



# 1ST HORIZON

PHASE 1 GROUND INVESTIGATION DESK STUDY (REF: 8607-R11) REV F

---

Client: **Home Office**

Project: **Haslar IRC, Gosport**

Date: **27/04/2026**



## CONTENTS

<b>1. INTRODUCTION</b> .....	<b>6</b>
1.1 Proposed Development.....	6
1.2 Previous Reports .....	7
1.3 Objectives.....	7
1.4 Assumptions .....	7
<b>2. THE SITE</b> .....	<b>9</b>
2.1 Site Location and Description.....	9
2.2 Site Description .....	9
<b>3. SITE HISTORY</b> .....	<b>11</b>
3.1 Site History Review.....	11
<b>4. ENVIRONMENTAL SEARCHES</b> .....	<b>22</b>
4.1 Geology.....	22
4.2 Mining and Quarrying .....	22
4.3 Hydrogeology .....	23
4.4 Hydrology .....	24
4.5 Environmental Designations .....	24
4.6 Landfill and Waste Management Activity .....	25
4.7 Local Industrial Land Uses .....	26
4.8 Radon Risk .....	28
4.9 Waste Classification and Materials Re-Use.....	28
<b>5. PRELIMINARY GEOTECHNICAL ASSESSMENT</b> .....	<b>30</b>
5.1 Ground Conditions .....	30
5.2 Site Levels, Earthworks and Site Preparation .....	30
5.3 Foundation Solution .....	30
5.4 Floor Slab Solution.....	30
5.5 Roads and Hardstanding .....	31
5.6 Drainage .....	31
5.7 Protection of Buried Concrete .....	31
<b>6. PREVIOUS INVESTIGATION FINDINGS</b> .....	<b>32</b>
<b>7. PRELIMINARY CONCEPTUAL SITE MODEL</b> .....	<b>34</b>
7.1 Introduction.....	34
7.2 Conceptual Site Model.....	35
7.3 Hazards Identified with the Proposed Development.....	35
7.4 Potential Sources of Contamination .....	35
7.5 Potential Receptors of Contamination.....	37

7.6	Identification of Pathways.....	38
7.6.1	Pathways to Human Health.....	38
7.6.2	Ground Gas.....	38
7.6.3	Pathways to Controlled Waters .....	38
7.6.4	Other Pathways.....	39
7.7	Uncertainties .....	39
7.8	Conceptual Site Model.....	39
<b>8.</b>	<b>CONCLUSIONS AND RECOMMENDATIONS.....</b>	<b>43</b>
8.1	Environmental Risk Assessment.....	43
<b>9.</b>	<b>REFERENCES .....</b>	<b>44</b>

## TABLES

Table 2.1 - Summary of Site Location.....	9
Table 2.2 - Description of the Site and its Environs .....	9
Table 4.1 - Geological Summary.....	22
Table 4.2 - Mining and Quarrying.....	22
Table 4.3 - Other Extractive Industries.....	23
Table 4.4 - Groundwater Occurrence and Abstraction.....	23
Table 4.5 - Surface Water Features.....	24
Table 4.6 - Summary of Environmental Designations.....	24
Table 4.7 - Waste Management Activities .....	25
Table 4.8 - Other Potentially Contaminative Processes in the Locality .....	26
Table 4.9 - Radon Risk Status .....	28
Table 6.1 - Summary of Ground Conditions.....	32
Table 7.1 - Identified Potential Receptors .....	37
Table 7.2 - Risk Assessment .....	41

## FIGURES

Figure 1.1 - Proposed Development Area .....	6
Figure 3.1 - 1856 OS Map (Scale 1:10,560) .....	12
Figure 3.2 - 1870 OS Map (Scale 1:10,560) .....	13
Figure 3.3 - 1896 OS Map (Scale 1:10,560) .....	14
Figure 3.4 - 1907 - 1908 OS Map (Scale 1:10,560) .....	15
Figure 3.5 - 1931 OS Map (Scale 1:10,560) .....	16
Figure 3.6 - 1938 OS Map (Scale 1:10,560) .....	17
Figure 3.7 - 1969 OS Map (Scale 1:10,560) .....	18
Figure 3.8 - 1990 OS Map (Scale 1:10,000) .....	19
Figure 3.9 - 2010 OS Map (Scale 1:10,000) .....	20
Figure 3.10 - 2025 OS Map (Scale 1:10,000) .....	21
Figure 7.1 - Extract from Past Land Use from Groundsure Report .....	36
Figure 7.2 - Conceptual Site Model .....	40

## APPENDICES

APPENDIX A - Groundsure Report .....	
APPENDIX B - UXO Risk Assessments .....	
APPENDIX C - Contaminated Land Risk Assessment Terminology .....	
APPENDIX D - Controlled Waters Risk Assessment .....	
APPENDIX E - Phase 2 Intrusive Ground Investigation Report .....	

## EXECUTIVE SUMMARY

<b>Introduction</b>	The Home Office are proposing to expand the Haslar Immigration Removal Centre (IRC).
<b>Proposed Land Use</b>	Land is currently occupied by an open field and a car park is proposed to be developed to provide additional facilities to the adjacent Immigration Removal Centre.
<b>Site location and Surrounding Land Uses</b>	The Solent is located to the east of the site. The towns of Alverstoke and Clayhall are located to the west of the site. To the north is a memorial garden and disused hospital and to the south is Fort Monckton.
<b>Site History</b>	The site has been an army barracks, a navy hospital and a young offender's institution before it became an Immigration Removal Centre. To the north was a navy hospital, which is now disused, and it had a gunboat and torpedo shed attached to it which is now an industrial estate. The south of the site was mainly open fields and a golf course until Fort Monckton was constructed. The towns of Alverstoke and Clayhall have always been present to the west of the site.
<b>Geology</b>	<p>Made Ground was encountered across the majority of the site during the Phase 2 ground investigation, with the exception of the car park area.</p> <p>River terrace deposits and alluvium are present on site in the form of sand and gravel.</p> <p>The Selsey Sand formation is located underneath the site in the form of silty sand, silty clay and sandy clayey silt, glauconitic, bioturbated, locally calcareous. However bedrock was not encountered during the ground investigation.</p> <p>There are no faults or coal seams present in this area.</p>
<b>Ground Gases</b>	There is a low risk of ground gases to the proposed development as although there is an historic landfill bounding the western site boundary, vertical and lateral diffusion of ground gases between the source and the receptor (proposed building plots) will occur over such a distance, and combined with flood risk mitigation measures understood to be being implemented within the construction of the foundations the risk is low.
<b>Radon Requirements</b>	Less than 1% of homes affected radon protection measures are required.
<b>Potential Contaminative Features</b>	Made Ground is known to be present across the majority of the site and has elevated levels of lead in some areas.
<b>Mining And Quarrying</b>	There is no mining and/or quarrying risk.

<b>Previous Investigations</b>	A Phase 2 (Intrusive) Site Investigation was undertaken by 1 <sup>st</sup> Horizon in 2023 across the site. However, this did not include the area of the proposed car park. The phase 2 report can be found in <b>Appendix E</b> .
<b>Preliminary Geotechnical Assessment</b>	Most of the site should be suitable for conventional foundations. Deep trench fill or may be required in areas of deep Made Ground or Alluvium. It is understood, however that in order to satisfy flood alleviation requirements that current foundation proposals are to form an elevated plinth using a combination of a low level dwarf perimeter wall with compacted granular backfill.
<b>Waste Soils Classification</b>	Material classification and WAC testing was undertaken as part of the previous Phase 2 works. Test results indicate that the Made Ground and natural material should be suitable for offsite disposal as inert waste.
<b>Materials Re-Use</b>	The majority of the excavated natural materials are suitable for reuse.
<b>Further Works or Other Issues Potentially Restricting Work</b>	No further investigation is required.

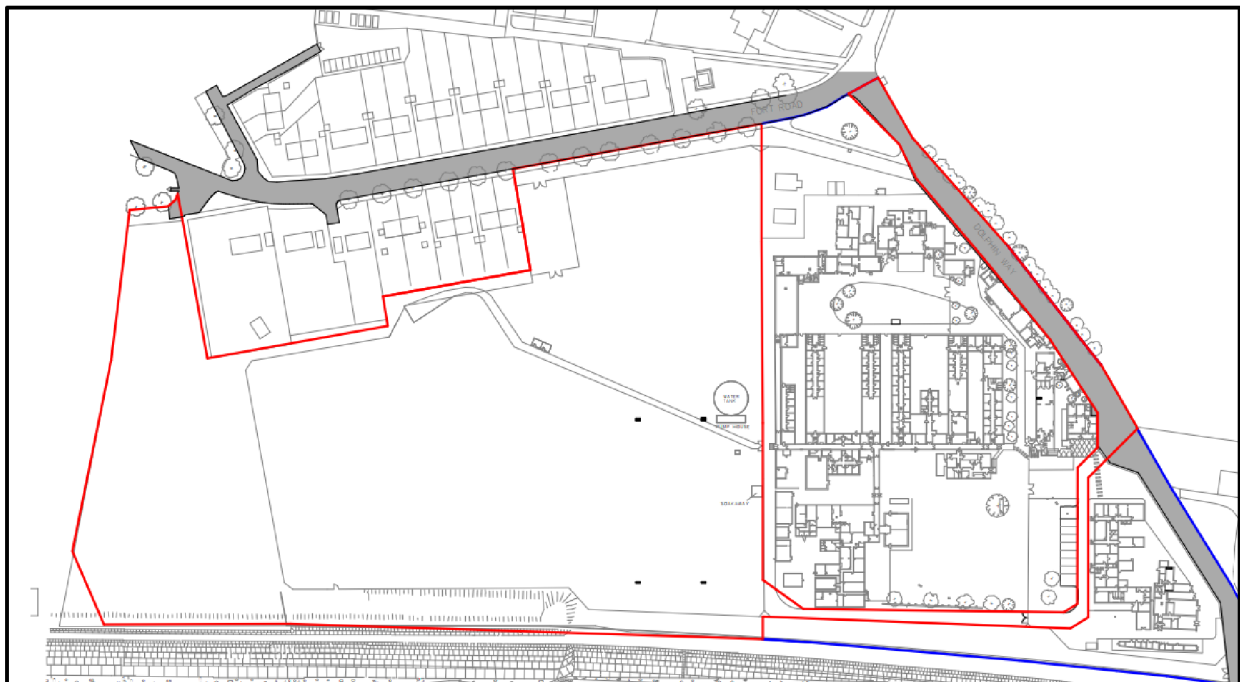
## 1. INTRODUCTION

The client proposes to submit an outline planning application for the expansion of the existing Haslar Immigration Removal Centre (IRC). Prior to development, 1st Horizon have been appointed to undertake a Phase 1 desk study for the development.

This report presents the findings of the desk study and gives preliminary geotechnical comments for the development. In addition, conceptual site models, and environmental risk assessments are given.

### 1.1 Proposed Development

Proposals are understood to comprise expansion of the site onto the existing field to the west of the site, including development of a car park area on the western boundary. This includes the erection of up to four three-storey buildings for accommodation the erection of a single storey dining hall and Care and Separation Unit (CASU) block. Proposals also include the creation of internal roads and upgrading of the existing “Haslar Sea Wall” car park area in the southwest. The development boundary is identified in **Figure 1.1**.



**Figure 1.1 - Proposed Development Area**

Foundation loads are not known at this stage, however based on experience, we anticipate these to be between a 50 and 75kN/m run for two to three storey structures. Floor slab loadings are anticipated to be low, probably not exceeding 5kN/m<sup>2</sup>. In addition, development levels have not yet been set.

The recommendations in this report are based on these assumptions, consequently, they should be reviewed, and if necessary revised during the detailed design.

As such, in accordance with the 'Updated technical background to the CLEA model' (Environment Agency, 2009) and 'Suitable 4 Use Levels' (LQM / CIEH 2015) the proposed generic land use for this development is Residential with gardens.

## 1.2 Previous Reports

A site investigation was undertaken on 20<sup>th</sup> and 21<sup>st</sup> February 2023. A Phase 2 ground investigation report was undertaken following a Phase 1 desk study (which this report acts to update). The Phase 2 ground investigation report findings are discussed within this report and can be found in full in **Appendix E**.

## 1.3 Objectives

Considering the proposed development of the site, the objectives of this appraisal were:

1. To determine the historical and current land use.
2. To establish the environmental setting of the site.
3. To evaluate whether past mining or other extractive industries could have an influence on the site.
4. To determine likely ground and groundwater conditions.
5. To determine the potential risks to human health and the wider environment.
6. To determine potential risks posed to the site from hazardous ground gases and / or vapours.
7. To derive a Preliminary Conceptual Site Model.

## 1.4 Assumptions

The following assumptions are made in this report:

1. It is assumed that ground levels will not change significantly from those described in this report or as shown on proposed development drawings. If this is not the case, then amendments to the recommendations made in this report may be required.
2. Any references to observations of suspected asbestos-containing materials are for information only and should be verified by a suitably qualified asbestos specialist and/or confirmed by laboratory analysis.
3. The use of the term 'Topsoil' within this report is based on a visual identification only and that these materials have not necessarily been classified in accordance with BS3882:2015.

4. The comments and opinions presented in this report are based on the findings of the desk study performed by 1st Horizon. There may be other conditions prevailing on the Site which have not been revealed by this investigation and which have not been considered by this report at this stage.
5. Responsibility cannot be accepted for any conditions not revealed by this investigation. Any diagram or opinion on the possible configuration of the findings is conjectural and given for guidance only. Confirmation of ground conditions should be undertaken if deemed necessary.
6. This report has been prepared for the sole use of the Client. No other third party may rely upon or reproduce the contents of this report without the written approval of 1<sup>st</sup> Horizon. If any unauthorised third party comes into possession of this report, they rely on it entirely at their own risk.

## 2. THE SITE

### 2.1 Site Location and Description

**Table 2.1 - Summary of Site Location**

<b>Location</b>	Haslar IRC, Dolphin Way, Gosport.
<b>Grid Reference</b>	461505 98323.
<b>Post Code</b>	PO12 2AW.
<b>Site Shape</b>	Irregular.
<b>Topography</b>	Relatively flat.

### 2.2 Site Description

The description below is based on the site visit undertaken in 2023 and comprises both visual and known information based on available public information.

**Table 2.2 - Description of the Site and its Environs**

<b>Current Use</b>	Immigration Removal Centre.
<b>Access</b>	Access to the site is off Dolphin Way, Gosport.
<b>Existing Buildings &amp; Structures</b>	The site comprises of an open field with an access road to the north east of the site.
<b>Site Surface</b>	The site is a mixture of hard standings, and grassed areas.
<b>Vegetation</b>	There are a few bushes and trees scattered around the site, but the majority is open grassed areas.
<b>Storage Tanks</b>	No above or below ground storage tanks have been identified within the site boundary from historical mapping.
<b>Services</b>	There are likely to be services in the northern area of the site surrounding the buildings, but services cannot be confirmed to be in the grassed area on the south of the site.
<b>Asbestos</b>	With the majority of buildings being built prior to 2000 potential Asbestos Containing Materials (ACMs) may be present in the buildings or on the ground surface. However, a refurbishment / demolition asbestos survey will be required prior to demolition.
<b>Waste Disposal / Materials Storage</b>	No materials currently known to be stored on site.
<b>Surrounding Area</b>	The Solent is located to the east of the site. The towns of Alverstoke and Clayhall are located to the west of the site. To the north is a memorial garden and disused hospital and to the south is Fort Monckton. Bounding the north of the site are buildings.

<p><b>Ecology</b></p>	<p>The grassed areas around the buildings to the north appear to be lawns. The field to the south of the site also appear to be mainly grass. The coastline to the east of the site is a protected coastline due to specific bird species present there.</p>
<p><b>Local / Background Knowledge</b></p>	<p>The site was previously an army barracks, a navy hospital and a young offender’s institution before it became an Immigration Removal Centre. To the north was a navy hospital, which is now disused, and had a gunboat and torpedo shed attached to it which is now an industrial estate. The south of the site was open fields and a golf course until Fort Monckton was constructed. The towns of Alverstoke and Clayhall have always been present to the west of the site.</p>
<p><b>UXO</b></p>	<p>An initial UXO Preliminary Risk Assessment (PRA), included within <b>Appendix B</b>. This stated the risk from German and Allied UXO at shallow depth (&lt;2.00m) as partially mitigated. Whilst the risk from deep UXO (&gt;2.00m) remains unmitigated.</p> <p>It concluded that a Stage 2 Detailed Risk Assessment (DRA) is necessary prior to the site investigation. The results of the DRA found within <b>Appendix B</b> determine that during site works an EOD engineer will be required and an intrusive magnetometer probe survey is required for areas of moderate risk.</p>

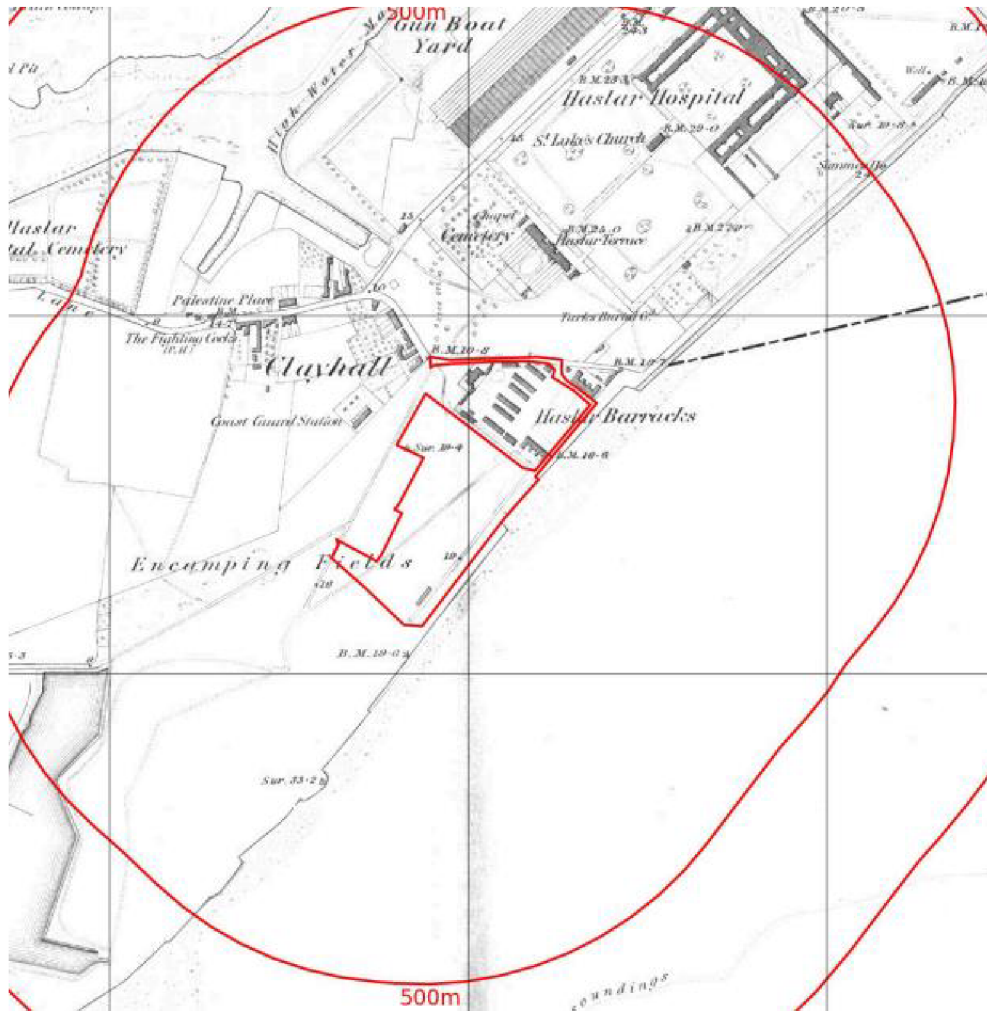
### 3. SITE HISTORY

#### 3.1 Site History Review

Extracts of Ordnance Survey (OS) plans dated from 1856 were reviewed. These were obtained as part of the Groundsure Report for the Site, which is presented in **Appendix A**.

Below presents a summary of the main aspects of the site relevant to the current and proposed future end uses. It is not the intention of this report to describe in detail all of the changes that have occurred on or adjacent to the site, where these are not relevant to the land use.

**Time Period: Pre-1856**



**Figure 3.1 - 1856 OS Map (Scale 1:10,560)**

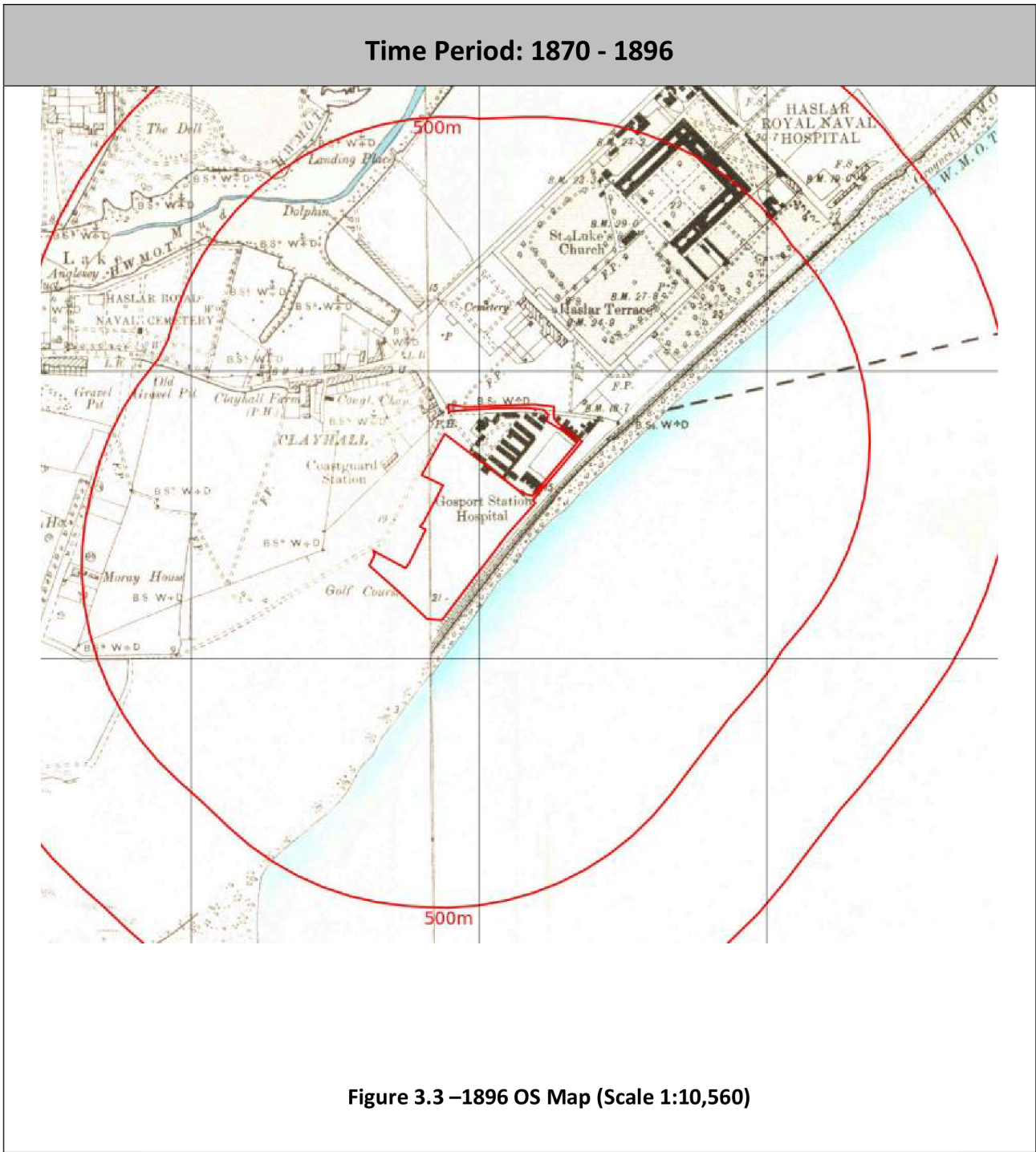
On-Site Features	Off-Site Features
<ul style="list-style-type: none"> <li>➤ Open fields.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Haslar Hospital and cemetery to the north.</li> <li>➤ Clayhall, Alverstoke and Seafield to the west/northwest.</li> <li>➤ Encamping fields to the south.</li> <li>➤ The Solent/English Channel to the east.</li> <li>➤ Haslar Lake and mud flats to the north.</li> </ul>

**Time Period: 1856 - 1870**



**Figure 3.2 - 1870 OS Map (Scale 1:10,560)**

On-Site Features	Off-Site Features
<ul style="list-style-type: none"> <li>➤ Haslar Barracks removed.</li> <li>➤ Open fields across the whole site.</li> </ul>	<ul style="list-style-type: none"> <li>➤ No significant change.</li> </ul>



On-Site Features	Off-Site Features
<ul style="list-style-type: none"> <li>➤ Gosport Station Hospital to the north of the site.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Golf course to the south.</li> <li>➤ Haslar Hospital has become Haslar Royal Naval Hospital.</li> </ul>

**Time Period: 1898 - 1908**

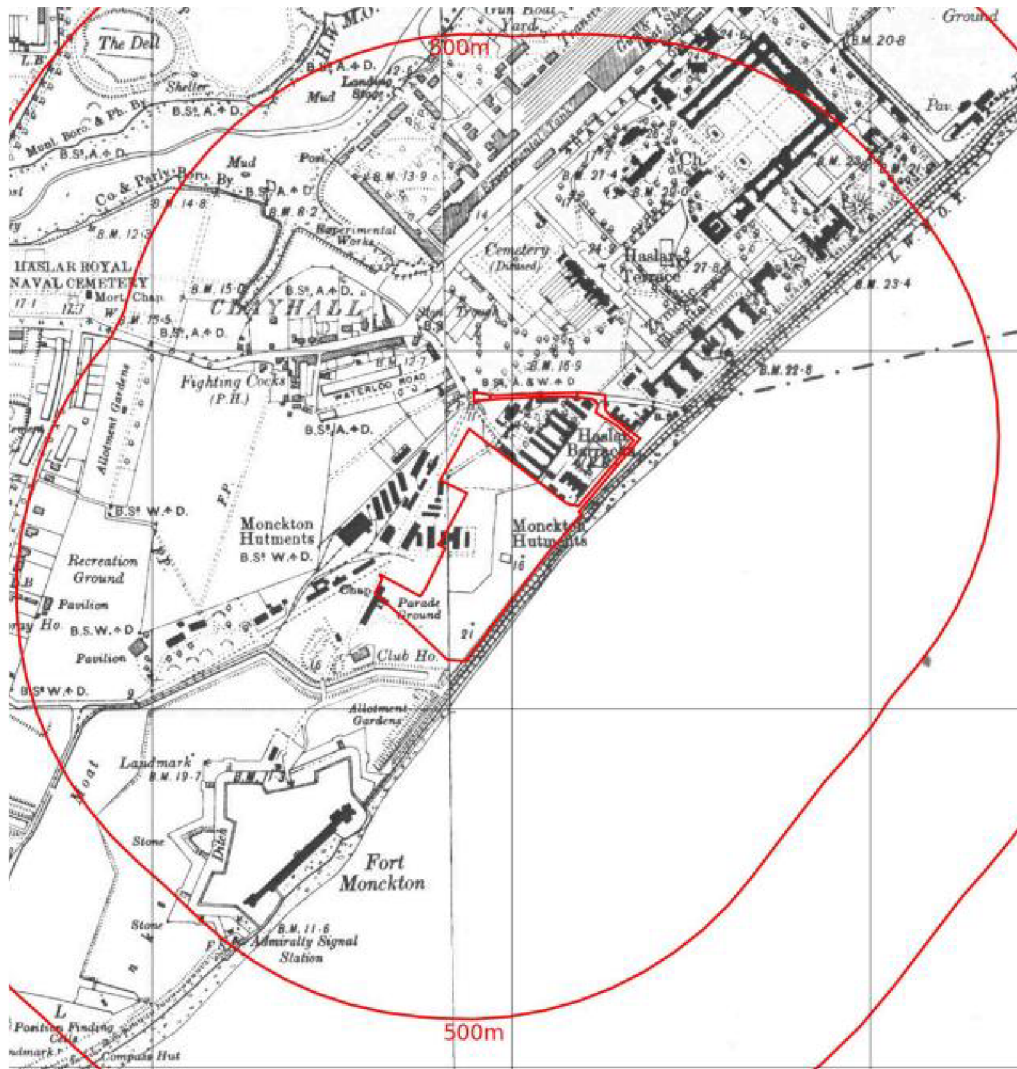


**Figure 3.4 – 1907 - 1908 OS Map (Scale 1:10,560)**

On-Site Features	Off-Site Features
<ul style="list-style-type: none"> <li>➤ Gosport Station Hospital has become a Military Hospital.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Haslar Royal Naval Hospital has expanded</li> <li>➤ Alverstoke, Clayhall and Seafield have expanded.</li> </ul>



**Time Period:1938**



**Figure 3.6 - 1938 OS Map (Scale 1:10,560)**

On-Site Features	Off-Site Features
<ul style="list-style-type: none"> <li>➤ Majority of the Monckton Hutments have been removed, however the barracks itself is still present.</li> <li>➤ Tramline track (sidings) present on the western section of the site and visible on the 1939 1:2,500 scale mapping.</li> </ul>	<ul style="list-style-type: none"> <li>➤ No significant change.</li> </ul>

**Time Period: 1969**



**Figure 3.7 - 1969 OS Map (Scale 1:10,560)**

On-Site Features	Off-Site Features
<ul style="list-style-type: none"> <li>➤ All Monckton Hutments and parade ground have been removed.</li> <li>➤ Tramway sidings no longer present.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Alverstoke, Anglesey, Seafield and Clayhall have all expanded.</li> <li>➤ A moat has been constructed to the south of the site.</li> <li>➤ Haslar Barracks has been replaced with HM Detention Centre although no buildings are visible.</li> </ul>

**Time Period: 1969 - 1990**



**Figure 3.8 - 1990 OS Map (Scale 1:10,000)**

On-Site Features	Off-Site Features
<ul style="list-style-type: none"> <li>➤ HM Detention Centre has been converted to HM Young Offender Institution (Haslar) although no buildings are visible.</li> <li>➤ The southwestern part of the site is now a car park.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Clay hall has expanded.</li> <li>➤ Torpedo sheds and the gunboat yard have been converted into the Admiralty Research Establishment.</li> <li>➤ Haslar YOI is now visible.</li> </ul>

**Time Period: 1990 - 2010**



**Figure 3.9 - 2010 OS Map (Scale 1:10,000)**

➤ On-Site features	➤ Off-Site features
➤ No significant change.	➤ No significant change.

**Time Period: 2010 - 2025**



**Figure 3.10 - 2025 OS Map (Scale 1:10,000)**

➤ On-Site features	➤ Off-Site features
➤ No significant change.	➤ No significant change.

## 4. ENVIRONMENTAL SEARCHES

### 4.1 Geology

Table 4.1 - Geological Summary

<b>Maps and Publications Referenced</b>	BGS Solid and Drift England and Wales 1994 Sheet 331 Portsmouth 1:50,000.
<b>Made Ground / Artificial Ground</b>	Made Ground will likely be encountered around demolished and existing buildings as well as roads and hard standings.
<b>Drift Geology</b>	<p>Published geology indicates river terrace deposits are present on site in the form of sand and gravel, locally with lenses of silt, clay, or peat.</p> <p>Following the site investigation, the site was confirmed to be underlain by Made Ground, comprising soft to firm silty or clayey alluvial soils, typically brown to grey and locally sandy, overlying medium dense to dense gravels associated with the River Terrace Deposits. These gravels are generally well-graded and subrounded to subangular, occasionally containing thin silt or clay lenses.</p>
<b>Solid Geology</b>	<p>The Selsey Sand formation is located underneath the site in the form of silty sand, silty clay, and sandy clayey silt, glauconitic, bioturbated, locally calcareous.</p> <p>Bedrock was not encountered during site investigation.</p>
<b>Faults</b>	There are no faults present in this area.
<b>Coal Seams</b>	The site is not within a coal mining reporting area.

### 4.2 Mining and Quarrying

Table 4.2 - Mining and Quarrying

	Yes/No	Comments
<b>Is the Site in an area of potential shallow coal workings?</b>	No.	
<b>Is the Site in a high risk development area?</b>	No.	
<b>Are there any known shafts, adits, tips, lagoons, or opencast workings likely to affect the Site?</b>	No.	
<b>Is exploratory work required to investigate the potential risk from shallow mining or quarrying?</b>	No.	

**Table 4.3 - Other Extractive Industries**

	Yes/No	Comments
<b>Superficial Drift Deposits</b>		
<b>Evidence of extraction on or within 250 m of the Site?</b>	Yes	47m SW – Unspecified Ground Workings – 1931 & 1938.
<b>Action required?</b>	No	Due to distance from site.
<b>Solid Strata</b>		
<b>Any evidence of mineral extraction on or within 250 m of the Site?</b>	No	
<b>Action required?</b>	None	

### 4.3 Hydrogeology

**Table 4.4 - Groundwater Occurrence and Abstraction**

	Presence/Location	Comments
<b>Environment Agency aquifer designation – Superficial Deposits</b>	On Site.	Secondary A of medium vulnerability.
<b>Environment Agency aquifer designation – Bedrock</b>	On Site.	Secondary A of low vulnerability.
<b>Anticipated groundwater depth(s)</b>	On Site.	Unknown at time of reporting, although likely to be broadly consistent with sea level.
<b>Direction of flow</b>	On Site.	Unknown at time of reporting, most likely towards the coast.
<b>Current licensed abstractions – potable</b>	On / Off Site.	None recorded within 2000m.
<b>Source Protection Zones</b>	On / Off Site.	None recorded within 500m.
<b>Springs</b>	On / Off Site.	None recorded within 500m.

For definition of Source Protection Zones, see **Appendix D**.

## 4.4 Hydrology

**Table 4.5 - Surface Water Features**

	<b>Presence/Location</b>	<b>Comments</b>
<b>Nearest surface water feature</b>	Off Site.	7m NE -The Solent/English Channel.
<b>Other surface water features</b>	Off Site.	7m NE -The Solent/English Channel .
<b>Canals, ponds, lakes, etc.</b>	Off Site.	150m SW – Moat. 530m NW – Haslar Lake.
<b>Water Framework Directive (WFD) Surface Water Bodies</b>	Off Site.	7m NE -The Solent. 7m NE -Portsmouth Harbour.
<b>Licensed surface water abstractions</b>	On / Off Site.	None within 2000m.

Environment Agency GQA Assessments: A = very good to E = poor

## 4.5 Environmental Designations

**Table 4.6 - Summary of Environmental Designations**

	<b>Presence/Location</b>	<b>Comments</b>
<b>Sites of Special Scientific Interest (SSSI)</b>	Off Site.	387m NW Portsmouth Harbour. 398m SW Gilkicker Lagoon.
<b>Conserved wetland sites (Ramsar sites)</b>	Off Site.	387m NW Portsmouth Harbour. 398m SW Solent and Southampton Water.
<b>Special Areas of Conservation (SAC)</b>	Off Site.	398m SW Solent & Isle of Wight Lagoons.
<b>Special Protection Areas (SPA)</b>	On and Off Site.	Solent and Dorset Coast. 387m NW – Portsmouth Harbour.
<b>National Nature Reserves (NNR)</b>	On / Off Site.	None recorded within 2000m.
<b>Local Nature Reserves (LNR)</b>	On / Off Site.	None recorded within 2000m.
<b>Designated Ancient Woodland</b>	On / Off Site.	None recorded within 2000m.
<b>Biosphere Reserves</b>	On / Off Site.	None recorded within 2000m.

	Presence/Location	Comments
<b>Forest Parks</b>	On / Off Site.	None recorded within 2000m.
<b>Marine Conservation Zones</b>	On / Off Site.	None recorded within 2000m.
<b>Green Belt</b>	On / Off Site.	None recorded within 2000m.
<b>Proposed Ramsar sites</b>	On / Off Site.	None recorded within 2000m.
<b>Possible Special Areas of Conservation (pSAC)</b>	On / Off Site.	None recorded within 2000m.
<b>Potential Special Protection Areas (pSPA)</b>	On / Off Site.	None recorded within 2000m.
<b>Nitrate Sensitive Areas</b>	On / Off Site.	None recorded within 2000m.
<b>Nitrate Vulnerable Zones</b>	Off Site.	564m NW – Chichester, Langstone and Portsmouth Harbours Eutrophic NVZ.
<b>SSSI Units</b>	Off Site.	387m NW - Portsmouth Harbour, Haslar Lake 398m SW - Gilkicker Lagoon.

## 4.6 Landfill and Waste Management Activity

**Table 4.7 - Waste Management Activities**

	Presence/Location	Comments
<b>Active or Recent Landfill</b>	Offsite.	Moat located off site proximal to the south western boundary comprising of commercial and household waste.
<b>Historical Landfill (BGS Records)</b>	On / Off Site.	None recorded within 500m.
<b>Historical Landfill (LA/Mapping Records)</b>	On / Off Site.	None recorded within 500m.
<b>Historical Landfill (EA/NRW Records)</b>	On Site.	Moat Along south western boundary. Southern Gosport Peninsula - Commercial, Household Environmental Permitting Regulations.
<b>Historical Waste Sites</b>	On / Off Site.	None recorded within 500m.
<b>Licensed Waste Sites</b>	Off Site.	295m N - Royal Naval Hospital Haslar. Issue Date: 14/02/1996. Surrendered Date: Oct 28, 2011.

	Presence/Location	Comments
<b>Waste Exemptions</b>	Off Site.	278m NW - Haslar Road, Gosport, PO12 2AG - Storing waste exemption. 497m N - Haslar Road, Gosport, PO12 2AG - Storing waste exemption.
<b>Evidence of other landfilling or potential infilling on or within 250m of Site</b>	On / Off Site.	No.
<b>Walkover evidence of fly-tipping on Site?</b>	N/A.	During the site walkover and the site works undertaken in 2023 no evidence of fly tipping was identified.
<b>Is a landfill/ground gas risk assessment required?</b>	On Site.	Yes, due to presence of historic landfill along southern boundary.

## 4.7 Local Industrial Land Uses

Other potentially contaminative activities are shown in **Table 4.8** below. The entries relate to activities within circa 250 m of the Site, with the exception of COMAH facilities where the assessment is extended to a distance of circa 500m from the Site.

**Table 4.8 - Other Potentially Contaminative Processes in the Locality**

	Location	Comments
<b>Recent Industrial Land Uses</b>	On/Off Site.	<b>Onsite</b> Barracks Tramway Sidings Zymotic Hospital  <b>Offsite</b> 25m NW – Electricity Sub Station 39m SW – Tank 113m NW – A J T Domestic 118m NW – Thermal Insulation Engineering Ltd 159m NW – Mast (Telecommunications)
<b>Current or Recent Petrol Stations</b>	On / Off Site.	No records within 500m.
<b>Electricity Cables</b>	On / Off Site.	No records within 500m.

	<b>Location</b>	<b>Comments</b>
<b>Gas Pipelines</b>	On / Off Site.	No records within 500m.
<b>Sites determined as Contaminated Land</b>	On / Off Site.	No records within 500m.
<b>Control of Major Accident Hazards (COMAH)</b>	On / Off Site.	No records within 500m.
<b>Regulated Explosive Sites</b>	On / Off Site.	No records within 500m.
<b>Hazardous Substance Storage/Usage</b>	On / Off Site.	No records within 500m.
<b>Historical Licensed Industrial Activities (IPC)</b>	Off Site.	466m N – Defence Research Agency.
<b>Licensed Industrial Activities (Part A(1))</b>	On / Off Site.	No records within 500m.
<b>Licensed Pollutant Release (Part A(2)/B)</b>	Off Site.	290m NE – Royal Navy Hospital.
<b>Radioactive Substance Authorisations</b>	Off Site.	386m NE - Royal Hospital Haslar.
<b>Licensed Discharges to Controlled Waters</b>	Off Site.	417m NW - Effluent Type: Sewage. 432m N - Effluent Type: Trade Discharges - Process Effluent - Not Water Company. 459m N - Effluent Type: Trade Discharges - Cooling Water. 461m NW - Effluent Type: Sewage.
<b>Pollutant Release to Surface Waters (Red List)</b>	On / Off Site.	No records within 500m.
<b>Pollutant Release to Public Sewer</b>	On / Off Site.	No records within 500m.
<b>List 1 Dangerous Substances</b>	On / Off Site.	No records within 500m.
<b>List 2 Dangerous Substances</b>	On / Off Site.	No records within 500m.

	Location	Comments
<b>Pollution Incidents (EA/NRW)</b>	Off Site.	339m N - Incident Date: 06/01/2002. Pollutant: Other Pollutant. Water Impact: Category 4 (No Impact). Land Impact: Category 4 (No Impact). Air Impact: Category 4 (No Impact).
<b>Pollution Inventory Substances</b>	On / Off Site.	No records within 500m.
<b>Pollution Inventory Waste Transfers</b>	On / Off Site.	No records within 500m.
<b>Pollution Inventory Radioactive Waste</b>	On / Off Site.	No records within 500m.

**COMAH** – Control of Major Accident Hazards (Regulations); **NIHHS** – Notification of Installations Handling Hazardous Substances (Regulations)

## 4.8 Radon Risk

**Table 4.9 - Radon Risk Status**

	Comments
<b>Estimated Properties Affected</b>	Less than 1% of properties are affected.
<b>Radon Protection Measures required?</b>	No protection measures are required.

## 4.9 Waste Classification and Materials Re-Use

Materials are to be disposed off-site, the material exported from the site to landfill should be hauled by a register waste carrier in accordance with Duty of Care Regulations 1991 and the Hazardous Waste Regulations 2005.

As part of the Phase 2 ground investigation report (**Ref: 8607-R12**) the soils were assessed to determine whether they are hazardous in terms of waste classification. It was determined that concentrations within soils were not hazardous in terms of waste classification and subsequently waste classification was undertaken by way of WAC testing, which was carried out on samples of the Made Ground. The results show that the samples tested are suitable for disposal offsite as inert waste.

It will be necessary to register the site in advance of the intended reclamation works with the Environment Agency before disposal to landfill can take place. There will be requirement for the waste producer to provide

appropriate Waste Acceptance Criteria (WAC) testing of the soils for disposal to ensure that the soils are appropriately classified and that the landfill is licensed to receive such soils. A consignment note shall be completed, signed, and retained by all parties involved. The consignment note shall state the volume of waste, a physical description of the material and statement of its chemical composition. The waste consignment notes shall be kept by the contractor for a period of at least two years.

Subject to volumetric fill requirements some materials may be considered for potential re-use in line with an appropriate end-of-waste protocol such as WRAP Quality Protocol for Aggregates from Inert Waste, U1 Exemption, or a Materials Management Plan in accordance with the CL:AIRE Definition of Waste Code of Practice (DoWCoP).

## 5. PRELIMINARY GEOTECHNICAL ASSESSMENT

### 5.1 Ground Conditions

The ground conditions have been confirmed to comprise of Made Ground extending to a minimum depth of 1.70m across the site (excluding TP103 from Report Ref:8607-R12 Phase 2), overlying alluvium and river terrace deposits. Although not encountered during the Phase 2 ground investigation, the underlying solid geology is the Selsey Sand Formation.

### 5.2 Site Levels, Earthworks and Site Preparation

The site topography is generally flat, and it is anticipated no cut & fill operations will be required as part of the development. The Made Ground, alluvium and river terrace deposits should prove suitable for excavation using conventional plant and machinery.

Excavations within the granular River Terrace Deposits (sand and gravel) and alluvium are unlikely to remain stable in the short term and will require battering back or temporary support. Groundwater may be encountered at shallow depths due to the location of the site.

Any changes in site levels for the proposed development should consider the proposed cut/fill in respect to the Materials Management Plan.

### 5.3 Foundation Solution

It is understood the foundation solution at the site comprises of reinforced concrete pad foundations founded on mass concrete infill taken to founding level, which is understood to range between 1.10m AOD and 2.29m AOD. The concrete pads are understood to be surrounded by a 250mm thick concrete retaining wall to founding level and all foundations extend below the Made Ground into the natural strata.

### 5.4 Floor Slab Solution

To mitigate the risk from the adjacent ground gas source located approximately 150m from the development plots, it is recommended that a suspended floor slab is utilised with sub floor venting (passive or mechanical) to further dilute gases that have not fully vertically or laterally diffused over the distance between the source and the development area.

## 5.5 Roads and Hardstanding

Access road recommendations will largely be dependent on final development levels. Any proposed extension of existing roads or hardstanding's should be investigated to confirm a suitable CBR value for design to avoid potential differential settlement. For initial costing purposes, California Bearing Ratio (CBR) values should be limited to 3%.

## 5.6 Drainage

The sands and gravels of the River Terrace deposits should prove suitable for the use of soakaways as part of any drainage design. It should be noted however that the underlying groundwater table is likely to lie at shallow depth consequently soakaways will need to be restricted to the upper 1 – 2m.

## 5.7 Protection of Buried Concrete

At this stage, there is no indication that buried concrete will require protection over and above that normally afforded structural concrete. A ground investigation should be undertaken to confirm the various soils properties to confirm the classification to BRE SD1.

## 6. PREVIOUS INVESTIGATION FINDINGS

Two previous investigations have been undertaken for the site, including a Phase 1 and a Phase 2 ground investigation. These are summarised below.

### Phase 1 Desk Study Findings (8607-R11)

- **Geology:** The British Geological Survey identifies River Terrace Deposits (sand and gravel) overlying the Selsey Sand Formation (silty sands and clays of Eocene age).
- **Hydrogeology:** Both superficial and bedrock deposits are classified as Secondary A Aquifers, of medium to low vulnerability.
- **Ground Conditions (Anticipated):** Made Ground around structures and roads, underlain by natural granular and cohesive materials.
- **Potential Contamination Sources:**
  1. Historic Made Ground associated with demolished structures.
  2. Infilled moat located near the southern boundary (recorded as a historic landfill).
- **Ground Gas Risk:** Low, with no active landfill gas recorded in proximity.
- **Flood Risk:** Low (tidally influenced, but elevated above sea level).
- **Radon:** <1% of properties affected — no protection required.
- **Key Recommendation:** Undertake intrusive investigation to assess the extent and nature of Made Ground and potential contaminants (lead, hydrocarbons, asbestos).

### Phase 2 Ground Investigation Findings (8607-R12)

Following the Phase 1 desk study, a targeted ground investigation was undertaken.

#### Fieldwork Summary

- **Exploratory Works:** 11 No. machine-dug trial pits (TP101–TP106, TP201 – TP207) to depths of up to 3.1 m bgl, plus 3 No. inspection pits and 10 No. DCP tests.
- **Groundwater:** Encountered in several locations between 2.0–2.8 m bgl, consistent with a shallow perched or tidal groundwater regime.

**Table 6.1 – Summary of Ground Conditions**

Stratum	Depth Range (m bgl)	Typical Description	Notes
Topsoil.	0.2–0.5	Dark brown slightly gravelly sand.	Present in soft landscaping only.
Made Ground.	0.4–1.7	Soft to firm slightly sandy gravelly CLAY with brick, mortar, concrete, and masonry.	Variable; present across majority of site.

Alluvium.	1.7–2.7	Firm to stiff brown silty CLAY and local loose silty fine SAND	
River Terrace Deposits.	2.7–3.1	Medium dense to dense sandy GRAVEL (flint)	
Bedrock.	Not proven.	Selsey Sand Formation (anticipated at >3.5 m bgl)	Not encountered during investigation.

## Geoenvironmental Assessment

### ➤ Contamination:

1. Elevated lead concentrations were recorded in 3 samples within Made Ground near the proposed medical facility and sports pitch area.
2. No exceedances for PAHs, TPHs, or asbestos.
3. Slight localised heavy metal enrichment in Made Ground only.

### ➤ Controlled Waters:

1. Cohesive alluvium acts as a natural aquitard, limiting downward migration of contaminants.
2. No evidence of active leachate or hydrocarbon contamination.

### ➤ Ground Gas & Radon:

1. Low risk from ground gases (no putrescible materials encountered, no viable pathway for ground gas).
2. No radon protection measures required.

### ➤ Human Health Risk:

1. Minor risk from shallow Made Ground in soft landscaped areas only.
2. Recommended removal of 600 mm Made Ground and replacement with clean cover in public open space and garden areas.

## 7. PRELIMINARY CONCEPTUAL SITE MODEL

### 7.1 Introduction

Based on the information provided in the previous sections of this report, a combined preliminary conceptual site model and conceptual exposure model has been developed for the proposed future land use. This summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors. In assessing the likely contaminants of concern present at the site, reference has also been made to Department for Environment Food and Rural Affairs (DEFRA) and Environment Agency supporting documentation. A preliminary qualitative risk assessment has also been made of the likelihood of the linkage operating and its potential significance in accordance with CIRIA C552.

The preliminary conceptual model is presented in schematic form in **Figure 12**. The potential pollutant linkages identified and the qualitative risk assessment for these are presented in Conceptual Site Model.

The terms used in the preliminary qualitative risk assessment are defined in **Appendix C**.

The following sections discuss all the identified potential on and off-site sources, pathways, and receptors in the context of the proposed development and plausible pollutant linkages which may represent a risk to identified receptors such as human health and/or controlled waters from the data gained from the desk study. At this stage, the assessment is qualitative and aimed to determine all pollutant linkages, irrespective of significance or allowing for uncertainty.

Three impact potentials exist for any given site, these are:

- The site impacting upon itself;
- The site impacting on its surroundings; and
- The surroundings impacting on the site.

All three impacts need to be considered in a risk assessment.

- **Sources:** These are potential or known sources of contamination that may relate to a former land use or present site feature or process (e.g., Made Ground, infilled ground etc).
- **Pathways:** A pathway is defined as a mechanism or route by which a contaminant encounters, or otherwise affects a receptor. Pathways by which the identified receptors may be impacted upon in the context of the proposed development.

- **Receptors:** Receptors are defined as people, living organisms, ecological systems, controlled waters, atmosphere, structures, and utilities that could be adversely affected by contaminant(s).

## 7.2 Conceptual Site Model

Based on the data available the following Conceptual Site Model has been developed. The various components of the potential “source–pathway–receptor” pollutant linkages identified at the site.

## 7.3 Hazards Identified with the Proposed Development

The hazard identification is based on the assumptions presented below:

- The site will be a residential development.
- The historical buildings are a potential source of contamination.
- The current buildings are a source of contamination.
- Drinking water will be from mains supply.
- Historical railway sidings.
- A household and commercial waste landfill located on the far southwestern boundary of the site is a potential source of ground gas.

## 7.4 Potential Sources of Contamination

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

### ***Potential On-site Sources of Contamination***

- Made Ground, from demolished/constructed buildings.
- Possible weapons and ammunitions storage.
- Historical tramway sidings.
- Backfilled moat on the south west site boundary.
- 

### ***Potential Off-site Sources of Contamination***

Historical substation located 25m northwest.



Figure 7.1 - Extract from Past Land Use from Groundsure Report

## 7.5 Potential Receptors of Contamination

Based on the data previously discussed, the following potential receptors to contamination have been identified:

**Table 7.1 - Identified Potential Receptors**

Sensitive Receptors	
<b>A</b>	Humans – Predevelopment completion, i.e., working on site during demolition and construction.
<b>B</b>	Humans working on the site post construction.
<b>C</b>	Controlled waters – Surface Waters (rivers and streams)
<b>D</b>	Groundwater in the secondary A aquifer.
<b>E</b>	Local flora and fauna during and post construction.
<b>F</b>	Building structure and services.

The possible contaminant linkages are discussed below. It should be noted not all may be formed between all sources and receptors.

The preliminary assessment of risks undertaken for the development considers potential risks to receptors **A** to **F** in **Table 7.1** above. The receptors **A** to **F** incorporate each of the receptors normally required by the Local Authority to be considered in their planning conditions relating to land contamination:

- Human Health (**A & B**)
- Property (including buildings, crops, livestock, pets, woodland, service lines) (**E & F**)
- Adjoining land (**D & F**)
- Groundwater and surface water (**C & D**)
- Ecological systems (**E**)
- Buildings and structures (**F**)

It should be noted that there are no archaeological sites or ancient monuments considered to be within the zone of influence of the site. They are therefore not considered in the risk assessment.

The closest of each of the above receptor categories to the site are considered to be:

### **On-site**

- Human Health, Property, Buildings and Structures, Groundwater, and Surface Water

### **Off-site**

- Human Health, , Groundwater, and Surface Water

The possible contaminant linkages are discussed below. It should be noted not all may be formed between all sources and receptors.

## **7.6 Identification of Pathways**

### **7.6.1 Pathways to Human Health**

There are various routes by which a potential contaminant may reach a receptor. For example, in areas where contaminated material is exposed, dermal contact with the material, inhalation or ingestion of dust may occur.

Inhalation or ingestion of dust and water could occur during the construction and development phase at the site. Pathways from dermal contact with soil and groundwater may also arise. It is considered that the risk of short-term exposure for ground workers and other construction workers is low, unless there are asbestos fibres are encountered.

Post construction, the surface of the development area will be occupied with buildings and hard standing, with smaller garden areas. This will effectively eliminate the persistence of potential pathways such as long-term direct contact and dust inhalation/ingestion, providing that the soil in the garden areas has no significant concentrations of contaminants.

### **7.6.2 Ground Gas**

The risk from ground gas is low, both due to the distance from the proposed development (>150m) and the likelihood of vertical and lateral venting of ground gases over such distance.

### **7.6.3 Pathways to Controlled Waters**

Groundwater levels are currently unknown but are assumed to be at sea level. Consequently, lateral migration of potentially contaminated groundwater offsite (either via permeable Made Ground or the underlying superficial and solid geology) must be considered.

The vertical leaching of contaminants from any potential Made Ground into the groundwater is a potential pathway for contaminants to impact upon groundwater.

Surface run off from contaminated areas into surface watercourses must also be considered.

Post construction the majority of the site and surface run-off will be limited and controlled through drains.

The nearest river is approximately 7m to the SE. There are viable overland migration pathways for surface run off to reach this receptor.

#### 7.6.4 Other Pathways

Other potential pathways, which are likely to be of lesser significance to the site but still require consideration, include chemical attack on buried services and the permeation of contaminants through potable water supply pipes. The potential risk to buildings from ground gases is discussed above under the Human Health assessment.

### 7.7 Uncertainties

The following uncertainties exist in the preliminary conceptual model:

- The presence of any features unrecorded by the historic maps.
- Any unrecorded geological features.
- Any unrecorded pollution events during the site's history.

### 7.8 Conceptual Site Model

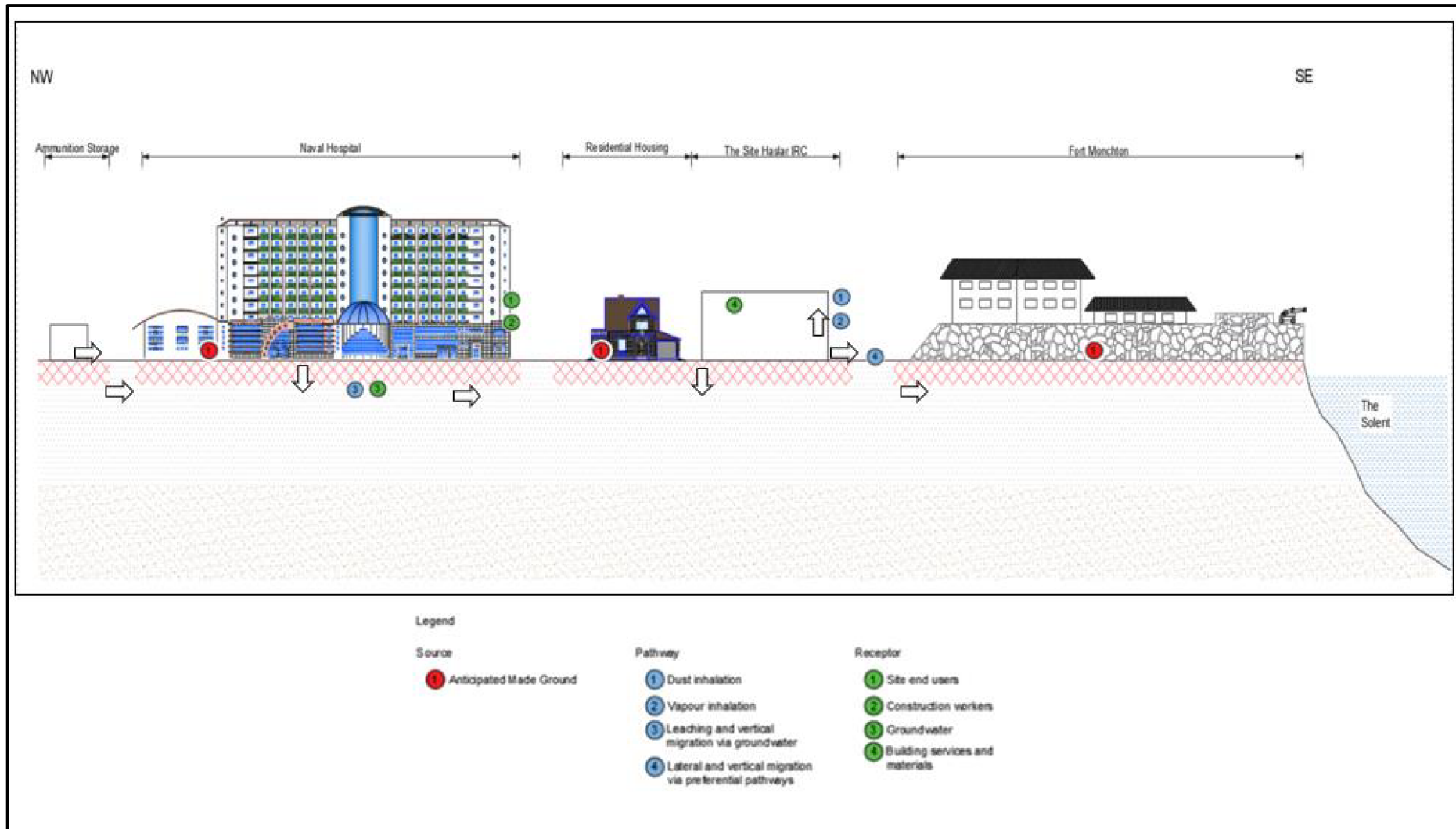
In accordance with BS 10175, a schematic section (see **Figure 7.2**) has been developed for the site based on the previously presented data and contaminant linkage assessment.

The model shows the predicted geology and topography, the major on-site potential contamination sources, and vulnerable receptors.

The information presented above represents the preliminary conceptual ground model that may need to be revised based on information obtained as part of any future intrusive investigation. A number of sensitive receptors and potential pathways and sources (in association with a list of likely contaminants) have been identified.

The ground model and proposed end use described above, should be considered broadly representative of the standard housing (with vegetable uptake) as defined in SR3 "Updated Technical Model to the CLEA Model" (SC050021/SR3, 2011) for the purpose of this report.

Figure 7.2 - Conceptual Site Model



**Table 7.2 - Risk Assessment**

Human Health and Controlled Waters						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of risk	Justification
<b>On site Made Ground (Historical buildings, railway/tramway sidings)</b> Metals, PAHs, asbestos, TPH	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Certain	Medium	High	Made Ground deposits are likely to be encountered in the northeast and south west of the site associated with both the historical barracks and hutments, as well as railway sidings.  The proposed development is to be an IRC and as such buildings are to include accommodation.  The risk is considered to be high at this stage due to the known elevated lead concentrations above residential GACs. Further remediation is required to address the exceedances in analyte identified within chemical testing undertaken on the site during the ground investigation ( Ref: 8607-R12 Phase 2) .
<b>On site Made Ground</b> Metals and organic contamination	Migration into/chemical attack of water supply pipelines	Water Pipelines / End users	Likely	Medium	Low	Chemical sampling undertaken as part of the Phase 2 ground investigation have shown no concentrations which could potentially attack the clean potable water supply pipe and as such the risk to water supply pipelines is low.
<b>Off site Made Ground</b> Ground Gas (carbon dioxide and methane & possible VOCs)	Migration into confined spaces, inhalation and asphyxiation/ explosion	End-users / property / structures	Unlikely	Severe	Low	Made Ground associated with the historical landfill located offsite on the south western boundary is a source, however based on the findings of the ground investigation, the distance between the source and receptor and the raised foundations including granular fill, any ground gas will defuse over such distance.

Human Health and Controlled Waters						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of risk	Justification
<b>On site Made Ground Metals, PAHs,</b>	Overland flow, / migration through saturated zone	SW) (Surface Waters)	Low Likelihood	Medium	Low	Made Ground associated with the previous developments is known to be notable in thickness (up to 1.70m thickness) ; It is considered contaminants associated with the Made Ground could impact adjacent surface water (Solent) however given the historical construction of the coastal erosion protection it's likely that contaminants will have low migration potential. Therefore, the risk is considered to be low.
	Overland flow, leaching through unsaturated zone / migration through saturated zone	Secondary (A) Aquifer (Groundwater)	Low likelihood	Medium	Low	The superficial Secondary A Aquifer within the river terrace deposits is considered to be of moderate sensitivity. The development of the site will likely result in a reduction in surface water infiltration with the installation of a new surface water drainage system, which will reduce any contaminant leaching and contribute to an overall betterment of groundwater quality. The overall risk is therefore considered to be low.
	Leaching through unsaturated zone / Migration through saturated zone	Principal Aquifer (Ground-water)	Unlikely	Medium	Low	The site is not within a Source Protection Zone, there are no potable groundwater abstraction licences located within 2000m of the site. The risk of known contaminants on site (lead) migrating to the principal aquifers unsaturated/saturated zone is unlikely following the development of the site as this will likely result in a reduction in surface water infiltration with the installation of a new surface water drainage system, which will reduce any contaminant leaching and contribute to an overall betterment of groundwater quality. The overall risk is therefore considered to be low.

## 8. CONCLUSION AND RECOMMENDATIONS

### 8.1 Environmental Risk Assessment

A preliminary risk assessment has been carried out based on the contaminant-pathway-receptor model, as defined in Statutory Guidance to Part IIA of the Environment Protection Act, 1990, and in accordance with BS 10175: 2011 +A1 2013 “Investigation of Potentially Contaminated Sites – Code of Practice”. The characteristic ground conditions and elements of the surrounding environment and has been summarised and a risk assessment carried out.

The site was originally made up of multiple separate buildings making up Haslar Barracks to the north of the site with fields in the southern end. From approximately 1898 onwards, Haslar Barracks became Gosport Station Hospital, which then became Haslar Barracks again sometime before 1931. The western side of the site was home to Moncton Hutments, which were erected before 1931. Between 1931 and 1969, Moncton Hutments were removed from the site and Haslar Barracks were demolished and replaced with HM Detention Centre, which is now Haslar IRC. Made Ground was found to be present across the majority of the site and elevated lead concentrations were found to be present in some of the material tested. There is no evidence of any hydrocarbon storage or spills on the site and no elevated TPHs or PAHs were found. No radon protective measures are required.

To the north of the site was Haslar Naval Hospital, and further northwest were torpedo sheds, and a gunboat yard which are all now disused. The south of the site had a historical tramway (railway) sidings located to the southwest. No deep Made Ground was encountered and no elevated concentrations of contaminants were found within this area.

The results of the risk assessments indicate that there is high risk to site users from elevated lead concentrations resulting from historical activity on the site. The sources identified in the risk assessment and the associated risks were addressed during the Phase 2 ground investigation undertaken in 2023. It was concluded that a remediation strategy and subsequent verification report will be required upon completion of the clean cover system.

## 9. REFERENCES

1. LQM/CIEH Ltd (2015) S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.
2. BGS Solid and Drift England and Wales 1994 Sheet 331 Portsmouth 1:50000
3. The Water Framework Directive, (Standards and Classification) Directions (England and Wales).
4. Contaminated Land: Applications in Real Environments (CL:AIRE) (2011) Definition of Waste Code of Practice (version 2).
5. BRE SD1 (2005). Concrete in Aggressive Ground. Special Digest 1 (revised edition). IHS BRE Press, Bracknell
6. CIRIA C552 (2001) Contaminated land risk assessment. A guide to good practice (report no. C552).
7. Environment Agency (2007) Evaluation of Models for Predicting Plant Uptake of Chemicals from Soil. Report SC050021/SR, Environment Agency, Bristol.
8. BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites - Code of Practice. British Standards Institution, London.
9. Department of Environment Food and Rural Affairs (DEFRA) (2012) Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (report no. PB13735
10. BRE BR211 (2015). Radon: Guidance on Protective Measures for New Dwellings. IHS BRE Press, Bracknell.
11. BS5930:2015+A12020 Code of practice for ground investigations BSI
12. BS8485 2015 Code of Practice for the design of protective measures for methane and carbon dioxide ground gases in new buildings. British Standards
13. BS8576-2013 Guidance on investigations for ground gas – permanent gases and volatile organic compounds (VOCs). BSI,
14. CIRIA Rep R 149 (1995a) Protecting Development from Methane. Report 149, CIRIA, London.
15. CIRIA Rep R 150 (1995b) Methane Investigation Strategies. Report 150, CIRIA, London.
16. CIRIA Rep R 132 (1996) A Guide for Safe Working on Contaminated Sites. Report 132, CIRIA, London.
17. CIRIA C665 (2007) Assessing the risks posed by hazardous gases to buildings CIRIA, London
18. CIRIA C681 (2009) Unexploded ordnance (UXO) A guide for the construction industry (C681)
19. CIRIA C785 (2019) Unexploded ordnance (UXO) risk management guide for land-based projects (C785)
20. CIRIA C758D (2019) Abandoned mine workings manual (C758D)
21. BRE 414 (2001) Protective measures for housing on gas-contaminated land. BRE.
22. Environment Agency (2000) Technical Aspects of Site Investigation. Report P5-065/TR, Environment Agency, Bristol.
23. Environment Agency (2002) Guidance on Monitoring Landfill Leachate, Groundwater, and Surface Water. Report LFTGN02, Environment Agency, Bristol.
24. World Health Organisation (2017) Guidelines for Drinking Water Quality (4th edition).
25. Britain From Above - <https://britainfromabove.org.uk/en/image/WPW060399>
26. <http://www.warstateandsociety.com/Bombing-Britain>
27. <https://www.epa.gov/pfas/basic-information-pfas>
28. UK Maps of Radon, <http://www.ukradon.org/information/ukmaps>
29. Health and Safety Executive (2015) Construction (Design and Management) Regulations.
30. Coal Authority Interactive Map Viewer, <http://mapapps2.bgs.ac.uk/coalauthority/home.html>
31. BGS Geology of Britain Viewer <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>.

## APPENDIX A: Groundsure Report

## APPENDIX B: UXO Risk Assessments

## APPENDIX C: Contaminated Land Risk Assessment Terminology

## CIRIA C552 Terminology

For the qualitative and quantitative assessment of risks posed by potential pollutant linkages have been undertaken using the risk matrix adapted from CIRIA C552 and outlined below.

	Category	Definition
<b>Potential severity</b>	Severe	Acute (short term) risk to human health, Major pollution of sensitive controlled waters, ecosystems, or habitat. Catastrophic damage to buildings or property or crops.
	Medium	Chronic (Medium / long term) risk to human health Pollution of sensitive controlled waters, ecosystems, or species, Significant damage to crops, buildings, or structures
	Mild	Easily preventable permanent health effects on humans. Pollution of non-sensitive controlled waters. Minor damage to buildings or structures.
	Minor	Easily preventable non-permanent health effects on humans, or no effects. Minor, low level and localised contamination of on-site soil. Easily repairable damage to buildings or structures.
<b>Probability of risk</b>	High Likelihood	Pollutant linkage may be present, and the risk is almost certain to occur , or there is evidence of harm already occurring.
	Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term.
	Low Likelihood	Pollutant linkages may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
	Unlikely	Pollutant linkage may be present but the circumstances under which harm would occur are improbable.

		Potential Severity			
		Severe	Medium	Mild	Minor
Probability of risk	High Likelihood	Very high risk	High risk	Moderate risk	Moderate / low risk
	Likely	High risk	Moderate risk	Moderate / low risk	Low risk
	Low Likelihood	Moderate risk	Moderate / low risk	Low risk	Very low risk
	Unlikely	Moderate / low risk	Low risk	very low risk	Very low risk

## APPENDIX D: Controlled Waters Risk Assessment

## CURRENT GUIDANCE FOR CONTROLLED WATERS RISK ASSESSMENT

### Regulatory Context

Government policy is based upon a “suitable for use approach,” which is relevant to both the current use of land and also to any proposed future use. When considering the current use of land, Part IIA of the Environment Protection Act 1990 (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995, which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, controlled waters or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

*“any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:*

- (a) Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- (b) Pollution of controlled waters is being, or is likely to be, caused.”*

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

*“the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter”*

Controlled Waters are defined Section 104 of the Water Resources Act 1991. In summary, they comprise relevant territorial waters which extend seaward for three miles from the low-tide limit from which the territorial sea adjacent to England and Wales is measured.

The Environment Agency has powers under Part 7 of The Water Resources Act (1991) to take action to prevent or remedy the pollution of controlled waters, including circumstances where the pollution arises from contamination in the land. This is reinforced in The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012.

Part IIA introduces the concept of a contaminant linkage; where for potential harm to exist, there must be a connection between the source of the hazard and the receptor via a pathway. Risk assessment in contaminated land is therefore directed towards identifying the contaminants, pathways and receptors that can provide contaminant linkages. This is known as the contaminant-pathway-receptor link (CPR or contaminant linkage).

Part IIA places contaminated land responsibility as a part of the planning and redevelopment process, rather than Local Authority or Environment Agency directly, except in cases of very high pollution risk or where harm is occurring. In the planning process, guidance is provided by National Planning Policy Framework (NPPF) of March 2012. The NPPF requires that a site which has been developed shall not be capable of being determined “contaminated land” under Part IIA. Therefore, appropriate risk-based investigation is required to identify the contaminant linkages that can then be assessed, and then mitigated using methods that can be agreed with the planners.

### Source Protection Zones

Source Protection Zones (SPZs) are defined by the Environment Agency (for England and Wales), SEPA (Scotland) and the Environment and Heritage Service (Northern Ireland) for groundwater sources such as wells, boreholes and springs that are used for public drinking water supply. The zones show the risk of contamination from activities that might cause groundwater pollution in the area. The size and shape of a zone depends upon subsurface conditions, how the groundwater is removed, and other environmental factors.

SPZs are classified into four categories:

- **Zone 1 (Inner protection zone).** Any pollution that can travel to the abstraction point within 50 days from any point within the zone is classified as being inside Zone 1. This applies at and below the groundwater table. This zone also has a minimum 50 m protection radius around the abstraction point. These criteria are designed to protect against the transmission of toxic chemicals and water-borne disease.
- **Zone 2 (Outer protection zone).** The outer zone covers pollution that takes up to 400 days to travel to the abstraction point, or 25% of the total catchment area, whichever area is the largest. This travel time is the minimum period over which the Environment Agency considers that pollutants need to be diluted, reduced in strength, or delayed by the time they reach the abstraction point.
- **Zone 3 (Total catchment).** This is the total area needed to support removal of water from the abstraction point, and to support any discharge from this.
- **Zone of special interest.** This may occasionally be defined as a special case. This is usually where local conditions mean that industrial sites and other potential sources of contamination could affect the groundwater source, even though they are outside the normal catchment area.

### Groundwater Vulnerability Assessments

From 1 April 2010 The Environment Agency Groundwater Protection Policy began to use aquifer designations which are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems.

The aquifer designation data is based on geological mapping provided by the British Geological Survey. It is updated regularly to reflect their ongoing programme of improvements to these maps. The maps are split into two different types of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels.
- Bedrock -solid permeable formations e.g., sandstone, chalk, and limestone.

The maps display the following aquifer designations:

**Table 1. Aquifer Classification (“Geological Classification”).**

Classification	Definition
<b>Principal Aquifers (Highly Permeable)</b>	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
<b>Secondary A Aquifers</b>	Permeable layers 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. These are generally aquifers formerly classified as minor aquifers.
<b>Secondary B Aquifers</b>	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons, and weathering. These are generally the water-bearing parts of the former non-aquifers.
<b>Secondary Undifferentiated Aquifers</b>	This has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
<b>Unproductive Strata</b>	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

## Environment Agency Guidance

The Environment Agency's stance on groundwater resources is:

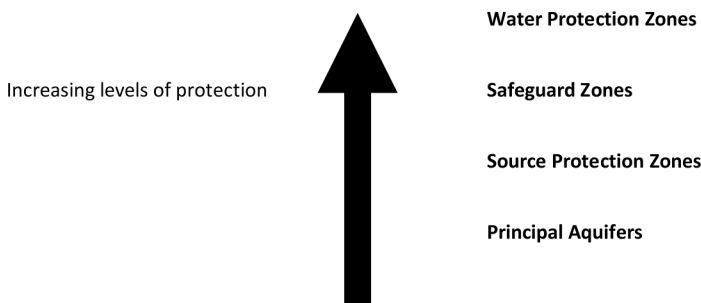
*“to protect and manage groundwater resources for present and future generations in ways that are appropriate for the risks we identify”*  
(Groundwater Protection: Policy and Practice GP3, 2012).

At present, the legislation and guidance pertaining to the protection of controlled waters in the UK is complex; however, the core objectives seek to enforce the position given above.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document introduced areas of focus for developments such as Source Protection Zones (SPZs) and Groundwater Vulnerability Maps. The Policy was revised in 1998, since which there have been substantial changes in legislation, driven by key European Directives relating to groundwater include the Groundwater Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled by primary UK legislation such as the Water Resources Act 1991 as amended by the Water Act 2003. Gaps in the 1998 PPPG that emerged as the result of further legislative changes were addressed in the Environment Agency Policy document Groundwater Protection: Policy and Practice (GP3), Version 1 of November 2012. The three main parts of GP3 were:

- Groundwater principals;
- Position statements and legislation; and
- Technical information.

The Environment Agency has a tiered risk-based approach to drinking water protection as summarised below:



Secondary Aquifers

## APPENDIX E: Phase 2 Ground Investigation Report



1ST HORIZON

---

**T:** +44 (0)1226 766 446 **E:** [office@1sth.co.uk](mailto:office@1sth.co.uk) **www.1sth.co.uk**

The Old Pop Factory | 88-90 High Street | Dodworth | Barnsley | S75 3RQ

Company Registration No: 5792353 | VAT Registration No: 886 5956 47