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Denville Hall

1521-LSL-XX-XX-RP-C-FRA

Flood Risk Assessment

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1.0 Introduction

1.1 Scope

London Structures Lab was commissioned by Denville Hall 2012 Ltd to undertake a flood risk assessment (FRA) for the proposed development at Denville Hall, 62 Duck's Hill Rd, London, Northwood HA6 2SB.

This report has been produced in support of a planning application and should be read in conjunction with the other planning documents.

1.2 Sources of Information

This report has been prepared based on the following set of information:

- Topographical Survey by Murphy Geospatial drawing MGS41468-T-02 dated May 2021
- Landscape proposal by Kalli-architecture and design Ltd, drawing reference GA (-2) 201.1 Proposed Master Plan
- Utilities records – Thames Water record reference ALS/ALS Standard/2018_3880986, dated September 2018
- Desk Study: Preliminary Risk Assessment – Groundsure investigation report reference GSP-2018-1161 FINAL, dated October 2018
- Environment Agency (EA) online flood maps at https://flood-map-for-planning.service.gov.uk/
- British Geological Survey online mapping available at https://mapapps.bgs.ac.uk/geologyofbritain/home.html?&_ga=2.111570884.1580712057.1616278391-1852494143.1597654958
- Magic website mapping available at https://magic.defra.gov.uk/magicmap.aspx
- Lead Local Flood Authority (LLFA) information – London Borough of Hillingdon SuDS Design Guide available at https://www.hillingdon.gov.uk/suds
- Lead Local Flood Authority (LLFA) information – Strategic Flood Risk Assessment (SFRA) available at https://westlondonsfra.london/
- Guidance on Flood risk and coastal change – UK Government, available from https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-3-Flood-risk-vulnerability

1.3 Limitations

This report has been prepared in accordance with the National Planning Policy Framework (NPPF) and Local Planning Policy. The proposed flood management (including ground floor level

recommendations) and surface water management strategies are based on the relevant British Standards (BS8533), the standing advice provided by the EA or based on common practice. The findings of this report are based on the information available at the time of the production.

The Construction (Design and Management) Regulations 2015 (CDM Regulations) will apply to any future development of this site which involves "construction" work, as defined by the CDM Regulations. As such it is the responsibility of the proposed developer (ultimate client) to fulfil its duties under the CDM Regulations.

2.0 Site Setting

2.1 Site Description

Denville Hall is a care home facility comprising a historic manor house (c.1851) and contemporary extension block (c.2004). The site coverers 1.25 ha in area and is located northwest of Ducks Hill Road, Northwood, London Borough of Hillingdon HA6 2SB. The approximate grid reference for the site is 508107E, 191341N. The planning boundary for the proposed works is shown below.

Figure 2.1 – Proposes planning boundary

2.2 Proposed Development

The proposed development includes of no. 48 and no. 60 Ducks Hill Road, a derelict garage and wooden storage unit and the erection of 12 assisted-living units (Class C2) in two separate buildings (Buildings A and B) and proposed ancillary communal space, including café and restaurant (Building C) accessed through connecting link building and associated landscaping.

2.3 Topography

An onsite topographic survey has been carried out by Murphy Geospatial. The proposed section for development is irregular in shape and slopes gently downward from west to east.

2.4 Hydrology

Ordnance Survey (OS) mapping and the EA's web-based mapping indicate that the River Colne is located approximately 2 km to the northwest of the site and Scarlet Spring is located approximately 2 Km to the southeast of the site.

2.5 Geology

Based on the information available from BGS online mapping:

- Bedrock geology description - Lambeth Group - Clay, Silt and Sand. Sedimentary Bedrock formed approximately 48 to 59 million years ago in the Palaeogene Period. Local environment previously dominated by swamps, estuaries and deltas.
- Superficial deposits – none recorded.

The nearest borehole records with similar geological profiles to the site available from this website are summarised below:

- TQ09SE275, approximately 700 m southeast of the site, dated 2010 - indicated uppermost 0.5 m gravel and topsoil, with sand between 0.5 to 5.0 m and white chalk below to a drilled depth of 50 m. Cover level not reported. Water struck at 25–30 m below ground level, with rest water level reported at 12 m below ground level.
- TQ09SE181, approximately 700 m east of the site, dated 2007 - indicated made ground to a depth of 2 m with stiff to very stiff light brown mottled grey slightly gravelly clay from 2 m to a trial pit depth of 4 m. Cover level not reported. Trial pit remained reportedly dry.
- TQ09SE22, approximately 700 m west southwest of the site, dated 1944 – indicated upper 6.7 m London clay, with Reading beds between 6.7 and 16.5 m, with upper chalk between 16.5 and 97.5 m and middle chalk below to a drilled depth of 106.7 m. Cover level recorded at 74.4 m AOD. No record of water encountered.
- TQ09SE51, approximately 670 m northwest of the site, dated 1903 – indicated upper 3 m gravel sand and clay (drift), with London clay between 3 to 21 m, with Reading beds between 21 to 35.7 m and upper and middle chalk below to a drilled depth of 137 m. Cover level recorded at 103.6 m AOD. Water reportedly struck at 55.5 m below cover level.

Soilscape information available from Magic Maps service indicate this area as:

- Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils

At the time of the report production, no detailed site investigation works has taken place.

2.6 Hydrogeology

The following hydrogeological information was obtained from the online Magic Maps service.

- Aquafer destination (Bedrock) – Secondary A
- Aquifer Designation Map (Superficial Drift) – no features found
- Groundwater Vulnerability – Medium

BGS borehole log reference TQ09SE275 recorded water struck at 25 to 30 m, with the rest water level at 12m on completion of drilling. BGS borehole log reference TQ09SE51 recorded water struck at 48.1 m AOD, 55.5 m below a cover level of 103.6 m AOD.

2.7 Existing Drainage

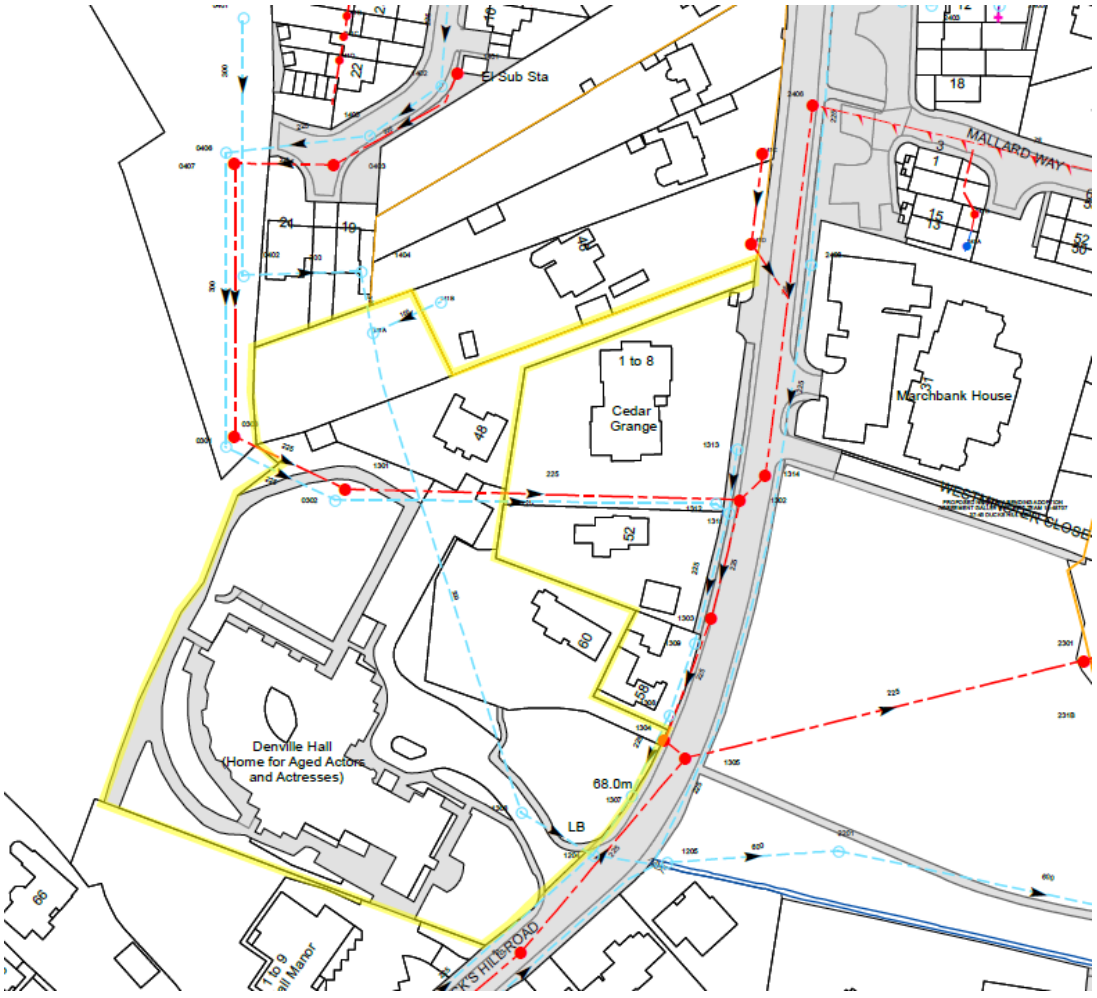

Figure 2.2 – Thames Water asset record reference ALS/ALS Standard/2018_3880986, dated September 2018

Thames Water asset record reference ALS/ALS Standard/2018_3880986, dated September 2018 indicates foul water and surface water sewers run west to east and cross the northern region of the site; with manhole access to each within the site boundary close to the western edge. A

further surface water sewer crosses the site near the northwest corner and runs to the southeast corner of the site. Manhole access to this surface water sewer is available in both the northwest and southeast corners within the site boundary. In addition, foul water and surface water sewers run adjacent to the site's eastern boundary along Duck's Hill Road. A schematic excerpt from Thames Water asset record reference ALS/ALS Standard/2018_3880986 reproduced in Figure 2.1.

3.0 Flood Risk

3.1 Criteria

The flood risk elements that need to be considered for any site are defined in BS 8533- 'Assessing and managing flood risk in development Code of practice' (October 2011) as the "Forms of Flooding" which are listed as:

- Flooding from rivers (fluvial flood risk)
- Flooding from the sea (tidal flood risk)
- Flooding from the land/surface water (pluvial flood risk)
- Flooding from groundwater
- Flooding from sewers (sewer and drain exceedance, pumping station failure etc)
- Flooding from reservoirs, canals and other artificial structures

The following section reviews each of these in respect of the subject site.

3.2 Fluvial Flood Risk

The latest EA published flood zone map (Figure 3.1 below) shows that the site lies within Flood Zone 1, i.e. land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding. As the site is within Flood Zone 1, there is a low risk of fluvial flooding to the site.

Based on the above, the risk of flooding from rivers is considered very low.

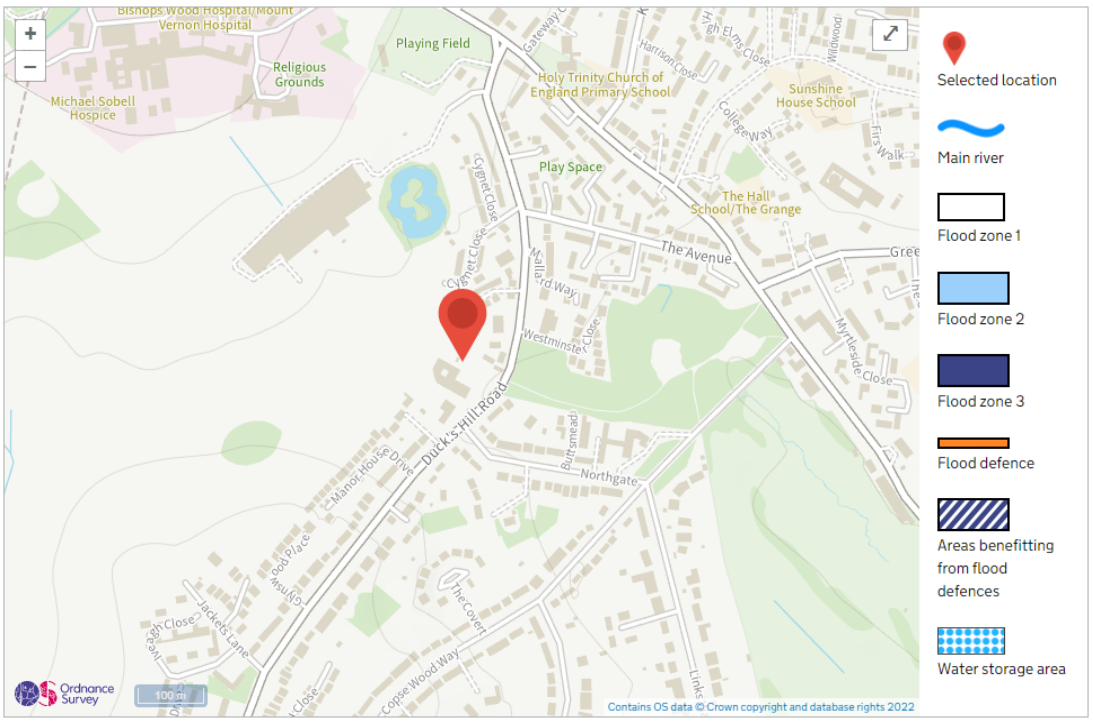

Figure 3.1 – EA Fluvial flood risk map

3.3 Tidal Flood Risk

The site is located inland and approximately 15 km beyond the tidal regions of the River Thames. Therefore, there is very low risk of flooding from this source.

3.4 Pluvial Flood Risk

Surface water flooding occurs when the rainwater does not drain away through the normal drainage system or infiltrate the ground, but instead lies on or flows over the ground.

Surface water flood risk to the site has been assessed using EA mapping. The maps were produced using 'direct rainfall' modelling. Although they consider local drainage capacity, non-surface water influences such as rivers, seas or groundwater are not considered. The map is based on LIDAR topographic data which is not suitable for site specific assessment and therefore, where available, topographic survey data should be used to provide a more accurate understanding of potential flow paths.

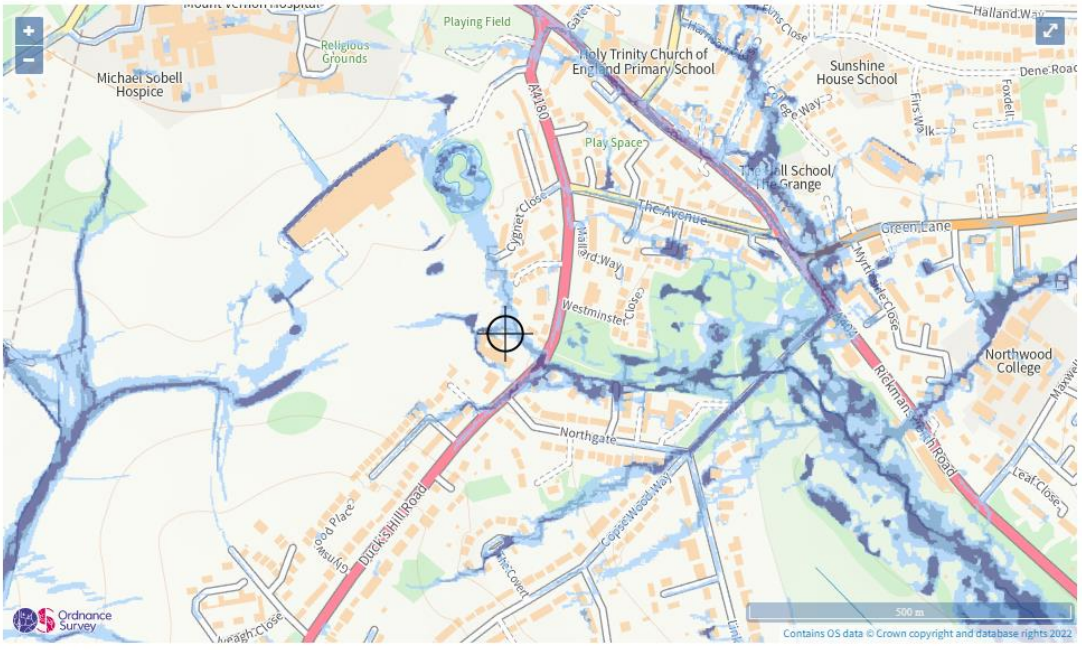

Figure 3.2 – EA mapping for surface water

EA surface water flood mapping indicates localised surface water flooding to some areas of the site as shown in Figure 3.2. Localised surface water flooding is also indicated to the southeast of the site boundary along Duck's Hill Road.

The EA has confirmed that there is no Product 4 data available for the site. Therefore, site specific surface water flood modelling has been undertaken to provide an informed understanding about the potential depth of surface water associated with the overland flow routes through the site. Figure 3.3 and Figure 3.4 provide the modelled depth of surface water flow through the site for a 1 in 100-year event, for scenarios with and without climate change allowance.

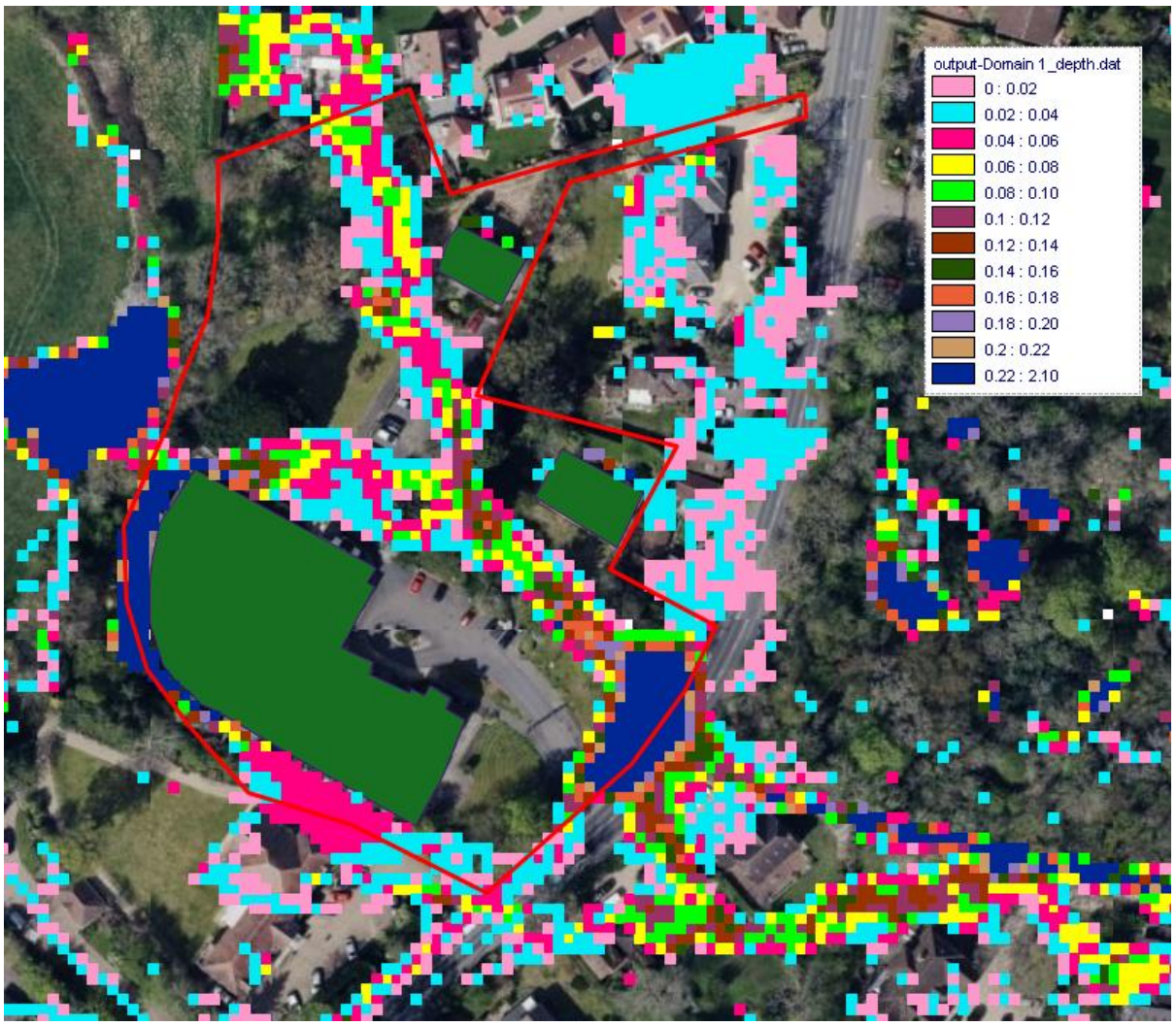

Figure 3.3 – Surface water flow depth for 1 in 100-year rainfall event

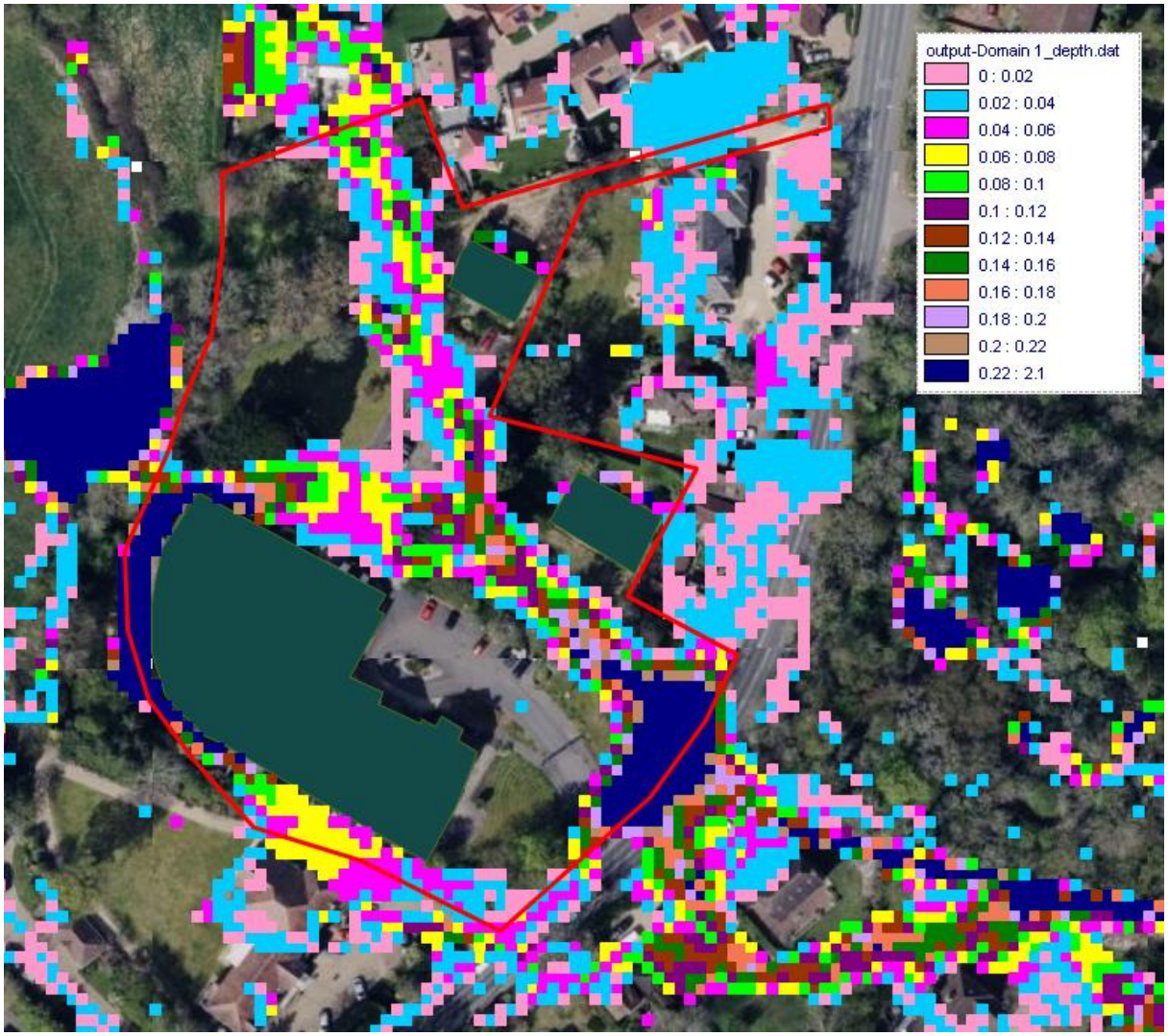

Figure 3.4 - Surface water flow depth for 1 in 100-year rainfall event with climate change added

For majority of the site, the depths are less than 120 mm. Where the new building C is proposed to be located to the north-east of the site, the depth varies from 20 mm to 160 mm when the climate change allowance is taken into account.

Based on the EA's mapping, local topography and site-specific surface water modelling, the risk of surface water flooding to the proposed locations of built structures is considered to be low to high. Hence, consideration should be given to accommodating the surface water flow paths in the proposed layouts to mitigate any potential increase in surface water flood risk to other areas on site or elsewhere.

3.5 Groundwater Flood Risk

Appraisal of BGS borehole logs from the closest available records with similar geology to the site informed that water was struck at 25 to 30 m below ground level at borehole reference TQ09SE275 approximately 700 m southeast of the site, with the rest water level recorded to be at 12 m below ground on completion of drilling. BGS borehole log reference TQ09SE51 recorded water struck at 48.1 m AOD, 55.5 m below a cover level of 103.6 m AOD.

The proposed development includes a below ground level cinema with FFL at 68.8 mAOD, 3.2 m below ground floor level. Based on the evidence available at the time of assessment, the risk of ground water flooding to the site is considered to be low.

At the time of the report production, no detailed site investigation works has taken place.

3.6 Sewer/Drainage Flood Risk

Sewer flooding is often caused by excess surface water entering the drainage system when there is insufficient sewer capacity to cope with this excess water, but also due to 'one off' events such as blockages.

Thames Water is the statutory undertaker for the local public sewer network. The Thames Water foul water and surface water sewer network cross the northern region of the site running west to east, with a further surface water sewer crossing the site from the northwest to the southeast corner. In addition, foul water and surface water sewers run adjacent to the site's eastern boundary along Duck's Hill Road.

There are no records within any local flooding and drainage documents of sewer flooding in the area. Therefore, the risk of sewer flooding to the site is considered to be low.

3.7 Reservoirs/Canal Flood Risk

The EA has produced a Reservoir Flood Map that shows that the site is not at risk from reservoir flooding.

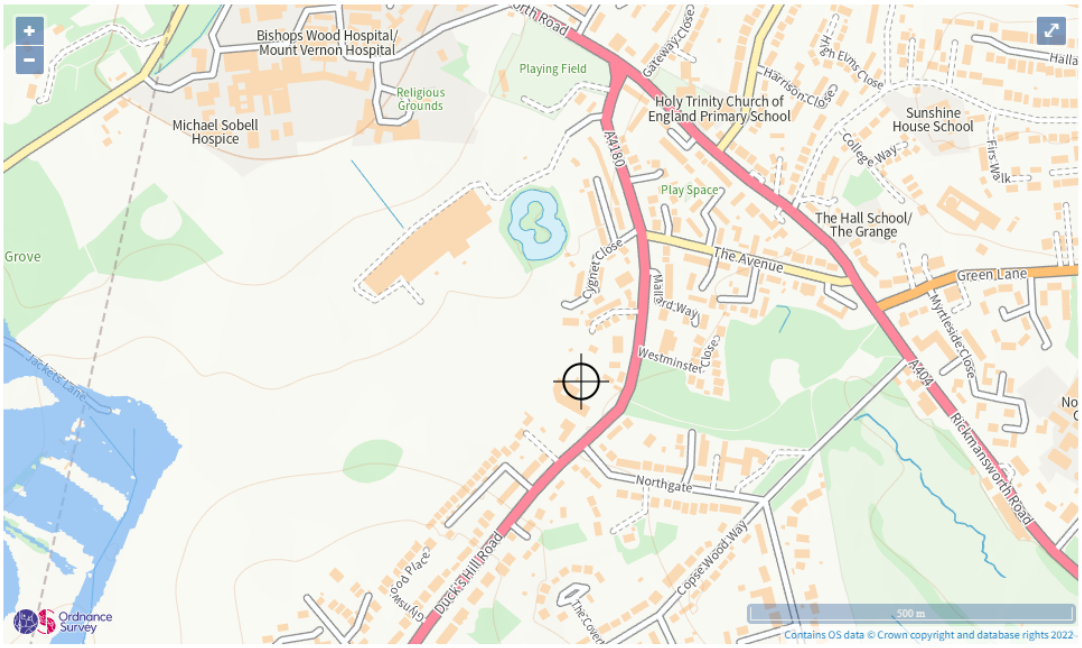

Figure 3.5 – EA reservoir flood risk map

It should also be emphasised that the risk of flooding from reservoir breach is very small since the EA is the enforcement authority for the Reservoirs Act (1975) and all large raised reservoirs are inspected and supervised by reservoir panel engineers.

On this basis, the risk from reservoir flooding to the site is considered to be negligible.

3.8 Summary of Flood Risk

The following table provides a summary of flood risk for the site:

Table 3.1 – Summary of Sources of Flood Risk

Source of Flooding	Risk Level	Source of Data	Comments, Mitigation Requirements
Fluvial	Low	EA mapping	Flood zone 1
Tidal	Low	EA mapping	Inland location
Surface water (Pluvial)	High	EA mapping and site-specific surface water flood modelling	Surface water flood mapping indicate some localised flooding around the northern, western and eastern site boundaries, with further surface water flooding indicated along Duck's Hill Road adjacent to the eastern site boundary. Site specific flood modelling indicate a flow path

Source of Flooding	Risk Level	Source of Data	Comments, Mitigation Requirements
			passing through the site affecting the proposed layout
Groundwater	Low	BGS mapping	Borehole records within a 700 m radius of the site recorded groundwater levels to be substantially lower than proposed FFLs.
Sewers	Low	LLFA information	No available records of sewer flooding in the area
Reservoirs, Canals	Low	EA mapping	Site not affected

Key	Description
	Low/Negligible Risk – No noticeable impact to site and not considered to be a constraint to development.
	Medium Risk – Issue requires consideration but not a significant constraint to development
	High Risk – Major constraint to development requiring active consideration in mitigation proposals

4.0 Flood Risk Mitigation

Appropriate flood mitigation measures should be considered when developing the design for the site.

4.1 Climate Change Allowances

Appropriate climate change allowances should be applied when developing the surface water drainage design. In line with the latest government guidance, the surface water drainage design must be able to cater with a rainfall event up to and including the 1 in 100 year + 40% allowance for climate change at this location.

4.2 Overland Flood Flow

EA mapping identifies overland flows through the site. Site specific surface water modelling has provided more specific surface water depth information associated with these flow paths. These need to be accommodated in the proposed layout either by providing alternative routes or incorporating mitigating design features into the proposed building arrangements.

SuDS measures are to be provided on site to control and store the surface water as a part of the surface water design for the development, as required. Surface flows may be generated on site due to drainage capacity exceedance, which can be conveyed into the SuDS features via surface flows along the hard standing areas.

Please refer to Surface Water Drainage Strategy report (Ref: 1521-LSL-XX-XX-RP-C-SWS) for further details on proposed arrangements for accommodating surface water flow paths and SuDS strategy.

4.3 Finished Floor Levels

As this site is unlikely to be affected by fluvial flooding there is no need to incorporate any freeboard levels into the finished floor levels of the design. Low lying areas that could lead to ponding of surface flows should be avoided by careful design of finished levels. It would be prudent to raise ground floor levels at least 150 mm above surrounding land to protect against ingress of ponded surface water or groundwater. The finished floor levels may need to be raised further to accommodate drainage requirements. This should be addressed as a part of the surface water drainage strategy.

4.4 Flood Compensation

The site is shown to be outside the 1 in 100-year climate change floodplain, so floodplain compensatory measures are not deemed necessary.

4.5 Safe Access/Egress

Flood Zone 1 refers to land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%) i.e. lowest risk level. As the site lies outside of the 1 in 1,000-year flood extent, safe access and egress will be available up to this extreme storm event.

5.0 Planning Context

5.1 Land Use Vulnerability

Table 3 of the Planning Practice Guidance (PPG) indicates the compatibility of various land uses in each flood zone, dependent on their vulnerability to flooding. Table 6.1 below is reproduced from Table 3 of the PPG.

Figure 5.1 – Table 3 of PPG detailing Flood Risk Vulnerability Classification

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Annex 3 of the PPG classifies 'Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels' as 'More vulnerable'. This classification of development is appropriate for areas within Flood Zone 1 and therefore appropriate for the subject site.

5.2 Sequential Test

The Sequential Test aims to direct new development to areas with the lowest probability of flooding. The site has been identified as located within Flood Zone 1 with no other significant flooding issues from other sources except surface water. The existing surface water flow path will be accommodated within the layout with appropriate mitigation measures provided in order not to increase the flood risk on site or elsewhere. It is therefore considered to pass the Sequential Test.

5.3 Exception Test

In accordance with Table 3 of the PPG, there is no requirement to apply the Exception Test for a 'more vulnerable' development within Flood Zone 1.

6.0 Conclusion

This FRA has been undertaken for the proposed development at Denville Hall, 62 Duck's Hill Rd, London, Northwood HA6 2SB. The site coverers 1.25 ha in area and currently contains care home facilities with associated access and landscaping.

The proposed development will see the demolition of 4 No. existing buildings to the north of Denville Hall and construction of 3 No. new buildings with residential and community facilities for residents, including enhancements to the landscaping.

This FRA complies with the NPPF and Planning Practice Guidance and demonstrates that flood risk from all sources has been considered in relation to the proposed development. It is also consistent with the Local Planning Authority requirements with regards to flood risk.

The proposed development site lies in an area designated by the EA as Flood Zone 1, and is outlined to have a chance of fluvial flooding of less than 1 in 1,000 (<0.1%) in any year. A summary of the flood risk and any associated mitigation measures are summarised in Table 6.1.

Table 6.1 – Flood risk summary

Source of Flooding	Risk Level	Mitigation
Fluvial	Low	N/A
Tidal	Low	N/A
Surface water (Pluvial)	High	Surface water drainage design to be developed to address any onsite surface water flood risk and existing flow paths
Groundwater	Low	N/A
Sewers	Low	N/A
Reservoirs, Canals	Low	N/A

The surface water drainage design for the site is to be developed in line with the LLFA requirements and applying appropriate mitigation factors. The LLFA requires a system that caters for a 1 in 100-year rainfall event + 40% allowance for climate change. This is to be addressed as a part of the surface water drainage strategy for the scheme.

Overall, taking into account the provided information, the development of the site should not be precluded on flood risk grounds.