	St Albans City and District Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Table
Site details	
Address	Garage Block B off Cotlandswick, London Colney
Area	0.12ha
Current land use	Garage block
Proposed land use	Residential
Flood Risk Vulnerability	More Vulnerable
Sources of flood risk	
Location of the site within the catchment	The site is located within the village of London Colney, Hertfordshire. London Colney is a well-connected village bordered by the North Orbital Road (A414) to the north, the A1081 to the east and the M25 to the south. It is situation in the northern area of the village, just to the south of Cotslandswick Leisure Centre. The site is currently a set of garage units with parking surrounded by residential properties, located off Cotlandswick. The site is situated upstream of the London Colney Stream, a tributary of the River Colne, which lies approximately 1.2 km south of the site. It is within the Upper Colne and Ellen Brook catchment, encompassing an area of 95.5 km². The site itself is located in the lower catchment, which is predominantly urbanized. The River Colne forms part of the Colne Management Catchment, covering a much larger area of 1,040 km².
Topography	Environment Agency 1m resolution LIDAR across the site shows that topography is fairly flat. 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 the highest elevations are along the sites northern boundary reaching a maximum elevation of 75.3mAOD. The elevations then fall to between mainly 74.5 to 74.9mAOD. There is an area of lower elevation in the southeastern area of the site between 74.3m-74.4mAOD.
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 London Colney 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 Upper Colne (2010) and London Colney (2018) 1D-2D hydraulic models received for this Level 2 SFRA. **Flood characteristics:** The site is located within Flood Zone 1 and is therefore at negligible risk of fluvial flooding. The Environment Agency's Upper Colne (2010) model is undergoing a full revision. No results were available at the time of preparation of this report. It is possible that the predicted fluvial flood risk to the site may change as a result of this remodelling.
Surface Water	**Proportion of site at risk (RoFSW):** **3.3% AEP** – 10% Max depth – 0.30 – 0.60m Max velocity – <0.25m/s **1% AEP** – 31% Max depth – 0.30 – 0.60m Max velocity – 0.50 – 1.00m/s **0.1% AEP** – 44% Max depth – 0.60 -0.90m 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:** During the 3.3% AEP event, there is surface water ponding occurs in the southeastern area of the site, situated in front of and between the exsisting garage blocks. The flood depths in these pondrd aread range between 0.15 to 0.30m and 0.30 to 0.60m. Flow velocities are<0.25m/s, and the flood hazard varies from 'Very low' to 'Danger for some'. During the 1% AEP event, surface water flood extents across the majority of the southern area of the site, affectingboth the area in front of the southern block of garages and the garage blocks themselves. Flood depths range primarily between 0.15 to 0.60m, with deeper depths in front of the southern garage block. Velocities are predominantly <0.25m/s,

	though some smaller areas reach maximum velocities between 0.50 to 1.00m/s. The flood hazard is 'Very low' to 'Danger for some'. During the 0.1% AEP event, the flood extent encompasses most of the southern and eastern area of the site. The area of ponding in front of the southern block of garages has extended northward, covering a larger area. The flood depths for this ponding area range mainly between 0.30 to 0.60m, reaching a maximum of 0.60 to 0.90m in some parts. Other flooded areas vary in depth from <0.15m to a maximum of 0.60 to 0.90m. FLow velocities reach a maximum of between 1.00 – 2.00m/s but are predominantly <0.25m/s. The flood hazard 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 the site is at moderate risk of groundwater flooding. Groundwater for the whole site is between 0.25-0.5m below ground level. The risk form groundwater will need to be investigated further as part of a site-specific flood risk assessment and is likely to require ground investigations to confirm the risk.
Sewers	The site is located within a postcode area with 23 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. . One incident was reported to St Albans District Council in June 2016 approximately 0.17km downstream of the site. Surface water caused a side road to flood off Cotlandswick, it also caused external flooding to the front and back garden of one property.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows that the site is not protected by any formal flood defences.
Residual risk	Based on topography and modelled surface water flow paths around the site, it is not likely that a blockage of the London Colney Stream at the King's Road culvert would impact the site.
Emergency planning	
Flood warning	The site is not located within any Environment Agency Flood Warning or Alert Areas.
Access and egress	Access and egress to the site is currently by an access road off Cotlandswick. Vehicular access to Cotlandswick is via High Street.

	During the 3.3% AEP surface water event, flooding occurs on the northern section of Cotlandswick near its junction with High Street. Flood depths are <0.15m, with velocities fairly slow moving reaching a maximum of 0.25 – 0.50m/s. The flood hazard is 'Very low' to 'Danger for some', therefore vehicular access and egress is possible. Additionally, there is no surface flooding on the remainder of Cotlandswick, ensuring that the southern exit onto High Street Remains accessible for pedestrians and vehicles. During the 1% AEP surface water event, similar to the 3.3% AEP there is an area of flooding along the northern section of Cotlandswick. The flood depth for this area of pooling reaches a maximum flood depth of between 0.15 to 0.30m. The flow velocity ranges from <0.25m/s to a maximum of 0.50 to 1.00m/s. The flood hazard is 'Very low' to 'Danger for some' therefore, vehicular access and egress is possible. As with the 3.3% AEP event there is no additional surface flooding on the rest of Cotlandswick. As a result, the southern exit of the road onto High Street also provides safe access and egress to pedestrians and vehicles. During the 0.1% AEP surface water event, surface water is present along Cotlandswick at both entrances to the road. At the northern entrance, the flooding reaches a maximum depth of 0.30 to 0.60m, with the majority of the area experiencing depths between 0.15 to 0.30m. Flow velocities varies from <0.25m/s to a maximum of 0.50 to 1.00m/s. The flood hazard in this area is 'Very low' to 'Danger for some', as a result vehicular access and egress is possible At the southern entrance of Cotlandswick, flooding reaches a maximum flood depth of 0.15 to 0.30m. Flow velocities here reach a maximum of 1.00 to 2.00m/s, with a flood hazard classified as 'Very low'. Therefore, vehicular and pedestrian access and egress is possible.
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 latest climate change allowances have been applied to the London Colney model. The 0.1% AEP extent from the Upper Colne model has also been used as a proxy for future flood risk. Mapping from both models shows that the site remains within Flood Zone 1 and that future 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 the southern and eastern areas of the site. The maximum flood depth, velocity and hazard on the site during this event is, 0.61m, 0.84m/s and 'Danger for most'. Safe access and egress route along Cotlandswick remains, with the northern area of flooding classed as 'Danger for some' and the southern 'Very low' hazard. 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 of the site is comprised of Kesgrave Catchment Subgroup – sand and gravel. This is a sedimentary superficial deposit.
	• Soils at the site consist of:
	  ○ Slightly acid loamy and clayey soils with impeded drainage.
	
	Sustainable Drainage Systems (SuDS)
	• Groundwater levels are indicated to be less than 0.5m below ground level. 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.
	• BGS data indicates that the underlying geology is chalk which is likely to be free draining. This should be confirmed through infiltration testing, and groundwater monitoring throughout a winter period.
	• The whole site is located within Groundwater Source Protection Zones 2 and 3. Proposed SuDS should be discussed with relevant stakeholders (with 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 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% 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. 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 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 site is within Flood Zone 1 but at risk from surface water and groundwater 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 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 from groundwater flooding to the site. • Consultation with the St Albans City and District Council, Hertfordshire County Council (Lead Local Folld Authority), 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. • 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. • Arrangements for safe access and egress will need to be demonstrated for all the surface water events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. • Due to the high groundwater flood risk, basements are advised. • The design of SuDS schemes must consider 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. • Mitigation for seasonal high groundwater levels must be considered (for example by raising finished floor levels to an appropriate height above ground level).

	• 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 and groundwater flooding. Development is likely to be able to proceed if:

- 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.
- A site-specific Flood Risk Assessment that demonstrates that site users will be safe in the 1% AEP surface water events, including 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 that development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- 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

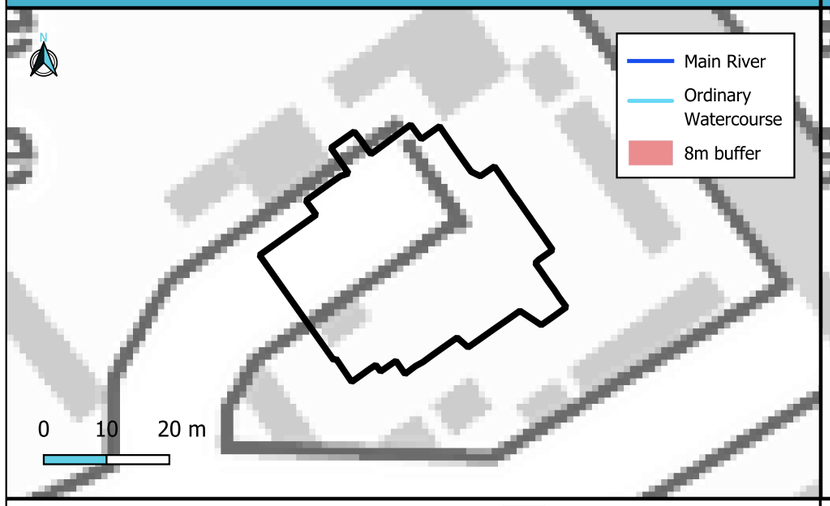
Flood Zones	Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Map for Planning mapping. Flood Zone 3b has been created from the Upper Colne (2010) and London Colney (2018) hydraulic models.
Climate change	The most recent uplifts have been applied to the London Colney (2018) hydraulic models to indicate the impacts on fluvial flood risk. The 0.1% AEP (Flood Zone 2) has been used as a proxy to represent the flood zone 3a plus climate change for the Upper Colne (2010) model. 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 London Colney (2018) 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	Garage Block B off Cotlandswick, London Colney

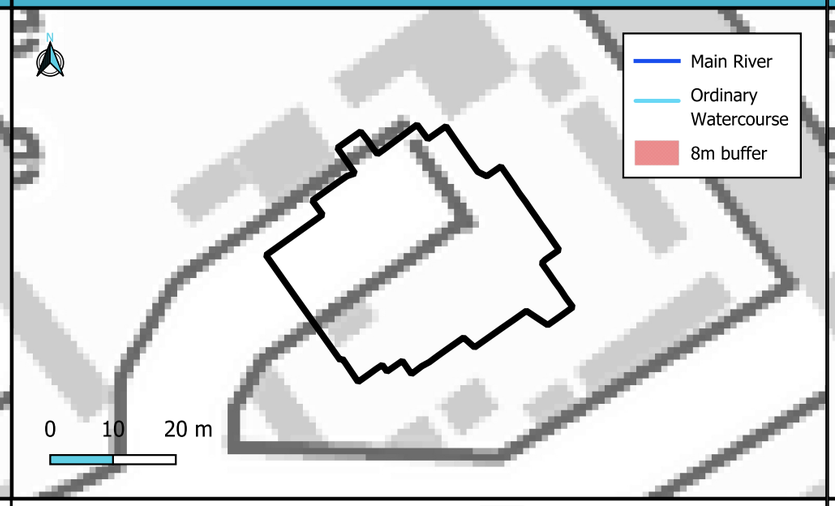
St Albans District Council
Strategic Flood Risk Assessment
Level 2 Detailed Site Summary

Flood Zone Map (present day)



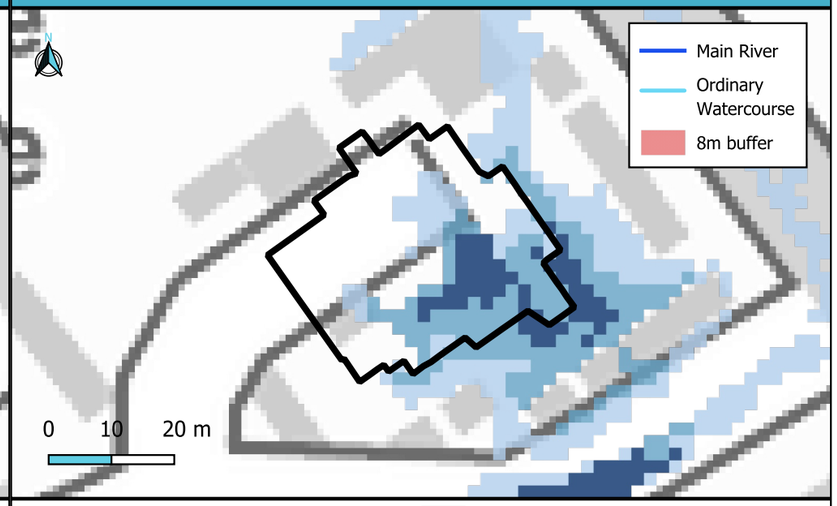
Flood Zone 2 (Between 1% and 0.1% AEP)
Flood Zone 3a (Between 3.33% and 1% AEP)
Flood Zone 3b (Less than 3.33% AEP)
Site boundary
Other site

Flood Zone 3b + Climate Change



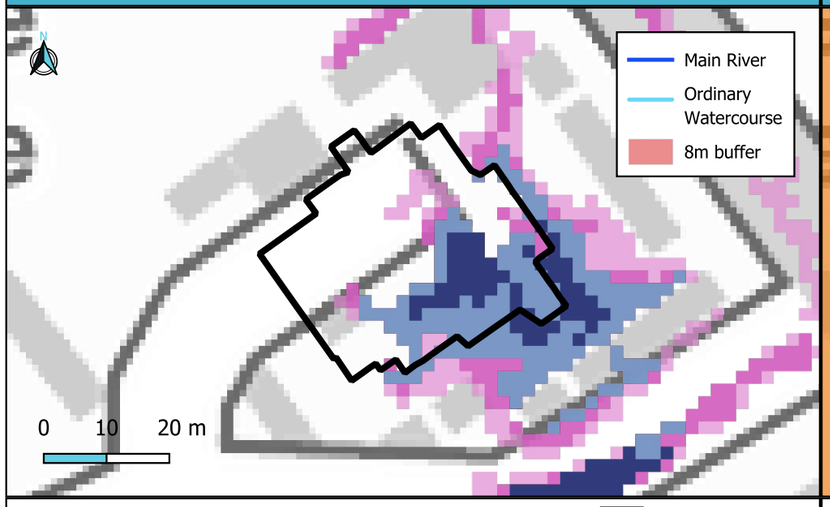
Flood Zone 3b + 21% (Central allowance)
Flood Zone 3b + 35% (Higher allowance)
Flood Zone 3b
Site boundary
Other site

Surface Water Map (RoFSW)



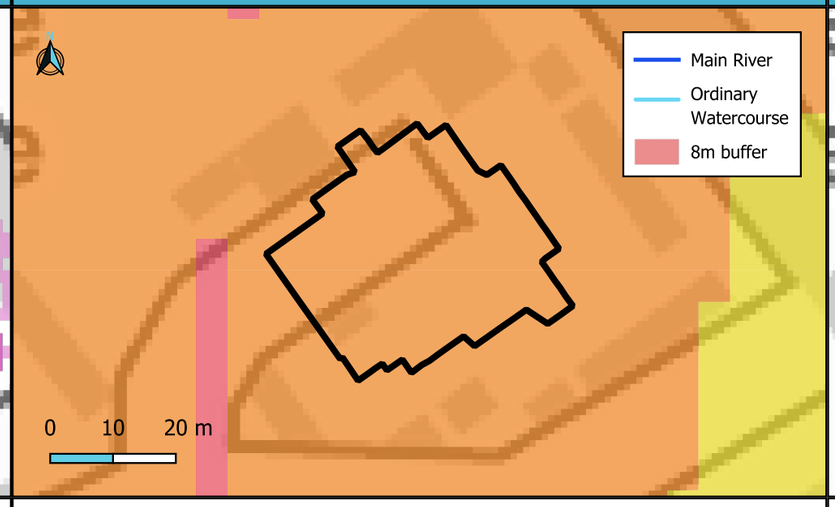
RoFSW 1 in 30-year (3.33% AEP)
RoFSW 1 in 100-year (1% AEP)
RoFSW 1 in 1000-year (0.1% AEP)
Site boundary
Other site

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

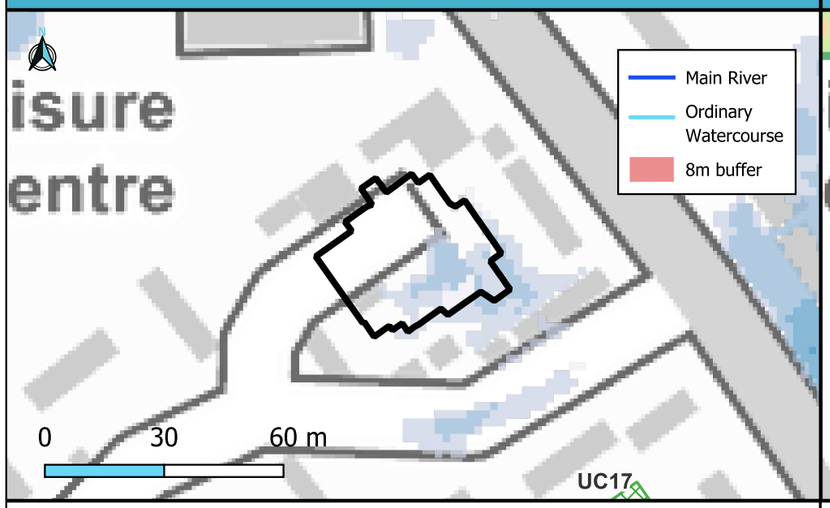
Reservoir Flood Risk

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

Site Reference	
Site Name	Garage Block B off Cotlandswick, London Colney

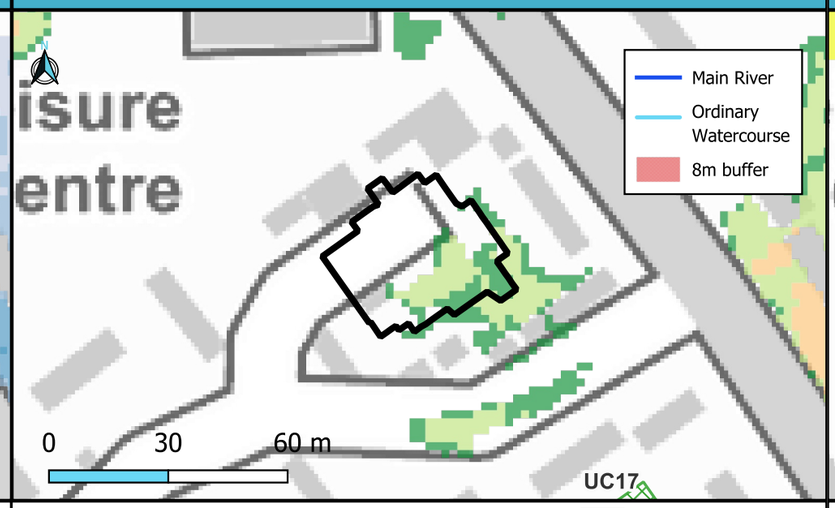
St Albans District Council
Strategic Flood Risk Assessment
Level 2 Detailed Site Summary

RoFSW Max Depth - 1% AEP



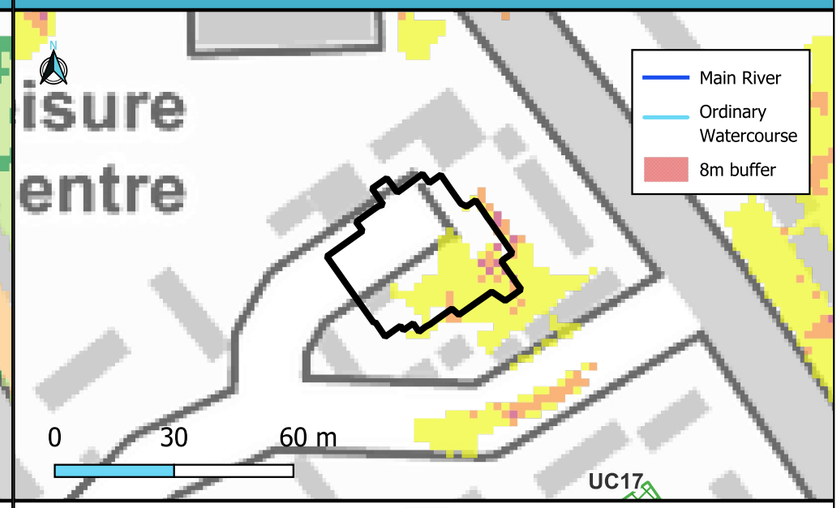
Depth (m)
0.00 - 0.15
0.15 - 0.30
0.30 - 0.60
0.60 - 0.90
0.90 - 1.20
> 1.20
Site boundary
Other site

RoFSW Max Hazard - 1% AEP



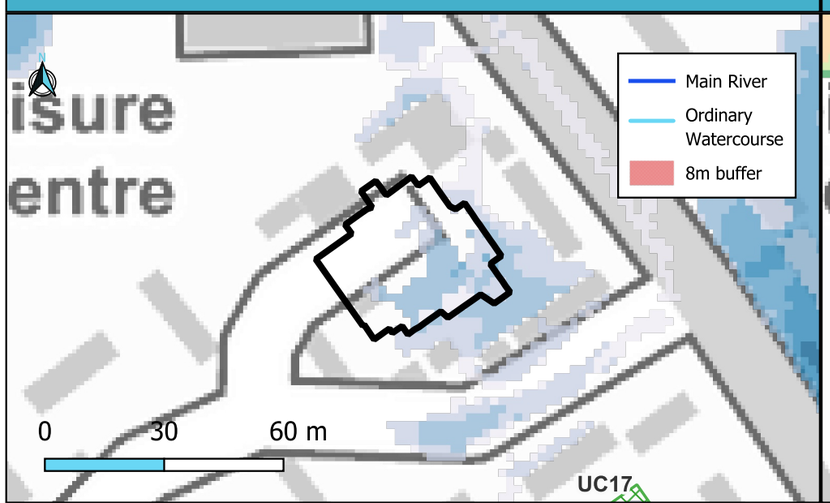
Hazard
< 0.75: Low
0.75 - 1.25: Moderate
1.25 - 2.00: Significant
> 2.00: Extreme
Site boundary
Other site

RoFSW Max Velocity - 1% AEP



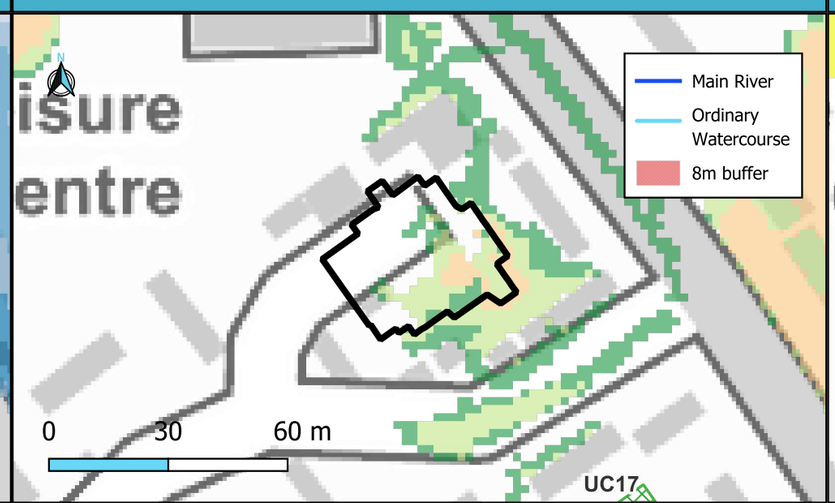
Velocity (m/s)
0.00 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 2.00
> 2.00
Site boundary
Other site

RoFSW Max Depth - 1% AEP + 40% CC



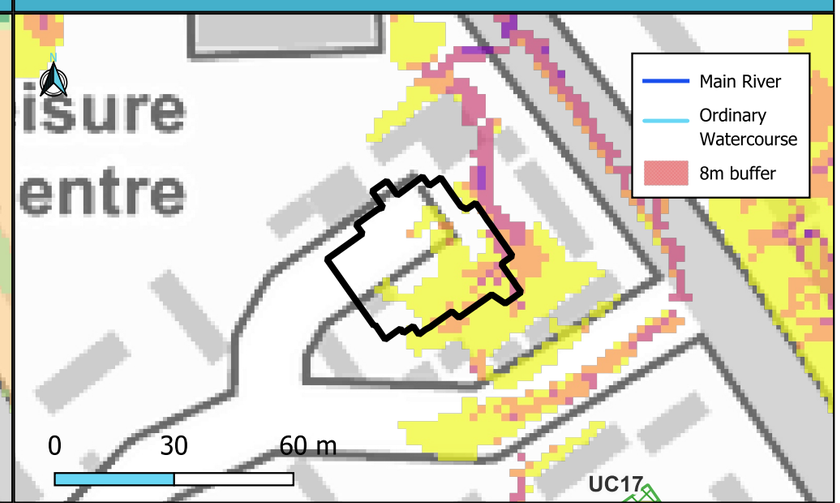
Depth (m)
<= 0.15
0.15 - 0.30
0.30 - 0.60
0.60 - 0.90
0.90 - 1.20
> 1.20
Site boundary
Other site

RoFSW Max Hazard - 1% AEP + 40% CC



Hazard
< 0.75: Low
0.75 - 1.25: Moderate
1.25 - 2.00: Significant
> 2.00: Extreme
Site boundary
Other site

RoFSW Max Velocity - 1% AEP + 40% CC



Velocity (m/s)
0.00 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 2.00
> 2.00
Site boundary
Other site