GeoSmart Information

FloodSmart BIA

Basement Impact Assessment

Site Address

148 Pine Gardens
Ruislip
HA4 9TH

Grid Reference

511005, 186836

Report Prepared for

Veera Kulinits

Date

2023-10-30

Report Status

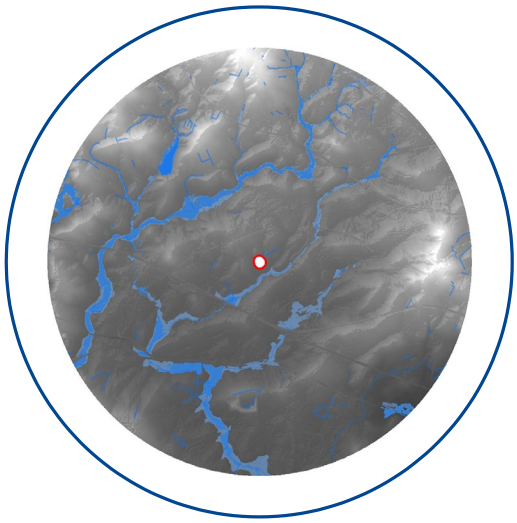
FINAL

Site Area

0.06 ha

Report Reference

80690R1



RISK – Very Low to Low

The proposed basement is located within the Lambeth Group formation considered unlikely to interact with a significant groundwater system. The risk of the proposed basement to impact on surface water or groundwater flows and any related flooding is considered to be Very Low to Low.

It is understood that flood resilient measures have been incorporated into the basement design including lining of the walls and floors, a drainage pump at the existing sump and drainage channels, to prevent water ingress and enable positive drainage of the feature.

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1. Executive summary

Site analysis

Flood risks and impacts	Baseline*	After Mitigation **
Groundwater flooding	Low	Low
Surface water flooding	Very Low	Very Low

*BASELINE risks have been calculated for the whole Site, using national risk maps, including the benefit of EA flood defences. Note that the risks presented in the baseline mapping are applicable to surface development only, whereas the risks presented on the table are applicable to the proposed subterranean development and therefore may be higher.

**FINAL RISK RATING Includes a detailed analyses of flooding risks over the lifetime of the proposed development, including allowances for climate change AND assumes recommended mitigation measures are implemented.

Summary of existing and proposed development

This report has been compiled to support the retrospective planning permission of the waterproof tanking of an existing level basement level beneath the garden room outbuilding at the southern boundary. The Site is currently used within a residential capacity comprising of a two-storey residential dwelling with associated landscaped areas there is no basement level of the main dwelling. Site plans are included within Appendix A.

The existing basement is set c. 2.40 m below ground level at the south of the Site with depth of foundations approximately 0.42 m. Access to the basement is via a set of external stairs. It is proposed that the basement will not be used for sleeping accommodation and is assumed to be used for storage. A drainage pump has been added to the existing sump draining to a soakaway.

Summary of groundwater flood risks

The Site setting is summarised as follows:

- No site investigation has been undertaken.
- A review of the BGS borehole database (BGS, 2023) indicates there are no relevant boreholes within the vicinity of the Site from which the mapped geology or likely depth to groundwater can be inferred. The closest borehole lies approximately 730 m to the north east of the Site.
- BGS 1:50,000 mapping indicates that there are no underlying superficial deposits. The bedrock geology comprises the Lambeth Group classified as a Secondary (A) Aquifer. The Lambeth Group comprises of mainly of clay with some silty, sandy and gravelly lenses with occasional sandstone and conglomerate.

- The London and Thames Valley Model indicates the geology underlying the Site comprises the Lambeth Group to a depth of 18 m below ground level (bgl) overlying the chalk group to a depth of 222 m bgl. The Chalk Group is a Principal Aquifer which is likely to contain significant groundwater however, this groundwater is at such a significant depth that the risk to the Site from the chalk aquifer is negligible..
- The Site is located within Flood Zone 1 and the Risk of Flooding from Rivers and Sea (RoFRS) mapping indicates a Very Low risk of fluvial or tidal flooding.
- A surface watercourse is noted c. 90 m south east and the Yeading Brook c. 330 m south from the Site providing an indication of the minimum groundwater levels at this point (c. 38.80 mAOD and 37.00 mAOD, respectively). Given the extent of the Lambeth Group there is the potential for continuity between the Site and these features however it should be noted that the lithology of this bedrock is typically, predominantly clay and therefore there is unlikely to support significant groundwater flow.
- The Risk of Flooding from Surface Water (RoFSW) mapping shows the Site to be at Very Low risk of pluvial flooding.

  It is noted that the surface water flood risk mapping indicates the risk to the development at the surface. The proposed basement reflects an excavation however, as no ingress points can be identified at ground floor level in areas deemed at risk, the risk of ponding/ collection of interflows can also be considered Very Low.
- Flooding of the existing basement has not been reported.

The sources reviewed, including BGS mapping and the London Thames Valley Model due to no BGS borehole data being available at the time of writing. This indicates that the Site is underlain by the Lambeth Group bedrock which is unlikely to contain significant groundwater. Groundwater seepage from isolated permeable horizons within the bedrock may be encountered and while this should be monitored it is unlikely to be a significant flow.

Based on this information the proposed basement is unlikely to interact with the groundwater system and is also unlikely to be affected by surface water flooding.

It is understood that as part of the existing basement a number of flood resilience measures have already been incorporated into the design these include:

- The wall floor junction is installed with a dry lining system with overlaps sealed used sealing rope.
- A damp proof membrane has been installed beneath the concrete slab.
- A drainage channel has been installed of assumed sufficient capacity and fall proposed to discharge to a soakaway. This includes an Aqua channel at the floor junctions at the base of the wall to further facilitate the positive drainage of the development./
- A drainage pump has been added to the existing sump at the entrance to the basement discharging via the aforementioned route.

Recommendations

Recommendations for mitigation are provided below, based upon the proposed basement and wider development design:

The aforementioned waterproofing features and drainage system should be maintained in perpetuity of the lifespan of the development.

2. Introduction

Background and purpose

GeoSmart Information Ltd was commissioned by Veera Kulinits in October 2023 to undertake the groundwater and surface water aspects of a Basement Impact Assessment (BIA) for the proposed development at 148 Pine Gardens, Ruislip, HA4 9TH (the Site). The Site is located at national grid reference TQ 11005 86836 within the London Borough of Hillingdon. Existing and proposed Site plans and drawings are provided in Appendix A.

Objective

This document comprises a desk-based assessment of the potential impact of the proposed basement development on surface water and groundwater flow and flooding and has been designed to support a planning submission for the proposed development.

Report scope

The scope of works undertaken includes:

- An outline of the hydrological and hydrogeological conditions with relevance to construction of the basement at the Site.
- An assessment of the impacts of the proposed development on surface water and groundwater flows and levels.
- Assessment will be presented using the clearly-defined reporting framework as outlined in the widely referenced Camden Planning Guidance for Basements. This report will consider the following sections:

    1) Screening – first stage in assessing the impact of a proposed basement development is to recognise what issues are relevant to the proposed site.
    2) Scoping – identify the potential impacts for each of the matters of concern identified in the screening stage.
    3) Recommendations – recommendations are made based on the outcome of the assessment.

Report limitations

It is noted that the findings presented in this report are based on a desk study of information supplied by third parties. Whilst we assume that all information is representative of past and present conditions, we can offer no guarantee as to its validity and a proportionate programme of site investigations would be required to fully verify these findings.

The basemap used is the OS Street View 1:10,000 scale, however the Site boundary has been drawn using BlueSky aerial imagery to ensure the correct extent and proportion of the Site is analysed.

This report excludes consideration of potential hazards arising from any activities at the Site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities.

Datasets

The following table shows the sources of information that have been consulted as part of this report:

Table 1. Datasets consulted to obtain confirmation of sources of flooding and risk

Source of flooding	Datasets consulted				
	Commercial Flood Maps	Local Policy & Guidance Documents*	Environment Agency	Thames Water (Appendix C)	OS Data
Historical	X	X	X		
River (fluvial) / Sea (tidal/coastal)	X	X	X		
Surface water (pluvial)	X	X	X		
Groundwater	X	X			
Sewer		X		X	
Culvert/bridges		X			X
Reservoir		X	X		

*Local guidance and policy, referenced below, has been consulted to determine local flood conditions and requirements for flood mitigation measures.

Relevant local guidance

For this report, several documents have been consulted for local policy and guidance and relevant information is outlined below:

Local Plan Part 2 – Development Management Policies (London Borough of Hillingdon, 2020):

Policy DMHD 3: Basement Development

- When determining proposals for basement and other underground development, the Council require an assessment of the scheme's impact on drainage, flooding, groundwater conditions and structural stability. The Council will only permit basement and other underground development that does not cause harm to the built and natural environment and local amenity and does not result in flooding or ground instability. Developers will be required to demonstrate by methodologies appropriate to the site that their proposals:
    - avoid adversely affecting drainage and run-off or causing other damage to the water environment;
    - avoid cumulative impacts upon structural stability or the water environment in the local area;
- Schemes should ensure that they:
    - do not harm the amenity of neighbours;
    - do not lead to the loss of trees of townscape or amenity value;
    - do provide satisfactory landscaping, including adequate soil depth;
    - do not harm the appearance or setting of the property or the established character of the surrounding area, for example through the introduction of front lightwells; and
    - do protect important archaeological remains.
- The Council will not permit basement schemes which include habitable rooms and other sensitive uses in areas prone to flooding.
- The Council will not permit basement schemes in Listed Buildings and will not permit them in Conservation Area locations where their introduction would harm the special architectural or historic character of the area.

Camden Planning Guidance: Basements (Camden Council, 2021)

- The Camden Planning Guidance: Basements policy was adopted in January 2021. The guidance is viewed as an exemplar of policy in regard to development of basements[1] by GeoSmart.
- The Screening questions from this guidance have been used in Section 4 of this report. As the Site is not within the London Borough of Camden, the Screening questions relating to the pond chains on Hampstead Heath have been excluded.

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/668958/Basements_Review_Summary_of_Responses.pdf

3. Site Setting

Location Description

The Site is located at in a setting of primarily residential land use. It is bound to the north west by the Pine Gardens highway, and to the south by Bessingby Park Bowls Club and with residential properties bounding the Site to the north east and west.

It is understood that the basement is located at the rear of the Site, adjacent to the southern boundary approximately 9 m from the main residential dwelling.

It is not known whether basement development is present within the vicinity of the Site, with no basements identified using Google Streetview and the Hillingdon Planning register. It is recognised that the Site contains an existing basement.

Figure 1. Aerial image of the Site (Bluesky, 2023).

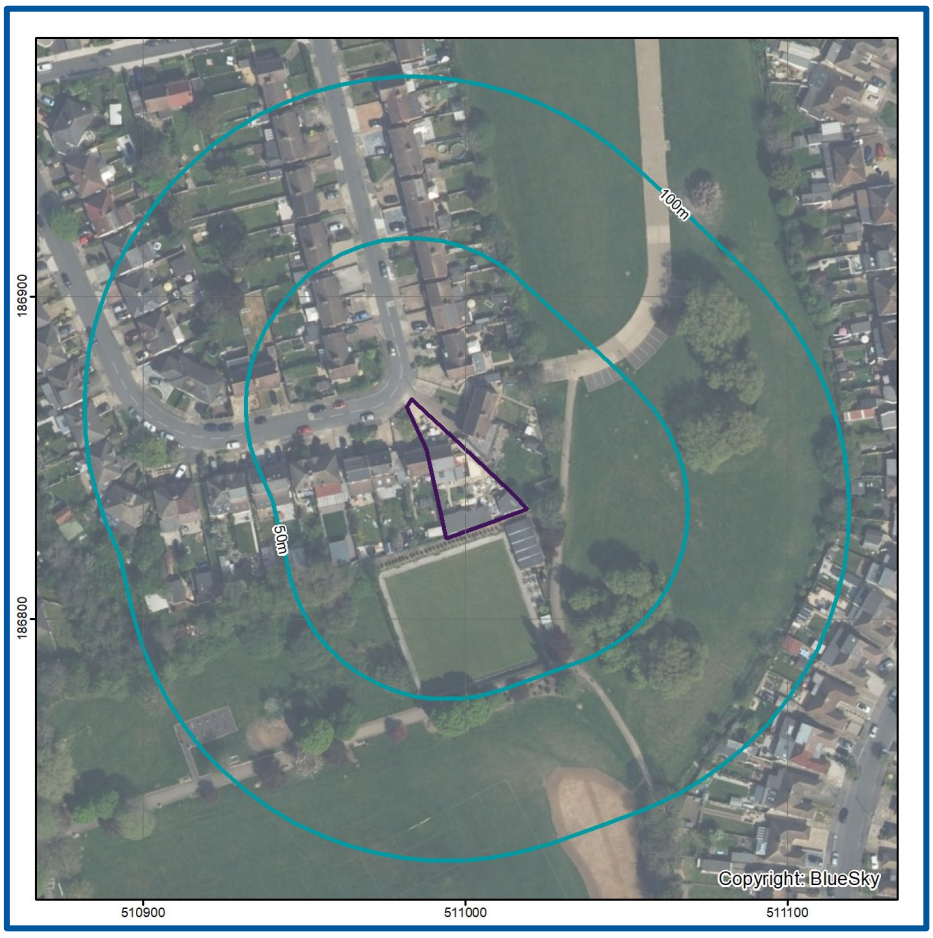

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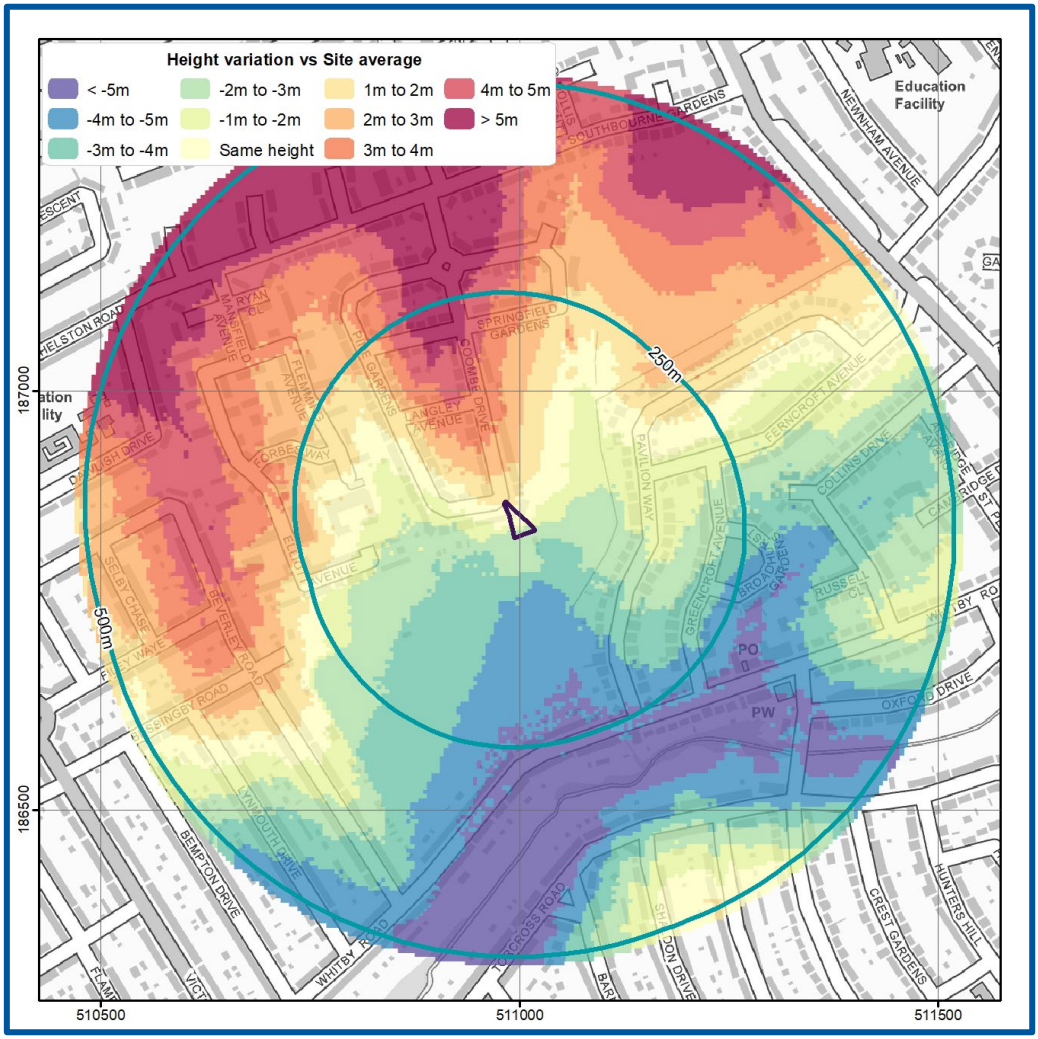
Figure 2 (overleaf) indicates ground levels within 500m of the Site fall in a southerly direction.

According to OS data, the level of the Site is between 42.29 and 43.94 mAOD with the Site falling in a southerly direction. This is based on EA elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of ±0.15 m (Appendix B).

Figure 2. Site Location and Relative Elevations (GeoSmart, 2023).



Proposed Development

This report has been compiled to support the retrospective planning permission of the waterproof tanking of an existing level basement level beneath the garden room outbuilding at the southern boundary. The Site is currently used within a residential capacity comprising of a two-storey residential dwelling with associated landscaped areas there is no basement level of the main dwelling. Site plans are included within Appendix A.

The existing basement is set c. 2.40 m below ground level at the south of the Site with depth of foundations approximately 0.42 m. Access to the basement is via a set of external stairs. It is proposed that the basement will not be used for sleeping accommodation and is assumed to be used for storage. A drainage pump has been added to the existing sump draining to a soakaway.

The estimated lifespan of the development is 100 years.

Surface Water Features

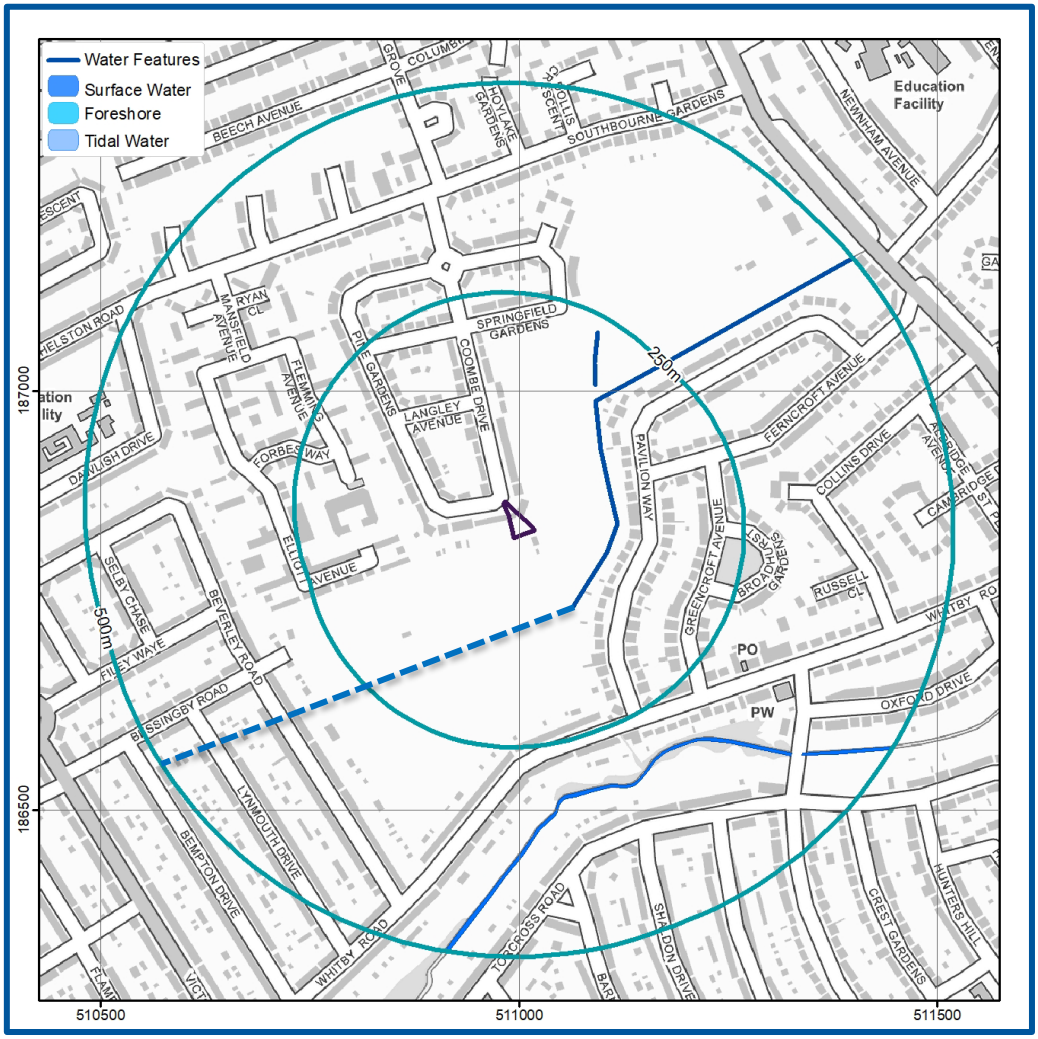
According to Ordnance Survey (OS) mapping (Figure 3), there are numerous surface water features within 500 m of the Site.

An unnamed watercourse is located approximately 90 m south east of the Site flowing in a southerly direction. Based on the SFRA interactive mapping (Metis Consultants, 2018) it is understood that this is culverted beneath the southern playing fields and south western residential areas eventually flowing into the Yeading Brook, 330 m south of the Site. The approximate route of this has been added to Figure 3, indicated by the dotted line.

According to LiDAR data, the water level within the unnamed watercourse and Yeading Brook has been estimated at 38.80 and 37.00 mAOD respectively, although note that fluvial fluctuations and rainfall recharge impact the derived level.

No subterranean rivers have been identified within the vicinity of the Site (Talling, 2023; Barton, 1992).

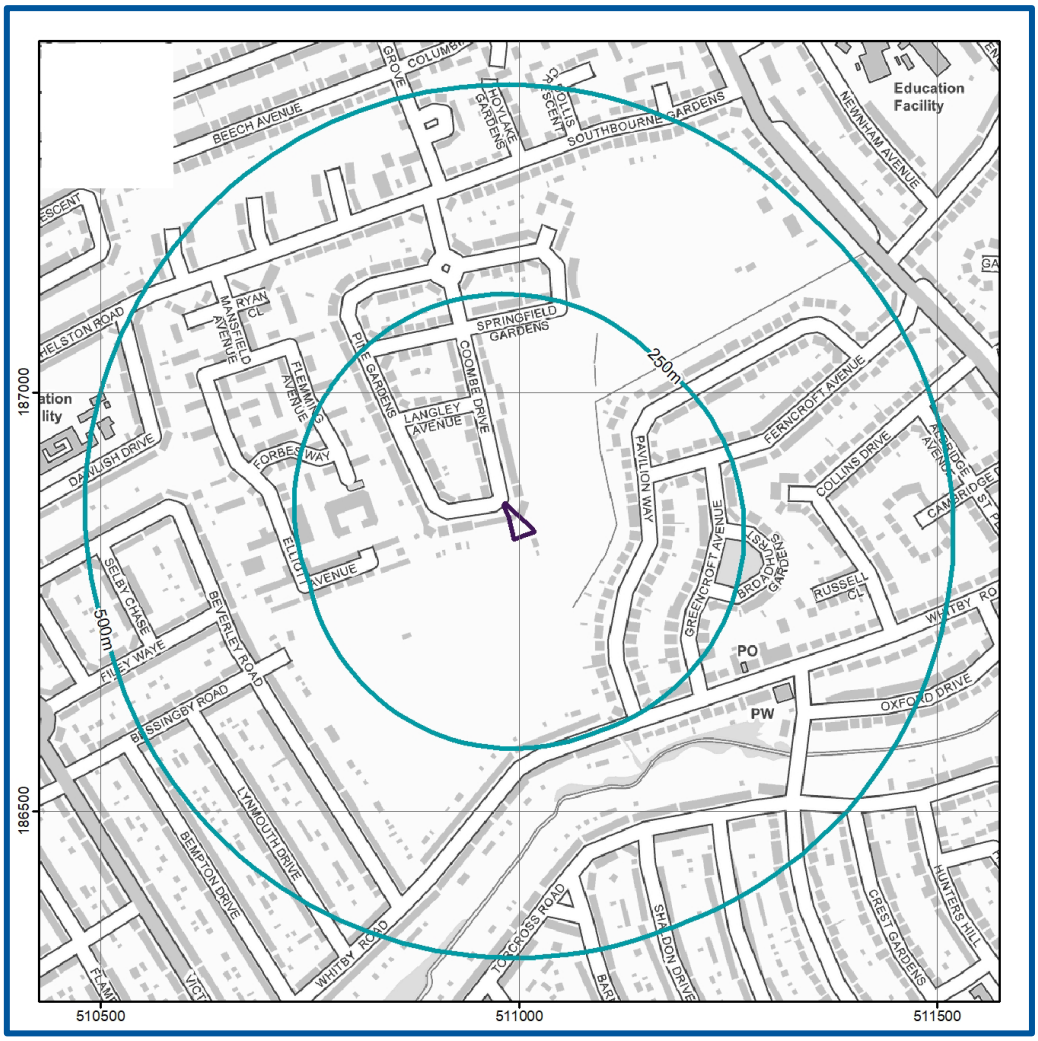
Figure 3. EA Surface Water Features (OS, 2023)



Ground Conditions

British Geological Survey (BGS) mapping indicates the absence of any mapped underlying superficial geology (Figure 4) (BGS, 2023).

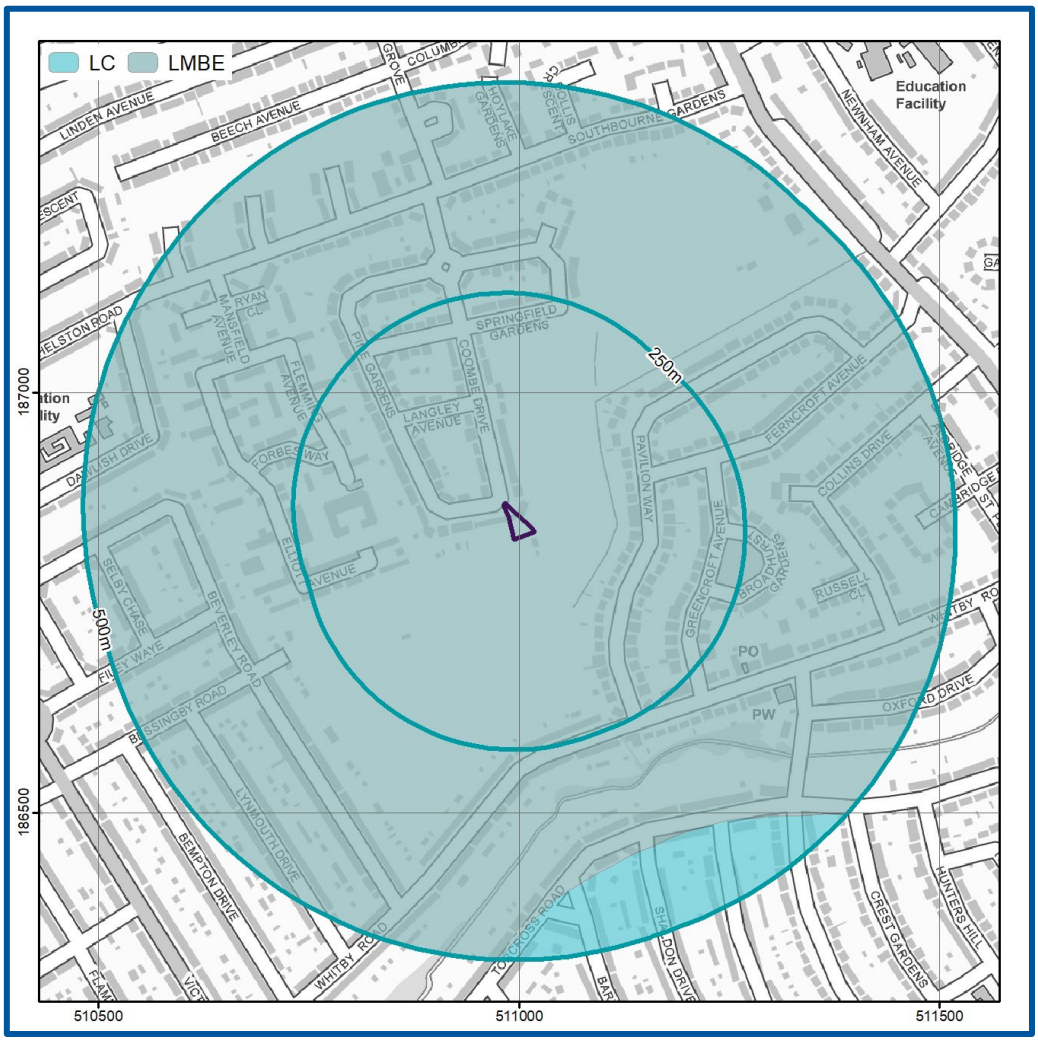
Figure 4. Superficial Geology (BGS, 2023)



BGS mapping indicates the underlying bedrock geology (Figure 5, overleaf) consists of the Lambeth Group - clay, silt and sand (LMBE) (BGS, 2023) and is classified as Secondary (A) Aquifer (EA, 2023). The Lambeth Group comprises of mainly of clay with some silty, sandy and gravelly lenses with occasional sandstone and conglomerate.

Based on the known history of the Site, Made Ground is not anticipated to be present at the Site.

Figure 5. Bedrock Geology (BGS, 2023)

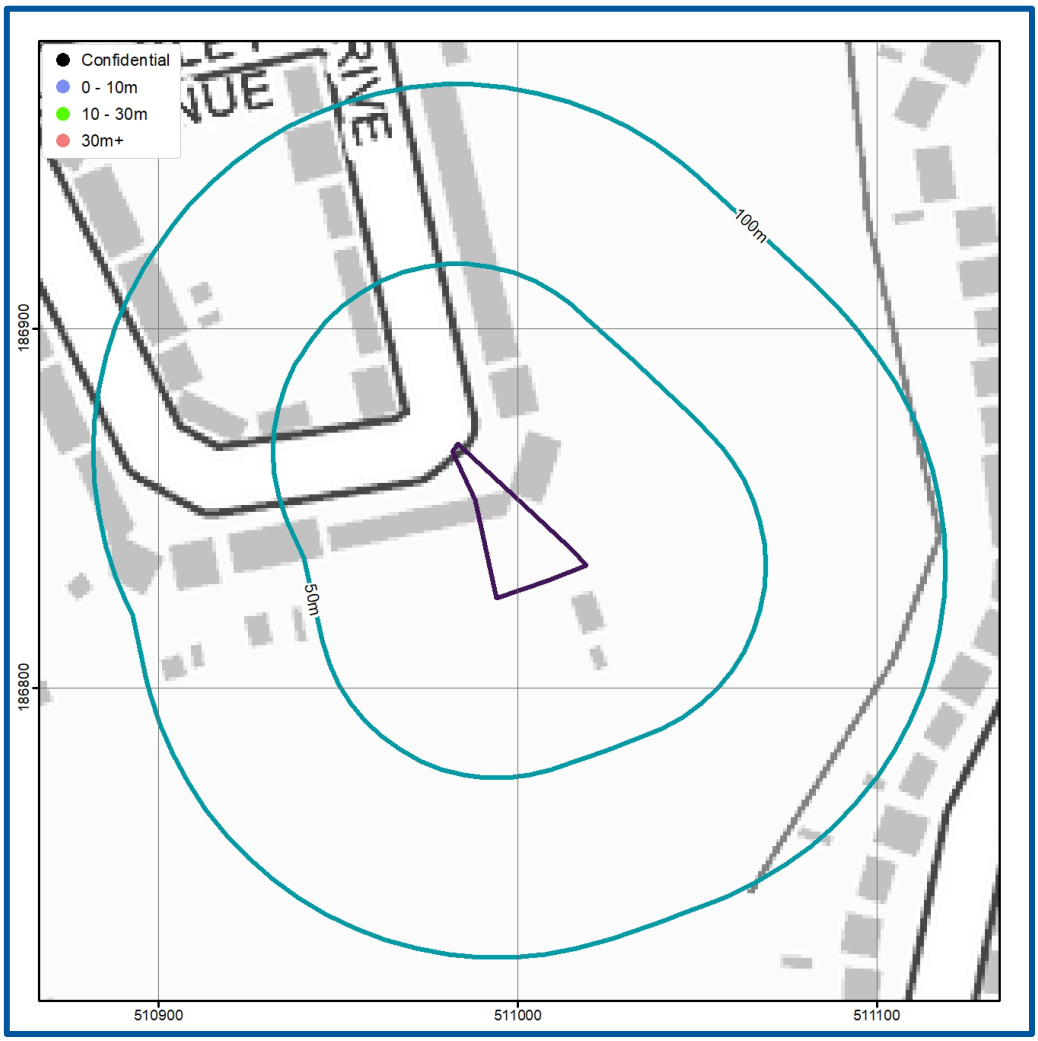


BGS Borehole Database

A review of the BGS borehole database (BGS, 2023) indicates there are no relevant boreholes within the vicinity of the Site from which the mapped geology or likely depth to groundwater can be inferred. Whilst the borehole record TQ18NW5 is located approximately 360 m north west of the Site, at the time of writing this log is missing and therefore cannot be included for analysis.

No site specific ground investigation is known to have been undertaken.

Figure 6. Borehole records (BGS, 2023)



London and Thames Valley Model

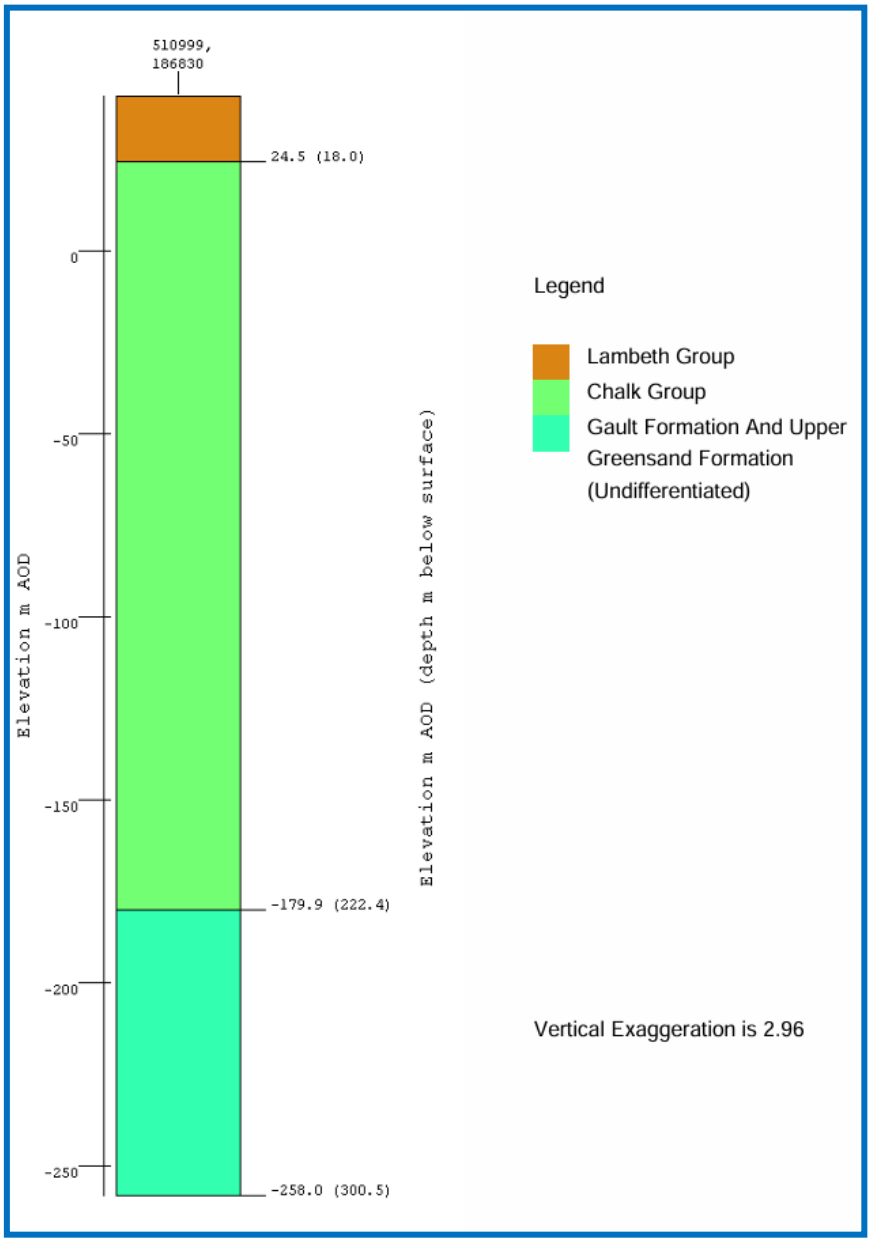
The London and Thames Valley Model has also been considered to further infer the local geology at the Site (BGS, 2023) (Figure 7). This model is a visualisation of the geology across the London and Thames Valley Model which is constructed from publicly available data, and as such should not be used as a replacement for site investigation. However, it is a useful tool at inferring the stratigraphy that could be at the Site and presenting the data in a helpful visualization.

The London and Thames Valley Model indicates the geology underlying the Site comprises:

- Lambeth Group to a depth of 18 m bgl;
- The Lambeth Group is underlain by the Chalk Group, which reaches a depth of 222 m bgl. The Chalk Group is a Principal Aquifer which is likely to contain significant groundwater; however, this groundwater is at such a significant depth that the risk to the Site from the chalk aquifer is negligible.

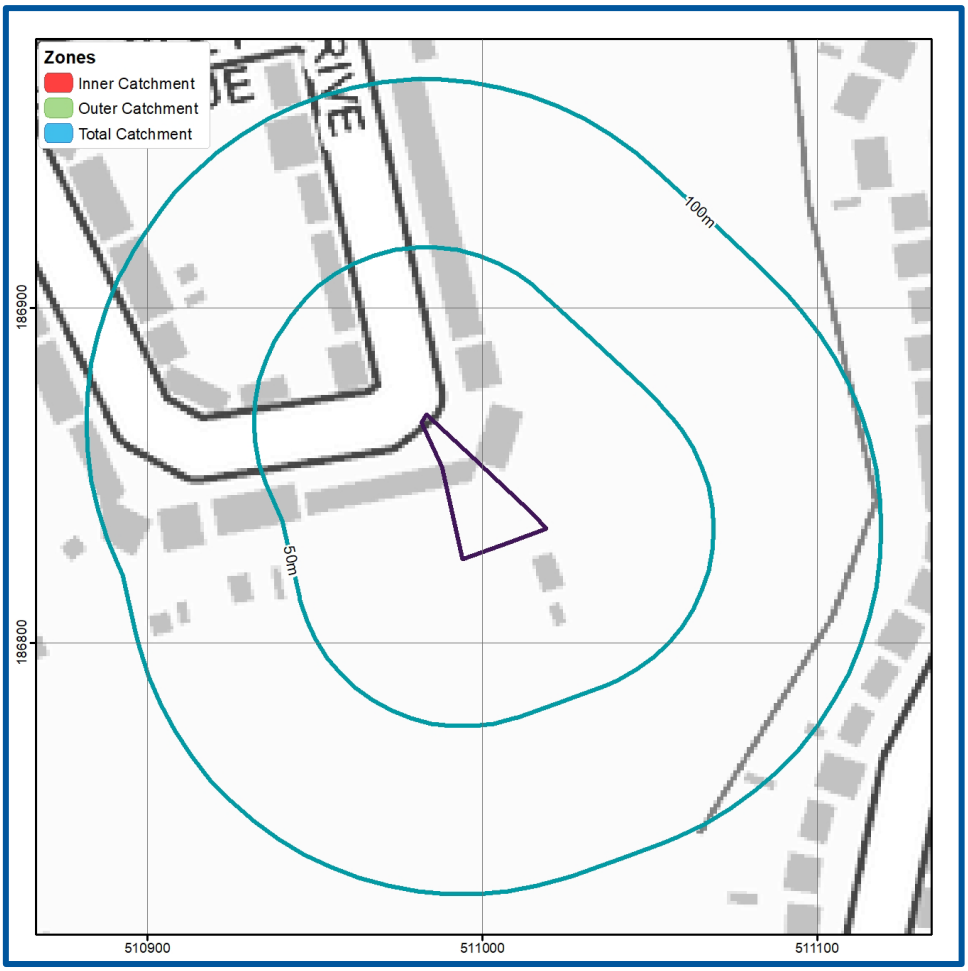
The London and Thames Valley Model are consistent with the published geological mapping (BGS, 2023), and indicate the underlying geology to comprise exclusively of the Lambeth Group bedrock with no superficial deposits.

Figure 7. BGS London and Thames Valley Model (BGS, 2023)



An assessment of the EA's groundwater Source Protection Zones (SPZs) has been undertaken within the vicinity of the Site and confirms the Site is not located within an SPZ. (EA, 2023).

Figure 8. Source protection zone map (EA, 2023)



Groundwater

There have been no Site-specific ground investigations on Site to confirm the depth of the water table. The Client has confirmed no incidence of groundwater flooding within the existing basement, the age of the basement is not known.

A review of the BGS borehole database (BGS, 2023) indicates there are no relevant boreholes within the vicinity of the Site from which the mapped geology or likely depth to groundwater can be inferred.

A surface watercourse is noted c. 90 m south east and the Yeading Brook 330 m south from the Site providing an indication of the minimum groundwater levels at this point (c. 38.80 mAOD and 37.00 mAOD, respectively). Given the extent of the Lambeth Group there is the potential for continuity between the Site and these features however it should be noted that

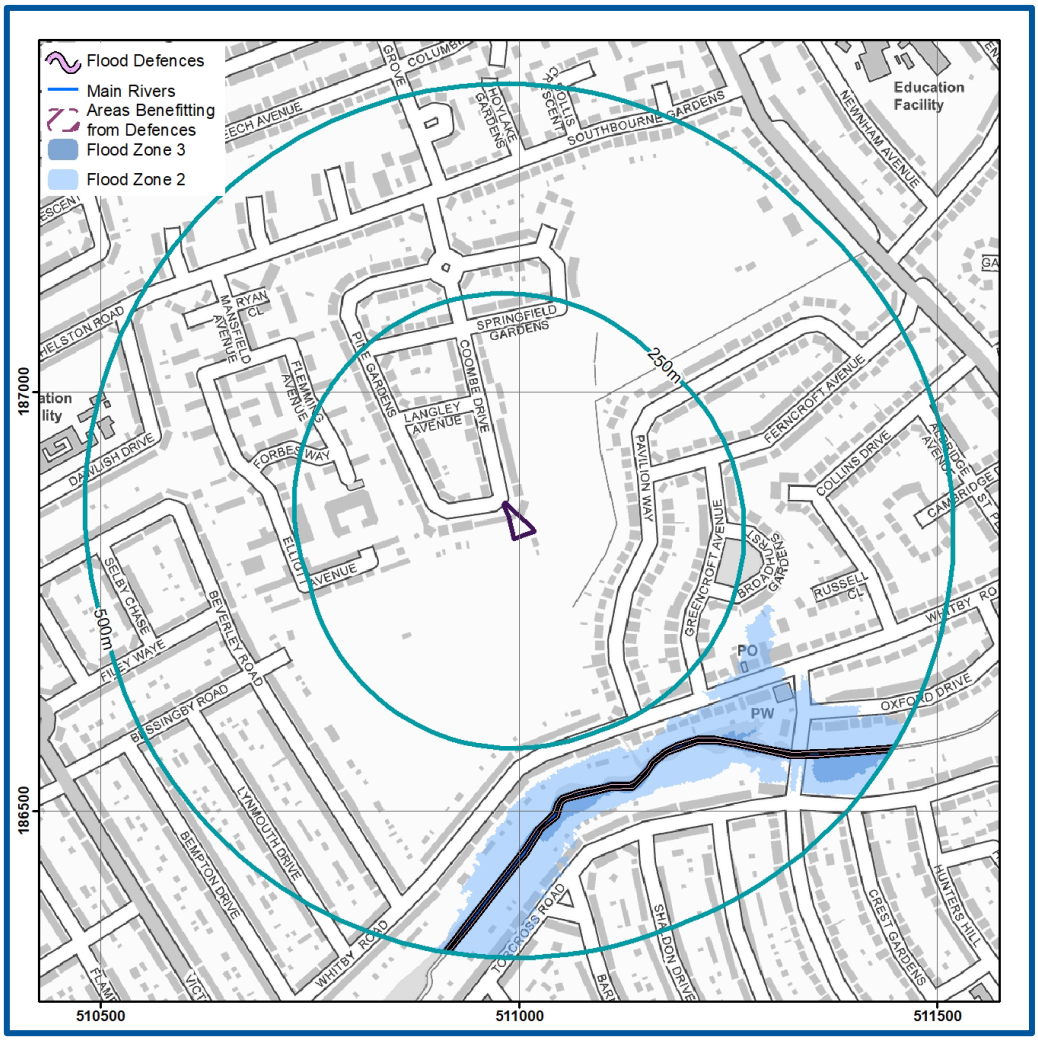
the lithology of this bedrock is typically, predominantly clay and therefore there is unlikely to support significant groundwater flow.

4. Flood risk

Fluvial and tidal flood risk

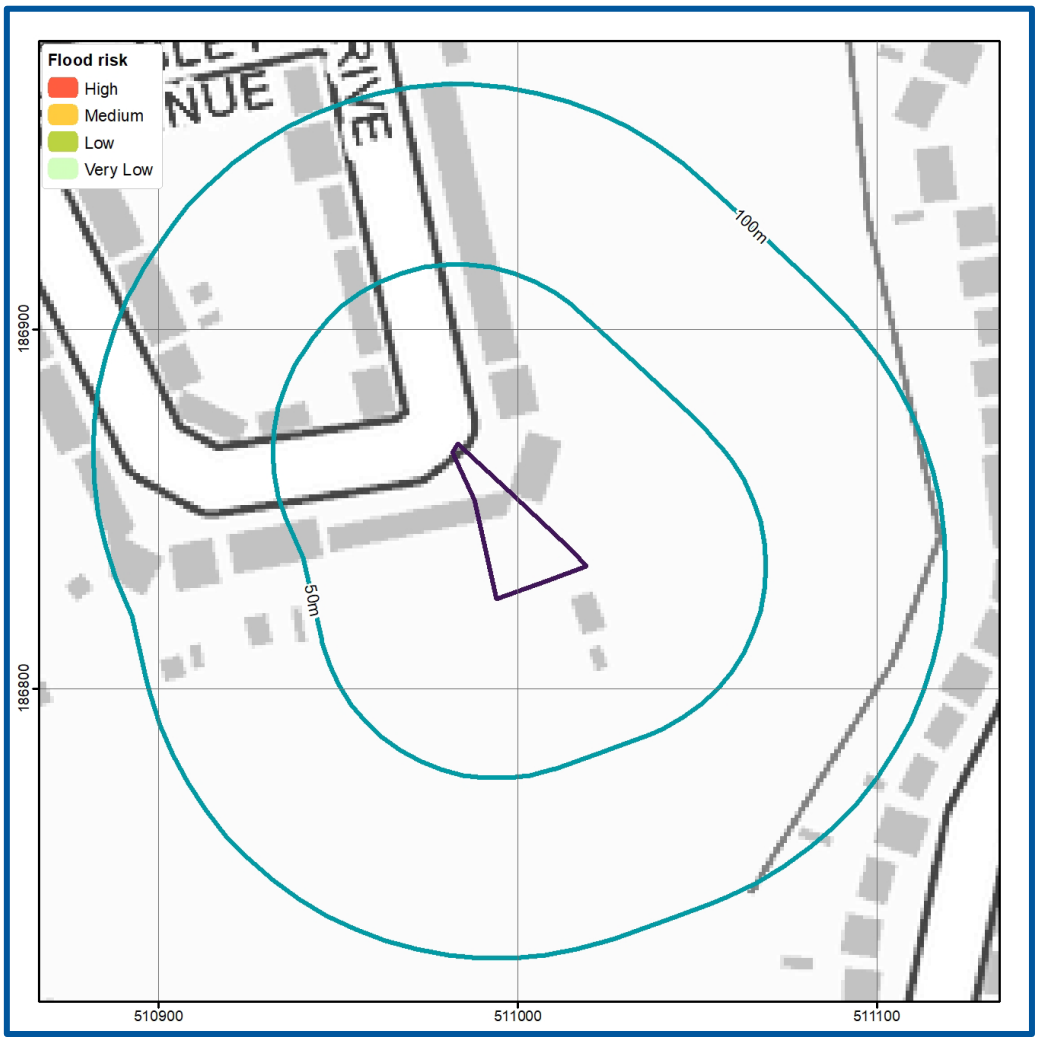
According to the Environment Agency's (EA) Flood Map for Planning Purposes (Figure 9), the Site is located within Flood Zone 1 and is classified as being at Low probability of fluvial and tidal flooding (EA, 2023).

Figure 9. EA Flood Map for Planning Purposes (EA, 2023)



According to the EA's Risk of Flooding from Rivers and the Sea (RoFRS) mapping (Figure 10, overleaf), which considers the crest height, standard of protection and condition of defences, the flood risk from Rivers and the Sea is Very Low.

Figure 10. Risk of Flooding from Rivers and Sea map (EA, 2023)



Surface water (pluvial) flood risk

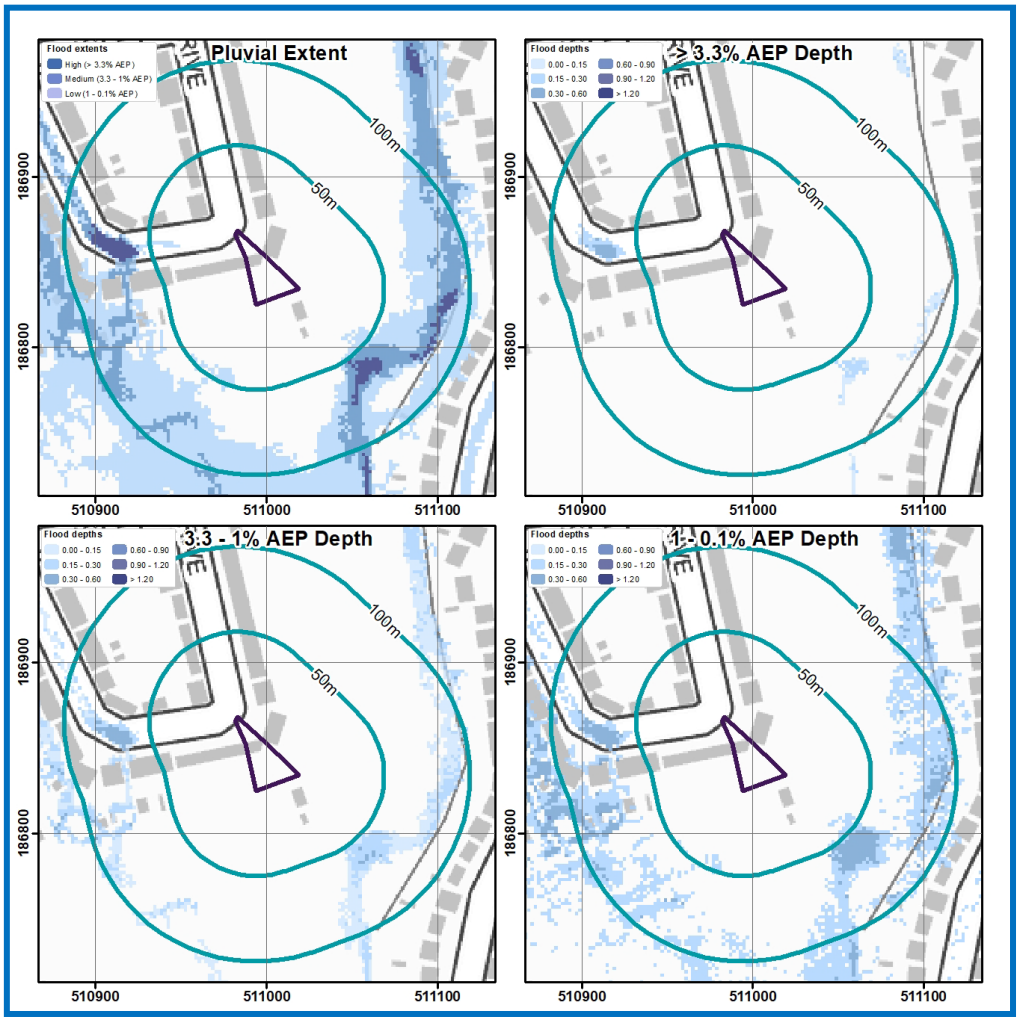
Surface water flooding occurs when intense rainfall exceeds the infiltration capacity of the ground and overwhelms the drainage systems. It can occur in most locations even at higher elevations and at significant distances from river and coastal floodplains.

According to the EA's Risk of Flooding from Surface Water (pluvial) flood mapping, the Site has a Very Low risk of pluvial flooding.

Figure 11 (overleaf) confirms the extent and depth of flooding during a 3.3% AEP (1 in 30 year - high risk) event; 1% AEP (1 in 100 year - medium risk) event and a 0.1% AEP (1 in 1000 year - low risk) event. This indicates the proposed development is located in an area at Very Low risk of surface water flooding.

The interactive mapping within the SFRA (Metis Consultants, 2018) confirms the Site is located within a Critical Drainage Area[2].

Figure 11. Risk of Flooding from Surface Water (pluvial) map (EA, 2023)



It is noted that the surface water flood risk mapping indicates the risk to the development at the surface. The proposed basement reflects an excavation and therefore is at increased risk ponding of surface water or collection of interflows. However, based on the EA's mapping, the proposed basement is not located in an area at risk of surface water flooding and therefore the risks of ponding within the basement are considered to be limited.

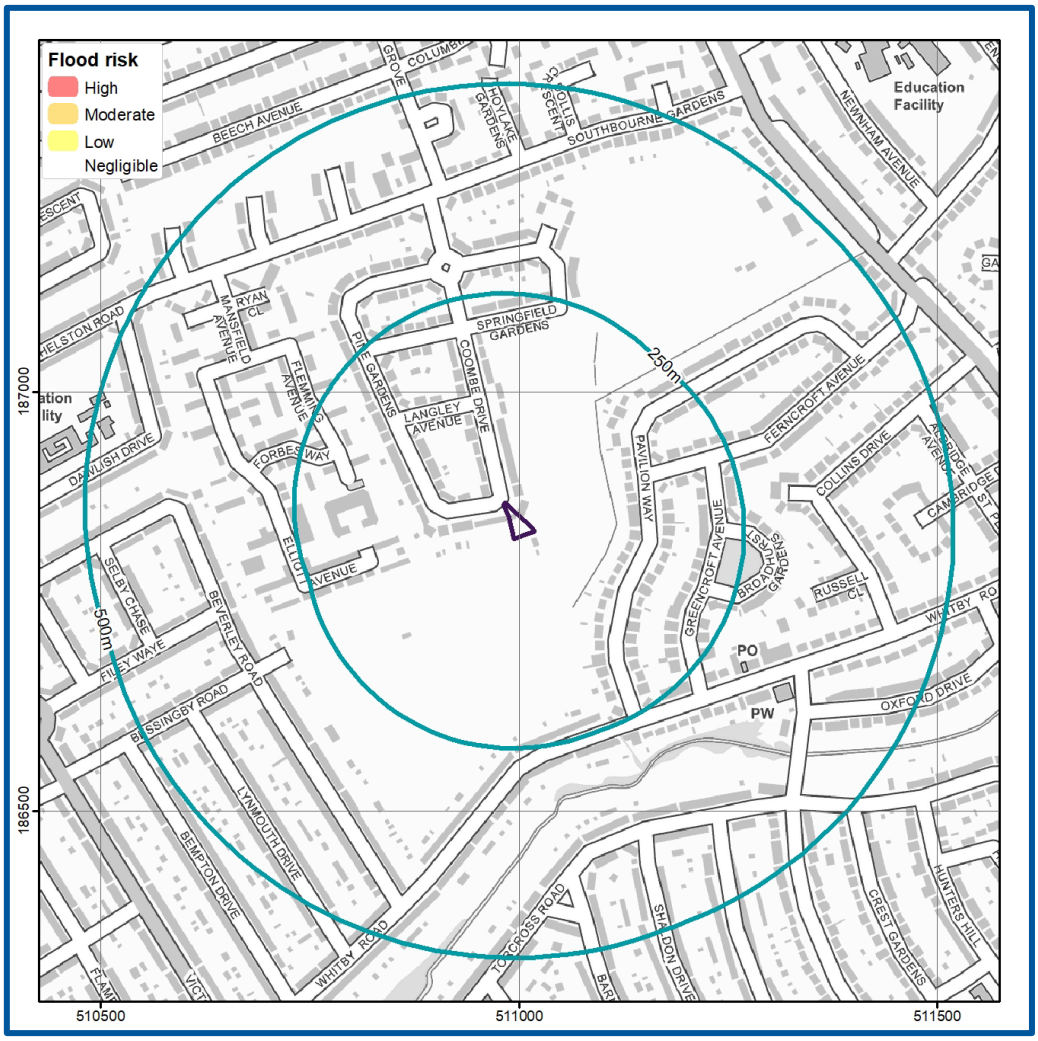
[2]A Critical Drainage Area (CDA) is an area that has critical drainage problems and which has been notified to the local planning authority as such by the Environment Agency in line with the National Planning Policy Framework (NPPF, 2021). CDA's are specific to Flood Zone 1, defined as areas where runoff can and may have historically contributed to flooding downstream, although they are not necessarily areas where flooding problems may occur. Where a Site is located in Flood Zone 1 and within a CDA, a Flood Risk Assessment (FRA) is required and the Council may also request Sustainable Drainage Scheme (SuDS) features to be included within the proposed development.

Groundwater flood risk

Groundwater flooding occurs when sub-surface water emerges from the ground at the surface or into Made Ground and structures. This may be as a result of persistent rainfall that recharges aquifers until they are full; or may be as a result of high river levels, or tides, driving water through near-surface deposits. Flooding may last a long time compared to surface water flooding, from weeks to months. Hence the amount of damage that is caused to property may be substantially higher.

Groundwater Flood Risk screening data (Figure 12) indicates there is a Negligible risk of groundwater flooding at surface in the vicinity from regional scale mechanisms during a 1 in 100 year event.

Figure 12. GeoSmart GW5 Groundwater Flood Risk Map (GeoSmart, 2023)



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According to the Greater London Authority (GLA) (2011) mapping in the interactive Sewer, Groundwater & Artificial Flood Risk Map included within the SFRA (Metis Consultants, 2018), the Site is not in an area at increased potential for elevated groundwater. The EA (2017)

mapping indicates the Site is in an area with less than 25% of the area is susceptible to groundwater flooding.

However, the risks will be higher for the proposed basement. The risks to the basement are summarised below:

- The Site is not underlain by superficial deposits and the underlying Lambeth Group formation is classified as a Secondary (A) Aquifer.
- There have been no Site-specific ground investigations on Site to confirm the depth of the water table. Flooding of the existing basement has not been reported.
- There are no nearby BGS borehole records from which the underlying groundwater depth can be inferred. The closest borehole to the Site (ref: TQ18NW5) was unavailable at the time of writing and therefore cannot be assessed.
- A surface watercourse is noted c. 90 m south east and the Yeading Brook 330 m south from the Site providing an indication of the minimum groundwater levels at this point (c. 38.80 mAOD and 37.00 mAOD, respectively). Given the extent of the Lambeth Group there is the potential for continuity between the Site and these features however it should be noted that the lithology of this bedrock is typically, predominantly clay and therefore there is unlikely to support significant groundwater flow.
- No spring lines have been identified within proximity of the Site.

The potential impacts of the proposed development on the local groundwater system and nearby development is summarised below:

- Basements have not been identified within the vicinity of the Site.
- The basement extends to a depth of 2.82 m bgl (including the depth of the foundations), whereas the underlying aquifer is expected to extend to a depth of c. 18 m bgl. As a result, groundwater would be able to flow beneath the basement, and the proposed basement would not increase any 'blockages' of groundwater flows.
- Furthermore, the basement is detached and therefore groundwater would be able to flow around either side of the basement. Therefore, the proposed basement is unlikely to cause an increase in groundwater flood risk at the Site and for other properties in the vicinity.

Flooding from artificial sources

Artificial sources of flood risk include waterbodies or watercourses that have been amended by means of human intervention rather than natural processes. Examples include reservoirs (and associated water supply infrastructure), docks, sewers and canals. The flooding mechanism associated with flood risk from artificial sources is primarily related to breach or failure of structures (reservoir, lake, sewer, canal, flood storage areas, etc.)

Sewer flood risk

According to the interactive Sewer, Groundwater & Artificial Flood Risk Map included within the SFRA, 21 - 40 incidences of sewer flooding have been recorded within the HA4 9 postcode area (Metis Consultants, 2018).

Records held by Thames Water indicate that there have been no incidences of flooding related to the surcharging of public sewers at the Site (Thames Water, 2023; Appendix C).

Note that in the event of a leak in the sewer or water main service trenches could provide a potential pathway for water to enter the basement. It is therefore recommended that water proof construction methods are used on the basement.

Canal failure

According to Ordnance Survey (OS) mapping, there are no canals within 500 m of the Site.

Culverts and bridges

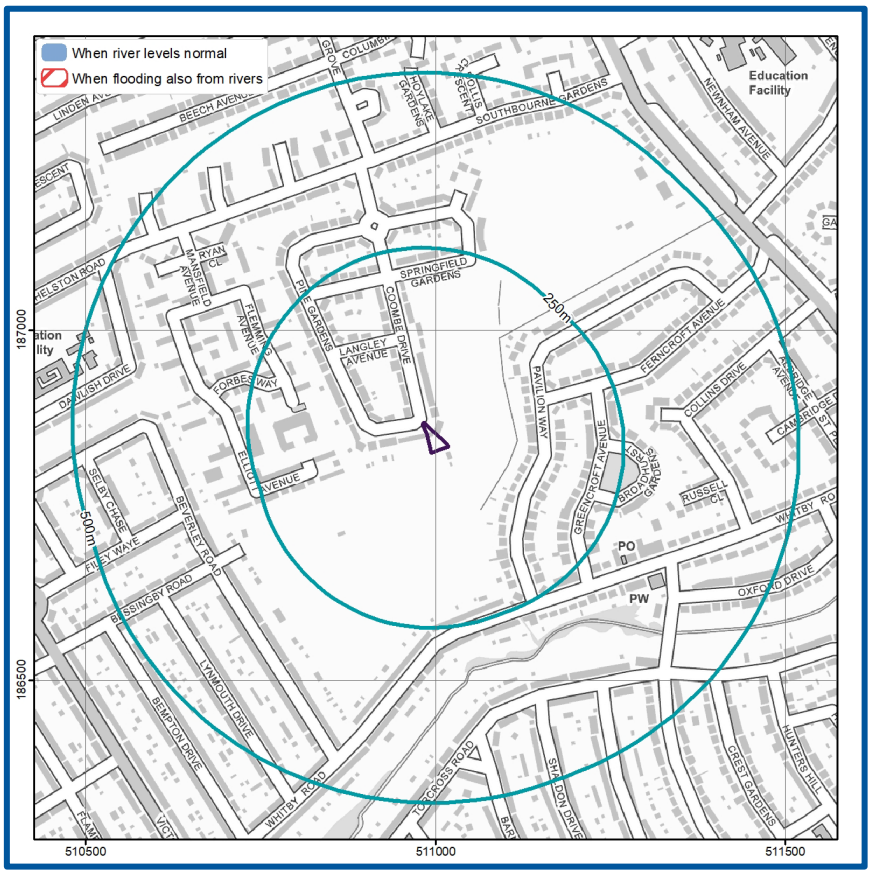
The blockage of watercourses or structures by debris (that is, any material moved by a flowing stream including vegetation, sediment and man-made materials or refuse) reduces flow capacity and raises water levels, potentially increasing the risk of flooding. High water levels can cause saturation, seepage and percolation leading to failure of earth embankments or other structures. Debris accumulations can change flow patterns, leading to scour, sedimentation or structural failure.

Culverts and bridges have not been identified within 50 m of the Site.

Reservoir Flooding

According to the EA's Risk of Flooding from Reservoir mapping, the Site is not at risk of flooding from reservoirs (Figure 13) (EA, 2023).

Figure 13. Risk of reservoir flooding map (GeoSmart, 2023)



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5. Basement Impact Assessment

The following sections follow guidance discussed in the relevant sections of the Camden Planning Guidance for Basements. This provides a clearly defined reporting framework against which to consider potential matters of concern and to scope out further work required.

Screening

Table 2. Groundwater Screening

Groundwater			
Impact Question	Answer	Justification	Reference
1a. Is the site located directly above an aquifer?	Yes	The Site is not underlain by superficial deposits. The underlying bedrock comprises the Lambeth Group categorised as a Secondary (A) Aquifer.	BGS (2023) EA (2023)
1b. Will the proposed basement extend beneath the water table surface?	Unlikely	Site investigation has not been undertaken at the Site and there are no available borehole records to confirm the depth to the local water table. The proposed basement will be set at approximately 2.82 m bgl (including the foundations). No significant groundwater system is anticipated within the bedrock, and therefore the proposed basement is unlikely to extend beneath the water table.	BGS (2023)

2. Is the site within 100m of a watercourse, well (used / disused) or potential spring line?	Yes	An unnamed watercourse is located approximately 90 m south east of the Site, flowing in a southerly direction eventually into the Yeading Brook, 330 m south of the Site.	OS (2023) EA (2023) BGS (2023)
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No	The development comprises the tanking of an existing basement level above an existing garden room, assumed to have no effect on the external features and therefore result in no increase in impermeable surfacing at the Site.	Site plans
4. As part of site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SuDS)?	Potentially	It is not known how the basement level discharged surface water prior to the re-development. From the Client plans proposals include discharge to a soakaway, it is not known whether this will constitute an increase in the volume discharged to ground.	Site plans
5. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond or spring line?	No	The elevation of the nearby watercourses have been estimated as approximately as 38.80 and 37.00 mAOD at the unnamed watercourse and Yeading Brook, respectively. The level of the basement foundations is approximately 39.58 mAOD. Furthermore due to the anticipated low permeability of the Lambeth geology there is unlikely to be significant hydraulic conductivity between the Site and watercourses.	OS (2023) EA (2023)

Table 3. Surface Water and Flooding Screening

Surface Water and Flooding			
1. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	Potentially	It is not known how the basement level discharged surface water prior to the re-development. From the Client plans proposals include discharge to a soakaway, it is not known whether this will constitute an alteration from the existing route.	Site plans
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No	The development comprises of a replacement basement level above an existing garden room, assumed to have no effect on the external features and therefore result in no increase in impermeable surfacing at the Site.	Site plans
3. Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	Potentially	Information regarding the existing drainage is not known at the time of writing. From the Client plans proposals include discharge to a soakaway, it is not known whether this will constitute an alteration from the existing route.	Site plans
4. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	The proposed development involves no alteration in the coverage of external surfacing and therefore no alteration to the quality of surface water runoff.	Site plans

5. Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature.	No	The Site is not identified as having surface water flood risk in the Strategic Flood Risk Assessment however is located within a CDA. The risk of pluvial flooding across the Site is Very Low according to EA mapping.	SFRA (Metis Consultants, 2018) EA (2023)

Screening summary

The screening process identifies the following issues to be carried forward to scoping for further assessment:

- The proposed basement is located within the Lambeth Group aquifer;
- A surface watercourse has been identified within 100 m of the Site; and
- There is the potential for surface water flows to be altered from the existing route, potentially resulting in additional water infiltrated to ground.

The other potential concerns considered within the screening process have been demonstrated to be not applicable or not significant when applied to the proposed development.

Scoping

Where a potential impact has been identified at the screening stage above, the potential further need for assessment is considered and scoped. The scoping stage should aim to build on the information provided in the screening stage. During this phase, a desk study should be undertaken to determine the preliminary impacts of the proposed basement development. This initial assessment should be used to identify any site investigation works required.

Table 4. Groundwater Scoping

Groundwater		
Impact Question	Answer	Potential Impact & Assessment
1a. Is the site located directly above an aquifer?	Yes	The Site is not underlain by superficial deposits. The underlying bedrock comprises the Lambeth Group formation categorised as a Secondary (A) Aquifer. Whilst this is classified as Secondary (A) Aquifer given this is typically predominantly clay it is unlikely to support significant groundwater flow. Groundwater seepage from isolated permeable horizons within the bedrock may be encountered and while this should be monitored it is unlikely to be a significant flow. The mitigation measures as detailed in the Client plans including the tanking and resilience measures are likely sufficient for the identified Low risk, any drainage features should be maintained in perpetuity of the lifespan of the development.

2. Is the site within 100m of a watercourse, well (used / disused) or potential spring line?	Yes	An unnamed watercourse is located approximately 90 m south east of the Site, flowing in a southerly direction eventually into the Yeading Brook, 330 m south of the Site. Given the extent of the Lambeth Group there is the potential for continuity between the Site and these features however it should be noted that the lithology of this bedrock is typically, predominantly clay and therefore there is unlikely to support significant groundwater flow. The mitigation measures as detailed in the Client plans including the tanking and resilience measures are likely sufficient for the identified Low risk, any drainage features should be maintained in perpetuity of the lifespan of the development.
4. As part of site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SuDS)?	Potentially	It is not known how the basement level discharged surface water prior to the re-development. From the Client plans proposals include discharge to a soakaway, it is not known whether this will constitute an increase in the volume discharged to ground. Consideration should be given as to the potential impacts of the soakaways on local groundwater levels, and whether this would impact the groundwater risk to the basement. It is noted that high groundwater levels (if encountered) and the anticipated, relatively low permeability of the underlying Lambeth Group deposits is likely to limit the potential for soakaways to be used as part of the development. In line with Building Regulations Part H (2015), soakaways should be located at least 5 m away from the proposed on-Site buildings.

Table 5. Surface Water and Flooding Scoping

Surface Water and Flooding		
1. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	Potentially	It is not known how the basement level discharged surface water prior to the re-development. From the Client plans proposals include discharge to a soakaway, it is not known whether this will constitute an alteration from the existing route. Consideration should be given as to the potential impacts of the soakaways on local groundwater levels, and whether this would impact the groundwater risk to the basement. It is noted that high groundwater levels (if encountered) and the anticipated, relatively low permeability of the underlying Lambeth Group deposits is likely to limit the potential for soakaways to be used as part of the development. In line with Building Regulations Part H (2015), soakaways should be located at least 5 m away from the proposed on-Site buildings.
3. Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?		

6. Conclusions and Recommendations

Site setting constraints

Flood risks and impacts	Baseline*	After Mitigation **
Groundwater flooding	Low	Low
Surface water flooding	Very Low	Very Low

*BASELINE risks have been calculated for the whole Site, using national risk maps, including the benefit of EA flood defences. Note that the risks presented in the baseline mapping are applicable to surface development only, whereas the risks presented on the table are applicable to the proposed subterranean development and therefore may be higher.

**FINAL RISK RATING Includes a detailed analyses of flooding risks over the lifetime of the proposed development, including allowances for climate change AND assumes recommended mitigation measures are implemented.

Recommendations / Next steps

Recommendations for mitigation are provided below, based upon the proposed basement and wider development design:

- It is understood that as part of the existing basement a number of flood resilience measures have already been incorporated into the design these include:
    - The wall floor junction is installed with a dry lining system with overlaps sealed used sealing rope.
    - A damp proof membrane has been installed beneath the concrete slab.
    - A drainage channel is installed of assumed sufficient capacity and fall proposed to discharge to a soakaway. This includes an Aqua channel at the floor junctions at the base of the wall to further facilitate the positive drainage of the development.
    - A drainage pump has been added to the existing sump at the entrance to the basement discharging via the aforementioned route.

7. Further information

The following table includes a list of additional products by GeoSmart:

Additional GeoSmart Products			
	Additional assessment: SuDSmart Report		The SuDSmart Report range assesses which drainage options are available for a Site. They build on technical detail starting from simple infiltration screening and work up to more complex SuDS Assessments detailing alternative options and designs. Please contact info@geosmartinfo.co.uk for further information.
	Additional assessment: EnviroSmart Report		Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective. Our EnviroSmart reports are designed to be the most cost effective solution for planning conditions. Each report is individually prepared by a highly experienced consultant conversant with Local Authority requirements. Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions. Please contact info@geosmartinfo.co.uk for further information.

8. References and glossary

References

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GeoSmart Information

Glossary

General terms

BGS	British Geological Survey
EA	Environment Agency
GeoSmart groundwater flood risk model	GeoSmart's national groundwater flood risk model takes advantage of all the available data and provides a preliminary indication of groundwater flood risk on a 50m grid covering England and Wales. The model indicates the risk of the water table coming within 1 m of the ground surface for an indicative 1 in 100 year return period scenario.
Dry-Island	An area considered at low risk of flooding (e.g. In a Flood Zone 1) that is entirely surrounded by areas at higher risk of flooding (e.g. Flood Zone 2 and 3)
Flood resilience	Flood resilience or wet-proofing accepts that water will enter the building, but through careful design will minimise damage and allow the re-occupancy of the building quickly. Mitigation measures that reduce the damage to a property caused by flooding can include water entry strategies, raising electrical sockets off the floor, hard flooring.
Flood resistance	Flood resistance, or dry-proofing, stops water entering a building. Mitigation measures that prevent or reduce the likelihood of water entering a property can include raising flood levels or installation of sandbags.
Flood Zone 1	This zone has less than a 0.1% annual probability of river flooding
Flood Zone 2	This zone has between 0.1 and 1% annual probability of river flooding and between 0.1% and 0.5 % annual probability sea flooding
Flood Zone 3	This zone has more than a 1% annual probability of river flooding and 0.5% annual probability of sea flooding
Functional Flood Plain	An area of land where water has to flow or be stored in times of flood.
Hydrologic model	A computer model that simulates surface run-off or fluvial flow. The typical accuracy of hydrologic models such as this is ±0.25m for estimating flood levels at particular locations.
OS	Ordnance Survey
Residual Flood Risk	The flood risk remaining after taking mitigating actions.
SFRA	Strategic Flood Risk Assessment. This is a brief flood risk assessment provided by the local council

SuDS	A Sustainable drainage system (SuDS) is designed to replicate, as closely as possible, the natural drainage from the Site (before development) to ensure that the flood risk downstream of the Site does not increase as a result of the land being developed. SuDS also significantly improve the quality of water leaving the Site and can also improve the amenity and biodiversity that a Site has to offer. There are a range of SuDS options available to provide effective surface water management that intercept and store excess run-off. Sites over 1 Ha will usually require a sustainable drainage assessment if planning permission is required. The current proposal is that from April 2014 for more than a single dwelling the drainage system will require approval from the SuDS Approval Board (SABs).

Aquifer Types

Principal aquifer	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
Secondary A aquifer	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.
Secondary B aquifer	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.
Secondary undifferentiated	Has been assigned in cases where it has not been possible to attribute either category A or B to a rock type due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that has negligible significance for water supply or river base flow.

NPPF (2023) terms

Exception test	Applied once the sequential test has been passed. For the exception test to be passed it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
Sequential test	Aims to steer new development to areas with the lowest probability of flooding.
Essential infrastructure	Essential infrastructure includes essential transport infrastructure, essential utility infrastructure and wind turbines.

Water compatible	Water compatible land uses include flood control infrastructure, water-based recreation and lifeguard/coastal stations.
Less vulnerable	Less vulnerable land uses include police/ambulance/fire stations which are not required to be operational during flooding and buildings used for shops/financial/professional/other services.
More vulnerable	More vulnerable land uses include hospitals, residential institutions, buildings used for dwelling houses/student halls/drinking establishments/hotels and sites used for holiday or short-let caravans and camping.
Highly vulnerable	Highly vulnerable land uses include police/ambulance/fire stations which are required to be operational during flooding, basement dwellings and caravans/mobile homes/park homes intended for permanent residential use.

Data Sources

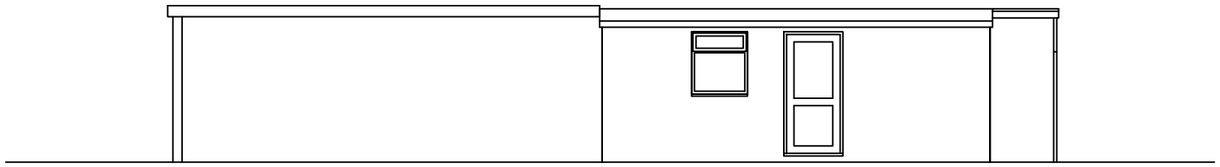
Aerial Photography	Contains Ordnance Survey data © Crown copyright and database right 2023 BlueSky copyright and database rights 2023
Geology (Bedrock/Superficial/Borehole locations)	Contains British Geological Survey materials © NERC 2023 Ordnance Survey data © Crown copyright and database right 2023
Flood Risk (Flood Zone/RoFRS/Pluvial/Surface Water Features/Reservoir/SPZ)	Environment Agency copyright and database rights 2023 Ordnance Survey data © Crown copyright and database right 2023
Flood Risk (Groundwater)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2023) Contains British Geological Survey materials © NERC 2023 Ordnance Survey data © Crown copyright and database right 2023
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2023 Environment Agency copyright and database rights 2023

9. Appendices

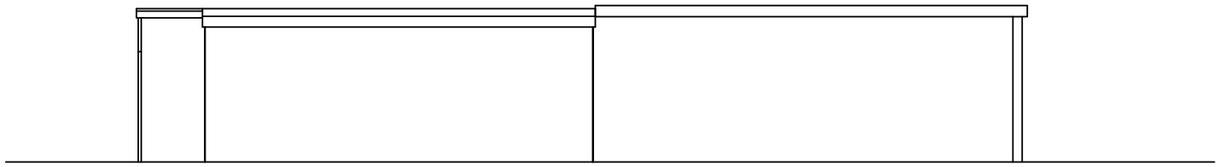
GeoSmart Information

Appendix A

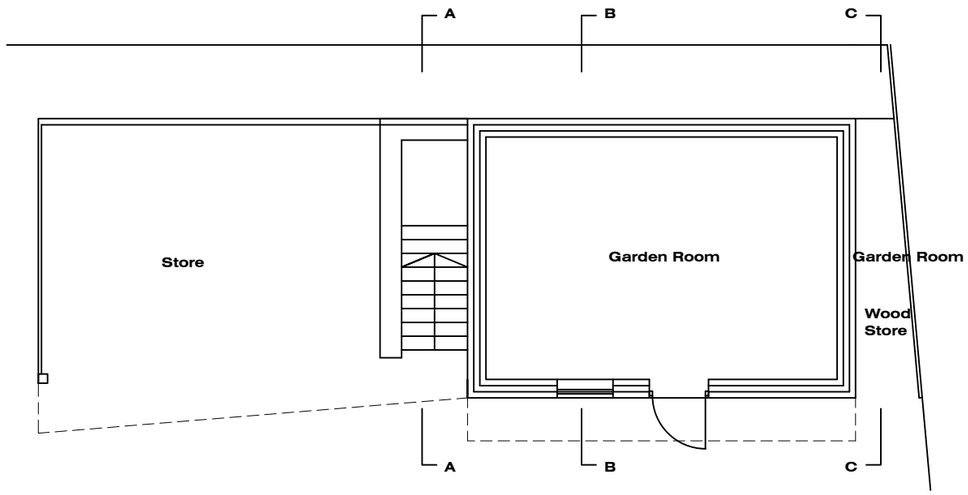
Site plans



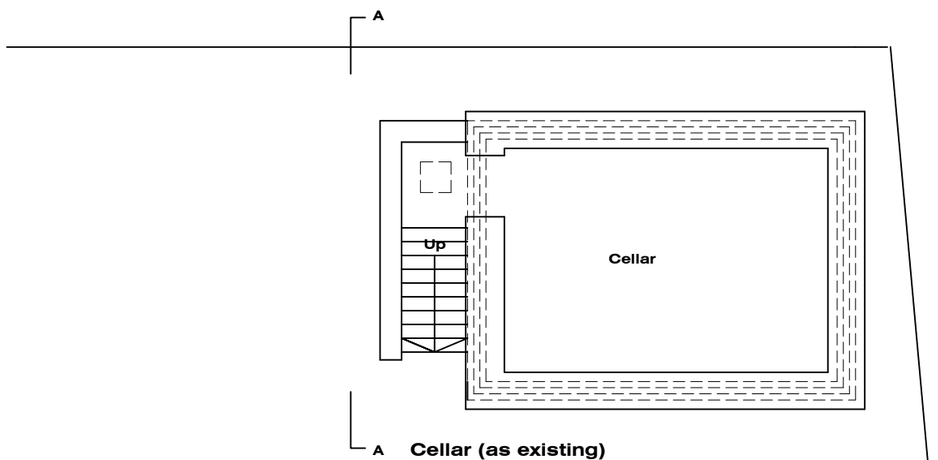
Existing Front Elevation



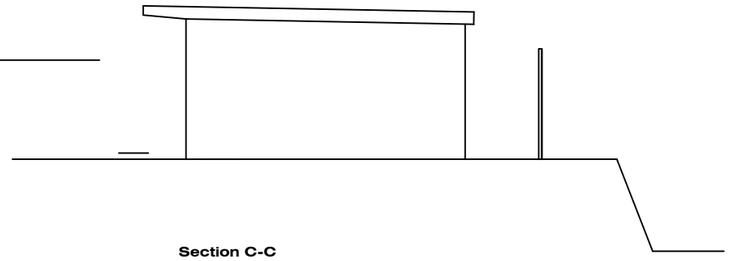
Existing Rear Elevation



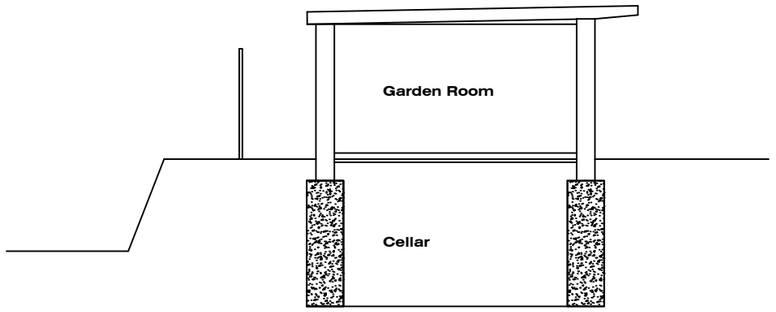
Ground Floor (as existing)



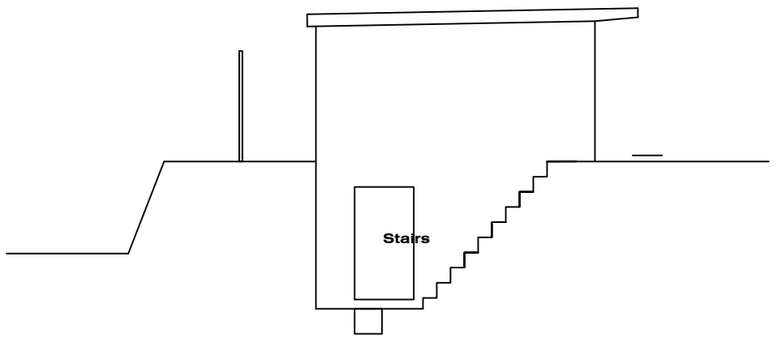
Cellar (as existing)



Section C-C



Section B-B



Section A-A

0m 2m

Notes:

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Where an item is covered by drawings to different scales the larger scale drawing is to be worked to

Revisions:

Clients
Ivan and Viktoria Kulinits

Project:
148 Pine Gardens, Ruislip HA4 9TH

Drawing:
Plans Elevations and Sections as Existing

Scale:
1:100@A3

Date:
July 2023

Drawn By:
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Checked By
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Drawing No:
104-101

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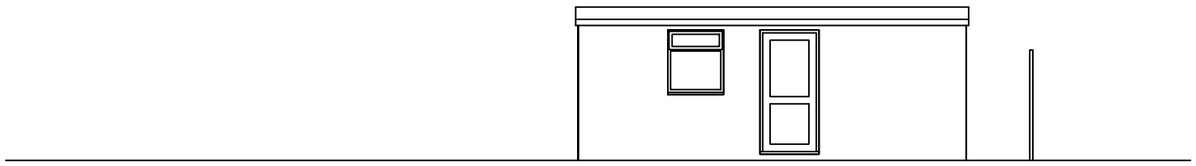
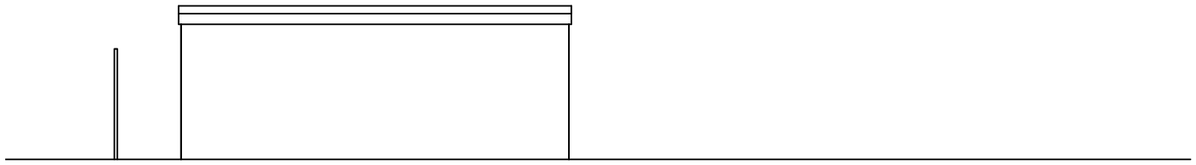
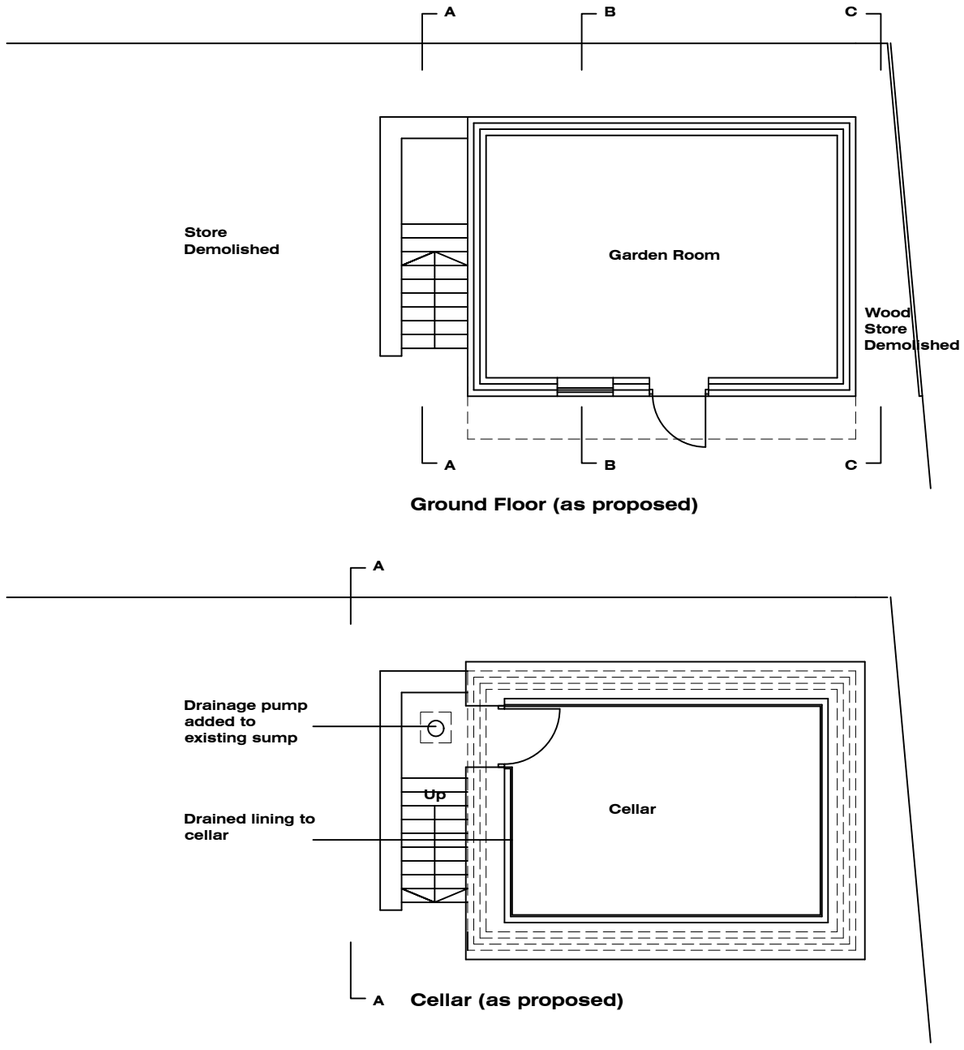


Proposed Front Elevation

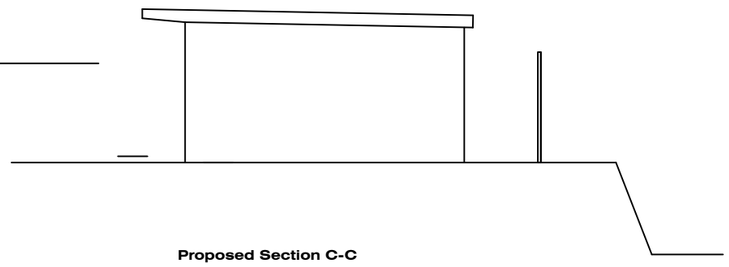


Proposed Rear Elevation

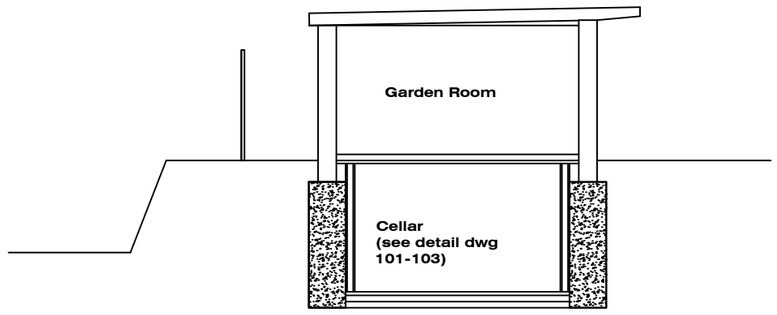


Ground Floor (as proposed)

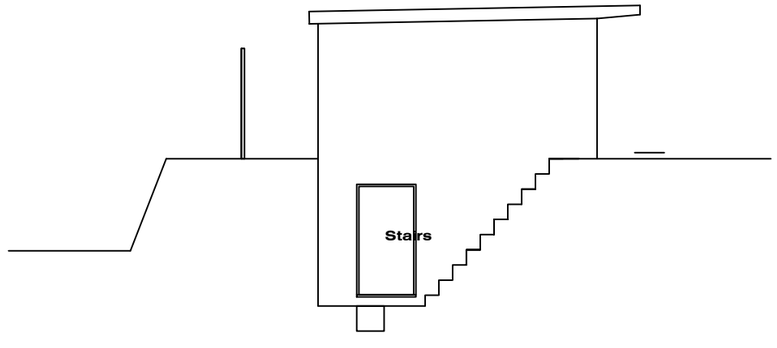
Cellar (as proposed)



Proposed Section C-C



Proposed Section B-B



Proposed Section A-A

0m 2m

Notes:

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Revisions:

Clients
Ivan and Viktoria Kulinits

Project:
148 Pine Gardens, Ruislip HA4 9TH

Drawing:
Plans Elevations and Sections as Proposed

Scale:
1:100@A3

Date:
July 2023

Drawn By:
PR

Checked By
PR

Drawing No:
104-101

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Notes:

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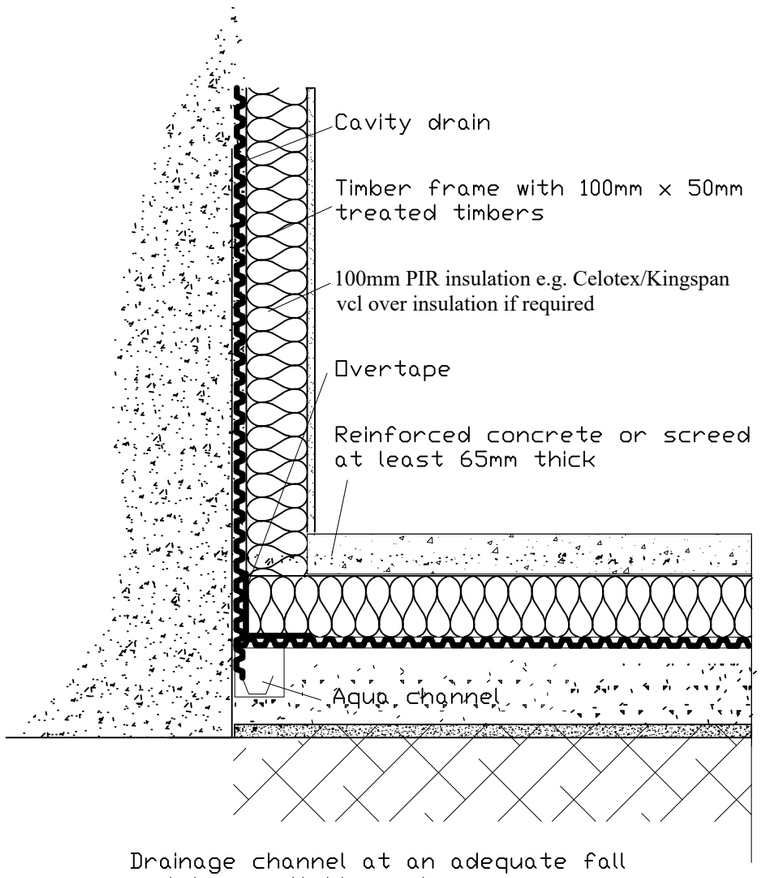

Drainage channel at an adequate fall and to a suitable soakaway

Wall floor junction with dry lining system to be installed in accordance with manufacturers details

overlaps to be sealed using Sealing Rope

The outer edge of the sheet to be covered with overtape

Incorporate Aqua Channel at floor junctions or the horizontal and vertical sheets should be butt jointed at the base of the wall

The dimples to be filled with a suitable strength concrete or mortar

A drainage system of suitable capacity

should be provided to collect and dispose of the infiltrating water

Pre-treat concrete surfaces with Cementseal Primer

Interlock sheets by two domes, giving an overlap of 100mm

Fixings should be made, using Brick Plugs,
Fixings are sealed with Sealing Rope,
The fixings are to be staggered at 1.0m centres

100mm PIR insulation (eg celotex/kingspan)

100mm thick concrete slab

1200g damp proof membrane

150mm sand blinded hardcore

0m 2m

Revisions:

Clients
Ivan and Viktoria Kulinits

Project:
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Drawing:
Basement Tanking Detail

Scale:
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Date:
July 2023

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PR

Checked By
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Drawing No:
104-103

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BUILDING REGULATIONS NOTES

SITE ASSESSMENT
A site assessment to be undertaken, assessment to include advice from a Geotechnical Specialist and a Waterproofing Specialist so that an integrated and practical waterproofing solution is created and any potential hazards and problems are identified at an early stage. Site investigation and risk assessment to be carried out before works commence to establish ground conditions and water table levels, presence of any contaminates and/or radon gas and location of drains and services etc.
Ground gases and contaminants - aggressive ground conditions may require the inclusion of a suitable ground barrier to protect the structure appropriately. Specialist advice must be sought in respect of dealing with ground gases, and designers are advised to check current standards at the time of construction for suitable guidance.

BASIC RADON PROTECTION
Damp proofing system to be assessed for compatibility with radon and advice from a Geotechnical Specialist and a Waterproofing Specialist to be sort.
Provide a 1600g (400 um) radon membrane over existing floor slab, lapped 300mm, double welted and taped with gas proof tape at joints and service entry points. Carry membrane over cavity and provide suitable cavity tray and weep holes.
Ground gases, contaminants and aggressive ground conditions may require the inclusion of a suitable ground barrier to protect the structure appropriately. Specialist advice to be sought in respect of dealing with ground gases.

MATERIALS AND WORKMANSHIP
All works are to be carried out in a workmanlike manner. All materials and workmanship must comply with Regulation 7 of the Building Regulations, all relevant British Standards, European Standards, Agreement Certificates, Product Certification of Schemes (Kite Marks) etc. Products conforming to a European technical standard or harmonised European product should have a CE marking.

THERMAL BRIDGING
Care shall be taken to limit the occurrence of thermal bridging in the insulation layers caused by gaps within the thermal element (i.e. around windows and door openings).

EXISTING STRUCTURE
Provide all necessary temporary protection, support, shoring and working platforms etc. in compliance with current health and safety requirements and Structural Engineer's details.
A Structural Engineer to carry out a desktop analysis of the geology and hydrology of the site to guide the design of foundation and basement structure.
Existing structure including foundations, floor, beams, walls, roof and lintels are to be exposed and checked by Structural Engineer for adequacy prior to commencement of work and as required by the Building Control Officer.
Any remedial works required to be designed by a Structural Engineer.

RIW CAVITY DRAIN R20
All existing walls and floors below ground to be assessed for structural adequacy by a structural engineer any structural remedial works to be undertaken in strict accordance with Structural Engineer's calculations and design.
A Waterproofing Specialist to be consulted on the design of waterproofing system.
Habitable spaces to be designed to Grade 3. Consideration to be given to the recommendations of BS 8102: 2009 (Code of practice for protection of structures against water from the ground), 'no water penetration acceptable' and a dry environment provided maintained by adequate ventilation, BS 8215 (Code of practice for design and installation of damp proof courses in masonry construction) and the information given in Building Research Establishment Digest 104 (Floor Screeds).
An existing brick structure's water resistance may require improvement with a Type A membrane prior to the installation of the internal system.
Grade 3 waterproofing protection to be provided using drained cavity & DPM.
Installation to be in strict adherence to manufacturers details of RIW Cavity Drain R20
Ensure surfaces are firm, and free from obstructions, which would hamper free drainage. Any defects to be remedied before the system is installed.
NEW STUD WALL INNER LEAF
New inner leaf wall to be 100mm studwork as specified by engineer –typically constructed using 150mm x 50mm head & sole plates and vertical studs (with noggins) at 400mm ctrs. 100mm Celotex insulation to be within the stud as manufacturer's details. Vcl and 12.5mm plasterboard and skim installed over studwork. Fixed on to 2 courses of engineering bricks with dpc under.
25mm additional Celotex insulation to be provided over stud for thermal bridging if required.

SOLID FLOOR INSULATION OVER SLAB
Perimeter / Area Ratio 0.7
To meet min U value required of 0.22 W/m²K
Solid ground floor to consist of 150mm consolidated well-rammed hardcore. Blinded with 50mm sand blinding. Provide 100mm ST2 or Gen2 ground bearing slab concrete mix to conform to BS 8500-2 over a 1200 gauge polythene DPM (if required). Floor to be insulated over slab 100mm thick Celotex GA4000.
25mm insulation to continue around floor perimeters to avoid thermal bridging. A VCL should be laid over the insulation boards, all joints to be lapped 150mm and sealed. Finish with 65mm sand/cement finishing screed with light mesh reinforcement. Horizontal surfaces to be laid to falls to drainage outlets. Any level slabs are not to pond water more than 20mm deep.

Wall and floor construction to incorporate cavity drain system as manufacturers details and as described below:
Concrete slab surface to be pre-treated with Cementseal Primer.
Membranes to be laid out 'domes down' over the floor slab, with an overlap of two interlocking domes. No fixings to go through the floor membrane.
Vertical Installation of Cavity Drain R20 to commence at the top of the construction within the cavity (see manufacturers details for installation). Interlocking sheets by two domes, with an overlap of 100mm. The lower sheet to be positioned in front of the upper sheet, to form a 'weathered lap'.
Fixings to be Brick Plugs, into 10mm diameter holes to a minimum depth of 75mm. Fixings to be sealed with Sealing Rope. The fixings to be staggered at 1.0m centres.
Seal overlaps using a run of Sealing Rope placed along the flat area of the Cavity Drain membrane between the two rows of domes. The outer edge of the sheet to be covered with Overtape.
Perforation of the tanking system by service entry pipes etc should be avoided or carried out strictly in accordance with the tanking manufacturer's details.
At Any Column/service penetrations the Cavity Drain R20 to be cut so it forms a butt joint against any projections, then sealed with Sealing Rope. The two rows of dimples surrounding the penetration to be filled
Designers to include the correct method and detailing to form all joints and junctions, to ensure they are correctly lapped and sealed in accordance with the manufacturer's recommendations, including those between:
- waterproofing system and superstructure damp proofing
- horizontal and vertical waterproofing
- waterproofing system components.
Tanking systems to be properly connected to and made continuous with wall damp proof courses/radon dpc trays.
Drainage
Incorporate Aqua Channel as manufacturers details at wall/floor junctions
A drainage system of suitable capacity should be provided to collect and disposed of the infiltration water. The system must be maintainable and inspected at regular intervals.
Drainage to be either gravity or a sump pump to be installed to a suitable outlet with access points for servicing and maintenance.
To prevent backflow, the drainage system should be fitted with a one-way valve.
Depending upon ground conditions and recommendations from the BCO, drains may be connected to surface drainage systems or soakaways.

ELECTRICAL
All electrical work required to meet the requirements of Part P (electrical safety) must be designed, installed, inspected and tested by a Competent Person registered under a Competent Person Self Certification Scheme such as BRE certification Ltd, BSI, NICEIC Certification Services or Zurich Ltd. An appropriate BS7671 Electrical Installation Certificate is to be issued for the work by a person competent to do so. A copy of a certificate will be given to Building Control on completion.

INTERNAL LIGHTING
Install low energy light fittings that only take lamps having a luminous efficiency better than 80 lumens per circuit watt. All fixed to have lighting capacity (lm) 185 x total floor area, to comply with Part L of the current Building Regulations and the Domestic Building Services Compliance Guide.

NEW AND REPLACEMENT DOORS
New and replacement doors to achieve a U-Value of 1.4W/m²K. Glazed areas to be double glazed with 16-20mm argon gap and soft low-E glass. Glass to be toughened or laminated safety glass to BS 6206, BS EN 14179 or BS EN ISO 12543-1 and Part K of the current Building Regulations.
Insulated plasterboard to be used in reveals to abut jambs and to be considered within reveal soffits. Fully insulated and continuous cavity closers to be used around reveals.
Windows and door frames to be taped to surrounding openings using air sealing tape.

CONDENSATION RISKS
The risk of condensation to be assessed by a specialist. A condensation risk analysis to be carried out and the tanking and thermal insulation system to be designed and installed to prevent any potential condensation/ interstitial condensation problems.
Walls, floors and roof of the building to be designed and constructed so that their structural and thermal performance will not be adversely affected by interstitial condensation, surface condensation or mould growth.
Account to be taken of the building's form and orientation in relation to topography, prevailing winds, sunlight and over-shadowing, and the rate at which humidity is generated.
Materials with the highest vapour resistance should be located on the warm side of a thermal element. VCLs to be provided where necessary.
The junctions between elements are designed to Accredited Construction Details or guidance of BRE IP17/01] and BS 5250:2021 Management of moisture in buildings to be followed.

Notes:

The contractor is responsible for checking dimensions, tolerences and references. Any discrepancy to be verified with the architect before proceeding with the work

Where an item is covered by drawings to different scales the larger scale drawing is to be worked to

Revisions:

Clients
Ivan and Viktoria Kulinits

Project:
148 Pine Gardens, Ruislip HA4 9TH

Drawing:
Construction Notes

Scale:
NTS

Date:
July 2023

Drawn By:
PR

Checked By
PR

Drawing No:
104-104

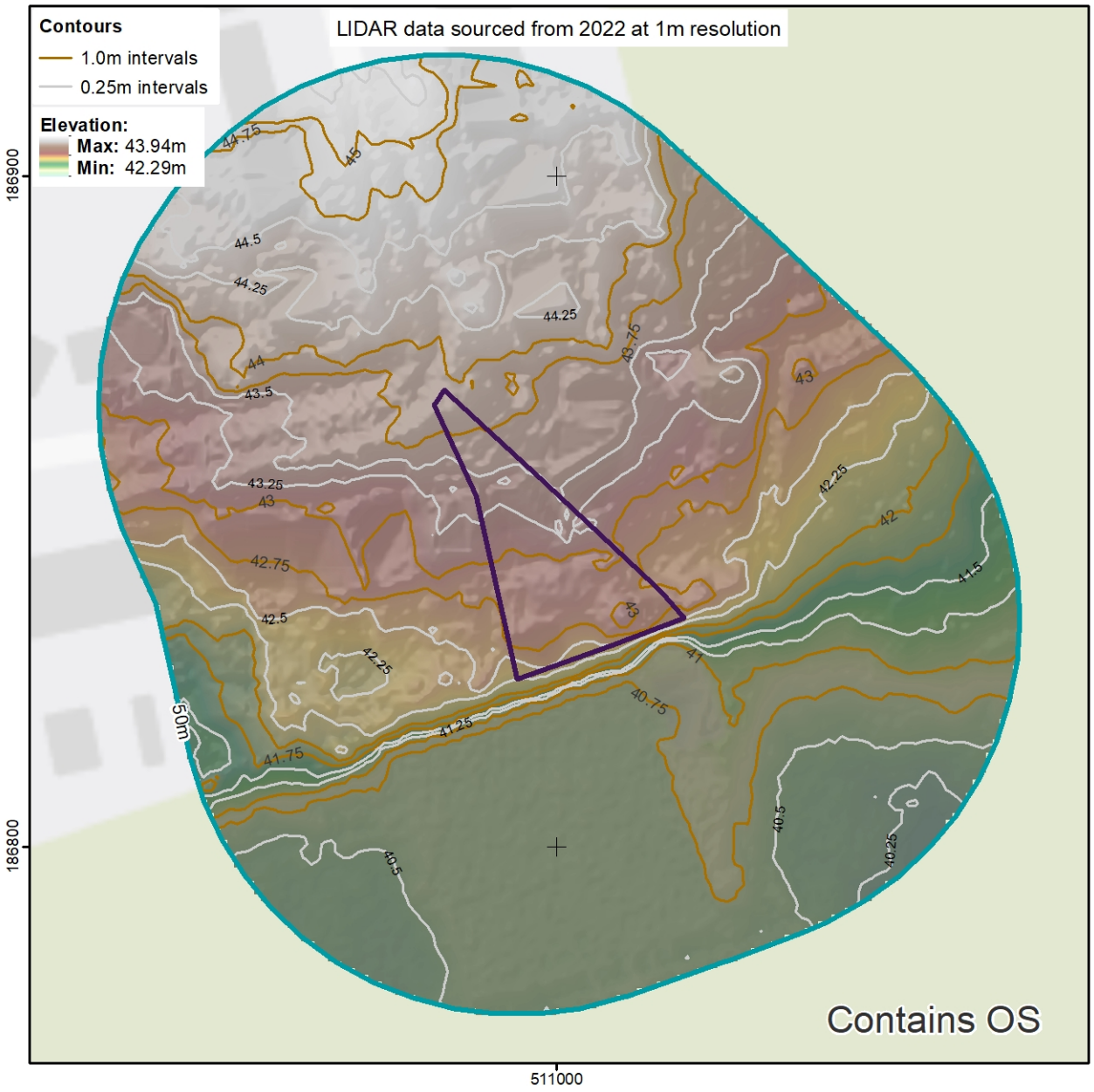
London Residential Architects

A: Stanmore Business and Innovation Centre HA7 1BT
T: 07759 058084
E: philiprhyder@yahoo.co.uk

GeoSmart Information

Appendix B

Environment Agency LiDAR map



GeoSmart Information

Appendix C

Thames Water sewer flooding report

Sewer Flooding
History Enquiry

Property Searches

GeoSmart Information Ltd

Bellstone

Search address supplied	148 Pine Gardens Ruislip HA4 9TH
Your reference	80690
Our reference	SFH/SFH Standard/2023_4898408
Received date	**17 October 2023**
Search date	**17 October 2023**

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Sewer Flooding
History Enquiry

Property Searches

Search address supplied: 148,Pine Gardens,Ruislip,HA4 9TH

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Sewer Flooding
History Enquiry

Thames Water Property Searches

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

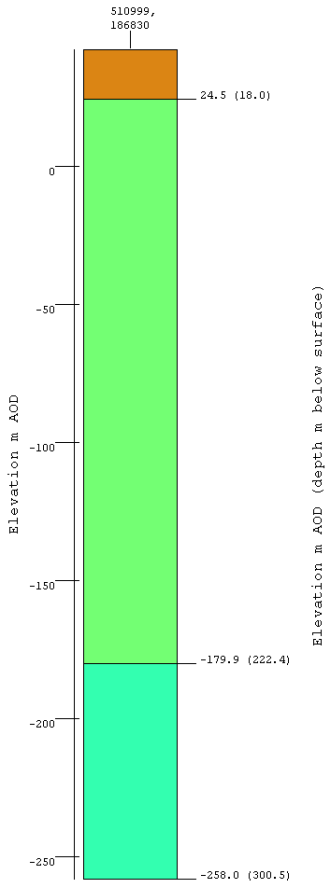
GeoSmart Information

Appendix D

London and Thames Valley Model borehole

3D geological model synthetic log

Synthetic borehole log derived from the BGS **London and Thames Valley** model



Legend

- Lambeth Group
- Chalk Group
- Gault Formation And Upper Greensand Formation (Undifferentiated)

Vertical Exaggeration is 2.96

Further information about the model:
Mathers, S J, Burke, H F, Terrington, R L, Thorpe, S, Dearden, R A, Williamson, J P, Ford, J R. 2014. A geological model of London and the Thames Valley, southeast England. *Proceedings of the Geologists' Association*, 125 (4). 373-382.

This synthetic log is derived from a model with a 50 m grid resolution and should not be used as a replacement for site investigation.

The 3D geological model is a generalisation of reality constrained by the data available at the time of the model construction. It is an interpretation only and actual ground conditions encountered may be different from those shown. Users should consult additional information provided and users of the model outputs do so at their own risk.

For comprehensive information on the geology and hydrogeology at this point, please use our BGS GeoReport Service at https://shop.bgs.ac.uk/Shop/Department/GeoReports.

Gridded surfaces from geological models are available to licence. Further information about available data can be found on the GeoIndex BGS Lithoframe layer, the BGS Lithoframe webpage, or by contacting our enquiries service.

Disclaimer

This report has been prepared by GeoSmart in its professional capacity as soil, groundwater, flood risk and drainage specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by GeoSmart solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to GeoSmart at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, GeoSmart may, by prior written agreement, agree to such release, provided that it is acknowledged that GeoSmart accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. GeoSmart accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual or otherwise, against GeoSmart except as expressly agreed with GeoSmart in writing.

For full T&Cs see http://geosmartinfo.co.uk/terms-conditions

Important consumer protection information

This search has been produced by GeoSmart Information Limited, Suite 9-11, 1st Floor, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU.

Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

GeoSmart Information Limited is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom.
- sets out minimum standards which firms compiling and selling search reports have to meet.
- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals.
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.
- By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports.
- act with integrity and carry out work with due skill, care and diligence.
- at all times maintain adequate and appropriate insurance to protect consumers.
- conduct business in an honest, fair and professional manner.
- handle complaints speedily and fairly.
- ensure that products and services comply with industry registration rules and standards and relevant laws.
- monitor their compliance with the Code.

GeoSmart Information

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award up to £5,000 to you if the Ombudsman finds that you have suffered actual financial loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs contact details:

The Property Ombudsman scheme

Milford House

43-55 Milford Street

Salisbury

Wiltshire SP1 2BP

Tel: 01722 333306

Fax: 01722 332296

Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk.

Please ask your search provider if you would like a copy of the search code

Complaints procedure

GeoSmart Information Limited is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly. If you want to make a complaint, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk.

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision. Complaints should be sent to:

Martin Lucass

Commercial Director

GeoSmart Information Limited

Suite 9-11, 1st Floor,

Old Bank Buildings,

Bellstone, Shrewsbury, SY1 1HU

Tel: 01743 298 100

martinlucass@geosmartinfo.co.uk

10. Terms and conditions, CDM regulations and data limitations

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CDM regulations can be found on our website:

http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/

Data use and limitations can be found on our website:

http://geosmartinfo.co.uk/data-limitations/