

**Greater Norwich
Level 2
Strategic Flood
Risk Assessment
Detailed Site
Summary Tables**



Site details

Site Code	GNLP0264
Address/Grid Ref.	Land at Dog Lane, Horsford/ 619160, 315755
Area	1.77ha
Current land use	Commercial and greenfield
Proposed land use	Residential

Sources of flood risk

Location of site within catchment	The site is in the catchment of the Spixworth Beck. The Spixworth Beck is an Environment Agency designated main river and flows in an easterly direction through Horsford. Several tributaries join the river along its course including the Stone Beck. The Spixworth Beck continues to flow east before its confluence with the Dobbs' Beck.
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Existing drainage features	The site is located on the edge of the Spixworth Beck. The river flows in an easterly direction in open channel, along the northern part of the site before continuing to flow east out of Horsford. There are no additional watercourses within the site boundary or in close proximity to the site.
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Fluvial	<p>Proportion of site at risk: FZ3b – 0% FZ3a – 0% FZ2 – 3% FZ1 – 97%</p> <p><i>The % Flood Zones quoted show the % 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, e.g. FZ2 includes the FZ3 %. FZ1 is the remaining area outside FZ2 (FZ2 + FZ1 = 100%).</i></p> <p>Available data: Modelling has been completed for the Spixworth Beck using TUFLOW. Further modelling was undertaken to apply recent climate change uplifts to the fluvial model of the Spixworth Beck.</p> <p>Flood characteristics: The site is not at risk of flooding from the Spixworth Beck during the 5% AEP and 1% AEP flood events.</p> <p>During the 0.1% AEP event, two small areas of the site are at risk of flooding. Flood water that overflows the channel upstream of the site flows towards the northern and western boundaries of the site. The area along the western boundary of the site is lower than the site itself, therefore flood water from the Spixworth Beck ponds in this area and a small area intersects the site boundary. Flood water also flows along Horsbeck Way and a small part of this flood water floods the access road from this area to the north eastern corner of the site. Flood depths in the north-east area are predominantly shallow, below 0.3m and are deeper to the west with a maximum depth of flooding of 0.9m. This area has a flood hazard rating between 'caution' and 'dangerous for most'</p>
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Coastal and Tidal	The site is not at risk from coastal or tidal flooding.
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<p>Surface Water</p>	<p>Proportion of site at risk (RoFfSW): 3.3% AEP – 3% Max depth 0.6-0.9m, Max velocity <0.25m/s 1% AEP – 5% Max depth 0.9-1.2m Max velocity >0.25m/s 0.1% AEP – 10% Max depth >1.2m Max velocity >0.25m</p> <p><i>The % SW extents quoted show the % 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 %)</i></p> <p>Description of surface water flow paths:</p> <p>Surface water flooding from the site occurs from an overflow of the Spixworth Beck.</p> <p>During the 3.3% AEP flood event, surface water is only modelled in the channel of the Spixworth Beck and does not pose a risk of flooding to the site.</p> <p>In the 1% AEP event, a narrow area of surface water ponding is present along the edge of the Spixworth Beck. Flood depths in this area could reach 0.6m to 0.9m.</p> <p>The 0.1% AEP flood event presents the most significant risk to the site. Surface water overflows the Spixworth Brook and flows onto the site in two locations, in the north-western part of the site and along the northern access road from Horsbeck Way. Flood depths are greatest in the north-western part of the site (0.15m->1.2m) with lower depths seen on the access road (0.15m-0.3m).</p>
<p>Reservoir</p>	<p>The site is not shown to be at risk of reservoir flooding from the available <u>online</u> maps.</p>
<p>Groundwater</p>	<p>The Environment Agency Areas Susceptible to Groundwater Flooding dataset, provided as 1km grid squares, shows the susceptibility of an area to groundwater flood emergence. The following comments can be made about groundwater flood risk:</p> <ul style="list-style-type: none"> The entire site is shown to have a >50%- <75% susceptibility to groundwater flood emergence. <p>This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific FRA stage.</p>
<p>Flood history</p>	<p>The Environment Agency's historic flooding and recorded flood outlines datasets do not record of flooding on the site.</p> <p>Flood history information provided in the Level 1 SFRA identifies one incidence of external historic flooding 140m west of the site. The site is in a postcode area which has experienced 13 incidences of sewer flooding (as identified in the Level 1 SFRA).</p>
<p>Flood risk management infrastructure</p>	
<p>Defences</p>	<p>This site is not protected by any formal flood defences.</p>
<p>Residual risk</p>	<p>There is no residual risk to the site from flood risk management structures.</p>
<p>Emergency planning</p>	
<p>Flood warning</p>	<p>A small part of the site (along the Spixworth Beck) is in the 'The River Bure, Spixworth Beck and surrounding Becks' Environment Agency's flood alert area.</p>
<p>Access and egress</p>	<p>The site is currently accessed from two locations, from Horsbeck Way and Dog Lane.</p> <p>In terms of fluvial flood risk, only the access road from Horsbeck Way is affected by flood water, however flood depths both on the access road and on Horsbeck Way are shallow. As the site can still be accessed from Dog Lane, access and egress point is unlikely to be affected during a fluvial flood event. Access and egress via dog lane is unlikely to be impacted in the future, even considering the most 0.1% AEP event under the Upper End (+65%) climate change scenario.</p> <p>In terms of surface water flood risk, surface water flooding impacts a small proportion of the site and some of the surrounding road network in the 1% AEP and 0.1% AEP modelled events. Access to Horsbeck Way may be restricted during a surface water flooding event however access to and from the site would still be available from Dog Lane.</p>
<p>Dry islands</p>	<p>The site is not located on a dry island.</p>

Climate change

Implications for the site

- The site is sensitive to increased fluvial flows in the Spixworth Beck resulting from climate change. The increase in extent is small but the increase in depth and hazard rating is more significant.
- A very small part of the site is in future Flood Zone 3a. During the 1% AEP plus Upper End (65%) climate change scenario, an area of flood water is present along the western boundary of the site and a small proportion overflows onto the site. Flood depths in this area are a maximum of 0.4m and have a maximum flood hazard rating of 'dangerous for most'.
- A small part of the site is in future Flood Zone 2. The 0.1% AEP plus Upper End (65%) climate change scenario results in flooding along the western site boundary and from the access road from Horsbeck Way. Flood depths are below 0.54m along the access road and are below 1m along the western edge of the site. The maximum flood hazard rating is 'dangerous for most'. This represents only a small increase from the present day 0.1% AEP flood extent.

Proportions of the site in Future Flood Zones can be found in Table 6-2 of the Greater Norwich Level 2 SFRA Report

Requirements for drainage control and impact mitigation

Broad scale assessment of possible SuDS

Geology & Soils

- Geology at the site consists of:
 - Bedrock – Wroxham Crag Formation - Sand and Gravel.
 - Superficial – Alluvium Deposits - Clay, Silt, Sand and Gravel; Head - Clay, Silt, Sand and Gravel (southern half).

SuDS

- Most source control techniques are likely to be suitable. Mapping suggests that permeable paving may have to use non-infiltrating systems given the possible risk both to and from groundwater.
- Infiltration may be suitable. Mapping suggests a medium risk of groundwater flooding and underlying soils may be permeable. Further site investigation should be carried out to assess potential for drainage by infiltration. If infiltration is suitable it should be avoided in areas where the depth to the water table is <1m. As the site is located within a Source Protection Zone, infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Additionally, proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.
- Detention may be feasible provided site slopes are <5% at the location of the detention feature. If the site has contamination or groundwater issues, a liner will be required.
- Filtration is probably suitable provided site slopes are <5% and the depth to the water table is >1m. If the site has contamination or groundwater issues, a liner will be required.
- All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. If the site has contamination or groundwater issues, a liner will be required.
- Developers should investigate and consider in full all SuDS options and demonstrate that SuDS are not appropriate where they are not implemented.
- The site is not designated by the Environment Agency as previously being a landfill site.

Opportunities for wider sustainability benefits and integrated flood risk management

- Due to the size of the site, there is likely to be limited space for green infrastructure. It is recommended that areas of hard paving are designed to ensure that flood water can be stored during a flood event alongside the use of green features such as rain gardens and tree pits.

NPPF and planning implications

Exception Test requirements

The Local Authority will need to confirm that the sequential test has been carried out. The Sequential Test will need to be passed before the Exception Test is applied.

Residential development is classified as 'More Vulnerable'. As only a small part of the site is in Flood Zone 2, the Exception Test is not required for the site.

Requirements and guidance for site-specific Flood Risk Assessment

Flood Risk Assessment:

- At the planning application stage, a site-specific Flood Risk Assessment will be required as the part of the development is in Flood Zone 2.
- All sources of flooding, particularly the risk of fluvial and surface water should be considered as part of a site-specific flood risk assessment.
- The site-specific FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance, Norwich City Council's Local Plan policies, and the Norfolk County Council Lead Local Flood Authority's Statutory Consultee for Planning Guidance Document.
- Consultation with the Local Authority, Lead Local Flood Authority and the Environment Agency should be undertaken at an early stage.
- The development should be designed to ensure that mitigation measures are in place to ensure the development does not flood.

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).
- Where possible, development should be located outside of the areas at risk of flooding.
- Safe access and egress will need to be demonstrated in the 1 in 0.1% AEP plus climate change fluvial and rainfall events, using the depth, velocity and hazard outputs. Ideally, the access route should be situated 300mm above the designed flood level and waterproofing techniques should be used where necessary. 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 areas of surface water flood risk. Alternatively, risk could be managed by inclusion of a higher refuge and a flood response plan that meets the requirements of the Local Council and their Emergency Planner.
- Compensatory flood storage is required for any land raising and all proposed buildings whenever there is built development on land within the 1% +35% climate change flood extent.
- The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, to ensure that runoff from the development is not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure there is no increase in runoff beyond current greenfield rates.
- Areas at risk from surface water flooding should ideally be integrated into green infrastructure, which presents wider opportunities to improve biodiversity and amenity as well as climate change adaptation. An integrated flood risk management and sustainable drainage scheme for the site is advised. It is essential that a detailed model of surface water flooding, using the existing drainage system, topographical and asset survey is constructed at the FRA stage. This will determine the risk from surface water flooding further and to ensure that overland flows do not overwhelm future sustainable drainage features.
- Brownfield sites should discharge surface water at the original pre-development (greenfield) runoff rate. If this is not possible, a significant reduction in the current rate of discharge should be achieved and agreed with the relevant drainage body (LLFA).
- Developers should refer to Norfolk County Council's 'Norfolk County Council Lead Local Flood Authority Statutory Consultee for Planning Guidance Document' and the Level 1 SFRA for information on SuDS for guidance on the information required by the LLFA from applicants to enable it to provide responses to planning applications.

Key messages

The development is likely to be able to proceed if:

- Development is located outside of areas at risk of flooding.
- Space for surface water to be stored on the site is provided and rainwater harvesting should be considered.
- Brownfield sites should discharge surface water at the original pre-development (greenfield) runoff rate. If this is not possible, a significant reduction in the current rate of discharge should be achieved and agreed with the relevant drainage body (LLFA, IDB or Anglian Water).

Mapping Information

The key datasets used to make planning recommendations regarding this site were the broadscale 2D modelling outputs from the Environment Agency's Flood Map for Planning, Spixworth Beck Flood Model and the Risk of Flooding from Surface Water map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 2 and 3 have been taken from the Environment Agency's Flood Map for Planning mapping.
Climate change	Climate change was modelled as part of the further modelling to apply recent climate change uplifts to the fluvial model of the Spixworth Beck.
Fluvial depth, velocity and hazard mapping	Fluvial depth and hazard mapping has been taken from the strategic modelling of the Spixworth Beck. This should be explored further at site-specific stage.
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth and hazard mapping for the 1 in 0.1% AEP event is taken Environment Agency's Risk of Flooding from Surface Water mapping.