Greater Norwich Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables	
Site details	
Site Code	**GNLP0253**
Address/Grid Ref.	Colney Hall, Watton Hill/ 617125,308268
Area	25.0 ha
Current land use	Greenfield
Proposed land use	Mixed Use
Sources of flood risk	
Location of site within catchment	The River Yare rises near Garvestone to the west of Norwich and flows eastward, around the southern edge of Norwich, towards its confluence with the River Wensum just downstream of the city centre. The site is located to the west of Norwich on the south bank of the River Yare, approximately 10km upstream of the confluence with the Wensum, and is bounded by a meander on the sites northern edge.
Existing drainage features	The River Yare passes around the north and western edges of the site. There are no other drainage features within the site boundary however there are several drainage channels, ponds and lakes in the area surrounding the northern end of the site.
Fluvial	**Proportion of site at risk:** **FZ3b –** 3% **FZ3a –** 4% **FZ2 –** 4% **FZ1 –** 96% *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%).* **Available data:** Modelling has been completed for the River Yare using TUFLOW. Both defended and undefended scenarios have been modelled and the defended scenarios have been used to assess the risk of flooding to the site. Further modelling was undertaken for the Level 2 SFRA to apply recent climate change uplifts to the fluvial model of the Wensum. **Flood characteristics:** The majority of the site is not at significant risk of fluvial flooding. Fluvial flooding is limited to a small area directly adjacent the river along the north western edge of the site. This area is significantly lower than the rest of the site. During the 5% AEP event flood depths reach up to 1.5m. Flood extent does not increase significantly during larger events. Depths during the 1% AEP event reach up to 1.8m and up to 2.0m during the 0.1% AEP event for the same area of fluvial risk. It is recommended that this area is left undeveloped.

Coastal and Tidal	The site is not at risk from coastal or tidal flooding.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – <1% Max depth <0.3m, Max velocity <0.25m/s **1% AEP** – 2% Max depth 0.6-0.9m Max velocity Z0.25m/s **1,000-year** – 4% Max depth >0.9m Max velocity <0.25m *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 %)* **Description of surface water flow paths:** The majority of the site is not at risk from surface water flooding. Surface water flooding is limited to a small area of the site directly adjacent the site alongside the river on the north western edge.
Reservoir	The site is not shown to be at risk of flooding from reservoirs from available online mapping.
Groundwater	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: • The entire site is shown to have a >50% <75% susceptibility to groundwater flood emergence. 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.
Flood history	The Environment Agency's historic flooding and recorded flood outlines dataset has no record of flooding on the site.
Flood risk management infrastructure	
Defences	The site is not currently protected by any formal flood defences.
Residual risk	There is no residual risk to the site from flood risk management structures.
Emergency planning	
Flood warning	The majority of the site is not in a flood warning area, however the Environment Agency's 'River Yare from Barham Broom to the A11 at Cringleford' Flood Warning Area crosses the south eastern edge of the site.
Access and egress	Access and egress to the site is currently provided by the B1108, which runs along the southern edge of the site. Access and egress via the B1108 is unaffected during both the 0.1% AEP fluvial and surface water events. This remains the case even in the Upper End (+65%) climate change scenario.
Dry islands	The site is not located on a dry island.
Climate change	
Implications for the site	The site is not sensitive to climate change. During the most extreme event modelled, 1,000-year plus Upper End (65%), the flooded extent remains limited to the small area adjacent the river on the north western edge, which is significantly lower than the rest of the site. Flood depths in this scenario reach up to 2.0m, which again does not represent any significant increase compared to the present day 1,000-year event.

	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 - Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation (undifferentiated) - Chalk.
	  ○ Superficial - Sheringham Cliffs Formation - Sand and Gravel.
	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 from groundwater.
	• Mapping suggests that there is a medium-high risk of groundwater flooding at this location, therefore it is likely infiltration techniques will not be suitable. This should be confirmed via site investigations to assess the potential for infiltration. Additionally, the site is located within a Source Protection Zone, therefore techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.
	• Detention is likely to be feasible as mapping suggests mean site slopes are <5%. Feasibility of such options should be assessed as part of a site-specific assessment. If this feature is feasible a liner maybe required to prevent the egress of groundwater.
	• Filtration is likely to be feasible as mapping suggests mean site slopes are <5%. Feasibility of such options should be assessed as part of a site-specific assessment. If this feature is feasible it should be located where the depth to the water table is >1m, additionally a liner maybe required to prevent the egress of groundwater.
	• 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. A liner maybe required to prevent the egress of groundwater.
	• 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 and greenfield nature of the site, there are likely to be many opportunities to install green infrastructure and preserve existing natural features. This could include features such as rain gardens, wild verges and the preservation of existing mature trees.
NPPF and planning implications	
Exception Test requirements	• Given the low risk to most of the site, the site is likely to be suitable for development with some mitigation. • The site is however in close proximity to existing flood zones and it is recommended that a precautionary approach is taken. Any developer should undertake a site-specific flood risk assessment including surface water modelling to demonstrate that the change in land use does not increase the risk of surface water flooding on the site and to nearby properties.
Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** • Provided no development is proposed within the Flood Zone along the north western edge, no site-specific Flood Risk Assessment is required at application stage. However, owing to the site's close proximity to existing flood zones it is recommended that a site-specific flood risk assessment is undertaken as a precautionary approach. • 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. **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, 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. • 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. • It is recommended that the most vulnerable area of the site, along the north western edge adjacent the river, is left undeveloped.

Key messages

The development is likely to be able to proceed if:

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward.
- A site specific Flood Risk Assessment demonstrates that the site is not at an increased risk of flooding in the future, and that the development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- A drainage strategy should help inform site layout and design to ensure there is no increase in runoff beyond current greenfield rates.

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, River Yare 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 allowances (for the 2080s) were modelled as part of Level 2 SFRA. This included Central (+25%), Higher central (+35%) and Upper end (+65%).
Fluvial depth, velocity and hazard mapping	Fluvial depth and hazard mapping has been taken from the River Yare model for present day, which was a 1D model and a 2D domain was added as part of the modelling completed for the Level 2 SFRA, alongside the climate change scenarios. 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 1% AEP event is taken Environment Agency's Risk of Flooding from Surface Water mapping.