Southern Testing
Environmental & Geotechnical

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Desk Study & Risk Assessment Report

Project Name: Land at Brook Farm

Location: Daws Heath Road, Daws Heath, SS7 2UG

Client: Countryside Partnerships (Eastern Home Counties)

Project ID: J15100

Report Date: 1 June 2022

Report Issue: 2

SUMMARY

The site, which extends to 19Ha, comprises a series of open fields with a number of buildings situated within the south western quarter. The site is currently in use for the stabling and grazing of horses and for the storage of caravans/motorhomes.

It is proposed to redevelop the site with housing, with associated private garden areas, soft landscaping, access roads and car parking. The eastern half of the site is indicated on a proposed site layout plan provided to us by the client (Figure 2) to be landscaped as open grassland and heathland, whilst an orchard is proposed in part of the southern half of the site.

A Phase 1 Desk Study & Walkover Survey was carried out.

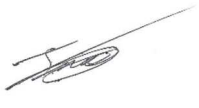
Geological records indicate the site to be underlain by the Claygate Member, whilst the overlying Bagshot Formation is mapped in part of the northern half of the site. The Claygate Member is mapped as overlain by superficial Head deposits, whilst superficial Glaciofluvial deposits are mapped as partially overlying the Bagshot Formation immediately off site to the north.

A historical Ordnance Survey map search and desk study carried out indicates that the site has a history of use as agricultural farmland. A number of potentially contaminative land uses have been identified both on and off-site, which are associated with historic land use.

There is the potential for soil contamination in the form of asbestos containing materials (ACM's), heavy metals, PAH's, organic and inorganic compounds and land gases.

It is advised that any intrusive investigation, in addition to providing general site coverage, should target soils around the existing buildings in the south western quarter of the site, including adjacent to an existing fuel tank.

Based on the available information, a potentially infilled pond situated off-site to the east is regarded as a potential source of land gas. Based on proposed site layout plans available to us at the time of this report, no structures are proposed in the area of the site closest to this source. If the proposed layout of the site is to change, with structures located in this area, and in the absence of further information on the infilling of the pond, the installation of monitoring wells and a programme of land gas monitoring may be necessary.

Author	J Whibberley **BSc MSc FGS**	
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For and on behalf of Southern Testing Laboratories Limited

DOCUMENT HISTORY AND STATUS

Issue No.	Date	Purpose or Status	Author	Check / Review
1	11/04/2022	Desk Study & Risk Assessment Report	JMW	CL
2	01/06/2022	Amendments to client name, site name & revised site layout (in Appendix A)	JMW	CL

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A INTRODUCTION

1 Authority

Our authority for carrying out this work is contained in a completed project order form signed by Mr A Harrison, representing Countryside Partnerships (Eastern Home Counties) and dated 22nd March 2022, in relation to our quote STL ref. Q211842, dated 19th November 2021.

2 Location

The site is located on the south eastern edge of the village of Daws Heath, which is itself situated approximately 1km north east of the town of Hadleigh, Essex, as is indicated on Figure 1 within Appendix A.

The approximate National Grid Reference of the site is TQ 81555 88355

3 Proposed Construction

It is proposed to develop the 19Ha site with housing, with associated private garden areas, soft landscaping, access roads and car parking. The eastern half of the site is indicated on a proposed site layout plan (provided by the client) to be landscaped as open grassland and heathland, whilst an orchard is proposed in part of the southern half of the site.

For the purposes of the contamination risk assessment, the proposed development land use in the western half of the site is classifiable as Residential with consumption of Homegrown Produce.

The eastern half of the site, where open grassland/heathland is proposed, is classifiable as Public Open Space (park) (Ref [1] / C4SL Report Ref [2]**)**.

The gas sensitivity of the proposed residential part of the development (in the west) is rated as High (CIRIA C665 Ref [3]).

4 Object

This is a Phase 1 Desk Study (risk estimation and evaluation) investigation (Tier 1) including a walkover survey.

The object of the desk study was to assess the likely nature and extent of soil, groundwater and soil gas contamination on the site.

5 Scope

This report presents our desk study findings our interpretation of these data.

A UXO risk assessment was not requested within our brief for the investigation.

This report is not an engineering design and the figures and calculations contained in the report should be used by the Engineer, taking note that variations will apply, according to variations in design loading, in techniques used, and in site conditions. Our figures therefore should not supersede the Engineer's design.

The report has been completed with reference to BS 5930 Ref [4] and BS 10175 Ref [5].

The findings and opinions conveyed via this report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

The investigation was conducted and this report has been prepared for the sole internal use and reliance of Countryside Partnerships (Eastern Home Counties) and their appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The recommendations contained in this report may not be appropriate to alternative development schemes.

Detailed information on the proposed development, such as detailed final layout, loadings and serviceability limits was not provided. Accordingly, where geotechnical design advice is provided it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules.

B DESK STUDY AND WALKOVER SURVEY

6 Desk Study

A desk study has been carried out. Reference has been made to the following information sources.

- Online Geological Maps Ref [6] & Ref [7]
- Online Hydrogeological Maps Ref [8]
- Aerial Photographs
- Historical Ordnance Survey Maps
- Environmental Databases
- BGS Online Historical Borehole Records Ref [9]
- Discussions with Site Owner
- Search on Local Authority Planning Portal for planning history
- Environment Agency / Gov.UK Website Flood Risk Ref [10]
- UK Radon Ref [11] and BRE Radon Ref [12]
- Google Earth (for old aerial photographs)

The environmental databases search report compiled for this desk study contains site-specific environmental data drawn from data sets that comprise publicly available information together with data from third parties, some of which is under review. Accordingly, Southern Testing Laboratories Limited does not warrant its accuracy, reliability or completeness.

The full report is included in Appendix C and D, a summary of the salient features is included in the following sections of this report.

6.1 Geology

The British Geological Survey 1:50,000 Map No. 258/259 ‘Southend & Foulness’ indicates that the sites bedrock geology primarily comprises the Claygate Member, whilst the overlying Bagshot Formation is mapped in part of the northern half of the site. The Claygate Member is mapped as overlain by superficial Head deposits, whilst superficial Glaciofluvial deposits are mapped as partially overlying the Bagshot Formation immediately off site to the north.

6.1.1 Head

Head is a superficial deposit comprising a poorly sorted and poorly stratified material formed mostly by solifluction and/or hillwash and soil creep. This is a polymict deposit of gravel, sand and clay depending on the local upslope geology, from which it is derived.

6.1.2 Glaciofluvial Deposits

The deposits comprise sediments transported and deposited by glacial meltwater, either sub-glacially, en-glacially, supra-glacially or downstream of glaciers via meltwater channels and/or glacial outwash events. Deposits are formed via number of processes and therefore vary greatly in depth. Sediments commonly comprise of sand and gravel, with moderate sorting and bedding. Fines including clay have generally been washed out leaving the sand and gravel which is commonly non-cohesive and highly permeable, a good bearing capacity and low settlement is common. However, lenses of silt, clay or organic material can be locally present.

6.1.3 Bagshot Formation

The Bagshot Formation typically comprises fine to coarse buff to pale grey or white, locally orange or crimson sand. The sands are frequently micaceous and locally clayey, with occasional gravel. The sands are commonly cross-bedded but some are laminated. Thin beds and lenses of laminated pale grey to white sandy or silty clay or pipe-clay occur sporadically, becoming thicker towards the top of the formation. In places, there is a basal bed of gravelly coarse-grained sand.

6.1.4 Claygate Member

The Claygate Member forms the upper part of the London Clay Formation and comprises dark grey clays with sand laminae, passing up into interbedded clays, silts and fine-grained sand, with beds of bioturbated silt. Ferruginous concretions and septarian nodules occur in places.

This member is known to contain pyrite.

6.2 Historical Borehole Records

A search of previous exploratory hole records both from the online British Geological Survey database [9] and Southern Testing in-house records revealed three records within the near vicinity of this site, all from the BGS source, which are summarised in the table below.

BH Reference	Final Depth (mbgl)	Distance from site (m) & Direction	Remarks
TQ88NW/F	11.0	250 / E	GL – 0.3m; Clayey sandy silt (Topsoil) 0.3 – 2.2m; 'Clayey' 'pebbly' SAND. 'Pebbles' comprises flints and reworked tertiaries (Possible Glaciofluvial deposit) 2.2 – 9.4m; Silty fine sand, silt and CLAY (Claygate Beds) 9.4 – 10.5m+; Stiff fissured silty CLAY (London Clay) *(A groundwater strike was recorded at 9.0m bgl)*
TQ88NW59	32.0	280 / N	GL – 0.2m; Silty gravelly sand (Topsoil) 0.2 – 0.9m; 'Clayey' gravelly SAND. Gravels comprise flints and tertiaries (Possible Glaciofluvial deposit) 0.9 – 1.4m; Clayey silty fine SAND (Bagshot Beds) 1.4 – 11.7m; Interbedded silty clayey and clayey SAND (Bagshot Beds) 11.7 – 29.0m; Very silty CLAY with rare fine sand (Claygate Beds) 29.0 - 32.0m+; Stiff olive grey CLAY (London Clay) *(A groundwater strike was recorded at around 8.0m bgl)*
TQ88NW84	5.25	350 / SW	GL – 0.3m; Topsoil 0.3 – 1.05m; Clayey SAND/SILT (Head) 1.05 – 5.25m+; Firm silty CLAY, with lenses of fine sand and crystallisation (described as London Clay, possibly Claygate Beds) *(No groundwater strike was recorded)*

No long-term groundwater monitoring is recorded as having been undertaken in any of the above BGS records.

6.3 Geological Hazards and Mining Activities

Data from various sources relating to potential geological hazards at the site are summarized below. The Hazard Potentials listed for the BGS data are as presented in the Envirocheck report, derived from various generic BGS sources, **which are not considered as site-specific**. It is important that this information is considered in context of the actual site topography, ground conditions encountered during future investigation, and development proposals.

Data Source	Hazard	Hazard Potential to Site	Remarks
BGS	Potential for Collapsible Ground Stability Hazard	Very Low	
	Potential for Compressible Ground Stability Hazard	Negligible	
	Potential for Ground Dissolution Stability Hazard	Negligible	
	Potential for Landslide Ground Stability Hazard	Very Low	
	Potential for Running Sand Ground Stability Hazard	Low	Given the mapped presence of Glaciofluvial deposits, which possibly include granular materials, and the Bagshot Formation (predominantly sands) a Moderate potential hazard is considered more appropriate.
	Potential for Swelling or Shrinkage Clay Ground Stability Hazard	Moderate	
	Shallow Mining Hazard	Negligible	
	BGS recorded mineral site	Low	45m E - Bramble Hall Gravel Pit – Opencast (Ceased) (Actually indicated 3m east of the site)
ARUP [Ref [13]]	Mining Instability	Negligible	
CCS [Ref [14]] KURG [Ref [15]]	Underground Openings	Negligible	
PBA	Natural & Mining Cavities	Negligible	

6.4 Radon Risk

With reference to the Envirocheck report and UK Radon Ref [11] and BRE Radon Ref [12] guidance, no radon protection is required on this site.

6.5 Hydrology and Hydrogeology

Data from the Environment Agency and other information relating to controlled waters is summarised below.

Data		Remarks	Possible Hazard to/from Site (Y/ N)
Aquifer Designation	Superficial Deposits	Head – Secondary (Undifferentiated) Aquifer Glaciofluvial Deposits (In N spur of site) – Secondary A Aquifer	Y
	Bedrock	Claygate Member – Secondary A Aquifer Bagshot Formation – Secondary A Aquifer	Y
Groundwater Vulnerability		High Vulnerability	Y
Abstractions	Surface Water	160m S – Prittle Brook at Hadleigh. Amenity: make-up or top-up water	N

Data		Remarks	Possible Hazard to/from Site (Y/ N)
	Groundwater	None listed within 1000m of the site	N
Source Protection Zones		None listed within 1000m of the site	N
Surface Watercourses		1m S – Unnamed stream	Y
Groundwater Flood Risk*		There is the potential for groundwater flooding to occur at the surface in the southern half of the site. There is the potential for groundwater flooding to occur in properties situated below ground level in the centre of the site. In the remainder of the site there is limited potential for groundwater flooding to occur.	Y
Surface Water Flood Risk*		Multiple isolated areas of the site are classified as at Low to High risk of surface water flooding. Land adjacent to Prittle Brook forming part of the south eastern site boundary is also shown to be at Low to High risk.	Y
Marine / Fluvial Flood Risk*		An area of the site adjacent to the southern site boundary is classified as at Medium risk of flooding from rivers or the sea.	Y
Reservoir Flood Risk*		The site is not shown within an area mapped as being at risk from flooding from reservoirs.	N
Discharge Consents (Within 250m of the site)		177m South – Discharge of surface water into freshwater stream. 183m North – Final/treated sewage effluent discharge into land/soakaway 205m North West - Discharge of surface water into freshwater stream.	N

** These sections are provided for information only, this report does not constitute a formal flood risk assessment and specialist advice should be sought in relation to potential flooding issues.*

An easterly/north easterly direction of surface water flow within streams adjacent to the southern boundary of the site and in the surrounding area, as indicated by the database information, suggests that groundwater flow may be in a similar direction. Any sources of potential contamination located to the south and west of the site may be transported towards the site within groundwater.

6.6 Historical Ordnance Survey Maps

Copy extracts of historical Ordnance Survey plans dating from 1885 to 2021 were obtained and are presented in Appendix C. A summary of the salient features is presented below.

In brief, the site is shown from the earliest available maps to comprise a series of open agricultural fields divided by fencelines and possibly hedgerow boundaries, with scattered trees. Shown from a map dated **1896** are detached buildings in the western corner of the site, with further buildings including a pond shown on later map editions which are collectively labelled as 'Brook Farm' on a map dated **1955**. By a map dated **1993**, some of the buildings, with the exception of the main farmhouse, appear to have been replaced by multiple buildings sited to the east of the original locations and labelled as 'Brook Farm Stables'.

Off-site, the surrounding area is rural on the earliest map editions, with the gradual development of housing shown on later editions, primarily to the north west and south west. Adjacent to the north western corner of the site on the earliest maps are greenhouse buildings and a well, which are no longer shown by the early twentieth century. A moderately sized gravel pit is shown adjacent to part of the eastern site boundary on the **1923** and **1938** maps, after which it is no longer shown, suggesting possible infilling. Between maps dated **1938** and **1971**, a large pond is shown on land 50m to the east of the site before its possible infilling. Later available map editions show gradual housing development in the surrounding area.

6.7 Environmental Databases

Data Source	Distance (m)	Direction	Details	Possible Hazard to Site (Y/N)
Historical Industrial Land Use (Within 250m of the site)	3	E	Former Quarry (Gravel Pit -1923-1947)	Y
	38	NE	Electrical Substation	N
	98	SE	Road Haulage (1989)	N
	201	E	Former Quarry (1923-1947)	N
Current Industrial Land Use (Within 250m of the site)	There are 5 No. *Contemporary Trade Directory Entries* listed within 250m.			
	148	NE	Car dealers – used (inactive)	N
	162	N	Ironing & Home Laundry Services (inactive)	N
	179	E	Garage services (active)	N
	206	E	Furniture - Repairing & Restoring (inactive)	N
	247	N	Lawnmowers & Garden Machinery - Sales & Service (inactive)	N
Current and Historical Landfills (Within 500m of the site)	/	/	No past or present landfills listed within the database	N
Fuel Sites (Within 500m of the site)	./	/	No *Fuel Station Entries* listed within the database	N
Pollution Incidents (Within 500m of the site)	29	SE	1997 - Crude sewage release into Prittle Brook (Cat 3 – Minor Incident)	N
IPPC/LAPPC Authorisations (Within 500m of the site)	/	/	None listed within the database	N

Data Source	Distance (m)	Direction	Details	Possible Hazard to Site (Y/N)
Hazardous Substances Consents (Within 500m of the site)	/	/	None listed within the database	N
Sensitive Land Uses	0	/	Area of Adopted Greenbelt	N
	1	S	Ancient Woodland/ Sites of Special Scientific Interest – Great Wood & Dodd's Grove	N
	1	SW	Local Nature Reserve - Belfairs	N
	15	NW	Ancient Woodland – Pound Wood	N

The subject site appears, on the available historical mapping, as open land, presumably agricultural land, from the earliest available map (1885) until the present day. Use as agricultural land implies that chemicals may have been applied to the site to promote plant growth and/or discourage insects. Whilst the volume of chemicals applied is anticipated to be relatively low, there is the possibility that residual chemicals may still be present within the shallow soils on the site, and/or potentially as isolated hotspots.

Buildings are shown in the western corner of the site from the earliest maps which are later labelled as 'Brook Farm' and then 'Brook Farm Stables' during the final quarter of the twentieth century. The available historical mapping indicates that multiple buildings were present in this area which have since been demolished, with the existing buildings generally sited to the east of where these former buildings were located. Therefore, there is a possibility that Made Ground soils associated with these buildings may be present within this area of the site.

A gravel pit is shown on historical mapping and recorded within the database (Bramble Hall Gravel Pit) off-site but adjacent to part of the eastern site boundary during the first half of the twentieth century, where after it is no longer shown, suggesting it may have been infilled. Similarly, a large pond is shown on mapping 50m to the east of the site around the middle of the twentieth century, where after it is also no longer shown, also suggesting infilling. Any materials used to infill the pit and/or pond may constitute a source of land gas. As mapped superficial soils are likely to act as a pathway for the migration of any land gases, these potentially infilled areas of land are considered as possible contaminant sources that may impact the proposed development.

6.8 Planning Application History

Planning records for the site were viewed on the Castle Point Borough Council's planning database, available online, on the 28th March 2022. Records pertinent to the development were viewed and are summarised below.

Application Number	Application Date	Proposal Details / Comments	Decision
CPT/888/86	06/1986	Hay Barn (No further information listed)	Unknown
CPT/983/87	08/1986	Conversion of integral garage to 'granny annexe'	Unknown
CPT/383/08/HED	06/2008	Hedgerow removal to facilitate sewer construction as part of a food alleviation scheme	Unknown
CPT/260/05/CLE	05/2015	Certificate of lawfulness of existing horse livery. Storage on plant, horse transport and caravans.	Granted
CPT/568/06/FUL	08/2016	Retrospective application for change of use from storage to parking of caravans, campers, small trailers and boats	Refused

The available planning records predominately concern the development of buildings associated with Brook Farm in the western quarter of the site. A record is also held for the removal of hedgerows adjacent to the southern site boundary to facilitate the construction of flood prevention drainage.

6.9 Ground Gas Risk

A gravel pit and pond are mapped adjacent and close to the eastern site boundary during the middle portion of the twentieth century. These features do not appear on later mapping (after approximately WWII). From the information available it remains unclear whether these features have been intentionally infilled or in the case of the pond has naturally silted up over time, or a combination of the two.

Any made ground soils used as infilling material that were organic in nature may constitute a potential source of land gas. Similarly, the possible siltation of the pond over time may have predominately comprised, or have confined lenses of, organic materials (rotting vegetation etc) which may also constitute a source of land gas. However, given that apparent age of infilling (ie. 60-70+ years) these off-site potential sources are considered a Low risk.

A plausible contaminant pathway from these sources to the wider site exists in the form of the superficial and bedrock deposits, classified as Secondary A Aquifers with High leachability, and which overly the Unproductive London Clay. Consequently, based on the information available, it is possible that any land gas producing materials within the infilled pond may impact the development.

6.10 UXO Risk Management

The agreed scope of work did not allow for either a preliminary or detailed UXO risk assessment.

However, by way of comment the possibility of unexploded ordnance (UXO) being encountered on a site falls within the category of a potentially significant risk and should be addressed as a legal duty under the Construction (Design and Management) Regulations by the Client as early as possible in a project.

The CIRIA publication C681 Ref [16] has been developed to provide a consistent framework for the management of potential risks posed by UXO during site investigation and groundwork phases of construction. The process adopts a tiered approach, divided into four distinct stages; Preliminary risk assessment, Detailed risk assessment, Risk mitigation and Implementation.

7 Site Walkover Survey

A site walkover survey was conducted on Wednesday 30th March 2022, at which time the weather was mild, with sunny intervals.

7.1 General Site Description and Boundaries

The site comprises a series of open fields which are primarily used for the grazing of horses and are subdivided by fence-lines and tree-lined hedgerow boundaries. A detached house, stable blocks and metal framed barn/shed structures are present in the south western quarter of the site. The sites perimeter boundary is also composed of a mixture of wooden and wire fences, hedgerows and trees. In the south eastern corner of the site the boundary is defined by a shallow stream (Prittle Brook).

Access to the site is via a gravel trackway leading from the western site boundary to the buildings located in this area. This trackway continues eastwards to longitudinally bisect the centre of the site.

7.2 Topography and Drainage

The highest elevations are located adjacent to the sites northern boundary within its western and eastern quarters. These areas are separated by a central portion which is set at a slightly lower elevation adjacent to the northern boundary. Correspondingly, site levels have a general rise to the north of between 4 and 6 degrees in the western and eastern quarters, whilst a rise within the central portion is shallower, between 2 to 3 degrees to the north. Off-site, the southerly fall in elevation steepens up to 8 degrees.

The site appeared generally well drained, with no notable areas of saturated ground or pooled water at the time of our walkover survey.

7.3 Vegetation

The open fields are set to grass, whilst field boundaries partly comprise hedgerows which are generally formed of Hawthorn. Trees on site are located on the field boundaries and around the site perimeter and comprise common tree species such as Oak, Beech and Ash amongst others. Dense woodland is present adjacent to the eastern and south eastern site boundaries.

7.4 Buildings and Land Use on Site and Nearby

The site is currently primarily in use for the stabling and grazing of horses, which at the time of the walkover survey were present within fields in the western half of the site.

The buildings in the south western quarter of the site comprise a mixture of horse stabling and agricultural barns, as well as a detached house. The barns were observed to be in use for stabling, the storage of hay and also farm equipment including some light machinery. These buildings were noted to have corrugated asbestos cement roofs. Externally, adjacent to these buildings a large metal fuel tank was observed. To the north of the buildings is an area partially set with gravel surfacing that was occupied by multiple stored caravans and motorhomes.

Within a field in the north eastern quarter of the site was observed a metal framed barn that was also used for the storage of farm equipment and machinery.

Off-site, land to the north west, north and north east comprises housing, with gardens adjoining the site boundary. Beyond the eastern site boundary are the gardens of adjacent houses and also an area of woodland within which former shallow excavations/ earthworks, some with pooled water, which is likely to be the former gravel pit indicated on historic mapping.

Immediately to the south east of the site is a small stream (Prittle Brook), beyond which is a wooded nature reserve, whilst to the south west are open fields. Bounding the west of the site is Daws Heath Road.

7.5 Inaccessible Site Areas

No access was available to the detached house or the stable buildings in the sites south western quarter during the walkover survey.

7.6 Other Information

From conversation with the landowner during the walkover survey it is understood that waste material associated with farm activities may have been buried on site. Whilst the exact locations of any buried material is unknown, it is likely to be present as isolated pockets

7.7 Site Photographs

A series of photographs showing the site and immediate surrounding area is included in Appendix B.

C PRELIMINARY SITE MODELS

8 Conceptual Engineering Geological Ground Model

From the desk study information and walkover undertaken at this site the following geotechnical conceptual ground model has been formulated.

Data Source	Comments
Geology	The recorded bedrock soils beneath the site primarily comprise the Claygate Member, whilst the overlying Bagshot Formation is also mapped on-site adjacent to the northern site boundary. These deposits are shown to be partially overlain by superficial Head soils, whilst Glaciofluvial deposits are mapped in the north eastern corner of the site. Records for historic boreholes located nearby indicate a variable coverage of Glaciofluvial and Head deposits overlying the Bagshot Formation and the Claygate Member, which in turn overly the London Clay Formation. A variable lateral distribution and depth of superficial deposits is anticipated on this site. Shallow foundations may be suitable on this site above the groundwater table. Excavations made within granular superficial soils are likely to be unstable, particularly beneath the water table (if present at the time of excavation etc).
Groundwater	Groundwater is anticipated to be encountered at shallow depths, particularly during periods of wet/winter weather. Any excavations made below the groundwater table are likely to be unstable and would require suitable de-watering measures.
Former Site Use	The site has a history of use as agricultural farmland before use for the stabling and grazing of horses and the storage of caravans/motorhomes. Given the previous and current land uses identified, there is thought to be a low risk of encountering contamination on the site within shallow soils.
Surface Water	The nearest surface water feature is a shallow stream (Prittle Brook) situated adjacent to the south eastern site boundary and which originates to the west and flows eastwards away from the site. A small man-made pond is also present adjacent to the western site boundary. Groundwater flow is anticipated to in a similar easterly direction. The site is partially mapped as at Low to High risk of surface water flooding. We would recommend that an allowance be made for a detailed flood risk assessment.
Potential Geo-hazards	The depth and lateral coverage of superficial soils across the site is likely to be variable. Granular superficial soils are likely to be water bearing. Significant instability is anticipated for excavations made in granular soils. Any clay soils may be susceptible to shrink/ swell behaviour. Foundation deepening may be required close to existing or proposed trees.

On the basis of the available information the geotechnical categorisation for the proposed structure(s) is considered to fall within Geotechnical Category 2 – Conventional structures with no exceptional risk or difficult ground or loading conditions Eurocode 7 Ref [17].

9 Conceptual Site Model

In the context of this report, the conceptual model summarises the potential pollutant linkages identified for the site and forms the basis of the risk assessment for the site. The preliminary model comprises the potential sources of contamination, receptors that could be harmed and exposure pathways identified from the desk study and walkover survey. These potential linkages form the basis upon which the investigation is designed and reported.

9.1 Potential Sources of Contamination

The site has a history of agricultural use and is located within a semi residential/ rural area.

Limited potentially contaminative uses have been identified, both on site and in the locality.

Potential contaminants associated with these uses have been compiled from our experience of such sites.

9.1.1 On-Site Sources

Potential Source	Potential Contaminants
Agricultural Land	Pesticides & Herbicides (Application of chemicals to promote crop growth) Asbestos Containing Materials (ACM's), Heavy Metals, PAH's, Petroleum Hydrocarbons (including potential isolated pockets of buried farm waste)
Made Ground associated with historic/existing buildings, redevelopment etc	Unknown composition, but can typically include Asbestos Containing Materials (ACM's) and elevated concentrations of Heavy Metals, PAH's, Petroleum Hydrocarbons
Existing stable/farmyard buildings	Asbestos Containing Materials (ACM's), Heavy Metals, PAH's, Petroleum Hydrocarbons

From the findings of our desk study and walkover survey, limited potential sources of contamination have been identified associated with historic and present day land use on the site. Historical use as an agricultural farmyard/ farmland may have resulted in the general spread of contaminants from farming activities and from the application of pesticides/ fertilisers on fields to aid plant growth. There is a risk, therefore, that residue from these chemicals may remain within the upper soil profile across the site. However, it is understood that the site has been used for the grazing of horses for some years, suggesting that the risk from organic compounds remaining in these soils, if they were applied at all, is low.

Any made ground soils associated with former and current farm/stable buildings located in the west of the site may also represent a potential contaminant source. From conversations with the existing landowner during the walkover survey, there is a risk of isolated buried pockets of farm waste material being present across the wider site, although any such pockets are likely to be relatively isolated.

Current land usage in the south western quarter of the site for the stabling of horses and the storage of caravans/motorhomes may also present a potential contaminant source. During the walkover survey a single external metal fuel tank was observed in this area, with some farm machinery housed within the barn structures which were noted to be roofed with possible corrugated asbestos cement.

On the basis of the above, the principal source of potential contamination on the site are made ground soils associated with historic and existing structures. Any contamination within underlying soils is likely to be localised within soils in the area of these structures. Any made ground may also be a potential source of land gas, although given the anticipated thickness of these soils the risk is considered to be very low. Potential contaminants associated with current site usage (i.e. metal fuel tank/ machinery) in the south western quarter are likely to be present only as hotspots in close proximity to their respective sources. Any uncontrolled disturbance of the suspected asbestos barn roofing material may cause contamination of soils in the vicinity.

9.1.2 Off-Site Sources

The site may be impacted by contamination migrating from beyond the site boundary. The following potential off-site sources have been identified.

Potential Source	Distance from Site Boundary	Direction	Potential Contaminants	Likely hazard to Site
Possibly infilled gravel pit	3	E	Land Gas	Low
Possibly infilled pond	50	E	Land Gas	Low

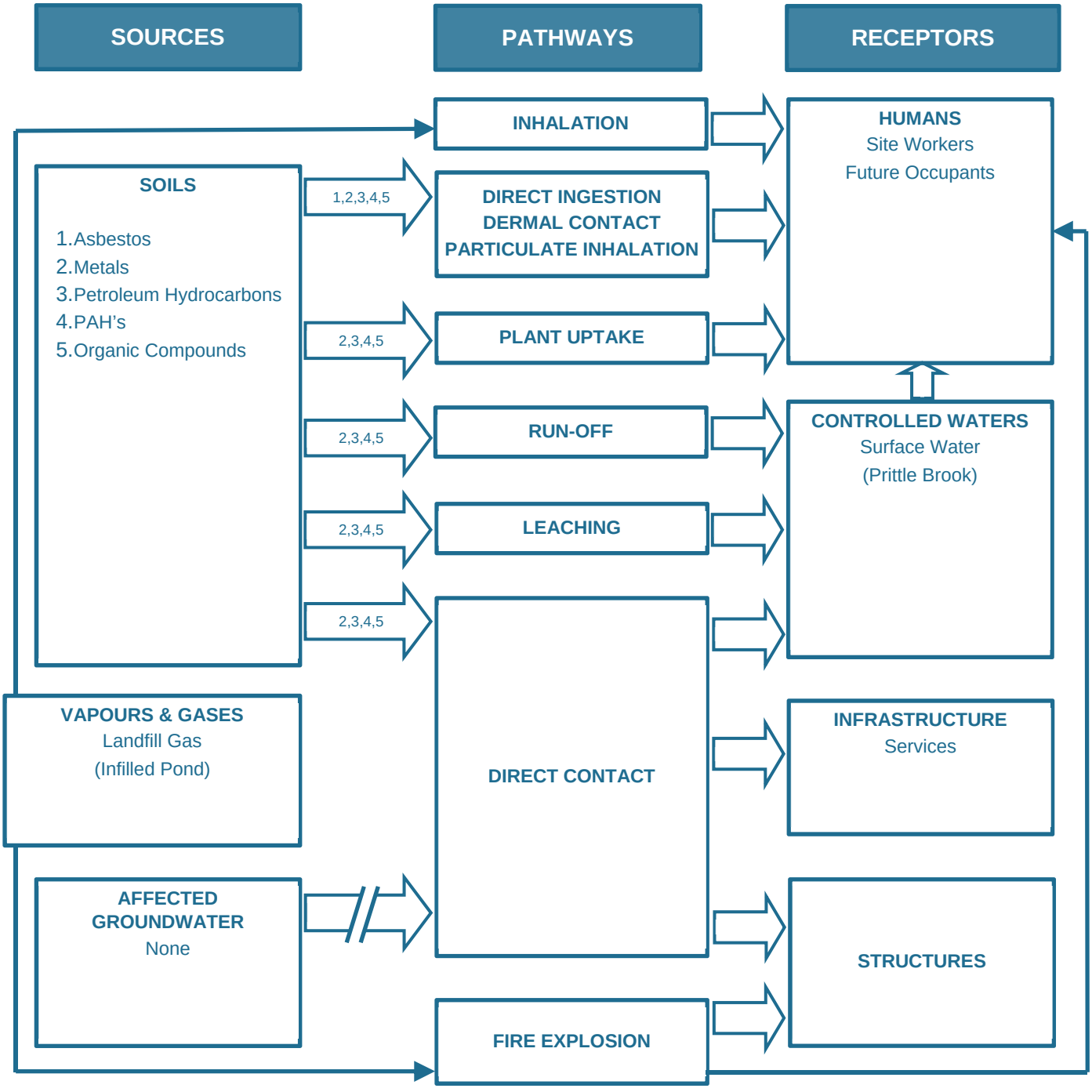
A potentially infilled gravel pit and pond were identified off-site adjacent and close to the eastern site boundary. Depending on the nature of any infilling material, these features are considered a potential source of land gas that could impact the development, subject to the final development layout proposals (ie. the proximity of buildings to these off-site potential sources of land gas).

During the walkover survey, ground workings and shallow excavations (est. 1-2m deep) were observed in the location of the former gravel pit as indicated on historical mapping and within the environmental database. Published geology for this area indicates a superficial covering of glaciofluvial deposits, which nearby borehole records (Section 6.2) indicate to comprise 'flints and reworked tertiary gravels' and to have a thickness of around 1-2m. These observed excavations may therefore still represent the total extent and depth of these workings. It is therefore considered unlikely that the gravel pit was even partially infilled and subsequently can be dismissed as a potential contaminant source.

The potentially infilled pond could not be observed during the walkover survey given its distance from the site and location on private land. Whether the pond has been infilled or not could not be verified, but it's infilling is suggested by the available historical mapping. Subsequently, in the absence of any further information this feature is considered to be a potential source of land gas given a plausible contaminant pathway from the source to the site exists within the superficial and bedrock deposits. However, the risk to the site is considered low given the distance from the site and the relatively small size of the pond.

9.2 Pollutant Linkages and Conceptual Site Model Summary

The following diagram shows the potential pollutant linkages identified for the site and summarises the preliminary conceptual model:



// Denotes potential pollutant linkage not complete.

10 Conclusions and Recommendations

Based on the findings of this desk based study, potential sources of contamination have been identified both on and off-site.

It is concluded that there is a potential risk of contamination from historic and current site uses. It is advised that an intrusive investigation, in addition to providing general site coverage, targets soils around the existing buildings in the south western quarter of the site, including adjacent to the existing fuel tank.

Based on the available information, a potentially infilled pond situated off-site to the east is regarded as a potential source of land gas. Based on proposed site layout plans available to us at the time of this report, no structures are proposed in the area of the site closest to this source and hence a Low hazard risk is considered appropriate at this stage. If the proposed layout of the site is to change, with structures located in this area, and in the absence of further information on the infilling of the pond, the installation of monitoring wells and a programme of land gas monitoring may be necessary.

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APPENDIX A

Site Plans

A

Site:	Land at Brook Farm, Daws Heath Road, Daws Heath, SS7 2UG	Project ID	J15100
Figure 1	Site Location Plan	Date:	11/04/2022

Site:	Land at Brook Farm, Daws Heath Road, Daws Heath, SS7 2UG	Project ID	J15100
Figure 2	Proposed Scheme Layout Plan	Date:	01/06/2022

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APPENDIX B

Photographs

B

View E of site entrance from Daws Heath Road

Detached house within site's SW quarter

Farmyard buildings within site's SW quarter

Stabling within site's SW quarter

Fuel tank within site's SW quarter

Caravan storage within site's SW quarter

Store of caravans and machinery in site's SW quarter

View NW of site's NW quarter, with housing beyond site boundary

View SE of fields within central portion of the site

View W of trackway bisecting the site

View SE of fields within the site's SE quarter

View of Prittle Brook adj to site's SE boundary

View NE of excavations within area of former gravel pit

View N of open fields in NE quarter of the site

View NE of barn within NE quarter of the site

View SE of land to the south of the site