff Sand Member	Dense to very dense (locally loose) light greyish/yellowish brown clayey fine to medium SAND, locally with pockets of firm clay.	0.30– 7.45	3H4517SA 3J5002SA 3J5003HP 3J5013HP 3J5015SA 3J5016TP
London Clay Formation - Possible D/C basal bed	Stiff brownish grey silty sandy CLAY with occasional black subangular/subrounded gravel of flint and claystone.	0.30–0.85	3H4517SA 3J5002SA
London Clay Formation - Possible Portsmouth Sand Member	Dense grey clayey fine to medium SAND.	2.00	3J5002SA

Section K: The River Hamble to Lower Upham

6.3.54 Section K is located between the B3035 and the B3037. Section K is located within a Superficial Sand and Gravel MSA between the B3035 and Manor Road as shown on Sheet 5 and 6 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6). Section K skirts the Brick Clay MSA (Lambeth Group) by Kimbers Copse.

6.3.55 Approximately 700m of the southern part of Section K is located within a site that has been safeguarded for mineral processing activities as shown on Sheet 4 and 5 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6).

6.3.56 Based on the Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), Superficial deposits are absent for the majority of Section K, except south-west of Bishops Waltham near the River Hamble (Alluvium, Head Deposits and River Terrace Deposits), and near watercourses to the east and south-east of Wintershill (Alluvium); all of which are underlain by London Clay bedrock. Lambeth Group and White Chalk Subgroup would be at greater depth.

6.3.57 Section K is underlain by London Clay Formation.

6.3.58 Two historic boreholes were drilled for water supply in the vicinity of Section K between years 1891 and 2000. These progressed to greater depths than the proposed works. Both boreholes encountered London Clay Formation to greater than 32m bgl. The borehole logs generally agreed with the geological sequence anticipated from the geological mapping. A disturbed mixture of chalk and Reading Formation (the latter part of the Lambeth Group) was identified in one of the boreholes (SU51NW2), which appears to be a local feature - the borehole was thought to have been drilled into a sub-Tertiary chalk dissolution pipe (previously unknown about in 1891).

6.3.59 The ground investigation works carried out (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), encountered Superficial deposits including Alluvium, Head Deposits and River Terrace Deposits which are not mapped where the exploratory holes are located. There were no Lambeth Group deposits encountered in any of the exploratory holes which would confirm the Brick Clay MSA is located to the north-east of the Order Limits. The exploratory hole locations are shown on Sheet 5 and 6 of ES Figure 16.3 Mineral Safeguarded Assessment: Borehole logs, Volume III (Document reference 6.3, DCO Volume 6). A summary of the encountered ground conditions is presented in Table 6-10.

6.3.60 The encountered ground conditions are consistent with the BGS boreholes summarised in the desk study to the top 1m bgl within boreholes 2K5502DS, 2K5503DS, 2K5534DS and 2K5535DS (terminated earlier than scheduled depth due to water ingress within the inspection pits).

6.3.61 The Desk Study did not list a likelihood of Made Ground within Section K however, it is expected that some would be encountered near agricultural or suburban areas along the route.

6.3.62 At exploratory hole 3K5525DR, between 24.15 – 24.90m bgl, silty sand is described, which may be associated with London Clay Division C (Portsmouth Sand Member) as encountered within Section J.

6.3.63 As shown on Sheet 5 and 6 of ES Figure 16.2 Mineral constraints Volume III (Document reference 6.3, DCO Volume 6), this part of Section K is partly located within 100m of residential properties and is dissected by a Priority Habitat. The presence of these existing environmental and physical constraints would likely preclude future mineral extraction developments from being permitted. It is unlikely that Section K would preclude future mineral extraction developments being consented and therefore is unlikely to sterilise safeguarded mineral resources.

Table 6-10 Summary of ground conditions based on GI locations within the Order Limits in Section K

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
Topsoil	Grass over gravely sandy CLAY/SILT	0.12–0.35	2K5501SR 2K5502DS 2K5503DS 2K5534DS 2K5535DS 3K5513HP 3K5515HP 3K5525DR 3K5527DR 3K5529HP 3K5530HP 3K5531DS 3K5604HP 3K5606SA 3K5607HP 3K5608HP 3K5609HP 3K5610HP 3K7541IT 3K7542IT 3K7543IT 3K7544IT 3K7545IT 3K7546IT
Made Ground	Soft brown sandy gravelly CLAY. Gravel is chert, brick, (burnt wood at 3K5511DS), macadam (2K5500SR only). Sand is fine to coarse.	0.45–1.60	2K5500SR 2K5502DS 3K5511DS
	Soft brown/orange sandy slightly gravelly CLAY. Gravel is chert, brick, tile, chalk, macadam (top 0.3 m at 2K5500SR). Sand is fine to medium.	0.35	3K7542IT
Alluvium	Soft and firm grey mottled black sandy SILT with organic odour (2K5502DS only). Sand is fine/Orange/brown sandy gravelly CLAY.	0.10–2.80	2K5502DS 2K5503DS 2K5534DS 2K5535DS 3K5525DR 3K5527DR 3K5606SA 3K7542IT 3K7543IT 3K7545IT 3K7546IT
Head Deposits	Firm orangish brown mottled grey sandy cobbly CLAY. Cobbles are of flint/Grey sandy clayey GRAVEL of flint/Firm orangish brown mottled grey sandy CLAY.	0.40-0.90	2K5501SR 3K5515HP 3K5607HP 3K5608HP 3K5610HP 3K7541IT 3K7544IT
River Terrace Deposits	Soft greyish brown slightly sandy gravelly CLAY. Gravel is flint and chalk.	4.20	2K5500SR
London Clay Formation	Firm to stiff becoming very stiff locally fissured slightly sandy silty CLAY with shell fragments (<25mm diameter) and pyrite nodules (25 – 50mm diameter). Locally soft to firm near the top of the stratum. At 3K5525DR, from 6.6-6.75m, 1 cobble of strong limestone.	0.45->27.50	2K5500SR 2K5501SR 3K5511DS 3K5513HP 3K5515HP 3K5525DR 3K5527DR 3K5530HP 3K5531DS 3K5604HP 3K5606SA 3K5607HP 3K5609HP 3K5610HP 3K7541IT 3K7542IT 3K7543IT 3K7544IT 3K7545IT 3K7546IT

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
	At 2K5500SR, very stiff from 6.50 – 20.20m For 2K5501SR, at 9.70 - 9.80m, fine to coarse medium strong claystone. For 2K5501SR, from 16.70-16.80m, strong dark greyish brown argillaceous fine to medium grained fossiliferous limestone with calcite voids. At 3K5525DR, at 24.1m, 1 No. well-rounded fine gravel of claystone. from 24.15-24.90m, silty fine sand.		

Section L: Lower Upham to Brambridge

6.3.64 Section L is located between the B3037 and the River Itchen. Section L is partially located within a Superficial Sand and Gravel MSA from Crowdhill to the western extent of the section. This section also passes within a Brick Clay MSA (Lambeth Group) between the B3037 and Lowhill Farm as shown on Sheet 5 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6).

6.3.65 On the eastern side of Stroudwood Lane, Section L passes within proximity to the 100m buffer that has been set around residential properties. In addition, the location is restricted in size due to the presence of existing adopted highways. This would therefore make it unlikely that a mineral extraction development would be suitable in this location. To the western side of Stroudwood Lane there are fewer existing environmental and physical constraints present and there is a risk this part of Section L could result in sterilisation of underlying mineral resource by precluding future mineral extraction developments.

6.3.66 Based on the Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), Section L is underlain by Alluvium and Head Deposits surrounding the trenchless construction, Bow Lake and small watercourses south of Fishers Pond, with River Terrace Deposits south-west of Brambridge near Lord's Wood.

6.3.67 Across Section L, London Clay Formation is the main underlying bedrock strata, and is outcropping at surface. It thickens to the south. Geological mapping to the north of Section L suggests that Lambeth Group strata is encountered (described in the desk study as Reading Formation). Though not shown as a separate stratum on geological maps of this area, there may also be a thin layer of Harwich Formation (approximately 0.3–2.8m thick) underlying London Clay Formation (above Reading Formation).

6.3.68 There are publicly available borehole logs located within the vicinity of Section L, which are summarised in Table 6-11 (location shown on Sheet 6 and 7 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6)). The first strata comprising clay varies in depth between of 1.2m below-ground level (m bgl) and 39m bgl across the area. Additional investigation would be needed to determine the suitability of the clay for country mineral resource supplies.

6.3.69 The ground investigation works carried out (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)) indicated that the encountered ground conditions are consistent with the Desk Study, in parts, as both London Clay Formation, possible Harwich Formation, and the Reading Formation are present. Cohesive strata (clay) of the Lambeth Group are present under the southern section of Section L, in line with the Brick Clay MSA. However, granular deposits to correspond with the Superficial Sand and Gravel MSA were not typically encountered. The exploratory hole locations are shown on Sheet 6 and 7 of ES Figure 16.3 Mineral Safeguarded Assessment: Borehole logs, Volume III (Document reference 6.3, DCO Volume 6). The encountered ground conditions are summarised in Table 6-12.

Table 6-11 Summary of British Geological Survey borehole logs located within 250m of the Order Limits in Section L

BH ref	NGR		Topsoil	Strata 1	Strata 2	Strata 3	Strata 4	Strata 5	Strata 6
SU52 SW24	SU 51260 20420	Thickness (m)	N/R	15	21	-	-	-	-
		Description	N/R	CLAY	CHALK	-	-	-	-
SU51 NW41	SU 51757 19515	Thickness (m)	N/R	31	1	2	2	6	35.30
		Description	N/R	Grey silty clay	Shells/shelly limestone	Grey silty clay	Firm red/brown mottled sandy/clay	White chalk	White chalk with occasional flint bands
SU51 NW5	SU 51900 19930	Thickness (m)	N/R	1.2	0.6	0.9	16.8	29.2	-
		Description	N/R	Light brown clay	Ballast	Sand	Reading Beds	Chalk	-
SU51 NW32	SU 52080 19920	Thickness (m)	N/R	3	1.7	5.3	31	-	-
		Description	N/R	Red/brown stiff silty clay	Brown silty stoney clay	Stiff red/brown clay	Firm flinty chalk	-	-
SU51 NW39	SU 50028 19851	Thickness (m)	1	39	18	9	44	-	-
		Description		Grey CLAY	Marbled CLAY. Red/grey/green/purple.	Thanet SAND	CHALK and flint	-	-
SU42 SE29	SU 46960 21730	Thickness (m)	0.2	1.9	0.8	0.7	3.60	1.6	1.7
		Description	Topsoil with gravel	Medium dense flint GRAVEL with traces of clay at lower levels	Firm to stiff brown silty CLAY with gravel	Stiff grey silty CLAY with grey, brown fine sand	Stiff grey fissured silty CLAY with occasional shell fragments	Grey clayey sandy SILT	Stiff sandy silty CLAY

Table 6-12 Summary of ground conditions based on GI locations within the Order Limits in Section L

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
Topsoil	Very soft to soft brownish grey sandy gravelly CLAY/SILT with rootlets. Sand is medium.	0.10 – 0.40	3L6013HP 3L6015HP 3L6017HP 3L6023HP 3L6024HP-B1 3L6026HP 3L6028HP 3L6029HP 3L6044HP 3L6100HP 3L6101DS 3L6102HP 3L6103HP 3L6104HP 3L6105HP
	Grass over dark brown slightly gravelly sandy clay.	0.15 – 0.50	2L6001TP 2L6003SA 2L6007DR 2L6008DR 2L6010DR 2L6011SR 2L6012SR BH501 TP502 TP503
Made Ground	Soft brown sandy gravelly CLAY with roots and rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine brick and chert.	0.30 – 0.35	3L6027HP 3L6106DS 3L6107DS
	Brown gravelly clayey SAND. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of chert and brick.	0.40 – 0.43	3L6045HP 3L6046HP
	Soft very gravelly slightly sandy CLAY. Gravel is of glass, burnt wood, brick, concrete, plastic, charcoal, chalk, chert. At 2L6002SA and 2L6005SA, possible asbestos containing materials were noted.	0.15 – 1.00	2L6000TP 2L6002SA 2L6004TP 2L6005SA 2L6006TP 2L6009DR
	Grass over soft to firm sandy gravelly SILT with occasional gravel sized angular fragments of concrete and brick with abundant rootlets.	0.25	TP501
Alluvium	Soft mottled brown, grey, locally black with organic material slightly fine sandy gravelly CLAY. Gravel of chert. Locally with partings of silt. Locally with beds of Gravel.	1.50 – 3.50	2L6007DR 2L6008DR 2L6009DR 2L6010DR

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
River Terrace Deposits	Soft orangish brown sandy CLAY. Sand is fine.	0.52	3L6046HP
	Yellowish brown sandy clayey GRAVEL. Sand is fine. Gravel is subangular to subrounded fine to coarse chert.	0.25	3L6046HP
	Dense brownish black slightly sandy clayey GRAVEL/Soft to firm very gravelly CLAY with medium cobble content.	1.70 – 2.25	2L6011SR 2L6012SR
	Medium dense sandy GRAVEL with occasional to abundant cobbles of flint/At TP502 (0.25 – 0.60m) and TP503 (0.25 – 0.45m), soft to firm gravely sandy CLAY with rootlets and occasional cobbles of flint.	1.15 – 3.10	BH501 TP501 TP502 TP503
Head Deposits	Soft locally firm orangish brown sandy very gravelly CLAY.	0.95 – 1.50	2L6004TP 2L6005SA 2L6006TP 2L6008DR
London Clay Formation	Soft locally very soft sandy gravelly silty CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse chert.	0.30 – 1.71	3L6015HP 3L6017HP 3L6023HP 3L6024HP-B 3L6027HP 3L6028HP 3L6029HP 3L6044HP 3L6045HP 3L6100HP 3L6101DS 3L6102HP 3L6103HP 3L6104HP 3L6105HP
	Firm to stiff greyish brown mottled orange silty sandy CLAY. Sand is medium. Occasional fissures.	0.30 – 1.05	3L6013HP 3L6017HP 3L6024HP-B 3L6026HP 3L6044HP
	Soft brown mottled orange sandy gravelly SILT. Gravel is subangular to subrounded fine to medium chert.	0.50 – 0.65	3L6103HP 3L6104HP
	Firm to stiff greyish brown mottled orange sandy CLAY. Sand is coarse. Occasional gypsum.	6.10	3L6106DS
	Medium strong to strong dark brown CLAYSTONE	0.05 – 3.20	2L6003SA 2L6007DR 2L6008DR 2L6009DR 2L6010DR 2L6011SR
	Stiff to very stiff dark bluish grey and brown slightly sandy CLAY.	13.75	BH501

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
Possible Harwich Formation	Stiff grey sandy CLAY with frequent pockets of green and black glauconitic locally micaceous sand/At 2L6012SR Medium dense to dense bluish grey slightly micaceous SAND.	0.25 – 2.85	2L6008DR 2L6011SR 2L6012SR
Lambeth Group	Stiff to very stiff locally firm red or grey locally bluish grey sandy CLAY. Sand is fine to coarse. Occasional shell fragments.	4.45 – 6.10	3L6101DS 3L6107DS
	Stiff to very stiff bluish grey mottled yellowish brown and multicoloured locally sandy CLAY. At 2L6011SR from 16.10 – 17.10m and 2L6012SR from 16.15 – 16.60m: Bluish grey and speckled black fine and medium SAND with occasional pockets of decomposed organic material (30mm x 15mm) and lignitic with increasing depth At 2L6011SR from 17.10 – 18.60m, locally cemented medium spaced strong to very strong nodules/concretions typical of Lower Mottled Clay subdivision (60mm x 100mm)	1.45 - 5.60	2L6007DR 2L6008DR 2L6010DR 2L6011SR 2L6012SR
Lambeth Group and White Chalk Subgroup	From 17.25 – 20.75m, Very stiff dark brownish grey sandy silty CLAY with rare lignite fragments (possible Lambeth Group) From 20.75 – 41.50m, Very stiff fissured multicoloured CLAY – Lambeth Group. From 41.50 – 42.05m, stiff multi-coloured sandy gravelly CLAY with rinded flint – Lambeth Group Upnor Formation – Mottled. From 42.05 – 45.15m, weak low to medium density white CHALK.	27.90	BH501

Section M: Brambridge to Otterbourne Water Supply Works

6.3.70 Section M is located between the River Itchen and the Otterbourne WSW and includes the INNS Treatment plant at Otterbourne WSW. Section M is located within a Superficial Sand and Gravel MSA (Alluvium) and also passes through a Brick Clay MSA (Lambeth Group) between Kiln Lane and Batsford Lane as shown on Sheet 5 of ES Figure 16.1 Proposed Development and Mineral Safeguarded Areas and Safeguarded Minerals and Waste Sites, Volume III (Document reference 6.3, DCO Volume 6).

6.3.71 Based on the Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), Superficial deposits are present across Section M apart from lengths of Pipeline to the north and south of Kiln Lane. From Highbridge Road in the south-east, superficial Alluvium and River Terrace Deposits are present at ground level, associated with deposition from the River Itchen. Superficial Alluvium and River Terrace Deposits are again present at the trenchless construction, associated with deposition from the tributary, while Head Deposits are present in the far north of Section M at the connection with the Otterbourne WSW adjacent to Batsford Lane.

6.3.72 These superficial deposits are underlain by bedrock of the London Clay Formation, Lambeth Group and White Chalk Subgroup. From Highbridge Road in the south-east, superficial deposits are underlain by the London Clay Formation. South of Kiln Lane the London Clay Formation is mapped at ground level and underlain by the Lambeth Group, which is found at ground level further north around Kiln Lane. The Lambeth Group is underlain by the White Chalk subgroup which underlies superficial deposits in the north of Section M.

6.3.73 Three historic boreholes were drilled along Section M (SU42SE30, SU42SE184 and BH-E SOCOTEC 2019). These progressed to between 3.50m and 20.0m bgl. Each borehole encountered varying thicknesses of Made Ground, Alluvium, Head Deposits and River Terrace Deposits with London Clay and White Chalk Subgroup bedrock. The boreholes generally agreed with the geological sequence anticipated from the geological mapping. The borehole logs are summarised in Table 6-13.

6.3.74 The ground investigation works carried out (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6)), indicated that the encountered ground conditions differed from mapping at several locations, as follows:

1. Made Ground was encountered at exploratory hole TP509 but was not mapped.
2. Exploratory holes BH504, TP507, TP508 and TP509 are on the contact of River Terrace Deposits and London Clay, with all investigations encountering River Terrace Deposits underlain by the London Clay Formation.
3. Exploratory hole 2M6507SA was mapped as Lambeth Group being present at ground level but River Terrace Deposits were encountered.
4. Exploratory hole 2M6508SA is mapped with River Terrace Deposits at ground level, however Alluvium was found.

5. Exploratory hole 3M6517HP mapping indicated no superficial deposits with Lambeth Group at ground level, however Made Ground was encountered at ground level and underlain by Alluvium and Head.

6.3.75 Cohesive strata (clay) of the Lambeth Group are present under Section M, in line with the Brick Clay MSA. The exploratory hole locations are shown on Sheet 7 of ES Figure 16.3 Mineral Safeguarded Assessment: Borehole logs, Volume III (Document reference 6.3, DCO Volume 6). A summary of the encountered ground conditions is presented in Table 6-14.

6.3.76 The alignment of Section M within the Superficial Sand and Gravel MSA but outside of the Brick Clay MSA, is considered to have a large number of existing environmental and physical constraints which would preclude future mineral extraction developments. These include residential properties and their 100m buffer, the River Itchen, Flood Zones 2 and 3, Priority Habitats, railway line and a SSSI. Where parts of the of Section M are located outside of constrained areas, there are constraints within the immediate vicinity, which could constrain future quarrying activity. It is unlikely that this part of Section M would preclude future mineral extraction developments being proposed and therefore is unlikely to sterilise safeguarded mineral resources.

6.3.77 Where Section M passes through the Brick Clay MSA, there are fewer constraints in these locations, as shown on Sheet 7 of ES Figure 16.2 Mineral constraints, Volume III (Document reference 6.3, DCO Volume 6). There is a risk that this part of Section M could result in sterilisation of underlying mineral resource by precluding future mineral extraction developments.

Table 6-13 Summary of British Geological Survey borehole logs located within 300m of the Order Limits in Section M

BH ref	NGR		Topsoil	Made Ground			Alluvium	Head Deposits		River Terrace Deposits		London Clay Formation	White Chalk Subgroup
SU42 SE30	SU 46650 22020	Top of Strata (m bgl)	0.00	-	-	-	0.35	-	-	1.10	-	4.20	-
		Description		Tarmac	Brown clayey SAND and coarse gravel	Light brown sandy locally organic CLAY with gravel of chalk and brick	Firm brown sandy silty CLAY with gravel	Soft light brown and white clayey silty sine SAND/sand SILT	Light brown and white clayey silty fine SAND/sandy SILT	Brown GRAVEL with silty clay	Sandy Gravel	Locally firm brownish grey locally brown CLAY	White CHALK with flint
SU42 SE184	SU 46715 23444	Top of Strata (m bgl)	-	0.00	0.10	0.20	-	-	-	-	-	-	0.50
		Description		Tarmac	Brown clayey SAND and coarse gravel	Light brown sandy locally organic CLAY with gravel of chalk and brick	Firm brown sandy silty CLAY with gravel	Soft light brown and white clayey silty sine SAND/sand SILT	Light brown and white clayey silty fine SAND/sandy SILT	Brown GRAVL with silty clay	Sandy Gravel	Locally firm brownish grey locally brown CLAY	White CHALK with flint
BH-ESOCOTEC 2019 GI*		Top of Strata (m bgl)	0.00	-	0.30	0.60	-	2.00	3.00	-	4.00	-	7.00
		Description		Tarmac	Brown clayey SAND and	Light brown sandy locally organic	Firm brown sandy silty CLAY	Soft light brown and white clayey	Light brown and white clayey	Brown GRAVL	Sandy Gravel	Locally firm brownish	White CHALK with flint

BH ref	NGR		Topsoil	Made Ground			Alluvium	Head Deposits		River Terrace Deposits		London Clay Formation	White Chalk Subgroup
					coarse gravel	CLAY with gravel of chalk and brick	with gravel	silty sine SAND/sand SILT	silty fine SAND/sandy SILT	with silty clay		grey locally brown CLAY	

Table 6-14 Summary of ground conditions based on GI locations within the Order Limits in Section M

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
Topsoil	Brown clayey gravelly SAND with rootlets and cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine flint.	0.30	2M6507SA
	Soft to firm dark brown sandy gravelly CLAY with rootlets. Sand is fine to coarse. Gravel is subrounded fine to medium chert and brick.	0.25 – 0.35	TP507 TP508 3M6601HP 2M6508SA
	Soft dark brown sandy silty GRAVEL with rootlets. Sand is fine, Gravel is subangular to subrounded fine to coarse chert.	0.25	BH504
Made Ground	Soft dark brown sandy gravelly CLAY. Sand is medium. Gravel is of chert, chalk and brick.	0.36 – 0.48	TP509 3M6517HP
Alluvium	Soft to firm orangish brown silty sandy gravelly CLAY. Sand is fine to medium. Gravel is subrounded fine extremely weak chalk.	0.17 – 2.25	3M6517HP 2M6508SA
Head Deposits	Soft brown sandy gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse chert.	0.55	3M6517HP

Stratum	Typical Description	Thickness (m)	Exploratory Hole Encountered
River Terrace Deposits	Medium dense brown gravelly clayey SAND/gravelly sandy clayey SILT. Sand is fine to coarse. Gravel is angular to subangular fine to medium flint.	1.95 - 5.40	2M6507SA 2M6508SA
	Soft to firm brown sandy gravelly silty CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse chert.	0.64 - 2.64	BH504 TP507 TP508 TP509
London Clay Formation (Division D)	Stiff orangish brown grading to dark grey sandy gravelly silty CLAY with occasional shell fragments. Sand is medium. Gravel Is medium to coarse mudstone.	2.60 - 6.60	BH504 TP507 TP508 TP509
London Clay Formation (Division A)	Very dense grey glauconitic fine silty SAND with rare gravel. Sand is fine to medium. Gravel is angular to subangular fine to coarse sandstone.	21.30	BH504
Lambeth Group	Firm to very stiff grey CLAY/silty sandy gravelly CLAY at base of strata. Gravel is angular to rounded fine to coarse flint.	0.95 - 8.40	BH504 3M6601HP 2M6507SA
	Grey glauconitic fine SAND with rare shell fragments.	5.30	BH504
White Chalk Subgroup	Yellow white and white CHALK recovered as gravelly SILT. Gravel is subangular to subrounded dine to medium extremely weak low-density chalk.	2.90	2M6508SA
	White CHALK recovered as silty GRAVEL with rare subangular fragments of flint. Gravel is very weak to weak low to medium density subangular fine to coarse chalk.	0.30 – 10.05	BH504 2M6507SA 2M6508SA
	White CHALK recovered as sandy gravelly SILT. Gravel is extremely weak to very weak low density of chalk with rare flint.	3.00 - 5.00	2M6507SA 2M6508SA
	Weak high density white CHALK with rare small to large fragments of flint.	9.90	BH504

6.4 Summary

6.4.1 Table 6-15 provides a summary of the MSAs in each section of the Proposed Development. Table 6-15 also summarises where the Proposed Development could result in the sterilisation of underlying mineral resources due to the location coinciding with a MSA.

6.4.2 The ground conditions broadly concur with the geological mapping as outlined in the Desk Study (ES Appendix 11.2 Ground investigation reports, Volume II (Document reference 6.2, DCO Volume 6).

6.4.3 Both Wittering Formation and Earnley Sand Formation (Soft Sand MSA) are noted within Section G with thicknesses ranging between 9.90 and 25.30m. Both formations are logged similarly on site, so the precise boundaries between them are not always clear. In Section J Wittering Formation is also present at 0.85m thickness (Earnley Sand Formation considered to be absent). As both formations are parts of the Soft Sand MSA, this is not of significance, and parts of Section G and Section J could potentially sterilise underlying mineral resources or preclude future mineral extraction developments.

6.4.4 Wittering Formation is also noted in parts of Section H consistent with the Soft Sand MSA (present at 8.3m). However, Section H is located within or in proximity to residential properties and adopted highways and it is unlikely that Section H in this location would preclude future mineral extraction developments being permitted and therefore is unlikely to sterilise safeguarded mineral resources.

6.4.5 Notable findings included identifying previously unconfirmed thicknesses of the Whitecliff Sand Member within the London Clay Formation within Section H. Due to the absence of previous GI available historically, it was originally estimated that the member would be of a minimal thickness (less than 1m). However, rotary drilling struggled to progress due to encountering thicknesses between 7–10m bgl resulting in poor core recovery and multiple metres of core loss such as at exploratory holes 2H4500DR and 2H4501DR. The Whitecliff Sand Member is not a MSA, and this does not have an impact on the MSA.

6.4.6 Section J encountered Made Ground at two historic landfill sites: Ash House Landfill at exploratory hole locations 3J5014TP, 3J5015SA and 3J5016TP up to 6.00m bgl and land at Rossgarth Landfill at exploratory hole locations 3J5004DS and 3J5007DS up to a maximum of 3.6m bgl.

6.4.7 Ash House Landfill has approximate plan dimensions of 75m width x 130m length within the pipeline development route. However, on the BGS mapping for the same area, Made Ground is not shown. Rossgarth Landfill also does not concur with the geological mapping likely due to its small size with approximate plan dimensions of 30m width x 250m length. Due to the presence of the above landfills, any underlying mineral resources are already sterilised.

Table 6-15 Summary of geological of findings from section 6

Proposed Development Section	Summary	Constraints within the study area
The WRP site (ES Figure 16.1, Sheet 2)	Part of this section is located within a Superficial Sand and Gravel MSA. This section of the Proposed Development is situated on a historic landfill so any underlying mineral resources are already sterilised. **This section of the Proposed Development is unlikely to impact the MSA.**	Landfill
Pipelines between Budds Farm WTW and the WRP site (ES Figure 16.1, Sheet 2)	Part of this section is located within a Superficial Sand and Gravel MSA. The Pipelines between Budds Farm WTW and the WRP site are also located within an area which has been safeguarded for mineral processing in the HMWP [6]. The location of Budds Farm WTW is located within an area which has been safeguarded for wastewater treatment which is operated by the Applicant. The land in this location is constrained and therefore future mineral developments are unlikely to be permitted. This section is also situated on historic landfill so any underlying mineral resources are likely to be already sterilised. **This section of the Proposed Development is unlikely to impact the MSA.**	Landfill, watercourse, HMWP safeguarded site for mineral processing, HWMP safeguarded waste site buffer zone (this site is operated by the Applicant)
Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works		
Section D: The WRP site to Portsdown Hill (ES Figure 16.1, Sheet 2)	Parts of Section D is located within a Brick Clay MSA. Parts of Section D passes within the buffer area of site that has been safeguarded for mineral and waste processing. The land is constrained and therefore future mineral developments are unlikely to be permitted however there are sections of the route where the potential for mineral extraction cannot be ruled out. The Proposed Development could therefore impact the MSA in isolated areas by sterilising mineral resources. **Parts of Section D could adversely impact the MSA in isolated areas without the implementation of tertiary mitigation.**	Residential properties (100m buffer), LWS, HMWP safeguarded waste processing site buffer zone.
Section E: Portsdown Hill to Boarhunt	Majority of this section of the Proposed Development is located within a MSA for Brick Clay. Dispersed constraints are present however large areas of land are not constrained. Due to lack	Adopted highways; residential

Proposed Development Section	Summary	Constraints within the study area
(ES Figure 16.1, Sheet 3)	of constraints present it is possible that a future mineral extraction activity could be permitted. Parts of Section E could therefore impact the MSA by sterilising mineral resources. **Parts of Section E could adversely impact the MSA without the implementation of tertiary mitigation.**	properties (100m buffer).
Section F: Boarhunt to Crockerhill (ES Figure 16.1, Sheet 3)	Part of Section F transects through a Superficial Sand and Gravel MSA, Brick Clay MSA and a Soft Sand MSA. This section passes through or within proximity to above and below-ground constraints. This section also passes within the boundary of a site which is designated as a Safeguarded Waste Site in the HMWP. Though there are constraints present along Section F and within the vicinity, there are sections which pass through areas which contain no constraints for mineral extraction. Therefore, the granting of a mineral extraction development in this location cannot be ruled out. Parts of Section F could therefore impact the MSA by sterilising mineral resources. **Parts of Section F could adversely impact the MSAs without the implementation of tertiary mitigation.**	OS open roads; local roads; a Portsmouth water net water pipe; residential properties (100m buffer), Priority Habitats, ancient woodland, HMWP safeguarded waste treatment site buffer zone.
Section G: Crockerhill to Wickham (ES Figure 16.1, Sheet 4)	Parts of this section are located within a MSA for Soft Sand and a MSA for Superficial Sand and Gravel. Part of Section G passes beneath the boundary of site that has been safeguarded for mineral and waste processing. Within the MSAs there are areas where the Proposed Development is located in areas which do not contain constraints to future mineral extraction The parts of Section G could therefore impact the MSA by sterilising mineral resources. **Parts of Section G could adversely impact the MSAs without the implementation of tertiary mitigation.**	Residential properties (100m buffer) and Priority Habitats, HMWP safeguarded water treatment works site buffer zone (this site is operated by the Applicant).
Section H: Wickham to Shedfield (ES Figure 16.1, Sheet 4)	Predominantly located within a Soft Sand MSA and partially located within a Superficial Sand and Gravel MSA. The ground investigation works carried out indicated underlying geology to typically be consistent with the MSAs. However, Section H is located within or in proximity to existing constraints to future mineral development. It is unlikely that Section H in this location would	Residential properties (100m buffer) and adopted highways

Proposed Development Section	Summary	Constraints within the study area
	preclude future mineral extraction developments being permitted and therefore is unlikely to sterilise safeguarded mineral resources. **Section H is unlikely to impact the MSAs.**	
Section J: Shedfield to the River Hamble (ES Figure 16.1, Sheet 4)	The majority of Section J is within a Soft Sand MSA. Additionally, a small part of this section passes within a Superficial Sand and Gravel MSA. The northern part of Section J passes within the buffer area of site that has been safeguarded for mineral and waste processing. The parts of Section J located within the Superficial Sand and Gravel MSA areas are largely unconstrained. However, a previous quarry planning application on land within the Order Limits was refused. The submission of the planning application indicated the presence of mineral resources. **Parts of Section J could adversely impact the MSAs without the implementation of tertiary mitigation.**	Adopted highways, HMWP safeguarded mineral processing site buffer zone.
Section K: The River Hamble to Lower Upham (ES Figure 16.1, Sheet 4 and 5)	The southern part of Section K is located within a Superficial Sand and Gravel MSA and also passes within a buffer area of a site that has been safeguarded for mineral and waste processing. Additionally, part of the section skims the boundary of a Brick Clay MSA as confirmed by the ground investigation works carried out. The mineral resource is considered to be sterilised due to constraints within vicinity. **Section K is unlikely to impact the MSA.**	Residential properties (100m buffer); PRoW; and Priority Habitats, HMWP safeguarded minerals processing site buffer zone.
Section L: Lower Upham to Brambridge (ES Figure 16.1, Sheet 5)	Section L is partially located within a Superficial Sand and Gravel MSA. Only a small southern section passes within a Brick Clay MSA. The ground investigation works carried out indicate the presence of clay with limited granular deposits. There are parts of Section L which could result in the sterilisation of underlying mineral resources and precluding future mineral extraction developments. **Parts of Section L could adversely impact the MSAs without the implementation of tertiary mitigation.**	Residential properties (100m buffer).

Proposed Development Section	Summary	Constraints within the study area
Section M: Brambridge to Otterbourne WSW (including INNS Treatment) (ES Figure 16.1, Sheet 5)	Parts of Section M are located within a Brick Clay MSA and for Superficial Sand and Gravel MSA. The part of Section M, which only passes through the Superficial Sand and Gravel MSA is located beneath the River Itchen and therefore is already considered to be sterilised. **Part of Section M is unlikely to impact the MSA.** The part of Section M which passes through the Brick Clay MSA and the Superficial Sand and Gravel MSA contains a large number of existing environmental and physical constraints which would preclude future mineral developments. However, there are sections of Section M located in areas which do not contain constraints to mineral extraction. There are parts of Section M which could result in the sterilisation of underlying mineral resources and the precluding future mineral extraction developments. **Parts of Section M could adversely impact the MSA without the implementation of tertiary mitigation.**	Railways; local roads; watercourse; PRoW; Flood Zone 2 and 3; Priority Habitats; underground utilities; and ecologically designated sites.

7 Needs assessment

7.1.1 Policy 15 of the HMWP states development without the prior extraction of mineral resources in the Mineral Safeguarding Area may be permitted if;

"…the merits of the development outweigh the safeguarding of the mineral".

7.1.2 A needs assessment is therefore required to satisfy the requirements of Policy 15 to compare the needs of the Proposed Development and the need to safeguard mineral resources. To assess the need for mineral safeguarding, a review has been conducted into the current status of mineral provision in the region. For additional information of the need for the Proposed Development refer to Case for the Project (Document Reference 5.6, Volume 5).

7.2 Need for the Proposed Development

7.2.1 The Applicant operates in a part of the United Kingdom that is classified by the EA as 'seriously water stressed' and the South East of England faces the greatest pressures on water resources of all the English regions. Projections undertaken by the Applicant in developing the emerging Water Resources Management Plan2024 [12] (WRMP24) and Water Resources South East[1] (WRSE) for its regional plan identify a substantial supply-demand deficit across the region by the mid to late century and identifies that this deficit is driven by population growth, climate change impacts and the need to deliver enhanced environmental protection. For further details see Case for the Project (Document Reference 5.6, Volume 5).

7.2.2 Currently, the Applicant's water supplies are largely reliant on groundwater from the widespread chalk aquifer that sits under much of the region. However, Hampshire, which forms the Applicant's western supply area, has a greater reliance on river abstractions, including from the River Test and River Itchen. Within the western supply area, the Applicant's Hampshire Southampton West water resource zone is wholly reliant on river abstractions and the Hampshire Southampton East water resource zone sources more than half of its water supply from river abstractions.

7.2.3 The Applicant's emerging WRMP24 forecasts that across the whole of its supply areas, under 1-in-500 year drought conditions, there would be a supply-demand deficit of around 280 Ml/d by 2035, increasing to around 500 Ml/d by 2050[2]. Critically, water supplies over the supply area are also in deficit in normal weather conditions and non-severe drought events, risking the Applicant's ability to maintain essential daily supplies to customers. The normal year forecasts in the Applicant's emerging WRMP24 indicate a deficit of around 90 Ml/d by 2035 increasing to around 450 Ml/d by 2050[3].

[1] WRSE comprises six constituent water companies including the Applicant.

[2] See Table 5.13 of the emerging WRMP 2024 https://www.southernwater.co.uk/media/2p5o0k0c/technical-report.pdf figures for situation 4 in the 1:500 DYAA planning scenario (these did not change from the earlier revised draft)

[3] See Table 5.13 of the emerging WRMP 2024 https://www.southernwater.co.uk/media/2p5o0k0c/technical-report.pdf figures for situation 4 in the NYAA planning scenario (these did not change from the earlier revised draft)

7.2.4 Within the Western Area the emerging WRMP24 indicates a water supply deficit of around 203Ml/d by 2040, rising to around 211Ml/d by 2050 in a 1 in 500 year drought. Under normal year forecasts, the Western Area faces a deficit of 156Ml/d in 2040, rising to 163Ml/d by 2050).

7.2.5 The primary cause of the projected water supply deficit in the western supply area is the river abstraction licence changes for the River Itchen and River Test. These river abstraction licence changes have been driven by the need to secure additional environmental protection for the River Itchen SAC and SSSI and the River Test SSSI.

7.2.6 The NPSWRI [13] sets out that a water company's WRMP will identify the need for water resources and determine the specific technology solutions required to meet that identified water resources need. Paragraph 2.5.2 of the NPSWRI states that "*if a water company identifies a future deficit in supply, it will need to assess the water resources and demand management options to eliminate the deficit and justify its preferred option in its WRMP*". This emphasises the role of the statutory duty to prepare, publish and maintain a WRMP (s37A Water Industry Act 1991) to set out the plan for how water companies will manage and develop water resources so that they can meet their supply obligations in considering and identifying the preferred solution type for meeting that need.

7.2.7 The NPSWRI also reiterates the government's expectation for water companies to work together to address water supply challenges. For new water resource development (supply) options, WRSE and its six constituent water companies collaborated on their options appraisal processes, with options identified and assessed by the individual companies, including Strategic Environmental Appraisal, Habitats Regulation Assessment (HRA) and Water Framework Directive assessments. Supply side options assessed for the WRSE regional plan and water company-level WRMPs included water transfers between regions, new reservoirs and the expansion of existing reservoirs, water recycling, enhancing groundwater and aquifer use, desalination, catchment management options, drought orders and permits, and multi-sector options (i.e. options involving water used for agricultural, power and other sectors). Many of the new resource options were included and assessed at different capacities and/or as single phase or multi-phase developments. Both demand management and supply side options formed a significant proportion of the overall 4,000 options considered for selection in the investment modelling.

7.2.8 The Applicant has considered a range of alternative technologies and solutions to the Proposed Development through the WRMP process, including those listed below:

1. Building new reservoirs / several smaller reservoirs
2. Moving the location of river abstraction points further downstream (for example, from the River Itchen).
3. Managed Aquifer Recharge and Aquifer Storage and Recovery
4. Bulk imports

7.2.9 Due to the size of the supply-demand deficit faced and limited opportunities for abstracting more water from surface water and groundwater, the WRMP process needs to rely on solutions that deliver resilience by using new sources, such as desalination and water recycling, together with bulk imports from neighbouring

WRSE members. The NPSWRI recognises at Table 1 that "*Water storage systems will be required to support transfers, along with other schemes such as desalination and effluent re-use that provide a high level of resilience to longer term drought periods.*"

7.2.10 The Applicant's emerging WRMP24 included six groundwater options, all of which were selected in the plan. These options involved enhancement to the existing asset in order to derive the maximum benefit under current licences; they also include a managed aquifer recharge scheme in the River Test catchment. However, these are typically small schemes and cannot provide the volume needed to achieve supply-demand balance under all planning scenarios considered in the emerging WRMP24.

7.2.11 The results presented in the final WRSE Regional Plan [14] and the Applicant's emerging WRMP24 show that the Proposed Development was selected in the preferred plan under the reported pathway (situation 4) and all of the other future pathways in the adaptive plan. There are no alternative solutions to the Proposed Development that are available and deliverable in the required timescales to provide the scale or deployable output to meet the need within the water resource zones that it will serve, by 2035. The final WRSE Regional Plan [14] modelling has identified that no other companies have surplus water of the volume required to transfer to the Applicant within the available timescale (i.e. by 2035) as an alternative to the Proposed Development.

7.2.12 The Applicant's emerging WRMP24 sets out the strategy for addressing the water supply deficit in the western supply area in a 1-in-500-year drought. This includes a strategic water resources infrastructure solution that would deliver 90Ml/d of water.

7.2.13 New reservoirs and additional storage form part of the Applicant's suite of measures to meet the supply need across its supply region including Havant Thicket Reservoir, which is being delivered by Portsmouth Water for the Applicant's customers, White Horse Reservoir which is a partnership reservoir scheme between Thames Water, Affinity Water and Southern Water, and the River Adur Offline Storage in the Applicant's central area (Sussex).

7.2.14 The pipelines delivered as part of the Project, and separately by Portsmouth Water, will enable the transfer of approximately 60 Ml/d (megalitres per day) of recycled water between the WRP site and Havant Thicket Reservoir at maximum operation. This supply of additional water into the already consented 8.7 billion litre reservoir will ensure the optimal use of the reservoir's storage capability. At maximum operation, this would allow approximately 90 Ml/d of source water (water that is used as a source for drinking water) to be transferred from the reservoir to Otterbourne Water Supply Works (WSW) for treatment to strict drinking water standards before being sent into supply to customers through the existing distribution network.

7.2.15 The Applicant is progressing the Proposed Development through the Regulators Alliance for Progressing Infrastructure Development (RAPID) gated process, which provides funding for investigations and development of strategic water resources infrastructure. RAPID is made up of Ofwat, the EA and the Drinking Water Inspectorate. The RAPID gated process runs alongside, but is separate to, the DCO consenting process.

7.2.16 ES Chapter 4 Consideration of alternatives, Volume I (Document reference 6.1, DCO Volume 6) sets out the process undertaken to consider alternatives to inform the selection of the Proposed Development which has been selected as the preferred option in WRMP24. Additional details on the need for the Proposed Development are included in the Case for the Project (Document Reference 5.6 Volume 5).

7.2.17 The Proposed Development comprises the construction, operation and maintenance of the following components:

1. Water Recycling Plant and associated pumping stations.
2. Pipelines between Budds Farm WTW and the WRP site.
3. Pipelines between the WRP site and Bedhampton Springs, connecting into pipelines being delivered by Portsmouth Water between Bedhampton Springs and Havant Thicket Reservoir.
4. Underground pipeline between the WRP site and Otterbourne WSW.
5. Above Ground Plant comprising Intermediate Pumping Stations and Break Pressure Tanks (BPTs) located along the Pipeline between the WRP and Otterbourne WSW.

7.2.18 The Proposed Development would also comprise the use of the following infrastructure:

1. Havant Thicket Reservoir (currently under construction) for the storage of recycled water.
2. Existing Eastney LSO, Eastney Pumping Station, and associated Eastney Transfer Tunnel for the release of reject water (containing impurities removed from the treated wastewater) from the WRP.
3. The use of pipelines that are consented separately by Portsmouth Water for the transfer of recycled water and source water between Bedhampton Springs and Havant Thicket Reservoir.
4. The construction and operation of the Proposed Development would include other works such as landscaping and environmental mitigation measures.

7.2.19 The benefits of the Proposed Development are outlined in the Case for the Project (Document Reference 5.6, Volume 5).

7.3 Aggregate/mineral supply

7.3.1 Paragraph 226 of the NPPF states "*Minerals Planning Authorities should plan for steady and adequate supply of aggregates by:*

f) maintaining landbanks of at least 7 years for sand and gravel and at least 10 years for crushed rock, whilst ensuring that the capacity of operations to supply a wide range of materials is not compromised".

7.3.2 The Proposed Development passes through MSAs for Superficial Sand and Gravel, Soft Sand and Brick Clay.

7.3.3 Policy 20 of the HMWP requires a minimum landbank for locally extracted sand of at least seven years.

7.3.4 Policy 22 of the HMWP requires a minimum landbank for locally extracted brick-making clay for use in Hampshire's brickworks of at least 25 years.

Sand and gravel resources in the sub-region

7.3.5 The latest available Local Aggregate Assessment (LAA) that has been produced for the Hampshire, Portsmouth, Southampton, New Forest National Park South Downs National Park, was for the year 2023 [15]. The purpose of the LAA is to detail the current and predicted situation in Hampshire with respect to aggregate supply.

7.3.6 The LAA identified that there were twelve permitted quarries in 2023, with the site at Roeshot not yet extracting making only eleven of these quarries active in 2023.

7.3.7 In addition, the latest LAA for year 2023 [15] states soft sand resources are scarce and concentrated in a small number of areas, in comparison sharp sand and gravel resources are much more prolific and spread out within Hampshire. In 2023, the landbank for both aggregates combined increased to 12.16 years. The soft sand landbank was increased to 9.13 years in 2023.

7.3.8 With regard to sales of soft sand and sharp sand in 2023, sales of soft sand decreased whilst sharp sand and gravel increased. Overall the combined sand and gravel sales showed an increased in 2023 for the first time in five years.

7.3.9 The LAA reported an increase in the sales of recycled and secondary aggregate in 2023. Over the past ten years sales increased to a peak in 2014 of 1.1Mt and since then have continued to fall year on year. However, sales of recycled and secondary aggregates have been recovering in the past three years

7.3.10 The total capacity for recycled or secondary aggregate processing in Hampshire is estimated to be 2.9Mt based on 2023 sales return data (estimated from sales return data where a response has not been provided this year).

7.3.11 Marine-won sand and gravel sales increased in 2023 with marine imports being received at five wharves within Hampshire. There is potential for a lack of capacity to meet an increase in demand at the current time, but evidence is limited.

7.3.12 The LAA stated Hampshire has no crushed rock resources of its own and therefore relies on imports, predominantly from Somerset, who have confirmed that they cannot foresee any issues with ongoing supply. Supply is imported to rail depots running along the east of Southampton. On occasion, a small percentage is imported into Hampshire's wharves.

7.3.13 The LAA concluded that Hampshire is meeting the required landbank based on the 2023 Annual Provision Rate (APR) which is based on HCC's judgement/default 10-year average sales (APR Rate for Sharp sand and gravel – 0.74Mt per annum, Soft Sand – 0.15Mt per annum, Total – 0.89Mt per annum).

Brick clay resources in the sub-region

7.3.14 Footnote 81 of the NPPF [4] outlines the landbank requirement for mineral supply. The NPPF states a landbank of "*at least 25 years for brick clay".*

7.3.15 The Annual Monitoring Report states that in 2023 the landbank for brick-making clay in 2023 breached respective threshold for more than five successive years.

Policy 22 (Brick-making clay) in the HMWP Partial Update does not identify any other reserves.

7.3.16 Both data sources indicate that there are insufficient reserves identified to meet the landbank.

7.3.17 In the HMWP Partial Update, Policy 22 (Brick-making clay) states:

> *"A supply of locally extracted brick-making clay for use in Hampshire's remaining brickworks that will enable the maintenance of a landbank of at least 25 years of brick-making clay, will be provided from:…*
> *2) Clay extraction outside the sites identified could take place where:*
> *a) the development is in line with the other policies in this Plan, the development would not pose significant adverse harm to the environment and local communities; and*
> *b) there is a demonstrated need for the development; and/or*
> *c) the extraction of brick-making clay is incidental to the extraction of local land-won aggregate at an existing sand and gravel quarry."*

7.3.18 The identification of additional brick-making clay resources to support the brickworks at Michelmersh is required to ensure that the brickworks have a secure and long-term supply of brick-making clay. However, based on current extent of potential resource identified within the HMWP, the potential resource is present within the MSA, but HCC need to identify potential sites to enable the supply. Therefore, the sensitivity of the receptor is not vulnerable to future change.

8 Approach to minerals extraction

8.1 Minerals policy extraction framework

8.1.1 Policy 15 of the HMWP, outlined in section 1.2, provides the policy framework for mineral resource in Hampshire. Where non-minerals development is proposed, the suitability and viability of extraction of known mineral resources in that location needs to be considered in any planning application.

8.1.2 Hampshire have produced an SPD for Minerals and Waste safeguarding in Hampshire, which has been adopted by South Downs National Park Authority (SDNPA). The SPD sets out the purpose of Policy 15, which is to avoid the needless sterilisation of viable mineral resources. The SPD encourages the maximum viable level of prior extraction. The SPD outlines three levels of prior extraction options:

1. Large scale extraction: Extraction of the full mineral resource. The extraction operations would be a separate activity to the non-mineral development.
2. Medium to smaller scale extraction: Where there is no opportunity for a more comprehensive extraction of the mineral resources present. This option would look to undertake extraction operations as part of the development such as during the preparation of the land for the development. This material could then either be processed and used on site or exported to a suitable site.
3. Incidental Extraction: Any preparation of the site for the development may result in the extraction of suitable mineral that could be processed and used on site. This may include excavating the foundations and footing or landscaping works associated with the development.

8.2 Proposed approach to mineral safeguarding

8.2.1 Section 3 of this report identified where parts of each section of the Proposed Development are located within MSAs. The review showed that the Proposed Development does not pass through defined allocated sites which have been designated for mineral extraction. However, parts of the Proposed Development were found to be located within MSAs for Superficial Sand and Gravel, Soft Sand and Brick Clay. Section 4 of this assessment outlined the environmental and physical constraints which may prevent the permitting of a mineral extraction developments. These environmental and physical constraints were then mapped to identify the areas within the Proposed Development which are located in MSAs and outside of these environmental and physical constraints.

8.2.2 Using the mapping exercise, in Section 4 a review of the geological deposits along the Proposed Development route was conducted to confirm the presence of minerals within the parts of the Proposed Development located in areas which are considered to be currently unconstrained for future mineral extraction. The purpose of this exercise was to determine if there is a risk the Proposed Development would result in the sterilisation of mineral resources.

8.2.3 Using the available geological information, the Minerals Assessment (see section 6) identified that there are locations along the Proposed Development where there is a risk that sterilisation may occur.

8.2.4 A review of both the need for the Proposed Development and need for mineral resources has been conducted. It is evident there is a strong need for the development as well as the need to maintain supply for minerals resources, in particular Brick Clay.

8.2.5 Brick Clay is considered to be a regionally important resource due to its limited extent throughout the HMWP area. The 2020 Review of the HMWP [16] identified that the current Policies are seeking to enable development to maintain permitted reserves provided that the site allocations are not deliverable where there is a *"demonstrable need for the development' and/or the 'extraction of brick-making clay is incidental."*

8.2.6 To address this concern and reduce the risk of sterilisation, an incidental extraction approach to mineral extraction is being considered as the most suitable for the Proposed Development. This approach would involve utilising groundworks and tunnelling activities to extract suitable materials encountered during the excavation of the Proposed Development and incorporating them into the construction process. By doing so, the need to source other local and valuable materials would be reduced, thereby minimising the impact on region reserves.

8.2.7 Mineral extraction beyond that which is encountered incidentally would not be practicable or sustainable due to the implications for construction and the potential impact to the Proposed Development, surrounding area and local infrastructure. Additional mineral excavation would result in increased temporary land requirements during the construction phase to incorporate the additional larger and deeper trenches that would be needed to extract the mineral resources. In addition to the trenches, additional land would be required to store the excavated minerals. The increased land use over the Proposed Development could have greater impact on receptors identified in the ES.

8.2.8 To facilitate mineral extraction, excavation pits would need to be created at the locations where mineral deposits have been identified. Following extraction, these pits would require backfilling. This would involve the importation and compaction of material to bring ground levels back to existing. This process will not only prolong the construction timeline but also incurs additional costs related to the procurement and transportation of fill material.

8.2.9 The increased excavation requirements would also generate a higher volume of construction vehicle movements, affecting both site operations and the local road network. This is due to increased vehicle movements from exporting the excavating as well as the importing backfill material. In areas where increased working width is not possible to accommodate material storage, then that mineral will also need to be transported to an alternative storage. This increased in vehicle activity would extend the overall duration of construction.

8.2.10 As such an incidental approach is deemed the most appropriate approach for the Proposed Development. The Incidental extraction approach can be achieved by implementing a Minerals Management Strategy (MMS) for minerals encountered through these works with the aim to maximise the re-use of the mineral within the Proposed Development.

8.2.11 There is a requirement in the Outline Construction Environmental Management Plan (CEMP) (Document reference 7.1, Volume 7) for a MMS to be developed by the appointed Contractor as part of preparing the detailed CEMP. As set out and

secured in the Outline CEMP this MMS will address the management of mineral resources and would align with the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites [17].

8.2.12 The MMS will include the following:

1. Extraction and handling procedures: methodologies for the extraction, handling and temporary storage and stockpiling and beneficial use within the construction of the Proposed Development.
2. Documentation and Records: method for documenting the quantities of minerals which have been excavated, stored/stockpiled and used in the construction of the Proposed Development.
3. Where safeguarded minerals are encountered during excavation and are not required for the construction of the Proposed Development, the potential for offsite reuse will be considered, having regard to the reasonable practicability and commercial viability of doing so in a manner that would not give rise to environmental effects not assessed in the ES.

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Annex A British Geological Society borehole logs

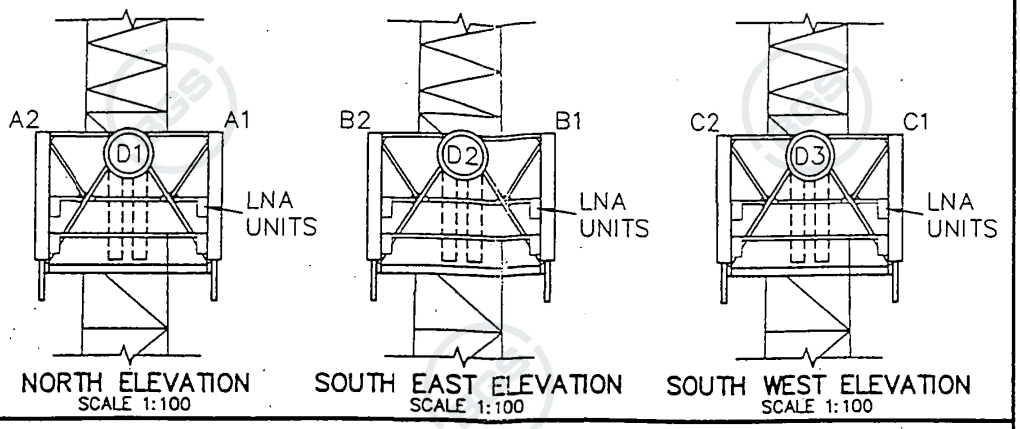
CLIENT	JOB NO	LOCATION	BOREHOLE NO
T.S.C. SWANN	C9699	HAM 0213 SOUTHERN WATER DEPOT	BH1
DATE: JULY 1998 / SCALE: 1 to 50	BORING METHOD: DYNAMIC SAMPLING		Sheet: 1

Drilling & Casing Progress	SAMPLE/TEST Type & No.	SAMPLE/TEST Depth(M)	SPT N – value or COHESION	DESCRIPTION	O D LEVEL	LEGEND	DEPTH
21ST				MADE GROUND – Tarmac.			0.0
				MADE GROUND – Medium brown clayey sand and coarse gravel.			0.10 0.20
				MADE GROUND – Light brown sandy clay with much fragments of chalk and brick.			0.50
				White very clayey weathered CHALK (grade IV) with occasional fragments of flint. Becoming less weathered below 2.00m			
21ST							3.50

DUNELM DRILLING CO
0191 626 2634 FAX 0191 617 0086

BOREHOLE LOGSHEET

Water Observations, Remarks, Etc
Borehole dry.

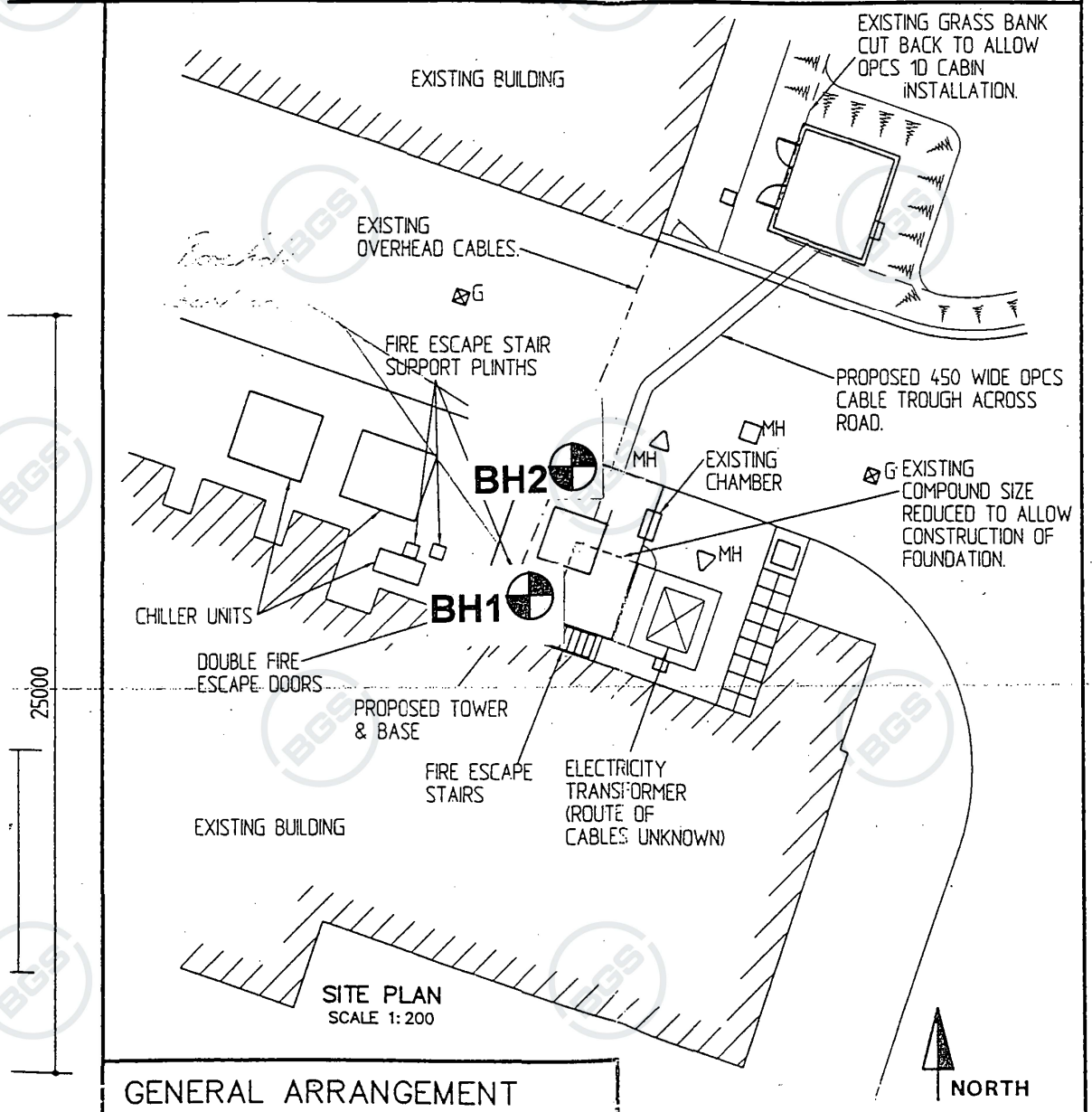


NORTH ELEVATION
SCALE 1:100

SOUTH EAST ELEVATION
SCALE 1:100

SOUTH WEST ELEVATION
SCALE 1:100

TORED



SITE PLAN
SCALE 1:200

NORTH

GENERAL ARRANGEMENT

NOTE: INFORMATION

REF	TYPE
1	
2	
3	
4	
5	
6	

NOTE: INFORMATION

ITEM	FUNCTION / LINK NO
A1	TX/RX
A2	RX
B1	TX/RX
B2	RX
C1	TX/RX
C2	RX
D1	
D2	
D3	
D4	

CONTAINS DERIVED FROM SIGN DATA MASTS, TOWERS AS Ltd AND ASSOCIATES

A3 ORIGINAL

INCHES 0 1 2
0 10 20 30 40 50 MILLIMETRES

ISS.	DESCRIPTION	BY	DATE
1	FIRST ISSUE	AGS	9/97

SCALE 1:200

DRAWN	AGS	CHECKED		APPROVED	
DATE	24/9/97	DATE	25/9	DATE	25/9

TITLE
PROPOSED RADIO IN
SOUTHERN WATER D
SPARROWGROVE, OT
HAMPSHIRE, SO23 C

DRAWING NUMBER
10/HAM0213/1

NGRC

BOREHOLE RECORDS

ADJUSTMENT FORM

QUARTER SHEET SU 51 SE

BH REGISTRATION NUMBER 147 - 155

RECORDS ENTERED AND HELD BY WALLINGFORD

BH REGISTRATION NUMBER(S)

Eastern HS
Anglian E.A.

316

SU51|75

G. STOW PLC

BOREHOLE RECORD

file:	PWWICKHAM98
EA No.	980061

A. SITE DETAILS

SU51SE

Borehole drilled for	PORTSMOUTH WATER PLC	
Location	MILL LANE WICKHAM SOUTHAMPTON	
NGR (8 fig.)	SU 5733 1201	B/H Type: EXPLORATION WELL
Ground level (if known) ..	40.605 m AOD	
Drilling Company	G. STOW PLC	
Date of drilling	Started: 07/08/98	Completed: 01/09/98

B. CONSTRUCTION DETAILS

Borehole datum (if not ground level) GL m A G L

Borehole drilled diameter	500	mm from	0	to	12	m/depth
	400	mm from	12	to	21	m/depth
	375	mm from	21	to	142	m/depth
	200	mm from	142	to	245	m/depth
Casing material: Mild Steel diameter:	219	mm from	+ 0.7 m	to	142	m/depth
and type: Butt Welded BS 879						

Grouting details ..... Casing grouted min thickness 50 mm SR Cement

Water struck at ..... m

Rest water level on completion ..... 28 m BGL

C. TEST PUMPING SUMMARY

Test pumping datum ..... 0.7 m AGL
(if different from borehole datum)

Pump suction depth ..... mbd

Water level (start of test) 28 mbd date: 01/09/98

Water level (end of test) 70 mbd

mbd

mbd

Pumping rate .....Air lift test only less than 1 L/sec for 20 mins

Recovery to ..... 69 6 mins

Remarks ..... The borehole was acidised with 2.5 T Hydrochloric acid but the pressure was very slow to dissipate and there was no improvement in yield. The borehole was backfilled in November 1998 and the casing cut off 2m BGL. (COND 760 pH 7)

PTO for strata log:

SU51/75

file:	PWWICKHAM98
EA No.	

D. STRATA LOG

Geological Classification	Description of strata	Thickn. m	Depth m
	Brown top soil	1.00	1.00
	Brown silty clay and fine gravel	1.00	2.00
	Fine yellow brown uncemented sands	2.00	4.00
	Buff coloured fine sand (loose)	2.00	6.00
	Orange fine friable sand	1.00	7.00
	Buff–orange fine sand , some sticky clay content	2.00	9.00
	Buff/light brown sands	1.00	10.00
	Light yellow friable fine sand	2.00	12.00
	Grey fine sand	2.00	14.00
	Grey green sandy clay	1.00	15.00
	Grey clay some silt content	2.00	17.00
	Buff brown sand	1.00	18.00
	Grey silty clay	5.00	23.00
	Grey clay	83.00	106.00
	Multi coloured clays – grey , red ,yellow	29.00	135.00
	Flint beds and chalk	7.00	142.00
	White chalk with a lot of flints	47.00	189.00
	White chalk less flints	56.00	245.00
	Other Comments (eg. gas encountered, saline water intercepted etc.)		

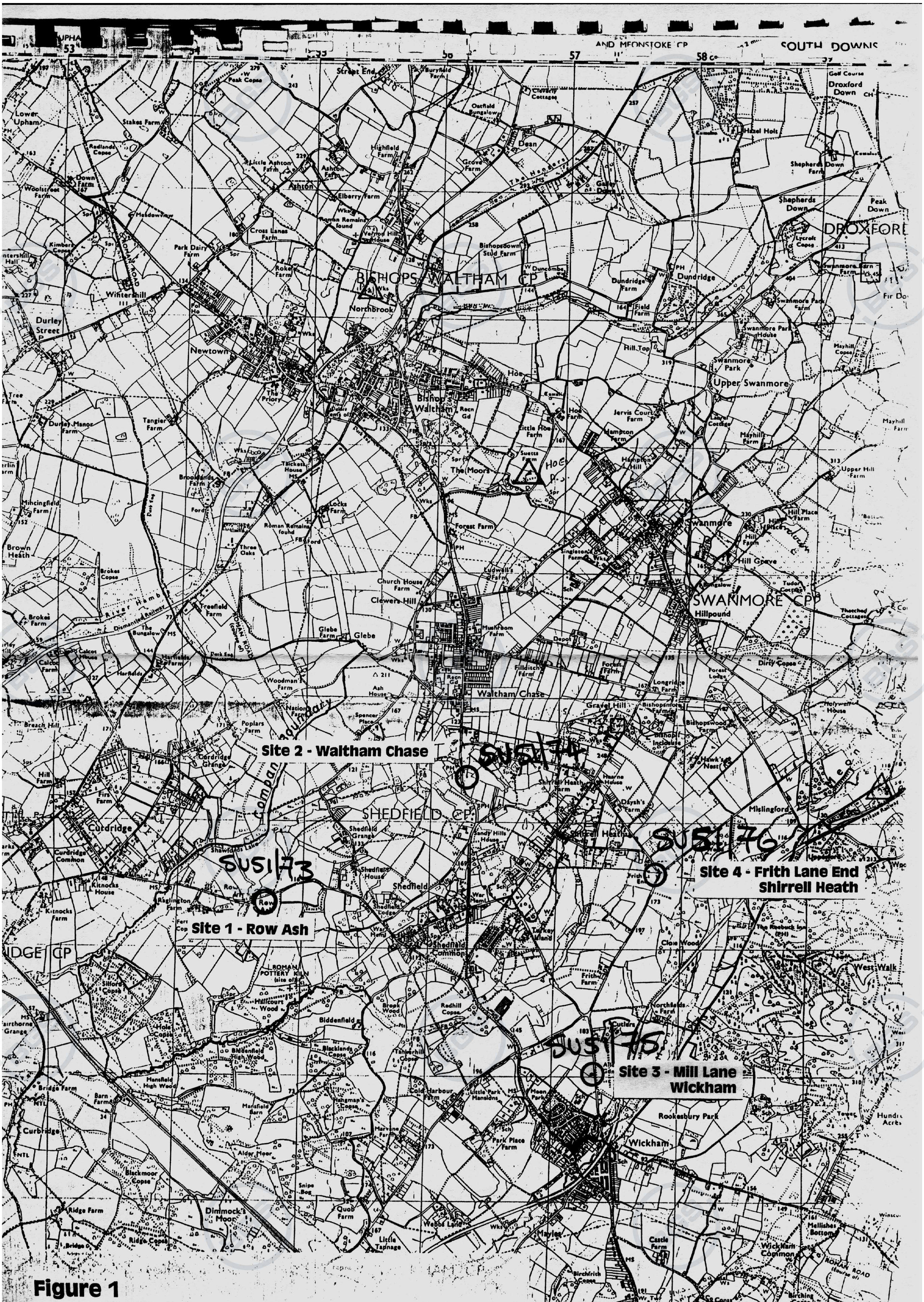

Site 1 - Row Ash
SU51/73
Site 2 - Waltham Chase
SU51/74
Site 3 - Mill Lane
Wickham
SU51/75
Site 4 - Frith Lane End
Shirrell Heath
SU51/76
BISHOPS WALTHAM CP
SHEDFIELD CP
SWANMORE CP
DROXFORD
SOUTH DOWNS
Bishops Waltham
Waltham Chase
Swanmore
Wickham
Curdridge
Shedfield
Newtown
Northbrook

Figure 1

Borehole record

Nicholls Boreholes

British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL

Environment Agency

Water Resources Act 1991 (as amended by the Water Act 2003) SOAKAWAY

A Site details

Borehole drilled for ENGLAND CIVILS LTD

Location ST. THOMAS MEAD, MANOR FARM, LOWER ROAD, BEDHAMPTON, PO93NB

NGR (ten digits) SU70061 06073 Please attach site plan

Ground level (if known) ..... metres Above Ordnance Datum

Drilling company NICHOLLS BOREHOLES

Date drilling commenced 27-04-2022 (DD/MM/YYYY) Completed 27-04-2022 (DD/MM/YYYY)

B Construction details

Borehole datum (if not ground level) ..... metres (m). Please tick if this is above ☐ or below ☐ ground level.
(point from which all measurements of depth are taken, for example, flange, edge of chamber)

Borehole drilled diameter 300 mm from 0 to 21 m/depth

..... mm from ..... to ..... m/depth

..... mm from ..... to ..... m/depth

..... mm from ..... to ..... m/depth

Casing material SOLID UPVC diameter 225 mm from 0 to 6 m/depth
and type (for example, if plain steel, plastic slotted). Please record permanent casing details, not temporary casing.

Casing material SLOTTED UPVC diameter 225 mm from 6 to 21 m/depth

Casing material ..... diameter ..... mm from ..... to ..... m/depth

Casing material ..... diameter ..... mm from ..... to ..... m/depth

Grouting details 1.5 TONS OF SHINGLE, 7 BAGS OF MIKOLIT

Water struck at 1. N/A m (depth below datum - mbd) 2. ..... m (mbd)

3. ..... m (mbd) 4. ..... m (mbd)

C Test pumping summary (Please supply full details on form WR39)

Test pumping datum ..... m. Please tick if this is above ☐ or below ☐ ground level.
(if different from borehole datum)

Pump suction depth ..... mbd

Water level (start of test) ..... mbd

Water level (end of test) ..... mbd

Type of test (for example, bailer, step, constant rate)

.....

Pumping rate ..... m^3/hour ☐ or litres/second ☐. Please tick as appropriate.

for ..... days, ... hours, ... mins

Recovery to ..... mbd in ..... days, ... hours, ... mins
(from end of pumping)

Date(s) of measurements Pump started ..... (DD/MM/YYYY)

Pump stopped ..... (DD/MM/YYYY)

Please supply chemical analysis if available. If you have included this please tick this box ☐

D Strata log

Geological classification (BGS only)	Description of strata	Thickness m	Depth (to base of strata) m
	BROWN CLAY	7	7
	SOFT CHALK	3	10
	FIRM CHALK	11	21
	(continue on separate page if necessary)		
	Other comments (for example, gas encountered, saline water intercepted)		

E Completing this form

How long did it take you to fill in this form?

For Official use only

Date received (DD/MM/YYYY)	File	Consent number	BGS reference number
Accession number	Wellmaster number	SOBI number	NGR
LIC NO	Purpose		EA reference number
Copy number	Entered by		

The British Geological Survey will use the information you

8#858

WR38: Borehole record form

Borehole record

Nicholls Boreholes

British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL

Environment Agency

Water Resources Act 1991 (as amended by the Water Act 2003)

A Site details

Borehole drilled for [redacted]

Location Red Oak & Bluebell woods, Fair Oak, Eastleigh, SO50 7EF

NGR (ten digits) SU 50028 19851 Please attach site plan

Ground level (if known) _____ metres Above Ordnance Datum

Drilling company Nicholls Boreholes

Date drilling commenced 30/1/19 (DD/MM/YYYY) Completed 5/2/19 (DD/MM/YYYY)

B Construction details

Borehole datum (if not ground level) _____ metres (m). Please tick if this is above ☐ or below ☐ ground level.
(point from which all measurements of depth are taken, for example, flange, edge of chamber)

Borehole drilled diameter

200	mm from	0	to	71 m/depth
117	mm from	71	to	111 m/depth
	mm from		to	m/depth
	mm from		to	m/depth

Casing material Welded Steel diameter 127 mm from 0 to 71 m/depth
and type (for example, if plain steel, plastic slotted). Please record permanent casing details, not temporary casing.

Casing material _____ diameter _____ mm from _____ to _____ m/depth
Casing material _____ diameter _____ mm from _____ to _____ m/depth
Casing material _____ diameter _____ mm from _____ to _____ m/depth

Grouting details 5x 6 bag mixes of Liquid Grout & 4 bags of Micolit

Water struck at 1. 73 m (depth below datum - mbd) 2. 102 m (mbd)
3. _____ m (mbd) 4. _____ m (mbd)

C Test pumping summary (Please supply full details on form WR39)

Test pumping datum _____ m. Please tick if this is above ☐ or below ☐ ground level.
(if different from borehole datum)

Pump suction depth _____ mbd

Water level (start of test) _____ mbd

Water level (end of test) _____ mbd

Type of test (for example, bailer, step, constant rate)

_____

Pumping rate _____ m^3/hour ☐ or litres/second ☐. Please tick as appropriate.

for _____ days, _____ hours, _____ mins

Recovery to _____ mbd in _____ days, _____ hours, _____ mins
(from end of pumping)

Date(s) of measurements Pump started _____ (DD/MM/YYYY)
Pump stopped _____ (DD/MM/YYYY)

Please supply chemical analysis if available. If you have included this please tick this box ☐

D Strata log

Geological classification (BGS only)	Description of strata	Thickness m	Depth (to base of strata) m
	• Top Soil	1	1
	• Grey clay.	39	40
	• Marbled clay. Red/Grey/Green & purple.	18	58
	• Thanet Sand.	9	67
	• Chalk and flint	44	111
	(continue on separate page if necessary)		
	Other comments (for example, gas encountered, saline water intercepted)		

E Completing this form

How long did it take you to fill in this form? _____

For Official use only

Date received (DD/MM/YYYY)	File	Consent number	BGS reference number
Accession number	Wellmaster number	SOBI number	NGR
LIC NO	Purpose		EA reference number
Copy number	Entered by		

Wardle Drilling and Geotechnical Ltd

Borehole Record and Drilling Log

A: SITE DETAILS	
Borehole drilled for	Ashbourne Stables, Mortimers Ln, Lower Upham, Southampton, Hants, SO32 1HF
Location	Ashbourne Stables, Mortimers Ln, Lower Upham, Southampton, Hants, SO32 1HF
NGR (8 fig)	SU 51757 19515
Ground level (if known)	50m AOD
Borehole drilled by	Wardle Drilling & Geotechnical Ltd
Date of drilling	December 2016

B: CONSTRUCTION DETAILS

Borehole Datum (point from which all measurements of depth are taken e.g. G.L., flange, edge of chamber)

G.L.

Diameter drilled:	diameter		depths		
rotary with mud flush	250	mm from	0.00	to 42.00	m/depth
rotary "open hole"	140	mm from	42.00	to 77.30	m/depth
		mm from		to	m/depth

Casing material (type/size/depths):	diameter		depths		
mild steel casing	168	mm from	+0.5	to 42.0	m/depth
cement grouted into the borehole		mm from	0.0	to 42.0	m/depth
		mm from		to	m/depth
		mm from		to	m/depth
		mm from		to	m/depth

Water struck at:		m/depth below datum
		m/depth below datum
		m/depth below datum
Rest water level on completion	10.5	m/depth below datum

C: TEST PUMPING DETAILS

Test Pumping datum (point from which all measurements of depth are taken e.g. G.L., flange, edge of chamber)

G.L.

Pump (base)		m/depth below datum
Rest Water Level	10.5	m/depth below datum
Pumping Water Level	16.5	m/depth below datum
Pumping rate	5.5	m3/hr
For	3	hours
Recovery to		m/depth below datum
Within		hours
Date of measurements	20/12/16	

Wardle Drilling and Geotechnical Ltd

Borehole Record and Drilling Log

D:STRATA LOG

Geo. Classification (B.G.S. use)	Description of strata	Thickness metres	Depth metres
	Grey silty clay	31.00	31.00
	shells/shelly limestone	1.00	32.00
	Grey silty clay	2.00	34.00
	Firm red/brown mottled sand/clay	2.00	36.00
	White Chalk	6.00	42.00
	White chalk with occasional flint bands	35.30	77.30

NGRC

BOREHOLE RECORDS

ADJUSTMENT FORM

QUARTER SHEET SU52SW.

BH REGISTRATION NUMBER 32-44.

RECORDS ENTERED AND HELD BY WALLINGFORD

BH REGISTRATION NUMBER(S)

SU 52/54

SU 5396 2093

316/152

UPHAM

Raye's Farm

6 in. Hants 58 N.E.(E.) O.D. +327. (Shown as "Hill Farm" on 6 in. map).

Bore by S.C.A.T.S. 1940/41.
Depth 300 ft.
Eighteen feet of water.
Pumping engine not yet installed.

U. Shall.

Visited,
S.C.A.H.
22.4.41.

Subsequent information from S.C.A.T.S. (Jan. 1942):—
Borehole 300 ft × 6 in. diameter
Lining tubes: 20 ft × 6 in.
Dec. 1940

L.S.W.

conglomerates, grits and sandstones with shelly, calcareous beds. The grits contain wind-facetted pebbles and well-rounded sand grains and the group was probably deposited near an arid land, whence it derived its wind-eroded material. Uriconian rocks formed part of this land, for fragments of them are common in the grits and conglomerates. In shale-bands interbedded with the sandstones the graptolite Nemagraptus gracilis has been found.

After the deposition of the Hoar Edge Group the area may have become dry land again, for there seem to be no beds corresponding with the shales of Pontesford and the Breiddens and the Upper Rorrington Flags of the Shelve-Chirbury area.

The next group, the Harnage Group, consists of shales in which the graptolites indicate the Zone of Dicranograptus clingani. They thus are equivalent to the Aldress Shales of the Shelve-Chirbury area.

The Chatwall Group, which follows, yields similar graptolites. It is mainly sandy. The lower part consists of the 'Glyptocrinus Flags', so called from the abundance in them of stem segments of the 'sea lily' Rhaphanocrinus [Glyptocrinus] basalis (M'Coy). The middle part is called the Chatwall or Soudley Sandstone, and may perhaps be regarded as the typical 'Caradoc Sandstone' of Murchison. The sandstone is pebbly in places and, near Soudley, a purple banding is characteristic. At the top of the Chatwall Group a calcareous sandstone with numerous lenses of shelly limestone is developed. This has been called the 'Alternata Limestone', from the abundance in it of the brachiopod Orthis (Heterorthis) alternata J. de C. Sowerby.

The Longville Group follows, and is the highest that crops out north of the Cardington Hills. It consists of flags and shales, the highest shales being characterized by the trilobite Trinucleus.

The Acton Scott Group, known only south of the Cardington Hills, comprises shales in the lower part of which calcareous nodules are developed. These constitute the 'Acton Scott Limestone', in which corals and other fossils are common. The upper part of the Acton Scott Group is called the Upper Trinucleus Shales.

No igneous intrusions are known in the Ordovician rocks of the 'Caradoc' area.

NGRC

BOREHOLE RECORDS

ADJUSTMENT FORM

QUARTER SHEET SU51NW

BH REGISTRATION NUMBER 20 - 35

RECORDS ENTERED AND HELD BY WALLINGFORD

BH REGISTRATION NUMBER(S)

NN 200120

G STOW PLC

Waterworks Engineers & Contractors

SU51/86

BOREHOLE RECORD

316

SOUTHERN LS SOUTHERN EA

SU51NW/32

G. Stow file reference						
Environment Agency Reference						
A. SITE DETAILS						
Borehole drilled for	Portsmouth Water					
Location	Red Lane					
NGR (8 fig.)	SU 5208 1992		**Borehole type**		Observation	
Ground level (if available)			**Total Depth**		41 m	
Drilling Company	G Stow Plc					
Date of construction	**Commenced**	05/04/01	**Completed**		09/04/01	
B. CONSTRUCTION DETAILS						
Borehole datum (unless Ground Level)	G.L.					
Borehole drilled diameter	250mm	FROM	0	TO	4.5	m depth
	200mm	FROM	4.5	TO	15	m depth
	130mm	FROM	15	TO	41	m depth
		FROM		TO		m depth
		FROM		TO		m depth
Lining tube material						
Mild steel plain	8"	FROM	0	TO	4.5	m depth
	6"	FROM	0	TO	15	m depth
		FROM		TO		m depth
		FROM		TO		m depth
		FROM		TO		m depth
Grouting Details	OP neat cement grout 0 - 4.5m & 0 - 15					
Water struck at						
Rest Water Level on Completion	0.96m					
Development method used						

C. TEST PUMPING SUMMARY				
Test pumping datum (if different to borehole)		ABOVE	BELOW	BH Datum
Pump suction depth			BELOW	
Water level at start of test			BELOW	
Water level at end of test			BELOW	
Test dates	FROM		TO	
Pumping rate		FOR		DAYS
Recovery to		IN		HOURS
Remarks				

G STOW PLC

Waterworks Engineers & Contractors

BOREHOLE RECORD

SU51/86

G. Stow file reference	
Environment Agency Reference	

STRATA LOG

Geological Classification	Description of Strata	Thickness (m)	Depth (m)
	Red/brown stiff silty clay	3	3
	Brown silty stoney clay	1.7	4.7
	Stiff red/brown clay	5.3	10
	Firm flinty chalk	31	41

Annex B Summary of GI data review

Component Section	Mineral Consultation Area	GI Reference	Exploratory Hole Location ID	Coordinates (Easting / Northing)		Depth (m)	Anticipated Geology from DS & PEI Report (Formation / Description)		Consistenncy of Geology based on review of GI data (Y/N)	Comments (based on information presented in the section specific GIRs)	
D	Superficial Sand and gravel (Alluvium) / Brick Clay (Lambeth Group) - Safeguarded Mineral & Waste Site	Phase 1 (23/10/2023)	BH202	469522.45	106020.78	60	Topsoil	Gravelly topsoil	N/A		GIR reviewed including summary tables of the ground conditions per location. No exploratory hole logs were reviewed. Residential area in majority of the section - Mineral Resources already sterilised
			BH301	468111.85	106302.61	100			Y		
			BH301A	468113.77	106302.14	86	Alluvium	Silt and Peat	Y		
			BH302	466952.11	106299.92	90			N/A		
			BH303	466633.36	106624.98	115	Head Deposits	Clay	Y		
			BH303S	466633.27	106626.03	48			Y		
			TP304	466618	106642	4	River Terrace Deposits	Gravel	Y	Limited depth (Trial pit)	
			TP305	466628	106635	4			Y	Limited depth (Trial pit)	
			TP306	466618.2	106628.12	4	White Chalk Subgroup	Chalk	Y	Limited depth (Trial pit)	
		Phase 2 (23/10/2023)	2D2500SA	468261.73	106211.84	10			N/A		
			2D2501DS	466848.01	106270.04	6			N/A		
E	Brick Clay (Lambeth Group)	Phase 2 (23/10/2023)	2E3000RC	466443.8	106478.99	30	Topsoil	Topsoil	N	No Lambeth Group encountered	GIR reviewed including summary tables of the ground conditions per location. No exploratory hole logs were reviewed.
			2E3001RC	466431.6	106548.73	8			N	No Lambeth Group encountered	
			2E3002RC	466400	106501.7	30			N	No Lambeth Group encountered	
		Phase 3b (07/06/2024)	3E7501IT	466419.94	106463.44	2.5			N	Limited depth (Trial pit)	
			3E7502IT	466456.78	106483.73	2.5			N	Limited depth (Trial pit)	
			3E7503IT	466459.34	106507.28	2.5			N	Limited depth (Trial pit)	
			3E7504IT	466435.33	106521.5	2.5	Lambeth Group / Reading Formation	Clay / Sand	N	Limited depth (Trial pit)	
			3E7505IT	466448.85	106462.04	2.5			N	Limited depth (Trial pit)	
			3E7506IT	466393.36	106469.97	2.5			N	Limited depth (Trial pit)	
			3E7507IT	466394.06	106498.41	2.5			N	Limited depth (Trial pit)	
			3E7508IT	466404.78	106522.9	2.5			N	Limited depth (Trial pit)	
			3E3101TP	466403.53	106637.17	4			N	Limited depth (Trial pit)	
			3E3102TP	466242	106829	4			Y	Limited depth (Trial pit)	
			3E3103HP	466080.1	106971.73	1.2			Y	Hand dug pit	
			3E3104HP	465799.3	107056.26	1.2			Y	Hand dug pit	
			3E3105HP	465585.7	107069.04	1.2	Upper Chalk	Clay with pebbles / Chalk	Y	Hand dug pit	
			3E3106TP	465296	106977	4			Y	Limited depth (Trial pit)	
			3E3107HP	465048	106977	1.2			N/A	Hand dug pit	
			3E3108TP	463829.98	107268.81	4			Y	Limited depth (Trial pit)	
			3E3109HP	463625.68	107323.63	1.2			N/A	Hand dug pit	
			3E3019DS	464700	107025	4.75			N		
			3E3110HP	463137.96	107418.75	1.2			N/A	Hand dug pit	
			3E3020DS	464355	107186	6			N	No head deposits encountered	
			3E3021DS	464169	107241	6			Y		
			3E3022HP	464032	107254	1.2			N/A	Hand dug pit	
			3E3023TP	463916	107256	4			Y	Limited depth (Trial pit)	
			3E3028HP	462897	107493	1.2			N/A	Hand dug pit - No head deposits encountered	
			3E3100DS	466551.88	106660.51	6			Y		
			3E3110DS	463460.56	107382.45	6			Y		
		Phase 3c (07/06/2024)	3E3112TP	462514	107661	4			Y	Limited depth (Trial pit)	
			3E3113HP	462261	107687	1.2			N/A	Hand dug pit	
			3E3114DS	462050	107697	6			Y		
			3E3115DS	462003	107702	6			Y		
			3E3116HP	461099	107824	1.2			N/A	Hand dug pit	
			3E3117HP	460637	107908	1.2			N/A	Hand dug pit	
			3E3118TP	460067	107972	4			N/A	Limited depth (Trial pit)	
			3E3119HP	462710	107568	1.2			Y	Hand dug pit	
			3E3034HP	461782	107751	1.2			Y	Hand dug pit	
			3E3035DS	461558	107809	6			Y		
			3E3036DS	461363	107814	6			Y		
			3E3038HP	460853	107821	1.2			N/A	Hand dug pit	
			3E3040DS	460382	108006	6			N/A		
F	Partially within Brick Clay (Lambeth Group) - Proximity to Safeguarded Mineral/Waste Site	Phase 2 (23/10/2023)	2F3504DS	458234.16	108947.96	6	Topsoil	Topsoil	N	No Lambeth Group encountered	GIR reviewed including summary tables of the ground conditions per location. No exploratory hole logs were reviewed. The ground conditions generally encountered correspond with the 2 No. BGS boreholes described in the desk study with Alluvium and White Chalk Subgroup being present. In the desk study, River Terrace Deposits (RTD) were noted as primarily granular. In the GI, RTD was not definitively encountered. In the GI, Head Deposits were variable as predicted by the desk study. Head Deposits and/or Alluvium is more extensive than mapped.
			2F3505DS	458218.08	108970.87	6			N	No Lambeth Group encountered	
			2F3512RC	457718.28	109093.16	20			N	No Lambeth Group encountered	
			2F3500DS	460040.18	108005.08	6	Head Deposits	Silt/Clay and Gravel	Y		
			2F3501DS	459521.54	108106.83	6			Y		
			2F3502SA	458802.18	108516.18	20			Y		
			2F3503SA	458541.72	108691.51	20			Y		
		Phase 3c (07/06/2024)	3F3517DS	459624.86	108113.38	6			Y		
			3F3519HP	459062	108334	1.2			N/A	Hand dug pit	
			3F3520HP	458921	108417	1.2			N/A	Hand dug pit	
			3F3521HP	458501	108717	1.2	Alluvium	Silt and Sand	N/A	Hand dug pit	
			3F3523DR	458257	109015	30			Y		
			3F3524DR	458231	108993	30			Y		
			3F3600HP	459563	108150	1.2			N/A	Hand dug pit	
			3F3601HP	459304	108303	1.2			N/A	Hand dug pit	
			3F3602HP	458307	108896	1.2			N/A	Hand dug pit	
			3F7509IT	458299.5	109001.8	2.5			N	Limited depth (Trial pit)	
			3F7510IT	458266.7	109017	2.5	River Terrace Deposits	Gravel	N	Limited depth (Trial pit)	
			3F7512IT	458224	109025	2.5			N	Limited depth (Trial pit)	
			3F7513IT	458267	108982	2.5			N	Limited depth (Trial pit)	
			3W8553DS	458261	109091	6	White Chalk Subgroup	Chalk	Y		
			3W8554DS	458251	109123	6			Y		
			3W8556DS	458154	109388	6			Y		
			3W8558SA	457899	109638	10			Y		
			3W8559TP	457997	109898	4			Y	Limited depth (Trial pit)	
			3W8563TP	457974	109870	4			Y	Limited depth (Trial pit)	
			3W8567SA	457987	109885	8			N	No Lambeth Group encountered	
G	Soft Sand (Earnley Sand Formation / Wittering Formation)	Phase 2 (23/10/2023)	2G4000SA	456194.97	110259.97	20	Topsoil	Topsoil & Clay	Y	Offset 700m south	GIR reviewed including summary tables of the ground conditions per location. No exploratory hole logs were reviewed. Overall the geology encountered during GI concurs with the desk study Made Ground was not mapped, but was encountered at 3G4037DS, 3G4038DS, 3W8534DS, 3W8536SA and 3W8539HP to a maximum of 2.2 m bgl. At 3W8529SA, 3W8530SA, 3W8536SA Wittering Formation is encountered prior to London Clay Formation - Whitecliff Sand Member (WHI) though only London Clay Formation and WHI bedrock is mapped at the location. River Terrace Deposits are shown to be predominantly fine grained, but were mapped as gravel, sand and silt, while Earnley Sand Formation is typically silty sand and sandy silt, but is found to be sandy clay in Section G. Ground investigations align with the historical BGS borehole.
			2G4001SA	456116.19	110350	20			Y	Offset 700m south	
			2G4002DS	455957.84	111181.42	6			Y		
			2G4004DS	455966.75	111201	6			Y		
			2G4003DS	455959.48	111182.95	6			Y		
		Phase 3c (07/06/2024)	3G4022DS	456237	111626	3.6			N	Limited termination depth	
			3G4023HP	456522	111909	1.2	Made Ground	Old well	N/A	Hand dug pit	
			3G4024DS	456585	111997	6			Y		
			3G4037DS	456287	111654	6			Y		
			3G4038DS	456306	111677	6			Y		
			3G4102SA	456666	112101	20			Y		
			3G7525IT	456361	111668	2.5			N	Limited termination depth	
			3W8526HP	458016	110456	1.2			N/A	Hand dug pit	
			3W8527HP	458067	110540	1.2	River Terrace Deposits	Gravel	N/A	Hand dug pit	
			3W8528HP	457714	110765	1.2			N/A	Hand dug pit	
			3W8529SA	457557	110802	20			Y		
			3G7530IT	456334	111689	2.5			N	Limited termination depth	
			3G4105SA	456361	111686	30			Y		
			3G4106SA	456360	111734	30			Y		
			3W8559TP	457997	109898	4			N/A	Limited depth (Trial pit)	
			3W8567SA	457987	109885	10	Earnley Sand Formation	Clay with sand and pebble beds	N/A		
			3W8563TP	457974	109870	4			N/A	Limited depth (Trial pit)	
			3W8558SA	457899	109638	10			N/A		
			3W8556DS	458154	109388	6			N/A		
			3W8553DS	458261	109091	6			N/A		
			3W8554DS	458251	109123	6			Y		
			3W8530SA	457486	110798	20	Wittering Formation	Sand with pebbles	Y		
			3W8535SA	456844	110705	20			Y		
			3W8536SA	456623	110866	20			Y		
			3W8534DS	456298	111487	6			Y		
			3W8539DS	456294	111471	2			N	Limited termination depth	
			3W8531HP	457280	110668	1.2			N/A	Hand dug pit	
			3W8532HP	456998	110576	1.2			N/A	Hand dug pit	
			3W8537HP	456577	111060	1.2			N/A	Hand dug pit	
			3W8538HP	456490.226	111275.061	1.2			N/A	Hand dug pit	
			3W8560HP	458001	110136	1.2			N/A	Hand dug pit	
H	Partially within Soft Sand (Earnley Sand Formation / Wittering Formation)	Phase 2 (23/10/2023)	2H4500DR	456963.09	113618.87	20	Topsoil	Topsoil	Y		GIR reviewed including summary tables of the ground conditions per location. No exploratory hole logs were reviewed. Residential area in majority of the section. Mineral Resources already sterilised
			2H4501DR	456829.99	113718.01	20			Y		
			2H4502DS	456695.97	113886.02	6	Head Deposits	Clay	Y		
			2H4503DS	456655.89	113905.03	6			Y		
		Phase 3b (07/06/2024)	3H4514HP	457000	113116	1.2	London Clay Formation	Clay	N/A	Hand dug pit	
			3H4515HP	456986	113268	1.2			N/A	Hand dug pit	
			3H4517SA	456426	113817	20			Y		
			3H4603HP	457114	112665	1.2			N/A	Hand dug pit	
			3H4606HP	456628.08	113868.87	1.2	Lambeth Group / Reading Formation	Clay with pebbles	N/A	Hand dug pit	
		Phase 3c (07/06/2024)	3H4600SA	456785	112109	20			Y		
			3H4602HP	457072	112188	1.2			Y	Wittering Formation sands encountered	
			3H4507HP	457147	112356	1.2	White Chalk Subgroup Middle Chalk	Chalk	Y	Wittering Formation clays encountered	
			3H4511HP	457140	112468	1.2			Y	Wittering Formation clays encountered	
			3H4513HP	457045	112950	1.2			N/A	Hand dug pit	
J	Partially within Soft Sand (Earnley Sand Formation / Wittering Formation)	Phase 3b (07/06/2024)	3J5002SA	456267	113803	20	Topsoil	Topsoil and Clay	Y		GIR reviewed including summary tables of the ground conditions per location. No exploratory hole logs were reviewed. In general ground conditions encountered in the exploratory holes match the superficial deposits on the geological mapping. The bedrock encountered matches that predicted by the geological mapping, except that: ■ London Clay Formation – Sand was mapped where 3J5025HP, 3J5026HP and 3J5029HP were excavated however sand deposits were not encountered within the top 1.2 m. The London Clay Formation strata with clay only was encountered. The BGS mapping is for guidance purposes only, and the thickness of this sand band is an unknown - it may be quite thin. ■ Whitecliff Sand Member, (WHI) was expected to be also encountered within 3J5014TP, however due to the landfill materials encountered to 3.8 m bgl, it is expected the top of the WHI may be encountered between 3.8 – 6.0 m bgl based on the exploratory locations (3J5015SA and 3J5016TP) completed within 25 m.
			3J5003HP	456128	113965	1.2			N/A	Hand dug pit	
			3J5004DS	456037	114203	6			Y		
			3J5012HP	455776	114563	1.2	Head Deposits	Clay	N/A	Hand dug pit	
			3J5023HP	454632	115240	1.2			N/A	Hand dug pit	
			3J5024HP	454382	115259	1.2			N/A	Hand dug pit	
			3J5025HP	454213	115445	1.2			N/A	Hand dug pit	
			3J5026HP	454010	115603	1.2	London Clay Formation	Clay	N/A	Hand dug pit	
			3J5027DS	455224	115050	6			Y	Wittering Formation sands encountered	
			3J5028DS	455082	115232	6			N		
			3J5029HP	454874	115323	1.2			N/A	Hand dug pit	
			3J5100HP	455933.41	114399.04	1.2	Lambeth Group / Reading Formation	Clay	N/A	Hand dug pit	
			3J5101HP	455771.5	114594.94	1.2			N/A	Hand dug pit	
			3J5102HP	455712.5	114662.01	1.2			N/A	Hand dug pit	
			3J5104SA	455606.87	114891.88	10			N/A		
			3J5105TP	455594.67	114900.67	4	White Chalk Subgroup	Chalk with flint	N/A		
			3J5103TP	455615	114887	4			N/A		
			3J5106HP	455368.52	114970.81	1.2			N/A	Hand dug pit	
		Phase 3c (07/06/2024)	3J5009HP	455959	114386	1.2			N/A	Hand dug pit	
			3J5013HP	455701	114753	1.2			N/A	Hand dug pit	
			3J5014TP	455577	114855	4			N	Trial pit terminated within Made Ground	
			3J5015SA	455571	114849	10			Y		
			3J5016TP	455557	114854	4			N		
			3J5017HP	455371	114971	1.2			Y	Wittering Formation clays encountered	
			3J5007DS	456038	114272	6			Y		
K	Small section within Brick Clay (Lambeth Group) - Small section within Safeguarded Waste Site	Phase 2 (23/10/2023)	2K5534DS	453971.41	115639.93	20	Topsoil	Topsoil & Clay	N/A		GIR reviewed including summary tables of the ground conditions per location. No exploratory hole logs were reviewed. Superficial deposits including Alluvium, Head Deposits and River Terrace Deposits are not mapped where the exploratory holes are located. However, superficial deposits that are expected with less than a 1 – 2 m thickness are not always shown on geological maps.
			2K5535DS	453899.1	115871.36	20	London Clay Formation	Clay	N/A		
			2K5502DS	452139.83	119217.9	6			N/A		
			2K5503DS	452127.07	119223.91	6			N/A		
			3K5511DS	453480	117568	6			Y		
			3K5515HP	452943	118254	1.2			N/A	Hand dug pit	
			3K5520CT	452807	118486	10			N/A		
			3K5521CT	452798	118518	10			N/A		
			3K5524CT	452769	118496	10			N/A		
			3K5525DR	452794	118471	30			Y		
			3K5527DR	452779	118529	8	Lambeth Group / Reading Formation	Clay	Y		
			3K5529HP	452639	118730	1.2			N/A	Hand dug pit	
			3K5609HP	452378.8	118974.62	1.2			N/A	Hand dug pit	
			3K5610HP	452272.1	119130.08	1.2			N	Head deposits (clay and gravel) encountered	
			3K5600HP	453969.1	116072.67	1.2			N/A	Hand dug pit	
			3K5601HP	454005.59	116319.02	1.2			N/A	Hand dug pit	
			3K5602HP	454061.3	116556.41	1.2			N/A	Hand dug pit	
			3K5604HP	453275.05	117637.05	1.2			N/A	Hand dug pit	
			3K5605SA	453015	117821	20			N/A		
			3K5606SA	452977.82	117981.17	20			N	Alluvium (silt) encountered	
			3K5607HP	452945.19	118490.32	1.2			N/A	Hand dug pit	
			3K5608HP	452851.74	118629.82	1.2	White Chalk Subgroup	Chalk	N/A	Hand dug pit	
			3K7541IT	452791.78	118482.55	2.5			N	Head deposits (clay and gravel) encountered	
			3K7542IT	452816.12	118499.94	2.5			Y		
			3K7543IT	452807.7	118512.02	2.5			Y		
			3K7544IT	452770	118474	2.5			N	Head deposits (clay and gravel) encountered	
			3K7545IT	452757	118509	2.5			Y		
			3K7546IT	452770	118531	2.5			Y		
		Phase 3c (07/06/2024)	3K5513HP	453046	117766	1.2			N/A	Hand dug pit	
			3K5519HP	452966	118404	1.2			N/A	Hand dug pit	
			3K5530HP	452457	118899	1.2			N/A	Hand dug pit	
			3K5531DS	452355.7	119091.5	6			Y		
L	Partially within Brick Clay (Lambeth Group)	Phase 2 (23/10/2023)	2L6000TP	449000.59	120372.85	4	Topsoil	Topsoil	Y	Limited depth (Trial pit)	GIR reviewed including summary tables of the ground conditions per location. No exploratory hole logs were reviewed. The encountered ground corresponds with the desk study, in parts, as both London Clay Formation, possible Harwich Formation (described as red flint gravel in the desk study), and the Reading Formation (part of Lambeth Group described in the desk study) are present.
			2L6001TP	448999.18	120392.92	4			Y	Limited depth (Trial pit)	
			2L6002SA	448996.44	120402.78	15	London Clay Formation	Clay	Y		
			2L6003SA	448993.64	120423.88	15			Y		
			2L6004TP	448981.2	120451.41	4			Y	Limited depth (Trial pit)	
			2L6005SA	448973.48	120473.02	10			Y		
			2L6006TP	448959.96	120507.88	4			Y	Limited depth (Trial pit)	
			2L6007DR	448878.58	120643.1	20			N	Lambeth Group encountered	
			2L6008DR	448809.01	120646.98	20			N	Lambeth Group encountered	
			2L6009DR	448545.06	120745.04	20			Y		
			2L6010DR	448545.07	120794.51	20			N	Lambeth Group encountered	
			2L6011SR	447176	121476.08	20			Y		
			2L6012SR	447131.21	121517.07	20			Y		
		Phase 3b (07/06/2024)	3L6023HP	450441	120206	1.2	Lambeth Group / Reading Formation	Limestone /Clay / Gravel	N/A	Hand dug pit	
			3L6024HP	450204	120254	1.2			N/A	Hand dug pit	
			3L6027HP	449517	120487	1.2			N/A	Hand dug pit	
			3L6028HP	449315	120422	1.2			N/A	Hand dug pit	
			3L6029HP	449075	120344	1.2			N/A	Hand dug pit	
			3L6041HP	448343.37	120965.46	1.2			N/A	Hand dug pit	
			3L6042HP	448101.27	121073.94	1.2			N/A	Hand dug pit	
			3L6043HP	447867.16	121124.87	1.2			N/A	Hand dug pit	
			3L6044HP	447653	121187	1.2			N/A	Hand dug pit	
			3L6045HP	447424	121268	1.2			N/A	Hand dug pit	
			3L6101DS	451624.44	119889.56	6			Y		
			3L6107DS	449884	120321	6	White Chalk Subgroup	Chalk with flint / Clay / Sand / Silt	N	Lambeth Group encountered	
			3L6106DS	449956	120300	6			Y		
			3L6100HP	451757.77	119683.85	1.2			N/A	Hand dug pit	
			3L6102HP	451446.88	119935.33	1.2			N/A	Hand dug pit	
			3L6103HP	451145.66	120062.05	1.2			N/A	Hand dug pit	
			3L6104HP	450908.91	120159	1.2			N/A	Hand dug pit	
			3L6105HP	450658.09	120173.93	1.2			N/A	Hand dug pit	
		Phase 3c (07/06/2024)	3L6013HP	451839	119626	1.2			N/A	Hand dug pit	
			3L6015HP	451686	119819	1.2			N/A	Hand dug pit	
			3L6017HP	451380	119966	1.2			N/A	Hand dug pit	
			3L6026HP	449686	120424	1.2			N/A	Hand dug pit	
			3L6046HP	447257	121422	1.2			N/A	Hand dug pit	
M	Brick Clay (Lambeth Group) & Superficial Sand and gravel (Alluvium)	Phase 1 (23/10/2023)	BH501	447070	121505	45	Topsoil	Topsoil	Y		GIR reviewed including summary tables of the ground conditions per location. No exploratory hole logs were reviewed. The encountered ground conditions differed from mapping at several locations, as follows. ■ Made Ground was encountered at TP509 but was not mapped. ■ BH504, TP507, TP508 and TP509 are on the contact of River Terrace Deposits and London Clay, with all investigations encountering River Terrace Deposits underlain by the London Clay Formation. ■ 2M6507SA was mapped as Lambeth Group being present at ground level but River Terrace Deposits were encountered. ■ 2M6508SA is mapped with River Terrace Deposits at ground level, however Alluvium was found. ■ 3M6517HP mapping indicated no superficial deposits with Lambeth Group at ground level, however Made Ground was encountered at ground level and underlain by Alluvium and Head.
			BH502	446343	121905.14	25	Made Ground	Tarmac/sand/clay	Y		
			BH503	446202.03	121945.52	55			Y		
			BH504	446192.3	122315.75	50	Alluvium	Clay	Y	River Terrace Deposits encountered as silt /clay	
			TP501	447053	121518	4			Y	Limited depth (Trial pit)	
			TP502	447064	121511	4			Y	Limited depth (Trial pit)	
			TP503	447052	121505	4	Head Deposits	Sand/Silt	Y	Limited depth (Trial pit)	
			TP504	446214.96	121935.87	4			N	River Terrace Deposits encountered as silt /clay	
			TP505	446204.72	121928.35	4			Y	Limited depth (Trial pit)	
			TP506	446213.69	121924.22	4	River Terrace Deposits	Sandy Gravel	Y	Limited depth (Trial pit)	
			TP507	446168.35	122320.24	4			N	River Terrace Deposits encountered as silt /clay	
			TP508	446183.72	122323.29	4			N	River Terrace Deposits encountered as silt /clay	
			TP509	446175.63	122310.73	4			N	Made Ground encountered	
		Phase 2 (23/10/2023)	2M6507SA	446369.35	123012.03	20	London Clay Formation	Clay	Y	Limited depth (Trial pit)	
			2M6508SA	446510	123140	20			N	No Lambeth Group encountered	
		Phase 3a (07/06/2024)	BH505	446378	121984	40			N/A		
			BH506	446175.47	122125.7	55			Y		
			BH507	446733.488	121710.345	40	White Chalk Subgroup	Chalk	N/A		
		Phase 3b (07/06/2024)	3M6517HP	446315	122610	1.2			N	Hand dug pit - Made Ground encountered	
			3M6519DS	446680	123220	6			N/A		
			3M6601HP	446329.19	122865.86	1.2			N/A	Hand dug pit	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