South Norfolk Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables

Site details

Site Code	**VC GIL1 REV**
Address	Land south of GIL1 The Street, Gillingham, 640599 291849
Area	3.7ha
Current land use	Greenfield
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is located in the River Waveney Catchment, between Ellingham Mill and Burgh St. Peter. The River Waveney flows from its source in the Regrave and Lopham Fen National Nature Reserve, through the towns of Harleston, Diss, Bungay and Beccles, and joins the River Yare before it reaches the sea at Great Yarmouth.
Existing drainage features	The site is located approximately 0.7km north of the River Waveney. The Environment Agency states that the reach section which the site is located near is heavily modified, having undergone channel straightening and deepening over the years. Online imagery suggests there are drainage ditches to the southeast of the site that direct water to the main river channel. There is an unnamed watercourse flowing north to south through Gillingham which appears to split into two branches to the north of the proposed development site around Old Yarmouth Road. One branch of this watercourse appears to flow broadly southeast on the northern side of Old Yarmouth Road before turning south to flow along the western side of The Street towards the River Waveney. The other branch appears to flow from Old Yarmouth Road, along the western boundary of the site, before turning eastwards along the southern boundary flowing towards a confluence with the other branch to the southwest of The Street and into a network of drainage ditches south of the King's Dam road.
Fluvial	**The proportion of site at risk (Environment Agency's Flood Map for Planning Flood Zones):** **FZ3 –** 11% **FZ2 –**14% **FZ1 –** 86% *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:** Additional modelling was undertaken for the purposes of the SFRA to inform the flood risk from the watercourse along the western and southern boundary of the site. This is a 2D model for the purposes of strategic assessment. **Flood characteristics:** The modelled 5% AEP flood event covers the western edge and southwest corner of the site. Depths are predicted to reach a maximum of approximately 0.3m here at a velocity of 0.1m/s and hazard rating of 'danger for some'. During the 1% AEP event, the extent increases but depths remain similar. Maximum depths for the 0.1% AEP

	event reach approximately 0.5m and the extent slightly increases, while the velocities reach 0.6m/s and the hazard rating increases to 'danger for most'.
Coastal and Tidal	**Available data:** Additional modelling was undertaken based on the Environment Agency's Lower Waveney model (2013) to provide depth, velocity and hazard outputs for specific sites. **Flood characteristics:** The modelling shows that during the 0.5% AEP event, the tidal flood extent encroaches onto the southeast corner of the site to depths of approximately 0.6m, velocities of 0.02m/s and hazard rating of 'danger for most'. During the 0.1% AEP, the extent increases in the southeast corner and also enters the site along the western boundary. Depths in the southeast corner reach up to approximately 2.4m, at a velocity of 0.03m/s and hazard rating of 'danger for most'.
Surface Water	**Proportion of site at risk (RoFSW):** **3.3% AEP** – 2% Max depth – 0.60 – 0.90m Max velocity – 0.50 – 1.00m/s **1% AEP** – 4% Max depth – 0.90 – 1.20m Max velocity – 1.00 – 2.00m/s **0.1% AEP** – 13% Max depth – >1.2m Max velocity – 1.00 – 2.00m/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 greater Annual Exceedance Probability (AEP) (e.g. 1% AEP % includes the 3.3% AEP %)* **Description of surface water flow paths:** The site is affected by surface water flooding in the 3.3%, 1% and 0.1% AEP events. In all three surface water events, there is a surface water flow path present to the west of the site, flowing from Geldeston Road, along the western edge of the site, and along the southern edge, similar to the fluvial flow path During the 3.3% event, depths along the western boundary are up to 0.9m at a velocity of between 0.25 and 1m/s and hazard rating of 'danger for some'. For the 0.1% AEP event, the flooding along the western boundary reaches the maximum hazard rating of 'danger for all'. Where flooding extends across the southwest corner, maximum depths are approximately 0.3m at a velocity of 0.25m/s during the 3.3% AEP event. The extent increases and depths increase to 0.6m and hazard rating of 'danger for most' for the 1% AEP event. For the 0.1% AEP event, the depths remain similar but the extent increases further across the corner, and a greater proportion of the flood extent reaches the hazard rating of 'danger for most'.
Reservoir	The site is not shown to be at risk of reservoir flooding from the available online maps. However, the Wet Day reservoir flood extent for Ditchingham Lake inundates a large part of the field to the east of the site, near to the southeast corner of the site. The Wet Day event seeks to estimate the effect of a breach at the same time as a 1 in 1000 river flood is occurring and suggests that the consequences of such a breach are similar to the modelled 1 in 1000 event river flood event, but probably would be associated with a much lower probability.
Groundwater	The Environment Agency Areas Susceptible to Groundwater Flooding, 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 has between a >=25% and <50% susceptibility to groundwater flood emergence. The assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific FRA stage.
Sewers	The site is located in a postcode area with no recorded historic sewer flooding, according to Anglian Water's DG5 Register for Greater Norwich.
Flood history	The Environment Agency's historic flooding and recorded flood outlines datasets do not have a record of any flooding on or surrounding the site. Norfolk County Council's historic flooding records also do not show any flooding on or surrounding the site.

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 site is not located in an Environment Agency Flood Alert or Flood Warning area. However, the extents of the tidal River Waveney from Ellingham to Breydon Water Flood Alert Area and the tidal River Waveney from Ellingham Marshes to Belton Flood Warning Area are about 30m southeast of the site.
Access and egress	The site is currently accessible by vehicles from The Street to the east of the site and Daisy Way to the north of the site. The site is surrounded by Flood Zones 2 and 3, which encroach on the western and southern boundaries of the site and cover The Street to the east of the site and Daisy Way and Geldeston Road to the north of the site. This is likely to impact access and egress at the site. Whilst the majority of the site is not at significant risk from surface water, the southern and western boundaries as well as western corner are impacted in the 3.3%, 1% and 0.1% AEP surface water events. This results from a flow path coming across Geldeston Road, flowing along the western boundary of the site then along the southern boundary. Surface water also ponds on The Street at a current access point, to depths up to 0.3m in the 3.3% AEP, and 0.6m in the 0.1% AEP and 1% AEP events with a hazard rating of 'danger for some'. Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water, fluvial and tidal events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment. Consideration should be given to the siting of access points with respect to areas of flood risk. A Flood Warning and Evacuation plan should be in place for the site. Alternatively, risk could be managed by raising vehicle and pedestrian access routes above the design flood level, inclusion of a higher refuge area, and a flood response plan that meets the requirements of the Local Council and their Emergency Planner, considering the likely warning time and duration of flooding.
Dry Islands	The site is surrounded by Flood Zones 2 and 3, forming a dry island bounded by flooding along Geldeston Road to the north, The Street to the northeast and east, and the field boundary to the south and west of the site. An emergency plan should be produced for the site, including raised access/egress routes and a safe refuge area.
Climate change	
Implications for the site	• Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard and frequency of fluvial, coastal and surface water flooding. • The fluvial central and higher central climate change scenarios for peak river flows have been modelled as part of this assessment, based on the Broadland Rivers Management Catchment peak river flow allowances. Modelling suggests that the site will not be at significantly greater risk of fluvial flooding in the future, as during the 1% and 0.1% AEP events in the higher central scenario, there is only a marginal increase in flood extent and depths compared to present day. • The coastal higher central and upper end climate change scenarios have been modelled as part of this assessment, based on sea level allowances for the Anglian river basin district. Modelling suggests the site will be at significantly greater risk of tidal flooding in the future, as during the 0.1% AEP, the higher central extent covers approximately half of the site (whereas for present day just a small part of the southeast corner is affected). Depths are predicted up to 2m in the southeast corner and up to 1m across the rest of the site. The hazard rating is classified as 'danger for all' in the southeast corner and 'danger for most' for a large portion of the rest of the site. • Climate change should also be considered for surface water events; at the site-specific stage, the 1% AEP +40% event is considered as part of surface water

	drainage strategies, or surface water modelling in the Broadland Rivers Management Catchment for the 2070s. The 1% AEP +40% event mapping shows that the site is not likely to be at significantly increased risk of surface water flooding in future, as the extent is only slightly greater in the southwest corner for the future 1% AEP than the present day 1% AEP event. • Developers should consider SuDS strategies to reduce the impacts of climate change from surface water in a detailed site-specific FRA.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock- Neogene to Quaternary Rocks (undifferentiated)- Gravel, Sand, Silt and Clay
	  ○ Superficial- Till-Diamicton
	• Soils at the site consist of:
	  ○ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
	SuDS
	• The site is considered to have a low susceptibility to groundwater. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system. Below ground development such as basements may not be appropriate at this site.
	• BGS data indicates that the underlying geology are conglomerates, gravel, silt, sand and muds which are likely to have highly variable permeability. This should be confirmed through infiltration testing.
	• The site is not located within a historic landfill site.
	• Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed 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 1% AEP event. 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 (LPA, LLFA and EA) 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 infiltration 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 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 and fluvial and tidal flow paths at the site 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 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. • The NPPF classifies residential development as 'More Vulnerable'. • The Exception Test should be applied as the site is located within Flood Zones 2 and 3, and is at surface water flood risk. It is recommended a precautionary approach is taken and further investigation undertaken if any development is proposed within the area of the site shown to be in Flood Zones 2 and 3 and the area shown to be at risk in the climate change scenario.
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 proposed development site is located in Flood Zones 2 and 3. • All sources of flooding, particularly the risk of fluvial, tidal 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, Water Company 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, or that ground level space is used for less vulnerable parts of the development. **Guidance for site design and making development safe:** • Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and rainfall events and in the 0.1% AEP plus climate change tidal event, using the depth, velocity and hazard outputs. 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 fluvial, tidal and surface water flood risk. • 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. • Compensatory flood storage is required for any land raising and all proposed buildings whenever there is built development on land within the 1% plus climate change flood extent for fluvial and rainfall events, and within the 0.1% plus climate change flood extent for tidal events. • Resilience measures will be required if buildings are situated in flood risk areas. • Areas at risk from surface water, fluvial and tidal flooding should ideally be integrated into green infrastructure, which presents wider opportunities to improve biodiversity and amenity as well as climate change adaptation. 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.

	• The proposed site 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).

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, with habitable floor levels above the 1% AEP fluvial design flood event and 0.5% AEP tidal design event, taking into account climate change.
- 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).
- The areas identified to be at risk of fluvial and surface water flooding in the western part of the site and tidal flooding in the southeast corner are left undeveloped.
- Safe access and egress can be demonstrated in the 1% AEP surface water and fluvial events and 0.5% AEP tidal event, plus climate change, or raising of access/egress routes for pedestrians and vehicles above the design events and an appropriate Flood Warning and Evacuation plan is agreed with the Local Councils' Emergency Planner.
- A Flood Warning and Evacuation Plan should be prepared for the site.

Mapping Information

The key datasets used to make planning recommendations regarding this site were the Environment Agency's Flood Map for Planning and the Risk of Flooding from Surface Water map. This was supplemented with additional fluvial and tidal modelling. 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 this Level 2 SFRA. This included Central (+11%) and Higher central (+20%) for fluvial and +1.2m AOD for Higher Central and +1.6m AOD for Upper End for tidal. For surface water a 1% AEP +40% scenario has been considered.
Fluvial and tidal depth, velocity and hazard mapping	Additional strategic 2D modelling was undertaken by JBA Consulting to inform the watercourse along the western boundary of the site.
Surface Water	The Risk of Flooding from Surface Water dataset has been used to define areas at risk from surface water flooding.