

BAKKAVOR SOLAR, HOLBEACH ST MARKS, SPALDING

SQUIRES PLANNING

Flood Risk Assessment

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The Site
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1.0 INTRODUCTION

- 1.1 K-Ten Consulting Ltd (K-Ten) provide professional Flood Risk, Infrastructure and Drainage services throughout the UK.
- 1.2 Planning has been submitted for the proposed development of a solar farm at Holbeach St Marks, Spalding
- 1.3 Refer to **Appendix A** for site proposals.
- 1.4 K-Ten have been commissioned by Squires Planning (applicant) to prepare a Flood Risk Assessment to support the planning application.
- 1.5 The purpose of this Flood Risk Assessment is to investigate and assess the various risks of flooding on site to the proposed development and to provide mitigation where appropriate in order to ensure future users of the development remain safe throughout the lifetime.

2.0 POLICY & GUIDANCE

National Planning Policy Framework (NPPF) December 2024

- 2.1 The National Planning Policy Framework (NPPF) defines the Government's national policies on different aspects of land use planning in England in relation to flood risk.
- 2.2 The revised NPPF issued on 12th December 2024 replaces the previous version revised in December 2023.
- 2.3 Paragraph 181 of the NPPF states:

When determining any planning applications, local planning authorities should ensure that the flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific Flood Risk Assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
 - b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
 - c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
 - d) any residual risk can be safely managed; and*
 - e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.*
- 2.4 Paragraphs 172 to 180 set out the requirements for the Sequential Test and Exception Test to direct any development to areas of lowest flood risk, ensuring that development will be safe and does not increase flood risk elsewhere whilst considering climate change allowances.
 - 2.5 Paragraph 175 of the NPPF states:

The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).

2.6 The NPPF states that a Flood Risk Assessment will be required for proposals:

- a) that are greater than 1 hectare in area;
- b) for all proposals for new development (including change of use) in Flood Zones 2 and 3;
- c) in an area within Flood Zone 1 which has critical drainage problems;
- d) within land identified in a Strategic Flood Risk Assessment as being at increased flood risk in the future;
- e) in an area in Flood Zone 1 that may be subject to other sources of flooding, where development would introduce a more vulnerable use.

Planning Practice Guidance (PPG) September 2025

- 2.7 The National Planning Practice Guidance adds context to the NPPF and should be read and considered together.
- 2.8 The Flood Risk and coastal change sections were updated on 17th September 2025.
- 2.9 The sequential test should be applied to 'Major' and 'Non-major' development proposed in areas at risk of flooding, as set out in paragraphs 173 to 174 of the National Planning Policy Framework.
- 2.10 Paragraphs 175, 176 and 180 set out exemptions from the sequential test.
- 2.11 In applying paragraph 175 a proportionate approach should be taken. Where a site-specific flood risk assessment demonstrates clearly that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development (therefore addressing the risks identified e.g. by Environment Agency flood risk mapping), without increasing flood risk elsewhere, then the sequential test need not be applied.

South Holland District Councils Strategy Level 1 Strategic Flood Risk Assessment 2017

- 2.12 The SFRA was carried out by the South East Lincolnshire Joint Planning Unit (SELJPU). The assessment has been undertaken to ensure there is consistent evidence base against which the SELJPU can inform its Local Plan and Development Management decisions.
- 2.13 The document has been prepared in consultation with the Environment Agency, and Lincolnshire County Council in its role as Lead Local Flood Authority. It brings together information from these organisations, as well as the Internal Drainage Boards.

Flood and Water Management Act 2010

- 2.14 The Flood and Water Management Act (FMWA) provides legislation for the management of risk with flooding and coastal erosion. It aims to reduce the flood risk generally associated with extreme weather conditions and heavy rainfall events with consideration to increased climate change. The Lead Local Flood Authority (LLFA) was created to manage flood risk through the planning process with powers given to local authorities, The Environment Agency and Water Companies.

[The SuDS Manual Ciria C753 2015](#)

- 2.15 The Ciria SuDS manual provides guidance on planning, design, construction, management and maintenance of Sustainable Drainage Systems (SuDS) within the built environment and should be referenced for surface water drainage design.

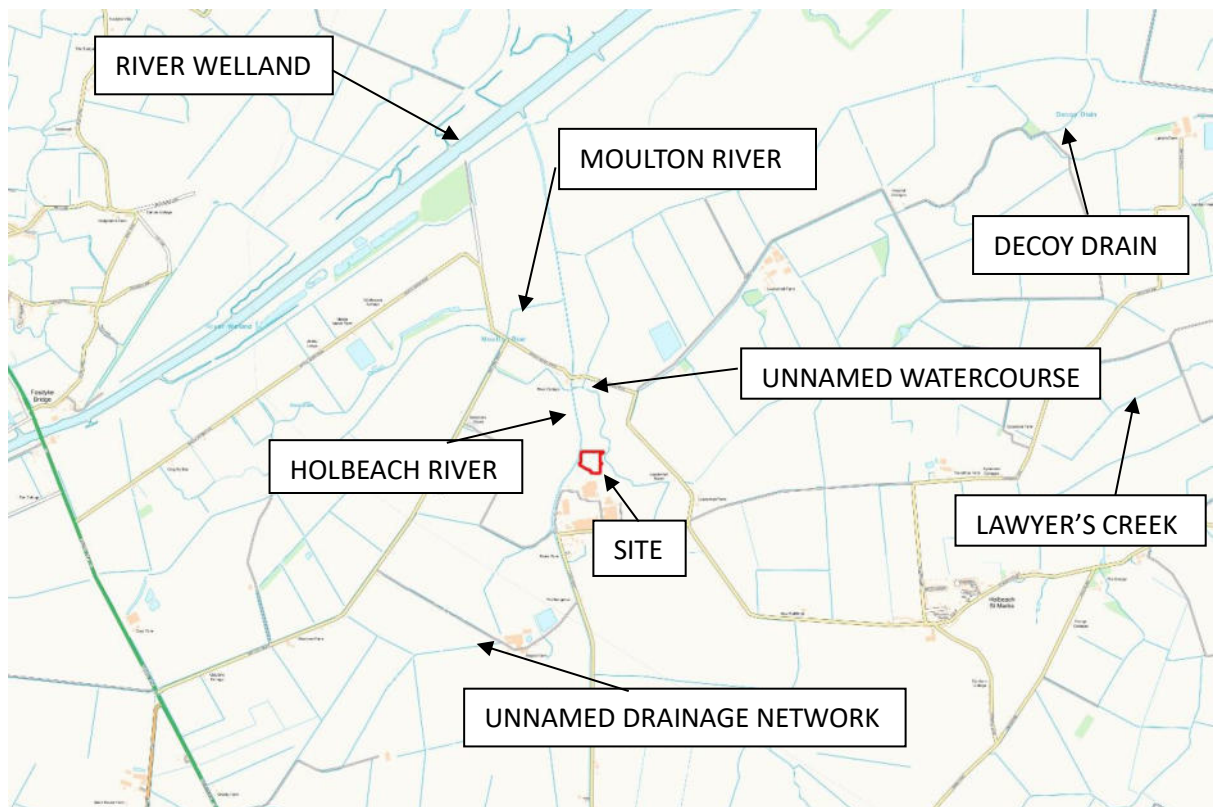
3.0 EXISTING SITE DETAILS

Site Location

- 3.1 The site is located off Middle Marsh Road within Holbeach CP, South Holland. The approximate site co-ordinates are E535013, N332262 and National Grid TF 35013 32262, with the nearest post code PE12 8HF.
- 3.2 Refer to **Appendix B** for site location plan.
- 3.3 The site is currently classified as Greenfield with arable grassland.

Existing Hydrology

- 3.4 The location of the site is encompassed by various water features and waterways. The closest watercourse, is the Holbeach River which is present along the western boundary and an unnamed watercourse located on the eastern boundary.
- 3.5 Moulton River is located approximately 760m to the north west of the development.
- 3.6 The Decoy Drain network is located east of the development, with the closest section of the network being located approximately 1.23km east of the proposed development site.
- 3.7 The River Welland is located approximately 1.75km north of the site.
- 3.8 The site is located approximately 21.8km south west from The Wash. Further watercourses surrounding the development can be seen on the figure below.



Existing Ground Conditions

- 3.9 To get an understanding of the ground geology BGS (British Geological Survey) records were used. The BGS records show that the site is underlain by West Walton Formation – Mudstone and siltstone bedrock with Tidal Flat Deposits – Clay and silt superficial deposits.
- 3.10 The Cranfield Environment Centre (CEC), incorporating the National Soil Resources Institute (NSRI), is the largest UK national and international centre for research and development, consultancy and training in soils and their interaction with the atmosphere, land use, geology and water resources. The LandIS Soilsclapes dataset map indicates the site is underlain by '*Loamy And clayey soils of costal flats with naturally high groundwater*'. These soils are described as being '*Naturally wet*'.
- 3.11 An extract from the geographic information map provided by Natural England indicates that the site is not underlain by any known Aquifers.
- 3.12 The BGS (British Geological Survey) hydrogeology records inform on the Aquifers with significant intergranular flow and Aquifers in which flow is virtually all through fractures and other discontinuities. The proposed site falls within the '*west walton formation, ampthill clay formation and kimmeridge clay formation (undifferentiated)*' and is classified as a '**Rocks with essentially no groundwater**'. This area is summarised as having '*Low permeability clays that can confine underlying aquifers.*'.

Existing Drainage

- 3.13 Anglian Water are the provider for this area and records show there are no assets within vicinity of the site.
- 3.14 Currently the site naturally drains by a combination of overland flow towards the drainage ditches and watercourse located on either side of the site and towards low points of the site and infiltration into the underlying ground.
- 3.15 Refer to **Appendix C** for Sewer records.

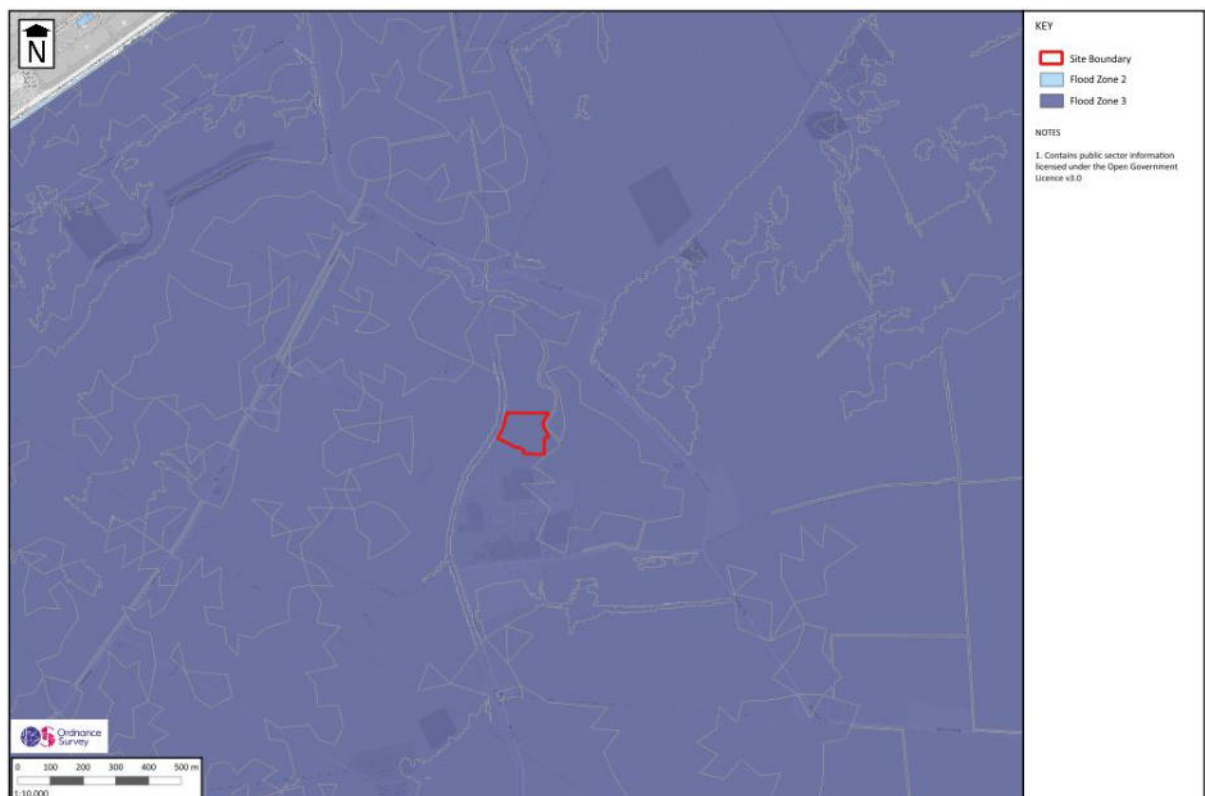
Topography

- 3.16 A topographical survey was undertaken by SUMO Services Ltd in November 2025. The survey shows that the site is relatively flat. The site generally falls towards the south eastern corner of the development site as well as the western boundary falling towards the Halbeach River. The site has high points of approximately 4.2m AOD located within the western area of the site, with low points of approximately 3.4m AOD located within the south eastern corner of the site and low points of approximately 4.00m AOD along the western boundary of the site.
- 3.17 Lidar ground levels have been obtained (TF33SE and TF33SW DTM 1m) and confirm existing ground levels surveyed.
- 3.18 Refer to **Appendix D** for Existing site levels.

4.0 FLOOD ZONE CLASSIFICATION AND VULNERABILITY

Environment Agency Flood Maps for Planning

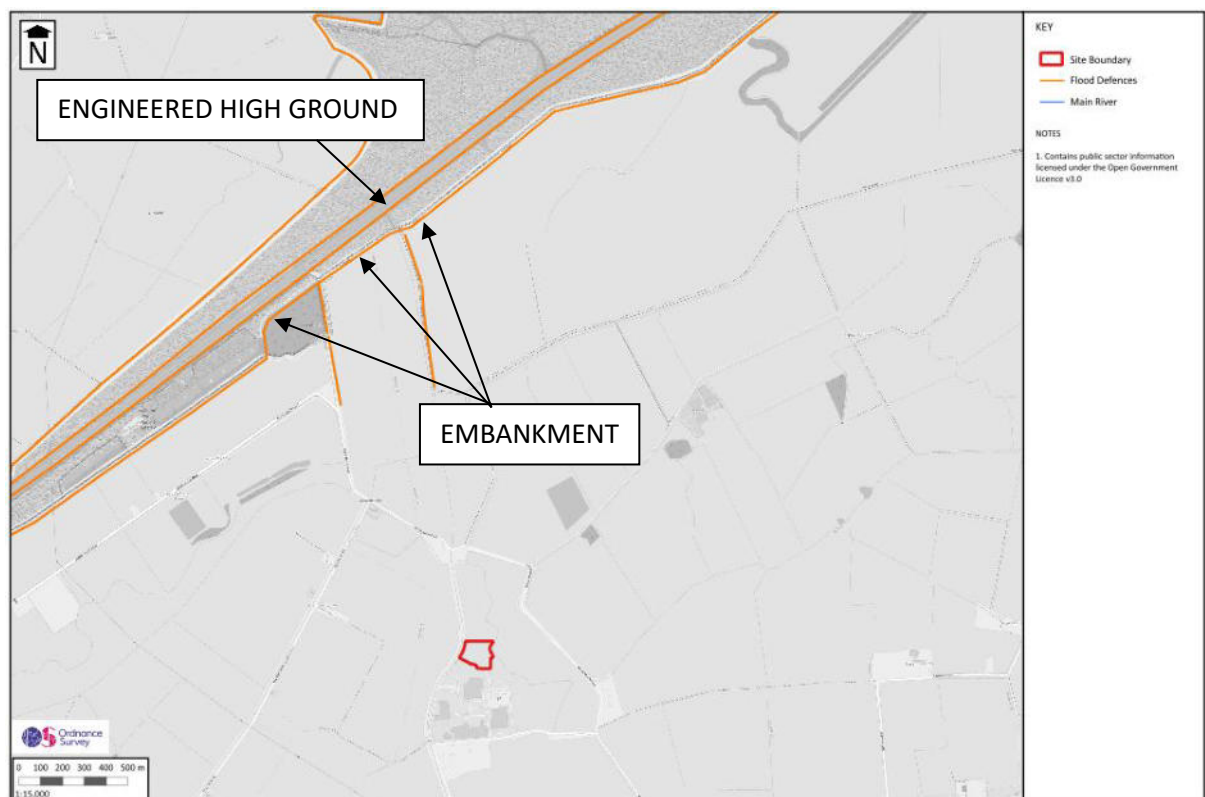
- 4.1 The Environment Agency's Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences, and show the extent of the natural floodplain and the additional extent of an extreme flood.
- 4.2 From an inspection of the Flood Map data it is indicated that the site is located in Flood Zone 3,.
 - a) Flood Zone 3 - Areas shown to be at a 1% (1 in 100) or greater annual probability of flooding from rivers or 0.5% (1 in 200) or greater annual probability of flooding from the sea. The Flood Zones refer to the land at risk of flooding and do not refer to individual properties.
- 4.3 An extract from the flood map data is shown in Figure below



Environment Agency Detailed Flood Risk Data

- 4.4 Product 4 (Detailed Flood Risk Data) was requested in July 2025.
- 4.5 The EA flood model has been provided with the 200 year and 1000 year datasets for Tidal Breaching and Tidal overtopping events.
- 4.6 Refer to **Appendix E** for EA Flood Level Data.

- 4.7 The modelled data shows that the site would remain unaffected by overtopping of defences or tidal breaches during the present day (2006) scenario for both the 0.5% (1 in 200 year) and 0.1% (1 in 1000 year) events.
- 4.8 The maps show that in the 0.5% (1 in 200 year) 2115 scenario the site is shown to flood during both the tidal breaching and tidal over overtopping events.
- 4.9 During the 0.5% (1 in 200 year) 2115 Tidal Breaching scenario flood depths affecting the site vary from 0.0m – 1.0m. The majority of the site appears to be affected by 0.0m – 0.25m depths, with the south eastern corner of the site being subject to flood depths of 0.25m – 1.0m.
- 4.10 During the 0.5% (1 in 200 year) 2115 Tidal Overtopping scenario the majority of the site is shown to not be affected by flooding with small areas within the south eastern corner being subject to flood depths of 0.00m – 0.5m.
- 4.11 The site is shown to benefit from flood defences. This defence is maintained by the EA and consists of multiple embankments and engineered high ground to defend against tidal/coastal flooding.
- 4.12 The current condition for each defence varies between level 4 and level 3. The target condition for each defence is level 3. The majority of the flood defences meet the current target (level 3) with a small area not reaching the target level and was assessed as having a current condition of level 4. The maintenance standards and alignments with condition grades as per the EA guidance is reproduced below.



- 4.13 The crest level of the engineered high ground vary between 1.9m AOD – 3.81m AOD. The crest level of the embankments vary from 6.94m AOD – 8.05m AOD. Based on the EA modelled data

the existing flood defences are in fair condition and reduce the risk of flooding (at the defence) to a 1% (1 in 100) chance of occurring in any year.

Maintenance Standard	Target Condition Grade	Description
High	2 - Good	Only allow minor defects that will not reduce performance of the asset
Medium	3 - Fair	Allow some defects that could reduce performance of the asset
Basic	4 – Poor	Allow defects that significantly reduce the performance of the asset

Flood Risk Vulnerability

- 4.14 The proposed development consists of the development of a solar farm. In accordance with the NPPF Table 2, the most applicable description will be - *Solar farms...* classified as **Essential infrastructure**.
- 4.15 The proposed development is located within Flood Zone 3. Essential infrastructure is appropriate in this zone provided the Exception Test is passed.
- 4.16 The proposed development would provide a wider sustainable benefits to the community that outweigh any flood risk as it will help to provide renewable clean energy. The development would be safe for its lifetime taking into account the vulnerability of its users as the site would remain mostly unoccupied with only essential maintenance requiring operators to be present on site. The proposed development would not increase flood risk elsewhere as the proposed drainage strategy would aim to mimic the existing condition of the site with the potential to offer a reduction in flood risk overall.

5.0 FLOOD RISK SOURCE

National Planning Policy Framework (NPPF) December 2024

- 5.1 In accordance with the NPPF, this Flood Risk Assessment will need to consider the following sources of flood risk:

Flood Source	Description
Tidal	from the sea
Fluvial	from Rivers and streams
Pluvial	overland flows from surface water and exceedance
Groundwater	from groundwater levels or springs
Sewers	exceedance and surcharge flows from existing sewer systems
Artificial Sources	Canals, Reservoirs etc
Historic	recorded historic flood events

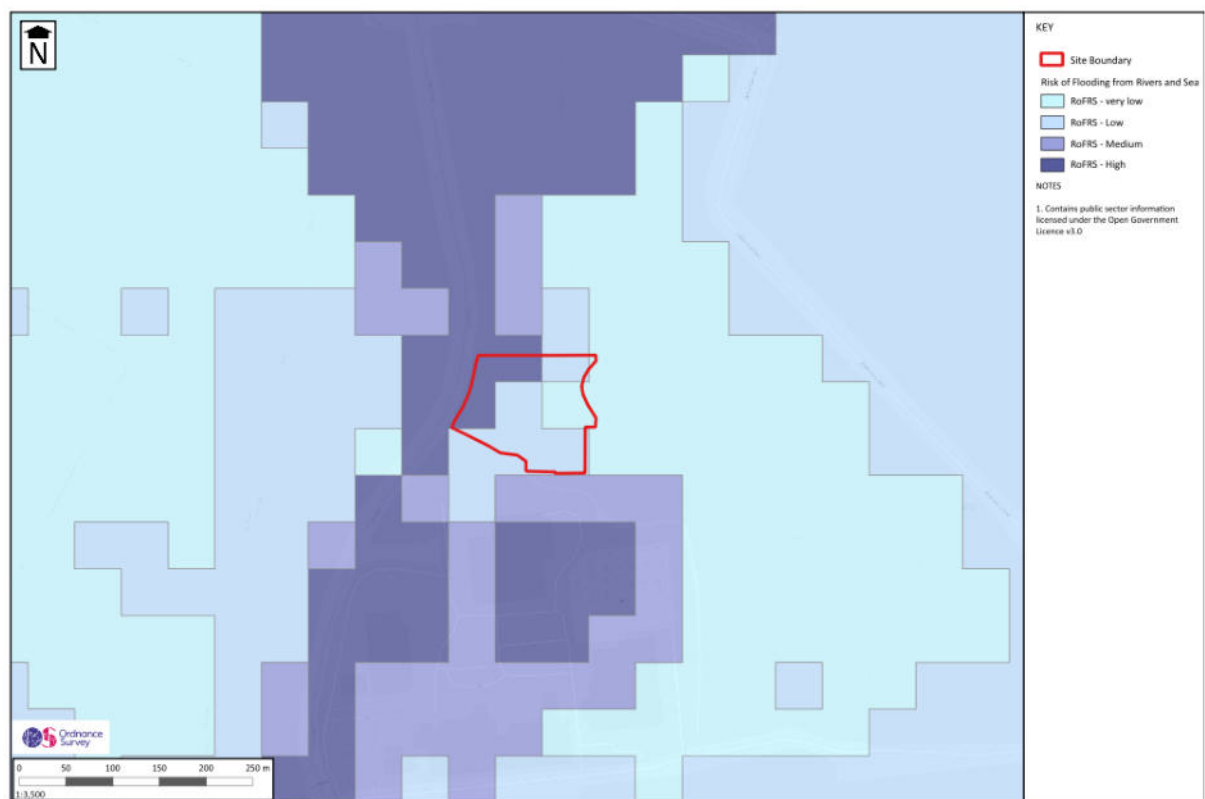
Tidal

- 5.2 Tidal flooding consists of low lying coastal areas can be impacted by tidal levels, wave overtop and storm surges. Some lower catchment Rivers are also influenced by tidal levels.
- 5.3 Modelling has been carried out by the EA to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.
- 5.4 As stated above the modelled data shows that the site is not affected by overtopping or tidal breaches during the 2006 scenarios.
- 5.5 During the 2115 scenarios the site is subject to flood depths of 0.00m – 1.0m, with the majority of the site being subject to flood depths of 0.00m – 0.25m, while a small area within the south eastern corner of the site being subject to flood depths of 0.25m – 1.0m.
- 5.6 As the site is located in the vicinity of the coast and based on the EA flood modelled data the site is shown to be at risk of flooding due to tidal flows. Therefore, the Tidal risk to the site is **High**.

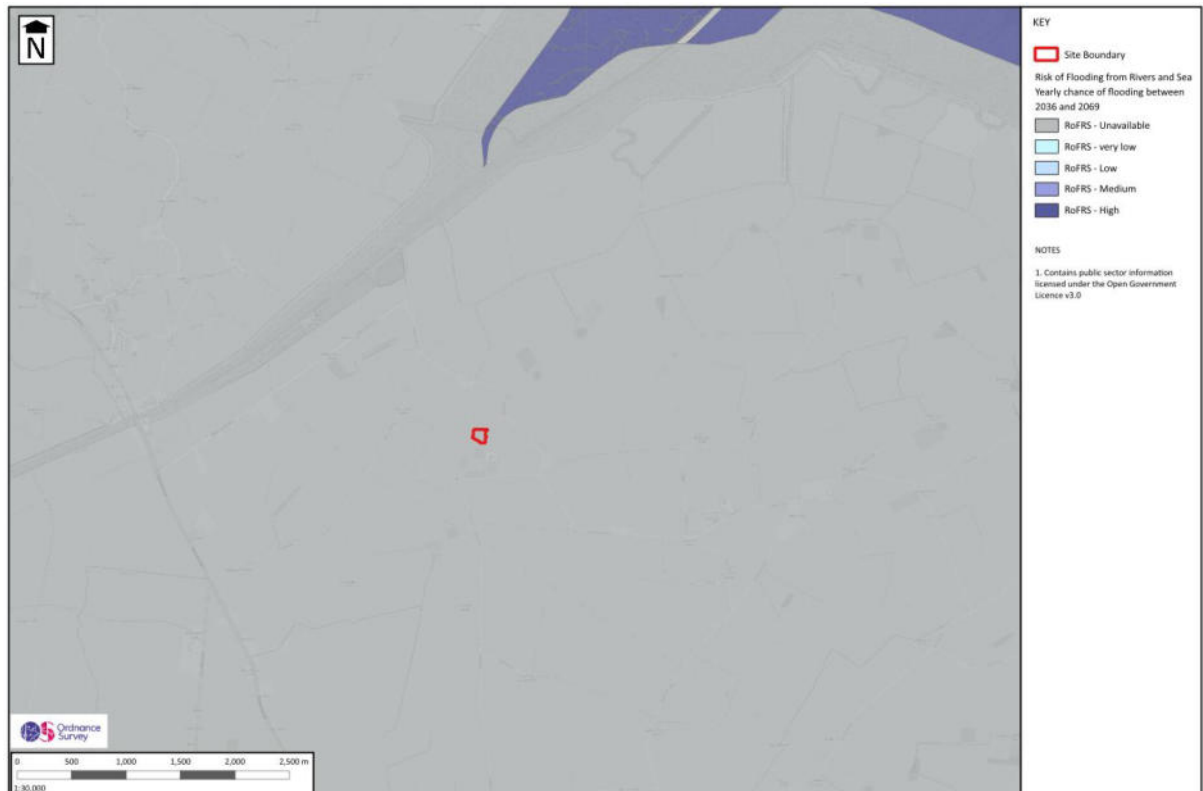
Fluvial

- 5.7 Fluvial flooding occurs when the capacity of an existing watercourse is breached leading to water levels overtopping the banks into surrounding floodplain areas.
- 5.8 The EA flood risk information indicated that the site is not considered to be at risk of flooding from main rivers.

- 5.9 It is considered that the site may be at risk from local ordinary watercourse which other management authorities, such as the Lead Local Flood Authority or Internal Drainage Board have responsibility.
- 5.10 Based on the EA long term flood risk data the site falls within a risk area, the site is shown to fall within areas subject to flooding varying from the very low – high risk event.
- a) Very Low – each year this area has a <0.1% chance of flooding each year
 - b) Low – each year this area has a chance of flooding between 0.1% and 1% each year
 - c) Medium - each year this area has a chance of flooding between 1% and 3.3% each year
 - d) High – each year this area has a >3.3% chance of flooding each year
- 5.11 There are no flood depths available as part of the EA flood data. An extract of the EA's flood data can be seen in the figure below.



- 5.12 The EA also holds data that shows a predicted flooding extent, chance and depths for the yearly chance of flooding between 2036 and 2069. There is no available data for the 2036 and 2069 data set. An extract of this data is depicted in the figure below.



- 5.13 The site is shown to be subject to varying flood risk ranging from very low – high with the majority of the site falling within the low risk area and the north western corner falling within the high risk area therefore, the Fluvial risk to the site is deemed to be **Medium**.

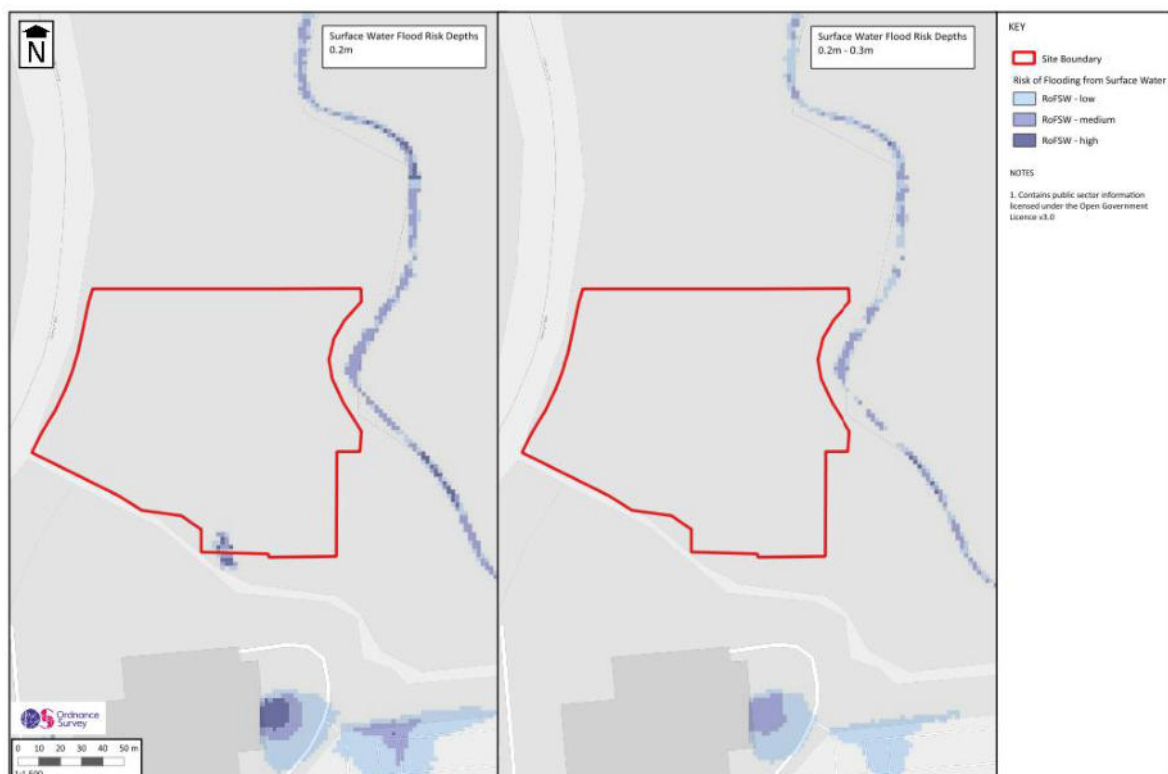
Pluvial

- 5.14 Pluvial flooding can occur when intense rainfall surpasses the capacity of the local drainage system, it can also be influenced by the current ground levels and elevations, the amount of rainfall, and the condition of the local drainage infrastructure. Additionally, it may arise when the ground's existing infiltration capacity is exceeded, leading to overland flows.
- 5.15 The EA surface water flood data contains mapped areas believed vulnerable to surface water flooding. An extract from the flood map is given in the Figure below.
- 5.16 The figure shows that **the majority of the site does not fall within a surface water flood risk area**. The site is shown to have a small area within the southern area of the site being subject to flood risk varying from **Low - High** chance of flooding.
- a) Low Risk - each year in these areas there is a chance of pluvial flooding of between 0.1% and 1%.
 - b) Medium Risk - each year in these areas there is a chance of pluvial flooding of between 1% and 3.3%.
 - c) High Risk - each year in these areas there is a chance of pluvial flooding of more than 3.3%.
- 5.17 This takes into account the effect of any flood defences in the area

- 5.18 The areas of elevated surface water flooding are associated with low points on the site where surface water runoff could collect.



- 5.19 The areas subject to flooding have been further assessed. In the figure below the EA surface water flood risk depths affecting the site are shown. The flood depths the site is subject to range from 0.00m – 0.2m in depth. Flood depths of 0.2m are shown to be present during the low (0.1% - 1 in 1000 year) medium (1% - 1 in 100 year) and high (3.3% - 1 in 30 year) events in a very small area within the south western area of the site.



- 5.20 The EA flood data also shows a predicted surface water flood extent, chance and depths for the yearly chance of flooding between 2040 and 2060. The surface water flooding is shown to increase in chance and extent between 2040 and 2060, with the flood depths remaining the same. An extract from the flood map is given in the figure below.



- 5.21 The risk of Pluvial flooding is therefore considered **Low**.

Groundwater

- 5.22 Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). These may be extensive regional aquifers (e.g. Chalk or Sandstone) or localised sands or river gravels in valley bottoms underlain by less permeable rocks.
- 5.23 Groundwater flooding occurs as a result of water rising from the underlying rocks or from water flowing from abnormal springs. This tends to occur after long periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels.
- 5.24 As stated in section 3.10 online soil maps indicate the site to be underlain by ***Loamy And clayey soils of costal flats with naturally high groundwater***.
- 5.25 The BGS (British Geological Survey) hydrogeology records indicate the proposed site is classified as falling within an area with ***Rocks with essentially no groundwater***.
- 5.26 According to the Groundwater Vulnerability Maps on Magic maps the site falls within a **Unproductive risk** groundwater vulnerability.
- 5.27 The risk to groundwater flooding can therefore be considered as **Medium**.

Sewers

- 5.28 Flooding from existing sewers can occur if the capacity of the system is exceeded as a result of surcharging or blockages. Combined sewers can be influenced by extreme rainfall events and cause foul water flooding if surcharged.
- 5.29 There are no known recorded reports of sewer flooding in the area.
- 5.30 In the event of exceedance, flows are directed away from the development. Therefore, the risk from Sewer flooding is considered **Low**.

Artificial Sources

- 5.31 Artificial sources include any water bodies not covered under other categories and typically include canals, lakes and reservoirs.
- 5.32 There is no artificial water within the vicinity of the site, and therefore there is no flood risk due to artificial sources



- 5.33 The risk of flooding from reservoirs is therefore considered to be **Low**.

6.0 FLOOD RISK MITIGATION AND LEVELS

Introduction

- 6.1 In accordance with the NPPF this Flood Risk assessment will need to demonstrate that future users will not be at risk from flood hazards during the lifetime of the development, and in line with the vulnerability classification as well as demonstrate the risk of flooding will also not be increased elsewhere as a result of the development.

Design Flood Levels

- 6.2 The EA modelled data shows that the site would remain unaffected by overtopping of defences or tidal breaches during the present day (2006) scenario for both the 0.5% (1 in 200 year) and 0.1% (1 in 1000 year) events.
- 6.3 The maps show that in the 0.5% (1 in 200 year) 2115 scenario the site is shown to flood during both the tidal breaching and tidal over overtopping events.
- 6.4 During the 0.5% (1 in 200 year) 2115 Tidal Breaching scenario flood depths affecting the site vary from **0.0m – 0.5m**. *The majority of the site appears to be affected by 0.0m – 0.25m* depths, with the small areas within south eastern corner of the site being subject to flood depths of **0.25m – 0.5m**.
- 6.5 During the 0.5% (1 in 200 year) 2115 Tidal Overtopping scenario the majority of the site is shown to not be affected by flooding with small areas within the north eastern corner being subject to flood depths of **0.00m – 0.25m**.
- 6.6 The maps show that in the 0.1% (1 in 1000 year) 2115 scenario the site is shown to flood during both the tidal breaching and tidal over overtopping events.
- 6.7 During the 0.1% (1 in 1000 year) 2115 Tidal Breaching scenario flood depths affecting the site vary from **0.0m – 0.5m**. *The majority of the site appears to be affected by 0.0m – 0.25m* depths, with the areas within south eastern corner of the site being subject to flood depths of **0.25m – 0.5m**.
- 6.8 During the 0.5% (1 in 200 year) 2115 Tidal Overtopping scenario the majority of the site is shown to not be affected by flooding with small areas within the north eastern corner being subject to flood depths of **0.00m – 0.25m**.
- 6.9 It is proposed that the worst case scenario will be utilised to ensure the appropriate flood mitigation measures are used. Based on the above data the worse-case scenario would be the 2115 0.1% (1 in 1000 year) Tidal breach. It is therefore understood that the development would mitigate against floods of up to **0.5m in depth**.

Proposed Mitigation Measures

- 6.10 It is proposed that all electrical equipment will be placed within areas with no flood risk from rivers or sea and surface water flooding, where electrical equipment cannot be placed within this area the equipment will be placed within the lowest flood risk area with flood depths of up to 0.25m, all electrical equipment within this area will be raised 500mm above the existing ground level to ensure the safety of the equipment while also ensuring safe access for any required maintenance.
- 6.11 The proposed Solar PV Panels will be above ground level and above the flood risk on metal frames securely anchored into the ground (known as solar arrays). As such the solar arrays would not be vulnerable to the shallow depths and flow of the flood waters and would be above the highest risk and level of flood water accumulation. It is also proposed that all solar panels will be raised 300mm above flood levels.

Access and Egress

- 6.12 Safe access and egress will be from the main road network (Sluice Road) to the south of the site.

Environment Agency Flood Warning

- 6.13 The site lies within the 'Flood Warning Area' of the River Welland. The construction contractor and operating staff will register to receive flood alerts / warnings from the Environment Agency. When a flood alert / warning is issued the site will be evacuated along the local highway network as a precautionary measure.
- 6.14 In England, The Environment Agency operates a Flood Warning service in all areas at risk of flooding, which is based on direct measurement of rainfall, river levels, tide levels and Met Office forecasting. The service operates all year round.
- 6.15 The service can be accessed, and registration completed online – <https://www.gov.uk/sign-up-for-flood-warnings>
- 6.16 The EA Floodline service can be accessed by calling 0345 988 1188 which is a 24 hour line.

Flood Warning Service

- 6.17 The likelihood of a rapid flood level rise and inundation of water within this area, posing a risk to life is considered to be minimal. The current Environment Agency flood warning system will provide a forewarning of two days of a pending flood event.

Residual Risk

- 6.18 Residual risks are those remaining after applying the sequential approach to the location of development and after the flood risk management and mitigation measures are implemented. Examples of residual risk include:
- a breach of a raised flood defence, blockage of a surface water conveyance system or failure of a pumped drainage system;
 - failure of a reservoir; and
 - a flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot accommodate.
- 6.19 The proposed drainage measures would ensure that there is minimal to no residual risk of property flooding occurring during flooding events. These measures would be designed to surpass the minimum acceptable standard of protection for new property, which requires that no flooding should occur as a result of a 1 in 100 year storm event including an appropriate allowance for climate change.
- 6.20 In the case of extreme events, it is considered that the proposed development would intercept any unregulated overland flow and direct it toward the proposed drainage systems. The proposed drainage measures would ensure the proposed development is sufficiently protected against flooding during extreme events over the lifetime of the development.

7.0 PROPOSED SURFACE WATER DRAINAGE STRATEGY

- 7.1 A surface water strategy is proposed to manage and reduce the flood risk and surface water run-off from the development, with consideration to SuDS.

Hierarchy of Disposal

- 7.2 The SuDS hierarchy dictates that surface water run off should be managed as high up the following list as practically possible:
- a) into the ground (via infiltration) and re-use, or then;
 - b) to a surface water body, or then;
 - c) to a surface water sewer, highway drain or another drainage system, or then;
 - d) to a combined sewer.

Development Proposals

- 7.3 The development proposals comprise the construction of a solar farm consisting of photovoltaic (PV) modules mounted on metal frames (known as arrays), with associated site infrastructure and ancillary control equipment.
- 7.4 The frames have a minimal cross-sectional area and will be 'pile driven' or 'screw anchored' into the ground. The proposed development does not involve any change in ground levels. The array of panels will be situated in rows running from east to west, south facing inclined at an angle of approximately 25 degrees from the horizontal. Each frame contains rows of PV panels separated by a horizontal 'rainwater' gap. This gap allows rainwater to drain freely to the ground beneath and between the PV panels, replicating the existing greenfield scenario. The lower edge of the panels will be set above ground level, allowing grass to grow underneath the panels.
- 7.5 Any new access tracks will be formed using semi-permeable materials (open graded stone) so as to avoid creating impermeable areas across the site. The site layout utilises existing access tracks where possible.

Hydrological Effect of Solar Farms

- 7.6 It is generally accepted that Solar Farm developments have a minimal effect on runoff rates as long as permanent vegetation is maintained under and around the solar panels. The site remains a predominately permanently grassed field with discrete control equipment distributed across its area. This view is supported by guidance summarised and quantified below
- 7.7 BRE published its 'Biodiversity Guidance for Solar Developments'¹ in 2014. The report recognises that in most Solar Farms:

'normally only 25-40% of the surface is over-sailed by panels' and "because panels are raised above the ground on posts greater than 95% of a field utilised for solar farm development is still accessible for plant growth ...'

¹ BRE (2014) Biodiversity Guidance for Solar Developments. Eds G E Parker and L Greene.

- 7.8 Natural England's 'Technical Information Note TIN101: Solar Parks: Maximising Environmental Benefits'² states:

'The key to avoiding increased run-off and soil into watercourses is to maintain soil permeability and vegetative cover. Permeable land surfaces underneath and between panels should be able to absorb rainfall as long as they are not compacted and there is some vegetation to bind the soil surface.'

- 7.9 In addition Cook and McCuen (2013) 'Hydrologic Response of Solar Farms'³ research paper concludes that provided grass cover is maintained the addition of solar panels over a grassy field does not have much of an effect on runoff volumes, the peak runoff nor the time to peak. A copy of the research paper's abstract is reproduced below:

'Because of the benefits of solar energy, the number of solar farms is increasing; however, their hydrologic impacts have not been studied. The goal of this study was to determine the hydrologic effects of solar farms and examine whether or not storm-water management is needed to control runoff volumes and rates. A model of a solar farm was used to simulate runoff for two conditions: the pre- and post paneled conditions. Using sensitivity analyses, modeling showed that the solar panels themselves did not have a significant effect on the runoff volumes, peaks, or times to peak. However, if the ground cover under the panels is gravel or bare ground, owing to design decisions or lack of maintenance, the peak discharge may increase significantly with storm-water management needed. In addition, the kinetic energy of the flow that drains from the panels was found to be greater than that of the rainfall, which could cause erosion at the base of the panels. Thus, it is recommended that the grass beneath the panels be well maintained or that a buffer strip be placed after the most downgradient row of panels. This study, along with design recommendations, can be used as a guide for the future design of solar farms.'

- 7.10 The majority of the proposed site would remain as 'soft' surface, with grassland around and underneath the solar panels, which in itself would minimise runoff from the site.
- 7.11 The solar arrays are spaced to avoid any shadowing effect from one panel to another. Between each row of solar panels is a vegetated buffer strip which would contribute to slowing the flow of runoff across the development site.
- 7.12 Soil compaction would be limited during construction and operation of the Solar Farm. During construction only light machinery would be required to install the solar array and vehicle movements would be minimised
- 7.13 If necessary, to alleviate the effects of any compaction during the construction process, any affected areas would be harrowed and seeded prior to final commissioning of the Solar Farm.
- 7.14 During operation of the Solar Farm maintenance of the panels would be infrequent, minimal and would only require light machinery. Thus, the infiltration rate of the underlying ground is unlikely to be changed by the proposed development.

² Natural England (2011) Natural England Technical Information Note TIN101 Solar parks: maximising environmental benefits.

³ Cook & McCuen (2013) Hydrologic Response of Solar Farms, Journal of Hydrologic Engineering, 18(5), 536-541.

- 7.15 Upon completion of the Solar Farm the site would be permanently grassed thereby reducing the risk of soil erosion and reducing potential runoff compared with the existing condition.
- 7.16 The proposed development would have a very limited extent of impermeable ground cover. The area beneath the solar panels would remain grassed and the post development site infiltration rate would not adversely change. The excavation of cable trenches which are backfilled with a granular surround to the cables and then backfilled with excavated material potentially increase the infiltration capacity of the site as the cable trenches act as land drains. Nonetheless rainwater falling onto each panel would drain freely onto the ground beneath the panel and infiltrate into the ground at the same rate as it does in the site's existing greenfield state
- 7.17 The total surface area of the photovoltaic array would not be considered an impermeable area in this assessment (only the area taken up by the panel supports). Similarly, it can be assumed that any rainwater falling onto the semi-permeable access tracks would soak into the ground beneath or adjacent to the tracks at the same rate that it presently does.
- 7.18 The extent of impermeable area created as a result of the proposed solar farm is summarised in the table below.

	Quantity	Unit Area (m ²)	Total Area (m ²)
Piles	8500	0.006	51
Total Impermeable Area			51
Site Area *approximately*			13750
Total Impermeable Area = 0.37% of Total Site Area			

- 7.19 In its current state the application area is considered to be 100% undeveloped. As a result of the development of the solar farm the extent of impermeable area will be approximately 51m² or 0.37 % of the total site area.
- 7.20 The effect the proposed solar farm would have on the greenfield runoff rates are considered to be negligible and would equate to a very small/minor increase to the greenfield runoff rate.

Proposed Surface Water Drainage Strategy

- 7.21 The proposed SuDS techniques to be utilized for the development site are considered below
- 7.22 Vegetation cover is proposed to be maintained in the areas around the solar panels and field margins throughout the lifetime of the development to minimise the risk of soil erosion and reduce runoff rates.
- 7.23 Interception swales are proposed to intercept runoff, 'slow the flow' and provide flood risk betterment in accordance with industry best practice. Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate. They should promote low flow velocities to allow much of the suspended particulate load in the storm water runoff to settle out, thus providing effective pollutant removal.

- 7.24 Refer to **Appendix F** for Drainage Layout.
- 7.25 Whilst it is considered that the photovoltaic panels oversailing permanent pasture will not result in a material increase in surface water runoff, it is proposed to provide a SuDS arrangement by way of interception swales in the lower areas of the site to intercept extreme flows which may already run offsite. It is emphasised that the swales do not form part of a formal drainage scheme for the development but are provided as a form of 'betterment' intercepting existing overland flows.
- 7.26 The purpose of the interception swales is simply to intercept runoff and encourage depression storage within the feature during the extreme storm event, promoting interception losses by infiltration or evapotranspiration and providing runoff pathway management. As such no specific overflow mechanism is proposed. Interception swales would overtop as sheet runoff and overland flow would follow the natural topography as per the pre development situation. This 'simplified' approach to runoff management is considered appropriate and proportionate to the type of development and is readily reversible at the end of the life of the Solar Farm.
- 7.27 The interception swales are proposed around the perimeter and at low points of the site as a series of discrete 'stepped' units parallel to the site's contours and perpendicular to the slope to ensure flows are not concentrated or conveyed downhill. Interception swales will be formed by creating shallow depressions 300mm deep along the lower boundaries of the site. The interception swales will incorporate a 1 in 3 side slopes and a base width of 0.5m
- 7.28 The provision of swales will reduce overland flows during extreme rainfall events. On this basis the proposed development would not increase flood risk onsite or elsewhere and would preserve the application site's natural drainage regime.

8.0 MAINTENANCE AND MANAGEMENT

- 8.1 Maintenance of SuDS features is required in order to ensure that the surface water drainage system operates effectively, and the risk of flooding of the site and surrounding areas is reduced.
- 8.2 A maintenance schedule should be undertaken to ensure that the drainage system remains fully operational for the design lifetime. The below table summarises a maintenance plan for the drainage systems and components within the development.
- 8.3 The SuDS Manual (CIRIA C753) and specific product suppliers guidelines should also be referred to for further information on maintenance and frequency.
- 8.4 All on site drainage will be maintained and managed by a private management company.

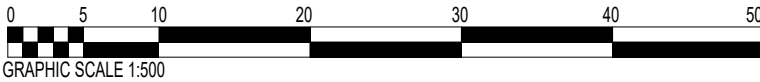
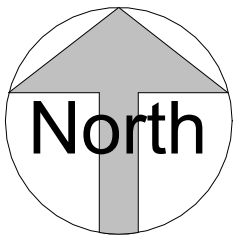
Drainage Component	Required Action	Typical Frequency
Swale	Litter and debris removal.	As required.
	Grass cutting or animal grazing – to retain grass height to site owner’s specification.	As required.
	Manage other vegetation and remove weeds.	Monthly (as stated, then as required)
	Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter, and cut back adjacent vegetation where possible.	Annually
	Re-seed areas of poor vegetation growth. Alter plant types to better suit conditions, if required.	Annually, or if bare soil is exposed over 20% or more of the swale treatment area.
	Repair erosion or other damage by re-turfing or reseeded.	As required.
	Re-level uneven surfaces and reinstate design levels.	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface.	As required.
	Remove build-up of sediment at top of filter strip.	As required.
	Inspect infiltration surfaces for ponding, compaction, and silt accumulation. Record areas where water is ponding for > 48 hours.	Monthly, or when required.
	Inspect surface for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly.

9.0 CONCLUSION

- 9.1 The development proposals comprise the construction of a Solar Farm consisting of photovoltaic modules mounted on metal frames, with associated site infrastructure
- 9.2 With reference to the GOV.UK's Flood Map for Planning (Rivers and Sea), the entire site falls within Flood Zone 3. Flood Zone 3 is land described as having areas to be at a 1% (1 in 100) or greater annual probability of flooding from rivers or 0.5% (1 in 200) or greater annual probability of flooding from the sea.
- 9.3 Based on the EA modelled flood data during the 0.1% (1 in 1000 year) 2115 Tidal Breaching scenario (worst case scenario) flood depths affecting the site vary from **0.0m – 0.5m**. **The majority of the site appears to be affected by 0.0m – 0.25m depths**, with the small areas within south eastern corner of the site being subject to flood depths of **0.25m – 0.5m**.
- 9.4 It is proposed that all electrical equipment will be placed within areas of no flood risk, where electrical equipment cannot be placed within this area the equipment will be placed within the lowest flood risk area with flood depths of up to 0.25m, all electrical equipment within this area will be raised 500mm above the existing ground level to ensure the safety of the equipment while also ensuring safe access for any required maintenance.
- 9.5 The proposed Solar PV Panels will be above ground level and above the flood risk on metal frames securely anchored into the ground (known as solar arrays). As such the solar arrays would not be vulnerable to the shallow depths and flow of the flood waters and would be above the highest risk and level of flood water accumulation. It is also proposed that all solar panels will be raised 300mm above flood levels.
- 9.6 The potential flood risk to the site from all sources of flooding is considered to be low for the majority of the site with areas of elevated risk associated with potential ground water and surface water runoff which could affect isolated low points of the site.
- 9.7 The development can continue to operate safely during flood conditions and would not impede flood flows. The proposed development is therefore appropriate in areas of elevated flood risk.
- 9.8 With respect to surface water runoff, the solar panels are raised above the existing ground allowing a permanent grass sward to be maintained underneath the panels. Rainfall falling onto the photovoltaic panels would runoff directly to the ground beneath the panels and infiltrate into the ground at the same rate as it does in the site's existing greenfield state.
- 9.9 A sustainable drainage strategy, involving the implementation of SuDS in the form of 300mm deep interception swales, is proposed for managing surface water runoff on the site. Interception swales are proposed at the low points of the application site to intercept extreme flows which may already run offsite. . It is emphasised that the swales do not form part of a formal drainage scheme for the development but are provided as a form of 'betterment'.
- 9.10 It is considered that the provision of swales would lead to an overall reduction in surface water flow rates from the site and mitigate any increase in run-off due to the minor reduction in the overall permeable area of the site.

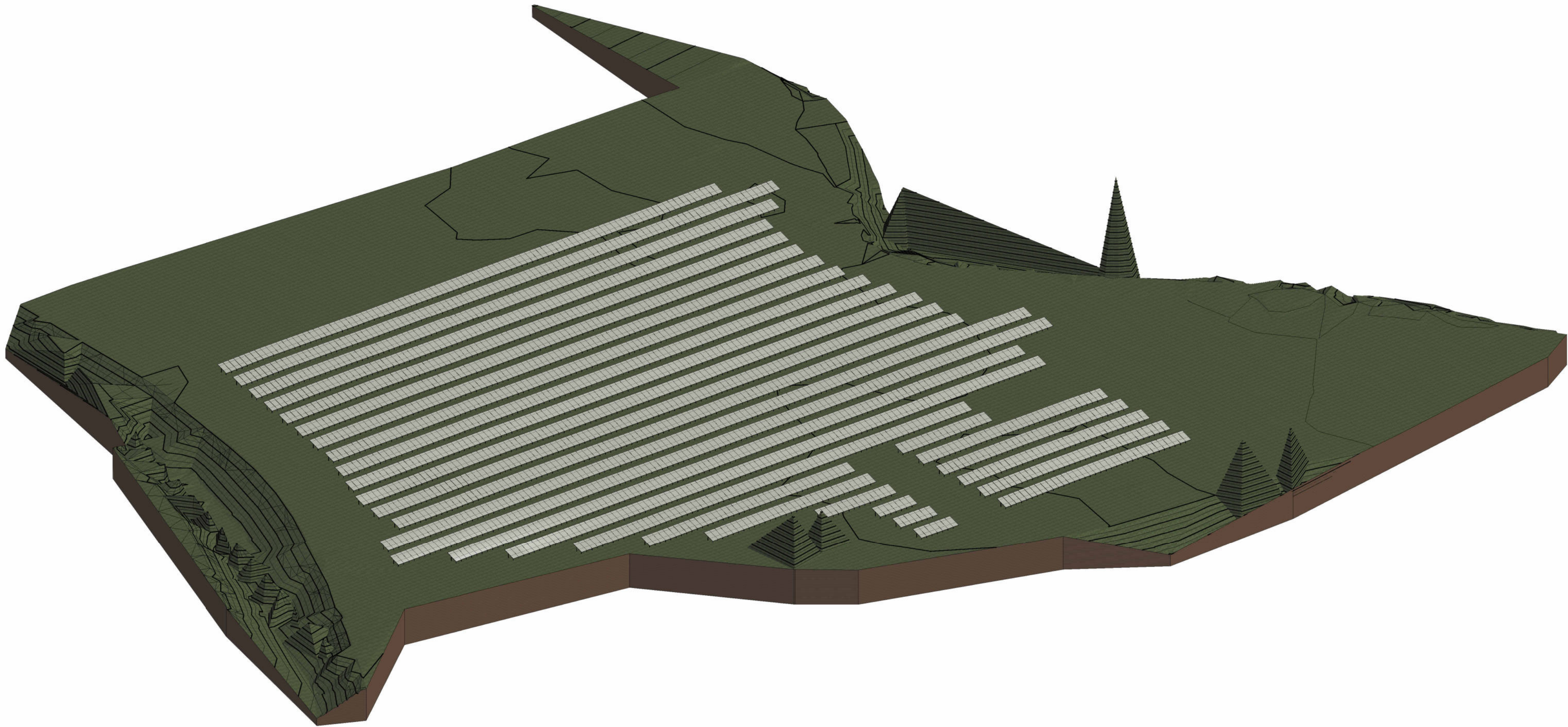
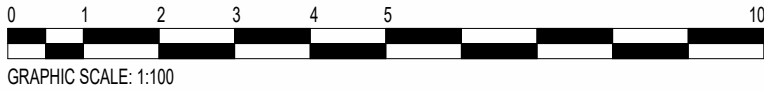
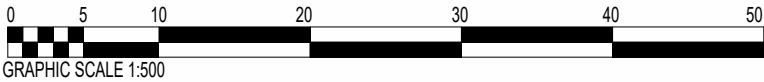
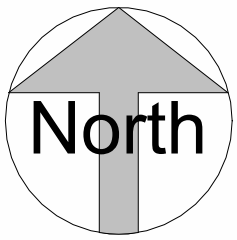
- 9.11 The proposed drainage strategy would ensure that the development would therefore have a negligible impact upon site drainage and surface water arising from the developed site would mimic the surface water flows arising from the site prior to the proposed development. The natural drainage regime would be retained except in the extreme storm event when a benefit is achieved by reducing the extreme storm run-off flows.
- 9.12 The overall conclusions drawn from this Flood Risk Assessment are that future users of the development would remain appropriately safe throughout the lifetime of the proposed development.

APPENDIX A
SITE PROPOSALS

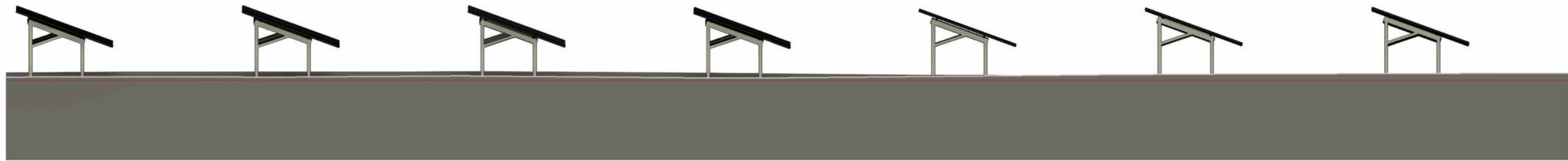


Cable Route





1 Proposed 3D



2 Typical Section
1 : 100

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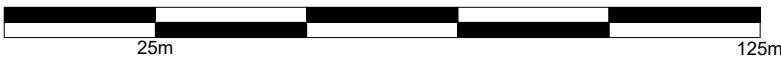
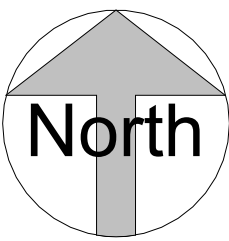
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Solar Project

Drawing Title
Proposed Ground Layout
- 3D and section

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	REV A

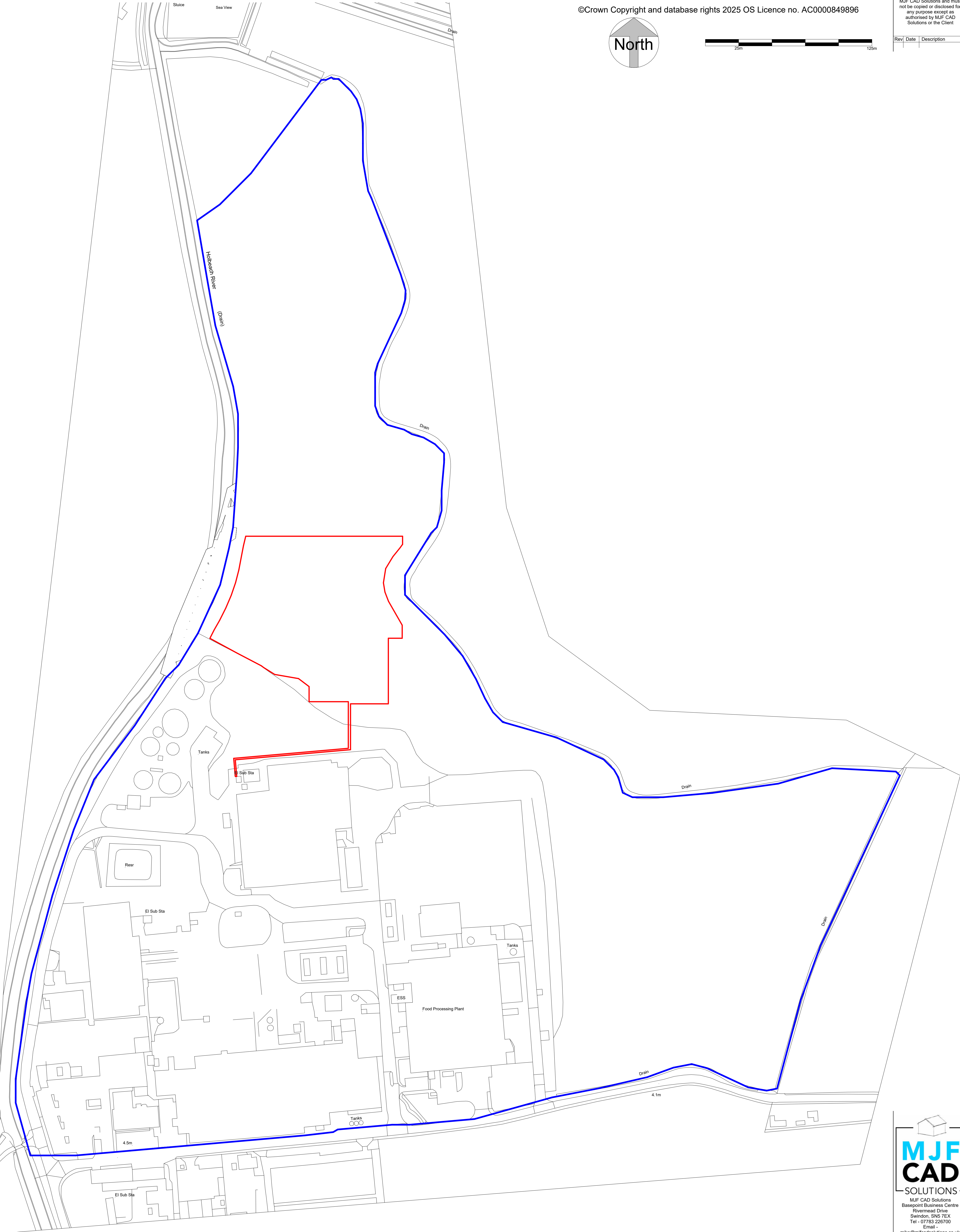
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APPENDIX B
SITE LOCATION PLAN



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Rev	Date	Description



1 OS Plan
1 : 1250



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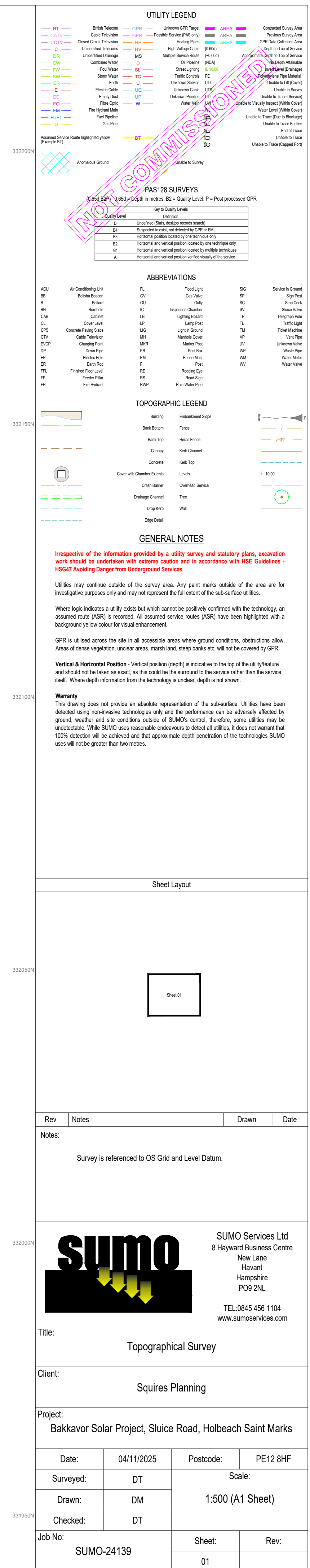
Client	Bakkavor
Project Title	Solar Project
Drawing Title	Site Location Plan
Scale (@ A1) 1 : 1250	Date Jan 2026
Drawing No. 1368_01	Drawn MJF
	REV A

APPENDIX C

SEWER RECORDS

APPENDIX D

EXISTING SITE LEVELS



APPENDIX E

EA PRODUCT 4 FLOOD LEVEL DATA

Kris Tovey
kristovey@k-ten.co.uk

Our ref: EIR2025/21298
Date: 8 August 2025

Dear Kris,

Flood Risk Information for Sluice Road, Holbeach St Marks

The flood risk information for the above site is set out below and attached. It is important you read any contextual notes on the maps provided.

If you are preparing a Flood Risk Assessment (FRA) for this site, please note this information may not be sufficient by itself to produce an adequate FRA to demonstrate the development is safe over its lifetime. Additional information may be required to carry out an appropriate assessment of all risks, such as the consequences of a breach in the flood defences.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

Please read the letter in full as the information covered has been updated in **July 2025**.

1. Flood Map for Planning

The attached map includes the current Flood Map for Planning for your area. The map indicates the Area at Risk of Flooding (Flood Zone 3) and the Extreme Flood Outline (Flood Zone 2) **assuming no flood defences exist**.

The Area at Risk of Flooding shows the land that could be impacted from a flood with a 0.5% or greater chance of occurring in any year for flooding from the sea, or a 1% or greater chance of occurring in any year for fluvial (river) flooding.

The Extreme Flood Outline shows the land that could be impacted from a flood which has between a 1% and 0.1% chance of occurring in any year for fluvial (river) flooding, or between a 0.5% and 0.1% annual probability of sea flooding, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

The Flood Map for Planning also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map for Planning only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

2. Recorded Flood Outlines

With regards to the history of flooding I can advise we do not have any records of flooding in this area. It is possible recent flooding may have occurred which we are currently investigating, therefore this information may be subject to change.

It is possible other flooding may have occurred which other risk management authorities, such as the Lead Local Flood Authority (i.e. top tier council) or Internal Drainage Board (where they exist) have responsibility.

3. Schemes in the area

There are no ongoing capital projects to reduce or sustain the current flood risk to this area.

4. Fluvial Flood Risk Information

This site is not considered to be at risk of flooding from main rivers.

The site may be at risk from local ordinary watercourses for which other risk management authorities, such as the Lead Local Flood Authority (i.e. top tier council) or Internal Drainage Board (where they exist) have responsibility.

5. Tidal Flood Risk Information

This site is considered to be at risk from tidal flooding.

5.1 Tidal Defence Information

The existing tidal defences protecting this site consist of earth embankments.

They are in fair condition and reduce the risk of flooding (at the defence) to a 1% (1 in 100) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

Refer to paragraph 3 for details of any ongoing capital projects to reduce the flood risk to this site.

5.2 Tidal Flood Levels

The attached data sheets show our current best estimate for extreme tide levels.

Please read the information notes on the data sheets.

5.3 Tidal Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available along the full coastal / tidal floodplain, except the tidal Witham Haven in Boston (upstream of Hobhole) where only breaching and not overtopping has been modelled and the tidal River Welland upstream of Fosdyke Bridge where neither breaching nor overtopping are available.

The number of locations we have this information for is expected to increase in time.

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from breaching of the defences at specific locations for the scenarios below. For some locations the breach mapping also includes flooding from overtopping if this is expected in that scenario. The location of modelled tidal breaches is shown on a separate attached map.

5.3.1 Tidal Hazard Mapping – Breaches

- Year 2006 0.5% (1 in 200) chance
- Year 2006 0.1% (1 in 1000) chance
- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

5.3.2 Tidal Hazard Mapping - Overtopping

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from simulated overtopping of defences for the following scenarios:

- Year 2006 0.5% (1 in 200) chance
- Year 2006 0.1% (1 in 1000) chance
- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

Your site is not affected by overtopping of the defences for the present day (2006) scenarios.

6. Development Planning

If you would like local guidance on preparing a flood risk assessment for a planning application, please contact our Sustainable Places team at LNplanning@environment-agency.gov.uk. It will help if you mention this data request and attach your site location plan.

We provide free preliminary advice; additional/detailed advice, review of draft FRAs and meetings are chargeable at a rate set to cover our costs, currently £115 (plus VAT) per hour of staff time. Further details are available on our website at <https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals>.

General advice on flood risk assessment for planning applications can be found on GOV.UK at <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>

We have provided information on risk of breach where it is available. If you are intending on using this information to prepare a Flood Risk Assessment you will need

to check if the data meets your requirements. You may need to carry out further assessment (or modelling) for sites that are at residual risk (including from breach of defences), or additional locations or scenarios.

Climate change will increase flood risk due to overtopping of defences. Please note, unless specified otherwise, the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in **July 2021**. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

7. Data Licence and Other Supporting Information

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

This information is provided in accordance with the Open Government Licence which can be found here: <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Further information on flood risk can be found on the GOV.UK website at: <https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

Rights of appeal

If you are not satisfied with our decision, you can contact us within two calendar months to ask for the decision to be reviewed. We will then conduct an internal review of our response to your request and give you our decision in writing within 40 working days.

If you are not satisfied with the outcome of the internal review, you can then make an appeal to the Information Commissioner Office, the statutory regulator for EIR and the Freedom of Information Act 2002. The address is: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire. SK9 5AF.

Tel: 0303 123 1113 (local rate) or 01625 545 745 (national rate) | Fax: 01625 524 510

Email: casework@ico.org.uk | Website: www.ico.org.uk

8. Other Flood Risk Management Authorities

The information provided with this letter relates to flood risk from main river or the sea. The Flood Map for Surface Water can be viewed at <https://www.gov.uk/check-long-term-flood-risk>

Additional information may be available from other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist).

I hope we have correctly interpreted your request. If you have any queries or would like to discuss the content of this letter further please contact Alexander Tan using the email address below and quoting our EIR reference number above.

Yours sincerely,



for John O'Neill

Welland and Nene Partnerships and Strategic Overview Team Leader

e-mail PSOWN@environment-agency.gov.uk

Enc.

Flood Map for Planning

Tidal Level Data Sheets - Map and Tables

Tidal Breach Points – Locations Map

Hazard Mapping – Breaching

Hazard Mapping – Overtopping

Flood Map centred on TF 35059 32075- created August 2025 [Ref: EIR2025-21298]



Scale 1:10,000



Legend

- Main Rivers
 Raised Defences
 Flood Storage Areas

Flood Zones 2 and 3 Rivers and Sea

Flood Zone

-  Flood Zone 2
-  Flood Zone 3

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This represents land that could be impacted by a flood which has a 1% (1 in 100) or greater chance of occurring in any year from rivers or 0.5% (1 in 200) or greater annual probability of flooding from the sea.

Light blue shows the extent of the Extreme Flood Outline. This represents land that could be impacted by a flood which has between a 1% and 0.1% (1 in 100 to 1 in 1000) chance of occurring in any year from rivers or between 0.5% and 0.1% (1 in 200 to 1 in 1000) annual probability of flooding from the sea, or the highest recorded historic extent if greater.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

Created by the Partnerships and Strategic Overview Team,
Kettering

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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

East Coast and Wash - 2018 Coastal Flood Boundary [CFB] Dataset

Key Node Points



Scale 1:550,000



▲ East Coast and Wash

See separate data sheet for predicted flood levels

Created by the Partnerships and Strategic Overview Team, Lincoln

East Coast and Wash: Immingham to the West Lighthouse

2018 Coastal Flood Boundary Extreme Sea Levels

CFB REF	LOCATION	EASTING	NORTHING	ANNUAL CHANCE (1 IN X) OF TIDE LEVEL IN METRES ODN																						
				1			10			50			100			200			300			1000				
				Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound				
				2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%
3888	Immingham	520440	417625	4.16	4.17	4.19	4.50	4.53	4.62	4.73	4.80	5.00	4.83	4.93	5.19	4.93	5.06	5.41	4.98	5.14	5.55	5.15	5.38	6.01		
3890	Haborough Marsh	522100	416512	4.14	4.15	4.17	4.48	4.51	4.60	4.70	4.77	4.97	4.80	4.90	5.16	4.90	5.03	5.38	4.94	5.10	5.51	5.11	5.34	5.97		
3898	Grimsby	529295	413162	3.98	3.99	4.01	4.31	4.34	4.43	4.53	4.60	4.80	4.61	4.71	4.97	4.71	4.84	5.19	4.74	4.90	5.31	4.88	5.11	5.74		
3906	Buck Beck	534709	407369	3.87	3.88	3.90	4.19	4.23	4.31	4.41	4.50	4.68	4.50	4.61	4.86	4.61	4.75	5.10	4.64	4.82	5.22	4.80	5.05	5.66		
3910	Tetney	538035	405537	3.85	3.86	3.89	4.17	4.22	4.30	4.40	4.50	4.67	4.49	4.61	4.86	4.60	4.75	5.10	4.63	4.82	5.21	4.80	5.06	5.66		
3918	Donna Nook	544641	401997	3.82	3.83	3.86	4.14	4.19	4.27	4.38	4.48	4.65	4.47	4.60	4.85	4.58	4.74	5.10	4.63	4.82	5.22	4.81	5.08	5.68		
3928	Saltfleet	549131	393360	3.78	3.79	3.82	4.11	4.16	4.26	4.36	4.46	4.64	4.47	4.59	4.86	4.57	4.74	5.11	4.63	4.83	5.25	4.83	5.11	5.74		
3942	Boygrift	555131	380860	3.72	3.74	3.77	4.06	4.11	4.22	4.33	4.43	4.65	4.43	4.57	4.87	4.56	4.73	5.13	4.62	4.83	5.28	4.85	5.15	5.82		
3968	Gibraltar Point	557652	356181	4.16	4.17	4.20	4.51	4.56	4.67	4.76	4.85	5.08	4.85	4.97	5.27	4.94	5.10	5.49	4.99	5.18	5.63	5.14	5.41	6.09		
3992_14	Hobhole	535990	340116	4.96	4.97	5.01	5.40	5.44	5.56	5.66	5.76	5.98	5.78	5.90	6.20	5.88	6.04	6.44	5.92	6.11	6.57	6.03	6.31	6.99		
	Grand Sluice*	532366	344510	4.93	4.94	4.98	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3		
3992_9	Boston Barrier	532754	342852	4.93	4.94	4.98	5.41	5.45	5.57	5.73	5.83	6.05	5.85	5.97	6.27	5.93	6.09	6.49	5.94	6.13	6.59	5.98	6.26	6.94		
3992_5	Fosdyke Bridge	531886	332234	4.87	4.88	4.92	5.31	5.35	5.47	5.58	5.68	5.90	5.71	5.83	6.13	5.82	5.98	6.38	5.87	6.06	6.52	6.01	6.29	6.97		
4008	West Lighthouse	550094	329971	4.87	4.88	4.91	5.21	5.26	5.37	5.46	5.56	5.78	5.56	5.68	5.98	5.66	5.82	6.21	5.71	5.90	6.35	5.86	6.14	6.81		
-	Marsh Road	525988	324065	-	5.04	-	-	5.44	-	-	5.73	-	-	5.85	-	-	5.98	-	-	-	-	-	-	-		
-	Wisbech	546110	309940	-	4.83	-	-	5.25	-	-	5.53	-	-	5.66	-	-	5.78	-	-	-	-	-	-	-		
-	Dog-in-a-Doublet	527200	299287	-	3.67	-	-	4.00	-	-	4.22	-	-	4.32	-	-	4.42	-	-	-	-	-	-	-		

See next page for notes

2018 Coastal Flood Boundary Extreme Sea Levels

NOTES:

The following notes apply to all CFB sites (ie all on table excluding Marsh Road, Wisbech, Dog-in-a-Doublet)

- The base date for the data is 2017.
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- For additional information relating to the 2018 Coastal Flood Boundary Extreme Sea Levels or to access the full dataset for the above sites or intermediate locations refer to the Defra Metadata Catalogue at <https://deframetadadata.com/geonetwork/srv/eng/catalog.search#/metadata/84a5c7c0-d465-11e4-b0bd-f0def148f590>

The following notes apply to all Marsh Road, Wisbech, Dog-in-a-Doublet

- The base date for the data is 2006
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- These levels will be updated as their respective tidal river models are updated.

The following notes apply to Grand Sluice

- Grand Sluice remains the tidal limit for the River Witham.
- The data is based on CFB 2018 data for Boston Barrier site, capped at 5.3mAOD to reflect use of the barrier which raises for tides above this level.
- The base date for the data is 2017
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- For additional information relating to the 2018 Coastal Flood Boundary Extreme Sea Levels or to access the full dataset for the above sites or intermediate locations refer to the Defra Metadata Catalogue at <https://deframetadadata.com/geonetwork/srv/eng/catalog.search#/metadata/84a5c7c0-d465-11e4-b0bd-f0def148f590>



★ **Modelled Breach Locations**

0 3.5 7 14 Kilometers

This map indicates the location of where we have modelled the consequence of breaches in the defences along the coastline and tidal rivers. We have mapped the maximum values of Hazard Rating (Danger to People), Depth and Velocity.

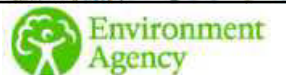
We have not assumed that all breaches occur at the same time, but have modelled each breach individually and overlaid the results to find the maximum values.

Our modelling only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. Our defences generally provide a good standard of flood defence but a risk of breaching remains.

Please contact the Environment Agency for information on how these maps are used in the management of flood risk.

General Enquiries No: 03708 506 506.

Weekday calls cost 5p plus up to 6ppm from BT Weekend Unlimited. Mobile and other providers charges may vary.

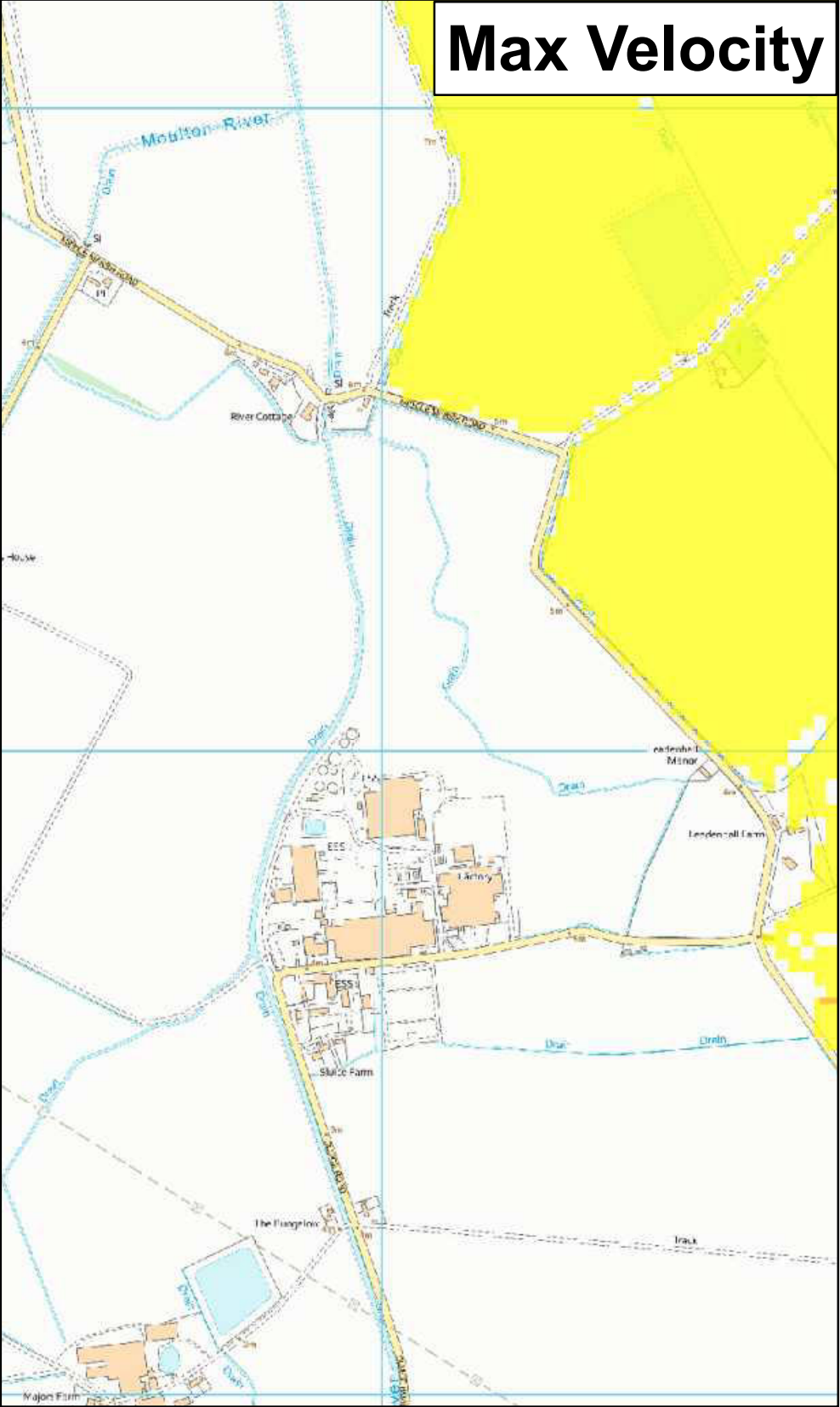
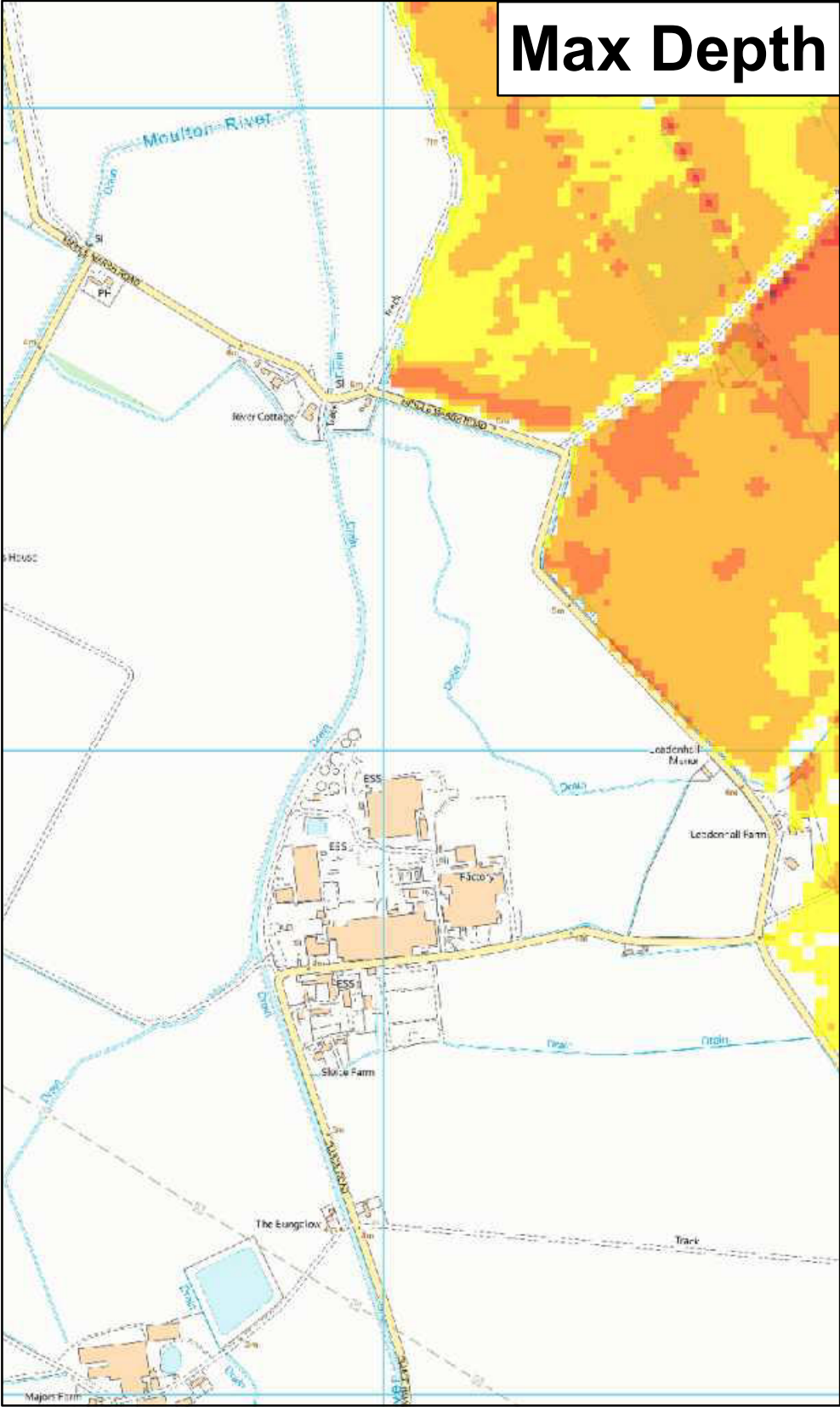
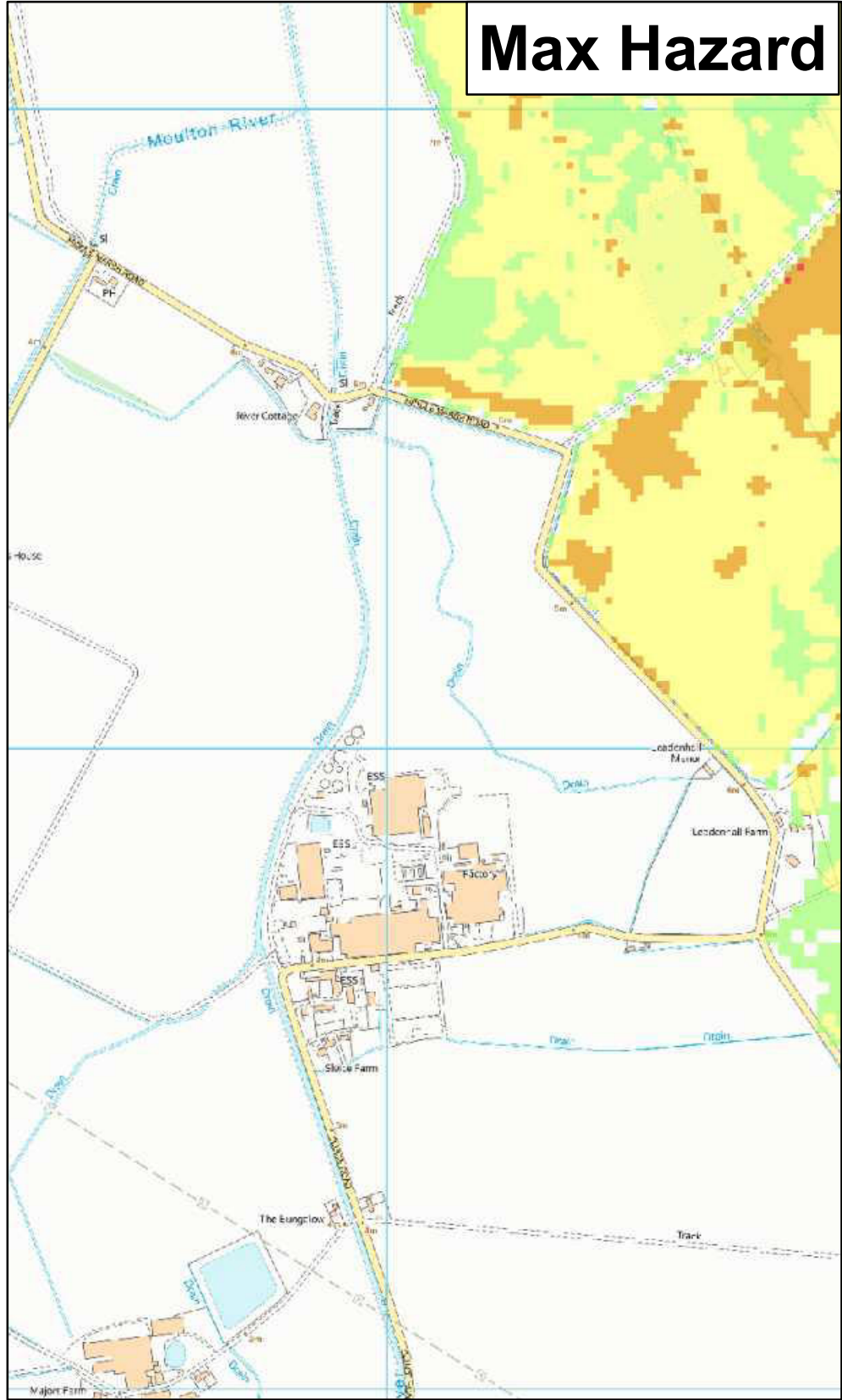


Produced by the Partnership and Strategic Overview Team, Lincoln
General Enquiries No: 03708 506 506

Northern Area Tidal Hazard Mapping

Location of Modelled Breaches

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★ Modelled Breach Locations - see also the accompanying plan "Location of Modelled Breaches"							
Max Hazard (Flood Risk to People : FD2320)		Max Depth (m)		Max Velocity (m/s)			
	Less than 0.75 (Low Hazard)		0 - 0.25		0 - 0.3		
	Between 0.75 and 1.25 (Danger for Some)		0.25 - 0.50		0.3 - 1.0		
	Between 1.25 and 2.0 (Danger for Most)		0.50 - 1.0		1.0 - 1.5		
	Greater than 2.0 (Danger for All)		1.0 - 1.6		1.5 - 2.5		
			1.6 +		2.5 +		
Date Printed	August 2025	Scenario year	2006	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	EIR2025/21298

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

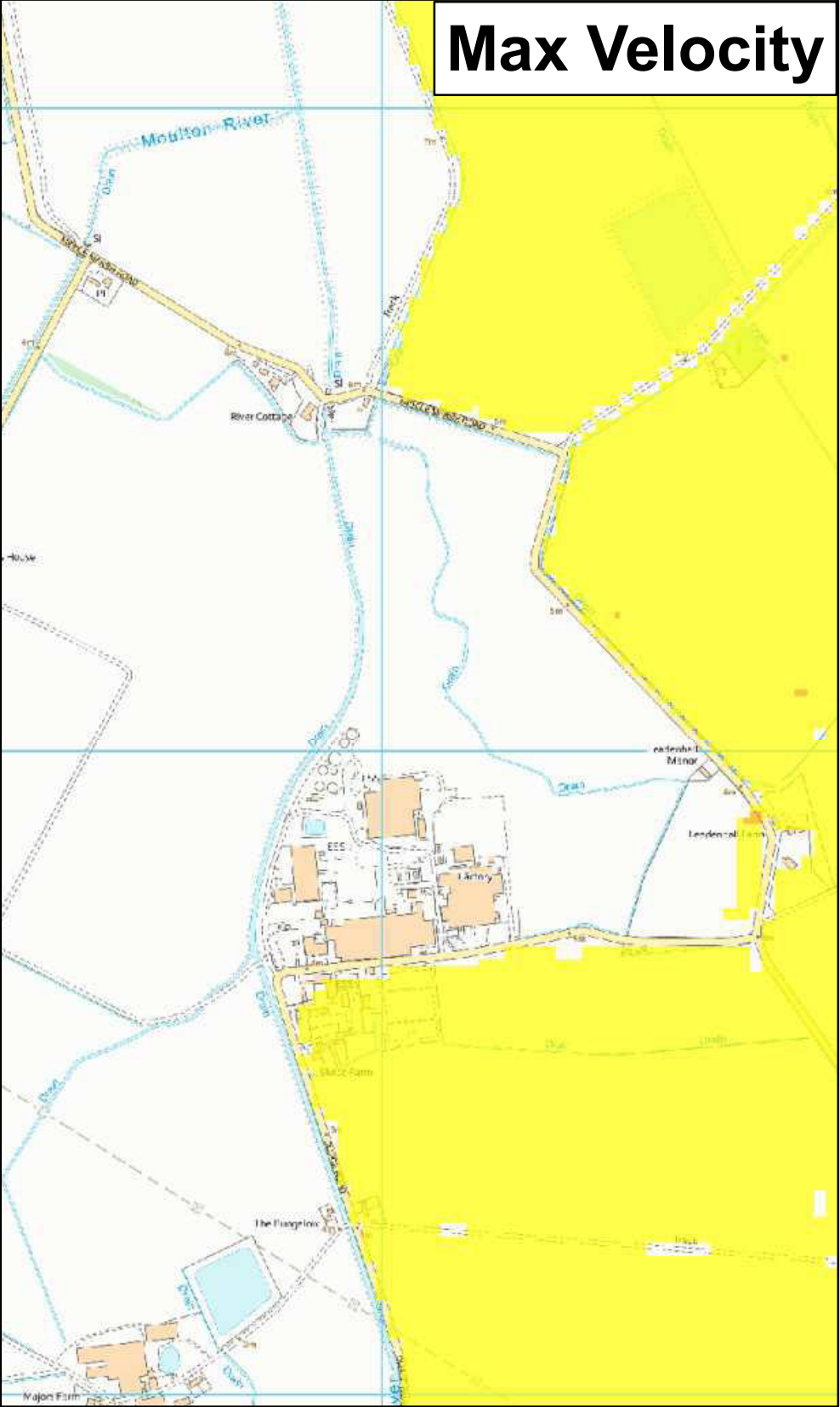
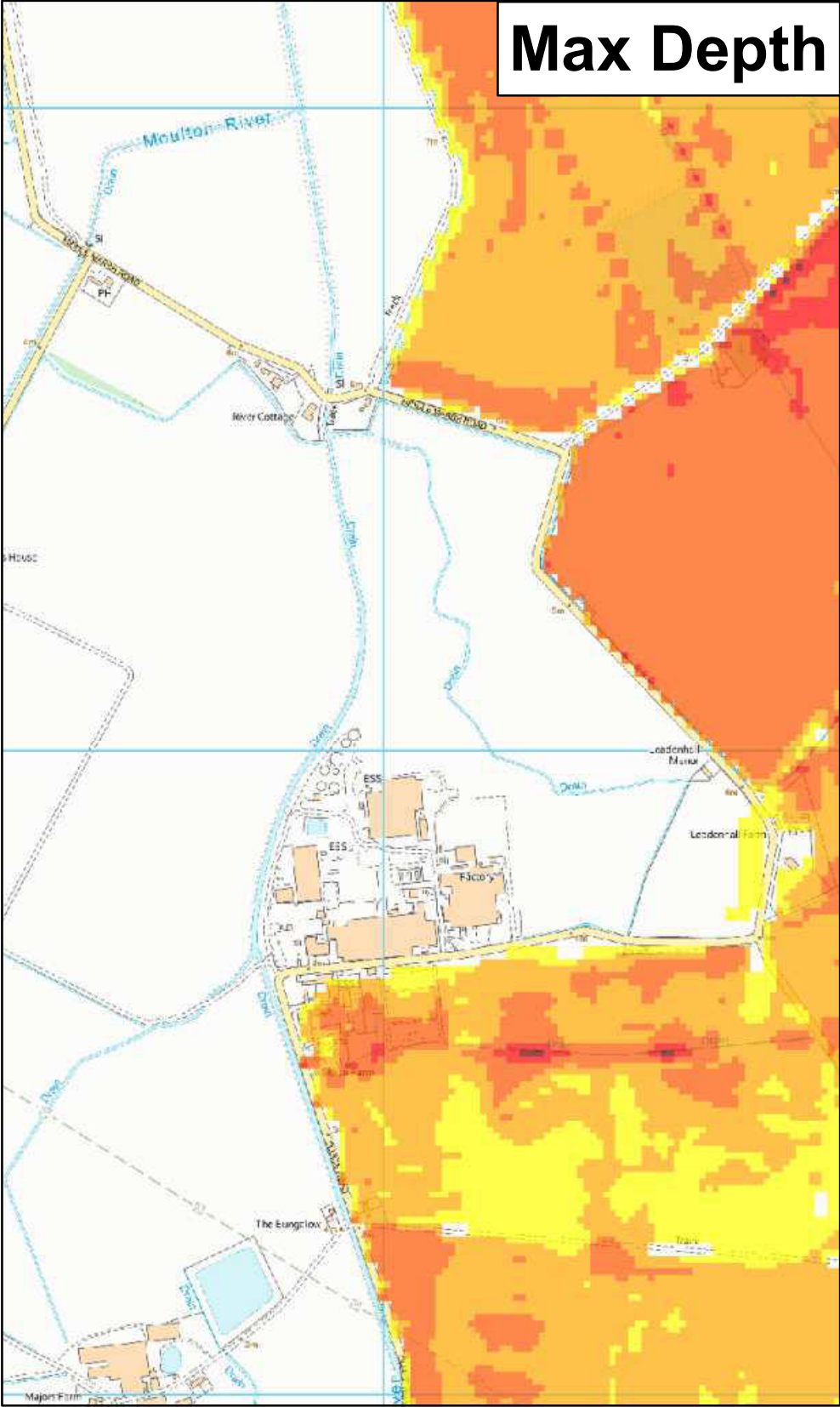
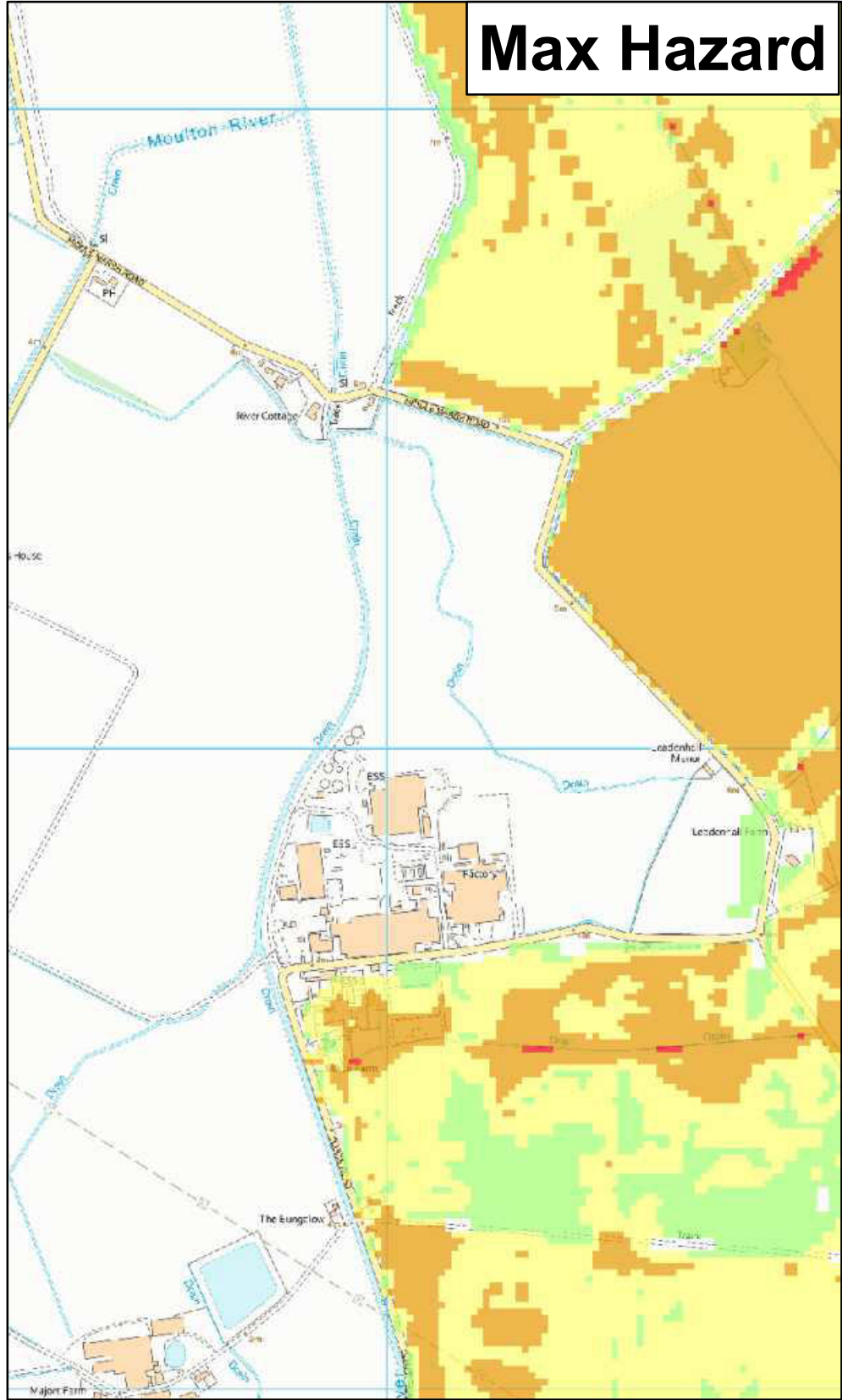
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

**Lincolnshire and Northamptonshire
Tidal Breaching Hazard
Mapping**

Map Centred on TF 35059 32075

1:10,000

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★ Modelled Breach Locations - see also the accompanying plan "Location of Modelled Breaches"							
Max Hazard (Flood Risk to People : FD2320)		Max Depth (m)		Max Velocity (m/s)			
	Less than 0.75 (Low Hazard)		0 - 0.25		0 - 0.3		
	Between 0.75 and 1.25 (Danger for Some)		0.25 - 0.50		0.3 - 1.0		
	Between 1.25 and 2.0 (Danger for Most)		0.50 - 1.0		1.0 - 1.5		
	Greater than 2.0 (Danger for All)		1.0 - 1.6		1.5 - 2.5		
			1.6 +		2.5 +		
Date Printed	August 2025	Scenario year	2006	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	EIR2025/21298

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

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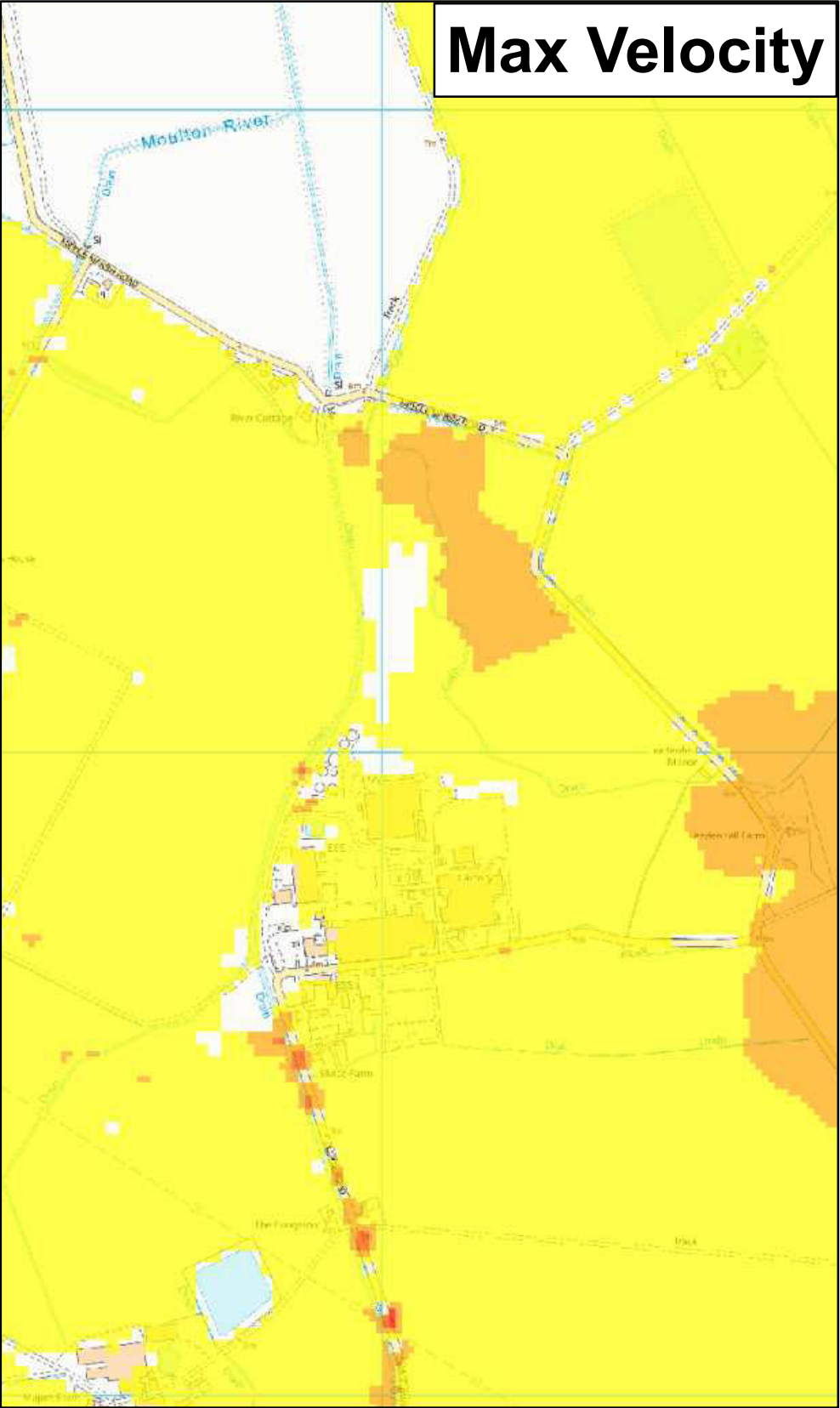
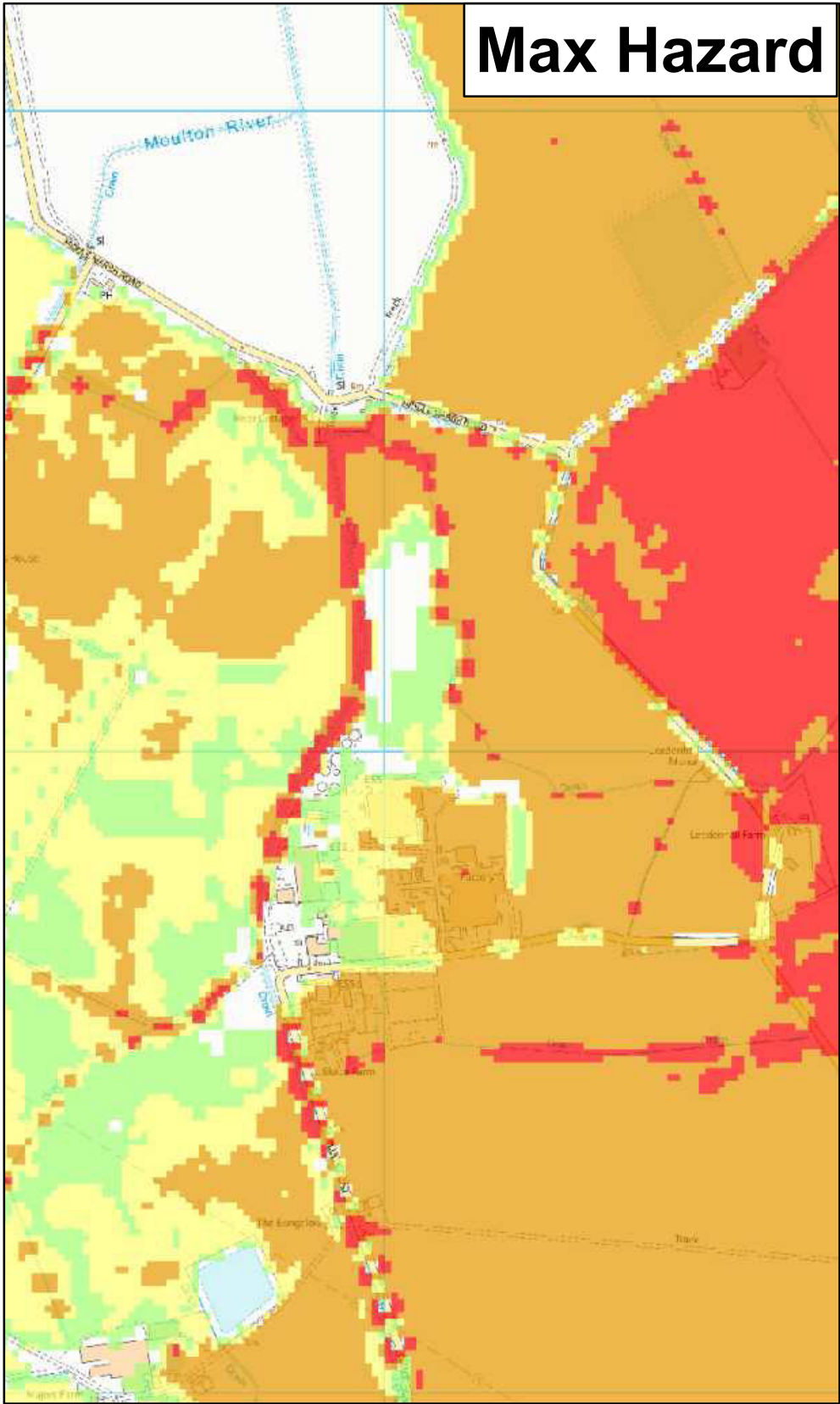
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

**Lincolnshire and Northamptonshire
Tidal Breaching Hazard
Mapping**

Map Centred on TF 35059 32075

1:10,000

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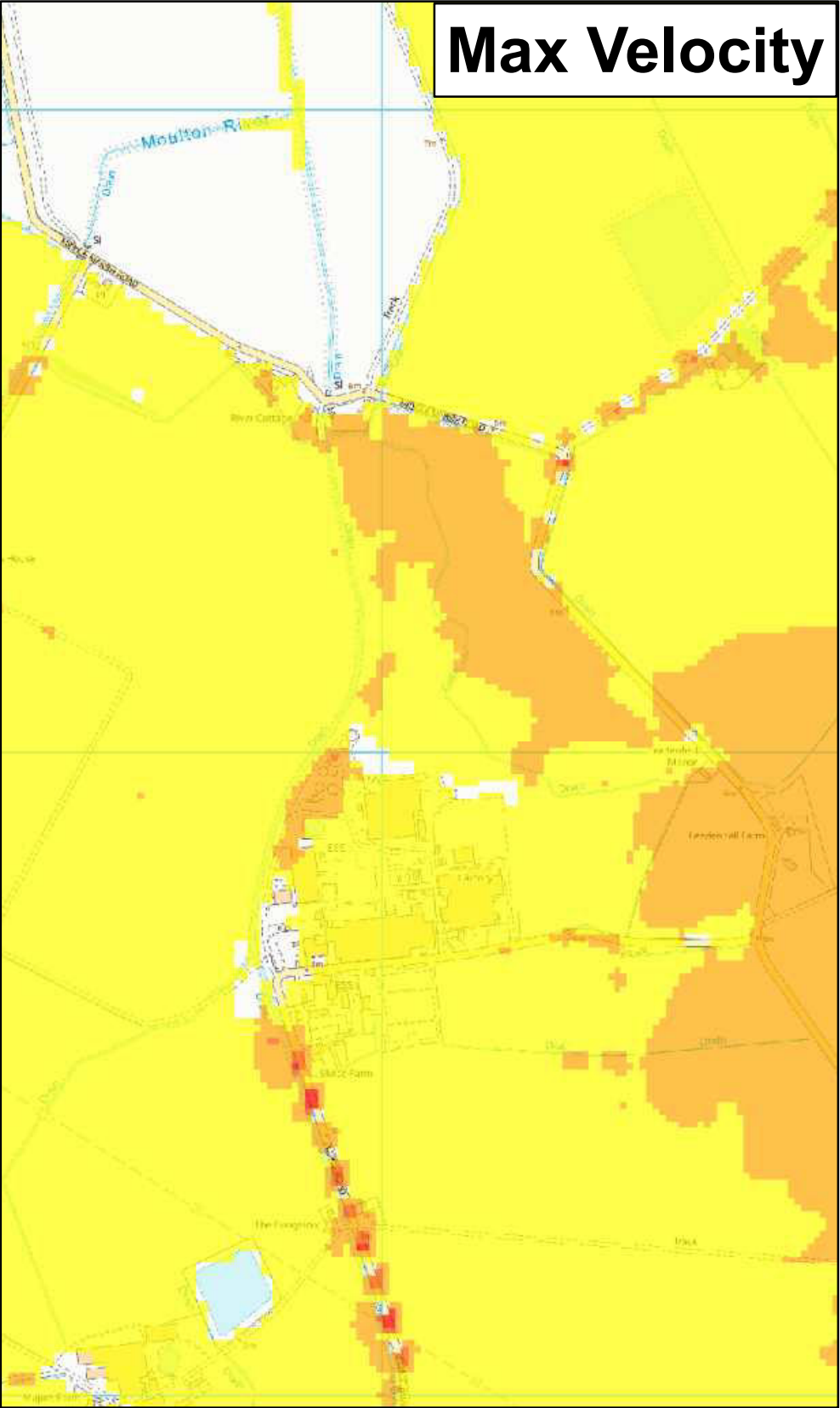
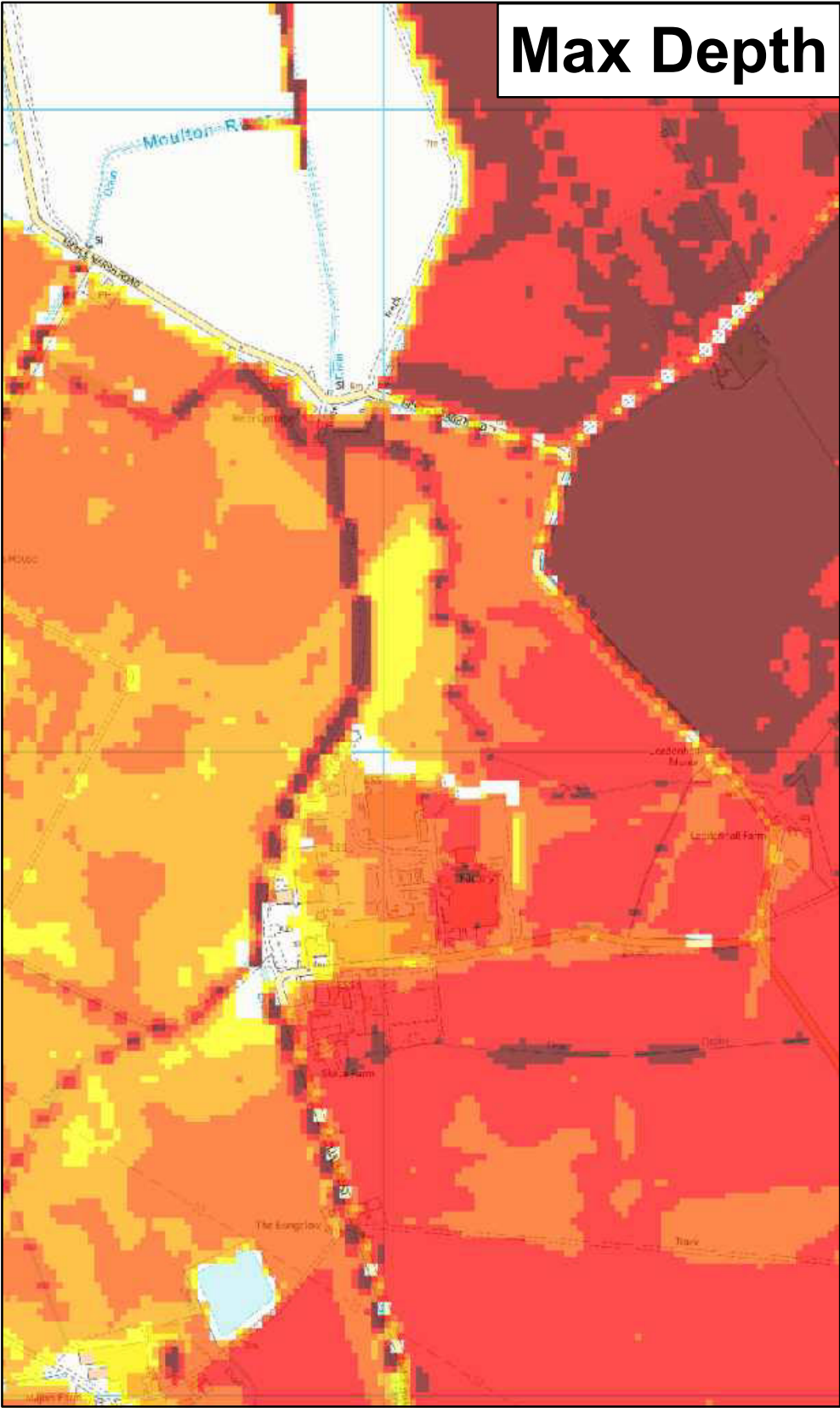
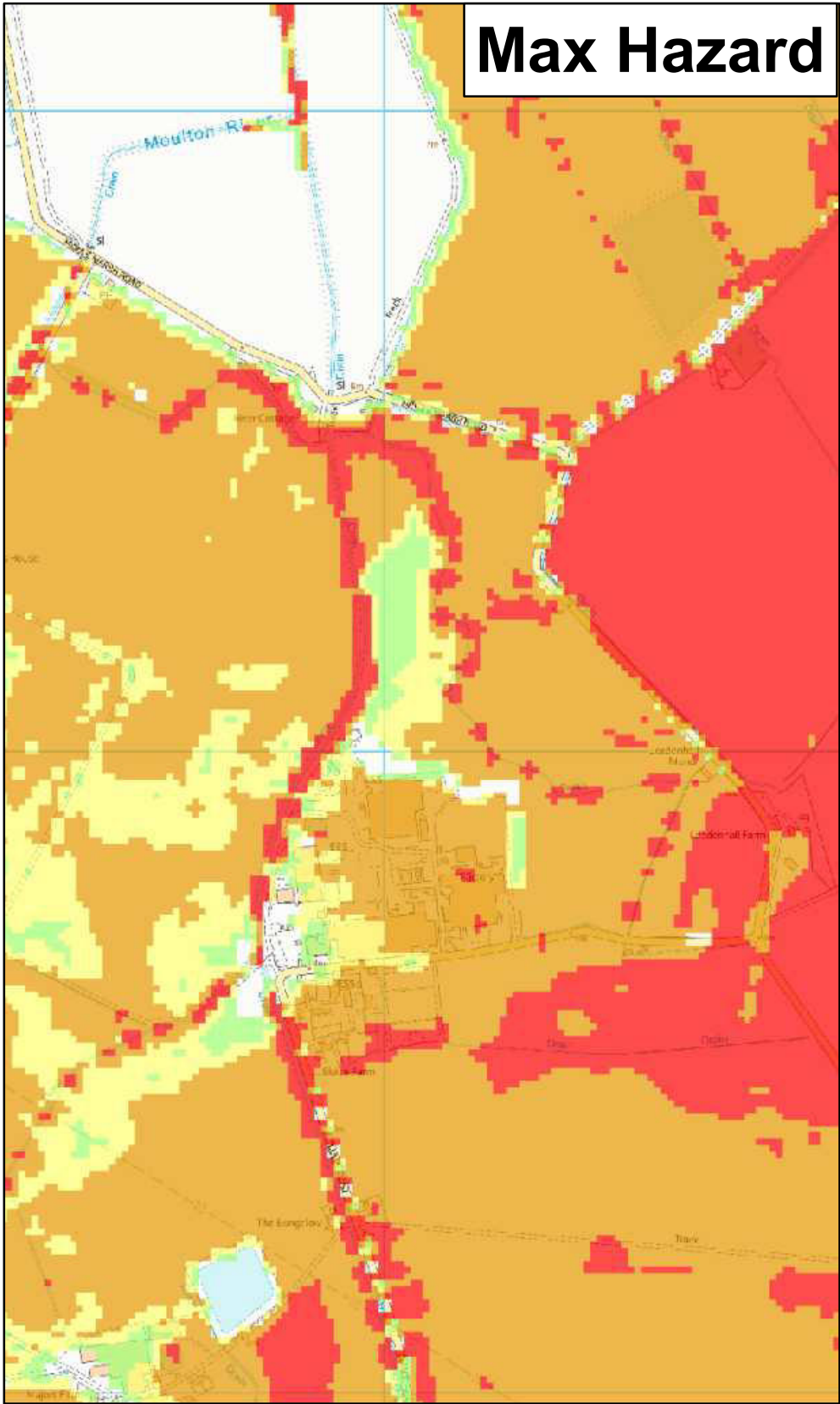
★ Modelled Breach Locations - see also the accompanying plan "Location of Modelled Breaches"								This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped. The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results. The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains. General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary	Max Hazard (Flood Risk to People : FD2320)		Max Depth (m)		Max Velocity (m/s)	
Less than 0.75 (Low Hazard) Between 0.75 and 1.25 (Danger for Some) Between 1.25 and 2.0 (Danger for Most) Greater than 2.0 (Danger for All)		0 - 0.25 0.25 - 0.50 0.50 - 1.0 1.0 - 1.6 1.6 +		0 - 0.3 0.3 - 1.0 1.0 - 1.5 1.5 - 2.5 2.5 +										
Date Printed	August 2025	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	EIR2025/21298							

Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

Map Centred on TF 35059 32075

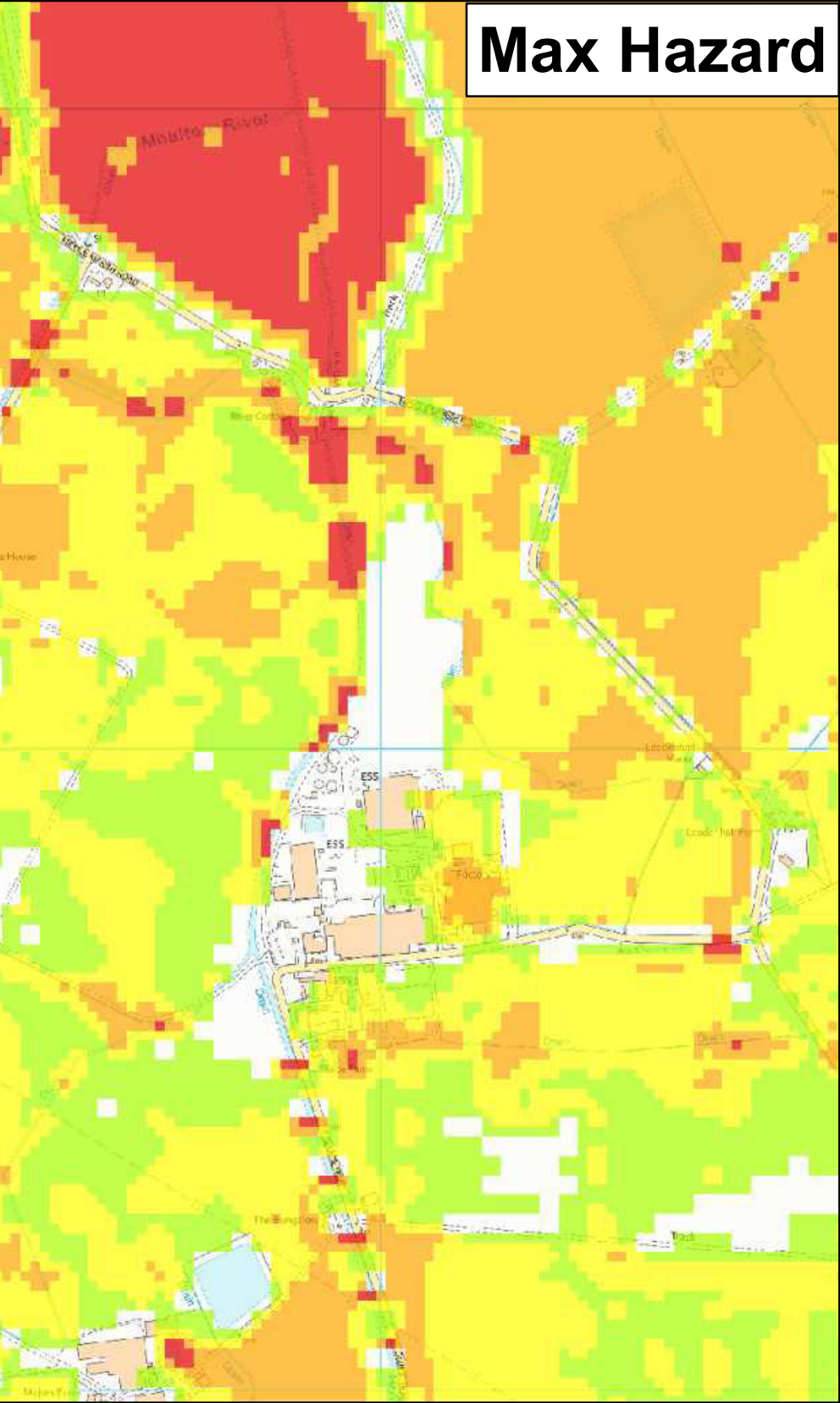
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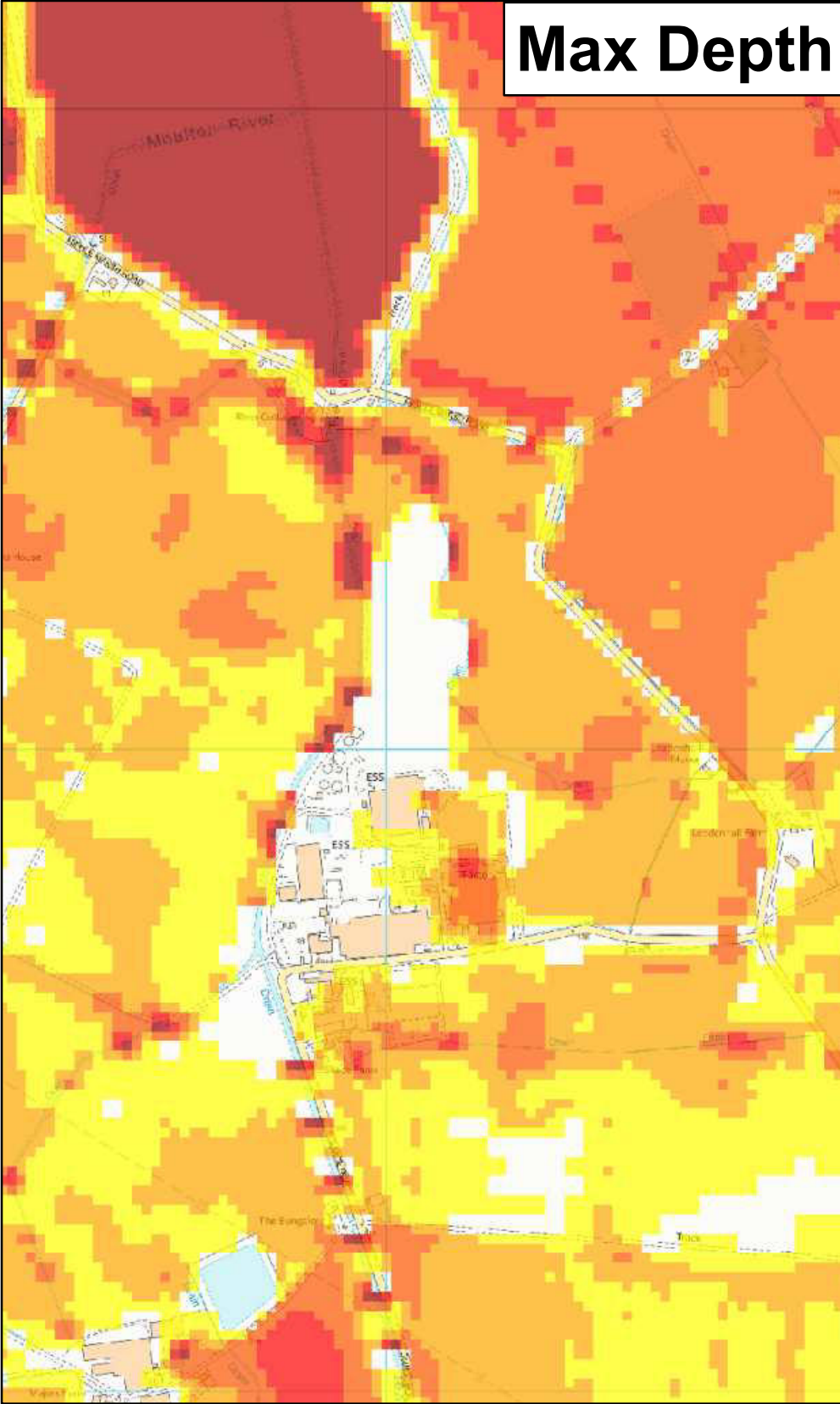


★ Modelled Breach Locations - see also the accompanying plan "Location of Modelled Breaches"								This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped. The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results. The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains. General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary	Max Hazard (Flood Risk to People : FD2320)		Max Depth (m)		Max Velocity (m/s)	
Less than 0.75 (Low Hazard) Between 0.75 and 1.25 (Danger for Some) Between 1.25 and 2.0 (Danger for Most) Greater than 2.0 (Danger for All)		0 - 0.25 0.25 - 0.50 0.50 - 1.0 1.0 - 1.6 1.6 +		0 - 0.3 0.3 - 1.0 1.0 - 1.5 1.5 - 2.5 2.5 +										
Date Printed	August 2025	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	EIR2025/21298							
Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping Map Centred on TF 35059 32075 1:10,000 © Environment Agency copyright and/or database rights 2025. © Crown Copyright and Database Rights 2025 OS AC0000807064.														

Max Hazard



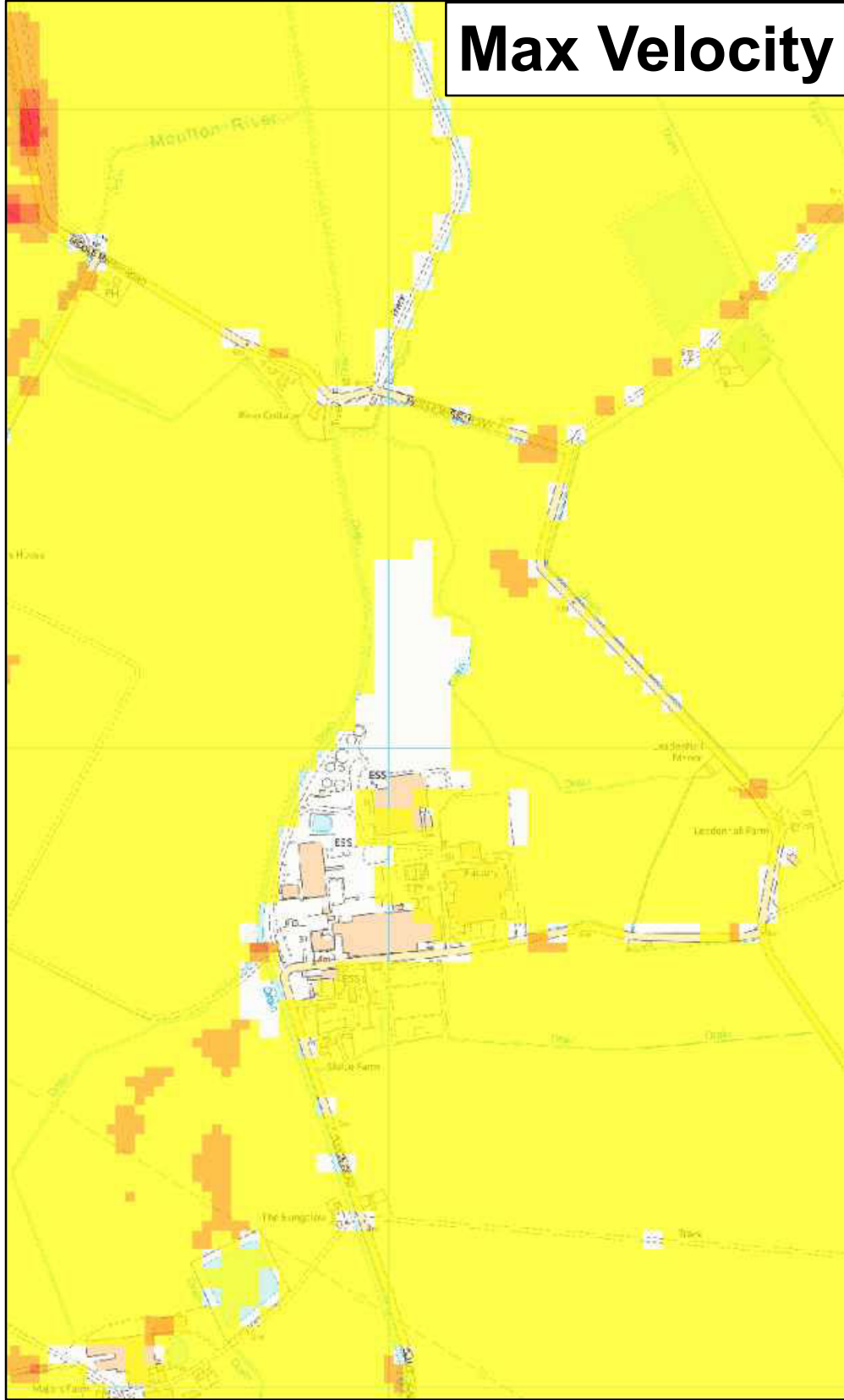
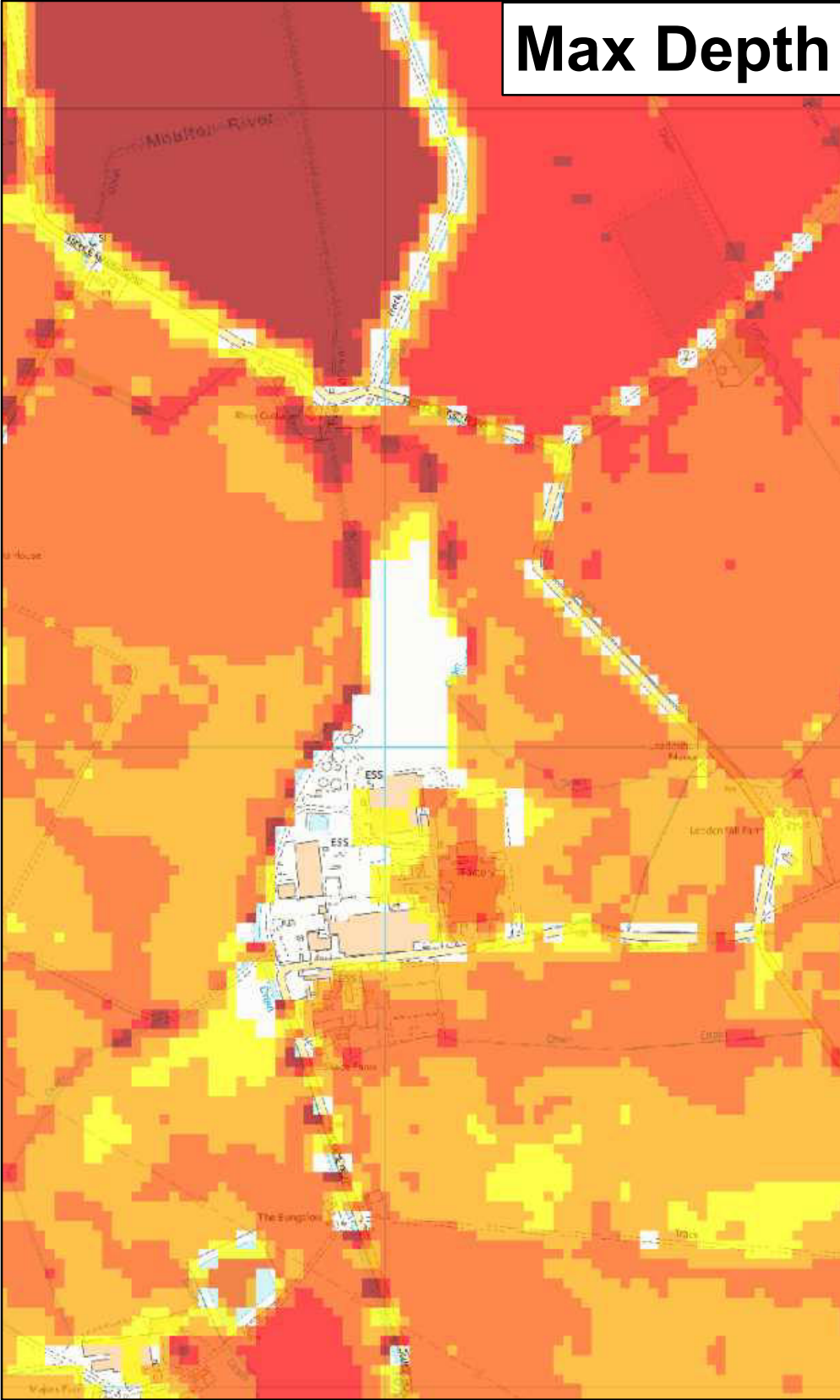
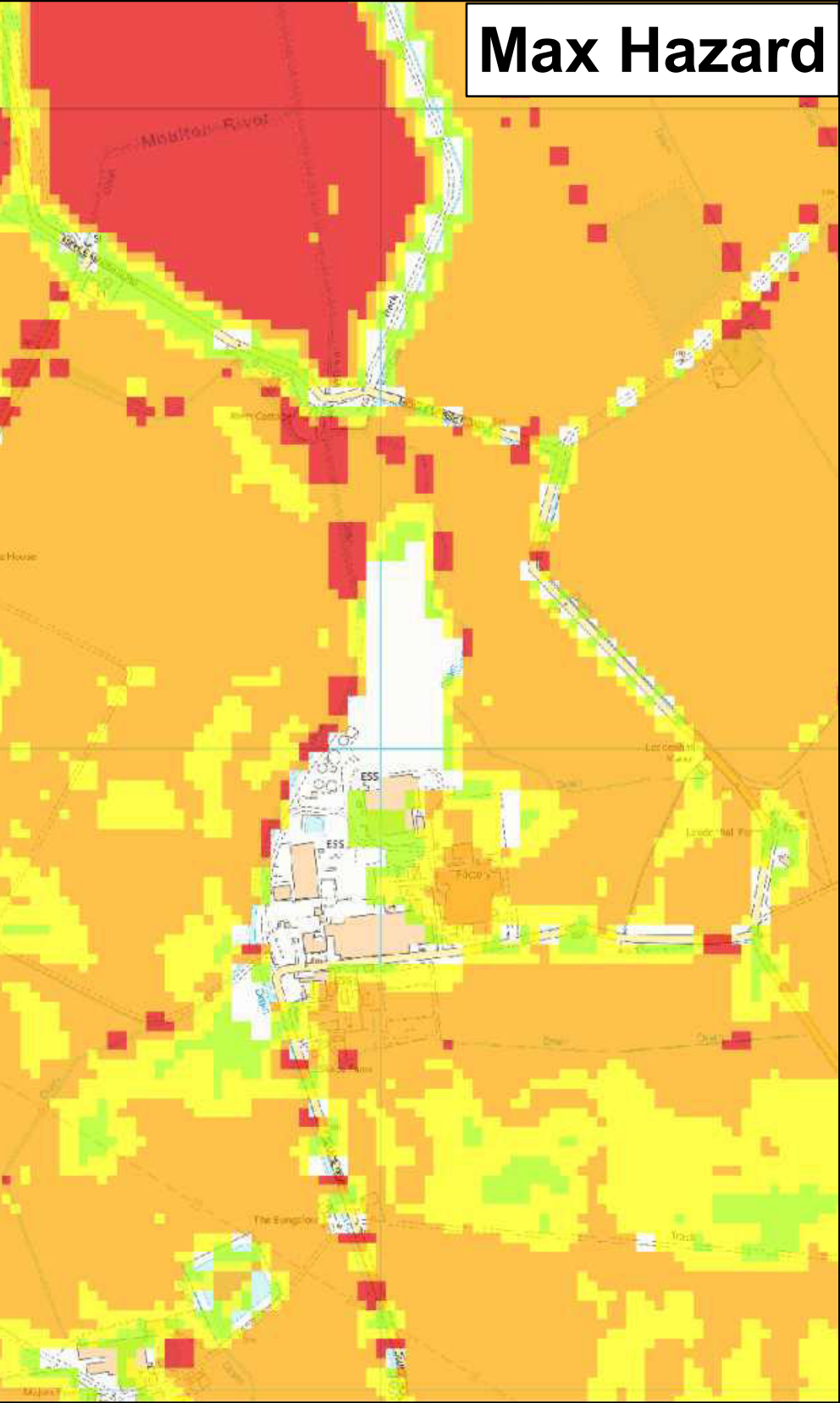
Max Depth



Max Velocity



Max Hazard (Flood Risk to People : FD2320) Less than 0.75 (Low Hazard) (Danger for Some) Between 1.25 and 2.0 Greater than 2.0			Max Depth (m) 0 - 0.25 0.25 - 0.50 0.50 - 1.0 1.0 - 1.6 1.6 +			Max Velocity (m/s) 0 - 0.3 0.3 - 1.0 1.0 - 1.5 1.5 - 2.5 2.5 +			The map is based on computer modelling of simulated overtopping of the main coastal defences for specific tidal scenarios. It does not include overtopping along the following tidal rivers which are currently being investigated: Witham Haven (upstream of Hobhole), and Welland (upstream of Fosdyke Bridge) The map only considers the consequences of overtopping of the defences, and does not show the possible consequences of breaches of the tidal defences. Separate maps of the flood extent from just breaching of the defences are available. For future climate change scenarios it is assumed that defences remain at 2006 heights. These maps do not replace the flood zone maps used in the National Planning Policy Framework (NPPF)			Lincolnshire and Northamptonshire Tidal Overtopping Hazard Mapping Map Centred on TF 35059 32075 1:10,000 © Environment Agency copyright and/or database rights 2025. © Crown Copyright and Database Rights 2025 OS AC0000807064.		
Date Printed	August 2025	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	EIR2025/21298	General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary						



Max Hazard (Flood Risk to People : FD2320)			Max Depth (m)			Max Velocity (m/s)		
Less than 0.75 (Low Hazard)			0 - 0.25			0 - 0.3		
(Danger for Some)			0.25 - 0.50			0.3 - 1.0		
Between 1.25 and 2.0			0.50 - 1.0			1.0 - 1.5		
Greater than 2.0			1.0 - 1.6			1.5 - 2.5		
			1.6 +			2.5 +		
Date Printed	August 2025	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	EIR2025/21298	

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The map only considers the consequences of overtopping of the defences, and does not show the possible consequences of breaches of the tidal defences. Separate maps of the flood extent from just breaching of the defences are available.

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General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary



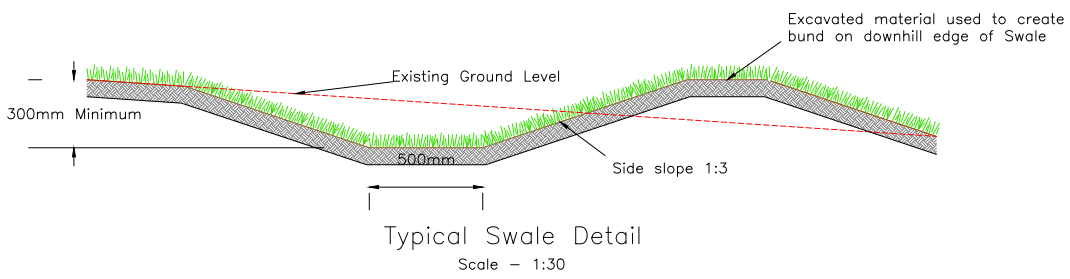
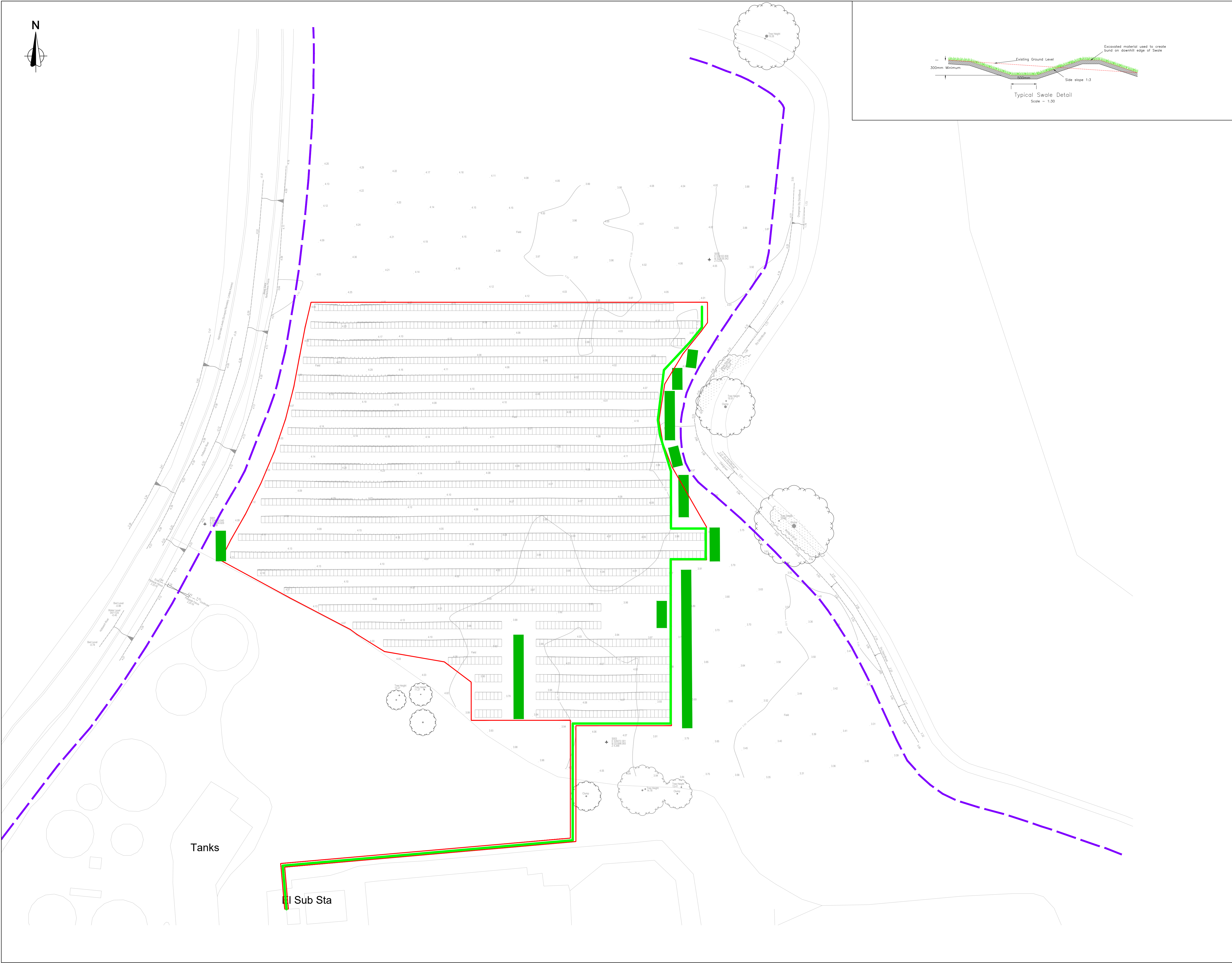
**Lincolnshire and Northamptonshire
Tidal Overtopping Hazard
Mapping**

Map Centred on TF 35059 32075

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APPENDIX F

PROPOSED DRAINAGE STRATEGY



- Notes:**
1. Do not scale from this drawing. All dimensions are in metres unless noted otherwise.
 2. Drawing to be read in conjunction with all other consultants drawings. Any discrepancies are to be reported to the engineer immediately.
 3. Position of existing services/statutory undertakers apparatus are to be checked by the contractor prior to starting work.

- KEY**
- SITE BOUNDARY
 - SWALES
 - - - 9m MAINTENANCE OFFSET

Rev	C	01.06.20	DRAINAGE DESIGN REVISION	SJC
	B	11.02.20	LAYOUT REVISION	SJC
	A	27.01.20	-	SJC

Rev	Date	Details	Drawn
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CLIENT:
SQUIRES PLANNING

PROJECT:
BAKKAVOR SOLAR,
HOLBEACH ST MARKS,
SPALDING

TITLE:
DRAINAGE LAYOUT

SCALE @ A1: 1:500		DATE: 13.11.25	STATUS: INFORMATION
JOB NO: 25-3269	DRAWING NO: C001	REVISION: C	