

## 14. Hydrology, drainage and flood risk

### Purpose of the Assessment

- 14.1 This chapter identifies the existing hydrology, drainage and flood risk conditions and development constraints, and assesses the potential effects on each of these during the construction, operation and decommissioning phases of the Proposed Development.
- 14.2 This assessment considers the natural flows paths, hydrological regime, the wide range of sources of flooding (as identified within National Planning Policy Framework), along with the existing surface water drainage regime. For each, the impacts associated with the design, construction, operation, and decommissioning of the Proposed Development is considered.
- 14.3 The full details of the hydrogeological regime comprising the groundwater in any permeable deposits (rock, soil or Made Ground) beneath the Proposed Development, and the hydrological regime (surface water), insofar as they interact with land contamination, are assessed in **Chapter 13** relating to ground conditions.
- 14.4 This chapter identifies the legislative and policy context for the assessment; the extent of the Study Area; summarises relevant consultation; describes the baseline surveys, data, and conditions; describes the methods used to assess the effects of the Proposed Development; identifies relevant embedded mitigation; provides an assessment of likely significant effects during construction, operation and decommissioning, and provides a cumulative assessment (inter and intra project). The chapter also identifies the mitigation measures required to prevent, reduce or offset any significant adverse effects and the likely residual effects after these measures have been adopted. Monitoring is identified where necessary, and a summary of the assumptions and limitations of the assessment is also provided.
- 14.5 The assessment considers the Main SRFI Site (including A43 access and all rail infrastructure); the J15a works, and other Minor Highways Works.
- 14.6 The Main SRFI Site works include the following main elements:
- Demolition of existing buildings and structures;
  - An intermodal freight terminal with direct connections to the Northampton Loop Railway Line, capable of accommodating trains of up to 775m long, including up to 3 gantry cranes, container storage, a train maintenance depot and facilities to transfer containers to Heavy Goods Vehicles (HGV);
  - An express freight terminal with direct connections to the West Coast Main Line, capable of accommodating trains of up to 240m long, a freight platform with associated loading and unloading facilities;
  - Up to 702,097 sq m (GEA) of rail connected and rail served warehousing and ancillary service buildings including a lorry park, terminal control building and bus terminal;

- New road infrastructure including a new separated access point on the A34 (T), an internal site underpass (under Northampton Road);
- Strategic landscaping and open space including alterations to public rights of way, the creation of new ecological enhancement areas and publicly accessible open areas, flood attenuation, and the partial diversion of the Milton Malsor brook.

14.7 The J15a works include the following main elements:

- Pre-development works to facilitate widening/ reconfiguration (which will lead to some loss of vegetation in accordance with the draft landscape plan);
- Widening and signalisation of existing northern roundabout;
- Widening of A5123 approach; widening of M1 southbound off-slip approach;
- Widening of A43 northbound approach to northern roundabout;
- Reconfiguration of existing southern roundabout to provide signalised T-Junction;
- Provision of two lane free flow slip on A43 South Bound;
- Provision of new link road between southern junction to M1 northbound on and off slips;
- Widening of A43 northbound approach to southern junction; and
- Provision of environmental enhancement measures including new native tree and shrub planting, hedgerows, ponds and grass, wildflower and marshland areas.

14.8 The other highways works relate to land at the following locations. A description of each of the other highways works proposed is provided at **Chapter 5**.

- Junction 16 of the M1 (M1/ A4500 (east to Northampton)/ A45 (west to Daventry));
- Junction 15 of the M1 (M1/ A45 (north to Northampton and Wellingborough)/ Saxon Avenue/ A508, Northampton Road (south to Milton Keynes));
- A4500, Weedon Road (east)/ Tollgate Way/ A4500, Weedon Road (west)/ A5076, Upton Way;
- A5076/ A5123/ Upton Way Roundabout (Pineham Park) (Dane Camp Way);
- A5076 (west)/ Hunsbury Hill Avenue/ Hunsbarrow Road/ A5076, Danes Camp Way/ Hunsbury Hill Road;

- Towcester Road/ A5076, Danes Camp Way/ A5123, Towcester Road/ Mere Way/ Tesco Access;
- A45, Nene Valley Way (south); A428, Bedford Road (west)/ A5095, Rushmere Road/ A45, Nene Valley Way (north)/ A428, Bedford Road (east);
- A45, Nene Valley Way (south); A43, Lumbertubs Way/ A45, Nene Valley Way (north)/ Ferris Row;
- Tove Roundabout (A43, Towcester Bypass (southwest)/ Towcester Road/ A5, (north)/ A43, (northeast)/ A5, Watling Street (southeast));
- Abthorpe Roundabout (Abthorpe Road/ A43, Towcester Bypass (north)/ Brackley Road/ A43, Towcester Bypass (south));
- A5076, Upton Way (south)/ Telford Way/ A5076, Upton Way (north)/ Walter Tull Way/ Dustan Mill Lane;
- A5076, Upton Way (south)/ High Street/ A5076, Upton Way (north)/ Dustan Mill (Stub);
- A45 (south)/ Eagle Drive/ A45 (north)/ Caswell Road; and
- A508, Harborough Road (south)/ A5199, Welford Road/ A508, Harborough Road (north)/ Cranford Road/ Kingsland Avenue.

14.9 Full details of the Proposed Development are provided in **Chapter 5**.

14.10 There are, however, three aspects of the other minor highway works described in Chapter 5 that have not been included in this assessment, due to their late identification as appropriate mitigation for the Proposed Development. These are:

- PL29 – A43/St John’s Road (signage and road surfacing scheme on the A43),
- PL 31 – A43 Northampton Road (signage scheme); and,
- Pedestrian/Cycle Way along Northampton Road and between Barn Lane to the junction of Collingtree Road (widening of existing footpaths, provision of new footpath and dropped kerbs, and realignment of the carriageway).

14.11 The first two elements listed above require no physical works to alter the footprint of the road. The pedestrian/cycle way is located within Highways land and will involve minimal disturbance of existing verges. Assessment of all three aspects will be included in the assessment undertaken for the final DCO submission.

14.12 This chapter is supported by the Flood Risk Assessment – Part 1 and 2 (FRA) and Surface and Foul Water Drainage Strategy which are included as **Appendix 14.1**. The FRA report provides detailed supporting technical information.

## **Legislation, Policy and Good Practice**

- 14.13 The key guidance documents used in the preparation of this chapter include the National Planning Policy Framework (Ref 14.2) and the accompanying PPG (Ref 14.3) as referenced within the NPS NN (Ref 14.1). The NPS NN generally follows the requirements as detailed within NPPF (such as assessment of flood risk, no detrimental impact off-site, and the sequential/exception tests) but with a greater focus on the impacts of climate change and how this may impact upon proposed developments. Other areas where additional focus is required relate to residual risks, and access and egress (including operational needs) during a flood risk event.
- 14.14 Particular use has also been made of the Northamptonshire Strategic Flood Risk Assessment. Information has also been provided by the Environment Agency (EA) in relation to predicted flood risk and any known historical incidents of flooding. Discussions have also been undertaken with the EA specifically to determine any local requirements that Statutory Consultees may request. Further details of this have been included within the 'Consultation' section of this chapter.
- 14.15 In line with current legislation and policy, a flood risk assessment has been prepared in accordance with guidance contained in the documents listed below in tables 14.1, 14.2, 14.3, and 14.4.

## National

**Table 14.1 – Hydrology, Flood Risk and Drainage, National Level**

Policy, Guidance	Key Provisions	Relevant Section of Chapter Where Key Provisions are Addressed
National Networks National Policy Statement	<p>Sets out the need and government policies for nationally significant infrastructure rail and road projects for England. The flood risk and drainage section reference the NPPF and PPG.</p> <p>The volumes and peak flows of surface water leaving the site should be no greater than the rates prior to the proposed project, unless specific off-site arrangements are made and result in the same net effect (NPSNN paragraph 5.113).</p> <p>Paragraph 5.219 of the NPSNN recognises that during construction and operation, projects can lead to increased demand for water, and discharges of pollutants to water causing adverse ecological impacts. In turn, these could compromise environmental objectives established under the Water Framework Directive. Activities that discharge to the water environment are subject to pollution control. For this reason, decisions under the PA 2008 should complement but not duplicate those taken under the relevant pollution control regime (NPSNN paragraph 4.50).</p> <p>The NPSNN also advises (amongst other things) that the existing quality of waters, water resources, physical characteristics of the water environment (including quantity and dynamics of flow) and protected areas (as described in the NNNPS) should be considered.</p>	<p>This is an overarching Policy that all elements of this assessment have been assessed against.</p> <p>The assessment that has been carried out meets the requirements of paragraphs 5.92-5.104, and 5.112-5.114 in relation to mitigation.</p> <p>The assessment also complies with paragraphs 5.219-5.231 in relation to water quality.</p> <p>The requirements have been included through the assessment of the existing conditions along with ensuring all mitigation measures and recommendations made meet the requirements of this Policy</p>

National Planning Policy Framework	Section 10 of the NPPF defines the wider aims and objectives for dealing with flooding, coastal change and climate change. This includes the requirements for strategic and site-specific flood risk assessments. This is referenced as a supporting document within NPS NN.	<p>This is overarching guidance that all elements of this assessment have been assessed against.</p> <p>All identified sources of flooding within this document have been included throughout this assessment. In addition, all mitigation measures and recommendations have met the criteria to ensure that the proposals result in no detrimental impact.</p>
Flood and Water Management Act 2010	The Flood and Water Management Act places a duty on all flood risk management authorities to co-operate with each other. The Act also includes amendments to the Reservoir Act of 1975 where the volume of water classified as a reservoir has been revised down from 25,000m <sup>3</sup> to 10,000m <sup>3</sup> .	This is an overarching Act that all elements of this assessment have been assessed against.
Land Drainage Act 1991	Consent of the internal drainage board, or unitary or county council is required to construct or alter a culvert or flow control structure (such as a weir) on any ordinary watercourse.	This is an overarching Act that all elements of this assessment have been assessed against.
Water Resources Act 1991	This includes four other pieces of legislation (Water Industry Act 1991, Land Drainage Act 1991, Statutory Water Act 1991 and the Water (Consequential Provisions) Act 1991) whose combined purpose was to consolidate existing water legislation. The Act governs the quality and quantity of water by outlining the functions of the Environment Agency. The WRA sets out offences relating to water, discharge consents, and possible defences to the offences.	This is an overarching Act that all elements of this assessment have been assessed against.

## Local

**Table 14.2 – Hydrology, Flood Risk and Drainage, Local Level**

Policy, Guidance	Key Provisions	Relevant Section of Chapter Where Key Provisions are Addressed
Northampton Borough Council Strategic Flood Risk Assessment 2009	The Northampton Borough Strategic Flood Risk Assessment (SFRA) provides an overarching view of flood risk issues within the area, along with recommended principles for guiding future development, in respect of flood risk, flood mitigation measures, drainage systems and the water environment. The SFRA is closely linked to the local plan and supports the sequential approach to new developments.	<p>This is an overarching Policy Document that all elements of this assessment have been assessed against.</p> <p>This Policy Document has been used to inform the baseline flood risk but also to ensure that all mitigation measures and recommendations meet the requirements.</p>
West Northamptonshire Joint Core Strategy 2014	<p>This sets out the long-term vision and objectives for the whole of the area covered by Northampton Borough, Daventry District and South Northamptonshire Councils for the plan period up to 2029, including strategic policies for steering and shaping development, together with strategic site allocations. BN1 – Green Infrastructure Connections – This Policy aims to promote the inclusion of green corridors to enhance existing conditions and provide new green infrastructure provisions that will be conserved, managed and enhanced.</p> <p>BN7 – Flood Risk – This ensures that any development proposals will comply with flood risk assessment and management requirements set out in the National Planning Policy Framework and Local Documents to address current and future flood risks with appropriate climate change allowance. This Policy also promotes the adoption of a Sequential Approach to site use along with the provision of suitable mitigation measures where required. Policy BN7A addresses water supply, quality and wastewater infrastructure.</p>	<p>This is an overarching document that all elements of this assessment have been assessed against with reference to hydrology, water quality and the water environment, and relevant infrastructure, a particular focus being the mitigation measures and recommendations.</p>

West Northamptonshire Water Cycle Study (2011)	This document reviews the implications of the Water Framework Directive and assesses the implications of development on water resources and regional strategic water resources infrastructure. This document also prepares demand management scenarios for water supply. This document also identifies, where required, requirements for water treatment and network along with water supply.	The water cycle study would primarily relate to the Utilities Chapter for water supply and Ecology Chapter for the Water Framework Directive. However, the proposed foul water strategy (and discussions with the water authority) have ensured the relevant requirements of this document are met.
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## Consultation and Scoping

**Table 14.3 – Summary of Scoping Opinion**

Scoping Opinion Section/Paragraph	Summary of Issue Raised	Where in the ES is this addressed
Para 3.57	Appropriate cross-referencing, where suitable, with other disciplines.	Referencing has been made to both the Ground Conditions, Utilities, and Ecology chapters where appropriate.
Para 3.58	Study Area has not been made clear.	Order Limit boundary plan is included within the FRA, which is appended to the chapter ( <b>Appendix 14.1</b> ).
Para 3.59	Figure showing all features along with flood risk mapping for the Site is required.	Plan included within the FRA, which is appended to the chapter ( <b>Appendix 14.1</b> ).
Para 3.60	Clearly identify which water features would be directly impacted by the proposed development, including details of any water body crossings.	Detailed within the FRA, which is appended to the chapter ( <b>Appendix 14.1</b> ).
Para 3.61	Final land levels across the site should be included.	Drawings have been included within the FRA, which is appended to the chapter. These include pre- and post-development ground levels based on current plans.



Para 3.62	Historic landfill identified on plans and will need to be considered.	<b>Chapter 13</b> considers landfill locations.
Para 3.63	Discuss and agree FRA approach with relevant consultees.	<b>Table 14.4</b> gives details of when this was discussed and agreed. Relevant correspondence also included within the FRA, which forms an Appendix to this chapter ( <b>Appendix 14.1</b> ).
Para 3.64	Flood Risk from or to different elements of the proposed development has been evaluated.	Included within the FRA, which is appended to this chapter ( <b>Appendix 14.1</b> ).
Para 3.65	Details are to be provided for Flood Mitigation Measures and Compensation.	<b>Table 14.4</b> gives details of when this was discussed and agreed. Relevant correspondence also included within the FRA, which forms an Appendix to this chapter ( <b>Appendix 14.1</b> ).
Para 3.66	Tabulated Methodology	Full methodology included within this chapter.
Para 3.67	Water Framework Directive.	This is addressed within the Ecology chapter in relation to biodiversity, fisheries, and water quality. The design inputs have been fed into the assessments but are not relevant to be discussed in detail in this Hydrology chapter.
Canal & River Trust	The canal should be recognised in relation to infrastructure failure flooding	Considered as part of the FRA, which is appended to this chapter ( <b>Appendix 14.1</b> ).
Environment Agency	Reference to Soakaways and not locating these in contaminated ground.	This is indirectly covered within the Surface Water Drainage section of the appended FRA. Soakaways are not being proposed due to the lack of acceptable ground conditions.

Environment Agency	Need for reference being made to the West Northamptonshire Water Cycle Study regarding water supply.	This report has been reviewed and this mirrors the findings of the Anglian Water response in relation to foul water and is therefore covered within the Foul Water Section of the appended FRA ( <b>Appendix 14.1</b> ). The requirements for water supply have been addressed within the Utilities Chapter.
Environment Agency	Biodiversity enhancement (West Northamptonshire Water Cycle Strategy, Green Infrastructure Strategy, the EU Habitat Directive and UK Regional and Local Biodiversity Action Plans)	Whilst the FRA details the diversion of watercourse and construction of green corridors through the Order Limits, this policy document is more relevant to the Landscape and Visual and Ecology chapters, and is not discussed further in this chapter.
Environment Agency	Reference to Northampton Borough Councils Green Infrastructure Plan	The Plan has been reviewed, and is not relevant for assessment in this chapter, but is covered within other technical chapters.
Environment Agency	Reference to Woodlands for Water	This has been reviewed, and is not relevant for assessment in this chapter, but is covered within other technical chapters.
Environment Agency	Reference to be made to the CEMP	Included within the Surface Water Drainage section of the FRA, which is appended to this chapter ( <b>Appendix 14.1</b> ). Other aspects from the CEMP are covered in other relevant chapters.

Milton Malsor Parish Council. Collingtree Parish Council.	Historic flooding of Milton Malsor village need to be considered.	All relevant flood risk considerations are addressed within the FRA ( <b>Appendix 14.1</b> ). Information is also provided in the summary of the baseline environment in this chapter.
Roade Parish Council	Ground and surface water flooding comments raised and required addressed.	All relevant flood risk considerations are addressed within the FRA ( <b>Appendix 14.1</b> ).

**Table 14.4 – Consultations Undertaken**

Consultation and Date	Summary of Consultation	Where in the ES is this addressed
Environment Agency (via email December 2016- January 2017 and meeting on 22 February 2017)	Discussions and agreement of the approaches used for the Flood Risk Assessment and principles of mitigation also discussed and agreed. The EA also confirmed the level of detail and works they would require.	Included within the FRA, which is appended to this chapter ( <b>Appendix 14.1</b> ).
Northamptonshire County Council (January 2017)	Discussions and agreement of the approaches used for the Flood Risk Assessment and Drainage Strategy and principles of mitigation also discussed and agreed. NCC also confirmed the level of detail and works they would require.	Included within the FRA, which is appended to this chapter ( <b>Appendix 14.1</b> ).

Anglian Water (January – April 2017)	Anglian Water, at the request of Hydrock, have undertaken a Pre-Development Enquiry and Drainage Impact Assessment. These discussions were related to Foul Water Only.	Reference Made within the 'Foul Water' section for each of the scenarios.
	26 April 2017 – a meeting was held regarding the Water Application and services.	The implications of the findings of the reports has been detailed further within the FRA which is appended to this chapter ( <b>Appendix 14.1</b> ).
		Detailed within the Utilities Chapter.
Internal Drainage Board (January 2017)	Awaiting response to discuss and agree any specific requirements the IDB may have.	Unable given no response at time of writing

### Study Area

- 14.17 In line with policy and legislation requirements the Study Area for this chapter has been primarily focused on the Order Limits itself and areas immediately adjacent in order to assess and demonstrate that there is no resultant detrimental impact on flood risk (including all forms of flood risk as detailed within the NPPF (Ref 14.1)) to areas upstream, within the site, or downstream of the development. As such the approach adopted, and detailed within this chapter, is expected to have no influence on any areas outside the Order Limits but could extend to include the watercourse catchment downstream of Potential Development Area. As such, the Zone of Influence, and therefore Study Area, is defined by the Potential Development Area (including all of the now identified minor highways works) for all existing boundaries excepting the northern site limit where a buffer of 1.5km has been included. A plan showing the Potential Development Area has been included within the FRA which is appended to this chapter as Appendix 14.1.

### Baseline Surveys and Data

- 14.18 A site walkover survey (photographs taken) was undertaken on 30 June 2016, no additional field surveys have been required for the technical assessment for Hydrology, Flood Risk and Drainage. The survey was to observe and understand site levels, flow mechanisms, and any potential impacts that need considering in the hydrological assessment (culverts, blockages etc.).

- 14.19 The main source of information has been via readily available flood risk data from the Environment Agency and Northampton Borough Council in their role as the Lead Local Flood Authority (LLFA) and, where required, South Northamptonshire Council. The LLFA is responsible for localized flooding management including managing the risks from surface water, ordinary watercourses and groundwater. This included a Product 4 data request from the EA which contained the current flood zone mapping along with confirmation of how this has been produced. Information provided by Local Authorities related to any evidence of historic events of flooding within the site /surrounding area. This chapter has also been informed by the Flood Risk Assessment which is an Appendix to this report and which sets out in full the surveys and data relevant to this assessment.

### **Baseline Conditions**

- 14.20 The extent of the Hydrology, Flood Risk and Drainage study area is the land within the proposed Order Limits and the immediate surrounding area. This baseline assessment contains an assessment of all sources of Flood Risk identified within NPPF and the Northamptonshire County Council SFRA and therefore assesses the present-day risk to the site from fluvial, tidal, surface water, groundwater, infrastructure failure sources along with the risk posed by artificial sources (canals, reservoirs etc).
- 14.21 Each of the sources assessed considers the current conditions and makes no allowance for any mitigation measures, and does not include any reference to the proposals.

### **Main SRFI Site (including A43 access and all rail infrastructure)**

#### ***Fluvial Flood Risk***

- 14.22 The Main SRFI Site is shown by the EA's Flood Zone Mapping to be predominantly within Flood Zone 1 (land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%)). However, small areas of the Main SRFI Site immediately adjacent to the Milton Malsor Brook and the 'Unnamed Watercourse' are shown to be at an increased risk with some land categorised as being at medium and high risk. High risk is Flood Zone 3, which is considered to have a greater than 1 in 100 annual probability of river flooding (>1%) in any year. Medium risk is Flood Zone 2 which is land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%) in any year.
- 14.23 Following discussions, the EA has confirmed that the current flood zones are based on wide area coarse modelling and the current risk to the Main SRFI Site is therefore subject to confirmation through more detailed and site-specific modelling of all watercourses. These works have been completed and run for both the 1 in 200 years plus climate change event (which is a local requirement set by the LLFA) and the 1 in 1,000-year events. The results from this modelling have shown the site to be at a significantly reduced risk from fluvial flooding than is currently shown on the EA's mapping, but localised areas adjacent to the watercourses are confirmed as being within both Flood Zones 2 and 3 and at medium and high risk respectively. Details of the works undertaken, along with updated flood outline

drawings, have been included within the Technical Appendix to this Chapter (**Appendix 14.1**).

- 14.24 The EA have confirmed that they hold no information relating to any historic flood events at the site. In addition, the LLFA's SFRA also makes no reference to any recorded historic incidents of fluvial flooding within the Study Area.
- 14.25 Anecdotal records provided by local residents identify that the Main SRFI Site has previously experienced localised flooding and evidence has been provided in the form of photographs. These photographs confirm that flooding through the Main SRFI Site has occurred but that it has not been extensive and, from the information provided, limited to lower lying areas of the Study Area that immediately border the watercourses. The information supports the modelled flood outlines in terms of general extents and mechanisms (i.e. location of out of bank flows and general flow routes).

#### ***Tidal Flood Risk***

- 14.26 Owing to the location of the Main SRFI Site relative to tidally influenced watercourses the risk of tidal flooding (including an allowance for climate change) is considered negligible and as such no further assessment is required. The watercourses within the Study Area drain into the River Nene. The River Nene is not shown as being tidally influenced until around 65km north-east of the downstream limit of the Study Area.

#### ***Surface Water***

- 14.27 The EA's Flooding from Surface Water mapping predicts a flood extent that is similar to the extents shown on the Fluvial Flood map. As such, the lower elevated sections of the Main SRFI Site that immediately border the Milton Malsor Brook are considered to be at an increased risk from this source.
- 14.28 Whilst the predicted surface water flooding extents closely match the EA's Fluvial Flood Map, two additional flow routes through the Main SRFI Site are also shown. The first is from the high section of land to the west with potential surface flows in an easterly direction towards the Milton Malsor Brook. The second route is within the east of the Main SRFI Site where flows are predicted to be directed by the topography in a northerly direction away from the Main SRFI Site.

#### ***Groundwater Flood Risk***

- 14.29 The British Geological Survey mapping indicates that the Main SRFI Site is predominantly underlain by the Dyrham Formation and the Whitby Mudstone formation and these are both considered as being low in permeability. Further information relating to the Groundwater and Geology of the site has been made within the Ground Conditions chapter, **Chapter 13**. As such, and given the Milton Malsor Brook flows through a section of the site, it is considered that groundwater levels would be in hydraulic connectivity with normal channel water levels but not to vary significantly over time. In order to adopt a conservative approach, the 1 in 1000-year fluvial outline from the modelling study is considered as being representative of the 'worst case' groundwater flooding scenario. The lower elevated

sections of the Main SRFI Site that immediately border the watercourse are therefore considered to be at an increased risk from this source.

- 14.30 A detailed site investigation has been undertaken which confirms the underlying ground conditions. Anecdotal evidence also confirms groundwater levels are considered as being 'near surface'. Further information on this has been detailed within the Groundwater Chapter of this PEIR, (**Chapter 13**).

#### ***Foul Water***

- 14.31 An Anglian Water Sewage Treatment works (also referred to as Blisworth Water Recycling Centre) is located to the immediate south of the Main SRFI Site.
- 14.32 Following discussions, Anglian Water have undertaken a Pre-Development Enquiry and a Drainage Impact Assessment. These assessments have identified that the existing foul network is known to have issues in relation to capacity and, as such, and within their response, Anglian Water have subsequently suggested possible mitigation measures that should be considered. These are discussed further within the mitigation works section of this chapter.
- 14.33 Anglian Water have provided sewer plans that indicate the only public sewer within the Main SRFI Site is a 300mm diameter foul sewer that runs from south to north through the western section of the Main SRFI Site and parallel to the Milton Malsor Brook.

#### ***Infrastructure Failure Flooding***

- 14.34 The Main SRFI site is currently shown to consist of large-scale arable farming with some smaller scale pastoral fields. As such, it is considered that there is only a limited engineered sewer network serving, or running through, the Main SRFI site.
- 14.35 From the review of sewer records it is considered that in the event of a failure (as a result of a blockage or collapse of the sewer) any generated overland flows would follow the existing topography of the Main SRFI Site and drain towards the two watercourses rather than causing flooding on the Main SRFI Site. Any infrastructure failure would increase the flood risk but it is expected that this would only affect lower elevated areas of the site before draining into existing land drainage features or watercourses. As such, and given that this is only considered to be a risk during exceedance flow events or a failure of the existing system, the receiving network is considered as having capacity to receive the flows and therefore there would be no detrimental impact to third party land.

#### ***Artificial Sources***

- 14.36 The EA's Flooding from Reservoir Mapping shows that the Main SRFI Site is not within an area considered as being within the maximum extent of predicted flooding from artificial sources.
- 14.37 The Grand Union Canal abuts the site to the west and is shown by Ordnance Survey contour mapping to be a level above sections of the Main SRFI Site and therefore there is the

potential for inundation of the Main SRFI Site in the event of a failure or breach of the Grand Union Canal. The risk of such a failure is considered as being low owing to the level of ongoing inspections and maintenance undertaken by the Canal & River Trust. The risk for this source is therefore considered as minimal and residual only.

### **J15a Works**

#### ***Fluvial Flood Risk***

- 14.38 The J15a works are classified by the EA's Flood Zone Mapping to be entirely within Flood Zone 1 (land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%)). However, from a review, the contributing catchment area for the watercourse through the site is such that the EA have not undertaken detail modelling. In order to assess the risk from this source, the flooding from surface water mapping has been used. This confirms that whilst the lower elevated sections of the site are at an increased risk, the A43 and M1 Motorway are suitably elevated and at low risk.
- 14.39 The EA have confirmed that they hold no information relating to any historic flood events. In addition, the LLFA's SFRA also makes no reference to any recorded historic incidents of fluvial flooding within the Study Area.

#### ***Tidal Flood Risk***

- 14.40 Owing to the location of the J15a works in relation to watercourse/bodies that are tidally influenced the impact of tidal flooding (including an allowance for climate change) is considered negligible. The watercourses within the Study Area drain into the River Nene. The River Nene is not shown as being tidally influenced until around 65km north east of the downstream limit of the study area.

#### ***Surface Water Flood Risk***

- 14.41 The EA's Flooding from Surface Water mapping predicts that whilst the central areas of the site (those earmarked for the bird mitigation works) and those adjacent to the watercourse and Grand Union Canal are at an increased risk, however the A43 and M1 Motorway are suitably elevated and shown as being above the main risk. As such, the main J15a works are shown as being outside the areas of risk from this source.

#### ***Groundwater Flood Risk***

- 14.42 The British Geological Survey mapping indicates that the J15a works are predominantly underlain by the Dyrham Formation and the Whitby Mudstone formation and these are both considered as being low in permeability. Given that the Grand Union Canal and an Unnamed Watercourse flows through a section of the site, it is considered that groundwater levels would be in hydraulic connectivity with normal channel water levels. As such, and in order to adopt a conservative approach, the 1 in 1000-year fluvial outline from the modelling study is considered as being representative of the 'worst case' groundwater flooding scenario. The J15a works are considered as being at low risk from this source. However, the bird mitigation works, which are concluded as being 'floodable' are within areas of increased risk.



- 14.43 A detailed Site Investigation has been undertaken which confirms the underlying ground conditions. Furthermore, anecdotal evidence indicates that groundwater levels are considered as being 'near surface'. Further information on this has been detailed within the Ground Conditions Chapter (**Chapter 13**).

#### ***Foul Water***

- 14.44 An Anglian Water Sewage Treatment works (also referred to as Blisworth Water Recycling Centre) is located to the south of the J15a works. Anglian Water have provided sewer plans that indicate no public sewers within the J15a works with all networks being at lower elevated areas adjacent to the watercourses.

#### ***Infrastructure Failure Flooding***

- 14.45 The J15a works are currently shown to consist of large-scale arable farmland with some smaller scale pastoral fields. There is limited, if any, engineered sewer network serving, or running through, the J15a works area.
- 14.46 From a review of the sewer records it is considered that, in the event of a failure (as a result of a blockage or collapse of the sewer), any generated overland flows would follow the wider area topography and drain towards the two watercourses and away from the J15a works. As such this source is not considered to pose any risk to this section of works.

#### ***Artificial Sources***

- 14.47 The EA's Flooding from Reservoir Mapping shows that the J15a works site is not within an area considered as being within the maximum extent of predicted flooding from artificial sources.
- 14.48 The Grand Union Canal passes through the site to the west and is shown by Ordnance Survey contour mapping to be a level above sections of the J15a works and therefore there is the potential for inundation of the J15a works site in the event of a failure or breach of the Grand Union Canal. The risk of such a failure is considered as being low owing to the level of ongoing inspections and maintenance undertaken by the Canal & River Trust. The risk from this source is considered as minimal and residual only.

#### **Other Minor Highway Works**

##### ***Fluvial Flood Risk***

- 14.49 The majority of the other Minor Highway Works are shown by the EA's Flood Zone Mapping to be within Flood Zone 1 (land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%)). However, the A45 Nene Valley, and Upton Way/High Street works have both been identified as being at medium risk from fluvial flooding. Medium risk is Flood Zone 2 which is land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%) in any year.

- 14.50 The EA have confirmed that they hold no information relating to any historic flood events. In addition, the LLFA's SFRA also makes no reference to any recorded historic incidents of fluvial flooding within this section of the Study Area.

#### ***Tidal Flood Risk***

- 14.51 Owing to the location of the other Minor Highway Works site the impact of tidal flooding (including an allowance for climate change) is considered negligible.

#### ***Surface Water Flood Risk***

- 14.52 The EA's Flooding from Surface Water mapping indicates that nine of the off-site highways works are at some part at an increased risk from surface water risk with localised areas in each of these areas being shown to be at increased risk. The remaining eight sites have been categorised as being at 'very low' risk from surface water flooding.
- 14.53 Whilst nine of the sites have been identified as being at an increased risk it should be noted that the EA's flooding from surface water mapping does not make any allowance for existing sewer networks (road of surface water drainage) and therefore provides a 'worst case' prediction of risk from this source. Given that all of the nine sites identified are existing roads it is considered that an existing sewer network exists and, as such, the site is concluded as being at low risk from this source of flooding provided the existing drainage system remains functional.

#### ***Groundwater Flood Risk***

- 14.54 The British Geological Survey mapping indicates that the other Minor Highway Works are predominantly underlain by the Dyrham Formation and the Whitby Mudstone formation and these are both considered as being low in permeability. It is considered that groundwater levels would be in hydraulic connectivity with normal channel water levels or nearby watercourses. In order to adopt a conservative approach, the 1 in 1000-year fluvial outline from the modelling study is considered as being representative of the 'worst case' groundwater flooding scenario. As such, and as explained elsewhere within this chapter, the other Minor Highway Works that are at lower elevations and immediately bordering the watercourse would be at an increased risk from this source.

#### ***Foul Water***

- 14.55 The majority of the off-site highways works are currently occupied by existing roads and would pose little interaction with existing foul water sewers. The remaining site is a proposed cycleway and would again pose little interaction with existing foul water sewers. As such, the risk posed is considered negligible.

#### ***Infrastructure Failure Flooding***

- 14.56 The other Minor Highway Works are proposed within 14 locations with some being in heavily developed areas and others being within predominantly arable farmland with some smaller scale pastoral fields. Whilst those located within developed areas are served by

complex engineered drainage systems, it is considered that there is only a limited engineered sewer network serving the areas to agricultural use.

- 14.57 From a review of available sewer records and a review of available topographical survey it is considered that in the event of a failure (as a result of a blockage or collapse of the sewer) any generated overland flows would follow the existing topography and drain towards the neighbouring watercourses/land drainage ditches rather than causing flooding to junctions or surrounding developments/land.

#### ***Artificial Sources***

- 14.58 The EA's Flooding from Reservoir Mapping shows that the other Minor Highway Works are not within areas considered as being within the maximum extent of predicted flooding from artificial sources.

#### **All Development in Proposed Order Limits**

#### ***Fluvial Flood Risk***

- 14.59 The Proposed Development Works are shown by the EA's Flood Zone Mapping to be predominantly within Flood Zone 1 (land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%)). However, small areas of the Proposed Development work immediately adjacent to the Milton Malsor Brook and the Unnamed Watercourse are shown to be at an increased risk with some land categorised as being at medium and high risk. High risk is Flood Zone 3, which is considered to have a greater than 1 in 100 annual probability of river flooding (>1%) in any year. Medium risk is Flood Zone 2 which is land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%) in any year.
- 14.60 Following discussions, the EA has confirmed that the current flood zones are based on wide area coarse modelling and the current risk to the Proposed Development works site is therefore subject to confirmation through more detailed and site-specific modelling of all watercourses. These works have been completed for both the 1 in 200 years plus climate change event (which is a local requirement set by the LLFA) and the 1 in 1,000-year events. The results from this modelling show the site to be at a significantly reduced risk from fluvial flooding than is currently indicated by the EA's mapping, but localised areas adjacent to the watercourses are confirmed as being within both Flood Zones 2 and 3 and at medium and high risk respectively. Details of the works undertaken, along with order limited flood outline drawings have been included within the Technical Appendix to this Chapter (**Chapter 14.1**).
- 14.61 The EA have confirmed that they hold no information relating to any historic flood events at the location of the site. In addition, the LLFA's SFRA also makes no reference to any recorded historic incidents of fluvial flooding within the Study Area.
- 14.62 Anecdotal records provided by local residents in the form of photographs indicate that the Proposed Development works site has previously experienced localised flooding. These photographs confirm that flooding through the Proposed Development works site has not been extensive has been limited to lower lying areas of the Study Area that immediately

border the watercourses. The information provided supports the modelled flood outlines in terms of general extents and mechanisms (i.e. location of out of bank flows and general flow routes).

#### ***Tidal Flood Risk***

- 14.63 Owing to the location of the Proposed Development works site the impact of tidal flooding (including an allowance for climate change) is considered negligible.

#### ***Surface Water Flood Risk***

- 14.64 The EA's Flooding from Surface Water mapping predicts a flood extent that is shown to be similar to the extents shown on the Fluvial Flood map. As such, the lower elevated sections of the Proposed Development work that immediately border the Milton Malsor Brook are considered to be at an increased risk from this source.
- 14.65 Whilst the predicted surface water flooding extents closely match the EA's Fluvial Flood Map, two additional flow routes through the Main SRFI Site are also shown. The first is from the high section of land to the west with potential surface flows in an easterly direction towards the Milton Malsor Brook. The second route is within the east of the Proposed Development works and predicted flows to be directed by the topography in a northerly direction and away from the Proposed Development works.

#### ***Groundwater Flood Risk***

- 14.66 The British Geological Survey mapping indicates that the Proposed Development works is predominantly underlain by the Dyrham Formation and the Whitby Mudstone formation and these are both considered as being low in permeability. Given the Milton Malsor Brook flows through a section of the site, it is considered that groundwater levels would be in hydraulic connectivity with normal channel water levels. In order to adopt a conservative approach, the 1 in 1000-year fluvial outline from the modelling study is considered as being representative of the 'worst case' groundwater flooding scenario. As such, and as explained earlier in this chapter, the lower elevated sections of the Proposed Development work that immediately border the watercourse would be at an increased risk from this source.
- 14.67 A detailed Site Investigation has been prepared and confirms the underlying ground conditions as being impermeable and with evidence of high groundwater levels – i.e. near surface. Further information on this is provided within the Ground Conditions chapter (**Chapter 13**).

#### ***Foul Water***

- 14.68 An Anglian Water Sewage Treatment works (also referred to as Blisworth Water Recycling Centre) is located to the immediate south of the Main SRFI Site.
- 14.69 Following discussions, Anglian Water have undertaken a Pre-Development Enquiry and a Drainage Impact Assessment. These assessments have identified that the existing foul network is known to have issues in relation to capacity and, as such, and within their

response, Anglian Water have subsequently suggested possible mitigation measures that should be considered. These are discussed further within the mitigation works section of this chapter.

- 14.70 Anglian Water have provided sewer plans that indicate the only public sewer within the Main SRFI Site is a 300mm diameter foul sewer that runs from south to north through the western section of the Main SRFI Site and parallel to the Milton Malsor Brook.
- 14.71 Whilst mitigation works are required to accommodate the Main SRFI site, the J15a works and the other minor highway works pose no interaction to foul water and, as such, wouldn't require any additional mitigation.

#### ***Infrastructure Failure Flooding***

- 14.72 The Main SRFI Site is currently shown to consist of large-scale arable farmland with some smaller scale pastoral fields. As such, it is considered that there is only a limited engineered sewer network serving, or running through, the Proposed Development works.
- 14.73 From a review of the sewer records it is considered that, in the event of a failure (as a result of a blockage or collapse of the sewer) any generated overland flows would follow the existing topography of the site and drain towards the two watercourses and towards the lower elevated sections of the Main SRFI Site. Any flooding as a result of any infrastructure failure would increase the flood risk but it is expected that this would only affect lower elevated areas of the site before draining into existing land drainage features or watercourses and posing little risk to third party land.

#### ***Artificial Sources***

- 14.74 The EA's Flooding from Reservoir Mapping shows that the site for the Proposed Development works is not within an area considered as being within the maximum extent of predicted flooding from artificial sources.
- 14.75 The Grand Union Canal is shown by Ordnance Survey contour mapping to be a level above sections of the Proposed Development works and therefore there is the potential for inundation of the Proposed Development works in the event of a failure or breach of the Grand Union Canal. The risk of such a failure is considered as being low owing to the level of ongoing inspections and maintenance undertaken by the Canal & River Trust. It is therefore considered as minimal and residual only.

#### ***Proposed Assessment of Climate Change***

- 14.76 As part of the Flood Risk and Drainage works a detailed assessment of the impacts of climate change has been undertaken for all proposed development works (including the Main SRFI Site, J15a works, and other minor highway works) for all potential sources of flooding and the proposed drainage strategy. This includes the assessment of both the higher and upper central limits for the Anglian region in relation to the modelled fluvial flows (as previously agreed with the EA during discussions) and also a 40% allowance for climate change in

relation to the surface water drainage strategy. This meets the climate change guidance requirements of NPPF (Ref 14.2) and those detailed within the NPS NN (Ref 14.1) document.

14.77 A full assessment of Climate Change impacts is set out at **Chapter 23**.

### Method of Assessment

14.78 To assess the effects of All Proposed Development Works (Main SRFI Site, J15a works and other Minor Highway Works), a set of threshold criteria have been defined to establish the sensitivity, magnitude and significance of the impacts identified. The below follows an accepted methodology for the assessment.

**Table 14.5 - Defining Magnitude of Effect**

Magnitude	Definition of Magnitude
High	Results in loss of attribute and/or quality and integrity of attribute (i.e. fundamental change to: water resources available within the region; flood risk posed to the development and/or surrounding areas; capacity within receiving surface water drainage system; water quality within surrounding watercourse(s) and/or groundwater; and, capacity within receiving foul water drainage system).
Medium	Results in impact on integrity of attribute, or loss of part of attribute (i.e. notable change to those attributes noted above).
Low	Results in some measurable change in attribute's vulnerability, but of insufficient magnitude to affect use or integrity (i.e. measurable change to those attributes noted above).
Negligible	Results in insignificant impact on integrity of attribute (i.e. insignificant change to those attributes noted above).

14.79 The sensitivity of receptors is a matter of professional judgement and is taken to be the likelihood that a receptor suffers impact. These are judged to be:

**Table 14.6 - Defining Sensitivity of Receptor**

Sensitivity	Definition of Sensitivity
Very High	No ability to absorb impact without fundamentally altering baseline condition (i.e. water resources classified as 'over-abstracted'; Site within Flood Zone 3; no capacity within receiving surface water drainage system; Water Framework Directive overall ecological classification of 'high' or 'good' in surrounding watercourse(s); Site underlain by Groundwater Source Protection Zone and/or local abstractions; and, no capacity within receiving foul water drainage system).

High	Little ability to absorb impact without fundamentally altering baseline condition (i.e. water resources classified as 'over-abstracted'; Site within Flood Zone 3; no capacity within receiving surface water drainage system; Water Framework Directive overall ecological classification of 'high' or 'good' in surrounding watercourse(s); Site underlain by Groundwater Source Protection Zone and/or local abstractions; and, no capacity within receiving foul water drainage system).
Moderate	Moderate capacity to absorb impact without significantly altering baseline condition (i.e. water resources classified as 'over-licensed' / 'no water available'; Site within Flood Zone 2; limited capacity within receiving surface water drainage system; Water Framework Directive overall ecological classification of 'moderate' in surrounding watercourse(s); Site underlain by Principal Aquifer; and, limited capacity within receiving foul water drainage system).
Low	Receptor tolerant of impact without detriment to baseline condition (i.e. water resources classified as 'water available'; Site within Flood Zone 1; unlimited capacity within receiving surface water drainage system; Water Framework Directive overall ecological classification of 'poor' or 'bad' in surrounding watercourse(s); Site underlain by Secondary Aquifer; and, unlimited capacity within receiving foul water drainage system).
Negligible	Results in insignificant impact on integrity of attribute (i.e. insignificant change to those attributes noted above).

14.80 The significance of a potential effect is based on the combination of the sensitivity of receptor and magnitude of that impact, as given in the matrix table below.

**Table 14.7 - Matrix of Assessing Significance of Effect**

Impact Magnitude		Receptor Sensitivity				
		Very High	High	Moderate	Low	Negligible
	High	Major	Major	Moderate	Moderate	Minor
	Medium	Major	Moderate	Moderate	Minor	Negligible
	Low	Moderate	Moderate	Minor	Negligible	Negligible
	Negligible	Minor	Minor	Negligible	Negligible	Negligible

14.81 Any receptor that is assessed as being at Major or Moderate will be considered as a 'significant' effect.

## **Embedded Mitigation**

- 14.82 This section demonstrates how the Proposed Development has been specifically designed to avoid or minimise the occurrence of adverse environmental effects and, where possible, provide a betterment to the wider area. All embedded Mitigation measures have been developed alongside the parameter plans. As such, and for the sake of this assessment, the parameter plans have been used as the 'worst case'. All mitigation works are included within the Order Limit Boundary.

### **Main SRFI Site (including A43 access and all rail infrastructure)**

#### ***Fluvial Flood Risk***

- 14.83 Owing to the identified fluvial flood risk to the Main SRFI Site and the location of the proposed units, mitigation is required to minimise the risk to the Proposed Development through the realignment of both the Milton Malsor Brook and the Unnamed Watercourse.
- 14.84 Each watercourse has been realigned around the proposed units shown on the parameter plan with the channel geometry adopting a two-stage channel designed to provide suitable capacity to contain and convey flows for all flood events up to and including the 1 in 1,000-year extreme flood event. The levels for the realigned watercourses are to tie into post development ground levels as shown on the level drawing contained within the FRA which is appended to this chapter as **Appendix 14.1**.
- 14.85 It is proposed that the 'first stage' channel would be used for all events up to and including the 1 in 100-year event with the second stage channel utilised during more extreme events greater than this such as the 1 in 200 years plus climate change and 1 in 1,000year events (to meet the design requirements of Northamptonshire County Council). The design of the proposed channels has also made an allowance for climate change based on current guidance.
- 14.86 The design of the watercourse realignment has included the required easements 8m either side of the 'first stage' channel for the Milton Malsor Brook given its status as a main river, and a 5m easement either side of the channel of the Unnamed Watercourse given this is an Ordinary Watercourse. This promotes a Green Corridor through the site and would maintain the watercourse and immediate area being vegetated.
- 14.87 These works also include the sizing of any proposed new watercourse crossings. Any proposed culvert has been sized in accordance with EA guidelines and to provide capacity for the 1 in 200 years plus climate change event.
- 14.88 Further information relating to the design of the realigned two stage channel has been included within the Technical Appendix to this Chapter (**Appendix 14.1**). The, detailed modelling of the proposed new channel route and geometry confirms a significant betterment in flood outlines when compared to the baseline scenario for both the Main SRFI Site and to third party land downstream. The modelling confirms that the proposed two stage channel provides sufficient capacity to convey all flows for the requested 1 in 200 years plus climate change event and the extreme 1 in 1,000-year event.



### ***Tidal Flood Risk***

- 14.89 No embedded Mitigation is required given the negligible risk from this source.

### ***Surface Water Flood Risk***

- 14.90 The surface water drainage system to be installed as part of the Proposed Development works will include the construction of a new system (as enabling works and therefore as embedded mitigation). The principles of this drainage strategy are to ensure post development peak run-off rates will not increase from the existing conditions and result in no increase of flooding to Main SRFI Site or surrounding settlements.
- 14.91 Infiltration techniques have been proven as not being viable, so it is assumed that, each building unit and its associated hardstanding areas will contain storage features which deal with their own attenuation requirements. In the majority of cases, because of the land use, the storage is provided in underground tanks beneath car park/working yard areas along with open above ground attenuation features where possible. All of these attenuation features are within the Order Limit boundary. It is proposed for any discharge from the site to be restricted to mimic the existing 'Greenfield QBAR runoff rate with attenuation provided for the 1 in 200 years plus 40% allowance for climate change storm event. This ensures that the proposals meet the criteria set out by Northamptonshire County Council in their role as the LLFA.
- 14.92 In a number of locations (areas of soft landscaping) the opportunity has been taken to include attenuation ponds/basins which provide additional storage and deliver the ability to improve water quality before discharging to the existing watercourses within the site. It is also intended to include swales or similar features as conveyance systems and to provide water treatment benefits where there are areas within the layout permit this.

### ***Groundwater Flood Risk***

- 14.93 No embedded Mitigation is considered as being necessary owing to the findings of the baseline assessment.

### ***Foul Water***

- 14.94 Discussions with Anglian Water have identified a lack of capacity to accept any additional flows. Anglian Water has confirmed the cost for such works along with the required additional volume of storage to be provided within the Order Limit boundary. Whilst costs and timescales have been provided these are caveated and will require confirmation following consultation.

### ***Infrastructure Failure Flooding***

- 14.95 Owing to the identified residual nature of any risk from this source, no embedded mitigation is required.

### ***Artificial Sources***

- 14.96 Owing to the identified residual nature of any risk from this source, no embedded mitigation is required.

### ***J15a Works***

#### ***Fluvial Flood Risk***

- 14.97 Given that the J15a works are shown as being located within an area of Flood Zone 1, no specific embedded mitigation measures are required for this area.

#### ***Tidal Flood Risk***

- 14.98 No embedded Mitigation is required given the negligible risk from this source.

#### ***Surface Water Flood Risk***

- 14.99 The surface water drainage system to be installed as part of the J15a works will involve the construction of a new system (as enabling works and therefore as embedded mitigation). The principles of this drainage strategy will be to ensure any surface water drainage strategy be designed to ensure post development peak run-off rates will not increase from the existing conditions and as such will result in no increase of flooding to J15a works or surrounding settlements. The new systems will be connected to the existing drainage networks where possible and maintain existing outfalls. In addition, petrol interceptors are to be installed to ensure no detrimental impacts.
- 14.100 Give that infiltration techniques have been proven as not being viable, it is assumed that, generally, the strategy will contain storage features which will deal with the J15a works attenuation requirements.
- 14.101 There should be the opportunity to include attenuation ponds/basins to provide the required storage and deliver the ability to improve water quality before discharging to the existing watercourses. It is also intended to include swales or similar features as conveyance systems and to provide water treatment benefits where there are areas available within the layout.

#### ***Groundwater Flood Risk***

- 14.102 No embedded Mitigation is considered as being necessary owing to the findings of the baseline assessment.

#### ***Foul Water***

- 14.103 The J15a works will not generate any foul flows and, as such, no embedded mitigation is required.

### ***Infrastructure Failure Flooding***

- 14.104 Owing to the identified residual nature of any risk from this source, no embedded mitigation is required.

### ***Artificial Sources***

- 14.105 Owing to the identified residual nature of any risk from this source, no embedded mitigation is required.

### ***Other Minor Highway Works***

- 14.106 Given that the majority of the other minor highways works are shown as being located within an area of Flood Zone 1, no specific embedded mitigation measures are required for this area.
- 14.107 For the other minor highways works areas that are at medium risk, mitigation is not required as the proposals will not result in any loss of floodplain storage. This applies to all 17 sites.
- 14.108 Works near any watercourse will require an easement to be provided and this will be a minimum of 8m for any watercourses identified as main and a 5m easement either side of an Ordinary Watercourse (including existing drainage ditches).

### ***Tidal Flood Risk***

- 14.109 No embedded Mitigation is required given the negligible risk to the site from this source.

### ***Surface Water Flood Risk***

- 14.110 The surface water drainage systems to be installed as part of the other Minor Highway Works will involve maintaining the existing systems where required with any upgrading/new systems being installed as enabling works (therefore as embedded mitigation). The design of these drainage works are currently ongoing but the principles of the drainage strategy (where required) will be to ensure any post development alterations to existing drainage systems will be designed to result in no increase of flooding to works or surrounding settlements and, where possible, will utilise existing infrastructure.

### ***Groundwater Flood Risk***

- 14.111 No embedded Mitigation is considered as being necessary owing to the findings of the baseline assessment.

### ***Foul Water***

- 14.112 Despite Anglian Water confirming that there is a lack of capacity within the existing system, the works are not considered to generate any foul flows and, as such, no embedded mitigation is required.

### ***Infrastructure Failure Flooding***

- 14.113 Owing to the identified residual nature of any risk from this source, no embedded mitigation is required.

### ***Artificial Sources***

- 14.114 Owing to the identified residual nature of any risk from this source, no embedded mitigation is required.

### **All Development in Proposed Order Limits**

#### ***Fluvial Flood Risk***

- 14.115 Owing to the identified fluvial flood risk to the Proposed Development works and the location of the proposed units, mitigation is required to minimise the risk to the development through the realignment of both the Milton Malsor Brook and the Unnamed Watercourse.
- 14.116 Each of the watercourses has been realigned around the proposed units with the channel geometry being a two-stage channel which is designed to provide suitable capacity to contain and convey flows for all flood events up to and including the 1 in 1,000-year extreme flood event. It is proposed that the 'first stage' channel would be used for all events up to and including the 1 in 100-year event with the second stage channel therefore only being utilized during more extreme events such as the 1 in 200 years plus climate change and 1 in 1,000year events. The design of the proposed channels has also made an allowance for climate change based on current guidance.
- 14.117 The design of the watercourse has also included the required easements for each of the watercourses with 8m either side of the 'first stage' channel for the Milton Malsor Brook given its status as a main river, and a 5m easement either side of the main channel for the Unnamed Watercourse given this is an Ordinary Watercourse.
- 14.118 Further information relating to the design of the realigned two stage channel has been included within the appendix to this Chapter. Detailed modelling of the proposed new channel route and geometry confirms a significant betterment in flood outlines when compared to the baseline scenario for both through the Main SRFI Site and to third party land downstream. The modelling confirms that the proposed two stage channel provides sufficient capacity to convey all flows for the requested 1 in 200 years plus climate change event and the extreme 1 in 1,000year event.

#### ***Tidal Flood Risk***

- 14.119 No embedded Mitigation is required given the negligible risk identified from this source

#### ***Surface Water Flood Risk***

- 14.120 The surface water drainage system to be installed as part of the Proposed Development works will involve the construction of a new system (as enabling works and therefore as

embedded mitigation) that ensure post development peak run-off rates will not increase from the existing conditions and as such will result in no increase of flooding to Main SRFI Site or surrounding settlements.

- 14.121 Given that infiltration techniques have been proven as not being viable each building unit and its associated hardstanding areas will contain storage features which will deal with their own attenuation requirements. The storage is to be provided in underground tanks beneath car park/working yard areas along with open above ground attenuation features where possible. It is proposed for any discharge from the site to be restricted to mimic the existing 'Greenfield runoff QBAR runoff rate with attenuation being provided for the 1 in 200 years plus 40% allowance for climate change storm event. This ensures that the proposals meet the criteria set out by Northamptonshire County Council in their role as the LLFA.
- 14.122 To the northern limit of the Main SFRI site (areas of soft landscaping) attenuation ponds/basins have been included to provide additional storage and improve water quality before discharging to the existing watercourses within the site. It is also intended to include swales or similar features as conveyance systems and to provide water treatment benefits where there are areas within the layout that will permit.

#### ***Groundwater Flood Risk***

- 14.123 No embedded Mitigation is considered as being necessary owing to the findings of baseline assessment.

#### ***Foul Water***

- 14.124 Discussions have been undertaken with Anglian Water and they have identified a lack of capacity to accept any additional flows. Anglian Water are currently undertaking modelling to determine what mitigation works are required. These works, at the time of writing, are ongoing and as such any embedded mitigation remains subject to confirmation.

#### ***Infrastructure Failure Flooding***

- 14.125 Owing to the identified residual nature of any risk from this source, no embedded mitigation is required.

#### ***Artificial Sources***

- 14.126 Owing to the identified residual nature of any risk from this source, no embedded mitigation is required.

#### **Assessment of Construction Phase Effects**

- 14.127 This section has been prepared on the basis that the embedded mitigation is being undertaken and constructed and is not yet fully functioning to ensure the assessment is based on the 'worst case' scenario from the parameter plans. It assumes all landscaping and noise attenuation bunds having been constructed (despite these not being located within areas identified as being 'at risk'). All assessments also include for the potential impacts of

climate change for the entire construction phase and cover a timeframe of present day (2019) until 2029.

#### **Main SRFI site (including A43 access and all rail infrastructure)**

##### ***Fluvial Flood Risk***

- 14.128 The updated modelling for the construction phase (i.e. embedded mitigation not in place) indicates that during the construction phase of the Main SRFI Site, there is the potential for ground alterations and works within the vicinity of both watercourses (Milton Malsor Brook and the Unnamed Watercourse) to impact upon fluvial risk and, as such, the potential impact would be of **high** magnitude and **moderate** sensitivity and therefore of **Moderate adverse significance** (which is significant), temporary in nature, and short term.

##### ***Tidal Flood Risk***

- 14.129 The Main SRFI Site has been assessed as being suitably elevated above the predicted tidal flood levels for both present day scenarios and when making an allowance for the projected impacts of climate change throughout the design life of the Main SRFI Site. As such, and given that the construction phase is not considered to affect this through ground lowering, the potential risk would be of **low** sensitivity and **negligible** magnitude resulting in a **negligible effect**.

##### ***Surface Water Flood Risk***

- 14.130 Construction of the Main SRFI Site would result in currently permeable land being developed, and a level of soil compaction with the erection of site buildings, internal road networks and storing of materials may impact on surface runoff and has the potential to disrupt existing flow routes. The compacted areas during construction have the potential to act as an impermeable surface, and would certainly alter the infiltration rates and increase potential runoff within the Main SRFI Site.
- 14.131 Given the nature of construction, there is also the potential for surface water to be contaminated in the event of a fuel spillage or spillage of any chemicals within the Main SRFI site. Contaminants could potentially enter the surrounding area and watercourses by being transported within generated runoff. The CEMP provides further details of these and the embedded mitigation measures to address the potential for this.
- 14.132 Whilst the potential for this is **low** through embedded mitigation if such an event were to occur, it would result in **medium** magnitude effect on a and **moderate** sensitivity receptor and therefore be of **moderate adverse significance** (which is significant).

##### ***Groundwater Flood Risk***

- 14.133 The British Geological Survey mapping shows that the Main SRFI Site is underlain by the Dyham & Whitby Formation Mudstone. These formations are considered as having low permeability (although overlain by more permeable soils) and therefore groundwater levels

are not expected to significantly vary and are likely to be linked to the regional groundwater level and are therefore considered as being near surface.

14.134 Owing to the scale and topography of the Main SRFI Site construction will include the excavation of existing ground levels and will interact with groundwater levels.

14.135 A Site Investigation report has been undertaken for the Main SRFI Site and this has been further referenced and explained within the Groundwater Chapter of this ES. However, and in summary, the geology and existing groundwater level are such that infiltration techniques would not be viable, The Site Investigations have also confirmed that groundwater levels are near surface throughout the Main SRFI Site and as such, any construction in these areas that require excavations would have an increased risk of interaction with groundwater. It is considered to result in a **medium** magnitude effect on a **moderate** sensitivity receptor and therefore be of **moderate adverse significance** (which is significant).

#### ***Foul Water***

14.136 During the construction phase, any foul water generated is expected to be temporarily stored onsite before being disposed of offsite. Additional details as to the foul water has been included within the CEMP. However, this information is kept as a high level as the details of foul water management are to be confirmed by the contractors on site. However, it is expected that any water classified as foul would be intercepted, stored, and disposed of off-site. As such, and despite Anglian Water confirming there is a lack of capacity within the existing system, the impact on foul water drainage is considered to be of **negligible** sensitivity and **negligible** magnitude and therefore will result in a **negligible effect**. Further details of this have been provided within the Appended FRA document (**Appendix 14.1**)

#### ***Infrastructure Failure Flooding***

14.137 The proposed construction has the potential to result in the disruption of existing land drainage ditches through the construction works. This would increase the potential for a localised failure of the existing system in which overland flows would be generated and ultimately drain towards both the Milton Malsor Brook and the Unnamed Watercourse. As such, the potential impact would be of **medium** magnitude and **low** sensitivity and therefore of **Minor significance**, temporary in nature and short term.

#### ***Artificial Sources***

14.138 Owing to the existing and ongoing nature of inspection and maintenance of the perched Canal section by the River & Canal Trust the risk is considered as being residual only and low. As such, the potential impact would be of **low** sensitivity and **low** magnitude and therefore of **Negligible Significance**, temporary in nature and short term.

#### **J15a works**

### ***Fluvial Flood Risk***

- 14.139 The location of these works are located outside the areas identified through detailed modelling as being at an increased risk of fluvial flooding and located entirely within Flood Zone 1. As such, the potential impact is of **low** sensitivity and **low** magnitude and therefore of **Negligible Significance**.

### ***Tidal Flood Risk***

- 14.140 Owing to the location of the J15a works the impact of tidal flooding (including an allowance for climate change) is considered negligible. As such, the potential impact is of **low** sensitivity and **low** magnitude and therefore of **Negligible Significance**.

### ***Surface Water Flood Risk***

- 14.141 Construction would result in currently permeable land being developed, and a level of soil compaction with the erection of site buildings, internal road networks and storing of materials may impact on surface runoff and has the potential to disrupt existing flow routes. The compacted areas during construction have the potential to act as an impermeable surface, and would certainly alter the infiltration rates and increase potential runoff within the J15a works.
- 14.142 Given the nature of construction, there is also the potential for surface water to be contaminated in the event of a fuel spillage or spillage of any chemicals within the J15a works. Contaminants could potentially enter the surrounding area and watercourses by being transported within generated runoff.
- 14.143 Given the nature of construction, there is also the potential for surface water to be contaminated in the event of a fuel spillage or spillage of any chemicals within the other Minor Highways works. Contaminants could potentially enter the surrounding area and watercourses by being transported within generated runoff. Whilst this is dealt with via embedded mitigation suggested within the CEMP, and despite this risk being unlikely, the potential would remain.
- 14.144 As such, the potential impact would be of **high** magnitude and **moderate** sensitivity and therefore of **Moderate Significance**, temporary in nature and short term.

### ***Groundwater Flood Risk***

- 14.145 The British Geological Survey mapping shows that the J15a works is underlain by the Dyham & Whitby Formation Mudstone. These formations are considered as having low permeability (although overlain by more permeable soils) and therefore groundwater levels are not expected to significantly vary and are likely to be linked to the regional groundwater level and are therefore considered as being near surface.
- 14.146 Owing to the nature of the J15a works construction will include the excavation of existing ground levels and increase the potential for interaction with groundwater levels. Therefore,



it is considered to result in a **moderate adverse** effect on a local scale which will be temporary in nature.

#### ***Foul Water***

- 14.147 During the construction phase, any foul water generated is expected to be temporarily stored onsite before being disposed of offsite. As such, and despite Anglian Water confirming there is a lack of capacity within the existing system, the impact on foul water drainage is considered to be of **negligible** sensitivity and **negligible** magnitude and therefore will result in a **negligible significance**.

#### ***Infrastructure Failure Flooding***

- 14.148 The proposed construction has the potential to result in the disruption of these ditch networks through the construction works. This would increase the potential for a localised failure of the existing system in which overland flows would be generated and ultimately drain towards the watercourse. As such, the potential impact would be of **medium** magnitude and **low** sensitivity and therefore of **Minor Adverse Significance**, temporary in nature and short term.

#### ***Artificial Sources***

- 14.149 Owing to the existing and ongoing nature of inspection and maintenance of the perched Canal section by the River & Canal Trust the risk is considered as being residual only and low. As such, the potential impact would be of **low** sensitivity and **low** magnitude and therefore of **Negligible Significance**, temporary in nature and short term.

#### ***Other Minor Highway Works***

- 14.150 Given that the majority of the other minor highways works are located within Flood Zone 1, no specific embedded mitigation measures are required.
- 14.151 For the other minor highways works areas that are at medium risk, mitigation is still not required as the proposals do not result in any loss of floodplain storage. As such the potential impact is of **negligible** sensitivity and **negligible** magnitude and therefore of **negligible significance**.

#### ***Tidal Flood Risk***

- 14.152 The other minor highways works have been assessed as being suitably elevated above the predicted tidal flood levels for both present day scenarios and when making an allowance for the projected impacts of climate change throughout the design life of the other minor highways works. As such, and given that the construction phase is not considered to affect this through ground lowering in areas at risk, the potential impact is of **low** sensitivity and **negligible** magnitude resulting in a **negligible effect**.

### ***Surface Water***

- 14.153 The EA's 'Flooding from Surface Water' mapping shows that sections of the other minor highways works have the potential to be located within, and disrupt areas shown to be at increased risks from surface water flooding.
- 14.154 Construction would result in currently permeable land being developed, and a level of soil compaction with the erection of site buildings, embankments, road networks etc. that may impact on surface runoff and has the potential to disrupt existing flow routes. The compacted areas during construction have the potential to act as an impermeable surface, and would certainly alter the infiltration rates and increase potential runoff within the other Minor Highways Works.
- 14.155 Given the nature of construction, there is also the potential for surface water to be contaminated in the event of a fuel spillage or spillage of any chemicals within the other Minor Highways works. Contaminants could potentially enter the surrounding area and watercourses by being transported within generated runoff. Whilst this is dealt with via embedded mitigation suggested within the CEMP, and despite this risk being unlikely, the potential would remain.
- 14.156 As such, the potential impact would be of **high** magnitude and **moderate** sensitivity and therefore of **Moderate Adverse Significance**, temporary in nature and short term.

### ***Groundwater Flood Risk***

- 14.157 The British Geological Survey mapping shows that the other minor highways works is underlain by the Dyham & Whitby Formation Mudstone. These formations are considered as having low permeability (although overlain by more permeable soils) and therefore groundwater levels are not expected to significantly vary and are likely to be linked to the regional groundwater level and are therefore considered as being near surface.
- 14.158 Owing to the nature and location of the other minor highways works it is considered that construction will include the excavation of existing ground levels and will interact with groundwater levels. As such, any construction in these areas that require excavations would have an increased risk of interaction and therefore potential impact would be of **high** magnitude and **moderate** sensitivity and therefore of **Moderate Adverse Significance**, temporary in nature and short term.

### ***Foul Water***

- 14.159 During the construction phase, any foul water generated is expected to be temporarily stored onsite before being disposed of offsite. As such, and despite Anglian Water confirming there is a lack of capacity within the existing system, the impact on foul water drainage is considered to be of **negligible** sensitivity and **negligible** magnitude and therefore will result in a **negligible** effect.

### ***Infrastructure Failure Flooding***

- 14.160 The proposed construction has the potential to result in the disruption of existing ditch networks, watercourses, and even spillways from the canal through the construction works. This would increase the potential for a localised failure of the existing system in which overland flows would be generated and ultimately drain towards neighbouring features such as watercourses/ditches etc. As such, the potential impact would be of **medium** magnitude and **low** sensitivity and therefore of **Minor Significance**, temporary in nature and short term

### ***Artificial Sources***

- 14.161 Owing to the existing and ongoing nature of inspection and maintenance of the perched Canal section by the River & Canal Trust the risk is considered as being residual only and low. As such, the potential impact would be of **low** sensitivity and **low** magnitude and therefore of **Negligible** Significance, temporary in nature and short term.

### **All Development in Proposed Order Limits**

#### ***Fluvial Flood Risk***

- 14.162 The updated modelling for the construction phase (i.e. embedded mitigation not in place) indicates that during the construction phase of all Proposed Development Works, there is the potential for all works (Main SRFI and highways works) to result in ground alterations and works within the vicinity of the watercourse to impact upon the risk and, as such, the potential impact would be of **high** magnitude and **moderate** sensitivity and therefore of **Moderate Significance**, temporary in nature and short term.

#### ***Tidal Flood Risk***

- 14.163 Proposed Development Works have been assessed as being suitably elevated above the predicted tidal flood levels for both present day scenarios and when making an allowance for the projected impacts of climate change throughout the design life of Proposed Development Works. As such, the potential risk would be of **low** sensitivity and **negligible** magnitude resulting in a **negligible effect**.

#### ***Surface Water Flood Risk***

- 14.164 The EA's 'Flooding from Surface Water' mapping shows that sections of the Proposed Development Works have the potential to be located within, and disrupt areas shown to be at both medium and high risk from surface water flooding. As such, the potential impact during construction would be of **high** magnitude and **moderate** sensitivity and therefore of **Moderate Significance**, temporary in nature and short term.

#### ***Groundwater Flood Risk***

- 14.165 The British Geological Survey mapping shows that the Proposed Development works is underlain by the Dyham & Whitby Formation Mudstone. These formations are considered as having low permeability (although overlain by more permeable soils) and therefore

groundwater levels are not expected to significantly vary and are likely to be linked to the regional groundwater level and are therefore considered as being near surface.

- 14.166 Owing to the scale and topography of the Proposed Development works it is considered that construction will include the excavation of existing ground levels and will interact with groundwater levels.
- 14.167 A Site Investigation report has been prepared for the Proposed Development works and this has been further reference and explained within the Groundwater Chapter of this ES. This report currently focusses on the Main SRFI site only and has not been undertaken for the other Minor Highways Works. However, the geology and existing groundwater level are such that infiltration techniques would not be viable, the Site Investigations have also confirmed that groundwater levels are near surface throughout the Proposed Development works and as such, any construction in these areas that require excavations would have an increased risk of interaction and therefore considered to result in a potential impact would be of **high** magnitude and **moderate** sensitivity and therefore of **Moderate Adverse Significance**, temporary in nature and short term.

#### ***Foul Water***

- 14.168 During the construction phase, any foul water generated is expected to be temporarily stored onsite (for both the Main SRFI Site and the other Minor Highways Works that are off site) before being disposed of off-site. As such, and despite Anglian Water confirming there is a lack of capacity within the existing system, the impact on foul water drainage is considered to be of **negligible** sensitivity and **negligible** magnitude and therefore will result in a **negligible effect**.

#### ***Infrastructure Failure Flooding***

- 14.169 The proposed construction has the potential to result in the disruption of these ditch networks through the construction works. This would increase the potential for a localised failure of the existing system in which overland flows would be generated and ultimately drain towards the watercourse. As such, the potential impact would be of **medium** magnitude and **low** sensitivity and therefore of **Minor Significance**, temporary in nature and short term.

#### ***Artificial Sources***

- 14.170 Owing to the existing and ongoing nature of inspection and maintenance of the perched Canal section by the River & Canal Trust the risk is considered as being residual only and low. As such, the potential impact would be of **low** sensitivity and **low** magnitude and therefore of **Negligible Significance**, temporary in nature and short term.

#### **Assessment of Operational Phase Effects**

- 14.171 All assessments also include for the potential impacts of climate change for the operational phase for both 'Short Term' (2021-2039) and 'Long Term' (2039-2089). This has been included within the assessment of significance for each of the areas. At this stage all of the

embedded mitigation will have been concluded and the assessment is on the basis that these are in place and functioning efficiently.

#### **Main SRFI site (including A43 access and all rail infrastructure)**

##### ***Fluvial Flood Risk***

- 14.172 During operation, and based on the embedded mitigation, suitable capacity will be available through the Main SRFI Site through the two staged realigned watercourses to ensure that flooding is contained within the designed river corridor and prevent flooding of the Main SRFI Site. The detailed modelling undertaken confirms the Main SRFI Site has been shown to be free from flooding apart from areas of public open space to the north for all events (including climate change allowances) for the design life of the Main SRFI Site.
- 14.173 Given the proposed works to the watercourses, the potential impacts during the operational phase would therefore be of **low** magnitude and **low** sensitivity and therefore of **negligible** significance and a betterment in relation to flood extents when compared to the baseline conditions.

##### ***Tidal Flooding***

- 14.174 During the operation phase no interaction with tidally influenced waters is considered likely from the site (owing to the nearest tidally influence water being around 65km away) and, as such, the potential impact would be **negligible** magnitude, **negligible** sensitivity and therefore of **negligible** significance.

##### ***Surface Water Drainage***

- 14.175 The surface water drainage system will have been installed and the storage tanks (designed to include the required allowance for climate change) will be operational. Given the restriction of outfall from the site mimics the pre-development conditions the effect of operation of the Main SRFI Site on surface water is considered to be of **negligible** magnitude and **negligible** sensitivity and therefore of **negligible** significance.

##### ***Groundwater***

- 14.176 During the operational phase, both short term and long term, it is considered that there will be no interaction with groundwater owing to the proposed site levels and sewer network. Based on available information at the time of writing, ground levels are predominantly being raised through the construction with the sewer network also then being raised above existing ground levels. As such, the impact of groundwater flooding on the operation of the Main SRFI Site is considered to be of **negligible** magnitude and **negligible** sensitivity and therefore of **negligible** significance.

##### ***Foul Water Drainage***

- 14.177 The foul water drainage system to be installed as part of the Main SRFI Site will connect to the existing Anglian Water foul system and drain via a gravity system.

- 14.178 Anglian Water have confirmed that mitigation works will be required prior to the operational phase. These discussions are ongoing and are subject to confirmation but once in place it is considered to be of **negligible** magnitude and **negligible** sensitivity and therefore of **negligible significance**.

#### **J15a Works**

##### ***Fluvial Flood Risk***

- 14.179 The location of these works are located outside the areas identified through detailed modelling as being at an increased risk of fluvial flooding and located entirely within Flood Zone 1. As such, the potential impact is of **low** sensitivity and **low** magnitude and therefore of **Negligible Significance**.

##### ***Tidal Flood Risk***

- 14.180 Owing to the location of the J15a works the impact of tidal flooding (including an allowance for climate change) is considered negligible. As such, the potential impact is of **low** sensitivity and **low** magnitude and therefore of **Negligible Significance**.

##### ***Surface Water Drainage***

- 14.181 The surface water drainage system will have been installed and the storage tanks (designed to include the required allowance for climate change) will be operational. Given the restriction of outfall from the site to mimic the pre-development conditions the effect of operation of the J15a works on surface water is considered to be of **negligible** magnitude and **negligible** sensitivity and therefore of **negligible significance**.

##### ***Groundwater***

- 14.182 During the operational phase, both short term and long term, it is considered that there will be no interaction with groundwater owing to the proposed site levels and sewer network. As such, the impact of groundwater flooding on the operation of the J15a works is considered to be of **negligible** magnitude and **negligible** sensitivity and therefore of **negligible significance**.

##### ***Foul Water Drainage***

- 14.183 Due to the nature of operation of the J15a works, these are not considered to result in any increase in foul flows and as such are considered to be of **negligible** magnitude and **negligible** sensitivity and therefore of **negligible significance**.

#### **Other Minor Highway Works**

##### ***Fluvial Flood Risk***

- 14.184 The location of these works are identified as being located predominantly within Flood Zone 1 but three of the sites are at an increased risk and within Flood Zone 2. However, and as the proposals result in minimal impact on ground levels, and that loss of floodplain

compensation is often not required within the medium risk zone the potential impact is of **low** sensitivity and **low** magnitude and therefore of **Negligible Significance**.

#### ***Tidal Flooding***

- 14.185 During the operational phase there will be no interaction with tidally influenced waters. As such, the potential impact is of **negligible** magnitude, **negligible** sensitivity and therefore of **negligible significance**.

#### ***Surface Water Drainage***

- 14.186 The surface water drainage system will have been installed to mimic the pre-development conditions to ensure the effect of operation of the other minor highway works on surface water is considered to be of **negligible** magnitude and **negligible** sensitivity and therefore of **negligible significance**.

#### ***Groundwater***

- 14.187 During the operational phase, both short term and long term, it is considered that there will be no interaction with groundwater owing to the proposed site levels and sewer network. As such, the impact of groundwater flooding on the operation of the other minor highway works is considered to be of **negligible** magnitude and **negligible** sensitivity and therefore of **negligible significance**.

#### ***Foul Water Drainage***

- 14.188 Due to the nature of operation of the other minor highway works, these are not considered to result in any increase in foul flows and as such are considered to be of **negligible** magnitude and **negligible** sensitivity and therefore of **negligible significance**.

#### **All Development in Proposed Order Limits**

#### ***Fluvial Flood Risk***

- 14.189 During operation, the embedded mitigation works to the watercourse will have been undertaken and, as such, suitable capacity will be available within the Study Area. The detailed modelling undertaken confirms that the alterations to ground levels and proposals to the watercourse result in all proposed development (other than an area of public open space) being at low risk from fluvial flooding and within Flood Zone 1 for the development design life (i.e. including for impacts of climate change).
- 14.190 Given the works undertaken to the watercourse, the potential impact is of **low** magnitude and **low** sensitivity and therefore of **negligible significance** and a betterment in relation to flood extents when compared to the baseline conditions.

#### ***Tidal Flooding***

- 14.191 During the operation phase the potential impact would be **negligible** magnitude, **negligible** sensitivity and therefore of **negligible significance**.

### ***Surface Water Drainage***

- 14.192 The surface water drainage system will have been installed (designed to include the required allowance for climate change) and operational. Given the restriction of outfall from the site to mimic the pre-development conditions the effect of operation on surface water is considered to be of **negligible** magnitude and **negligible** sensitivity and therefore of **negligible significance**.

### ***Groundwater***

- 14.193 During the operational phase, both short term and long term, it is considered that there will be no interaction with groundwater owing to the proposed site levels and sewer network. As such, the impact of groundwater flooding on the operation of all proposed development is considered to be of **negligible** magnitude and **negligible** sensitivity and therefore of **negligible significance**.

### ***Foul Water Drainage***

- 14.194 The foul water drainage system to be installed as part of the Main SRFI site will connect to the existing Anglian Water foul system and drain via a gravity system with pumped solutions only being used as a last resort.
- 14.195 Anglian Water have confirmed that mitigation works will be required prior to the operational phase for the Main SRFI site. Owing to the nature of the J15a and other minor highways works no mitigation is required. These discussions are ongoing and are subject to confirmation. Anglian Water are currently undertaking investigations

### **Assessment of Decommissioning Phase Effects**

- 14.196 Decommissioning phase effects are the effects resulting from the activities associated with the removal of the Proposed Development if it is no longer required.
- 14.197 It is not known when the Proposed Development will be removed and many elements of the development are unlikely to be decommissioned at all. The design life of the warehousing buildings will be in the order of 60+ years and the rail infrastructure and civil engineering works will be significantly longer than this. Once the warehouses reach the end of their design life, it is entirely feasible that they will be re-provided in a modern form. Should that occur it would be subject to its own assessment of effects at the relevant time.
- 14.198 Predicting the baseline so far into the future to enable a meaningful assessment of the sensitivity of the environment, and the significance of effects from the decommissioning of the Proposed Development is extremely difficult.
- 14.199 When and if the development is decommissioned, the appropriate environmental assessments will be undertaken to identify any significant environmental effects and suitable mitigation methods proposed. Notwithstanding this, professional judgement indicates that it is likely that the effects will be similar to, or less than, those experienced during the construction phase.



## Cumulative Effects

- 14.200 The Proposed Development and any surrounding development will collectively increase the impermeable area. This will increase the volume and rate of surface water runoff from the area. However, surface water for each of the other planning applications will have a surface water system designed with the requisite attenuation capacity required by both the EA and LLFA in order to result in no increase in flood risk elsewhere and as such no cumulative impacts are anticipated with regard to surface water.
- 14.201 From a review of the identified cumulative sites, none of these are located within the catchment of the Study Area (including Northampton Gateway). All of the identified sites are topographically separated from the site and would therefore have no interaction with the Order Limits. As such, and despite the policy requirements that will be met through the planning process, no cumulative impact would affect the site. The only impacts to the site would be in the event of unattenuated discharges or unmitigated significant ground reprofiling and loss of floodplain storage within areas in the upstream sections of the catchment within which all works are proposed. Given no sites are shown in this location, no cumulative impacts are considered to affect the Main SRFI.

## Mitigation

- 14.202 Areas where mitigation is required are addressed in this section. These areas have been assessed based on those factors identified as being significant and not already covered in the embedded mitigation works (realignment of watercourse, constructed of green corridor, adequate sizing of culvert crossings, surface and foul water drainage strategy). Measures within Table 14.8 are adaptive mitigation measures. All aspects covered in the CEMP are considered to be included within the embedded mitigation.

**Table 14.8 - Proposed Mitigation Measures – Main SRFI Site**

Potential effect	Proposed mitigation	Means of implementation	Mechanism for securing mitigation and DCO reference (where applicable)
Construction			
None			
Operation			
Decrease in efficiency of both fluvial and surface water features	Management and Maintenance Schedule to be prepared for both the surface water and realigned watercourse.		
Decommissioning			
None			

Cumulative
None

**Table 14.9 - Proposed Mitigation Measures – J15a Works**

Potential effect	Proposed mitigation	Means of implementation	Mechanism for securing mitigation and DCO reference (where applicable)
Construction			
None			
Operation			
None			
Decommissioning			
None			
Cumulative			
None			

#### **All Development in Proposed Order Limits**

- 14.203 This assumes that all works (Main SFRI site, J15a, and other minor highways works are all progressed at the same time.

**Table 14.10 - Proposed Mitigation Measures – Proposed Development Site**

Potential effect	Proposed mitigation	Means of implementation	Mechanism for securing mitigation and DCO reference (where applicable)
Construction			
None			
Operation			
Decrease in efficiency of both fluvial and surface water features	Management and Maintenance Schedule to be prepared for both the surface water and realigned watercourse.		
Decommissioning			
None			
Cumulative			

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None

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## Residual Effects

**Table 14.11 - Summary of Residual Effects – Main SRFI Site**

Description of impact	Significance of effect	Possible mitigation measures	Residual effect
Construction			
None			
Operation			
Decrease in efficiency of both fluvial and surface water features	Moderate Averse	Management and Maintenance Schedule to be prepared for both the surface water and realigned watercourse.	Not Significant
Decommissioning			
None			
Cumulative			
None			

**Table 14.12 - Summary of Residual Effects – J15a works**

Description of impact	Significance of effect	Possible mitigation measures	Residual effect
Construction			
None			
Operation			
None			
Decommissioning			
None			
Cumulative			
None			

**Table 14.13 - Summary of Residual Effects: Other Minor Highways Works**

Description of impact	Significance of effect	Possible mitigation measures	Residual effect
Construction			
None			
Operation			
None			

Decommissioning
None
Cumulative
None

#### All Development in Proposed Order Limits

**Table 14.14 - Summary of Residual Effects**

Description of impact	Significance of effect	Possible mitigation measures	Residual effect
Construction			
None			
Operation			
Decrease in efficiency of both fluvial and surface water features	Moderate Averse	Management and Maintenance Schedule to be prepared for both the surface water and realigned watercourse.	Not significant
Decommissioning			
None			
Cumulative			
None			

#### Monitoring

- 14.204 No monitoring post development is considered necessary other than a visual inspection of any watercourse crossings to remove any blockages or notice structure deficiencies within the system.

#### Assumptions and Limitations

- 14.205 At the time of writing, the hydraulic modelling of the post development conditions (detailed within embedded mitigation section) is yet to be reviewed and agreed by the EA. Whilst the principles proposed (watercourse redesign and realignment) has been agreed, any model review may result in some amendments being required which may impact upon the final design. This report has been prepared on the assumption that no significant changes to the design will be required.

## References

- 14.1 (Ref 14.1) Department for Transport: National Policy Statement for National Networks 2014
- 14.2 (Ref 14.2) DCLG: National Planning Policy Framework (NPPF) 2012
- 14.3 (Ref 14.3) DCLG: Planning Policy Guidance (PPG) 2014