	St Albans City and District Council **Level 2 Strategic Flood Risk Assessment** **Detailed Site Summary Table**
Site details	
Address	Griffiths Way Retail Park, St Albans AL1 2RJ
Area	6.44ha
Current land use	Commercial - Brownfield
Proposed land use	Residential
Flood Risk Vulnerability	More Vulnerable
Sources of flood risk	
Location of the site within the catchment	The site is located in the residential area of Sopwell in southern St Albans. It is comprised of two adjoining retail parks: Griffiths Way Retail Park and the Abbey View Retail Park. The site is approximately 0.2km south of St Albans Abbey Station which is located on the London Northwestern Railway. The site is on Griffiths Way a minor road off the A5183, which eventually joins the North Orbital Road (A414) to the south of St Albans. Griffiths Way makes up the site's northern boundary, with residential housing bordering the site to the east, south and west. The site is within the River Ver catchment, which covers an area of 146.4 km², with the River Ver located approximately 0.3 km to the north of the site. The site is in the lower catchment, which is primarily urban. The River Ver is part of the Colne Management Catchment, which covers a much larger area of 1,040 km².
Topography	Environment Agency 1m resolution LIDAR across the site shows the elevation varies across the site. The site is in a densely developed urban area and 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. The LIDAR shows that the higher elevations within the site are in the centre between 83.4 to 84.2mAOD. The western area of the site has elevations between 81.9 to 83.4mAOD, with the lower elevations located along the western access road into the site. The area to the east of Graham Close sits slightly lower than the rest of the site between 81.0 to 82.0mAOD with the lowest elevation located at the entrance to Graham Close where it joins Griffiths Way.
Existing drainage features	There are no existing drainage features within the site that are visible on topographic mapping or aerial imagery. Given that the site is within the main St Albans urban area, it is likely to be drained by the surface water drainage network.

Fluvial	**The proportion of site at risk FMFP:** FZ3b – 0% FZ3a – 0% FZ2 – 0% FZ1 – 100% The Flood Zone values quoted show the percentage of the site at flood risk from that particular 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, alongside the River Ver (2019) 1D-2D hydraulic model received for this Level 2 SFRA. **Flood characteristics:** The site is located within Flood Zone 1 and is at negligible risk of fluvial flooding.
Surface Water	**Proportion of site at risk (RoFSW):** **3.3% AEP** – 5% Max depth – 0.30 – 0.60m Max velocity – 0.50 – 1.00m/s **1% AEP** – 10% Max depth – 0.60 – 0.90m Max velocity – 0.50 – 1.00m/s **0.1% AEP** – 26% Max depth – 0.90 – 1.20m Max velocity – 1.00 – 2.00m/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:** During the 3.3% AEP event, there are several areas affected by surface water. There are two areas affected by large surface water ponding, this includes the northwestern entrance to the site in addition to an area to the west of Graham Close entrance. There are three additional small areas of ponding in the southwest, central and eastern areas of the site. The flood depths are mainly between 0.30 to 0.60m, with two smaller areas of ponding in the southwester and eastern areas only reaching a maximum depth of 0.15 to 0.30m. The flow velocities for the areas of ponding are <0.25m/s with small areas reaching a maximum of 0.25 to 0.50m/s. The flood hazard ranges from 'Very low' to 'Danger for some'.

	During the 1% AEP event, the area of ponding to the west of Graham Close affects a larger area, and flood depths reach a maximum of 0.60 to 0.90m. The ponding by the northwestern entrance reaches a maximum of 0.30 to 0.60m. There are several additional smaller areas of ponding across the site ranging between 0.15 to 0.30m and 0.30 to 0.60m. Flow velocities for these areas of surface water ponding are mainly <0.25m/s, with small areas reaching a maximum of 0.50 to 1.00m/s. The flood hazard ranges from 'Very low' to 'Danger for most', with the higher flood hazard associated with the area of ponding to the west of the Graham Close entrance. During the 0.1% AEP event, surface water covers a significant portion of the northern area of the site. The northwestern entrance is largely affected by surface water which extends southwards into the carpark as well as to the east. This are of ponding then connects to the area of ponding west of the Graham Close entrance, which also affects a large area of Graham Close. The flow path then continues further eastwards across the carpark before exiting the site along the eastern boundary. Additional areas of surface water include, the southeastern corner, the centre of the site and the southwester area. The maximum flood depth within the site reaches 0.90 to 1.20m, located west of the Graham Close entrance. The remaining flood depths range mainly between 0.15 to 0.30m or 0.30 to 0.60m. The flood hazard classification across the site ranges from 'Very low' to 'Danger for most'.
Reservoir	The Environment Agency's reservoir maps show the site is not at risk of flooding from any reservoir.
Groundwater	The JBA Groundwater mapping shows that groundwater risk to the site is low, as the groundwater levels are 0.5 to 5m below ground level.
Sewers	The site is located within a postcode area with 15 historic incidences of sewer flooding, according to the Thames Water Hydraulic Sewer Flood Risk Register.
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 site is not at residual risk of flooding.
Emergency planning	
Flood warning	The site is not located within any Environment Agency Flood Warning or Alert Areas.
Access and egress	Access and egress into the site are currently enabled via two entrances located along the northern boundary of the site, one to the west into Abbey

	View retail park and the second to the east via Graham Close into Griffiths Way Retail Park. During the 3.3% AEP surface water event, there is an area of surface water ponding along the access and egress route into the Abbey View Retail Park. Flood depths reach a maximum of 0.30 to 0.60m, and flow velocities are primarily <0.25m/s. As a result, the flood hazard is classified as 'Very low' to 'Danger for some', therefore access and egress via a vehicle is possible. The second access and egress route via Graham Close into the current Griffiths Way Retail Park, is also affected by surface water. Flood depths are between 0.15 to 0.30m with velocities of <0.25m/s. The flood hazard is 'Very low', as a result vehicular and pedestrian access and egress is possible via this route. During the 1% AEP surface water event, there is a larger area of ponding along the access and egress route into Abbey View Retail Park than that of the 3.3% AEP event. Flood depths reach a maximum of 0.30 to 0.60m, although velocities are primarily <0.25m/s, some areas along the road reach 0.50 to 1.00m/s. The resulting hazard is 'Very low' to 'Danger for some', therefore vehicular access and egress is still possible. The access and egress route along Graham Close also has an area of ponding, this reaches a maximum depth of 0.30 to 0.60m. Although the velocity of the area of surface water is mainly <0.25m/s there is an area to the south that reaches 0.50 to 1.00m/s. The flood hazard is classed as 'Very low' to 'Danger for some', as a result vehicular access and egress is possible. During the 0.1% AEP event, the access and egress route into Abbey View Retail Park is again affected by a large area of surface water, in addition to a large area of the carpark. The flood depths and velocity reach a maximum of 0.30 to 0.60m and 0.50 to 1.00m/s. The resulting flood hazard reaches 'Danger for most', therefore access and egress via this route is not possible. Similarly, the access and egress route into Griffiths Way Retail Park via Graham Close is impacted by a surface water flow route along most of the road, accompanied by a large area of ponding near its junction with Griffiths Way. The ponding area reaches maximum depths of 0.60 to 0.90m, with velocities peaking at 1.00 to 2.00m/s to the south of the ponding. The flood hazard associated with this ponding is classified as 'Danger for most', thereby vehicular access and egress via this route is not possible. Developers will need to demonstrate that safe access and egress in the 0.1% AEP event, including allowance for climate change.
Dry Islands	The site is 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 latest climate change allowances have been applied to the River Ver (2019) hydraulic model to indicate the impact of fluvial flood risk. Mapping shows that the site is within Flood Zone 1 and with the latest climate change allowances applied fluvial flood risk to the site remains negligible. **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, affecting a large portion of the northern area of the site and several areas across the south. The maximum flood depth recorded on the site during this event is 1.01 meters, with flow velocities reaching up to 1.72 meters per second. This results in a flood hazard classified as 'Danger for most'. 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 consist of:
	  ○ Bedrock – Bedrock geology of the site is Lewes Nodular Chalk Formation and Seaford Chalk Formation – chalk. This is a sedimentary bedrock.
	  ○ Superficial deposits – The superficial deposits on the site are comprised of River Terrace Deposits – Sands and gravel. This is a sedimentary superficial deposit.
	• Soils at the site consist of:
	  ○ Freely draining slightly acid but base-rich soils
	Sustainable Drainage Systems (SuDS)
	• 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.
	• BGS data indicates that the underlying geology is chalk with superficial deposits of sands and gravels 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 whole site is located within Groundwater Source Protection Zone 3 and 93% of the site is in Groundwater Source Protection Zone 2. Proposed SuDS should be discussed with relevant stakeholders (St Albans City and District Council, Hertfordshire County Council (LLFA) and the Environment Agency) at an early stage to understand possible opportunities and constraints. The Groundwater Source Protection Zone guidance is currently undergoing a review. Therefore, developers should ensure they are using the latest guidance. • 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 3.3%, 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. • 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 (St Albans City and District Council, Hertfordshire County Council, Thames Water 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 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 site is within Flood Zone 1 but at risk from surface water flooding. The Sequential Test must be passed, the criteria for which is highlighted within the Level 1 Assessment. The Exception Test is not required under the NPPF. However, it must be shown that the development will be safe for its lifetime and the risk can be managed through a sequential approach to design.

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:
	  ○ Greater than one hectare
	  ○ At risk of flooding from surface water and groundwater
	• All sources of flooding should be considered as part of a site-specific FRA. Ground investigations are likely to be necessary to confirm the risk form groundwater flooding to the site.
	• 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).
	• 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.

- Arrangements for safe access and egress will need to be demonstrated for the 1% and 0.1% AEP surface water events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs.
- Should built development be proposed within the 1% AEP surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures.
- 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 site is in Flood Zone 1 however has some significant risk of surface water flooding and low risk of groundwater flooding. Development is likely to be able to proceed if:

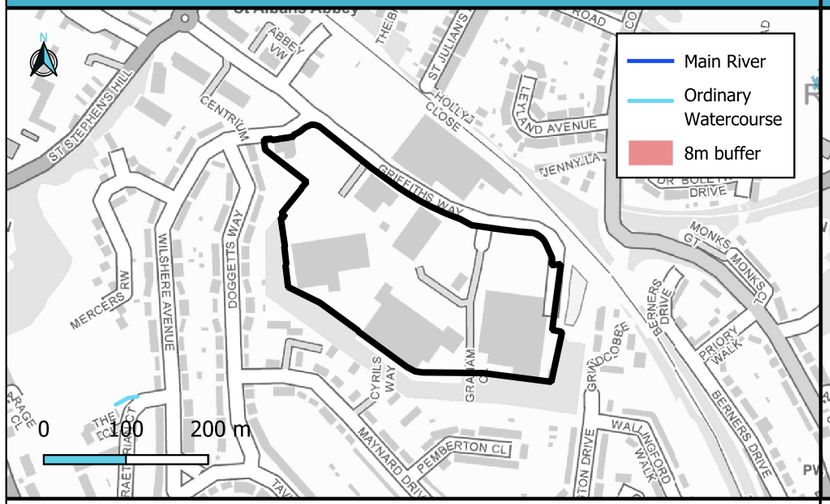
- A site-specific FRA demonstrates that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding on the site and to neighbouring areas.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development steered away from the areas identified to be at risk of surface water flooding across the site.
- Arrangements for safe access and egress will need to be demonstrated for the 0.1% AEP and 1% surface water events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. This includes measures to reduce flood risk along these routes such as raising access, but not displacing floodwater elsewhere.
- The surface water flow paths which cross the site are incorporated into SuDS/blue-green infrastructure.
- 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).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. Flood Zone 3b has been created from the River Ver (2019) hydraulic model.
Climate change	The most recent uplifts have been applied to the River Ver (2019) hydraulic model to indicate the impacts on fluvial flood risk. 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	Depth, velocity, and hazard data was derived from the River Ver (2019) hydraulic model.
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	
Site Name	Griffiths Way Retail Park, St Albans AL1 2RJ

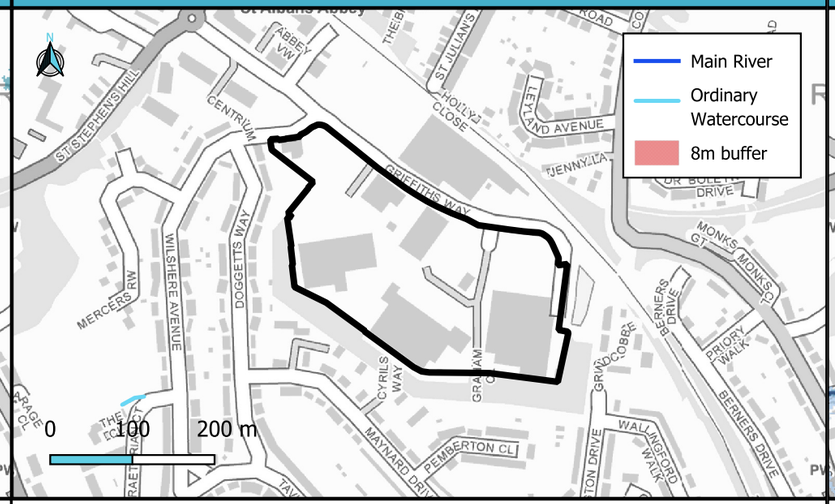
St Albans District Council
Strategic Flood Risk Assessment
Level 2 Detailed Site Summary

Flood Zone Map (present day)



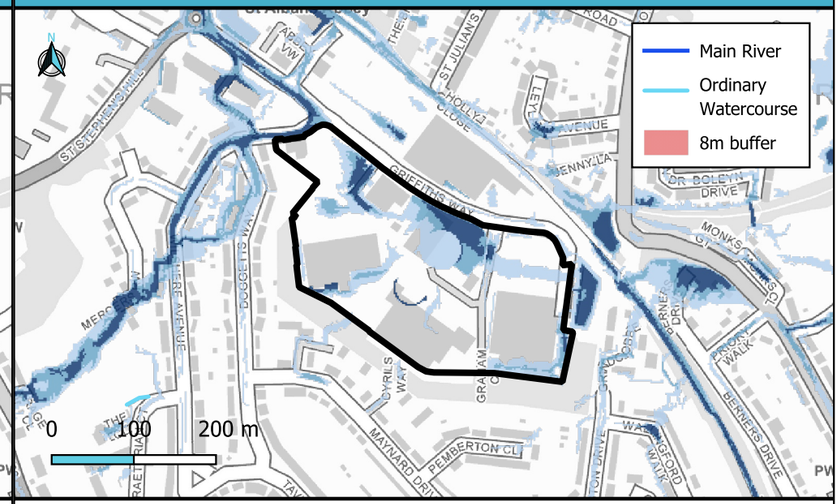
Flood Zone 2 (Between 1% and 0.1% AEP)
Flood Zone 3a (Between 3.33% and 1% AEP)
Flood Zone 3b (Less than 3.33% AEP)
Site boundary
Other site

Flood Zone 3b + Climate Change



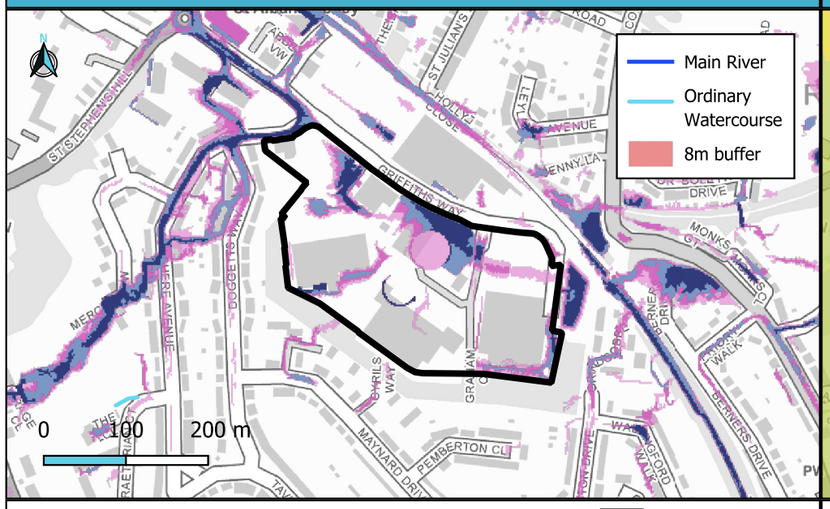
Flood Zone 3b + 21% (Central allowance)
Flood Zone 3b + 35% (Higher allowance)
Flood Zone 3b
Site boundary
Other site

Surface Water Map (RoFSW)



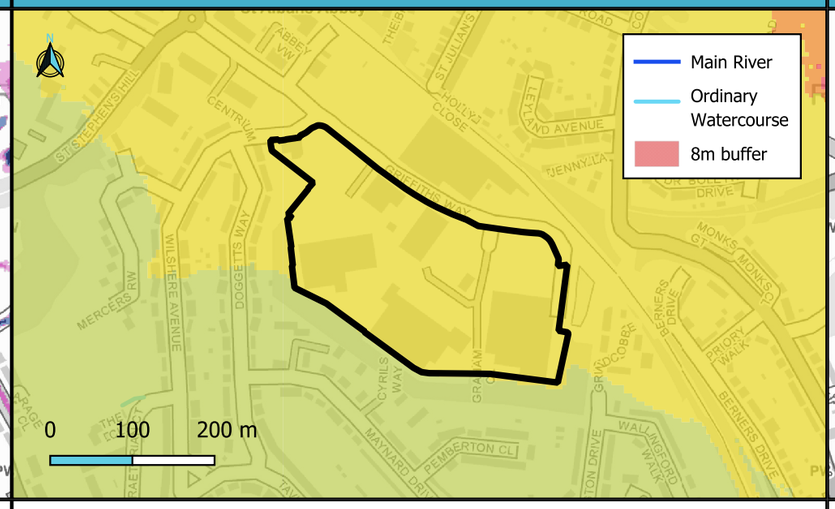
RoFSW 1 in 30-year (3.33% AEP)
RoFSW 1 in 100-year (1% AEP)
RoFSW 1 in 1000-year (0.1% AEP)
Site boundary
Other site

Surface Water Map + Climate Change



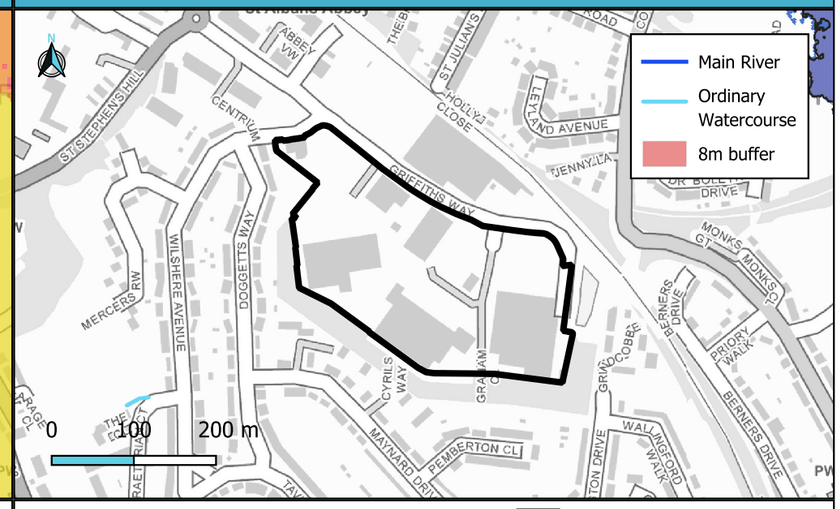
RoFSW 1 in 30-year (3.33% AEP)
RoFSW 1 in 30-year (3.33% AEP) plus 40%
RoFSW 1 in 100-year (1% AEP)
RoFSW 1 in 100-year 1% AEP plus 40%
Site boundary
Other site

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
Other site

Reservoir Flood Risk



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

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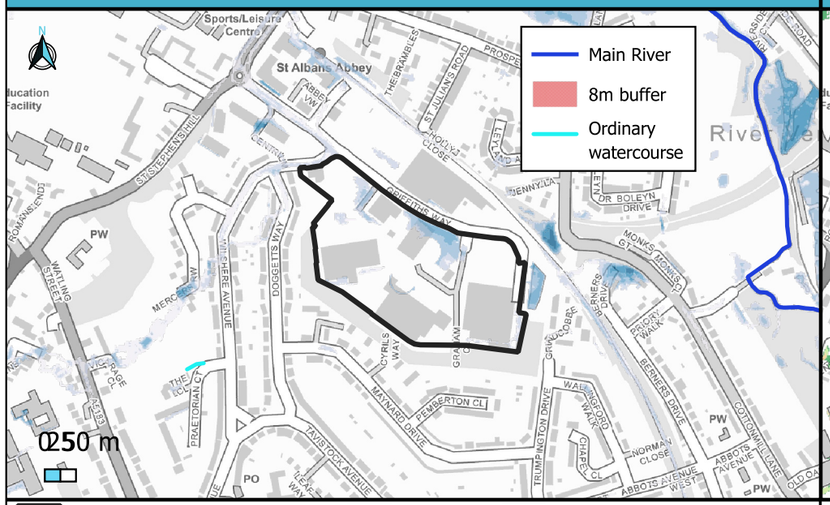
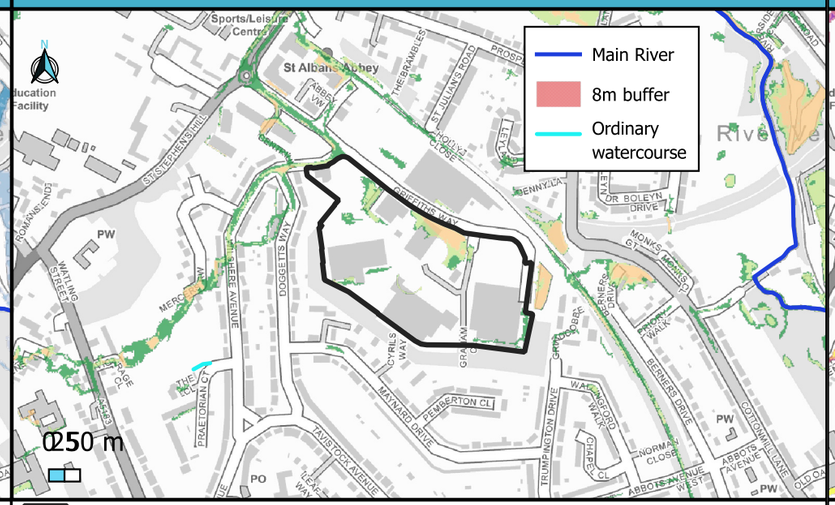
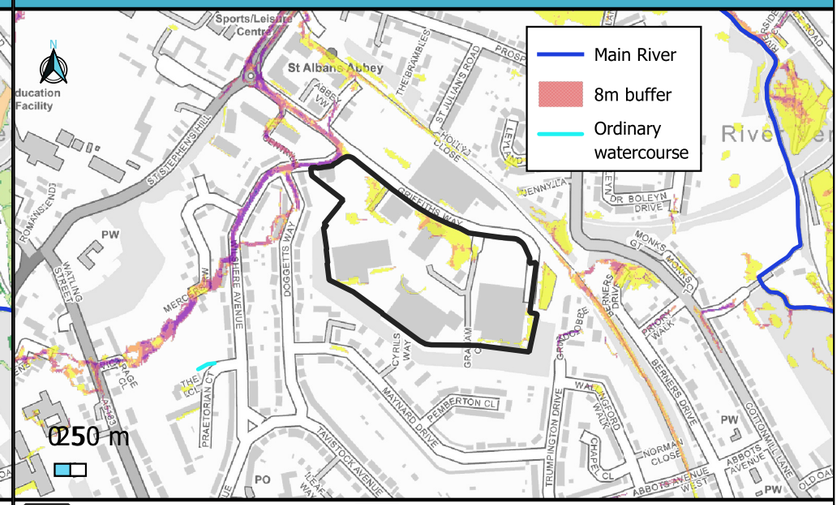
RoFSW Max Depth - 1% AEP



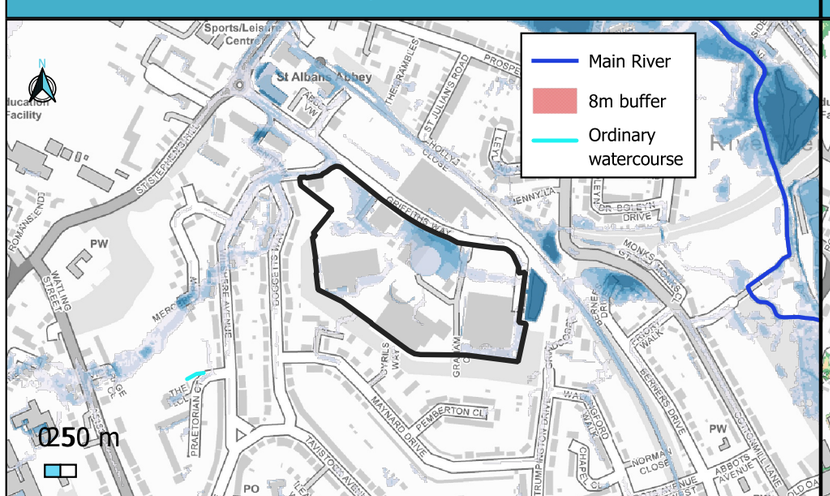
RoFSW Max Hazard - 1% AEP



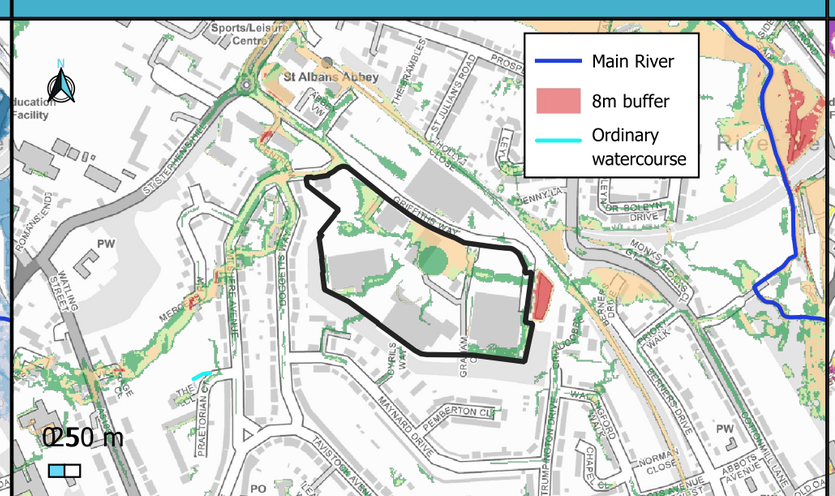
RoFSW Max Velocity - 1% AEP



RoFSW Max Depth - 1% AEP + 40% CC



RoFSW Max Hazard - 1% AEP + 40% CC



RoFSW Max Velocity - 1% AEP + 40% CC