Castle Point Borough Council Level 2 Strategic Flood Risk Assessment Addendum

Castle Point Borough Council

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Quality information

Prepared by	Checked by	Verified by	Approved by
Becci Ward Senior Flood Consultant	Richard Moore Associate	Sarah Littlewood Associate	Sarah Littlewood Associate Richard Moore Project Manager

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Prepared for:

Castle Point Borough Council

Prepared by:

AECOM Limited
3rd Floor, Portwall Place
Portwall Lane
Bristol BS1 6NA
United Kingdom

T: +44 (0)117 901 7000
aecom.com

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1. Introduction

1.1.1 Castle Point Borough Council (CPBC) is preparing a New Local Plan (Castle Point Plan) which contains the overall vision and framework for future development in the area, addressing needs and opportunities in relation to housing, the economy, community facilities and infrastructure, as well as providing a basis for conserving and enhancing the natural and historic environment, mitigating and adapting to climate change, and achieving well designed places. The emerging Castle Point Plan will set out planning policies and proposals for how communities and places in the Borough will develop up to 2043.

1.1.2 **A Level 1 Strategic Flood Risk Assessment** (SFRA) was undertaken in March 2025[1]. The **Level 1 SFRA** provides a strategic overview of flood risk throughout Castle Point, for both the present day and in the future. The report provides the background information on flood risk and flood risk policy in the Borough, along with requirements and guidance on assessing flood risk for site-specific development proposals. The report provides guidance on land use planning and flood risk mitigation options for sites where flood risk has been identified as a potential constraint to future development. The Level 1 report sets out the methodology for applying the Sequential Test and the Exception Test in the Borough.

1.1.3 The Environment Agency guidance 'How to prepare a strategic flood risk assessment' states that where a **Level 1 SFRA** shows that land outside areas at risk of flooding now or in the future cannot appropriately accommodate all the necessary development, it may be necessary to increase the scope of the assessment to a **Level 2 SFRA** to provide the information necessary for application of the Exception Test, where appropriate. A high level sieving exercise was undertaken and from this, CPBC identified 35 potential development allocation sites for consideration within the **Level 2 SFRA**. A **Level 2 SFRA** should consider the detailed nature of the flood characteristics within a flood zone including, where possible, flood probability, flood depth, flood velocity, rate of onset of flooding and duration of flood. Subsequently, a **Level 2 SFRA**[2] was undertaken for Castle Point Borough Council in May 2025. The **Level 2 SFRA** draws upon all the information and data sources that were compiled as part of the Level 1 assessment, examining them in more detail on a site-by-site basis. It also examines detailed hydraulic modelling outputs undertaken as part of the **Level 1 SFRA**.

1.1.4 Since the production of the **Level 2 SFRA**, the Castle Point Plan has developed, and four additional sites now require a Level 2 assessment. These additional sites are defined as broad locations in the Castle Point Plan, with a quantum of development specified, although the exact locations and development plots within the broad locations are not identified. This document has been prepared alongside the Level 1 and Level 2 SFRA updates, as an addendum to the 2025 **Level 2 SFRA** report, and provides a summary table and site proformas for the additional sites. The additional sites have been assessed following the same methodology as the May 2025 **Level 2 SFRA** and the same process, utilising the same datasets and site proforma template.

1.1.5 It is important to recognise that the SFRAs have been developed using the best available information at the time of preparation. This relates both to the current risk of flooding from rivers, and the potential impacts of future climate change. In particular, it is noted at the time of writing the Environment Agency are in the process of publishing a suite of datasets as part of the national flood and coastal erosion risk[3] (NaFRA2) information which might be useful in the future. Developers must ensure that they obtain and use the most up to date model data for detailed site-specific flood risk assessments.

[1] AECOM, March 2025, Castle Point Borough Council Level 1 Strategic Flood Risk Assessment. https://www.castlepoint.gov.uk/general-evidence-documents Accessed Sep-2025.
[2] AECOM, May 2025, Castle Point Borough Council Level 2 Strategic Flood Risk Assessment. https://www.castlepoint.gov.uk/general-evidence-documents Accessed Sep-2025.
[3] Environment Agency, 2025, Rivers and Sea defended and undefended flood risk extents - present day and climate change. https://www.data.gov.uk/dataset/1589b7ec-2300-4028-9199-aa7cac4b0f68/rivers-and-sea-defended-and-undefended-flood-risk-extents-present-day

2. Methodology

2.1 Datasets

2.1.1 An overview of the datasets and sources of information used to inform the **Level 2 SFRA** is provided in Table 2-1. These datasets were those obtained and compiled as part of the **Level 1 SFRA**.

Table 2-1: Datasets obtained to inform the SFRA

Dataset	Source	Description
LiDAR Topographic DTM	Defra Data Services Platform (Feb, 2024)	Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground. The DTM is produced from the last return LiDAR signal and surface objects are removed (such as buildings, vegetation) to provide a ground surface model. The data covering Castle Point has a spatial resolution of 1m.
Detailed River Network	Environment Agency (March, 2024)	Spatial dataset showing Main Rivers and smaller watercourses.
Flood Map for Planning (Rivers and Sea) Flood Zone 2	Defra Data Services Platform (Nov, 2025)	The Environment Agency's best estimate of the areas of land at risk of flooding, from rivers or the sea with 0.1% chance of flooding each year, when the presence of flood defences is ignored.
Flood Map for Planning (Rivers and Sea) Flood Zone 3	Defra Data Services Platform (Nov, 2025)	The Environment Agency's best estimate of the areas of land at risk of flooding, when the presence of flood defences is ignored and covers land with a 1% or greater chance of flooding each year from Rivers; or with a 0.5% or greater chance of flooding each year from the Sea.
Reduction in Risk of Flooding from Rivers and Sea due to Defences[4]	Defra Data Services Platform (Feb, 2024)	A spatial dataset that indicates where areas have reduced flood risk from rivers and sea due to the presence of flood defences. The dataset has been created to help initiate conversations about the impact flood defences have on the risk of flooding from the rivers and sea, and as a prompt to find out more about the flood defences in a particular area of interest. It does not replace any local, more detailed information.
Bedrock Geology and Superficial Deposits	British Geological Society (July, 2024)	Generalised digital geological map data based on British Geological Survey's (BGS) published poster maps of the UK.
Susceptibility to Groundwater Flooding	British Geological Society via CPBC (April, 2024)	GIS layer identifying where there is potential for groundwater flooding to occur based on geological and hydrogeological information. The map shows the following information: limited potential for groundwater flooding to occur, potential for groundwater flooding of property situated below ground level, potential for groundwater flooding to occur at surface
Historic Flood Map / Recorded Flood Outlines	Defra Data Services Platform (Feb, 2024)	GIS layer showing areas of land that have previously been subject to flooding from sea, river or groundwater in line with criteria set by the Environment Agency. This excludes flooding from surface water, except in areas where it is impossible to determine whether the source is fluvial or surface water, but the dominant source is fluvial.
Sewer Flooding Records	AWSL (March, 2024)	Records of internal and external sewer flooding incidents within the last 5 years reported by AWSL within 4-digit postcode areas. It should be noted that records only appear on the register where they have been reported to AWSL, and as such they may not include all instances of sewer flooding.
Risk of Flooding from Reservoirs	Defra Data Services Platform (Feb, 2024)	Flood extents for all large[5] raised reservoirs in the event that they were to fail and release the water held on a "dry day" when local rivers are at normal levels, and on a "wet day" when local rivers had already overflowed their banks.
Flood Warning Areas	Defra Data Services Platform (Feb, 2024)	Geographical areas where flooding is expected to occur and where the Environment Agency provide a Flood Warning Service. They generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater.
Benfleet Hall Brook Modelling, AECOM, 2024	AECOM (2024)	Updates to the existing 1D-only FMP model. The modelling was simulated for the following events: 3.3% AEP, 3.3% AEP + 25%CC, 3.3% AEP + 38%CC, 1% AEP, 1% AEP + 25%CC, 1% AEP + 38%CC, 0.1% AEP, 0.1% AEP + 25%CC and 0.1% AEP + 38%CC. The 3.3% AEP event was used to delineate the functional floodplain (Flood Zone 3b). Further details are documented in a separate standalone Fluvial Modelling Technical Note[6] [60725540-FF-001].

[4] In October 2024 this dataset was temporarily discontinued and is due to be replaced by a new dataset in the future. Reduction in Risk of Flooding from Rivers and Sea due to Defences - data.gov.uk

[5] A large reservoir is one that holds over 25,000 cubic metres of water, equivalent to approximately 10 Olympic sized swimming pools.
[6] AECOM, 2024, Castle Point Strategic Flood Risk Assessment, Fluvial Modelling Technical Note, 60725540-FF-001.

Dataset	Source	Description
Prittle Brook Modelling, AECOM, 2024	AECOM (2024)	Updates to the existing Prittle Brook model, a fully linked 1D/2D Flood Modeller Pro (FMP) – TUFLOW model. The modelling was simulated for the following events: 3.3% AEP, 3.3% AEP + 25%CC, 3.3% AEP + 38%CC, 1% AEP + 25%CC, 1% AEP + 38%CC, 0.1% AEP + 25%CC and 0.1% AEP + 38%CC. The 3.3% AEP event was used to delineate the functional floodplain (Flood Zone 3b). Further details are documented in a separate standalone Fluvial Modelling Technical Note[6] [60725540-FF-001].
Castle Point Tidal Overtopping and Breach Modelling, AECOM, 2024	AECOM (2024)	Updates 2D model using TUFLOW software for 10 breach scenarios and one overtopping scenario for the 0.5% AEP and 0.1% AEP for 2025, the 0.5% AEP and 0.1% AEP for 2125 using the higher central allowance (1.20m) and the 0.5% AEP and 0.1% AEP for 2125 using the upper end allowance (1.60m). Also includes time to inundation for the 0.1% AEP 2125 Upper Event breach scenarios. Further details are documented in a separate standalone Tidal and Breach Modelling Technical Note[7] [60725540-TF-001].
Castle Point Surface Water Modelling, AECOM, 2024	AECOM (2024)	Updates to the 2016 South Essex Surface Water model and 2015 Canvey Island Integrated Urban Drainage Model. The modelling was simulated for the 3.3% AEP, 1% AEP and 0.1% AEP events and these events including climate change using the upper end peak rainfall allowance for the 2080s epoch (40%). Further details are documented in a separate standalone Technical Note[8] [60725540-SWF-001].
Critical Drainage Areas (CDAs)	ECC (Feb, 2024)	Discrete geographic area (usually a hydrological catchment), within the SWMP Study Area where multiple or interlinked sources of flood risk cause flooding during a severe rainfall event thereby affecting people, property, or local infrastructure.

2.2 Interpretation of Results

Fluvial

2.2.1 This section outlines how the Flood Zones dataset and modelling of the functional floodplain have been used to calculate the values in the proformas. The percentage values associated with each Annual Exceedance Probability (AEP) event represent the proportion of the site that falls within the respective flood extent. These percentages are calculated in a mutually exclusive manner to avoid double counting overlapping areas. The method of calculation is as follows:

- Flood Zone 3b (functional floodplain) Extent: The percentage represents the total site area which overlaps with the Flood Zone 3b (functional floodplain) flood extent.
- Flood Zone 3a (1% AEP) Extent: The percentage represents the total site area which overlaps with the Flood Zone 3 flood extent, excluding any areas already counted in the Flood Zone 3b (functional floodplain) extent. In other words, it captures only the additional area covered by the Flood Zone 3 extent that is not part of the Flood Zone 3b (functional floodplain) extent.
- Flood Zone 2 (0.1% AEP) Extent: The percentage represents the total site area which overlaps with the Flood Zone 2 flood extent excluding areas already included in both the Flood Zone 3b (functional floodplain) and Flood Zone 3a extents. This ensures that only new or additional areas beyond the Flood Zone 3b (functional floodplain) and Flood Zone 3a extents are counted.
- Flood Zone 1 (<0.1% AEP) Extent: This percentage is based on a calculation rather than the proportion of the site that falls within Flood Zone 1 as there is no Flood Zone 1 dataset. It represents the total site area remaining, excluding areas already included in the Flood Zone 3b (functional floodplain), Flood Zone 3a extents and Flood Zone 2 extents.

Surface Water

2.2.2 The section outlines how the surface water datasets (including climate change extents) have been used to calculate the values in the proformas. The percentage values associated with each AEP event represent the proportion of the site that falls within the respective flood extent. These percentages are calculated in a mutually exclusive manner to avoid double counting overlapping areas. The method of calculation is as follows:

- 3.3% AEP Extent: The percentage represents the total site area which overlaps with the 3.3% AEP flood extent.

[7] AECOM, 2024, Castle Point Strategic Flood Risk Assessment, Tidal and Breach Modelling Technical Note, 60725540-TF-001
[8] AECOM, 2024, Castle Point Strategic Flood Risk Assessment, Surface Water Modelling Technical Note, 60725540-SWF-001.

- 1% AEP Extent: The percentage represents the total site area within the 1% AEP flood extent excluding any areas already counted in the 3.3% extent. In other words, it captures only the additional area covered by the 1% AEP extent that is not part of the 3.3% extent.
- 0.1% AEP Extent: The percentage represents the total site area within the 0.1% AEP flood extent excluding areas already included in both the 3.3% and 1% extents. This ensures that only new or additional areas beyond the 3.3% and 1% extents are counted.

3. Level 2 SFRA Site Assessments

3.1 Overview

3.1.1 CPBC have provided four additional sites which have been assessed in this **Level 2 SFRA Addendum**. These sites are considered broad development locations and are as follows:

- West Canvey, Canvey Island
- Manor Trading Estate, Benfleet
- Hadleigh Town Centre
- Canvey Town Centre

3.1.2 Table 3-2 provides a summary of flood risk issues and constraints for the four sites. It is noted in Table 3-2 whether or not the Exception Test is required in accordance with Table 2 of the PPG, based on Flood Zone and development vulnerability classification.

3.2 Site Assessment Proforma Template

3.2.1 AECOM have prepared site assessment proformas for all four sites. These are included in **Appendix A**.

3.2.2 Table 3-1 provides an overview of the fields in the site assessment proformas and the source of the information or dataset. An overview of the risk of flooding is provided, based on the available datasets, followed by recommendations for how development could be delivered on the site to meet part (2) of the Exception Test.

Table 3-1: Datasets and information used for Level 2 Site Assessment Proformas

Proforma Field	Dataset / information used
Site Description	
Site Reference and Allocation Number	As provided by CPBC (Excel sheet and GIS layer of sites).
Cluster	As provided by CPBC (Excel sheet and GIS layer of sites).
Site Area (ha)	The area of the site (hectares).
Site Name	As provided by CPBC (Excel sheet and GIS layer of sites).
Proposed Units	As provided by CPBC (Excel sheet and GIS layer of sites).
Vulnerability Classification	Defined in accordance with Flood Risk and Coastal Change PPG Table 2.
Flood Zones and Historic Flooding	
Proportion within each Flood Zone	Flood Map for Planning (Rivers and Sea) Flood Zone 2; Flood Map for Planning (Rivers and Sea) Flood Zone 3; Flood Map for Planning (Rivers and Sea); Flood Zone 3b Functional Floodplain outline created from the 3.3% AEP modelled event for the Prittle Brook[6] and Benfleet Hall Brook[6].
Flood Warning Area	Environment Agency Flood Warning Areas.
Recorded River Flooding Outlines in which the site is located	The dates of the flood events that have affected the site, as detailed in the Environment Agency 'Recorded Flood Outlines'.
Proximity to Main River/Watercourse	Calculated using the Environment Agency Main River dataset obtained from the Defra Data Services Platform and the Detailed River Network layer provided by CPBC.
Sewer flooding records within the post code area in which the site is located:	As provided by AWSL. Described in Section 2.
Fluvial Flooding	
Maximum Flood Extents	Maximum flood extent map(s) for the watercourses relevant to the site (Prittle Brook and Benfleet Hall Brook).
Surface Water Flooding	
Risk of Flooding from Surface Water Modelling (present day)	Modelled surface water flood risk.
Risk of Flooding from Surface Water Modelling (climate change)	Modelled surface water flood risk including an allowance for Climate Change.
Groundwater Flooding	
Bedrock Geology	Bedrock geology underlying the site, based on BGS mapping.
Superficial Geology	Superficial geology underlying the site, based on BGS mapping.
BGS Susceptibility for Groundwater Flooding	A BGS dataset which gives a high level overview of where groundwater flooding may occur based on a conceptual understanding of regional geology and hydrogeology.

Tidal Flooding	
Overtopping Design Event	Maximum depth and hazard from the modelled 2125 0.5% AEP + Higher Central scenario.
Breach Event	Maximum depth and hazard from the modelled 2125 0.5% AEP + Higher Central scenario.
Breach Fastest Time to Inundation	Fastest Time to Inundation from the modelled 0.1% AEP 2125 Upper End scenario and location of the breach.
Other Sources	
Flooding from Reservoirs in the Event of a Break or Failure (when river levels are normal and when there is also flooding from rivers)	Environment Agency datasets obtained from the Defra Data Services Platform.
Exception Test	
An overview of whether the Exception Test is required for the site.	
Flood Risk Summary	
An overview of the risk of flooding to the site now and in the future (as a result of the impacts of climate change) based on the information within the proforma.	
Site Specific Recommendations	
Recommendations for how development could be delivered on the site to meet the requirements of part 2 of the Exception Test (where required) i.e., that development will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall. Recommendations are made in line with the development management measures presented within the **Level 1 SFRA**[1] and typically address the following: - Applying the sequential approach within the development site, - Setting back development from the edge of watercourses, - Finished floor levels, - Floodplain compensation storage, - Access and egress arrangements, - Flood warning and evacuation procedures, - Surface water management and considerations for SuDS, - Further investigation of groundwater levels.	

Table 3-2: Summary of flood risk issues and constraints

Site Reference / Allocation Number	Area (ha)	Address	Units	Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)	Proportion of site at risk of flooding from rivers during design event (1% AEP + central CC allowance)	Proportion of site at risk of flooding from overtopping during design event (0.5% AEP + higher central CC allowance)	Proportion of site at risk of flooding from breach (0.5% AEP + higher central CC allowance)	Risk of Flooding from Surface Water: from modelled data	Susceptibility to Groundwater Flooding (BGS Dataset)	Exception Test Required?	Summary of Flood Risk Constraints and Safety of Development (Refer to Appendix A for full details and recommendations for each site highlighted in Orange).
1 / C4	61.1	West Canvey, Canvey Island	2000	0.1	0	99.9	0	0	0	76%	Majority of site at very low risk with areas at high risk. Access routes are at very low risk with a small area of low risk.	Not shown to be prone to groundwater flooding.	Site is located within Flood Zone 3a. Exception Test required for Essential Infrastructure and More Vulnerable Development. Less Vulnerable and Water Compatible Development the Exception Test is not required.	The site, and the whole of Canvey Island, is defined as Flood Zone 3a 'High probability' of flooding from the Thames Estuary. Canvey Island is surrounded by tidal flood defences which provide a high level of protection. During the design event (0.5% AEP) for the year 2125, the site and Canvey Island is shown to be protected from flooding from the Thames. The site is therefore at residual risk of flooding from the sea, in the event of a breach or failure of flood defences. An internally accessible place of safety should be defined within the proposed development above the breach flood level (0.1% AEP including climate change), capable of accommodating the likely number of occupants. An unnamed watercourse flows southwards through the centre of the site before discharging into Holehaven Creek. There is a network of unnamed ordinary watercourses within the site. These watercourses may be culverted and should therefore be investigated further as part of a site specific Flood Risk Assessment. An 8m wide buffer strip should be retained alongside Main Rivers and Ordinary Watercourses and opportunities should be explored for riverside restoration and deculverting (where applicable). New development within 8m of an Ordinary Watercourse will require consent from Essex County Council (as LLFA). The modelled surface water risk mapping indicates parts of the site are at high risk of flooding although the majority of the site is at very low risk. The access routes to the north are at very low risk of surface water flooding. There is a small area of low risk on the roundabout connecting Roscommon Way to Canvey Road, when taking climate change into consideration.
2 / B8	14.7	Manor Trading Estate, Benfleet	200	83	9	8	0	0	0	0	A significant surface water flow path passes through the site. Access route to the west is at high risk, access route to the east is at very low risk.	Potential at surface.	Site is partially located within Flood Zone 3a. Exception Test therefore required for Essential Infrastructure and More Vulnerable Development within Flood Zone 3a. The Exception Test is not required for Less Vulnerable and Water Compatible Development.	The majority of the site (83%) is defined as Flood Zone 1 'Low Probability of Flooding', 9% is defined as Flood Zone 2 'Medium Probability of Flooding', and 8% is defined as Flood Zone 3a 'High Probability of Flooding'. This site is not indicated to be at risk of flooding from rivers and/or sea during the design events. Safe access/egress (i.e. that is dry or Low hazard during the 1% AEP event including central climate change allowance) is achievable for the site. An unnamed Ordinary Watercourse flows from east to west through the southern part of the site before flowing northwest towards the A130. This watercourse appears to be culverted. An 8m wide buffer strip should be retained alongside Ordinary Watercourses and opportunities should be explored for riverside restoration and deculverting (where applicable). New development within 8m of an Ordinary Watercourse will require consent from Essex County Council (as LLFA). The modelled surface water risk identifies a significant surface water flow path passes through the centre of the site from east to west associated with the culverted watercourse. The risk associated with this surface water flow path increases in the future when considering the impact of climate change. The access route along Church Road to the south of the site is at high risk of surface water flooding in the westerly direction and very low risk in the easterly direction. The site is located within the New Thundersley CDA. The BGS Susceptibility to Groundwater Flooding dataset indicates there is potential for groundwater flooding to occur at the surface within a small area to the west of the site.
3 / Had1	12.9	Hadleigh Town Centre	388	100	0	0	0	0	0	0	Majority of site at very low risk with areas at low to high risk. Access routes are at very low risk with some areas of low to high risk.	Limited potential for groundwater flooding to occur.	Site is fully located within Flood Zone 1. Exception Test is not required.	The site is in Flood Zone 1, low probability of flooding from rivers and sea. This site is not indicated to be at risk of flooding from rivers and/or sea during the design events. Safe access/egress (i.e. that is dry or Low hazard during the 1% AEP event including central climate change allowance) is achievable for the site. The modelled surface water risk indicates the site is at very low risk of surface water flooding with areas at low to high risk. The access routes along the A13 to both the northwest and the southeast are at very low risk of surface water flooding. There are some small areas of low to high risk surface water ponding on both access routes. The BGS Susceptibility to Groundwater Flooding dataset indicates there is limited potential for groundwater flooding.
4 / C1	15.6	Canvey Town Centre	820	0	0	100	0	0	0	97%	Majority of site at very low risk with areas at low to high risk. Access routes are at low to high risk.	Not shown to be prone to groundwater flooding.	Site is fully located within Flood Zone 3a. Exception Test required for Essential Infrastructure and More Vulnerable Development. Less Vulnerable and Water Compatible Development the Exception Test is not required.	The site, and the whole of Canvey Island, is defined as Flood Zone 3a 'High probability' of flooding from the Thames Estuary. Canvey Island is surrounded by tidal flood defences which provide a high level of protection. During the design event (0.5% AEP) for the year 2125, the site and Canvey Island is shown to be protected from flooding from the Thames. The site is therefore at residual risk of flooding from the sea, in the event of a breach or failure of flood defences. An internally accessible place of safety should be defined within the proposed development above the breach flood level (0.1% AEP including climate change), capable of accommodating the likely number of occupants. An unnamed Main River which feeds into Canvey Lake flows along the northern boundary of the site, entering the site boundary for a short distance. An unnamed Ordinary Watercourse flows through the northwest of the site before entering Canvey Lake . Both of these watercourses may be culverted and should therefore be investigated further as part of a site specific Flood Risk Assessment. An 8m wide buffer strip should be retained alongside Main Rivers and Ordinary Watercourses and opportunities should be explored for riverside restoration and deculverting (where applicable). New development within 8m of an Ordinary Watercourse will require consent from Essex County Council (as LLFA).

Site Reference / Allocation Number	Area (ha)	Address	Units	Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)	Proportion of site at risk of flooding from rivers during design event (1% AEP + central CC allowance)	Proportion of site at risk of flooding from overtopping during design event (0.5% AEP + higher central CC allowance)	Proportion of site at risk of flooding from breach (0.5% AEP + higher central CC allowance)	Risk of Flooding from Surface Water: from modelled data	Susceptibility to Groundwater Flooding (BGS Dataset)	Exception Test Required?	Summary of Flood Risk Constraints and Safety of Development (Refer to Appendix A for full details and recommendations for each site highlighted in Orange).
														The modelled surface water risk mapping indicates the majority of the site is at very low risk of surface water flooding with some areas at low to high risk associated with watercourses and highway routes. The access route to the south is at high risk of surface water flooding and to the north is at low risk of surface water flooding. The access road to the west has some areas at medium risk of flooding when taking climate change into account. The north of the site is located within the North Canvey Island CDAI.

4. Summary of Recommendations

4.1.1 CPBC is preparing a Local Plan (Castle Point Plan) which contains the overall vision for future development across the Borough. Using the information within the **Level 1 SFRA**, and a high level sieving exercise, alongside other evidence on general site suitability, sustainability, transport and biodiversity, CPBC initially identified 35 sites for consideration within a **Level 2 SFRA**. This document has been prepared as an addendum to **the Level 2 SFRA** report, providing a summary table and site proformas for four additional sites. The following recommendations are made.

4.1.2 For **all** proposed development sites:

- Peak surface water runoff rate from the development must be as close as reasonably practicable to the greenfield runoff rate from the same rainfall event. Supporting evidence must be submitted to justify the proposed discharge rate. Development proposals must demonstrate that the surface water will be managed and discharged from the site in accordance with the drainage hierarchy. Development offers the opportunity to utilise a range of sustainable surface water management techniques which not only contribute to a reduction in discharge rates from the site, but provide amenity, biodiversity and water quality improvements and contribute to mitigating climate change by considering both drought and flood conditions. Development proposals must demonstrate sustainable approaches to the management of surface water making use of SuDS and incorporate soft landscaping, planting, and permeable surfacing.
- For sites with surface water flood risk present, the drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 3.3% AEP rainfall event including an allowance for climate change. The design must also ensure that flows resulting from rainfall in excess of a 1% AEP rainfall event, including an allowance for climate change, are managed in exceedance routes.
- A sequential approach should be applied on site, as far as possible, by directing the most vulnerable elements of the development to the areas of lowest flood risk. Wherever possible built development should be kept out of areas at risk of flooding from all sources.

4.1.3 For sites where the BGS Susceptibility to Groundwater Flooding mapping shows that there may be risk of groundwater flooding at surface or below ground:

- A preliminary Hydrogeological Risk Assessment (HRA) should be undertaken to determine ground conditions and groundwater levels in proximity to the site, and to identify whether the proposed development will impact on groundwater, either from subsurface construction or from changes to surface water drainage. The potential impact of climate change will be included within this assessment. Should the preliminary HRA identify potential for impact, a full HRA should be prepared to identify proposed mitigation measures. Further details are provided within the **Level 1 SFRA** Section 5.7.

4.1.4 For sites in close proximity to a Main River or other watercourses:

- The Environmental Permitting Regulations 2016 require a Flood Risk Activity Permit (FRAP) to be obtained for works on or near a Main River, on or near a flood defence structure, or in a floodplain. Applicants should review the Environment Agency flood risk activities: environmental permit information[9] to determine if a permit is required.
- Responsibility for the consenting of works by third parties on Ordinary watercourses, under Section 23 of the Land Drainage Act 1991 (as amended by the Flood and Water Management Act 2010), lies with the LLFA. ECC is responsible for the consenting of works to Ordinary Watercourses and has powers to enforce un-consented and non-compliant works. This includes any works (including temporary) that affect flow within the channel (such as in channel structures or diversion of watercourses). Enquiries and applications for Ordinary Watercourse consent should be directed through the ECC website[10].

[9] Flood risk activities: environmental permits. https://www.gov.uk/guidance/flood-risk-activities-environmental-permits
[10] Essex County Council, Apply for a watercourse consent. Available at: https://flood.essex.gov.uk/maintaining-or-changing-a-watercourse/apply-for-a-watercourse-consent/

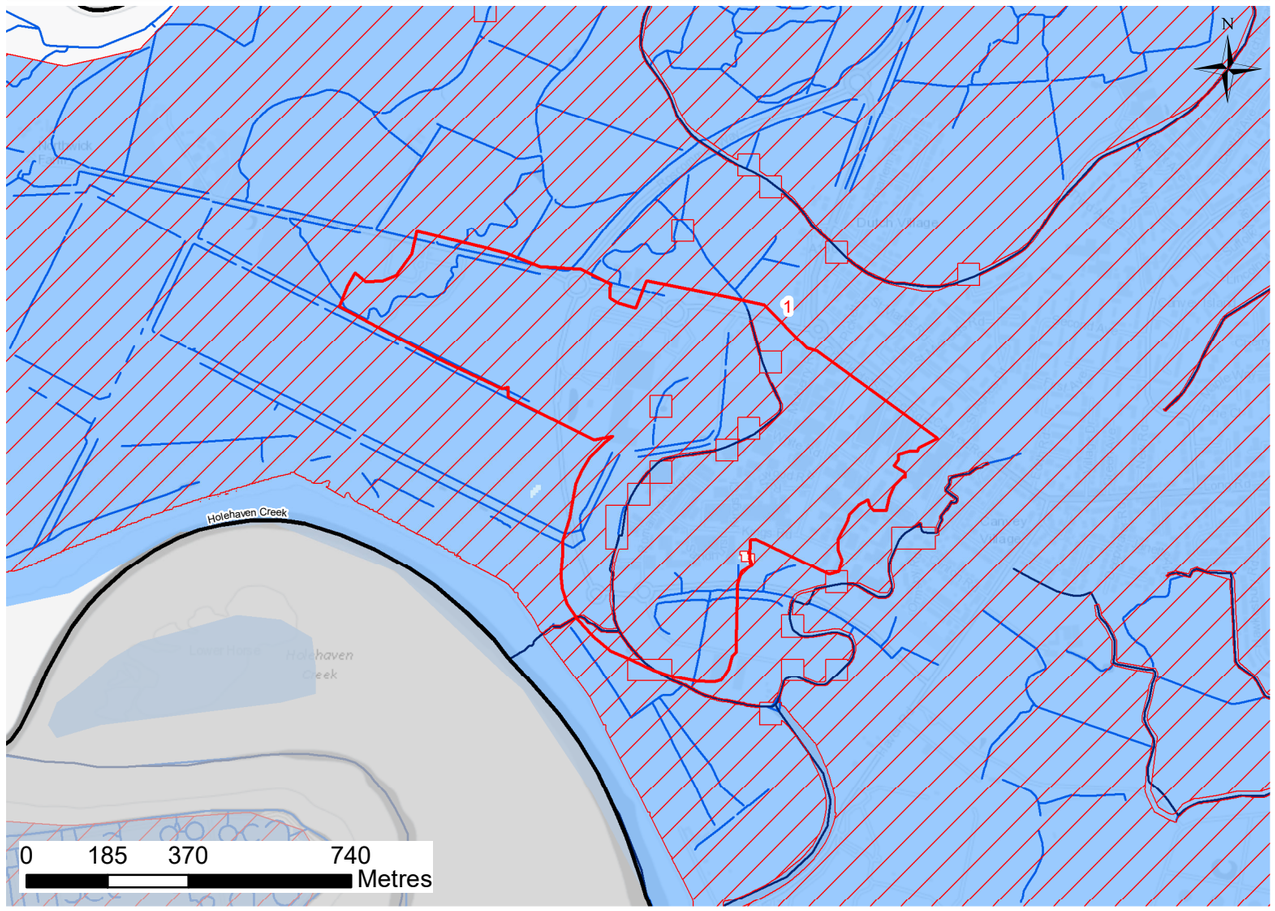
4.1.5 For sites located within a CDA:

- In line with advice provided by ECC, development sites located within a CDA should have permeable hardstanding surfaces and the provision of rainwater harvesting, where possible. All sites should provide source control of surface water and should consider the conveyance hierarchy as per the updated SuDS Guidance Document.
- Development sites in CDAs should discharge at the 100% AEP greenfield rate for all events up to the 1% AEP plus climate change event.
- Where development sites have a surface water flow path, consideration should be given as to what betterment can be provided to reduce the risk of downstream flooding.

4.1.6 For the sites, CPBC, in consultation with Emergency Planners, will need to determine whether reliance on evacuation prior to a flood event and the provision of places of safety are an appropriate approach to demonstrate safety of development and satisfy the Exception Test. CPBC should also consider and identify opportunities to improve access routes in the future as part of wider infrastructure delivery in these areas.

Appendix A Site Assessment Proformas

SITE REFERENCE: 1	ALLOCATION NUMBER: C4	CLUSTER: N/A	SITE AREA: 61.1 ha
SITE NAME: West Canvey, Canvey Island			



Legend

- Castle Point Borough Council
- Site of Interest
- Other Allocation Sites
- EA Main River
- Watercourse
- Reduction in Risk of Flooding from Rivers and Sea due to Defences

Flood Zones

- Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

THESE MAPS ARE INTERACTIVE AND REQUIRE THE USE OF ADOBE ACROBAT TO BE ABLE TO CLICK ON THE INDIVIDUAL TABS TO LOAD THE LAYERS. PLEASE USE THE BUTTONS BELOW TO DISPLAY / HIDE DIFFERENT SOURCES OF FLOOD RISK TO THE SITE.

FLOOD ZONES | MODELLED FLUVIAL FLOOD EXTENTS: Benfleet Hall Brook and Prittle Brook

RISK OF FLOODING FROM SURFACE WATER: PRESENT DAY | RISK OF FLOODING FROM SURFACE WATER: CLIMATE CHANGE

SUSCEPTIBILITY TO GROUNDWATER FLOODING | RISK OF FLOODING FROM RESERVOIRS

MODELLED OVERTOPPING DESIGN EVENT FLOOD DEPTH** | MODELLED OVERTOPPING DESIGN EVENT FLOOD HAZARD**

MODELLED BREACH EVENT FLOOD DEPTH** | MODELLED BREACH EVENT FLOOD HAZARD**

*Fluvial modelling marked with a singular asterisk in the legend identifies the design flood event.
**For tidal modelling, the design event is the 0.5% AEP including a higher central climate change allowance. It should be noted that this is 'actual' risk for the overtopping and 'residual' risk for the breach.
***Due to the number of breach scenarios modelled, individual time to inundation breach mapping has not been included within this proforma.
**** Results from two models; South Essex and Canvey Island. The Canvey Island model has superseded the South Essex model across the Canvey Island area.
PLEASE REFER TO THE SFRA REPORT FOR FURTHER DETAIL ON MODELLING DISPLAYED WITHIN THIS PROFORMA

PROPOSED UNITS: 2000

VULNERABILITY CLASSIFICATION: More Vulnerable

FLOOD ZONES AND HISTORIC FLOODING

Flood Zone 1 (<0.1% AEP):	Flood Zone 2 (0.1% AEP):	Flood Zone 3a (1% AEP):	Flood Zone 3b (defined in SFRA report):
0.1%	0%	99.9%	0%

FLOOD WARNING AREA: Canvey Island North

RECORDED FLOOD OUTLINES IN WHICH THE SITE IS LOCATED: 1953 Coast Flood Outline

PROXIMITY TO MAIN RIVER: Flow through the site (unnamed) **PROXIMITY TO NEAREST WATERCOURSE:** Flow through the site (unnamed)

ANGLIAN WATER DG5 RECORDED FLOOD INCIDENTS BASED ON POSTCODE AREA

90 records in Postcode Area

FLUVIAL FLOODING

% OF SITE AT RISK OF FLOODING IN THE DESIGN EVENT (1% AEP + HIGHER CENTRAL CLIMATE CHANGE ALLOWANCE): 0%

SURFACE WATER FLOODING

0.1% AEP:	1% AEP:	3.33%:
6.7%	1.9%	1.5%
0.1% AEP + 40% Climate Change: 9.3%	**1% AEP + 40% Climate Change:** 4.2%	**3.33% AEP + 40% Climate Change:** 4.2%

GROUNDWATER FLOODING

BEDROCK GEOLOGY: London Clay Formation **SUPERFICIAL GEOLOGY:** Tidal Flat Deposits

BGS SUSCEPTIBILITY TO GROUNDWATER FLOODING

This site is not indicated to be prone to groundwater flooding.

TIDAL FLOODING

OVERTOPPING DESIGN EVENT (0.5% AEP + HIGHER CENTRAL CLIMATE CHANGE ALLOWANCE)

% OF SITE AT RISK OF FLOODING: 0%

BREACH EVENT (0.5% AEP + HIGHER CENTRAL CLIMATE CHANGE ALLOWANCE)

% OF SITE AT RISK FROM FLOODING: 76%

BREACH FASTEST TIME TO INUNDATION (0.1% AEP + UPPER END CLIMATE CHANGE ALLOWANCE)***

FASTEST TIME TO INUNDATION: <1 hour **FROM BREACH LOCATION(S):** CAS02 and CAS03

RISK OF FLOODING FROM RESERVOIRS (IN THE EVENT OF A BREACH)

% OF SITE AT RISK OF FLOODING FROM RESERVOIRS (IN THE EVENT OF A BREACH):

WHEN RIVER LEVELS ARE NORMAL: 0% **WHEN THERE IS ALSO FLOODING FROM RIVERS:** 0%

Site Reference	1	Allocation Number	C4	Site Name	West Canvey, Canvey Island

Flood Risk Summary

The site is located in the south west of Canvey Island. An unnamed main river flows southwards through the centre of the site before discharging into Holehaven Creek (as shown on the Environment Agency's Statutory Main River Map). There is a network of unnamed ordinary watercourses within the site (as shown on the OS Watercourse layer). Some of these watercourses may be culverted. The site, and the whole of Canvey Island, is defined as Flood Zone 3a 'High Probability of Flooding' from the Thames Estuary. However, Canvey Island is surrounded by tidal flood defences which provide a high level of protection, and therefore the majority of the island, and therefore the site (96%), is also shown to be defined as within the 'Reduction in Risk of Flooding from Rivers and Sea due to Defences' area. During the design event (0.5% AEP) for the year 2125, the site and Canvey Island is shown to be protected from flooding from the Thames. The site is therefore at residual risk of flooding from the sea, in the event of a breach or failure of flood defences. Historic flood records indicate that the site experienced flooding during the 1953 Essex flood event, before the tidal flood defences were in place.

Tidal breach modelling has been undertaken to assess the residual risk of flooding from the Thames Estuary. This shows that the majority of the site (76%) is at risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP for the year 2125. The majority of the eastern area of the site is at 'Significant' (Danger for Most) hazard with a small area to the south at 'Extreme' hazard (Danger for All). The western area of the site is at 'No Hazard' to 'Moderate' (Danger for Some) with a small area of 'Significant' (Danger for Most) hazard. The maximum flood depth on the site during this event is between 2m and 2.5m, this is contained to the south of the site. The maximum water level on the site during this event from breach location CAS02 is approximately 2.9m AOD. Ground levels are approximately 1.5m AOD to 2.5m AOD across most of the site with elevated levels of up to 3.5m AOD associated with Roscommon Way. Ground levels of approximately 0m AOD to 0.8m AOD are present in the south of the site associated with watercourses. Access off Canvey Island is also at risk of flooding from a breach event.

The modelled surface water risk mapping indicates parts of the site are at high risk of flooding from surface water although the majority of the site is at very low risk. There are areas of low to high risk ponding, mostly associated with topographical low spots and flow paths along highway routes. This risk increases when taking climate change into account, particularly within the greenfield land to the west of Roscommon Way. The access routes to the north along Roscommon Way and Canvey Road are at very low risk of surface water flooding. There is a small area of low risk on the roundabout connecting Roscommon Way to Canvey Road, when taking climate change into consideration.

The BGS Susceptibility to Groundwater Flooding dataset indicates this area is not considered to be prone to groundwater flooding.

The site is not shown to be at risk of flooding from reservoirs in the event of a breach or failure when both river levels are normal or when there is also flooding from rivers area. The site lies within the SS8 0 postcode area where 90 records of sewer flooding have been reported to Anglian Water Services Limited within the last 5 years.

Site Specific Recommendations

1000 units are proposed for the site. More Vulnerable development (e.g. residential) is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall. Less Vulnerable development (e.g. offices and shops) is permitted within Flood Zones 1, 2 and 3a and the Exception Test is not required. For other types of vulnerability including Essential Infrastructure and Water Compatible, refer to the NPPF and PPG. A site-specific FRA will be required for developments within this location. The following recommendations are made for this site:

Tidal and Fluvial

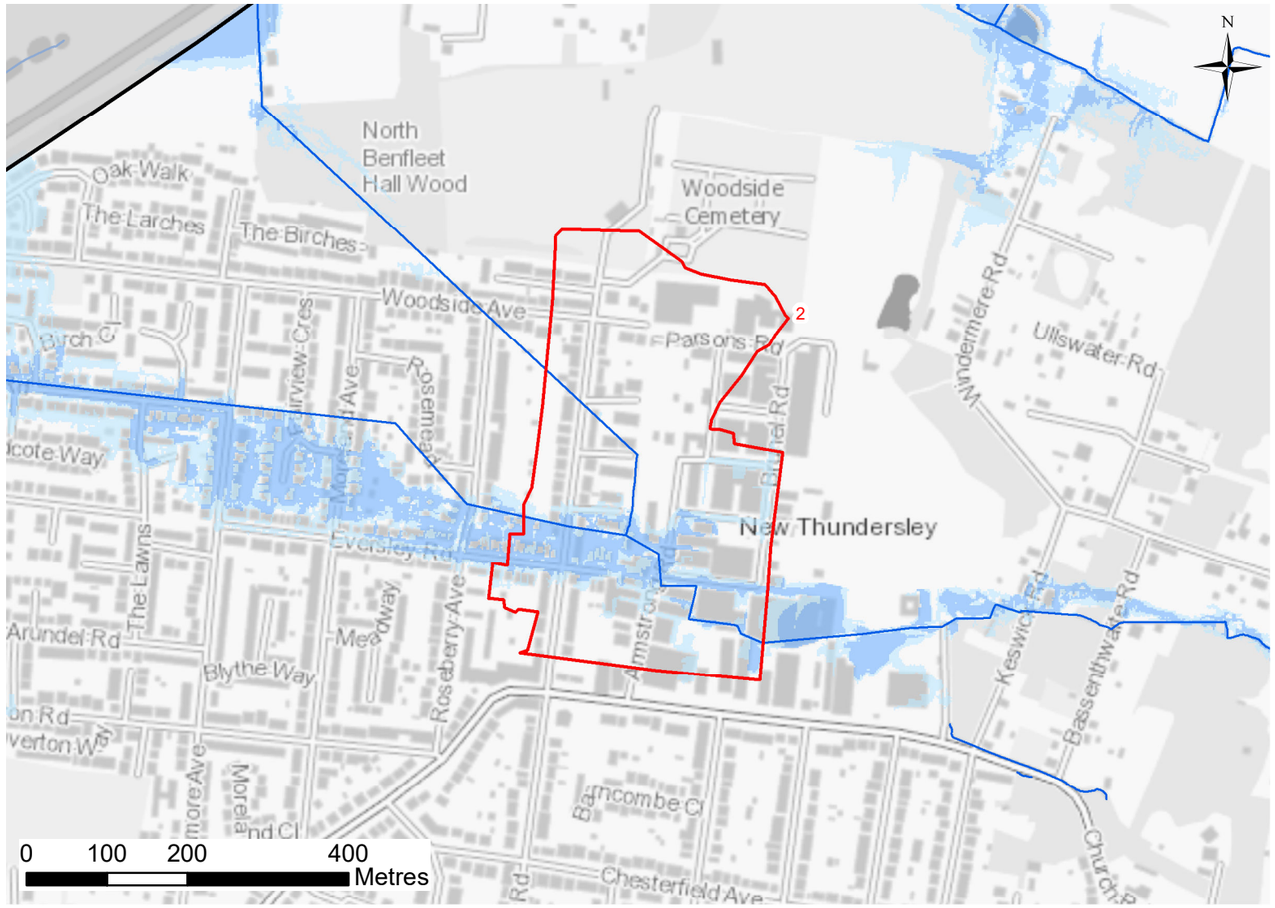
- The unnamed Environment Agency Main River which flows through the site should be investigated further as part of a site specific Flood Risk Assessment to confirm its alignment and whether it is culverted along its reach. An 8m wide undeveloped buffer strip should be retained alongside the watercourse and opportunities should be explored for riverside restoration and deculverting (where applicable). New development within 8m of a Main River will require consent from the Environment Agency.
- The unnamed Ordinary Watercourses which flow through the site may be culverted and should therefore be investigated further as part of a site specific Flood Risk Assessment. An 8m wide buffer strip should be retained alongside Ordinary Watercourses and opportunities should be explored for riverside restoration and deculverting (where applicable). New development within 8m of an Ordinary Watercourse will require consent from Essex County Council (as LLFA).
- A sequential approach should be applied on site, as far as possible, by directing the most vulnerable elements of the development to the areas of lowest flood risk. Wherever possible built development should be kept out of areas at risk of flooding from all sources.

- The site is at residual risk of flooding from the Thames Estuary in the event of a breach in flood risk management infrastructure. Therefore an internally accessible place of safety should be defined within the proposed development above the extreme flood level (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the extreme flood event from breach location CAS02 is approximately 3.0m AOD.
- The site is located within the 'Canvey Island North' Flood Warning Area. Safe access/egress is available during the design event but is not available during a breach event. Developers need to sign any development up to Flood Warnings and prepare Emergency Plans for occupants of the site to set out the response in the event of a flood warning with respect to safe access routes and places of safety.
- Modelling of the design event (0.5% AEP including higher central climate change allowance) shows that Canvey Island is not at risk of flooding through defence overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea.

Surface Water

- Due to the presence of surface water on the site, the drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 3.3% AEP rainfall event including an allowance for climate change. The design must also ensure that flows resulting from rainfall in excess of a 1% AEP rainfall event, including an allowance for climate change, are managed in exceedance routes.
- Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing.
- Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.

SITE REFERENCE: 2	ALLOCATION NUMBER: B8	CLUSTER: N/A	SITE AREA: 14.7 ha
SITE NAME: Manor Trading Estate, South Benfleet			



Legend

- Castle Point Borough Council
- Site of Interest
- Other Allocation Sites
- EA Main River
- Watercourse
- Reduction in Risk of Flooding from Rivers and Sea due to Defences

Flood Zones

- Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

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FLOOD ZONES | MODELLED FLUVIAL FLOOD EXTENTS: Benfleet Hall Brook and Prittle Brook

RISK OF FLOODING FROM SURFACE WATER: PRESENT DAY | RISK OF FLOODING FROM SURFACE WATER: CLIMATE CHANGE

SUSCEPTIBILITY TO GROUNDWATER FLOODING | RISK OF FLOODING FROM RESERVOIRS

MODELLED OVERTOPPING DESIGN EVENT FLOOD DEPTH** | MODELLED OVERTOPPING DESIGN EVENT FLOOD HAZARD**

MODELLED BREACH EVENT FLOOD DEPTH** | MODELLED BREACH EVENT FLOOD HAZARD**

*Fluvial modelling marked with a singular asterisk in the legend identifies the design flood event.
**For tidal modelling, the design event is the 0.5% AEP including a higher central climate change allowance. It should be noted that this is 'actual' risk for the overtopping and 'residual' risk for the breach.
***Due to the number of breach scenarios modelled, individual time to inundation breach mapping has not been included within this proforma.
**** Results from two models; South Essex and Canvey Island. The Canvey Island model has superseded the South Essex model across the Canvey Island area.
PLEASE REFER TO THE SFRA REPORT FOR FURTHER DETAIL ON MODELLING DISPLAYED WITHIN THIS PROFORMA

PROPOSED UNITS: 200

VULNERABILITY CLASSIFICATION: N/A

FLOOD ZONES AND HISTORIC FLOODING

Flood Zone 1 (<0.1% AEP):	Flood Zone 2 (0.1% AEP):	Flood Zone 3a (1% AEP):	Flood Zone 3b (defined in SFRA report):
83%	9%	8%	0%

FLOOD WARNING AREA: N/A

RECORDED FLOOD OUTLINES IN WHICH THE SITE IS LOCATED: N/A

PROXIMITY TO MAIN RIVER: 1884m **PROXIMITY TO NEAREST WATERCOURSE:** Runs through the site.

ANGLIAN WATER DG5 RECORDED FLOOD INCIDENTS BASED ON POSTCODE AREA

120 records in Postcode Area

FLUVIAL FLOODING

% OF SITE AT RISK OF FLOODING IN THE DESIGN EVENT (1% AEP + HIGHER CENTRAL CLIMATE CHANGE ALLOWANCE): 0%

SURFACE WATER FLOODING

0.1% AEP:	1% AEP:	3.33%:
6.4%	3.1%	7.3%
0.1% AEP + 40% Climate Change: 6.4%	**1% AEP + 40% Climate Change:** 4.1%	**3.33% AEP + 40% Climate Change:** 11.4%

GROUNDWATER FLOODING

BEDROCK GEOLOGY: London Clay Formation **SUPERFICIAL GEOLOGY:** Head

BGS SUSCEPTIBILITY TO GROUNDWATER FLOODING

Potential for groundwater flooding to occur at the surface.

TIDAL FLOODING

OVERTOPPING DESIGN EVENT (0.5% AEP + HIGHER CENTRAL CLIMATE CHANGE ALLOWANCE)

% OF SITE AT RISK OF FLOODING: 0%

BREACH EVENT (0.5% AEP + HIGHER CENTRAL CLIMATE CHANGE ALLOWANCE)

% OF SITE AT RISK FROM FLOODING: 0%

BREACH FASTEST TIME TO INUNDATION (0.1% AEP + UPPER END CLIMATE CHANGE ALLOWANCE)***

FASTEST TIME TO INUNDATION: N/A **FROM BREACH LOCATION(S):** N/A

RISK OF FLOODING FROM RESERVOIRS (IN THE EVENT OF A BREACH)

% OF SITE AT RISK OF FLOODING FROM RESERVOIRS (IN THE EVENT OF A BREACH):

WHEN RIVER LEVELS ARE NORMAL: 0% **WHEN THERE IS ALSO FLOODING FROM RIVERS:** 0%

Site Reference	2	Allocation Number	B8	Site Name	Manor Trading Estate, Benfleet

Flood Risk Summary

The site is located in South Benfleet. An unnamed Ordinary Watercourse flows east to west through the lower section of the site before diverting with one watercourse continuing flowing eastwards and the second flowing northwards along a section of the western boundary towards the A130 (as shown on the OS Watercourse layer). A review of satellite imagery suggests this watercourse may be culverted. The majority of the site (83%) is defined as Flood Zone 1 'Low Probability of Flooding', 9% is defined as Flood Zone 2 'Medium Probability of Flooding', and 8% is defined as Flood Zone 3a 'High Probability of Flooding'. Historic flood records indicate that the site has not experienced flooding. Ground levels across the site slope downwards towards its centre, ranging from approximately 40m AOD in the north to between 26m AOD – 30m AOD at the centre. In the southeastern corner, levels rise again to approximately 33m AOD.

The site itself and the local area including access routes are not shown to be at risk from the fluvial watercourses during the design events when climate change is considered.

The site is located within the New Thundersley Critical Drainage Area. The modelled surface water risk for the present day identifies a significant surface water flow path passes through the centre of the site from east to west associated with the culverted watercourse. The risk associated with this surface water flow path increases in the future when considering the impact of climate change. There is an area of high surface water flood risk along the access route (Church Road) to the south of the site, heading west. This risk increases in the future when considering the impact of climate change. The access route to the east along Church Road is at very low risk of surface water flooding. The site is located within a critical drainage area, as defined by Essex County Council.

The BGS Susceptibility to Groundwater Flooding dataset indicates there is potential for groundwater flooding to occur at the surface within a small area to the west of the site. The site is not shown to be at risk of flooding from reservoirs in the event of a breach or failure when both river levels are normal or when there is also flooding from rivers area. The site lies within the SS7 5 postcode area where 120 records of sewer flooding have been reported to Anglian Water Services Limited within the last 5 years.

Site Specific Recommendations

200 units are proposed for the site. More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2, and the Exception Test is not required. More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall. A site-specific FRA will be required. Less Vulnerable development (e.g. offices and shops) is permitted within Flood Zones 1, 2 and 3a and the Exception Test is not required. For other types of vulnerability including Essential Infrastructure and Water Compatible, refer to the NPPF and PPG. In line with planning guidance, a site-specific FRA will be required for developments within this location which exceed 1 hectare in size and/or are located within Flood Zone 3a, is at risk of flooding from surface water or which increases the vulnerability classification, and may be subject to sources of flooding other than rivers or sea. A site-specific FRA needs to demonstrate that the proposed development will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall. The following recommendations are made for this site:

Fluvial

- The unnamed Ordinary Watercourse which flows through the site may be culverted and should therefore be investigated further as part of a site specific Flood Risk Assessment. An 8m wide buffer strip should be retained alongside Ordinary Watercourses and opportunities should be explored for riverside restoration and deculverting (where applicable). New development within 8m of an Ordinary Watercourse will require consent from Essex County Council (as LLFA).
- A sequential approach should be applied on site, as far as possible, by directing the most vulnerable elements of the development to the areas of lowest flood risk. Wherever possible built development should be kept out of areas at risk of flooding from all sources.
- Development of the site must ensure that the risk of flooding to surrounding areas is not increased, and where possible is reduced (including for all sources of flood risk). If development is proposed within Flood Zone 3a, it is likely that level for level and volume for volume floodplain compensation storage will be required. Refer Level 1 SFRA Section 5.6.

Surface Water

- Due to the presence of surface water on the site, the drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 3.3% AEP rainfall event including an allowance for climate change. The design must also ensure that flows resulting from rainfall in excess of a 1% AEP rainfall event, including an allowance for climate change, are managed in exceedance routes.

- Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing.
- Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.
- As the site is located within a Critical Drainage Area, guidance, as specified in the Level 2 SFRA report, must be considered.

Groundwater

- A preliminary Hydrogeological Risk Assessment (HRA) should be undertaken to determine ground conditions and groundwater levels in proximity to the site, and to identify whether the proposed development will impact on groundwater, either from subsurface construction or from changes to surface water drainage. The potential impact of climate change should be included within this assessment. Should the preliminary HRA identify potential for impact, a full HRA should be prepared to identify proposed mitigation measures.

SITE REFERENCE: 3	ALLOCATION NUMBER: Had1	CLUSTER: N/A	SITE AREA: 12.9 ha
SITE NAME: Hadleigh Town Centre			

Legend

- Castle Point Borough Council
- Site of Interest
- Other Allocation Sites
- EA Main River
- Watercourse
- Reduction in Risk of Flooding from Rivers and Sea due to Defences

Flood Zones

- Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

THESE MAPS ARE INTERACTIVE AND REQUIRE THE USE OF ADOBE ACROBAT TO BE ABLE TO CLICK ON THE INDIVIDUAL TABS TO LOAD THE LAYERS. PLEASE USE THE BUTTONS BELOW TO DISPLAY / HIDE DIFFERENT SOURCES OF FLOOD RISK TO THE SITE.

FLOOD ZONES | MODELLED FLUVIAL FLOOD EXTENTS: Benfleet Hall Brook and Prittle Brook

RISK OF FLOODING FROM SURFACE WATER: PRESENT DAY | RISK OF FLOODING FROM SURFACE WATER: CLIMATE CHANGE

SUSCEPTIBILITY TO GROUNDWATER FLOODING | RISK OF FLOODING FROM RESERVOIRS

MODELLED OVERTOPPING DESIGN EVENT FLOOD DEPTH** | MODELLED OVERTOPPING DESIGN EVENT FLOOD HAZARD**

MODELLED BREACH EVENT FLOOD DEPTH** | MODELLED BREACH EVENT FLOOD HAZARD**

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*Fluvial modelling marked with a singular asterisk in the legend identifies the design flood event.
**For tidal modelling, the design event is the 0.5% AEP including a higher central climate change allowance. It should be noted that this is 'actual' risk for the overtopping and 'residual' risk for the breach.
***Due to the number of breach scenarios modelled, individual time to inundation breach mapping has not been included within this proforma.
**** Results from two models; South Essex and Canvey Island. The Canvey Island model has superseded the South Essex model across the Canvey Island area.
PLEASE REFER TO THE SFRA REPORT FOR FURTHER DETAIL ON MODELLING DISPLAYED WITHIN THIS PROFORMA

PROPOSED UNITS: 388

VULNERABILITY CLASSIFICATION: More Vulnerable

FLOOD ZONES AND HISTORIC FLOODING

Flood Zone 1 (<0.1% AEP):	Flood Zone 2 (0.1% AEP):	Flood Zone 3a (1% AEP):	Flood Zone 3b (defined in SFRA report):
100%	0%	0%	0%

FLOOD WARNING AREA: N/A

RECORDED FLOOD OUTLINES IN WHICH THE SITE IS LOCATED: N/A

PROXIMITY TO MAIN RIVER: 816m (Prittle Brook) **PROXIMITY TO NEAREST WATERCOURSE:** 105m (unnamed)

ANGLIAN WATER DG5 RECORDED FLOOD INCIDENTS BASED ON POSTCODE AREA

99 records in Postcode Area

FLUVIAL FLOODING

% OF SITE AT RISK OF FLOODING IN THE DESIGN EVENT (1% AEP + HIGHER CENTRAL CLIMATE CHANGE ALLOWANCE): 0%

SURFACE WATER FLOODING

0.1% AEP:	1% AEP:	3.33%:
2.9%	0.9%	0%
0.1% AEP + 40% Climate Change:	**1% AEP + 40% Climate Change:**	**3.33% AEP + 40% Climate Change:**
5.4%	1.3%	1.5%

GROUNDWATER FLOODING

BEDROCK GEOLOGY: Bagshot Formation, Claygate Member **SUPERFICIAL GEOLOGY:** Superficial Deposits, Head

BGS SUSCEPTIBILITY TO GROUNDWATER FLOODING

Limited potential for groundwater flooding.

TIDAL FLOODING

OVERTOPPING DESIGN EVENT (0.5% AEP + HIGHER CENTRAL CLIMATE CHANGE ALLOWANCE)

% OF SITE AT RISK OF FLOODING: 0%

BREACH EVENT (0.5% AEP + HIGHER CENTRAL CLIMATE CHANGE ALLOWANCE)

% OF SITE AT RISK FROM FLOODING: 0%

BREACH FASTEST TIME TO INUNDATION (0.1% AEP + UPPER END CLIMATE CHANGE ALLOWANCE)***

FASTEST TIME TO INUNDATION: N/A **FROM BREACH LOCATION(S):** N/A

RISK OF FLOODING FROM RESERVOIRS (IN THE EVENT OF A BREACH)

% OF SITE AT RISK OF FLOODING FROM RESERVOIRS (IN THE EVENT OF A BREACH):

WHEN RIVER LEVELS ARE NORMAL: 0% **WHEN THERE IS ALSO FLOODING FROM RIVERS:** 0%

Site Reference	3	Allocation Number	Had1	Site Name	Hadleigh Town Centre

Flood Risk Summary

The site is located in Hadleigh. An unnamed tributary of the Prittle Brook lies to the northeast of the site at a distance of approximately 105m and flows eastwards (as shown on the OS Watercourse layer). The entire site is defined as Flood Zone 1 'Low Probability of Flooding'. Historic flood records indicate that the site has not experienced flooding. Ground levels across the site generally slope downward from northwest to southeast, ranging from approximately 75m AOD in the northwest, to around 73m AOD in the centre, decreasing to approximately 67m AOD in the southeastern corner.

The site itself and the local area including access routes are not shown to be at risk from the fluvial watercourses during the design events when climate change is considered.

The modelled surface water risk mapping indicates the majority of the site is at very low risk of surface water flooding. There are some areas of low to high risk ponding, mostly associated with topographical low spots and flow paths along highway routes including London Road. This risk increases with climate change. The mapping indicates there are some small areas of high risk ponding and there is a low risk flowpath along the majority of London Road. The access routes along the A13 to both the northwest and the southeast are at very low risk of surface water flooding. There are some small areas of low to high risk surface water ponding on both access routes.

The BGS Susceptibility to Groundwater Flooding dataset indicates there is limited potential for groundwater flooding across the entire site. The site is not shown to be at risk of flooding from reservoirs in the event of a breach or failure when both river levels are normal or when there is also flooding from rivers area. The site lies within the SS7 2 postcode area where 99 records of sewer flooding have been reported to Anglian Water Services Limited within the last 5 years.

Site Specific Recommendations

388 units are proposed for the site. More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2, and the Exception Test is not required. Less Vulnerable development (e.g. offices and shops) is permitted within Flood Zones 1, 2 and 3a and the Exception Test is not required. In line with planning guidance, a site-specific FRA will be required for developments within this location which exceed 1 hectare in size, is at risk of flooding from surface water or which increases the vulnerability classification, and may be subject to sources of flooding other than rivers or sea. A site-specific FRA needs to demonstrate that the proposed development will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall. The following recommendations are made for this site:

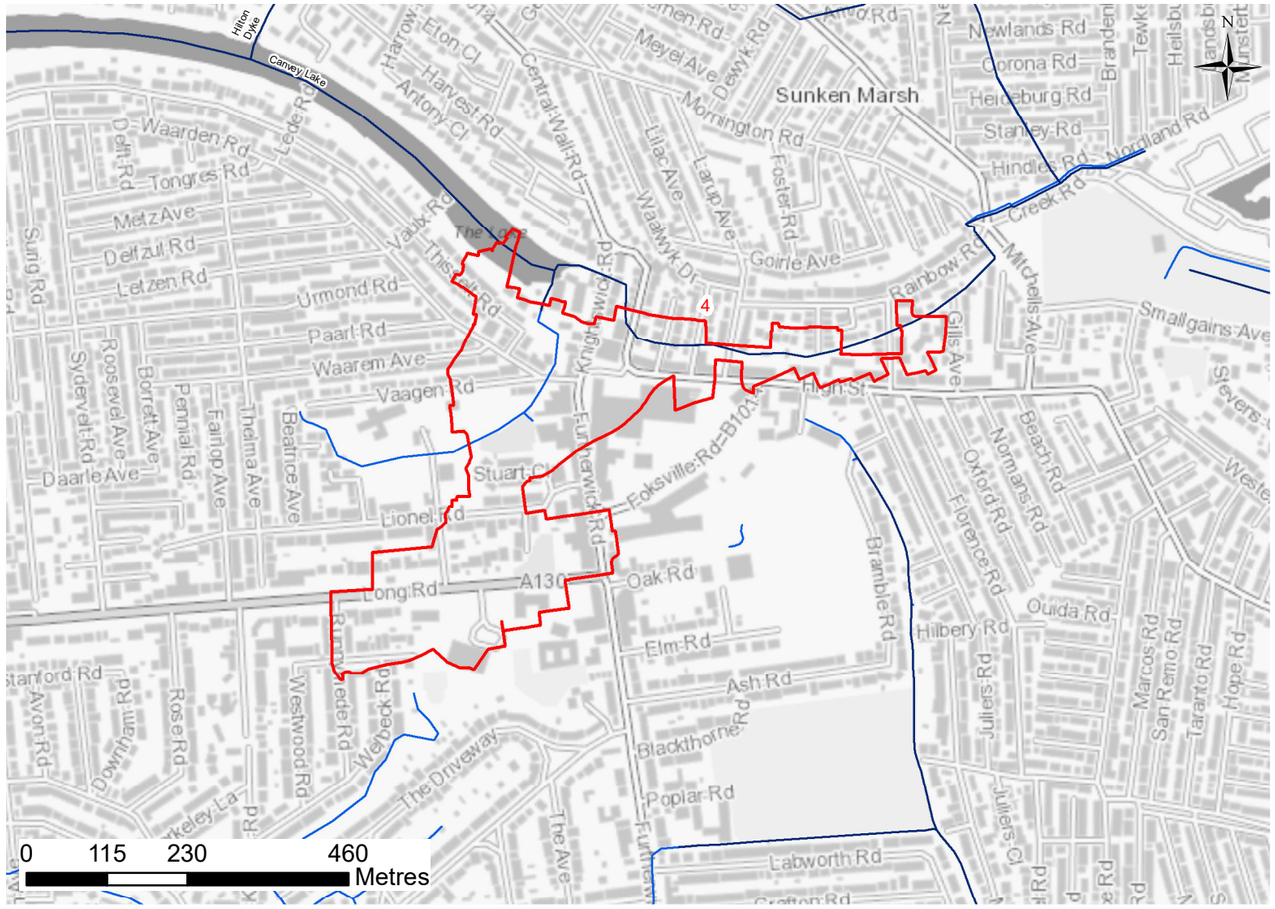
Surface Water

- A sequential approach should be applied on site, as far as possible, by directing the most vulnerable elements of the development to the areas of lowest flood risk. Wherever possible built development should be kept out of areas at risk of flooding from all sources.
- Due to the presence of surface water on the site, the drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 3.3% AEP rainfall event including an allowance for climate change. The design must also ensure that flows resulting from rainfall in excess of a 1% AEP rainfall event, including an allowance for climate change, are managed in exceedance routes.
- Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing.
- Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.

Groundwater

- A preliminary Hydrogeological Risk Assessment (HRA) should be undertaken to determine ground conditions and groundwater levels in proximity to the site, and to identify whether the proposed development will impact on groundwater, either from subsurface construction or from changes to surface water drainage. The potential impact of climate change should be included within this assessment. Should the preliminary HRA identify potential for impact, a full HRA should be prepared to identify proposed mitigation measures.

SITE REFERENCE: 4	ALLOCATION NUMBER: C1	CLUSTER: N/A	SITE AREA: 15.6 ha
SITE NAME: Canvey Town Centre			



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*Fluvial modelling marked with a singular asterisk in the legend identifies the design flood event.

**For tidal modelling, the design event is the 0.5% AEP including a higher central climate change allowance. It should be noted that this is 'actual' risk for the overtopping and 'residual' risk for the breach.

***Due to the number of breach scenarios modelled, individual time to inundation breach mapping has not been included within this proforma.

**** Results from two models; South Essex and Canvey Island. The Canvey Island model has superseded the South Essex model across the Canvey Island area.

PLEASE REFER TO THE SFRA REPORT FOR FURTHER DETAIL ON MODELLING DISPLAYED WITHIN THIS PROFORMA

Legend

- Castle Point Borough Council
- Site of Interest
- Other Allocation Sites
- EA Main River
- Watercourse
- Reduction in Risk of Flooding from Rivers and Sea due to Defences

Flood Zones

- Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

THESE MAPS ARE INTERACTIVE AND REQUIRE THE USE OF ADOBE ACROBAT TO BE ABLE TO CLICK ON THE INDIVIDUAL TABS TO LOAD THE LAYERS. PLEASE USE THE BUTTONS BELOW TO DISPLAY / HIDE DIFFERENT SOURCES OF FLOOD RISK TO THE SITE.

FLOOD ZONES

MODELLED FLUVIAL FLOOD EXTENTS: Benfleet Hall Brook and Prittle Brook

RISK OF FLOODING FROM SURFACE WATER: PRESENT DAY

RISK OF FLOODING FROM SURFACE WATER: CLIMATE CHANGE

SUSCEPTIBILITY TO GROUNDWATER FLOODING

RISK OF FLOODING FROM RESERVOIRS

MODELLED OVERTOPPING DESIGN EVENT FLOOD DEPTH**

MODELLED OVERTOPPING DESIGN EVENT FLOOD HAZARD**

MODELLED BREACH EVENT FLOOD DEPTH**

MODELLED BREACH EVENT FLOOD HAZARD**

PROPOSED UNITS: 820

VULNERABILITY CLASSIFICATION: More Vulnerable

FLOOD ZONES AND HISTORIC FLOODING

Flood Zone 1 (<0.1% AEP):	0%	Flood Zone 2 (0.1% AEP):	0%	Flood Zone 3a (1% AEP):	100%	Flood Zone 3b (defined in SFRA report):	0%

FLOOD WARNING AREA: Canvey Island North and Canvey Island South

RECORDED FLOOD OUTLINES IN WHICH THE SITE IS LOCATED: 1953 Coast Flood Outline

PROXIMITY TO MAIN RIVER: Borders the site (unnamed) **PROXIMITY TO NEAREST WATERCOURSE:** Flow through site (unnamed)

ANGLIAN WATER DG5 RECORDED FLOOD INCIDENTS BASED ON POSTCODE AREA

228, 134, 90 and 101 records in Postcode Area

FLUVIAL FLOODING

% OF SITE AT RISK OF FLOODING IN THE DESIGN EVENT (1% AEP + HIGHER CENTRAL CLIMATE CHANGE ALLOWANCE): 0%

SURFACE WATER FLOODING

0.1% AEP:	4.6%	1% AEP:	1.3%	3.33%:	1.3%
0.1% AEP + 40% Climate Change:	7.4%	1% AEP + 40% Climate Change:	2.6%	3.33% AEP + 40% Climate Change:	3.1%

GROUNDWATER FLOODING

BEDROCK GEOLOGY: London Clay Formation **SUPERFICIAL GEOLOGY:** Tidal Flat Deposits

BGS SUSCEPTIBILITY TO GROUNDWATER FLOODING

This site is not indicated to be prone to groundwater flooding.

TIDAL FLOODING

OVERTOPPING DESIGN EVENT (0.5% AEP + HIGHER CENTRAL CLIMATE CHANGE ALLOWANCE)

% OF SITE AT RISK OF FLOODING: 0%

BREACH EVENT (0.5% AEP + HIGHER CENTRAL CLIMATE CHANGE ALLOWANCE)

% OF SITE AT RISK FROM FLOODING: 97%

BREACH FASTEST TIME TO INUNDATION (0.1% AEP + UPPER END CLIMATE CHANGE ALLOWANCE)***

FASTEST TIME TO INUNDATION: <1 hour **FROM BREACH LOCATION(S):** CAS06

RISK OF FLOODING FROM RESERVOIRS (IN THE EVENT OF A BREACH)

% OF SITE AT RISK OF FLOODING FROM RESERVOIRS (IN THE EVENT OF A BREACH):

WHEN RIVER LEVELS ARE NORMAL: 0% **WHEN THERE IS ALSO FLOODING FROM RIVERS:** 0%

Site Reference	4	Allocation Number	C1	Site Name	Canvey Town Centre

Flood Risk Summary

The site is located in the south east of Canvey Island. An unnamed Main River which feeds into Canvey Lake flows along the northern boundary of the site, entering the site boundary for a short distance (as shown on the Environment Agency's Statutory Main River Map). An unnamed Ordinary Watercourse flows through the northwest of the site before entering Canvey Lake (as shown on the OS Watercourse layer). Both of these watercourses may be culverted. The site, and the whole of Canvey Island, is defined as Flood Zone 3a 'High Probability of Flooding' from the Thames Estuary. However, Canvey Island is surrounded by tidal flood defences which provide a high level of protection, and therefore the majority of the island, and therefore the site (99%), is also shown to be defined as within the 'Reduction in Risk of Flooding from Rivers and Sea due to Defences' area. During the design event (0.5% AEP) for the year 2125, the site and Canvey Island is shown to be protected from flooding from the Thames. The site is therefore at residual risk of flooding from the sea, in the event of a breach or failure of flood defences. Historic flood records indicate that the site experienced flooding in the 1953 Essex flood event, before the tidal flood defences were in place.

Tidal breach modelling has been undertaken to assess the residual risk of flooding from the Thames Estuary. This shows that the majority of the site (97%) is at risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP for the year 2125. The majority of the site is at 'Low' (Caution) to 'Significant' (Danger for Most) hazard. A small area to the north west of the site near Canvey Lake is at 'Extreme' hazard (Danger for All). The maximum flood depth during this event is between 1.5m and 2m in the north west of the site. The maximum water level on the site during this event from breach location CAS06 is approximately 2.8m AOD. Ground levels are approximately 2.4m AOD across the site with lower levels of between 1m AOD and 1.5m AOD in the south of the site and around Canvey Lake in the north. Access off Canvey Island is also at risk of flooding from a breach event.

The site is located within the North Canvey Island Critical Drainage Area. The modelled surface water risk mapping indicates the majority of the site is at very low risk of surface water flooding. There are areas of low to high surface water flood risk, associated with watercourses, topographical low spots and flow paths along highway routes. This risk increases when taking climate change into account. The access route to the south on Furtherwick Road is at high risk of surface water flooding and Central Wall Road to the north is at low risk of surface water flooding. The access road to the west along Long Road has some areas at medium risk of flooding when taking climate change into account. The north of the site is located within a critical drainage area, as defined by Essex County Council.

The BGS Susceptibility to Groundwater Flooding dataset indicates this area is not considered to be prone to groundwater flooding.

The site does is not shown to be at risk of flooding from reservoirs in the event of a breach or failure when both river levels are normal or when there is also flooding from rivers area. The site lies within the boundaries of 4 postcode areas where a total of 553 records of sewer flooding have been reported to Anglian Water Services Limited within the last 5 years.

Site Specific Recommendations

820 units are proposed for the site. More Vulnerable development (e.g. residential) is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall. Less Vulnerable development (e.g. offices and shops) is permitted within Flood Zones 1, 2 and 3a and the Exception Test is not required. For other types of vulnerability including Essential Infrastructure and Water Compatible, refer to the NPPF and PPG. A site-specific FRA will be required for developments within this site. The following recommendations are made for this site:

Tidal and Fluvial

- The unnamed Environment Agency Main River which flows along the northern boundary of the site may be culverted and should therefore be investigated further as part of a site specific Flood Risk Assessment. An 8m wide undeveloped buffer strip should be retained alongside the watercourse and opportunities should be explored for riverside restoration and deculverting (where applicable). New development within 8m of a Main River will require consent from the Environment Agency.
- The unnamed Ordinary Watercourse which flows through the northwest of the site may be culverted and should therefore be investigated further as part of a site specific Flood Risk Assessment. An 8m wide buffer strip should be retained alongside Ordinary Watercourses and opportunities should be explored for riverside restoration and deculverting (where applicable). New development within 8m of an Ordinary Watercourse will require consent from Essex County Council (as LLFA).
- A sequential approach should be applied on site, as far as possible, by directing the most vulnerable elements of the development to the areas of lowest flood risk. Wherever possible built development should be kept out of areas at risk of flooding from all sources.

- The site is at residual risk of flooding from the Thames Estuary in the event of a breach in flood risk management infrastructure. Therefore an internally accessible place of safety should be defined within the proposed development above the extreme flood level (0.1% AEP including higher central climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the extreme flood event from breach location CAS06 is approximately 2.9m AOD.
- The site is located within the 'Canvey Island North' and 'Canvey Island South' Flood Warning Areas. Safe access/egress is available during the design event but is not available during a breach event. Developers need to sign up any development to Flood Warnings and prepare Emergency Plans for occupants of the site to set out the response in the event of a flood warning with respect to safe access routes and places of safety.
- Modelling of the design event (0.5% AEP including higher central climate change allowance) shows that Canvey Island is not at risk of flooding through defence overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea.

Surface Water

- Due to the presence of surface water on the site, the drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 3.3% AEP rainfall event including an allowance for climate change. The design must also ensure that flows resulting from rainfall in excess of a 1% AEP rainfall event, including an allowance for climate change, are managed in exceedance routes.
- Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing.
- Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.
- As the site is located within a Critical Drainage Area, guidance, as specified in the Level 2 SFRA, must be considered.