	St Albans City and District Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Table
Site details	
Site Code	**B8**
Address	Harper Lane, north of Radlett
Area	11.40 ha
Current land use	Mixed use – greenfield and commercial land.
Proposed land use	Residential
Flood Risk Vulnerability	More Vulnerable
Sources of flood risk	
Location of the site within the catchment	The site is located on the northern edge of the village of Radlett, Hertfordshire. In a mainly rural area of the catchment. The M25 is to the north of the village and the M1 to the south. The site is adjacent to the Midland Main line, making up the site's western boundary. The line is also used by the Thameslink, with regular trains to St Pancras International Station. The B556 Harper Lane forms the northern boundary which joins the A5183 to the west via a traffic lighted junction over the railway line. The eastern and southern boundaries are comprised of arable land. The site's south-western corner borders the Kitswell Brook. The Kitswell Brook joins the Tykes Water stream to the west of the site, which covers a small catchment area of 26.9 km². The upstream end of the catchment is predominantly rural but gradually becomes urbanised downstream as it includes the towns of Borehamwood and Radlett. The Tykes Water stream then flows northward, joining the River Colne approximately 0.6 km north of the site. The Tykes Water stream catchment is part of the broader Colne Management Catchment, which encompasses an area of 1,040 km².
Topography	Environment Agency 1m resolution LIDAR across the site shows the elevation varies, as the site is on a slope from the northeast to the southwest. The elevations in the northeast of the site range between 91.8 – 95.0mAOD, with the latter elevation in the very eastern point of the site. The elevations then fall to the lowest elevation of 72.4mAOD in the southwestern corner of the site.
Existing drainage features	The Radlett Brook is situated to the west of the site, approx. 0.2km at the closest point, flowing northwards through Radlett into the River Colne (Upper reaches). An additional watercourse flows close to the southern boundary of the site; Kitwells Brook, which flows westward joining Radlett

	Brook by Oakridge Avenue. There are no existing drainage features within the site that are visible on topographic mapping or aerial imagery.
Fluvial	**The proportion of site at risk FMFP:** FZ3b – 1% FZ3a – 1% FZ2 – 1% FZ1 – 98% The Flood Zone values quoted show the percentage of the site at flood risk from that flood zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%). **Available data:** The Environment Agency's Flood Zone mapping has been used in this assessment. No detailed hydraulic modelling was available for this site. **Flood characteristics:** The Environment Agency Flood Zone data indicates a minor area of the site is at fluvial flood risk. The southwestern corner of the site is located within Flood Zone 2, 3a and 3b, due to its proximity to the Kitswell Brook watercourse. However, as the site then increases in elevation from the southwestern corner the fluvial flood risk to the rest of the site is negligible; in Flood Zone 1.
Surface Water	**Proportion of site at risk (RoFSW):** **3.3% AEP** – 0% Max depth – N/A Max velocity – N/A **1% AEP** – 0% Max depth – N/A Max velocity – N/A **0.1% AEP** – 2% Max depth – >1.2m Max velocity – 0.50 – 1.00m/s **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment. **Description of surface water flow paths:** There is no surface water flooding during the 3.3% and 1% AEP events. During the 0.1% AEP event there are two small areas of surface water flooding. One area of ponding is in the eastern side of the site, with flood depths between 0.30 to 0.60m, and velocities <0.25m/s. The flood hazard for this area of ponding is 'Danger for some'. The other area of ponding is

	in the southwestern corner of the site, flood depths reach a maximum >1.2m on the boundary of the site, with velocities reaching between 0.50 to 1.00m/s. The flood hazard is classified as 'Danger for most'.
Reservoir	The site is not shown to be at risk from the Environment Agency Reservoir Flood Extents.
Groundwater	The JBA Groundwater mapping shows that the site is at low risk from ground water flooding, 41% of the site, specifically the western and southern half of the site has ground water levels at least 5m below the grounds surface. In the southern corner of the site the ground water levels are between 0.5 – 5m below the grounds surface, covering 21% of the site. Again, the risk of flooding from ground water is unlikely but there is a risk of flooding to subsurface assets. The remaining 38% of the site located in the northeastern and not at risk.
Sewers	The site was within a postcode area that was not covered within the data received for this Level 2 assessment. As a result, the number of historic incidences of sewer flooding according to the Thames Water Hydraulic Sewer Flood Risk Register is unknown.
Flood history	There are no reported flood incidents reported by the Environment Agency, St Albans District Council or Hertfordshire County Council within the site.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows that the site is not protected by any formal flood defences.
Residual risk	The southwestern area of the site is at residual risk from fluvial flooding. The Kitswell Brook, which runs close to the southern boundary, enters a culvert underneath the railway near the southwestern corner of the site. If the culvert were to become blocked, the southwestern area of the site might be at risk of flooding. The residual risk to the site posed by a culvert blockage must be considered in a site-specific Flood Risk Assessment.
Emergency planning	
Flood warning	The southwestern corner of the site is located in the Environment Agency Flood Warning and Flood Alert Area. It is located specifically within the 062WAF28UpColne, The Upper River Colne and Radlett Brook at Colney Heath, London Colney, Borehamwood and Radlett alert area. And the 062FWF28Radlett, The Radlett Brook at Radlett warning area.
Access and egress	Access and egress to the site is currently via the B556 – Harper Lane. Vehicular access to Harper Lane is via the A5183 to the west. There is no surface water flooding to the western end of Harper Lane by the site or where it joins the A5183 during the 3.3%, 1% and 0.1% AEP events. Thus, providing a safe access and egress route to the site.
Dry Islands	The site is not located on a dry island.

Climate change	
Implications for the site	**Management Catchment: Colne Management Catchment** Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard and frequency of both fluvial and surface water flooding. **Fluvial:** The Kitswell Brook has not been included within the Upper Colne (2010) or London Colney (2018) models. Instead, the Environment Agency's Flood Zone 2 (0.1% AEP event) has been used as an indicative assessment of future fluvial risk at 1% AEP. This shows that 2% of the site in the southwestern corner is at risk **Surface Water:** The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. The 1% AEP plus 40% climate change corresponds to the 1% AEP upper end allowance for peak rainfall intensity for the 2070s epoch and is therefore the 'design event' scenario. In the 1% AEP plus 40% climate change event the flood extent is similar to that in the 0.1% AEP event. Flood water only affects an area in the southwestern of the site. Flood depths remain similar to the 0.1% AEP with maximum flood depths reaching 1.4m with hazard classified at 'Danger for most'. This shows that the site is somewhat sensitive to increases in pluvial flooding due to climate change. 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.
Requirements for surface water drainage and integrated flood risk management	

Broad-scale assessment of potential SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock – Bedrock geology of the site is the Lewes Nodular Chalk Formation and Seaford Chalk Formation
	  ○ Superfical deposits – The Lambeth group (clay, silt and sand).
	• Soils at the site consist of:
	  ○ Freely draining slightly acid loamy soils
	
	Sustainable Drainage Systems (SuDS)
	• Groundwater levels are indicated to be at least 5m below ground level for the majority of the site and groundwater flooding is not likely, however below ground development such as basements may still be susceptible to groundwater flooding. The area where groundwater levels are indicated 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. Additionally, groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system. • BGS data indicates that the underlying geology is chalk 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 whole site is located within Groundwater Source Protection Zones 2 and 3. Proposed SuDS should be discussed with relevant stakeholders (St Albans City and District Council, Hertfordshire County Council, and the Environment Agency) at an early stage to understand possible opportunities and constraints. The Groundwater Source Protection Zone guidance is currently undergoing review; therefore, developers should ensure they are using the latest guidance in available. • 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. This is only relevant to the southern corner 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 (St Albans City and District Council, Hertfordshire County 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 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 clean 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 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 in the southwestern area of the site there is a proportion of the site located within Flood Zone 3a and 3b.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	• At the planning application stage, a site-specific FRA will be required as the site is:
	  ○ Partially within fluvial flood zones 2, 3a and 3b.
	  ○ Greater than one hectare
	  ○ At risk of flooding from surface water
	• All sources of flooding should be considered as part of a site-specific FRA, using the most up to date flood risk data available.
	• Consultation with St Albans City and District Council, Hertfordshire County Council, Thames Water, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); St Albans City and District Council's Local Plan Policies and Hertfordshire County Council's Guidance for Developers.
	• The development should be designed with mitigation measures in place where required.
	
	Guidance for site design and making development safe:
	• 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. (Para 048 Flood Risk and Coastal Change PPG).
	• Should built development be proposed within the 1% AEP surface water flood extents, careful consideration will need to be given to flood resistance and resilience.
	• 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 greenfield rates.

- Planning permission is required to surface more than 5 square metres of unpaved ground using a material that cannot absorb water.
- 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
    - 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.

Key messages

The Exception Test will be required for this site, and St Albans Council will need to carefully consider the benefits of developing the site against the fluvial risk. Development may be possible provided the flood risk part of the Exception Test can be satisfied as below: Development is likely to be able to proceed if:

- A site-specific FRA demonstrates that the site is not at an increased risk of flooding in the future, that site users will be safe throughout the lifetime of the development, and that development of the site does not increase the risk of surface water flooding on the site and to neighbouring areas.
- The southwestern corner of the site located in Flood Zone 3b is left undeveloped or the boundary is changed to exclude this area.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward.
- A site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan is submitted along with the FRA.
- 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).

Mapping Information	
Flood Zones	Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Map for Planning mapping. As the Kitswell Brook was not included within the Upper Colne (2010) model a precautionary approach of using the existing Flood Zone 3a (1 in 100-year) has been used to represent the functional floodplain.
Climate change	In the absence of detailed hydraulic modelling, Flood Zone 2 has been used as an indicative assessment of future fluvial risk at 1% AEP. The latest climate change allowances have been applied to the Environment Agency's RoFSW map to indicate the impact on pluvial flood risk.
Fluvial depth, velocity and hazard mapping	There is no detailed hydraulic modelling available at this location.
Surface Water	The Environment Agency's Risk of Flooding from Surface Water dataset has been used for this assessment.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from Environment Agency's RoFSW.

Site Reference	B8
Site Name	Harper Lane, north of Radlett, WD7 7HU

St Albans District Council
Strategic Flood Risk Assessment
Level 2 Detailed Site Summary

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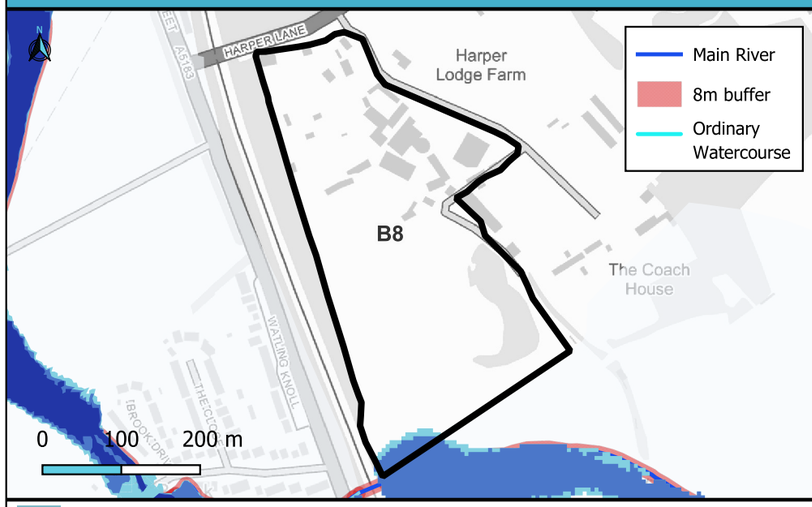
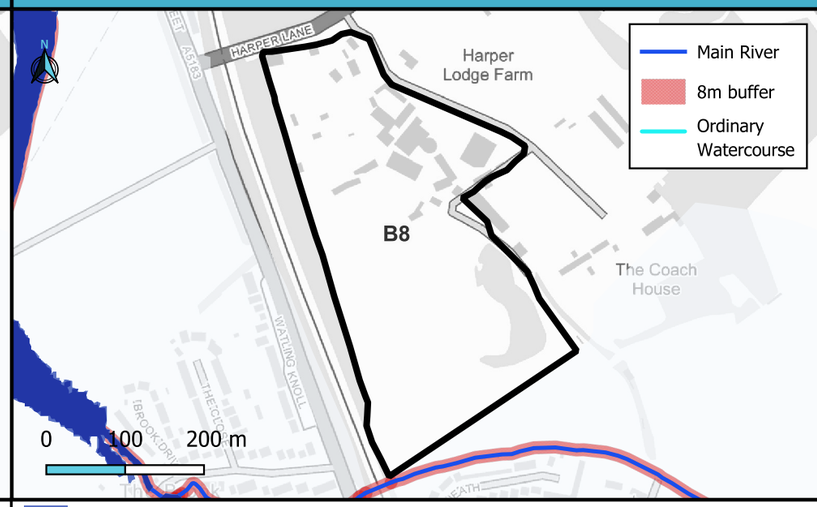
Flood Zone Map (present day)



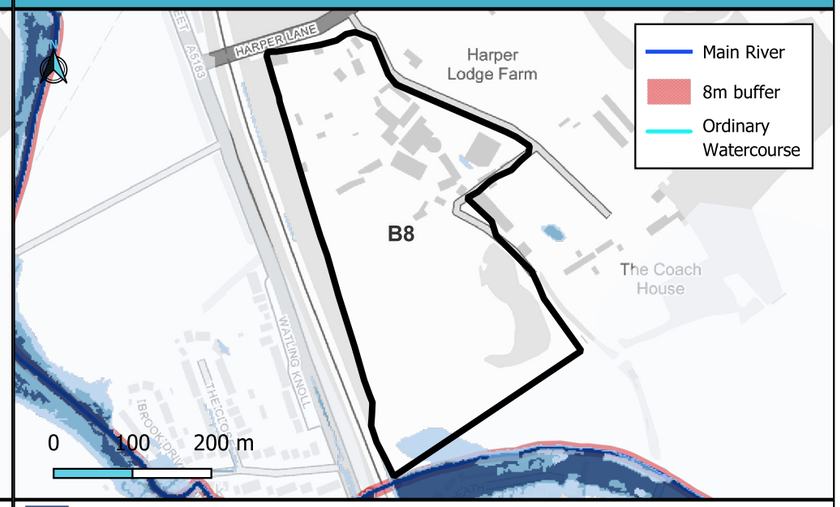
Flood Zone 2 (Between 1% and 0.1% AEP)
Flood Zone 3a (Between 3.33% and 1% AEP)
Flood Zone 3b (Less than 3.33% AEP)
Site boundary

Flood Zone 3b + Climate Change



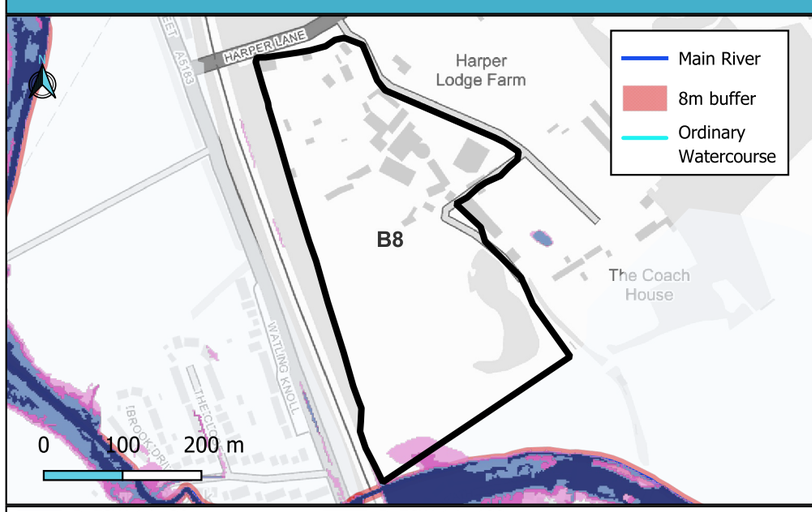
Flood Zone 3b + 21% (Central allowance)
Flood Zone 3b + 35% (Higher allowance)
Flood Zone 3b
Site boundary

Surface Water Map (RoFSW)



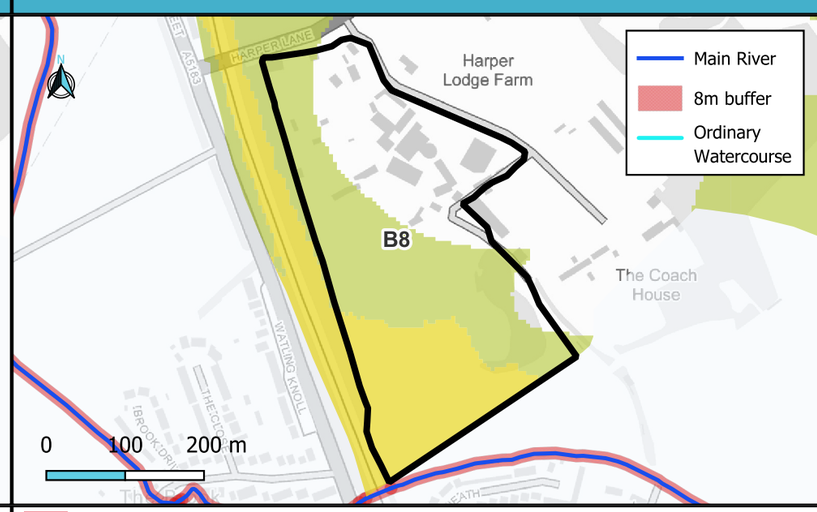
RoFSW 1 in 30-year (3.33% AEP)
RoFSW 1 in 100-year (1% AEP)
RoFSW 1 in 1000-year (0.1% AEP)
Site boundary

Surface Water Map + Climate Change



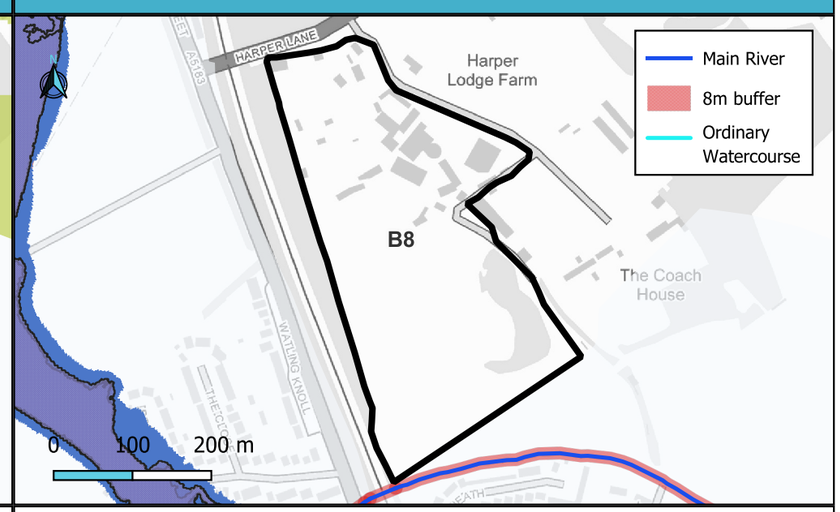
RoFSW 1 in 30-year (3.33% AEP)
RoFSW 1 in 100-year (1% AEP)
RoFSW 1 in 30-year (3.33% AEP) plus 40%
RoFSW 1 in 100-year 1% AEP plus 40%
Site boundary

Groundwater (Gw) Flood Risk 1% AEP



GW levels <0.025m below ground
GW levels 0.025m to 0.5m below ground
GW levels 0.5 to 5m below ground
GW levels atleast 5m below ground
Site boundary

Reservoir Flood Risk



Reservoir 'Dry Day' flood extent
Reservoir 'Wet Day' flood extent
Site boundary
Reservoir - Fluvial contribution to flood extent

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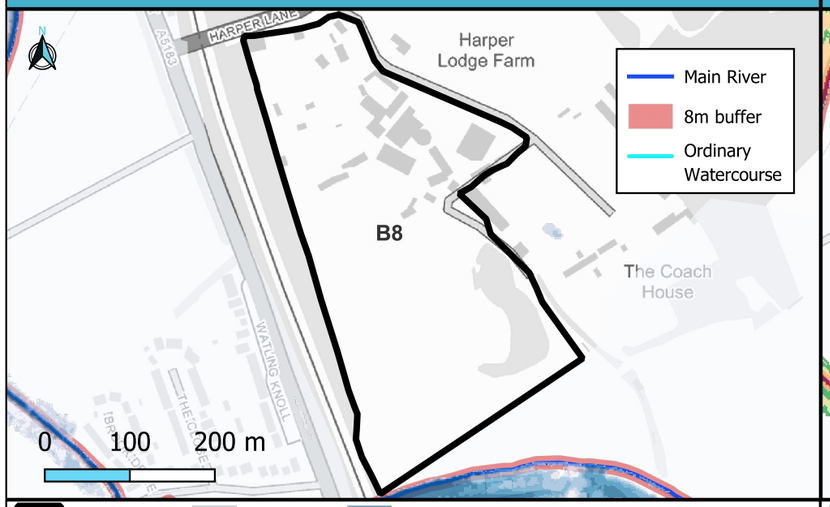
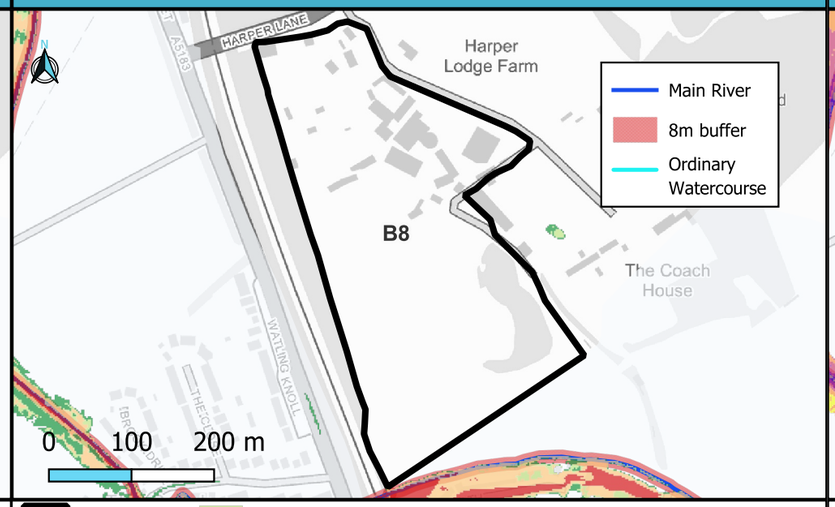
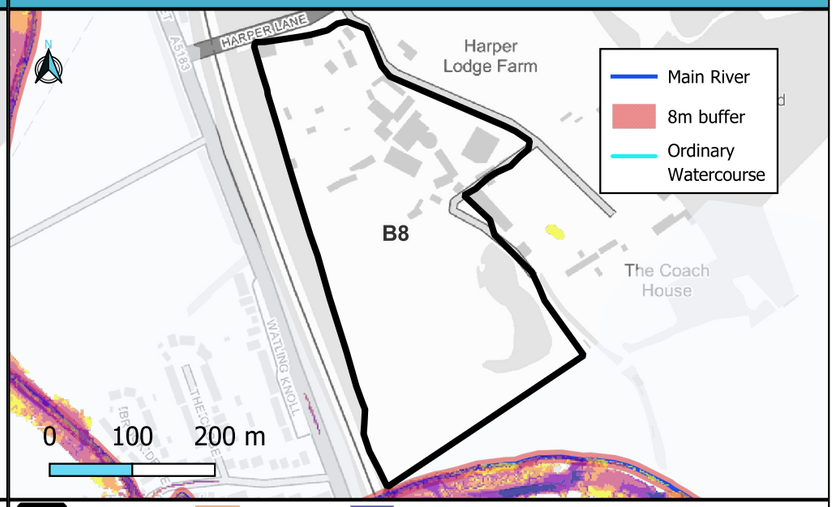
RoFSW Max Depth - 1% AEP



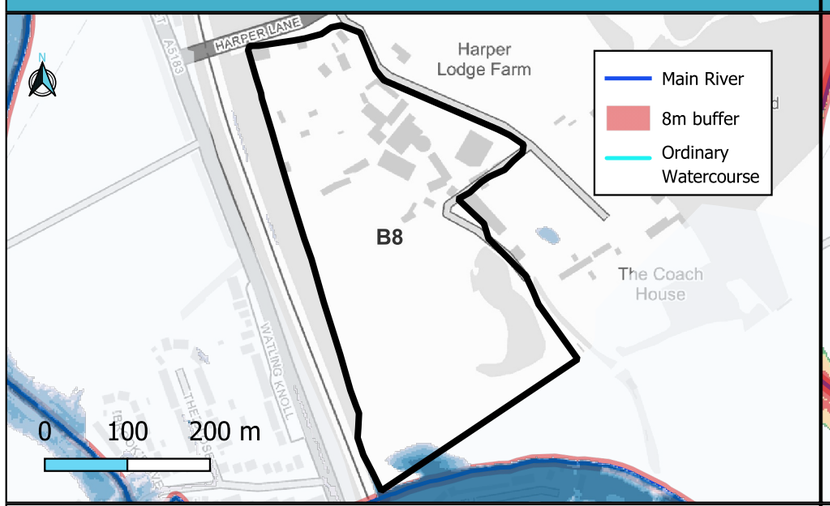
RoFSW Max Hazard - 1% AEP



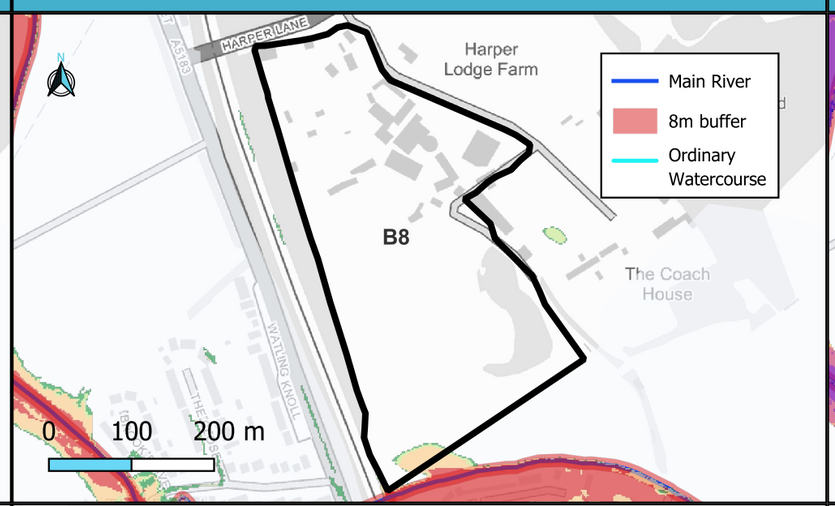
RoFSW Max Velocity - 1% AEP



RoFSW Max Depth - 1% AEP + 40% CC



RoFSW Max Hazard - 1% AEP + 40% CC



RoFSW Max Velocity - 1% AEP + 40% CC