# Flood Risk Sequential Test Report
# Colchester Local Plan
# 2017- 2033

**Planning Policy Team**
**Colchester Borough Council**
**(October 2017)**

## Introduction

Paragraphs 100 - 104 of the NPPF and the Planning Practice Guideance sets out the approach for applying the Flood Risk Sequential Test

Application of the Sequential Test and Exception Test helps ensure that development is directed to areas of low flood risk and that more vulnerable development is only located in areas of flood risk in exceptional circumstances.

The NPPF /PPG recommends applying the Sequential Test as early as possible in the Local Plan making process. Application of the Flood Risk Sequential Test at an early stage of preparation ensures that flood risk is considered early in the process, that sites can be allocated with confidence which means that housing targets can be sustainably delivered, and developers do not waste their time promoting proposals in areas of high flood risk. It also ensures that there is consistency when dealing with flood risk issues at the development management stage.

The sequential approach is a decision making tool designed to ensure that areas at little or no risk of flooding are developed in preference to areas at a higher risk of flooding. It is the Local Planning Authority's (LPA) responsibility to make the most appropriate use of land in order to minimise flood risk, ensuring that the most vulnerable uses are located in the lowest flood risk areas. The LPA should also make the most of opportunities to reduce flood risk through the use of sustainable drainage systems (SuDS). Related to this, the NPPF requires LPAs to consider the likelihood of flooding from all sources i.e. flooding from tidal, pluvial, groundwater, surface water, reservoirs as well as from rivers and the sea. The LPA has complied with this requirement by integrating the findings of the Strategic Flood Risk Assessment into the Flood Risk Sequential Test and Sustainability Appraisal and through the inclusion of policies DM23 (Flood Risk and Management) and DM24 (Sustainable Urban Drainage) in the Local Plan. These policies seek to direct development to land at the lowest risk of flooding and requires development proposals to incorporate measures for the sustainable management and use of water.

The Flood Risk Sequential Test is only one part of the process of managing flood risk and more detailed sequential tests may be required at the planning application stage i.e. for sites which were not subject to the Flood Risk Sequential Test completed for the Local Plan, where the permission sought for a site differs from the Local Plan allocation and because application of the Flood Risk Sequential test does not preclude the need for a detailed site specific flood risk assessment (FRA).

In exceptional circumstances 'more vulnerable' uses, as defined in the PPG, may pass the Sequential Test in higher flood risk areas. Where this is the case the Exception Test must be undertaken and the proposal can only be supported when the Exception Test is passed. There are two parts to the Exception Test. The proposed development must deliver
(1) wider sustainability benefits to the community that outweighs flood risk and
(2) be safe over its lifetime.

For residential development this is 100 years but the lifespan of non - residential development is more variable dependant on the proposed use. Developers will be expected to justify why they have adopted a given lifetime for the development, as part of site-specific flood risk assessment.

The wider sustainability benefits delivered by a site (Part 1) is considered through the Strategic Land Availability Assessment (SLAA), Habitat Regulations Assessment (HRA) and Sustainability Appraisal (SA) processes. The SFRA only tests Part 2 of the Exception Test.

***Methodology***

As part of the development of the new Colchester Local Plan, the (LPA) consulted on an Issues and Options document in January 2015. A Call for Sites was issued in June 2014, followed by a second Call for Sites during in 2015 and a further call in 2016. Approximately 281 sites were received as a result of these processes however a total of 460 sites were initially assessed including previous SLAA sites that had not come forward for development under the current plan. These sites were tested to ensure that all reasonably available alternative sites had been fully considered as part of the site selection/allocation process.

Each site was individually assessed against a number of Strategic Land Availability Assessment (SLAA) criteria, including flood risk, which helped the LPA to start identify potential sites for allocation in the emerging Local Plan for Colchester and to exclude sites at high risk of flooding. As part of the SLAA process, 395 sites were identified as potential sites for allocation. As part of the evidence base for the Local Plan, the LPA commissioned a new Strategic Flood Risk Assessment (which included both a Level 1 and Level 2 Assessment). As part of this process AECOM assessed the 395 sites.

Following the Preferred Options consultation during 9 July 2016 – 16 September 2016, AECOM were also asked to assess additional sites as part of the Level 2 SFRA that had been submitted in response to the Preferred Options consultation. These included sites that despite being located in Flood Zone 1, were potentially at risk from surface water flooding.

On completion of the SFRA (Level 1 and Level 2) and the informal selection of 'Preferred sites' the LPA applied the flood risk sequential test to allocate the final sites for inclusion in the Publication draft of the Local Plan. The methodology for applying the flood risk sequential test as set out below was agreed with the Environment Agency – see Appendix 1.

The LPA applied the flood risk sequential test by taking each garden community, and the proposed development sites in the Sustainable Settlements, including Colchester Town in turn (with the exception of East Colchester/Hythe Special Policy Area – see below)) and identifying all of the preferred sites located within flood zone 1. For any preferred sites that fell within flood zone 2, the LPA looked for reasonably available alternative sites within flood zone 1. Similarly, for any preferred sites located within flood zone 3, the LPA looked for reasonably available alternative sites in flood zones

1 and 2. The proposed use(s) and flood vulnerability classification were also considered as part of the process. Where no reasonable alternative sites were available in lower flood zones, each site in flood zones 2 and 3 was assessed in order to conclude whether or not it passed the sequential test; consideration was given to the proposed use against the flood zone that the site fell within and vulnerability classification (e.g. more vulnerable, water compatible etc) and the findings of the Strategic Flood Risk Assessment. For those sites where it was concluded that it passed the sequential test, but the flood risk vulnerability and flood zone compatibility matrix identified that the exception test was required, the Exception Test was also applied. Any of the 'preferred sites' that failed the Sequential Test and Exceptions Test were not progressed any further through the Local Plan process. The area of search for reasonably available alternatives sites was applied at the Borough level for all sites outside East Colchester/Hythe Special Policy Area.

The LPA proposed a different approach for the application of the Flood Risk Sequential Test within East Colchester/ Hythe Special Policy Area, much of which falls within flood Zone 3. While the methodology for applying the sequential test was not different, the LPA sought consent from the Environment Agency to restrict the area of search for reasonably available alternative sites in East Colchester to within East Colchester/ Hythe Special Policy Area only.

As part of the development of Colchester's Core Strategy in 2008, the LPA, the Environment Agency (EA) and DCLG agreed that sites coming forward for development within the East Colchester Regeneration Area could be sequentially tested regarding flood risk against other reasonably available sites within the East Colchester Regeneration Area boundary solely rather than against Borough wide alternative sites. This approach was agreed on wider sustainable development grounds to ensure that regeneration in East Colchester/Hythe which had commenced in 2001 was able to continue through the current plan period up to 2023. DCLG were supportive of this pragmatic approach.

The Publication draft of Colchester's Local Plan includes proposals for the continuing regeneration of East Colchester/Hythe Special Policy Area, therefore the LPA sought agreement from the EA that the previous approach adopted for the East Colchester Regeneration Area could continue to be applied within East Colchester/Hythe Special Policy Area in the new Local Plan to allow this part of urban Colchester to continue to be regenerated. In further support of this request, this part of the town benefits from flood protection from river/tidal flooding due to the presence of the Colne Barrier and from river walls along the Colne River which help protect the development behind them. The Environment Agency confirmed that the approach for East Colchester is 'reasonable and consistent with the previously agreed position (see Appendix 1).

The vast majority of the Council's preferred sites are located within flood zone 1. Some sites, whilst largely located within FZ1, include small areas within Flood Zone 2 and 3. For these sites development will be directed to flood zone 1 land initially, before land in the higher flood zones is considered for development. This is made clear in the relevant site specific assessments.

The sites to be allocated that fall within Flood Zone 1, which have a low risk of flooding and those in urban Colchester located within Critical Drainage Areas (CDAs) are identified in the report. Sites within CDAs will be required to contribute financially to flood risk solutions identified in Colchester's Surface Water Management Plan. As these sites fall within Flood Zone 1 and are at a low risk from surface water flooding, the Flood Risk Sequential Test has been passed. The majority of these were not subject to the Exceptions Test. A number of sites in Flood Zone 1 which potentially were at a medium/high risk from surface water flooding were assessed as part of the Level 2 SFRA work to assist with site allocations. The Level 2 SFRA also assessed sites in flood zones 2 & 3 to aid allocation and to ensure compliance with the NPPF and PPG with regards to flood risk management. Appendix 2 sets out the approach being adopted for assessing flood risks in areas preparing Neighbouring Plans. The Local Planning Authority asked AECOM to assess an additional 3 sites in East Colchester for their suitability for development. These have been added into Appendix 3 to this report.

**Flood Risk Sequential Test Level 2**

**Town Centre**

**Sites proposed for residential allocation in Colchester Town Centre in flood zone 1, at low risk from surface water flooding and/or within a CDA.**

Britannia Car Park (within CDA 03) -150 dwellings
St Runwalds Car Park – 40 dwellings

**Sites proposed for residential allocation in Colchester Town Centre subject to SFRA Level 2 assessment**

None

## North Colchester

**Sites proposed for residential allocation in North Colchester in flood zone 1, at low risk from surface water flooding and/or within a CDA.**

Rugby Club, Mill Road (NC3) – 300 dwellings

**Sites proposed for residential allocation in Colchester Town Centre subject to SFRA Level 2 assessment**

**Name of site – Land at Braiswick (NC3)**

**Flood Risk Map**

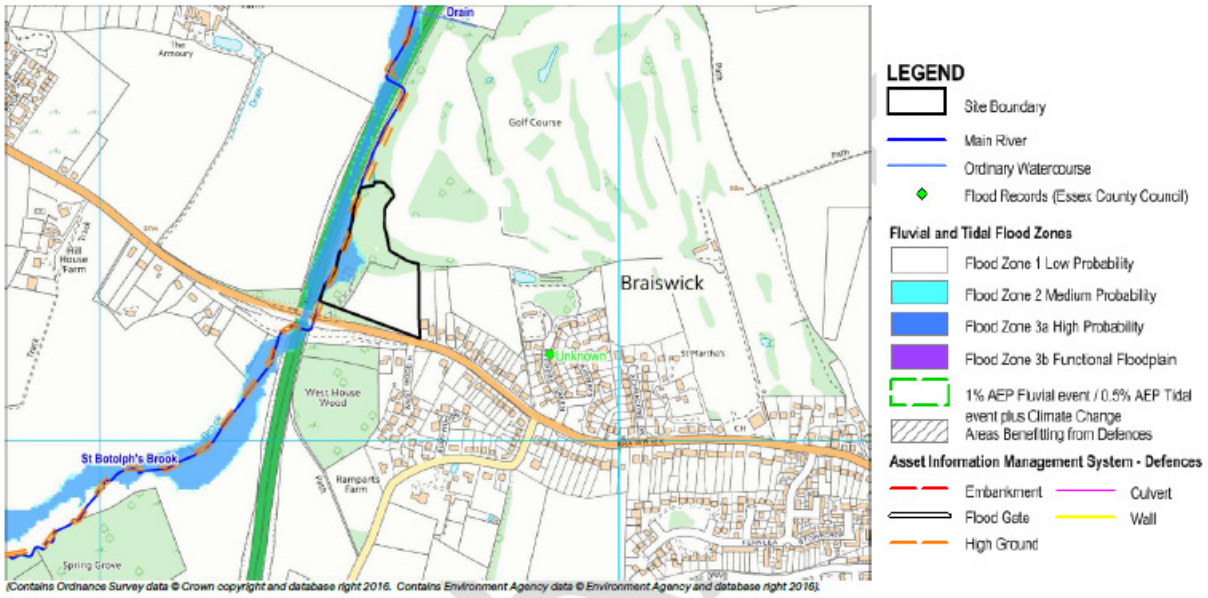




**Figure A Flood Zones**

**Surface Water Flood Risk**

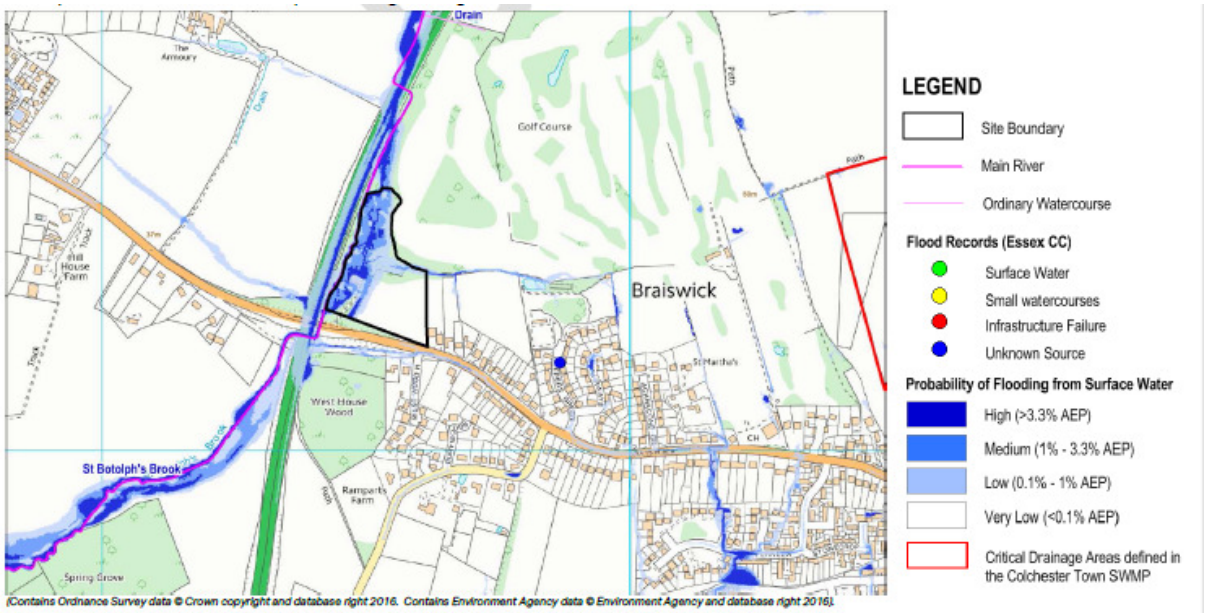




**Figure B Risk of Flooding from Surface Water (RoFSW)**

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| **Preferred use residential (70 dwellings)** | |
| **Site flood zone** | The majority of the site (86%) falls within Flood Zone 1. The western edge of the (11%) falls within Flood Zone 3a, and has a high probability of fluvial flooding |
| **Is there an alternative reasonably available site in flood zone 1?** | Yes. The majority of this site falls within flood zone 1 and built development will be contained to this part of the site. |
| **Is there an alternative reasonably available site in flood zone 2?** | N/A |
| **Does the site lie in the functional floodplain (zone 3b)?** | **Functional Floodplain**<br>St Botolph's Brook was not included in the hydraulic model of the River Colne used to inform this SFRA. Outputs for Flood Zone 3b functional floodplain are not available and further modelling is required to determine the extent of Flood Zones across the site. |
| **Surface water flood risk** | The western edge of the site, within the floodplain of St Botolph's Brook, is the natural topographic low point, and is susceptible to surface water ponding. There is a contributing flow path that flows from east to west across the development site. |
| **Is the site at risk from groundwater flooding?** | The site is located within a 1km square of which 25% is susceptible to groundwater emergence. The risk of groundwater flooding in this area is therefore generally considered to be low. This will need to be confirmed during site investigation survey. |
| **Is the site at risk from flooding in the event of a reservoir failing?** | The floodplain of St Botolph's Brook, adjacent to the site, is at risk of flooding in the event of a failure of the Brick Kiln Reservoir which is located approximately 1km north of the site Given the regular inspection of these reservoirs in accordance with the Reservoirs Act 1975, flooding from reservoirs is considered to be a managed risk. |
| **Is the site within a Critical drainage Area?** | No |
| **SFRA comments** | Site Specific recommendations |

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| | This flow path crossing the site should be considered carefully in the development of the site layout to ensure that residential dwellings are not placed at surface water flood risk, and that the position of any new development does not divert the flow path to a neighbouring area.<br><br><u>Fluvial Modelling</u><br>As part of a site specific FRA for this site, a simple hydraulic model should be developed to more accurately determine the probability of flooding across the site from St Botolph's Brook. As part of this assessment, a range of probability events should be compared to determine the impact of climate change on the risk of flooding at this location.<br><br><u>Site Layout and Design</u><br>Residential development should be avoided in areas defined as Flood Zone 3a on the western edge of the site, and instead lower vulnerability uses including landscaped open space should be located here.<br>The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS, taking care to consider SuDS features in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).<br>Storage features should not be located within the floodplain of the ordinary watercourse, as they may be rendered ineffective during times of fluvial flooding.<br><br><u>Set-back Distance</u><br>St Botolph's Brook is a main river, and therefore all development should be set back at least 8m from the watercourse. The Environment Agency will need to be consulted and an Environmental Permit obtained for any works within 8m of the watercourse.<br><br><u>Finished Floor Levels</u><br>If residential development cannot be avoided within the flood extent for the 1% AEP event including climate change, finished floor levels should be set at least 300mm freeboard above the flood level for 1% AEP event including an appropriate allowance for climate change. In this |

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| | case, for More Vulnerable development in Flood Zone 3a, the higher central (35%) climate change allowance should be used and should be tested against the upper (65%) climate change allowance also.<br><br><u>Access / Egress</u><br>Safe dry access to and from the site should be provided, and this should be achievable to the south of the site onto B1508 Colchester Road.<br><br><u>Floodplain Compensation</u><br>Land raising and any built development should be avoided within the floodplain of St Botolph's Brook. Where alterations to the floodplain are proposed, compensatory floodplain storage will need to be provided on a level-for-level and volume-for-volume basis. The land used to provide compensation storage will need to be in hydraulic connectivity with the existing floodplain, but not already part of the floodplain.<br><br><u>Emergency Planning</u><br>The site is not shown to be within an Environment Agency Flood Warning Area; however residents should register to receive the warning service associated with the River Colne, into which St Botolph's Brook feeds. Due to the proximity of the site to the watercourse, Flood Response Plans should be prepared by residents of the site |
| **Will the proposed development type be acceptable in this flood zone?** | Yes. The proposed development entails More Vulnerable residential development located in Flood Zone 1, which is considered compatible development in accordance with the NPPF. |
| **Conclusion** No residential development should be built within the western area of site that falls within Flood Zone 3. Subject to this and the above recommendations/mitigations being implemented the Sequential and Exception Tests are passed.<br>**Recommendation: Allocate the site.** | |

## South Colchester

**Sites proposed for residential allocation in South Colchester in flood zone 1, at low risk from surface water flooding and/or within a CDA.**

Land south of Berechurch Hall Road (SC1) – 150 dwellings

**Sites proposed for residential allocation in Colchester Town Centre subject to SFRA Level 2 assessment**

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| **Name of site – Gosbecks Phase 2 (SC1)** |
| **Preferred use residential (150 dwellings)** |
| **Flood Zone Map** |

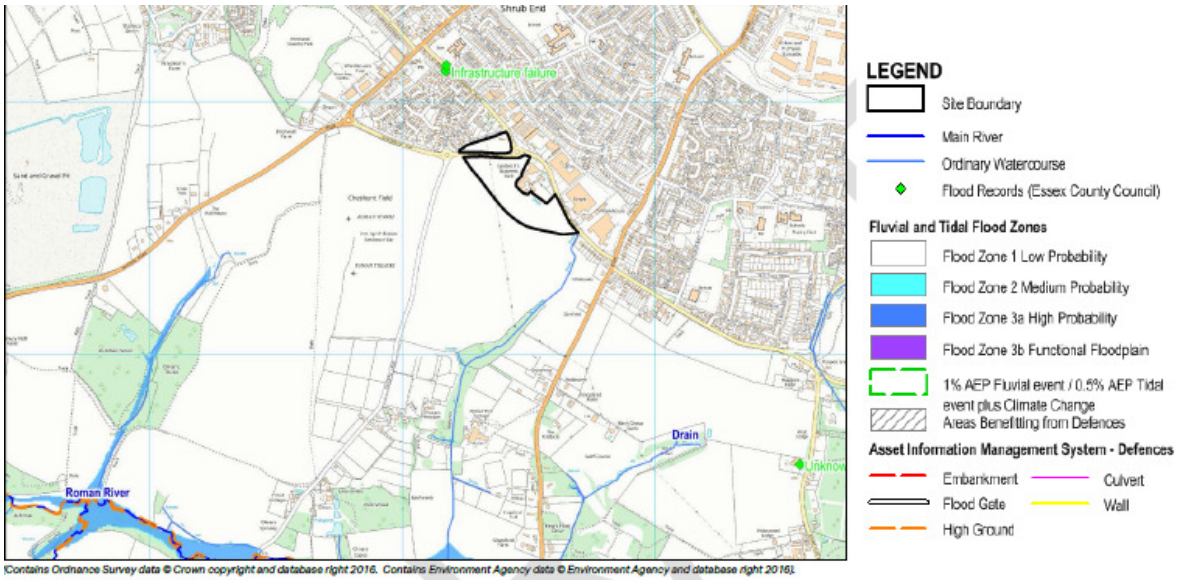




Figure A Modelled Flood Extents

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| **Surface Water Flood Risk** |

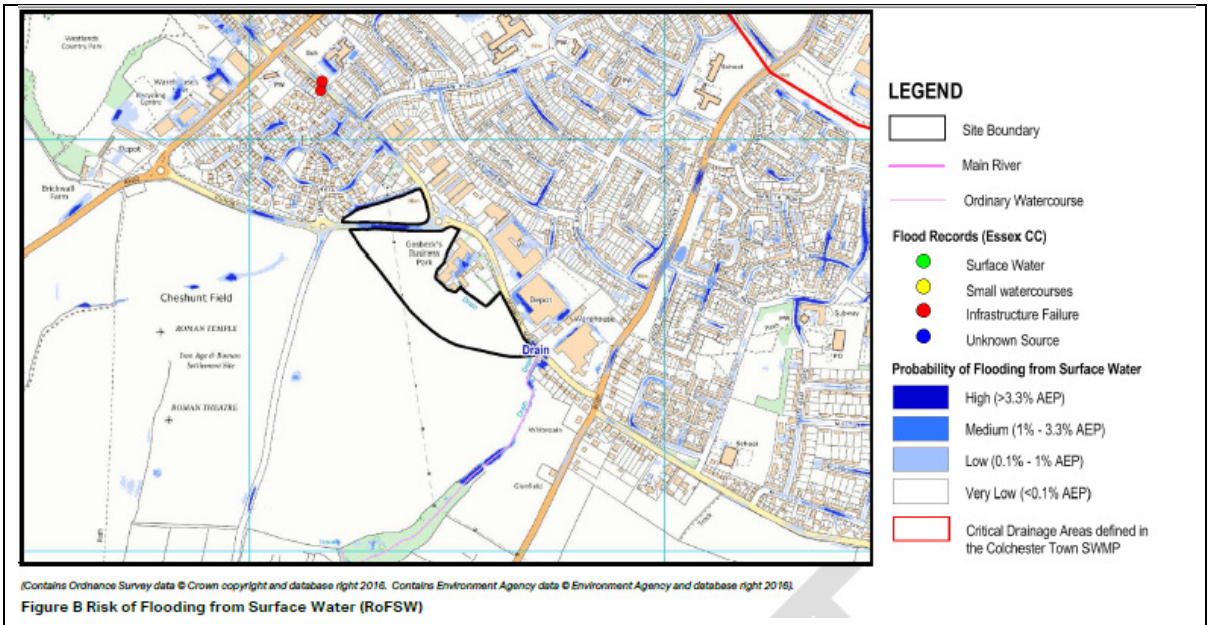




Figure B Risk of Flooding from Surface Water (RoFSW)

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| **Site flood zone** | 100% of the site is in Flood Zone 1 |
| **Is there an alternative reasonably available site in flood zone 1?** | N/A |
| **Is there an alternative reasonably available site in flood zone 2?** | N/A |
| **Does the site lie in the functional floodplain (zone 3b)?** | No |
| **Surface water flood risk** | The RoFSW and SWMP modelling indicate that the site itself is at low risk of surface water ponding, however there may be a risk to Cunobelin Way, which passes through the two portions of the site.<br><br>The proposed development should not have unacceptable adverse impacts on the flow and quantity of surface water. |
| **Is site at risk from groundwater flooding?** | The AStGWF mapping shows that the site is located within a 1km square of which >75% is susceptible to groundwater emergence |
| **Risk from flooding in event of reservoir failure.** | The site is not shown to be at risk of inundation in the event of a failure of a reservoir on the Environment Agency 'Risk of Flooding from Reservoirs' mapping. |

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| **Is the site at risk from an extreme tidal event** | No |
| **Is the site located within a Critical Drainage Area?** | No |
| **SFRA comments** | <u>Site Specific Recommendations</u><br>The proposed development should not have unacceptable adverse impacts on the flow and quantity of surface water.<br>The potential for groundwater flooding in this area will need to be confirmed during site investigation surveys.<br><br>The site layout should be carefully planned to ensure that residential dwellings are not at risk from surface water flooding and the position of new development does not divert flow paths to the vicinity of the site. As part of a site specific FRA for this site, a simple hydraulic model may need to be developed to more accurately determine the probability of flooding across the site from the ordinary watercourse. As part of this assessment, a range of probability events should be compared to determine impact of climate change on the risk of flooding at this location.<br><br><u>Site Layout and Design</u><br>The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS. They should be considered in accordance with Essex CC's SuDS Design Guide14. (I.e. considering infiltration measures first wherever possible).<br><br><u>Set-back Distance</u><br>Essex CC, as the LLFA, requires at least a 3m set back on one side of the ordinary watercourse to the east of the site, to provide access for maintenance. Essex CC will need to be consulted and consent obtained for any proposed works that may impact flow within the channel of the watercourse.<br>Finished Floor Levels |

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| | Finished floor levels should be set 300mm above ground level, to provide protection from surface water flooding in accordance with Environment Agency guidance on FRA's15.<br><br><u>Access / Egress</u><br>Access to the site is provided via Cunobelin Way which is shown to be susceptible to surface water ponding in the SWMP modelling. Further assessment of access routes to<br>the site and potential surface water flood risk should be made |
| **Will the proposed development type be acceptable in this flood zone?** | Yes. The proposed development entails More Vulnerable residential development located in Flood Zone 1, which is considered compatible development in accordance with the NPPF. |
| **Conclusion** The site falls wholly within Flood Zone 1 therefore proposals are not usually subject to the Exceptions Test. However the site was assessed in the level 2 assessment due to the risk of surface water flooding. Built development should avoid the areas at risk from surface water flooding. These areas could be used for the provision of SuDS or open space. Based on the assessment and subject to the above recommendations/mitigations being implemented the Sequential and Exception Tests are passed.<br>**Recommendation: Allocate the site.** | |

**Name of site - Middlewick Ranges (SC2)**

**Proposed Use Residential (1000 dwellings)**

**Flood Zone Map**

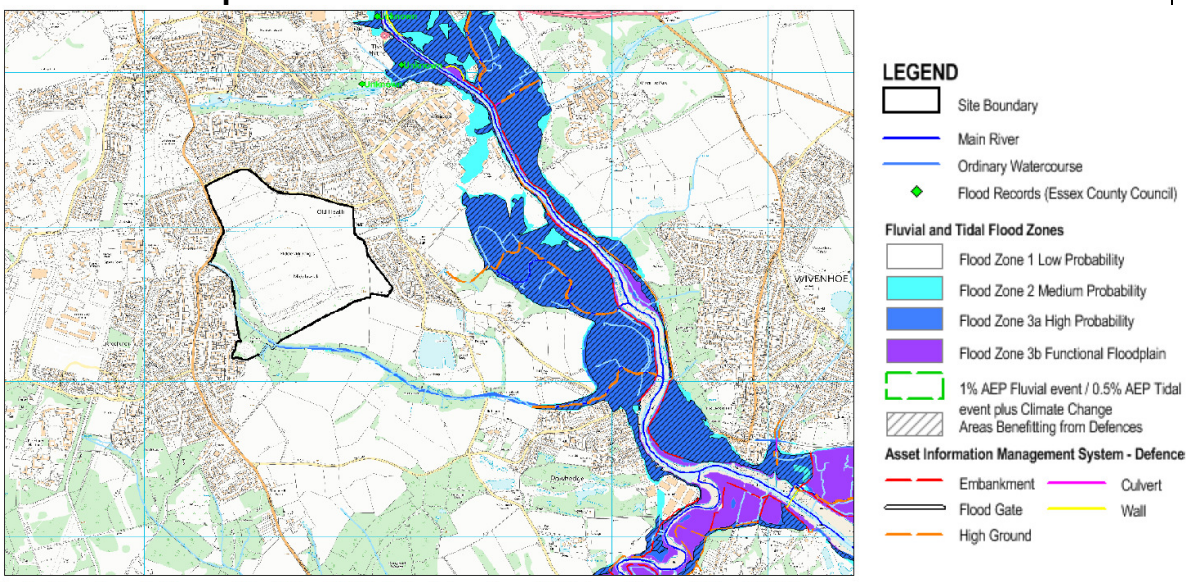


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**Figure A Modelled Flood Extents**

**Surface Water Flood Risk**

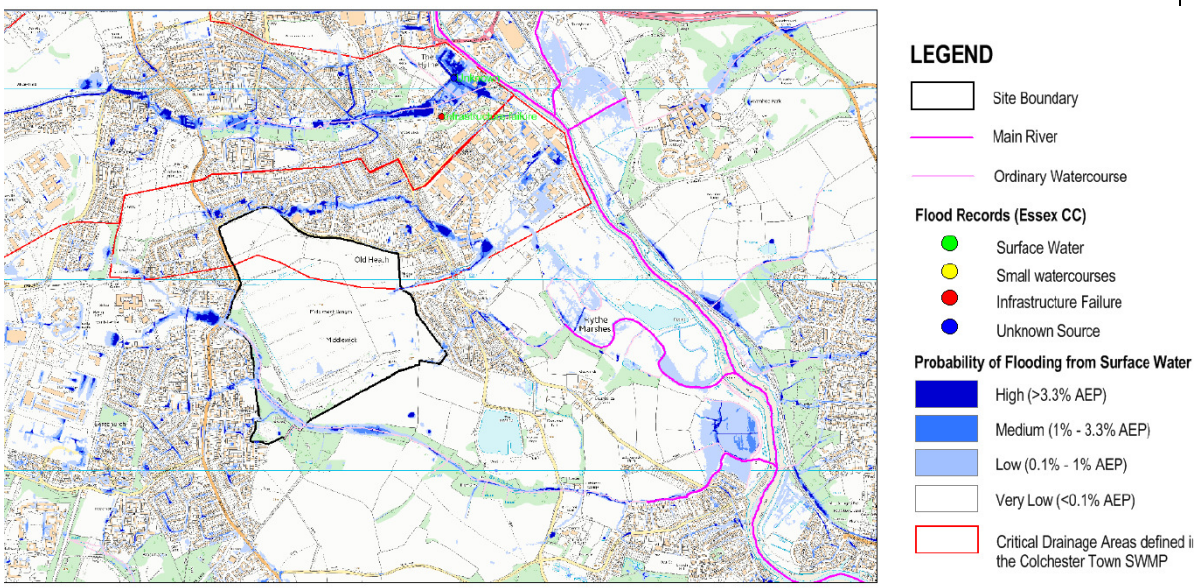


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**Figure D Risk of Flooding from Surface Water (RoFSW)**

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| **Site flood zone** | The majority of the large site (99.82%) is located in Flood Zone 1. A very small area in the south of the site is subject to medium and high probability of flooding and is classed as Flood Zone 2 and 3, where Birch Brook runs through the site from |

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| | west to east. The site is considered to be at low risk from flooding from the River Colne. |
| **Is there an alternative reasonably available site in flood zone 1?** | Yes but virtually the whole of Middlewick Ranges falls within Flood Zone 1 and built development will be confined to this part of the site. |
| **Is there an alternative reasonably available site in flood zone 2?** | NA |
| **Does the site lie in the functional floodplain (zone 3b)?** | No |
| **Is the site at risk from Surface water flooding** | The RoFSW mapping indicates that the majority of the site is at low risk of surface water flooding, however mapping shows that there may be areas at medium to high risk of surface water flooding, particularly in the south of the site where the Birch Brook runs through the site. There are also some potential flow routes to the north and west of the site boundary. |
| **Is the site at risk from groundwater flooding?** | The risk of groundwater flooding in this area is generally considered to be high. This will need to be confirmed during site investigation survey. |
| **Is the site at risk from flooding in the event of a reservoir failure** | No |
| **Is the site at risk in the event of a failure of the Colne Barrier** | No |
| **Is the site within a Critical Drainage area?** | The northern section of the site is within Old Heath CDA 01 |
| **SFRA recommendations** | <u>Site specific recommendations:</u><br><br><u>Fluvial Modelling</u><br>As part of a site specific FRA for this site, a simple hydraulic model may need to be developed to more accurately determine the probability of flooding across the site from the Birch Brook. As part of this assessment, a range of probability events should be compared to determine impact of climate change on the risk of flooding at this location. |

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| | Site Layout and Design<br>The site is located within Flood Zone 1, low probability of flooding from rivers in which More Vulnerable residential development is considered appropriate.<br><br>Further assessment should be made of the surface water flowpaths across the site. The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS.<br>Development has been identified as being within a CDA.<br><br>Policies to manage surface water are already in place and should be adhered to. The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS. They should be considered in accordance with Essex CC's SuDS Design Guide24 (i.e. considering infiltration measures first wherever possible). Potential to modify the kerb and flow patterns along Abbots Road to divert flows into SuDS measures within the remaining open space south of the road. Would pend investigation.<br><br>Set-back Distance<br>Essex CC, as the LLFA, requires at least a 3m set back on one side of the ordinary watercourse to the east of the site, to provide access for maintenance. Essex CC will need to be consulted and consent obtained for any proposed works that may impact flow within the channel of the watercourse.<br><br>Finished Floor Levels<br>Finished floor levels should be set 300mm above ground level, to provide protection from surface water flooding in accordance with Environment Agency guidance on<br>FRA's25.<br><br>Access / Egress<br>Safe dry access to and from the site should be provided, and this should be achievable along the road network to the north west of the site and onto Mersea Road. |

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| | Emergency Planning<br>The site is not shown to be within an Environment Agency Flood Warning Area; however residents may wish to register to receive the warning service associated with the<br>River Colne, into which the nearby Birch Brook feeds, so that they are aware of the flood risk to the area local to where they are located, including key transport routes. |
| **Will the proposed development type be acceptable in this flood zone?** | The proposed development entails More Vulnerable residential development located in Flood Zone 1, which is considered compatible development in accordance with the NPPF. |
| **Conclusion:** The majority of Middlewick Ranges falls within Flood Zone 1 therefore proposals are not usually subject to the Exceptions Test. However the site was assessed in the level 2 assessment due to the risk of surface water flooding. No residential development should be built within the areas towards the south of the site that fall within Flood Zone 2 or 3 or in areas at risk from surface water/ groundwater flooding. Based on the assessment of flood risk and subject to the above recommendations/mitigations being implemented the Sequential and Exception Tests are passed.<br>**Recommendation: Allocate the site.** | |

**West Colchester**

**Sites proposed for residential allocation in West Colchester in flood zone 1 & at low risk form surface water flooding.**

North of London Road (WC2) – 630 dwellings
Land between Tollgate West and London Road (Formers Sainsburys Site) WC2 – 200 dwellings
Chitts Hill (WC2) – 150 dwellings
Dyers Road/ Five Ways Fruit Farm (planning permission granted) (WC2) – 490 dwellings
Essex County Hospital Site (WC4)
Irvine Road (WC4) – 8 dwellings

**Sites proposed for residential allocation in West Colchester subject to SFRA Level 2 assessment**

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| **Name of site – West of Lakelands** |
| **Preferred** use – Residential (150 dwellings) |
| **Flood Zone Map** |

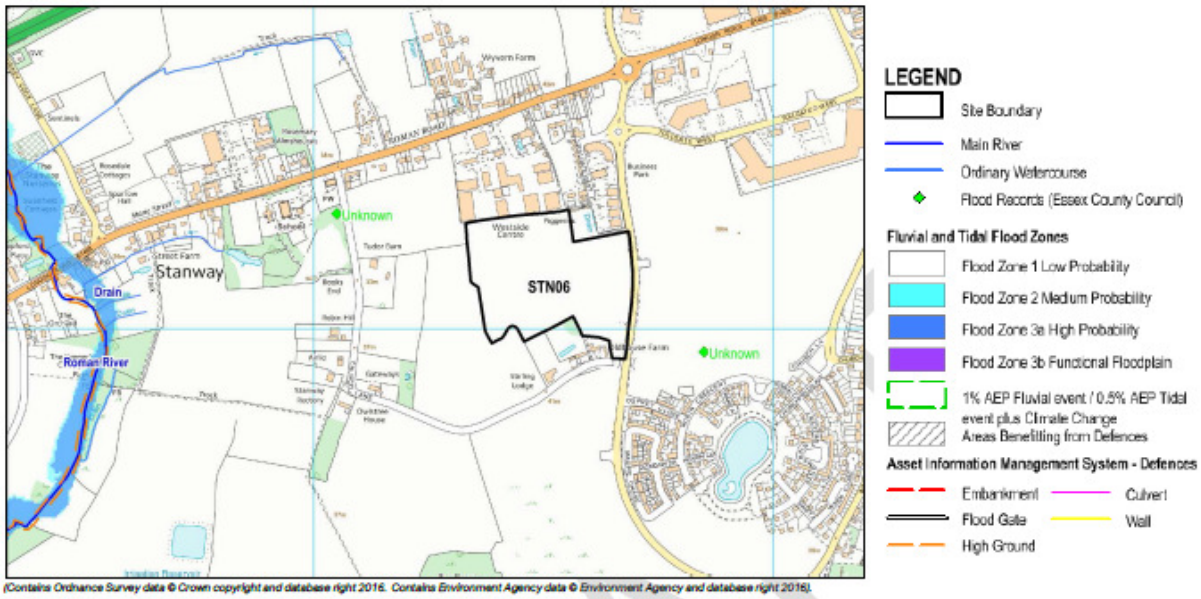


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**Figure A Modelled Flood Extents**

**Surface Water Flood Map**

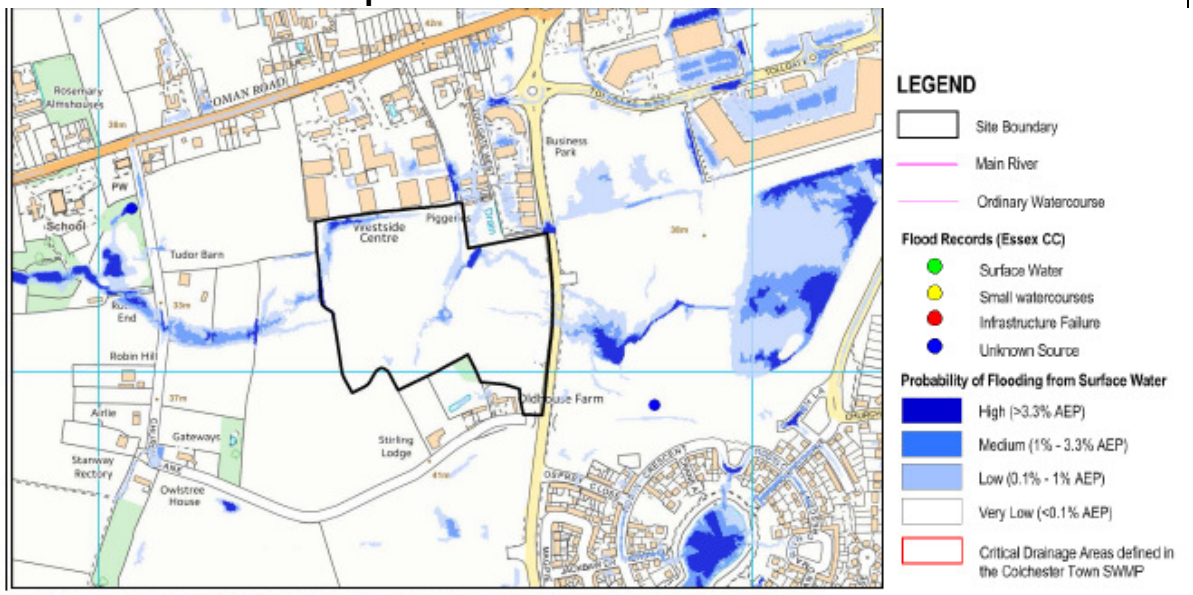


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**Figure B Risk of Flooding from Surface Water (RoFSW)**

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| **Site flood zone** | The whole of the site is in Flood Zone 1 |
| **Is there an alternative reasonably available site in flood zone 1?** | N/A |
| **Is there an alternative reasonably available site in flood zone 2?** | N/A |
| **Does the site lie in the functional floodplain (zone 3b)?** | No |

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| **Is the site at risk from Surface water flood risk?** | The RoFSW mapping indicates that whilst the majority of the site is at low risk of surface water flooding (<0.1% AEP), the mapping indicates there may be areas at medium to high risk of surface water flooding. |
| **Is the site at risk from groundwater flooding?** | The AStGWF mapping (Level 1 SFRA Appendix A Figure 5) shows that the site is located within a 1km square of which 25-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area is therefore generally considered to be low. This will need to be confirmed during site investigation survey. |
| **Risk from flooding in event of reservoir failure?** | The site is not at risk of inundation in the event of a failure of a reservoir |
| **Is the site within a Critical Drainage area?** | No |
| **SFRA comments** | Proposed development should not have unacceptable adverse impacts on the flow and quantity of surface water.<br><br>The site layout should be carefully planned to ensure that residential dwellings are not at risk from surface water flooding and the position of new development does not divert flow paths to the vicinity of the site.<br><br><u>Site Layout and Design</u><br>The site is located within Flood Zone 1, low probability of flooding from rivers in which More Vulnerable residential development is considered appropriate.<br><br>Further assessment should be made of the surface water flow paths across the site. The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS. They should be considered in accordance with the Essex CC's SuDS Design Guide18. (I.e. considering infiltration measures first wherever possible). |

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| | <u>Finished Floor Levels</u><br>Finished floor levels should be set 300mm above ground level, to provide protection from surface water flooding in accordance with Environment Agency guidance on FRA's19.<br><br><u>Access / Egress</u><br>Safe dry access to and from the site should be provided, and this should be achievable along the road network to the east of the site and onto London Road. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes. The proposed development entails More Vulnerable residential development located in Flood Zone 1, which is considered compatible development in accordance with the NPPF. The proposals are therefore not subject to the Exception Test. |
| **Conclusion –** Sites located in flood zone 1 are not usually subject to the Exception Test. This site was considered as part of the Level 2 SFRA to assess the risk from surface water flooding. Built development should avoid the areas at higher risk from surface water flooding. Based on the strategic assessment of flood risk and subject to the above recommendations/mitigations being implemented the Sequential and Exception Tests are passed.<br>**Recommendation: Allocate the site.** | |

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| **Name of site – Colchester Zoo** |
| **Preferred use – Zoo Uses** |
| **Flood Zone Map** |

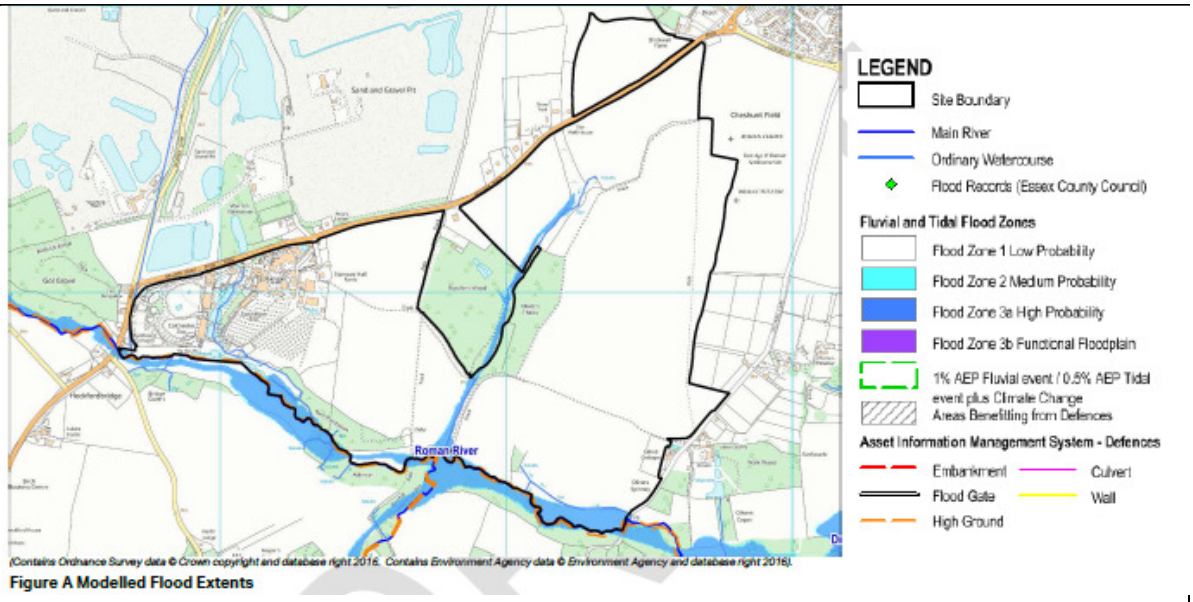


**Figure A Modelled Flood Extents**

**Surface water Flood Map**

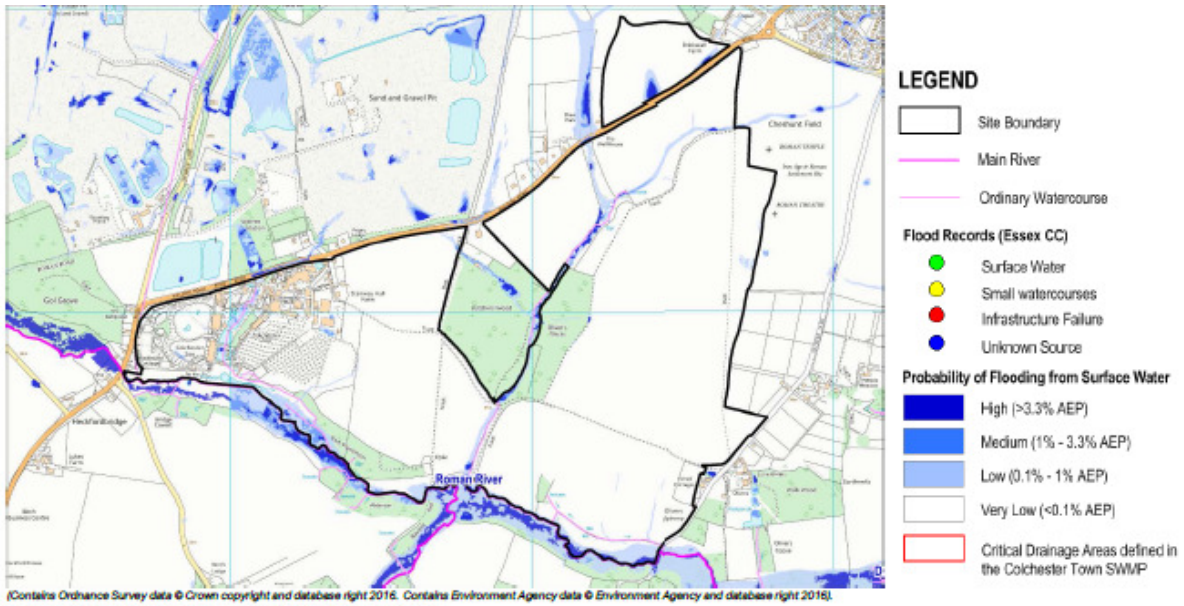


**Figure B Risk of Flooding from Surface Water (RoFSW)**

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| **Site flood zone** | The majority of the site is at very low risk of surface water flooding (<0.1% AEP) |
| **Is there an alternative reasonably available site in flood zone 1?** | N/A |
| **Is there an alternative reasonably available site in flood zone 2?** | N/A |

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| **Does the site lie in the functional floodplain (zone 3b)?** | Flood Zone 3b outputs not available Further modelling required. |
| **Is the site at risk from Surface water flood risk?** | The risk of surface water flooding is concentrated in areas adjacent to the watercourses and their contributing flow paths. |
| **Is the site at risk from groundwater flooding?** | The risk of groundwater flooding in this area is considered to be variable and more detailed information regarding the conditions will need to be confirmed during site investigation survey. |
| **Risk from flooding in event of reservoir failure?** | The floodplain of the Roman River adjacent to the southern edge of the site, is at risk of inundation in the event of a failure of Abberton Central and Western Arm and Abberton Reservoir however given the fact that reservoirs are regularly monitored, the risk is considered a managed risk. |
| **Is the site within a Critical drainage area?** | No |
| **SFRA comments** | <u>Site specific recommendations</u><br><br><u>Fluvial Modelling</u><br>Depending on the location of the new elements of development proposed for the zoo site, a simple hydraulic model may need to be developed to more accurately determine the probability of flooding across the site from the tributary of the Roman River. As part of this assessment, a range of probability events should be compared to determine impact of climate change on the risk of flooding at this location.<br><br><u>Site Layout and Design</u><br>The majority of the site is defined as Flood Zone 1, low probability of flooding from the ordinary watercourse, and therefore it should be possible to steer new development towards areas within Flood Zone 1. More vulnerable development (i.e. hotel development) should be avoided in |

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| | areas defined as Flood Zone 3a. The drainage strategy for the new development must be considered early in the site planning process to ensure adequate inclusion of SuDS, and retrofitting of SuDS where possible. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).<br><br><u>Set-back Distance</u><br>In the southern part of the site, development must be set back at least 8m from the Roman River (main river). The Environment Agency will need to be consulted and an Environmental Permit obtained for any works within 8m of the watercourse.<br>All development should be set back from the ordinary watercourses. Essex CC, as the LLFA, requires at least a 3m set back on one side of the watercourses to provide access for maintenance. Essex CC will need to be consulted and consent obtained for any proposed works that may impact flow within the channel of the watercourse.<br><br><u>Finished Floor Levels</u><br>If More Vulnerable hotel development cannot be avoided within the flood extent of the Roman River and its tributary for the 1% AEP event including climate change, finished floor levels should be set at least 300mm freeboard above the flood level for 1% AEP event including an appropriate allowance for climate change. In this case, for More Vulnerable development in Flood Zone 3a, the higher central (35%) climate change allowance should be used and tested against the upper (65%) climate change allowance also.<br><br><u>Access / Egress</u><br>It is assumed that access to the site is provided to the west and the north, via Maldon Road (B1022). This route is located in Flood Zone 1 and will therefore |

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| | provide a safe dry access route to and from the site.<br><br><u>Floodplain Compensation</u><br>Land raising and any built development should be avoided within the floodplain of the ordinary watercourses and Roman River. Where alterations to the floodplain are proposed, compensatory floodplain storage will need to be provided on a level-for-level and volume-for-volume basis. The land used to provide compensation storage will need to be in hydraulic connectivity with the existing floodplain, but not already part of the floodplain.<br><br><u>Emergency Planning</u><br>The site is not shown to be within an Environment Agency Flood Warning Area. Due to the proximity to the watercourses, flood response planning should be considered by the zoo management, as part of their emergency planning procedures. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes. While zoo uses are not classed as a 'more vulnerable' use some of the proposed ancillary uses i.e. a Hotel is. However in flood zone 1 this is considered compatible with NPPF/ PPG. |
| **Conclusion –** Built development should avoid the areas at greatest risk from surface water flooding in the vicinity of the Roman River valley. Subject to the above recommendations/mitigations being implemented the Sequential and Exception Tests are passed<br>**Recommendation: Allocate the site** | |

## East Colchester / Hythe Special Policy Area

**Sites proposed for residential allocation in East Colchester/Hythe Special Policy Area in flood zone 1 at low risk form surface water flooding and or within a CDA.**

Port Lane within CDA 02 (EC3) – 130 dwellings
Barrington and Bourne Road CDA 02 (EC3) – 28 dwellings
Magdalen Street Sites within CDA 03
Hythe Gasworks site CDAO2 (EC2)

**Sites proposed for residential allocation in East Colchester/Hythe Special Policy Area subject to SFRA Level 2 assessment**

| |
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| **Name of site Derelict Depot Hythe Station Road and River Colne (EC2 Hythe Special Policy Area)** |
| **Preferred use Residential 800 dwellings across whole policy area** |
| **Flood Zone Map** |

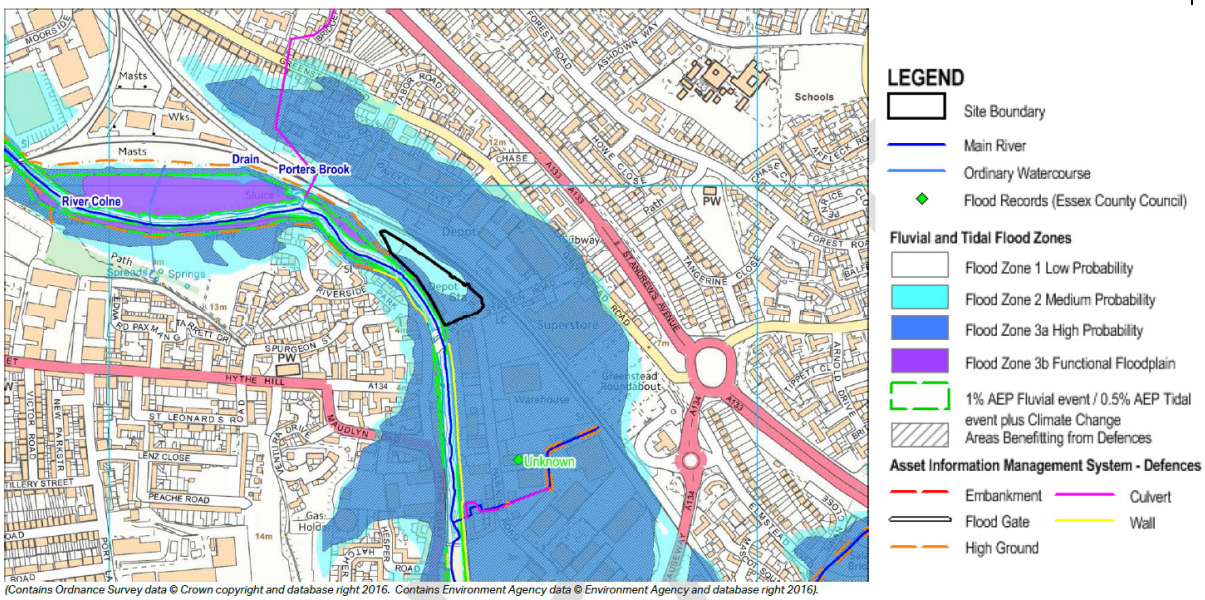




**Figure A Modelled Flood Extents**

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| **Surface Water Flood Map** |

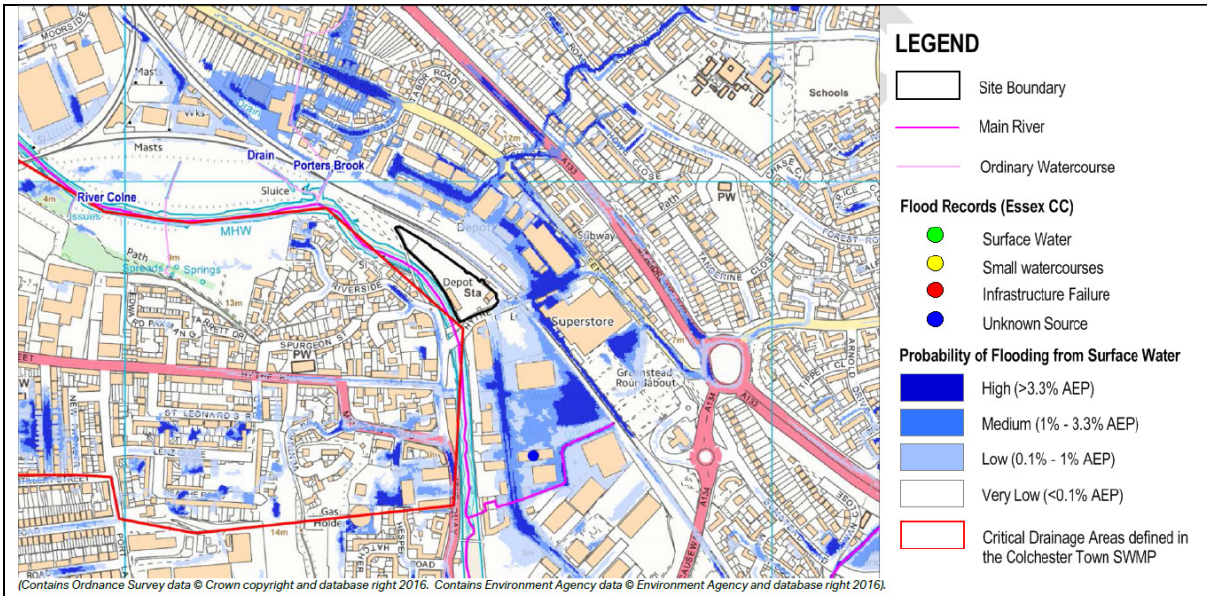


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**Figure C Risk of Flooding from Surface Water (RoFSW)**

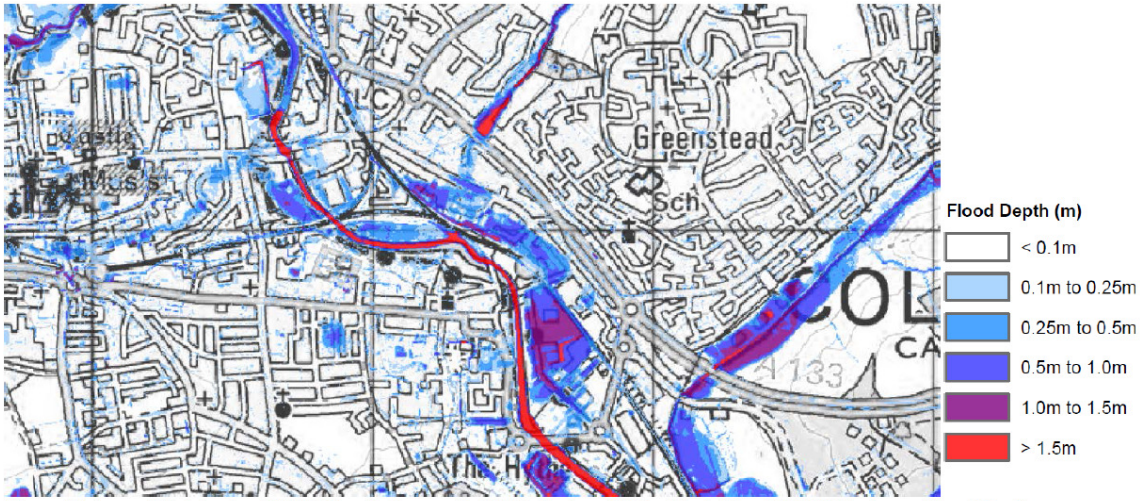


**Figure D Town of Colchester SWMP (Capita Symonds 2013), Surface Water Modelling 1% AEP Maximum Flood Depth**

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| **Site flood zone** | The River Colne flows from north to south along the western edge of the site in open channel. At this location the River Colne is tidally influenced. Approximately half of the site is identified as Flood Zone 2, and the remaining half as Flood Zone 3, high probability of flooding associated with the River Colne. The site is shown to benefit from the presence of defences. |
| **Is there an alternative reasonably available site in flood zone 1?** | No |
| **Is there an alternative reasonably available site in flood zone 2?** | No - approximately half of this site falls within flood zone 2. |

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| **Does the site lie in the functional floodplain (zone 3b)?** | No. The site is located adjacent to, but not within, the functional floodplain associated with the River Colne. |
| **Is the site at risk from Surface water flooding?** | The area in which the site is located is at a very low risk of surface water flooding |
| **Is the site at area at risk from groundwater flooding?** | The site is located within a 1km square of which 25-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area is therefore generally considered to be low. This will need to be confirmed during site investigation survey. |
| **Is the area at risk in the event of a failure of a reservoir?** | The floodplain of the River Colne including the site, is at risk of inundation in the event of a failure of the Ardleigh, Abberton Central and Western Arm and Abberton Reservoirs however given the regularity of monitoring, flooding from reservoirs is considered a managed risk. |
| **Is the area at risk in the event of a failure of the Colne Barrier?** | The site is protected by the Colne Barrier at Wivenhoe, which closes during extreme tidal events. A model simulation has been completed to determine the residual risk to the site in the event there is a failure of the Barrier to close. Results for the 0.5% AEP event including an allowance for climate change (2115) show that flood depths on the site would be 0.1-1.0m, corresponding to a hazard rating of Significant (danger for most people). Potential access / egress routes for the site would experience greater depths of flooding, up to 2.0m. |
| **Is the site within a Critical Drainage area?** | Yes the site is located within CDA 03 |
| **SFRA comments** | <u>Site specific recommendations</u>:<br><br>The site layout should be carefully planned to ensure that new development does not result in increased runoff to neighbouring areas.<br><br><u>Site Layout and Design</u><br>Residential development should be steered towards areas defined as Flood Zone 2 away from the edge of the River Colne. |

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| | The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).<br><br>The site is in close proximity to the Colchester Town Centre CDA; opportunities should be sought for the development to contribute to the proposed scheme for surface water management in this area and Essex CC should be consulted to confirm the current status of this work. A summary of the initial preferred option for the CDA, as set out in the SWMP, is provided in Section 4 of this Report.<br><br><u>Set-back Distance</u><br>All development should be set back 16m from the edge of the River Colne. The Environment Agency will need to be consulted and an Environmental Permit obtained for any works within 16m of the watercourse.<br><br><u>Finished Floor Levels</u><br>The Environment Agency will seek Finished Floor Levels for new development set 300mm above the 0.5% AEP flood level including an allowance for climate change. The modelled flood level in the event of a failure of the Colne Barrier during the 0.5% AEP flood event including climate change to 2115 in this location is 4.6mAOD. Based on LiDAR topographic survey, the ground levels across the site vary between approximately 3.5-4.3mAOD.<br><br><u>Access / Egress</u><br>Safe dry access to and from the site should be provided where possible, and this is likely to be provided to the east of the site via Hythe Station Road and Greenstead Road. When considering the residual risk to the site, flood depths of up to 2m are modelled to occur along this route, corresponding to a |

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| | hazard rating of Significant (danger to most). It will therefore be necessary to include provision of a place of safe refuge for residents of the residential development above the 1 in 1000 annual probability flood level with an allowance for climate change.<br><br><u>Emergency Planning</u><br>The site is shown to be within an Environment Agency Flood Warning Area for the Tidal Colne upstream of the Colne Barrier; residents should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the Colne Barrier, Flood Response Plans should be prepared by residents of the site including details of egress routes and place to safe refuge. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes. Residential development is classed as a 'more vulnerable' use in the PPG. Proposals for residential development in flood zone 2 and or 3 are required to pass both the Sequential Test and both parts of the Exceptions Test. There is no reasonably available land in flood zone 1 in East Colchester/ Hythe Special Policy Area. It has been demonstrated that this site can satisfy both the Sequential and Exception Tests. Allocating this site for development will contribute positively to the continuing regeneration of East Colchester which has been on-going since 2001. New development will be responsive to the historic character of the East Colchester/Hythe and reinforce the Conservation Area by reusing heritage assets and will also delver new green infrastructure including new areas of open space and for public enjoyment. |
| **Conclusion -** Built development should be directed to land in flood zone 2 and away from the River Colne. As the site falls within the CDA03 development proposals will be required to contribute towards flood risk solutions, in accordance with Flood Risk Management policy DM23 and SWMP recommendations for CDA 03. Based on the strategic assessment of flood risk and subject to the recommendations for mitigation measures set out above being implemented, the Sequential and Exceptions Tests are passed.<br>**Recommendation: Allocate the site.** | |

**Name of site – Commercial land in Haven Road and River Colne (Hythe Special Policy Area)**

**Preferred use - Residential 800 dwellings across whole policy area**

## Flood Zone Map

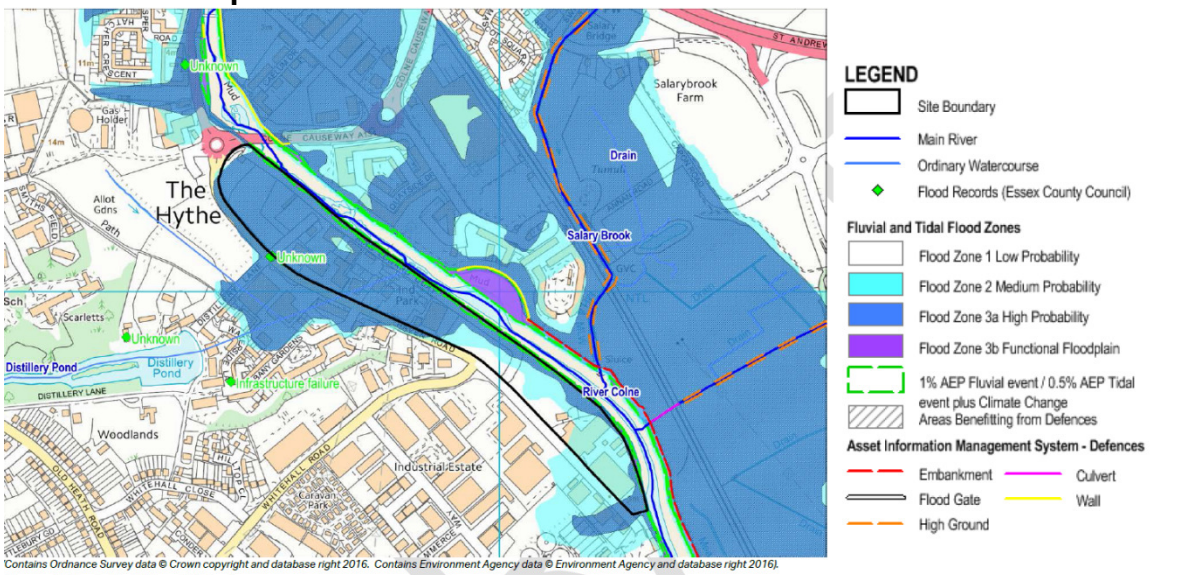
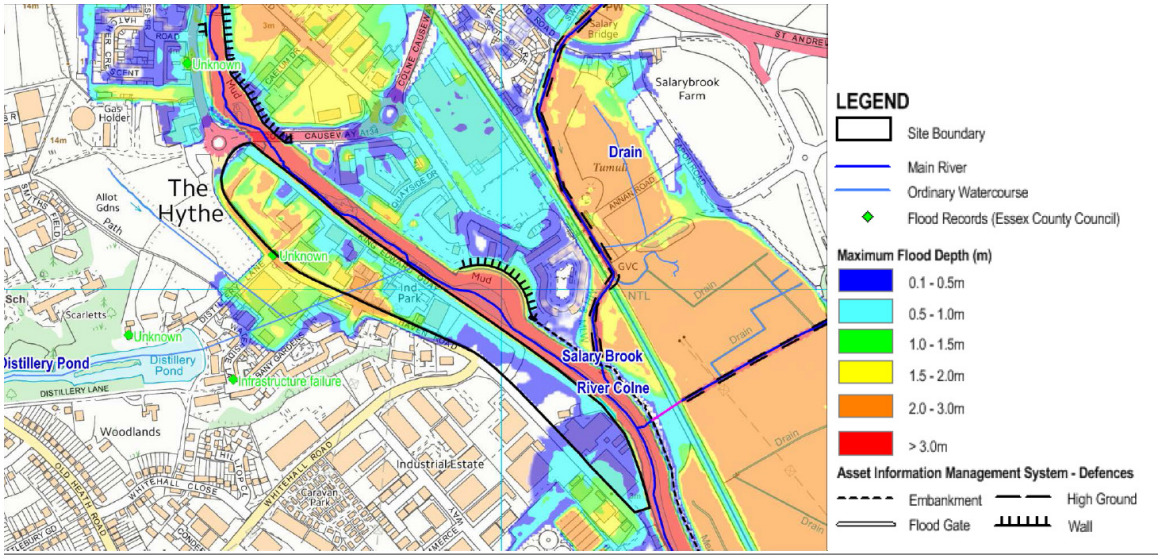





**Figure A Modelled Flood Extents**




## Surface Water Flood Map

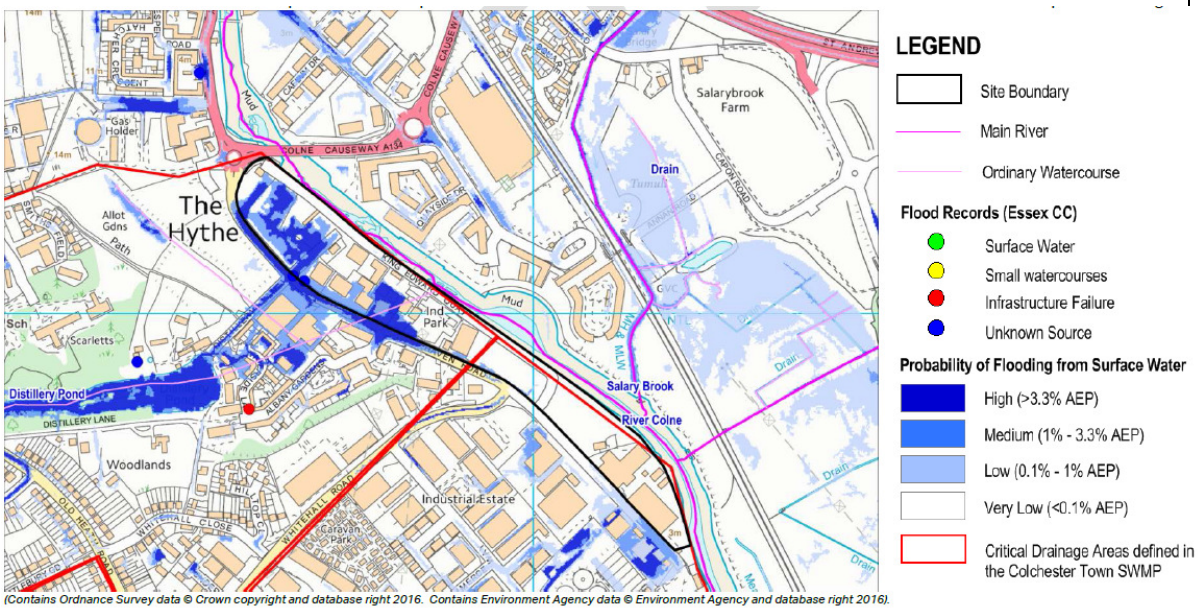




**Figure C Risk of Flooding from Surface Water (RoFSW)**

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| **Site flood zone** | The River Colne flows from north to south along the eastern edge of the site in open channel. At this location the River Colne is tidally influenced. The large majority of the site (70%) is identified as Flood Zone 3a high probability of flooding and the remaining part as Flood Zone 2 and 1. The site is shown to benefit from the presence of defences including the Colne Barrier. |
| **Is there an alternative reasonably available site in flood zone 1?** | No |
| **Is there an alternative reasonably available site in flood zone 2?** | No – 22% of this site falls within flood zone 2. |
| **Does the site lie in the functional floodplain (zone 3b)?** | The site is not located with the functional floodplain associated with the River Colne. |
| **Is the site at risk from Surface water flooding?** | Parts of the site and local area are at high risk of surface water flooding during which flood depths of 300-900mm could be experienced on the site. The SWMP modelling identifies the potential for depths of 1-1.5m on the site during the 1% AEP event. |
| **Is the site at area at risk from groundwater flooding?** | The AStGWF mapping shows that the site is located within 1km squares of which 25-50% are susceptible to groundwater emergence. The risk of groundwater flooding in this area is therefore generally |

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| | considered to be low. This will need to be confirmed during site investigation survey. |
| **Is the area at risk in the event of a failure of a reservoir?** | The floodplain of the River Colne including the site, is at risk of inundation in the event of a failure of the Ardleigh, Abberton Central and Western Arm and Abberton Reservoirs however given the regularity of monitoring, flooding from reservoirs is considered to be a managed risk. |
| **Is the area at risk in the event of a failure of the Colne Barrier?** | The site is protected by the presence of the Colne Barrier at Wivenhoe, which closes during extreme tidal events. A model simulation has been completed to determine the residual risk to the site in the event there is a failure of the Barrier to close. Results for the 0.5% AEP event including an allowance for climate change show that flood depths on the site vary between 0.1-1.0 in the southern part of the site, with greater depths of up to 1.5-3.0m in the north western part. The hazard rating across the site is predominantly Significant (danger for most people), with some areas of Extreme (danger for all). |
| **Is the site within a Critical Drainage area?** | Yes – The site lies within Critical Drainage Areas CDA01 and CDA 02 |
| **SFRA comments** | <u>Site specific recommendations</u><br><br><u>Set-back Distance</u><br>All development should be set back 16m from the edge of the River Colne. The Environment Agency will need to be consulted and an Environmental Permit obtained for any works within 16m of the watercourse.<br><br><u>Site Layout and Design</u><br>Residential development should be preferentially located in the south eastern part of the site which is defined as Flood Zone 2. Lower vulnerability uses forming part of the development scheme such as landscaped open space could be provided in those areas defined as Flood Zone 3a and Extreme hazard (with respect to residual tidal flood risk) in the northern part of the site. The drainage strategy for the site |

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| | must be considered early in the site planning process to ensure adequate inclusion of SuDS. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The site is within The Hythe CDA; opportunities should be sought for the development to contribute to the proposed scheme for surface water management in this area and Essex CC should be consulted to confirm the current status of this work. A summary of the initial preferred option for the CDA, as set out in the SWMP, is provided in Section 4 of this Report.<br><br><u>Finished Floor Levels</u><br>At this location upstream of the Colne Barrier, the Environment Agency will seek Finished Floor Levels for new development set 300mm above the 0.5% AEP flood level including an allowance for climate change. The modelled flood level in the event of a failure of the Colne Barrier during the 0.5% AEP flood event including climate change to 2115 in this location is 4.6mAOD. Based on LiDAR topographic survey, the ground levels across the site vary between approximately 3.5-5mAOD.<br><br><u>Access / Egress</u><br>Where possible safe dry access to and from the site should be provided. The site is located on the edge of the floodplain and therefore an egress route away from the site into an area of lower flood risk should be achievable along Whitehall Road. Given the residual risk to the site, resulting in hazard ratings of Significant and Extreme across the site, safe egress from the site may not be possible. Safe refuge should therefore be provided, via internal access, at a level above the 0.1% AEP flood level including an allowance for climate change, which is 5.2mAOD in this location.<br><br><u>Emergency Planning</u><br>The site is shown to be within an Environment Agency Flood Warning Area |

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| | for the Tidal River Colne upstream of the Colne Barrier; residents should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the Colne Barrier, Flood Response Plans should be prepared by residents of the site. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes. Residential development is classed as a 'more vulnerable use in the PPG. Proposals for residential development in flood zone 2 and or 3 are required to pass both Sequential Test and both parts of the Exceptions Test. There are no reasonably available land in flood zone 1 in East Colchester/ Hythe Special Policy Area. It has been demonstrated that this site can satisfy both the Sequential and Exception Tests. Allocating this site for development will contribute positively to the continuing regeneration of East Colchester which has been on-going since 2001. New development will be responsive to the historic character of the East Colchester/Hythe and reinforce the Conservation Area by reusing heritage assets and will also delver new green infrastructure including new areas of open space and for public enjoyment. |
| **Conclusion -** Built development should be directed to flood zones 1 and 2 first then to land in flood zone 3. The key issue for the proposed site is the surface water flood risk posed to the site itself and access/egress route along Haven Road and Distillery Lane. Development should also avoid areas at highest risk of surface water/ groundwater flooding. As the site falls within the CDA03 development proposals will be required to contribute towards flood risk solutions, in accordance with Flood Risk Management policy DM23 and SWMP recommendations for CDA 03. There are already known reoccurring flooding issues along Haven Road. Risk management authorities and developers will be required to work together to deliver a solution for the flooding on Haven Road and Distillery Lane as part of the allocation of this site. Based on the strategic assessment of flood risk and subject to the recommendations and mitigation measures set out above being implemented, the Sequential and Exceptions Tests are passed.<br>**Recommendation: Allocate the site** | |

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| **Name of site- Scrapyard site, off Haven Road, Hythe Quay (EC2 Hythe Special Policy Area)** |

**Preferred use – Residential 800 dwellings across whole policy area**

**Flood Zone Map**

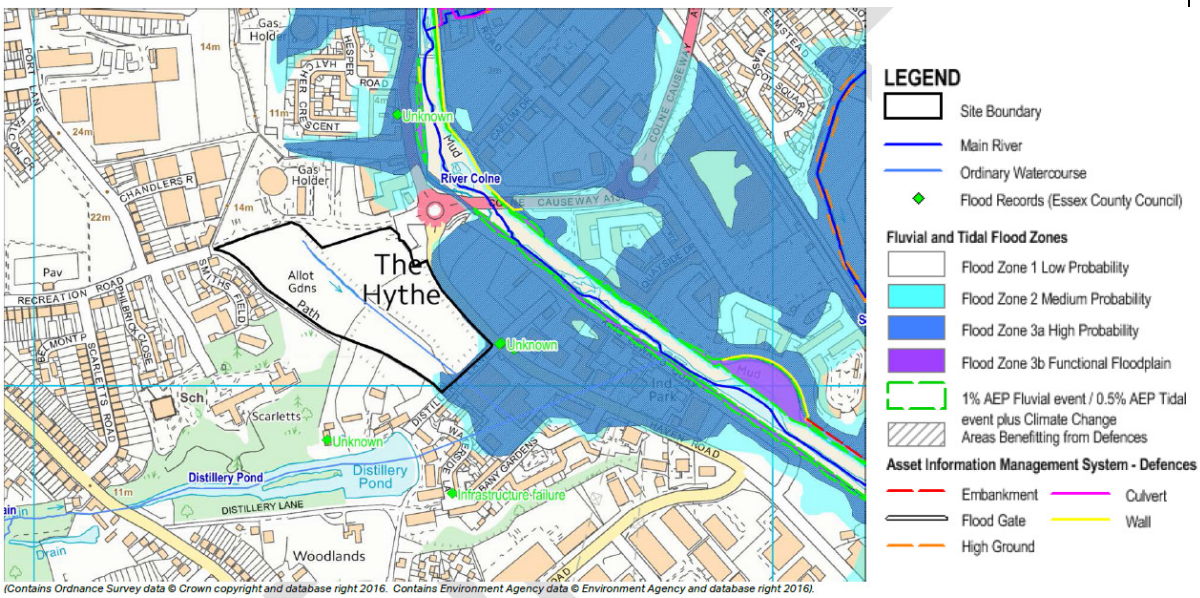
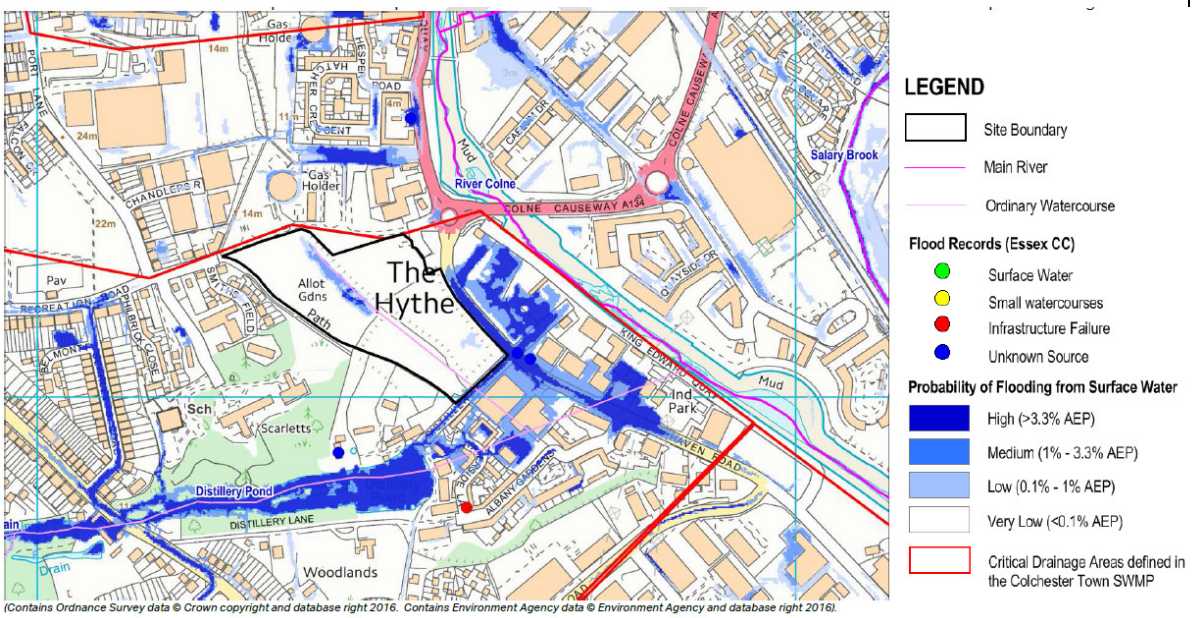





**Figure A Modelled Flood Extents**

**Surface Water Flood Map**



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| **Site flood zone** | The large majority of the site (97%) is identified as Flood Zone 1 low probability of flooding associated with the River Colne; the southern fringe of the site is identified as Flood Zones 2 and 3a and is shown to benefit from the presence of |

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| | defences. An ordinary watercourse passes through the centre of the site; there are no modelled flood zones for this watercourse. The River Colne flows from north to south in open channel approximately 150m to the east of the site. At this location the River Colne is tidally influenced. |
| **Is there an alternative reasonably available site in flood zone 1?** | No |
| **Is there an alternative reasonably available site in flood zone 2?** | No |
| **Does the site lie in the functional floodplain (zone 3b)?** | The site is not located within the functional floodplain associated with the River Colne. |
| **Is the site at risk from Surface water flooding?** | The RoFSW mapping indicates that the majority of the site is at very low risk of surface water flooding. There is some ponding adjacent to the ordinary watercourse that flows through the site, which is also shown in the SWMP modelling. |
| **Is the site at area at risk from groundwater flooding?** | The AStGWF mapping shows that the site is located within 1km squares of which 25-50% are susceptible to groundwater emergence. The risk of groundwater flooding in this area is therefore generally considered to be low. This will need to be confirmed during site investigation surveys. |
| **Is the area at risk in the event of a failure of a reservoir?** | The 'Risk of Flooding from Reservoirs' mapping shows that the floodplain of the River Colne including the southern fringe of the site, is at risk of inundation in the event of a failure of the following reservoirs: Abberton Central & Western Arm and Abberton.<br>Given the fact that reservoirs are regularly inspected, flooding from reservoirs is considered a managed risk. |
| **Is the area at risk in the event of a failure of the Colne Barrier?** | The southern fringe of the site and the surrounding area is protected by the presence of the Colne Barrier at Wivenhoe, which closes during extreme tidal events. A model simulation has been completed to determine the residual risk to |

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| | the site in the event there is a failure of the Barrier to close. Results for the 0.5% AEP event including an allowance for climate change show that flood depths on the southern fringe of the site could reach up to 1.5m, corresponding to a hazard rating of Significant (danger for most people). |
| **Is the site within a Critical Drainage area?** | Yes – the site lies within the Hythe CDA 02 |
| **SFRA comments** | There are known reoccurring flooding issues in this location. The suitability of allocating this site in the Colchester BC Site Allocations rests on the ability of the risk management authorities to work together to deliver a solution for the flooding on Haven Road and Distillery Lane.<br><br><u>Fluvial Modelling</u><br>As part of a site specific FRA for this site, a simple hydraulic model should be developed to more accurately determine the probability of flooding across the site from the ordinary watercourse that passes through the site. As part of this assessment, a range of probability events should be compared to determine impact of climate change on the risk of flooding at this location.<br><br><u>Site Layout and Design</u><br>Residential development should be avoided in areas within the 1% AEP flood extent of the ordinary watercourse (as defined from the preparation of a simple hydraulic model), and instead lower vulnerability uses including landscaped open space should be located here. The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The site is within The Hythe CDA; opportunities should be sought for the development to contribute to the proposed scheme for surface water |

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| | management in this area and Essex CC should be consulted to confirm the current status of this work. A summary of the initial preferred option for the CDA, as set out in the SWMP, is provided in Section 4 of this Report.<br><br><u>Set-back Distance</u><br>A 3m wide set-back distance should be retained on at least one side of the ordinary watercourse to provide access for maintenance. Essex CC, as the LLFA, will need to be consulted and consent obtained for any proposed works that may impact flow within the channel of the water course.<br><br><u>Finished Floor Levels</u><br>If residential development cannot be avoided within the flood extent for the 1% AEP event including climate change associated with the ordinary watercourse, finished floor levels should be set at least 300mm freeboard above the flood level for 1% AEP event including an appropriate allowance for climate change. In this case, for More Vulnerable development in Flood Zone 3a, the higher central (35%) climate change allowance should be used.<br>At this location upstream of the Barrier, the Environment Agency will also seek Finished Floor Levels for new development set 300mm above the 0.5% AEP flood level including an allowance for climate change for tidal flooding associated with the River Colne. The modelled flood level in the event of a failure of the Colne Barrier during the 0.5% AEP flood event including climate change to 2115 in this location is 4.6mAOD. Based on LiDAR topographic survey, the ground levels across the southern fringe of the site vary between approximately 3-4.4mAOD.<br><br><u>Access / Egress</u><br>Safe dry access to and from the site should be provided. The current access |

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| | for the site is along Distillery Lane and Haven Road. This area is susceptible to significant surface water flooding problems. This route is also at residual risk of flooding in the event of breach of the Colne Barrier, with hazard ratings of Extreme and Significant (during the 0.5% AEP event including climate change). Assessment of alternative access/egress routes should be made in order to determine whether this site can deliver development that is safe for its lifetime and thereby satisfy the requirements of the Exception Test.<br><br><u>Emergency Planning</u><br>The site is not shown to be within an Environment Agency Flood Warning Area; it is strongly recommended that occupants of the site should register to receive the warning service for the Tidal River Colne upstream of the Colne Barrier given that proximity to the River Colne and the risk posed to the potential access/egress route for the site. To manage the residual risk of flooding to the egress route associated with a failure of the Colne Barrier, Flood Response Plans should be prepared by residents of the site. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes. The proposed development entails 'more vulnerable residential development principally in flood zone 1 which is considered compatible with the with the NPPF in the PPG. Allocating this site for development will contribute positively to the continuing regeneration of East Colchester which has been on-going since 2001. New development will be responsive to the historic character of the East Colchester/Hythe and reinforce the Conservation Area by reusing heritage assets and will also delver new green infrastructure including new areas of open space and for public enjoyment. |
| **Conclusion –** There are known reoccurring flooding issues in this location. The suitability of allocating this site. Built development should be confined to the land in flood zone 1. A key issue for the proposed site is the surface water flood risk, (and the residual tidal flood risk), posed to the existing access/egress route along Haven Road and Distillery Lane. Development should avoid the parts of the site at risk from | |

surface water flooding. As the site falls within CDA O2 proposals will be required to contribute towards flood risk solutions, in accordance with Flood Risk Management policy DM23 and SWMP recommendations for CDA 02. Risk management authorities and developers will be required to work together to deliver a solution for the flooding on Haven Road and Distillery Lane as part of the allocation of this site. Based upon the strategic review of the flood risk posed to the site, and the implementation of site specific recommendations and mitigation set out above, the sequential and Exception Tests are passed.
**Recommendation: Allocate the site.**

**Name of site – Land between River Colne and Hythe Quay (EC2 Hythe Special Policy Area)**

**Preferred use – Residential 800 dwellings across whole policy area**

**Flood Zone Map**

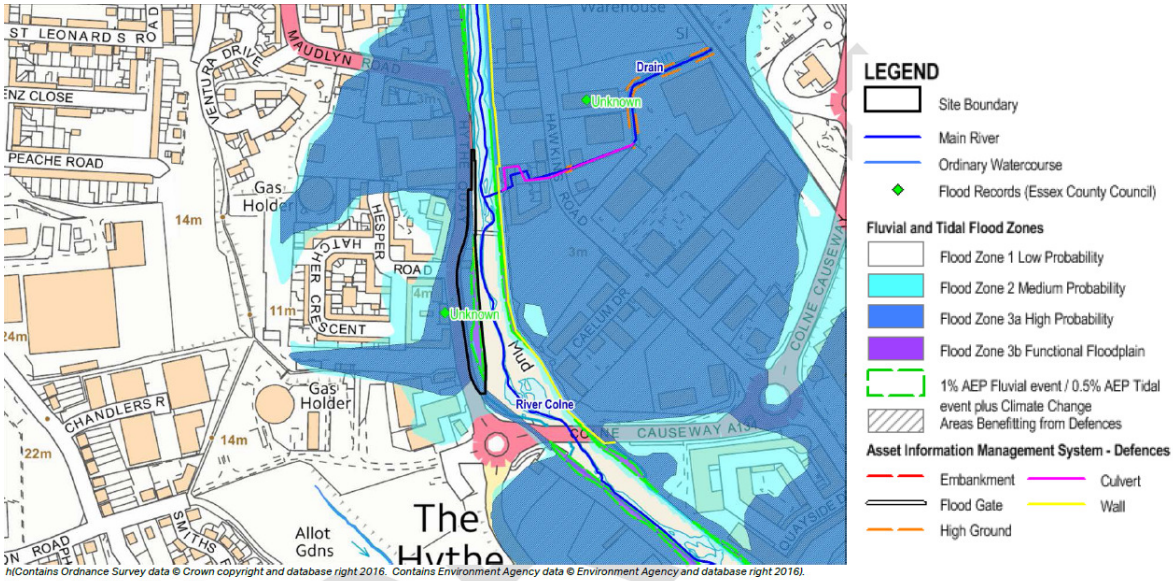


**Figure A Modelled Flood Extents**

**Surface Water Flood Map**

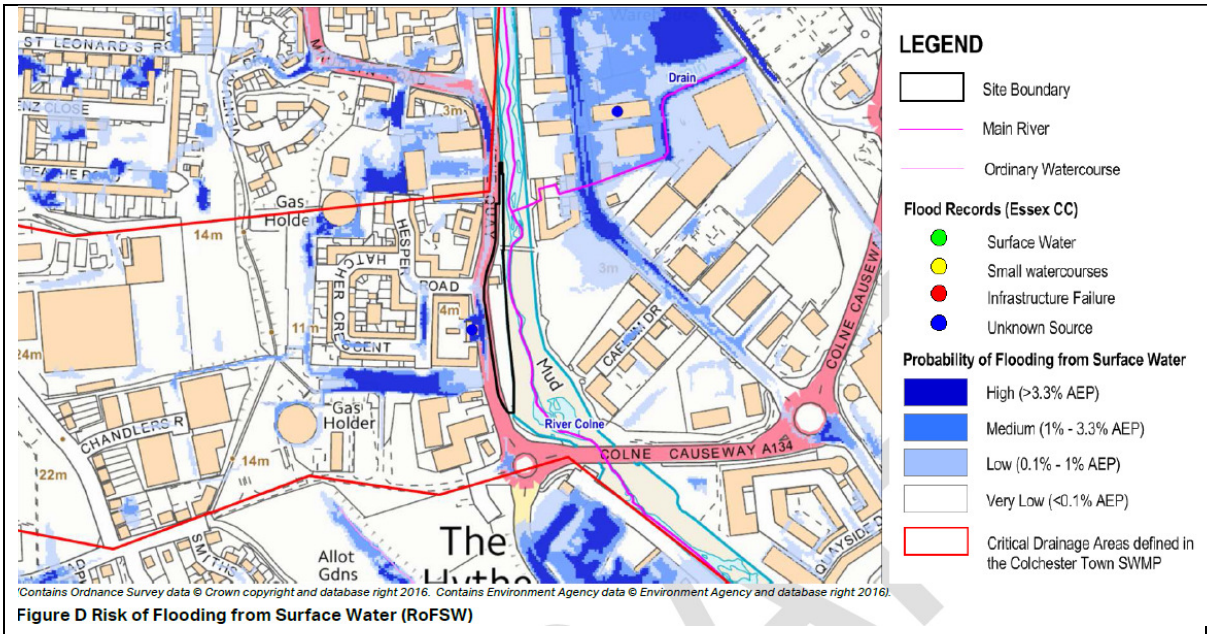



**Figure D Risk of Flooding from Surface Water (RoFSW)**

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| **Site flood zone** | The majority of the site (82%) is identified as Flood Zone 3a with a high probability of flooding associated with the River Colne. This area of Flood Zone 3a is shown to benefit from the presence of defences. |
| **Is there an alternative reasonably available site in flood zone 1?** | No |
| **Is there an alternative reasonably available site in flood zone 2?** | No |
| **Does the site lie in the functional floodplain (zone 3b)?** | Yes - The eastern strip (18%) of the site is defined as Flood Zone 3b functional floodplain. Modelling of the Colne and Blackwater Estuary shows that the eastern edge of the site, which is located in the floodplain, is at risk of flooding during the 0.5% AEP flood event including an allowance for climate change, but water does not come out of bank and impact the rest of the site. |
| **Is the site at risk from Surface water flooding?** | Yes - The SWMP modelling indicates that the site is at risk of surface water ponding, with flood depths of up to 1m adjacent to the River Colne. |
| **Is the site at area at risk from groundwater flooding?** | The AStGWF mapping) shows that the site is located within a 1km square of which 25-50% is susceptible to groundwater emergence. The risk of |

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| | groundwater flooding in this area is therefore generally considered to be low. This will need to be confirmed during site investigation survey. |
| **Is the area at risk in the event of a failure of a reservoir?** | The 'Risk of Flooding from Reservoirs' mapping shows that the floodplain of the River Colne including the site, is at risk of inundation in the event of a failure of: Ardleigh, Abberton Central and Western Arm and Abberton Reservoirs however given the regular inspection of flooding is considered a managed risk. |
| **Is the area at risk in the event of a failure of the Colne Barrier?** | The site is protected by the presence of the Colne Barrier at Wivenhoe, which closes during extreme tidal events. A model simulation has been completed to determine the residual risk to the site in the event there is a failure of the Barrier to close. Results for the 0.5% AEP event including an allowance for climate change show that flood depths on the site could reach up to 1.5m or greater, corresponding to a hazard rating of Significant (danger for most people) increasing to Extreme (danger for all). |
| **Is the site within a Critical Drainage area?** | Yes . The site falls within CDA 03. To the south of the site, there are reoccurring flooding problems along Haven Road and Distillery Lane. Colchester BC has undertaken a Flood Investigation in this area. Haven Road is low lying, and is at risk of tidal flooding. During heavy rainfall conditions surface water outfalls become tide locked, exacerbating the problem. In addition, Distillery Pond, located to the south west of the site, drains a large upstream catchment, and the outlet for this pond is considered to be inadequate, thereby resulting in additional surface water reaching the Haven Road area. Actions resulting from the study are still undergoing review by the relevant risk management authorities. |
| **SFRA comments** | <u>Site specific recommendations</u><br><br><u>Site Layout and Design</u><br>The site is very narrow and the hazard rating across the site is fairly uniform and |

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| | therefore there is little scope to apply the sequential approach within the site. Development should be set as far back from the River Colne as possible. The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).<br><br><u>Set-back Distance</u><br>All development should be set back 16m from the tidal River Colne. The Environment Agency will need to be consulted and an Environmental Permit obtained for any works within 16m of the river.<br><br><u>Finished Floor Levels</u><br>At this location upstream of the Barrier, the Environment Agency will seek Finished Floor Levels for new development set 300mm above the 0.5% AEP flood level including an allowance for climate change. The modelled flood level in the event of a failure of the Colne Barrier during the 0.5% AEP flood event including climate change to 2115 in this location is 4.6mAOD. The LiDAR data suggests ground levels on the site vary between 2-4mAOD. Depending on the precise ground levels on the site, this may be more effectively delivered by providing habitable accommodation at first floor level and above, with lower vulnerability uses (for example car parking) at ground level.<br><br><u>Access / Egress</u><br>Safe access to and from the site should be provided. The access for the site along the A134 Hythe Quay is not shown to be at risk during the 0.5% AEP event including an allowance for the climate change. However, the route is shown to be at residual risk in the event of a failure of the Colne Barrier with hazard rating of Significant. It is therefore necessary to |

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| | consider the provision of safe refuge for any proposed development on this site. Safe refuge should therefore be provided, via internal access, at a level above the extreme flood level.<br><br><u>Emergency Planning</u><br>The site is within the Environment Agency Flood Warning Area for the Tidal River Colne upstream of the Colne Barrier; occupants of the site must register to receive the warning service given the proximity to the River Colne and the risk posed to the potential access/egress route for the site. To manage the residual risk of flooding to the egress route associated with a failure of the Colne Barrier, Flood Response Plans should be prepared by residents of the site which should include details of places of safe refuge. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes. Residential development is classed as a 'more vulnerable use in the PPG. Proposals for residential development in flood zone 2 and or 3 are required to pass both Sequential Test and both parts of the Exceptions Test. There are no reasonably available land in flood zone 1 or 2 in East Colchester/ Hythe Special Policy Area. It has been demonstrated that this site can satisfy both the Sequential and Exception Tests. Allocating this site for development will contribute positively to the continuing regeneration of East Colchester which has been on-going since 2001. New development will be responsive to the historic character of the East Colchester/Hythe and reinforce the Conservation Area by reusing heritage assets and will also delver new green infrastructure including new areas of open space and for public enjoyment. |
| **Conclusion -** Built development should be confined to the flood zone 3a and be set back from the river as far as possible to avoid the river frontage and functional flood plain. As there are reoccurring flooding problems along Haven Road and Distillery Lane, risk management authorities and developers will be required to work together to deliver a solution for the flooding on Haven Road and Distillery Lane as part of the allocation of this site. | |

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| Based upon the strategic review of the flood risk posed to the site, and the implementation of site specific recommendations and mitigation set out above, the Sequential and Exception Tests are passed.<br>**Recommendation: Allocate the site.** |

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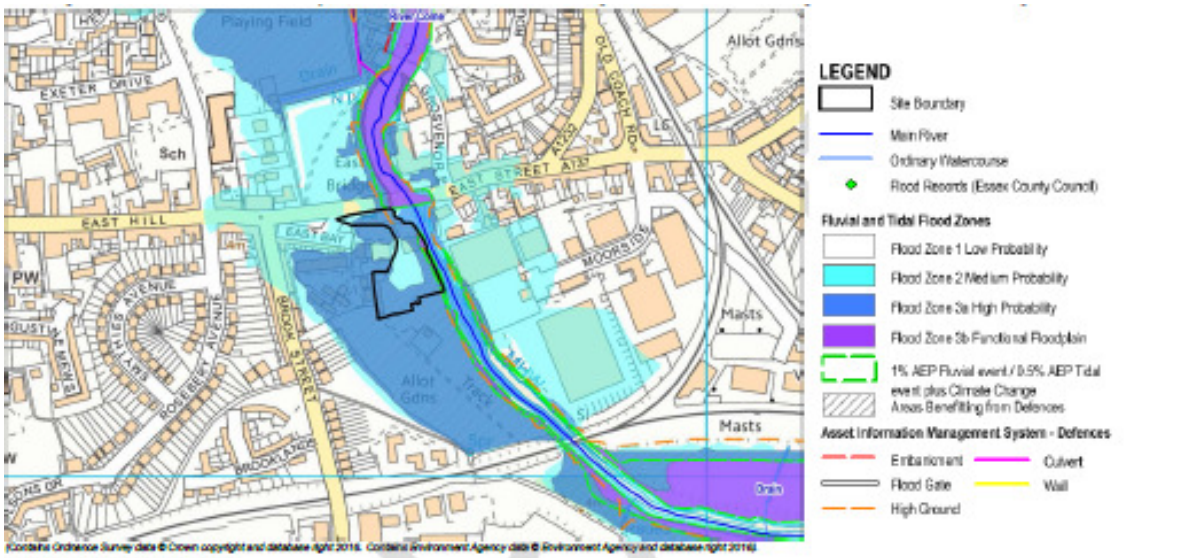
| **Name of site – East Bay Mill (EC3)** |
| **Preferred use residential (up to 22 dwellings)** |
| **Flood Zone Map**<br>  <br><br>Figure A Modelled Flood Extents |
| **Surface Water Flood Map** |

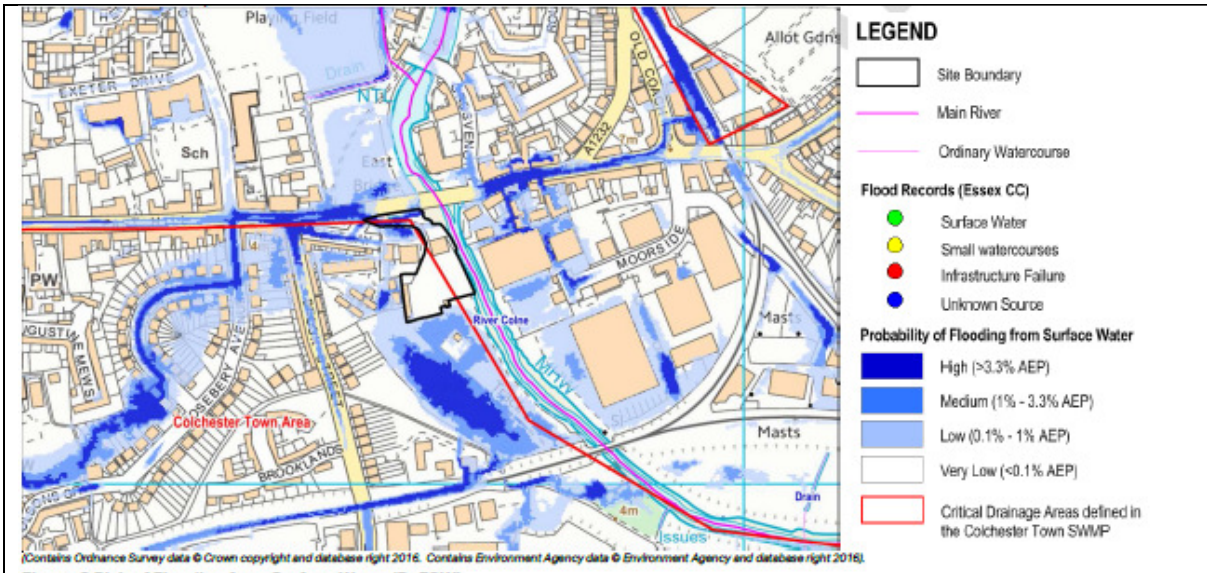
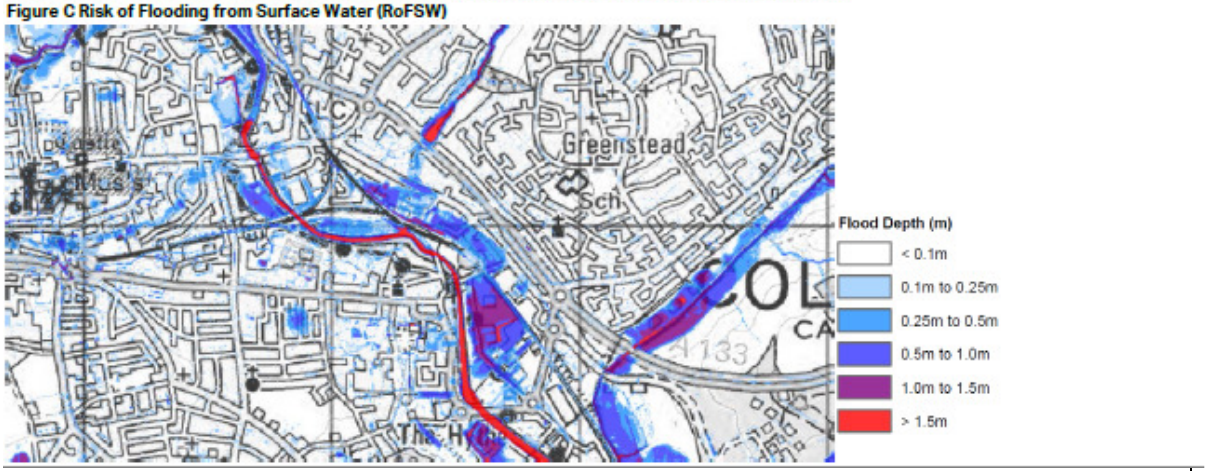



**Figure C Risk of Flooding from Surface Water (RoFSW)**

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| **Site flood zone** | 70% of this site falls within flood zone 3a. |
| **Is there an alternative reasonably available site in flood zone 1?** | No |
| **Is there an alternative reasonably available site in flood zone 2?** | No. 30% of this site falls within flood zone 2 |
| **Does the site lie in the functional floodplain (zone 3b)?** | No |
| **Surface water flood risk** | The RoFSW mapping indicates that parts of the area in which the site is located are at high risk of flooding (>3.3% AEP). The SWMP modelling identifies that the north of the site is at risk of surface water flooding up to 0.5m during the 1% AEP |

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| | event. To the south and north of the site there are areas shown to be at risk of flooding up to 1m during the 1% AEP modelled event. |
| **Is the site at risk from ground water flooding?** | Risk generally considered low. |
| **Is the site at risk from failure of a reservoir** | The 'Risk of Flooding from Reservoirs' mapping shows that the floodplain of the River Colne including the site, is at risk of inundation in the event of a failure of the Ardleigh, Abberton Central and Western Arm and Abberton Reservoirs. Given the fact that these are regularly inspected flooding from reservoirs is considered to be a managed risk. |
| **Is site within a Critical Drainage Area?** | The western part of the site falls within the Colchester Town Centre CDA. Opportunities should be sought for the development to contribute to the proposed scheme for surface water management in the CDA. |
| **SFRA comments** | <u>Site specific recommendations</u><br><br>The site layout should be carefully planned to ensure that residential dwellings are not placed at surface water flood risk, and that the position of any new development does not divert the flow path to a neighbouring area.<br><br><u>Set-back Distance</u><br>All development should be set back 16m from the edge of the River Colne. The Environment Agency will need to be consulted and an Environmental Permit obtained for any works within 16m of the watercourse.<br><br><u>Site Layout and Design</u><br>The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering |

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| | infiltration measures first wherever possible).<br><br>The site is within the Colchester Town Centre CDA; opportunities should be sought for the development to contribute to the proposed scheme for surface water management in this area and Essex CC should be consulted to confirm the current status of this work. A summary of the initial preferred option for the CDA, as set out in the SWMP, is provided in Section 4 of this Report. Given the residual flood risk posed to the site, it may be prudent to consider residential accommodation at first floor level and above.<br><br><u>Finished Floor Levels</u><br>At this location upstream of the Barrier, the Environment Agency will seek Finished Floor Levels for new development set 300mm above the 0.5% AEP flood level including an allowance for climate change. The modelled flood level in the event of a failure of the Colne Barrier during the 0.5% AEP flood event including climate change to 2115 in this location is 4.6mAOD. Based on LiDAR topographic survey, the ground levels across the site vary between approximately 3-4.2mAOD.<br><br><u>Access / Egress</u><br>Safe dry access to and from the site should be provided where possible, and this is likely to be provided to the north of the site via East Street. When considering the residual risk to the site, flood depths of up to 2m are modelled to occur along this route, corresponding to a hazard rating of Significant (danger to most). It will therefore be necessary to include provision of a place of safe refuge for residents of the residential development which is located above the extreme flood level with climate change and is internally accessible.<br><br><u>Emergency Planning</u> |

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| | The site is shown to be within an Environment Agency Flood Warning Area for the Tidal Colne upstream of the Colne Barrier; residents should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the Colne Barrier, Flood Response Plans should be prepared by residents of the site including details of egress routes and place to safe refuge. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes – the developed proposed is appropriate in flood zones 2 or 3 provided that the Sequential and Exceptions Tests can be satisfied which in this case they can. Developing this site will result in the restoration of a fire damaged mill which is listed. The proposed development will also continue the regeneration of this part of East Colchester/Hythe that has been ongoing since 2001. |
| **Conclusion** Built development should be directed to flood zone 2 land first then land in flood zone 3. Given the residual flood risk posed to the site, it may be prudent to consider residential accommodation at first floor level and above. Built development should be set back from the edge of the River Colne. As the site falls within CDA proposals will be required to contribute towards flood risk solutions, in accordance with Flood Risk Management policy DM23 and SWMP recommendations for CDA. Based on the strategic assessment of flood risk and subject to the above recommendations/mitigations being implemented the Sequential and Exception Tests are passed.<br>**Recommendations: Allocate the site.** | |

| Name of site – Essex University Employment Zone |
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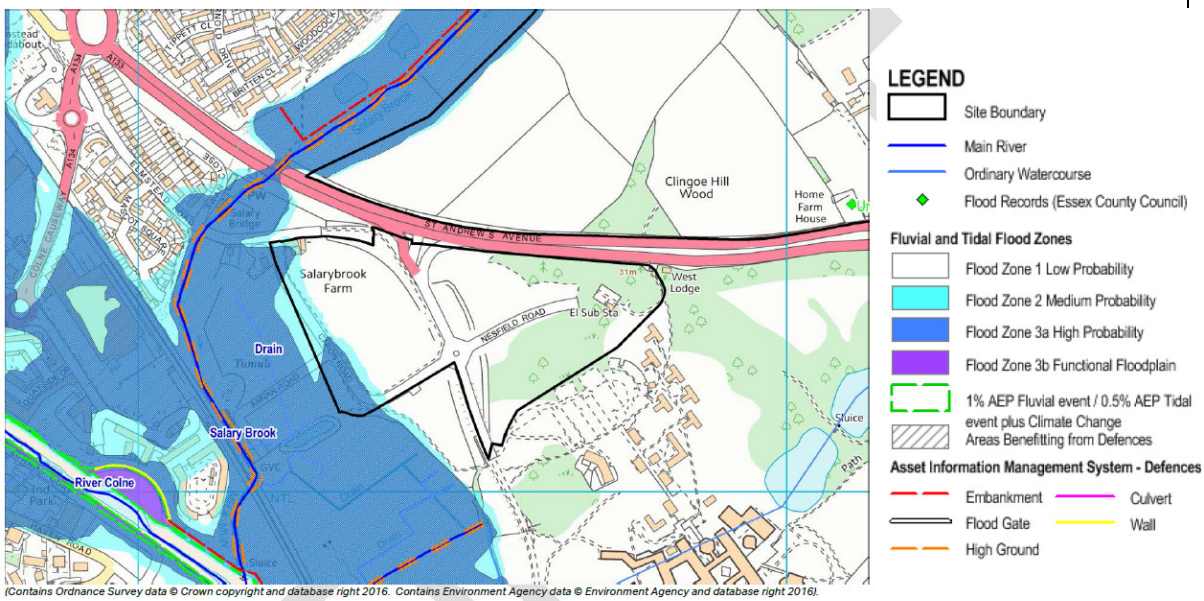
| **Preferred use – Employment** |
| **Flood Zone Map**<br>  <br><br>*(Contains Ordnance Survey data © Crown copyright and database right 2016. Contains Environment Agency data © Environment Agency and database right 2016).*<br>**Figure A Modelled Flood Extents** |
| **Surface Water Flood Map** |

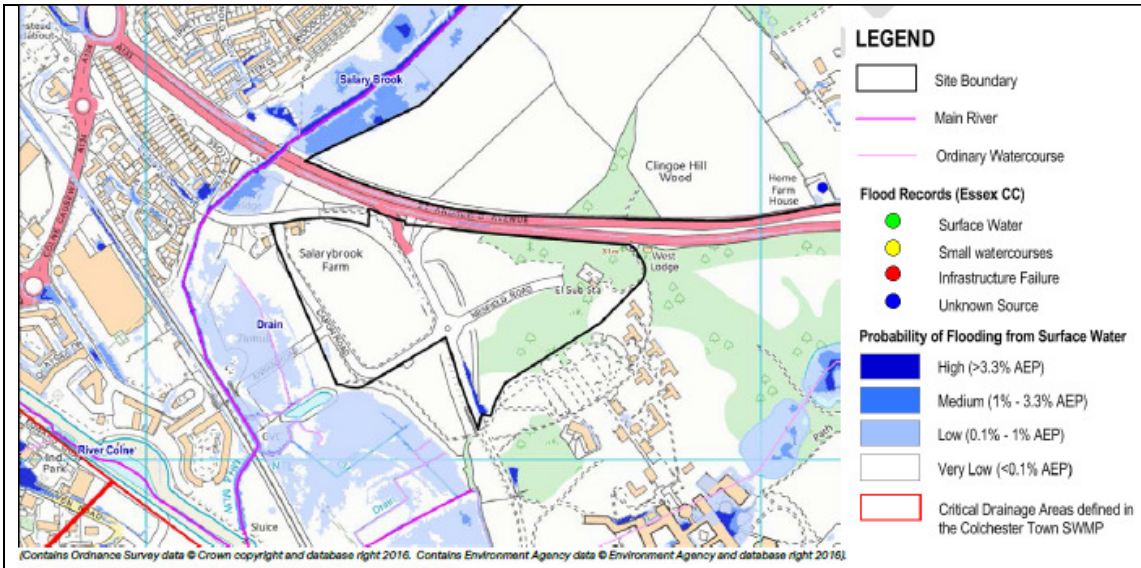
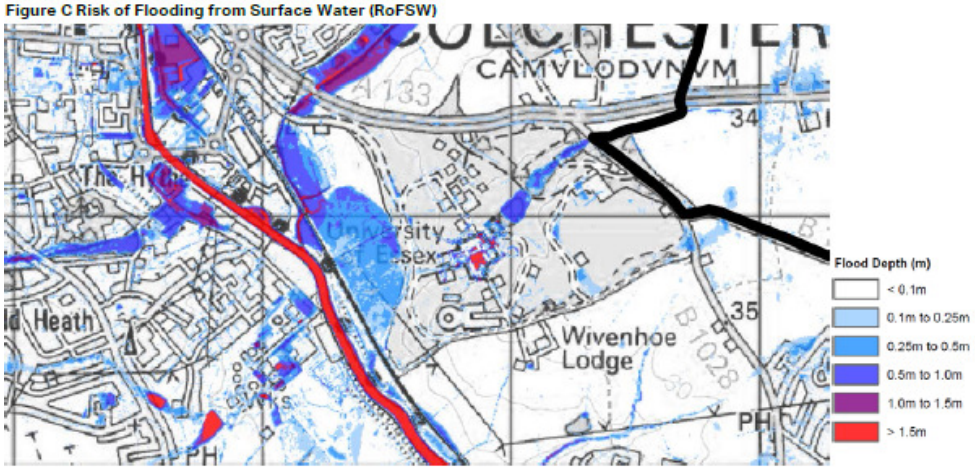



Figure C Risk of Flooding from Surface Water (RoFSW)

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| **Site flood zone** | The majority of the site 84% is located in flood zone 1, 11% in Flood Zone 2 and 5 % in Flood Zone 3a. Salary Brook flows from north to south round the north west edge of the site, and joins the River Colne approximately 450m to the south of the site. The Salary Brook is a designated main river in this location, and the AIMS dataset identifies the presence of high ground either side of the watercourse in this area. The Colne Barrier is located approximately 3.5km downstream at Wivenhoe and provides protection when water levels are forecast to rise greater than 3.2mAOD |
| **Is there an alternative reasonably available site in flood zone 1?** | Yes but 84% of this site falls within flood zone 1. |

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| **Is there an alternative reasonably available site in flood zone 2?** | Yes but only 11% of this site falls within flood zone 2 |
| **Does the site lie in the functional floodplain (zone 3b)?** | The current modelling of Salary Brook did not include a scenario to delineate the functional floodplain. Outputs for Flood Zone 3b functional floodplain are not currently available for this watercourse. Further modelling is required |
| **Is the site at risk from Surface water flooding?** | The majority of the site is at very low risk of surface water flooding. |
| **Is the site at area at risk from groundwater flooding?** | The AStGWF mapping shows that the site is located within 1km squares, less than 25% of which and 25-50% of which are susceptible to groundwater emergence. The risk of groundwater flooding in this area is therefore generally considered to be low. This will need to be confirmed during site investigation survey. |
| **Is the area at risk in the event of a failure of a reservoir?** | The 'Risk of Flooding from Reservoirs' mapping shows that the floodplains of the River Colne and Salary Brook, which flow adjacent to the site, are at risk of inundation in the event of a failure of the following reservoirs: Ardleigh , Abberton Central and Western Arm and Abberton. Given that reservoirs are regularly inspected, flooding from reservoirs is considered a managed risk. |
| **Is the area at risk in the event of a failure of the Colne Barrier?** | The site is protected by the presence of the Colne Barrier at Wivenhoe, which closes during extreme tidal events. A model simulation has been completed to determine the residual risk to the site in the event there is a failure of the Barrier to close. Results for the 0.5% AEP event including an allowance for climate change show that flood depths on the western fringe of the site could reach up to 1.5m, corresponding to a hazard rating of Significant (danger for most people). |
| **Is the site within a Critical Drainage area?** | No |

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| **SFRA comments** | Site Specific Recommendations<br><br>Fluvial Modelling<br>As part of a site specific FRA for this site, a simple hydraulic model may need to be developed for the Salary Brook, to more accurately determine the probability of flooding across the site and to inform appropriate finished floor levels for any proposed More Vulnerable development. As part of this assessment, a range of probability events should be compared to determine impact of climate change on the risk of flooding at this location.<br><br>Site Layout and Design<br>In accordance with the sequential approach, development should be steered away from those areas identified as Flood Zone 3a. The drainage strategy for the new elements of the site should be considered early in the site planning process to ensure adequate inclusion of SuDS. New development on this site is likely to be delivered in phases, however it will be important that SuDS design is considered at a strategic scale for the entire development area, to maximise the effectiveness of the strategy. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).<br><br>Finished Floor Levels<br>For any new More Vulnerable (e.g. residential development) that may be proposed within the floodplain of the Salary Brook, finished floor levels should be set at least 300mm freeboard above the flood level for 1% AEP event including an appropriate allowance for climate change. In this case, for More Vulnerable development in Flood Zone 3a, the higher central (35%) climate change allowance should be used and tested against the upper (65%) climate change allowance also.<br><br>Access / Egress |

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| | Safe dry access to and from the site should be provided, and this should be achievable via St Andrews Avenue (A133), to the north of the site. This route is not shown to be at residual risk of tidal flooding in the event of a breach of the Colne Barrier.<br><br><u>Emergency Planning</u><br>The western fringe of the site is within the Environment Agency Flood Warning Area for the Tidal River Colne upstream of the Colne Barrier. Occupants of the site may wish to register to receive the warning service given the proximity to the tidal River Colne and the risk posed to the local area. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes. The proposed development entails 'More Vulnerable' development in the NPPF but as the majority of this site falls within flood zone 1, the proposed use is considered compatible with the NPPF. Essex University is a major employer and asset within Colchester. The allocation of this site will help meet the objective to expand and grow the Knowledge Gateway as per policy EC1. The growth of the Knowledge Gateway will help meet the objective in the Tendring Colchester Border Garden Community to deliver high quality jobs. |
| **Conclusion –** Built development should be directed to land in flood zone 1 first then within flood zone 2. Build development should avoid land in flood zone 3. This land should be used for the delivery of SuDS or open space provision. Based on the strategic assessment of flood risk and subject to the recommendations for mitigation measures set out above being implemented, the Sequential and Exception Tests are passed.<br>**Recommendation: Allocate the site** | |

## Garden Communities

| Name of site - Colchester Braintree Borders Garden Community |
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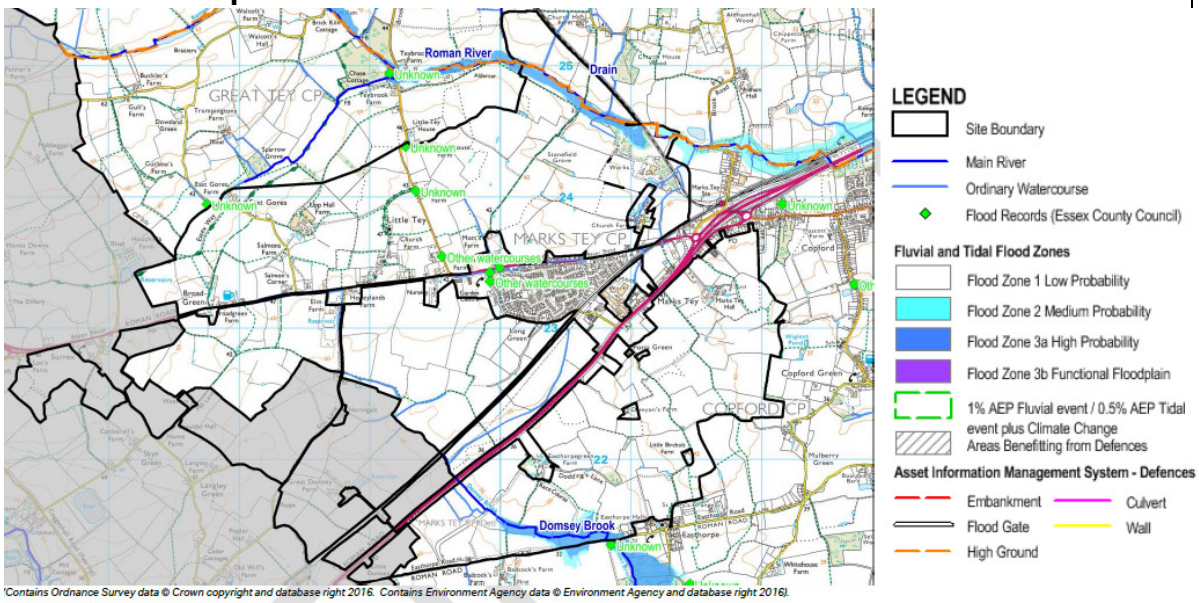
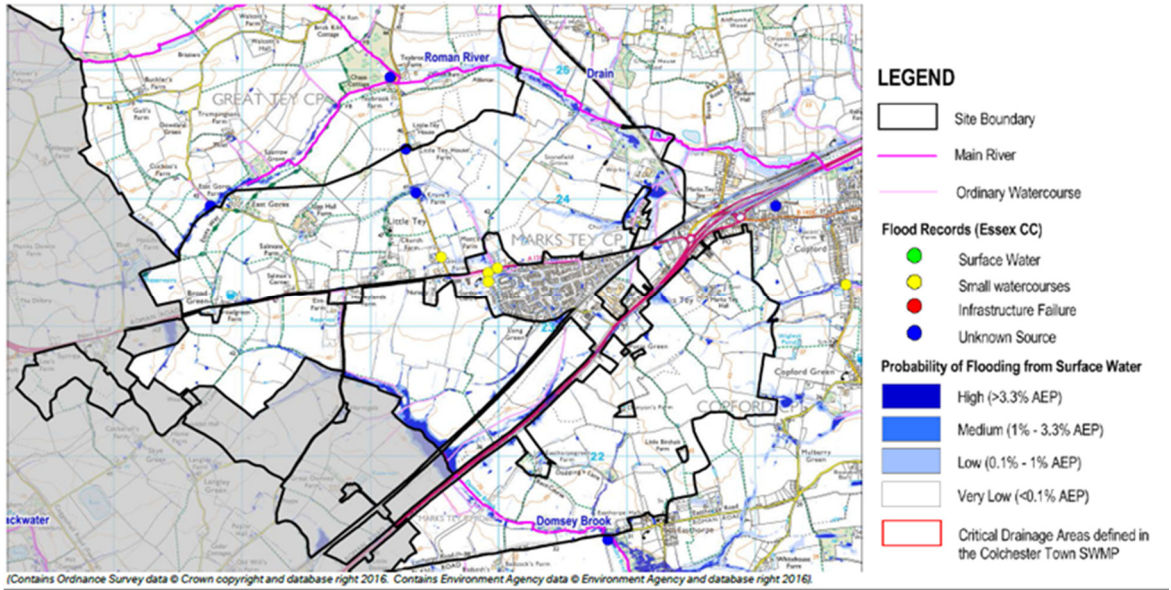
| **Preferred use - Garden Community (SP9) - 1350 dwellings** |
| **Flood Zone Map**<br>  <br><br>*(Contains Ordnance Survey data © Crown copyright and database right 2016. Contains Environment Agency data © Environment Agency and database right 2016).*<br>**Figure A Modelled Flood Extents** |
| **Surface Water Flood Map**<br>  <br><br>*(Contains Ordnance Survey data © Crown copyright and database right 2016. Contains Environment Agency data © Environment Agency and database right 2016).* |

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| **Site flood zone** | The majority of the proposed Garden Community, 94%, is located in Flood Zone |

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| | 1, and it has a low probability of flooding from fluvial watercourses. |
| **Is there an alternative reasonably available site in flood zone 1?** | Yes but the majority of the land to be allocated falls within flood zone 1 |
| **Is there an alternative reasonably available site in flood zone 2?** | Only 3% of this site falls within flood zone 2 and built development will be steered towards the land at lowest risk of flooding first. |
| **Does the site lie in the functional floodplain (zone 3b)?** | Flood modelling of the Roman River and Domsey Brook in this location is derived from high level JFLOW modelling, and therefore outputs for Flood Zone 3b functional. Floodplain are not available for this watercourse. Further modelling is required. |
| **Is the site at risk from Surface water flooding?** | The RoFSW mapping indicates that the floodplain of the Domsey Brook and smaller watercourses are susceptible to the ponding of surface water, and some of these areas are at high risk of surface water flooding |
| **Is the site at area at risk from groundwater flooding?** | The risk of groundwater flooding in this area is considered to be low.<br>The northern, southern, and eastern parts of the area are within 1km squares in which <25% or 25-50% may be susceptible to groundwater emergence. |
| **Is the area at risk in the event of a failure of a reservoir?** | This area is not at risk of inundation in the event of a failure of a reservoir |
| **Is the area at risk in the event of a failure of the Colne Barrier?** | No |
| **Is the site within a Critical Drainage area?** | No |
| **SFRA comments** | Site specific recommendations<br><br>The management of surface water throughout the entire Garden Settlement area should be considered early in the master planning process to ensure that adequate provision is made, taking into account the impact of climate change on the frequency and intensity of future rainfall events. |

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| | The site layout should be carefully planned to ensure that new development is not placed at surface water flood risk, and not contribute to diversion of flow paths and/or increased flood risk to neighbouring and/or downstream areas.<br><br><u>Fluvial Modelling</u><br>As part of a site specific FRA for this area, a simple hydraulic model should be developed to more accurately determine the probability of flooding from the Roman River and<br>Domsey Brook, and their contributing tributaries. As part of this assessment, a range of probability events should be compared to determine impact of climate change on the risk of flooding at this location.<br><br><u>Site Layout and Design</u><br>Residential development should be avoided in areas defined as Flood Zone 3a or 3b adjacent to the Roman River and Domsey Brook. The strategy for surface water management across the Garden Settlement area must be considered early in the site master planning process to ensure adequate inclusion of SuDS. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).<br><br><u>Set-back Distance</u><br>The Roman River and the Domsey Brook are main rivers, and therefore all development should be set back at least 8m from these watercourses. The Environment Agency will need to be consulted and an Environmental Permit obtained for any works within 8m of the watercourse. Essex CC, as the LLFA, requires at least a 3m set back on one side of ordinary watercourses to provide access for maintenance. Essex CC will need to be consulted and consent obtained for any proposed works that may |

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| | impact flow within the channel of the watercourse.<br><br><u>Finished Floor Levels</u><br>If residential development cannot be avoided within the flood extent for the 1% AEP event including climate change for any of the watercourses in the area, finished floor levels should be set at least 300mm freeboard above the flood level for 1% AEP event including an appropriate allowance for climate change. In this case, for More Vulnerable development in Flood Zone 3a, the higher central (35%) climate change allowance should be used and tested against the upper (65%) climate change allowance also.<br><br><u>Access / Egress</u><br>Safe dry access to and from new development should be provided. Given the general low risk of fluvial flooding through the area this should be achievable.<br><br><u>Floodplain Compensation</u><br>Land raising and any built development should be avoided within the floodplain. Where alterations to the floodplain are proposed, compensatory floodplain storage will need to be provided on a level-for-level and volume-for-volume basis. The land used to provide compensation storage will need to be in hydraulic connectivity with the existing floodplain, but not already part of the floodplain.<br><br><u>Emergency Planning</u><br>The site is not shown to be within an Environment Agency Flood Warning Area. Depending on the proximity of new development to the local watercourses, Flood Response Plans may need to be prepared by residents of the site. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes - as the majority of the land to be allocated falls within flood zone 1. The allocation of land for residential development for schools and hospitals which are classed as 'more vulnerable' are |

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| | considered compatible with the NPPF. Other proposals for economic growth, open space, as less vulnerable uses are also considered compatible uses in this flood zone. The Garden Community proposals will result in the delivery of a highly sustainable new settlement on the borders of Colchester and Braintree designed following the original Garden City principles. |
| **Conclusion –** Build development should be contained to flood zone 1 land and directed away from flood zone 2 and flood zone 3 land along the floodplain of The Roman River and Domsey Brook. This land should be used as part of the provision of a SuDS train through the site to help manage surface water. Based on the strategic assessment of flood risk and subject to the mitigation measures set out above being implemented the Sequential and Exception Tests are passed.<br>**Recommendation: Allocate the site** | |

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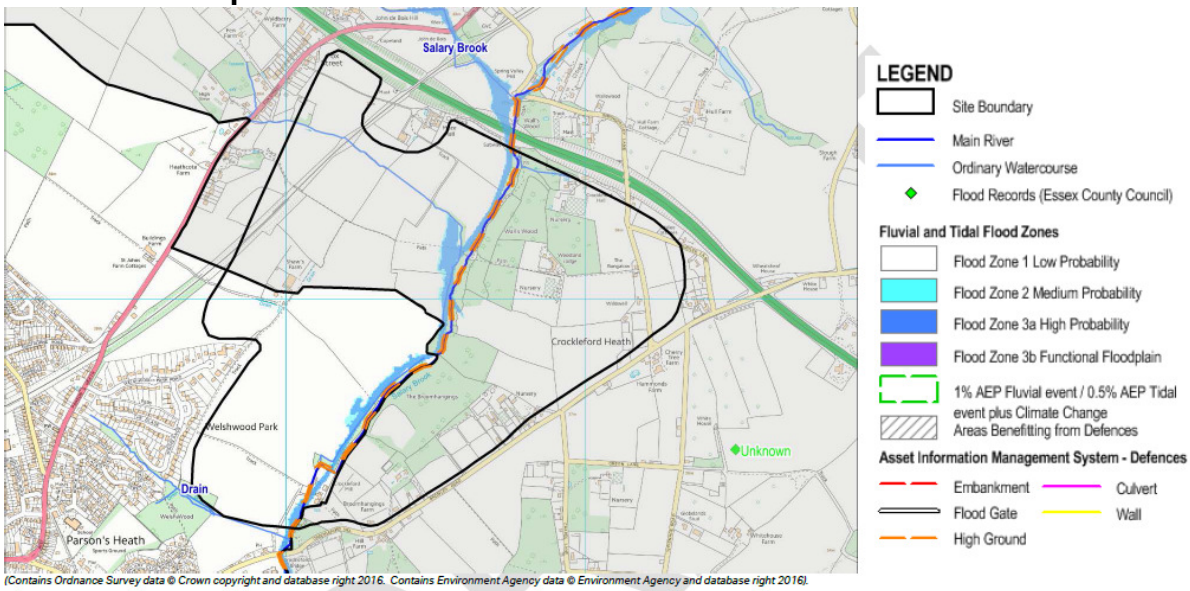
| **Name of site – Tendring Colchester Borders Garden Community** |
| **Preferred use - Garden Community (SP10) – 1250 dwellings** |
| **Flood Zone Map**<br>  <br>*(Contains Ordnance Survey data © Crown copyright and database right 2016. Contains Environment Agency data © Environment Agency and database right 2016).*<br>**Figure A Modelled Flood Extents** |

**Surface Water Flood Map**

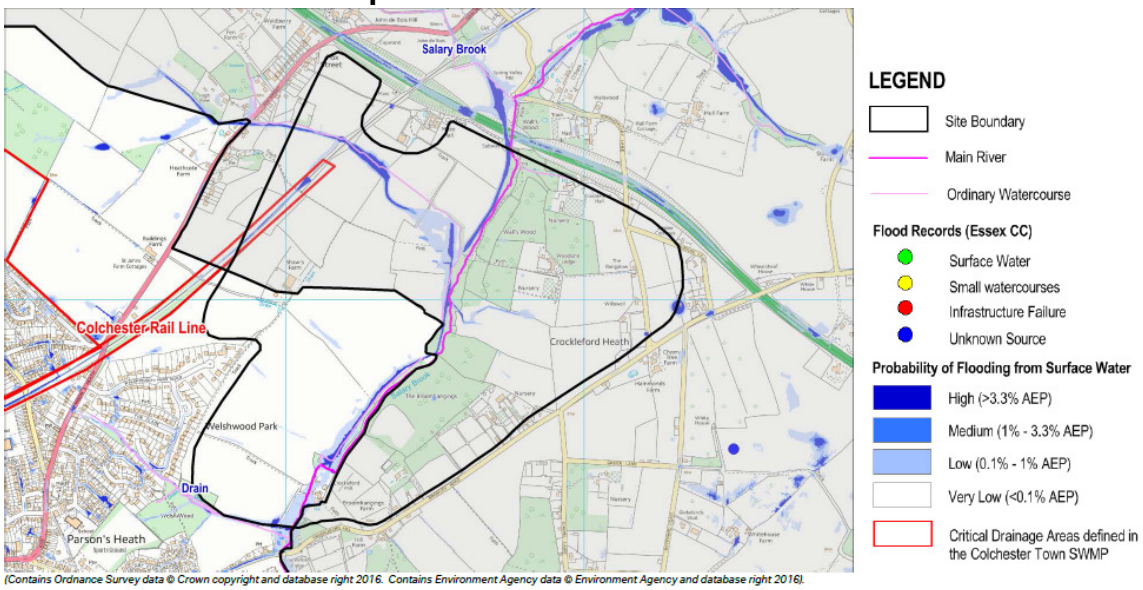





**Figure B Risk of Flooding from Surface Water (RoFSW)**

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| **Site flood zone** | The majority of the site (94%) falls within flood zone 1. 3% falls within flood zone 2 and 3% within flood zone 3a |
| **Is there an alternative reasonably available site in flood zone 1?** | Yes but the majority of the land falls within flood zone 1 and built development will be steered towards the land at lowest risk of flooding. |
| **Is there an alternative reasonably available site in flood zone 2?** | Yes but only 3 % of the site falls within flood zone and built development will be steered towards the land at lowest risk of flooding. |
| **Does the site lie in the functional floodplain (zone 3b)?** | Outputs for Flood Zone 3b functional floodplain are not currently available for this watercourse. Further modelling is required. |
| **Is the site at risk from Surface water flooding?** | The RoFSW mapping indicates that parts of the area are at high risk of surface water flooding (>3.3% AEP). These mainly correlate with the floodplain of the Salary Brook and contributing tributaries. |
| **Is the site at area at risk from groundwater flooding?** | The AStGWF mapping shows that the site is located across 1km squares of which none, or <25% is susceptible to groundwater emergence. The risk of groundwater flooding in this area is therefore generally considered to be low. This will need to be confirmed during site investigation survey. |

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| **Is the area at risk in the event of a failure of a reservoir?** | The floodplain of Salary Brook which passes through the site, is at risk of inundation in the event of a failure of the Ardleigh and Abberton Central and Western Arm and Abberton Reservoirs however given the regular inspection of these, flooding from reservoirs is considered a managed risk. |
| **Is the area at risk in the event of a failure of the Colne Barrier?** | N/A |
| **Is the site within a Critical Drainage area?** | Partially within the Colchester Rail Line CDA |
| **SFRA comments** | <u>Site specific recommendations</u><br><br>The management of surface water throughout the entire Garden Settlement area should be considered early in the master planning process to ensure that adequate provision is made, taking into account the impact of climate change on the frequency and intensity of future rainfall events.<br><br><u>Site design and layout</u><br>The site layout should be carefully planned to ensure that new development is not placed at surface water flood risk, and not contribute to increased flood risk to neighbouring and/or downstream flow paths and areas.<br><br><u>Fluvial Modelling</u><br>As part of a site specific FRA for this area, a simple hydraulic model should be developed to more accurately determine the probability of flooding from the Salary Brook and its contributing tributaries. As part of this assessment, a range of probability events should be compared to determine impact of climate change on the risk of flooding at this location.<br><br><u>Site Layout and Design</u><br>Residential development should be avoided in areas defined as Flood Zone 3a or 3b adjacent to the Salary Brook. The strategy for surface water management across the |

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| | Garden Settlement area must be considered early in the site master planning process to ensure adequate inclusion of SuDS. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).<br><br><u>Set-back Distance</u><br>The Salary Brook is a main river, and therefore all development should be set back at least 8m from these watercourses. The Environment Agency will need to be consulted and an Environmental Permit obtained for any works within 8m of the watercourse. Essex CC, as the LLFA, requires at least a 3m set back on one side of ordinary watercourses to provide access for maintenance. Essex CC will need to be consulted and consent obtained for any proposed works that may impact flow within the channel of the watercourse.<br><br><u>Finished Floor Levels</u><br>If residential development cannot be avoided within the flood extent for the 1% AEP event including climate change for any of the watercourses in the area, finished floor levels should be set at least 300mm freeboard above the flood level for 1% AEP event including an appropriate allowance for climate change. In this case, for More Vulnerable development in Flood Zone 3a, the higher central (35%) climate change allowance should be used and tested against the upper (65%) climate change allowance also.<br><br><u>Access / Egress</u><br>Safe dry access to and from new development should be provided. Given the general low risk of fluvial flooding through the area this should be achievable.<br><br><u>Floodplain Compensation</u><br>Land raising and any built development should be avoided within the floodplain. Where alterations to the floodplain are proposed, compensatory floodplain storage |

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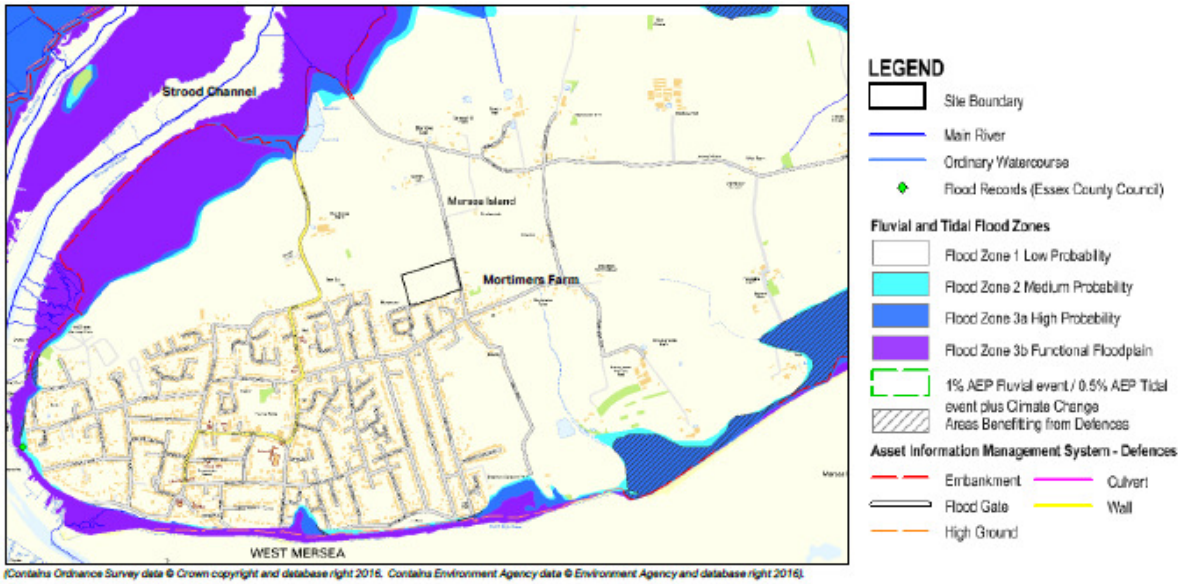
| | will need to be provided on a level-for-level and volume-for-volume basis. The land used to provide compensation storage will need to be in hydraulic connectivity with the existing floodplain, but not already part of the floodplain.<br><br><u>Emergency Planning</u><br>The site is not shown to be within an Environment Agency Flood Warning Area. Depending on the proximity of new development to the local watercourses, Flood Response. Plans may need to be prepared by residents of the site. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes - as the majority of the land to be allocated falls within flood zone 1. The allocation of land for residential development for schools and hospitals which are classed as 'more vulnerable' are considered compatible with the NPPF. Other proposals for economic growth, open space, as less vulnerable uses are also considered compatible uses in this flood zone. The Garden Community proposals will result to the delivery of a highly sustainable new settlement on the borders of Tendring and Colchester designed following the original Garden City principles. |
| **Conclusion –** Built development (particularly residential) should be contained to flood zone 1 and avoid land in areas defined as Flood Zone 3a or 3b adjacent to the Salary Brook and in areas susceptible to surface water flooding. This land could be used as part of the provision of a SuDS train through the site to help manage surface water. As the site partially falls within a CDA proposals will be required to contribute towards flood risk solutions, in accordance with Flood Risk Management policy DM23 and SWMP recommendations for the CDA. Based on the strategic assessment of flood risk and subject to the recommendations and mitigation measures set out above being implemented, the Sequential and Exceptions Test are passed.<br>**Recommendation: Allocate the site.** | |

**Sustainable Settlements**

**Sites proposed for residential allocation in Sustainable Settlements in flood zone 1 & at low risk form surface water flooding.**

Abberton and Langhanhoe – East & West Peldon Road (SS1) 55 dwellings
Boxted (SS2) 36 dwellings
Chappel and Wakes Colne – Swan Grove (SS3) – 30 dwellings
Copford - East of Queensberry Road & Hall Road (SS4) –120 dwellings
Fordham – Plummers Road (SS6) – 20 dwellings
Great Horkesley – Great Horkesley Manor and School Road (SS7) – 93 dwellings
Great Tey – Brook Road and Greenfield Drive (SS8) – 30 dwellings
Langham – Wick Road and School Lane (SS9) – 80 dwellings
Layer de la Haye – Great House Farm Road (SS10) – 35 dwellings

**Sites proposed for residential allocation in Sustainable Settlements subject to SFRA Level 2 assessment**

| **Name of site – Mersea Island (Dawes Lane) (SS12a)** |
|---|
| **Preferred use residential (100 dwellings)** |
| **Flood Risk Map**<br>  <br><br>*(Contains Ordnance Survey data © Crown copyright and database right 2016. Contains Environment Agency data © Environment Agency and database right 2016).*<br>**Figure A Modelled Flood Extents** |
| **Surface Water Flood Risk** |

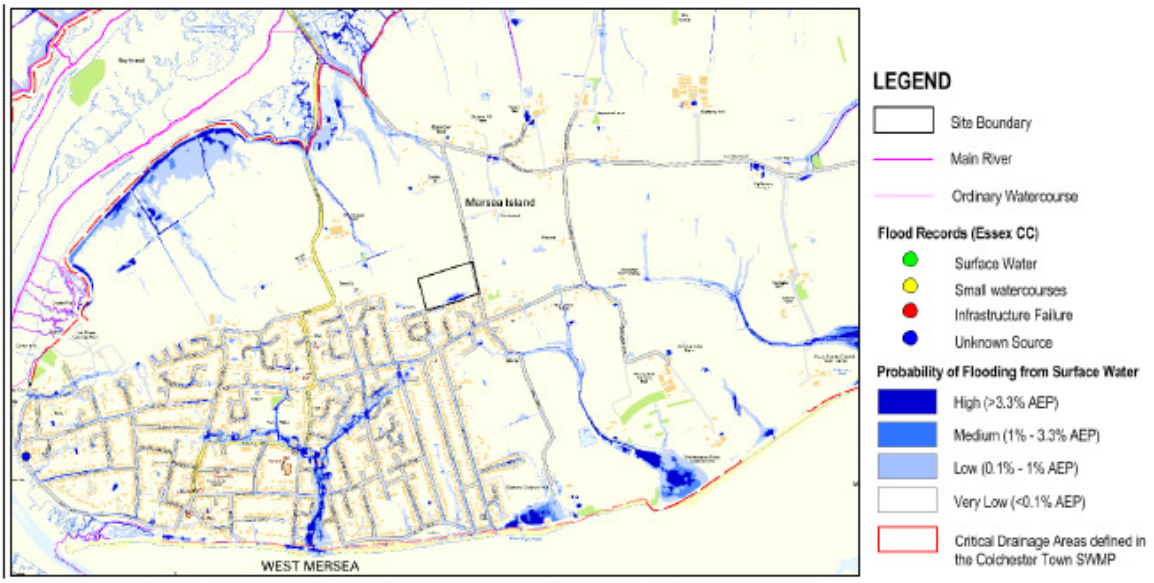





**Figure D Risk of Flooding from Surface Water (RoFSW)**

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| **Site flood zone** | The site is located entirely within Flood Zone 1 and is therefore currently considered to be at low risk of flooding. |
| **Is there an alternative reasonably available site in flood zone 1?** | N/A |
| **Is there an alternative reasonably available site in flood zone 2?** | N/A |
| **Does the site lie in the functional floodplain (zone 3b)?** | No |
| **Surface water flood risk** | Most of the site is at very low risk of surface water flooding. However south of the site, an area with a high risk of surface water flooding is illustrated. In addition the access road to the site, Dawes Lane, has a very low risk of surface water flooding. |
| **Is the site located within a Critical Drainage Area?** | No |
| **Is site at risk from groundwater flooding?** | The AStGWF mapping shows that the site is located within a 1km square of which <25% is susceptible to groundwater emergence. The risk of groundwater |

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| | flooding in this area is therefore considered to be low. This will need to be confirmed during site investigation survey. |
| **Risk from flooding in event of reservoir failure.** | The site is at risk of inundation in the event of a failure of a reservoir on the Environment Agency 'Risk of Flooding from Reservoirs' mapping. |
| **Is the site at risk from an extreme tidal event** | The proposed site does not present to be at risk from an extreme tidal event. |
| **SFRA comments** | <u>Site specific recommendations</u><br><br>The site layout should be carefully planned to ensure that residential dwellings are not placed at surface water flood risk, and that the position of any new development does not divert the flow path to a neighbouring area.<br><br><u>Site Layout and Design</u><br>The site is located within Flood Zone 1, low probability of flooding from rivers in which More Vulnerable residential development is considered appropriate. Further assessment should be made of the surface water flow paths across the site. The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS. They should be considered in accordance with the hierarchy of SuDS as stated within Essex CC's SuDS Design Guide46 (i.e. considering infiltration measures first wherever possible). The drainage strategy should also consider the small drainage network east of the site, travelling towards the Mersea Flats.<br><br><u>Finished Floor Levels</u><br>Finished floor levels should be set 300mm above ground level, to provide protection from surface water flooding in accordance with Environment Agency guidance on FRA's47.<br><br><u>Access / Egress</u><br>Safe dry access to and from the site should be provided, and this should be |

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| | achievable along the road network Dawes Lane. However as the site is located on an island, the only access road onto the Island can become cut off during high tides, proving access to be difficult during these conditions.<br><br><u>Emergency Planning</u><br>The site is not shown to be within an Environment Agency Flood Warning Area; however residents may wish to register to receive the warning service so that they are aware of the flood risk to the area local to where they are located, including key transport routes. It is fundamental that residents are aware that the island can become cut off from the mainland when the access road onto the island is inundated by high tides. Increasing community resilience and safe refuge sites should be considered on Mersea Island. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes - The proposed development entails More Vulnerable residential development located in Flood Zone 1, which is considered compatible development in accordance with the NPPF. |
| **Conclusion -** Residential development proposals in flood zone 1 are not usually subject to the Exception Test. The LPA included this site for assessment as part of the Level 2 SFRA due to the risk of surface water flooding. Build development should avoid the areas at risk from surface water flooding. These areas could be used to provide SUDS. Subject to the above recommendations/mitigations being implemented the Sequential and Exception Test are passed.<br>**Recommendation: Allocate the site** | |

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| **Name of site Mersea Island (Brierley Paddocks) (SS12a)** |
| **Preferred use residential (100 dwellings)** |
| **Flood Zone Map** |

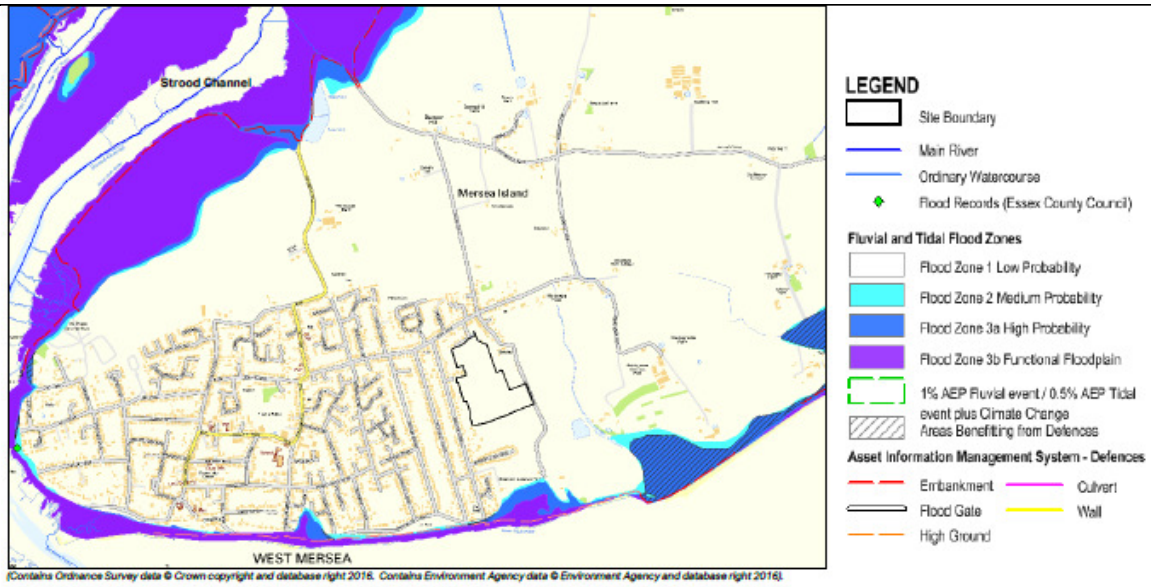




**Figure A Modelled Flood Extents**

**Surface Water Flood Map**

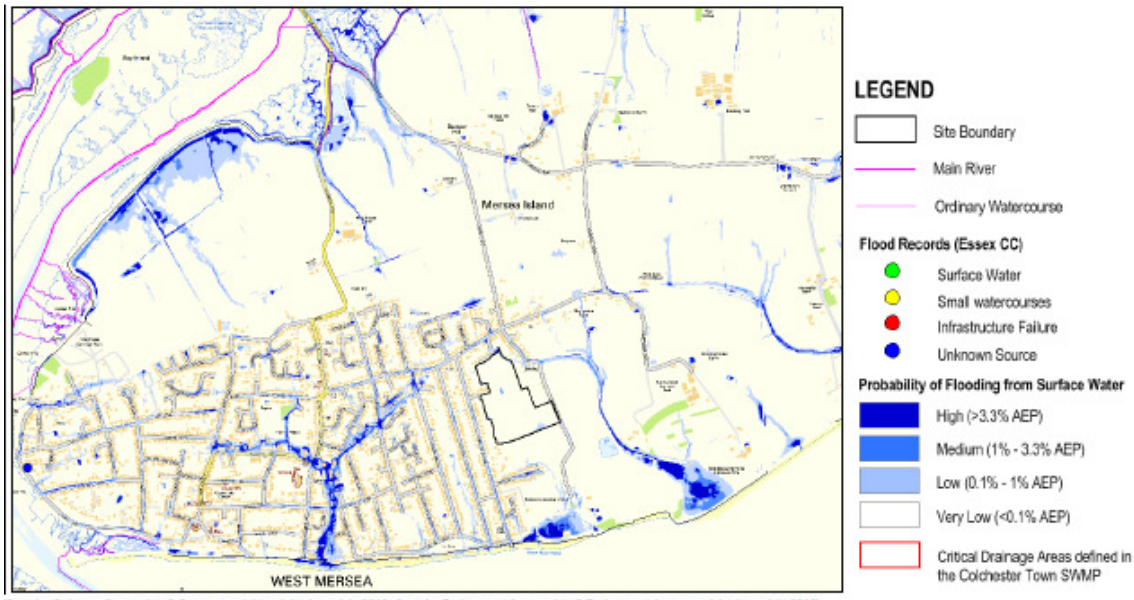




**Figure D Risk of Flooding from Surface Water (RoFSW)**

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| **Site flood zone** | The site is located entirely within Flood Zone 1 and is therefore currently considered to be at low risk of flooding |
| **Is there an alternative reasonably available site in flood zone 1?** | N/A |
| **Is there an alternative reasonably available site in flood zone 2?** | N/A |

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| **Does the site lie in the functional floodplain (zone 3b)?** | No |
| **Surface water flood risk** | The RoFSW mapping indicates that most of the site is at very low risk of surface water flooding (<0.1% AEP). South-east of the site, an area has a low probability of flooding from surface water (0.1% - 1%). In addition, whilst not within the site boundary, a small area north of the site, demonstrates a high probability of flooding from surface water.<br><br>Most of the access road, Cross Lane, has a very low probability of surface water flooding although north of the road, the risk does increase to medium (1% - 3.3%). |
| **Is the site at risk from groundwater flooding?** | The AStGWF mapping shows that most of the site is located within a 1km square of which <25% is susceptible to groundwater emergence. However 1.46ha south of the site is located within a 1km square of which 25% - 50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area is therefore considered to be generally low. This will need to be confirmed during site investigation survey. |
| **Risk from flooding in event of reservoir failure.** | The site is not shown to be at risk of inundation in the event of a failure of a reservoir on the 'Risk of Flooding from Reservoirs' mapping. |
| **Is the site at risk from an extreme tidal event No** | The proposed site does not present to be at risk from an extreme tidal event. Although adjacent to the site is Cross Lane which obtains a maximum flood depth of 0.1 – 0.5m at the end of the road, corresponding to a low hazard rating. This is approximately 352m from the site. |

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| **Is the site within a Critical drainage area?** | No |
| **SFRA comments** | Site specific recommendations<br><br>The site layout should be carefully planned to ensure that residential dwellings are not placed at surface water flood risk, and that the position of any new development does not divert the flow path to a neighbouring area.<br><br><u>Site Layout and Design</u><br>The site is located within Flood Zone 1, low probability of flooding from rivers in which More Vulnerable residential development is considered appropriate.<br><br>Further assessment should be made of the surface water flow paths across the site. The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS. They should be considered in accordance with the hierarchy of SuDS as stated within Essex CC's SuDS Design Guide48 (i.e. considering infiltration measures first wherever possible). The drainage strategy should also consider the small drainage network east of the site towards the Mersea Flats.<br><br><u>Finished Floor Levels</u><br>Finished floor levels should be set 300mm above ground level, to provide protection from surface water flooding in accordance with Environment Agency guidance on FRA's49.<br><br><u>Access / Egress</u><br>Safe dry access to and from the site should be provided, and this should be achievable along Cross Lane. However as the site is located on an island, the only access road onto the Island can become cut off during high tides, |

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| | proving access to be difficult during these conditions.<br><br><u>Emergency Planning</u><br>The site is not shown to be within an Environment Agency Flood Warning Area; however residents may wish to register to receive the warning service so that they are aware of the flood risk to the area local to where they are located, including key transport routes. It is fundamental that residents are aware that the island can become cut off from the mainland when the access road onto the island is inundated by high tides. Increasing community resilience and safe refuge sites should be considered on Mersea Island. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes - The proposed development entails More Vulnerable residential development located in Flood Zone 1, which is considered compatible development in accordance with the NPPF. |
| **Conclusion-** Residential development proposals in flood zone 1 are not usually subject to the Exception Test. The LPA included this site for assessment as part of the Level 2 SFRA due to the risk of surface water flooding, Build development should avoid the areas at risk from surface water flooding. These areas could be used to provide SUDS. Subject to the above recommendations/mitigations being implemented the Sequential and Exception Tests are passed.<br>**Recommendation: Allocate the site** | |

**Name of site – Rowhedge (Rowhedge Business Centre) (SS13)**

**Proposed use Residential 40 dwellings**

**Flood Zone Map**

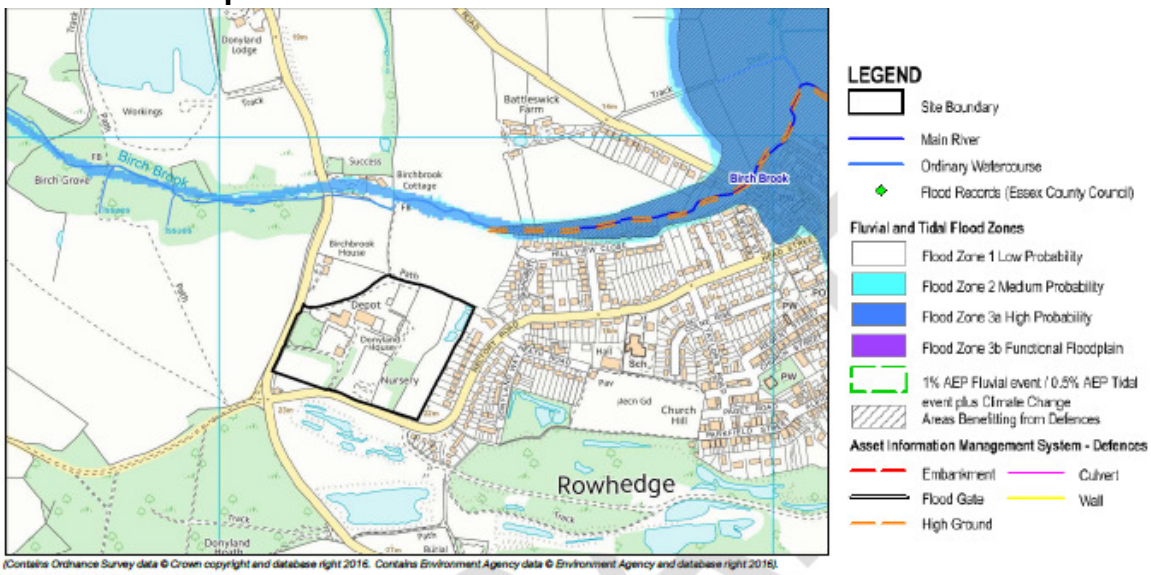


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**Figure A Modelled Flood Extents**

**Surface Water Flood Map**

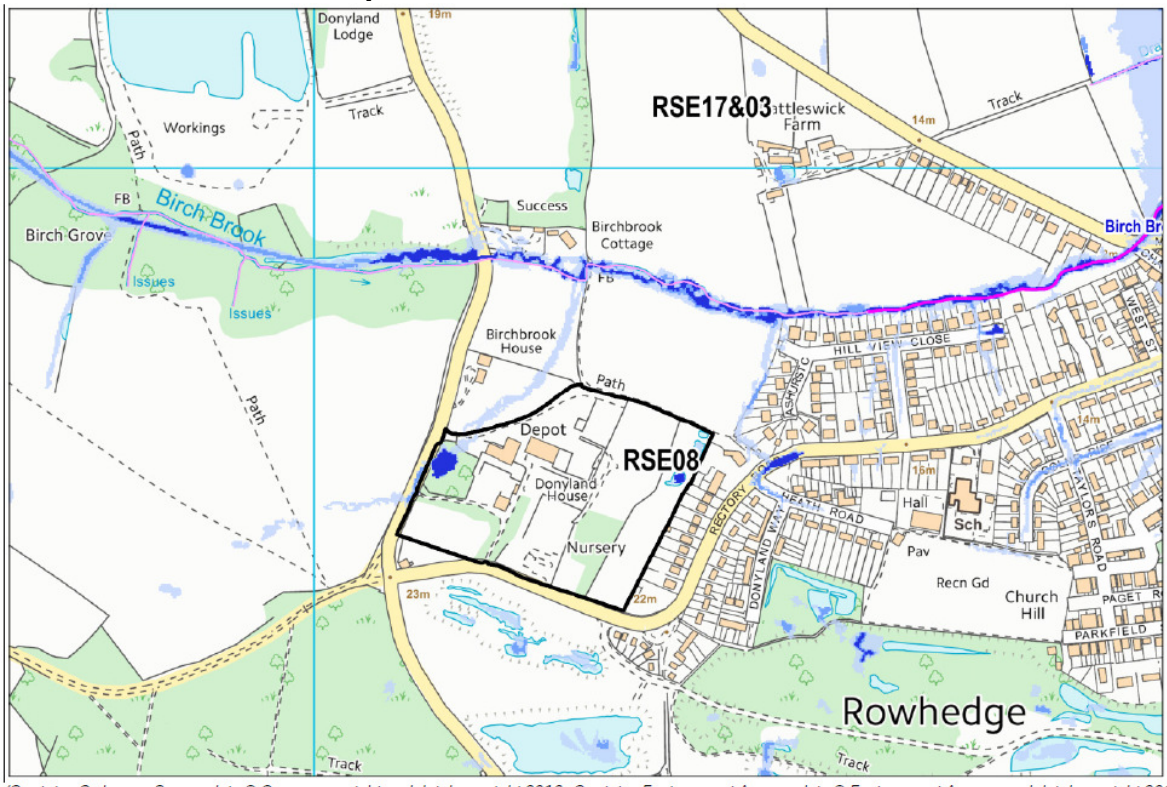


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**Figure D Risk of Flooding from Surface Water (RoFSW)**

| **Preferred use residential (40 dwellings)** | |
|---|---|
| **Site flood zone** | The whole site is located within Flood Zone 1 |
| **Is there an alternative reasonably available site in flood zone 1?** | N/A |
| **Is there an alternative reasonably available site in flood zone 2?** | N/A |
| **Does the site lie in the functional floodplain (zone 3b)?** | No |
| **Is the site at risk from surface water flood risk** | The RoFSW mapping and SWMP modelling indicate that the majority of the site is at very low risk of surface water flooding (<0.1% AEP). |
| **Is the site at risk from groundwater flooding?** | The AStGWF mapping shows that the site is located within a 1km square of which <25% is susceptible to groundwater emergence. The risk of groundwater flooding in this area is therefore generally considered to be low. This will need to be confirmed during site investigation survey. |
| **Risk from flooding in event of reservoir failure.** | The floodplain of Birch Brook is at risk of inundation in the event of a failure of Abberton Central and Western Arm and Abberton reservoirs. Given that these are regularly inspected flooding from reservoirs is considered a managed risk. |
| **Is the site at risk from an extreme tidal event** | No |
| **Is the site within a Critical drainage area?** | No |
| **SFRA comments** | Site specific recommendations |

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| | Proposed development should not have unacceptable adverse impacts on the flow and quantity of surface water.<br><br>Site layout should be carefully planned to ensure that residential dwellings are not at risk from surface water flooding and the position of new development does not divert flow paths to the vicinity of the site.<br><br><u>Site Layout and Design</u><br>The site is located within Flood Zone 1, low probability of flooding from rivers in which More Vulnerable residential development is considered appropriate. The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS. They should be considered in accordance with the Essex CC's SuDS Design Guide 16 (i.e. considering infiltration measures first wherever possible).<br><br><u>Finished Floor Levels</u><br>Finished floor levels should be set 300mm above ground level, to provide protection from surface water flooding in accordance with Environment Agency guidance on FRA's 17.<br><br><u>Access / Egress</u><br>Safe dry access to and from the site should be provided, and this should be achievable via Rectory Road and Fingringhoe Road to the south and west of the site. Access to the site from the east along Head Street and Rowhedge Road is shown to be at residual risk of flooding from the River Colne, in event of a breach of the Colne Barrier.<br><br><u>Emergency Planning</u><br>The site is not shown to be within an Environment Agency Flood Warning Area; however residents may wish to register to receive the warning service |

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| | associated with the River Colne, into which the nearby Birch Brook feeds, so that they are aware of the flood risk to the area local to where they are located, including key transport routes. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes…. The proposed development entails More Vulnerable residential development located in Flood Zone 1, which is considered compatible development in accordance with the NPPF. |
| **Conclusion:** Sites in flood zone 1 are not usually subject to Exception Test This site however was assessed as part of the Level 2 SFRA due to the potential risk from surface water flooding.<br>Subject to the above recommendations and proposed mitigations being implemented the Sequential and Exception Tests are passed.<br>**Recommendation: Allocate the site.** | |

Additional Sites assessed in the Flood Risk Sequential Test

Appendixes

Appendix 1 - Environment Agency Letter of support for Flood Risk Sequential Test methodology for allocating sites in Publication draft of the Colchester Local Plan 2017-2033- see separate attachment

**Appendix 2 – Sites proposed for allocation through Neighbourhood Plans**

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| Boxted (Hill Farm) (SS2) – 36 dwellings | The site is in Flood Zone 1. The site was identified through the Boxted Neighbourhood Plan. |
| Eight Ash Green (SS5) – 120 dwellings | Site(s) to be identified and assessed through the Eight Ash Green Neighbourhood Plan. |
| Marks Tey (SS11) | Sites to be assessed through the Marks Tey Neighbourhood Plan. |
| Tiptree (SS14) – 600 dwellings | Sites to be identified and assessed through the Tiptree Neighbourhood Plan. |
| West Bergholt (SS15) – 120 dwellings | Sites to be identified and assessed through the West Bergholt Neighbourhood Plan. |
| Wivenhoe - (SS16) – 250 dwellings | The following sites are in Flood Zone 1 have been assessed through by the LPA as part of the SFRA: |

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| | Broadfields, Croquet Gardens, North of Elmstead Road and Colchester Road, Wivenhoe. The sites will be allocated through the Wivenhoe Neighbourhood Plan. |

Appendix c - Additional Sites assessed in the Flood Risk Sequential Test

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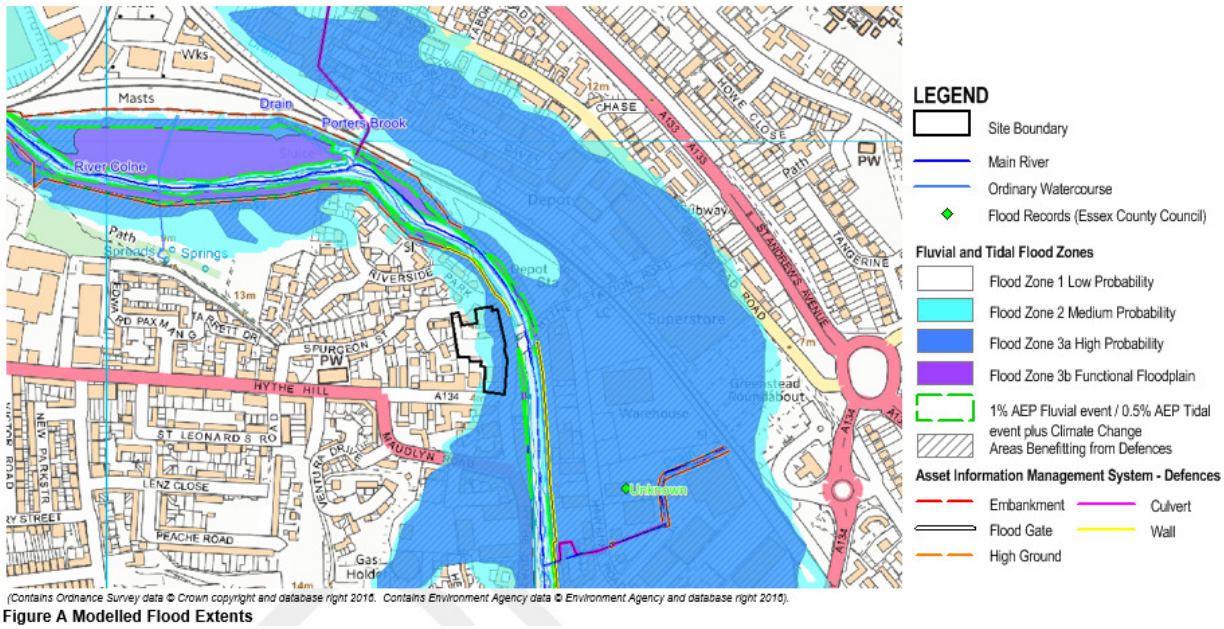
| **Name of site –** Bridge House, Hythe Quay, Colchester |
| **Preferred use** – Residential (36 dwellings) |
| **Flood Zone Map**<br>  <br><br>*(Contains Ordnance Survey data © Crown copyright and database right 2016. Contains Environment Agency data © Environment Agency and database right 2016).*<br>**Figure A Modelled Flood Extents** |

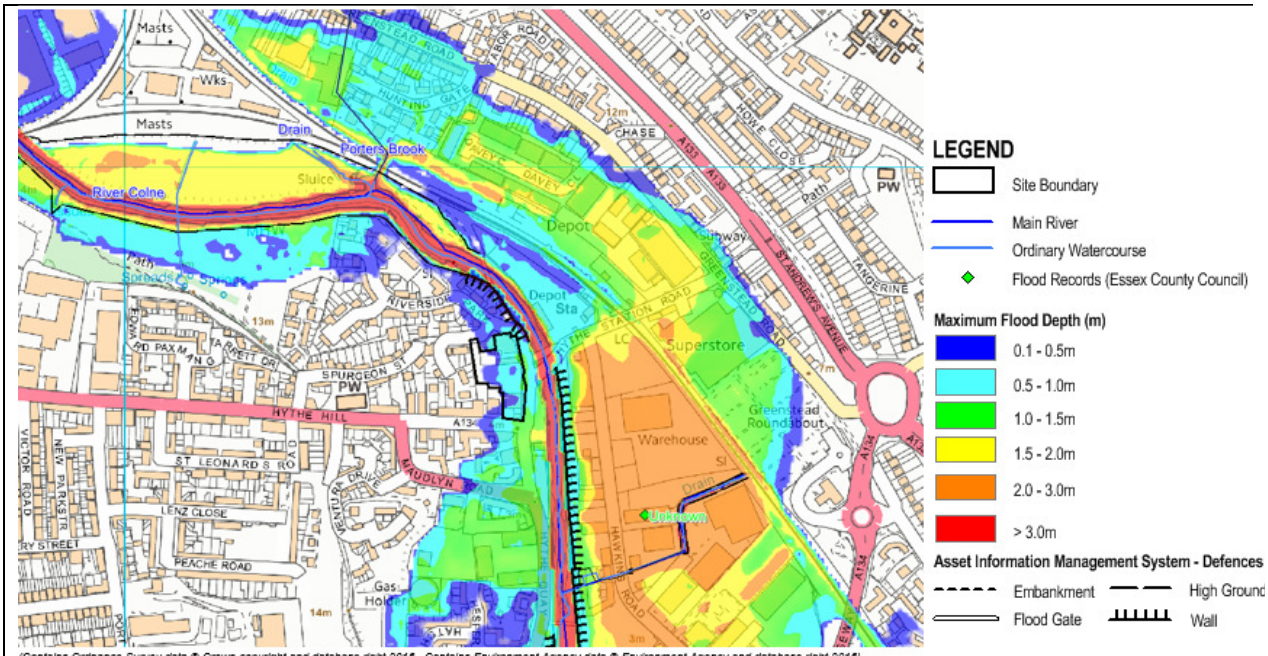





**Figure B Colne Barrier Breach Assessment; 0.5% AEP including Climate Change: Maximum Flood Depth**

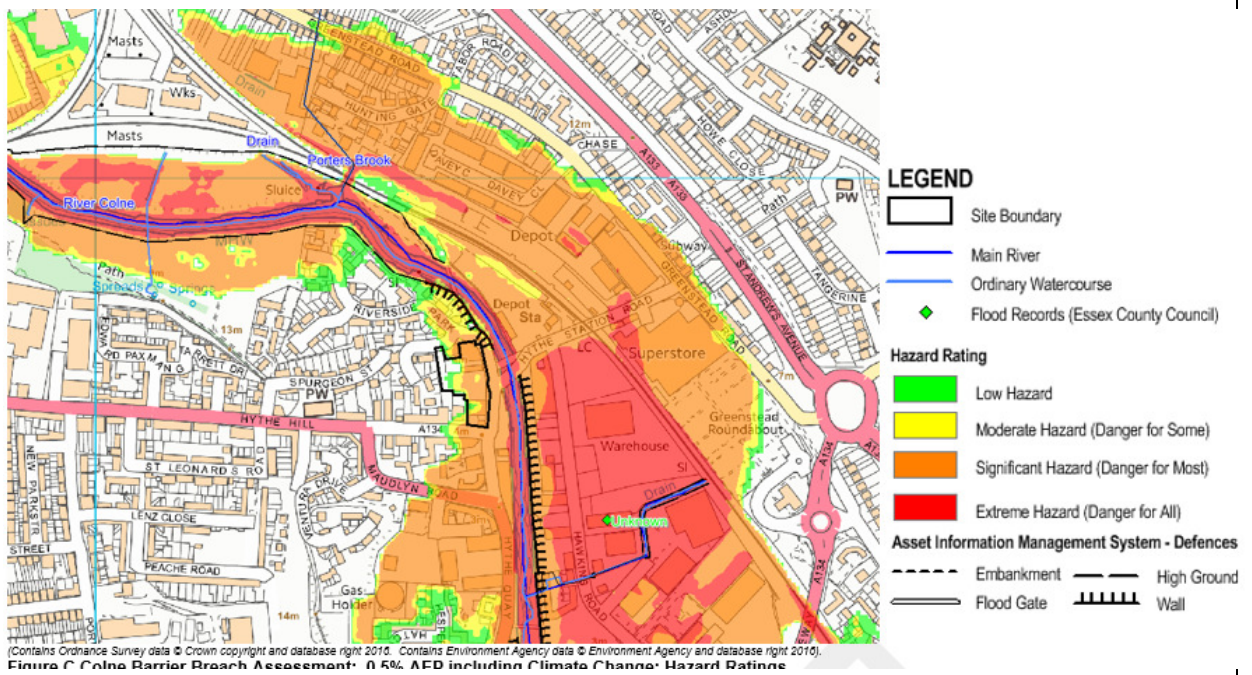





**Figure C Colne Barrier Breach Assessment; 0.5% AEP including Climate Change: Hazard Ratings**

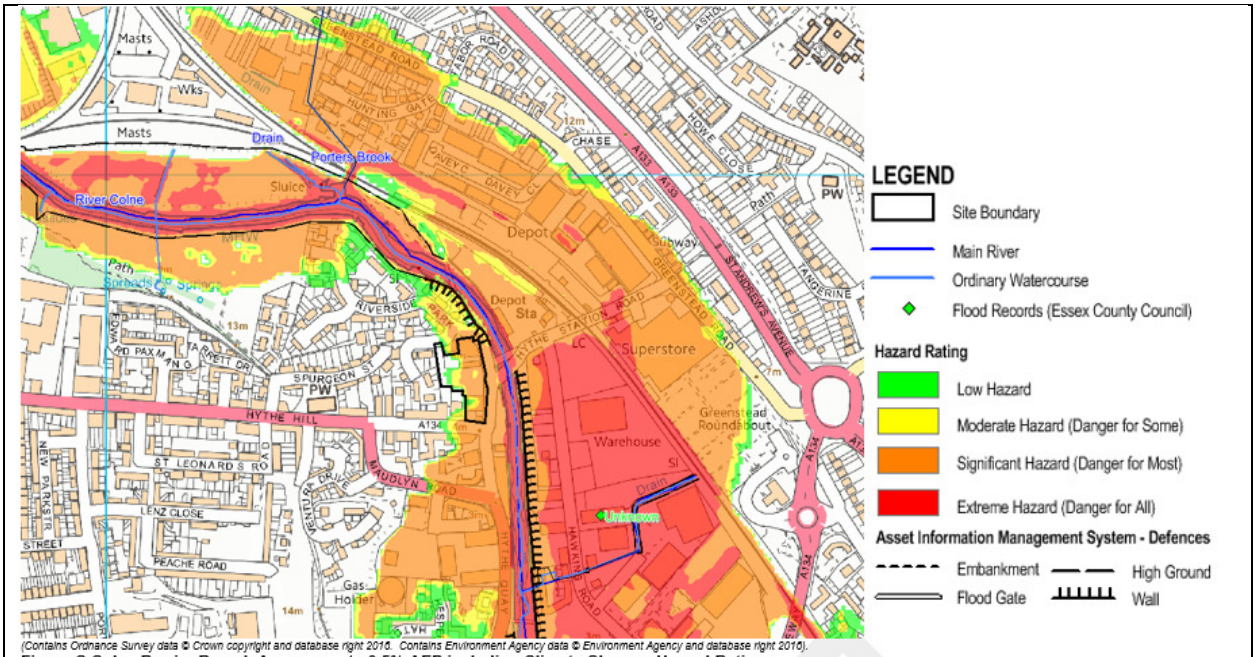



**Figure C Colne Barrier Breach Assessment; 0.5% AEP including Climate Change: Hazard Ratings**

## S urface Water Flood Map

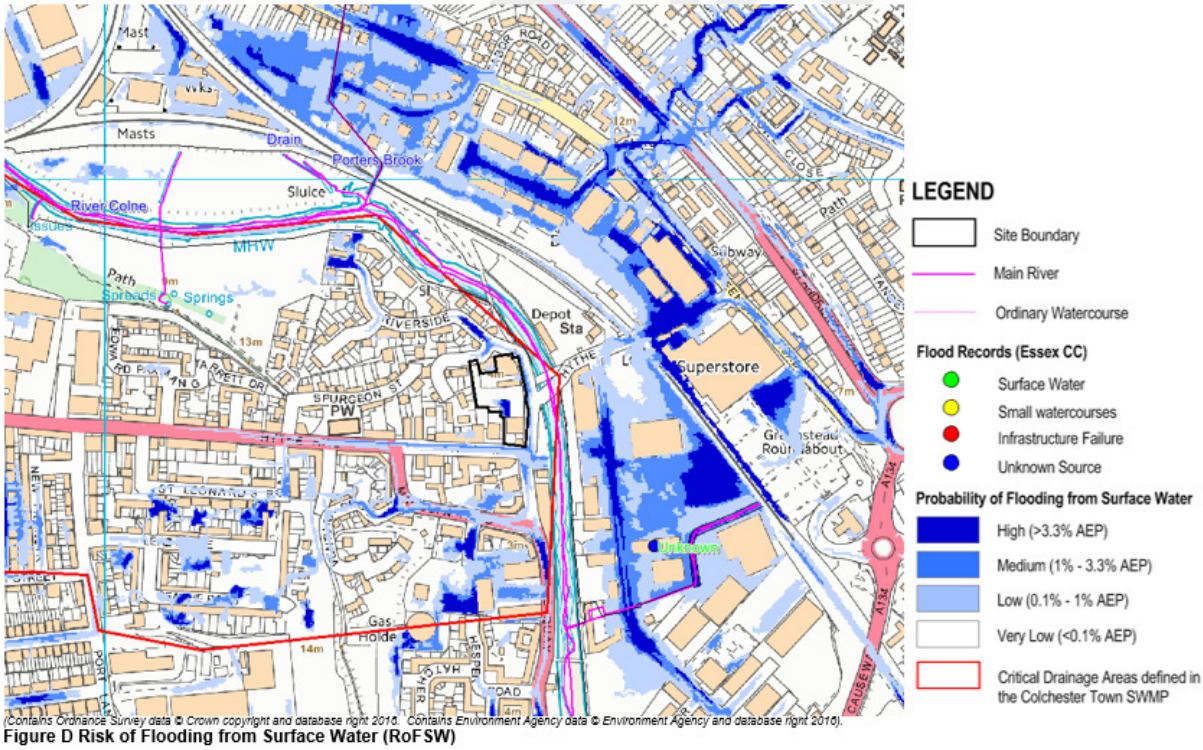



**Figure D Risk of Flooding from Surface Water (RoFSW)**

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| **Site Flood Zone** | The River Colne flows from north to south along the eastern edge of the site in open channel. At this location the River Colne is tidally influenced and the dominant source of flooding. The majority of the site is identified as Flood Zone 2 and just under half of the site is |

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| | identified as Flood Zone 3, high probability of flooding associated with the River Colne.<br>Figure A shows the extent of flooding without the presence of flood defences including the absence of the River Colne Barrier.<br>The eastern area of the site is shown to benefit from the presence of defences. Immediately east of the site a private coastal wall acts as a flood defence. The Colne Barrier is located approximately 4.5km downstream at Wivenhoe and provides protection when water levels are forecast to rise greater than 3.2mAOD. |
| **Is there an alternative reasonably available site in flood zone 1?** | No – 30% of this site is located within Flood Zone 1 |
| **Is there an alternative reasonably available site in flood zone 2?** | No – 29% of this site is located within Flood Zone 2 |
| **Does the site lie in the functional floodplain (zone 3b)?** | The site is not located within the functional floodplain associated with the River Colne. |
| **Surface water flood risk** | The ROFSW and SWMP modelling indicates that the area in which the site is located is at very low risk of surface water flooding (<0.1% AEP) with the exception of an isolated area of ponding south-west of the site shown to be at high risk of surface water flooding (>3.3% AEP).<br>The SWMP modelling indicates that surface water ponding within the site is between 0.1 – 0.25m.<br>In accordance to the National Planning Policy Framework, proposed development should not have unacceptable adverse impacts on the flow and quantity of surface water. Therefore the site layout should be carefully planned to ensure that residential dwellings are not at risk from surface water flooding and the position of new development does not divert flow paths to a neighbouring area. |
| **Is the site at risk from** | The AStGWF mapping (Level 1 SFRA Appendix A Figure 5) shows that the site is located within a 1km square of which 25-50% is susceptible to groundwater emergence. The potential for groundwater flooding in this area is therefore generally considered |

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| **groundwater flooding?** | to be low. This will need to be confirmed during site investigation survey. |
| **Risk from flooding in event of reservoir failure.** | The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the floodplain of the River Colne including the site is at risk of inundation in the event of a failure of the following reservoirs: Ardleigh, Abberton Central and Western Arm and Abberton. As noted in the Level 1 SFRA report, given the regular inspection of these reservoirs in accordance with the Reservoirs Act 1975, flooding from reservoirs is considered to be a managed risk. |
| **Is the site at risk from an extreme tidal event** | The site is protected by the presence of the Colne Barrier at Wivenhoe which closes during extreme tidal events. A model simulation has been completed to determine the residual risk to the site in the event there is a failure of the Barrier to close. Results for the 0.5% AEP event including an allowance for climate change (2115) show that flood depths on the site would be 0.1-1.5m, corresponding to a hazard rating of Significant Hazard (danger for most). Potential access / egress routes for the site would experience depths of flooding up to 1.0m. |
| **Is the site within a Critical drainage area?** | The site is shown to lie within a Critical Drainage Area (CDA) named Colchester Town Area which was identified during the preparation of the town of Colchester SWMP. There are historic records of flooding to the south of the site; however the source of flooding for these records are unknown. |
| **SFRA comments** | Confirm risk from groundwater flooding during site investigation surveys<br><br><u>Set-back Distance</u><br>All development should be set back 16m from the edge of the River Colne. The Environment Agency will need to be consulted and an Environmental Permit obtained for any work within 16m of the watercourse.<br><br><u>Site Layout and Design</u><br>Residential development should be steered towards areas defined as Flood Zone 1 and 2 away from the edge of the River Colne. The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS as stated within the Interim Code of Practice for SuDS July 2004[1] (i.e. considering infiltration measures first wherever possible). The site is within a Critical Drainage Area, Colchester Town Area; opportunities should be sought for the development to contribute to the proposed scheme for surface |

[1] http://www.susdrain.org/files/resources/other-guidance/nswg_icop_for_suds_0704.pdf

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| | water management in this area and Essex CC should be consulted to confirm the current status of this work. A summary of the initial preferred option for the CDA, as set out in the SWMP, is provided in Section 4 of the Colchester Level 2 SFRA Report.<br><br><u>Finished Floor Levels</u><br>The Environment Agency will seek Finished Floor Levels for new development set 300mm above the 0.5% AEP flood level including an allowance for climate change. The modelled flood level in the event of a failure of the Colne Barrier during the 0.5% AEP flood event including climate change to 2115 in this location is 4.5mAOD. Based on LiDAR topographic survey, the ground levels across the site vary between approximately 3.6-4.8mAOD.<br><br><u>Access / Egress</u><br>Safe dry access to and from the site should be provided where possible, and this is likely to be provided to the south-west of the site via Hythe Hill. When considering the residual risk to the site, flood depths of up to 1.3m are modelled to occur along this route, corresponding to a hazard rating of Significant (danger to most). It will therefore be necessary to include provision of a place of safe refuge for residents of the residential development above the 0.1% AEP flood level including an allowance for climate change and is internally accessible.<br><br><u>Emergency Planning</u><br>The site is shown to be within an Environment Agency Flood Warning Area for the Tidal Colne upstream of the Colne Barrier; residents should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the Colne Barrier, Flood Response Plans should be prepared by residents of the site including details of egress routes and place to safe refuge. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes. Residential development is classed as a 'more vulnerable use in the PPG. Proposals for residential development in flood zone 2 and or 3 are required to pass both Sequential Test and both parts of the Exceptions Test. There are no reasonably available sites in flood zone 1 in East Colchester/ Hythe Special Policy Area. It has been demonstrated that this site can satisfy both the Sequential and Exception Tests. Allocating this site for development will contribute positively to the continuing regeneration of East Colchester which has been on-going since 2001. New development will be responsive to the historic character of the East Colchester/Hythe and reinforce the Conservation Area and also delver new green infrastructure including new areas of open space and for public enjoyment. |

**Conclusion -** Built development should be directed to flood zones 1 and 2 first then to land in flood zone 3. Development should avoid areas at highest risk of surface water/ groundwater flooding. As the site falls within the CDA03 development proposals will be required to contribute towards flood risk solutions, in accordance with Flood Risk Management policy DM23 and SWMP recommendations for CDA 03. There are already known reoccurring flooding issues along Haven Road. Risk management authorities and developers will be required to work together to deliver a solution for the flooding on Haven Road and Distillery Lane as part of the allocation of this site.
Based on the strategic assessment of flood risk and subject to the recommendations and mitigation measures set out above being implemented, the Sequential and Exceptions Tests are passed.
**Recommendation: Allocate the site**

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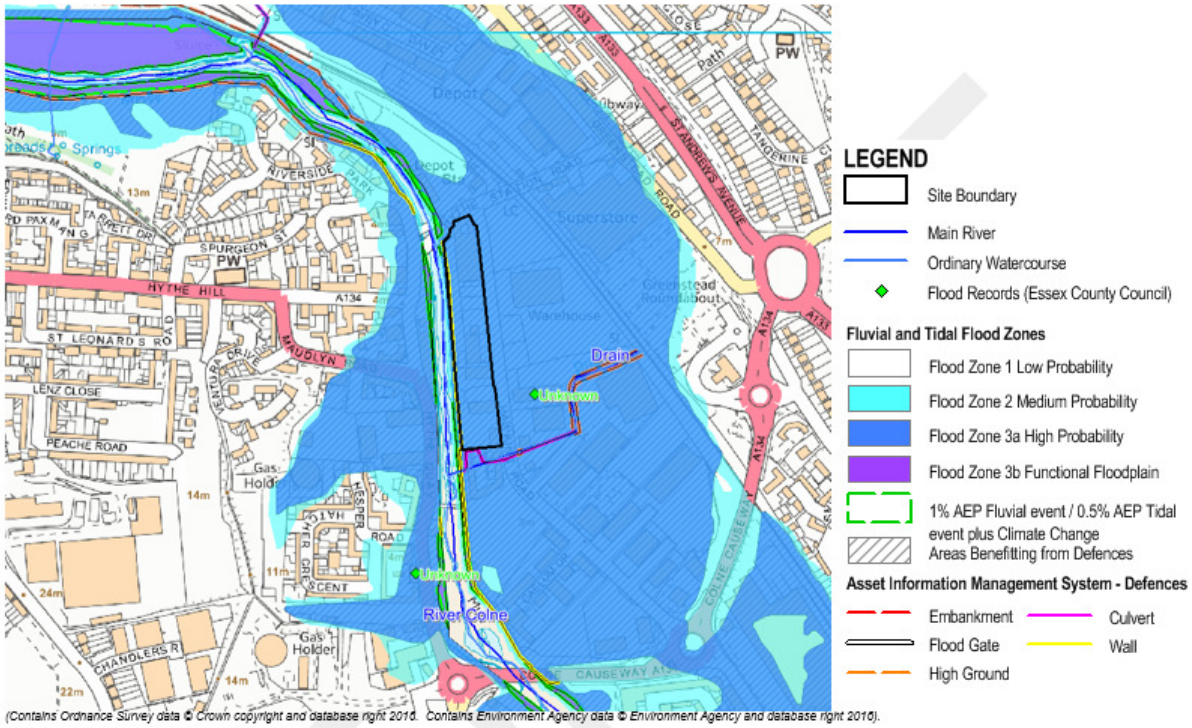
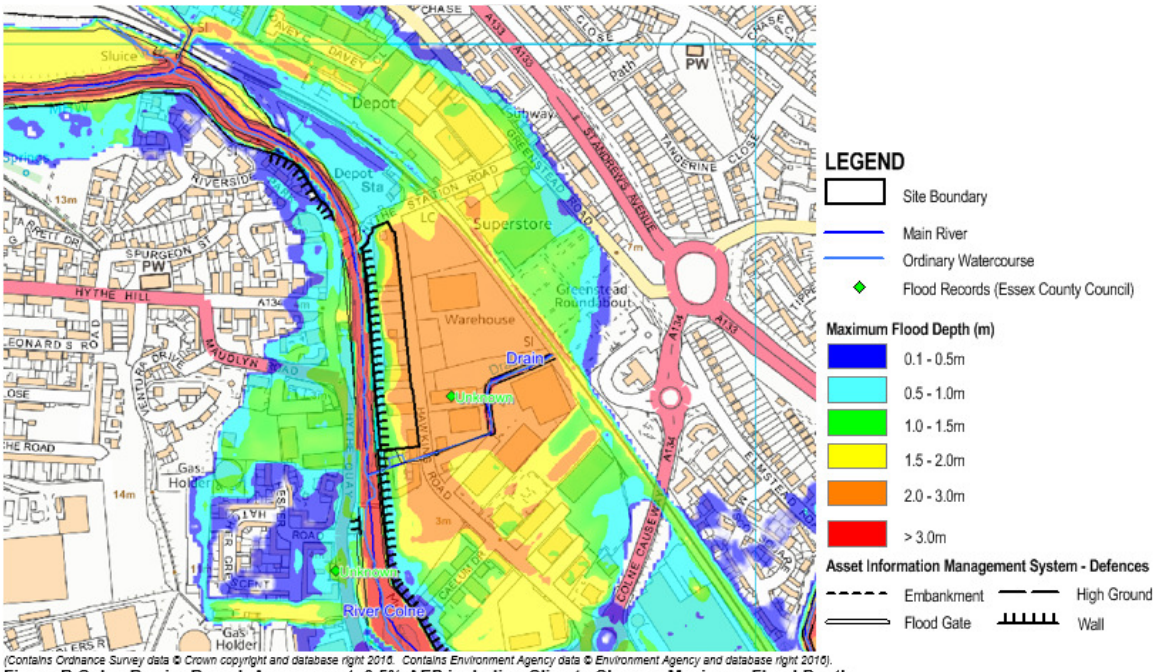
| **Name of site –** Land west of Hawkins Road, Colchester |
| **Preferred use** –Residential (100 dwellings) |

## Flood Zone Map




(Contains Ordnance Survey data © Crown copyright and database right 2016. Contains Environment Agency data © Environment Agency and database right 2016).

**Figure A Modelled Flood Extents**




(Contains Ordnance Survey data © Crown copyright and database right 2016. Contains Environment Agency data © Environment Agency and database right 2016).

**Figure B Colne Barrier Breach Assessment; 0.5% AEP including Climate Change: Maximum Flood Depth**

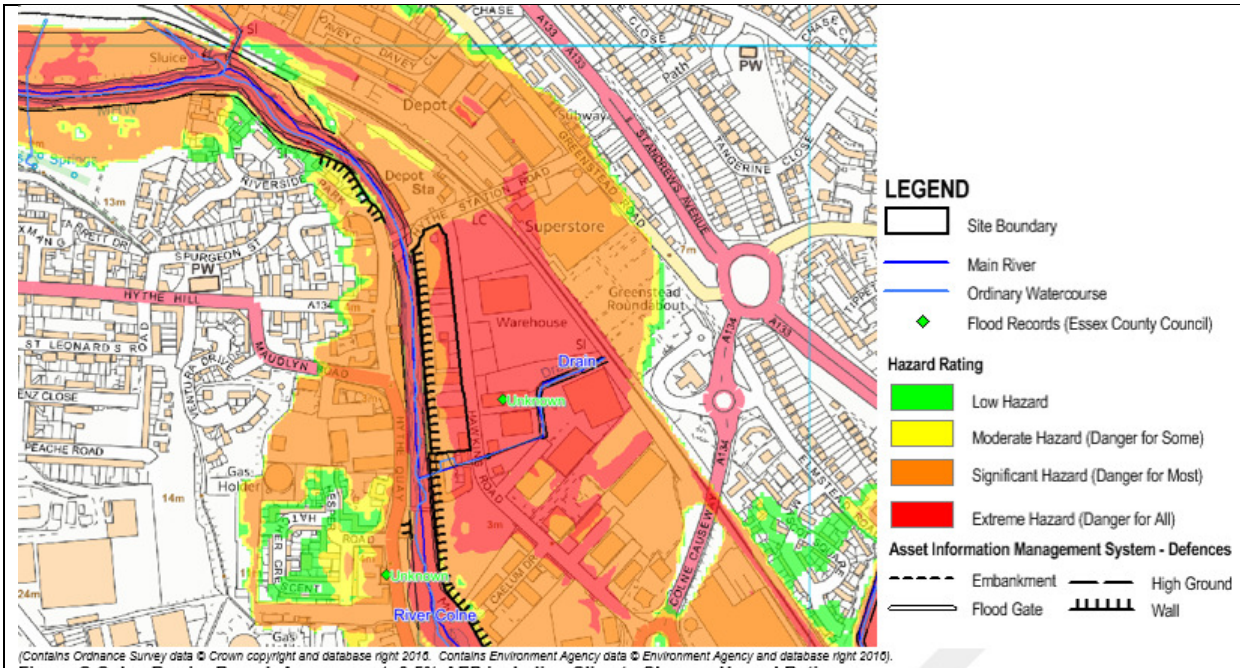





**Figure C Colne Barrier Breach Assessment; 0.5% AEP including Climate Change: Hazard Ratings**

## Surface Water Flood Map

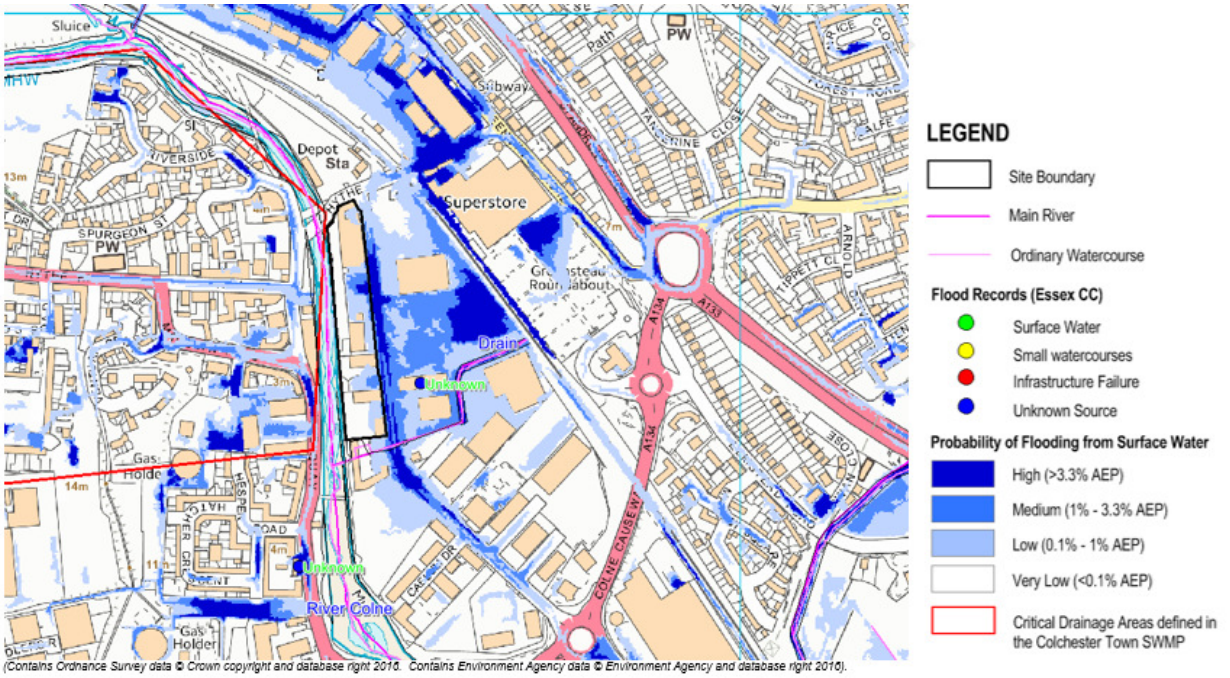





**Figure D Risk of Flooding from Surface Water (RoFSW)**

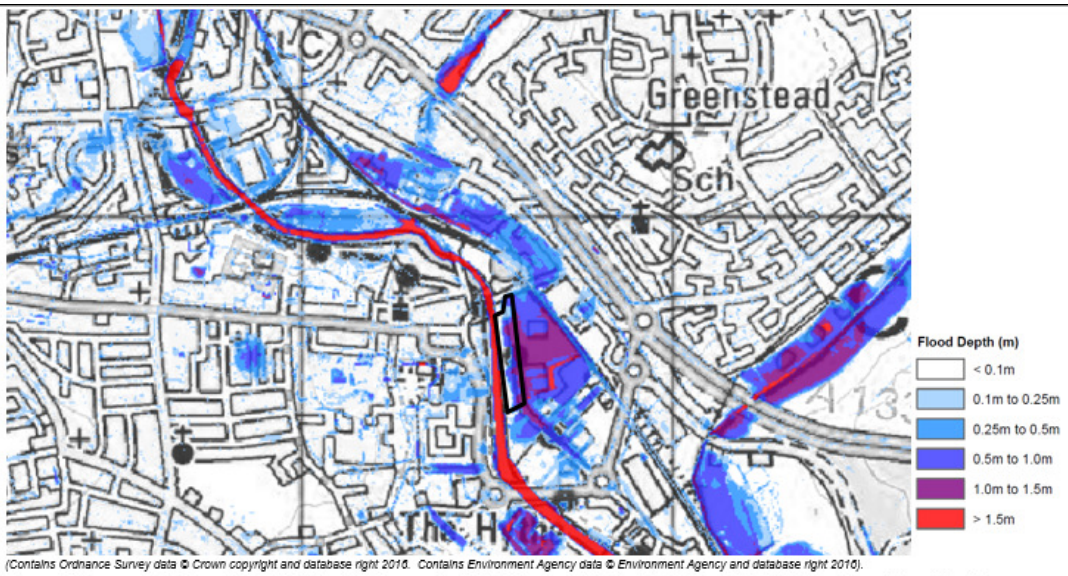





**Figure E Town of Colchester SWMP (Capita Symonds, 2013) Surface Water Modelling, 1% AEP Maximum Flood Depth**

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| **Site Flood Zone** | The River Colne flows from north to south in open channel along the western edge of the site. At this location the River Colne is tidally influenced and the dominant source of flooding. The entirety of the site is identified as Flood Zone 3a; high probability of flooding associated with the River Colne. |
| **Is there an alternative reasonably available site in flood zone 1?** | No |
| **Is there an alternative reasonably available site in flood zone 2?** | No |
| **Does the site lie in the functional floodplain (zone 3b)?** | The site is not within the functional floodplain associated with the River Colne. |
| **Surface water flood risk** | The RoFSW mapping and SWMP modelling indicates that west of the site is located at a very low risk of surface water flooding (<0.1% AEP). However, east of the site is identified as having a high risk of surface water flooding (>3.3% AEP). The SWMP modelling indicates that flood depths could reach up to 1.5m. In accordance to the National Planning Policy Framework, proposed development should not have unacceptable adverse impacts on the flow and quantity of surface water. Therefore the site layout should be carefully planned to ensure that residential dwellings are not at risk from surface water flooding and the position of new development does not divert flow paths to a neighbouring area. |

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| **Is the site at risk from groundwater flooding?** | The AStGWF mapping (Level 1 SFRA Appendix A Figure 5) shows that the site is located within a 1km square of which 25-50% is susceptible to groundwater emergence. The potential for groundwater flooding in this area is therefore generally considered to be low. This will need to be confirmed during site investigation survey. |
| **Risk from flooding in event of reservoir failure.** | The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the floodplain of the River Colne including the site is at risk of inundation in the event of a failure of the following reservoirs: Ardleigh, Abberton Central and Western Arm and Abberton. As noted in the Level 1 SFRA report, given the regular inspection of these reservoirs in accordance with the Reservoirs Act 1975, flooding from reservoirs is considered to be a managed risk. |
| **Is the site at risk from an extreme tidal event** | The site is protected by the presence of the Colne Barrier at Wivenhoe, which closes during extreme tidal events. A model simulation has been completed to determine the residual risk to the site in the event there is a failure of the Barrier to close. Results for the 0.5% AEP event including an allowance for climate change show that flood depths on the site could reach up to 3m, corresponding to a hazard rating of Significant (danger to most) and Extreme (danger for all) across the site. Potential access / egress routes for the site would experience depths of flooding up to 2.8m, corresponding to a hazard rating of Extreme (danger for all). |
| **Is the site within a Critical drainage area?** | The site is not shown to lie within a Critical Drainage Area (CDA) identified during the preparation of the town of Colchester SWMP. There are historic records of flooding to the east and south of the site; however the source of flooding for these records is unknown. |
| **SFRA comments** | Confirm the risk from groundwater flooding as part of site surveys<br><br><u>Set-back Distance</u><br>All development should be set back 16m from the edge of the River Colne. The Environment Agency will need to be consulted and an Environmental Permit obtained for any work within 16m of the watercourse. A 3m wide set-back distance should be retained on at least one side of the ordinary |

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| | watercourse to provide access for maintenance. Essex CC, as the LLFA will need to be consulted and consent obtained for any proposed works that may impact flow within the channel of the watercourse.<br>Site Layout and Design<br>Residential development should be steered away from the edge of the River Colne. The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. They should be considered in accordance with the hierarchy of SuDS as stated within the Interim Code of Practice for SuDS July 2004[2] (i.e. considering infiltration measures first wherever possible).<br>Finished Floor Levels<br>The Environment Agency will seek Finished Floor Levels for new development set 300mm above the 0.5% AEP flood level including an allowance for climate change for tidal flooding associated with the River Colne. The modelled flood level in the event of a failure of the Colne Barrier during the 0.5% AEP flood event including climate change to 2115 in this location is 4.6mAOD. Based on LiDAR topographic survey, the ground levels across the site vary between approximately 1.9m-3.7mAOD.<br>Access / Egress<br>Safe dry access to and from the site should be provided where possible, and this is likely to be provided to the north of the site via Hythe Station<br>Road in relation to surface water flooding. When considering the residual tidal risk to the site, flood depths of up to 1.8m are modelled to occur along this route, corresponding to a hazard rating of Extreme (danger to all) in areas. Therefore a safe dry access route would not be achievable during residual tidal flooding. It will therefore be necessary to include provision of a place of safe refuge for residents of the residential development above the 0.1% AEP flood level including an allowance for climate change and is internally accessible.<br><br>Emergency Planning<br>The site is shown to be within an Environment Agency Flood Warning Area for the Tidal Colne upstream of the Colne Barrier; residents should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the Colne Barrier, Flood Response Plans should be prepared by residents of the site including details of egress routes and place to safe refuge. |

[2] http://www.susdrain.org/files/resources/other-guidance/nswg_icop_for_suds_0704.pdf

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| **Will the proposed development type be acceptable in this flood zone?** | Yes. Residential development is classed as a 'more vulnerable use in the PPG. Proposals for residential development in flood zone 2 and or 3 are required to pass both Sequential Test and both parts of the Exceptions Test. There are no reasonably available sites in flood zone 1 or 2 in East Colchester/ Hythe Special Policy Area. It has been demonstrated that this site can satisfy both the Sequential and Exception Tests. Allocating this site for development will contribute positively to the continuing regeneration of East Colchester which has been on-going since 2001. New development will be responsive to the historic character of the East Colchester/Hythe and reinforce the Conservation Area and also delver new green infrastructure including new areas of open space for public enjoyment. |
| Conclusion - The proposed development is a More Vulnerable residential development located in Flood Zone 3a which is subject to the Exception Test in accordance with the NPPF. One of the key issues for the proposed site is the residual tidal flood risk posed to the site and the existing access/egress route along Hythe Station Road and the high risk of surface water flooding in the east of the site. Note the residual tidal risk is based on the failure of the Colne Barrier to close and is considered an unlikely event. The suitability of allocating this site in the Colchester BC Site Allocations rests on the ability of the risk management authorities to work together to deliver a solution for the potential flood risk. Based upon the strategic review of the flood risk posed to the site, and the recommendations set out above, it is likely that the proposed development itself could be suitably designed to protect the site and occupants from the risk of flooding.<br><br>Based on the strategic assessment of flood risk and subject to the recommendations and mitigation measures set out above being implemented, the Sequential and Exceptions Tests are passed.<br><br>**Recommendation: Allocate the site** | |

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| **Name of site –** Land east of Hawkins Road, Colchester |
| **Preferred use** – Residential (200 dwellings) |
| **Flood Zone Map** |

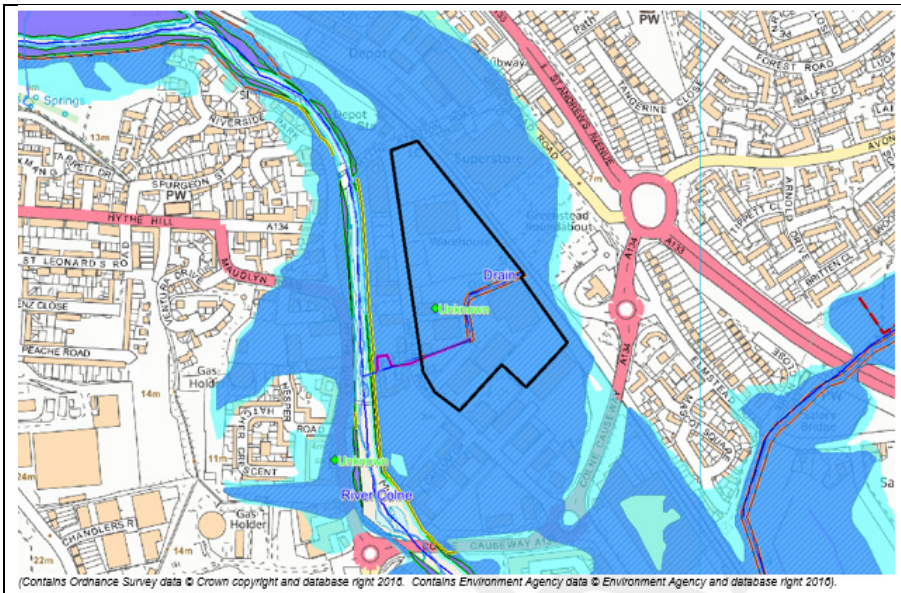




**Figure A Modelled Flood Extents**

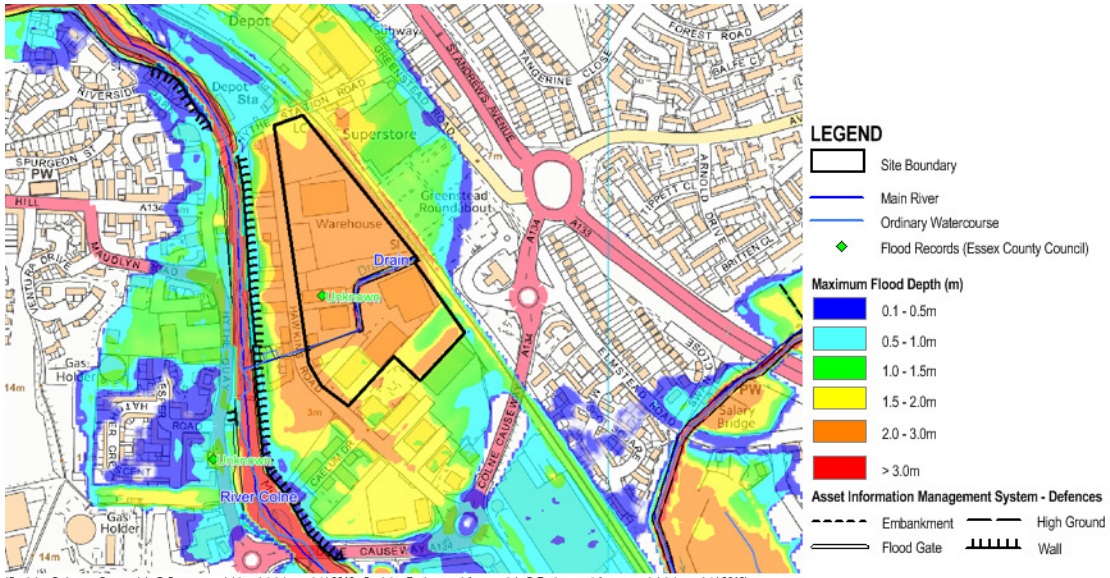




**Figure B Colne Barrier Breach Assessment; 0.5% AEP including Climate Change: Maximum Flood Depth**

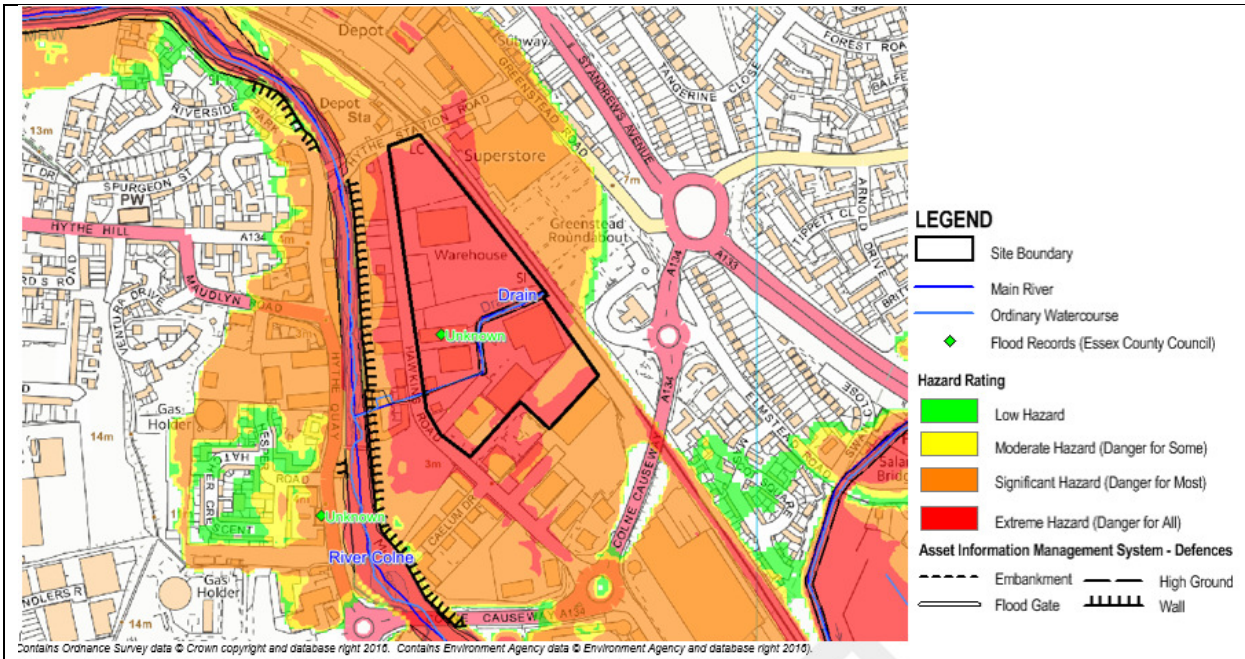




Figure C Colne Barrier Breach Assessment; 0.5% AEP including Climate Change: Hazard Ratings

## Surface Water Flood Map

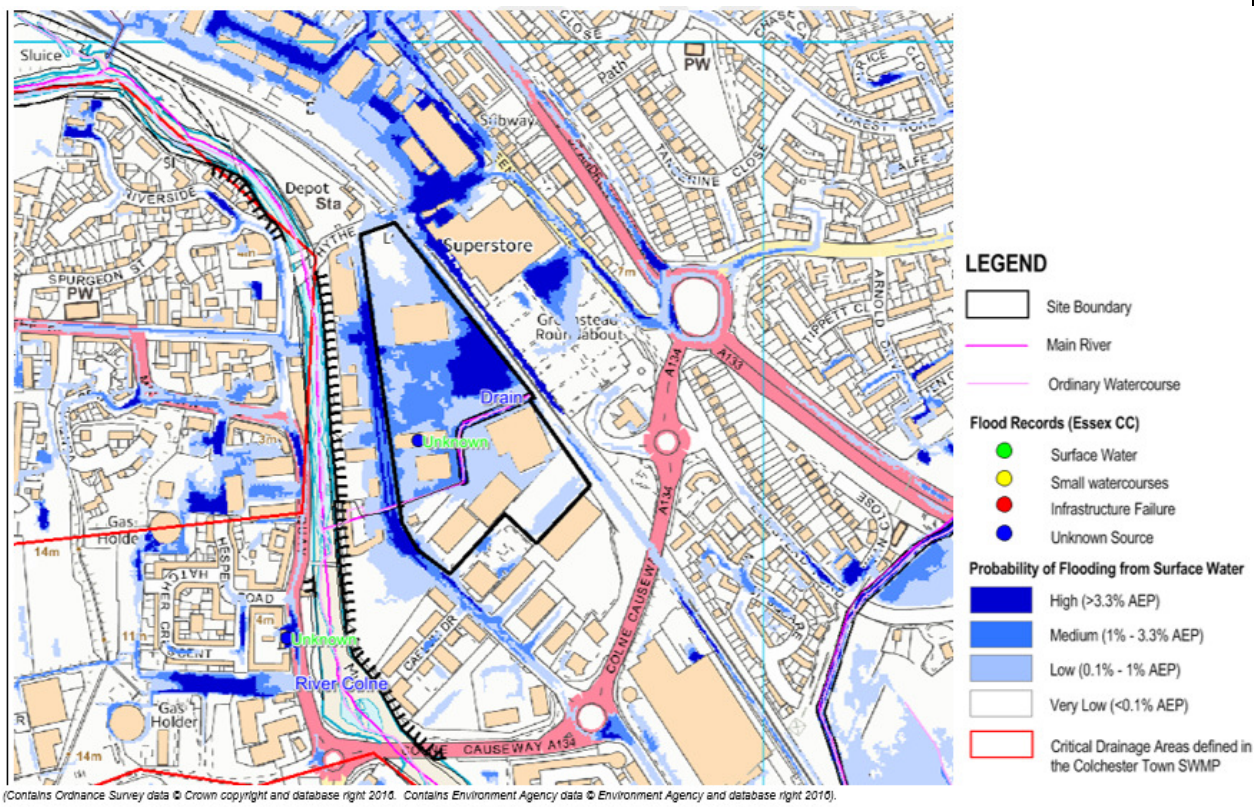




Figure D Risk of Flooding from Surface Water (RoFSW)

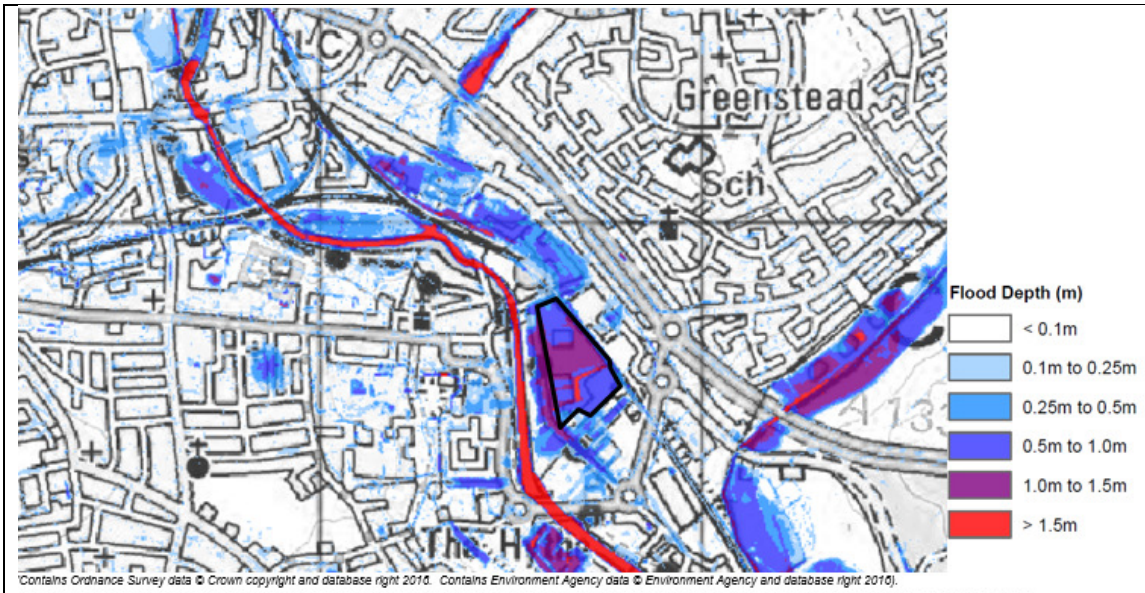



Figure E Town of Colchester SWMP (Capita Symonds, 2013) Surface Water Modelling, 1% AEP Maximum Flood Depth

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| **Site Flood Zone** | The River Colne flows from north to south in open channel west of the site. At this location the River Colne is tidally influenced and the dominant source of flooding. The entirety of the site is identified as Flood Zone 3a; high probability of flooding associated with the River Colne. It is important to note that Figure A shows the extent of flooding without the presence of flood defences including the absence of the River Colne Barrier. The area of Flood Zone 3a is shown to benefit from the presence of defences. The AIMS dataset identifies a private river wall along the eastern edge of the River Colne. The Colne Barrier is located approximately 4.16km downstream at Wivenhoe and provides protection when water levels are forecast to rise greater than 3.2mAOD. |
| **Is there an alternative reasonably available site in flood zone 1?** | No |
| **Is there an alternative reasonably available site in flood zone 2?** | No |
| **Does the site lie in the functional floodplain (zone 3b)?** | The site is not within the functional floodplain associated with the River Colne. |

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| **Surface water flood risk** | The RoFSW mapping indicates that most of the site is at a medium (1% - 3.3% AEP) to a high risk of surface water flooding (>3.3% AEP). This is evident north of the ordinary watercourse; The SWMP modelling indicates that flood depths could reach up to 1.5m on site and increasing above 1.5m within the ordinary watercourse. In accordance to the National Planning Policy Framework, proposed development should have unacceptable adverse impacts on the flow and quantity of surface water. Therefore the site layout should be carefully planned to ensure that residential dwellings are not at risk from surface water flooding and the position of new development does not divert flows paths to a neighbouring area. |
| **Is the site at risk from groundwater flooding?** | The AStGWF mapping (Level 1 SFRA Appendix A Figure 5) shows that the site is located within a 1km square of which 25-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area is therefore generally considered to be low. This will need to be confirmed during site investigation survey. |
| **Risk from flooding in event of reservoir failure.** | The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the floodplain of the River Colne including the site is at risk of inundation in the event of a failure of the following reservoirs: Ardleigh (NGR (603487, 228024); Abberton Central and Western Arm (NGR 598901, 219790); and Abberton (NGR 598780, 219734). As noted in the Level 1 SFRA report, given the regular inspection of these reservoirs in accordance with the Reservoirs Act 1975, flooding from reservoirs is considered to be a managed risk. |
| **Is the site at risk from an extreme tidal event** | The site is protected by the presence of the Colne Barrier at Wivenhoe, which closes during extreme tidal events. A model simulation has been completed to determine the residual risk to the site in the event there is a failure of the Barrier to close. Results for the 0.5% AEP event including an allowance for climate change show that flood depths on the site could reach up to 2.8m on site increasing to 3.6m within the open channel of the ordinary |

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| | watercourse. This corresponds to a hazard rating of Extreme (danger for all). Potential access / egress routes for the site would experience depths of flooding up to 2.6m, corresponding to a hazard rating of Extreme (danger for all). |
| **Is the site within a Critical drainage area?** | The site is not shown to lie within a Critical Drainage Area (CDA) identified during the preparation of the town of Colchester SWMP. There are historic records of flooding within the site boundary and to the south-west of the site; however the source of flooding for these records is unknown. |
| **SFRA comments** | Confirm risk from groundwater flooding as part of site surveys<br><br><u>Set-back Distance</u><br>All development should be set back 16m from the edge of the River Colne. The Environment Agency will need to be consulted and an Environmental Permit obtained for any work within 16m of the watercourse. A 3m wide set-back distance should be retained on at least one side of the ordinary watercourse to provide access for maintenance. Essex CC, as the LLFA will need to be consulted and consent obtained for any proposed works that may impact flow within the channel of the watercourse.<br><u>Site Layout and Design</u><br>Residential development should be steered away from the edge of the River Colne. The drainage strategy for the site must be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. They should be considered in accordance with the hierarchy of SuDS as stated within the Interim Code of Practice for SuDS July 2004[3] (i.e. considering infiltration measures first wherever possible).<br><u>Finished Floor Levels</u><br>The Environment Agency will seek Finished Floor Levels for new development to be set 300mm above the 0.5% AEP flood level including an |

[3] http://www.susdrain.org/files/resources/other-guidance/nswg_icop_for_suds_0704.pdf

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| | allowance for climate change for tidal flooding associated with the River Colne. The modelled flood level in the event of a failure of the Colne Barrier during the 0.5% AEP flood event including climate change to 2115 in this location is 4.6mAOD. Based on LiDAR topographic survey, the ground levels across the site vary between approximately 1.8m- 3.1mAOD.<br>Access / Egress<br>Safe dry access to and from the site should be provided where possible. The current access for the site is along Hawkins Road and Hythe Station Road. The safest access is likely to be provided to the north of the site via Hythe Station Road where flood depths of up to 1.8m are modelled to occur along this route corresponding to a hazard rating of Extreme (danger to all) in some areas and Significant (danger to most). Flood depths of up to 2.8m are modelled to occur along Hawkins Road, corresponding to a hazard rating of Extreme (danger to all). It will therefore be necessary to include provision of a place of safe refuge for residents of the residential development above the extreme flood level with an allowance for climate change and is internally accessible.<br>Emergency Planning<br>The site is shown to be within an Environment Agency Flood Warning Area for the Tidal Colne upstream of the Colne Barrier; residents should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the Colne Barrier, Flood Response Plans should be prepared by residents of the site including details of egress routes and place to safe refuge. |
| **Will the proposed development type be acceptable in this flood zone?** | Yes. Residential development is classed as a 'more vulnerable use in the PPG. Proposals for residential development in flood zone 2 and or 3 are required to pass both Sequential Test and both parts of the Exceptions<br><br>Test. There are no reasonably available sites in flood zone 1 or 2 in East Colchester/ Hythe Special Policy Area. It has been demonstrated that this site can satisfy both the Sequential and Exception Tests. Allocating this site for development will contribute positively to the continuing regeneration of East Colchester which has been on-going since |

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| | 2001. New development will be responsive to the historic character of the East Colchester/Hythe and reinforce the Conservation Area and also delver new green infrastructure including new areas of open space for public enjoyment. |
| Conclusion - The proposed development entails More Vulnerable residential development located in Flood Zone 3a, which is subject to the Exception Test in accordance with the NPPF. The site is also identified as having a high risk of surface water flooding east of the site and therefore appropriate surface water flooding mitigation measures need to be considered in the design. One of the key issues for the proposed site is the residual tidal flood risk posed to the existing access/egress route along Hythe Station Road and Hawkins Road. Note the residual tidal risk is based on the failure of the Colne Barrier to close and is considered an unlikely event. The suitability of allocating this site in the Colchester BC Site Allocations rests on the ability of the risk management authorities to work together to deliver a solution for the potential flood risk. Based upon the strategic review of the flood risk posed to the site, and the recommendations set out above, it is likely that the proposed development itself could be suitably designed to protect the site and occupants from the risk of flooding.<br><br>Based on the strategic assessment of flood risk and subject to the recommendations and mitigation measures set out above being implemented, the Sequential and Exceptions Tests are passed.<br><br>**Recommendation: Allocate the site** | |