GeoSmart Information

FloodSmart Plus

Flood Risk Assessment

Site Address

Lower Fleet Marston Farmhouse
Berryfields Gated Road
Quarrendon
Aylesbury
Buckinghamshire
HP22 4AA

Grid Reference

477614, 217627

Report Prepared for

Mr John P Leyden

Date

2024-04-19

Report Status

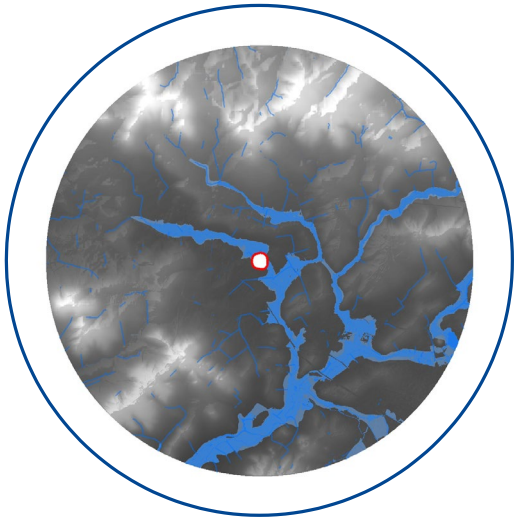
FINAL

Site Area

1.08 ha

Report Reference

81524R1



RISK – Very Low to Medium

The Site is mapped within the EA's fluvial Flood Zone 1, 2 and 3 (Low to High probability) from the Fleet Marston Brook. According to the EA's Risk of Flooding from Rivers and Sea (RoFRS) map, the Site has a risk of flooding ranging from Very Low to Medium taking into account the presence of defences.

Surface water (pluvial) flood risks to areas proposed for development are Very Low, Groundwater flood risks in areas proposed for development are Negligible, and flooding risks from artificial sources (i.e. canals, reservoirs and sewers) are Low.

Mitigation measures are recommended in this report to reduce the risks to an acceptable level over the lifetime of the development.

Report Author
Toby Kay
Consultant

Report Checker
James Robinson
Senior Consultant

Report Reviewer
Bob Sargent
Associate

GeoSmart Information Ltd
Suite 9-11, 1st Floor,
Old Bank Buildings,
Bellstone, Shrewsbury, SY1 1HU
+44(0)1743 298 100
info@geosmartinfo.co.uk
www.geosmartinfo.co.uk

1. Executive summary

A review has been undertaken of national environmental data sets to assess the flood risk to the Site from all sources of flooding in accordance with the National Planning Policy Framework (NPPF) (2023) and National Planning Practice Guidance (NPPG) (Published in 2014 and updated in August 2022). A site-specific flood risk assessment, to assess the flood risk to and from the development Site, is provided within this concise interpretative report written by an experienced GeoSmart consultant. Baseline flood risk and residual risks that remain after the flood risk management and mitigation measures are implemented are summarised in the table below.

Site analysis

Source of Flood Risk	Baseline[1]	After analysis[2]	After Mitigation[3]
River (fluvial) flooding	Very Low to Medium	Very Low to Medium	Very Low
Sea (coastal/tidal) flooding	Very Low		N/A
Surface water (pluvial) flooding	Very Low to High	Very Low	N/A
Groundwater flooding	Negligible to Moderate	Negligible	N/A
Other flood risk factors present	Yes (Culvert)		N/A
Is any other further work recommended?	Yes (see below)		

1 BASELINE risks assigned for the whole Site, using national risk maps, including the benefit of EA flood defences.

2 AFTER ANALYSIS modification of risk assessment based on detailed site specific analysis including some or all of the following: flood model data, high resolution mapping, building location, access routes, topographic and CCTV surveys. Reasons for the change in classification are provided in the text.

3 AFTER MITIGATION risks include risks to proposed development / asset and occupants if mitigation measures recommended in this report are implemented, including the impacts of climate change.

*N/A indicates where mitigation is not required.

Summary of existing and proposed development

The Site is currently used within a residential capacity as a two storey detached, dwelling including associated access, car parking and landscaping. Development proposals comprise

the construction of a 3-bay garage, a wall between the existing annex and main house, a folly, a pool house, a wetland garden, and a wildflower meadow. Site plans are included within Appendix A.

Summary of flood risks

The flood risks from all sources have been assessed as part of this report and are as follows:

River (fluvial) and Sea (Estuarine/Coastal) flooding

According to the Environment Agency's (EA) Flood Map for Planning Purposes, the Site is located partially within a fluvial Flood Zone 3 (High probability).

Natural High Ground (Asset ID: 9825 and 8886) is located 10m to the northeast of the Site on both banks of Fleet Marston Brook. According to the EA (2024) these assets will defend up to a 1 in 2 year flood event. The current condition of the assets is unknown.

According to the EA's Risk of Flooding from Rivers and Sea (RoFRS) map, which considers the type, condition and crest height of flood defences, the Site has a risk of flooding ranging from Very Low to Medium. from the nearby watercourse, Fleet Marston Brook.

The Site could potentially be at risk from flooding due to blockage or failure of a culvert located on the water course 10m from the Site.

- Modelled flood data obtained from the EA has been analysed in line with the most up to date guidance on climate change (EA, 2022), to confirm a maximum "design" flood level at the Site.
- During a 1 in 100 year plus 31% climate change allowance event the flood level at the Site would be 73.85mAOD.
- During this event, flood depths in the area proposed for the garage development could be up to 0.65m. Flood mitigation measures are included in the next section.

Emergency evacuation routes are available to the south. In the event of a flood, safe refuge can be taken on the 1st floor levels and above.

Surface water (pluvial) flooding

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

- Flooding would not affect the area proposed for development in the 1 in 100 year present day scenario event.
- Flooding would not affect the area proposed for development in the 1 in 100 year plus climate change event.

Baseline mapping indicates a Very Low to High. risk, however a review of the l proposed development layout indicates the risk is likely to be Very Low.

Groundwater flooding

Groundwater Flood Risk screening data indicates there is a variable potential risk of groundwater flooding at the surface in the vicinity of the Site, during a 1 in 100 year event ranging from Negligible to Moderate.

- The Moderate risk of groundwater flooding is confined the northeast of the Site which contains underlying permeable superficial Alluvium deposits. Areas proposed for development are at Negligible risk of groundwater flooding.

Baseline mapping indicates a Negligble to Moderate risk, however a review of the borehole data and proposed development layout indicates the risk is likely to be Negligible.

Artificial sources of flooding

The risk of flooding from artificial (man-made) sources such as reservoirs, sewers and canals has been assessed:

- The EA's Risk of Flooding from Reservoir map confirms the Site is not at risk of reservoir flooding. The potential for a breach of a reservoir to occur and flooding affecting the Site is low.
- Ordnance Survey (OS) data confirms there are no canals near to the Site.
- Section 5.7.1 of the SFRA has identified 0 incidences or modelled incidences of flooding as a result of surcharging sewers within the HP22 4 postcode (JBA, 2017).
- 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, 2024; Appendix C).
- A culvert has been identified 10m to the northeast of the Site. This structure may pose a flood risk to the Site should it become blocked or damaged.

The risk of flooding from artificial sources is considered to be Low.

In accordance with paragraphs 167, 174 and footnote 60 of the NPPF (2023), as the development proposals are comprised of a Minor Development within Flood Zone 3 the sequential test is not required.

Recommendations

Recommendations for flood mitigation are provided below, based upon the proposed development and the flood risk identified at the Site.

- There is a risk of flooding from fluvial sources, where flood depths could be up to 0.45m in depth in the area which is currently proposed for development.
- The development layout should be reconfigured in order to relocate the proposed garage outside of the Flood Zone (e.g. 30m southeast) to reduce the risk from fluvial sources. It is understood from the client that this will not be feasible due to the fact that moving the garage outside of the Flood Zone would require the removal of a number of large trees and would negatively impact the line of site from the rear of the existing dwelling.
- As the proposed garage development cannot be relocated, the development is non-habitable and there is a risk of flooding from fluvial sources where flood depths could be up to 0.45m in depth in the area proposed for development, standard flood resilient design measures should be incorporated.
- The ongoing management and maintenance of existing and any proposed drainage networks, under the riparian ownership of the developer, should be undertaken in perpetuity with the development.
- If the development is not able to be relocated, an assessment of floodplain storage should be considered to ensure the proposed development does not displace flooding.
- A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for effective management of surface water runoff over the lifetime of the proposed development.

GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.

2. Introduction

Background and purpose

A site-specific flood risk assessment has been undertaken, to assess the flood risk to and from the development Site. This assessment has been undertaken by firstly compiling information concerning the Site and the surrounding area. The information gathered was then used to construct a 'conceptual site model', including an understanding of the appropriateness of the development as defined in the NPPF (2023) and the source(s) of any flood risk present, guided by the NPPG (Published in 2014 and updated in August 2022). Finally, a preliminary assessment of the steps that can be taken to manage flood risk to the development was undertaken.

This report has been prepared with reference to the NPPF (2023) and NPPG (2022).

"*The National Planning Policy Framework set out the Government's planning policies for England and how these are expected to be applied*" (NPPF, 2023).

The NPPF (2023) and NPPG (2022) promote a sequential, risk based approach to the location of development. This also applies to locating a development within a Site which has a variable risk of flooding.

"*The approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. This means avoiding, so far as possible, development in current and future medium and high flood risk areas considering all sources of flooding including areas at risk of surface water flooding*" (Paragraph: 023. NPPG, 2022).

The purpose of this report is to provide clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at the Site.

Report scope

In accordance with the requirements set out within NPPG 2022 (Paragraph: 021 Reference ID: 7-021-20220825), a thorough review of publicly and commercially available flood risk data and EA supplied data indicating potential sources of flood risk to the Site from rivers and coastal sources, surface run-off (pluvial), groundwater and reservoirs, including historical flood information and modelled flood extent. Appropriate measures are recommended to manage and mitigate the flood risk to the property.

Information obtained from the EA and a review of the Aylesbury Vale District Council Strategic Flood Risk Assessment (SFRA) (JBA, 2017) and the Vale of Aylesbury Local Plan (Aylesbury Vale District Council, 2021) are used to ascertain local flooding issues and, where appropriate, identify information to support a Sequential and/or Exception test required as part of the NPPF (2023).

The existing and future flood risk to and from the Site from all flood sources is assessed in line with current best practice using the best available data. The risk to the development has been assessed over its expected lifetime, including appropriate allowances for the impacts of climate change. Residual risks that remain after the flood risk management and mitigation

measures are implemented, are considered with an explanation of how these risks can be managed to keep the users of the development safe over its lifetime.

An indication of whether the Site will potentially increase flood risk elsewhere is provided, including where the proposed development increases the building footprint at the Site. A drainage strategy to control runoff can be commissioned separately if identified as a requirement within this report.

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 (Appendix B)	Thames Water (Appendix C)	OS Data
Historical	X	X	X		
River (fluvial) / Sea (tidal/coastal)	X	X	X		

Source of flooding	Datasets consulted				
	Commercial Flood Maps	Local Policy & Guidance Documents *	Environment Agency (Appendix B)	Thames Water (Appendix C)	OS Data
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.

Local policy and guidance

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

Vale of Aylesbury Local Plan (Aylesbury Vale District Council, 2021):

I4 Flooding

Management of flood risk

a) In order to minimise the impacts of and from all forms of flood risk the following is required: Site-specific flood risk assessments (FRAs), informed by the latest version of the SFRA, where the development proposal is over 1ha in size and is in Flood Zone 1, or the development proposal includes land in Flood Zones 2 and 3 (as defined by the latest Environment Agency mapping). A site-specific FRA will also be required where a development proposal affects land in Flood Zone 1 where evidence, in particular the SFRA, indicates there are records of historic flooding or other sources of flooding, e.g. due to critical drainage problems, including from ordinary watercourses and for development sites located within 9m of any water courses (8m in the Environment Agency's Anglian Region50)

b) All development proposals must clearly demonstrate that the flood risk sequential test, as set out in the latest version of the SFRA, has been passed and be designed using a sequential approach, and

c) If the sequential test has been satisfied, development proposals, other than those allocated in this Plan, must also satisfy the exception test in all applicable situations as set out in the latest version of the SFRA.

Flood risk assessments

All development proposals requiring a Flood Risk Assessment in (a) above will assess all sources and forms of flooding, must adhere to the advice in the latest version of the SFRA and will:

d) provide level-for-level floodplain compensation, up to the 1% annual probability (1 in 100) flood extent with an appropriate allowance for climate change, and volume-for-volume compensation unless a justified reason has been submitted and agreed which may justify other forms of compensation

e) ensure no increase in flood risk on site or elsewhere, such as downstream or upstream receptors, existing development and/or adjacent land, and ensure there will be no increase in fluvial and surface water discharge rates or volumes during storm events up to and including the 1 in 100 year storm event, with an allowance for climate change (the design storm event)

f) not flood from surface water up to and including the design storm event, or any surface water flooding beyond the 1 in 30 year storm event, up to and including the design storm event will be safely contained on site

g) explore opportunities to reduce flood risk overall, including financial contributions from the developer where appropriate

h) ensure development is safe from flooding for its lifetime (and remain operational where necessary) including an assessment of climate change impacts

i) ensure development is appropriately flood resistant, resilient and safe and does not damage flood defences but does allow for the maintenance and management of flood defences take into account all sources and forms of flooding

j) ensure safe access and exits are available for development in accordance with Department for Environment, Food and Rural Affairs (DEFRA) guidance51. Access to “safe refuges” or “dryislands” are unlikely to be considered safe as this will further burden the Emergency Service in times of flood

k) include detailed modelling of any ordinary watercourses within or adjacent to the site, where appropriate, to define in detail the area at risk of flooding and model the effect of climate change

l) provide an assessment of residual flood risk

m) provide satisfactory Evacuation Management Plans, where necessary, including consultation with the Emergency Services and Emergency Planners

Aylesbury Vale District Council Strategic Flood Risk Assessment (JBA, 2017):

6.3 Requirements for flood risk assessments

The aim of an FRA is to demonstrate that the development is protected to the 1 in 100-year (1% AEP) event and is safe during the design flood event, including an allowance for climate change. This includes an assessment of mitigation measures required to safely manage flood risk. Where appropriate, the following aspects of flood risks should be addressed in all planning applications in flood risk areas:

- The area liable to flooding;
- The probability of flooding occurring now and over time;
- The extent and standard of existing flood defences and their effectiveness over time;
- The likely depth of flooding;
- The rates of flow likely to be involved;
- The likelihood of impacts to other areas, properties, habitats and protected species;
- The effects of climate change;
- The nature and currently expected lifetime of the development proposed and the extent to which it is designed to deal with flood risk; and
- Any opportunities to increase areas of Natural Flood Management to provide connectivity for the movement of flood water, habitats and protected species.

Development proposals requiring FRAs should therefore:

- Be performed in accordance with the requirements of the Sequential and, when necessary, the Exception Tests;
- Not increase flood risk, either upstream or downstream, of the site, taking into account the impacts of climate change;
- Seek to not increase surface water volumes or peak flow rates that would result in increased flood risk to the receiving catchments;
- Use opportunities provided by new development to, where practicable, reduce flood risk within the site and elsewhere;
- Ensure that where development is necessary in areas of flood risk (after application of the Sequential and Exception Tests), it is made safe from flooding for the lifetime of the development, taking into account the impact of climate change;
- Consider all sources of flood risk, including fluvial, surface water and drainage; and
- Seek to use Natural Flood Management solutions in the first instance.

FRAs for sites located in the study area should follow government guidance on development and flood risk, complying with the approach recommended by the NPPF (and its associated guidance) and guidance provided by the Environment Agency. The NPPF advocates a risk-based approach to flood risk management in terms of appraising, managing and reducing the consequences of flooding both to and from a development site.

Guidance

Strategic Flood Risk Assessments are carried out by local authorities, in consultation with the Environment Agency, to assess the flood risk to the area from all sources both now and in the future due to climate change. They are used to inform planning decisions to ensure inappropriate development is avoided (NPPF, 2023).

3. Site analysis

Site information

The Site is located in Quarrendon, Aylesbury in a setting of residential and agricultural land use at National Grid Reference SP 77614 17627.

Figure 1. Aerial imagery of the Site (Bluesky, 2024)

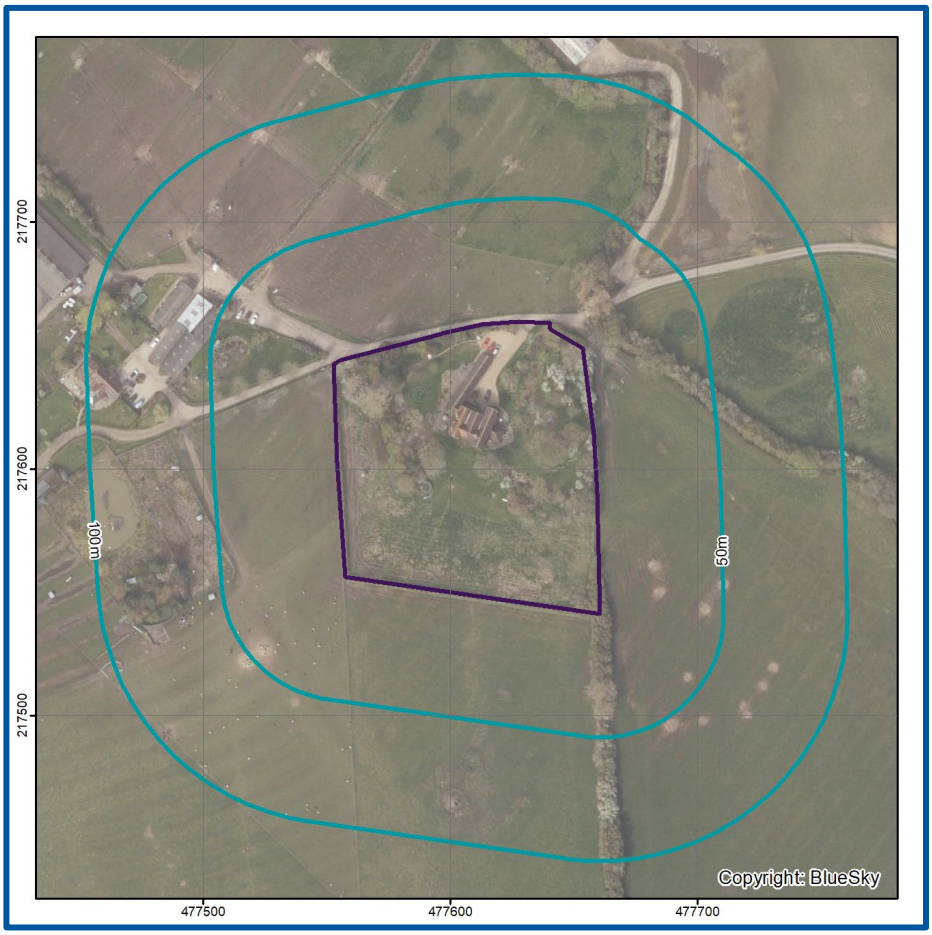
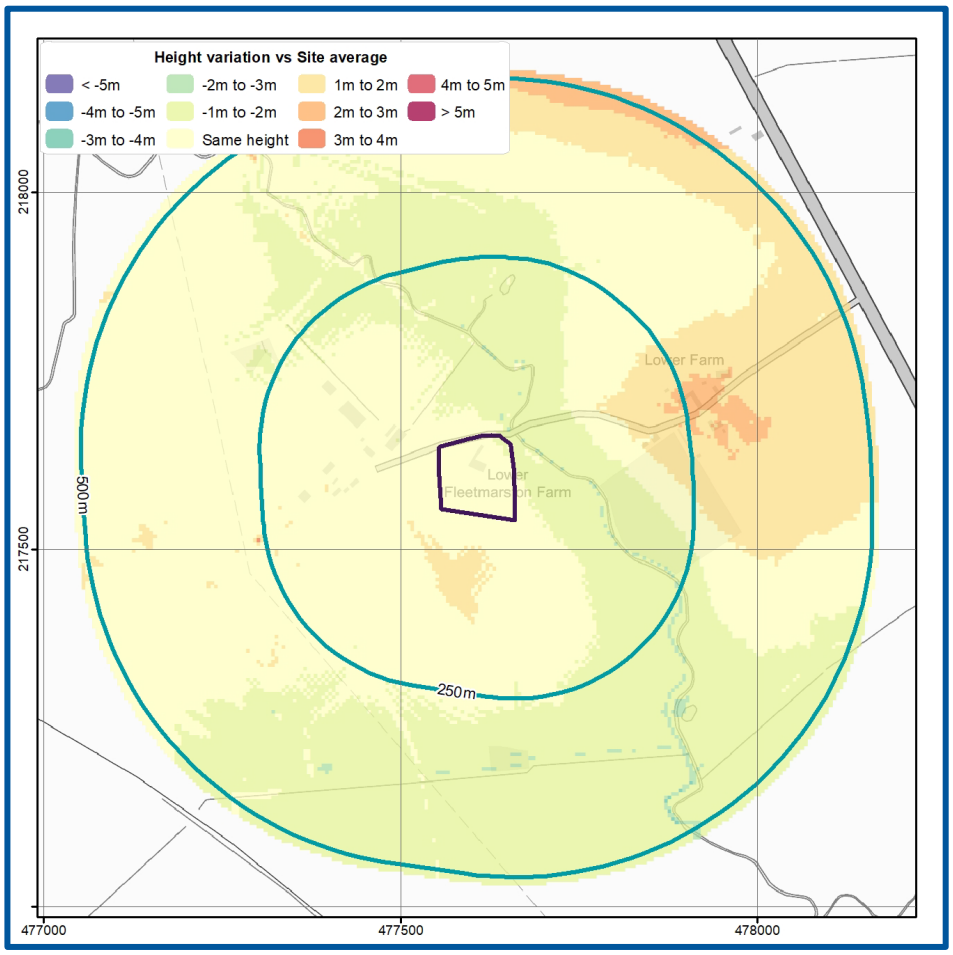


Figure 2 (overleaf) indicates ground levels within 500m of the Site fall in a south easterly direction.

The general ground levels on the Site are between 73.2 and 74.6mAOD with the Site falling gradually in an north easterly 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 D).

Figure 2. Site Location and Relative Elevations (GeoSmart, 2024)



Development

The Site is currently used within a residential capacity as a two storey detached, dwelling including associated access, car parking and landscaping.

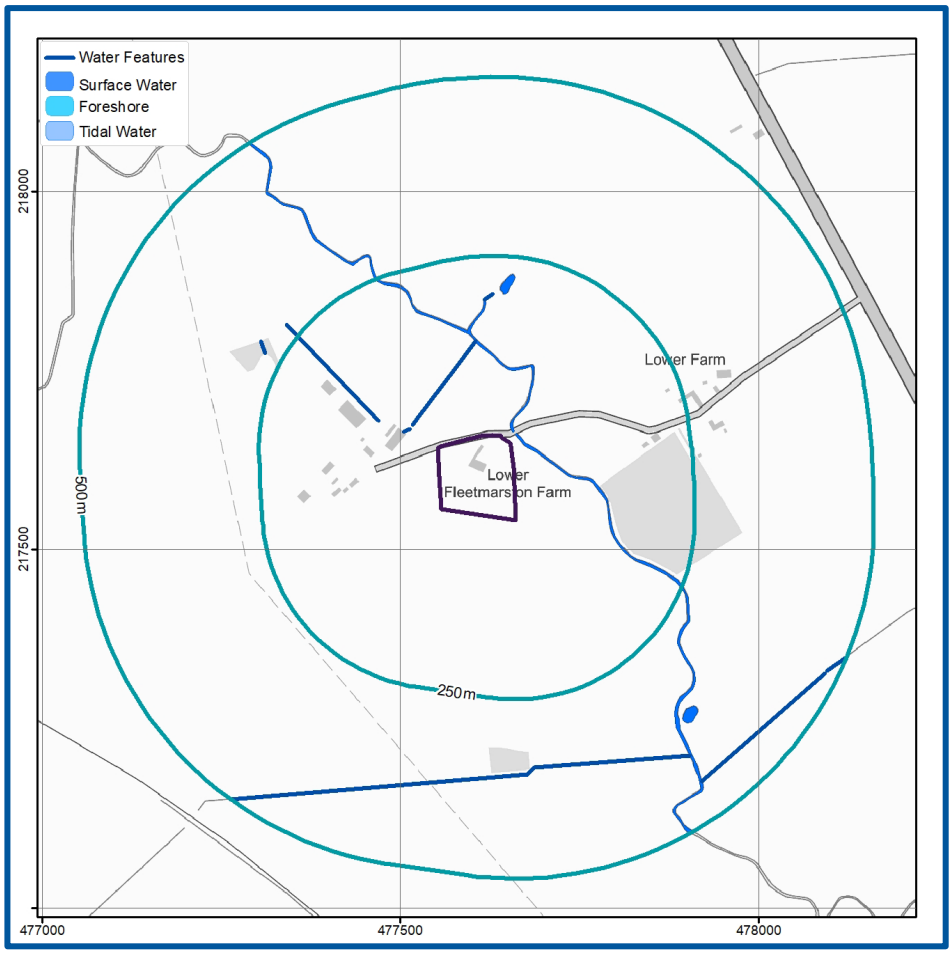
Development proposals comprise the construction of a 3-bay garage, a wall between the existing annex and main house, a folly, a pool house, a wetland garden, and a wildflower meadow. Site plans are included within Appendix A.

The effect of the overall development will not result in an increase in number of occupants and/or users of the Site and will not result in the change of use, nature or times of occupation. According to Annex 3 of the NPPG (2022), the vulnerability classification of the existing development is More Vulnerable and proposed development is More Vulnerable. The estimated lifespan of the development is 100 years.

Hydrological features

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

Figure 3. Surface water features (EA, 2024)



Fleet Marston Brook is located approximately 10m northeast of the Site.

Multiple drainage ditches are located nearby the Site with the closest located approximately 70m northwest of the Site.

Two unnamed ponds are located 200m north and 670m southeast of the Site.

Proximity to relevant infrastructure

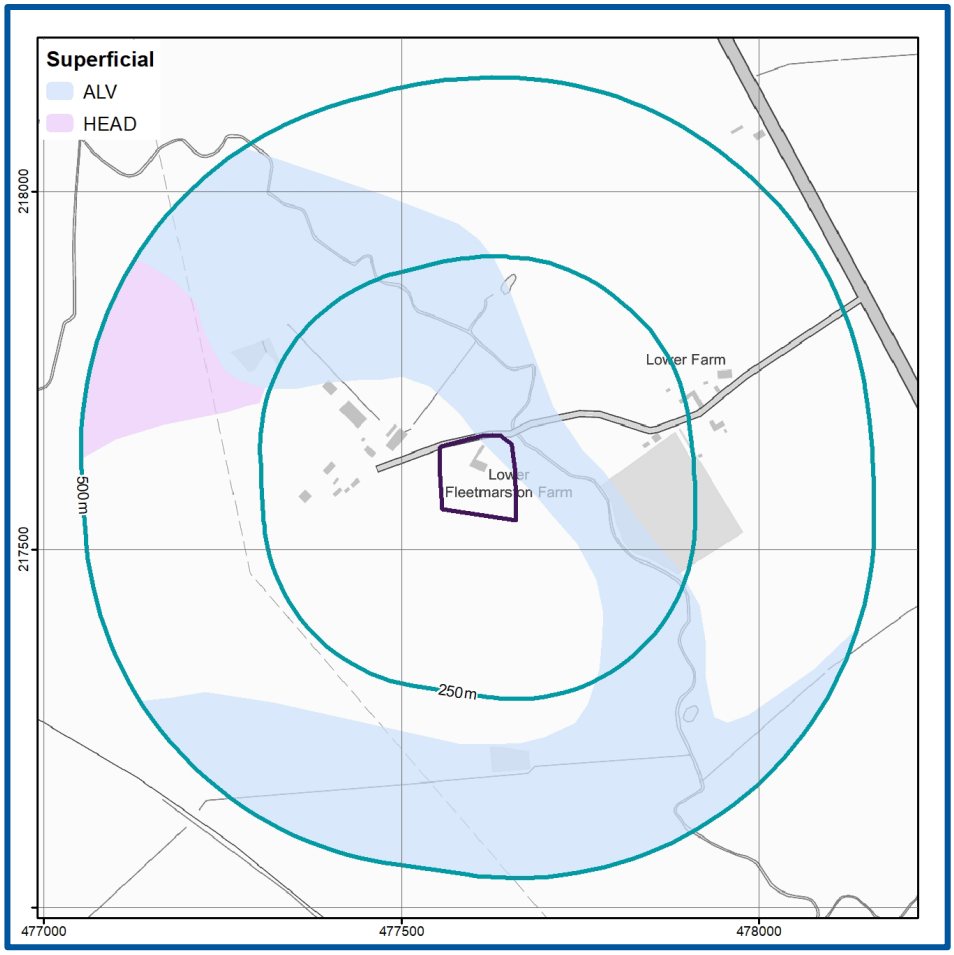
Infrastructure has been identified within 500 m of the Site which could influence the risks of flooding to existing or future occupants. These include:

Fleet Marston Brook runs is culverted beneath Berryfields Gated Road 10m northeast of the Site.

Hydrogeological features

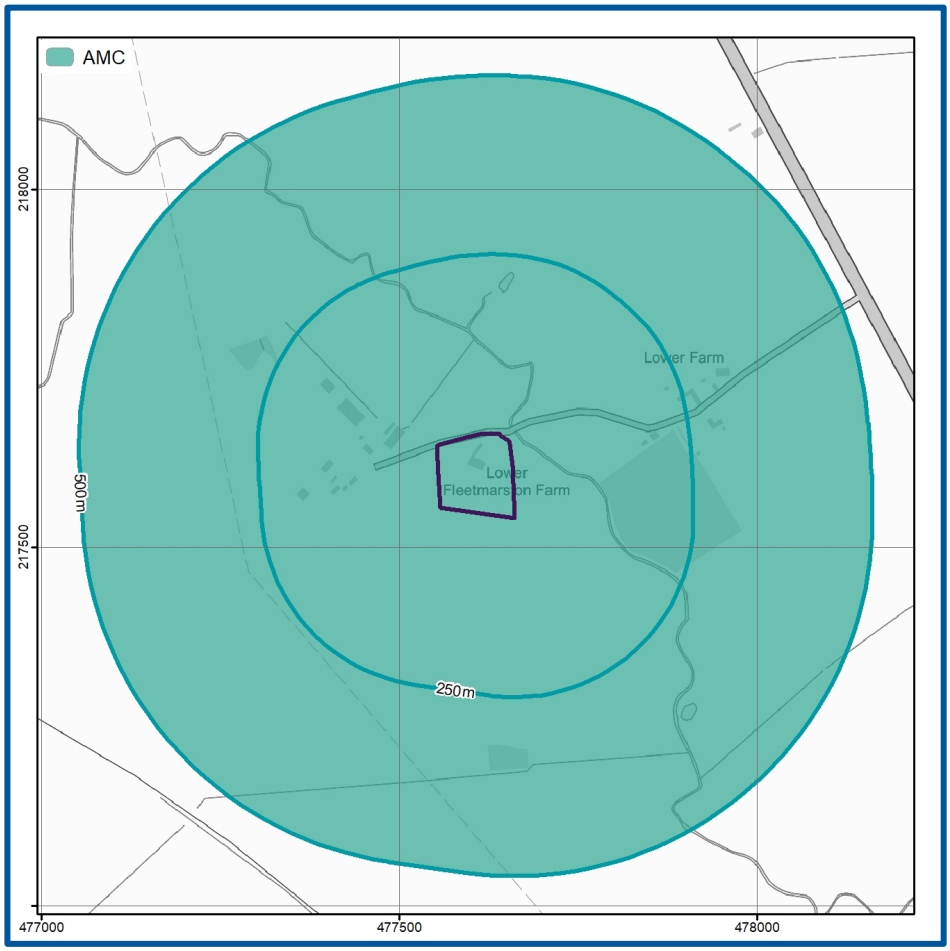
British Geological Survey (BGS) mapping indicates that the superficial geology underlying the northeast of the Site (approximately 11% of total Site area) (Figure 4) consists of Alluvium (ALV) (BGS, 2024) and is classified as a Secondary (A) Aquifer (EA, 2024). The remaining area of the Site does not possess underlying superfical geology.

Figure 4. Superficial Geology (BGS, 2024)



BGS mapping indicates the underlying bedrock geology (Figure 5) consists of the Ampthill Clay Formation (AMC) (BGS, 2024) and is classified as Unproductive Strata (EA, 2024).

Figure 5. Bedrock Geology (BGS, 2024)



Geological conditions

A review of the BGS borehole database (BGS, 2024) indicates there are no relevant boreholes within the vicinity of the Site (250m) from which the mapped geology can be confirmed. The two nearest boreholes to the Site are as follows, but given the significant distance from the Site are unlikely to be fully representative of the underlying hydrogeological conditions:

Ref: SP71NE154 located 595m to the southwest of the Site boundary at an elevation of 75mAOD.

This borehole indicates the underlying geology consists of:

- Dirty ballast angular to subangular to 0.6m below ground level (bgl)
- Subangular to angular brick to 0.7m bgl
- Dense, clayey, gravely sand to 1m bgl
- Stiff black clay to 1.5m bgl at which the borehole terminates.

Ref: SP71NE132 located 655m to the southwest of the Site boundary at an elevation of 75mAOD.

This borehole indicates the underlying geology consists of:

- Gravel and very dirty ballast to 0.3m bgl
- Sandy clayey gravel to 0.6m bgl
- Sandy clayey gravel with chalk to 1.2m bgl where the borehole terminates.

An additional borehole has been included due to its significant depth compared to SP71NE154 and SP71NE132. However, this borehole is also a significant distance from the Site.

Ref: SP71NE58 located 780m to the northeast of the Site boundary at an elevation of 82.2mAOD.

This borehole indicates the underlying geology consists of:

- Clay to 58m bgl where the borehole terminates.

Elevation of the Site is between 73.2 and 74.6mAOD.

Groundwater

Groundwater was not struck during boring within boreholes SP71NE154, SP71NE132, and SP71NE58.

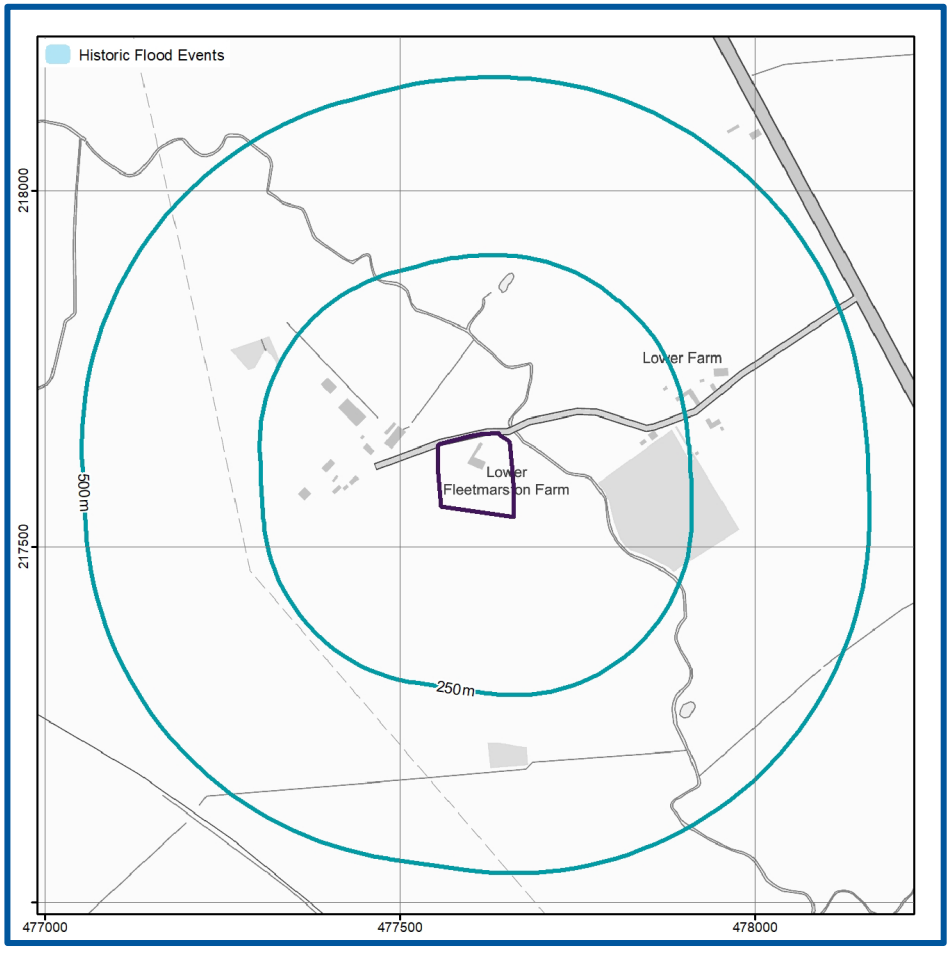
4. Flood risk to the development

Historical flood events

According to the EA's Historical Flood Map (Figure 6) and Appendix C of the SFRA (JBA, 2017), there have been no flooding events affecting the Site.

The purpose of historical flood data is to provide information on where and why flooding may have occurred in the past. The absence of any recorded events does not mean flooding has never occurred on-Site or that flooding will never occur at the Site.

Figure 6. EA Historic Flood Map (EA, 2024)



River (fluvial) flooding

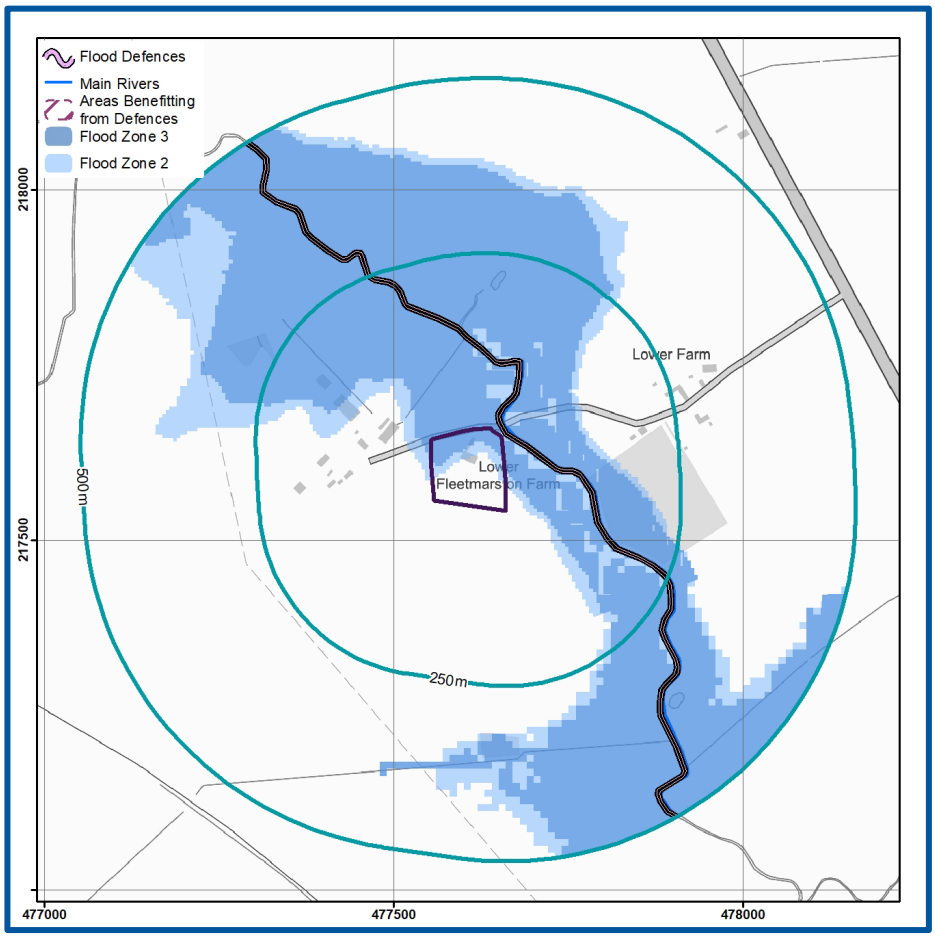
The predominant risk at the Site is from flooding from rivers, termed as fluvial flooding. The Site is located in an inland location and the risk of flooding from coastal and tidal processes are therefore considered to be Very Low.

River (fluvial) flooding occurs during times of heavy rainfall or snow melt when watercourses' capacity can be exceeded, over topping the banks and flood defences.

According to the EA's Flood Map for Planning Purposes (Figure 7), the Site is located in areas of Flood Zones 1, 2 and 3. Flood Zone 3 covers the northern area of the Site (approx. 20%) including the existing annex and proposed garage, Flood Zone 2 extends roughly 15m to the south of the Flood Zone 3 extent and includes the north west half of the main property including the proposed wall, and the remaining southern section (approx. 54%) of the Site is within Flood Zone 1.

Access to the Site may be affected as Berryfields Road runs over Fleet Marston Brook in Flood Zone 3.

Figure 7. EA Flood Map for Planning Purposes (EA, 2024)



Guidance

As defined in the NPPF (2023):

Flood Zone 1

Ignoring the presence of any defences, land located in a Flood Zone 1 is considered to have a Low probability of flooding, with less than a 1 in 1000 annual probability of fluvial or coastal flooding in any one year.

Development of all uses of land is appropriate in this zone.

Flood Zone 2

Land located in a Flood Zone 2 is considered to have a Medium probability of flooding, with between a 1 in 100 and 1 in 1000 annual probability of fluvial flooding or between a 1 in 200 and 1 in 1000 annual probability of coastal flooding in any one year.

Development of "Water-Compatible", "Essential Infrastructure", "Less Vulnerable" and "More Vulnerable" land uses are suitable for this zone with "Highly Vulnerable" land uses requiring an Exception Test to be passed prior to development taking place.

Flood Zone 3

Land located in a Flood Zone 3 is considered to have High probability of flooding with a 1 in 100 year or greater annual probability of fluvial flooding or a 1 in 200 or greater annual probability of coastal flooding in any one year.

Development of "Water-Compatible" and "Less Vulnerable" land uses are suitable for this zone with "More Vulnerable" and "Essential Infrastructure" requiring an Exception test to be passed prior to development taking place.

(see glossary for terminology).

Flood defences

Guidance

Sites that are located close to flood defences are likely to be zones where rapid inundation will occur in the event of the flood defences being overtopped or breached. A Site located close to flood defences (within 250 m) may require a more detailed FRA subject to local topography.

Existing flood defences

The Environment Agency Asset Information Management Systems (AIMS) dataset (2024) identifies high ground on either side of the Fleet Marston Brook (Asset ID: 9825 and 8886) stated to provide up to a 1 in 2 year standard of protection. The crest height and condition of these defences were not included within the dataset. Based on the limited information it can be considered that the Site does not benefit from flood defences with the only protection afforded to the Site through the capacity of the watercourse.

There are no formal flood defences within 250 m of the Site.

Future flood defences

The likelihood of future flood schemes for the Fleet Marston Brook and the vicinity of the Site could not be ascertained at the time of writing. It is therefore assumed that the risk as presented below is likely to be representative of the future fluvial flood risk at the Site.

Model data

The EA's modelled flood data was requested on the 13th February 2024. The EA responded on 9th April 2024 and provided modelled flood data from the Upper Thame and Bear Brook modelling study (AECOM, 2018).

Upon analysis of the model data, it became clear that Fleet Marston Brook was not included in sufficient detail in the study as the EA's Flood Zones differ greatly in extent. The Upper Thame and Bear Brook modeling study appears to cut off downstream of the site and, therefore, it has been deemed insufficient for analysis in this Flood Risk Assessment. JFLOW modelling has been used in the absence of appropriate model data.

JFLOW Modelling

The modelled fluvial flood depth data was created for the 1% and 0.1% annual chance of flooding situations and was produced as a by-product from the 2004 generalised modelling project in 2004, using JFLOW modelling. The purpose of the generalised modelling project was to fill the gaps where there was no detailed local modelled data in 2004, in order to define the extents of Flood Zones for spatial planning. A two-dimensional hydrodynamic model called JFLOW was used to produce this modelled fluvial flood depth data on a 5x5m grid.

Since 2004, local detailed modelling has been used to replace this generalised modelling in many areas to define the extents of Flood Zones. However, the JFLOW dataset in this location has not been updated.

JFLOW was used to produce flood maps for the whole of England and Wales for all catchments greater than 3 sq km in a consistent manner. The method is therefore very generalised and therefore cannot take account of information that may be very significant locally. This might include:

1. Effects of bridges and other structures including flood defences are not taken into account.
2. Errors in the DTM, caused by trees and buildings for example.
3. The effect of reservoirs and urban drainage and other man made influences on the flow regime can only be taken into account in a very general sense in JFLOW.
4. The channel is assumed to be able to take the 2 year flow. This may not be true especially in those modified by man.
5. Hydraulic roughness is assumed to be the same everywhere in JFLOW, but of course it is not.

In light of this and as there is no detailed modelling included within the SFRA, to estimate flood levels at the Site, the EA's 1m LiDAR data has been compared with the EA's Flood Zones.

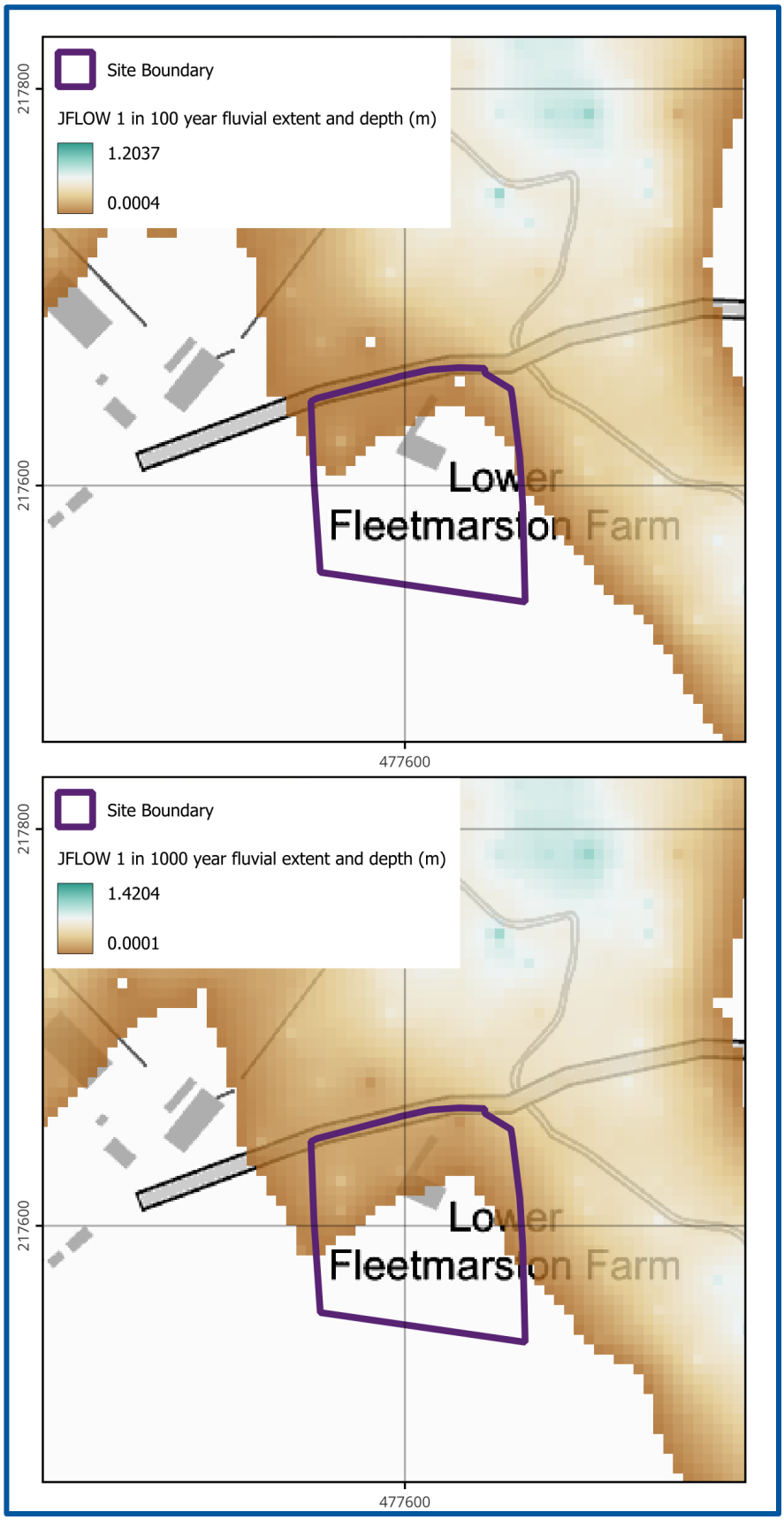
The 2m LiDAR data has been classified and the highest elevation on the extent of the Flood Zone 3 and 2 has been used to form the basis for the 1 in 100 year and 1 in 1000 year flood events respectively (Figure 8)[1]. The following flood levels have been estimated for the Site, using the method described above:

Table 2. Estimated flood levels using LiDAR data

Ground levels on-Site (mAOD)	Estimated Modelled Flood Levels (mAOD)	
	1 in 100 year	1 in 1000 year
73.2 to 74.6	74.19	74.30
Estimated Flood depths (m)	Up to 0.99	Up to 1.1

[1] As the calculated flood elevation is based on LiDAR the accuracy of the calculated level is +/- 0.15m.

Figure 8. JFLOW modelled fluvial flood extents and depths



Climate change factors

The EA's *Flood risk assessments: climate change allowances* guidance (Published 19 February 2016 and updated May, 2022) has been used to inform a suitable increase in peak river flows for the proposed development. The updated guidance confirms 'Less Vulnerable' developments are required to undertake a Basic assessment approach.

As the Site is located within the Thames and Chilterns South Management Catchment, within the Thames and the proposed development is classed as Less Vulnerable, where the proposed lifespan is approximately 100 years, the Central (31%) allowance has been used to determine a suitable climate change factor to apply to river data.

Modelled in-channel flow data has not been provided and so a stage graph has been produced (Appendix B) using the EA's modelled flood level data. The climate change allowances have been derived as a proportion of the 100 year peak flow to the 1 in 1000 year event, using the Flood Studies Report (FSR) (1975) growth curves.

In the Thames region, the 1 in 1000 year event flow is approximately 65% greater than the 1 in 100 year flow, therefore the following flood levels apply.

Table 3. Flood levels plus climate change allowances

Ground levels on-Site (mAOD)	Modelled Flood Levels (mAOD)
	1 in 100 year plus 31% 2080 central allowance for climate change flood level
73.2 to 74.6	74.25
Flood depths (m)	Up to 1.05

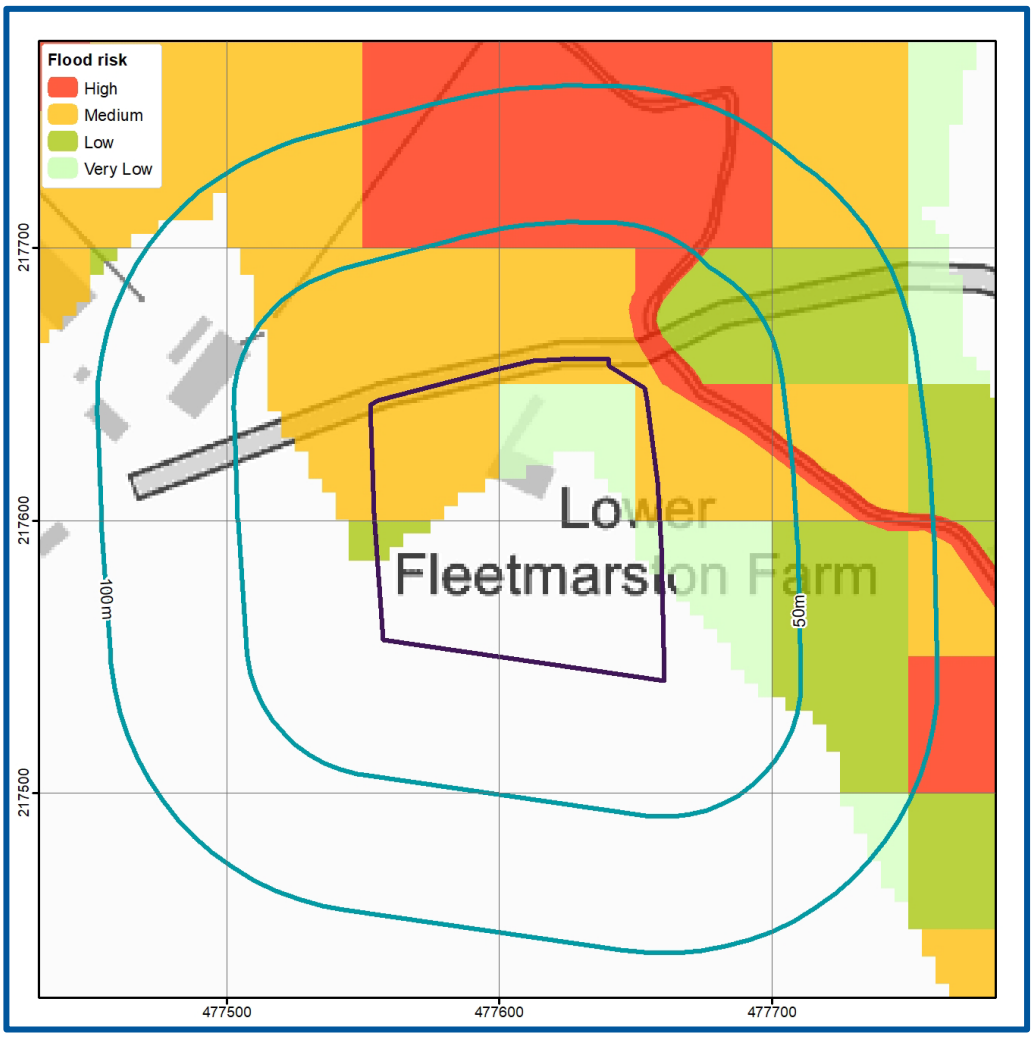
Flood risk including the benefit of defences

The type and condition of existing flood defences influence the 'actual' risk of fluvial flooding to the Site, albeit the long-term residual risk of flooding (ignoring the defences) should be considered when proposing new development.

According to the EA's Risk of Flooding from Rivers and Sea (RoFRS) map (Figure 9), which considers the type, condition and crest height of flood defences, the Site has a risk of flooding ranging from Very Low to Medium from the nearby watercourse, Fleet Marston Brook.

The proposed garage is located in an area of Medium risk, while other development proposals are in areas ranging from Very Low to Low.

Figure 9. Risk of Flooding from Rivers and Sea map (EA, 2024)



Surface water (pluvial) flooding

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.

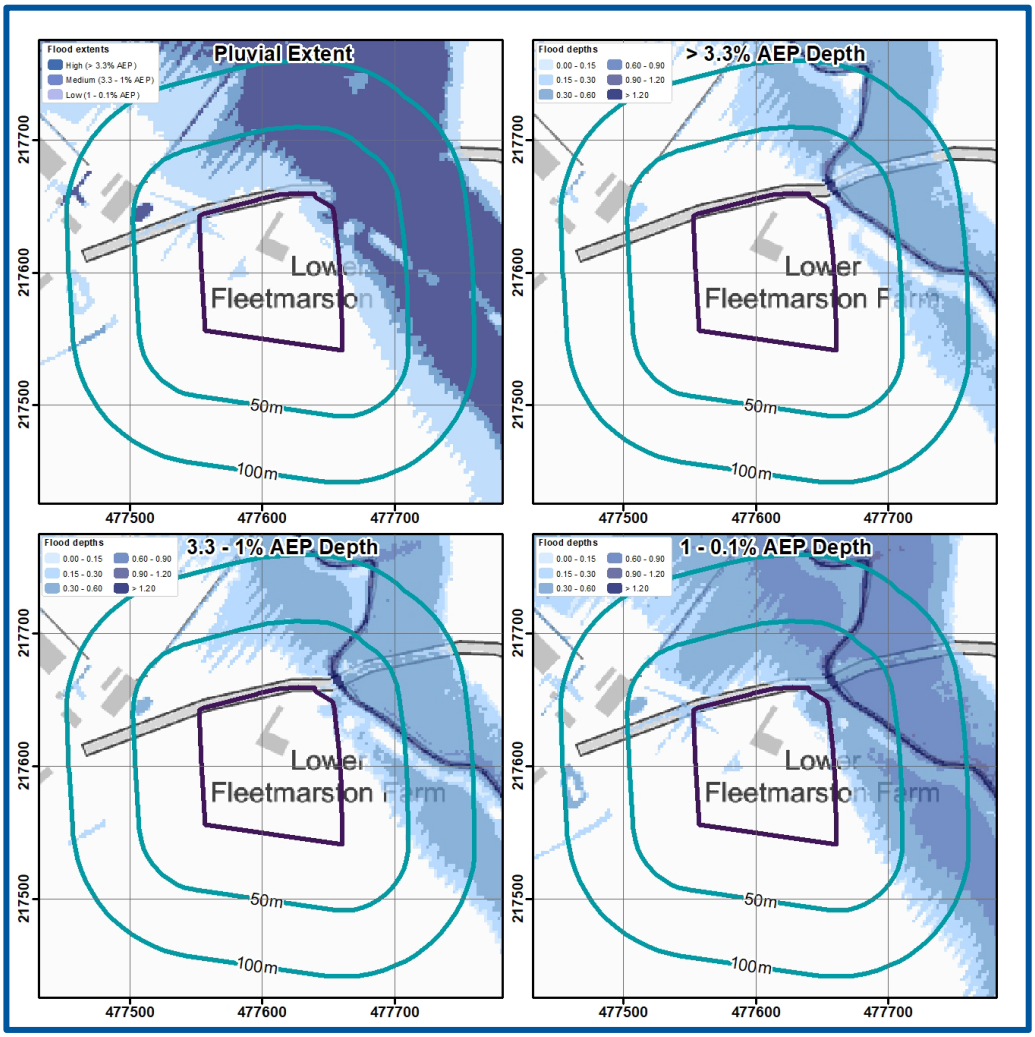
According to the EA's Risk of Flooding from Surface Water (pluvial) flood mapping (Figure 11), the Site is at a variable risk of pluvial flooding ranging from Very Low to High.

High risk surface water flooding (>3.3% AEP Depth) is confined to a small area of the northeast of the Site.

Areas at medium risk (3.3 – 1% AEP Depth) are slightly greater in extent, but still confined to the northeast of the Site.

Areas affected by Low risk surface water flooding (1 - 0.1% AEP Depth) include the north east and north west corners of the Site, and an isolated area of flooding 15m to the south west of the existing farmhouse.

Figure 10. EA surface water flood extent and depth map (EA, 2024)



Guidance

According to EA's surface water flood risk map the Site is at:

- Very Low risk - chance of flooding of less than 1 in 1000 (0.1%).
- Low risk - chance of flooding of between a 1 in 1000 & 1 in 100 (0.1% and 1%).
- Medium risk - chance of flooding of between a 1 in 100 and 1 in 30 (1% and 3.3%).
- High risk - chance of flooding of greater than 1 in 30 (3.3%).

The SFRA does not indicate reported incidents of historical surface water flooding within 100m of the Site and Critical Drainage Areas (CDA)[2] have not yet been designated (JBA, 2017).

Figure 10 confirms the extent and depth of flooding in multiple modelled flood scenarios. The areas proposed for development are expected to be unaffected by pluvial flooding in the >3.3% (High) risk, 3.3 - 1% AEP (Medium) risk, and 1 - 0.1% AEP (Low) risk events. However, flood depths of up to 1.2m would impact the access routes to and from the Site in the High (>3.3% AEP Depth), Medium (3.3 – 1% AEP Depth), and Low (1 - 0.1% AEP Depth) risk events.

As the 1 - 0.1% AEP (Low) risk, 3.3 - 1% AEP (Medium) risk, and >3.3% (High) risk pluvial flooding extents are confined to non-essential areas of the Site, the pluvial after analysis risk rating has been downgraded from Very Low to High, to Very Low.

Guidance

According to EA's surface water flood risk map the following advisory guidance applies to the Site:

Flood Depth

- 0.15 to 0.3 m - Flooding would: typically exceed kerb height, likely exceed the level of a damp-proof course, cause property flooding in some areas.
- 0.3 to 0.9 m - Flooding is likely to exceed average property threshold levels and cause internal flooding. Resilience measures are typically effective up to a water depth of 0.6 m above floor level.

Climate change factors

Paragraph 002 of the National Planning Practice Guidance (August, 2022) requires consideration of the 1% AP (1 in 100 year) event, including an appropriate allowance for climate change.

[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, 2023). 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.

As the Site is located within the Thames and South Chilterns Management Catchment and the proposed development is classed as More Vulnerable, where the proposed lifespan is approximately 100 years. years, the Upper End (40%) allowance is required to determine a suitable climate change factor to apply to rainfall data.

The 0.1% AP (1 in 1000 year) surface water flooding event has been used as a proxy in this instance for the 1% AP (1 in 100 year) plus climate change event.

Surface water flooding flow routes

Analysis of OS mapping, ground elevation data and the EA's pluvial flow route mapping in the 1 in 1000 year (Low probability) event confirms the northeast of the Site is located on a potential overland flow route.

During a 1 in 100 year event the majority of of flow velocities are less than 0.25m/s. The flows are unlikely to affect the Site itself including the area proposed for development, however, flows of 1-2m/s may affect access to the Site along Berryfields Road.

A review of the Site plans, topography and the EA's Risk of Flooding from Surface Water Direction mapping indicates any overland flows on the Site would not be obstructed by the proposed development and occur across non-essential areas of the Site.

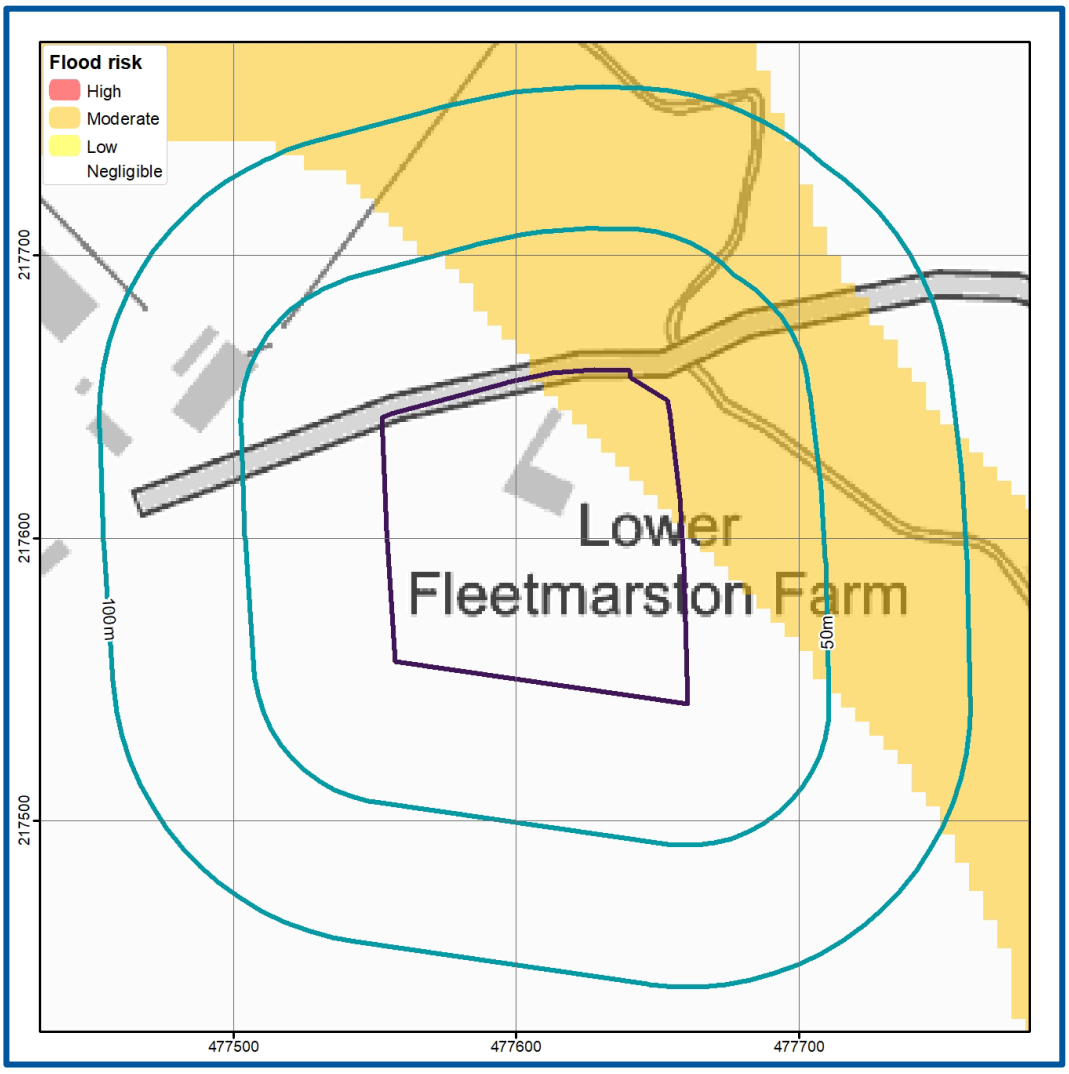
Groundwater flooding

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 to Moderate risk of groundwater flooding at surface in the vicinity from permeable superficial deposits during a 1 in 100 year event.

The Moderate risk of groundwater flooding is confined to areas of the Site with underlying permeable superficial Alluvium deposits. Areas proposed for development are at Negligible risk of groundwater flooding.

Figure 11. GeoSmart GW5 Groundwater Flood Risk Map (GeoSmart, 2024)



Mapped classes within the screening map combine likelihood, possible severity and the uncertainty associated with predicting the subsurface system. The map is a national scale screening tool to prompt site-specific assessment where the impact of groundwater flooding would have significant adverse consequences. Mapping limitations and a number of local factors may reduce groundwater flood risk to land and property even where it lies within mapped groundwater flood risk zones, which do not mean that groundwater floods will occur across the whole of the risk area.

A site-specific assessment has been undertaken to refine the groundwater risk screening information on the basis of site-specific datasets (see Section 3) including BGS borehole data and the EA's fluvial and tidal floodplain data (where available) to develop a conceptual groundwater model. The risk rating is refined further using the vulnerability of receptors including occupants and the existing and proposed Site layout, including the presence of basements and buried infrastructure. The presence of any nearby or on-Site surface water features such as drainage ditches, which could intercept groundwater have also been considered.

- It is understood there are no existing basements and a basement is not proposed as part of the development. The risks are higher for basements, buried infrastructure and soakaway systems which may be affected by high groundwater levels.
- According to a review of the hydrogeology (Section 3), the northern section of the Site is underlain by permeable superficial deposits above low permeability bedrock. A shallow groundwater table could potentially exist above the contact between the superficial and bedrock layers, resulting in a 'perched' groundwater table. Groundwater levels may rise in the superficial aquifer in a seasonal response to prolonged rainfall recharge which may cause an unusually high peak in groundwater levels during some years.
- Groundwater levels may also rise in the superficial aquifer in response to high riverevents due to the potential hydraulic continuity with the nearby Fleet Marston Brook.
- The closest borehole records to the Site with comparable geological characteristics are ref: SP71NE154, ref: SP71NE132 and ref: SP71NE58. These boreholes did not report encountering groundwater during boring. However, it is noted that these boreholes are a significant distance from the Site and at a higher elevation.
- Appendix C of the SFRA does not indicate reported incidents of historical ground water flooding within 50m of the Site (JBA, 2017).
- The hydrogeological characteristics suggest there is potential for a groundwater table beneath the northeast of the Site, however, this area is not included in the proposed development.

The baseline groundwater flood risk rating is Negligble to Moderate, but on the basis of the site-specific assessment the groundwater flood risk is considered to be Negligible.

Guidance

Negligible Risk - There will be a remote possibility that incidence of groundwater flooding could lead to damage to property or harm to other sensitive receptors at, or near, this location.

Climate change predictions suggest an increase in the frequency and intensity of extremes in groundwater levels. The impact of climate change on groundwater levels beneath the Site is linked to the predicted rise in peak river levels.

- A rise in peak river levels will lead to a response of increased groundwater levels in adjacent aquifers subject to the predicted climate change increases in peak river level for the local catchment.

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 flooding

Section 5.7.1 of the SFRA has identified 0 incidences or modelled incidences of flooding as a result of surcharging sewers within the HP22 4 postcode (JBA, 2017).

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, 2024; Appendix C).

Guidance

Properties classified as “at risk” are those 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 either once or twice in the ten year reference period. Records held by the sewage utility company provide information relating to reported incidents, the absence of any records does not mean that the Site is not at risk of flooding.

Canal failure

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

Water supply infrastructure

Water supply infrastructure is comprised of a piped network to distribute water to private houses or industrial, commercial or institution establishments and other usage points. In urban areas, this represents a particular risk of flooding due to the large amount of water supply infrastructure, its condition and the density of buildings. The risks of flooding to properties from burst water mains cannot be readily assessed.

If more information regarding the condition and history of the water supply infrastructure within the vicinity of the Site is required, then it is advisable to contact the local water supplier Thames Water.

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.

A culvert has been identified 10m to the northeast of the Site. This structure may pose a flood risk to the Site should it become blocked or damaged.

Due to the absence of detailed hydrological modelling including blockage scenarios, the risk to the Site in the event of a culvert blockage cannot be fully assessed.

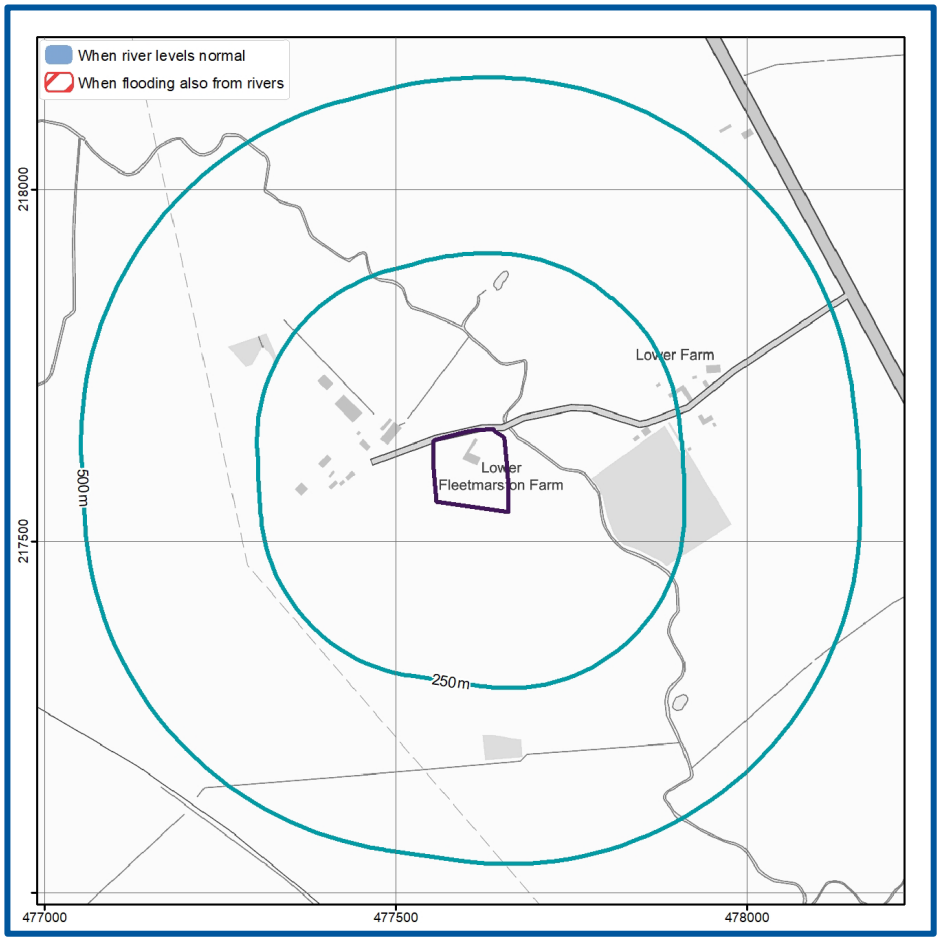
Discussions should be held with the Local authority, adjacent landowner and/or Environment Agency to ascertain the responsibility of maintenance for the infrastructure. Where no such schedule is already in effect it is recommended that an appropriate maintenance regime is put in place to maintain effective operation of the nearby culvert.

The SFRA has not identified any historic drainage issues within the Site area (JBA, 2017).

Reservoir flooding

According to the EA's Risk of Flooding from Reservoir mapping the Site is not at risk of flooding from reservoirs (Figure 12 (EA, 2024).

Figure 12. EA Risk of Reservoir Flooding (EA, 2024)



Guidance

The risk of reservoir flooding is related to the failure of a large reservoir (holding over 25,000 m^3 of water) and is based on the worst-case scenario. Reservoir flooding is extremely unlikely to occur (EA, 2024).

5. Flood risk from the development

Floodplain storage

Where flood storage from any source of flooding is to be lost as a result of development, on-site level-for-level compensatory storage, accounting for the predicted impacts of climate change over the lifetime of the development, should be provided. Where it is not possible to provide compensatory storage on site, it may be acceptable to provide it off-site if it is hydraulically and hydrologically linked.

The loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is solely tidal.

As the development is comprised exclusively of structures

The development is located within an area which would be impacted by a 1 in 100 year plus 31% climate change fluvial events and involves an increase in building footprint. As the development would displace flood waters, compensatory flood storage is required for the loss in flood plain storage. Any losses in floodplain storage are likely to displace flooding and could potentially alter flood flow routes, increasing flood risk elsewhere.

Compensation for any reduction in floodplain storage and displacement of flood water (up to the 1 in 100 year event with allowance made for climate change) should be provided. Compensatory flood storage should be provided through a level for level, volume for volume approach and may require an area at the edge of the floodplain to provide storage.

Where this is not possible, the EA and Lead Local Flood Authority (LLFA) may accept voids, stilts or undercroft parking as options for flood plain storage compensation. Whilst the use of stilts and voids below buildings may be an appropriate approach to mitigating flood risk to the buildings themselves, such techniques should not normally be relied upon for compensating for any loss of floodplain storage. This is because voids do not allow water to freely flow through them, trash screens get blocked, voids get silted up, they have limited capacity, and it is difficult to stop them being used for storing belongings or other materials.

These solutions should be discussed at an early stage and may require a management and maintenance plan, as they can become blocked over time leading to a gradual reduction in storage. More information is provided in the EA's "*Framework and Guidance for Assessing and Managing Flood Risk for New Development*" FD2320/TR2 publication (EA, 2005).

Scoping estimates of the storage requirements can be made by multiplying the increase in building footprint by the average flood depth at the development, during the 1 in 100 year flood event with a 31% allowance for climate change.

Drainage and run-off

Based on the topography and Very Low to Low surface water flood risk in the vicinity, interference or interaction with overland flow paths and inflows from off-Site is considered unlikely.

Any changes to the existing drainage system will be undertaken in accordance with best practice and care will be taken to ensure the new development does not overload/block any existing drainage or flow pathways to/from the Site.

The potential surface water run-off generated from the Site during a 1 in 100 year return period should be calculated, using FEH 2013 rainfall data from the online Flood Estimation Handbook (FEH), developed by NERC (2009) and CEH (2016).

The NPPF (2023) recommends the effects of climate change are incorporated into FRA's. As per the most recent update to the NPPG (May 2022) the applicable climate change factor for the 1 in 30 (≥ 3.3% AEP) and 1 in 100 (< 3.3 to 1% AEP) year event to apply to surface water flooding is dependent upon the management catchment.

As the proposed development is being changed to residential, the lifespan of the development and requirements for climate change should allow up to the 1% AEP upper end allowance. As the Site is located within the Thames and South Chilterns Management Catchment the following peak rainfall allowances are to be applied.

Table 4. Climate change rainfall allowances

Thames and South Chilterns Management Catchment	3.3% Annual exceedance rainfall event		1% Annual exceedance rainfall event	
	2050s	2070s	2050s	2070s
Upper end	35%	35%	20%	40%
Central	20%	25%	20%	25%

Sustainable Drainage System (SuDS)

It is recommended that attenuation of run-off is undertaken on-Site to compensate for proposed increases in impermeable surface areas. Attenuation may comprise the provision of storage within a Sustainable Drainage System (SuDS). SuDS can deliver benefits from improving the management of water quantity, water quality, biodiversity and amenity. Potential SuDS options are presented in the table below, subject to further investigation:

Table 5. SuDS features which may be feasible for the Site

Option	Description
Rainwater harvesting	Rainwater harvesting can collect run-off from the roofs for use in non-potable situations, using water butts for example.
Green roof	Having part/all of the roof as a green roof covered in vegetation can intercept and store a proportion of the rainfall to result in an overall reduction in the amount of surface water run-off generated from a building structure. They comprise a substrate (growth medium) layer which can be seeded with specially selected plants suitable for the local climatic conditions. Beneath the growth medium is a geotextile filter layer which filters out the substrate from entering the aggregate/geo-composite drainage layer below. At the very bottom of the green roofing, a waterproof membrane protects the roof structure below.
Permeable paving	Permeable pavements can be used for driveways, footpaths and parking areas to increase the amount of permeable land cover. Suitable aggregate materials (angular gravels with suitable grading as per CIRIA, 2007) will improve water quality due to their filtration capacity. Plastic geocellular systems beneath these surfaces can increase the void space and therefore storage but do not allow filtration unless they are combined with aggregate material and/or permeable geotextiles.
Swales	Shallow, wide and vegetated channels that can store excess run-off whilst removing any pollutants.
Soakaways	An excavation filled with gravel within the Site. Surface water run-off is piped to the soakaway.
Attenuation basins/pond	Dry basin or a permanent pond that is designed to hold excess water during a rainfall event.

6. Suitability of the proposed development

The information below outlines the suitability of proposed development in relation to national and local planning policy.

National policy and guidance

The aims of the national planning policies are achieved through application of the Sequential Test and in some cases the Exception Test.

Guidance

Sequential test: The aim of this test is to steer new development towards areas with the lowest risk of flooding (NPPF, 2023). Reasonably available sites located in Flood Zone 1 should be considered before those in Flood Zone 2 and only when there are no reasonably available sites in Flood Zones 1 and 2 should development in Flood Zone 3 be considered.

Exception test: In some cases, this may need to be applied once the Sequential Test has been considered. For the exception test to be passed it must be demonstrated that the development would provide 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.

Suitability of the proposed development, and whether the Sequential and Exception Tests are required, is based on the Flood Zone the Site is located within and the flood risk vulnerability classification of the existing and proposed development. Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

This report has been produced to assess all development types, prior to any development. The vulnerability classification and Flood Zones are compared within the table overleaf (Table 2 of the NPPG (2022)).

The application is considered a 'Minor Development' and in line with Paragraph 174 of the NPPF (2023), it may not be subject to the Sequential or Exception Tests.

Paragraph 174 of the NPPF (2023) states: *"Applications for some minor development and changes of use [60] should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 59.*

Footnote 60 of the NPPF (2023) states: *This includes householder development, small non-residential extensions (with a footprint of less than 250m^2) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate".*

As a result, as the proposals are defined as "minor development – householder development" they are not subject to the Sequential Test or an Exception Test.

Table 6. Flood risk vulnerability and flood zone 'incompatibility (taken from NPPG, 2022)

Flood risk vulnerability classification		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood Zone	Zone 1 – low probability	✓	✓	✓	✓	✓
	Zone 2 – medium probability	✓	✓	Exception test required	✓	✓
	Zone 3a - high probability	Exception test required	✓	X	Exception test required*	✓
	Zone 3b – functional flood plain	Exception test required	✓	X	X	X

*As the application is considered a Minor development in line with Paragraph 174 of the NPPF (2023) the sequential test is not required.

EA Flood Risk Standing Advice for vulnerable developments located in Flood Zones 2 or 3 (February, 2022)

For all relevant vulnerable developments (i.e. more vulnerable, less vulnerable and water compatible), advice on the points should be followed:

- Surface water management;
- Access and evacuation; and
- Floor levels.

Surface water management

Plans for the management of surface water need to meet the requirements set out in either the local authority's:

- Surface water management plan where available; OR

- Strategic flood risk assessment.

They also need to meet the requirements of the approved building regulations Part H: drainage and water disposal. Read section H3 rainwater drainage.

Planning permission is required to use a material that can't absorb water (e.g. impermeable concrete) in a front garden larger than 5m^2.

Access and evacuation

Details of emergency escape plans should be provided for any parts of a building that are below the estimated flood level:

Plans should show:

- Single storey buildings or ground floors that don't have access to higher floors can access a space above the estimated flood level, e.g. higher ground nearby;
- Basement rooms have clear internal access to an upper level, e.g. a staircase;
- Occupants can leave the building if there's a flood and there's enough time for them to leave after flood warnings.

Floor levels

The following should be provided:

- average ground level of your site
- ground level of the access road(s) next to your building
- finished floor level of the lowest room in your building

Finished floor levels should be a minimum of whichever is higher of 300mm above the:

- average ground level of the site
- adjacent road level to the building
- estimated river or sea flood level

You should also use construction materials that have low permeability up to at least the same height as finished floor levels.

If you cannot raise floor levels to meet the minimum requirement, you will need to:

- raise them as much as possible
- consider moving vulnerable uses to upper floors
- include extra flood resistance and resilience measures

When considering the height of floor levels, you should also consider any additional requirements set out in the SFRA. Flood water can put pressure on buildings causing structural issues. If your design aims to keep out a depth of more than 600mm of water, you should get advice from a structural engineer. They will need to check the design is safe.

Extra flood resistance and resilience measures

Follow the guidance in this section for developments in flood risk areas where you cannot raise the finished floor levels to the required height. You should design buildings to exclude flood water where possible and to speed recovery in case water gets in.

Make sure your flood resilience plans for the development follow the guidance in the CIRIA Property Flood Resilience Code of Practice. Please note that the code of practice uses the term 'recovery measures'. In this guide we use 'resilience measures'.

Flooding can affect the structural stability of buildings. If your building design would exclude more than 600mm of flood water, you should get advice from a structural engineer. They will need to check the design is safe. Only use resistance measures that will not cause structural stability issues during flooding. If it is not possible to safely exclude the estimated flood level, exclude it to the structural limit then allow additional water to flow through the property.

The design should be appropriately flood resistant and resilient by:

- using flood resistant materials that have low permeability to at least 600mm above the estimated flood level
- making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level
- using flood resilient materials (for example lime plaster) to at least 600mm above the estimated flood level
- by raising all sensitive electrical equipment, wiring and sockets to at least 600mm above the estimated flood level
- making it easy for water to drain away after flooding such as installing a sump and a pump
- making sure there is access to all spaces to enable drying and cleaning
- ensuring that soil pipes are protected from back-flow such as by using non-return valves

Temporary or demountable flood barriers are not appropriate for new buildings. Only consider them for existing buildings when:

- there is clear evidence that it would be inappropriate to raise floor levels and include passive resistance measures
- an appropriate flood warning or other appropriate trigger is available

If proposals involve the development of buildings constructed before 1919, refer to Flooding and Historic Buildings guidance produced by Historic England.

7. Resilience and mitigation

Based on the flood risk identified at the Site, the national and local policies and guidance and proposed development, the mitigation measures outlined within this section of the report are likely to help protect the development from flooding.

Sea (coastal/tidal) flood mitigation measures

As the Site is not identified as being at risk of flooding from the sea, mitigation measures are not required.

Rivers (fluvial) flood mitigation measures

The Site is located within an area which is affected by flooding from rivers, the following table confirms the flood depths associated with the Site.

Table 7. Flood levels compared to ground levels on-Site

Ground levels on-Site (mAOD)	Modelled Flood Levels (mAOD)	
	1 in 100 year plus 31% CC (mAOD)	1 in 1000 year (mAOD)
73.2 to 74.6	74.25	74.30
Flood depths (m)	Up to 0.65	Up to 0.8

Primary Recommendation – Reconfiguring development

The development layout should be reconfigured in order to relocate the proposed garage outside of the Flood Zone (e.g. 30m southeast) to reduce the risk from fluvial sources. It is understood from the client that this will not be feasible due to the fact that moving the garage outside of the Flood Zone would require the removal of a number of large trees and would negatively impact the line of site from the rear of the existing dwelling.

Secondary Recommendation – Flood resilient design

If the proposed garage development cannot be relocated, the vulnerability classification of the Site and the Flood Zone means proposals for the Site fall under the EA's Flood Risk Standing Advice (FRSA) for more vulnerable developments.

As the proposed garage development is non-habitable, the raising of the finished floor level (FFL) is not required. However, it is recommended that the following flood resilience measures are considered.

- Flood resilient materials and designs:

- Use of low permeability building materials up to 0.3 m such as engineering bricks (Classes A and B) or facing bricks;
- The use of internal lime plaster/render or where plasterboards are used these should be fitted horizontally instead of vertically and/or using moisture resistant plasterboard at lower levels;
- Water, electricity and gas meters and electrical sockets should be located above the predicted flood level.

If flood resistant resilience measures can be implemented for the proposed garage development, this will reduce the risk of fluvial flooding from Very Low to Medium to Very Low.

Surface water (pluvial) flood mitigation measures

Although the Site has been identified to be at risk of pluvial flooding, modelled flood depths are confined to non-essential areas and are not anticipated to impact the proposed development. Therefore, mitigation measures are not required.

Groundwater flood mitigation measures

Although the Site has been identified to be at risk of groundwater flooding, modelled flood depths are confined to non-essential areas and are not anticipated to impact the proposed development. Therefore, mitigation measures are not required.

Reservoir flood mitigation measures

The Site is not a risk of flooding from reservoirs; therefore, mitigation measures are not required.

Other flood risk mitigation measures

A culvert has been identified 10m to the northeast of the Site. This structure may pose a flood risk to the Site should it become blocked or damaged.

Due to the absence of detailed hydrological modelling including blockage scenarios, the risk to the Site in the event of a culvert blockage cannot be fully assessed.

Discussions should be held with the Local authority, adjacent landowner and/or Environment Agency to ascertain the responsibility of maintenance for the infrastructure. Where no such schedule is already in effect it is recommended that an appropriate maintenance regime is put in place to maintain effective operation of the nearby culvert.

Residual flood risk mitigation measures

The risk to the Site has been assessed from all sources of flooding and appropriate mitigation and management measures proposed to keep the users of the development safe over its lifetime. There is however a residual risk of flooding associated with the potential for failure of mitigation measures if regular maintenance and upkeep isn't undertaken. If mitigation

measures are not implemented or maintained, the risk to the development will remain as the baseline risk.

Further flood mitigation information

More information on flood resistance, resilience and water entry can be found here: http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

www.knowyourfloodrisk.co.uk

Emergency evacuation - safe access / egress and safe refuge

Emergency evacuation to land outside of the floodplain should be provided if feasible. Where this is not possible, development in general (including basements), should have internal stair access to an area of safe refuge within the building to a level higher than the maximum likely water level. An area of safe refuge should be sufficient in size for all potential users and be reasonably accessible to the emergency services.

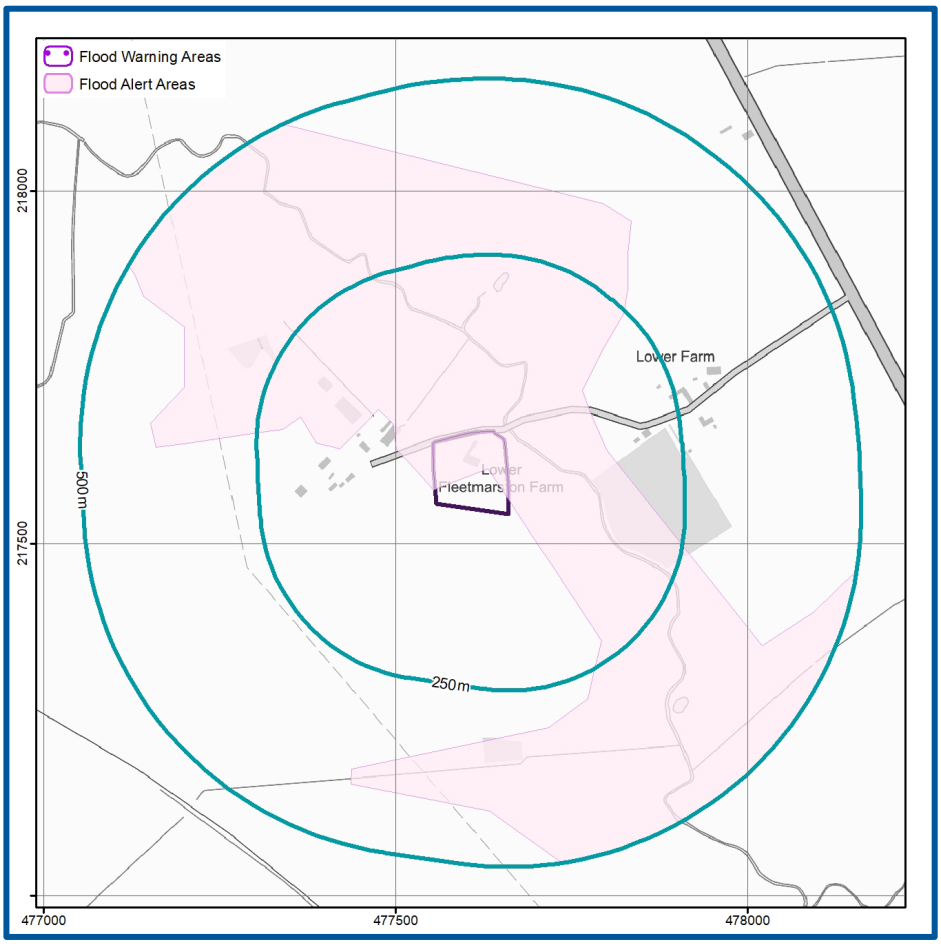
Emergency evacuation from the development and the Site should only be undertaken in strict accordance with any evacuation plans produced for the Site, with an understanding of the flood risks at the Site including available mitigation, the vulnerability of occupants and preferred evacuation routes.

Flood warnings

The EA operates a flood warning service in all areas at risk of flooding; this is available on their website: https://www.gov.uk/check-flood-risk. The Site is located within an EA Flood Alerts coverage area (ref: 061WAF19Thame) so is able to receive alerts (Figure 14, overleaf). The Quick-Dial code is: 171115. All warnings are also available through the EA's 24 hour Floodline Service 0345 988 1188.

The EA aims to issue Flood Warnings 2 hours in advance of a flood event. Flood Warnings can provide adequate time to enable protection of property and evacuation from a Site, reducing risk to life and property.

Figure 13. EA Flood Warning Coverage for the local area (EA, 2024).



Emergency evacuation

Where possible, a safe access and egress route with a 'very low' hazard rating from areas within the floodplain to an area wholly outside the 1 in 100 year flood event including an allowance for climate change should be demonstrated.

Based on the EA's Flood Zone Map the closest dry evacuation area within Flood Zone 1 is within the south of the Site. It is advised that evacuation from the premises would be the preferred option in a flood event if safe to do so. It is recommended that residents prepare to evacuate as soon as an EA Flood Warning is issued in order to completely avoid flood waters.

On-Site refuge

Evacuation should be the primary action in preference, however safe refuge could be sought at first floor level in a worst-case scenario.

Other relevant information

Registration to the Environment Agency's flood warning scheme can be done by following this link: https://www.gov.uk/sign-up-for-flood-warnings.

It is recommended that main communication lines required for contacting the emergency services, electricity sockets/meters, water supply and first aid stations and supplies are not compromised by flood waters. Where possible these should all be raised above the extreme flood level.

8. Conclusions and recommendations

Table 8. Risk ratings following Site analysis

Source of Flood Risk	Baseline[1]	After analysis[2]	After Mitigation[3]
River (fluvial) flooding	Very Low to Medium	Very Low to Medium	Very Low
Sea (coastal/tidal) flooding	Very Low		N/A
Surface water (pluvial) flooding	Very Low to High	Very Low	N/A
Groundwater flooding	Negligible to Moderate	Negligible	N/A
Other flood risk factors present	Yes (Culvert)		N/A
Is any other further work recommended?	Yes (see below)		

1 BASELINE risks assigned for the whole Site, using national risk maps, including the benefit of EA flood defences.

2 AFTER ANALYSIS modification of risk assessment based on detailed site specific analysis including some or all of the following: flood model data, high resolution mapping, building location, access routes, topographic and CCTV surveys. Reasons for the change in classification are provided in the text.

3 AFTER MITIGATION risks include risks to proposed development / asset and occupants if mitigation measures recommended in this report are implemented, including the impacts of climate change.

*N/A indicates where mitigation is not required.

The table below provides a summary of where the responses to key questions are discussed in this report. Providing the recommended mitigation measures are put in place it is likely that flood risk to this Site will be reduced to an acceptable level.

Less vulnerable developments in a Flood Zone 3 are acceptable according to the NPPF and providing the recommended mitigation measures are put in place (see previous sections) it is likely that flood risk to this Site will be reduced to an acceptable level.

Table 9. Summary of responses to key questions in the report

Key sources of flood risks identified	Fluvial (see Section 4).
Are standard mitigation measures likely to provide protection from flooding to/from the Site?	Yes (see Section 7).
Is any further work recommended?	Yes (See exec summary and section 7).

9. 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.

10. References and glossary

References

British Geological Survey (BGS) (2024). GeoIndex. Accessed from: https://www.bgs.ac.uk/map-viewers/geoindex-onshore/ on 11/04/24.

Defra/Environment Agency (2005). Flood Risk Assessment Guidance for New Development. *Phase 2 Framework and Guidance for Assessing and Managing Flood Risk for New Development – Fill Documentation and Tools*. R & D Technical Report FD232-/TR2.

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Environment Agency [EA] (2024). Flood map for planning. Accessed from https://flood-map-for-planning.service.gov.uk/ on 11/04/24.

Environment Agency [EA] (2024). Long term flood risk assessment for locations in England. Accessed from https://flood-warning-information.service.gov.uk/long-term-flood-risk on 11/04/24.

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Ministry of Housing, Communities & Local Government (2022). Planning Practice Guidance (NPPG). Flood Risk and Coastal Change. Accessed from https://www.gov.uk/guidance/flood-risk-and-coastal-change on 11/04/24.

Ordnance Survey Mapping (2024). © Crown copyright. All rights reserved. Licence number AL 100054687. For full terms and conditions visit: www.ordnancesurveyleisure.co.uk

JBA (2017). Aylesbury Vale District Council Strategic Flood Risk Assessment. Accessed from: https://www.buckinghamshire.gov.uk/planning-and-building-control/planning-policy/local-development-plans-and-guidance/local-development-plans/ on 11/04/24.

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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 2024 BlueSky copyright and database rights 2024
Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2024 Ordnance Survey data © Crown copyright and database right 2024
Flood Risk (Flood Zone/RoFRS/Historic Flooding/Pluvial/Surface Water Features/Reservoir/ Flood Alert & Warning)	Environment Agency copyright and database rights 2024 Ordnance Survey data © Crown copyright and database right 2024
Flood Risk (Groundwater)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2024) Contains British Geological Survey materials © NERC 2024 Ordnance Survey data © Crown copyright and database right 2024
Location Plan	Contains Ordnance Survey data © Crown copyright and database right 2024
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2024 Environment Agency copyright and database rights 2024

11. Appendices

GeoSmart Information

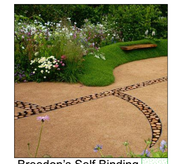
Appendix A

Site plans

Notes

LEGEND

- Existing
- Proposed
- New mix of trees
- New 1.2m high mixed fruit hedge
- New 0.5m/1m high hedge, Euonymus 'Jean Hugues' - Parterre
- New 1m high copper beech hedge (Fagus sylvatica 'Purpurea' hedging)
- New 1m high estate fencing
- Proposed English lavender (Lavandula angustifolia) border planting along lawn, 3plant/metre



Breedon's Self Binding Amber Gravel

Blue Kota limestone paving

N

0m 10m 20m

scale 1-250 @A1

0m 10m 50m

scale 1-500 @ A3

Planning Application

no	date	revision

PLANNING & ARCHITECTURAL CONSULTANCY
Chetwood House • Chilton • HP18 9LS
01844 267990 • admin@jcemmett.co.uk

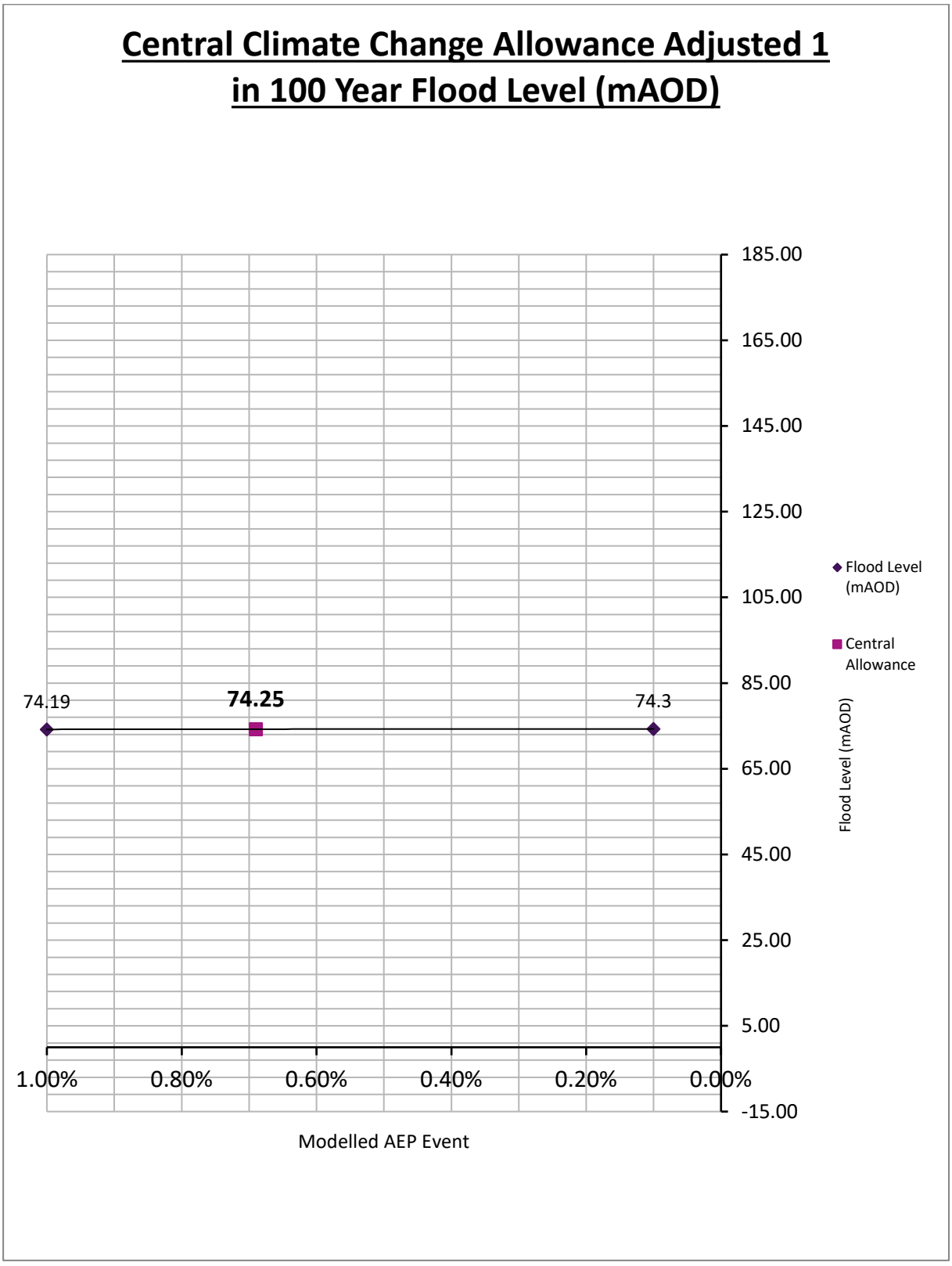
project
Lower Fleet Marston Farmhouse,
Berryfields,
Gated Road, HP22 4AA

title
Proposed Site Layout (Block) Plan

drawn AK	Project number 1369
date 21/03/2024	
scale 1:250 @ A1	Drawing no 1369_PL-03

Appendix B

Environment Agency data



GeoSmart Information

Appendix C

Thames Water sewer flooding history

Sewer Flooding
History Enquiry

Property Searches

GeoSmart Information Ltd

Bellstone

Search address supplied	Lower Fleet Marston Farmhouse Berryfields Gated Road Quarrendon Aylesbury HP22 4AA
Your reference	81542
Our reference	SFH/SFH Standard/2024_4951593
Received date	**23 February 2024**
Search date	**23 February 2024**

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: Lower Fleet Marston Farmhouse,Berryfields Gated Road,Quarrendon,Aylesbury,HP22 4AA

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

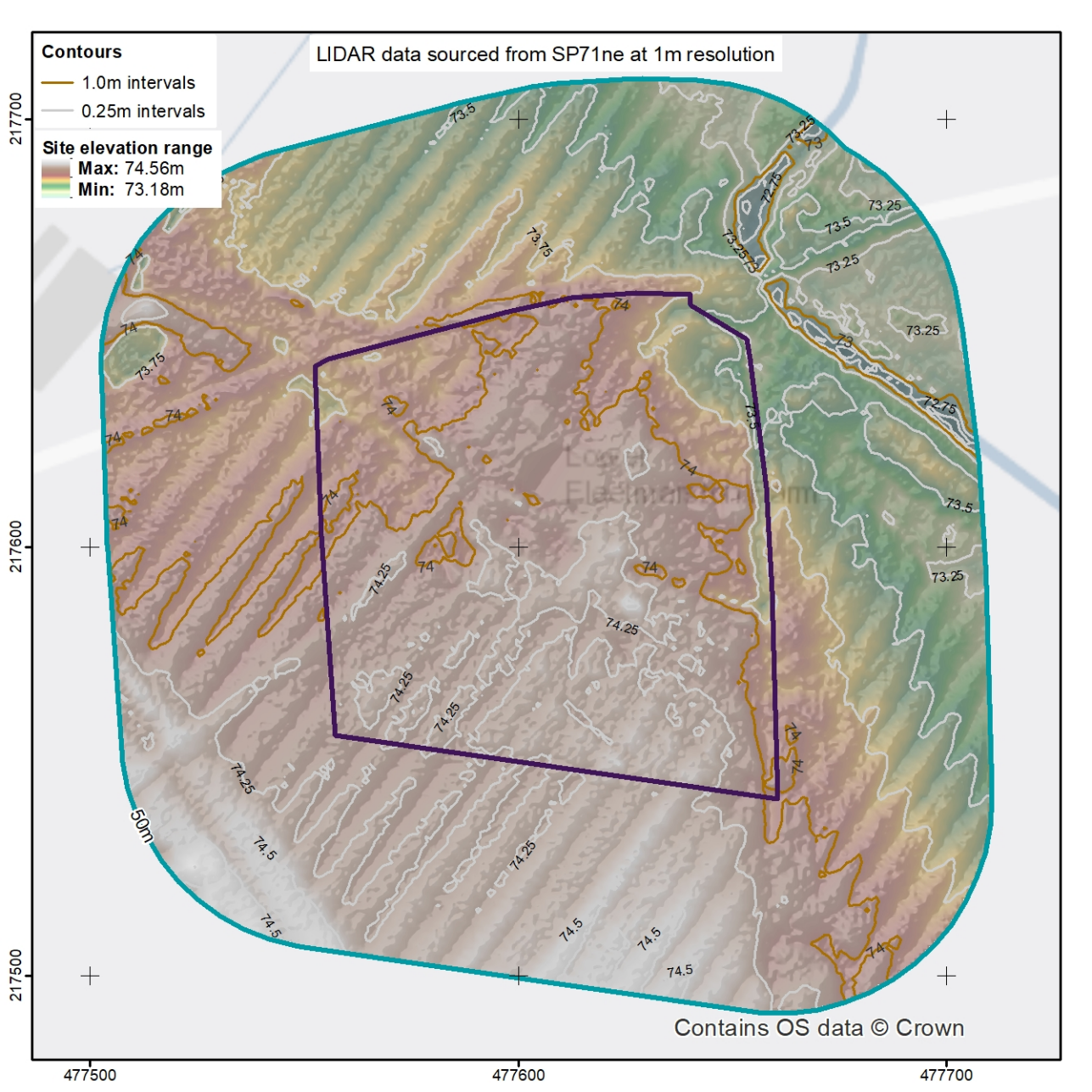
searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

GeoSmart Information

Appendix D

Environment Agency LiDAR ground elevation data


Contours
1.0m intervals
0.25m intervals
Site elevation range
Max: 74.56m
Min: 73.18m
LIDAR data sourced from SP71ne at 1m resolution
50m
Contains OS data © Crown
217700
217600
217500
477500
477600
477700

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.

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Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

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handle complaints speedily and fairly.

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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

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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

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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/