Greater Norwich Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables	
Site details	
Site Code	**DIS2**
Address/ Grid Ref.	Land south of Park Road/ 611367,279433
Area	0.89ha
Current land use	Agricultural
Proposed land use	Residential
Sources of flood risk	
Location of site within catchment	The site is within the catchment of the River Waveney. The river rises on the Norfolk-Suffolk border between the villages of Redgrave in Suffolk and South Lopham in Norfolk. The river continues to wind its way eastwards towards Diss, Bungay and Beccles and then through Oulton Broad – the southernmost of the Broads National Park – before reaching the sea at Lowestoft.
Existing drainage features	The upstream extent of the River Waveney flows in an easterly direction, 60m south of the site. the River Waveney is an Environment Agency designated main river and flows in open channel. An artificially modified drainage channel flows along the north-easterly boundary of the site before flowing south into the River Waveney. The drainage channel connects to additional drainage channels located around the boundary of the adjacent field.
Fluvial	**Proportion of site at risk:** **FZ3b –** 0% **5% AEP -** 0% **FZ3a –** 0% **1% AEP -** 0% **FZ2 –** 89% **0.1% AEP -** 4% **FZ1 –** 11% **<0.1% AEP-** 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%). Flood Zones are based on the current EA Flood Map for Planning, % AEP values are based on modelling undertaken for the Level 2 SFRA.* **Available data:** 2D modelling has been completed for the River Waveney using TUFLOW with further modelling undertaken to apply recent climate change uplifts to the fluvial model. This model has been externally reviewed by the Environment Agency and flood zones quoted above are based on the new modelling. We however recognise there is a significant difference between the Environment Agency's currently published flood zones and the latest modelling and current planning decisions should be based on the greater of the two, in this case the published Flood Zones. **Flood characteristics:** The site is not at risk of flooding during the 5% AEP and 1% AEP flood events. In the 0.1% AEP flood event, a small part of the south-eastern part of the site is in the floodplain of the River Waveney. Flood depths in this area are shallow and are up to 0.2m in depth. This area has a maximum flood hazard rating of 'Caution'.

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 0.15-0.3m, Max velocity >0.25m/s **1% AEP** – 2% Max depth 0.15-0.3m Max velocity >0.25m/s **0.1% AEP** – 42% Max depth 0.3-0.6m Max velocity >0.25m/s *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 site is impacted by surface water flooding in all modelled events. In the 3.3% AEP event, three areas of surface water ponding are present in the centre and east of site. The extent of flooding is minimal, and depths range from 0m to 0.6m and a flood hazard rating of 'Caution'. In the 1% AEP event, a flow path originating from Water Gardens and Pipers Gardens converges to the north of the site and flows along the northern and eastern boundary of the site. Flood depths are shallow and are below 0.6m and have a flood hazard rating of 'Caution'. In the 0.1% AEP event, surface water flooding is extensive and affects the majority of the site. The flow path from the north of the site increases in size (from the 1% AEP flow path) and divides into two flow paths, the first flows south-west through the site and the second flows east through the site. Flood depths are a maximum of 0.6m but are predominantly shallow in depth, below 0.3m. The flood hazard ratings on the site range between 'Caution' and 'Dangerous for most'.
Reservoir	The site is not shown to be at risk of reservoir flooding from the available online maps.
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 >=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 datasets do not record of flooding on the site. The site is in a postcode area which has experienced 2 incidences of sewer flooding (as identified in the Level 1 SFRA).
Flood risk management infrastructure	
Defences	This site is not 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 site is located within the Environment Agency's 'The River Waveney from Diss to Bungay' flood warning area. The site is in the 'The River Waveney from Diss and the River Dove to Ellingham, including Bungay' Environment Agency's flood alert area.
Access and egress	The site is currently accessed via an unnamed road from Park Road. In terms of fluvial flood risk, most of the site is not shown to be at risk of flooding during the 20- and 1% AEP flood events. Flood water during the 0.1% AEP event only affects a small proportion of the site and is very shallow, therefore access and egress to and from the site should not be affected. Access and egress do not appear likely to be affected more significantly in future, however as the most extreme (Upper End (+65%)) scenario was not modelled for this site, further investigation should be undertaken to confirm that access and egress is possible during an extreme event. If access and egress is likely to be impacted, a shelter in situ policy should be adopted and the

	development should include a facility for all residents to shelter during an extreme event at a level above the 0.1% AEP plus the Upper End (+65%) flood level, with an allowance for freeboard. In terms of surface water flood risk, surface water flooding impacts a significant part of the site and some of the surrounding road network in the 0.1% AEP modelled event. In the 0.1% AEP flood event, surface water flooding is extensive and may impact access and egress from the site. Flood depths however are predominantly shallow and should not have a significant impact on access to the site.
Dry islands	The site is not located on a dry island.
Climate change	
Implications for the site	• The site is sensitive to climate change causing increased in fluvial flows in the River Waveney. • A very small part of the site is in future Flood Zone 3a. Flooding from the 1% AEP plus the Upper End (65%) scenario affects a small part of the south-eastern part of the site. Flood depths are below 0.1m and have a flood hazard rating of 'caution'. • In the 1,000 year plus the central allowance (25%) climate change scenario, flooding is extensive and affects a significant proportion of the site. Flood depths remain shallow (<0.4m) across most of the site and have a flood hazard rating of 'caution' to 'dangerous for some'. This represents a significant increase from the present day. Further investigation into the impacts of climate change on flood risk to the site should be undertaken, as higher uplift climate change scenarios for the 1% AEP event were not completed in this assessment.
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, Portsdown Chalk Formation (undifferentiated) - Chalk.
	  ○ Superficial – River Terrace Deposits - Sand and Gravel.
	
	• 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 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.
	
	• Detention may be feasible provided site slopes are <5% at the location of the detention feature. A liner may be required to prevent the egress of groundwater.
	
	• Filtration is probably suitable provided site slopes are <5% and the depth to the water table is >1m. A liner may be 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 may be 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.
	
	• The site is not located within any Environment Agency designated Source Protection Zones.

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 the site is in published 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 should be produced to assess the risk of flooding. • All sources of flooding, particularly the risk from fluvial and surface water sources should be considered as part of a site-specific flood risk assessment. • Further modelling to determine the impact of climate change on the River Waveney at the higher scenarios (35% and 65%) should be carried out by the developer. • 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). • 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 or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • 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. • Development on greenfield land should discharge at rates no greater than the existing greenfield rates for the 100% and the 1% rainfall events. • 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:

- If flood mitigation measures are implemented then they are tested to ensure 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)
- Space for surface water to be stored on the site is provided and rainwater harvesting should be considered.
- Development on greenfield land should discharge at rates no greater than the existing greenfield rates for the 100% and the 1% rainfall events.

- Safe access and egress routes must not be in the areas of high surface water risk or the 1% AEP fluvial design flood event (taking into account climate change).

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 Waveney Strategic 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 Level 2 SFRA strategic 2D modelling. The 25%, 35%, and 65% allowances were run for the 5%, 1% and 0.1% AEP events however only the 25% climate change allowance was successful for the 0.1% AEP event and this is what has been used to assess climate for the 0.1% AEP event.
Fluvial depth, velocity and hazard mapping	2D modelling has been completed for the River Waveney using TUFLOW with further modelling undertaken to apply recent climate change uplifts to the fluvial model. This model has been externally reviewed by the Environment Agency and Flood Zones quoted in the summary table are based on the new modelling. We however recognise there is a significant difference between the Environment Agency's currently published flood zones and the latest modelling and current planning decisions should be based on the greater of the two. As this model has been externally reviewed by the Environment Agency, we would look to have the new results reconciled with the published Flood Zones in due course.
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.