

STAGE 1 ENVIRONMENTAL RISK ASSESSMENT DESK STUDY

At

Land at rear of Sefter School
House, Pagham

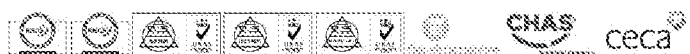
On behalf of

Hamilton Homes and Developments Ltd

PROJECT REFERENCE: 21.1146.ERA

March 2022

constructiveevaluation
site investigation • building pathology

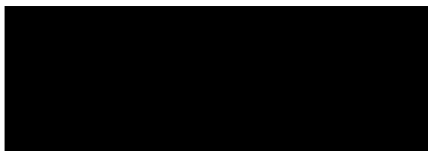


Stage 1 Environmental Risk Assessment Desk Study

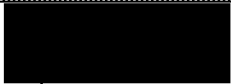
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Foreword

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Appendix C – Report Terms and Conditions

1.0 Executive Summary

Site Address	Land at rear of Sefter School House, Sefter Road, Pagham PO21 3EE
Site Description	Triangular disused field.
Proposed Development	Construction of six two-storey dwellings, comprising four semi-detached houses and two detached houses, with associated access, parking and private garden areas.
Environmental Setting	Generally rural with some residential properties.
Geology and Hydrology	Superficial: Raised Beach Deposits - sand and gravel. Boundary of River Terrace Deposits to north Bedrock: London Clay Formation - clay, silt and sand
Site History	Open land/field since 1875. Some surface debris between 2005-2015.
Potential Areas of Concern	Potential ACM in surface debris. Fire pits Imported Made Ground (surface debris and stockpiles)
Conceptual Site Model	Human Health – high Controlled Waters – low/moderate Ground Gas - low Geological Hazard* - low UXO - medium
Ground Engineering	Shrinkable clay, and soakage to ground unlikely to be feasible in London Clay Formation.
Conclusions and Recommendations	Additional works to further refine the potential risks identified within the Conceptual Site Model. A Stage 2: Detailed Unexploded Ordnance Desktop Threat Assessment is recommended for the site to clarify the UXO risk to future ground works.

2.0 Introduction

Constructive Evaluation Ltd (CE) was appointed by Hamilton Homes and Developments Ltd (*the Client*) to undertake a Stage 1 Desk Study Environmental Risk Assessment at Land rear of Sefter School House, Sefter Road, Pagham PO21 3EE, hereafter referred to as the “site”. The Site Location Plan is provided as **Figure 1**. The Client is proposing to develop the site for residential use and this report has been prepared to comply with the likely conditions of planning.

The aims of this Environmental Risk Assessment report are as follows;

- To provide information on the anticipated geology, hydrology and hydrogeology of the subject site.
- Investigate the development history and most recent uses of the subject site.
- To identify whether there is any contamination on site which is likely to cause significant harm to human health, the environment or other sensitive receptors.

In order to achieve these aims, CE proposes the following objectives;

- Conduct a Site Walkover of the site to assess possible sources of contamination.
- Comprehensive assessment of Environmental Database Information.
- Develop a Conceptual Site Model (CSM) based on environmental database information.

The works described in this report are subject to the Service Constraints presented in **Appendix C**. This report was finalised in March 2022 and should be read in light of any subsequent changes in legislation, statutory requirements, statutory guidance, non-statutory guidance, relevant research and industry practices. This report is currently assigned to the Client for their sole reliance.

Previously, CE Ltd have completed two reports for the site: a contamination survey¹ and a geotechnical survey². Both of these reports should be read in conjunction with this report and are summarised below;

Contamination Summary

Seven (non-targeted) window sampling boreholes were carried out to a maximum of 3mbgl. Anthropogenic materials were proven visually to 0.45mbgl, including concrete, brick and tile fragments. Metal, glass and suspected asbestos containing materials (ACM) were observed across the surface of site. Sandy gravelly Clay and clayey Sand were proven to an average depth of 1.7mbgl, with London Clay to 3mbgl. Twelve samples were screened for contamination testing. Chrysotile was detected and quantified with a maximum of 0.003%. Results were compared with GAC residential with plant uptake. Exceedances included lead and PAHs including Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(a,h)anthracene. Waste Acceptance Criteria (WAC) testing confirmed spoil will likely be accepted at Inert and Non-Hazardous waste facilities.

The report concluded that the ACM should be hand-picked and double-bagged and disposed of appropriately by a competent person. Areas of soft standing would require remediation with a minimum 450mm thick capping layer and use of a geotextile membrane.

¹ Letter Report. CE Ltd. 19.1295, dated February 2020.

² Interpretative Site Investigation Report. CE Ltd. 21.1146, dated August 2021.

Geotechnical Summary

Four windowless sampling boreholes were carried out to a maximum of 6mbgl with two super heavy dynamic probes to a maximum of 6mbgl. Anthropogenic materials were proven to 1m-1.2mbgl. Slightly sandy slightly gravelly Clay was proven to a maximum depth of 2.4mbgl. Raised Beach Deposits were proven to a maximum depth of 2.7mbgl, with London Clay to 5.2mbgl and the Bognor Sand Member proven to 6.45mbgl.

2.1 Proposed Development

It is understood that the proposed development is for the construction of six two-storey dwellings, comprising four semi-detached houses and two detached houses, with associated access, parking and private garden areas. The Proposed Development Plan is provided in **Figure 2**.

2.2 Site Location

The site comprised a triangular shaped plot of land at approximate National Grid Reference SZ 89526 99488. The site comprised a disused field which was accessed via Sefter Road to the north. Topography was generally flat, however there was a small slope down to a drainage channel along the southeast border.

The site surroundings are as follows:

- North: Sefter Road and agricultural fields,
- East: A drainage channel trending NE-SW and agricultural fields,
- South: Residential properties and agricultural fields,
- West: Rear gardens of residential properties, Pagham Road and agricultural fields beyond.

The Site Location Plan is provided in **Figure 1**.

2.3 Site Description

The site is triangular in shape with maximum dimensions of ~70m north to south by ~60m east to west, covering an area of 0.29ha.

At the time of the site walkover the site was hoarded along the Sefter Road boundary. The site was an open piece of land, located to the rear of the Sefter School House. Site clearance had previously been carried out with a construction site set up located in the northwest quadrant, including a few equipment storage containers, water bowser, Heras fencing and a Portaloo. Groundwork materials were stored in preparation in various areas across the site.

Several stockpiles were located across the site, including topsoil, brick and concrete rubble. Surface debris across the site included plastic (roofing gutter) sections, brick, concrete and breezeblock fragments, metal pipes, strips and metal mattress springs, glass, polystyrene, timber fencing and pallets, concrete posts and plastic bags.

In addition, along the southeast border on the bank of the drainage channel possible asbestos containing materials (ACM) were noted in the form of sections of corrugated roofing. Two fire pits were also noted, containing burnt metal, timber and metal cans.

A shallow excavation along the northwest border was partly water-filled and contained some surface debris.

The site was bound by mature and semi-mature deciduous trees of various species to the south.

Site details are presented on the Site Walkover Plan on **Figure 3**. Site Photographs are presented in **Appendix A**.

2.4 Site Walkover Observations

A site walkover was undertaken on 10th March 2022 with the aim of identifying any potential areas of concern that may be present on site prior to the commencement of future works.

Potential areas of concern were observed:

- 1 - Potential ACM from fragments of corrugated roofing identified on ground surface,
- 2 - Fire pits identified on ground surface,
- 3 - Imported Made Ground (surface debris and stockpiles).

3.0 Physical Site Setting

3.1 Geology

3.1.1 Anticipated Geology

Published geological information indicates that the site lies upon bedrock of the London Clay Formation with superficial Raised Beach Deposits being recorded on site.

Raised Beach Deposits – sand and gravel. Superficial deposits formed up to 3 million years ago in the Quaternary Period. The local environment was previously dominated by shorelines. These sedimentary deposits are shallow-marine in origin. They are detrital, generally coarse-grained forming beaches and bars in coastal settings.

It is also noted that the boundary of the River Terrace Deposits is approximately 12m north of the site. These deposits comprise sand, silt and clay.

London Clay Formation – clay, silt and sand. Sedimentary bedrock formed approximately 48-56 million years ago in the Palaeogene Period. The local environment was previously dominated by deep seas. These sedimentary rocks are marine in origin. They are detrital and comprise coarse- to fine-grained slurries of debris from the continental shelf flowing into deep-sea environments, which formed distinctively graded beds.

3.1.2 Historical Boreholes

There is one historical borehole record within 250m of the site. The 142m deep borehole (BGS reference SZ89NE4) was drilled in 1890, located 34m northwest of the site, recording drift (to 5mbgl) over London Clay (to 55mbgl), Reading Beds (to 85mbgl) and Upper Chalk (proven to 142mbgl).

3.2 Hydrology

The nearest watercourse is an unnamed inland river (narrower than 5m), which is located 3m southeast of the site. There are 15no. surface water features (wider than 5m), located within 250m of the site.

The site is within the surface body catchment area of the River Pagham Rife, part of the Arun and Western Streams, which is located 606m southwest of the site.

The site has a High Risk of Flooding from Rivers and the Sea (RoFRaS) Flood rating.

There are no records of historical flood events for the site since 1946 when records began to be documented.

The site has been identified as being near floodplains:

- Zone 2 Environment Agency floodplain, which includes fluvial and tidal models, 1m south,
- Zone 3 Environment Agency floodplain, which includes fluvial models, 9m southwest.

The highest risk on site to surface water flooding is a 1 in 100 year chance of flooding with water depths between 0.3-1.0m. Within 50m of site the highest risk of flooding is a 1 in 30 year chance with water depths of 0.3-1m.

There is a high risk of groundwater flooding on site and within 50m of site.

3.3 Hydrogeology

The Raised Beach Deposits (Superficial Deposit) is classed as a Secondary A Aquifer. The geology is of 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.

The London Clay Formation (Bedrock) is classed as unproductive strata. These are deposits with low permeability that have negligible significance for water supply or river basin flow.

3.4 Controlled Waters

3.4.1 Groundwater Abstractions

There are no groundwater abstraction licenses recorded within 500m of the site.

3.4.2 Surface Water Abstractions

There are nine records within 2km of site. The nearest record is for spray irrigation at Pagham Rife Sefter Farm located 615m northwest of the site.

3.4.3 Potable Water Abstractions

There are no records within 2km of site.

3.4.4 Source Protection Zones

The site is not situated within an Environment Agency Source Protection Zone with regards to potable water abstraction.

3.4.5 Groundwater Vulnerability and Soil Leaching Potential

The Secondary A Aquifer, the Raised Beach Deposits (Superficial Deposit) which covers the whole site has a high groundwater vulnerability. The site is classified as having a high leaching potential.

3.5 Geological Hazards

3.5.1 Natural Hazards

The Natural Hazards Findings has identified a number of potential hazards which are summarised in Table 1 below.

Table 1 - Natural Hazard Findings

Natural Hazard	Risk Rating
<i>Shrink Swell</i>	<i>Low</i>
<i>Landslides</i>	<i>Very Low</i>
<i>Soluble Rocks</i>	<i>Negligible</i>
<i>Compressible Ground</i>	<i>Negligible</i>
<i>Collapsible Rocks</i>	<i>Very Low</i>
<i>Running Sand</i>	<i>Low</i>

3.5.2 Natural Cavities

There are no records of Natural Cavities within 500m of site.

3.5.3 Radon

The site is in a lower probability radon area, as between 1% and 3% of homes are at or above the action level. As a result, no radon protective measures are likely to be necessary in the construction of new dwellings or extensions.

3.6 BGS Estimated Soil Chemistry

A summary of expected onsite soil chemistry concentration values is presented in Table 2.

Table 2 - BGS Soil Chemistry Average Concentration Values (mg/kg)

Contaminant	Concentration
<i>Arsenic</i>	15
<i>Cadmium</i>	1.8
<i>Chromium</i>	60 - 90
<i>Lead</i>	100
<i>Nickel</i>	15 - 30

3.7 Sensitive Land Use

The site lies within the Pagham Rife nitrate vulnerable zone, however, there are no sensitive land uses recorded within 250m of the site.

4.0 Desk Study

4.1 Information Sources

Information used to compile this desk study includes;

- Site walkover – site walkover plan presented in **Figure 3** and photographs presented in **Appendix A**
- Environmental Database Information – presented in **Appendix B**

4.2 Programme of Works

The programme of works that was undertaken is presented in Table 3.

Table 3 - Programme of works

Item	Description	Start Date	Completion Date
1	Site Walkover	10/03/2022	10/03/2022
2	Environmental Risk Assessment Report	09/03/2022	16/03/2022

4.3 Historical Land Uses

The following assessment of the historical land uses adjacent to site summarises land uses and features land uses up to 250m from the site boundary, unless stated otherwise.

4.3.1 Historical Potentially Contaminative Industrial Sites

- Brick field (1938) – 328m SE

4.3.2 Historical Energy Features

- Electricity substation (1992-1994) – 368m SE

4.3.3 Historical Tank Database

- Unspecified Tank (1898) – 430m NW

4.3.4 Historical Garage and Motor Vehicle Repair Sites

There are no historical garage and motor vehicle repair sites recorded within 500m of the site.

4.3.5 Historical Petrol and Fuel Sites

There are no historical garages recorded within 500m of the site.

4.3.6 Historical Railway and Tunnel Features

There are no historical railway and tunnel features within 250m of the site.

4.3.7 Historical/Current Landfill/Waste Site

The nearest historic landfill is at Sefter Lodge, located 38m west of the site. The site operated between 1950-1960 dealing with waste types including inert, commercial and household waste.

The nearest licensed waste site is at Sefter Farm, located 373m northwest. The license issue date was 2010 for the anaerobic digestion facility.

4.4 Contemporary Land Uses Adjacent to Site

There are no potentially contaminative activities recorded within 500m of the site.

4.4.1 Part A(2) and Part B Activities and Enforcements

There are no Part A(2) and Part B Activities and Enforcements within 500m of the site.

4.4.2 Petrol and Fuel Sites

There are no recorded petrol or fuel sites within 500m of the site.

4.4.3 Potentially Infilled Land

- Made Ground (artificial deposit, shown on maps along the river channel, linked to the drainage channel bordering the site) – from 67m SW

4.4.4 Pollution Incidents

There are four pollution incidents recorded on/within 500m of the site. The one on site, dated 2001 was for construction and demolition materials and wastes causing either no impact or minor impact to water, land and air. The nearest off-site located 12m west (at the old school) also dated 2001 was for specific metal waste, causing no impact to water, land and air.

4.4.5 Licensed Discharge Consents

There are no licensed discharge consents recorded within 500m of the site.

4.4.6 Waste Exemptions

There are four records within 500m of the site. The nearest is Sefter Farm for the use of non-agricultural waste in construction.

4.5 Site History

The following observations have been formed based on the available historical map extracts of the site and are summarised in Table 4.

Table 4 - Summary of Historical Maps

Date	Map Scale	On Site	Off Site
1875	1:10,560	<i>The site appears as open land.</i>	<i>The site is within Pagham district. Three roads meet approximately at the site. Sefter Farm and Rookery Farm are both ~400m NW and SW respectively. Covets Farm >500m SE. General area is rural/agricultural with field dividers. Pagham Rife meanders ~N-W >500m W.</i>
1878-77	1:2,500	<i>The site appears as a section of a larger piece of land/field.</i>	<i>The area is shown as Sefter Bottom. Adjacent NW is a school with a well. A track borders to N. Open land to SE and SW. 2no. dwellings with a well S. Road trending NW-S ~25m W.</i>
1909-10	1:10,560	<i>No significant change.</i>	<i>Pagham Rife shown flowing S.</i>
1933-34	1:10,560	<i>No significant change.</i>	<i>Residential development >500m E adjacent to road. Brick Field shown ~400m SE.</i>
1938-40	1:10,560	<i>No significant change.</i>	<i>Further residential development SE.</i>
1957-61	1:10,560	<i>No significant change.</i>	<i>Further residential development SE.</i>
1965 & 1968	1:2,500	<i>No significant change.</i>	<i>The track bordering to N is shown as Sefter Road. A river cutting with track is shown >100m SW. The school is shown as Sefter School House. Pond >250m NW. Residential dwellings >300m SE.</i>
1977 & 1973-76	1:2,500 1:10,000	<i>No significant change.</i>	<i>Residential development >300m SE. Part of school shown as Works. Power lines shown trending ~NW-SE ~50m N. Drainage channels shown >250m SW and >250m E/NE.</i>
1992	1:2,500	<i>No significant change.</i>	<i>Channel shown on SE border flowing SW.</i>
2003	1:1,250	<i>No significant change.</i>	<i>Water channel shown flowing SW along SE border then diverting to SE and SW.</i>
2010	1:10,000	<i>No significant change.</i>	<i>Sefter Farm development with building structures and 2no. reservoirs >250m W/NW.</i>
2022	1:10,000	<i>No significant change.</i>	<i>A 3rd reservoir at Sefter Farm >250m W.</i>

4.6 Aerial Photography

Aerial photography images suggest that the site may have been active since 1999 with potential evidence of construction material or fly-tipping noted across the site. Between 2005 and 2012 this becomes more apparent with a site entrance and building and something of a builder's yard is shown, until 2012 when potential site clearance has occurred.

4.7 Bomb Damage Maps

As part of the Desk Study enquiries were made to SafeLane Global Ltd to obtain a Stage1: Preliminary Unexploded Ordnance Risk Assessment of the site. This report concludes that there is an overall **Medium** risk from UXO. This report is provided in **Appendix B**. Subsequently, SafeLane Global recommend that a Stage 2: Detailed Unexploded Ordnance Desktop Threat Assessment is completed for the site to clarify the UXO risk to future ground works.

4.8 Potential Areas of Concern

One potential area of concern has been identified within the site boundaries from the historic maps and aerial photographs. This includes the potential for imported made ground from historic land use between 2005-2015.

All potential areas of concern including those detailed in Section 2.4 are summarised in Table 5 and shown on **Figure 4**.

Table 5 - Summary of Potential Areas of Concern

Ref	On Site
A	<i>Potential ACM associated with fragments of corrugated roofing identified on ground surface.</i>
B	<i>Fire pits identified on ground surface.</i>
C	<i>Imported Made Ground (surface debris and stockpiles)</i>

5.0 Preliminary Risk Assessment

To assess the potential for risk, the Source-Pathway-Receptor relationships have been evaluated to determine whether there are potentially active pollutant linkages between sources and receptors. It is only when there is an active pollutant linkage, can there be a potential risk to a receptor from a source via a particular pathway. Each active pathway has been assigned a qualitative assessment as to the level of risk explained in Table 6 as per R&D 66⁵.

Table 6 - Qualitative Risk Classification Scheme

		Consequence			
		Severe	Medium	Mild	Minor
Probability (Likelihood)	High	Very High risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Moderate/Low risk	Low risk
	Low	Moderate risk	Moderate/Low risk	Low risk	Very low risk
	Unlikely	Moderate/Low risk	Low risk	Very low risk	Very low risk

5.1 Identification of Contaminant Sources

The potential sources of contamination on site and in the surrounding areas are summarised in Table 7.

Table 7 - Identification of Potential Sources of Contamination

	Potential Source	Potential Contaminants
On-site sources	Potential imported made ground at ground surface including ACM and fire pits	Hydrocarbons (TPH, BTEX, PAH), Heavy Metals, Phenols, Inorganics, Asbestos
Off-site sources	Current and historical industrial land uses, and potentially infilled land	Hydrocarbons (TPH, BTEX, PAH), Heavy Metals, Phenols and Inorganics

5.2 Pathways

5.2.1 Human Health Pathways

The potential human health exposure pathways, based on the relevant guidance³, for a residential receptor are indicated in Table 8.

Table 8- Potentially Active Human Health Exposure Pathways

Potential Pathway	Active/ Inactive	Comments
<i>Ingestion of home grown produce</i>	Active	Qualitative Risk Assessment required
<i>Ingestion of soil and dusts</i>	Active	Qualitative Risk Assessment required
<i>Dermal contact with soils and dusts</i>	Active	Qualitative Risk Assessment required
<i>Inhalation of dusts</i>	Active	Qualitative Risk Assessment required
<i>Inhalation of organic vapours (generated by shallow soils) in external areas or inside buildings</i>	Active	Qualitative Risk Assessment required
<i>Inhalation of organic vapours generated by dissolved phase groundwater migrating onto site to neighbouring residential properties</i>	Active	Qualitative Risk Assessment required
<i>Inhalation of organic vapours generated by dissolved phase groundwater migrating onto site from off-site sources</i>	Active	Qualitative Risk Assessment required
<i>Contaminants from site entering groundwater and migrating into public water abstraction borehole for human consumption</i>	Inactive	No water abstractions within 250m. No further action required

5.2.2 Controlled Water Pathways

The potentially active controlled waters migration pathways are indicated in Table 9.

Table 9 - Potentially Active Controlled Water Pathways

Potential Pathway	Active/ Inactive	Comments
<i>Impacted soils leaching to groundwater</i>	Active	Qualitative Risk Assessment required
<i>Impacted soils leaching to groundwater and migration to adjacent surface water</i>	Active	Qualitative Risk Assessment required

5.2.3 Ground Gas Pathways

The potentially active migration pathways for ground gas are indicated in Table 10.

³ Environment Agency. August 2008. Updated technical background to the CLEA model. Science Report – SC050021/SR3.

Table 10 - Potentially Active Ground Gas Pathways

Potential Pathway	Active/Inactive	Comments
Ground gas generated from current/historic landfills within 250m radius	Inactive	Landfill >50 years old ^(A) . No further action required
Ground gas generated from historic infilled land within 250m radius	Inactive	Artificial ground associated with river channel ^(B) . No further action required

^A After 50 years it is considered that the landfill would have reached its peak gassing potential and therefore no longer a potential concern.

^B It is considered that superficial deposits were excavated as part of the river channel cutting, with very limited ground gas potential.

5.3 Receptors

Based on future residential land use, the potentially sensitive receptors are considered as the following:

- Residential Human Health: Future occupants on site
- Residential Human Health: Current occupants off-site
- Surface Water: Unnamed drainage channel bordering site to southeast
- Groundwater: Secondary A Aquifer of superficial deposits
- On site workers*

*The risks to on site workers (during development) can be minimised by following appropriate health and safety guidance on site (i.e. wearing protective clothing and washing).

5.4 Qualitative Risk Assessment

A summary of the relevant pollutant linkages based on a Source-Pathway-Receptor analysis is provided in Table 11.

Table 11 - Summary of Potentially Active Source-Pathway-Receptor Assessment

Source	Potential Pathway	Potential Receptor	Risk Classification
On-site Sources	Ingestion of dust and soils	Human Health (On-site Residential)	High
On-site Sources	Outdoor inhalation and indoor inhalation	Human Health (On-site Residential)	Moderate
On-site Sources	Inhalation of organic vapours generated by dissolved phase groundwater migrating from site to neighbouring properties	Human Health (Off-site Residential)	Low/Moderate
On-site Sources	Impacted soils leaching to groundwater and migrating towards surface water	Controlled Waters (Surface Water)	Low/Moderate
Off-site Sources	Vapour inhalation from dissolved phase migration from off-site sources	Human Health (On-site Residential)	Low

<i>Off-site Sources</i>	<i>Migration via groundwater from off-site source onto site</i>	<i>Human Health (On-site Residential)</i>	<i>Low</i>
<i>Off-site infilled Land/Landfills</i>	<i>Inhalation of organic vapours and ground gas</i>	<i>Human Health (On-site Residential)</i>	<i>Low</i>

The high risk is based on the potential ingestion of the heavy metal lead and PAHs, both of which have recorded GAC exceedances in laboratory testing results from the intrusive site works.

The moderate risk for inhalation is due to the ACM identified at site both visually and through laboratory testing.

The low risk for inhalation of organic vapours and ground gas from infilled land and landfills is detailed below Table 10.

6.0 Ground Engineering Assessment

The Raised Beach Deposits (superficial deposits) are classed as a Secondary A Aquifer. They generally provide good foundation conditions, however the frost-susceptibility of near-surface silt and fine sand lithologies should be considered in the design of shallow foundations.

It is important to determine lithological variation and deposit geometry, particularly the presence and dimensions of buried channels and infilling deposits. Immediate support is required upon excavation and groundwater control measures will be necessary where deposits are below the water table.

The London Clay Formation are considered to be unproductive with low permeability, which will have an effect on the drainage strategy which is adopted for this site. There are also known mature trees on site, which will have a high water demand, that will be affected by high volume change potential clays of the London Clay Formation.

An assessment of the ground engineering parameters is provided in Table 12.

Table 12 - Qualitative Ground Engineering Assessment

Category	Parameter	Potential Issue	Likelihood/Consequence
Foundations	<i>Shrinkable clay in close vicinity of mature, high water demand trees</i>	<i>Shallow foundations may need to be extended in line with NHBC guidance or piling required</i>	<i>Likely</i>
Drainage	<i>Poorly permeable clays in shallow soils</i>	<i>Soakages to ground unlikely to be feasible</i>	<i>Unlikely</i>

7.0 Conclusions and Recommendations

Based on the information provided within this Phase 1 Environmental Risk Assessment Report and information from the previous surveys, the conceptual site model and qualitative risk assessment have identified the following risk shown in Table 13.

Table 13 - Summary of Qualitative Risk Assessment

Category	Risk Classification
<i>Human Health</i>	<i>High</i>
<i>Controlled Waters</i>	<i>Low/Moderate</i>
<i>Ground Gas</i>	<i>Low</i>
<i>Geological Hazard*</i>	<i>Low</i>
<i>UXO</i>	<i>Medium</i>

*Risk posed by Shrink/Swell of soils and Running Sand

To summarise, the remedial recommendations as specified in the previous contamination letter report should be followed for soft-standing areas including private gardens. Where natural ground is not proven during excavation geotextile membrane should be installed to prevent upward migration of Made Ground.

Therefore, any additional intrusive investigation work on site would be to;

- 1) Further refine the potential risks identified within the Conceptual Site Model.

It has been noted that as the contamination survey was non-targeted only one position has been carried out in the area of proposed private gardens. The firepits observed during the site walkover should also be investigated to understand the ground conditions.

The preliminary UXO report suggested an overall **Medium** risk from UXO. Subsequently, a Stage 2: Detailed Unexploded Ordnance Desktop Threat Assessment is recommended for the site to clarify the UXO risk to future ground works. This could have an effect on intrusive works and project programme.

8.0 Statutory Consultees

We would recommend that this report be forwarded to the relevant Statutory Consultees including the Local Council's Environmental Health, Planning Department and potentially the Warranty Provider to seek their comments and subsequent approval prior to works commencing on site.

The Statutory Authorities may require a full Remediation Report and Validation and/or closure report providing documentation/audit trail for the importation/removal/reuse of material on site and any other remedial works completed on site.

9.0 Relevant Guidance

Constructive Evaluation has duly taken account of the recommendations contained within the following current and historical guidance documents during the preparation of this report.

1. Land Contamination Risk Management (LCRM) produced by DEFRA and the Environment Agency⁴
2. Environment Agency Soil Science Report SR3³.
3. Safe Development of Housing on Land Affected by Contamination⁵.
4. British Standards guidance for the Investigation of Potentially Contaminated Sites⁶ and for undertaking of Site Investigations⁷
5. Environment Agency Updated Technical Background to the CLEA Model⁸
6. Sampling Strategies for Contaminated Land⁹

The above documents produced by DEFRA, the Environment Agency, the National House-Building Council (NHBC) and the Chartered Institute of Environmental Health (CIEH) outline structured mechanisms to identify potential risk issues and, where necessary, provide a way forward to develop a robust risk management strategy to address potentially unacceptable risks in an appropriate manner.

The National Planning Policy Framework¹⁰ has also been considered. This document states that, prior to development, a site must meet the following criteria;

- The site is made suitable for its intended use, taking account of all ground conditions arising from natural and former activities, pollution arising from previous uses and proposals for mitigation including land remediation.
- After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990.
- Adequate site investigation information, prepared by a competent person, is presented.

⁴ Environment Agency. October 2020. Land Contamination Risk Management.

⁵ Environment Agency. 2008. Guidance for the Safe Development of Housing on Land Affected by Contamination. R&D 66.

⁶ British Standards. 2011. Investigation of Potentially Contaminated Sites – Code of Practice. BS10175: 2011.

⁷ British Standards. 2015. Code of Practice for Ground Investigations. BS5930: 2015.

⁸ Environment Agency. August 2008. Updated Technical Background to the CLEA Model. Science Report – SC050021/SR3.

⁹ DOE. 1994. Sampling Strategies for Contaminated Land. CLR Report No 4.

¹⁰ Department of Communities and Local Government. March 2012.