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## 1. INTRODUCTION

- 1.1 This report sets out the Sequential Test for the development sites identified in the *Basildon Borough Local Plan*. The Sequential Test is required to ensure that the proposals in the Local Plan are appropriate in terms of their location in relation to sources of flood risk. It has been prepared in accordance with the *National Planning Policy Framework (NPPF)*, and *Planning Policy Guidance (PPG)*.
- 1.2 A Sequential Test was carried out for the *Draft Local Plan* in 2015. Since that time, the associated evidence base has been updated and this report sets out to reassess the development sites in line with the new evidence.

## 2. NATIONAL POLICY CONTEXT

- 2.1 The NPPF requires Local Planning Authorities (LPAs) to undertake sequential based testing on proposed locations for development within the Local Plan. The purpose of such testing is to steer development to areas with the lowest probability of flooding in order to ensure that potential flood risk to people and property is avoided where possible, and any identified residual risk is managed appropriately. LPAs must also take into account the impacts of climate change on flood risk.
- 2.2 The overall aim of the Sequential Test, as stated in the *PPG*, is to direct new development away from areas with the highest risk of flooding to Flood Zone 1 (low probability). Where there are no reasonably available sites in Flood Zone 1, Local Plans should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (medium probability), applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (3a high probability) be considered, taking account of the flood risk vulnerability of land uses and applying the Exception Test if required. Within each flood zone, surface water and other sources of flooding also need to be taken into account in applying the sequential approach to the location of development.

- 2.3 Table 1 below shows what development vulnerability classifications can be appropriately located in each flood zone and the circumstances in which the Exception Test will be required. The types of development falling under each of the flood risk vulnerability classifications are listed within Appendix 1.
- 2.4 The NPPF recognises that following the application of the Sequential Test, it is not always possible or consistent with wider objectives, for certain development proposals/requirements to be located in lower 'flood risk zones'. It therefore also sets out a test that needs to be passed if certain types of development are to be exceptionally allocated in a local plan. This is known as the Exception Test.
- 2.5 The Exception Test comprises of two parts and new development must meet both in order to pass the test. The first part is to show that the development provides wider sustainability benefits to the community which outweighs the costs associated with flood risk, and the second part is to demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing the flood risk elsewhere and where possible, reducing flood risk overall.

Table 1: The types of development which can be appropriately located in each flood zone and the circumstances in which the Exception Test will be required

Flood Risk		Essential	Less	Highly	More	Water
Vulnerability		Infrastructure	Vulnerable	Vulnerable	Vulnerable	Compatible
Cla	assification					
	Zone 1	✓	✓	✓	✓	✓
	Zone 2			Exception		
		✓	✓	Test	✓	✓
				required		
	Zone 3a	Exception			Exception	
a		Test required	✓	×	Test	✓
Zone					required	
N P	Zone 3b	Exception				
Flood	Functional	Test required	×	×	×	✓
Ē	Floodplain					

<sup>✓=</sup> Development is appropriate

**x** = Development should not be permitted

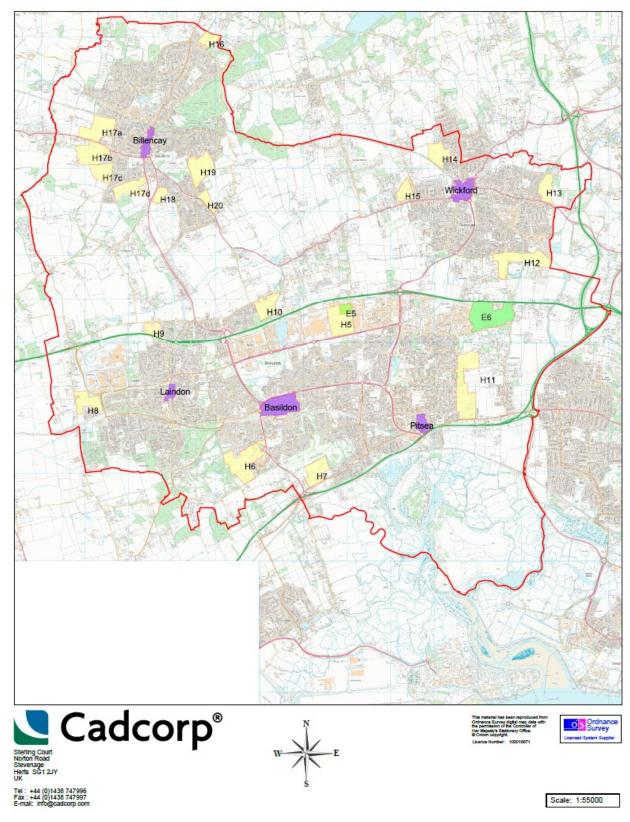
## 3. EVIDENCE BASE

- 3.1 The *PPG* sets out how LPAs should assess flood risk by undertaking a Strategic Flood Risk Assessment (SFRA) to fully understand the flood risk in the area. A *South Essex Level 1 Strategic Flood Risk Assessment* was undertaken in 2018 which includes assessment of the Basildon Borough, this is considered to be sufficiently up to date to inform this Sequential Test.
- 3.2 Essex County Council as the Lead Local Flood Authority (LLFA) carried out a review of their Surface Water Management Plan (SWMP) modelling in 2018. The review impacted on the number of properties identified as being 'at risk' of surface water flooding within the Borough and the way Critical Drainage Area's (CDA's) were also redefined having moved to a hydraulic catchment based approach. A South Essex Surface Water Management Plan Action Plan (2020) was produced to assist the LLFA to reduce flood risk to existing residential properties. This work resulted in the locations of the CDA's within the Basildon Borough being revised which has altered whether some sites in the Basildon Borough Local Plan now lie within a CDA. It is felt necessary to carry out a new Sequential Test on the strategic sites to ensure that due consideration is given to this revised and most upto-date data.

## 4. BASILDON BOROUGH LOCAL PLAN

- 4.1 The following strategic sites, as set out in the *Basildon Borough Local Plan:*Post Submission Modifications, are the subject of this Sequential Test, and where necessary an Exception Test will be carried out. The Strategic Site locations can be seen in Figure 1 below:
  - H5 and E5: Land West of Gardiners Lane South, Basildon
  - H7: Land North of London Road, Vange
  - H8: West of Basildon
  - H9: Land West of Steeple View, Laindon
  - H10: Land East of Noak Bridge, Basildon
  - H11: East of Basildon
  - H12: Land South of Wickford
  - H13: Land North of Southend Road, Shotgate
  - H14: Land South of Barn Hall, Wickford
  - H15: Land North of London Road, Wickford
  - H16: Land North East of Potash Road, Billericay
  - H17: South West Billericay
  - H18: Land South of Windmill Heights, Billericay
  - H19: Land East of Greens Farm Lane, Billericay
  - H20: Land East of Southend Road, Billericay
  - E6: Land East of Burnt Mills, Basildon
  - R2: Basildon Town Centre
  - R3: Laindon Town Centre
  - R4: Pitsea Town Centre
  - R5: Wickford Town Centre
  - R6: Billericay Town Centre

Figure 1: Strategic Sites within the Basildon Borough Local Plan



## 5. FLOOD RISK IN THE BOROUGH

- 5.1 The majority of the Basildon Borough is within Flood Zone 1, with approximately 2% of the Borough in Flood Zone 2 and 9% defined as Flood Zone 3.
- 5.2 The primary source of flood risk within the Borough is defined in the *South Essex Strategic Flood Risk Assessment (SFRA)*<sup>1</sup>, as pluvial flooding (heavy rainfall) in the urban centres of Basildon, Billericay and Wickford, which leads to high levels of surface water run-off that drainage systems cannot cope with and often coincides within fluvial flooding associated with the River Crouch and its tributaries.
- 5.3 The risk of surface water flooding in the Borough is managed, in part, by a series of engineered 'washlands' connected by engineered surface and underground channels through the towns of Basildon, Billericay and Wickford. Each washland plays an important role in helping to manage the Borough's drainage network and reduce flood risk in the urban areas, and as such, have been designated as part of the functional floodplain (Zone 3b) within the *SFRA*. Many are also publicly accessible having been incorporated into the Borough's open spaces.
- There is also a risk of flooding from tidal sources in the southern part of the Borough, close to Vange Creek and East Haven Creek which are part of the tidal estuary of the River Thames. Whilst there are flood defences in the form of sea walls along the southern edge of the Borough and two mechanical flood barriers providing a high standard of protection, there is still a residual flood risk for parts of the Borough in the event of a barrier failing or the flood defence walls being breached by the sea.
- 5.5 The most significant fluvial flood events in the Borough tend to occur when high rainfall events in the upper catchment of the River Crouch coincide with high tide water levels to produce high volume fluvial flows and elevated water levels in the River Crouch and its tributaries. The flood zones delineating the variation in probability of fluvial flooding from these watercourses have been used to inform this Sequential Test and are shown in Appendix 2. The zones show the extent of flooding across the Borough should a defence be overtopped or breached during a flood event.
- 5.6 The national definition of "areas at risk of flooding" is land within Flood Zones 2 and 3; or land within Flood Zone 1 which has critical drainage problems and which has been notified to the LPA by the Environment Agency. Within the Basildon Borough there are 19 CDA's which are detailed within the South Essex Surface Water Management Plan Action Plan (2020). Appendix 3 shows the locations of the CDAs within the Borough in relation to the strategic sites.

<sup>&</sup>lt;sup>1</sup> South Essex Strategic Flood Risk Assessment, 2011

#### 6. METHODOLOGY AND SEQUENTIAL TEST

- 6.1 This section of the report sets out the Sequential Test undertaken for all the 16 housing allocation sites, two employment allocation sites and the town centre regeneration and enhancement areas which have been identified within the *Basildon Borough 2014 2034 Local Plan*. It follows the steps outlined in the *PPG* and has been informed by *South Essex SFRA (2018)*.
- 6.2 The following methodology has been used to determine the flood risk of each site using a two staged approach to identify the sites that sequentially pass the flood risk criteria:
  - Allocate Flood Risk Zone to each site according the EA fluvial and tidal flood mapping (see Appendix 2). Where a site falls within more than one zone, it has been allocated to the zone with the highest risk of flooding, taking a precautionary approach.
  - All sites that fall within Flood Zone 1 (low risk area), are considered to have passed the test.
  - Taking consideration of the landuse vulnerability classification (see Appendix 1), vulnerable sites with significant areas of Flood Zone 2 are subjected to a Stage 2 assessment.
  - Sites with significant areas of Flood Zone 3 automatically require an exception test.
  - Sites containing smaller sections of Flood Zone 2 and 3 are highlighted with general comments provided on planning considerations (sites with a medium flood risk) as well as consideration given to whether the more vulnerable uses can be directed to parts of the sites where the risk is lower.
- 6.3 The next step is to take a sequential approach at a site level by assessing all sites that pass stage 1 (Flood Zone 1) against the Risk of Flooding from Surface Water (RoFSW). Then identify the percentage area of the site which is at risk of surface water flooding<sup>2</sup> and categorise accordingly (low, medium, high), giving a scoring on each site and summary mitigation and/or recommendations for the site.
- 6.4 For those sites with a proportion of Flood Zone 2 or 3 within or adjacent to them a Stage 2 assessment must be undertaken, as required by the NPPF. Where the risks of flooding from these zones can potentially be mitigated through planning decisions surrounding the number and positioning of housing units within the site it will be noted so that this can be considered during land allocation decisions.
- 6.5 Table 2 below sets out the results of the Sequential Test and only a Stage 1 Assessment has been required.

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<sup>&</sup>lt;sup>2</sup> Surface Water Flood Risk Mapping: <u>Your long term flood risk assessment - GOV.UK (check-long-term-flood-risk.service.gov.uk)</u>

Table 2: Sequential Test of the Basildon Borough 2014 - 2034 Local Plan housing, employment and town centre regeneration allocation sites

Site	Capacity and Land Use	Vulnerability Classification		luvi Zone 2		Surface water, RoFSW	Sequential Test met/comments (other eg Potential Groundwater risk) <sup>4</sup>	Stage 2 Assessment Required?
H5 and E5: Land West of Gardiners Lane South, Basildon	790 dwellings and 5.5ha land for employment	More Vulnerable	X	2	3	( <b>H, M, L)</b> <sup>3</sup> <5% high risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
H7 <sup>5</sup> : Land North of London Road, Vange	3901 dwellings	More Vulnerable	X			<5% high risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
H8: West of Basildon	300 dwellings	More Vulnerable	X			<5% high risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
H9: Land West of Steeple View, Laindon	245 dwellings	More Vulnerable	X			<5% high risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
H10: Land East of Noak Bridge, Basildon	400 dwellings	More Vulnerable			X	<5% high risk and <5% medium risk	Flood zone 2 & 3 present on eastern part of the site.  Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
H11: East of	285 dwellings	More	Χ			<5% high risk	Exception test not required.	N/A

<sup>&</sup>lt;sup>3</sup> Low - >1:1000 RoFSW, Medium - >30 -100yr RoFSW, High - <30yr RoFSW

<sup>4</sup> Consider groundwater level monitoring to assess groundwater flood risk (for medium and high risk areas) and recommendations during planning submission

<sup>5</sup> H7a which has been deleted in the post submission modifications version of the Local Plan also did not require the Exception Test.

Site	Capacity and Land Use			Fluvial Zone		Surface water, RoFSW	Sequential Test met/comments (other eg Potential Groundwater risk) <sup>4</sup>	Stage 2 Assessment
			1	2	3	(H, M, L) <sup>3</sup>	,	Required?
Basildon		Vulnerable				and <10% medium risk	More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	
H12: Land South of Wickford	1,100 dwellings	More Vulnerable			X	<5% high risk and <10% medium risk	Flood zone 2 & 3 present on very small part of the site. Exception test not required. More vulnerable development to be sited away from higher surface water flood risk areas. Appropriate surface and ground water management to be used onsite.	N/A
H13: Land North of Southend Road, Shotgate	280 dwellings	More Vulnerable	X			<5% high risk and <5% medium risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
H14: Land South of Barn Hall, Wickford	500 dwellings	More Vulnerable	Х			<10% high risk and <5% medium risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
H15: Land North of London Road, Wickford	300 dwellings	More Vulnerable			X	<5% high risk and <5% medium risk	Flood zones 2 & 3 present within northern part of the site due to EA Main River on northern boundary.  Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
H16: Land North East of Potash Road, Billericay	255 dwellings	More Vulnerable	X			<10% high risk and <5% medium risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.	N/A

Site	Capacity and Land Use	Vulnerability Classification	Fluvial Zone			Surface water, RoFSW	Sequential Test met/comments (other eg Potential Groundwater risk) <sup>4</sup>	Stage 2 Assessment
			1	2	3	(H, M, L) <sup>3</sup>	,	Required?
							Appropriate surface and ground water management to be used onsite.	
H17a – H17d: South West Billericay	1,700 dwellings	More Vulnerable	X			<10% high risk and <5% medium risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
H18: Land South of Windmill Heights, Billericay	200 dwellings	More Vulnerable	X			Very low risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
H19: Land East of Greens Farm Lane, Billericay	400 dwellings	More Vulnerable	X			Very low risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
H20: Land East of Southend Road, Billericay	190 dwellings	More Vulnerable	X			30% high risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
E6: Land East of Burnt Mills, Basildon	48ha land for employment and a Travelling Showpeople yard	More Vulnerable			X	>5% high risk, 10% medium risk	Flood zones 2 & 3 present to the north east part of the site.  Exception test not required.  More vulnerable development to be steered away from this area.  Appropriate surface and ground water management to be used onsite.	N/A
R2: Basildon Town Centre	Mixed use, including around 4,200 dwellings	More Vulnerable	X			20% high risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water	N/A

Site	Capacity and Land Use	Vulnerability Classification	Fluvial Zone			Surface water, RoFSW	Sequential Test met/comments (other eg Potential Groundwater risk) <sup>4</sup>	Stage 2 Assessment
			1	2	3	(H, M, L) <sup>3</sup>		Required?
							management to be used onsite.	
R3: Laindon Town Centre	Mixed use, including 200- 300 dwellings	More Vulnerable	X			10% high risk, 30% medium risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
R4: Pitsea Town Centre	Mixed use, including retail and commercial	More Vulnerable	Х			10% high risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A
R5: Wickford Town Centre	Mixed use, including 200- 300 dwellings	More Vulnerable			X	40% high risk	Flood zones 2 & 3 present within south and east parts of the site. Exception test not required. More vulnerable development to be sited away from higher surface water flood risk areas. Appropriate surface and ground water management to be used onsite.	N/A
R6: Billericay Town Centre	Mixed use, including retail and commercial	More Vulnerable	Х			<5% high risk	Exception test not required.  More vulnerable development to be sited away from higher surface water flood risk areas.  Appropriate surface and ground water management to be used onsite.	N/A

## 7. SITES WITH MEDIUM FLOOD RISK

- 7.1 This section details the five sites that have identified flood risks from either surface water or groundwater, or contain smaller sections of Flood Zones 2 or 3 that are not significant enough to trigger a Stage 2 Assessment. These sites are considered to be medium flood risk and the risk of flooding at each site has been deemed great enough to warrant more specific consideration of it at the planning stage.
- 7.2 The five sites identified are as follows and they are shown in Appendices 5 to 9:
  - H10: Land East of Noak Bridge, Basildon
  - H12: Land South of Wickford
  - H15: Land North of London Road, Wickford
  - E6: Land East of Burnt Mills, Basildon
  - R5: Wickford Town Centre
- 7.3 It would be possible on the above sites to locate development away from the areas at greater flood risk, as the flood risk zones 2 and 3 only cover a small proportion of each site, around 15% or less in most cases. It is not considered necessary to apply the Exception Test in this instance as the more vulnerable forms of development, as identified in Appendix 1, can be located within the lower flood zones and, where necessary, development which is less vulnerable is located within higher flood zones.
- 7.4 It is also considered that appropriate flood risk management measures should be used onsite. Examples include the following and should be assessed on a site by site basis as part of the planning decision process:
  - The total number of housing units provided should be considered where sites have been allocated for residential development.
  - Residential units should always be positioned outside of flood zones 2 and 3.
  - Employments units should be positioned outside of flood zones 2 and 3 where possible, unless appropriate mitigation measures can be implemented.
  - Site layouts should be adjusted to position green spaces and car parking areas within flood zones 2 and 3 and areas of higher surface water flood risk.
  - Appropriate SuDS measures should be provided for all sites.
  - Safe access and egress routes should be provided for all sites.
  - The availability of flood warning should be considered where car parking is advocated within a flood risk area

## 8. CONCLUSION

- 8.1 In accordance with the *NPPF*, Basildon Council has undertaken the Sequential Test in order to steer development proposals in the Local Plan away from areas at higher risk of flooding.
- 8.2 The Stage 1 Assessment concludes that the vast majority of development locations identified within the Local Plan are at the lowest risk of flooding. There are five sites considered to be at medium risk of flooding as a small part of the site falls within Flood Zone 2 and/or 3. However, the more vulnerable development on these sites can be located in areas of lower flood risk and incorporate flood risk management measures to mitigate flood risk, to prevent increased risk on site or to other properties nearby.
- 8.3 As it is possible to avoid the areas at greatest risk of flooding, there is no requirement for the Stage 2 Assessment or Exception Test to be applied to those sites identified for development purposes within the *Basildon Borough Local Plan*. Furthermore, there is no requirement to appraise alternative sites, which are otherwise less sustainable than those included within the *Basildon Borough Local Plan*.
- 8.4 In conclusion the application of the Sequential Test using the revised evidence base has reconfirmed that the proposed development locations identified in the *Basildon Borough Local Plan* have been directed to locations with low flood risk.

## **APPENDIX 1: Flood Risk Vulnerability Classification**

#### **ESSENTIAL INFRASTRUCTURE**

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including infrastructure for electricity supply including generation, storage and distribution systems; and water treatment works that need to remain operational in times of flood.
- Wind turbines.
- Solar farms

#### HIGHLY VULNERABLE

- Police and ambulance stations; fire stations and command centres;
   telecommunications installations required to be operational during flooding.
- · Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent. (Where there is a
  demonstrable need to locate such installations for bulk storage of materials with
  port or other similar facilities, or such installations with energy infrastructure or
  carbon capture and storage installations, that require coastal or water-side
  locations, or need to be located in other high flood risk areas, in these instances
  the facilities should be classified as 'Essential Infrastructure'.)

#### MORE VULNERABLE

- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non-residential uses for health services, nurseries and educational establishments.
- Landfill\* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

#### LESS VULNERABLE

- Police, ambulance and fire stations which are not required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill\* and hazardous waste facilities).

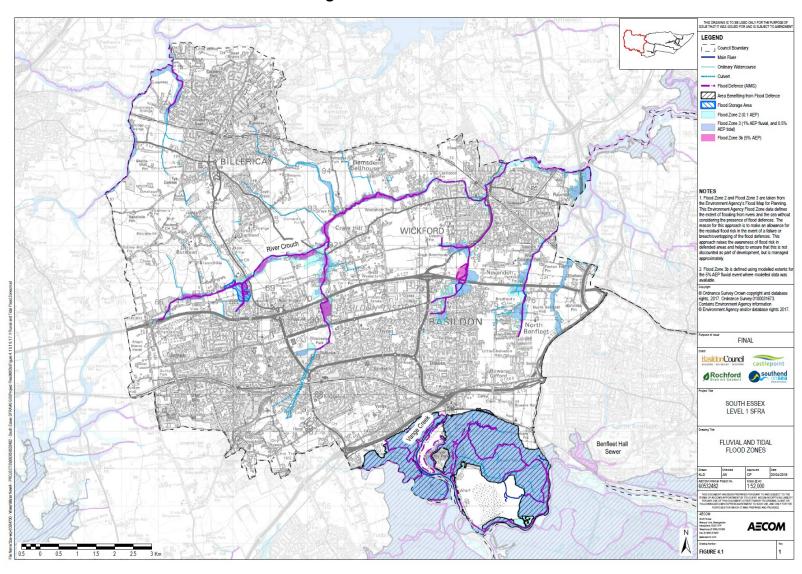
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
- Car parks.

#### WATER-COMPATIBLE DEVELOPMENT

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

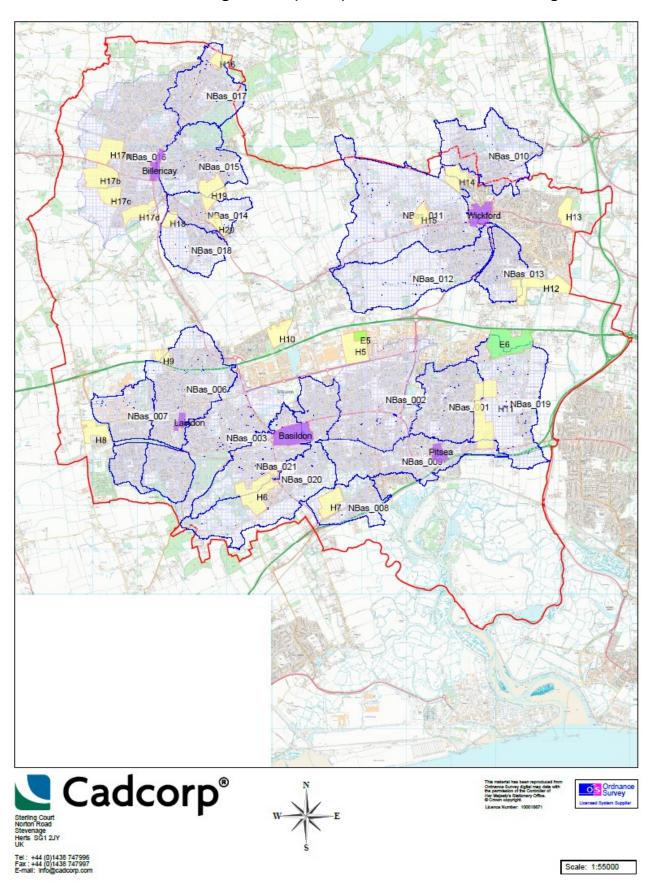
<sup>\*</sup> Landfill is as defined in Schedule 10 of the Environmental Permitting (England and Wales) Regulations 2010.

APPENDIX 2: Flood Risk Zones in the Basildon Borough<sup>6</sup>

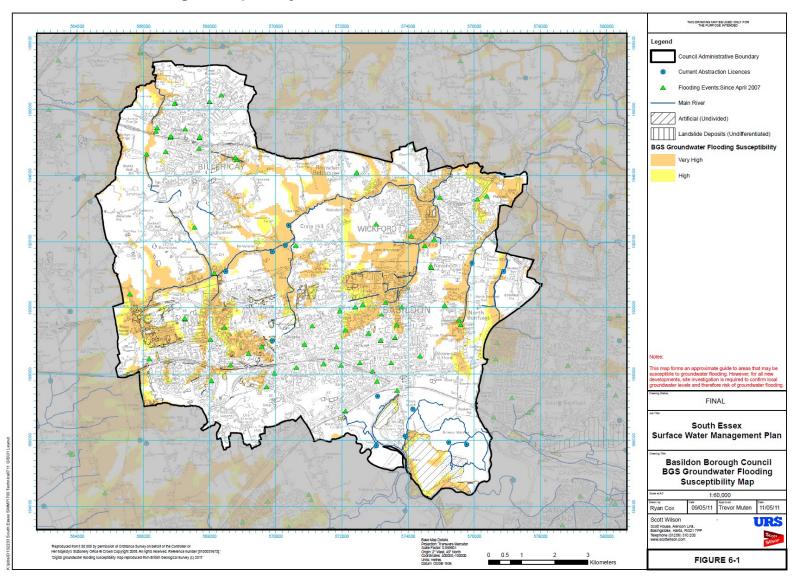


<sup>&</sup>lt;sup>6</sup> South Essex Level 1 Strategic Flood Risk Assessment (2018)

APPENDIX 3: Critical Drainage Areas (CDAs) within the Basildon Borough

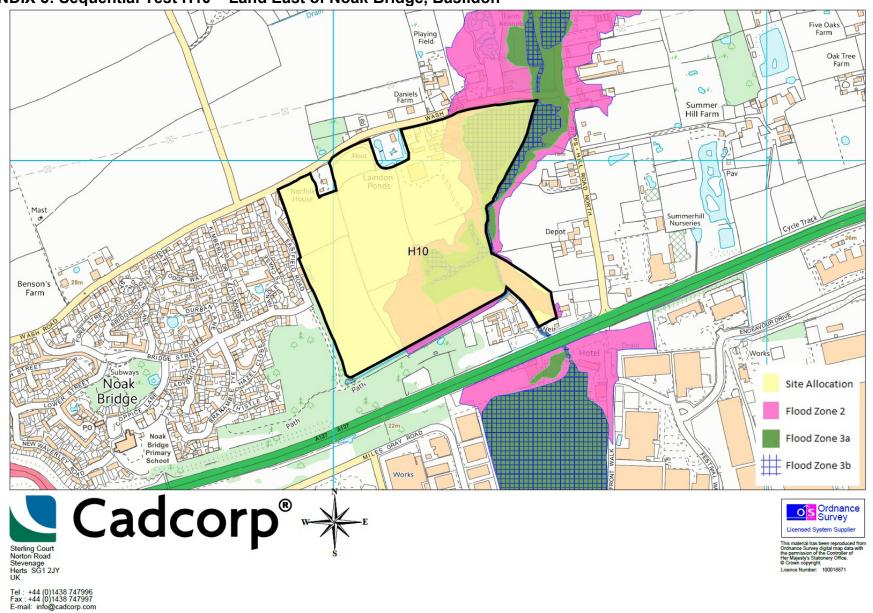


**APPENDIX 4: Groundwater Flooding Susceptibility**<sup>7</sup>



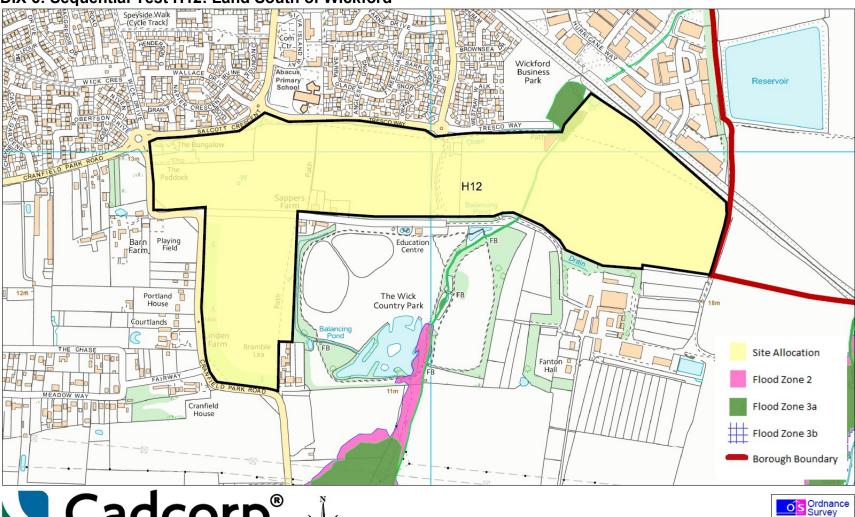
<sup>&</sup>lt;sup>7</sup> South Essex Surface Water Management Plan (2012)

APPENDIX 5: Sequential Test H10 - Land East of Noak Bridge, Basildon



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## **APPENDIX 6: Sequential Test H12: Land South of Wickford**

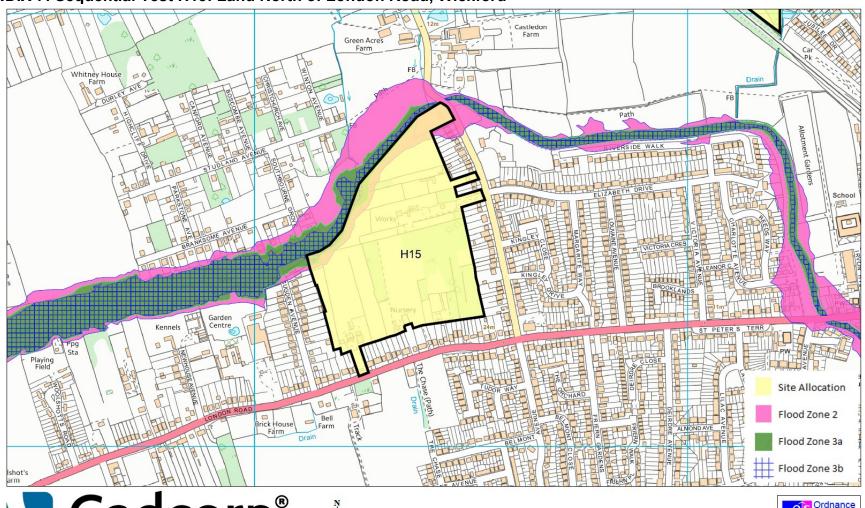


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APPENDIX 7: Sequential Test H15: Land North of London Road, Wickford

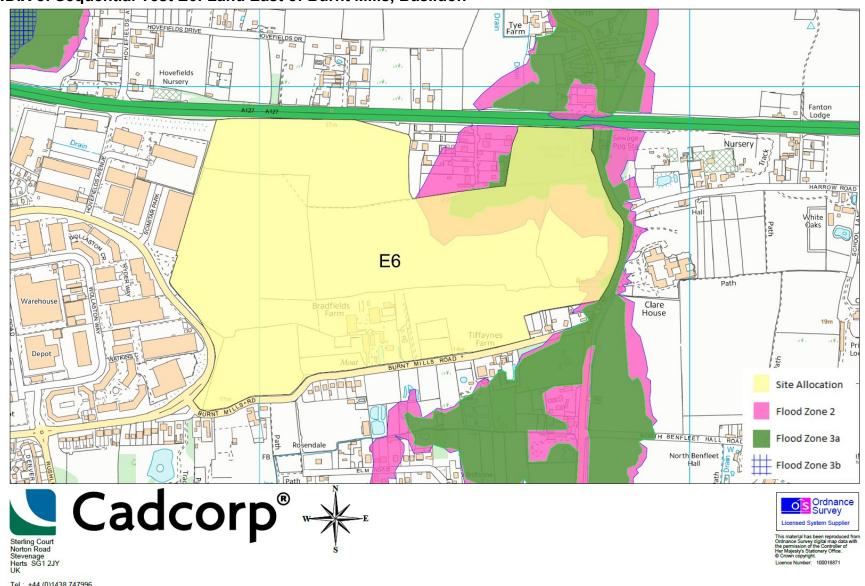








APPENDIX 8: Sequential Test E6: Land East of Burnt Mills, Basildon



**APPENDIX 9: Sequential Test R5: Wickford Town Centre** 

