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Level 2 Strategic Flood Risk Assessment - Site AB26

Garages Tibbs Hill Road, Abbots Langley

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site AB26. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Local Plan for Three Rivers District Council Level 1 Strategic Flood Risk Assessment and read the Local Plan for Three Rivers District Council Level 2 Strategic Flood Risk Assessment Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Garages Tibbs Hill Road, Abbots Langley, WD5 0EE.
- Site area: 0.11ha
- Existing site use: Brownfield - Garages
- Proposed site use: Residential

Topography

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR data.

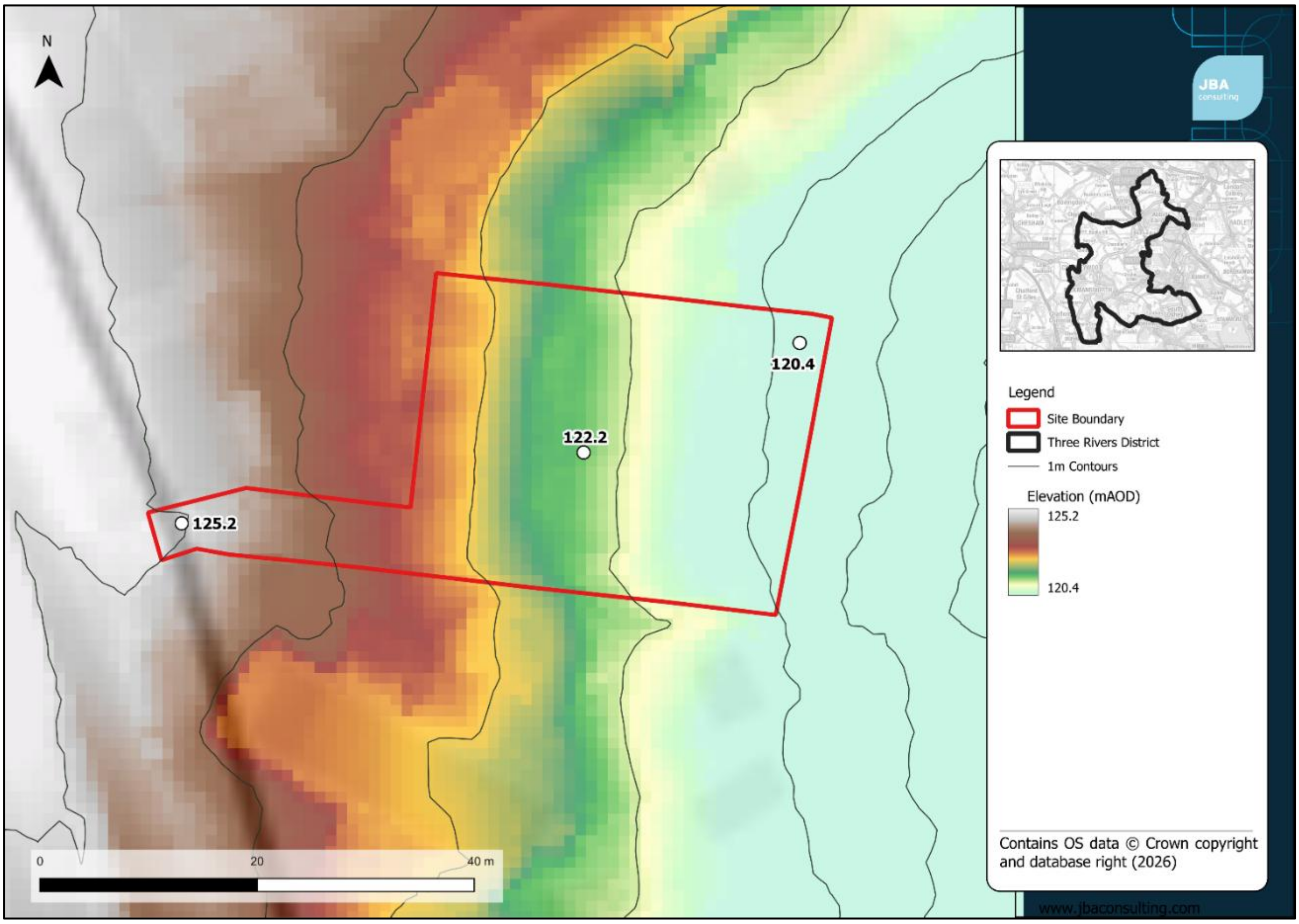

Figure 0-1: Topography of the site

The site slopes from west to east with levels ranging between 120.35mAOD (Above Ordnance Datum) to 125.16mAOD. As the site is in a developed urban area the LiDAR data is unlikely to be representative of the actual site topography, this may have an impact on some of the flood risk datasets used in the assessment.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewes Nodular Chalk Formation and Seaford Chalk Formation
- Superficial - Kesgrave Catchment Subgroup – Sand and gravel

Soils at the site consist of:

- Free draining slightly acid and loamy soil

Sources of flood risk

Location of site within the catchment

The site is located within the built-up urban area of Abbots Langley and is located within the River Colne Catchment. The site is approximately 2km east of Mill Stream.

Existing drainage features

There are no existing drainage features within the site that are visible on topographic mapping or aerial imagery. As the site is in an urban area, it likely drains to the surface water drainage network.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset has been used in this assessment.

Description of risk to the site

The FMfP shows that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site.

Table 0-1: Existing fluvial flood risk based on EA FMfP *

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The site is not predicted to flood during the 3.3% AEP or 1% AEP events.

During the 0.1% AEP rainfall event, 21.12% of the site is at risk from surface water ponding, affecting the central parts of the site. Maximum flood depths and velocities are predicted to reach 0.30-0.60m and 0.5-1m/s respectively. These high depths and velocities are found in the north-eastern part of the site, resulting in a maximum hazard classification of 'Moderate'. Elsewhere in the site, flood depths are shallow and velocities are generally low, resulting in a 'Low' hazard classification.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0	0	21.13
Maximum depth (m)	N/A	N/A	0.3-0.6
Maximum velocity (m/s)	N/A	N/A	0.5-1.0
Maximum hazard classification	N/A	N/A	Moderate

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that the site is at a low risk of groundwater flooding, where groundwater levels are expected to lie greater than 5m below the ground surface. Therefore, groundwater flooding does not pose a significant constraint to safe development of the site.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 66 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's EA's Historic Flood Map or Recorded Flood Outlines dataset.

In addition, Hertfordshire County Council records do not identify any incidents in the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three Rivers District Council Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

The Environment Agency guidance recommends that the both the Central (21%) and Higher Central (35%) allowances are considered when assessing the impact of climate change.

Description of risk to the site

The NaFRA2 data shows that during the 1% and 0.1% AEP plus climate change events, the site remains outside of Flood Zone 2 and 3 extents.

Surface water

Available data

The Environment Agency’s Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070’s epoch, unless the allowance for the 2050’s epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

As with the present-day scenario, the site is expected to remain flood-free during the 1% AEP plus 20% (Central allowance for the 2050s epoch) climate change event. However, during the 0.1% AEP plus 20% climate change event, the surface water extent is predicted to increase to 30.5% of the site. With the application of climate change, an additional area of surface water ponding is shown in the north-western corner of the site, although flood depths, velocities and hazard are generally low in this location. The maximum depth of 0.3-0.6m and the maximum velocity of 0.5-1.0m/s occurs in the north-eastern part of the site, resulting in a 'Moderate' (0.75-1.25) hazard classification.

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is likely to be accessed via Tibbs Hill Road, with current access at the western border of the site. The road is in Flood Zone 1, and therefore at negligible risk of fluvial flooding. The road is predicted to be at low risk of flooding from surface water. Developers will need to demonstrate that safe access and egress in the 1% AEP event, including allowance for climate change.

Fluvial

Safe access is available to the west of the site to Tibbs Hill Road in all events.

Surface water

Safe access is available to the west of the site to Tibbs Hill Road in all events.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- The site is at a low risk of groundwater flooding with groundwater levels are expected to lie greater than 5m below the ground surface. This should be confirmed through additional site investigation work. Below ground development such as basements may still be susceptible to groundwater flooding.
- The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- SuDS should be designed in line with the National Standards for Sustainable Drainage Systems.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and

should be supported by an appropriately detailed maintenance and operation manual.

- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should consider the increased surface water flooding extents due to climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The Sequential approach should consider all sources of flooding that affect the site.

The NPPF classifies residential development as 'More Vulnerable'.
The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council's Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside the eastern part of the site due to surface water flood risk.
Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Should built development be proposed within the design surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures.

Arrangements for safe access and egress will need to be provided for the 1% AEP surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is not at risk of fluvial flooding during present day or climate change scenarios. The site is at low risk of surface water flooding, with up to 21.12% of the site is at risk during the 0.1% AEP surface water event. The flooding in this event is predicted to affect the central part of the site. Maximum flood depths and velocities are predicted to reach 0.30-0.60m and 0.5-1m/s respectively resulting in a maximum hazard classification of 'Moderate'. These high depths and velocities primarily affect the north-eastern part of the site. Elsewhere in the site, flood depths are shallow and velocities are generally low, resulting in a 'Low' hazard classification. With climate change, the site is expected to remain flood-free up to the 1% AEP plus 20% (central allowance for the 2050s epoch) climate change event. However, during the 0.1% AEP plus 20% climate change event, the surface water extent is predicted to increase to 30.5% of the site. Additionally, there is low risk of groundwater flooding at the site during a 1% AEP groundwater flood event.

The following points should be considered in development of this site:

- Development should be steered outside the areas of surface water flood risk on the site. It is expected that the site can be developed safely by incorporating appropriate mitigation measures, including effective SuDS for surface water drainage, and raising building thresholds above the predicted flood depths.
- A site-specific Flood Risk Assessment is required which demonstrates that site users will be safe during events up to and including the 1% AEP surface water events, with an appropriate allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding either on or off the site.
- Arrangements for safe access and escape will need to be provided for the 1% AEP surface water events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.
- Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.

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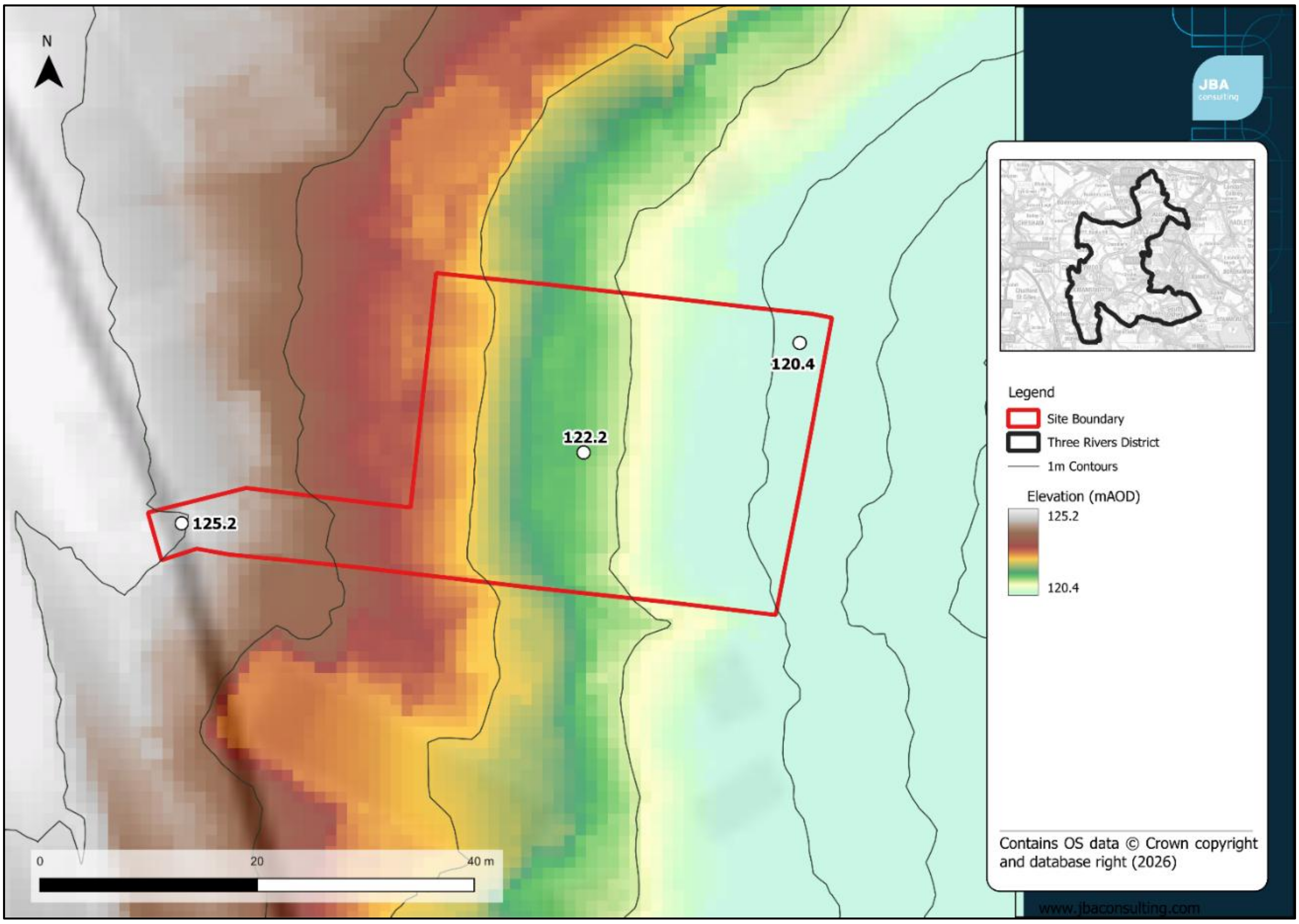

Figure 0-1: Topography of the site

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Geology and soils

Geology at the site consists of:

- Bedrock - Lewes Nodular Chalk Formation and Seaford Chalk Formation
- Superficial - Kesgrave Catchment Subgroup – Sand and gravel

Soils at the site consist of:

- Free draining slightly acid and loamy soil

Sources of flood risk

Location of site within the catchment

The site is located within the built-up urban area of Abbots Langley and is located within the River Colne Catchment. The site is approximately 2km east of Mill Stream.

Existing drainage features

There are no existing drainage features within the site that are visible on topographic mapping or aerial imagery. As the site is in an urban area, it likely drains to the surface water drainage network.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset has been used in this assessment.

Description of risk to the site

The FMfP shows that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site.

Table 0-1: Existing fluvial flood risk based on EA FMfP *

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The site is not predicted to flood during the 3.3% AEP or 1% AEP events.

During the 0.1% AEP rainfall event, 21.12% of the site is at risk from surface water ponding, affecting the central parts of the site. Maximum flood depths and velocities are predicted to reach 0.30-0.60m and 0.5-1m/s respectively. These high depths and velocities are found in the north-eastern part of the site, resulting in a maximum hazard classification of 'Moderate'. Elsewhere in the site, flood depths are shallow and velocities are generally low, resulting in a 'Low' hazard classification.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0	0	21.13
Maximum depth (m)	N/A	N/A	0.3-0.6
Maximum velocity (m/s)	N/A	N/A	0.5-1.0
Maximum hazard classification	N/A	N/A	Moderate

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that the site is at a low risk of groundwater flooding, where groundwater levels are expected to lie greater than 5m below the ground surface. Therefore, groundwater flooding does not pose a significant constraint to safe development of the site.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 66 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's EA's Historic Flood Map or Recorded Flood Outlines dataset.

In addition, Hertfordshire County Council records do not identify any incidents in the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three Rivers District Council Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

The Environment Agency guidance recommends that the both the Central (21%) and Higher Central (35%) allowances are considered when assessing the impact of climate change.

Description of risk to the site

The NaFRA2 data shows that during the 1% and 0.1% AEP plus climate change events, the site remains outside of Flood Zone 2 and 3 extents.

Surface water

Available data

The Environment Agency’s Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070’s epoch, unless the allowance for the 2050’s epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

As with the present-day scenario, the site is expected to remain flood-free during the 1% AEP plus 20% (Central allowance for the 2050s epoch) climate change event. However, during the 0.1% AEP plus 20% climate change event, the surface water extent is predicted to increase to 30.5% of the site. With the application of climate change, an additional area of surface water ponding is shown in the north-western corner of the site, although flood depths, velocities and hazard are generally low in this location. The maximum depth of 0.3-0.6m and the maximum velocity of 0.5-1.0m/s occurs in the north-eastern part of the site, resulting in a 'Moderate' (0.75-1.25) hazard classification.

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is likely to be accessed via Tibbs Hill Road, with current access at the western border of the site. The road is in Flood Zone 1, and therefore at negligible risk of fluvial flooding. The road is predicted to be at low risk of flooding from surface water. Developers will need to demonstrate that safe access and egress in the 1% AEP event, including allowance for climate change.

Fluvial

Safe access is available to the west of the site to Tibbs Hill Road in all events.

Surface water

Safe access is available to the west of the site to Tibbs Hill Road in all events.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- The site is at a low risk of groundwater flooding with groundwater levels are expected to lie greater than 5m below the ground surface. This should be confirmed through additional site investigation work. Below ground development such as basements may still be susceptible to groundwater flooding.
- The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- SuDS should be designed in line with the National Standards for Sustainable Drainage Systems.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and

should be supported by an appropriately detailed maintenance and operation manual.

- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should consider the increased surface water flooding extents due to climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The Sequential approach should consider all sources of flooding that affect the site.

The NPPF classifies residential development as 'More Vulnerable'.
The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council's Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside the eastern part of the site due to surface water flood risk.

Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Should built development be proposed within the design surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures.

Arrangements for safe access and egress will need to be provided for the 1% AEP surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is not at risk of fluvial flooding during present day or climate change scenarios. The site is at low risk of surface water flooding, with up to 21.12% of the site is at risk during the 0.1% AEP surface water event. The flooding in this event is predicted to affect the central part of the site. Maximum flood depths and velocities are predicted to reach 0.30-0.60m and 0.5-1m/s respectively resulting in a maximum hazard classification of 'Moderate'. These high depths and velocities primarily affect the north-eastern part of the site. Elsewhere in the site, flood depths are shallow and velocities are generally low, resulting in a 'Low' hazard classification. With climate change, the site is expected to remain flood-free up to the 1% AEP plus 20% (central allowance for the 2050s epoch) climate change event. However, during the 0.1% AEP plus 20% climate change event, the surface water extent is predicted to increase to 30.5% of the site. Additionally, there is low risk of groundwater flooding at the site during a 1% AEP groundwater flood event.

The following points should be considered in development of this site:

- Development should be steered outside the areas of surface water flood risk on the site. It is expected that the site can be developed safely by incorporating appropriate mitigation measures, including effective SuDS for surface water drainage, and raising building thresholds above the predicted flood depths.
- A site-specific Flood Risk Assessment is required which demonstrates that site users will be safe during events up to and including the 1% AEP surface water events, with an appropriate allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding either on or off the site.
- Arrangements for safe access and escape will need to be provided for the 1% AEP surface water events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.
- Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.

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Level 2 Strategic Flood Risk Assessment - Site ACFS1

Heath House, Rickmansworth Road, Chorleywood

Prepared for

Three Rivers District Council

Date

19 February 2026

THREE RIVERS DISTRICT COUNCIL

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site ACFS1. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Local Plan for Three Rivers District Council Level 1 Strategic Flood Risk Assessment and read the Local Plan for Three Rivers District Council Level 2 Strategic Flood Risk Assessment Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Heath House, Rickmansworth Road, Chorleywood, WD3 5SG.
- Site area: 0.2ha
- Existing site use: Residential dwelling
- Proposed site use: Residential

Topography

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR data.

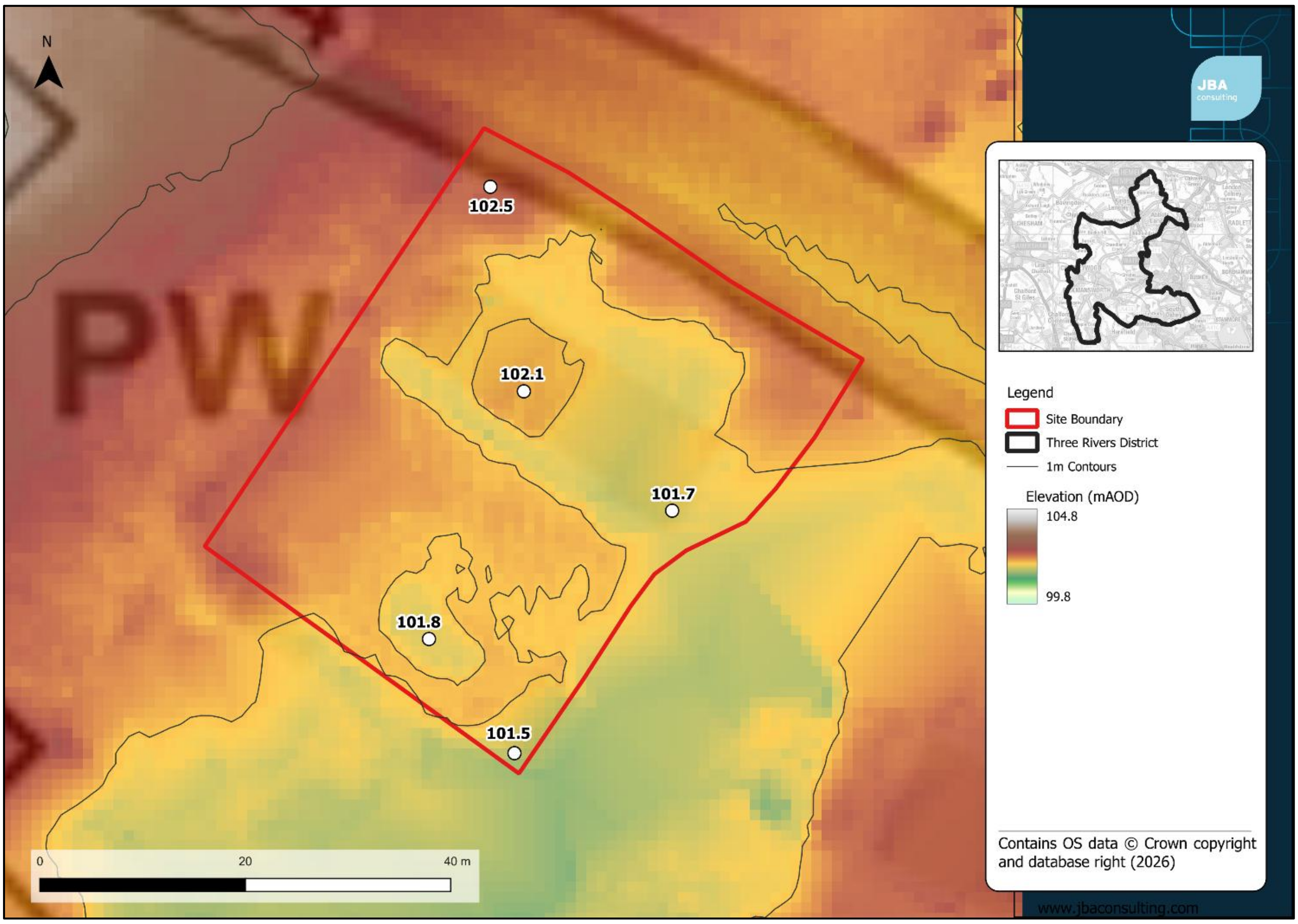

Figure 0-1: Topography of the site

The Environment Agency 1m resolution LiDAR shows that the site is slopes slightly from the northern corner to the southern corner. Levels in the northern corner, along Rickmansworth Road, are 102.47mAOD (Above Ordnance Datum), decreasing to 101.67mAOD in the southern corner.

Geology and soils

Geology at the site consists of:

- Bedrock - Seaford Chalk Formation and Newhaven Chalk Formation
- Superficial - Chorleywood Gravel Formation – Sand and gravel

Soils at the site consist of:

- Free draining slightly acid and loamy soil

Sources of flood risk

Location of site within the catchment

The site is located in the settlement of Chorleywood, on the outskirts of Rickmansworth. It is in a semi-rural location with Chorleywood Common to the rear. To the west and south of the site is Christ Church Chorleywood C of E School. The River Chess is approximately 670m north-east of the site. There are no mapped ordinary watercourses in close proximity to the site.

Existing drainage features

There are no existing drainage features within the site that are visible on topographic mapping or aerial imagery.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) has been used in this assessment as the site is not covered by a detailed hydraulic model.

Description of risk to the site

The FMfP and 2010 Upper Colne model show that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site.

Table 0-1: Existing fluvial flood risk based on EA FMfP *

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The Environment Agency Risk of Flooding from Surface Water mapping shows that the site is at risk of surface water flooding in the 1% AEP and 0.1% AEP events. During the 1% AEP event, ponding occurs in areas of low topography in the north of the site with a velocity of 0-0.25m/s and maximum depths up to 0.2-0.3m. The mapping also shows that there is flooding to Rickmansworth Road, directly outside the site for the 1% AEP event with a maximum anticipated depth of up to 0.2-0.3m. The maximum hazard classification during this event is 'Low' (0.5-0.75).

For the 0.1% AEP event, the mapping shows that the risk of flooding from surface water increases to 33.9% of the site, although this is contained to the northern part of the site. Depths of flooding reach a maximum of 0.3-0.6m, with the greatest depth to the northern section of the site. The mapping shows that runoff from Rickmansworth Road is making its way into the site for the 0.1% AEP event. There is a flow route adjacent to the eastern boundary of the site, flowing south towards Chorleywood Common, however this flow route is outside the site boundary. The velocity mapping identifies that the flooding will be at speeds of up to 0.5-1.0m/s. During this event, the maximum hazard classification increases to 'Moderate' (0.75-1.25) in the northern part of the site.

It is expected that the site can be developed safely by incorporating appropriate mitigation measures, including effective SuDS for surface water drainage, and raising building thresholds above the predicted flood depths.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0	6.1	33.9%
Maximum depth (m)	N/A	0.2-0.3	0.3-0.6
Maximum velocity (m/s)	N/A	0.0-0.25	0.5-1.0
Maximum hazard classification	N/A	Low (0.5-0.75)	Moderate (0.75-1.25)

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that the site is at a low risk of groundwater flooding, where groundwater levels are expected to lie greater than 5m below the ground surface. Therefore, groundwater flooding does not pose a significant constraint to safe development of the site.This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 74 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's Historic Flood Map or Recorded Flood Outlines dataset.

Flood Records from Hertfordshire County Council do not show any records on or within the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three Rivers District Council Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The mapping shows that the site will remain in Flood Zone 1 and therefore the risk of fluvial flooding to the site is low.

Table 0-1: Comparison of fluvial flood risk to the site between the 1% AEP and 1% AEP plus 21% climate change extents.

Event	1% AEP	1% AEP plus 21% CC
Percentage of site at risk (%)	0	0
Maximum depth (m)	N/A	N/A
Maximum velocity (m/s)	N/A	N/A
Maximum hazard classification	N/A	N/A

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

The application of climate change to rainfall results in a slight increase in surface water flood extent during the 1% AEP plus 20% (Central allowance for the 2050s epoch) climate change event, increasing from 6.1% to 8.7% of the site. Dring this event, surface water ponding is predicted in the northern part of the site, reaching a maximum depth of 0.2-0.3m and a velocity of 0.25-0.5m/s. Within this flood extent, the highest hazard classification increases to 'Moderate', observed in an area of low topography in the northern part of the site.

However, as per Environment Agency guidance the central uplift does not provide a sufficient basis for assessing future flood risk. The present day 0.1% AEP can be used a proxy to indicate future surface water risk for the 1% AEP plus 40% climate change (Upper End allowance for the 2070s epoch) scenario. The 0.1% AEP event shows the deepest flooding (0.3-0.6m) occurring in areas of low topography in the north of the site. Velocities reach a maximum of 0.5-1.0m/s, found at the site access road, coming off Rickmansworth Road. The highest hazard classification during this event is 'Moderate'.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	6.1	8.7
Maximum depth (m)	0.2-0.3	0.2-0.3
Maximum velocity (m/s)	0.0-0.25	0.25-0.5
Maximum hazard classification	Low (0.5-0.75)	Moderate (0.75-1.25)

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is currently accessed from Rickmansworth Road along the northern boundary of the site, and it is likely this will remain the access for future development. For the 1% AEP plus climate change (20%) surface water flood event, Rickmansworth Road has a hazard rating of 'Moderate' adjacent to the site which may present access and egress issues for some.

Developers will need to demonstrate that safe access and egress in the 1% AEP event, including allowance for climate change.

Fluvial

Access roads remain in Flood Zone 1, and therefore at negligible risk of fluvial flooding. Safe access and egress are available to the north of the site to Rickmansworth Road in all events.

Surface water

Flooding is expected to Rickmansworth Road to the north of the site in all modelled events. However, flood depths are shallow (<0.3m) up to the 0.1% AEP surface water event.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
  - Priority 1: collected for non-potable use
  - Priority 2: infiltrated to ground
  - Priority 3: discharged to an above ground surface water body
  - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
  - Priority 5: discharged to a combined sewer
- BGS data indicates that the underlying geology is chalk which is likely to be free draining. This should be confirmed through infiltration testing, with the use of infiltration maximised as much as possible in accordance with the SuDS hierarchy.
- The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work. Below ground development such as basements may still be susceptible to groundwater flooding.
- The entire site is mostly located within Groundwater Source Protection Zone 2 (SPZ). Infiltration techniques may not be suitable and should only be used following the granting of any required environmental permits from the Environment Agency for Zones 2, 3 and 4 although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and EA) at an early stage to understand possible opportunities and constraints.
- The site is not located within a historic landfill site.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure.
- If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be

confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the increased surface water flooding extents due to climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such bioretention areas or rain gardens must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.
The NPPF classifies residential development as 'More Vulnerable'.
The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA, specifically surface water flooding.
Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council's Local Local Plan Policies.
The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside the areas of surface water flood risk on the site. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. These measures should be assessed to make sure that flooding is not increased either on or off-site.

Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Should built development be proposed within the design surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures. Arrangements for safe access and egress will need to be provided for the 1% AEP surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is not at risk of fluvial flooding during present day or climate change scenarios. Additionally, there is a no risk of groundwater flooding is predicted in the mapping. However, northern areas of the site are at risk of surface water flooding during the 1% and 0.1% AEP events. Up to 16% of the site is predicted to flood during the 1% AEP event and approximately 34% in the 0.1% AEP event. Surface water ponding during these events affects a central part of the site. Access to the site through the A404 is possible up to the 0.1% AEP, as flood depths are predicted to remain below 0.3m.

The following points should be considered in development of this site:

- A site-specific Flood Risk Assessment is required which demonstrates that site users will be safe during events up to and including the 0 1% AEP surface water event, with an appropriate allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding either on or off the site.
- Development should be steered outside the areas of surface water flood risk on the site. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. These measures should be assessed to make sure that flooding is not increased either on or off the site.
- Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.
- Arrangements for safe access and escape will need to be provided for the 1% AEP surface water events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

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Level 2 Strategic Flood Risk Assessment - Site ACFS10

Andrews Ley Farm, Harefield Rd

Prepared for

Three Rivers District Council

Date

19 February 2026

THREE RIVERS DISTRICT COUNCIL

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site ACFS10. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Level 1 SFRA and read the Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Andrews Ley Farm, Harefield Rd
- Site area: 0.5 ha
- Existing site use: Previously developed brownfield and greenfield land
- Proposed site use: Residential

Topography

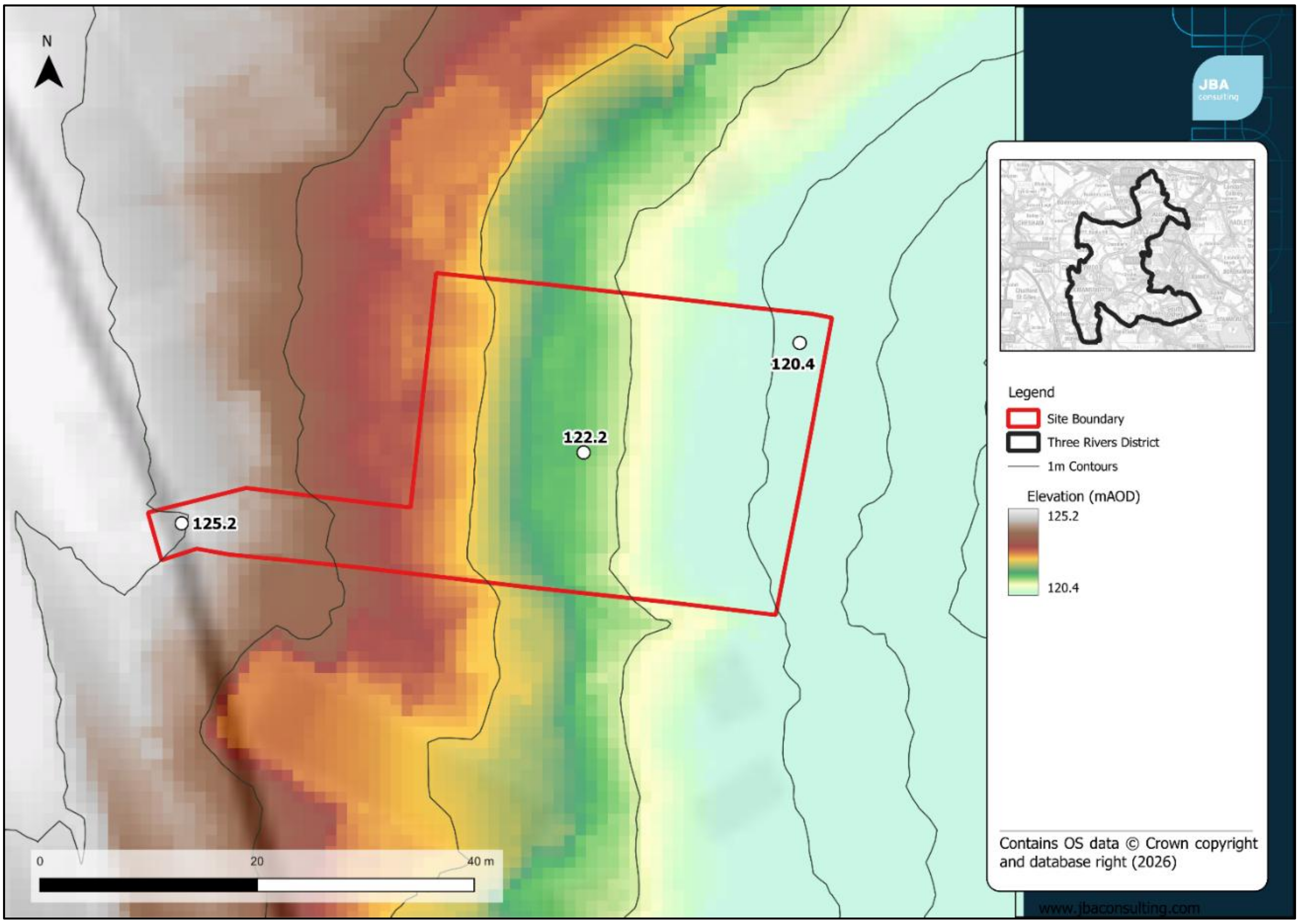

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR. The topography of the site declines in elevations from the western boundary to the eastern boundary. The highest elevation, along the western boundary is 59.5mAOD, which declines to approximately 53.8mAOD along the eastern boundary.

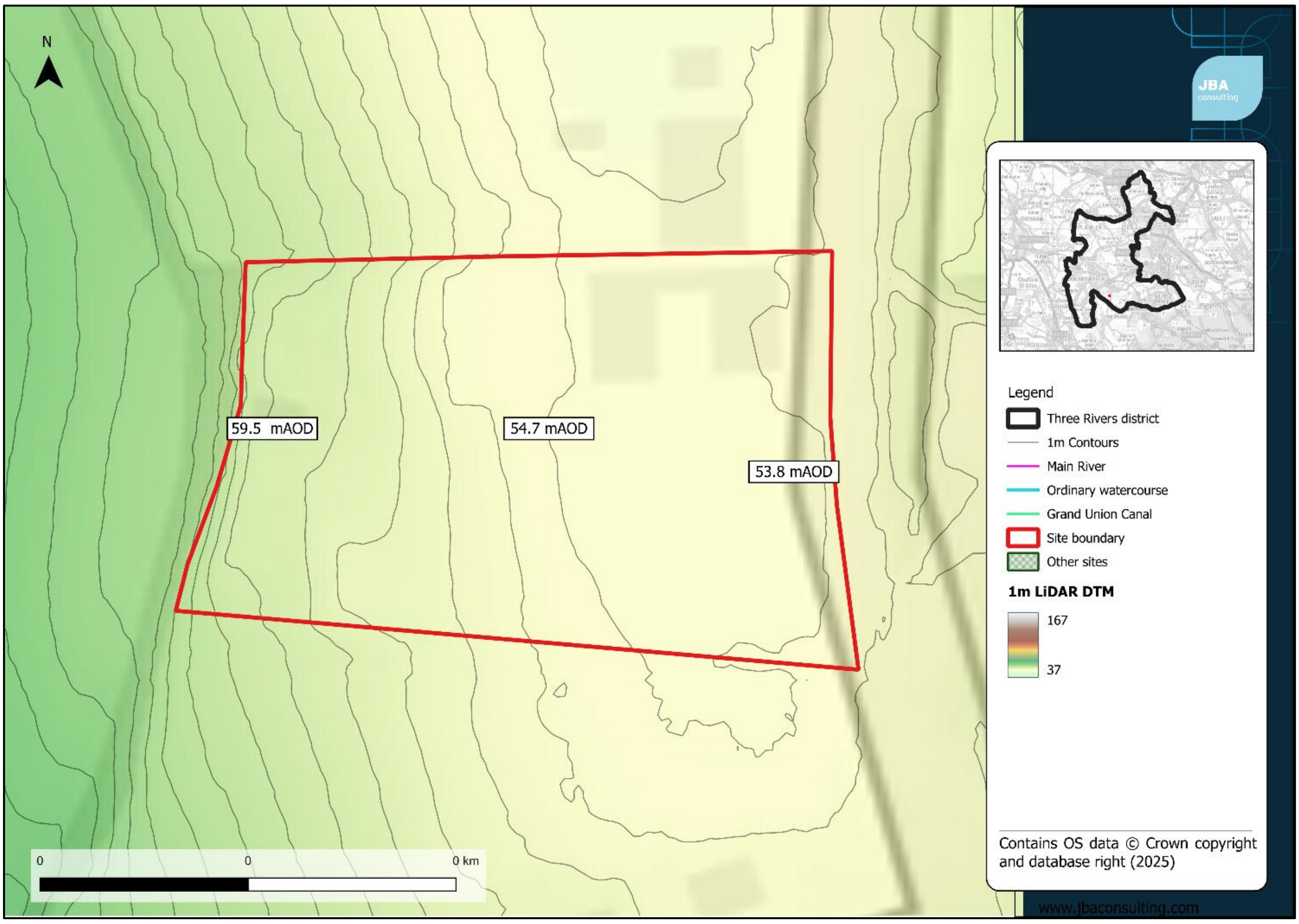

Figure 0-1: Topography of the site.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewes Nodular Chalk Formation
- Superficial - Head-Clay, silt, sand, and gravel

Soils at the site consist of:

- Freely draining, slightly acidic, loamy soils

Sources of flood risk

Location of site within the catchment

The site is located in Chorleywood and is comprised of previously developed land. The site is located within the Colne (confluence with Chess to River Thames) water body catchment, which forms part of the Thames River Basin District.

Existing drainage features

There is no drainage features located on the site. The site located approximately 500m south of the Grand Union Canal and 1km south of the River Colne which flows southwest through Rickmansworth.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset and, the Upper Colne (2025) hydraulic model have been used to assess fluvial flood risk at this site.

Description of risk to the site

The FMfP show that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site. The Upper Colne model confirms that the site remains in Flood Zone 1.

Table 0-1: Existing fluvial flood risk based on EA FMfP *

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The RoFSW mapping shows that the site is at high risk of surface water flooding along the northern and eastern boundary from a large external flow path originating from an unnamed watercourse which flows from Batchworth Heath Hill to Park Wood. Surface water runoff follows the topographic gradient towards the site, travelling east of the Batchworth Park Golf Club. Significant surface water flooding is present from the 3.33% AEP event.

Flood depths more than 1.2m are predicted within the site boundary during all three events. In the 3.33% AEP, the deepest flood depths are limited to the southeast of the site, where the elevation is the lowest. Elsewhere in the site flood depths largely range from 0.3 - 0.9m. Areas of deep accumulation increase significantly in the 1% AEP and 0.1% AEP, in the latter event depths ≥1.2m are predicted for most of the inundated area in the east of the site (which occupies up to 60% of the site).

The flow path approaches the site boundary at high velocity (1m/s or greater) from the 3.33% AEP event. Within the site, velocity increases with flood depth across all three events reaching 2m/s in the 0.1% AEP. As such, the associated hazard across all three events ranges from 'Significant - Danger for most' to 'Extreme - Danger for all'.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	54.3	56.4	60.3
Maximum depth (m)	>1.2	>1.2	>1.2
Maximum velocity (m/s)	0.5-1.0	1.0-2.0	≥2.0
Maximum hazard classification	Significant -Extreme	Significant - Extreme	Significant - Extreme

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The Environment Agency's reservoir flooding mapping shows that 50% of the site is at risk from reservoir flooding if there was a breach from the Harefield No.3 reservoir. As part of a site-specific Flood Risk Assessment, an agreed emergency plan should identify appropriate safe access and egress routes from the site, in the event of a reservoir breach

Groundwater

The JBA Groundwater Emergence Map shows that across a majority of the site, groundwater levels are predicted to be between 0.5m and 5m below the ground surface during a 1% AEP groundwater emergence event.

Based on the RoFSW and topography of the site it is likely that any groundwater that emerges will pool along the eastern boundary, within the sites topographical low.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 30 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the EA's historical flood map. Hertfordshire County Council records identify 3 records of flooding at or near the site. All three incidents are attributed to the February 2014 winter flooding, which was caused by heavy rain fall. Internal property flooding is shown to have resulted from this event.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Description of risk to the site

The NaFRA2 dataset shows that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site when the central allowance is applied to the 1% AEP (Flood Zone 3) and 0.1% AEP (Flood Zone 2).

Surface water

Available data

Surface Water flooding for the 3.3%, 1% and 0.1% AEP events with central climate change uplift (up to the 2050s epoch), using data available as part of the NAFRA2 release. The central allowance applied in the NAFRA2 data is a 20% uplift.

The Environment Agency guidance recommends that the Upper End allowance is considered for both the 3.3% and 1% AEPs for the 2070’s epoch, unless the allowance for the 2050’s epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

Description of risk to the site

The extent of surface water flood risk at the site remains broadly consistent with the present-day surface water model, with a slight increase in extent.

During the 1% AEP plus 20% climate change event maximum depth, velocity, and hazard remain consistent with the present-day scenario. There are no new areas of risk predicted within the boundary. The southwest flow path remains dominant and is the main source of flood risk to the site. The predicted extents, depth, velocity and hazard remain less than the 0.1% AEP event.

Table 0-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	56.4	57.8

Event	1% AEP	1% AEP plus 20% CC
Maximum depth (m)	>1.2	>1.2
Maximum velocity (m/s)	1.0-2.0	1.0-2.0
Maximum hazard classification	Significant - Extreme	Significant - Extreme

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

The site is at risk of reservoir flooding in the unlikely event of a breach at Harefield No 3 Reservoir.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial/surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Harefield Road is the main access road for this site for this site.

Fluvial

Harefield Road is not affected by fluvial flooding in the vicinity of the site, but at Batchworth Harefield Road is in Flood Zone 3b. Here, flood depths reach 0.4m in the 1% AEP and 0.5m in the 0.1% AEP, but hazard remains low for both events. Access from the north of the site is severely impeded from the 1% AEP event.

Surface water

Harefield Road in affected by surface water flooding north of the site at Batchworth, with 'Significant' hazard predicted from the 3.33% AEP defended event (Flood zone 3b). The main flow path affecting the site from the southeast of the site, also bisects Harefield Road adjacent to the site. Flood depths are predicted to the shallow in the 3.33% AEP event (less than 0.2m) but peak velocity is high (2m/s) and hazard is 'Moderate - Danger for some' (with a small area reaching 'Significant - danger for most'). Flood depths increase to 0.6m in the 1% AEP, and hazard is 'Significant'. In the 0.1% AEP, hazard in this location of Harefield Road reaches 'Extreme - danger for all'. Fast flowing and deep flood water means that vehicular and pedestrian access and egress is not possible.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- BGS data indicates that the underlying geology is Lewes Nodular Chalk Formation which is likely to be free draining. This should be confirmed through infiltration testing, with the use of infiltration maximised as much as possible in accordance with the SuDS hierarchy.
- The site is considered to have a low susceptibility to groundwater. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system. Below ground development such as basements may not be appropriate at this site.
- The site is located within Groundwater Source Protection Zone 3. Infiltration techniques may not be suitable and should only be used following the granting of any required environmental permits from the Environment Agency for Zones 2, 3 and 4 although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible opportunities and constraints.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Opportunities for using source control SuDS to manage runoff rates and volumes, contributing to the reduction of flood peaks downstream and existing surface water flow paths leaving the site.
- SuDS techniques implemented on the site should seek to manage the on-site and downstream impacts of the existing large surface water flow path.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should consider the impacts of future climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition of receiving waterbodies

- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies Residential development as More Vulnerable.
The Exception Test is not required for this site because the site is in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- within Flood Zone 1 and the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the Three Rivers District Council, Hertfordshire County Council Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

Detailed modelling will be required to confirm surface water climate change extents. Demonstration that safe access and egress is required for the 1% AEP plus climate change event. The impact of the development on flood risk from all sources both on and off-site must be considered and modelled where appropriate. The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside of the area of surface water flood risk along the eastern boundaries of the site. Development must seek opportunities to reduce overall level of flood risk both on and off-site, for example by reducing volume and rate of runoff and creating space for flooding.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe. Fluvial and surface water mapping used in this assessment, suggests that access is severely impeded during from the 3.33% AEP fluvial and surface water events.

Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels. These measures should be assessed to make sure that flooding is not increased elsewhere:

- raise them as much as possible.
- include extra flood resistance and resilience measures.

Conclusions

A majority of the site is at high surface water flood risk during the 3.3%, 1% and 0.1% present day AEP events and developers will need to carefully consider this risk and demonstrate users of the site can be kept safe during the lifetime of the development through a detailed site-specific FRA, including detailed surface water modelling. High flood depths and hazard affect the site and the access to the site. Flood depths of more than 1.2m are predicted within the site boundary during all three events, hazard also remains high ranging from 'Significant' in the 3.33% AEP up to 'Extreme' in the 0.1% AEP. Areas of deep accumulation increase significantly in the 1% AEP and 0.1% AEP.

A comparison of the 1% AEP and the 1% AEP plus central climate change shows that the site shows little sensitivity to the impacts of climate change and extents, depths and hazard do not exceed the 0.1% AEP event. Modelling should be undertaken for the 1% plus upper end climate change allowance.

Harefield Road, which is the access road for the site, is at risk of surface water flooding from the 3.33% AEP and access is severely impeded by the 1% AEP surface water event due to high depths (up to 0.6m) and hazard ('Significant' to 'Extreme').

Groundwater flood risk is moderate, with groundwater levels between 0.5m and 5 m below ground, ponding could occur along the eastern boundary in the site’s topographical low if emergence happens.

The following points should be considered in development of this site:

- The development is residential, therefore is classed as 'More Vulnerable'.
- The development should be designed using a sequential approach. Development should be steered away from surface water flow routes and areas where groundwater risk is highest, preserving these areas as green infrastructure.
- Safe access and egress should be demonstrated in the 1 in 100-year plus climate change event. An emergency flood plan must be prepared, to demonstrate how safe access and egress from the site can be achieved. Raising of access routes must not impact on surface water flow routes. Consideration should be given to the siting of access points with respect to fluvial, surface water flood, reservoir and groundwater risk areas.
- Access and egress from this site are important to the overall safety of the development, and therefore this should be discussed with the Local Planning Authority and Environment Agency at the earliest stage.
- Groundwater monitoring is suggested to determine emergence risk.
- Flow routes would need to be preserved if carrying out land-raising within the surface water risk area.

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Level 2 Strategic Flood R Assessment - Site ACFS8b

Flowerhouse, 2-3 Station Road, Kings Langley

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site ACFS8b. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Local Plan for Three Rivers District Council Level 1 Strategic Flood Risk Assessment and read the Local Plan for Three Rivers District Council Level 2 Strategic Flood Risk Assessment Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Flowerhouse, 2-3 Station Road, Kings Langley, WD4 8LL
- Site area: 0.38ha
- Existing site use: Brownfield - Commercial
- Proposed site use: Residential

Topography

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

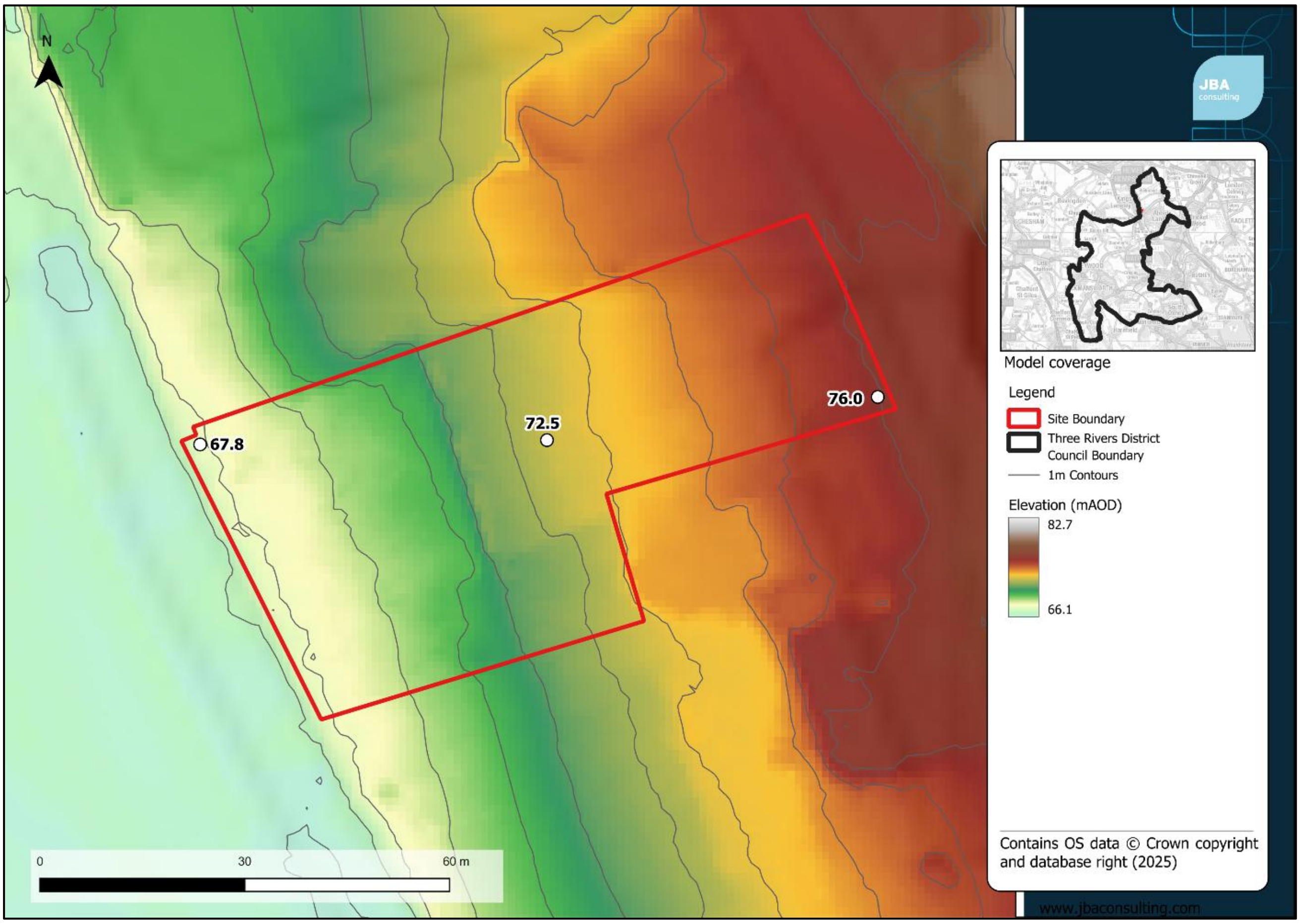

Figure 0-1: Topography of the site.

The LiDAR shows the site falls from east to west by approximately 8m. Along the northern boundary of the site, levels decline from 76.00mAOD (above ordnance datum) to 67.72mAOD.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewes Nodular Chalk Formation and Seaford Chalk Formation
- Superficial - Alluvium – Clay, Silt, Sand and Gravel

Soils at the site consist of:

- Loamy and clayey floodplain soils with naturally high groundwater.

Sources of flood risk

Location of site within the catchment

The site is located within south Kings Langley, in a built-up area opposite the train station. The site is located within the Gade water body catchment.

Existing drainage features

There are no watercourses within the site boundary. However, Mill Stream, an EA designated Statutory Main River, flows along the western border of the site. The watercourse is culverted to the north-west of the site. The Grand Union Canal and River Gade merge 150m north-west of the site and continues to flow south towards Watford.

Fluvial

Available data

The EA's 2019 1D-2D detailed hydraulic model for the River Gade and Bulbourne was used to assess fluvial flood risk as it covers Mill Stream which runs along the western site boundary. As flood waters remain in-channel in flood events up to and including the 0.1% AEP event, detailed results represent in-channel depths, velocities and hazards rather than representing results on the floodplain. In the absence of detailed modelling for the 3.33% AEP defended scenario, the 2% AEP defended scenario has been used as a proxy to define Flood Zone 3b.

For scenarios where detailed modelling is not available, the EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset has been used in this assessment.

Description of risk to the site

The EA FMfP shows that the site is primarily located within Flood Zone 1. The River Gade and Bulbourne (2019) model confirms that the site largely remains within Flood Zone 1, consistent with the FMfP. Flood Zone 3b intersects the western boundary, covering 5.8% of the site. However, in this area, the River Gade and Grand Union Canal merge, so flows and water levels in the channel are controlled. The Mill Stream forms a bypass channel, although water levels are predicted to remain in-channel up to the 0.1% AEP event, with no change seen in the extents between Flood Zone 2 and 3a despite an increase in return period.

Detailed modelling results are available for the 1% AEP defended and undefended scenarios and the 0.1% undefended events. A maximum flood depth of 0.64m is predicted during the 1% AEP defended and undefended events. Maximum flood velocity and hazard are also comparable between the two 1% AEP scenarios, at 0.06m/s and 0.44 ('Low').

Flood depths remain below 0.71m during the 0.1% AEP undefended event. Flood velocity and hazard during the 0.1% AEP event are 0.07m/s and 0.47 ('Low') respectively.

Table 0-1: Existing fluvial flood risk based on EA FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
91.8	8.2	8.2	5.8

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Canals

The Grand Union Canal flows is represented in the Upper Colne 2025 model. The assessment of fluvial flood risk is, therefore, considered to give a reasonable indication of risk from canal flooding. As the canal is located on higher ground approximately 150m from the site boundary, the risk of flooding to the site from canal is considered to be low.

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The site is at negligible risk of surface water flooding, and therefore surface water flooding does not pose a significant constraint to safe development of the site.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0	0	0
Maximum depth (m)	N/A	N/A	N/A
Maximum velocity (m/s)	N/A	N/A	N/A
Maximum hazard classification	N/A	N/A	N/A

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows the site is at very high risk of groundwater flooding in the west of the site (approximately 33% of the site), with water levels estimated to be within 0.025m of the ground surface during the 1% AEP ground water flood event. High risk is shown elsewhere in the site, with water levels between 0.025m to 0.5m below the ground surface.

As a result, within the site there is a risk of groundwater flooding to surface and subsurface assets, as well as the possibility of groundwater emerging at the surface locally. Mitigation for seasonal high groundwater levels must be considered in design of the site, for example by raising finished floor levels to an appropriate height above ground level. Surface water drainage is likely to be impeded during periods with high groundwater levels and infiltration may not be possible. There also may be ingress into sewer networks and below ground storage such as soakaways.

Based on the topography of the site it is likely that any groundwater that emerges will flow to the east.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outlines the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five digit post code level. The site is located within a postcode area with 16 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's Historic Flood Map and Recorded Flood Outlines dataset.

Flood Records from the LLFA shows one recent incident of internal flooding to a property along Gallows Hill. The cause of flooding was attributed to inadequate drainage.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three Rivers District Council Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The River Gade and Bulbourne (2019) defended model was also used to assess fluvial flood risk at the site with the application of climate change. The detailed modelling does not provide climate change outputs for the undefended scenarios, therefore, the defended 1% AEP plus climate change event has been used to inform this part of the assessment. The Environment Agency guidance recommends that the both the Central (21%) and Higher Central (35%) allowances are considered when assessing the impact of climate change.

Description of risk to the site

A comparison of the 1% AEP event defended extent against the 1% AEP plus 35% climate change defended event shows that when the higher central climate change allowance is applied, water levels on the Mill Stream are predicted to remain in-bank. Climate change flood extents do not extend beyond Flood Zone 2 (equivalent to the present day 0.1% AEP event extent). There is a marginal increase in fluvial flood extents between the 1% and 1% AEP plus 35% climate change defended scenarios, with coverage increasing by less than 1% of the site area. Maximum depth, velocity and hazard is comparable to the 0.1% AEP, with little hazard shown to the site.

Table 0-1: Comparison of fluvial flood risk to the site between the 1% AEP and 1% AEP plus 35% defended climate change extents.

Event	1% AEP	1% AEP plus 35% CC
Percentage of site at risk (%)	5.8	6.5
Maximum depth (m)	0.64	0.67
Maximum velocity (m/s)	0.06	0.06
Maximum hazard classification	Low - Caution	Low - Caution

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

In all events, the site is not at an increased risk of surface water flooding when a 20% climate change allowance is applied to 1% AEP event. The entire site remains located at low surface water flood risk.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	0	0
Maximum depth (m)	N/A	N/A
Maximum velocity (m/s)	N/A	N/A
Maximum hazard classification	N/A	N/A

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

North-west of the site, Mill Stream is culverted under Home Park Mill Link. Using the RoFSW mapping as a proxy, blockage of this structure is not predicted to affect the site, with flows backing up and flowing in a north-westerly direction into the River Gade, rather than spilling onto the site.

Emergency planning

Flood warnings and alerts

The site is not located within an EA Flood Warning or Flood Alert area. However, the River Gade at Kings Langley and Croxley Flood Warning Area and the Rivers Gade and Bulbourne Flood Alert Area are located along the western boundary of the site.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is likely to be accessed from Station Road, which is adjacent to the eastern boundary of the site. This road is not at risk from surface water or fluvial flooding in all events.

Fluvial

Safe access is available to the east of the site to Station Road in all events up to the 0.1% AEP fluvial event.

Surface water

Safe access is available to the east of the site to Station Road in all events up to the 0.1% AEP surface water event.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- Groundwater levels are indicated to be at or very near (within 0.025m) ground level in 33% of the site and there is a risk of groundwater flooding at the surface during a 1% AEP event, which may flow to and pool within topographic low spots. The infiltration capacity is likely to rapidly decline just a shallow distance below the surface, and so infiltration basins would require shallow depths. The presence of superficial deposits across the site should also be considered, as infiltration into these thin aquifers may result in groundwater mounding.
- Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- For any infiltration-based techniques, sufficient lining of the system will be required to ensure no capacity is lost. The slope of the site should also be accounted for when allocating infiltration design within the site, as water that is infiltrated in the higher areas of the site may resurface in the lower areas, creating areas of ponding.
- The site is located within a Groundwater Source Protection Zone 1 and 2. Proposed SuDS should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and Environment Agency) at an early stage to understand possible opportunities and constraints.
- The site is not located within a historic landfill site.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- The existing site is predominantly impermeable. Redevelopment of the site should look to reduce coverage of impermeable areas through the use of SuDS, to reduce surface water runoff rates and volumes, and manage downstream flood risk.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should consider the impacts of future climate change over the projected lifetime of the development.
- Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.
- SuDS should be designed with a holistic approach, combining ecology, landscape and drainage requirements specific to the site, and incorporating Biodiversity Net Gain requirements.
- SuDS should be designed in line with the National Standards for Sustainable Drainage Systems.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as 'More Vulnerable'.
The Exception Test is required for this site because it is classed as more vulnerable development and part of the site is located within Flood Zone 3b.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- is within Flood Zone 3
- within 'Flood Zones plus Climate Change', showing it is at increased risk of flooding from rivers or sea in future
- the Flood Map for Planning shows it is at risk from surface water flooding
- is subject to sources of flooding other than rivers or sea

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the Three Rivers District Council, Hertfordshire County Council, Thames Water, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council's Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development must seek opportunities to reduce overall level of flood risk both on and offsite, for example by reducing volume and rate of runoff and creating space for flooding.

The development should be designed using a sequential approach. Flood Zones 2 and 3, should be preserved as public green space, with built development restricted to Flood Zone 1.

The impact of high groundwater levels must be assessed as part of a site-specific flood risk assessment; this must be supported by groundwater levels monitoring and must demonstrate that any proposed buildings with deep foundations do not increase flood risk elsewhere.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe. Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

As a brownfield site, post-development surface water runoff rates and volumes should aim to meet the equivalent greenfield values, in line with Defra national guidance. If greenfield rates and volumes are not attainable, consultation with Hertfordshire County Council (the LLFA) will be required.

The design of SuDS schemes must take into account the seasonally high groundwater table. Infiltration techniques may be ineffective and may pose a pollution risk. SuDS may need to be shallow and take up larger areas. Above ground conveyance and attenuation can be used but care must be taken that groundwater does not enter the SuDS feature and reduce the storage capacity and structural integrity of the design. Example features may include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.

The design must ensure that flows resulting from rainfall in excess of a 1% AEP event are managed via exceedance routes that minimise the risks to people and property.

An 8m wide buffer should be maintained between the riverbanks of the Mill Stream and any built structures, to enable the riparian owners and/or the Environment Agency to access and maintain the channel and asset.

Conclusions

A small proportion of the site is shown to be at risk of fluvial flooding as the Mill Stream flows along the western border of the site and is therefore within Flood Zone 3b. However, flood waters remain in-channel in flood events up to and including the 0.1% AEP event, so a majority of the site is within Flood Zone 1.

The site is not at risk of surface water flooding.

Shallow groundwater levels are present across much of the site. A site-specific flood risk assessment should confirm the risk to the site. This is likely to require ground investigations.

The following points should be considered in development of this site:

- The Exception Test must be undertaken and passed. Most of the site is shown to be at risk during the design fluvial and surface water events. If the Exception Test is failed, the development will not be able to be proceed.
- Development must seek opportunities to reduce overall level of flood risk both on and offsite, for example by reducing volume and rate of runoff and creating space for flooding.
- The development should be designed using a sequential approach. Flood Zones 2 and 3, plus climate change (subject to a detailed flood risk assessment) should be preserved as public green space, with built development restricted to Flood Zone 1.
- Safe access and egress should be demonstrated in the 1% AEP plus climate change event.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, with development steered away from the areas identified to be at risk of fluvial flooding across the site.
- If flood mitigation measures are implemented then they are tested to check that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Level 2 Strategic Flood Risk Assessment - Site BR20

Northwick Day Centre, South Oxhey

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site BR20. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Local Plan for Three Rivers District Council Level 1 Strategic Flood Risk Assessment and read the Local Plan for Three Rivers District Council Level 2 Strategic Flood Risk Assessment Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Northwich Day Centre, South Oxhey, WD19 6RS.
- Site area: 0.56ha
- Existing site use: Brownfield
- Proposed site use: Residential

Topography

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR data.

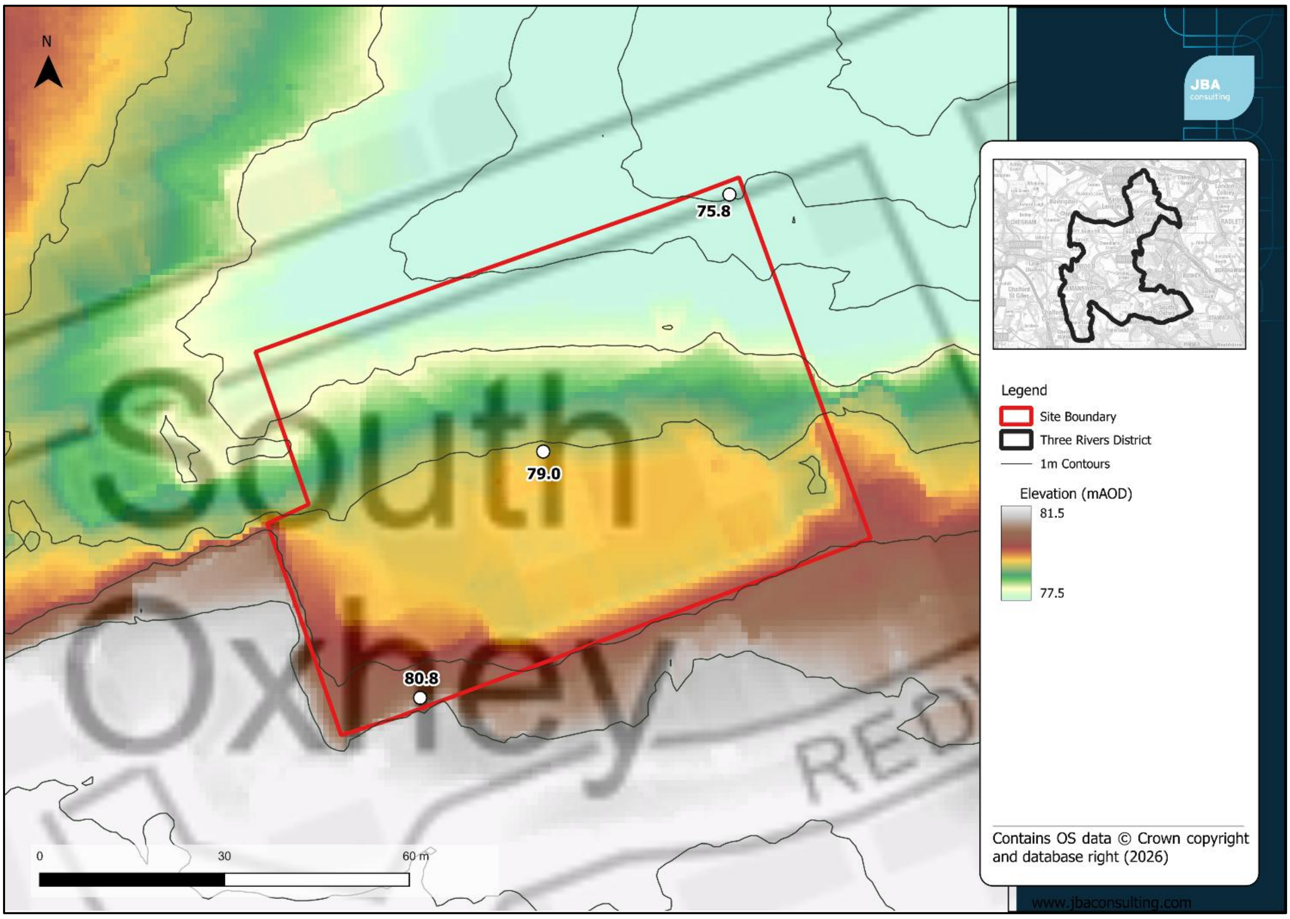

Figure 0-1: Topography of the site

The site slopes from southwest to northeast with levels ranging between 75.81mAOD (Above Ordnance Datum) to 81.08mAOD. As the site is in a developed urban area the LiDAR data is unlikely to be representative of the actual site topography, this may have an impact on some of the flood risk datasets used in the assessment.

Geology and soils

Geology at the site consists of:

- Bedrock - London Clay Formation
- Superficial - N/A

Soils at the site consist of:

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

Sources of flood risk

Location of site within the catchment

The site is located within the built-up urban area of South Oxhey and is located within the River Colne Catchment. The site is approximately 0.7km west of the Hartsbourne Stream and 2km south of the River Colne.

Existing drainage features

There are no existing drainage features within the site that are visible on topographic mapping or aerial imagery. As the site is in an urban area, it likely drains to the surface water drainage network.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset has been used in this assessment.

Description of risk to the site

The FMfP shows that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site.

Table 0-1: Existing fluvial flood risk based on EA FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The site is at risk of surface water flooding in all modelled events. During the 3.33% AEP event, ponding occurs in the southern part of the site, covering 54.3% of the site. During the high-risk scenario, flood depths and velocities reach 0.3-0.6m and 0.25-0.5m/s respectively, resulting in a maximum hazard classification of 'Significant'.

The area of ponding extends slightly during the 1% and 0.1% AEP events, with maximum flood depths remaining at 0.3-0.6m. Additionally, a surface water flow path originating outside the site on Northwick Road encroaches into the north-western corner during the 1% and 0.1% AEP events. Although flood depths along the surface water flow path remain shallow (<0.2m), velocities in this location reach a maximum of 1.0-2.0m/s during the 0.1% AEP event. The maximum hazard during the Low-risk scenario is 'Significant' (1.25-), shown in the southern part of the site. The hazard in the rest of the site remains 'Low' (0.5-0.75).

It is expected that the site can be developed safely by incorporating appropriate mitigation measures, including effective SuDS for surface water drainage, and raising building thresholds above the predicted flood depths.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	4.5	6.3	11.5
Maximum depth (m)	0.3-0.6	0.3-0.6	0.3-0.6
Maximum velocity (m/s)	0.25-0.5	0.50-1.0	1.0-2.0
Maximum hazard classification	Significant	Moderate	Significant

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that the site is not at risk of groundwater flooding. Therefore, groundwater flooding does not pose a significant constraint to safe development of the site.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 20 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not shown to be within the Environment Agency’s Historic Flood Map or Recorded Flood Outlines dataset.

In addition, Hertfordshire County Council records do not identify any incidents in the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three Rivers District Council Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Description of risk to the site

The site is not at an increased risk of flooding due to climate change. The entire site remains located in Flood Zone 1.

Surface water

Available data

The Environment Agency’s Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070’s epoch, unless the allowance for the 2050’s epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

The application of climate change to rainfall results in an increase in surface water flood extent during the 1% AEP plus 20% (Central allowance for the 2050s epoch) climate change event, increasing from 6.3% to 7.7% of the site. As with the present-day scenario, surface water ponding occurs in the southern part of the site to depths of 0.3-0.6m, however the hazard increases to Significant (1.25-2.0).

Under the medium-risk scenario (1% AEP plus 20% climate change event), the maximum velocity along the surface water flow path in the north-western part of the site increases to 1.0-2.0m/s.

However, as per Environment Agency guidance the central uplift does not provide a sufficient basis for assessing future flood risk. The 0.1% AEP event shows maximum depths and hazard reaching 0.3-0.6m and 1.25-2.0 ("Significant") respectively in the area of ponding in the south of the site. Depths along the surface water flow path in the north-west remain shallow, while velocities reach 1.0-2.0m/s.

Table 0-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	6.3	7.7
Maximum depth (m)	0.3-0.6	0.3-0.6
Maximum velocity (m/s)	0.50-1.0	1.0-2.0
Maximum hazard classification	Moderate	Significant

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is likely to be accessed via Northwick Road, with current access at the northern border of the site. The road is in Flood Zone 1, and therefore at negligible risk of fluvial flooding. Fluvial

Safe access is available to the north of the site to Northwick Road up to 0.1% AEP fluvial event.

Surface water

The access road is shown to flood in the westward direction during the 3.3% AEP surface water event, while the eastward direction is predicted to allow flood-free access during the high-risk scenario. A moderate risk of surface water flooding is shown to this road immediately adjacent to the site, with access likely to be affected during a 1% AEP and greater surface water event.

Developers will need to demonstrate that safe access and egress in the 1% AEP event, including allowance for climate change.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- The site is not considered to be susceptible to groundwater flooding. This should be confirmed through additional site investigation work. Below ground development such as basements may still be susceptible to groundwater flooding.
- The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- SuDS should be designed in line with the National Standards for Sustainable Drainage Systems.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the increased surface

water flooding extents due to climate change over the projected lifetime of the development.

- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as 'More Vulnerable'.
The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA, specifically surface water flooding.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council's Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside the southern part of the site due to surface water flood risk. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. These measures should be assessed to make sure that flooding is not increased either on or off-site.

Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Should built development be proposed within the design surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures.

Arrangements for safe access and egress will need to be provided for the 1% AEP surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is not at risk of fluvial flooding during present day or in the assessed climate change scenarios. Additionally, no risk of groundwater flooding is predicted at the site during a 1% AEP groundwater flood event. However, southern parts of the site are at risk of surface water flooding during the 3.3%, 1% and 0.1% AEP events.

The following points should be considered in development of this site:

- A site-specific Flood Risk Assessment is required which demonstrates that site users will be safe during events up to and including the 0.1% and 1% AEP rainfall events, with an appropriate allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding either on or off the site.
- Development should be steered outside the areas of surface water flood risk on the site. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. These measures should be assessed to make sure that flooding is not increased either on or off the site.
- Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.
- Arrangements for safe access and escape will need to be provided for the 1% AEP surface water events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

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Level 2 Strategic Flood Risk Assessment - Site CFS14

Land North of Oxhey Lane

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site CFS14. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Local Plan for Three Rivers District Council Level 1 Strategic Flood Risk Assessment and read the Local Plan for Three Rivers District Council Level 2 Strategic Flood Risk Assessment Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Land North of Oxhey Lane, WD19 5BA.
- Site area: 3.45ha
- Existing site use: Greenfield
- Proposed site use: Residential

Topography

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR data.

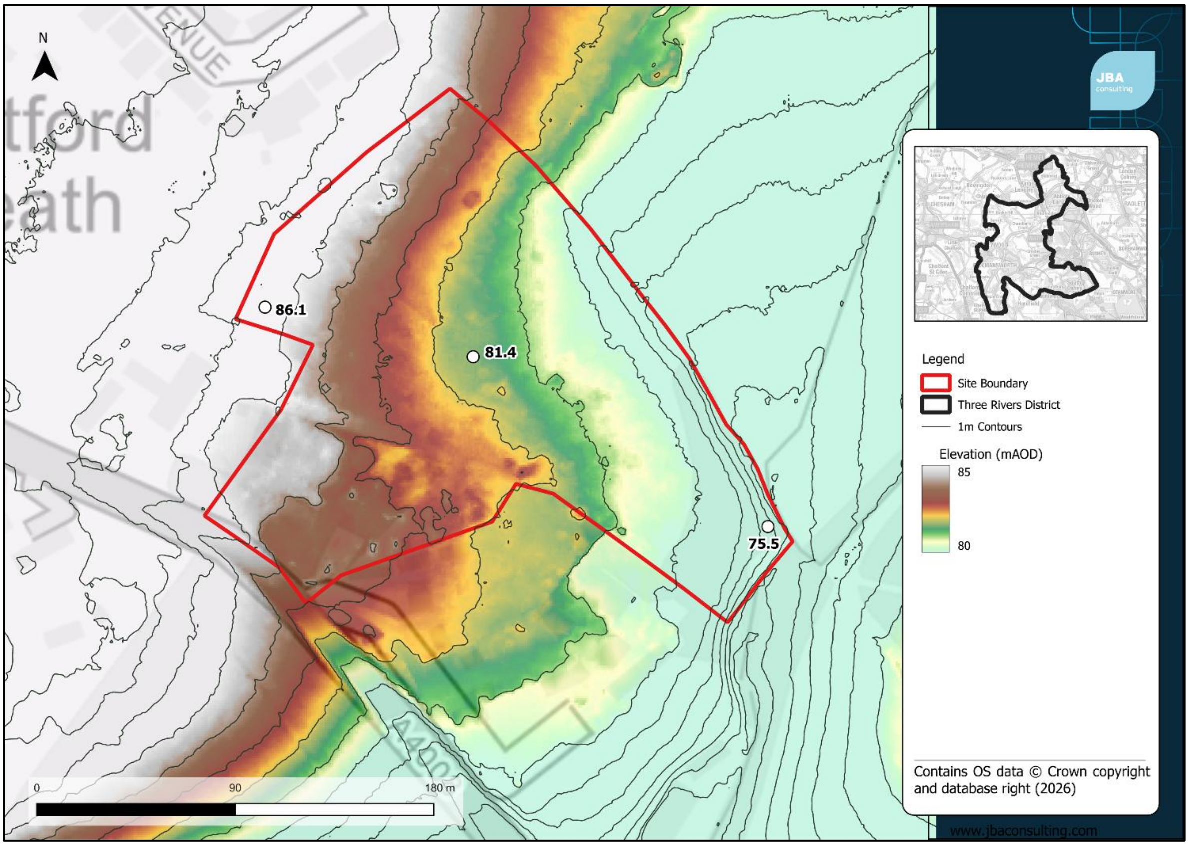

Figure 0-1: Topography of the site

The site slopes from north-west to south-east, with levels ranging between 75.5mAOD (Above Ordnance Datum) to 86.1mAOD.

Geology and soils

Geology at the site consists of:

- Bedrock - London Clay Formation
- Superficial - None recorded

Soils at the site consist of:

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

Sources of flood risk

Location of site within the catchment

The site is located within the River Colne Catchment. The site is approximately 0.7km east of the Hartsbourne Stream.

Existing drainage features

There are no existing drainage features within the site that are visible on topographic mapping or aerial imagery. As the site is in an urban area, it likely drains to the surface water drainage network.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset has been used in this assessment as the site is not covered by a detailed hydraulic model.

Description of risk to the site

The FMfP shows that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site.

Table 0-1: Existing fluvial flood risk based on EA FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The site is at risk of surface water flooding in all modelled events. During the 3.33% AEP event, ponding occurs in the western part of the site to depths of 0.3-0.6m, although velocities are generally low (<0.5m/s). From the 3.33% AEP event surface water runoff from Oxhey Brook encroaches into a small area along the south-eastern boundary. Along the flow path, flood depths reach a maximum of 0.9-1.2m and velocities are >2m/s, resulting in a maximum hazard classification of 'Significant' (1.25-2.0).

During the 1% AEP and the 0.1% AEP events the surface water flood extent extends slightly, covering 5.2% and 10.2% of the site respectively. However, this is largely due to ponding and is not associated with the Oxhey Brook. Significant depths (>1.2m) and velocities (>2m/s) are limited to areas immediately adjacent to Oxhey Brook. The influence of Oxhey Brook on surface water risk to the site is minimal.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	4.4	5.2	10.2
Maximum depth (m)	0.9-1.2	>1.2	>1.2
Maximum velocity (m/s)	1.0-2.0	>2.0	>2.0
Maximum hazard classification	Significant	Extreme	Extreme

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that the site is not at risk of groundwater flooding. Therefore, groundwater flooding does not pose a significant constraint to safe development of the site. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 46 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's Historic Flood Map or Recorded Flood Outlines dataset.

Flood Records from Hertfordshire County Council do not show any records on or within the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three Rivers District Council Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Description of risk to the site

The site is not at an increased risk of flooding due to climate change. The entire site remains located in Flood Zone 1.

Surface water

Available data

The Environment Agency’s Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070’s epoch, unless the allowance for the 2050’s epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

The application of climate change to rainfall results in an increase in surface water flood extent during the 1% AEP plus 20% (Central allowance for the 2050s epoch) climate change event, increasing from 5.2% to 6.5% of the site. As with the present-day scenario, surface water ponding occurs in the western part of the site, flood risk from Oxhey Brook remains minimal and does not exceed the 0.1% AEP event.

Table 0-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	5.2	6.5
Maximum depth (m)	>1.2	>1.2
Maximum velocity (m/s)	>2.0	>2.0
Maximum hazard classification	Extreme (>2.0)	Extreme (>2.0)

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

Residual risk is present due to the situation of culverts. Oxhey Brook is culverted under the Oxhey Lane (A4008). Blockages from debris may restrict flow can cause water to back up, potentially leading to large areas of flooding.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is likely to be accessed via Oxhey Lane (A4008), with current access at the western border of the site. Fluvial

Safe access and egress are available to the west of the site to Oxhey Lane in all events.

Surface water

A high risk of surface water flooding is shown on Oxhey Lane, with access to and from the south likely to be affected during a 3.3% AEP and greater surface water events. This appears to be associated to a location on the A4008 where Oxhey Brook is culverted. Flood depths at this point are predicted to be high (up to 0.6m) from the 3.33% to 0.1% AEP. High peak velocity is also predicted, from 0.5m/s in the 3.33% AEP event to up to 2m/s in the 0.1% AEP event. As such, the maximum hazard is 'Significant' for all events.

Developers will need to demonstrate that safe access and egress in the 1% AEP event, including allowance for climate change.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work. Below ground development such as basements may still be susceptible to groundwater flooding.
- The site is not located within a Groundwater Source Protection Zone. However, most of the site is designated by the Environment Agency as being a historic landfill site (Oxhey Lane landfill). As such, infiltration techniques should only be used where there are suitable levels of treatment and following the granting of any required environmental permits from the Environment Agency.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- SuDS should be designed in line with the National Standards for Sustainable Drainage Systems.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.

- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the increased surface water flooding extents due to climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as 'More Vulnerable'.
The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific Flood Risk Assessment (FRA) will be required as the proposed development site:

- the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA, specifically surface water flooding.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council's Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside the southern part of the site due to surface water flood risk. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. These measures should be assessed to make sure that flooding is not increased either on or off-site.

The impact of Oxhey Brook on flood risk to the site has been assessed through the RoFSW data set. It is recommended that detailed modelling is undertaken as part of the site-specific FRA to confirm the risk to the site, particularly the residual risk of the culvert on the A4008.

Additionally, the risk from surface water flow routes should be quantified as part of a site-specific FRA, considering residual and including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Should built development be proposed within the design surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures.

Arrangements for safe access and egress will need to be provided for the 1% AEP surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. The RoFSW mapping suggests that the presence of culvert on the A4008 is likely to severely impede access to and from the south of the site via Oxhey Lane. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding. Due to the site's location within land designated by the EA as a historic landfill, infiltration may pose a pollution risk. SuDS may need to be shallow and take up larger areas. Above ground conveyance and attenuation can be used but care must be taken that groundwater does not enter the SuDS feature and reduce the storage capacity and structural integrity of the design. Example features may include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.

Conclusions

The site is not at risk of fluvial flooding during present day or assessed climate change scenarios. While the site is at risk of surface water flooding during the 3.3%, 1% and 0.1% AEP events, Oxhey Brook only has minimal influence on surface water risk at the site. There are isolated areas of ponding, affecting up to 10% of the site in the 0.1% AEP event. It is expected that development can be designed to avoid areas of existing risk. However, it is likely that access to the site from the south via Oxhey Lane (A4008) is affected, risk is likely to be exacerbated where Oxhey Brook is culverted. Risk to the site from Oxhey Brook should be modelled and quantified as part of a site-specific FRA, considering residual risk form the culvert on the Oxhey Lane and its impact on access to the site.
The following points should be considered in development of this site:

- A site-specific FRA is required which demonstrates that site users will be safe during events up to and including the 1% AEP surface water event, with an appropriate allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding either on or off the site.
- Development should be steered outside the areas of surface water flood risk on the site. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. These measures should be assessed to make sure that flooding is not increased either on or off the site.
- Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.
- The site is in a located on a historic landfill site; therefore, a thorough ground investigation will be required as part of a drainage strategy to determine the extent of the contamination and SuDS features may need to be lined.
- Arrangements for safe access and escape will need to be provided for the 1% AEP surface water events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

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Level 2 Strategic Flood Risk Assessment - Site CFS32

Lynsters Farm, Uxbridge Road, Maple Cross

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site CFS32. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Lynsters Farm, Uxbridge Road, Maple Cross
- Site area: 13.8 Ha
- Existing site use: Greenfield
- Proposed site use: Employment

Topography

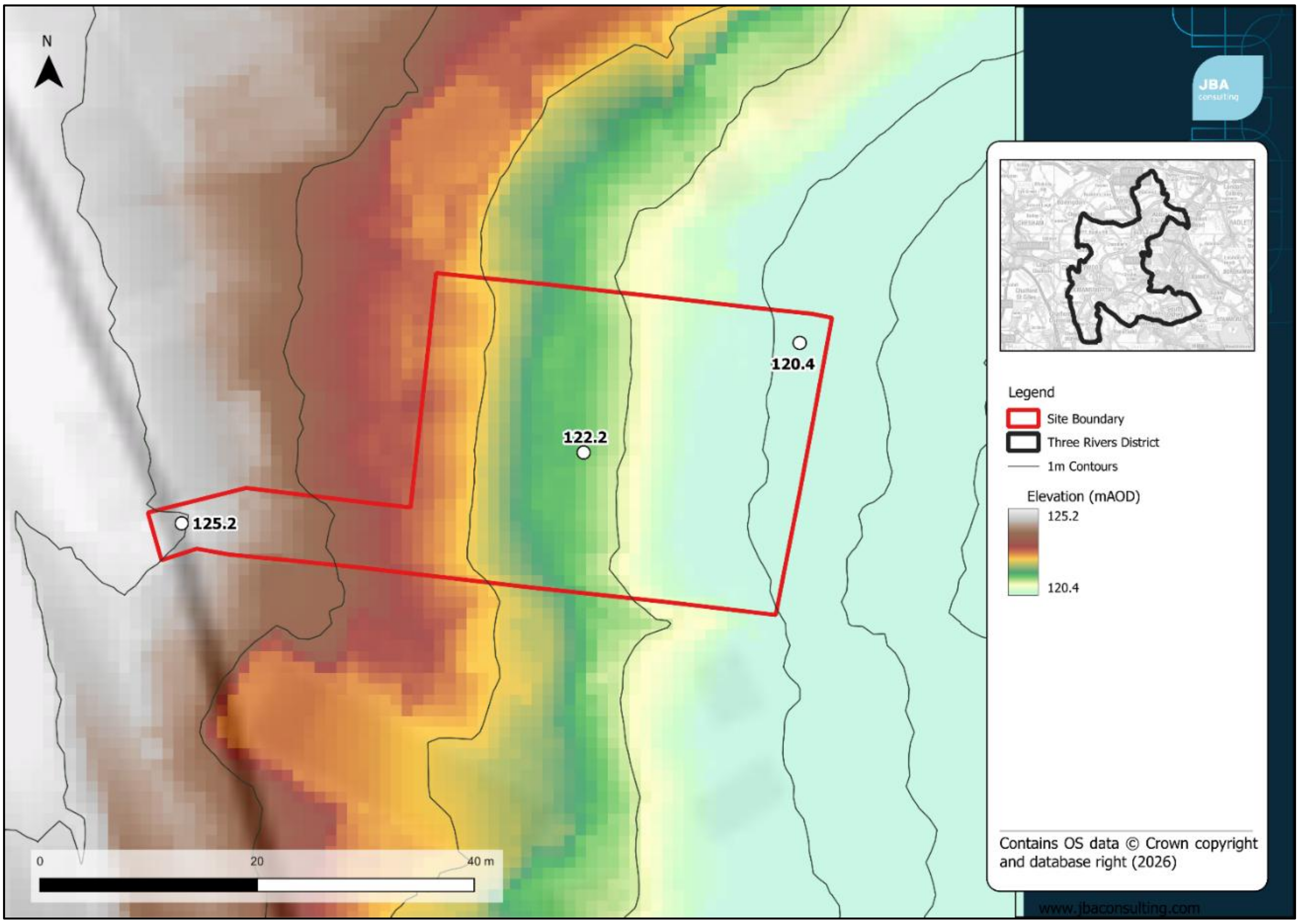

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

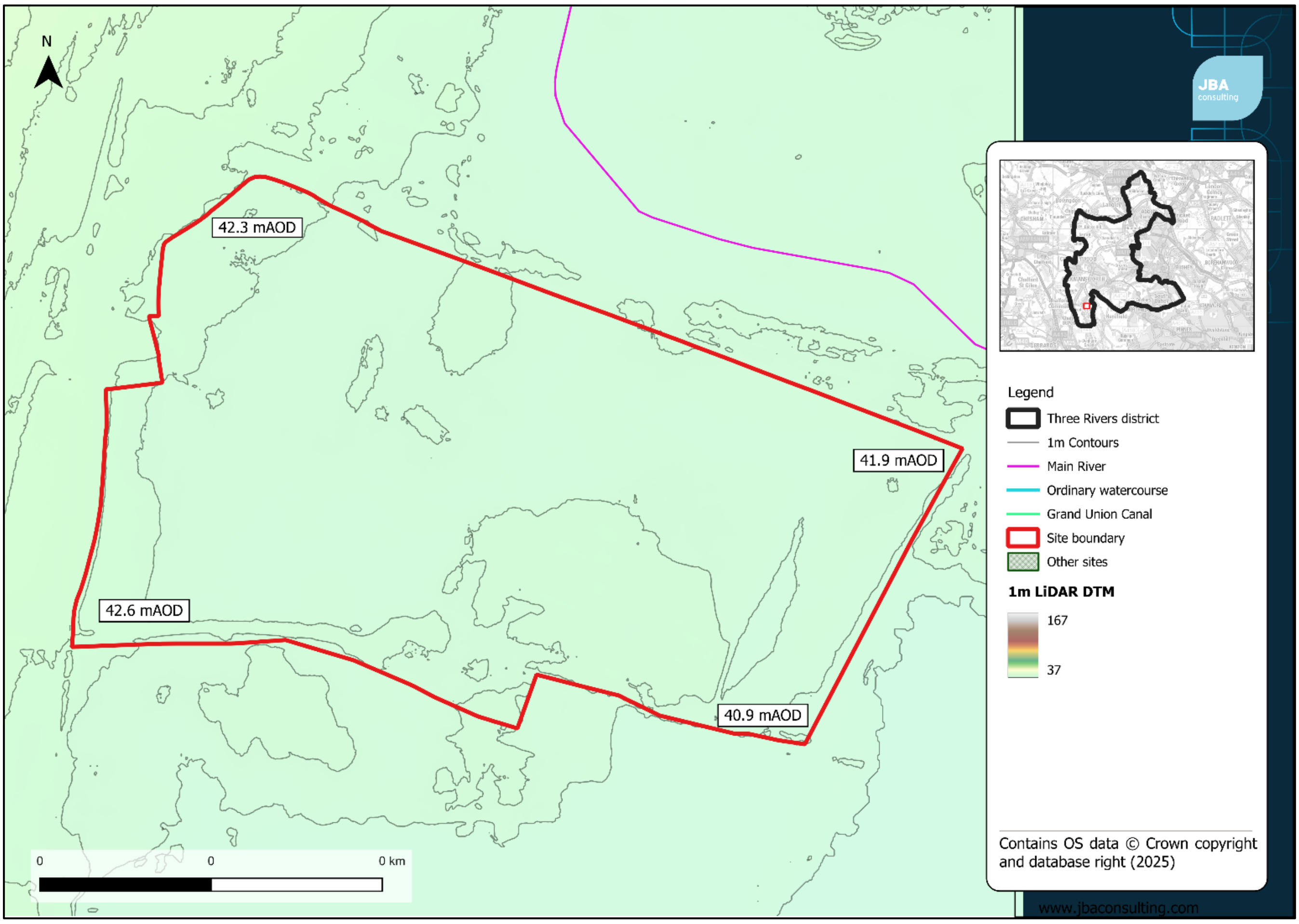

Figure 0-1: Topography of the site.

The site slopes from west to east with the highest point located in the western area at about 42.3mAOD, falling to 40.9mAOD in the southeast. In the eastern part of the site, there is a significant southward gradient.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewes Nodular Chalk Formation
- Superficial - Clay, Silt, Sand and Gravel

Soils at the site consist of:

- Loamy and clayey floodplain soils with naturally high groundwater

Sources of flood risk

Location of site within the catchment

The site falls within the Colne (Confluence with Chess to River Thames) water body catchment. The site is in the settlement of West Hyde, a largely rural hamlet in the district. The site is situated west of the A412 Denham Way/North Orbital Road.

Existing drainage features

There are no watercourses within the site boundary, however an unnamed main river (tributary to the River Colne) is within 100m of the northern site boundary. Lynsters Lake is located immediately southeast of the site.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) and the Upper Colne (2025) hydraulic model have been used to assess fluvial flood risk at this site.

Description of risk to the site

The Upper Colne model shows that the majority of the site is situated within Flood Zones 2 and 3a. This suggests that fluvial flooding does pose a significant risk to the site.

Table 0-1: Existing fluvial flood risk based on Upper Colne 2025 model*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
30.4	69.6	44	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

During the 1% AEP undefended (Flood Zone 3a) event, fluvial risk is primarily associated with the unnamed river which flows along the eastern border of the site. A small part of the site that encroaches on Lynsters Lake in the southeast, the peak depth for this site during this event of 0.77m is predicted in this part of the site. Flood depths up to 0.55m are shown to affect a central part of the site. The peak velocity during the event is up to 0.5m/s along the southeast flow path but remains below 0.25m/s elsewhere. The maximum hazard predicted for the site is less than 0.75 ('Low - caution').

During a 0.1% AEP event (Flood Zone 2), there is an extension of existing flood paths and areas with deeper flooding. Flood depths up to 1m are predicted in southeast and 0.7m in the central site area. The peak velocity increases along the southeast flow path, and is expected to reach 1m/s, elsewhere in the site where flooding is predicted flood velocities are under 0.5m/s. The maximum hazard remains 'Low - caution' across much of the site and only increases to 'Moderate - Danger for Some' in the small topographic depression in the southeast, Much of the site is at fluvial flood risk during a 0.1% AEP (1 in 1,000-year) event, therefore fluvial flooding poses a significant constraint to development of the site.

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

In the 3.33% AEP and 1% AEP events, due to the flat topography of the floodplain only areas of shallow ponding are predicted within the site boundary and no external flow paths affect the site. These areas of ponding only extend into a flow path during 0.1% AEP rainfall event, which eventually flows into Lynsters Lake to the south. During 1% AEP rainfall event, maximum flood depths reach moderate depths of 0.2-0.3 within most of the site, although there are isolated areas of deeper flooding (0.30 – 0.6m), with peak velocities of up to 0.25-0.5m/s. However, flood hazard remains low across the majority of the site.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	2.8	11.7	34.3
Maximum depth (m)	0.3-0.6	0.3-0.6	0.6-0.9
Maximum velocity (m/s)	0.25	0.25-0.5	0.25-0.5
Maximum hazard classification	Low	Moderate	Significant

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is at risk of flooding from Hilfield Park Reservoir and the Hartsbourne Stream Flood Storage Area, in the event of a breach. As part of a site-specific Flood Risk Assessment, an agreed emergency plan should identify appropriate safe access and egress routes from the site, in the highly unlikely event of a reservoir breach

Groundwater

The entire site is at very high risk of groundwater flooding. During a 1% AEP groundwater flood event, water levels are estimated to be either at or within 0.025m of the ground surface. As a result, within the site there is a risk of groundwater flooding to surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. Based on the RoFSW map and the topography of the site it is likely that any groundwater that emerges will flow south.

High groundwater levels are also likely to impede drainage and there is a risk of inundation from water ingress to below ground structures (such as soakaways)

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outlines the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five digit post code level. The site is located within a postcode area with 27 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's Historic Flood Map or recorded flood outlines dataset. Historic Flood Records from the Hertfordshire County Council have been provided and there are records of highway flooding near the site on A412 (Denham Way/North Orbital Road). The most recent event occurred in 2016. The cause of these flood events is attributed to blocked drains.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling is also available as part of the Upper Colne 2025 model. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.

The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The NaFRA2 data shows that during the 1% and 0.1% AEP plus climate change events, flooding extends to 41% and 76% respectively. This shows a significant sensitivity to the impacts of climate change.

The Upper Colne 2025 defended model shows minimal flooding on the site. As such there is also an insignificant increase in extent due to the climate change.

Table 0-1: Comparison of fluvial flood risk to the site between the defended 1% AEP and 1% AEP plus 35% climate change extents.

Event	1% AEP	1% AEP plus 35%CC
Percentage of site at risk (%)	0.11	0.47
Maximum depth (m)	0.08	0.22
Maximum velocity (m/s)	0.00	0.01
Maximum hazard classification	Low	Low

Surface water

Available data

Surface Water flooding for the 3.3%, 1% and 0.1% AEP events with central climate change uplift (up to the 2050s epoch), using data available as part of the NAFRA2 release. The central allowance applied in the NAFRA2 data is a 20% uplift.

The Environment Agency guidance recommends that the Upper End allowance is considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

The site is shown to flood during the 1% climate change event, the areas of surface water ponding increase slightly in size, the locations of flooding remain unchanged.

Peak flood depths increase from between 0.2m and 0.3m to between 0.6m and 0.9m. Peak flow velocities increase from a maximum of 0.25m/s to 0.5m/s, however maximum hazard increases from 'Low' to 'Moderate'. Relatively shallow flooding (less than 0.3m) is predicted on the A412 road, adjacent to the site, in both scenarios. There is no change in peak velocity or hazard on the A412 road.

However, as per Environment Agency guidance the central uplift does not provide a sufficient basis for assessing future flood risk. The present day 0.1% AEP can be used a proxy to indicate future surface water risk during the 1% AEP event. The 0.1% AEP shows a greater increase in the extent of ponding within the site compared to the 1% AEP and 1% AEP plus climate change events. Flood flows move towards a central part of the site in the 0.1% AEP. Peak velocity is not elevated in the 0.1% AEP when compared to 1% AEP plus climate change event, but hazard increases to 'Significant'. Peak flood depths are also predicted to increase on the A412 to between 0.6m to 0.9m. However, peak flow velocity and maximum hazard do not change.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	11.7	13.6
Maximum depth (m)	0.2-0.3	0.6-0.9
Maximum velocity (m/s)	0.0-0.25	0.25-0.50
Maximum hazard classification	Low - Caution	Moderate - Danger for some

Flood risk management infrastructure

Defences

The Environment Agency AIMS database shows a short section of embankment and a flood wall on the Colne approximately 500m upstream of the site. Both structures have a 20% AEP (1-in-5 year) standard of protection. It is unlikely that site benefits from these defences, but any likely benefit has been evaluated through the assessment carried out using the Upper Colne 2025 model which includes all defences in the AIMS database.

Residual risk

Most of the site is at risk of flooding in the unlikely event of a breach event on Hilfield Reservoir.

Emergency planning

Flood warnings and alerts

The site is within both EA Flood Warning and Flood Alert areas:

- Flood Alert Area: The Lower River Colne and Frays River at Uxbridge, West Drayton, Poyle and Stanwell Moor
- Flood Warning Area: The River Colne at Willowbank including Uxbridge Moor

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is likely to be accessed from Old Uxbridge Road and the A412 along the western boundary of the site.

Fluvial

This road remains flood free in the 0.1% AEP fluvial event and is in Flood Zone 1.

Surface water

To the northwest of the site, the A412 road is predicted to experience ponding of surface water during the 3.33% AEP event and greater return periods, due to a flow path along Woodland Road. However, significant flood depths (between 0.3m and 0.6m) are predicted until the 0.1% AEP event.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The site is considered to have high susceptibility to groundwater flooding. As, groundwater levels are indicated to be less than 0.025m below ground level during a 1% AEP event in part of the site infiltration may not be feasible at all times. Development such as basements may be susceptible to groundwater flooding.
- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- The site is located within Groundwater Source Protection Zone (SPZ) 1, therefore early engagement with the LLFA and the EA is recommended to determine requirements for mitigating the impacts to aquifers because of the surface water drainage system. The infiltration potential of the site should be confirmed through infiltration testing, in line with BRE 365.
- This site has areas within its boundary designated by the Environment Agency as being a landfill site. The south-west corner of the site contains Lynsters Farm Landfill. A thorough ground investigation will be required as part of a drainage strategy to determine the extent of the contamination and SuDS features may need to be lined.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the Hertfordshire County Council. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The layout and function of drainage systems need to be considered at the start of the design process for new development, as integration with road networks and other infrastructure can maximise the availability of developable land.
- All development should adopt source control SuDS techniques. Conveyance features should be designed above ground and following natural flow paths where possible.
- Proposed attenuation features such as basins, ponds and tanks should be located outside of Flood Zone 3 to avoid the potential risks to the hydraulic capacity or structural integrity of these features. Surface water outfalls that discharge into the ordinary watercourses may be susceptible to surcharging due to water levels. The impacts of flood flows will need to be considered in terms of the attenuation storage requirements of the site and placement of the outfalls.

- The Risk of Flooding from Surface Water (RoFSW) mapping indicates surface water flooding during the 3.3% AEP event. Existing flow paths should be retained and integrated with blue-green infrastructure.
- If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
- The topography of the site is unlikely to affect any proposed SuDS features

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council, and the EA) at an early stage to understand possible constraints.
- The central and eastern unnamed watercourses should be integrated into the site drainage strategy as blue-green infrastructure.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.
- Consideration should be made to the existing condition of receiving waterbodies
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies the proposed type of non-residential development as 'Less Vulnerable'.

While the development is in Flood Zone 3a, the Exception Test is not required for this site due to its vulnerability classification.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- is within Flood Zone 3
- within 'Flood Zones plus Climate Change', showing it is at increased risk of flooding from rivers or sea in future
- the Flood Map for Planning shows it is at risk from surface water flooding
- is subject to sources of flooding other than rivers or sea

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the Three Rivers District Council, Hertfordshire County Council, Thames Water, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development must seek opportunities to reduce overall level of flood risk both on and off-site, for example by reducing volume and rate of runoff and creating space for flooding.

The development should be designed using a sequential approach. Development should be steered away from surface water flow routes and areas where groundwater risk is highest, preserving these areas as green infrastructure.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

The impact of high groundwater levels must be assessed as part of a site-specific flood risk assessment; this must be supported by groundwater levels monitoring and must demonstrate that any proposed buildings with deep foundations do not increase flood risk elsewhere. Mitigation for seasonal high groundwater levels must be considered in design of the site, for example by raising finished floor levels to an appropriate height above ground level.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe. Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

The design of SuDS schemes must consider the seasonally high groundwater table and low permeability. Infiltration techniques may be ineffective and may pose a pollution risk. SuDS may need to be shallow and take up larger areas. Above ground conveyance and attenuation can be used but care must be taken that groundwater does not enter the SuDS feature and reduce the storage capacity and structural integrity of the design. Detailed site investigations will be required including infiltration testing and groundwater monitoring during the winter months (November through to March).

Conclusions

A significant proportion of the site is shown to be at risk of fluvial flooding as it is in Flood Zones 2 and 3. The source of flood risk is an unnamed tributary of the River Colne, which flows along the eastern border of the site. Flood flows enter the site from the north, with depths reaching up to 0.77m, velocities up to 1m/s, and a maximum hazard classification is 'Moderate' across all modelled events. The site is also at surface water flood risk during the 3.3%, 1% and 0.1% present day AEP events. Less than 3% of the site is affected in the 3.33% AEP event, this extends to 12% in the 1% AEP event and 34% in the 0.1% AEP event. Surface water flood risk is influenced by fluvial flooding from the Colne, surface water and fluvial extents on this site are coincident.

The greatest flood depths in the fluvial and surface water events occur primarily in the southwest part of the site. The site also shows high sensitivity to the impacts of climate change, surface water and fluvial extents are both shown to be exacerbated by increases in peak river flow and rainfall respectively. Developers will need to carefully consider this risk and demonstrate users of the site can be kept safe during the lifetime of the development through a detailed site-specific FRA, including detailed climate change modelling.

Shallow groundwater levels are present across much of the site. A site-specific flood risk assessment should confirm the risk to the site. This is likely to require ground investigations.

The following points should be considered in development of this site:

- A significant proportion of the site is shown to be at risk during the design fluvial and surface water events (1% AEP plus climate change). However, as the site is considered as being 'Less vulnerable', the exception test is not required.
- The site is at risk within the Hilfield Park Reservoir flood extents; a Flood Warning and Evacuation Plan should be prepared which considers the likely onset and duration of flooding and demonstrates how residents can safely be evacuated during the unlikely event of a reservoir breach.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed hydraulic modelling, with development to be steered away from the areas identified to be at highest risk of flooding within the site. This is in line with the sequential approach to site layout
- The site would benefit from SuDS implementation to manage surface water, improve water quality, and deliver wider sustainability benefits such as biodiversity and amenity.

Level 2 Strategic Flood Risk Assessment - Site CFS36

Land at Junction 17 of M25

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site CFS36. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Land at Junction 17 of M25
- Site area: 6.79ha
- Existing site use: Greenfield
- Proposed site use: Employment

Topography

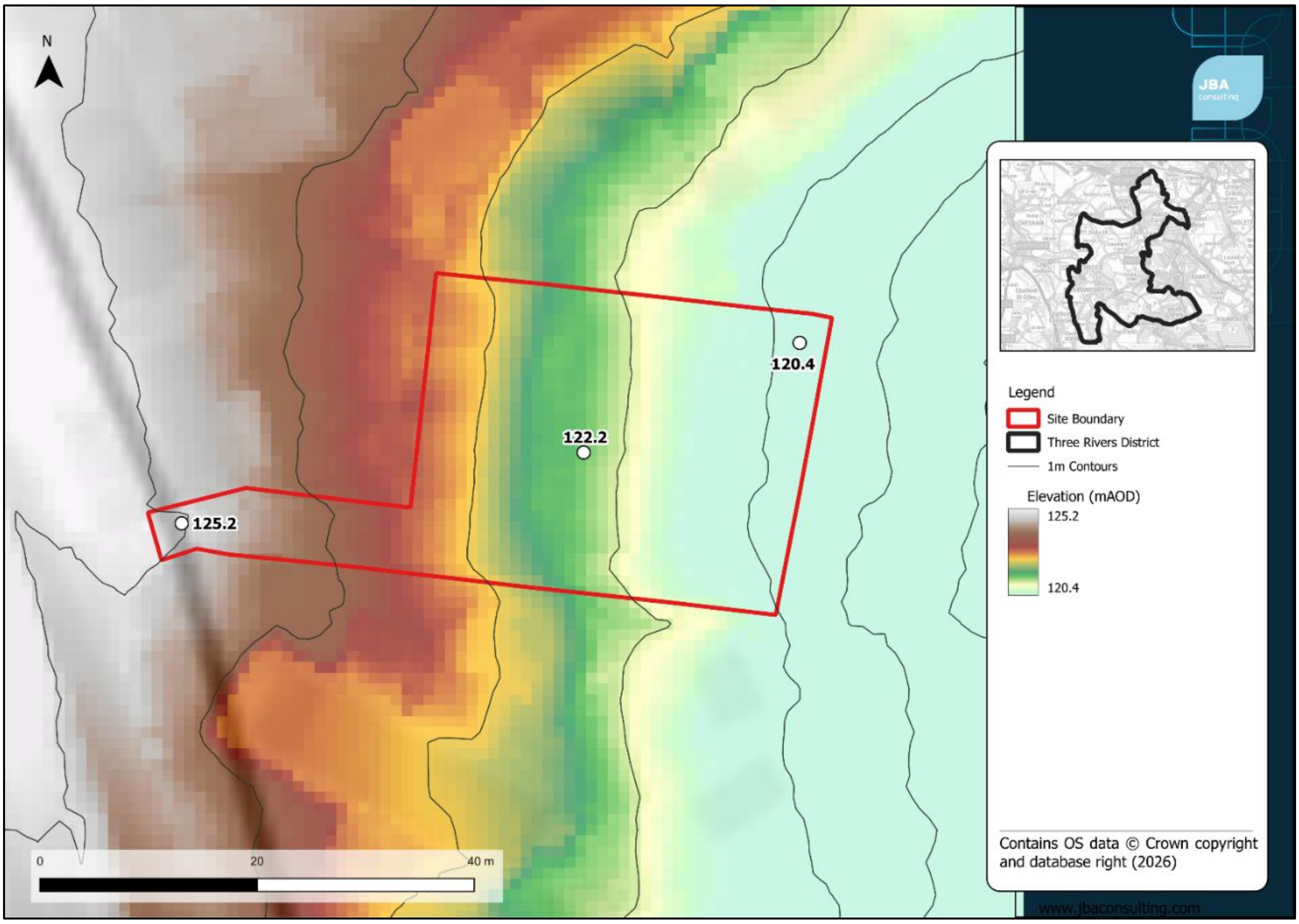

Figure 0-1 shows the Environment Agency 1m resolution LiDAR. The mapping shows that there is a steep eastward gradient.

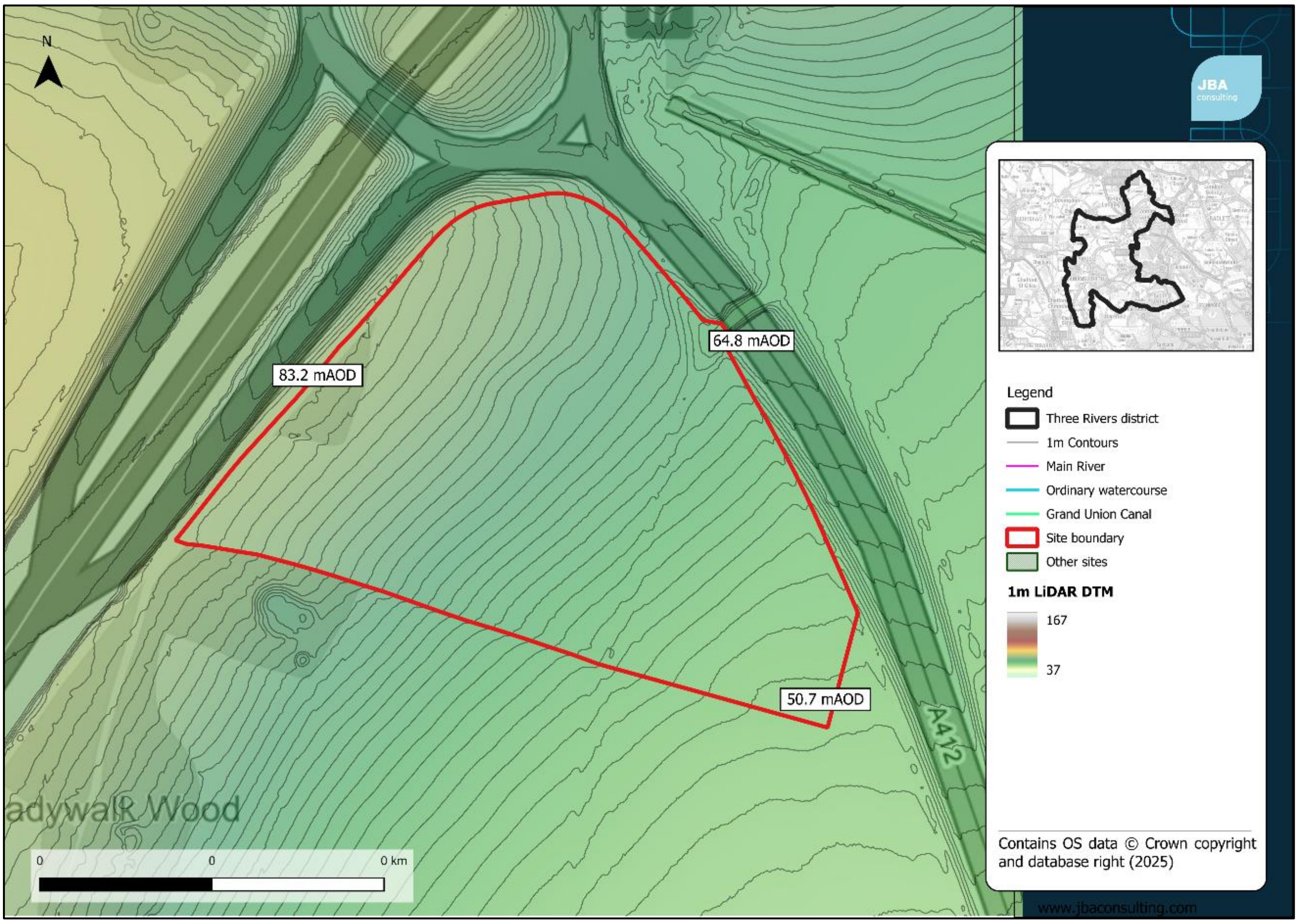

Figure 0-1: Topography of the site.

Along the northern and north-western boundary levels are at 50.2mAOD. Elevations range from 83.2mAOD in the west to 50.7mAOD in the southeast of the site. There is also a distinctive topographic depression in the east of the site, where the elevation is approximately 64.8mAOD.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewis Nodular Chalk Formation
- Superficial - Gerrards Cross Gravel Member-Sand and gravel.

Soils at the site consist of:

- Freely draining lime rich loamy soils.

Sources of flood risk

Location of site within the catchment

The site is located within Mill End, a built-up urban area. The site lies within the River Colne catchment.

Existing drainage features

There are no drainage features within the site boundary.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) and the Upper Colne (2025) hydraulic model have been used to assess fluvial flood risk at this site.

Description of risk to the site

The site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site. The more recent, Upper Colne modelling confirms that the site remains within Flood Zone 1, outside the Flood Zone 2 extent, consistent with the FMfP.

Table 0-1: Existing fluvial flood risk based on the EA's FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

Surface water flood risk to the site is primarily associated with flow path present at the on the eastern border of the site. Runoff accumulates around a topographic low point on the site, where the entrance to a culvert appears to be located. From the 3.33% AEP event, this flow path is predicted to form on the M25 slip road and on the A412 roundabout, which is conveyed southeast towards the site (along Denham Way). While this flow path only affects a small portion of the site, deep areas of ponding form with the site (greater then 1.2m). High velocities are associated with this flow path, resulting in a small area reaching 'Extreme' hazard in the 0.1% AEP.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0.7	0.8	1.0
Maximum depth (m)	>1.2	>1.2	>1.2

Event	3.3% AEP	1% AEP	0.1% AEP
Maximum velocity (m/s)	1.0-2.0	1.0-2.0	1.0-2.0
Maximum hazard classification	Significant	Significant	Extreme

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is at risk of flooding from Heronsgate Reservoir No.3, in the event of a breach. As part of a site-specific Flood Risk Assessment, an agreed emergency plan should identify appropriate safe access and egress routes from the site.

Groundwater

The site is at low to moderate risk of groundwater flooding. In the west of the site, groundwater levels are predicted to reach between 0.5 – 5m below the surface, however in the east ground water levels are expected to more than 5m below the ground during a 1% AEO groundwater event. The variance in groundwater depth across the site, are likely due to the the presence of superficial deposits in the east of the site which increase permeability and allows a localised rise in groundwater.

Mitigation for seasonal high groundwater levels must be considered in design of the site, for example by raising finished floor levels to an appropriate height above ground level

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a The site is located within a postcode area with 72 historic incidences of sewer flooding, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's EA's Historic Flood Map or Recorded Flood Outlines dataset.

In addition, Hertfordshire County Council records do not identify any incidents in the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see the Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling is also available as part of the Upper Colne 2025 model. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.

The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The NaFRA2 data shows that during the 1% and 0.1% AEP plus climate change events, the site remains outside of Flood Zone 2 and 3 extents.

The 1% AEP defended plus 35% Climate Change event also does not predict a change in fluvial risk to the site.

Table 0-1: Comparison of fluvial flood risk to the site between the defended 1% AEP and 1% AEP plus 35% climate change extents.

Event	1% AEP	1% AEP plus 35%CC
Percentage of site at risk (%)	0	0
Maximum depth (m)	N/A	N/A
Maximum velocity (m/s)	N/A	N/A
Maximum hazard classification	N/A	N/A

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

The flood risk from surface water at the site marginally increase in the scenarios with added climate change.

The 1% AEP extent increases to 0.84% when an 20% uplift is applied, but extents do not reach the 0.1% AEP. The deepest depths predicted at the site are limited to the topographic depression, and peak depth and velocity are comparable to the present day 1% AEP. Maximum hazard is elevated to 'Extreme', but the extent of the site exposed to this hazard is akin to the 0.1% AEP and is limited to the lowest elevation where runoff accumulates.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	0.8	1.0
Maximum depth (m)	>1.2	>1.2
Maximum velocity (m/s)	1.0-2.0	1.0-2.0
Maximum hazard classification	Significant	Extreme

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is residual risk to the site due to the A412 culvert, the impact of blockage on flood risk to the site must be evaluated as part of site-specific Flood Risk Assessment.
The site is also at residual risk from the Heronsgate Reservoir No.3 in the unlikely event of a breach.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Potential access

The site is likely to be accessed from the west via the M25 and through Denham Way (the A412) in the east.

Fluvial

Both access routes remain flood free in the 0.1% AEP fluvial event.

Surface water

The M25 is unaffected by surface water flooding up to the 0.1% AEP event. However, surface water flow paths form on the junction between the M25 slip road and the A412 roundabout from the 3.33% AEP event. Flood depths remain below 0.3m up to the 0.1% AEP event, but flow velocities reach up to 2m/s. The maximum hazard predicted along the areas affected by this flow path is 'Significant'. On the A412 culvert a limited area of 'Extreme' hazard is predicted.

Dry islands

The site not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- BGS data indicates that the underlying geology is the Lewes Nodular Chalk formation with superficial deposits which is likely to have highly variable permeability. The site is considered to have a low to moderate susceptibility to groundwater. In the east of the site groundwater levels are indicated to be between 0.5 and 5m below ground level during a 1% AEP groundwater event. In the west groundwater levels are predicted to be deeper (at 5m or more below the ground).
- Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- The entire site is located within Groundwater Source Protection Zone 1 (SPZ) and infiltration techniques may not be appropriate for anything other than clean roof drainage. If infiltration is proposed for anything other than clean roof drainage a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply. Proposed SuDS should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and EA) at an early stage to understand possible opportunities and constraints.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and EA) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should consider the increased surface water flooding extents due to climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies the proposed type of non-residential development as 'Less Vulnerable'.

The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site because:

- the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside of the area of surface water flooding located in and around the topographical low at the northern area of the site.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. Surface water flood risk on the site appears to be highly correlated with the capacity of the A412 culvert, as such detailed modelling should be carried out as part of a site-specific Flood Risk Assessment to evaluate the operational capacity of the culvert and the impact of culvert blockage on flood risk to site and the surrounding access roads.

A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and egress will need to be provided for the 1% AEP surface water event with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is in Flood Zone 1, so it is not identified to be at fluvial risk.

The site is at risk of surface water flooding from the 3.33% AEP. While than 2% of the site in the 0.1% AEP surface water event, the external flow path affecting the site appears to be influenced by a culvert present adjacent to the site on the A412. This flow path that affects the site, which forms on the A412 roundabout is also likely to affect access to the site. As such, detailed modelling should be carried out during a site-specific Flood Risk Assessment to quantity residual risk to the site from this culvert.

The modelled climate change scenarios show a marginal increase in surface water flood risk. In the 1% AEP plus climate change event, peak flood extents, depths and velocity are comparable to the present day. Maximum hazard is elevated but does not exceed the 0.1% AEP event.

The following points should be considered in development of this site:

- The proposed development is classified as Less Vulnerable.
- Development should be steered away from surface water flow routes and areas where groundwater risk is highest, preserving these areas as green infrastructure.
- Residual risk to the site and access roads from the A412 culvert must be evaluated as part of a site-specific Flood Risk Assessment.
- The site is at risk of flooding from Heronsgate Reservoir in an unlikely event of a breach. An emergency flood plan must be prepared, to demonstrate how safe access and egress from the site can be achieved.
- The site would benefit from SuDS implementation to manage surface water, improve water quality, and deliver wider sustainability benefits such as biodiversity and amenity.

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JBA consulting

Level 2 Strategic Flood Risk Assessment - Site CFS39B

Land to the east of Merchant Taylors School, Moor Park

Prepared for

Three Rivers District Council

Date

19 February 2026

THREE RIVERS DISTRICT COUNCIL

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site CFS39B. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Level 1 SFRA and read the Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Land to the east of Merchant Taylors School, Moor Park
- Site area: 9.2ha
- Existing site use: Greenfield
- Proposed site use: Employment

Topography

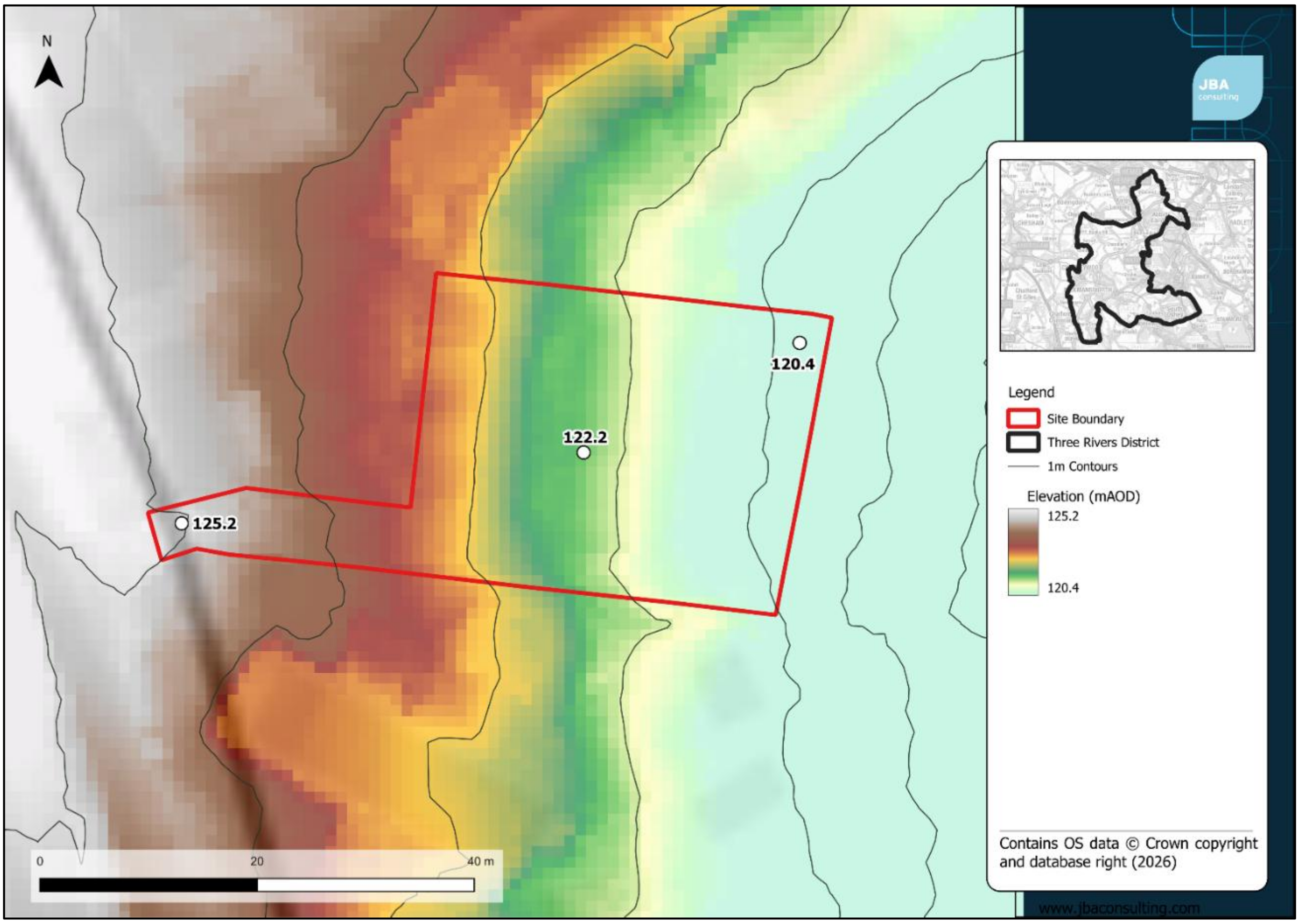

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

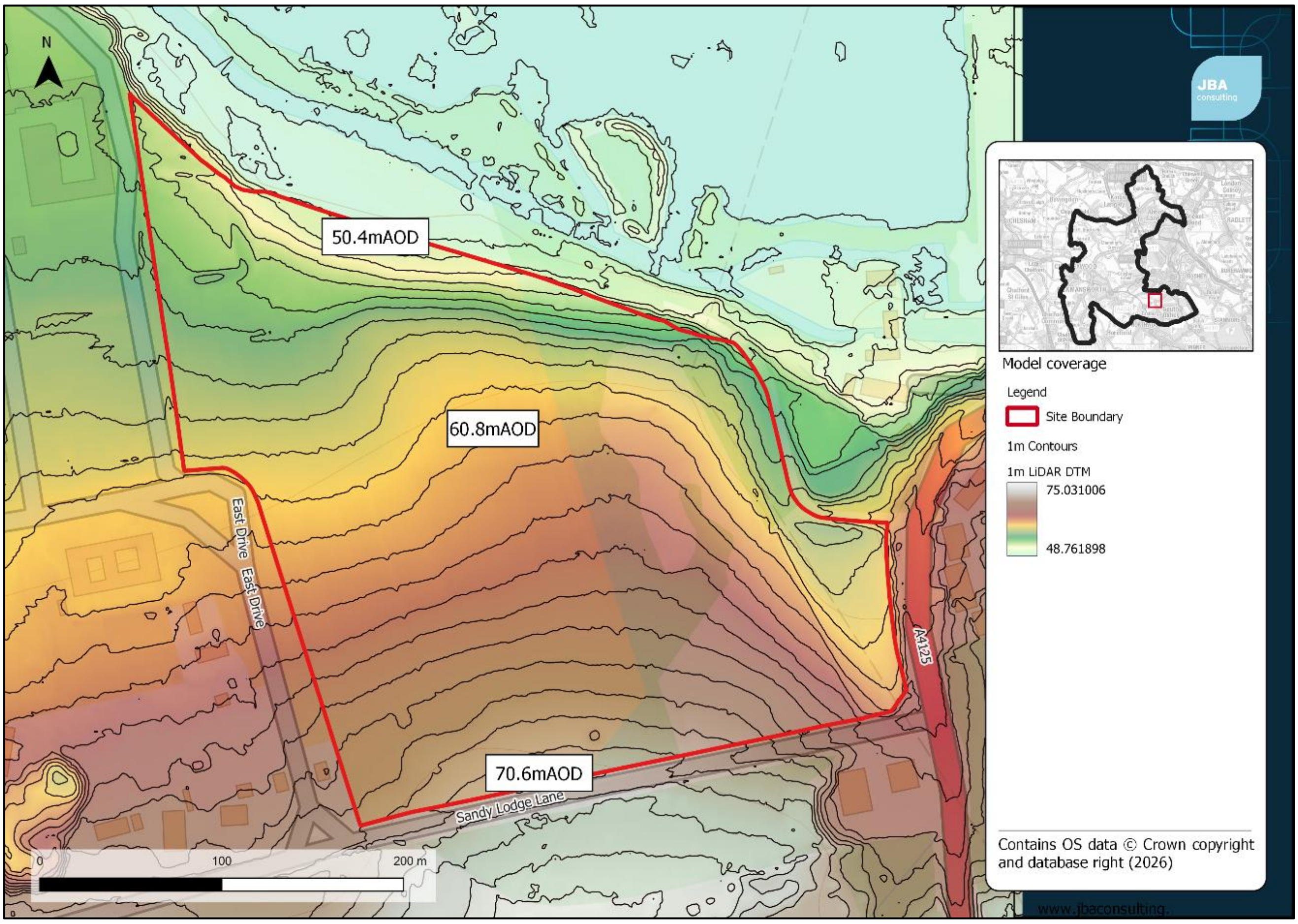

Figure 0-1: Topography of the site.

The sites topography slopes downwards from the southern boundary to the northern boundary. The highest elevations are near Sandy Lodge Lane and East Drive with elevations up to 70.6mAOD, while the lowest point lies along the northern boundary adjacent to the watercourse at 50.4mAOD. The eastern edge near the A4125 features a steep gradient, while the central area transitions through a moderate slope.

Geology and soils

Geology at the site consists of:

- Bedrock - The south of the site consists of Lambeth ground Clay, Sand and Silt. The north of the site consists of Seaford Chalk Formation.
- Superficial - The north of the site consists of alluvium.

Soils at the site consist of:

- Freely draining, slightly acidic, loamy soils

Sources of flood risk

Location of site within the catchment

The site is located east within the Colne (from confluence with Ver to Gade) waterbody, which ports part of the Thames River Basin District.

Existing drainage features

There are no watercourses within the site boundary. The Main River Colne lies around 80m north of the site, and an unnamed ordinary watercourse lies immediately east of the site.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) and the Upper Colne (2025) hydraulic model have been used to assess fluvial flood risk at this site.

Description of risk to the site

The Flood Map for Planning shows 100% of the site within Flood Zone 1. Whereas the Upper Colne model shows that 0.04% of the site is within Flood Zone 2, 0.01% of the site is within Flood Zone 3a, and 0.004% of the site is within Flood Zone 3b. This area of flood risk is along the northern boundary.

The maximum depth of flood at the site is 0.09m, with a maximum velocity of 1.75m/s with an overall maximum hazard classification of 'Low'.

Overall, the majority of the site is at a very low risk of fluvial flooding.

Table 0-1: Existing fluvial flood risk based on the Upper Colne 2025*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
99.69	0.04	0.01	0.004

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The RoFSW mapping shows that the site is at risk of surface water flooding in the 0.1%, 1%, and 3.3% AEP events. Surface water flood risk is concentrated along the northern boundary, where the ground falls sharply into low-lying land where floodwater pools. Runoff from the higher southern areas flows downslope toward this boundary, creating defined flow paths that channel water through the central part of the site before it spreads across the areas of lower elevation. There is also surface water risk present along the eastern boundary from the unnamed watercourse, where water accumulates within a localised topographic depression. A small area of localised flooding is also present near the northwest boundary.

During the 0.1% AEP surface water event flooding covers 5.5% of the site, with maximum flood depths reaching =>1.2m in the eastern topographical depression. The maximum velocity during this event is =>2m/s with a maximum hazard classification of 'Significant'.

During the 1% AEP event flooding covers 1.3% of the site, with maximum flood depths between 0.9m and 1.2m. The maximum velocity during this event is between 1m/s and 2m/s, with a maximum hazard classification of 'Significant'.

During the 3.3% AEP event, surface water flooding covers 0.8% of the site, with maximum flood depths between 0.9m and 1.2m. The maximum velocity during this event is between 1m/s and 2m/s, with a maximum hazard classification of 'Significant'.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0.8	1.3	5.5
Maximum depth (m)	0.9-1.2	0.9-1.2	=>1.2
Maximum velocity (m/s)	1-2	1-2	=>2
Maximum hazard classification	Significant	Significant	Significant

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

Reservoir flood mapping shows the northern edge of the site to be affected by the Dry Day flood extents from Hilfield park reservoirs. The Wet Day flood extent shows all three reservoirs, further encroachment of floodwaters, extending southwards onto the site from the northern edge.
The 'Wet Day' event seeks to estimate the effect of a breach at the same time as a 0.1% AEP river flood is occurring and suggests that the consequences of such a breach are similar to the modelled 0.1% AEP event river flood event but probably would be associated with a much lower probability.

Groundwater

The JBA Groundwater Emergence Map shows that the site has varying groundwater flood risk, with the highest risk concentrated along the northern boundary where groundwater levels are either at or very near (within 0.025m) the ground surface, and moderate risk across the central portion, with groundwater levels between 0.025m and 0.5m below the ground surface while the southern area is at lower risk, with groundwater levels between 0.5 and 5m below the ground surface. The southwestern area of the site poses no risk of groundwater flooding.

Based on the RoFSW and topography of the site it is likely that any groundwater that emerges will flow northwards, pooling in topographic lows at the north of the site.
This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 22 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not with the EA's Historic Flood Map, however a recorded flood outline for the River Colne from July 1987 lies immediately north of the site. The cause of the flooding is stated as exceedance of the channel capacity.

In addition, Hertfordshire County Council records do not identify any incidents in the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling from the 2025 Upper Colne defended model was used to obtain depth, velocity, and hazard information for the site. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.

The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The Upper Colne defended models shows that the flooding extent increases during the 1% AEP plus climate change event. The extent has increased to 0.04%, with the maximum depth of 0.19m, maximum velocity of flows at 0.24m/s, and a maximum hazard classification of 'Low'.

Table 0-1: Comparison of fluvial flood risk to the site between the 1% AEP and 1% AEP plus 35% defended climate change extents.

Event	1% AEP	1% AEP plus 35% CC
Percentage of site at risk (%)	0.01	0.04
Maximum depth (m)	0.13	0.19
Maximum velocity (m/s)	0.04	0.25
Maximum hazard classification	Low	Low

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's

epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

The RoFSW plus climate change mapping shows an increase in surface water flood risk in on site, showing that the site is sensitive to increased rainfalls due to climate change. The site shows areas with new, elongated flow paths along the western boundary of the site. Increases in surface water flood extent and new areas of localised flooding are present on the eastern boundary of the site from the watercourse.

During the 1% AEP plus climate change event, the coverage of surface water flooding increases to 2.7% of the site. The maximum flood depths remain between 0.9m and 1.2m, and the maximum velocity remains between 1m/s and 2m/s. The maximum hazard classification remains as 'Significant'.

The 0.1% AEP shows a greater increase in the extent of ponding within the site compared to the 1% AEP and 1% AEP plus climate change events. The 0.1% AEP event shows maximum flood depths reaching =>1.2m, maximum velocity reaching =>2m/s with a maximum hazard classification of 'Significant'.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	1.3	2.7
Maximum depth (m)	0.9-1.2	0.9-1.2
Maximum velocity (m/s)	1-2	1-2
Maximum hazard classification	Significant	Significant

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site benefits from existing flood defence infrastructure. To the northeast, two culverts along the River Colne provide managed conveyance of water, and a control gate is also present to regulating flows. Additionally, a concrete channel wall has been installed 100m northeast of the site, and diverts flows to a mill race, acting as a high flow spill way.

Residual risk

A residual flood risk is present in the event of culvert blockage, as obstructed flow at the two culverts could lead to water backing up, overtopping the channel, and causing localised flooding.

There is also residual risk from Hilfield park reservoir, as such as part of a site-specific Flood Risk Assessment, an agreed emergency plan should identify appropriate safe access and egress routes from the site, in the highly unlikely event of a reservoir breach.

Emergency planning

Flood warnings and alerts

The northern boundary of the site is located in the River Colne at Watford EA Flood Warning Area and the Middle River Colne Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Access to the site is likely to be via Hampermill Lane to the east of the site, or Sandy Lodge Lane to the south.

Fluvial

The access routes are flood free during the 0.1% AEP flvuial event.

Surface water

Sandy Lodge Lane is flood free during the 1% AEP plus climate change event, whereas Hampermill Lane floods to depths up to 0.6m in small, localised areas.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- BGS data indicates that the underlying geology is Lambeth Ground Clay and Seaford Chalk Formation which is likely to be with highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
- The site is considered highly susceptible to groundwater flooding. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- The entire site is mostly located within Groundwater Source Protection Zone 1 (SPZ) and infiltration techniques may not appropriate for anything other than clean roof drainage. If infiltration is proposed for anything other than clean roof drainage a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply. Proposed SuDS should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and EA) at an early stage to understand possible opportunities and constraints.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and the EA) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.

- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition of the River Colne and its Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies the proposed type of non-residential development as 'Less Vulnerable'.

The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- within Flood Zone 1 with a site area of 1 hectare or more
- the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council's LPA Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside of the small area of fluvial flood risk along the northern and eastern boundaries of the site, and the areas of surface water flood risk, located within the topographical depressions.

The impact of the unnamed watercourse on flood risk to the site has been assessed through the RoFSW data. It is recommended that detailed modelling is undertaken as part of the site-specific FRA to confirm the risk to the site

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

Fluvial risk is very low with only very small areas affected on the northern boundary with depths up to 0.09m, peak velocities up to 1.75m/s and a maximum hazard rating of 'Low'.

Surface water risk is significant with maximum depths of 1.2 m, peak velocity up to 2 m/s and 'Significant' hazard from the 3.33% AEP event in the northern and eastern topographic low spots. Surface water risk is influenced by the River Colne to the north and an unnamed watercourse to the east. There is residual risk from culvert blockage which could cause water to back up and overtop the channel.

Additional detailed modelling should be undertaken as part of a site-specific FRA to assess risk from the unnamed watercourse and blockage of the culverts on the River Colne, present northeast of the site.

Reservoir breach risk affects the northern boundary with Wet Day flooding extending onto the site at similar depths and velocities to the 0.1% AEP river event.

Groundwater risk is highest along the northern boundary with levels at or within 0.025 m of ground level and variable groundwater levels elsewhere across the site.

Access and egress are safe via Sandy Lodge Lane, while Hampermill Lane experiences surface water flooding up to 0.6m deep in localised areas.

The following points should be considered in development of this site:

- Safe access and egress should be demonstrated in the 1% AEP plus climate change event. As part of a site-specific Flood Risk Assessment, an agreed emergency plan should identify appropriate safe access and egress routes from the site, in the unlikely event of a reservoir breach.
- Mitigation for seasonal high groundwater levels must be considered (for example by raising finished floor levels to an appropriate height above ground level).
- The design of SuDS schemes must take into account the seasonally high groundwater table. Infiltration techniques may be ineffective and may pose a pollution risk. SuDS may need to be shallow and take up larger areas. Above ground conveyance and attenuation can be used but care must be taken that groundwater does not enter the SuDS feature and reduce the storage capacity and structural integrity of the design.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed hydraulic modelling, with development to be steered away from the areas identified to be at highest risk of flooding within the site. This is in line with the sequential approach to site layout.

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Level 2 Strategic Flood Risk Assessment - Site CFS55

Land at Station Road, Kings Langley

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site CFS55. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Local Plan for Three Rivers District Council Level 1 Strategic Flood Risk Assessment and read the Local Plan for Three Rivers District Council Level 2 Strategic Flood Risk Assessment Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Land at Station Road, Kings Langley
- Site area: 16.98 ha
- Existing site use: Mixed
- Proposed site use: Employment

Topography

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

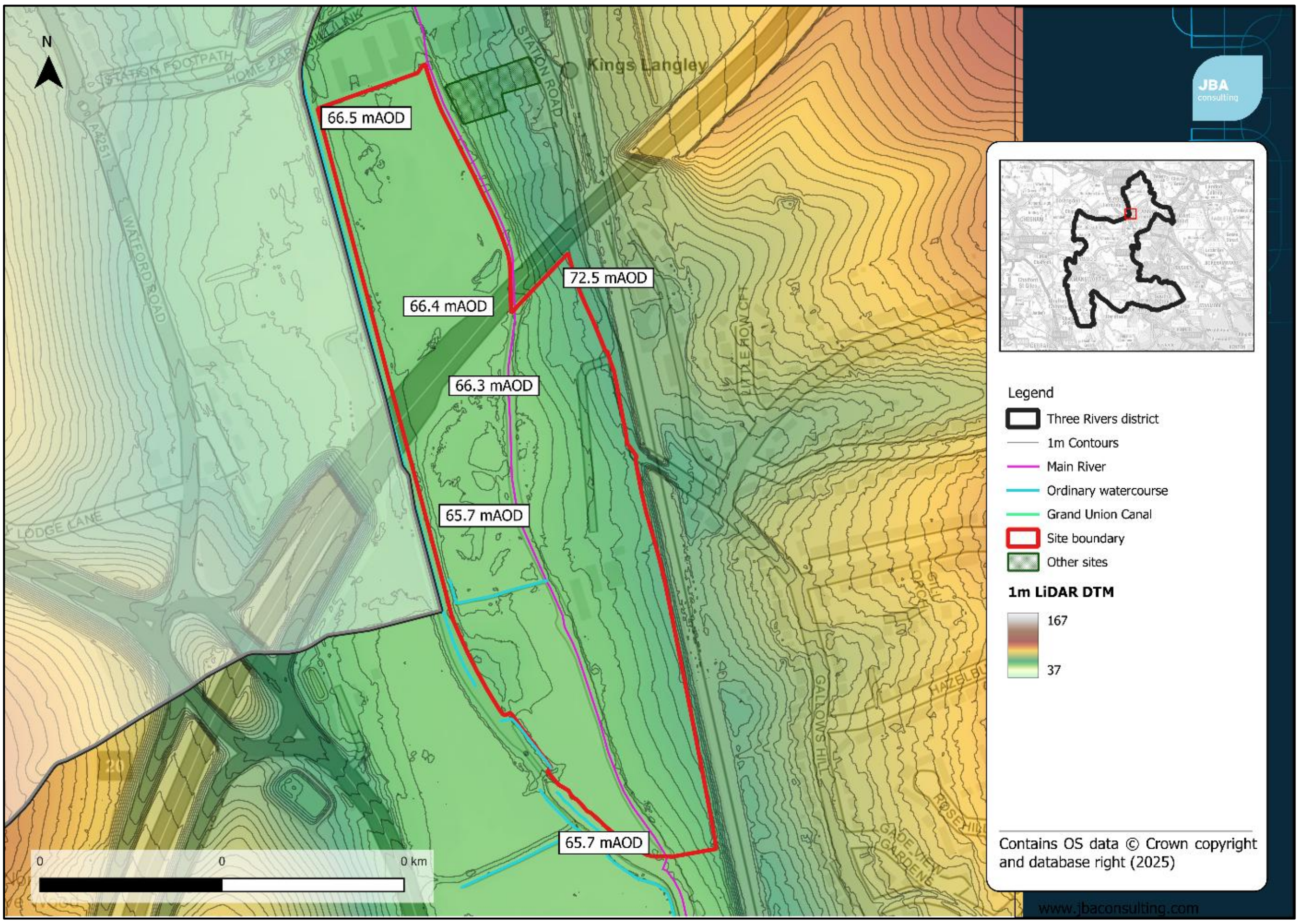

Figure 0-1: Topography of the site.

Elevation on the site falls from east to west by approximately 7m. From the northern to southern boundary of the site, levels decline from 66.5mAOD to 65.7mAOD.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewes Nodular Chalk Formation and Seaford Chalk Formation
- Superficial - Alluvium – Clay, Silt, Sand and Gravel

Soils at the site consist of:

- Loamy and clayey floodplain soils with naturally high groundwater.

Sources of flood risk

Location of site within the catchment

The site is located within south Kings Langley, in a built-up area close to the district. The site is bisected in the north by the M25.

The site is located within the Gade water body catchment.

Existing drainage features

The Main River Gade (incorporating the Grand Union Canal) forms the western boundary of the site. The Main River Mill Stream flows in a southerly direction through the centre of the site, and its point of confluence with the River Gade is located on the southern site boundary. An unnamed drain is also located in the centre of the site, which is forms a tributary of the Mill Stream.

Fluvial

Available data

The EA's 2019 1D-2D detailed hydraulic model for the River Gade and Bulbourne was used to assess fluvial flood risk as it covers Mill Stream which runs along the western site boundary. As flood waters remain in-channel in flood events up to and including the 0.1% AEP event, detailed results represent in-channel depths, velocities and hazards rather than representing results on the floodplain. In the absence of detailed modelling for the 3.33% AEP defended scenario, the 2% AEP defended scenario has been used as a proxy to define Flood Zone 3b.

For scenarios where detailed modelling is not available, the EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset has been used in this assessment.

Description of risk to the site

The floodplains of the Mill Stream and River Gade extend through the centre and west of the site, respectively, with large portions of the north and west of the site are located within Flood Zone 2 (0.1% AEP event). Significant flooding is present along the length of the western site boundary but flood depths and velocities on the site remain relatively low up to the 0.1% AEP event (less than 0.25m). Although a small area of deeper and higher velocity flooding is predicted to form around the unnamed drain in the south of the site, hazard remain low. The peak flood depth (2.95m) and velocity (1.14m/s) in the 0.1% AEP event is only predicted within the channel.

Flood hazard to people remains low across the site. As the Mill Stream passes through the centre of the site, part of the site is classified as within Flood Zone 3b, although flood results indicate that flows are predicted to remain in-channel during the 2% and 1% AEP events. Areas of the site in the west and centre of the site are located within Flood Zone 1. As most of the site is in Flood Zone 1, it is considered that all built development can be located outside areas of fluvial flood risk. Where this is not possible, building thresholds should be raised above the predicted flood depths, which are predicted to be relatively shallow.

Table 0-1: Existing fluvial flood risk based on EA FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
69.2	30.8	18.4	9

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Canals

The site is located adjacent to the Grand Union Canal. Through this reach, the Grand Union Canal and the River Gade are one and the same, and flood risk associated with the canal is incorporated within the Gade and Bulbourne hydraulic model. The assessment of fluvial flood risk is, therefore, considered to give a reasonable indication of risk from canal flooding.

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The site is at risk of surface water flooding from the 3.33% AEP event. However, during the 3.33% AEP and 1% AEP, surface water risk concentrated adjacent to the Mill Strem. Significant flood depths are not predicted away from the channel.

In the 0.1% AEP event, a western flow path emerges from the west, conveyed by Station Road, accumulating at the topographic lows near the Mill Stream. There are two additional area of risk between the Mill Stream and the eastern site boundary, where a flow path emerges from the unnamed watercourse and in the southwest where there is an accumulation of surface water along the Mill stream. Flooding during a 0.1% AEP event predominantly affects the west and south of the site, with maximum flood depths reaching between 0.3 – 0.60m. Built development should avoid areas of surface water flood risk, but if this is not possible, appropriate mitigation measures should be incorporated to ensure the site remains safe, including effective SuDS for surface water drainage, and raising building thresholds above the predicted flood depths.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	2.4	4.5	16.1

Event	3.3% AEP	1% AEP	0.1% AEP
Maximum depth (m)	0.3-0.6	0.3-0.6	0.6-0.9
Maximum velocity (m/s)	0.0-0.25	0.25-0.5	0.5-1.0
Maximum hazard classification	Moderate - Danger for some	Significant - Danger for most	Significant - Danger for most

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that the majority of the site (79%) is at very high risk of groundwater flooding, with water levels estimated to be within 0.025m of the ground surface during the 1% AEP ground water flood event. Based on the RoFSW and topography of the site it is likely that the part of the site south of the M25 will be affected. Surfaces infiltration in these zones is likely to be impeded during periods when high ground water levels are present. There also may be ingress into sewer networks and below ground storage such as soakaways.

As a result, within the site there is a risk of groundwater flooding to surface and subsurface assets, as well as the possibility of groundwater emerging at the surface locally. Mitigation for seasonal high groundwater levels must be considered in design of the site, for example by raising finished floor levels to an appropriate height above ground level.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outlines the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five digit post code level. The site is located within a postcode area with 16 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's Historic Flood Map and Recorded Flood Outlines dataset.

Flood Records from the LLFA do not show any records on or within the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three Rivers District Council Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

The River Gade and Bulbourne (2019) defended model was used to assess fluvial flood risk at the site with the application of climate change. The detailed modelling does not provide climate change outputs for the undefended scenarios, therefore, the defended 1% AEP plus climate change event has been used to inform this part of the assessment. The Environment Agency guidance recommends that the both the Central (21%) and Higher Central (35%) allowances are considered when assessing the impact of climate change.

Description of risk to the site

The NaFRA2 dataset a modest change to the 1% AEP event plus central climate change event (Flood zone 3a) to 14.8%, but up to 49% of the site is predicted to be the 0.1% AEP plus climate change event (Flood Zone 2).

The 1% AEP defended plus 35% climate change event risk from the Mill Stream increases and extend marginally into the north and west of the site. In the centre of the site, around the unnamed drain, flood extents do not extend beyond Flood Zone 2 (0.1% AEP undefended event). This shows a mild sensitivity to the impacts of climate change.

Peak flood depths, velocities and hazard remain low across most of the site. As in the case of the 0.1% AEP undefended event, the deepest (2.88m) and fastest flowing (0.69 m/s) floodwater is predicted to occur around Mill Stream in the centre of the site.

Table 0-1: Comparison of fluvial flood risk to the site between the 1% AEP and 1% AEP plus 35% climate change extents.

Event	1% AEP	1% AEP plus 35% CC
Percentage of site at risk (%)	9.7	11.1
Maximum depth (m)	2.77	2.88
Maximum velocity (m/s)	0.21	0.69
Maximum hazard classification	Significant - Danger for most	Significant - Danger for most

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

The 1% AEP surface water flood extent is predicted to increase minimally across the site when a 20% climate change allowance is applied to rainfall. The climate change extents do not reach the 0.1% AEP surface water flood extent.

The peak flood depths and velocities only increase within the Mill Stream, elsewhere in the site, as in the 1% AEP flood depths remain shallow (<0.2m). The maximum hazard classification of 'Significant' is only predicted in the Mill Stream channel. Elsewhere, hazard largely remains at 'Moderate'. Flooding within the site boundary is contained to limited areas of ponding with no significant flow paths which are predicted to occur in the 0.1% AEP event.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	4.5	6.9
Maximum depth (m)	0.3-0.6	0.6-0.9
Maximum velocity (m/s)	0.25-0.5	0.5-1.0
Maximum hazard classification	Significant - Danger for most	Significant - Danger for most

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There are no structures within the site. There is culvert beneath Home Park Mill Link Road at the northeast corner of the site. To assess the risk from this culvert, blockage modelling will be required as part of a site-specific Flood Risk Assessment.

Emergency planning

Flood warnings and alerts

The site is located within the River Gade at Kings Langley and Croxley Flood Warning Area and the Rivers Gade and Bulbourne Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Access to the site is likely to be via Station Road or Home Park Mill Link Road.

Fluvial

Station Road is located within Flood Zone 1. Home Park Mill Link Road is located within Flood Zones 2 and 3, flooding occurs at the culvert.

Surface water

Station Road is at risk of flooding from a significant surface water flow path during a 2% AEP and greater return periods, at the eastern boundary of the site. Flood depths below 0.3m are largely predicted across all events. As such, access is still possible via Station Road.

Home Park Mill Link Road is also at risk of surface water flooding from the 2% AEP at the northern boundary of the site. Flood depths up to 1.2m in the 0.1% AEP event are predicted on Home Park Mill Link Road.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- BGS data indicates that the underlying has limited permeability and as such shallow infiltration techniques may not be appropriate. As the underlying geology is permeable, deeper infiltration may be possible, however there is a high risk of groundwater flooding.
- Groundwater levels are indicated to be at or very near (within 0.025m) ground level and there is a risk of groundwater flooding at the surface during a 1% AEP event, which may flow to and pool within topographic low spots. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- Most of the site is in Zone 1 inner protection zone, while a small proportion of the eastern area of the site is in Zone 2. Proposed SuDS should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and Environment Agency) at an early stage to understand possible opportunities and constraints.
- There are no historic landfill sites within the site boundary. The Junction 20 M25-A41 historic landfill site is located 200m to the southwest of the site.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council, and the EA) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should consider the impacts of future climate change over the projected lifetime of the development.
- Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- Development should adopt source control SuDS techniques, and conveyance features should be designed above ground, following natural flow paths where possible.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.
- SuDS should be designed with a holistic approach, combining ecology, landscape and drainage requirements specific to the site, and incorporating Biodiversity Net Gain requirements.
- SuDS should be designed in line with the National Standards for Sustainable Drainage Systems.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies the proposed type of non-residential development as 'Less Vulnerable'.

The Exception Test is required for this site due to its vulnerability and part of the site is located within Flood Zone 3b.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- Is within Flood Zone 3
- within ‘Flood Zones plus Climate Change’, showing it is at increased risk of flooding from rivers or sea in future
- Is subject to sources of flooding other than rivers or sea

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the Three Rivers District Council, Hertfordshire County Council, Thames Water, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development must seek opportunities to reduce overall level of flood risk both on and offsite, for example by reducing volume and rate of runoff and creating space for flooding.

The development should be designed using a sequential approach. Flood Zones 2 and 3, should be preserved as public green space, with built development restricted to Flood Zone 1. Resilience measures will be required if buildings are situated in the flood risk area.

The impact of high groundwater levels must be assessed as part of a site-specific flood risk assessment; this must be supported by groundwater levels monitoring and must demonstrate that any proposed buildings with deep foundations do not increase flood risk elsewhere.

Detailed surface water modelling should be undertaken to better understand baseline and post-development surface water risk flowing into the site, on site and downstream.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe. Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Storage for runoff from the development in extreme events should be located out of flood risk areas. Compensation storage would need to be provided for any land-raising within the 1% AEP plus appropriate climate change allowance, including to provide a safe access route.

The design of SuDS schemes must consider the seasonally high groundwater table and low permeability. Infiltration techniques may be ineffective and may pose a pollution risk. SuDS may need to be shallow and take up larger areas. Above ground conveyance and attenuation can be used but care must be taken that groundwater does not enter the SuDS feature and reduce the storage capacity and structural integrity of the design. Detailed site investigations will be required including infiltration testing and groundwater monitoring during the winter months (November through to March).

Conclusions

A significant proportion of the site (30%) is shown to be at risk of fluvial flooding as it is in Flood Zones 2 and 3. The source of flood risk is the Mill Stream which flows through the site and the ordinary watercourse in the southwest of the site. However, flood waters remain in-channel in flood events up to and including the 0.1% AEP event, so a majority of the site is within Flood Zone 1. Access to site from Station Road is possible up to a 0.1% AEP event but there is flood risk predicted along Home Park Mill Link which provides access for the northern part of the site. The risk of blockage to the culvert on this road should also be assessed as part of a site-specific Flood Risk Assessment.

The site is at surface water flood risk during the 3.3%, 1% and 0.1% present day AEP events. Significant flood depths are not predicted within the site boundary in areas away from the watercourse, however, flow paths are shown to affect access roads to the site from the 3.33% AEP.

Shallow groundwater levels are present across much of the site. A site-specific Flood Risk Assessment should confirm the risk to the site. This is likely to require ground investigations.

The following points should be considered in development of this site:

- The Exception Test must be undertaken and passed. A significant the site is shown to be at risk during the design fluvial events. If the Exception Test is failed, development will not be able to be proceed.
- The development should be designed using a sequential approach. Flood Zones 2 and 3, plus climate change (subject to a detailed flood risk assessment) should be preserved as public green space, with built development restricted to Flood Zone 1.
- Safe access and egress should be demonstrated in the 1% AEP plus climate change surface water and fluvial events.
- As a brownfield site, post-development surface water runoff rates and volumes should aim to meet the equivalent greenfield values, in line with Defra national guidance. If greenfield rates and volumes are not attainable, consultation with Hertfordshire County Council (the LLFA) will be required.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, with development steered away from the areas identified to be at risk of fluvial and surface water flooding across the site.
- Mitigation for seasonal high groundwater levels must be considered (for example by raising finished floor levels to an appropriate height above ground level).
- If flood mitigation measures are implemented then they are tested to check that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).
- The River Gade, which flows through the site, is a Main River. An 8m wide buffer should be maintained between the riverbank and any built structures, to enable the riparian owners and/or the Environment Agency to access and maintain the channel.

- The unnamed watercourse which flows through the site is an Ordinary Watercourse. A minimum 3m wide buffer should be maintained between the riverbank and any built structures, in line with the Hertfordshire Local Flood Risk Management Strategy, to enable riparian owners to access and maintain the channel

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Level 2 Strategic Flood Risk Assessment - Site CFS60

Affinity Water Depot, Church Street

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site CFS60. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council (TRDC) Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Affinity Water Depot, Church Street, Rickmansworth, WD3 1JQ
- Site area: 151 ha
- Existing site use: Water works (Affinity Water)
- Proposed site use: Residential (within footprint of existing buildings on the site)

Topography

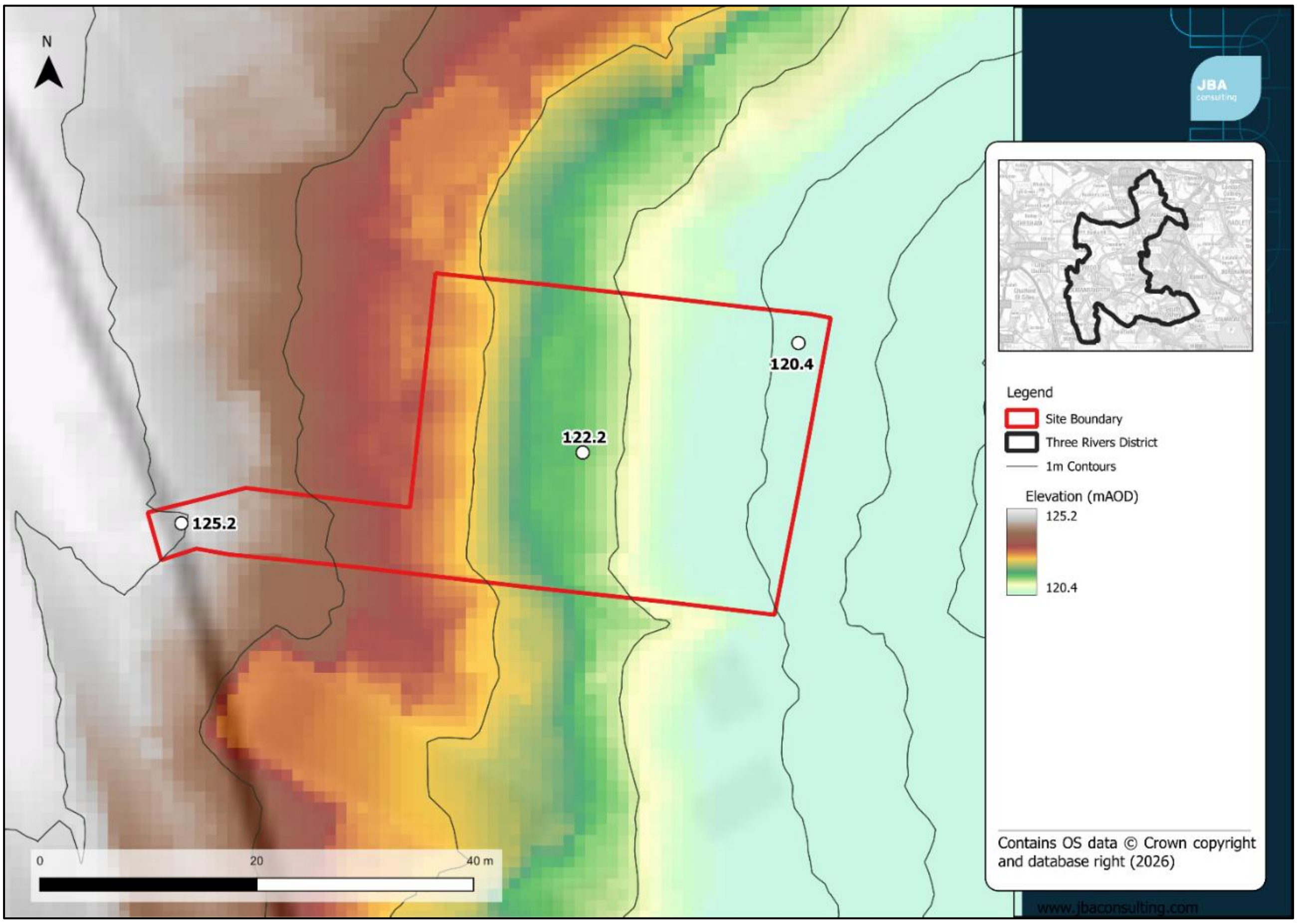

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

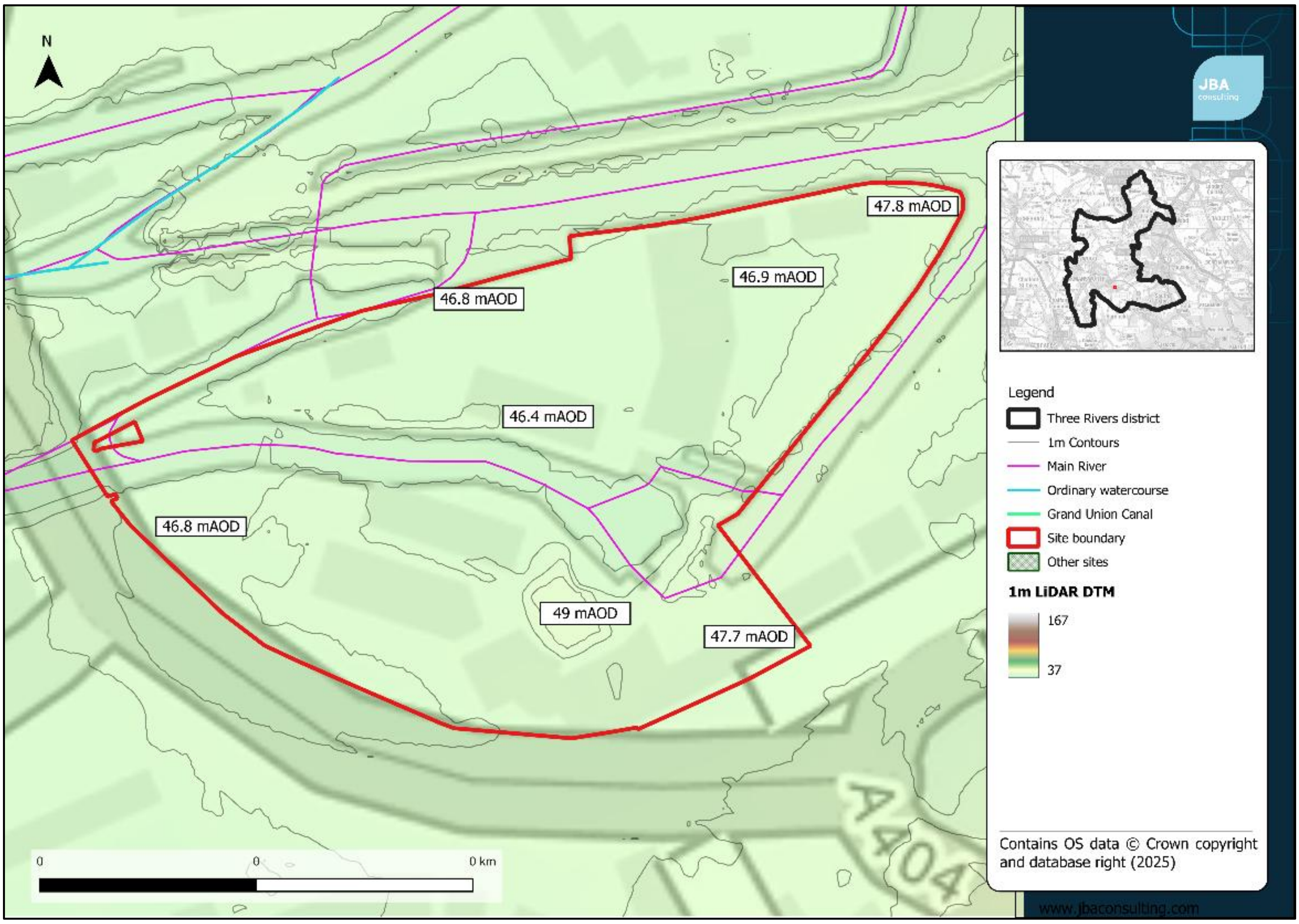

Figure 0-1: Topography of the site.

The LiDAR shows there a prominent westward gradient, with a decrease in elevation from the west (47.8mAOD) towards the watercourse (46.8mAOD) in the east. There is a small rise in elevation from the watercourse to the eastern border in the side from 46.4mAOD to 46.8mAOD. There is an isolated area of high ground in the southeast near the existing property line. There is also a gentle south north gradient, towards the floodplain of the Colne, where the elevation slopes from 47.7mAOD in the south to 46.8mAOD in the north.

Geology and soils

Geology at the site consists of:

- Bedrock – Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated)
- Superficial - Alluvium – Clay, Silt, Sand and Grave

Soils at the site consist of:

- Loamy and clayey floodplain soils with naturally high groundwater

Sources of flood risk

Location of site within the catchment

The site is in south central Rickmansworth within the Upper Colne catchment.

Existing drainage features

The River Colne flows through the centre of the site in a south westerly direction and the Grand Union Canal is located at the northern boundary.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset and, the Upper Colne (2025) hydraulic model have been used to assess fluvial flood risk at this site.

Description of risk to the site

A majority of the site is located within Flood Zone 3b and is predicted to be at risk of flooding during the 3.33%, 1% and 0.1% AEP events. Fluvial flooding first occurs from the River Colne in the centre of the site. The area at risk of flooding increases during the 1% AEP event, although it does not reach the southern boundary and south-west corners of the site.

Moderately high maximum flood depths from the 3.33% AEP with the greatest depths (up to 0.87m) predicted to occur along the south-western boundary of the site, adjacent to the A404. In the 1% and 0.1% AEP events, peak depths up to 0.86m and 0.92m are respectively predicted. Peak velocities mostly remain low during the 3.33% AEP (<0.25m/s) within the site boundary but areas of high velocity form on the south-west boundary near the A404 (up to 2 m/s). Maximum flood velocity within the site increases to 0.5m/s in the 1% AEP and 0.1% AEP events. Flood hazard to people is predicted to be low to moderate across the south of the site up to the 1% AEP, increasing to significant hazard at the south-west boundary during the 0.1% AEP event.

As a large proportion of the site is at high fluvial flood risk (86% in Flood Zone 3b), with significant flood depths predicted within the site itself, and flood hazards expected to be moderate to significant, it may not be possible to pass the Exception Test by making future development safe. Therefore, the site presents significant challenges to enable large scale residential development.

Table 0-1: Existing fluvial flood risk based on the Upper Colne 2025 model*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
10.1	89.9	89.0	86.4

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

The site is at a low risk of surface water flooding. Surface water flow paths are not connected to the watercourse and is predicted largely as ponding at topographic depressions.

Up to the 1% AEP event, flood depths within the site are shallow (less than 0.2m), as surface water accumulates as ponding in the northeast and southwest of the site. In the 0.1% AEP flood depths become more significant and along the southern border, a flow path from the A404 begins to encroach into the site boundary. The maximum flood hazard remain low up to the 1% AEP, even in the 0.1% AEP only a small area in the southwest of the site is at moderate hazard due to the external flow path from the A404.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	2.0	5.1	9.4
Maximum depth (m)	0.2-0.3	0.2-0.3	0.3-0.6
Maximum velocity (m/s)	0.0-0.25	0.25-0.50	0.5-1.0
Maximum hazard classification	Low - Caution	Low - Caution	Moderate - Danger for some

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is at risk of reservoir flooding in the unlikely event of a breach on Aldenham Reservoir and Hilfield Park Reservoir. As part of a site-specific Flood Risk Assessment, an agreed emergency plan should identify appropriate safe access and egress routes from the site, in the event of a reservoir breach.

Canals

The Grand Union Canal is located at the northern boundary of the site. Through this reach, the Grand Union Canal and the River Colne are one and the same. The assessment of fluvial flood risk is, therefore, considered to give a reasonable indication of risk from canal flooding.

Groundwater

The site is at moderate to high risk of groundwater flooding. Across the majority of the site (79%), groundwater levels reach between 0.5 – 5m below the surface during a 1% AEP groundwater flood event. There is variance across the site, as a result of the presence of superficial deposits which increase permeability, allowing a localised rise in groundwater.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outlines the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five digit post code level. The site is located within a postcode area with 31 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site itself is not within the Environment Agency's recorded flood outlines dataset, however, the land to the northeast of the site is included in the extents from the Winter 2014 flood event. Historic Flood Records from the Hertfordshire County Council have been provided and there is 1 record of external flooding to a nearby property, the cause of flooding is unknown.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three River Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling is also available as part of the Upper Colne 2025 model. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.

The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The NaFRA2 data shows that during the 1% and 0.1% AEP plus climate change events, flooding extends to 100% of the site. This shows a sensitivity to the impacts of climate change.

The defended flood modelling shows little impact of climate on the predicted flood extents. No new areas of flooding are predicted. The areas where the deepest flood depths and velocity are predicted are the southwest of the site. There is a small increase in maximum depth and velocity between the two events, however hazard to the site remains at moderate across both events.

Table 0-1: Comparison of fluvial flood risk to the site between the defended 1% AEP and 1% AEP plus 35% climate change extents.

Event	1% AEP	1% AEP plus 35%CC
Percentage of site at risk (%)	88.95	89.95
Maximum depth (m)	0.87	0.92
Maximum velocity (m/s)	1.76	1.75
Maximum hazard classification	Moderate - Danger for some	Moderate - Danger for some

Surface water

Available data

Surface Water flooding for the 3.3%, 1% and 0.1% AEP events with central climate change uplift (up to the 2050s epoch), using data available as part of the NAFRA2 release. The central allowance applied in the NAFRA2 data is a 20% uplift.

The Environment Agency guidance recommends that the Upper End allowance is considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

There is a small increase in the predicted flood extents in the 1% AEP plus climate change event compared to the 1% AEP, however they do not reach the 0.1% AEP. There is no change in predicted peak depths and velocity with the site boundary, but there is an increase in hazard from low to moderate. As observed in the 0.1% AEP, the area of elevated hazard is due to the surface flows that accumulate along the southwest border of the site from the A404.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	5.1	6
Maximum depth (m)	0.2-0.3	0.2-0.3
Maximum velocity (m/s)	0.25-0.50	0.25-0.50
Maximum hazard classification	Low - Caution	Moderate - danger for some

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences

Residual risk

Within the site, there is a culvert and a bridge across the River Colne. These structures pose a risk to the site, in the case of blockage, as well as to areas downstream, such as the properties along Moor Lane. Blockage of the bridge adjacent to the site under the A404 would increase flood risk to the western part of the site as well as the A404 itself, should the blockage result in overtopping.

Four sluices are located beneath the access bridge in the southwest of the site. It is recommended that blockage modelling is carried out as part of a site-specific Flood Risk Assessment to evaluate the impact on flood risk. The Environment Agency has identified that the existing culvert on the site is in poor condition and should be de-culverted or repaired as part of any future development.

Additionally, the risk of breach of the Aldenham and Hilfield Reservoirs should be considered as residual risk to the site.

Emergency planning

Flood warnings and alerts

The site is within both EA Flood Warning and Flood Alert Areas.

- The Middle River Colne at Watford and Rickmansworth including Carpenders Park Flood Alert Area
- The River Colne at Rickmansworth including Batchworth, Money Hill and Maple Cross Flood Warning Area

Access and egress

Potential access

The site is likely to be accessed from the A404 along the eastern boundary, or Moor Lane at the southern tip of the site.

Fluvial

Both access routes are shown to be at fluvial flood risk from the 3.33% AEP event. Flood depths up to 1m are predicted on the A404 adjacent to the site in the 1% and 0.1% AEP event, with peak velocities reaching 2m/s and the associated maximum hazard is between moderate and significant.

Surface water

Surface water flooding may also restrict access and egress, with an area of ponding occurring in the 3.33% AEP event along the A404 adjacent to the site. A surface water flow path also forms along Moor Lane in the 3.33% AEP event. The peak hazard on these access routes also ranges from moderate to significant across all three events.

Access and egress from this site are important to the overall safety of the development, and therefore this should be discussed with the Local Planning Authority and Environment Agency at the earliest stage.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- BGS data and groundwater mapping suggests that there is high risk of groundwater flooding at this location due to the presence of permeable superficial deposits, therefore infiltration techniques may not be suitable. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site. The infiltration potential of the site should be confirmed through infiltration testing, in line with BRE 365.
- The site is located within Groundwater Source Protection Zone 1. This, combined with high groundwater levels, is likely to limit the feasibility of infiltration. Such techniques should only be used where there are suitable levels of treatment and following the granting of any required environmental permits from the Environment Agency.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The layout and function of drainage systems needs to be considered at the start of the design process for new development, as integration with road networks and other infrastructure can maximise the availability of developable land.
- Proposed attenuation features such as basins, ponds and tanks should be located outside of Flood Zone 3 to avoid the potential risks to the hydraulic capacity or structural integrity of these features. Surface water outfalls that discharge into the watercourses may be susceptible to surcharging due to water levels. The impacts of flood flows will need to be considered in terms of the attenuation storage requirements of the site and placement of the outfalls.

- The Risk of Flooding from Surface Water (RoFSW) mapping indicates surface water flooding during the 3.3% AEP event. Existing flow paths should be retained and integrated with blue-green infrastructure.
- If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management

- Development of the site should ensure there is no loss in floodplain storage. Redevelopment of the site should look to reduce coverage of impermeable areas where possible.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. There is an increase in flood risk to the central part of the site during the 1% AEP plus climate change surface water event.
- The culvert within the site boundary should be replaced with an open channel ('daylighted') to increase its capacity and reduce the risk of blockage. If this is not possible, the existing culvert on the site should be repaired.
- Opportunities for using source control SuDS to manage runoff rates and volumes, contributing to the reduction of flood peaks downstream and existing surface water flow paths leaving the site.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.
- SuDS should be designed with a holistic approach, combining ecology, landscape and drainage requirements specific to the site, and incorporating Biodiversity Net Gain requirements.
- SuDS should be designed in line with the National Standards for Sustainable Drainage Systems.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as **'More vulnerable'**.

The Exception Test is required for this site because it is classed as more vulnerable development and part of the site is located within Flood Zone 3b.
A large proportion of the site is at high fluvial flood risk (86% in Flood Zone 3b), with significant predicted flood depths and flood hazards expected to be moderate to significant, and therefore it may not be possible to pass the Exception Test by making future development safe.

If no alternative sites at lower flood risk can be allocated according to the Sequential Test, a sequential approach must be taken to designing the site. Development must occur within the existing building footprints and avoid placing More Vulnerable development in areas of the site within Flood Zone 3, using them instead for appropriate uses such as Water Compatible uses (e.g. green infrastructure, flood storage) and using the ground floor of the existing buildings within the site for Less Vulnerable uses (e.g. commercial development).

If the development passes the Exception Test, redevelopment of existing buildings on the site must look to implement robust flood risk mitigation (such as raised floor levels) and resilience (such as flood resilient building materials). Safe access and egress will also need to be maintained, which may require works outside of the boundary of the site. This should be discussed with the Local Planning Authority and Environment Agency at the earliest stage. Due to the extent of flood risk on the site and surrounding access roads, as well as the potential for upper-storey residential development, a comprehensive emergency flood plan must be developed as part of the site-specific Flood Risk Assessment for the site.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- Is located within Flood Zone 3a and 3b
- Is within ‘Flood Zones plus Climate Change’, showing it is at increased risk of flooding from rivers or sea in the future in the Flood Map for Planning.
- the Flood Map for Planning shows it is at risk from surface water flooding
- is subject to sources of flooding other than rivers or sea

All sources of flooding, particularly the risk of surface water flooding, groundwater flooding and the interaction between them, should be considered as part of a site-specific FRA. The impact of the development on flood risk from all sources both on and off-site must be considered and modelled where appropriate.

A detailed assessment of the risk and location of high groundwater levels and groundwater emergence should be undertaken, including groundwater monitoring during the winter months.

Consultation with the Three Rivers District Council, Hertfordshire County Council, Thames Water, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

Guidance for site design and making development safe

Development must seek opportunities to reduce overall level of flood risk both on and off-site, for example by reducing volume and rate of runoff and creating space for flooding.

Floodplain compensation must be demonstrated for any loss in floodplain storage through the raising of levels for development, in consultation with the Environment Agency. Flow routes would also need to be preserved if carrying out land-raising within areas at risk of surface water flooding.

The development should be designed using a sequential approach. Development should be steered away from surface water flow routes and areas where groundwater risk is highest, preserving these areas as green infrastructure

Safe access and egress should be demonstrated in the 1% AEP plus climate change event. An emergency flood plan must be prepared, to demonstrate how safe access and egress from the site can be achieved. Raising of access routes must not impact on surface water flow routes. Consideration should be given to the siting of access points with respect to fluvial, surface water flood, reservoir and groundwater risk areas. Access and egress from this site are important to the overall safety of the development, and therefore this should be discussed with the Local Planning Authority and Environment Agency at the earliest stage.

The design must ensure that surface water flows resulting from rainfall in excess of 1% AEP event are managed via exceedance routes that minimise the risks to people and property.

Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels. These measures should be assessed to make sure that flooding is not increased elsewhere:

- raise them as much as possible.
- include extra flood resistance and resilience measures.

The design of SuDS schemes must consider the seasonally high groundwater table and low permeability. Infiltration techniques may be ineffective and may pose a pollution risk. SuDS may need to be shallow and take up larger areas. Above ground conveyance and attenuation can be used but care must be taken that groundwater does not enter the SuDS feature and reduce the storage capacity and structural integrity of the design. Detailed site investigations will be required including infiltration testing and groundwater monitoring during the winter months (November through to March).

The River Colne, which flows through the site, is a Main River. An 8m wide buffer should be maintained between the riverbank and any built structures, to enable the riparian owners and/or the Environment Agency to access and maintain the channel.

A buffer, the distance to be determined in consultation with the Canal and River Trust, should be maintained between the Grand Union Canal and any built structures, to enable access and maintenance.

Conclusions

The River Colne flows through the centre of this site, as such the majority of this site is at high risk of fluvial flooding, with 86% of the site predicted to be within Flood Zone 3b. Significant flood depths and hazard are predicted within the site boundary and along access roads for the site. Climate change is expected to increase flood extents to the entire site area.

A small percentage of the site (up to 10%) itself is at surface water flood risk up to the 0.1% AEP and flood depths and hazard remain low within the site boundary. However, significant flood depths and hazard are predicted along the access routes to the site from the 1% AEP surface water event.

Shallow groundwater levels are present across much of the site. A site-specific flood risk assessment should confirm the risk to the site. This is likely to require ground investigations.

The following points should be considered in development of this site:

- Most of the site is shown to be at risk during the design fluvial and surface water events. Therefore, the site presents significant challenges to enable large scale residential development. If the Exception Test is failed, development will not be able to be proceed.
- If the development passes the Exception Test, redevelopment of existing buildings on the site must look to implement robust flood risk mitigation (such as raised floor levels) and resilience (such as flood resilient building materials).
- A sequential approach must be taken to designing the site, avoiding placing More Vulnerable development in areas of the site within Flood Zone 3, using them instead for appropriate uses such as Water Compatible uses (e.g. green infrastructure, flood storage) and using the ground floor of the existing buildings within the site for Less Vulnerable uses (e.g. commercial development).
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed hydraulic modelling, with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site. This is in line with the sequential approach to site layout.
- To ensure safe access and egress during the 1% AEP fluvial and surface water flood events, works outside of the boundary of the site may be required. This should be discussed with the Local Planning Authority and Environment Agency at the earliest stage.
- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

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Level 2 Strategic Flood Risk Assessment - Site CFS61

Cinnamon House, Cassiobridge, Croxley Green

Prepared for

Three Rivers District Council

Date

19 February 2026

THREE RIVERS DISTRICT COUNCIL

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site CFS61. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Local Plan for Three Rivers District Council Level 1 Strategic Flood Risk Assessment and read the Local Plan for Three Rivers District Council Level 2 Strategic Flood Risk Assessment Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Cinnamon House, Cassiobridge, Croxley Green, WD3 3RT
- Site area: 1.0ha
- Existing site use: Brownfield - Commercial
- Proposed site use: Residential

Topography

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR data.

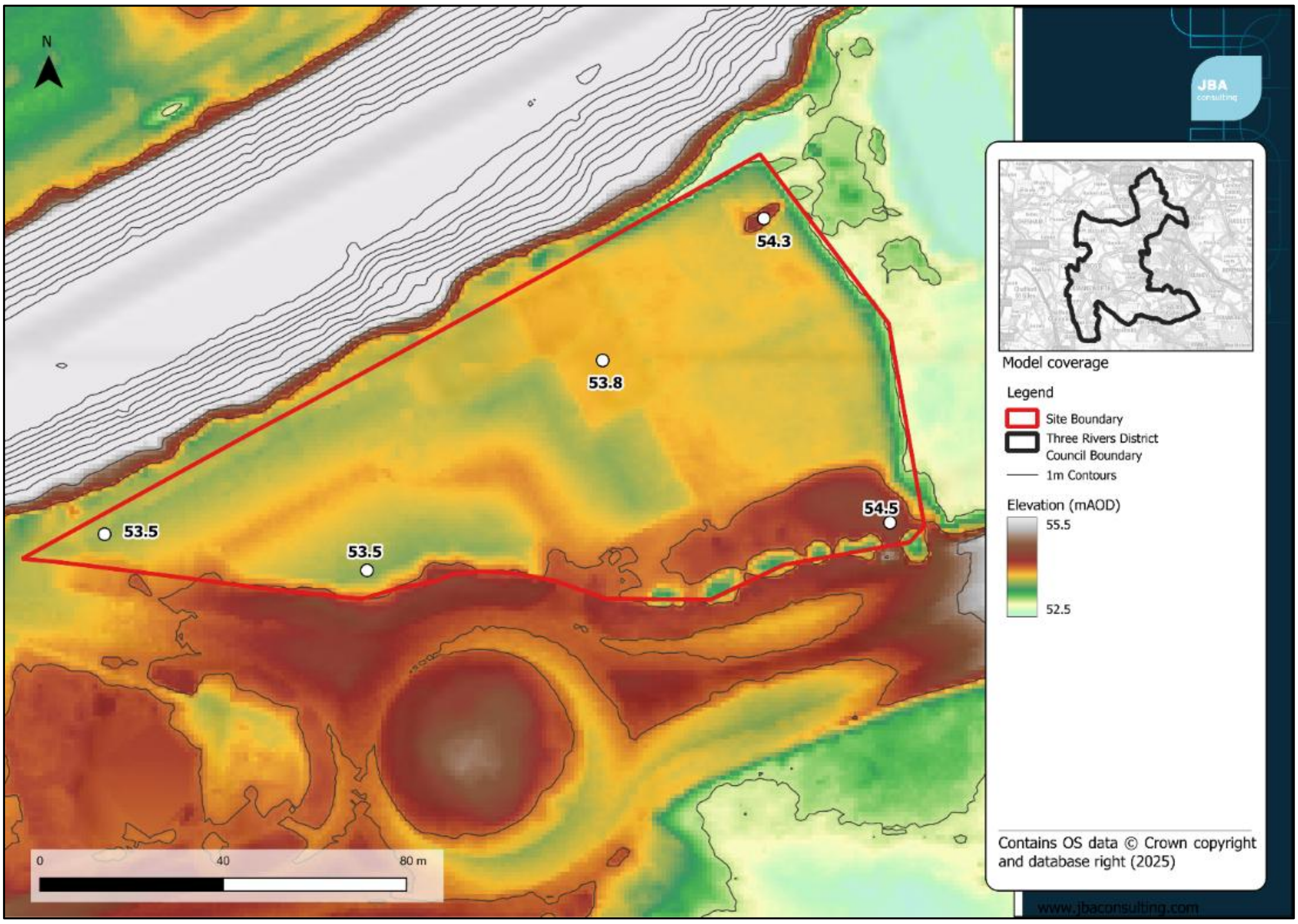

Figure 0-1: Topography of the site

The majority of the site is relatively level, with the lowest point of 52.9mAOD (Above Ordnance Datum) along the eastern boundary. There is slight increase in levels along the southern boundary with Watford Road with the highest point being 54.5mAOD. There is a railway embankment to the north of the site, which is approximately 10m higher than the site. As the site is in a developed urban area the LiDAR data is unlikely to be representative of the actual site topography, this may have an impact on some of the flood risk datasets used in the assessment.

Geology and soils

Geology at the site consists of:

- Bedrock - Seaford Chalk Formation and Newhaven Chalk Formation
- Superficial deposits - Alluvium – Clay, Sand and Silt

Soils at the site consist of:

- Free draining slightly acid and loamy soil

Sources of flood risk

Location of site within the catchment

The site is within the area of Croxley Green, an urban built-up area. The site is located along the eastern boundary of the Three River District. The site is located 50m west of the River Gade and Grand Union Canal. There is also a railway line 50m to the north

Existing drainage features

There are no existing watercourses within the site boundary, however the Grand Union Canal and River Gade are located 50m and 110m respectively to the east of the site. As the site is in an urban area, it likely drains to the surface water drainage network.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) and the Upper Colne (2025) hydraulic model have been used to assess fluvial flood risk at this site.

Description of risk to the site

The EA FMfP shows that the site is primarily located within Flood Zone 1, however, 1.2% falls within Flood Zone 2 due to fluvial flooding that marginally encroaches into the eastern site boundary.
The Upper Colne model confirms that the site largely remains within Flood Zone 1 with 0.4% falling within Flood Zone 2, consistent with the FMfP. The detailed modelling shows that the site is not at risk of fluvial flooding up to and including the 1% AEP undefended event. During the 0.1% AEP undefended event, fluvial flows encroach within the eastern boundary due to overtopping of the Grand Union Canal adjacent to the site. However, flood depths are shallow (<0.25m), and velocities are low (<0.25m/s), resulting in a 'Low' hazard classification (<0.75).

Table 0-1: Existing fluvial flood risk based on the Upper Colne 2025 model*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
98.8	1.2	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA’s Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The site is at risk of flooding from surface water in all modelled events. During the 3.3% AEP rainfall event, a surface water flow path enters the site from Baldwins Lane to the west of the site, causing flooding in the north-west corner against the railway embankment and existing building. Areas of ponding are also shown in the existing carparking areas in the centre and south of the site. During this event, flood depths are predicted to be shallow (0.2m) and velocities low (0m/s). For the 3.3% AEP event, the maximum hazard is classified as 'Moderate' (0.75-1.25).

The mapping shows that the extent of flooding increases during the 1% AEP event to 36.9%. Flood depths are predominantly 0.2-0.3m, however localised pockets of deeper flooding (0.3-0.6m) are shown in the carparking areas in the centre and south of the site. Additionally, velocities are mainly 0m/s, however localised maximums of 0.25-0.5m/s are shown. Under the 1% AEP event, the maximum hazard remains 'Moderate', concentrated alongside the railway embankment and in the car parking areas.

During the 0.1% AEP event, the extent of surface water flooding extends across the width of the site, flowing from west to east. The maximum depth of surface water flooding has been modelled as 0.3m, and velocities reach 2m/s in most of the western part of the site. Under the 0.1% AEP event, the maximum hazard classification increases to 'Significant' (1.25-2.0), covering most of the western part of the site, whilst the hazard in the eastern part of the site is 'Low'.

The site is at significant surface water flood risk and developers will need to carefully consider this risk and demonstrate users of the site can be kept safe during the lifetime of the development through a detailed site-specific FRA, including detailed surface water modelling.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	8.8	36.9	65.4
Maximum depth (m)	<0.2	0.3-0.6	0.3-0.6
Maximum velocity (m/s)	0.0	0.25-0.5	0.5-1.0
Maximum hazard classification	Moderate (0.75-1.25)	Moderate (0.75-1.25)	Significant (1.25-2.0)

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The site is at high risk of groundwater flooding. At 0.8% of the site, groundwater levels are within 0.025m of the ground surface during the 1% AEP event. Groundwater levels are primarily between 0.025m and 0.5m below the ground surface during a 1% AEP groundwater flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. The impact of high groundwater levels must be assessed as part of a site-specific flood risk assessment; this must be supported by groundwater levels monitoring and must demonstrate that any proposed buildings with deep foundations do not increase flood risk elsewhere.

Based on the RoFSW and topography of the site it is likely that any groundwater that emerges will flow/pool along the railway embankment in the north of the site and in the carparking areas to the south of the existing building.
This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 75 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency’s recorded flood outlines dataset.

Flood Records from the LLFA shows a record of surface water flooding to the west of the site along Baldwins Lane, under the railway bridge.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three Rivers District Council Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch was used for this assessment.

The Upper Colne (2025) defended model was also used to assess fluvial flood risk at the site with the application of climate change. The detailed modelling does not provide climate change outputs for the undefended scenarios, therefore, the defended 1% AEP plus climate change event has been used to inform this part of the assessment.
The Environment Agency guidance recommends that the both the Central (21%) and Higher Central (35%) allowances are considered when assessing the impact of climate change.

Description of risk to the site

The NaFRA2 data and the River Colne defended model show that the site is at negligible risk of fluvial flooding during the 1% AEP plus climate change event.

During the undefended 0.1% AEP event, the NaFRA2 data shows that the fluvial flood extent increases to 58.6%.

Table 0-1: Comparison of fluvial flood risk to the site between the 1% AEP and 1% AEP plus 35% climate change extents.

Event	1% AEP	1% AEP plus 35% CC
Percentage of site at risk (%)	0	0
Maximum depth (m)	N/A	N/A
Maximum velocity (m/s)	N/A	N/A
Maximum hazard classification	N/A	N/A

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

The 3.3% AEP surface water flood extent increases to 31.4% when a 20% climate change allowance is applied to rainfall. However, it does not reach the 1% AEP (1 in 100-year) surface water flood extent. During the 3.3% AEP event plus climate change event, surface water reaches a maximum depth of 0.2-0.3m and a maximum speed of 0-0.25m/s. Within this flood extent, the highest hazard classification is 'Moderate'.

During the 1% AEP plus climate change surface water flood extent, the eastern part of the site remains flood-free. As with the present day 1% AEP event, depths reach up to 0.3-0.6m, but maximum velocities increase to 0.5-1.0m/s. These do not exceed the 0.1% AEP present day event.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	36.9	43.1
Maximum depth (m)	0.3-0.6	0.3-0.6
Maximum velocity (m/s)	0.25-0.5	0.5-1.0
Maximum hazard classification	Moderate (0.75-1.25)	Moderate (0.75-1.25)

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Access to the site is likely to be via the A412 Rickmansworth Road or Baldwins Lane. Baldwins Lane has the greatest risk of flooding from surface water, and access on this route from the north is likely to be restricted during all modelled events. The section of the A412 road next to the site boundary is at low risk of surface water flooding. However, larger flood extents occur further east and west along the A412, and therefore access may be restricted due to flooding at locations further away from the site. Developers will need to demonstrate that safe access and egress in the 0.1% AEP event, including allowance for climate change and this should be discussed with the Local Planning Authority and Environment Agency at the earliest stage.

Fluvial

The A412 remains flood free in the eastern direction up to the 0.1% AEP fluvial event and is in Flood Zone 1. Baldwins Lane is affected by fluvial flooding along the western border of the site and is in Flood Zone 2.

Surface water

Baldwins Lane is at risk of flooding from surface water during the 3.33% AEP surface water event to depths of 0.3-0.6m.

Surface water flow paths affect the A412 road along the roundabout adjacent to the site, although depths are generally shallow (0.2-0.3m) and only become significant in the 0.1% AEP event (0.3-0.6m).

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- Groundwater levels are indicated to be at or very near (within 0.025m) ground level and there is a risk of groundwater flooding at the surface during a 1% AEP event, which may flow to and pool within topographic low spots. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- The site is in Groundwater Protection Zone 1. Defined as the 50-day travel time from any point below the water table to the source. Infiltration techniques may not appropriate for anything other than clean roof drainage. If infiltration is proposed for anything other than clean roof drainage a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply
- The site is not located within a historic landfill site. The Rousebarn Lane landfill site is located 150m to the north-east of the site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Local Planning Authority, Lead Local Flood Authority, and the EA) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such bioretention areas or rain gardens must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access.

- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as 'More Vulnerable'.
The Exception Test is not required for this site due to the vulnerability of the development, and its location within Flood Zone 2.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- Is within Flood Zone 2
- the flood map for planning shows it is at risk of flooding from surface water
- increases the vulnerability classification and may be subject to sources of flooding other than rivers or sea

All sources of flooding should be considered as part of a site-specific FRA, specifically surface water flooding.

Consultation with the Three Rivers District Council, Hertfordshire County Council, Thames Water, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council's Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside the areas of surface water flood risk on the site. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. These measures should be assessed to make sure that flooding is not increased either on or off-site.

Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

The risk of flooding from groundwater must be investigated and must be supported by groundwater level monitoring.

Should built development be proposed within the design surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures.

Storage for runoff from the development in extreme events should be located out of flood risk areas.

Arrangements for safe access and egress will need to be provided for the 1% AEP surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is predominantly in Flood Zone 1, but the eastern boundary falls within Flood Zone 2. The site is shown to be at significant risk from surface water flooding from the 1% AEP present day event. During the 1% AEP groundwater event, groundwater levels are anticipated to be within 0.5m of the ground surface. Due to the extensive surface water flood risk and the potential for highly vulnerable use, the management of flow paths on site is important to ensuring the viability of the development. The following points should be considered in development of this site:

- A site-specific Flood Risk Assessment is required which demonstrates that site users will be safe during events up to and including the 0.1% and 1% AEP rainfall events, with an appropriate allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding either on or off the site.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed hydraulic modelling (as above), with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site. This is in line with the sequential approach to site layout. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. These measures should be assessed to make sure that flooding is not increased either on or off the site
- Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.
- Arrangements for safe access and escape will need to be provided for the 1% AEP surface water events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe

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Level 2 Strategic Flood Risk Assessment - Site CFS70

Croxley Business Park

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Croxley Business Park. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council Level 1 SFRA and read the Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Croxley Business Park
- Site area: 1.04ha
- Existing site use: Brownfield
- Proposed site use: Employment

Topography

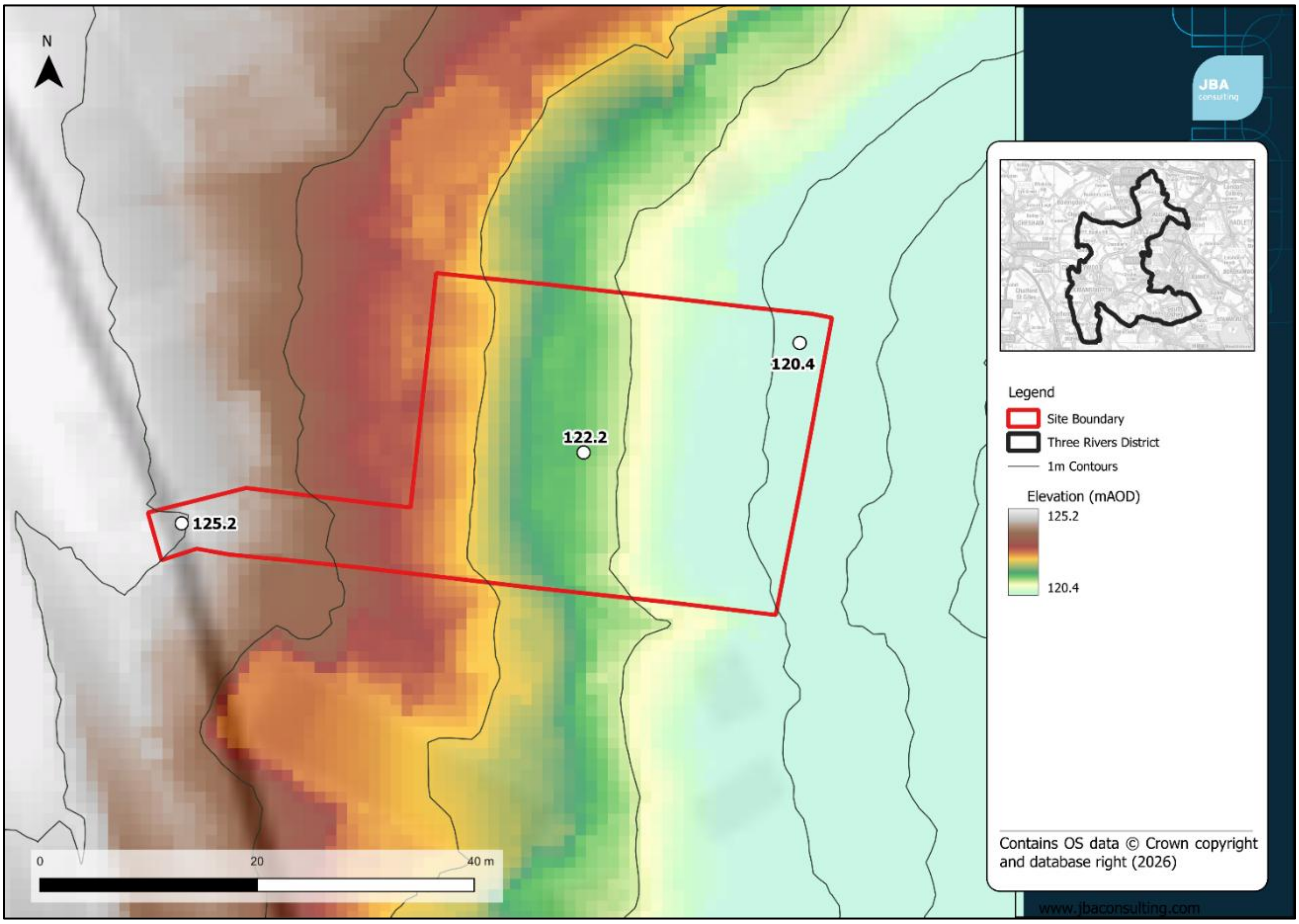

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

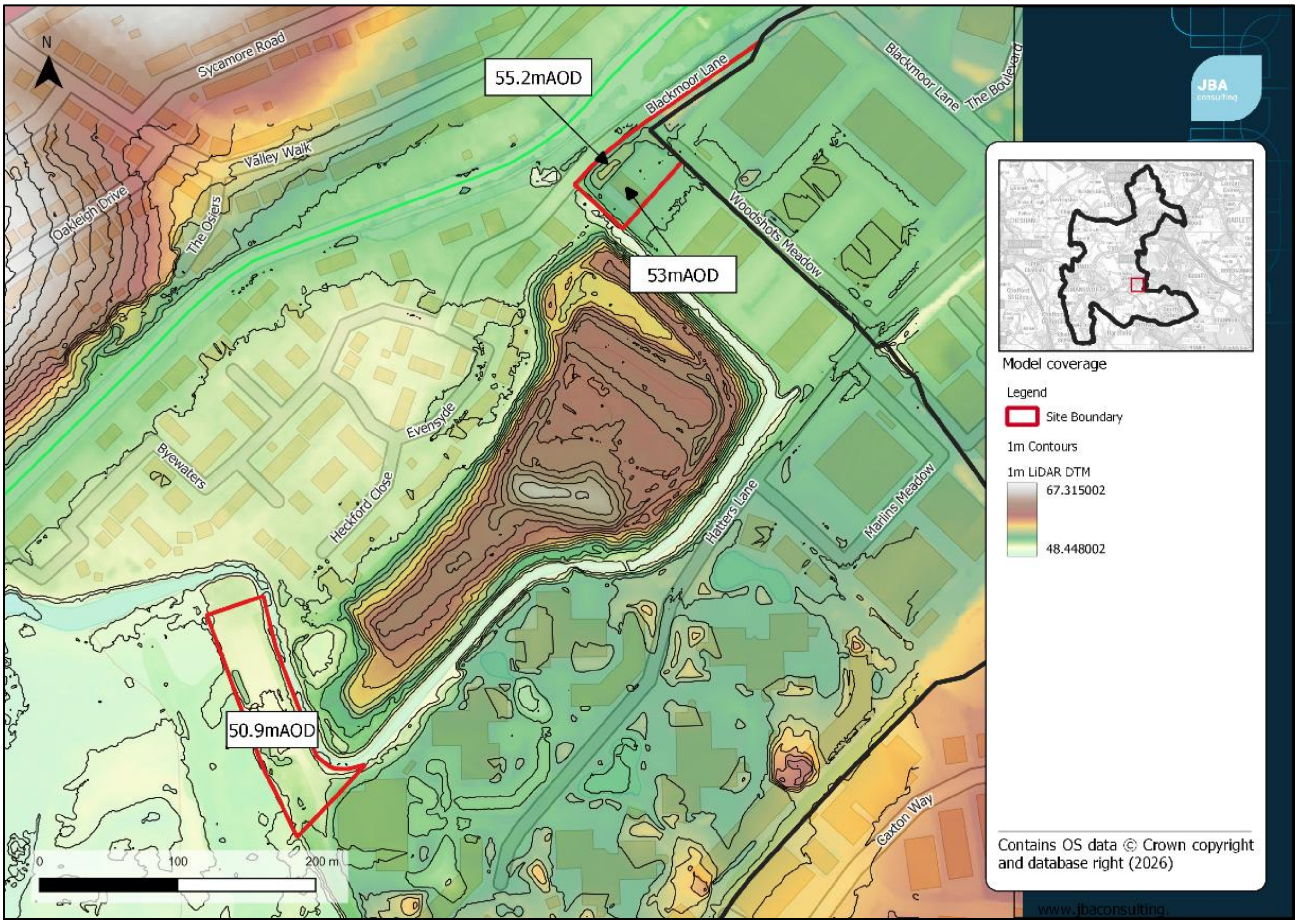

Figure 0-1: Topography of the site.

The topography of the site is mostly flat. The northern parcel of land mostly has an elevation around 53mAOD, however, along the western border of the site is a mound, increasing to an elevation of 55.2mAOD. The southern parcel of land remains consistently flat with areas of slight variation; elevations range from 50.9mAOD to 52.3mAOD.

Geology and soils

Geology at the site consists of:

- Bedrock - White Chalk Subgroup
- Superficial - None recorded

Soils at the site consist of:

- Loamy, clayey floodplain soils with naturally high groundwater

Sources of flood risk

Location of site within the catchment

The site is located south of the Gade water body (from its confluence with the Bulbourne to the Chess), which forms part of the wider River Colne catchment. This catchment ultimately drains toward the River Thames.

Existing drainage features

The Main River Gade forms the boundary of both land parcels of the site. The Grand Union Canal is located adjacent to the northeastern boundary of the northern land parcel.

Fluvial

Available data

The Grand Union Canal at this location is represented in the 2025 Upper Colne model, however, as the River Gade is not represented, the model was not considered appropriate for the assessment of fluvial risk at this site.
The EA Flood Map for Planning was used in conjunction with the detailed modelling results available in the 2019 Gade and Bulbourne model. Flood risk associated with the canal is also incorporated in this model, and thus this modelling is also considered to give a reasonable indication of risk from canal flooding.

Description of risk to the site

There is no increase predicted between the Flood Zone 2 and 3a flood extents. The this is likely due to the influence of the Grand Union Canal, where water levels are controlled. Flooding appears to remain in channel up to the 0.1% AEP event.

Flood Zone 2 (0.1% AEP) shows a maximum depth of 1.93m, with a maximum velocity of 0.31m/s. The maximum hazard classification during this event is 'Significant'.

Flood Zone 3a (1% AEP) shows a maximum flood depth of 1.7m, with a maximum velocity of 0.2m/s with a maximum hazard classification of 'Significant'.

Flood Zone 3b (2% AEP) shows a maximum flood depth of 1.3m, with a maximum velocity of 0.1m/s, with a maximum hazard classification of ' Moderate'.

Table 0-1: Existing fluvial flood risk based on the Upper Colne 2025 model*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
86.5	13.5	13.5	9.9

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The RoFSW mapping shows areas of surface water flooding in both parcels of land. In the northern parcel, two areas of ponding are predicted in the centre of the site. In the southern parcel, another two areas of ponding are present. Flooding is present only in the 0.1% AEP event.

During the low risk (0.1% AEP) event, the northern parcel of land shows a small area of ponding toward the southern boundary with depths between 0.2m and 0.3m, the velocity of the flooding is between 0m/s and 0.25m/s, with a maximum hazard classification of 'Low'. The southern parcel of land has a very small area of surface water flooding with depths, velocity and hazard classification consistent with the northern parcel.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0	0	5.6
Maximum depth (m)	N/A	N/A	0.2-0.3
Maximum velocity (m/s)	N/A	N/A	0-0.25
Maximum hazard classification	N/A	N/A	Low

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that the entirety of the northern parcel of land has groundwater levels at or very near (within 0.025m) the ground surface. The southern parcen is shown to have areas at the north and south boundary with groundwater levels between 0.5m and 5m of the ground surface, and in the centre of the site is shown that groundwater levels are shown to be within 0.25m and 0.5m of the ground surface.

Based on the RoFSW and topography of the site it is likely that any groundwater that emerges will likely pool in the centre of the site.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for

Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 4 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not shown to be within the Environment Agency's Historic Flood Map or Recorded Flood Outlines dataset.

In addition, Hertfordshire County Council records do not identify any incidents in the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Refer to Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling from the 2019 Gade and Bulbourne defended model was also used to obtain depth, velocity, and hazard information for the site. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.
The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The NaFRA2 data shows that during the 0.1% AEP plus climate change event (Flood Zone 2), flooding extends to 35% respectively. This shows a moderate sensitivity to the impacts of climate change.

The River Gade Model showed that during the 1% AEP event, the maximum depth of flood is 1.7, with a maximum velocity of 0.25m/s. The maximum hazard classification remains as 'Significant'.

Table 0-1: Comparison of fluvial flood risk to the site between the 1% AEP and 1% AEP plus 35% climate change extents.

Event	1% AEP	1% AEP plus 35% CC
Percentage of site at risk (%)	9.3	11.7
Maximum depth (m)	1.7	1.8
Maximum velocity (m/s)	0.2	0.25
Maximum hazard classification	Significant	Significant

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's

epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

The Risk of Flooding from Surface Water and Climate Change Mapping indicates that surface water flooding extents increase under future climate scenarios, highlighting the site’s sensitivity to intensified rainfall. In the northern parcel of land, the areas of pooling elongate, while in the southern parcel, the two existing areas of surface water flooding expand and merge, forming a single, larger area of pooling.

Surface water flooding is predicted during the 1% AEP plus climate change event. The maximum depth of flooding is below 0.2m, with the velocity between 0m/s and 0.25m/s. The maximum hazard classification is 'Low'.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	0	1.1
Maximum depth (m)	N/A	<0.2
Maximum velocity (m/s)	N/A	0-0.25
Maximum hazard classification	N/A	Low

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that near the southern boundary of the northern parcel of land are three outfall structures. Additionally, near the eastern boundary of the southern parcel of land are three outfall structures

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is located in the River Gade and Kings Langley EA Flood Warning Area and the River Gade and Bulbourne Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Access to the site is likely to be via Hatters Lane and Woodshots Meadow.

Fluvial

Both access routes are flood free in the 0.1% AEP event.

Surface water

Flooding is predicted on Woodshots meadow from the 3.33% AEP event. Depths remain below 0.3m up to the 0.1% AEP event, but hazard reaches 'Significant'.

Hatters Lane is also affected from the 3.33% AEP, but flood extents are not significant until the 0.1% AEP. Peak flood depths are predicted to remain below 0.3m and hazard is 'Low'.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- BGS data indicates that the underlying geology is White Chalk Subgroup which is likely to be free draining. However, the site is highly susceptible to groundwater flooding. In the northern parcel of land groundwater levels are indicated to be at or very near (within 0.025m) ground level and there is a risk of groundwater flooding at the surface during a 1% AEP event, which may flow to and pool within topographic low spots. Groundwater flooding could occur at the surface which may flow to and pool within topographic low spots during very wet winters.
- Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- All development should adopt source control SuDS techniques. Conveyance features should be designed above ground and following natural flow paths where possible.
- The site is located within Groundwater Source Protection Zone 2. Infiltration techniques may not be suitable and should only be used following the granting of any required environmental permits from the Environment Agency for Zones 2, 3 and 4 although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible opportunities and constraints.
- The site is not located within a historic landfill site.
- Proposed attenuation features such as basins, ponds and tanks should be located outside of Flood Zone 3 to avoid the potential risks to the hydraulic capacity or structural integrity of these features. Surface water outfalls that discharge into the River Gade may be susceptible to surcharging due to water levels in the river. The impacts of high flood flows will need to be considered in terms of the attenuation storage requirements of the site and placement of the outfalls.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should consider the impacts of future climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition River Gade and its Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies the proposed commercial development as 'Less Vulnerable'
The Exception Test is required for this site because the site is located within Flood Zone 3b.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- is in Flood Zones 2 or 3
- is within Flood Zone 3b
- the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three River District Council's LPA Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside of the areas within Flood Zone 2, 3a, and 3b.
The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is predominantly located within Flood Zone 1, with small areas along the southern and eastern boundaries falling within Flood Zones 2, 3a, and 3b. Maximum depths reach 1.93 m, and hazard classifications range from 'Moderate' to 'Significant'. Climate change modelling indicates a slight increase in fluvial flood extent, confirming the site's sensitivity to future river flow increases.

Surface water flood risk is limited to the 0.1% AEP event, with shallow depths (0.2-0.3 m), low velocities (≤0.25 m/s), and a 'Low' hazard rating. Climate change scenarios show minor expansion of pooling.

Groundwater emergence is a key consideration, particularly in the northern parcel where levels are near the surface.

The following points should be considered in development of this site:

- The Exception Test must be undertaken and passed.
- The development should be designed using a sequential approach. Flood Zones 2 and 3, plus climate change (subject to a detailed flood risk assessment) should be preserved as public green space, with built development restricted to Flood Zone 1.
- Safe access and egress should be demonstrated in the 1% AEP plus climate change surface water and fluvial events. Mapping indicates that access is likely to impeded during these events.
- As a brownfield site, post-development surface water runoff rates and volumes should aim to meet the equivalent greenfield values, in line with Defra national guidance. If greenfield rates and volumes are not attainable, consultation with Hertfordshire County Council (the LLFA) will be required.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, with development steered away from the areas identified to be at risk of fluvial and surface water flooding across the site.
- Shallow groundwater levels are present across much of the site. A site-specific FRA should confirm the risk to the site. This is likely to require ground investigations.

Level 2 Strategic Flood Risk Assessment - Site CFS72

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for CFS72. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Land off Solesbridge Lane, Chorleywood, WD3 5SR
- Site area: 0.4ha
- Existing site use: Greenfield
- Proposed site use: Residential

Topography

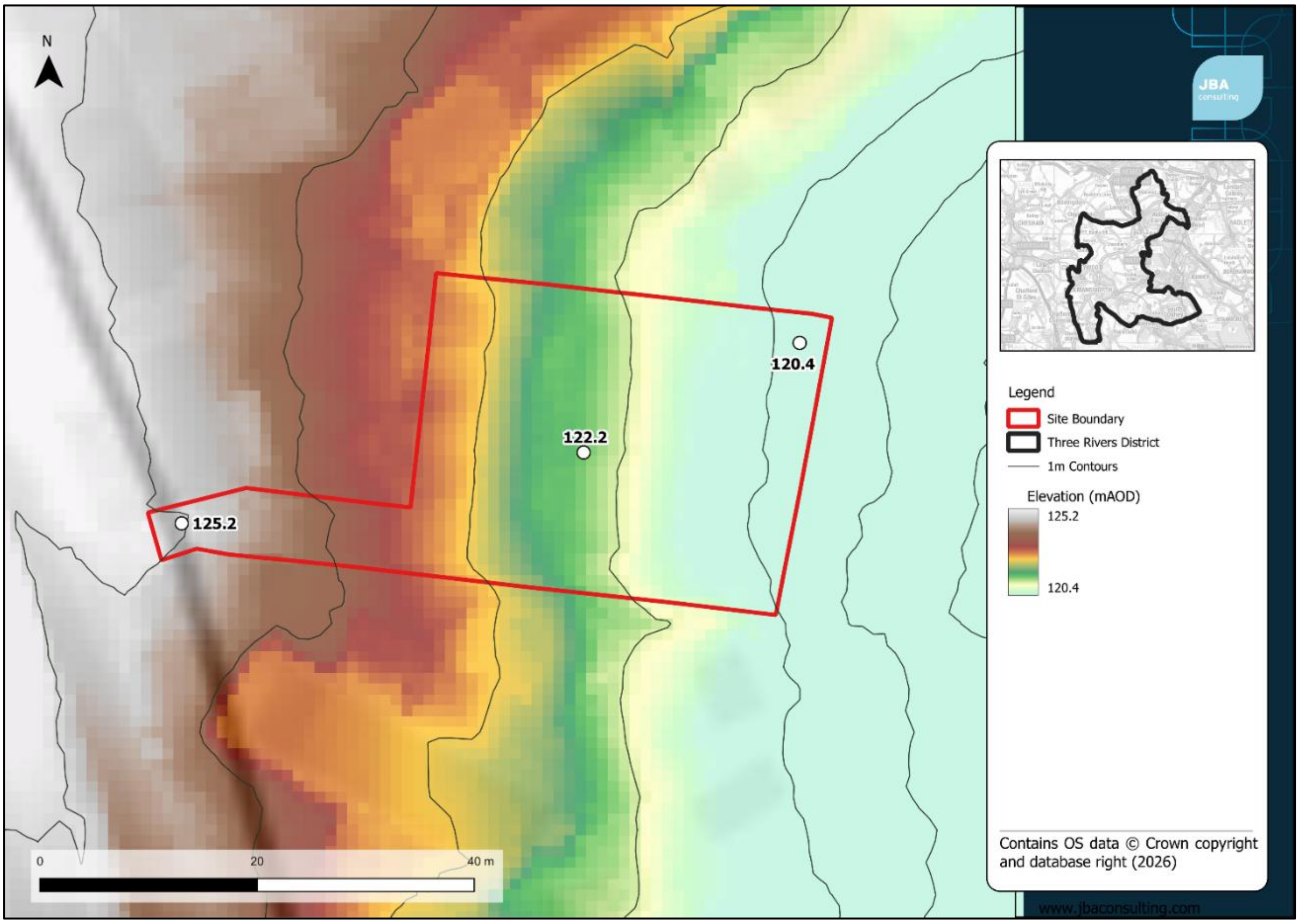

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR. The elevation of the site slopes gradually from the southern and western boundaries (68.3mAOD) to the northeast corner of the site (62.1mAOD).

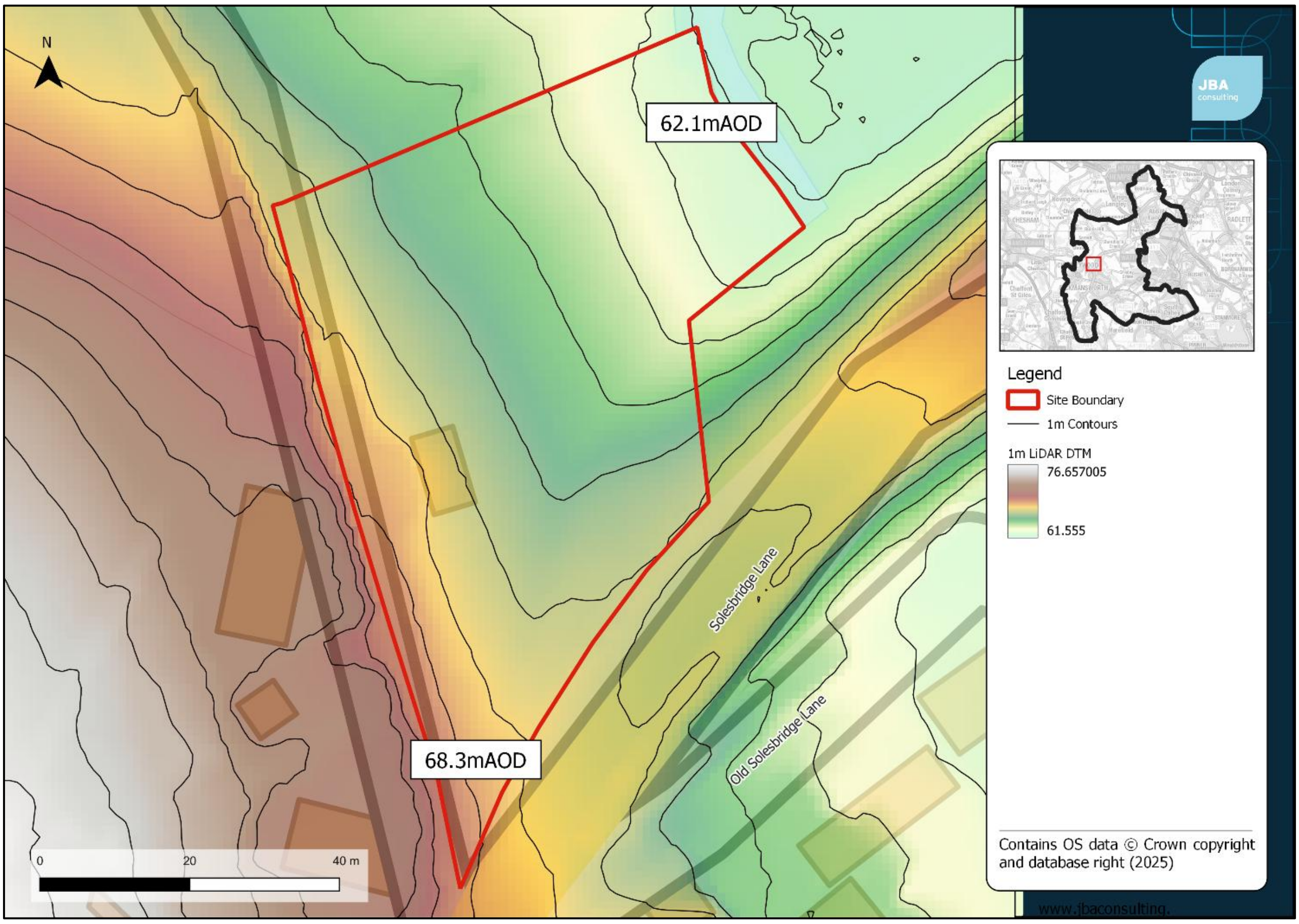

Figure 0-1: Topography of the site.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewes Nodular Chalk Formation.
- Superficial - Clay, silt, sand and gravel.

Soils at the site consist of:

- Freely draining slightly acid loamy soils

Sources of flood risk

Location of site within the catchment

The site lies within the Chess Water Body catchment, a sub-catchment of the River Colne, which forms part of the Thames River Basin District.

Existing drainage features

An unnamed ordinary watercourse is present in the eastern boundary of the site and forms a tributary of the River Chess.

Fluvial

Available data

The EA’s Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset has been used to assess fluvial flood risk at this site. In the absence of detailed modelling results, Flood Zone 3a is used a conservative proxy for the functional floodplain.

Description of risk to the site

The FMfP indicates that Flood Zone 2 extends onto the site along its northeastern boundary, affecting approximately 8.3% of the total area. In addition, approximately 3.3% of the site is shown to be at high flood risk and within the functional floodplain (Flood Zones 3a and 3b).

Table 0-1: Existing fluvial flood risk based on EA FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)
87.2	8.5	3.3

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA’s Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The surface water flood risk extent is present in 0.2% of the site. Runoff to the site is generated from the watercourse bordering the site, as such risk is concentrated on the northeastern boundary of the site only in the low risk (0.1% AEP) event. The maximum depth of the flooding is 0.2, with a velocity up to 0.25m/s, thus the maximum hazard classification is 'Low - caution for some'.

Surface water flooding is not present in the medium (1% AEP) event, or the high (3.3% AEP) event.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0	0	0.2

Event	3.3% AEP	1% AEP	0.1% AEP
Maximum depth (m)	N/A	N/A	0.2
Maximum velocity (m/s)	N/A	N/A	0-0.25
Maximum hazard classification	N/A	N/A	0.5-0.75

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

Reservoir flood mapping shows the northeastern boundary of the site to be affected by the Dry Day flood extents from the Latimer Lakes reservoir. Flooding from this reservoir extends along the River Chess. The Wet Day flood extent shows the reservoir flooding from Latimer Lakes reservoir encroaching further into the site, inundating the northeast extent of the site.

The 'Wet Day' event seeks to estimate the effect of a breach at the same time as a 0.1% AEP river flood is occurring and suggests that the consequences of such a breach are similar to the modelled 0.1% AEP event river flood event but are associated with a much lower probability.

Groundwater

The JBA Groundwater Emergence Map shows that most of the site has groundwater levels between 0.5m and 5m below the ground surface. In the eastern extent of the site a small area shows that groundwater levels are between 0.025m and 0.5m below the ground surface. The majority of the eastern extent shows an area with groundwater levels that are either at or very near (within 0.025m) the ground surface.

Based on the RoFSW and topography of the site it is likely that any groundwater that emerges will pool in the northeastern corner of the site where the elevation is lowest and the groundwater levels are highest.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outlines the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five digit post code level. The site is located within a postcode area with 74 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site itself is not within the Environment Agency’s recorded flood outlines dataset, however, the land to the north and west of the site are included. Historic Flood Records from the Hertfordshire County Council have been provided. This shows one sewer flooding incident from 2019, located approximately 250m from the side border.

Climate Change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset to assess fluvial flood risk at this site. The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered. Only the central uplift for the 2080s epoch is available in the FMfP. As such, Flood Zone 2 (0.1% AEP) is used as a conservative proxy for Flood Zone 3 (1% AEP) plus climate change.

Description of risk to the site

The Flood Map for Planning (FMfP) incorporates a 21% climate change allowance which demonstrates that the site is sensitive to increased river flows due to climate change. Under all risk scenarios, flood extents increase further into the site, resulting in 15.9% of the total area being affected.

The Flood Zone 2 extent (0.1% AEP plus climate change) expands to 15.9%, encroaching further into the site from the northeast boundary. Similarly, the Flood Zone 3a extent (1% AEP plus climate change) increases to 8.4.

The FMfP does not include depth, velocity and hazard classification information, therefore, detailed modelling in the site-specific FRA must include these. The greatest depths are likely to be closest to the northeastern boundary, where the topography is lowest and the flooding extents are closest to the watercourse.

Table 0-1: Comparison of fluvial flood risk to the site between the 1% AEP and 1% AEP plus 21% climate change extents.

Event	1% AEP	1% AEP plus 21% CC
Percentage of site at risk (%)	3.3	8.4

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

The extent of surface water flood risk at the site in the plus 20% climate change scenario remains broadly consistent with the present-day surface water model.

In the climate change extents, the surface water flood risk extent has increased to covering 0.3% of the site, in the low risk (0.1% AEP) event, the maximum depths remain at 0.2m, and the velocity increases to 0.25m/s, resulting in a maximum hazard classification of 'Moderate'. Additionally, the medium risk (1% AEP) event is now present in 0.1% of the site, occurring in the northeastern boundary. The depth of flooding is less than 0.2m, with a velocity of 0m/s, resulting in a maximum hazard classification of 'Low - caution'.

Therefore, the site is mildly sensitive to increases in surface water flooding with a 25% uplift. A site-specific FRA must include modelling with the 40% uplift to better understand future surface water flood risk.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	0	0.1
Maximum depth (m)	N/A	<0.2
Maximum velocity (m/s)	N/A	0
Maximum hazard classification	N/A	Low

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the River Chess is culverted beneath the M25, to the east of the site.

Residual risk

Residual risk is present due to the situation of culverts. Blockages from debris may restrict flow can cause water to back up, potentially leading to large areas of flooding.

Emergency planning

Flood warnings and alerts

The northeast extent of the site is located in the River Chess at Chenies, including Latimer and Sarratt EA Flood Warning Area and the River Chess at Chesham, Chenies and Loudwater Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is likely to be accessed by Solesbridge Lane, adjacent to the southern border.

Fluvial

Solesbridge Lane is flood free under the 0.1% AEP plus climate change fluvial event.

Surface water

Solesbridge Lane is mostly flood free under the 0.1% AEP event. A small, localised area of flooding is present near the southern boundary of the site, though the maximum depth of flooding is 0.2m, which is unlikely to prevent safe access and egress.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The site is considered to be highly susceptible to groundwater flooding. Groundwater flooding could occur at the surface which may flow to and pool within topographic low spots during very wet winters. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- Groundwater levels are indicated to be between 0.5 and 5m below ground level in most of the site area. This means that there is a risk of flooding to subsurface assets and below ground development such as basements in this area.
- In the northeastern area of the site, groundwater levels are indicated to be at or very near (within 0.025m) ground level and there is a risk of groundwater flooding at the surface during a 1% AEP groundwater event, which may flow to and pool within topographic low spots.
- BGS data indicate that the underlying geology is Lewes Nodular Chalk Formation which is likely to be freely draining. This should be confirmed through infiltration testing, with the use of infiltration maximised as much as possible in accordance with the SuDS hierarchy.
- The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Local Planning Authority, Lead Local Flood Authority, and the EA) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.

- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as 'More Vulnerable'.
The Exception Test is required for this site due to its flood vulnerability and its location in Flood Zone 3b.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- Is within Flood Zone 2, 3a and 3b
- Is within ‘Flood Zones plus Climate Change’, showing it is at increased risk of flooding from rivers or in the future
- the Flood Map for Planning shows it is at risk from surface water flooding
  All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the Three Rivers District Council, Hertfordshire County Council, Thames Water, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside of the northeastern extent of the site, where Flood Zones 2, 3a and 3b are present.

A detailed hydraulic model of the ordinary watercourse, along the eastern boundary of the site may be required at FRA stage to accurately represent the risk from this watercourse and set the height of any mitigation measures.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is located within Flood Zones 2, 3a and 3b in the present-day fluvial flood model. An ordinary unnamed watercourse forms the eastern border of the site and is the primary source of flood risk. Climate change sensitivity is notable in the FMfP fluvial model with climate change, with flood extents increasing under a 21% allowance. Flood Zone 2 expands to 15.9% of the site, Flood Zone 3a to 8.4%, and Flood Zone 3b to 2%, primarily affecting the northeastern boundary.

Surface water flood risk is minor, affecting only 0.2% of the site at the northeastern boundary during the low-risk (0.1% AEP) event, with shallow depths (0.2m), no velocity, and a ‘Low’ hazard classification. No risk is present in medium (1% AEP) or high (3.3% AEP) events. Surface water flood risk under climate change shows a slight increase, with coverage rising to 0.3% of the site in the low-risk (0.1% AEP) event (depth 0.2m, velocity 0.25m/s, hazard ‘Moderate’) and 0.1% in the medium-risk (1% AEP) event (depth 0.2m, velocity 0m/s, hazard ‘Low’).

Groundwater flood risk is potentially significant in the eastern extent, where groundwater levels are at or near the surface (within 0.025 m), with likely pooling in the northeastern corner due to low elevation.

Reservoir flood risk is very low, with only the northeastern boundary affected by Latimer Lakes reservoir breach scenarios. The Dry Day extent marginally enters the site, while the Wet Day extent encroaches slightly further during a combined breach and 0.1% AEP river flood event.

The following points should be considered in development of this site:

- The Exception Test must be undertaken for this site and passed.
- Detailed modelling in the site-specific FRA is required to assess fluvial depth, velocity, and hazard, with the inclusion of an appropriate climate change uplift.
- Culverts may pose residual risk to the site.
- Development should be directed away from the northeastern area of the site, where fluvial flood risk is present.

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Level 2 Strategic Flood Risk Assessment - Site CG47

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site CG47 The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Garages off Grove Crescent, Croxley Green, WD3 3JS
- Site area: 0.3ha
- Existing site use: Brownfield - Garages
- Proposed site use: Residential

Topography

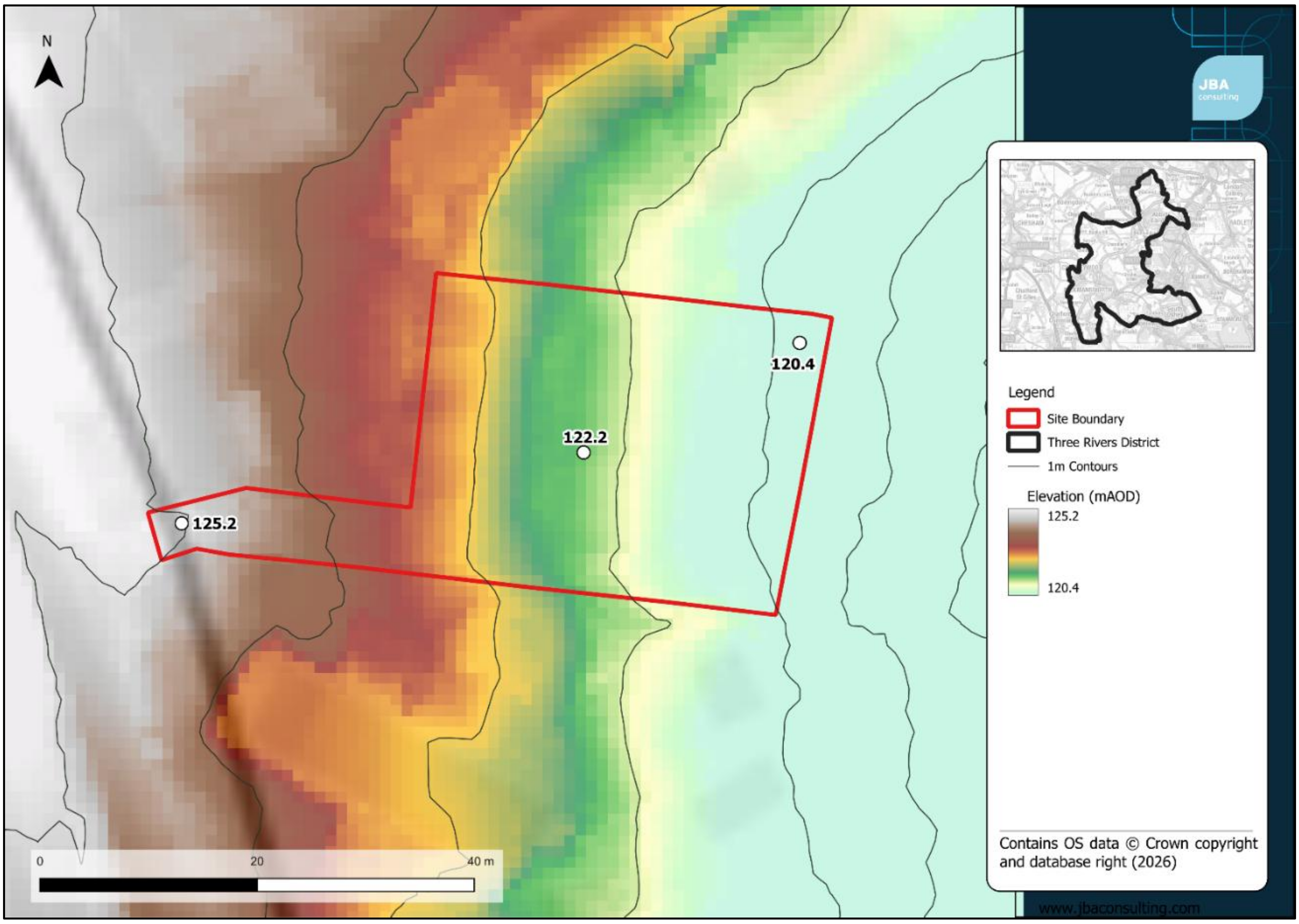

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

Figure 0-1: Topography of the site.

The LiDAR shows a decrease in elevation of over 1m across the site, from north to south. Levels in the northern corner are shown to be about 84.15mAOD (Above Ordnance Datum) and levels along the southern border are approximately 83.08mAOD. As the site is in a developed urban area the LiDAR data is unlikely to be representative of the actual site topography, this may have an impact on some of the flood risk datasets used in the assessment.

Geology and soils

Geology at the site consists of:

- Bedrock - Seaford Chalk Formation
- Superficial - Gerrards Cross Gravel Member

Soils at the site consist of:

- Freely draining slightly acid, loamy soils

Sources of flood risk

Location of site within the catchment

The site is located within the Gade water body catchment, in the lower section near its confluence with the River Chess.

Existing drainage features

The site is located in the north-west area of Croxley Green, a built-up urban area. There are no Main Rivers or ordinary watercourses in the vicinity of the site.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset and, the Upper Colne (2025) and the Gade and Bulbourne (2019) hydraulic model have been used to assess fluvial flood risk at this site.

Description of risk to the site

The site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site. The more recent, Upper Colne and Gade and Bulbourne modelling confirms that the site remains within Flood Zone 1, outside the Flood Zone 2 extent, consistent with the FMfP.

Table 0-1: Existing fluvial flood risk based on the EA's FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The RoFSW extent mapping shows that the source of flooding is ponding in an area of lower topography toward the south of the site. The flooding extends into a flow path which reaches beyond the site boundary, ending just before Grove Cresent.

During the 0.1% AEP surface water event, ponding covers most of the southern extent of the site, extending northwards and westwards, just outside of the site boundary. It is assumed that most of this flooding extent is below 0.2m, as the RoFSW depths mapping only shows two small areas of ponding in the south of the site with depths of 0.3m, with approximately 28% of the site at risk of surface water flooding. The maximum velocity of this flooding is 0.5m/s, resulting in a maximum hazard classification of 'Moderate - Danger for some'.

The flooding extent in the 1% AEP event is smaller, with the northern and western flow paths significantly shorter, the RoFSW depths mapping shows a very small area toward the southeast corner of the site with a maximum flood depth of 0.2m, again, suggesting that most of the flooding extent is below 0.2m. The area at risk has decreased to 20.2% of the site. The maximum velocity of flood water is 0m/s, with maximum hazard classification of 'Low'.

During the 3.3% AEP event, the extent reduces to a smaller area of ponding, though it remains significant. The RoFSW depth mapping does not show any flooding, suggesting that all flood depths in the high-risk event are below 0.2m. The maximum velocity if flooding is 0.25m/s, with a maximum hazard classification of 'Low - Caution'.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	14.4	20.2	28
Maximum depth (m)	<0.2	0.2	0.2-0.3
Maximum velocity (m/s)	0.25	0.25	0.25-0.5
Maximum hazard classification	Low	Low	Low

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that the ground water levels are at least 5m below the ground surface, therefore, flooding from groundwater is not likely.
This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outlines the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five digit post code level. The site is located within a postcode area with 75 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's recorded flood outlines dataset. However, Hertfordshire County Council's flood incident record shows three flood incidents in the vicinity of the site. The source of flooding for these incidents is surface water flooding, often caused by insufficient drainage capabilities, and blocked drains. These flooding incidents include reports of property damage.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

The Upper Colne defended model has been used to assess fluvial flood risk at this site. The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The NaFRA2 dataset shows that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site when the central allowance is applied to the 1% AEP (Flood Zone 3) and 0.1% AEP (Flood Zone 2).

The site is not at an increased risk of flooding due to climate change from fluvial flooding. The entire site is outside of the 100-year defended (+35% climate change uplift) flood extent.

Surface water

Available data

Surface Water flooding for the 3.3%, 1% and 0.1% AEP events with central climate change uplift (up to the 2050s epoch), using data available as part of the NAFRA2 release. The central allowance applied in the NAFRA2 data is a 20% uplift. The Environment Agency guidance recommends that the Upper End allowance is considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

Description of risk to the site

The extent of surface water flooding minorly increases in the RoFSW plus climate change mapping but remains mostly consistent with the present-day mapping.

In the medium risk event (1% AEP plus 20% climate change), the mapping now shows two small areas of localised flooding with depths up to 0.3m, the maximum velocity has increased to 0.5m/s, while the maximum hazard remains as 'Low'.

In the 0.1% AEP event, there is more extensive flooding, but it remains shallow (mostly below 0.2m in depth). The maximum velocity increases up to 0.5m/s but only at the southwestern border of the site. The maximum hazard classification increases to 'Moderate - Danger for some'.

Table 0-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	20.2	23.7
Maximum depth (m)	0.2-0.3	0.2-0.3
Maximum velocity (m/s)	0.25	0.25-0.5
Maximum hazard classification	0.75	0.75

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial/surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Access to the site will be available from Grove Cresent, from the west and east of the site. Grove Cresent forms a loop around the residential area, which leads onto Baldwins Lane.

Fluvial

Grove Cresent and Baldwins Lane are flood free up to the 0.1% AEP fluvial event.

Surface water

Grove Cresent is flood free in the 0.1% AEP surface water event. Baldwins Lane shows a small, localised area of flooding along Baldwins Lane, but the depths remain below 0.2m, thus safe access is possible.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- BGS data indicates that the underlying geology is Seaford Chalk Formation which is likely to be free draining.
- Groundwater levels are indicated to be at least 5m below ground level and groundwater flooding is not likely, however below ground development such as basements may still be susceptible to groundwater flooding.
- The site is located within a Groundwater Source Protection Zone 2. Infiltration techniques may not be suitable and should only be used following the granting of any required environmental permits from the Environment Agency for Zones 2, 3 and 4 although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and Environment Agency) at an early stage to understand possible opportunities and constraints.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and Environment Agency) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should consider the impacts of future climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.

- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies Residential development as 'More Vulnerable'.
The Exception Test is not required for this site as it located in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- the flood map for planning shows it is at risk of flooding from surface water
- that increases the vulnerability classification and may be subject to sources of flooding other than rivers or sea

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the Three Rivers District Council, Hertfordshire County Council, Thames Water and Environment Agency should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and the Three Rivers District Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside of the areas of significant surface water flooding, mostly located in the south of the site.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is located outside of flood risk zones and is therefore considered to be at low risk of fluvial flooding.

Surface water flooding is present on site from the 3.33% AEP event. The RoFSW plus climate change mapping indicates only a slight increase in surface water flooding compared to present-day, with overall patterns remaining similar. Up to the 1% AEP event depths remain below 0.2m, with a maximum velocity of 0.25m/s, and low hazard. In the 0.1% AEP event, depths are mostly below 0.2m, but there are few localised areas with higher depths (up to 0.3m). The peak velocity and hazard remain at 0.25 m/s but hazard increases to 'Moderate'.

The site has records of previous flood incidents, mainly pertaining to blocked or insufficient drainage.

The following points should be considered in development of this site:

- The proposed development of the site is residential; thus, the development is classified as 'More Vulnerable'.
- Safe access and egress must be demonstrated in the surface water plus climate change events. This includes measures to reduce flood risk along these routes such as raising access, but not displacing floodwater elsewhere
- A site-specific FRA should demonstrate that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding on the site and to neighbouring areas.

Level 2 Strategic Flood Risk Assessment - Site CW9

Garages at Copmans Wick, Chorleywood

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site CW9. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Local Plan for Three Rivers District Council Level 1 Strategic Flood Risk Assessment and read the Local Plan for Three Rivers District Council Level 2 Strategic Flood Risk Assessment Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Garages at Copmans Wick, Chorleywood, WD3 5JW
- Site area: 0.1ha
- Existing site use: Brownfield - Garages
- Proposed site use: Residential

Topography

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR data.

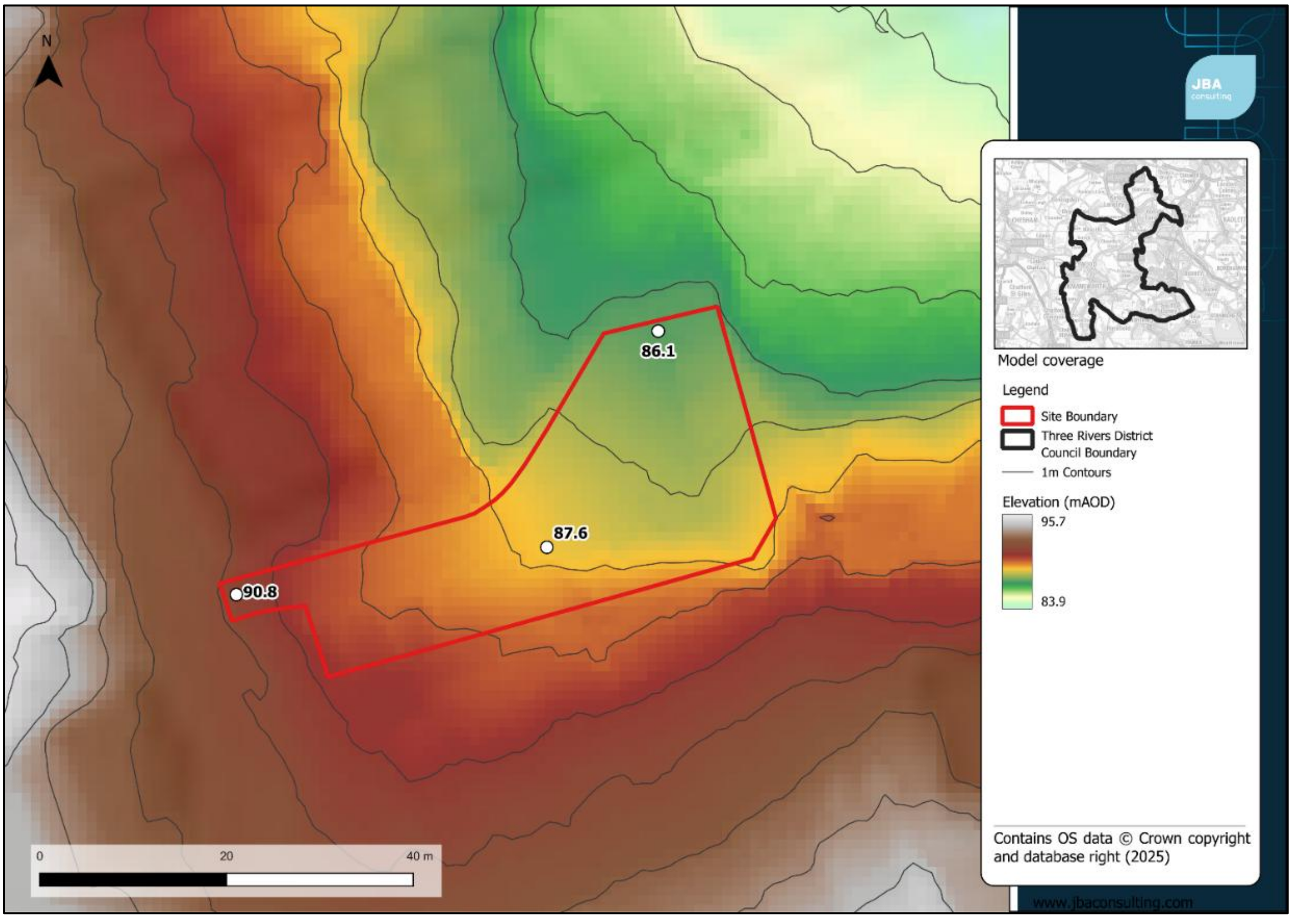

Figure 0-1: Topography of the site

The highest levels are at the entrance of the site off Copmans Wick at 90.8mAOD (Above Ordnance Datum). The lowest point of the site is in the north-east corner where levels are 86.1mAOD. As the site is in a developed urban area the LiDAR data is unlikely to be representative of the actual site topography, this may have an impact on some of the flood risk datasets used in the assessment.

Geology and soils

Geology at the site consists of:

- Bedrock - Seaford Chalk Formation and Newhaven Chalk Formation
- Superficial deposits - no superficial deposits recorded at the site

Soils at the site consist of:

- Free draining slightly acid and loamy soil

Sources of flood risk

Location of site within the catchment

The site is located within the large village of Chorleywood, in the west of the Three Rivers District. The nearest Main River is the River Chess, which is located over 2km north of the site. There are no ordinary watercourses in the vicinity of the site.

Existing drainage features

There are no existing drainage features within the site that are visible on topographic mapping or aerial imagery. As the site is in an urban area, it likely drains to the surface water drainage network.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) has been used in this assessment as the site is not covered by a detailed hydraulic model.

Description of risk to the site

The FMfP shows that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site.

Table 0-1: Existing fluvial flood risk based on EA FMfP *

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The RoFSW map shows that the site is expected to be flood-free during the 3.33% AEP and 1% AEP event. During the 0.1% AEP event, the southern part of the site is at risk of flooding from a surface water flow path originating to the south-west. Flood depths are predicted to reach 0.2-0.3m. By the time the surface water flow path reaches the site, the velocities are predominantly 0m/s in an area of ponding at the garages in the south of the site. However, localised maximums of 0.5-1.0m/s are shown. For the 0.1% AEP event, the maximum hazard is classified as 'Low' (<0.75).

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0.0	0.0	10.0

Event	3.3% AEP	1% AEP	0.1% AEP
Maximum depth (m)	N/A	N/A	0.2-0.3
Maximum velocity (m/s)	N/A	N/A	0.5-1.0
Maximum hazard classification	N/A	N/A	Low

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The entire site is at risk of reservoir flooding in the unlikely event of a breach at Heronsgate No 3 Reservoir. As part of a site-specific Flood Risk Assessment, an agreed emergency plan should identify appropriate safe access and egress routes from the site, in the event of a reservoir breach.

Groundwater

JBA groundwater mapping shows that the site is at low risk of groundwater flooding, with groundwater levels predicted to lie at least 5m below the ground surface during the 1% AEP event. Therefore, groundwater flooding does not pose a significant constraint to safe development of the site.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outlines the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 74 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's Historic Flood Map and Recorded Flood Outlines dataset.

Hertfordshire County Council records show 7 records of flooding within 250m of the site. The records are to the south and the north-east of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three Rivers District Council Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Description of risk to the site

The mapping shows that the site remains in Flood Zone 1 and therefore the risk of fluvial flooding to the site is low.

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

The site remains unaffected by surface water flooding during the 3.33% AEP and 1% AEP events when a 20% climate change allowance is applied to rainfall. Under the low-risk scenario (0.1% AEP plus 20% climate change event), the predicted flood extent increases, covering approximately 18.9% of the site. With the application of climate change, the northern part of the site is expected to be affected by flooding from a surface water flow path originating in the north-east. Flood depths at the site are predominantly up to 0.2-0.3m, however, an area of deeper flooding (0.3m) is shown to encroach into the south-eastern corner of the site. Velocities in the southern part of the site mostly remain at 0m/s, whilst the northerly flow path mostly ranges between 0.5m/s and 1m/s. A 'Low' hazard classification is shown across most of the flood extent, however localised peaks of a 'Moderate' hazard classification are observed in the south-east of the site.

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

The entire site is at risk of reservoir flooding in the unlikely event of a breach at Heronsgate No 3 Reservoir.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is likely to be accessed from Copmans Wick, at the western border of the site. The road is predicted to be at negligible risk of fluvial and surface water flooding in all modelled events.

Fluvial

Safe access and egress is available to Copmans Wick in all events up to the 0.1% AEP event.

Surface water

Safe access and egress is available to Copmans Wick in all events up to the 0.1% AEP event.

Dry islands

The site is not located on a dry island during any modelled flood event.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- Groundwater levels are indicated to be at least 5m below ground level and groundwater flooding is not likely, however below ground development such as basements may still be susceptible to groundwater flooding.
- BGS data indicates that the underlying geology is chalk which is likely to be free draining. However, the site is located within a Groundwater Source Protection Zone 2. Infiltration techniques may not be suitable and should only be used following the granting of any required environmental permits from the Environment Agency. Proposed SuDS should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and the Environment Agency) at an early stage to understand possible opportunities and constraints.
- The site is not located within a historic landfill site.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Local Planning Authority, Lead Local Flood Authority, and the EA) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.

- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as 'More Vulnerable'.
The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- Within Flood Zone 1 but at risk of flooding from surface water.

All sources of flooding should be considered as part of a site-specific FRA, specifically surface water and groundwater flooding.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council's Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside the areas of surface water flood risk on the site. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. These measures should be assessed to make sure that flooding is not increased either on or off-site.

Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

The risk of flooding from groundwater must be investigated and must be supported by groundwater level monitoring.

Should built development be proposed within the design surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures.

Arrangements for safe access and egress will need to be provided for the 1% AEP surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Flood resilience and resistance measures should be implemented where appropriate during

Conclusions

The site is in Flood Zone 1 but is at low risk of surface water flooding during the 0.1% AEP event. During the 0.1% AEP event, the southern part of the site is at risk of flooding from a surface water flow path originating to the south-west. Peak flood depths are predicted to reach 0.2-0.3 and maximum hazard is classified as 'Low' (<0.75).

Mapping also shows that the site is at low risk of groundwater flooding, with groundwater levels predicted to lie at least 5m below the ground surface during the 1% AEP groundwater event. As such groundwater flooding is not likely, however below ground development such as basements may still be susceptible to groundwater flooding. An appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

The following points should be considered in development of this site:

- A site-specific Flood Risk Assessment is required which demonstrates that site users will be safe during events up to and including the 0.1% and 1% AEP rainfall events, with an appropriate allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding either on or off the site.
- Development should be steered outside the areas of surface water flood risk on the site. It is expected that the site can be developed safely by incorporating appropriate mitigation measures, including sequential site design, effective SuDS for surface water drainage, and raising building thresholds above the predicted flood depths.
- Arrangements for safe access and escape will need to be provided for the 1% AEP surface water events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Level 2 Strategic Flood R Assessment - Site H15

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site H15. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Garages rear of Drillyard, West Way
- Site area: 0.22ha
- Existing site use: Brownfield
- Proposed site use: Residential

Topography

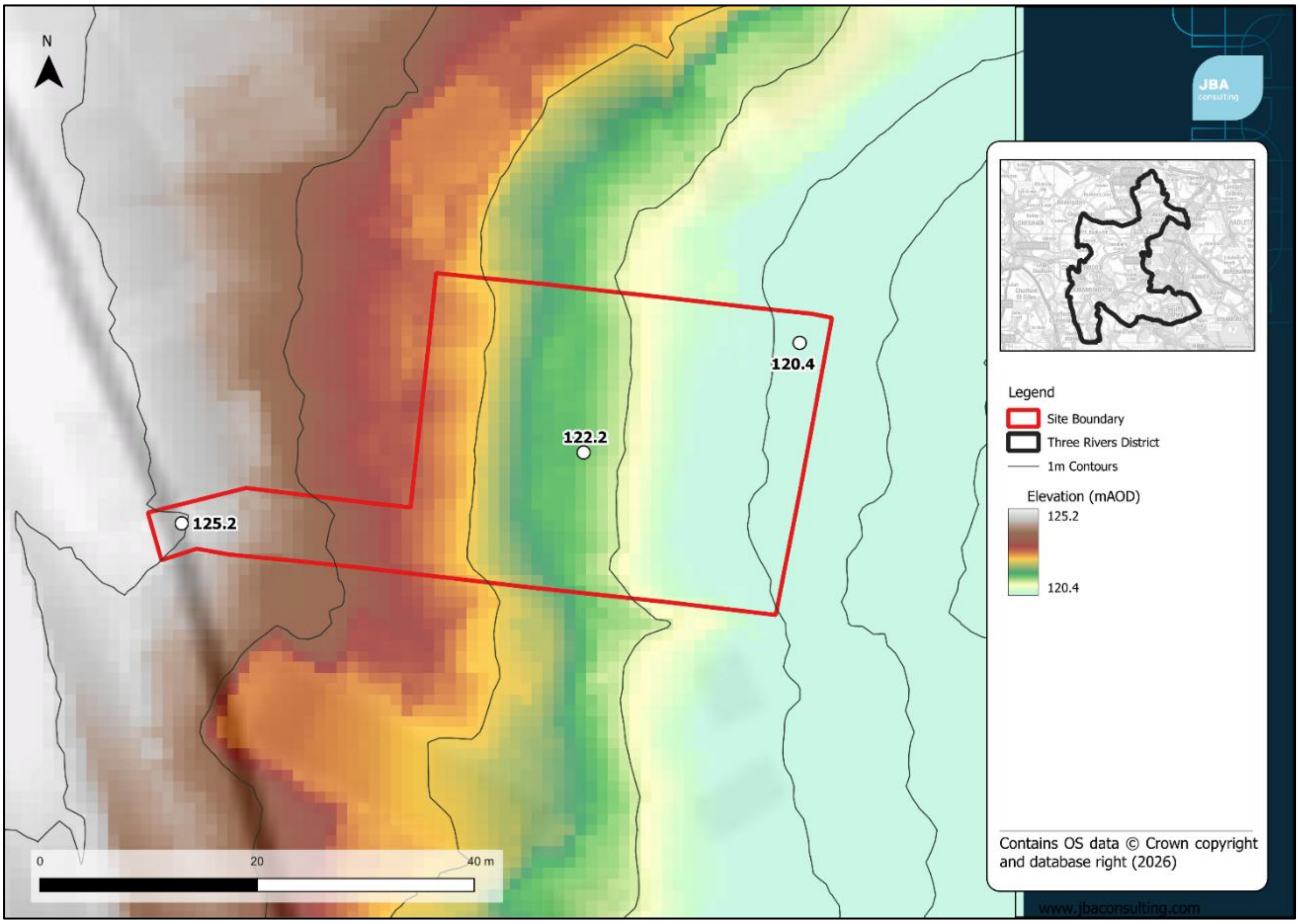

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

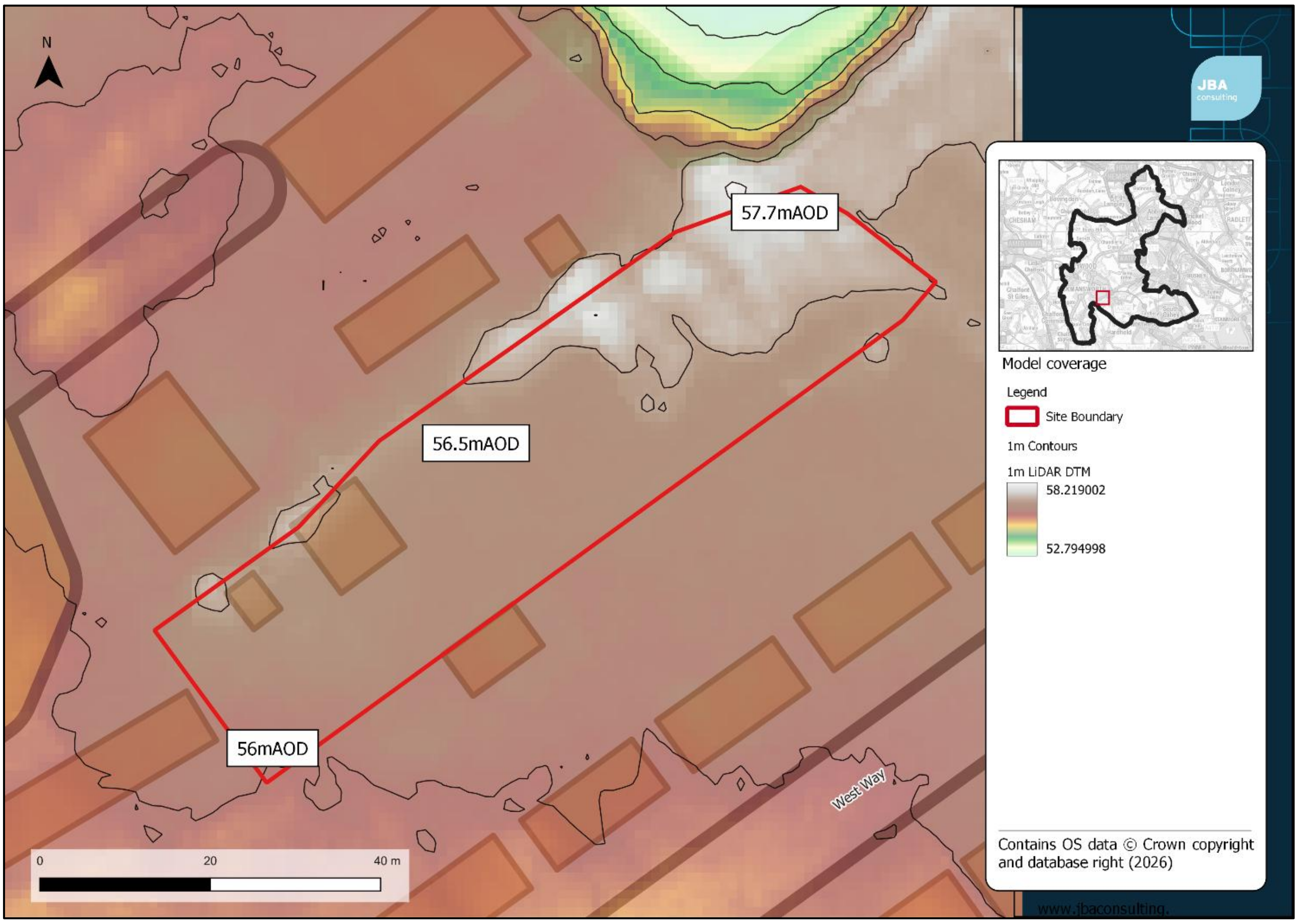

Figure 0-1: Topography of the site.

The topography across the site is mostly flat. The centre and southwest, of the site have the lowest elevations ranging from 56 to 56.7mAOD. Elevation slightly rises toward the northeast, where elevations reach approximately 57.7mAOD.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewes Nodular Chalk Formation
- Superficial - Taplow Gravel Member, Sand and gravel

Soils at the site consist of:

- Freely draining, slightly acidic, loamy soils

Sources of flood risk

Location of site within the catchment

The site is located within Moneyhill, a built-up urban area. The site lies within the River Colne catchment with the River Colne flowing 0.42km to the south of the site.

Existing drainage features

There are no drainage features within the site boundary.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) and the Upper Colne (2025) hydraulic model have been used within this assessment.

Description of risk to the site

The site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site. The more recent, Upper Colne modelling confirms that the site remains within Flood Zone 1, consistent with the FMfP.

Table 0-1: Existing fluvial flood risk based on EA FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The RoFSW map shows surface water pooling in the central area between the garages during the 0.1% AEP event. The maximum depth, velocity and hazard for the site up to the 0.1% AEP event are predicted to be low, as it does not meet the threshold for mapping. Furthermore, surface water flooding on the site only occurs during the 0.1% AEP event, the site remains flood-free during the 1% AEP and 3.3% AEP events.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0	0	10.5
Maximum depth (m)	0	0	0
Maximum velocity (m/s)	0	0	0
Maximum hazard classification	None	None	None

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that groundwater levels at the site are between 0.5 and 5m below the ground surface.
Based on the RoFSW and topography of the site it is likely that any groundwater that emerges will flow west and south, and pool in the centre of the site.
This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The site is located within a postcode area with 23 historic incidences of sewer flooding, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the EA's historic flood map dataset.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Level 2 SFRA report** for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling is also available as part of the Upper Colne 2025 model. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.

The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The NaFRA2 data shows that during the 1% and 0.1% AEP plus climate change events, the site remains outside of Flood Zone 2 and 3 extents.

The 1% AEP defended plus 35% Climate Change event also does not predict a change in fluvial risk to the site.

Surface water

Available data

Surface Water flooding for the 3.3%, 1% and 0.1% AEP events with central climate change uplift (up to the 2050s epoch), using data available as part of the NAFRA2 release. The central allowance applied in the NAFRA2 data is a 20% uplift.

The Environment Agency guidance recommends that the Upper End allowance is considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

The RoFSW climate change mapping shows that the site is not sensitive to increases in rainfall due to climate change. There is no increase in extent in the 1% AEP scenario.

Table 0-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus

20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	0	0
Maximum depth (m)	0	0
Maximum velocity (m/s)	0	0
Maximum hazard classification	None	None

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus upper end climate change fluvial and surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Access to the site is expected to be via the existing footpath located in the south-western corner of the site, which connects to West Way.

Fluvial

West Way is flood free during the 0.1% AEP event.

Surface water

West Way is flood free during the 0.1% AEP event.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- BGS data indicates that the underlying geology is Lewes Nodular Chalk Formation which is likely to be free draining. However, the site is considered to be highly susceptible to groundwater flooding. Groundwater levels are indicated to be between 0.5 and 5m below ground level and there is a risk of flooding to subsurface assets and below ground development such as basements.
- Groundwater flooding could occur at the surface which may flow to and pool within topographic low spots during very wet winters. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- The entire site is mostly located within Groundwater Source Protection Zone 1 (SPZ) and infiltration techniques may not appropriate for anything other than clean roof drainage. If infiltration is proposed for anything other than clean roof drainage a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply. Proposed SuDS should be discussed with relevant stakeholders ((Three Rivers District Council, Hertfordshire County Council and EA) at an early stage to understand possible opportunities and constraints.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA) at an early stage to understand possible constraints.

- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.
- Consideration should be made to the existing condition of the River Colne and its Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies Residential development as More Vulnerable.
The Exception Test is not required for this site because it is within Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- is within Flood Zone 1 and the Flood Map for Planning shows it is at risk of flooding from surface water.

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the (Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA) should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside of the area of surface water flood risk.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is located in Flood Zone 1; therefore, it is at low risk of fluvial flooding. The site contains an area of surface water pooling between two rows of garages on site. Under the present-day scenario, the site is predicted to flood in the low risk (in the 0.1% AEP event), with floodwater depths remaining below 0.2m with low hazard and velocity There is low sensitivity to climate change at this site, with only a marginal increase in extent predicted in the 0.1% AEP event with a central climate change uplift.

Groundwater levels are indicated to be between 0.5 and 5m below ground level therefore the site is susceptible to flooding.

The following points should be considered in development of this site:

- The proposed development of the site is residential; thus, the development is classified as More Vulnerable.
- The site contains a topographical depression in the north, which acts as the main area at risk of surface water flooding.
- Development should be directed away from the northern area of the site, particularly within and around the topographical depression.
- The site would benefit from SuDS implementation to manage surface water, improve water quality, and deliver wider sustainability benefits such as biodiversity and amenity.

Level 2 Strategic Flood Risk Assessment - Site H22a

Depot, Stockers Farm Rd

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site H22a. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council (TRDC) Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Stockers Farm Road, Rickmansworth, WD3 1NX
- Site area: 0.76ha
- Existing site use: Brownfield – Depot
- Proposed site use: Residential

Topography

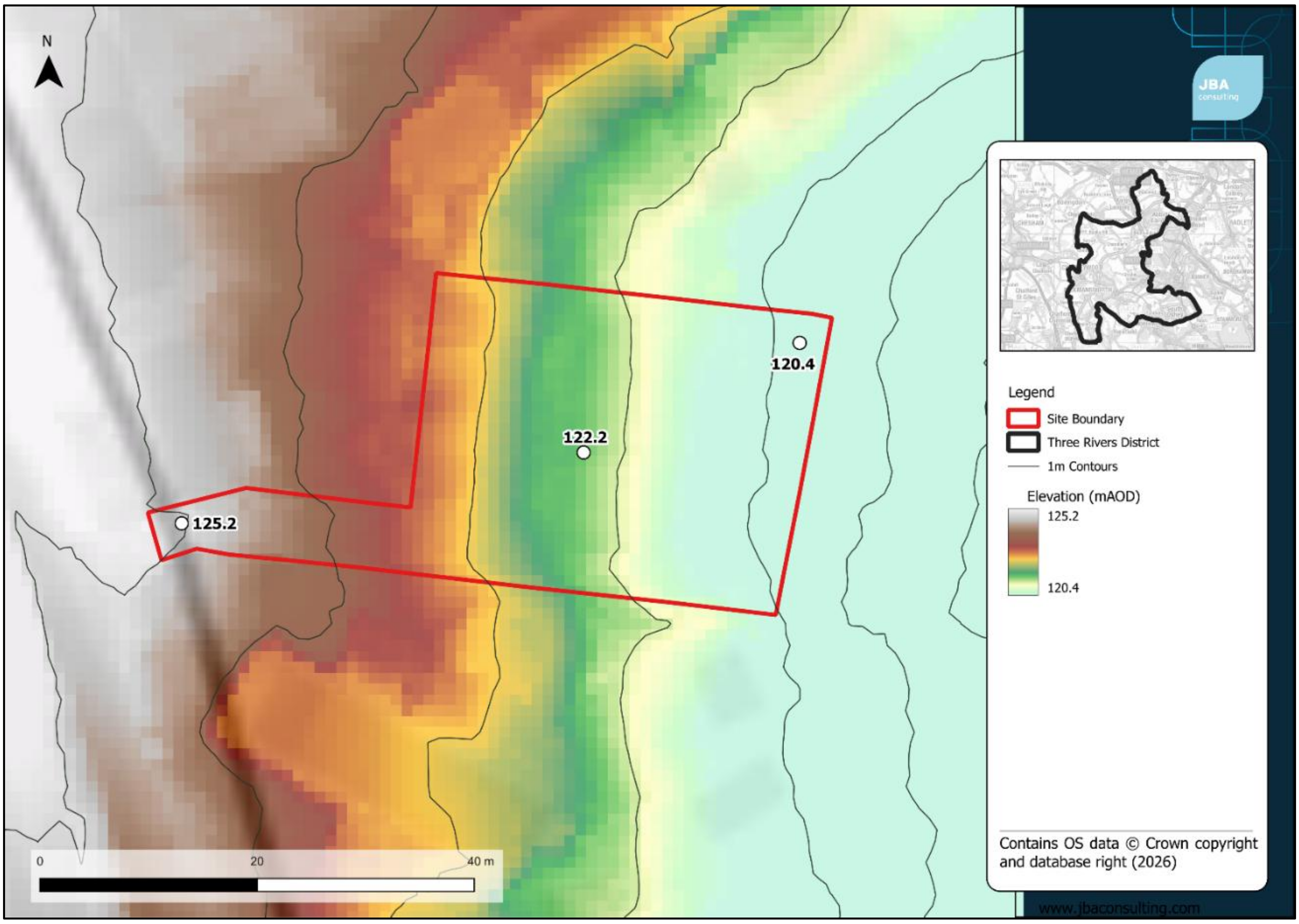

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

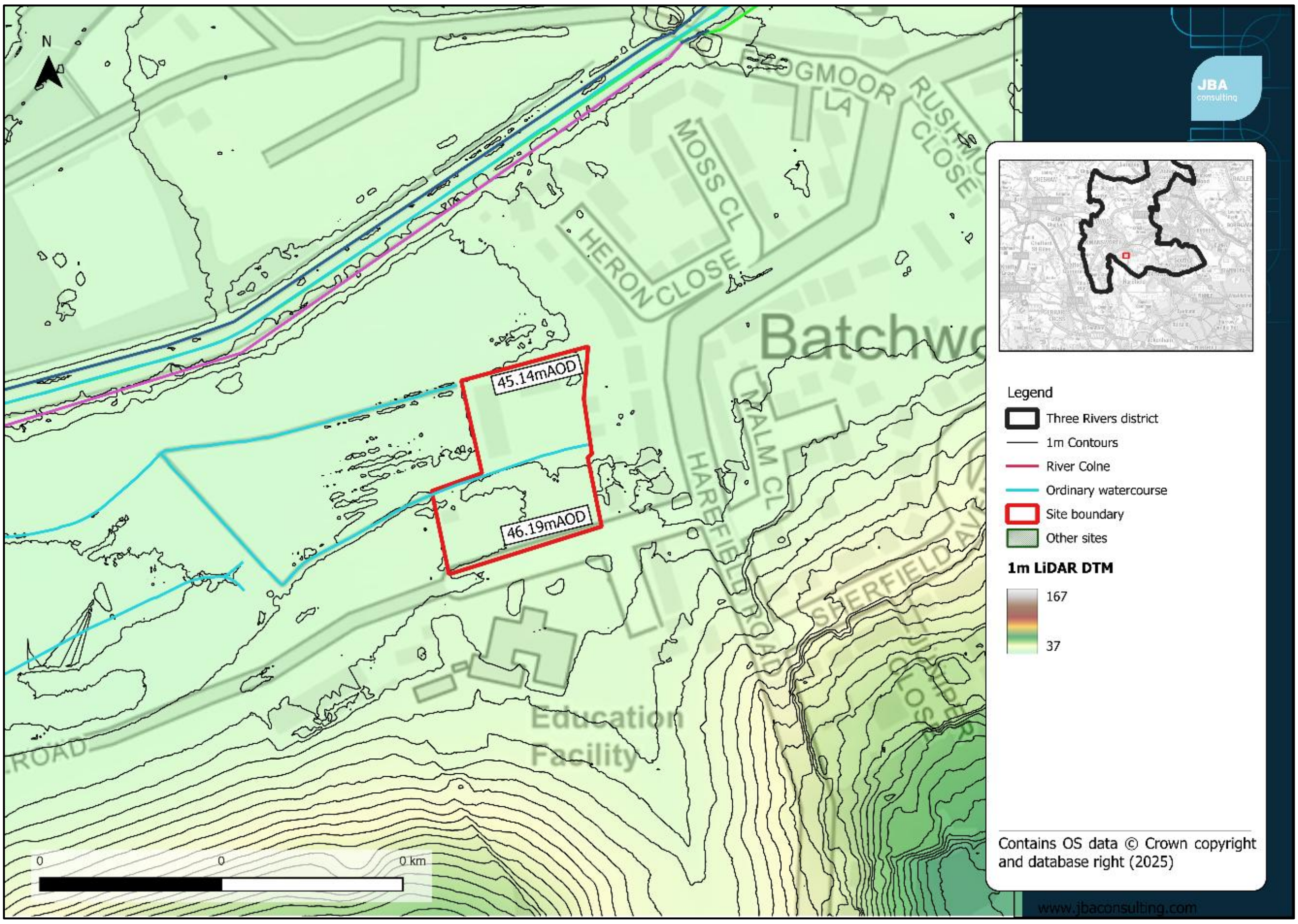

Figure 0-1: Topography of the site.

The LiDAR shows there is a decrease in elevation from the south to the north by approximately 1m, towards the Grand Union Canal, with the highest level of in the southeast corner at 46.19mAOD on Stockers Farm Road. Along the northern boundary of the site, levels range from 45.28mAOD in the north-western corner to 45.14mAOD in the north-eastern corner.

Geology and soils

Geology at the site consists of:

- Bedrock – Seaford Chalk Formation and Newhaven Chalk Formation
- Superficial - Clay, silt, sand and gravel (alluvium)

Soils at the site consist of:

- Loamy and clayey floodplain soils with naturally high groundwater

Sources of flood risk

Location of site within the catchment

The site is on the edge of south Rickmansworth within the Upper Colne catchment.

Existing drainage features

The River Colne is approximately 500m north of site and the Grand Union Canal flows 85m north of the site. There are three lakes with associated watercourses situated between the River Colne and the Grand Union Canal; Batchworth Lake, Bury Lake and Stockers Lake. Batchworth Lake is the closest to the site at 250m north.

There is also an ordinary watercourse which flows east to west through the centre of the site, reviewing LiDAR and satellite imagery, it appears that the watercourse may be culverted through the site. The mapping also shows that this watercourse is part of a wider series of drainage ditches which are hydraulically linked to the Grand Union Canal and flow toward the site through the fields to the west of the site.

Fluvial

Available data

The EA’s Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset and, the Upper Colne (2025) hydraulic model have been used to assess fluvial flood risk at this site.

Description of risk to the site

The Environment Agency Flood Map for Planning and the Upper Colne modelling outputs, show that the northern boundary and the north-eastern section of the site is in Flood Zone 3 and is therefore at high risk of fluvial flooding from the River Colne. Detailed modelling results are available for the 1% AEP defended and undefended scenarios and the 0.1% undefended events.

The area which is at highest risk of fluvial flooding has depths up to 0.26m in the 3.33% AEP and 0.17m in the 1% AEP undefended event. It is notable the 3.33% defended scenario shows higher risk to the site than the 1% AEP undefended. For instance, the maximum velocity of 0.43m/s is predicted in the 1% AEP event, but a peak velocity of 0.5m/s. The flood depths are up to the 0.1% AEP undefended event (m), with maximum depths of 0.32m. Flood velocity and hazard during the 0.1% AEP are 0.6m/s and 0.28 ('Low - Caution') respectively. The 1% defended event exceeds the 0.1% AEP extents. A maximum flood depth of 0.36m is predicted during the 1% AEP defended. Maximum flood velocity and hazard is also elevated compared to the undefended scenarios, at 0.81m/s and 0.36 ('Low - Caution'). However, hazard to site for all events remains at 'Low - Caution'.

The drainage ditches that flow into the site are linked to the Grand Union Canal after it flows under Stockers Lock and the channel widens. Upstream of this point in the channel, the Grand Union canal is embanked which reduces upstream channel capacity, as such these ditches effectively act as a storage area for floodwaters that accumulate downstream of the lock. In the undefended scenario, upstream water levels are not being controlled and there is increased channel and floodplain storage, which results in a decrease in downstream flow at this point. Therefore, this backwater effects results in a higher fluvial risk to the site in the defended scenario.

Table 0-1: Existing fluvial flood risk based on the Upper Colne 2025 model

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
81	19	7.6	12.7

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The Environment Agency Risk of Flooding from Surface Water mapping shows that flooding to the north-eastern section connects to the surface water flow route from the south. The source of the southern flow path follows a natural topographic depression. The flow route flows north along the eastern boundary of the site and then travels west cutting across the north-eastern section of the site. As shown by the LiDAR this section of the site is a topographic low point with maximum flood depths reaching 0.6m in the 3.33% AEP and up to 0.9m in the 0.1% AEP. Maximum velocity similarly increases along the eastern border from 1.0 to 2.0m/s in the 3.33% AEP to 2.00m/s or greater in the 0.1% AEP. The associated hazard rating remains at 'Significant - Danger for most' up to the 1% AEP, in the 0.1% AEP event this hazard rating may be exceeded.

There is also significant ponding predicted along the southern section of the western boundary with possible depths up to 0.60m. It should be noted that Stockers Farm Road is at risk of surface water flooding across all events, with a possible depth of flooding up to 0.9m. Where Stockers Farm Road intersects with Harefield Road flood velocities and hazard are the greatest in all three events.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	52.8	69.4	92.7
Maximum depth (m)	0.3-0.6	0.3-0.6	0.6-0.9
Maximum velocity (m/s)	1.0-2	1.0-2.0	≥2.0
Maximum hazard classification	1.25-2.0	1.25-2.0	≥2.0

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The Environment Agency's reservoir flooding mapping shows that the entire site is at risk from reservoir flooding if there was a breach from the Harefield No.3 reservoir. As part of a site-specific Flood Risk

Assessment, an agreed emergency plan should identify appropriate safe access and egress routes from the site, in the event of a reservoir breach.

Groundwater

Groundwater mapping shows that most of the site is at low risk of groundwater flooding during a 1% AEP groundwater event. Groundwater levels are estimated to be between 0.5 and 5m below ground level, there is a risk of flooding to subsurface assets and below ground development such as basements. In the north-east corner of the site, groundwater levels are estimated to be between 0.025 and 0.5m below ground and therefore this section of the site is at medium risk of groundwater flooding during the 1% AEP event.

Based on the RoFSW mapping and the topography of the site, groundwater that emerges is likely to flow north towards the floodplain. Surface water infiltration is also likely to be impeded in northeast of the site.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outlines the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five digit post code level. The site is located within a postcode area with 31 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site itself is not within the Environment Agency's recorded flood outlines dataset, however, the land to the north and west of the site are included. Historic Flood Records from the Hertfordshire County Council have been provided and there are 37 records of flooding within 200m of the site. The two main flood events occurring in February 2014 and October 2020, which was caused by surface water flooding from heavy rain events. There are also three records 370m south of the site along Harefield Road from 2014, also attributed to surface water flooding.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three River Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling is also available as part of the Upper Colne 2025 model. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.

Description of risk to the site

The NaFRA2 data shows that during the 1% and 0.1% AEP plus climate change events, Flood Zone 2 and 3, extends to 26% in both events. This shows a moderate sensitivity to the impacts of climate change. However, as discussed, the Section 0, fluvial risk to the site is increased in the defended scenario due to the presence of upstream embankments and the expansion of the canal downstream of Stockers Lock.

The northeast corner of the site is primarily affected by fluvial flooding in the 1% AEP defended scenario. There is a 5.2% increase in fluvial flood extents between the 1% and 1% AEP plus 35% climate change defended scenarios. There is an increase in maximum depth, velocity and hazard between the two events, however hazard to the site remains at 'Low - Caution' across both events.

Table 0-1: Comparison of fluvial flood risk to the site between the defended 1% AEP and 1% AEP plus 35% climate change extents.

Event	1% AEP	1% AEP plus 35%CC
Percentage of site at risk (%)	21.25	26.46
Maximum depth (m)	0.36	0.41
Maximum velocity (m/s)	0.81	1.13
Maximum hazard classification	0.36	0.49

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

The site is shown to flood during the 1% climate change event, covering up to 10.3% of the site during the 1% AEP plus 20% climate change event. As with the present day, surface water enters the site from two major flow paths in the south and east via Harefield Road, 65% of the site is predicted to be inundated by the 3.33% AEP event. The maximum depths occur in the northeast and southwest corners of the site and range between 0.6-0.9m. Maximum velocity occurs along the eastern border from flows originating from the southern flow path, which are predicted to reach ≥2.0m/s. The maximum hazard occurs along the areas with the highest depths in the northeast and southwest reaching ≥2.0 ('Danger for most' up to 'Danger for all') during the 1% AEP plus 20% climate change event.

However, as per Environment Agency guidance the central uplift does not provide a sufficient basis for assessing future flood risk. The present day 0.1% AEP can be used a proxy to indicate future surface water risk during the 1% AEP event. The 0.1% AEP shows the northern flow path from Harefield Road and the larger southern flow path converge significantly inundating a majority of the site. There is also an increase extent of ponding along the western border of the site, with flows moving towards a central part of the site in the 0.1% AEP. The extent of elevated velocity (>2.0m/s) and hazard ('Danger for most') also increase significantly.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	69.4	77.4
Maximum depth (m)	0.6 - 0.9	0.6 - 0.9
Maximum velocity (m/s)	≥2.0	≥2.0
Maximum hazard classification	≥2.0	≥2.0

Flood risk management infrastructure

Defences

The Grand Union Canal is located 85m north of the site, which is embanked in this location. Flood risk associated with the canal is incorporated within the Upper Colne (2025) model. The assessment of fluvial flood risk in the model is considered to give a reasonable indication of risk from canal breach.

Residual risk

The site is at risk of reservoir flooding in the unlikely event of a breach at Harefield No 3 Reservoir. There is also a residual risk associated with the potential blockage of the culverted ordinary watercourse which crosses the centre of the site.

Emergency planning

Flood warnings and alerts

The site is partially covered by an Environment Agency Flood Alert and Flood Warning service. The northern boundary and north-east corner are covered by the and ‘River Colne at Rickmansworth’ Flood Warning Area and 'Middle River Colne' Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Harefield Road is at high risk of flooding, to the east of the site it is in Flood Zone 3b. Here, flood depths reach 0.4m in the 1% AEP and 0.5m in the 0.1% AEP, but hazard remains low for both events.

For both the 3.3% and 1% AEP surface water events, entrance of the site and Stockers Farm Road have hazard ratings of ‘Significant – Dangerous for most, which is due to the depth and velocity of the surface water flooding. It should also be noted that Harefield Road also has a hazard rating of ‘Significant – Dangerous for most’ directly north of the junction with Stockers Farm Road. Due to the ‘Significant – danger for most’ hazard rating for the 3.3% and 1% AEP events, vehicular and pedestrian access and egress is not possible. The entrance of the site, Stockers Farm Road and the junction of Stockers Farm Road with Harefield Road has a possible hazard rating of ‘Extreme – dangerous for all’ for the 0.1% AEP event, which is the most severe hazard rating. Fast flowing and deep flood water means that vehicular and pedestrian access and egress is not possible.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- BGS data indicates that the underlying geology is chalk which is likely to be free draining. This should be confirmed through infiltration testing, with the use of infiltration maximised as much as possible in accordance with the SuDS hierarchy. However, groundwater levels are indicated to be less than 0.5m below ground level during a 1% AEP event in part of the site. As such, infiltration may not be feasible at all times.
- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- The site is located within Groundwater Source Protection Zone (SPZ) 1, therefore early engagement with the LLFA and the EA is recommended to determine requirements for mitigating the impacts to aquifers because of the surface water drainage system. The infiltration potential of the site should be confirmed through infiltration testing, in line with BRE 365.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The layout and function of drainage systems needs to be considered at the start of the design process for new development, as integration with road networks and other infrastructure can maximise the availability of developable land.
- Proposed attenuation features such as basins, ponds and tanks should be located outside of Flood Zone 3 to avoid the potential risks to the hydraulic capacity or structural integrity of these features. Surface water outfalls that discharge into the ordinary watercourses may be susceptible to surcharging due to water levels. The impacts of flood flows will need to be considered in terms of the attenuation storage requirements of the site and placement of the outfalls.

- The Risk of Flooding from Surface Water (RoFSW) mapping indicates surface water flooding during the 3.3% AEP event. Existing flow paths should be retained and integrated with blue-green infrastructure.
- If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. There is an increase in flood risk to the central part of the site during the 1% AEP plus 25% surface water event.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.
- SuDS should be designed with a holistic approach, combining ecology, landscape and drainage requirements specific to the site, and incorporating Biodiversity Net Gain requirements.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access.
- SuDS should be designed in line with the National Standards for Sustainable Drainage Systems.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as **'More Vulnerable'**.
The Exception Test is required for this site because the site is within Flood Zone 3b.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- Is located within Flood Zone 3a and 3b
- Is within 'Flood Zones plus Climate Change', showing it is at increased risk of flooding from rivers or sea in the future in the Flood Map for Planning.
- Increases the vulnerability classification and may be subject to sources of flooding other than rivers or sea

All sources of flooding should be considered as part of a site-specific FRA.

The fluvial flood zones do not predict the greatest flood extents in this location; it will be necessary to consider the impact of defences on flood risk to the site. As such appropriate modelling should be used to support a site-specific FRA.

Detailed modelling will be required to confirm surface water climate change extents. Demonstration that safe access and egress is required for the 1% AEP plus climate change event

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development must seek opportunities to reduce overall level of flood risk both on and offsite, for example by reducing volume and rate of runoff and creating space for flooding. Fluvial risk to the site is complex due to the interaction of the watercourses within the site and the Grand Union Canal. As such, the development must be designed using a sequential approach. Areas with the highest predicted fluvial risk, should be preserved as public green space, with built development restricted to areas which are flood free up to the 1% AEP defended scenario with an appropriate allowance for climate change. Resilience measures will be required if buildings are situated in the flood risk area.

The developer will need to investigate the potential culverted watercourse though the site, and demonstrate the condition, length and capacity. The culvert should be opened up and integrated into the surface water drainage scheme for the site. The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

An 8m wide buffer should be maintained between the riverbank or culverted watercourse and any built structures, to enable the riparian owners to access and maintain the channel and asset.

Storage for runoff from the development in extreme events should be located out of flood risk areas. The design must ensure that flows resulting from rainfall in excess of the 1% AEP event are managed via exceedance routes that minimise the risks to people and property.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe. Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. Fluvial and surface water mapping used in this assessment, suggests that access is severely impeded during from the 3.33% AEP fluvial and surface water events.

Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels. These measures should be assessed to make sure that flooding is not increased elsewhere:

- raise them as much as possible.
- include extra flood resistance and resilience measures.

Other examples of flood resistance and resilience measures include:

- using flood resistant materials that have low permeability to at least 600mm above the estimated flood level. o making sure any doors, windows or other openings are flood resistant 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

Conclusions

The north-east section of the site is shown to be at significant risk of fluvial flooding as it is located in Flood Zones 2 and 3. Approximately 26% is identified as being location in Flood Zone 2, with up to 12.7% in Flood Zone 3b. However, fluvial risk to the site is exacerbated in the defended scenarios due to the expansion of the Grand Union Canal downstream of Stockers Lock. As such, defended modelling should be used as the 1% AEP plus climate change design fluvial events. The 1% AEP plus 35% defended climate change event predicts that 26% of the site is at risk.

A majority of the site is at significant surface water flood risk during the 3.3%, 1% and 0.1% present day AEP events. There is likely to be residual risk from blockage to the watercourse present within the site. A site-specific FRA modelling should include detailed modelling to assess this risk.

Shallow groundwater levels are present across much of the site. A site-specific flood risk assessment should confirm the risk to the site. This is likely to require ground investigations.

The following points should be considered in development of this site:

- The Exception Test shall be undertaken and passed. The majority of the site is shown to be at risk during the design fluvial and surface water events. If the Exception Test is failed, development will not be able to be proceed.
- As safe access and egress is not likely to be possible in the fluvial and surface water design events (1% AEP plus climate change), a Flood Warning and Evacuation Plan should be prepared which considers the likely onset and duration of flooding and demonstrates how residents can safely be evacuated and/or shelter safely in situ during such an event.
- A site-specific Flood Risk Assessment should demonstrate that site users will be safe in the 1% surface water AEP event, and the 1% AEP fluvial event, plus an allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and the development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed hydraulic modelling, with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site. This is in line with the sequential approach to site layout.
- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

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Level 2 Strategic Flood Risk Assessment - Site NCFS15

Prepared for

Three Rivers District Council

Date

19 February 2026

THREE RIVERS DISTRICT COUNCIL

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site NCFS15. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Level 1 SFRA and read the Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Chorleywood Library, Chorleywood
- Site area: 0.1ha
- Existing site use: Brownfield
- Proposed site use: Residential

Topography

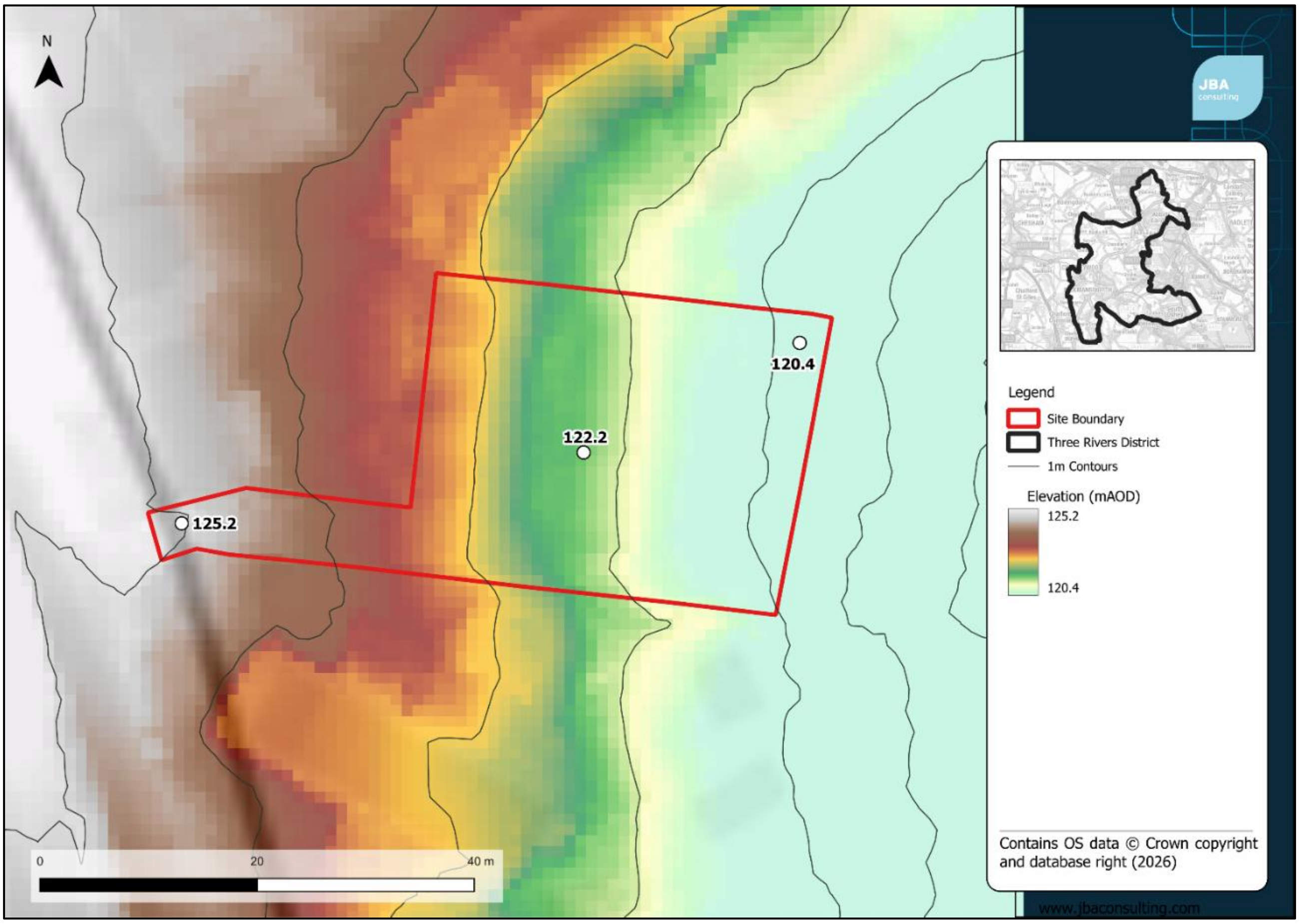

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR. The topography of the site declines in elevations from the western boundary to the eastern boundary. The highest elevation, along the western boundary is 81.5mAOD, which declines to 77.3mAOD along the eastern boundary.

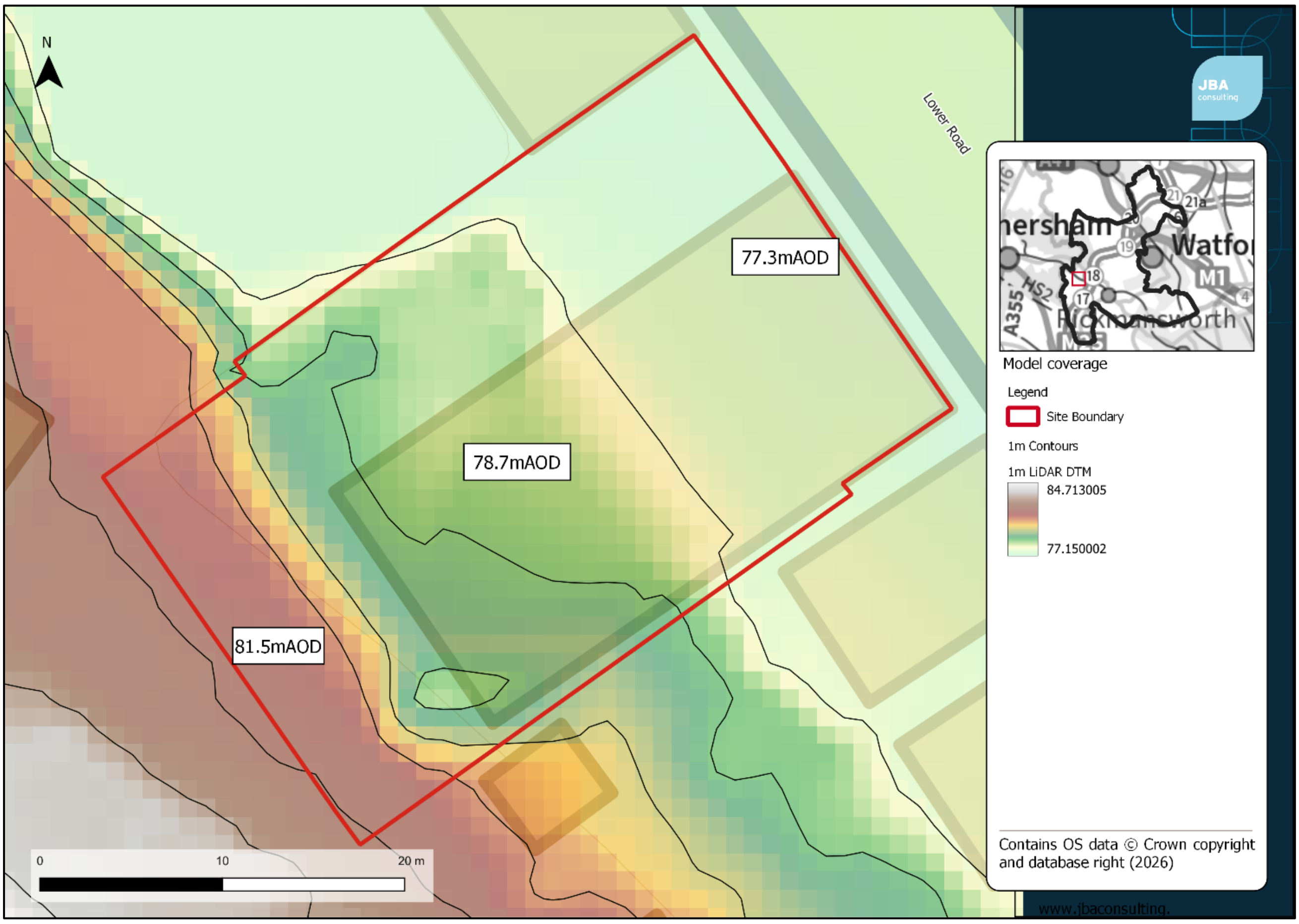

Figure 0-1: Topography of the site.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewes Nodular Chalk Formation
- Superficial - Head-Clay, silt, sand, and gravel

Soils at the site consist of:

- Freely draining, slightly acidic, loamy soils

Sources of flood risk

Location of site within the catchment

The site is located north of the Colne (confluence with Chess to River Thames) water body, which forms part of the Thames River Basin District.

Existing drainage features

There are no drainage features located on the site.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset has been used to assess fluvial flood risk at this site. In the absence of detailed modelling results, Flood Zone 3a is used a conservative proxy for the functional floodplain.

Description of risk to the site

The FMfP show that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site.

Table 0-1: Existing fluvial flood risk based on EA FMfP *

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The RoFSW mapping shows that the site is at risk of surface water flooding along the northern and eastern boundaries, around areas with lower topography. Significant surface water flooding is only present during the 1% and 0.1% AEP events, primarily from a northern flow path formed outside the district boundary. There is a large area of accumulated runoff at Shire Lane (located approximately 270m of the site), where two flow paths converge. Runoff is conveyed from this point towards the site through Lower Road.

During the 1% AEP event, the extent of surface water flooding covers 10.2% of the site. Depths reach between 0.2m and 0.3m, with a peak velocity of 0.25m/s. The maximum hazard classification during this event is 'Moderate'.

In the 0.1% AEP, the extent of surface water flooding covers 17.1% of the site. Surface water flooding reaches depths between 0.3m and 0.6m, with the flood water reaching velocities between 0.25m/s and 0.5m/s. The maximum hazard classification for this event is 'Significant'

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0	10.2	17.1
Maximum depth (m)	N/A	0.2-0.2	0.3-0.6
Maximum velocity (m/s)	N/A	0-0.25	0.25-0.5
Maximum hazard classification	N/A	Moderate	Significant

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that along the eastern boundary of the site, groundwater levels are between 0.5m and 5m below the ground surface. Most of the site has a very low risk of groundwater flooding, with levels at least 5m below the ground surface.
Based on the RoFSW and topography of the site it is likely that any groundwater that emerges will pool along the western boundary, within the sites topographical low.
This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 74 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not identified to be within the Environment Agency's Historic Flood Map and Recorded Flood Outlines dataset.

Hertfordshire County Council records show two incidents of surface water flooding on Lower Road due to surcharged drains.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling from the 2025 Upper Colne defended model was used to obtain depth, velocity, and hazard information for the site. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.

Description of risk to the site

The NaFRA2 dataset shows that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site when the central allowance is applied to the 1% AEP (Flood Zone 3) and 0.1% AEP (Flood Zone 2).

The Upper Colne defended model also shows no increase in risk.

Table 0-1: Comparison of fluvial flood risk to the site between the 1% AEP and 1% AEP plus 35 % climate change extents.

Event	1% AEP	1% AEP plus 35% CC
Percentage of site at risk (%)	0	0
Maximum depth (m)	N/A	N/A
Maximum velocity (m/s)	N/A	N/A
Maximum hazard classification	N/A	N/A

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's

epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

The extent of surface water flood risk at the site remains broadly consistent with the present-day surface water model, with a slight increase in extent.

During the 1% AEP plus climate change event the depth and hazard remain the same as the present day, whereas the velocity increases to speeds between 0.25m/s and 0.5m/s. These extents, and peak flood depths, velocity and hazard do not exceed the 0.1% AEP event.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	10.2	13.3
Maximum depth (m)	0.3-0.6	0.3-0.6
Maximum velocity (m/s)	0-0.25	0.25-0.5
Maximum hazard classification	Moderate	Moderate

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial/surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is accessible via Lower Road.

Fluvial

Lower Road is flood free during the 1% AEP plus climate change event.

Surface water

Most of Lower Road experiences surface water flooding during the 0.1% AEP event. The mapping shows that the majority of flood depths on Lower Road are expected to remain below 0.2m. Although, an area of surface water flooding along the eastern site boundary of the site could experience depths between 0.3m and 0.6m

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- BGS data indicates that the underlying geology is Lewes Nodular Chalk Formation which is likely to be free draining. This should be confirmed through infiltration testing, with the use of infiltration maximised as much as possible in accordance with the SuDS hierarchy.
- The site is considered to have a low susceptibility to groundwater. Groundwater levels are indicated to be between 0.5 and 5m below ground level and there is a risk of flooding to subsurface assets and below ground development such as basements. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system.
- Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system. Below ground development such as basements may not be appropriate at this site.
- The site is located within Groundwater Source Protection Zone 2. Infiltration techniques may not be suitable and should only be used following the granting of any required environmental permits from the Environment Agency for Zones 2, 3 and 4 although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible opportunities and constraints.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies Residential development as 'More Vulnerable'.
The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- within Flood Zone 1 and the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside of the area of surface water flood risk along the northern and eastern boundaries of the site.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site lies entirely within Flood Zone 1, meaning fluvial flood risk is not predicted to affect the site.

Up to 17.1% of the site is affected by surface water flooding during the 0.1% AEP event, with depths between 0.3 m and 0.6 m and a hazard classification of Significant. Under climate change scenarios, the extent of surface water flooding increases slightly to 13.3% for the 1% AEP plus 20% uplift, with depths remaining at 0.3 m to 0.6 m and hazard remaining Moderate.

Lower Road experiences surface water flooding during the 1% AEP plus climate change event, with most depths below 0.2 m but some areas reaching 0.3 m to 0.6 m.

Groundwater flood risk is low, with groundwater levels mostly more than 5 m below ground, although pooling could occur along the western boundary in the site’s topographical low if emergence happens.

The following points should be considered in development of this site:

- The development is 'Residential', therefore is classed as 'More Vulnerable'.
- Development should be steered away from areas of significant surface water flooding.
- Groundwater monitoring is suggested to determine emergence risk.
- Safe access may not be possible during the 1% AEP plus climate change event, which must be considered during the site-specific FRA.

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Level 2 Strategic Flood Risk Assessment - Site NCFS26

Meresworth Care Home

Prepared for

Three Rivers District Council

Date

19 February 2026

THREE RIVERS DISTRICT COUNCIL

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the Meresworth Care Home. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Garden Land off Uxbridge Road, Mill End, WD3 8EA
- Site area: 0.17ha
- Existing site use: Brownfield
- Proposed site use: Care Home

Topography

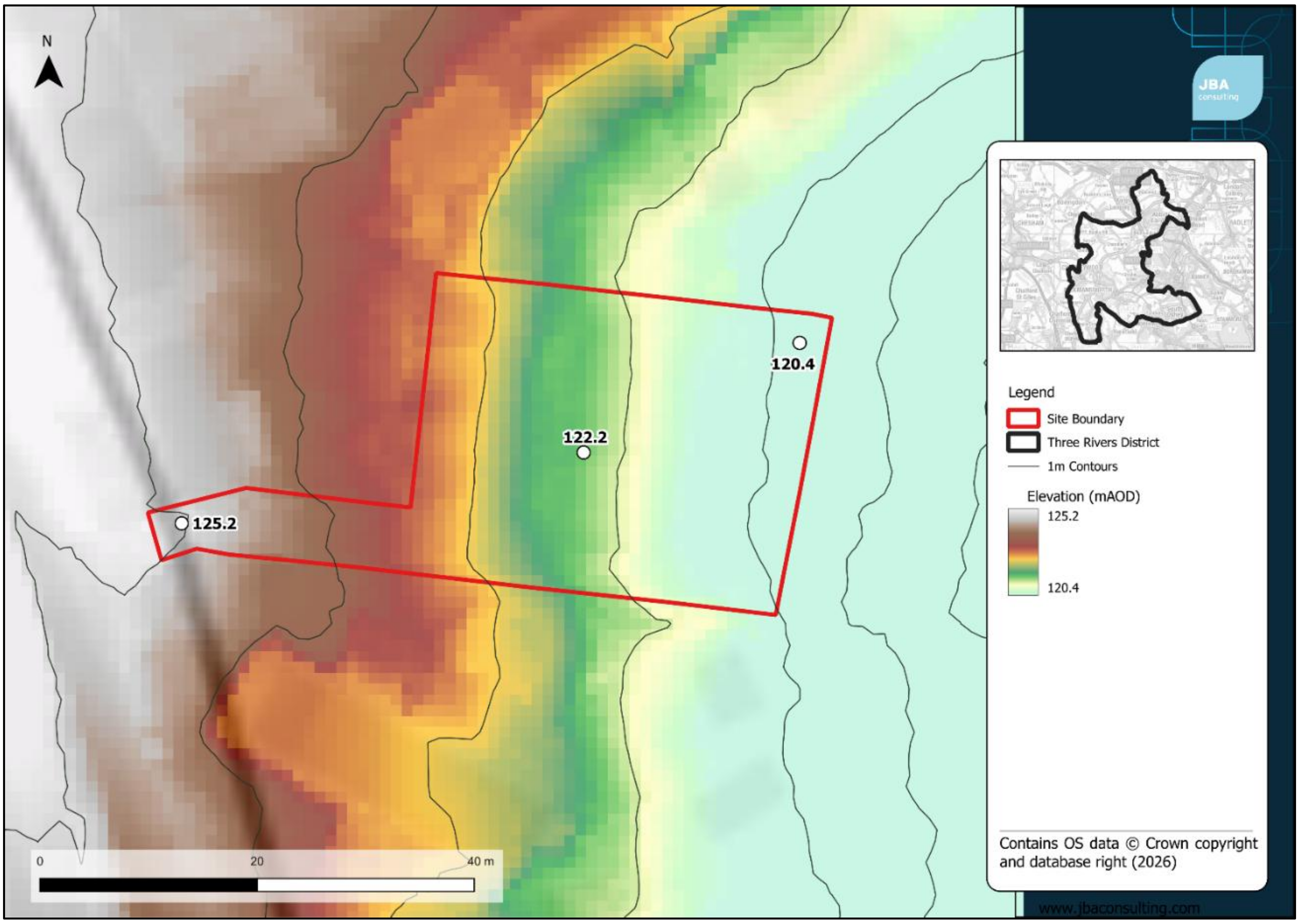

Figure 0-1 shows the Environment Agency 1m resolution LiDAR.

Figure 0-1: Topography of the site.

The mapping shows that that the site has largely flat topography, that is characteristic of land near the floodplain. The most prominent gradient is from west to east; elevations range from 51.5mAOD in the northwest to 50.7mAOD in the southeast.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewis Nodular Chalk Formation.
- Superficial - Head, 1-Clay, silt, sand and gravel

Soils at the site consist of:

- Soils on the site are unclassified. Soils in area in close vicinity to the site are identified as loamy and clayey floodplain soils with naturally high groundwater.

Sources of flood risk

Location of site within the catchment

The site is located within Moneyhill, a built-up urban area. The site lies within the Colne catchment with the River Colne flowing 65m to the south of the site.

Existing drainage features

There are no drainage features within the site boundary.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) and the Upper Colne (2025) hydraulic model have been used to assess fluvial flood risk at this site.

Description of risk to the site

The site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site. The more recent, Upper Colne modelling confirms that the site remains within Flood Zone 1, outside the Flood Zone 2 extent, consistent with the FMfP.

Table 0-1: Existing fluvial flood risk based on the EA's FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

Surface water flooding is predicted along the eastern boundary, when flows from the west are abutted against the existing property line. There is a small additional area of risk in the southeast where elevations are the lowest, flows enter the site from the existing cark park.

During the 0.1% AEP event, floodwater is expected to reach depths between 0.2m and 0.3m (within the ponded area) The maximum flow velocity predicted 0.25 m/s which rises to 0.5m/s where the eastern flow path enters the site. However, the maximum hazard classification expected across the site is 'Low'.

The site is not predicted to flood during the 3.3% or 1% AEP events.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at	0	0	12.1

Event	3.3% AEP	1% AEP	0.1% AEP
risk* (%)			
Maximum depth (m)	N/A	N/A	0.2-0.3
Maximum velocity (m/s)	N/A	N/A	0.25-0.5
Maximum hazard classification	N/A	N/A	Low

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The site is at moderate risk of groundwater flooding, with groundwater levels predicted to lie 0.5 - 5m below the surface. Mitigation for seasonal high groundwater levels must be considered in design of the site, for example by raising finished floor levels to an appropriate height above ground level

Sewers

The site is located within a postcode area with 23 historic incidences of sewer flooding, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's EA's Historic Flood Map or Recorded Flood Outlines dataset.

Hertfordshire County Council records shows that two incidents of surface flooding from 2015 and 2016 at the junction of Field Way and Uxbridge Road (immediately southwest of the site). Flooding in both incidents is simply described as a large area of standing water.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see the Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling is also available as part of the Upper Colne 2025 model. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.

The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The NaFRA2 data shows that during the 1% and 0.1% AEP plus climate change events, the site remains outside of Flood Zone 2 and 3 extents.

The 1% AEP defended plus 35% Climate Change event also does not predict a change in fluvial risk to the site.

Surface water

Available data

The Environment Agency’s Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070’s epoch, unless the allowance for the 2050’s epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

The flood risk from surface water at the site has increased in the scenarios with added climate change.

When a 20% uplift is applied the site is within the 1% AEP extent, with the same areas of risk predicted in the 0.1% AEP. The peak depth and velocity predicted at the site is also less than the 0.1% AEP event, remaining below 0.2m and 0.25m/s respectively. Peak hazard across the site is classified as 'Low' in both areas of risk.

Table 0-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	0	6.4
Maximum depth (m)	N/A	<0.2
Maximum velocity (m/s)	N/A	0.25
Maximum hazard classification	N/A	Low

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Potential access

The site is likely to be accessed from the southern boundary through Uxbridge Road and in the northern boundary, through Field Way

Fluvial

The A412 (Uxbridge Road) and Field Way are flood free in the 0.1% AEP fluvial event.

Surface water

The A412 (Uxbridge Road) is largely unaffected by flooding in the 0.1% AEP surface water event. Peak flood depths fall below the threshold for mapping (0.2m). The peak velocity and hazard class are 0.5m/s and 'Low' respectively. On Field Way, flood depths mostly remain below 0.3m with low velocity (<0.25m/s) and hazard (<0.75). The mapping suggests that flooding during this event is unlikely to significantly impede access to site.

Dry islands

The site not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- BGS data indicates that the underlying geology is the Lewes Nodular Chalk formation with superficial deposits which is likely to have highly variable permeability. This should be confirmed through infiltration testing.
- The site is considered to have a low susceptibility to groundwater. In a localised area to the north of the site, groundwater levels are indicated to be between 0.5m and 5m below ground level during a 1% AEP groundwater event. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- The entire site is located within Groundwater Source Protection Zone 1 (SPZ) and infiltration techniques may not be appropriate for anything other than clean roof drainage. If infiltration is proposed for anything other than clean roof drainage a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply. Proposed SuDS should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and EA) at an early stage to understand possible opportunities and constraints.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and EA) at an early stage to understand possible constraints.

- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should consider the increased surface water flooding extents due to climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as 'More Vulnerable'.

The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site because:

- the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside of the area of surface water flooding located in and around the topographical low at the northern area of the site.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and egress will need to be provided for the 1% AEP surface water event with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is located in Flood Zone 1, so it is not identified to be at fluvial risk.

The site is at low risk of surface water flooding. Under the present-day scenario in the RoFSW mapping, the site is predicted to flood in the 0.1% AEP event, with floodwater reaching a maximum depth of 0.3 m and a velocity of 0.5 m/s, resulting in a 'Significant' hazard classification. No flooding is predicted during the 3.3% or 1% AEP events.

The modelled climate change scenarios show an increase in surface water flood risk. In the 1% AEP plus climate change event, the site experiences flooding covering approximately 6.4% of the site within the depression. Maximum depths are 0.2m with low velocity, meaning the entire affected area is classified as 'Low' hazard.

The following points should be considered in development of this site:

- The proposed development of the site is residential; thus, the development is classified as 'More Vulnerable'.
- Development should be directed away from the northern area of the site, particularly within and around the topographical depression.
- The site would benefit from SuDS implementation to manage surface water, improve water quality, and deliver wider sustainability benefits such as biodiversity and amenity.

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Level 2 Strategic Flood Risk Assessment - Site NCFS34

Pinewood Lodge, South Oxhey

Prepared for

Three Rivers District Council

Date

19 February 2026

THREE RIVERS DISTRICT COUNCIL

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site NCFS34. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Local Plan for Three Rivers District Council Level 1 Strategic Flood Risk Assessment and read the Local Plan for Three Rivers District Council Level 2 Strategic Flood Risk Assessment Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Pinewood Lodge, South Oxhey, WD19 7HR
- Site area: 0.52ha
- Existing site use: Brownfield
- Proposed site use: Residential

Topography

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR data.

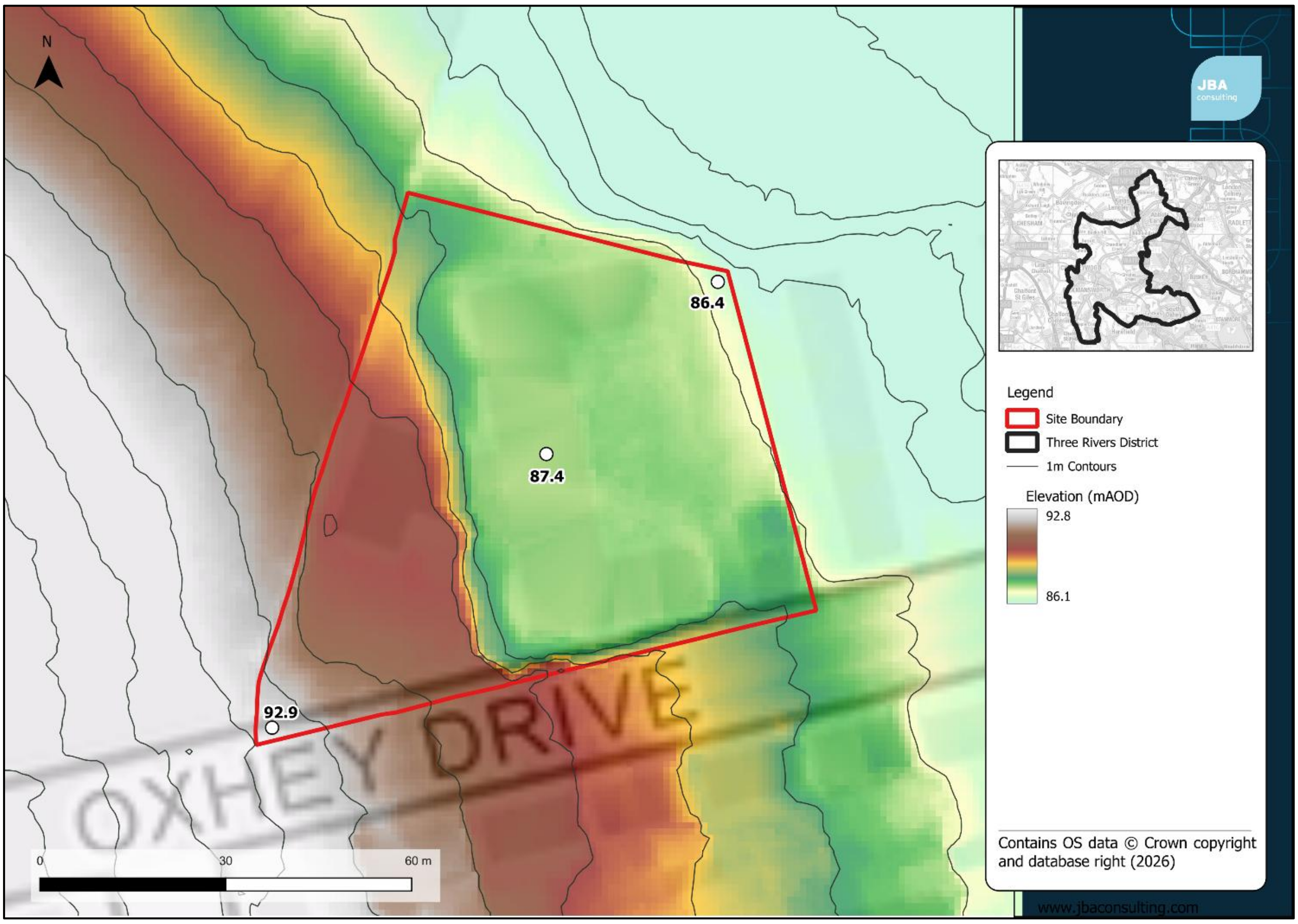

Figure 0-1: Topography of the site

The site slopes from west to east with levels ranging between 86.4mAOD (Above Ordnance Datum) to 92.9mAOD. As the site is in a developed urban area the LiDAR data is unlikely to be representative of the actual site topography, this may have an impact on some of the flood risk datasets used in the assessment.

Geology and soils

Geology at the site consists of:

- Bedrock - London Clay Formation
- Superficial - N/A

Soils at the site consist of:

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

Sources of flood risk

Location of site within the catchment

The site is located within the built-up urban area of South Oxhey and is located within the River Colne Catchment. The site is approximately 1km west of the Hartsbourne Stream and 1.8km south of the River Colne.

Existing drainage features

There are no existing drainage features within the site that are visible on topographic mapping or aerial imagery. As the site is in an urban area, it likely drains to the surface water drainage network.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset has been used in this assessment as the site is not covered by a detailed hydraulic model.

Description of risk to the site

The FMfP shows that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site.

Table 0-1: Existing fluvial flood risk based on EA FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The site is at risk of surface water flooding in all modelled events. During the 3.33% AEP event, ponding occurs in the southern part of the site, covering 11.4% of the site. During the high-risk scenario, flood depths and velocities reach 0.6-0.9m and 0.5-1.0m/s respectively, resulting in a maximum hazard classification of 'Significant' (1.25-2.0).

The area of ponding extends slightly during the 1%, with maximum flood depths increasing to 0.9-1.2m and velocities increasing to 1.0-2.0m/s. This maximum hazard remains 'Significant' during the Medium-risk scenario.

During the 0.1% AEP event, the surface water flood extent increases to 50.9% of the site, reaching maximum flood depths and velocities of >1.2m and 1.0-2.0m/s respectively. The maximum hazard during the Low-risk scenario is 'Significant' (1.25-2.0), shown in the southern part of the site. The hazard in the rest of the site is predominantly 'Low' (0.5-0.75).

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	11.4	12.8	50.9
Maximum depth (m)	0.6-0.9	0.9-1.2	>1.2
Maximum velocity (m/s)	0.5-1.0	1.0-2.0	1.0-2.0
Maximum hazard classification	Significant	Significant	Significant

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that the site is not at risk of groundwater flooding. Therefore, groundwater flooding does not pose a significant constraint to safe development of the site.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 15 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not shown to be within the Environment Agency’s Historic Flood Map or Recorded Flood Outlines dataset.

In addition, Hertfordshire County Council records do not identify any incidents in the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three Rivers District Council Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling from the 2025 Upper Colne defended model was used to obtain depth, velocity, and hazard information for the site. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.

The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The NaFRA2 data shows that during the 1% and 0.1% AEP plus climate change events, the site remains outside of Flood Zone 2 and 3 extents.

The 1% AEP defended plus 35% Climate Change event also does not predict a change in fluvial risk to the site.

Surface water

Available data

The Environment Agency’s Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070’s epoch, unless the allowance for the 2050’s epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

The application of climate change to rainfall results in an increase in surface water flood extent during the 1% AEP plus 20% (Central allowance for the 2050s epoch) climate change event, increasing from 12.8% to 16.3% of the site. As with the present-day scenario, surface water ponding occurs in the southern part of the site to depths of 0.9-1.2m, velocities up to 1.0-2.0m/s and a maximum hazard of 'Significant' (1.25-2.0).

However, as per Environment Agency guidance the central uplift does not provide a sufficient basis for assessing future flood risk. The present day 0.1% AEP can be used a proxy to indicate future surface water risk for the 1% AEP plus 40% climate change (Upper End allowance for the 2070s epoch) scenario. The 0.1% AEP event shows maximum depths increasing to >1.2m in the area of ponding in the south of the site. During this scenario, maximum velocities and hazard remain 1.0-2.0m/s and 'Significant' respectively.

Table 0-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	12.8	16.3
Maximum depth (m)	0.9-1.2	0.9-1.2
Maximum velocity (m/s)	1.0-2.0	1.0-2.0
Maximum hazard classification	Significant	Significant

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is likely to be accessed via Oxhey Drive, with current access at the southern border of the site.

Developers will need to demonstrate that safe access and egress in the 1% AEP event, including allowance for climate change.

Fluvial

Safe access is available to the south of the site to Oxhey Drive in all events.

Surface water

Oxhey Drive is at risk of flooding from surface water from the 3.33% surface water event but the extents are not significant until the 0.1% AEP. While the peak velocity reaches 1 m/s, the peak depths do not exceed 0.2m and so the hazard remains 'Low' (<0.75). Access is not likely to be impeded up to the 0.1% AEP event.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
  - Priority 1: collected for non-potable use
  - Priority 2: infiltrated to ground
  - Priority 3: discharged to an above ground surface water body
  - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
  - Priority 5: discharged to a combined sewer
- The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work. Below ground development such as basements may still be susceptible to groundwater flooding.
- The site is located within a Groundwater Source Protection Zone 3. This is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. There are possible restrictions over the use of infiltration techniques with regard to groundwater quality.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- SuDS should be designed in line with the National Standards for Sustainable Drainage Systems.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.

- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the increased surface water flooding extents due to climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as 'More Vulnerable'.
The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA, specifically surface water flooding.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council's Local Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside the southern part of the site due to surface water flood risk. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. These measures should be assessed to make sure that flooding is not increased either on or off-site.

Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Should built development be proposed within the design surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures.

Arrangements for safe access and egress will need to be provided for the 1% AEP surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is not at risk of fluvial flooding during present day or climate change scenarios. Additionally, there is a no risk of groundwater flooding at the site during a 1% AEP groundwater flood event. However, the site is at significant risk of surface water flooding during the 3.3%, 1% and 0.1% AEP events. The access road for the site (Oxhey Drive) is affected by flooding during these events, but peak flood depths and hazard remain low.

Due to the extensive surface water flood risk and the potential for highly vulnerable development, the Exception Test is required for the site. The following points should be considered in development of this site:

- A site-specific Flood Risk Assessment is required which demonstrates that site users will be safe during events up to and including 1% AEP surface water events, with an appropriate allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding either on or off the site.
- Development should be steered outside the areas of surface water flood risk on the site. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. These measures should be assessed to make sure that flooding is not increased either on or off the site.
- Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.
- Arrangements for safe access and escape will need to be provided for the 1% AEP surface water events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

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Level 2 Strategic Flood Risk Assessment - Site NCFS35

South of Little Oxhey Lane, Carpenders Park

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site NCFS35. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: South of Little Oxhey Lane, Carpenders Park, WD19 6FW
- Site area: 19.42
- Existing site use: Greenfield
- Proposed site use: Employment

Topography

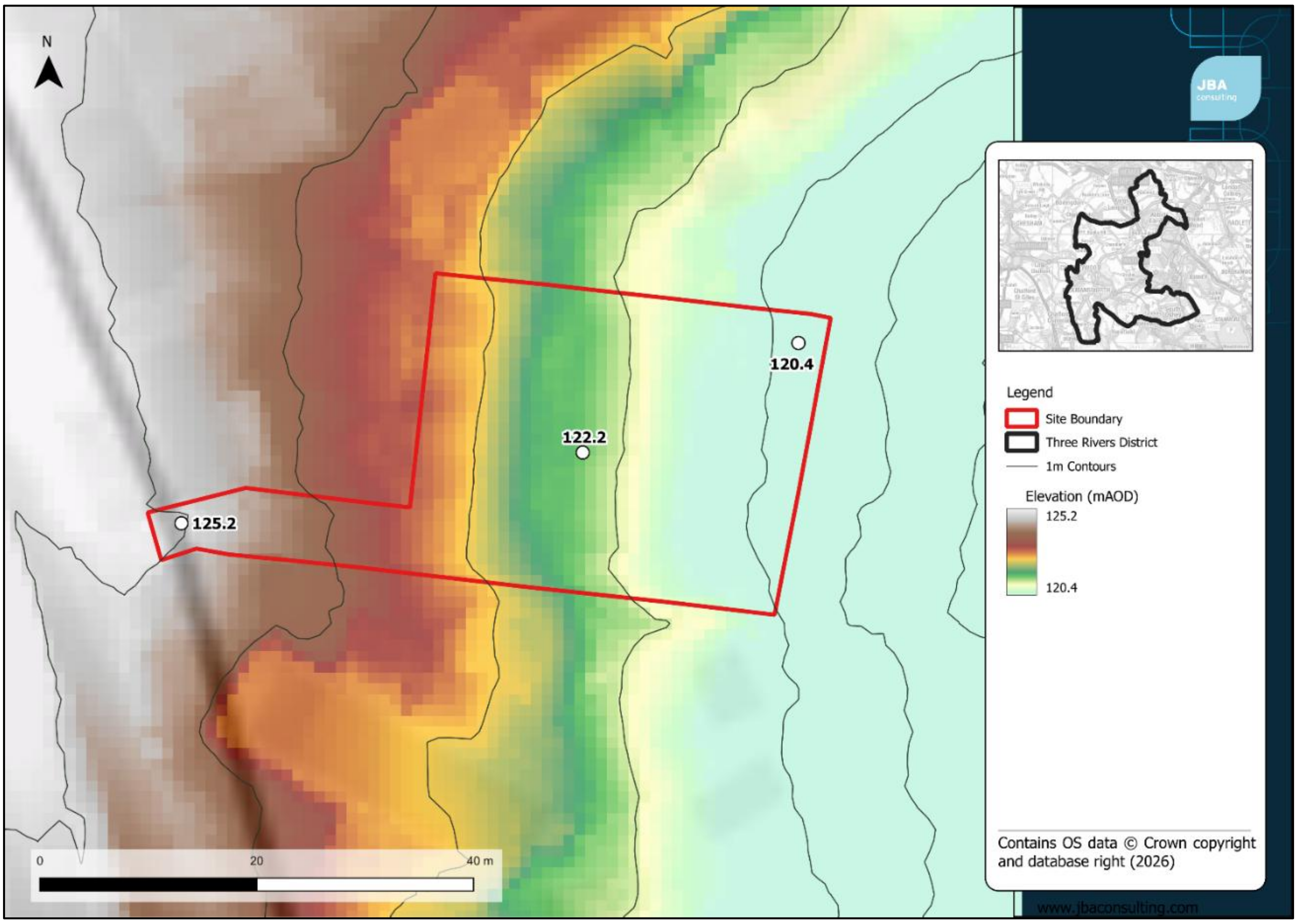

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

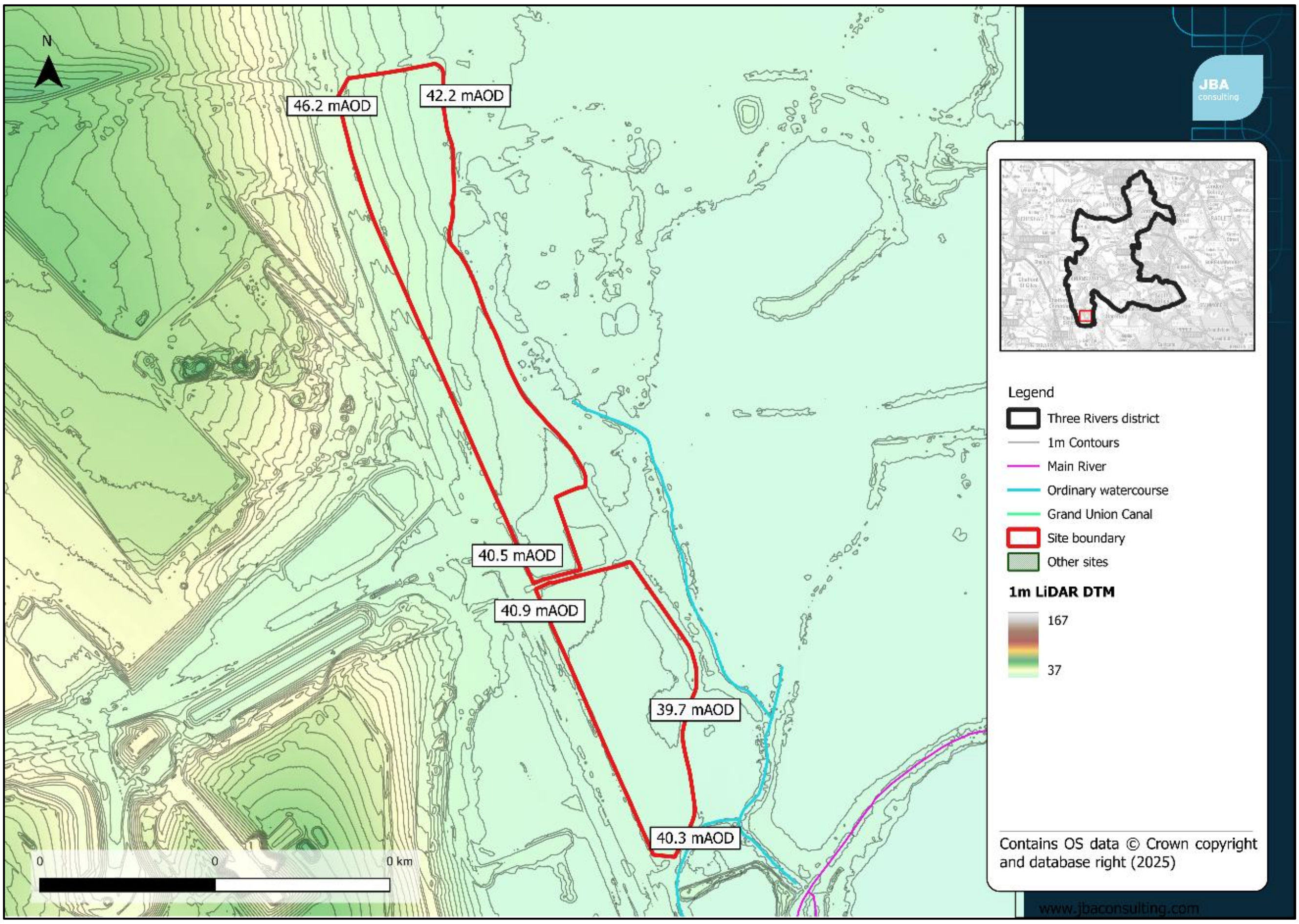

Figure 0-1: Topography of the site.

In the northern site, there is significant northwest to the southeast gradient with elevations ranging from 46.2mAOD in the northwest to 40.5mAOD in the southeast. In the southern part of the site, there is a similar but milder western gradient from 40.9mAOD to 39.7mAOD in the east.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewes Nodular Chalk Formation
- Superficial - Clay, Silt, Sand and Gravel

Soils at the site consist of:

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

Sources of flood risk

Location of site within the catchment

The site falls within the Colne (Confluence with Chess to River Thames) water body catchment. The site is in the settlement of West Hyde, a largely rural hamlet in the district. The site located between the A412 Denham Way/North Orbital Road in the west and Old Uxbridge Road in the east.

Existing drainage features

There are no watercourses within the site boundary, however an unnamed watercourse which flows east of the North Orbital Road and drains into Pynesfield Lake. The east of the site is helmed several waterbodies, including Pynesfield Lake and Lynsters Lake. The River Colne and Grand Union Canal are located approximately 730m east of the site.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) and the Upper Colne (2025) hydraulic model have been used to assess fluvial flood risk at this site.

Description of risk to the site

The Upper Colne model shows that the site is situated within Flood Zones 2, 3a and 3b. This southern site is at significant risk of fluvial flooding.

Table 0-1: Existing fluvial flood risk based on Upper Colne 2025 model*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	27.4	20.1	9.6

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

The modelling shows that fluvial risk is highest in areas close to where the watercourse drains into Pynesfield Lake. Fluvial flood flows enter the northern site from the eastern and southeastern boundary of this part of the site. Floodwater accumulates at topographic depressions in the site. Flooding is not predicted to affect the southern part of the site.

During the 3.33% AEP, the average depth of 0.2m is predicted across the site, there are small areas of deeper ponding (up to 0.5m) in the southeast of the site. In the 1% AEP and 0.1% undefended events (Flood Zone 2 and 3a) events, the average depth increases up to 0.3m and 0.4m respectively. Flooding extends further eastwards into the site and ponded areas in the site reach depths up to 0.8m in the 1% AEP and 1m in the 0.1% AEP events.

The peak flood velocity across all three events is low, below 0.25m/s and as such the hazard to the site similarly remains below 0.75 ('Low - Caution').

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The site is at high risk of surface water flooding. In the northern part of the site, during the 3.33% AEP and greater return periods, a significant flow path enters from southwest of the site and appear to pass under a culvert on the A412. Runoff flows eastwards across the site, following the gradient of the site. There is a significant area of ponding at a topographic low point in the southeast corner. During the 0.1% AEP event, floodwater is expected to reach a maximum depth between 0.6m and 0.9m in the areas with the deepest ponding. Along the flow path into the site, depths are shallower (between 0.2m and 0.3m). Peak depth predicted in the ponded areas remains between 0.3m and 0.6m in both the 3.33% and 1% AEP events. A peak flow velocity is predicted to be 1m/s along the flow path entering the site in the 1% AEP, while the in 3.33% AEP flow velocities only reach 0.25m/s. The maximum hazard classification of 'Significant' is predicted for all three events around areas with deep ponding.

Only minor areas of ponding occur in the southern part of the site up to the 0.1% AEP event.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	2.4	3.8	7.2
Maximum depth (m)	0.3-0.6	0.6-0.9	0.6-0.9
Maximum velocity (m/s)	0.75-1.25	0.5-1.0	1.0-2.0
Maximum hazard classification	Significant	Significant	Significant

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is at risk of flooding from Hilfield Park and Latmer Lakes Reservoirs, in the event of a breach. As part of a site-specific Flood Risk Assessment, an agreed emergency plan should identify appropriate safe access and egress routes from the site, in the highly unlikely event of a reservoir breach,

Groundwater

The JBA Groundwater Emergence Map shows that the site is at high risk of groundwater flooding. In the north-east corner of the site levels are between 0.025m and 0.5m below the ground surface during a 1% AEP groundwater flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.

Surface water drainage is likely to be impeded during periods with high groundwater levels and infiltration may not be possible. There also may be ingress into sewer networks and below ground storage such as soakaways.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outlines the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five digit post code level. The site is located within a postcode area with 27 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is within the Environment Agency's Historic Flood Map, within the flood extents of the February 2014 flood event. Historic Flood Records from the Hertfordshire County Council have been provided and there are records of surface water flooding near the site on Old Uxbridge Road. The most recent event occurred in 2020 and is described as a 'flash flood'. The cause of these flood events is attributed to blocked drains.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling is also available as part of the Upper Colne 2025 model. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.

Description of risk to the site

The NaFRA2 data shows that during the 1% and 0.1% AEP plus climate change events, flooding extends to 35% and 40% respectively. This shows a moderate sensitivity to the impacts of climate change.

The southern part of the site is primarily affected by fluvial flooding in the 1% AEP defended scenario. There is a 5.5% increase in fluvial flood extents between the 1% and 1% AEP plus 35% climate change defended scenarios. There is an increase in maximum depth, velocity and hazard between the two events, however hazard to the site remains at 'Low - Caution' across both events.

Table 0-1: Comparison of fluvial flood risk to the site between the defended 1% AEP and 1% AEP plus 35% climate change extents.

Event	1% AEP	1% AEP plus 35%CC
Percentage of site at risk (%)	18.9	25.4
Maximum depth (m)	0.77	0.92
Maximum velocity (m/s)	0.42	0.77
Maximum hazard classification	Low	Low

Surface water

Available data

The Environment Agency’s Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070’s epoch, unless the allowance for the 2050’s epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

There is an increase in flood extents between the 1% AEP and 1% AEP plus climate change event, but no new areas of flooding. The site is indicated to be mildly sensitive to climate change. Peak flood depths increase from between 0.2m and 0.3m to between 0.6m and 0.9m. Peak flow velocities and maximum hazard are at 'Significant' for both events.

However, as per Environment Agency guidance the central uplift does not provide a sufficient basis for assessing future flood risk. The present day 0.1% AEP can be used a proxy to indicate future surface water risk during the 1% AEP event. The 0.1% AEP shows a greater increase in the extent of ponding within the site compared to the 1% AEP and 1% AEP plus climate change events. Peak velocity is elevated to 1.0m/s to 2.0m/s in the 0.1% AEP when compared to 1% AEP plus climate change event, but hazard remains at 'Significant'.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 25% CC
Percentage of site at risk (%)	3.8	5.1
Maximum depth (m)	0.3-0.6	0.6-0.9
Maximum velocity (m/s)	0.5-1.0	0.5-1.0
Maximum hazard classification	Significant	Significant

Flood risk management infrastructure

Defences

The Environment Agency AIMS database shows two defences approximately 600m east of the site. A section of the Colne is embanked, and a spillway is also present to control flows into Pynesfield Lake, which provides flood storage in this part of the catchment. Both structures have a 1 in 100-year standard of protection. The Upper Colne 2025 model includes both defended and undefended modelling, which includes all defences in the AIMS database. Therefore, the assessment of fluvial flood risk using this model sufficiently considers any benefits of these defences on flood risk to the site.

Residual risk

The majority of the site is at risk of flooding in the event of a breach event on Hilfield Reservoir.

Additionally, the RoFSW mapping suggests that there is a culvert present on the A412, immediately west of the site boundary. The impact of blockage to this culvert to surface water flooding should be assessed within a site-specific Flood Risk Assessment.

Emergency planning

Flood warnings and alerts

The site is within both EA Flood Warning and Flood Alert areas:

- Flood Alert Area: The Lower River Colne and Frays River at Uxbridge, West Drayton, Poyle and Stanwell Moor
- Flood Warning Area: The River Colne at Willowbank including Uxbridge Moor

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Access to the site is available from the A412 Denham Way/North Orbital Road and via Old Uxbridge Road.

Fluvial

The A412 remains flood free in the 0.1% AEP fluvial event and is in Flood Zone 1. Old Uxbridge way is affected by fluvial flooding along the eastern border of the site and is in Flood Zone 3b. Access is still possible via Old Uxbridge Road for the northern section of the site, which remains dry up to the 0.1% AEP event (Flood Zone 2). For the southern section of the site, access will be via the east on the A412.

Surface water

Both roads are at risk of flooding from surface water during the 3.33% AEP surface water event. Surface water flow paths affect sections of both roads at their junction with Tilehouse Lane (which separates both parts of the site).

On Old Uxbridge Road, flood depths only become significant in the 0.1% AEP event (reaching between 0.3m and 0.6m). Flood depths on the A412 remain shallow (between 0.2 and 0.3m) up to the 0.1% AEP event.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- Groundwater mapping suggests that there is high risk of groundwater flooding at this location, therefore infiltration techniques may not be suitable. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site. The infiltration potential of the site should be confirmed through infiltration testing, in line with BRE 365.
- Any detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The site is located within Groundwater Source Protection Zone (SPZ) 1, therefore early engagement with the LLFA and the EA is recommended to determine requirements for mitigating the impacts to aquifers because of the surface water drainage system.
- There are no historic landfill sites within the site boundary. The Old Uxbridge Road historic landfill site is located approximately 50m to the east of the site.
- The layout and function of drainage systems need to be considered at the start of the design process for new development, as integration with road networks and other infrastructure can maximise the availability of developable land.
- The topography of the site is unlikely to affect any proposed SuDS features.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.
- SuDS should be designed with a holistic approach, combining ecology, landscape and drainage requirements specific to the site, and incorporating Biodiversity Net Gain requirements.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.
- Consideration should be made to the existing condition of receiving waterbodies
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access.
- Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- SuDS should be designed in line with the National Standards for Sustainable Drainage Systems.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies the proposed commercial development as 'Less Vulnerable'.
The Exception Test is required for this site due the vulnerability of the development and is location within Flood Zone 3b.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- Is located within Flood Zone 3a and 3b
- Is within ‘Flood Zones plus Climate Change’, showing it is at increased risk of flooding from rivers or sea in the future in the Flood Map for Planning.
- the Flood Map for Planning shows it is at risk from surface water flooding
- is subject to sources of flooding other than rivers or sea

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the Three Rivers District Council, Hertfordshire County Council, Thames Water, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside of the areas of the site with the highest flood risk, which is the southern part of this site. The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF’s policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development.

There is an unmodelled watercourses located in close proximity to the eastern site boundary. Detailed hydraulic modelling will be required at FRA stage to accurately represent the risk from these watercourses. It is also recommended that site specific FRAs include modelling of the upper-end surface water flood event.

The impact of high groundwater levels must be assessed as part of a site-specific flood risk assessment; this must be supported by groundwater levels monitoring and must demonstrate that any proposed buildings with deep foundations do not increase flood risk elsewhere.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Storage for runoff from the development in extreme events should be located out of flood risk areas. The design must ensure that flows resulting from rainfall in excess of the 1% AEP event are managed via exceedance routes that minimise the risks to people and property.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe. Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

The design of SuDS schemes must take into account the seasonally high groundwater table and low permeability. Infiltration techniques may be ineffective and may pose a pollution risk. SuDS may need to be shallow and take up larger areas. Above ground conveyance and attenuation can be used but care must be taken that groundwater does not enter the SuDS feature and reduce the storage capacity and structural integrity of the design. Detailed site investigations will be required including infiltration testing and groundwater monitoring during the winter months (November through to March).

Conclusions

The site is bisected laterally by Tilehouse Lane. The southern section of site is shown to be at high risk of fluvial flooding as it is located in Flood Zone 3b. Flood flows enter the site from the east, conveyed from Pynesfield Lake, which provides flood storage for the Colne at this location. An ordinary watercourse flows along the eastern border of the site.

The northern section of the site is at significant surface water flood risk during the 3.3%, 1% and 0.1% present day AEP events and developers will need to carefully consider this risk and demonstrate users of the site can be kept safe during the lifetime of the development through a detailed site-specific FRA, including detailed surface water modelling.

Access to the site is available from the A412 Denham Way/North Orbital Road up to the 0.1% AEP event. However, mapping suggests that a culvert is present on this road, therefore the risk of blockage should be evaluated through detailed modelling as part of a site-specific FRA.

Shallow groundwater levels are present across much of the site. A site-specific flood risk assessment should confirm the risk to the site. This is likely to require ground investigations.

The following points should be considered in development of this site:

- The Exception Test should be undertaken and passed as the site is shown to be at risk during the design fluvial and surface water events.
- The site is at risk of reservoir flooding; a Flood Warning and Evacuation Plan should be prepared which considers the likely onset and duration of flooding and demonstrates how residents can safely be evacuated during the unlikely event of a reservoir breach.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed hydraulic modelling, with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site. This is in line with the sequential approach to site layout
- The unnamed watercourse which flows along the southeastern border of the site is an Ordinary Watercourse. A minimum 3m wide buffer should be maintained between the riverbank and any built structures, in line with the Hertfordshire Local Flood Risk Management Strategy, to enable riparian owners to access and maintain the channel

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Level 2 Strategic Flood Risk Assessment - Site NSS10

Land at Mill Place

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site NSS10. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council (TRDC) Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Land at Mill Place
- Site area: 0.59ha
- Existing site use: Brownfield - Warehouse
- Proposed site use: Residential

Topography

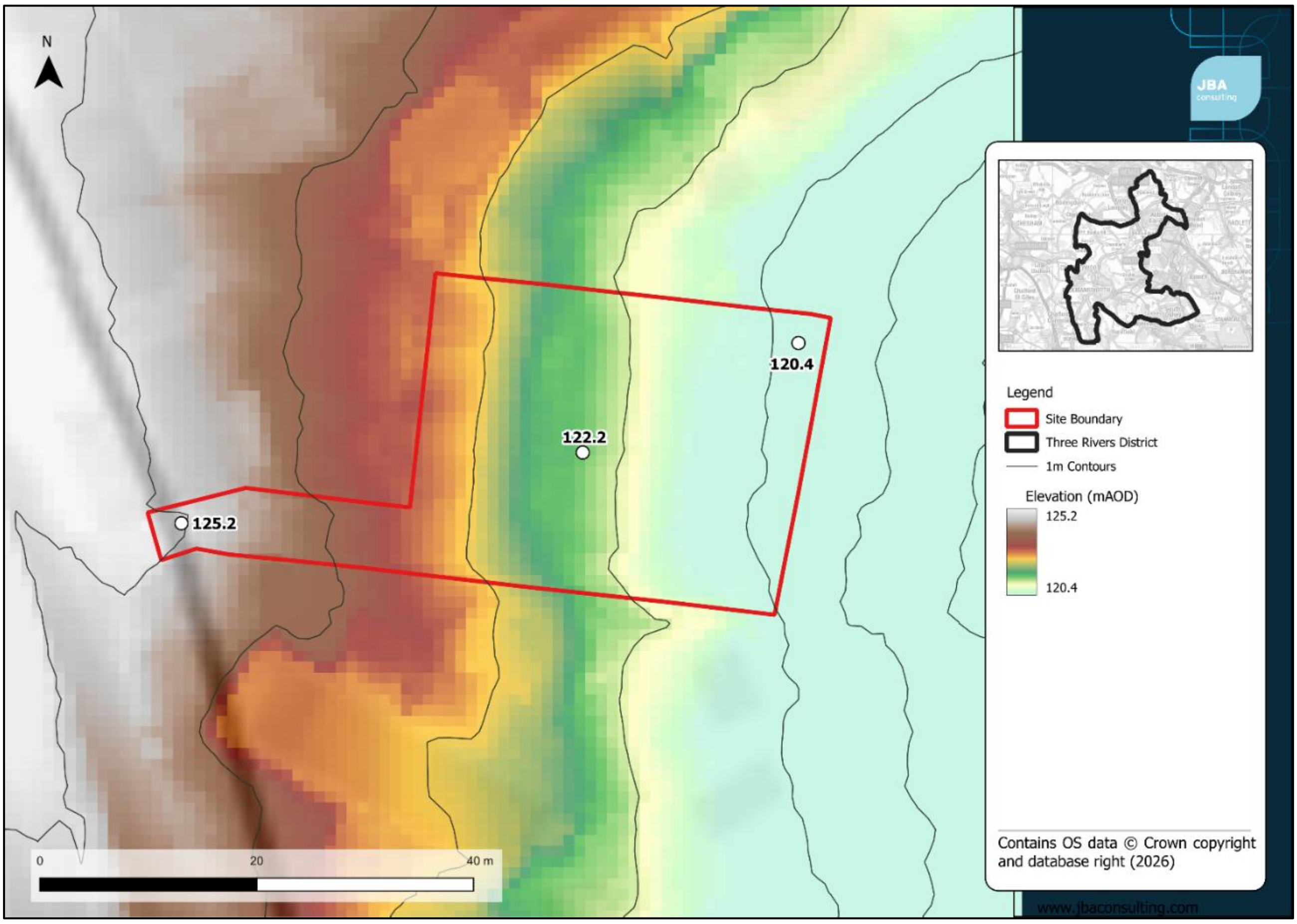

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

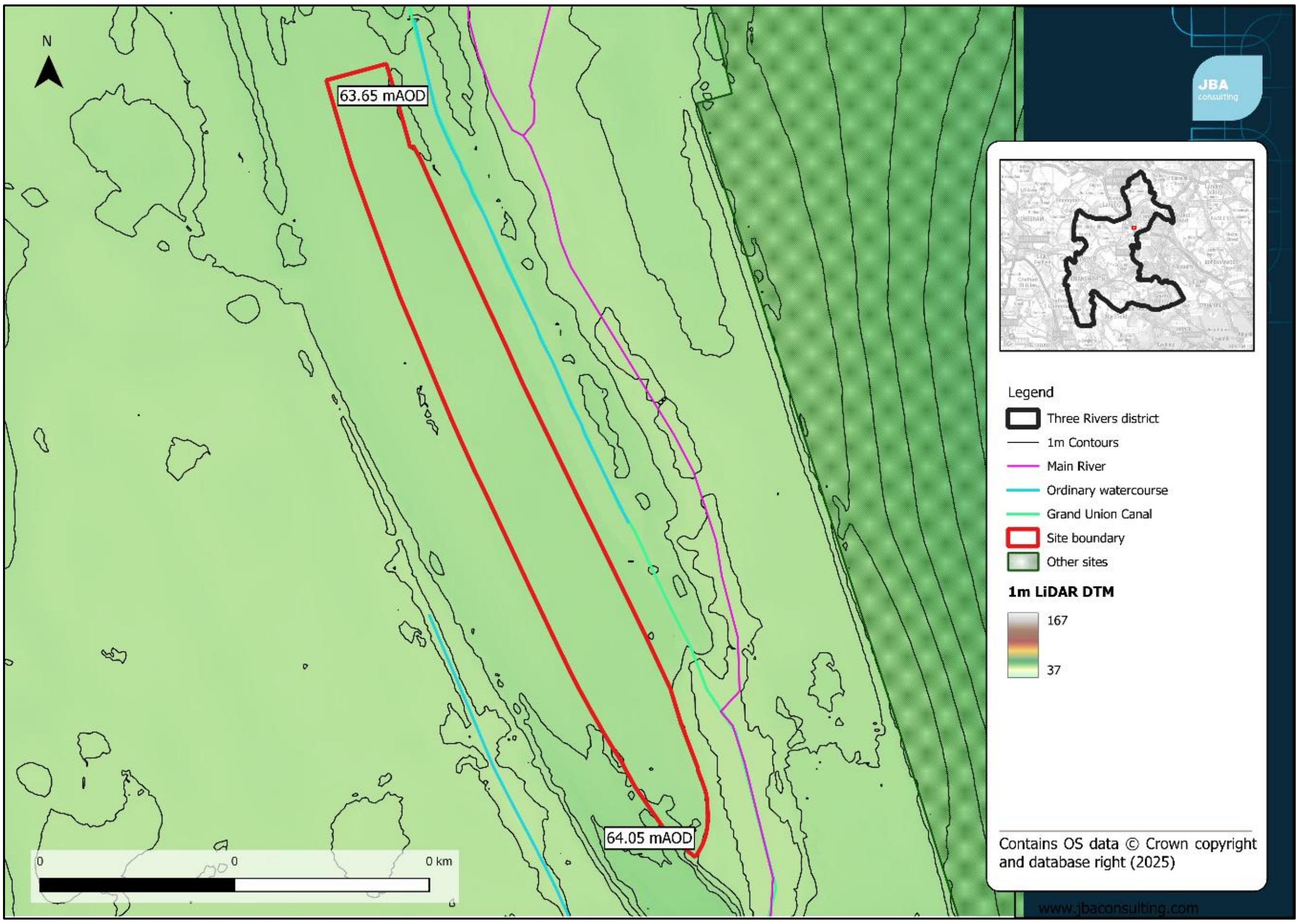

Figure 0-1: Topography of the site.

The LiDAR shows there is a decrease in elevation of approximately 0.4m across the site, from north to south. Levels in the northern corner are shown to be about 63.65mAOD (Above Ordnance Datum) and levels along the southern border are approximately 64mAOD. The site has a mild gradient; this flat topography is associated with its adjacency to the floodplain.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewes Nodular Chalk Formation
- Superficial - Clay, silt, sand and gravel (alluvium)

Soils at the site consist of:

- Loamy and clayey floodplain soils with naturally high groundwater

Sources of flood risk

Location of site within the catchment

The site is located within the Gade water body catchment, in the upper reaches within the district.

Existing drainage features

The site is in the north-east area of Hunton Bridge. The River Gade runs approximately 50m of the eastern site boundary, flowing in a south-east direction away from the site to Croxley Green. The Grand Union Canal also runs immediately adjacent to the eastern border of the site, merging with the Gade near the southeastern border.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset and, the Gade and Bulbourne model (2019) hydraulic model have been used to assess fluvial flood risk at this site. No detailed modelling results are available for the 3.33% defended event, therefore the 2% AEP defended event is used as proxy for Flood Zone 3b.

Description of risk to the site

The site is located primarily within Flood Zone 1. The River Gade modelling confirms that the site largely remains within Flood Zone 1, consistent with the FMfP. However, minimal flooding is predicted within the site boundary up to the 2% AEP defended event (equivalent to Flood Zone 3b). There is little change seen in the Flood Zone extents despite an increase in return period. In this area, the River Gade and Grand Union Canal merge, so flows and water levels in the channel are controlled.

Detailed modelling results are available for the 1% AEP defended and undefended scenarios and the 0.1% undefended events. The flood depths largely remain shallow up to the 0.1% AEP undefended event (<0.1m), with maximum depths of 0.22m. Flood velocity and hazard during the 0.1% AEP are 0.01m/s and 0.2 ('caution') respectively.

A maximum flood depth of 0.21m is predicted during the 1% AEP defended and undefended events. Flood velocity and hazard are also comparable between the two events and the 0.1% AEP event, at 0.01m/s and 0.2 ('caution').

Table 0-1: Existing fluvial flood risk based on the EA's FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
98.8	1.2	1.2	0.3

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The Environment Agency Risk of Surface Water flooding (RoFSW) data is available for the 3.3%, 1% and 0.1% AEP events. It should be noted that the data discussed below relates to the available surface water data published in March 2025 as part of the NAFRA2 release, and depth, hazard and velocity information published in September 2025. A comparison between the superseded RoFSW data and the newly released dataset is made in the Level 2 SFRA report.

Description of risk to the site

Up to 17.2% of the site is shown to be at surface water risk in the 0.1% AEP surface water event. The highest flood depths (up to 0.6m) are associated with ponding in the northern part of the site. Shallow flooding is also present along the northwest border of the site flowing from surface water accumulation on a topographic low point on A40 Watford Road. Velocities only reach 0.5 m/s in the 0.1% AEP event. The maximum hazard predicted for the site is 1.25 (‘Low - Caution).

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	5.3	7.7	17.2
Maximum depth (m)	0.2-0.3	0.2-0.3	0.3-0.6
Maximum velocity (m/s)	0-0.25	0.25-0.5	0.25-0.5
Maximum hazard classification	Low	Low	Low

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Canals

The Grand Union Canal is located immediately east of the site, which is operated by the Canal and Rivers Trust. Flood risk associated with the canal is incorporated within the Gade and Bulbourne model (2019). The assessment of fluvial flood risk is considered to give a reasonable indication of risk from canal flooding. No canal overtopping events have been reported in this location.

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that in the northwest of the site (approximately 22% of the site) is situated over an area with very shallow groundwater (within 0.025m of the ground surface). Elsewhere, ground water is likely to be between 0.025m and 0.5m below the ground. As such in addition to groundwater emergence, there is a significant risk of flooding to subsurface assets and below ground development such as basements.

Based on the RoFSW and topography of the site it is likely that any groundwater that emerges is likely to accumulate in the northwest of the site.

Surface water drainage is likely to be impeded during periods with high groundwater levels and infiltration may not be possible. There also may be ingress into sewer networks and below ground storage such as soakaways.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outlines the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five digit post code level. 16 reportable sewer incidents have occurred between 2015 and 2025 within the five-digit postcode area of the proposed development site. These incidents have been attributed to hydraulic overload following rainfall.

Flood history

The site is not identified to be within the Environment Agency's Historic Flood Map and Recorded Flood Outlines dataset.

Hertfordshire County Council records do show any incidents in the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three River Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

The River Gade and Bulbourne (2019) defended model was used to assess fluvial flood risk at the site with the application of climate change. The detailed modelling does not provide climate change outputs for the undefended scenarios, therefore, the defended 1% AEP plus climate change event has been used to inform this part of the assessment. The Environment Agency guidance recommends that the both the Central (21%) and Higher Central (35%) allowances are considered when assessing the impact of climate change.

Description of risk to the site

The NaFRA2 dataset predicts minimal change to the 1% AEP event plus central climate change event (Flood zone 3a) to 0.6%, but up to 69% of the site is predicted to be the 0.1% AEP plus climate change event (Flood Zone 2).

The Gade defended model shows a marginal increase in fluvial flood extents between the 1% and 1% AEP plus 35% climate change defended scenarios. However, the total coverage of the site is minor at <1% of the total site area. Maximum depth, velocity and hazard are comparable between the two events, remaining low and with little hazard ('Low - Caution') to the site.

Table 0-1: Comparison of fluvial flood risk to the site between the defended 1% AEP and 1% AEP plus 35% climate change extents.

Event	1% AEP	1% AEP plus 35%CC
Percentage of site at risk (%)	0.31	0.57
Maximum depth (m)	0.21	0.21
Maximum velocity (m/s)	0.01	0.01
Maximum hazard classification	Low	Low

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

The site is shown to flood during the 1% climate change event, covering up to 10.3% of the site during the 1% AEP plus 20% climate change event. As with the present day, surface water enters the site from the west (Watford Road), with localised flooding in the north-west. The maximum depth, velocity and hazard is shown to be 0.6m, 0.5m/s and 1.25 (a 'danger to some') during the 1% AEP plus 20% climate change event.

The 0.1% AEP shows that the flow path from Watford Road extends into the central part of the site. There is also an increase in the depth of ponding along the western border of the site, with maximum depths increasing from up to 0.3 to 0.6m. However, velocity remains low during this event, resulting in a moderate hazard.

Table 0-2: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	7.7	10.3
Maximum depth (m)	0.2-0.3	0.3-0.6
Maximum velocity (m/s)	0.25-0.5	0.25-0.5
Maximum hazard classification	Moderate	Moderate

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences. Raised canal embankments are only present upstream and downstream of the site.

Residual risk

The River Gade is culverted just south of the site, passing under the A40 (Watford Road).

Emergency planning

Flood warnings and alerts

The site is located in the River Gade at Kings Langley and Croxley Flood Warning Area and the Rivers Gade and Bulbourne Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Fluvial

Access is available during the 0.1% AEP fluvial event via Watford Road, which remains dry north and south of the site. In areas where flooding is present, depths do not exceed 0.3m and predicted hazard remain at 'Low'.

Surface water

Peak flood depths do not exceed 0.3m on Watford Road until the 0.1% AEP event. In the 3.33% AEP and 1% AEP events, the maximum predicted hazard is 'Low'. However, in the 0.1% AEP event, the maximum hazard is elevated to 'Significant' adjacent to the site.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- The bedrock geology is permeable but due to the presence poor draining soils with very shallow groundwater levels (within 0.025m) the use of infiltration SuDS may not be feasible at all times.
- Any detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- The site is located within Groundwater Source Protection Zone 1. Additionally, most of the site is designated by the Environment Agency as being a historic landfill site (Hunton Bridge landfill). As such, infiltration techniques should only be used where there are suitable levels of treatment and following the granting of any required environmental permits from the Environment Agency.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The layout and function of drainage systems need to be considered at the start of the design process for new development, as integration with road networks and other infrastructure can maximise the availability of developable land.
- The topography of the site is unlikely to affect any proposed SuDS features.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.
- SuDS should be designed with a holistic approach, combining ecology, landscape and drainage requirements specific to the site, and incorporating Biodiversity Net Gain requirements.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. There is an increase in flood risk to the central part of the site during the 0.1% AEP surface water event.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access.
- SuDS should be designed in line with the National Standards for Sustainable Drainage Systems.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as **'More Vulnerable'.**
The Exception Test is required for this site because the site is within Flood Zone 3b.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- Is located within Flood Zone 3a and 3b
- Is within 'Flood Zones plus Climate Change', showing it is at increased risk of flooding from rivers or sea in the future in the Flood Map for Planning.
- Increases the vulnerability classification and may be subject to sources of flooding other than rivers or sea

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and TRDC Local Plan Policies.
The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered away from areas at highest risk of flooding.

Developers should consider utilising the predicted western surface flow path as a green corridor or as a location for SuDS.
The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding. Due to the site's location within land designated by the EA as a historic landfill, infiltration may pose a pollution risk. SuDS may need to be shallow and take up larger areas. Above ground conveyance and attenuation can be used but care must be taken that groundwater does not enter the SuDS feature and reduce the storage capacity and structural integrity of the design.

Example features may include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.
The impact of high groundwater levels must be assessed as part of a site-specific flood risk assessment; this must be supported by groundwater levels monitoring and must demonstrate that any proposed buildings with deep foundations do not increase flood risk elsewhere.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

A small proportion of the site is located within Flood Zone 3b. According to the 2019 Gade and Bulbourne model, approximately 1% of the site is at risk of fluvial flooding in the 0.1% AEP event (Flood Zone 2). In this area, the River Gade and Grand Union Canal merge, so flows and water levels in the channel are controlled. The site shows low sensitivity to climate change in the 1% AEP (Flood Zone 3a plus central allowance) but a high sensitivity for the 0.1% AEP event (Flood Zone 2 plus central allowance).

The site is at moderate risk of surface water flooding. Up to 17.2% of the site is shown to be at surface water risk in the 0.1% AEP surface water event. The highest flood depths (up to 0.6m) are associated with ponding in the northern part of the site.

The River Gade is culverted just south of the site, passing under the A40 (Watford Road). A developer must investigate the residual risk associated with a culvert in a site-specific flood risk assessment.

Shallow groundwater levels are present across much of the site. A site-specific flood risk assessment should confirm the risk to the site. This is likely to require ground investigations.

The following points should be considered in development of this site:

- The Exception Test should be undertaken and passed.
- A site-specific Flood Risk Assessment should demonstrate that site users will be safe in the 1% surface water AEP event, and the 1% AEP fluvial event, plus an allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and the development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- The site is in a located on a historic landfill site; therefore, a thorough ground investigation will be required as part of a drainage strategy to determine the extent of the contamination and SuDS features may need to be lined.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed hydraulic modelling, with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site. This is in line with the sequential approach to site layout.

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Level 2 Strategic Flood Risk Assessment - Site OSPF6

Land west of Leavesden Aerodrome, Hunton Bridge

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site OSPF6. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council (TRDC) Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Land west of Leavesden Aerodrome, Hunton Bridge
- Site area: 19.96 ha
- Existing site use: Greenfield
- Proposed site use: Employment

Topography

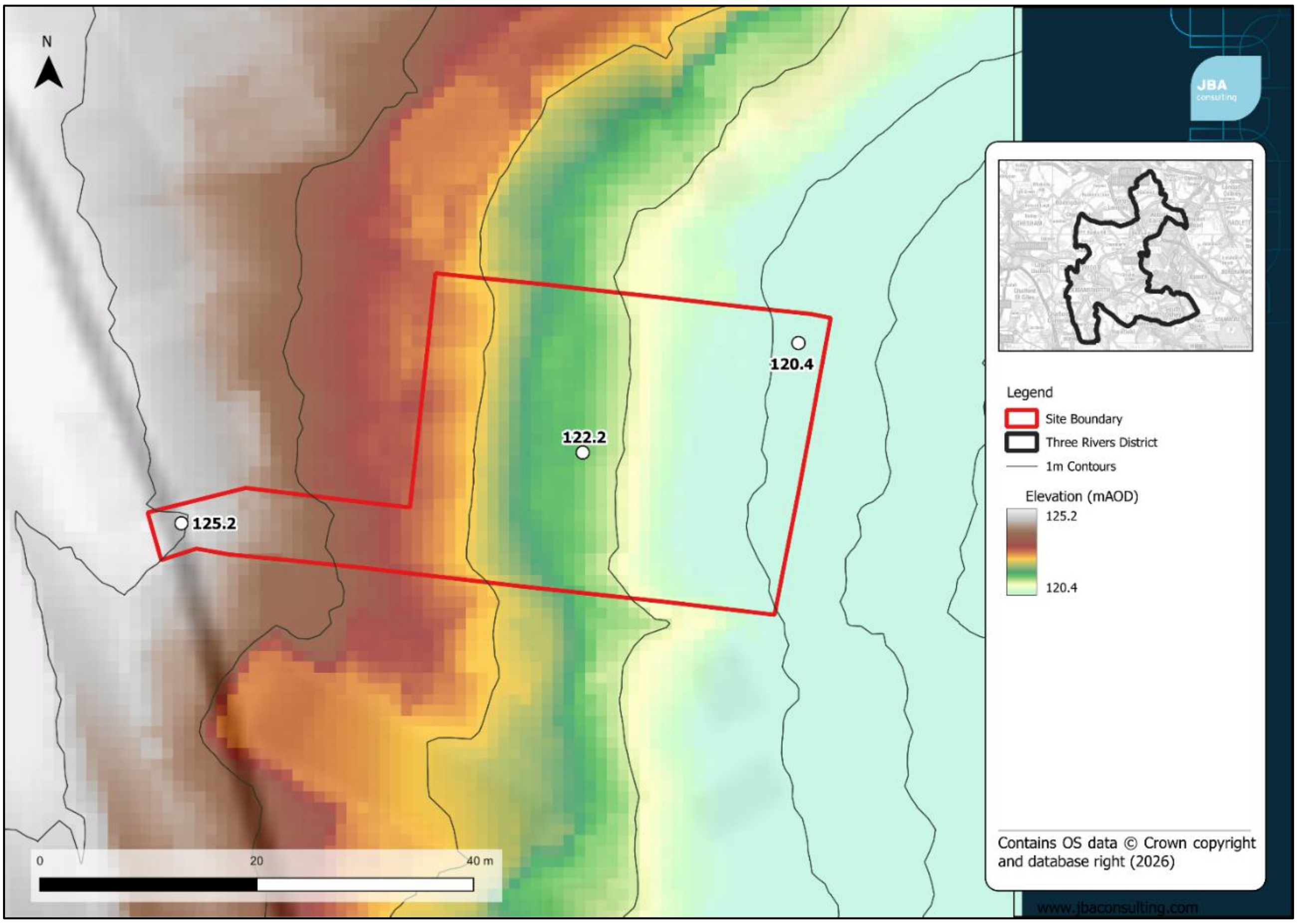

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

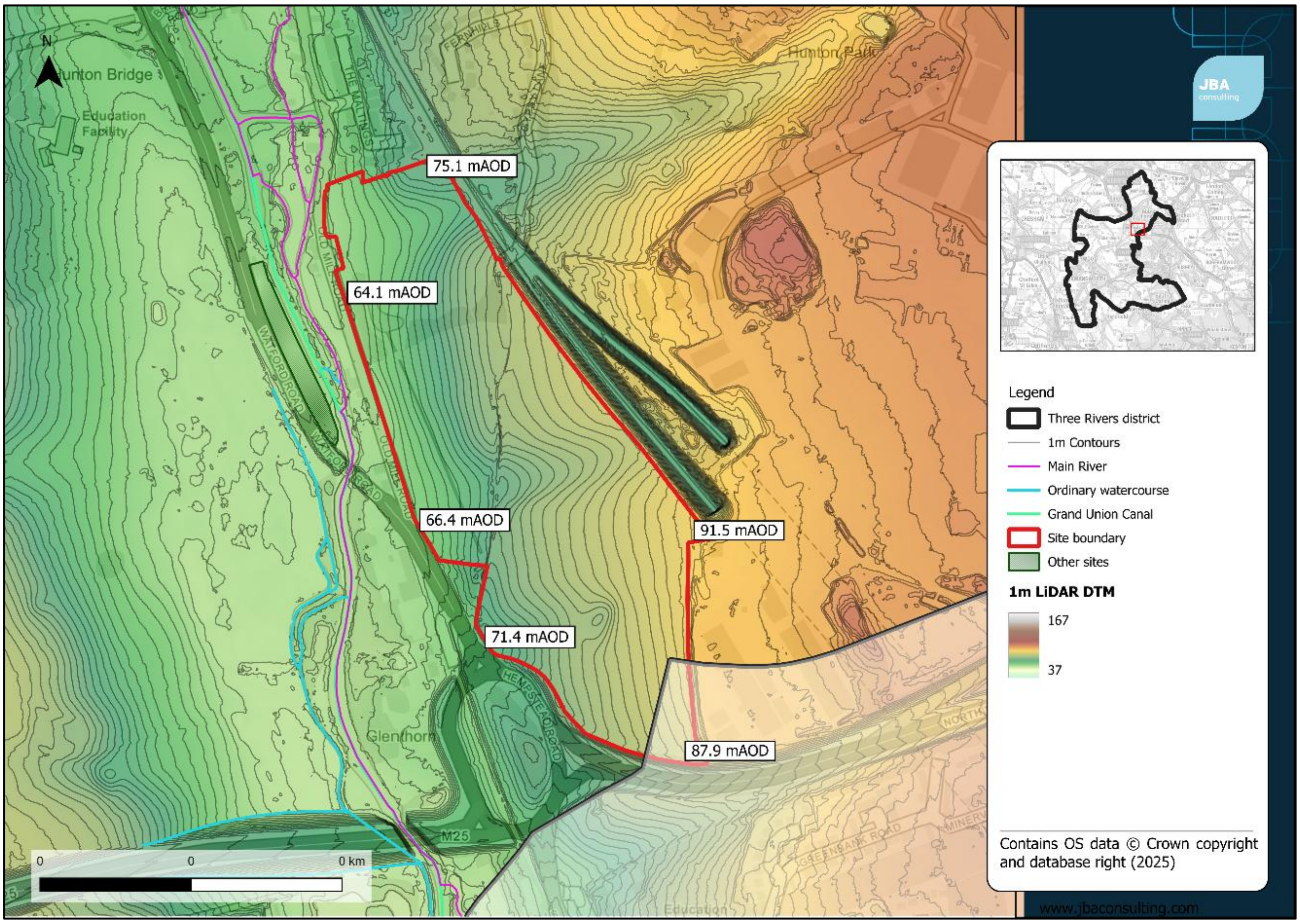

Figure 0-1: Topography of the site.

The LiDAR shows that the site has a predominant westward gradient, with a decrease in elevation from 91.5mAOD in the southwest to 64.1mAOD in the northwest.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewes Nodular Chalk Formation
- Superficial - Head, 1-Clay, silt, sand and gravel

Soils at the site consist of:

- Freely draining slightly acid, loamy soils

Sources of flood risk

Location of site within the catchment

The site is located within the Gade water body catchment, in the upper reaches within the district.

Existing drainage features

The site is in the north-east area of Hunton Bridge. The River Gade flows within 50m of the northwest site boundary, flowing in a south-east direction away from the site to Croxley Green. The Grand Union Canal also runs immediately adjacent to the western border of the site, merging with the Gade near the southeastern border.

Fluvial

Available data

The EA’s Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset and, the Gade and Bulbourne model (2019) hydraulic model have been used to assess fluvial flood risk at this site. No detailed modelling results are available for the 3.33% defended event, therefore the 2% AEP defended event is used as proxy for Flood Zone 3b.

Description of risk to the site

The site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site.

Table 0-1: Existing fluvial flood risk based on the EA's FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The Environment Agency’s Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070’s epoch, unless the allowance for the 2050’s epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

Only 1.4% of the site is shown to be at surface water risk in the 0.1% AEP surface water event. Surface water flooding is localised at a topographic depression present in in the south-central part of the site, this extents to a flow path in the 0.1% AEP event. There is a small flow path that forms east of this ponding in the 0.1% AEP event; however, this is predicted to be shallow flooding (<0.2m).

The highest flood depths associated with ponding in the site is between 0.6 and 0.9m in all three events. Peak velocities increase in the 0.1% AEP to up to 1m/s. The maximum hazard predicted for the site across all three events is 'Significant - Danger for some', however this is limited to the area of deep ponding. Other flow paths in the site are classified as 'Low' hazard.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0.3	0.4	1.4
Maximum depth (m)	0.6-0.9	0.6-0.9	0.6-0.9
Maximum velocity (m/s)	0.25-0.5	0.25-0.5	0.5-1.0
Maximum hazard classification	Significant	Significant	Significant

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Canals

The Grand Union Canal is located immediately east of the site, which is operated by the Canal and Rivers Trust. Flood risk associated with the canal is incorporated within the Gade and Bulbourne model (2019). The assessment of fluvial flood risk is considered to give a reasonable indication of risk from canal flooding. No canal overtopping events have been reported in this location.

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that in the west of the site is situated over an area with shallow groundwater (between 0.025m and 0.5m of the ground surface). Elsewhere, ground water is likely to be between 0.5m and 0.5m below the ground. Due to this variation across the site, the presence of superficial deposits which increase permeability, allowing a localised rise in groundwater. Based on the RoFSW and topography of the site it is likely that any groundwater that emerges will flow away from the site towards the fluvial floodplain. There are no dominant flow paths that convey runoff in the north of the site.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outlines the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five digit post code level. 16 reportable sewer incidents have occurred between 2015 and 2025 within the five-digit postcode area of the proposed development site. These incidents have been attributed to hydraulic overload following rainfall.

Flood history

The site is not identified to be within the Environment Agency’s Historic Flood Map and Recorded Flood Outlines dataset.

Hertfordshire County Council records show two incidents of surface water flooding (from surcharged drains) to properties in a 300m radius of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three River Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

The River Gade and Bulbourne (2019) defended model was used to assess fluvial flood risk at the site with the application of climate change. The detailed modelling does not provide climate change outputs for the undefended scenarios, therefore, the defended 1% AEP plus climate change event has been used to inform this part of the assessment. The Environment Agency guidance recommends that the both the Central (21%) and Higher Central (35%) allowances are considered when assessing the impact of climate change.

Description of risk to the site

The NaFRA2 dataset shows that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site when the central allowance is applied to the 1% AEP (Flood Zone 3) and 0.1% AEP (Flood Zone 2).

The Gade defended model also shows no increase in risk to the site.

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

The predicted flood extents show little sensitivity to climate change, with no increase in peak depth, velocity and hazard. The 0.1% AEP extent shows the largest flood extents and depths within the site.

Table 0-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	0.4	0.4
Maximum depth (m)	0.6-0.9	0.6-0.9
Maximum velocity (m/s)	0.25-0.5	0.25-0.5
Maximum hazard classification	Significant	Significant

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences. Raised canal embankments are only present upstream and downstream of the site.

Residual risk

The River Gade is culverted on the Watford Road (immediately west of the site) and on Bridge Road (approximately 260m north of the site.

Emergency planning

Flood warnings and alerts

The site is located in the River Gade at Kings Langley and Croxley Flood Warning Area and the Rivers Gade and Bulbourne Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Access to the site is likely through Old Mill Road and Watford Road.

Fluvial

Access is available during the 0.1% AEP fluvial event through both routes, which remains dry north and south of the site. In areas where flooding is present, depths are not expected to exceed 0.25m and predicted hazard remains at 'Low'.

Surface water

Old Mill Road remains unaffected by flooding up to the 0.1% AEP event.

Access to south of the site through Watford is affected in the 0.1% AEP event. Peak flood depths do not exceed 0.3m on Watford Road up to the 0.1% AEP event. In the 3.33% AEP and 1% AEP events, the maximum predicted hazard is 'Low'. However, in the 0.1 % AEP event, the maximum hazard is elevated to 'Significant' adjacent to the site.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- The bedrock geology is permeable but due to the presence poor draining soils with very shallow groundwater levels (within 0.025m) the use of infiltration SuDS may not be feasible at all times.
- Any detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- The site is located within a Groundwater Source Protection Zone. Additionally, most of the site is designated by the Environment Agency as being a historic landfill site (Hunton Bridge landfill). As such, infiltration techniques should only be used where there are suitable levels of treatment and following the granting of any required environmental permits from the Environment Agency.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water ponding and flow paths. Existing flow paths should be retained and integrated with blue-green infrastructure
- The layout and function of drainage systems need to be considered at the start of the design process for new development, as integration with road networks and other infrastructure can maximise the availability of developable land.
- The topography of the site is unlikely to affect any proposed SuDS features.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible constraints.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.
- SuDS should be designed with a holistic approach, combining ecology, landscape and drainage requirements specific to the site, and incorporating Biodiversity Net Gain requirements.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. There is an increase in flood risk to the central part of the site during the 0.1% AEP surface water event.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access.
- SuDS should be designed in line with the National Standards for Sustainable Drainage Systems.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies commercial development as **'Less Vulnerable'.**
The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- the flood map for planning shows it is at risk of flooding from surface water
- is subject to sources of flooding other than rivers or sea

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and TRDC Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered away from areas at highest risk of flooding.

Developers should consider utilising predicted flow paths in the site as a green corridor or as a location for SuDS.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. Hydraulic modelling should also be undertaken during a site-specific Flood Risk Assessment to evaluate the risk from blockage of culverts present near the site.

Development should be directed away from areas of significant surface water A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding. Due to the site's location within land designated by the EA as a historic landfill, infiltration may pose a pollution risk. SuDS may need to be shallow and take up larger areas.

Above ground conveyance and attenuation can be used but care must be taken that groundwater does not enter the SuDS feature and reduce the storage capacity and structural integrity of the design. Example features may include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

The impact of high groundwater levels must be assessed as part of a site-specific flood risk assessment; this must be supported by groundwater levels monitoring and must demonstrate that any proposed buildings with deep foundations do not increase flood risk elsewhere.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is predicted to remain Flood Zone 1 up to the 0.1% AEP event plus 20% (central) climate change, and so is identified as being at low fluvial risk.

Surface water risk is present from the 3.33% AEP. However, up to the 1% AEP event significant depths are only predicted in an area of ponding at a topographic depression in the south-central part of the site. In the 0.1% there is an extension of this ponding to a minor flow path, but this affects less than 2% of the site.

The River Gade is culverted on the Watford Road (immediately west of the site) and on Bridge Road (approximately 260m north of the site. A developer must investigate the residual risk associated with these culverts in a site-specific flood risk assessment.

Shallow groundwater levels are present across much of the site. A site-specific flood risk assessment should confirm the risk to the site. This is likely to require ground investigations.

The following points should be considered in development of this site:

- A site-specific Flood Risk Assessment should demonstrate that site users will be safe in the 1% surface water and fluvial events, plus an allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and the development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed hydraulic modelling, with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site. This is in line with the sequential approach to site layout.

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Level 2 Strategic Flood Risk Assessment - Site PCS2

East Carpenders Park

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site PCS2. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: East Carpenders Park
- Site area: 5.26 ha
- Existing site use: Previously developed brownfield and greenfield land
- Proposed site use: Employment

Topography

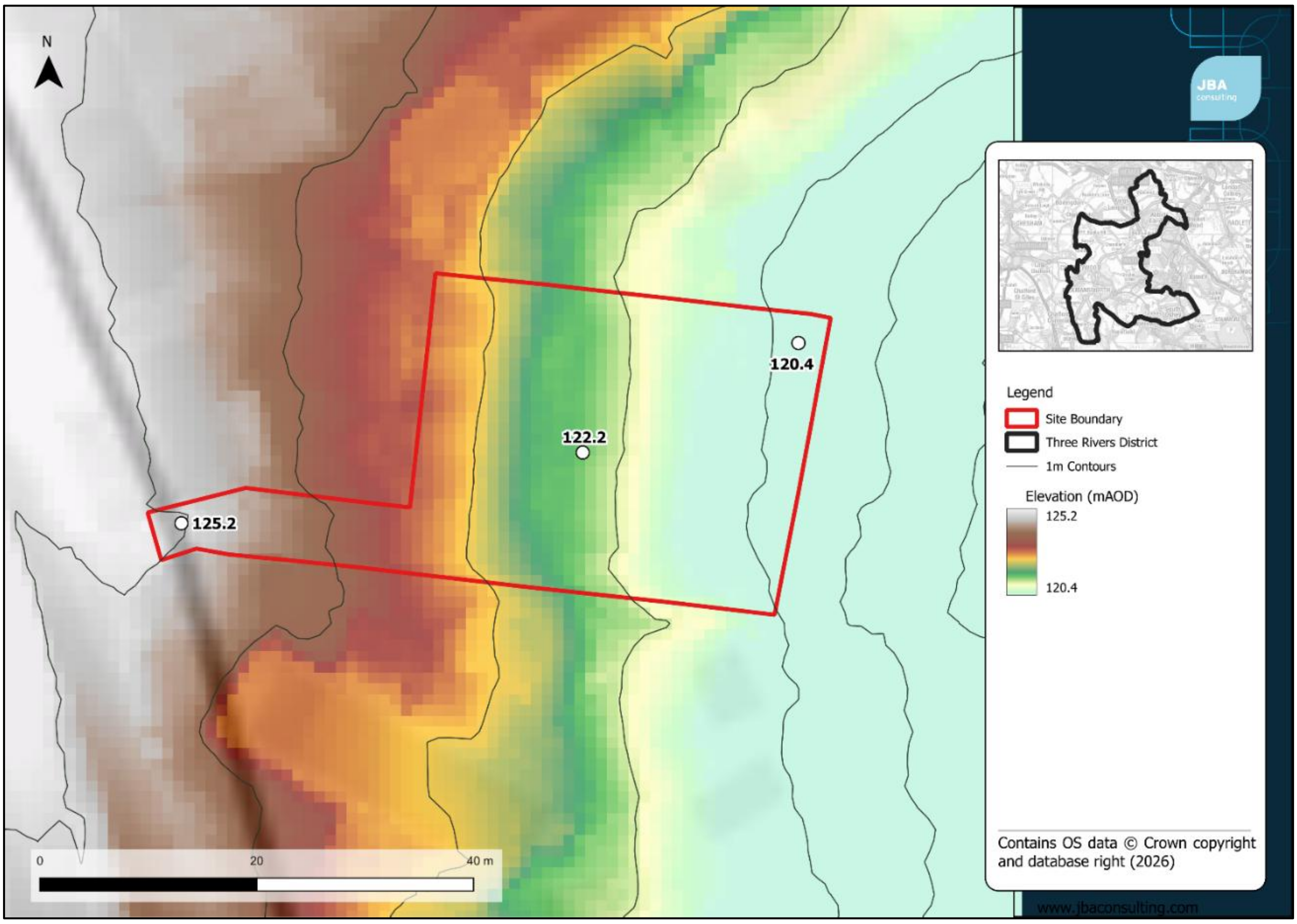

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

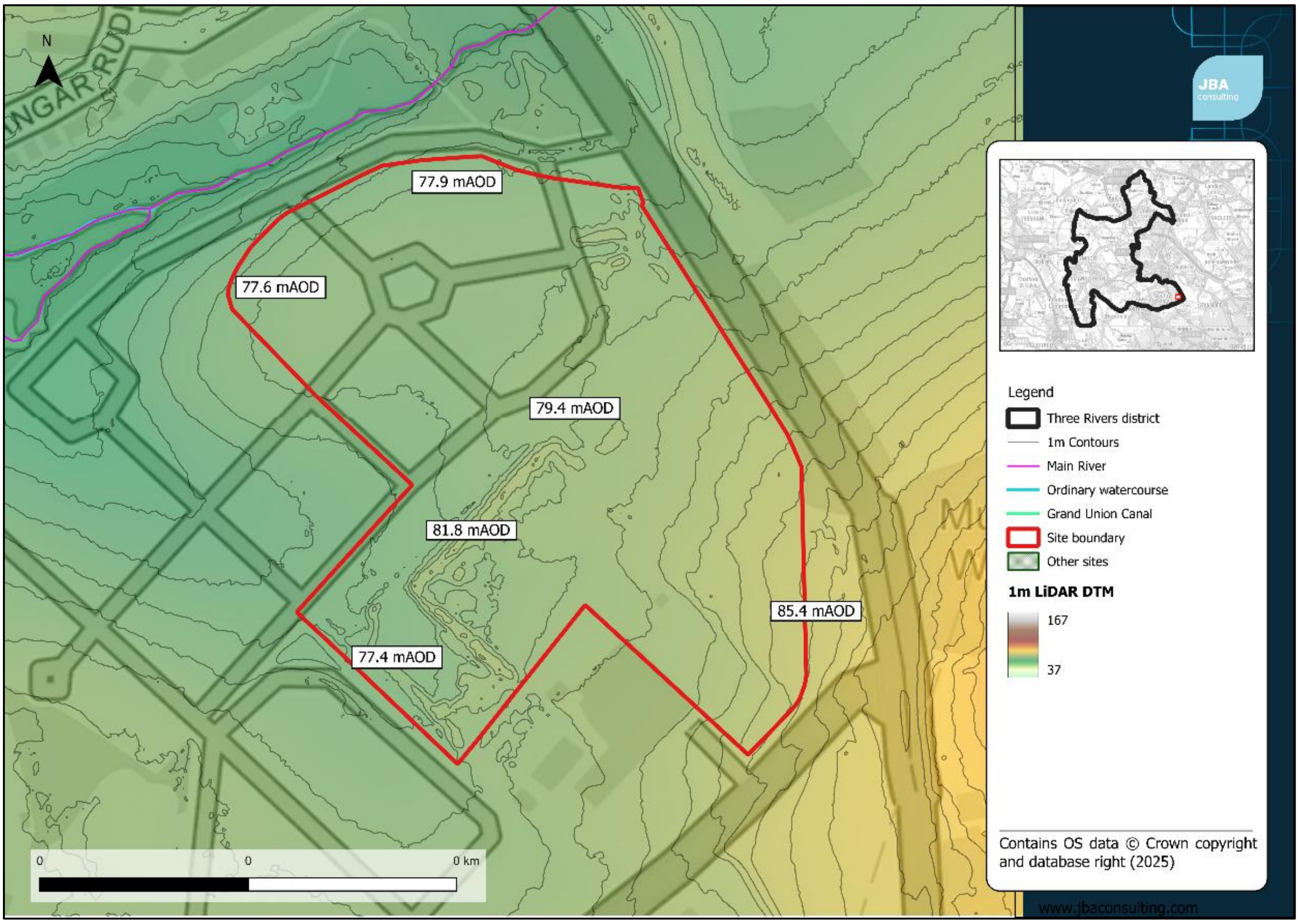

Figure 0-1: Topography of the site.

There is southeast to northwest gradient, with elevations range from 85.4mAOD to 77.6mAOD in the north and 77.4mAOD in the west. There is a localised area of high ground in centre to the west of the site, with a highest point reaching 81.8mAOD.

Geology and soils

Geology at the site consists of:

- Bedrock - London Clay Formation
- Superficial - None recorded

Soils at the site consist of:

- The soil at this site is unclassified. Soils in areas in close vicinity to site are classified as slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey soils

Sources of flood risk

Location of site within the catchment

The site is located within the Pinn Water Body catchment. The Pinn is a tributary of the River Colne and forms part of the Upper Colne operational catchment within the Thames River Basin District.

Existing drainage features

The Hartsbourne Stream (which is a main river) is approximately 30m north of site boundary.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) and the Upper Colne (2025) hydraulic model have been used to assess fluvial flood risk at this site. The Hartsboune Stream is represented in the Upper Colne 2025 model.

Description of risk to the site

The site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site. The more recent, Upper Colne modelling confirms that the site remains within Flood Zone 1, outside the Flood Zone 2 extent, consistent with the FMfP.

Table 0-1: Existing fluvial flood risk based on EA FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The RoFSW mapping shows that the site is at risk of surface water flooding in the west from a large external flow path. The flow path appears to emerge from east of Oxhey Lane (outside the district boundary) and converges with an unnamed watercourse which flows along the western boundary of the site PCS47 before crossing Little Oxhey Lane and reaching the site. There is also a significant area of ponding around the high ground in the central part of the site. From satellite imagery, this area of high ground is greenfield and appears to act as storage from the 3.33% AEP event.

During the 3.3% AEP event, the maximum depth of floodwater is 0.6m, is predicted near the western border where the external flow path enters the site. Elsewhere flood depths largely remain under 0.3m. The maximum flow velocity in this event reaches 1m/s where the flow path enters and leaves the site, once runoff enters the site it slows to 0.25-0.5m/s. The maximum hazard classification predicted is 'Significant'. In the 1% AEP event the maximum predicted depth within most of the site are at or below 0.6m with only small areas near the western border reaching 0.9m. Flood depths across the site largely remain low (below 0.3m) The peak flow velocity also remains at 1m/s, resulting in a maximum hazard classification of 'Significant'.

During the 0.1% AEP event, flood depths up to 0.6m are expected across much of the at-risk areas though there are no new areas of inundation precited only. A larger area near the western boundary experiences deeper flooding (up to 0.9m) though this limited to low ground near the boundary. The maximum flow velocity predicted is 2m/s near the boundary where the flow path enters and exits, elsewhere there is no significant increase in peak velocity compared to the lower return periods. As such the maximum hazard classification remains at 'Significant'

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	5.7	7.5	10.3
Maximum depth (m)	0.3-0.6	0.3-0.6	0.6-0.9
Maximum velocity (m/s)	0.5-1.0	0.5-1.0	1.0-2.0
Maximum hazard classification	Significant	Significant	Significant

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The Hartsbourne Flood Storage Area is located to the east of the site, the site itself is not predicted to be at risk of reservoir flooding. However, the main access to the site (the A4008) will be affected, as such as part of a site-specific Flood Risk Assessment, an agreed emergency plan should identify appropriate safe access and egress routes from the site, in the highly unlikely event of a reservoir breach.

Groundwater

The JBA Groundwater Emergence Map shows that the site is within an area of low risk from groundwater flooding.
This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 46 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The EA Historic Flood Map and Recorded Flood Outline mapping identifies that flooding from Hartsbourne Stream in May 1988 reached land north of the boundary, but the site itself is outside of these extents.

In addition, Hertfordshire County Council records identify that a number of surface water flooding incidents have occurred within the vicinity of the site, within South Oxhey, Oxhey and Carpenders Park.

Climate Change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling is also available as part of the Upper Colne 2025 model. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.

The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The NaFRA2 dataset shows that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site when the central allowance is applied to the 1% AEP (Flood Zone 3) and 0.1% AEP (Flood Zone 2).

The Upper Colne defended model also shows that the site is outside of the 1% AEP defended plus 35% climate change event extent.

Surface water

Available data

The Environment Agency’s Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070’s epoch, unless the allowance for the 2050’s epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

The extent of flooding at the site is broadly consistent with the present-day surface water model. While areas of pooling increase slightly in size, no new areas of flooding are predicted. The site is mildly sensitive to climate change.

During the 1% AEP plus climate change scenario flood extent on site increases to 8.3% compared to the present-day scenario, but the extents do not reach the 0.1% AEP present day scenario. Floodwater is expected to reach a maximum depth of 0.6m near the eastern boundary and around the central area of ponding. The maximum flow velocity predicted is 1m/s near the point where the flow path enters elsewhere peak velocities are limited to 0.25-0.5m/s, resulting in a maximum hazard classification of 'Significant'. This remains consistent with the present-day 1% AEP scenario, indicating that there is little increase in flood risk in the climate change scenario.

Table 0-3: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 25% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	7.5	8.3
Maximum depth (m)	0.3-0.6	0.3-0.6
Maximum velocity (m/s)	0.5-1.0	0.5-1.0
Maximum hazard classification	Significant - danger for most	Significant - danger for most

Flood risk management infrastructure

Defences

The EA AIMS dataset shows there is two embankment present east of the A4008 which impound the Hartbourne Flood Storage Area. The design standard of protection is indicated to be 1% AEP. The Upper Colne 2025 model includes representation of all flood defences in the AIMS database, as such the undefended scenario represents the flood risk to site when these defences are not breached or not present.

Residual risk

Residual risk is present due to the situation of culverts. The Hartsboune Stream is culverted under the Oxhey Lane (A4008). Blockages from debris may restrict flow can cause water to back up, potentially leading to large areas of flooding.
Residual risk is also present from the Hartsbourne Flood Storage area in the unlikely event of a breach.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Access to the site is available from Oxhey Lane A4008, that is immediately adjacent to the eastern boundary of the site.

Fluvial

Oxhey Lane is shown to be in Flood Zone 3b (3.33% AEP defended event), due to Hartbourne Stream and its proximity to the Hartsbourne Flood Storage Area. Flood depths on Oxhey Lane adjacent to the site are predicted to largely remain below 0.25m in the 1% AEP and 0.1% AEP undefended events (Flood Zone 3a and Flood Zone 2 respectively). Velocities in the 1% AEP undefended event remain low (up to 0.25m/s) and hazard is 'Low'. In the 0.1% AEP event peak velocity reaches up to 1m/s in limited areas but hazard remains at 'Low'.

It should be noted however that the flood risk predicted in the defended events is higher than the undefended. In the 3.33% AEP event, peak depths and hazard are equivalent to the 1% AEP undefended event but peak velocity is elevated up to 1m/s on Oxhey Lane. The 1% AEP plus climate change defended event exceeds the 0.1% AEP event. Flood depths are increased to 0.35m in localised areas and peak velocity increases up to 1.7m/s, but hazard is not elevated (it remains at 'Low').

Surface water

Oxhey Lane is shown to be affected by surface water flooding from the 3.33% AEP event, but flood depths remain shallow (less than 0.2m) up to the 0.1% AEP event. The peak velocity reaches up to 1m/s in localised areas on Oxhey Lane, the maximum hazard predicted is 'Low'. Therefore, access to the site is not impeded up to the 0.1% AEP event.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- The site is considered to have very low susceptibility to groundwater flooding; this should be confirmed through additional site investigation work. Below ground development such as basements may still be susceptible to groundwater flooding.
- BGS data indicates that the underlying geology is the London Clay Formation and is likely to be poorly draining. Any proposed use of infiltration should be supported by infiltration testing. Off-site discharge in accordance with the SuDS hierarchy is required to discharge surface water runoff.
- The site is located within Groundwater Source Protection Zone 3 This is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source.
- The site is not located within a historic landfill site.
- The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths from the 3.33% AEP event. Existing flow paths should be retained and integrated with blue-green infrastructure.

Opportunities for wider sustainability benefits and integrated flood risk management

- Opportunities for using source control SuDS to manage runoff rates and volumes, contributing to the reduction of flood peaks downstream and existing surface water flow paths leaving the site.
- SuDS techniques implemented on the site should seek to manage the on-site and downstream impacts of the existing large surface water flow path. This should include preservation of the area in the west of the site which impounds runoff in the 3.33% AEP and higher surface water events.

- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should consider the impacts of future climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition of receiving waterbodies
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
- Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies commercial development as 'Less Vulnerable'.
The Exception Test is not required for this site because the site is located in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- the Flood Map for Planning shows it is at risk from surface water flooding.

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

Detailed modelling will be required to confirm the impact to flood risk from blockage to the culvert on Oxhey Lane. Demonstration that safe access and egress is required for the 1% AEP plus upper end climate change event. The impact of the development on flood risk from all sources both on and off-site must be considered and modelled where appropriate. The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development must seek opportunities to reduce overall level of flood risk both on and off-site, for example by reducing volume and rate of runoff and creating space for flooding.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The eastern part of the site is at risk of surface water flooding due to a large flow path that emerges from outside the site district boundary. Flood depths are not significant (exceeding 0.3m) across much of the site until the 0.1% AEP event. High velocities (>1m./s) are only predicted where the flow path enters and leaves the site, once runoff enters the site it slows to 0.25-0.5m/s. In the 0.1% AEP event, flood depths are up to 0.6m across much of the inundated area in the east of the site. The maximum hazard classification across all three surface water events is 'Significant'.

The site is located within Flood Zone 1 and is outside of the flood extents of the Hartsbourne Stream. It should be noted that due to the proximity of the Hartsbourne Flood Storage Area and its embankments, there is a localised increase flood risk to the Oxhey Lane predicted in the fluvial defended scenario when compared to the undefended modelling. During the 0.1% AEP undefended and 1% AEP plus central climate change defended extents, there is risk to the Oxhey Lane, but access is likely still possible. Surface water mapping used in this assessment also suggests that while flooding is present on Oxhey Lane from the 3.33% AEP event onwards, access is not significantly impeded up to the 0.1% AEP event.

The current use of the site is commercial but as residential development is proposed, there is an increase in vulnerability from 'Less Vulnerable' to 'More Vulnerable'. However, due to its location in Flood Zone 1, the exception test is not required.

There is residual risk of flooding from the culvert where the Hartsbourne Stream flows under Oxhey Lane. The risk of blockage should be modelled and evaluated as part of a site-specific Flood Risk Assessment. There is also residual risk from the Hartsbourne Flood Storage Area. An agreed emergency plan should identify appropriate safe access and egress routes from the site, in the highly unlikely event of a reservoir breach.

The following points should be considered in development of this site:

- Hydraulic modelling should be undertaken during a site-specific Flood Risk Assessment to assess and quantify from blockage of the culvert on Oxhey Lane.
- Development should be directed away from areas of significant surface water flood risk. Additionally, surface water flow routes should be preserved if carrying out land-raising within the surface water risk area.
- Access from this site is important to the overall safety of this development, and therefore this should be discussed with the Local Planning Authority and Environment Agency at the earliest stage.
- The site would benefit from SuDS implementation to manage surface water, improve water quality, and deliver wider sustainability benefits such as biodiversity and amenity.

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Level 2 Strategic Flood Risk Assessment - Site PCS47

South of Little Oxhey Lane, Carpenders Park

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site PCS47. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: South of Little Oxhey Lane, Carpenders Park, WD19 6FW
- Site area: 19.42
- Existing site use: Greenfield
- Proposed site use: Residential

Topography

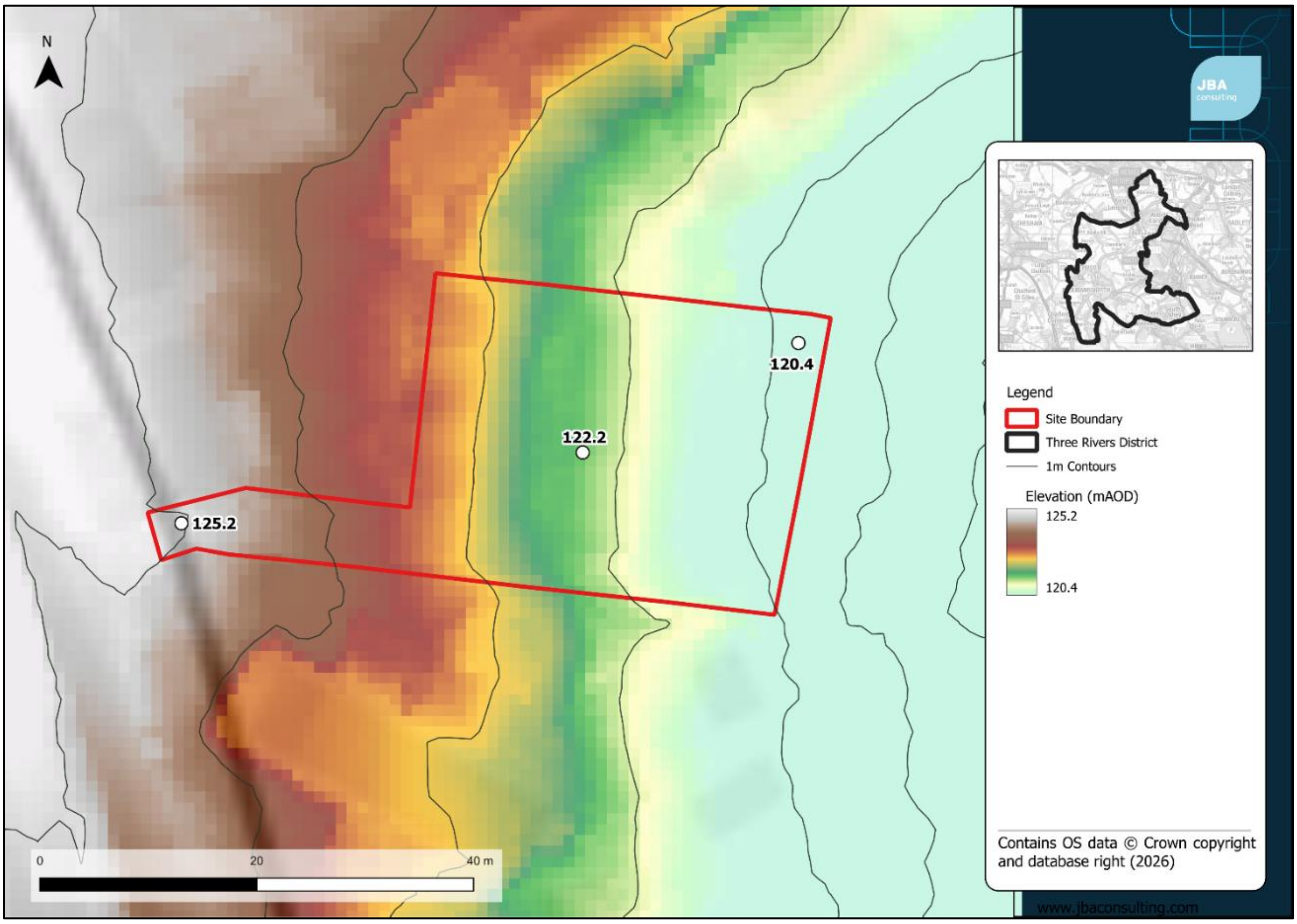

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR.

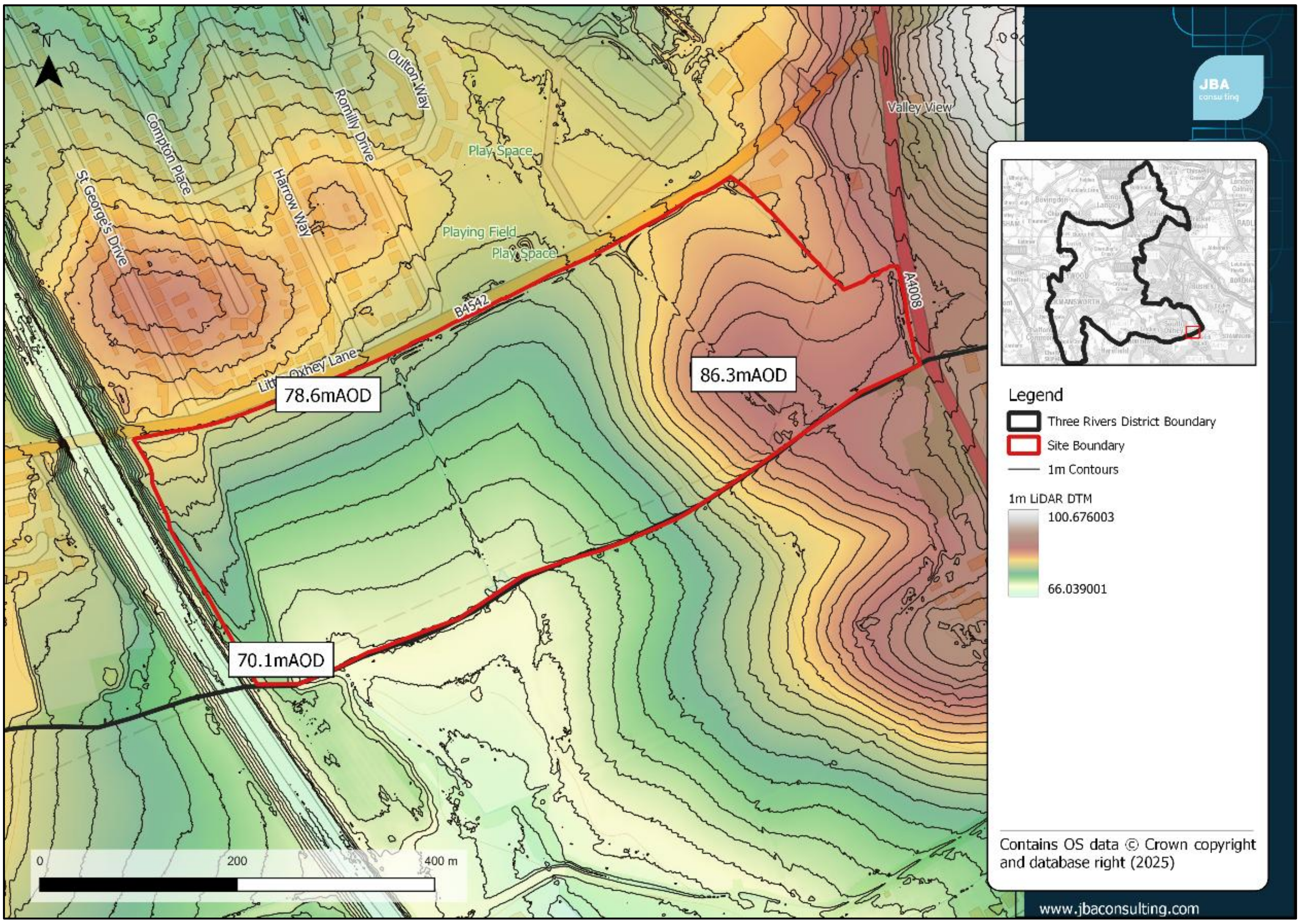

Figure 0-1: Topography of the site.

The western area of the site slopes gently downward from north to south, with elevations ranging from approximately 77.5mAOD to 78.6mAOD in the north, reducing to around 70.1mAOD to 71.3mAOD in the south. There is a more significant gradient from east to west, with the highest point located in the eastern area at about 86.3mAOD, falling to the lowest point in the southeast at 70.1mAOD.

Geology and soils

Geology at the site consists of:

- Bedrock - London Clay Formation
- Superficial - None recorded

Soils at the site consist of:

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

Sources of flood risk

Location of site within the catchment

The site is located within the Pinn Water Body catchment. The Pinn is a tributary of the River Colne and forms part of the Upper Colne operational catchment within the Thames River Basin District.

Existing drainage features

An unnamed ordinary watercourse flows southwards through the centre of the site and forms the southern boundary. A second watercourse is located on the eastern boundary of the site. Both form tributaries of the Main River Pinn. The two watercourses are not contained within the available watercourse GIS layer however, they are shown on the OS background mapping. The LiDAR data shows a land drain in the eastern area of the site, also flowing southward toward the southern boundary. Additionally, another land drain flows along the northern boundary of the site connecting to the watercourses.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) and the Upper Colne (2025) hydraulic model have been used to assess fluvial flood risk at this site.

Description of risk to the site

The site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site. The more recent, Upper Colne modelling confirms that the site remains within Flood Zone 1, outside the Flood Zone 2 extent, consistent with the FMfP.

Table 0-1: Existing fluvial flood risk based on EA FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The surface water flooding extent across the site is mainly present in the watercourses on site. The largest extent is present in the eastern watercourse, where flows exceed the course and large areas of ponding occur. The northern and central watercourses experience surface water flooding, leading down to the southern boundary of the site where an area of ponding is present at the topographical low. Small areas of localised flooding are present in the centre of the site.

During the 0.1% AEP event, floodwater is expected to reach a maximum depth of 0.6m in small areas within the watercourses and land drains, with larger extents such as ponding experiencing depths between 0.2m and 0.3m. The maximum flow velocity predicted is 1m/s, resulting in a maximum hazard classification of 'Significant'.

The 1% AEP event shows that floodwater is expected to reach a maximum depth of 0.6m in small areas along the watercourses and land drains, areas of ponding are predicted to have depths between 0.2m and 0.3m. The maximum flow velocity is predicted to be 1m/s, resulting in a maximum hazard classification of 'Significant'.

During the 3.3% AEP event, the maximum depth of floodwater is 0.6m, in small areas of the watercourses and land drains, larger areas with depths of 0.2m and 0.3m are present only within the watercourse. The maximum flow velocity in this event is 1m/s in small, localised areas, a velocity of 0.5m/s is present across a larger area of the site. The maximum hazard classification predicted is 'Significant'.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	6	7.5	10.3
Maximum depth (m)	0.3-0.6	0.3-0.6	0.3-0.6
Maximum velocity (m/s)	0.5-1	0.5-1	0.5-1
Maximum hazard classification	Significant	Significant	Significant

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater Emergence Map shows that the site is within an area at no risk from groundwater flooding.
This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for

Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 46 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's Historic Flood Map and Recorded Flood Outlines datasets. Hertfordshire County Council records so not identify any flood incidents in vicinity of the site

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling is also available as part of the Upper Colne 2025 model. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used. The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The NaFRA2 dataset shows that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site when the central allowance is applied to the 1% AEP (Flood Zone 3) and 0.1% AEP (Flood Zone 2).

The Upper Colne defended model also shows that the site remains outside of the 1% AEP defended plus 35% climate change event extent.

Surface water

Available data

Surface Water flooding for the 3.3%, 1% and 0.1% AEP events with central climate change uplift (up to the 2050s epoch), using data available as part of the NAFRA2 release. The central allowance applied in the NAFRA2 data is a 20% uplift.

The Environment Agency guidance recommends that the Upper End allowance is considered for both the 3.3% and 1% AEPs for the 2070’s epoch, unless the allowance for the 2050’s epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

Description of risk to the site

The extent of flooding at the site is broadly consistent with the present-day surface water model. While areas of pooling increase slightly in size, the locations of flooding remain unchanged. The site is mildly sensitive to climate change.

During the 1% AEP plus climate change scenario flood extent on site increases to 9.3% compared to the present-day scenario, but the extents do not reach the 0.1% AEP present day scenario. Floodwater is expected to reach a maximum depth of 0.6 m in small areas within the watercourses and land drains, with larger extents such as ponding experiencing depths between 0.2m and 0.3m. The maximum flow velocity predicted is 1m/s, resulting in a maximum hazard classification of ‘Significant’. This remains consistent with the present-day medium risk scenario, indicating that there is little increase in flood risk in the climate change scenario.

Table 0-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	7.9	9.3
Maximum depth (m)	0.3-0.6	0.3-0.6
Maximum velocity (m/s)	0.5-1	0.5-1
Maximum hazard classification	Significant	Significant

Flood risk management infrastructure

Defences

The two watercourses within the site appear to be culverted beneath Little Oxhey Lane at the north of the site, and the eastern watercourse is also culverted beneath Oxhey Lane, to the east. The culverts are not represented within the RoFSW mapping, the 0.1% AEP extent has been interpreted to equate to a blocked scenario. Blockage of the Oxhey Lane culvert causes an increase in flood extent at the southeast corner of the site.

Residual risk

Residual risk is present due to the situation of culverts. Blockages from debris may restrict flow can cause water to back up, potentially leading to large areas of flooding.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

Access to the site is available from B4542 Little Oxhey Lane, which is parallel to the northern site boundary. and the A4008 Oxhey Lane, that is adjacent to the eastern boundary of the site.

Fluvial

Both roads are flood free in the 0.1% AEP fluvial event.

Surface water

Both roads are at risk of flooding from surface water during the 0.1% AEP surface water event. The flooding is in small, localised areas with a maximum flood depth of 0.3m, so access is likely still possible.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- The site is considered to have very low susceptibility to groundwater flooding; this should be confirmed through additional site investigation work.
- BGS data indicates that the underlying geology is the London Clay Formation and is likely to be poorly draining. Any proposed use of infiltration should be supported by infiltration testing. Off-site discharge in accordance with the SuDS hierarchy is required to discharge surface water runoff.
- The site is located within Groundwater Source Protection Zone 3 This is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. Early engagement with the LLFA and the EA is recommended to determine requirements for mitigating the impacts to aquifers because of the surface water drainage system.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Opportunities for using source control SuDS to manage runoff rates and volumes, contributing to the reduction of flood peaks downstream and existing surface water flow paths leaving the site.
- SuDS techniques implemented on the site should seek to manage the on-site and downstream impacts of the existing large surface water flow path.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should consider the impacts of future climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition of receiving waterbodies
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.

- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
- Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies Residential development as 'More Vulnerable'.
The Exception Test is not required for this site because the site is located in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- is within Flood Zone 1 with a site area of 1 hectare or more
- the Flood Map for Planning shows it is at risk from surface water flooding.

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside of the areas at risk of surface water flooding This includes areas near the eastern watercourse due to large flooding extents, areas near the land drains and watercourses, and the centre of the site where localised areas of surface water flooding occur.

There are two unmodelled watercourses within the site boundary. Detailed hydraulic modelling will be required at FRA stage to accurately represent the risk from these watercourses. It is also recommended that site specific FRAs include modelling of the upper-end surface water flood event.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard.

Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is located outside of flood risk zones for all fluvial flood events; however, the site contains two watercourses and two land drains. The RoFSW dataset has been used to assess flood risk from these watercourses. Runoff from the watercourses present on the site result in flooding from the 3.33% AEP event.

The RoFSW data has been used to assess flood risk from the two watercourses present on the site. Additionally, the eastern watercourse is culverted on Oxhey Lane, therefore there is residual risk of flooding. Detailed modelling should be carried out as part of a site-specific FRA; this should include an evaluation of the impact of a blockage on flood risk.

Surface water flood extents are concentrated along watercourses and land drains, with the largest extent at the eastern watercourse and additional ponding at the southern boundary. Depths reach up to 0.6m, velocities up to 1m/s, and the maximum hazard classification is ‘Significant’ across all modelled events.

Surface water climate change flood extents remain broadly consistent with present-day, with only slight increases in pooling. Depths remain up to 0.6m, velocities up to 1m/s, and hazard classification stays ‘Significant’, indicating mild sensitivity to climate change.

The following points should be considered in development of this site:

- The proposed development of the site is residential; thus, the development is classified as 'More Vulnerable'.
- Hydraulic modelling should be undertaken during a site-specific Flood Risk Assessment to assess and quantify risk from the watercourses and drainage channels that flow through the site
- Culverts may pose residual risk to the site.
- Development should be directed away from areas of significant surface water flood risk such as the watercourses and land drains.
- The site would benefit from SuDS implementation to manage surface water, improve water quality, and deliver wider sustainability benefits such as biodiversity and amenity.

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Level 2 Strategic Flood Risk Assessment - Site RW31

Garden Land off Uxbridge Road, Mill End, WD3 8EA

Prepared for

Three Rivers District Council

Date

19 February 2026

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site RW31. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Three Rivers District Council Level 1 SFRA and read the Three Rivers District Council Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Garden Land off Uxbridge Road, Mill End, WD3 8EA
- Site area: 0.17ha
- Existing site use: Brownfield
- Proposed site use: Residential

Topography

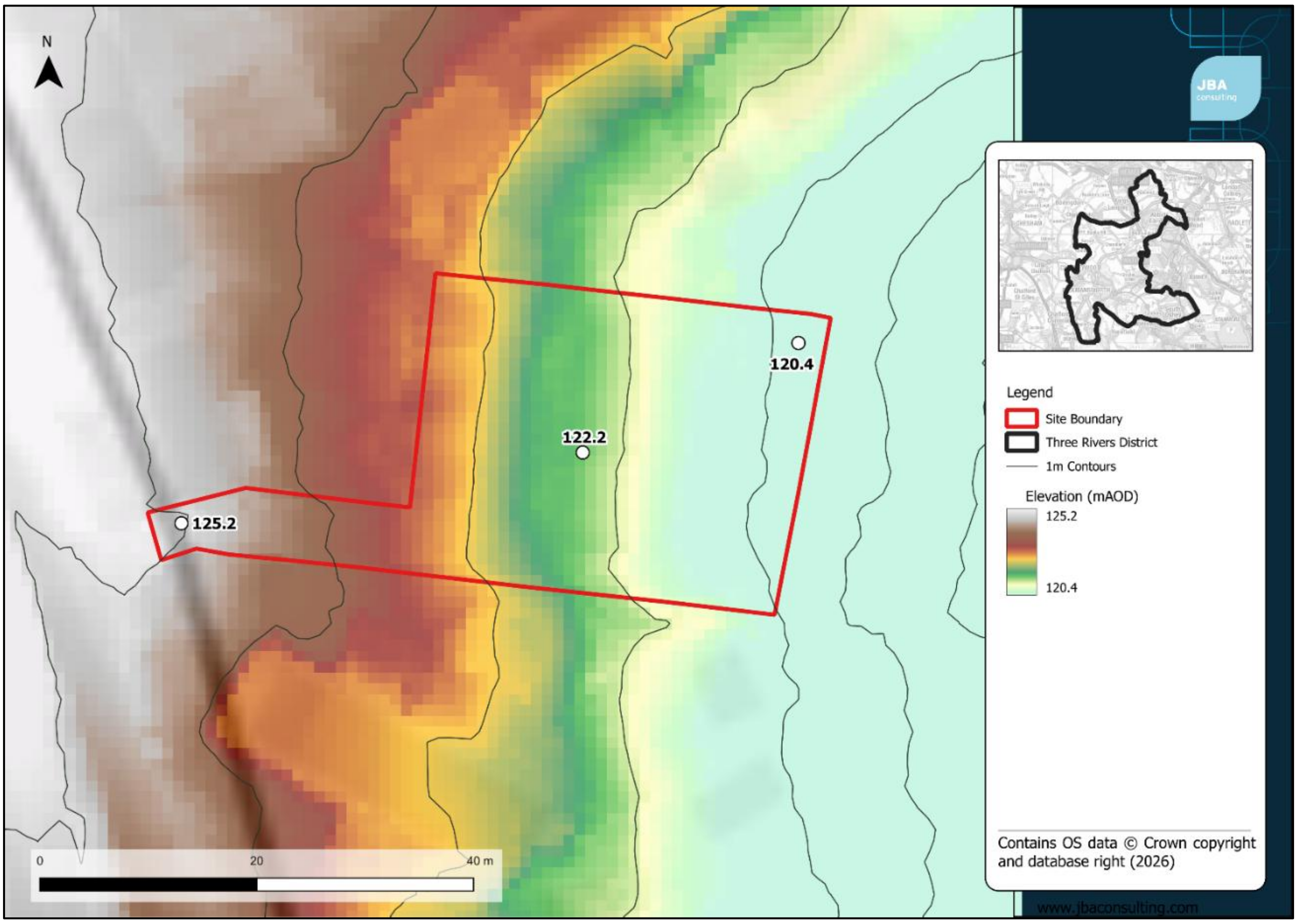

Figure 0-1 shows the Environment Agency 1m resolution LiDAR.

Figure 0-1: Topography of the site.

The mapping shows that levels are variable across the site. Along the northern and north-western boundary levels are at 50.2mAOD. The mapping shows a distinctive depression in the northern area of the site, with levels decreasing to 45.9mAOD. Ground levels then rise from the depression to the centre of the site and the southern boundary along Uxbridge Road to levels between 47.3mAOD and 47.6mAOD.

Geology and soils

Geology at the site consists of:

- Bedrock - Lewis Nodular Chalk Formation.
- Superficial - Alluvium Clay, silt, sand and gravel.

Soils at the site consist of:

- Freely draining slightly acidic loamy soils.

Sources of flood risk

Location of site within the catchment

The site is located within Mill End, a built-up urban area. The site lies within the River Colne catchment with the River Colne flowing 65m to the south of the site.

Existing drainage features

There are no drainage features within the site boundary.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) and the Upper Colne (2025) hydraulic model have been used to assess fluvial flood risk at this site.

Description of risk to the site

The site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site. The more recent, Upper Colne modelling confirms that the site remains within Flood Zone 1, outside the Flood Zone 2 extent, consistent with the FMfP.

Table 0-1: Existing fluvial flood risk based on the EA's FMfP*

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The topographical depression located at the northern part of the site is assessed as being at low risk of surface water flooding. This depression acts as the ponding area and contains the entire predicted flood extent within the site boundary.

During the 0.1% AEP event, floodwater is expected to reach depths between 0.3m and 0.6m, with lower depths observed along the edges of the ponded area. The maximum flow velocity recorded is =>2 m/s, resulting in a maximum hazard classification of 'Significant'.

The site is not predicted to flood during the 3.3% or 1% AEP events.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	0	0	12.6
Maximum depth (m)	N/A	N/A	0.3-0.6
Maximum velocity (m/s)	N/A	N/A	=>2
Maximum hazard classification	N/A	N/A	Significant

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The site is at moderate risk of groundwater flooding, with groundwater levels predicted to lie 0.5 - 5m below the surface. Mitigation for seasonal high groundwater levels must be considered in design of the site, for example by raising finished floor levels to an appropriate height above ground level

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a The site is located within a postcode area with 32 historic incidences of sewer flooding, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not within the Environment Agency's EA's Historic Flood Map or Recorded Flood Outlines dataset.

In addition, Hertfordshire County Council records do not identify any incidents in the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see the Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

Climate Change modelling is also available as part of the Upper Colne 2025 model. The 100-year defended modelling with 35% (higher central) uplift for climate change has been used.

The Environment Agency guidance recommends that the Central (21%) and Higher Central (35%) allowance is considered.

Description of risk to the site

The NaFRA2 data shows that during the 1% and 0.1% AEP plus climate change events, the site remains outside of Flood Zone 2 and 3 extents.

The 1% AEP defended plus 35% Climate Change event also does not predict a change in fluvial risk to the site.

Surface water

Available data

The Environment Agency's Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

No local detailed surface water modelling is available.

Description of risk to the site

The flood risk from surface water at the site has increased in the scenarios with added climate change.

The 1% AEP extent increases to 5.7% when an 20% uplift is applied, primarily due to a topographic depression in the north of the site. The depths predicted at the site are between 0.2m and 0.3m, with velocities between of 0m/s and 0.25m/s, thus, most of the predicted flood extent is classified as 'Low' hazard. A small area in the centre of the ponding is classified as 'Moderate'.

Table 0-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	0	5.7
Maximum depth (m)	N/A	0.2-0.3
Maximum velocity (m/s)	N/A	0-0.25
Maximum hazard classification	N/A	Moderate

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is likely to be accessed from the southern boundary via the A412 and Uxbridge Road. Alternative access points are unlikely, as the site is surrounded by residential properties along the eastern, western, and northern boundaries.

Fluvial

The A412 and Uxbridge Road is flood free in the 0.1% AEP fluvial event.

Surface water

The A412 and Uxbridge Road is flood free in the 0.1% AEP surface water event.

Dry islands

The site not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- BGS data indicates that the underlying geology is the Lewes Nodular Chalk formation with superficial deposits which is likely to have highly variable permeability. This should be confirmed through infiltration testing.
- The site is considered to have a moderate susceptibility to groundwater. In a localised area to the north of the site, groundwater levels are indicated to be between 0.5 and 0.5m below ground level during a 1% AEP event. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- The entire site is located within Groundwater Source Protection Zone 1 (SPZ) and infiltration techniques may not be appropriate for anything other than clean roof drainage. If infiltration is proposed for anything other than clean roof drainage a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply. Proposed SuDS should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and EA) at an early stage to understand possible opportunities and constraints.
- The site is not located within a historic landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Three Rivers District Council, Hertfordshire County Council and EA) at an early stage to understand possible constraints.

- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should consider the increased surface water flooding extents due to climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as More Vulnerable.

The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site because:

- the flood map for planning shows it is at risk of flooding from surface water

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with Three Rivers District Council, Hertfordshire County Council, Thames Water and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside of the area of surface water flooding located in and around the topographical low at the northern area of the site.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and egress will need to be provided for the 1% AEP surface water event with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is located in Flood Zone 1, so it is not identified to be at fluvial risk.

The site is at low risk of surface water flooding. The site contains a topographical depression in the north, which is the main area at risk of surface water flooding Under the present-day scenario in the RoFSW mapping, the site is predicted to flood in the 0.1% AEP event, with floodwater reaching a maximum depth of 0.3 m and a velocity of 2 m/s, resulting in a significant hazard classification. No flooding is predicted during the 3.3% or 1% AEP events.

The modelled climate change scenarios show an increase in surface water flood risk. In the 1% AEP plus climate change event, the site experiences flooding covering approximately 5.7% of the site within the depression. Maximum depths are 0.2m with low velocity, meaning most of the area is classified as 'Low' hazard, except for a small 'Moderate' hazard zone at the centre of the site.

The following points should be considered in development of this site:

- The proposed development of the site is residential; thus, the development is classified as More Vulnerable.
- Development should be directed away from the northern area of the site, particularly within and around the topographical depression.
- The site would benefit from SuDS implementation to manage surface water, improve water quality, and deliver wider sustainability benefits such as biodiversity and amenity.

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Level 2 Strategic Flood Risk Assessment - Site CFS20

Croxley Station, Watford Road, Croxley Green

Prepared for

Three Rivers District Council

Date

19 February 2026

THREE RIVERS DISTRICT COUNCIL

Contents

Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site CFS20. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Local Plan for Three Rivers District Council Level 1 Strategic Flood Risk Assessment and read the Local Plan for Three Rivers District Council Level 2 Strategic Flood Risk Assessment Main Report and is therefore familiar with the terminology used in this report.

Site details

- Location: Croxley Station, Watford Road, Croxley Green, WD3 3DY
- Site area: 2.2ha
- Existing site use: Brownfield - Station, carpark and timber yard
- Proposed site use: Employment

Topography

Figure 0-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR data.

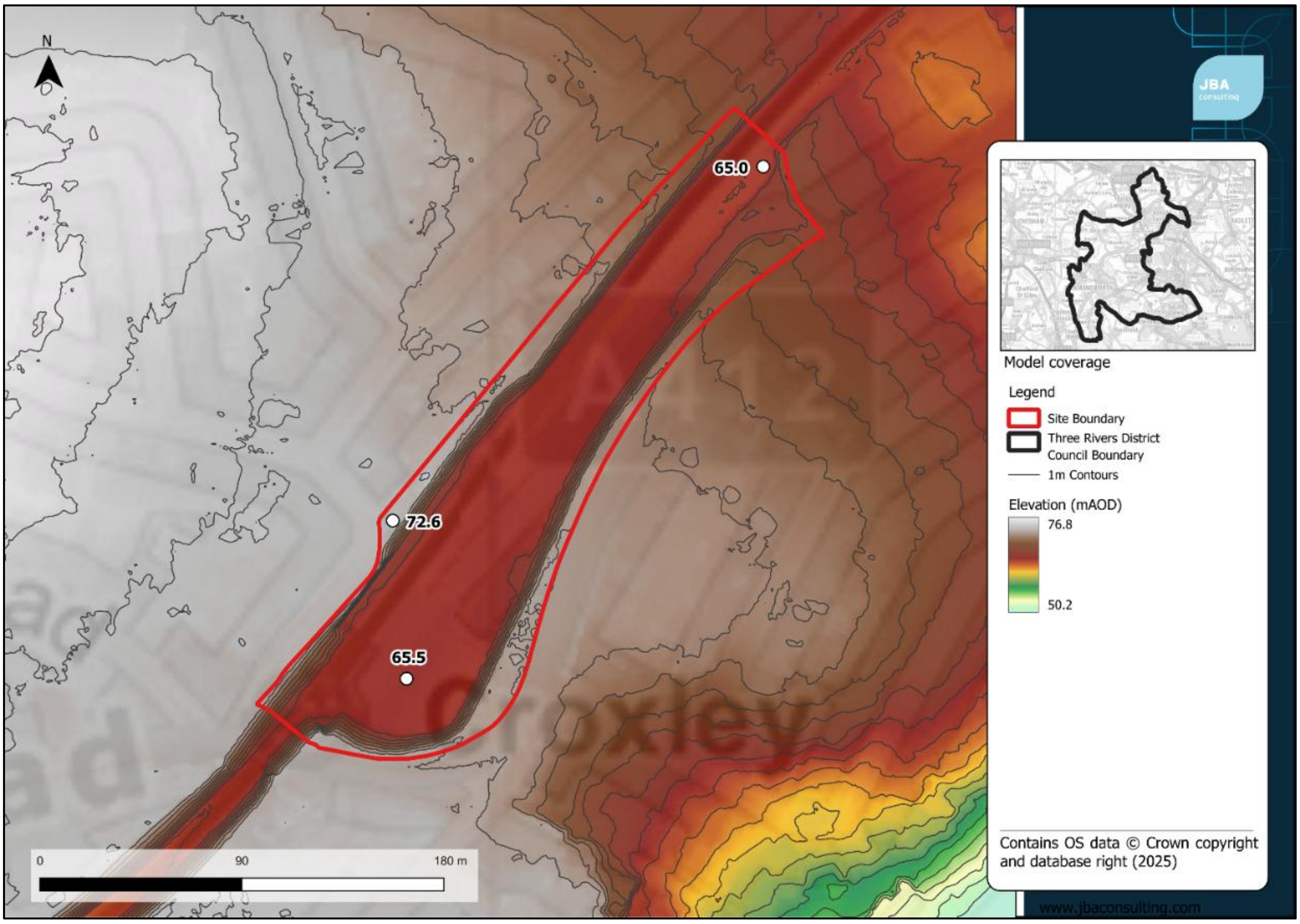

Figure 0-1: Topography of the site

The majority of the site is level, with elevations ranging between 65.05mAOD (Above Ordnance Datum) and 65.58mAOD. Elevations are greater along the site boundary, reaching up to 72.59mOD. As the site is in a developed urban area the LiDAR data is unlikely to be representative of the actual site topography, this may have an impact on some of the flood risk datasets used in the assessment.

Geology and soils

Geology at the site consists of:

- Bedrock - Seaford Chalk Formation and Newhaven Chalk Formation
- Superficial deposits - Winter Hill Gravel – Sand and gravel

Soils at the site consist of:

- Free draining slightly acid and loamy soil

Sources of flood risk

Location of site within the catchment

The site is located in the built-up area of Croxley Green, the current site use is an underground station, car park and a timber yard. The Grand Union Canal is located approximately 220m south of the site, with the River Gade a further 40m south of site.

Existing drainage features

The Grand Union Canal is located to 220m south of the site. The River Gade (Main River) also flows parallel to the Grand Union Canal, approximately 260m south of Croxley Station. Approximately 290m South of the site there is a connection between the Grand Union Canal and the River Gade.

Fluvial

Available data

The EA's Flood Map for Planning (FMfP) released as part of the NaFRA2 dataset has been used to assess fluvial flood risk to the site.
The EA's 2019 1D-2D detailed hydraulic model for the River Gade and Bulbourne was also used to assess fluvial flood risk. The River Gade and Grand Union Canal to the south of the site have been assessed as part of the Gade and Bulbourne 2019 model. In the absence of detailed modelling for the 3.33% AEP defended scenario, the 2% AEP defended scenario has been used as a proxy to define Flood Zone 3b.

Description of risk to the site

The FMfP and the detailed hydraulic model show that the site is located entirely in Flood Zone 1. Therefore, fluvial flooding does not pose a risk to the site.

Table 0-1: Existing fluvial flood risk based on EA FMfP *

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

Surface water

Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

Description of risk to the site

The site is at risk of surface water flooding in all modelled events. During the 3.33% AEP event, a small area at the north of the site and the carpark in the south of the site are at risk of surface water flooding, reaching depths of 0.2-0.3m. Ponding occurs against the railway embankment within the site during the 1% and 0.1% AEP rainfall events and extends across the entire length of the site. During the 0.1% AEP event, flooding reaches depths of 0.30-0.6m, with the deepest flooding expected in north and centre of the site. Flood velocities range are shown to reach maximums ≥2m/s.

The hazard classification varies across the different AEP events. For the 3.3% AEP event, the maximum hazard is classified as 'Low' (0.5-0.75). Under the 1% AEP event, the maximum hazard increases to 'Moderate' (0.75-1.25), concentrated in the area of ponding alongside the railway in the north of the site. Under the 0.1% AEP event, the area of 'moderate' hazard extends along the railway from the north to the south of the site.

It is expected that the site can be developed safely by incorporating appropriate mitigation measures, including sequential site design, effective SuDS for surface water drainage, and raising building thresholds above the predicted flood depths.

Table 0-2: Existing surface water flood risk based on the RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	5.4	11.7	20.3
Maximum depth (m)	0.2-0.3	0.2-0.3	0.3-0.6
Maximum velocity (m/s)	0.25-0.5	0.25-0.5	≥2
Maximum hazard classification	Low	Moderate	Moderate

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

Groundwater

The JBA Groundwater depth mapping shows that levels are between 0.5m and 5m below the ground surface during a 1% AEP groundwater flood event. There is a risk of flooding to subsurface assets, however surface manifestation of groundwater is unlikely. Therefore, groundwater flooding does not pose a significant constraint to safe development of the site.

Based on the RoFSW and topography of the site it is likely that any groundwater that emerges will flow/pool in the northern parts of the site.
This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

Sewers

The Three Rivers district is within the Chesham Sewage Treatment Works (STW) catchment. The Thames Water Drainage and Wastewater Management Plan (DWMP) outline the strategic plan for Hertfordshire in the Hertfordshire catchment strategic plan and sewer flooding history database at a five-digit post code level. The site is located within a postcode area with 75 historic incidences of sewer flooding between 2015 and 2025, according to the Thames Water Sewer Flooding Records.

Flood history

The site is not shown to be within the Environment Agency's Historic Flood Map or Recorded Flood Outlines dataset.

In addition, Hertfordshire County Council records do not identify any incidents in the vicinity of the site.

Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Three Rivers District Council Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Fluvial

Available data

The 'Rivers and Sea undefended flood risk extents - climate change' dataset released as part of NaFRA2, which applies the central uplift for the 2080s epoch. Detailed modelling results are not available as part of this dataset.

The River Gade and Bulbourne hydraulic model (2019) has also been used in this assessment, covering the north-east corner of the site. Climate change uplifts of 21% and 35% have been added to the River Gade and Bulbourne hydraulic model (2019) 1% AEP event to indicate the impact of climate change on fluvial flooding. The detailed modelling does not provide climate change outputs for the undefended scenarios, therefore, the defended 1% AEP plus climate change scenarios have been used to inform this part of the assessment.

Description of risk to the site

The NaFRA2 data and detailed hydraulic modelling show that the site will remain in Flood Zone 1 and therefore the risk of fluvial flooding to the site is low.

The Gade defended model similarly shows that the site is outside of the 1% AEP plus 35% climate change extent.

Surface water

Available data

The Environment Agency’s Risk of Flooding from Surface Water plus Climate Change dataset was used to inform this assessment for the 3.3%, 1% and 0.1% AEP events. In the latest NaFRA2 release, only the central climate change allowance (20%) for the 2050s epoch has been applied to the surface water flood events.

According to Environment Agency guidance, the Upper End climate change allowance should be considered for both the 3.3% and 1% AEPs for the 2070’s epoch, unless the allowance for the 2050’s epoch is higher, in which case this should be used. The recommended upper end allowance for the 2050s and 2070s epoch is 35% and 40% respectively.

As the currently available NaFRA2 mapping does not include the 40% Upper End allowance for the 1% AEP event (2070s epoch), the present day 0.1% AEP event has been used as a proxy for this scenario.

No local detailed surface water modelling is available.

Description of risk to the site

The 1% AEP surface water flood extent increases to 14.6% of the site, predominantly along the railway embankment when a 25% climate change allowance is applied to rainfall. As with the present-day scenario, flood depths are predominantly 0.2-0.3m and velocities reach a maximum of 0.2-0.5m/s. However, a small, localised area of ponding reaches a maximum depth of 0.3-0.6m in the north of the site during the 1% AEP event plus climate change (25%) event. Within this flood extent, the highest hazard classification is 'Moderate', observed in the northern part of the site where ponding occurs. Elsewhere in the site, a 'Low' hazard classification extends across the surface water flow path along the railway embankment.

However, as per Environment Agency guidance the central uplift does not provide a sufficient basis for assessing future flood risk. The present day 0.1% AEP shows that the predicted flood extent increases, covering approximately 20.3% of the site. During this event, additional areas of ponding are shown in the south of the site compared to the present-day 1% AEP event. The deepest flooding, reaching 0.3-0.6m, predominantly occurs in the northern part of the site in the area of ponding. Elsewhere in the site, flood depths reduce to approximately 0.2-0.3m. Velocities within the northern ponding area range between 0 and 0.25m/s. Along the railway embankment, velocities are mainly less than 0.25-0.5m/s, with localised peaks of 0.5-1.0m/s. The highest hazard classification during this event remains 'Moderate', extending along the railway embankment.

Table 0-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP plus 20% climate change extents.

Event	1% AEP	1% AEP plus 20% CC
Percentage of site at risk (%)	11.7	14.6
Maximum depth (m)	0.2-0.3	0.3-0.6
Maximum velocity (m/s)	0.25-0.5	0.25-0.5
Maximum hazard classification	Moderate (0.75-1.25)	Moderate (0.75-1.25)

Flood risk management infrastructure

Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

Residual risk

There is no residual risk to the site from flood risk management structures.

Emergency planning

Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

Access and egress

Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Potential access

The site is likely to be accessed from the A412 Watford Road. The road is at risk of flooding from surface water during the 1% and 0.1% AEP events. Winton Drive runs parallel to the site and provides an alternative access route from the north. Surface water flooding occurs on Winton Drive during a 3.3% AEP event and greater return periods. Developers will need to demonstrate that safe access and egress in the 0.1% AEP event, including allowance for climate change.

Fluvial

Safe access is available to the A412 Watford Road in all events up to the 0.1% AEP fluvial event.

Surface water

Safe access is available to the A412 Watford Road up to the 0.1% AEP surface water event.

Dry islands

The site is not located on a dry island.

Requirements for drainage control and impact mitigation

Broadscale assessment of possible SuDS

- The selection of SuDS should be in line with Defra's National Standards for Sustainable Drainage Systems, runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
    - Priority 1: collected for non-potable use
    - Priority 2: infiltrated to ground
    - Priority 3: discharged to an above ground surface water body
    - Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
    - Priority 5: discharged to a combined sewer
- BGS data indicates that the underlying geology is chalk which is likely to be free draining. However, groundwater levels are indicated to be between 0.5 and 5m below ground level and there is a risk of flooding to subsurface assets and below ground development such as basements. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system.
- The entire site is mostly located within Groundwater Source Protection Zone 1 (SPZ) and infiltration techniques may not appropriate for anything other than clean roof drainage. If infiltration is proposed for anything other than clean roof drainage a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply. Proposed SuDS should be discussed with relevant stakeholders (Hertfordshire County Council, Three Rivers District Council and the Environment Agency) at an early stage to understand possible opportunities and constraints.
- There are no historic landfill sites within the site boundary. The Long Valley Wood landfill site is located within 200m south of the site.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure.
- If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be

confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Hertfordshire County Council, Three Rivers District Council and the Environment Agency) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such bioretention areas or rain gardens must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

NPPF and planning implications

Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies the proposed type of non-residential development as 'Less Vulnerable'.
The Exception Test is not required for this site due to its location in Flood Zone 1.

Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- Within Flood Zone 1 but at risk of flooding from surface water.

All sources of flooding should be considered as part of a site-specific FRA, specifically surface water flooding.

Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Three Rivers District Council's Local Plan Policies.

The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe

Development should be steered outside the areas of surface water flood risk on the site.
Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

The risk of flooding from groundwater must be investigated and must be supported by groundwater level monitoring.

Arrangements for safe access and egress will need to be provided for the 1% AEP surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

Conclusions

The site is in Flood Zone 1 but is at high risk of surface water flooding and low risk of groundwater flooding. The site is at risk of surface water flooding in all modelled events. In the 3.33% AEP event, a small area at the north of the site and the carpark in the south of the site are at risk of low depth surface water flooding. More significant ponding occurs against the railway embankment within the site during the 1% and 0.1% AEP rainfall events and extends across the whole site. During the 0.1% AEP event, flooding reaches depths of 0.30-0.6m, with the deepest flooding expected in north and centre of the site.

The following points should be considered in development of this site:

- A site-specific Flood Risk Assessment is required which demonstrates that site users will be safe during events up to and including the 0.1% and 1% AEP rainfall events, with an appropriate allowance for climate change. This will need to show that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding either on or off the site.
- Development should be steered outside the areas of surface water flood risk on the site. Where this is not possible, flood resilience and resistance measures should be implemented, where appropriate e.g. raising of floor levels, including property flood resistance and resilience measures. These measures should be assessed to make sure that flooding is not increased either on or off the site.
- Developers should utilise SuDS with multiple benefits throughout the site, particularly in areas of predicted surface water ponding.
- Arrangements for safe access and escape will need to be provided for the 1% AEP surface water events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

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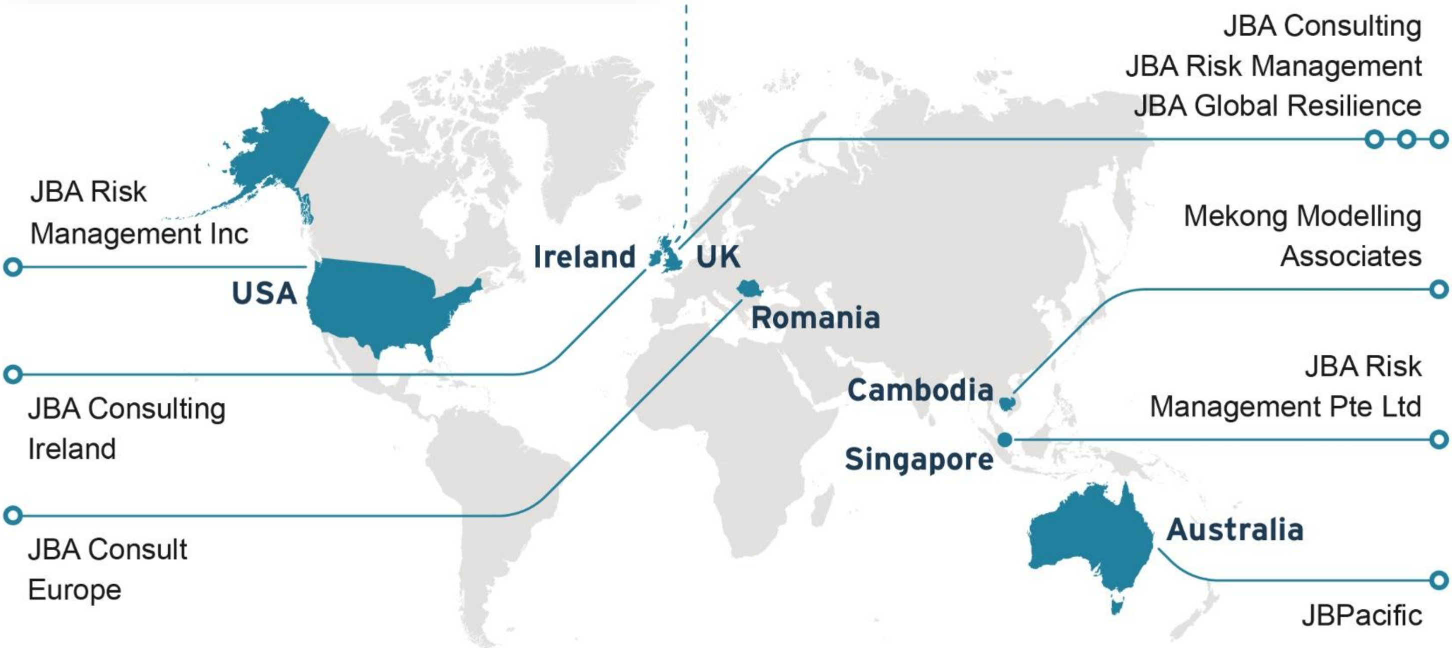

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