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GROUNDWATER FLOOD RISK ASSESSMENT REPORT

67C CAMLET WAY,
HADLEY WOOD
EN4 0NL



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EXECUTIVE SUMMARY

Nicky & Fran Sallas (“The Client”) has commissioned Jomas Associates Ltd (‘Jomas’), to prepare a Groundwater Flood Risk Assessment for a site referred to as 67C Camlet Way, Hadley Wood, EN4 0NL. The aim of this report is to assess whether the ground conditions within the local area represent an impediment to the proposed development.

It should be noted that the table below is an executive summary of the findings of this report and is for briefing purposes only. Reference should be made to the main report for detailed information and analysis.

Desk Study	
Current Site Use	The site currently comprises an occupied residential building fronting directly onto Camlet Way, with an associated front driveway and rear garden.
Proposed Site Use	The proposed development is to comprise the construction of a partially subterranean outhouse building.
Site History	<p>On the earliest available map (1865), the site is shown as undeveloped land devoid of any features. By the map dated 1935, a detached residential house has been constructed in the south of the site with a private garden encompassing the north of the site. A small glasshouse has been constructed in the north of the site by 1959. No observational changes then occur to the site until the most recent map dated 2023.</p> <p>Historically, the surrounding area has comprised mainly agricultural land, with residential developments occurring to the south and east of the site throughout the 20th century. A waterway labelled as ‘Monkey Mead’ is present roughly 350m north, flowing west to east. The feature is culverted in the vicinity of a railway line 400m to the northeast. A waterway labelled as ‘Green Brook’ is located approximately 550m southeast of the site, flowing west to east. The feature is culverted in the vicinity of a railway line 550m to the southeast.</p>
Site Setting	<p>The British Geological Survey indicates that the site is directly underlain by solid deposits of the London Clay Formation.</p> <p>The underlying London Clay Formation is identified as Unproductive.</p> <p>A review of the EnviroInsight Report indicates that there are no Environment Agency Zone 2 or Zone 3 flood zones within 250m of the site.</p> <p>There are no detailed river entries or surface water features reported within 250m of the site.</p>
Potential Geological Hazards	<p>The Groundsure data identifies a moderate risk for shrink swell clays.</p> <p>Foundations should not be formed within Made Ground or organic rich materials (i.e. Topsoil) due to the unacceptable risk of total and differential settlement.</p> <p>The BGS notes disseminated pyrite within the London Clay Formation and as such may be a source of elevated sulphate. If such levels are noted then sulphate resistant concrete may be required.</p> <p>Given the identified geology, a shallow groundwater table is not anticipated.</p>

Groundwater Flood Risk Assessment

Groundwater Flood Risk Assessment	Based on the available data, the site is at low risk from identified potential sources of flooding. The development can be constructed and operated safely in flood risk terms without being at significant risk or increasing flood risk elsewhere and is therefore considered NPPF compliant.
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1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Nicky & Fran Sallas (“The Client”) has commissioned Jomas Associates Ltd (‘Jomas’), to prepare a Desk Study and Groundwater Flood Risk Assessment at a site referred to as 67C Camlet Way, Hadley Wood, EN4 0NL.

1.1.2 Jomas' work has been undertaken in accordance with the email proposal dated 26 September 2023.

1.2 Proposed Development

1.2.1 The proposed development for this site is understood to comprise the construction of a partially subterranean one-storey outbuilding located at the rear of a private garden.

1.2.2 A plan of the proposed development is included in Appendix 1.

1.2.3 For the purpose of geotechnical assessment, it is considered that the project could be classified as a Geotechnical Category (GC) 2 site in accordance with BS EN 1997 Part 1.

1.2.4 This will be reviewed at each stage of the project.

1.3 Objectives

1.3.1 The objectives of Jomas' investigation was as follows:

- To present a description of the present site status, based upon the published geology, hydrogeology and hydrology of the site and surrounding area;
- To review readily available historical information (i.e., Ordnance Survey maps and database search information) for the site and surrounding areas;
- To assess the potential impacts that the proposal may have on ground stability, the hydrogeology and hydrology on the site and its environs.

1.4 Scope of Works

1.4.1 The following tasks were undertaken to achieve the objectives listed above:

- A walkover survey of the site;
- A desk study, which included the review of a database search report (GeoInsight Report, attached in Appendix 2) and historical Ordnance Survey maps (attached in Appendix 3);
- A groundwater flood risk assessment;

- The compilation of this report, which collects and discusses the above data, and presents an assessment of the site conditions, conclusions and recommendations.

1.5 Scope of Flood Risk Assessment

- 1.5.1 The site lies within the remit of the London Borough of Enfield. Given that the proposed outbuilding structure is partially subterranean, the council have requested a groundwater flood risk assessment as a planning condition for the development.

1.6 Supplied Documentation

- 1.6.1 Jomas Associates have not been supplied with any previously produced reports at the time of writing this report.

1.7 Limitations

- 1.7.1 Jomas Associates Ltd has prepared this report for the sole use of Nicky & Fran Sallas in accordance with the generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon by any other party without the explicit written agreement of Jomas. No other third party warranty, expressed or implied, is made as to the professional advice included in this report. This report must be used in its entirety.
- 1.7.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless Jomas has actual knowledge to the contrary, information obtained from public sources or provided to Jomas by site personnel and other information sources, have been assumed to be correct. Jomas does not assume any liability for the misinterpretation of information or for items not visible, accessible or present on the subject property at the time of this study.
- 1.7.3 Whilst every effort has been made to ensure the accuracy of the data supplied, and any analysis derived from it, there may be conditions at the site that have not been disclosed by the investigation, and could not therefore be taken into account. As with any site, there may be differences in soil conditions between exploratory hole positions. Furthermore, it should be noted that groundwater conditions may vary due to seasonal and other effects and may at times be significantly different from those measured by the investigation. No liability can be accepted for any such variations in these conditions.
- 1.7.4 ***This report is not an engineering design and the figures and calculations contained in the report should be used by the Structural Engineer, taking note that variations may apply, depending on variations in design loading, in techniques used, and in site conditions. Our recommendations should therefore not supersede the Engineer's design.***

2 SITE SETTING & HISTORICAL INFORMATION

2.1 Site Information

2.1.1 The site location plan is appended to this report in Appendix 1.

Table 2.1: Site Information

Name of Site	-
Address of Site	67C Camlet Way, Hadley Wood, EN4 0NL
Approx. National Grid Ref.	526004 197858
Site Area (Approx)	0.09 hectares
Site Occupation	Residential
Local Authority	London Borough of Enfield
Proposed Site Use	Residential with a partially subterranean outhouse located within the rear garden.

2.2 Walkover Survey

2.2.1 The site was visited by a Jomas Engineer on 19th October 2023. The following information was noted while on site.

Table 2.2: Site Description

Area	Item	Details
On-site:	Current Uses:	Site consists of a two-storey brick construction, currently used as residential, fronting directly onto Camlet Way. The building has an associated front driveway area and a private garden at the rear.
	Evidence of historic uses:	No evidence of historic uses observed on site.
	Surfaces:	Site is approximately 25% hardstanding underfoot made up of the footprint of the building and a rear paved patio area. The remainder of site is soft cover, comprising predominantly grass and a gravel front driveway.
	Vegetation:	Numerous hedges and trees up to 10m tall were observed within the site along the western and eastern boundaries, and in the north of the site.
	Topography / Slope Stability:	The site is observed to be sloping gradually down to the north. The building situated adjacent to the east of the site is formed on a lower level than the site itself.

Area	Item	Details
	Drainage:	Site appears to be connected to normal drainage facilities with no issues noted.
	Services:	Site appears to be connected to services which are in use.
	Controlled waters:	No controlled waters were observed on site.
	Tanks:	No tanks were observed on site.
Neighbouring land:	North:	Residential and agricultural.
	East:	Residential.
	South:	Residential.
	West:	Residential and agricultural.

2.2.2 Photos taken during the site walkover, along with photos provided to Jomas Associates by the client, are provided in Figure 3 of Appendix 1.

2.3 Historical Mapping Information

2.3.1 The historical development of the site and its surrounding areas was evaluated following the review of a number of Ordnance Survey historic maps, procured from Groundsure, and these are provided in Appendix 3 of this report.

2.3.2 A summary produced from the review of the historical map is given in Table 2.3 below. Distances are taken from the site boundary.

Table 2.3: Historical Development

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1865 – 1868 1:2,500 1:10,560	Site appears to be agricultural land and is devoid of any features.	<p>The surrounding area is predominantly agricultural land with some minor residential uses.</p> <p>Camlet Way is located immediately adjacent to the south of the site, oriented approximately southwest-northeast.</p> <p>A wooded area labelled as 'Green Wood' is present roughly 20m south of the site.</p> <p>Approximately 7 No ponds are located between 200m-250m east, associated with a residential development labelled as Greenwood.</p> <p>Approximately 8 No ponds associated with a brick field are located between 200m-400m to the southeast.</p> <p>Extensive groundworks and a tunnel are present 250m northeast and southeast from</p>

SECTION 2

SITE SETTING & HISTORICAL INFORMATION

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
		<p>the site, associated with a railway undercutting Camlet Way.</p> <p>Great Broadgate Hill is located approximately 250m east of the site.</p> <p>A waterway labelled as 'Monkey Mead' is present roughly 350m to the north, flowing west to east. The feature is culverted in the vicinity of the railway line 400m to the northeast.</p> <p>A waterway labelled as 'Green Brook' is located approximately 550m southeast of the site, flowing west to east. The feature is culverted in the vicinity of the railway line 550m southeast of the site.</p>
<p>1895 – 1898 1:2,500 1:10,560</p>	No significant changes.	<p>Small scale residential developments have taken place roughly 50m east of the site.</p> <p>4No ponds are now located between 200m-250m to the east, indicating some have been infilled.</p> <p>There are now approximately 7No ponds located between 200m-400m southeast from the site, with different locations and dimensions to the ponds in the previous map entry.</p> <p>Various rises are located from 550m to the southwest of the site that converge into a larger waterway at the Hadley Common. This waterway is partially culverted and likely correlates with the Green Brook.</p> <p>2No ponds and a spring are located between 600m-750m to the southwest.</p>
<p>1912 – 1920 1:2,500 1:10,560</p>	No significant changes.	<p>A large residential building has been constructed adjacent to the east of the site.</p> <p>Small scale residential developments have also taken place from 125m southwest of the site.</p> <p>2No ponds and a small area of marshland are present in the vicinity of Great Broadgate Hill from 200m to the east.</p>
<p>1935 – 1938 1:2,500 1:10,560</p>	The site is located within a residential plot. A small building is present in the southern half of the site.	Detached residential developments have been constructed adjacent to the west and south of the site.
<p>1959 – 1971 1:1,250 1:2,500 1:10,560</p>	A glasshouse structure is present in the far north of the site.	Extensive residential developments have occurred to the south of the site.

SECTION 2
SITE SETTING & HISTORICAL
INFORMATION

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1974 1:10,000	No significant changes.	A drain is present 500m west of the site.
1983 – 1994 1:1,250 1:10,000	No significant changes.	No significant changes.
2001 – 2010 1:1,250 1:10,000	No significant changes.	No significant changes.
2023 1:10,000	No significant changes.	No significant changes.

2.3.4 Aerial photographs supplied as part of the Groundsure Enviro+GeoInsight report range from 1999 to 2021. These show a hardstanding driveway at the south of the site, and a rear private garden comprising soft cover. Vegetation within the rear garden and along site boundaries obscures any potential features in the northern half of site.

2.4 Previous Site Investigations

2.4.1 No previous site investigation reports were provided at the time of writing.

2.5 Planning Information

2.5.1 A review of the local authority’s planning portal was undertaken on 20 October 2023 at <https://planningandbuildingcontrol.enfield.gov.uk/online-applications/>.

2.5.2 However, no information was found pertaining to ground conditions.

3 GEOLOGICAL & ENVIRONMENTAL SETTING

3.1.1 The following section summarises the principal geological resources of the site and its surroundings. The data discussed herein is generally based on the information given within the Groundsure Report (in Appendix 2).

3.2 Solid and Drift Geology

3.2.1 Information provided by the British Geological Survey (BGS) indicates that the site is directly underlain by solid deposits of the London Clay Formation. An extract of the BGS description is provided below:

“...bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions (‘cementstone nodules’) and disseminated pyrite.”

3.2.2 No Made Ground is reported on site but given the sites identified history, a depth of Made Ground should be expected.

3.3 British Geological Survey (BGS) Borehole Data

3.3.1 As part of the assessment, publicly available BGS borehole records were obtained and reviewed from the surrounding area. The local records obtained are presented in Appendix 4.

3.3.2 The nearest such record was located approximately 213m southeast of the site, from November 1986.

3.3.3 This showed the underlying ground conditions to comprise Made Ground to a depth of around 0.9m bgl, overlying stiff brown clay (London Clay) to the base of the borehole, at approximately 5.0m bgl.

3.3.4 During the drilling of the borehole groundwater was not encountered.

3.3.5 All depths and measurements should be viewed as approximate, due to the age of the borehole.

3.4 Geological Hazards

3.4.1 The following are brief findings extracted from the Groundsure Enviro+GeoInsight Report, that relate to factors that may have a potential impact upon the engineering of the proposed development.

Table 3.1: Geological Hazards

Potential Hazard	Site check Hazard Rating	Details	Further Action Required?
Shrink swell clays	Moderate	Ground conditions predominantly high plasticity.	GI
Running sands	Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	No
Compressible deposits	Negligible	Compressible strata are not thought to occur.	No
Collapsible Deposits	Very low	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	No
Landslides	Very low	Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.	No
Ground dissolution soluble rocks	Negligible	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present	No
Coal mining	None	The study site is not located within the specified search distance of an identified coal mining area.	No
Non-coal mining	None	The study site is not located within the specified search distance of an identified non-coal mining area.	No

- 3.4.2 In addition, the Enviro+Geolinsight report notes the following:
- 48No historical surface ground working features are reported within 250m of the site. Nearest reported 128m southeast as a brick field. Other records of note include an unspecified heap 186m east and a pond 193m to the southeast.
 - 19No. historical underground working features are reported within 1km of the site. Nearest reported 220m to the east as a tunnel. All features reported are tunnels.
 - 1No BGS Current Ground Working Feature is reported within 1km of the site. The feature is reported 357m to the southeast as ‘Green Wood Brick Field’. The commodity is recorded as clay and shale, and the status is given as ceased.
- 3.4.3 Foundations should not be formed within Made Ground or organic rich materials (i.e. Topsoil) due to the unacceptable risk of total and differential settlement.
- 3.4.4 The BGS notes disseminated pyrite within the London Clay Formation and as such may be a source of elevated sulphate. If such levels are noted then sulphate resistant concrete may be required.
- 3.4.5 Given the identified geology, a shallow groundwater table is not anticipated.
- 3.4.6 The underlying London Clay Formation is likely to be affected by shrinking and swelling as a result of water uptake of nearby trees.

SECTION 3
GEOLOGICAL & ENVIRONMENTAL
SETTING

- 3.4.7 It is recommended that a geotechnical ground investigation is undertaken to inform foundation design.

4 HYDROGEOLOGY, HYDROLOGY AND FLOOD RISK REVIEW

4.1 Hydrogeology & Hydrology

4.1.1 General information about the hydrogeology of the site was obtained from the MAGIC website and the EnviroInsight Report.

Groundwater Vulnerability

4.1.2 Since 1 April 2010, the EA's Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. This comprises;

- **Secondary A** - 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;
- **Secondary 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.
- **Secondary Undifferentiated** - 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.
- **Principal Aquifer** – this is a formation with a high primary permeability, supplying large quantities of water for public supply abstraction.
- **Unproductive Strata** - These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Source Protection Zones (SPZ)

4.1.3 In terms of aquifer protection, the EA generally adopts a three-fold classification of SPZs for public water supply abstraction wells.

- Zone I - or 'Inner Protection Zone' is located immediately adjacent to the groundwater source and is based on a 50-day travel time. It is designed to protect against the effects of human activity and biological/chemical contaminants that may have an immediate effect on the source.
- Zone II - or 'Outer Protection Zone' is defined by a 400-day travel time to the source. The travel time is designed to provide delay and attenuation of slowly degrading pollutants.
- Zone III - or 'Total Catchment' is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.

Hydrogeology

- 4.1.4 The baseline hydrogeology of the site is based on available hydrogeological mapping, including the BGS online mapping, and generic information obtained from the Groundsure report.
- 4.1.5 The available data indicates that the geology of the area consists of the London Clay Formation. It would be expected that a groundwater table would not be encountered within this stratum due to its impermeable nature.

Hydrology

- 4.1.6 The hydrology of the site and the area covers water abstractions, rivers, streams, other water bodies and flooding.
- 4.1.7 The Environment Agency defines a floodplain as the area that would naturally be affected by flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas.
- 4.1.8 There are two different kinds of area shown on the Flood Map for Planning. They can be described as follows:

Areas that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5 per cent (1 in 200) or greater chance of happening each year;
- or from a river by a flood that has a 1 per cent (1 in 100) or greater chance of happening each year.

(For planning and development purposes, this is the same as Flood Zone 3, in England only.)

- The additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000) chance of occurring each year.

(For planning and development purposes, this is the same as Flood Zone 2, in England only.)

- 4.1.9 These two areas show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.
- 4.1.10 Outside of these areas flooding from rivers and the sea is very unlikely. There is less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year. The majority of England and Wales falls within this area. (For planning and development purposes, this is the same as Flood Zone 1, in England only.)
- 4.1.11 Some areas benefit from flood defences and these are detailed on Environment

Agency mapping.

- 4.1.12 Flood defences do not completely remove the chance of flooding, however, and can be overtopped or fail in extreme weather conditions.

Table 4.1: Summary of Hydrogeological & Hydrology

Feature	On Site	Off Site	
Aquifer	Superficial:	-	
	Solid:	Unproductive	
		Secondary A aquifer 296m southwest	
Surface Water Features	None	No surface water features within 250m of site. No detailed river networks within 250m of site.	
Discharge Consents	None	2No reported within 500m of site; nearest recorded 438m northeast for 'miscellaneous discharges – surface water'.	
Flood Risk	EA Flood Zone 2	No	
	EA Flood Zone 3	No	
	RoFRaS	None	
	Historical Flood Events	None reported within 250m of site.	
	Flood Defences	There are no areas benefiting from Flood Defences within 250m of the study site	
	Surface Water Flooding	Highest risk on site and within 50m is 'Negligible'.	
	Groundwater Flooding	High risk on site and within 50m is 'Negligible'.	

4.2 Radon

- 4.2.1 As reported, the site is not within a radon affected area, as less than 1% of properties are above the action level.
- 4.2.2 Consequently, no radon protective measures are necessary in the construction of new dwellings or extensions as described in publication BR211 (BRE, 2023).
- 4.2.3 However, a growing number of London Boroughs are adopting Public Health England guidance as outline in their 'UK National Radon Action Plan' (PHE, 2018), which states that Radon measurements should be made in regularly occupied basements of properties irrespective of their geographical location. Therefore, such an assessment, or precautionary radon protection measures may be required by the London Borough of Enfield, based on their consideration of the development as a basement.

5 FLOOD RISK REVIEW

5.1.1 In accordance with the NPPF Guidance, below is a review of flood risks posed to and from the development and recommendations for appropriate design mitigation where necessary. Specific areas considered are based on the requirements laid out in the “Camden Guidance for Subterranean Development” as this document is generally considered to be the most comprehensive Local Authority Guidance in the London area.

Table 4.2: Flood Risk Review

Flood Sources	Site Status	Comment on flood risk posed to / from the development
Fluvial / Tidal	Site is not within 250m of an Environment Agency Zone 2 or zone 3 floodplain. Risk of flooding from rivers and the sea (RoFRaS) rating negligible.	Very low risk of flooding from fluvial and tidal sources.
Groundwater	Groundsure reports a “negligible” risk of groundwater flooding on, and within 50m of site.	As SUDS will be required by NPPF, PPG and LLFA policy requirements, this is likely to be provided by surface and above ground attenuation before releasing to the existing sewer network. This will ensure that the proposed development will not increase the potential risk of groundwater flooding. Sub-surface structure will be fully waterproofed as appropriate to industry standard. Low Risk.
Artificial Sources	No surface water features within 250m of site.	Low Risk.
Surface Water / Sewer Flooding	No surface water features within 250m of site. Condition, depth and location of surrounding infrastructure uncertain.	The proposed development will be formed on an area of existing soft cover and will increase the proportion of hardstanding on site as a result. As SUDS will be required by NPPF, PPG and LLFA policy requirements, these are likely to include attenuation before releasing to the existing sewer network. If permeable paving is used this would likely reduce the risk of surface water flooding. Combined, these are likely to reduce the risk of both surface and sewer flooding to both the site and surrounding properties. Sub-surface structure will be fully waterproofed as appropriate to industry standard. Low Risk.
Climate Change	Included in the flood modelling extents. Site not within climate change flood extent area	Development will not significantly increase the peak flow and volume of discharge from the site. Low risk posed to and from the development.

5.1.2 Information about the risk to the study site from flooding has been obtained from the following documents produced for London Borough of Enfield: Strategic Flood Risk Assessment (London Borough of Enfield, 2008); Level 2 Strategic Flood Risk Assessment (London Borough of Enfield, 2013); Preliminary Flood Risk Assessment

(London Borough of Enfield, 2011); and Surface Water Management Plan (London Borough of Enfield, 2012).

- 5.1.3 Potential impacts to the site are discussed below.

Flooding from Fluvial/Tidal Sources

- 5.1.4 No surface water features are reported within 250m of the site.

- 5.1.5 Figure 3.1 within the SFRA and Figure 7 of the SWMP shows that the site is approximately 310m south from the largest modelled flood extent of the nearest river (Monken Mead Brook), with a 1 in 100 or greater annual probability of river flooding in any year. In addition, no EA recorded flood outlines or EA historic flooding events are shown within 500m of site.

- 5.1.6 No EA recorded flood outlines or EA historic flooding events are shown within 250m of site. Given this information, and the fact that the site does not lie within an EA Flood Zone, it is considered there is a very low risk from fluvial flooding to occur at the subject site.

Groundwater Flooding

- 5.1.7 Groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather.

- 5.1.8 The Groundsure report and Figure 3.3 from the SFRA shows the site within an area of negligible risk of groundwater flooding, with no recorded groundwater flooding incidents. Figure 10 of the SWMP indicates the area does not lie within any permeable superficial deposits or consolidated aquifers. The same Figure reports the nearest groundwater flood incident approximately 150m southwest of the site. 2No additional groundwater flood incidents are reported within 500m of site, both located approximately 400m south.

- 5.1.9 The site is underlain by unproductive strata of London Clay Formation, and as such the risk of groundwater flooding is considered to be negligible.

Surface Water Flooding

- 5.1.10 Surface water flooding is the term used to describe flooding which occurs when intense, often short duration rainfall is unable to soak into the ground or to enter drainage systems and therefore runs over the land surface causing flooding. It is most likely to occur when soils are saturated so that they cannot infiltrate any additional water or in urban areas where buildings tarmac and concrete prevent water soaking into the ground. The excess water can pond (collect) in low points and result in the development of flow pathways often along roads but also through built up areas and open spaces.

- 5.1.11 According to Figure 3.4 of the SFRA, the closest area known to be prone to surface water flooding is located approximately 360m north-east of site on Crescent East, 1No surface water flooding event at this location was reported as 'highway floods under heavy rainfall following seasonal leaf fall'.
- 5.1.12 Figure 4 of the SWMP shows that the site is approximately 200m south from the largest modelled flood extent for surface water (200-year surface water event (deep). In addition, Figure 5 of the SWMP reports the nearest surface water flood outlines approximately 360m from the site and the nearest surface water flood incident approximately 330m northeast of the site.
- 5.1.13 The site does not lie within an EA Flood Zone and the Groundsure report indicates the highest risk for surface water flooding within 50m of site as 'negligible'.

Sewer/Artificial Flooding

- 5.1.14 No other artificial water sources were identified within 100m of site and the site is not indicated to be within the maximum extent of flooding of reservoirs.
- 5.1.15 Figure 3.5 of the SFRA indicates that the site does not lie within an area where sewer flooding has affected properties within the last 10 years of the report date.
- 5.1.16 Figure 9 of the SWMP shows the number of sewer flooding events for the postcode "EN4 0--". Between 6-10 properties are shown to have been impacted by flooding of sewers in the area up to the date of the report. The same figure reports the nearest sewer flooding incident approximately 380m southeast of the site.
- 5.1.17 Negligible risk.

Critical Drainage Areas (CDAs)

- 5.1.18 A Critical Drainage Area is defined in the Surface Water Management Plan as "A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure."
- 5.1.19 They are where manmade drainage infrastructure has been identified as at critical risk of failure, resulting in flooding. Such areas can be completely different or similar, to the areas identified by the Environment Agency as at risk of natural watercourse, river and sea flooding.
- 5.1.20 18No Critical Drainage Areas (CDA) are located within the Surface Water Management Plan (SWMP). This site is not located within a CDA, however, the Group4_006 CDA associated with the 'National Rail track around Hadley Wood Station' is reported approximately 80m north of the site. No other CDA's are reported within 1km of the site.

5.1.21 Negligible risk.

Sustainable Drainage Systems (SuDS)

5.1.22 The proposed development comprises the construction of a new structure at the rear of the garden; and is likely to increase the impermeable areas on site.

5.1.23 In accordance with the NPPF, PPG and LLFA policy requirements, sustainable drainage systems (SUDS) should be incorporated wherever possible to reduce positive surface water run-off and flood risk to other areas.

5.1.24 Given the expected underlying ground and hydrogeological conditions it is likely that infiltration drainage would be impracticable and an alternative, such as a combination of on-site attenuation and off-site discharge, could be considered.

Conclusion

5.1.25 Based on the available data, the site is considered to be at low risk from identified potential sources of flooding. The development can be constructed and operated safely in flood risk terms without being at significant risk or increasing flood risk elsewhere and is therefore considered NPPF compliant.

6 CONCLUSIONS

6.1 Proposed Changes to Areas of External Hardstanding

6.1.1 Existing areas of hardstanding include the existing building on site which covers approximately 25% of the site. The proposed development will comprise a partially subterranean outbuilding structure located in existing soft cover at the rear of the garden. As a result, there is likely to be an increase in hardstanding areas.

6.2 Past Flooding

6.2.1 The National Planning Policy Framework sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow.

6.2.2 When assessing the site-specific flood risk and the potential for historic flooding to reoccur the above guidance recommends that, historic flooding records and any other relevant and available information including flood datasets (e.g. flood levels, depths and/or velocities) and any other relevant data, which can be acquired are assessed.

6.2.3 The Groundsure report and Figure 3.3 from the London Borough of Enfield SFRA shows the site within an area of negligible risk of groundwater flooding, with no recorded groundwater flooding incidents. Figure 10 of the London Borough of Enfield SWMP reports the nearest groundwater flood incident approximately 150m southwest of the site. 2No additional groundwater flood incidents are reported within 500m of site, both located approximately 400m south.

6.2.4 The site is therefore considered to be at low risk of groundwater flooding based on historic flooding.

6.3 Geological Impact

6.3.1 The published geological maps indicate that the site is directly underlain by solid deposits of the London Clay Formation.

6.3.2 The groundwater table is not considered to be present at shallow depths as a result of the very low permeability London Clay Formation directly underlying the site.

6.4 Hydrology and Hydrogeology Impact

6.4.1 Based on the information available at the time of writing, the risk of flooding from groundwater is considered to be low. The proposed development is unlikely to have a detectable impact on the local groundwater regime.

6.4.2 Appropriate water proofing measures should be included within the whole of the proposed development wall/floor design as a precaution.

6.5 Cumulative Impacts

6.5.1 The above individual effects could theoretically interact to form a greater issue.

SECTION 5
CONCLUSIONS

- 6.5.2 However, the site has been identified as being directly underlain by very low permeability London Clay Formation.
- 6.5.3 Such materials would prevent the movement of groundwater and the ingress of surface water into the ground.
- 6.5.4 The development of the structure would not significantly affect the groundwater flow through the ground due to the very low permeability London Clay Formation.
- 6.5.5 The construction of the proposed development would not reduce the groundwater flow through the general area due to the impermeability of the natural materials.
- 6.5.6 Based on the available data, the site is considered to be at low risk from identified potential sources of flooding. The development can be constructed and operated safely in flood risk terms without being at significant risk or increasing flood risk elsewhere and is therefore considered NPPF compliant.

7 REFERENCES

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APPENDICES

APPENDIX 1 – FIGURES

APPENDIX 2 – GROUNDSURE REPORTS

APPENDIX 3 – OS HISTORICAL MAPS

APPENDIX 4 – BGS BOREHOLE RECORDS

APPENDIX 5 – LBE MAP EXCERPTS

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