

Tritax Symmetry (Hinckley) Limited

HINCKLEY NATIONAL RAIL FREIGHT INTERCHANGE

The Hinckley National Rail Freight Interchange Development Consent Order

Project reference TR050007

Environmental Statement Volume 1: Main Statement

Chapter 14: Surface water and flood risk

Document reference: 6.1.14

Revision: 05

November 2022

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009
Regulation 5(2)(a)

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
Regulation 14

This document forms a part of the Environmental Statement for the Hinckley National Rail Freight Interchange project.

Tritax Symmetry (Hinckley) Limited (TSH) has applied to the Secretary of State for Transport for a Development Consent Order (DCO) for the Hinckley National Rail Freight Interchange (HNRFI).

To help inform the determination of the DCO application, TSH has undertaken an environmental impact assessment (EIA) of its proposals. EIA is a process that aims to improve the environmental design of a development proposal, and to provide the decision maker with sufficient information about the environmental effects of the project to make a decision.

The findings of an EIA are described in a written report known as an Environmental Statement (ES). An ES provides environmental information about the scheme, including a description of the development, its predicted environmental effects and the measures proposed to ameliorate any adverse effects.

Further details about the proposed Hinckley National Rail Freight Interchange are available on the project website:



The DCO application and documents relating to the examination of the proposed development can be viewed on the Planning Inspectorate's National Infrastructure Planning website:

<https://infrastructure.planninginspectorate.gov.uk/projects/east-midlands/hinckley-national-rail-freight-interchange/>

Chapter 14 ◆ Surface water and flood risk

INTRODUCTION

- 14.1. This ES chapter sets out the assessment of the potential effects of the Proposed Development, as described in Chapter 3 (document reference 6.1.3), on surface water and flood risk. In particular, consideration is given to effects that might arise during construction and operation in terms of flood risk, surface water drainage, surface water quality, ground water quality, water supply and surface and foul water sewerage capacity.
- 14.2. This ES chapter considers the impact of the Proposed Development upon the Development Consent Order (DCO) Site and its surrounding area in relation to existing baseline conditions and relevant legislation and national, regional and local planning policy with regard to surface water and flood risk.
- 14.3. The chapter provides a description of the methods used in the assessment. This is followed by a description of the relevant baseline conditions of the Proposed Development and an assessment of the likely environmental effects of the Proposed Development during the construction works and once the Proposed Development is completed and operational. Mitigation measures are identified where appropriate to avoid, reduce or offset any significant adverse effects identified, together with the nature and significance of likely residual effects.
- 14.4. This ES chapter is accompanied by the following appendices and figures:
- Appendix 14.1 Flood Risk Assessment (FRA) (hydraulic modelling is referenced in, and modelling reports are appended to, the FRA) (document reference 6.2.14.1).
 - Appendix 14.2 Sustainable Drainage Statement (SDS) (document reference 6.2.14.2).
 - Figure 14.1 Study Area (document reference 6.3.14.1).
 - Figure 14.2 Flood Map for Planning (document reference 6.3.14.2).
 - Figure 14.3 Risk of Flooding from Surface Water (document reference 6.3.14.3).
 - Figure 14.4 Main HNRFI Site Concept Surface Water Drainage Strategy (document reference 6.3.14.4)
 - Figure 14.5 Main HNRFI Site Concept Foul Water Drainage Strategy (document reference 6.3.14.5)
 - Figure 14.6 A47 Link Road Concept Drainage Strategy (document reference 6.3.14.6)

- Figure 14.7 M69 Junction 2 Concept Drainage Strategy (document reference 6.3.14.7)

METHODOLOGY AND DATA SOURCES

EIA Scoping Opinion

- 14.5. An application for an EIA Scoping Opinion was submitted in November 2020 (document reference 6.2.6.1). A Scoping Opinion from the Planning Inspectorate on behalf of the Secretary of State was returned in response in December 2020 (document reference 6.2.6.2).
- 14.6. Table 14.1 summarises the Planning Inspectorate’s (PINS) comments received in relation to Surface Water and Flood Risk, and how these comments have been considered in TSH’s assessment of this topic.

Table 14.1: Summary of scoping opinion and responses

Source	ID / Ref	Scoping Comment	Response
PINS	4.8.2	<p><i>‘The Scoping Report (Table 13.1 (ID 1)) states that new roads and alterations to existing roads have been included in this revised Scoping Report, and the approach to assessment will be agreed through consultation with relevant consultees.</i></p> <p><i>The ES should make reference to the new access road and alterations to the M69 and include an assessment of how the construction of the access road and the alteration of existing roads will affect the assessment of impacts from surface water and flood risk. The approach to this assessment to be discussed with relevant consultees should take into account the latest applicable guidance.’</i></p>	<p>Assessment of the offsite highway and railway works in line with latest applicable guidance is included throughout the ES Chapter.</p> <p>Consultation has been undertaken with the EA and LLFA to discuss the approach.</p>

Source	ID / Ref	Scoping Comment	Response
PINS	4.8.3	<p>‘The ES should explain how effects on key receptors including existing infrastructure, habitats/sites of ecological value or local residents have been considered, and the Applicant should seek to agree receptors with relevant statutory consultees including the Environment Agency (EA).</p> <p>A preliminary Water Framework Directive (WFD) assessment should be carried out to inform the assessment of impacts from the Proposed Development on WFD waterbodies.’</p>	<p>Consultation has been undertaken with the EA to agree the approach. The ES Chapter identifies the key flood risk receptors (Table 14.8).</p> <p>A WFD assessment (document reference 20.1) has been undertaken).</p>
PINS	4.8.4 13.63	<p><i>‘The Scoping Report describes the Study Area as including ‘areas within and immediately adjacent to the Main HNRFI Site, including the western link road and Eastern Villages by-pass’. The works to the M69 Junction 23 / M1 Junction 21 are not mentioned, nor are the wider highways management works. The ES must assess the impacts of the Proposed Development in its entirety.’</i></p>	<p>This assessment has assessed the impact of the entire Proposed Development.</p> <p>(Note: works to the M69 Junction 23 / M1 Junction 21 and the Eastern Villages by-pass are no longer included in the proposed development and, therefore, do not need to be included in this assessment.</p>
PINS	4.8.5 13.64	<p><i>‘The Scoping Report states that the ES will be supported and informed through consultations with various stakeholders. The ES should set out how the stakeholder consultation responses have influenced the assessment.’</i></p>	<p>Stakeholder consultation has been undertaken and documented within this ES Chapter. Responses from the consultation have been considered when undertaking the assessments.</p>

Source	ID / Ref	Scoping Comment	Response
PINS	4.8.6 13.67	<p><i>'The Scoping Report states that the assessment would consider the construction and operational stages of the Proposed Development over the lifetime of the proposed scheme, i.e., taking account of the potential influence of climate change on the surface water and flood risk receptors under consideration.</i></p> <p><i>The ES should set out the supporting information for the methodological approach and clearly explain how this has been applied to the assessment of effects for the lifetime of the Proposed Development including any decommissioning that is anticipated.</i></p> <p><i>The assumptions and assessment made of climate change effects should be fully explained in the ES.'</i></p>	<p>A list of supporting information has been provided. Where further information and assessment is required to support the ES Chapter, this has been documented.</p> <p>Consideration of climate change has been included throughout the ES Chapter.</p>

Section 42 consultation

14.7. Table 14.2 summarises the s.42 consultation comments received in relation to Surface Water and Flood Risk, and how these comments have been considered in TSH’s assessment of this topic. S.42 comments were also received by Leicestershire County Council (LCC) Lead Local Flood Authority (LLFA) and Warwickshire County Council (WCC) LLFA. However, their comments were also submitted by the Environment Agency (EA) as part of their s.42 response and detailed in Table 14.2.

Table 14.2: Summary of s42 consultation (2021) consultation responses

Consultee	ID / Ref	Consultee Comment	Response
EA		<p><i>‘With regards to the impact of the development on Flood Zones 2 and 3, the Environment Agency has no concerns with the proposals at this stage, based on the information provided to date.</i></p> <p><i>Since Lead Local Flood Authorities (LLFAs) are not listed as a statutory consultee EA provided, in their capacity as statutory consultee, the Requirements which the LLFAs are requesting be included on any DCO, based on the information submitted as part of the s42 consultation.</i></p> <p><i>Leicestershire County Council LLFA</i></p> <p><i>1) No phase of the authorised development shall take place until such time as a surface water drainage scheme for that phase based on sustainable drainage principles and the assessment of the hydrological and hydrogeological context of the development in accordance with [the approved Flood Risk Assessment] has been submitted to and approved in writing by the Local Planning Authority. The surface water drainage scheme must be implemented in accordance with the details approved by the Local Planning Authority or in accordance with any variations to the details agreed in writing by the Local Planning Authority prior to the</i></p>	<p>The EA comments relate to information required prior to construction. The drainage principles identified by the LLFA and listed by the EA, align with those adopted within the proposed drainage strategy.</p> <p>Prior to construction the requested information will be submitted to the appropriate authority.</p>

Consultee	ID / Ref	Consultee Comment	Response
		<p><i>first occupation of the authorised development. The scheme must include:</i></p> <p><i>a. The limitation of surface water run-off generated by all rainfall events up to the critical 1 in 100-year return period rainfall event (plus 20% for climate change) to the equivalent greenfield Qbar rate;</i></p> <p><i>b. Detailed design (plans, cross sections and calculations) in support of any surface water drainage scheme, including details of any attenuation system and the outfall arrangements;</i></p> <p><i>c. Details in relation to the management of surface water on site during construction of the development in order to mitigate flood risk, and for the removal of suspended solids from surface water discharging from the site. Details shall demonstrate how surface water will be managed on site to prevent an increase in flood risk during the various construction stages of development from initial site works through to completion. This shall include temporary attenuation, additional treatment, controls, maintenance and protection; and</i></p> <p><i>d. Infiltration testing to BRE Digest 365 (or equivalent) or suitable evidence that infiltration methods of disposal</i></p>	

Consultee	ID / Ref	Consultee Comment	Response
		<p><i>on-site is not technically viable. Where infiltration results indicate that infiltration is a viable method of surface water disposal, the surface water strategy should be amended to incorporate infiltration disposal methods.</i></p> <p><i>Reason: To prevent flooding by ensuring the satisfactory storage and disposal of surface water from the site.</i></p> <p><i>2) No occupation of any phase of the authorised development shall take place until such time details in relation to the long-term maintenance of the surface water drainage system within the development have been submitted to and approved in writing by the Local Planning Authority. The surface water drainage system shall then be maintained in accordance with these approved details in perpetuity. The maintenance plan must include:</i></p> <p><i>a. Details of routine maintenance, access, remedial actions and monitoring of the separate elements of the surface water drainage system that will not be adopted by a third party; and</i></p> <p><i>b. Where relevant, procedures that must be implemented in the event of pollution incidents.</i></p> <p><i>Reason: To establish a suitable maintenance regime that may be monitored over time; that</i></p>	

Consultee	ID / Ref	Consultee Comment	Response
		<p><i>will ensure the long-term performance, both in terms of flood risk and water quality, of the surface water drainage system (including sustainable drainage systems) within the proposed development.</i></p> <p><i>Warwickshire County Council LLFA</i></p> <p><i>The following information may be relevant should the applicant find there to be an existing highway ditch, land drainage ditch / culvert etc likely to be affected by the proposed highway works within Warwickshire (that is, unless an alternative arrangement is in place for approving such works).</i></p> <p><i>‘In accordance with Section 23 of the Land Drainage Act 1991, prior written Land Drainage Consent must be obtained from Warwickshire County Council Lead Local Flood Authority for any works within an ordinary watercourse within Warwickshire. This is likely to include, but not limited to, any proposed drainage outfalls, culverts or other temporary or permanent obstructions and the diversion or stopping up of the ordinary watercourse.’</i></p>	
<p>Natural England</p>		<p><i>‘Noted that there is little concern regarding water quality impact on Burbage Wood and Aston Firs SSSI.</i></p>	<p>All comments have been considered as part of the SDS (document reference 6.2.14.2).</p>

Consultee	ID / Ref	Consultee Comment	Response
		<p><i>Noted proposed mitigation measure mean NE do not anticipate any adverse impacts from pollution events to designated sites.</i></p> <p><i>Advise that for the SuDS scheme to remain functioning in perpetuity, a maintenance and monitoring plan must be put in place to ensure the SuDS remain functioning in perpetuity.</i></p> <p><i>Queried whether south westerly pond is included in the development but not part of the drainage strategy.'</i></p>	<p>The south westerly pond is not included within the drainage strategy.</p>
<p>Stoney Stanton Parish Council</p>		<p><i>'The indicative scheme design seeks to provide all the new buildings outside of Flood Zones 2 and 3, providing just the rail interchange within these higher zones. Whilst protection of the proposed buildings through their positioning outside of the flood zone is welcomed, it is surprising that the critical infrastructure considered of national importance is still incorporated within the flood zone.</i></p> <p><i>In terms of the flooding of the site in question, there is photographic evidence of the site being flooded in recent years on multiple occasions. Incorrect assumptions...The proposal should fully consider the reasoning behind this flooding and the implications it would have upon any proposed scheme, including the drainage</i></p>	<p>To better understand the potential flood risk, a hydraulic model of the local watercourses was developed in consultation with Leicestershire LLFA and the EA. The model identified that the existing rail line is raised above flood levels and is at a low risk of flooding from the local watercourses. Similarly, the connection to the railway line from the Main HNRFI Site would also be raised above flood levels to also be a low flood risk. Detail of the assessment is provided in the FRA (document reference 6.2.14.1).</p> <p>The flooding within the Main HNRFI Site is a product of runoff from within the Main HNRFI site itself and its inability to drain into the ground or into the</p>

Consultee	ID / Ref	Consultee Comment	Response
		<p><i>solution so that there are not potentially catastrophic issues elsewhere as a result.</i></p> <p><i>In terms of the design of the drainage scheme, there are three fundamental elements that need to be given careful additional consideration.</i></p> <p><i>The first relates to culverting of the existing unnamed stream to run along the edge of the M69. This culvert will be set above the level of the M69 and thus its design, capacity and maintenance programme needs to be robustly designed in order to prevent flooding of the motorway at a future date.</i></p> <p><i>The second major concern is the ability to store the surface water so that it can be discharged at an appropriate rate.</i></p> <p><i>Reflecting the high water table, ground level changes and water storage capacity concerns, the provision of the flood water ponds on the northern part of the site by the higher flood zone area represents the third concern.'</i></p>	<p>downstream watercourses quickly enough. To address this on-site risk, new surface water drainage infrastructure is proposed which would store storm water falling on the Proposed Development. Further detail is provided in the SDS (document reference 6.2.14.2).</p> <p>The realigned watercourse would flow along a corridor that would be designed to contain the necessary flood flows; this would include an allowance for future climate change. Any necessary culverts would also be designed to convey the necessary flood flows. To ensure the long-term performance of the watercourse and culverts, operational and maintenance procedures would be prepared to set out routine inspection, maintenance, and remedial actions in line with land owner riparian responsibilities.</p> <p>The shallow groundwater on the Main HNRFI Site is a product of impeded drainage conditions brought about by the cohesive underlying geology. The cohesive geology means that there is not a significant groundwater reservoir or flow pathway that could be negatively impacted by the Proposed Development. Where the</p>

Consultee	ID / Ref	Consultee Comment	Response
			<p>shallow groundwater is encountered during construction, it can be safely addressed through localised dewatering.</p> <p>The LLFA and the EA have reviewed the Flood Risk Assessment, the proposed mitigation measures, and the drainage strategy and have not raised any concerns.</p>
Blaby District Council		<p><i>‘Overall summary The baseline situation needs to be fully established to ensure drainage solutions are appropriate.</i></p> <p><i>Concerns that the background information is not sufficiently robust and therefore the proposed drainage system is not sufficiently robust.</i></p> <p><i>Greater surface water storage should be proposed for amenity and ecological reasons.</i></p> <p><i>If the Environment Agency’s consultation response does not include sufficient depth of local knowledge, the Council is prepared to engage further with TS(H) Ltd in this respect and lend our own local knowledge and expertise to aid the drainage assessment of the proposals’.</i></p> <p><i>‘The Flood Map for Planning may not be accurate for the site, due to it being within a catchment area of less than 3</i></p>	<p>The EA and LLFA have been consulted at various stages in the project to ensure that all available data and local knowledge was used when assessing the baseline conditions. Blaby and Hinckley were also consulted but were unable to provide any local information on flooding.</p> <p>Due to the small size of the watercourses in and around the site, neither the EA nor LLFA held much data. This led to the development of a site specific hydraulic model to help identify the floodplain extents. The hydraulic model was developed in consultation with the EA and LLFA, and it was approved by the EA on the 24th March 2022.</p> <p>A site specific hydraulic flood model was prepared to help identify probable floodplain extents in the absence of</p>

Consultee	ID / Ref	Consultee Comment	Response
		<p><i>km for the Thurlaston Brook Tributary. Local resident evidence suggests that flooding of the site either from river flooding or surface water pooling is more expansive than the plans and information suggests. Additional work to establish fully the baseline is therefore required’.</i></p>	<p>available data from the EA and LLFA. The hydraulic model was developed in consultation with the EA and LLFA, and it followed best practice guidelines published by the EA. The model was approved as fit for purpose by the EA on the 24th of March 2022.</p> <p>While the hydraulic model includes all of the contributing runoff from the site and wider catchment, it only illustrates the floodplain that emanates from the watercourse channel - it does not illustrate the overland flow routes which storm water runoff may take before reaching the watercourses. However, crucially, the hydraulic modelling has shown that the flood risk within the site, upstream of the railway line, is primarily a product of the surface water runoff from within the site itself. Therefore, addressing the storm water runoff from the site as part of the development will help address the flood risk. Storm water falling on the development will be intercepted and stored by new drainage infrastructure, which will relocate much of the water currently pooling in the site to within purpose-built ponds, swales, basins and underground tanks. Hydraulic modelling has</p>

Consultee	ID / Ref	Consultee Comment	Response
			<p>shown that this would address the flood risk to the development, while also offering some downstream betterment. Detail of the assessment is provided in the FRA (document reference 6.2.14.1).</p>
		<p><i>'It is unclear what survey period length has been used to conclude that there is low risk of groundwater flooding. If surface water capacity is not deliverable underground as anticipated, then the quantum of development would need to be reconsidered'.</i></p>	<p>Groundwater monitoring was undertaken between October and December 2018 which identified groundwater at over 3m below ground level, typically perched on the top of the Mercia Mudstone bedrock, which is itself unlikely to contain a continuous aquifer. The shallow cohesive geology underlying the site, is also unlikely to transmit large volumes of groundwater. This cohesive geology layer impedes infiltration from shallower depths, and results in some localised shallow groundwater being present on the site. Where the shallow groundwater is encountered during construction, it can be safely addressed through localised dewatering.</p> <p>Both the drift deposits and deeper bedrock are of low permeability underlying the site means that there is not a significant groundwater reservoir or flow pathway that could be negatively impacted by the development. While it is not expected to be a constraint,</p>

Consultee	ID / Ref	Consultee Comment	Response
			<p>the below ground tanks can be sealed so that they are unaffected by potential groundwater, if found to be necessary.</p>
		<p><i>'The effects upon the SSSI designations should be robustly presented and considered even if the level of impact is not 'significant'.</i></p>	<p>Burbage Wood and Ashton Firs (SSSI) is located to the south-west of the Main HNRFI Site. The topography of the area is such that land falls away from the SSSI and the watercourses in site flow away from the SSSI. As the development is located downstream of the SSSI, it will not affect the surface water and flood risk aspects of the SSSI.</p>
		<p><i>'Potential harm to construction workers needs to be considered as the site is within flood zones 2 and 3'.</i></p>	<p>This ES acknowledge that prior to mitigation at the construction stage flood risk to construction workers in of a major adverse significance. This chapter set out measures to address this risk, which include: following the latest guidelines and best practice when working near to watercourses, monitoring weather warnings, and locating the site compound, welfare facilities, and materials outside of the floodplain.</p>
		<p><i>'The operation of the areas of the site within flood zones 2 and 3, particularly in relation to whether trains can run and the carrying out of maintenance works, must be fully considered'.</i></p>	<p>Flood Zone 2 and 3 do not reflect the elevated railway line. Detailed site specific modelling has shown that the existing railway line is in reality raised above the floodplain. Once complete, the rail port and new connections to the rail line</p>

Consultee	ID / Ref	Consultee Comment	Response
			<p>will also be above the floodplain. Therefore, the operation of the rail port and northern rail line would be unaffected in a flood event. Detail of the assessment is provided in the FRA (document reference 6.2.14.1).</p>
<p>Burbage Parish Council</p>		<p><i>‘We have read the consultation chapter which covers flood issues and believe the content does not provide the clear explanation to interested respondents in non-technical language that these issues have been fully investigated, assessed and full mitigation measures have been included in the plans, which are prepared in an understandable form to all interested parties. It is essential that full remedial measures are known and put in place’.</i></p>	<p>Chapter 14 of the PEIR presented a preliminary assessment of the flood risk and drainage issues at the site, along with the proposed measures that would be included to prevent any deterioration of the baseline conditions. The Chapter was accompanied by a preliminary version of the FRA, and it was summarised within the PEIR non-technical summary. Additionally, a series of webinar presentations were made, as part of the consultation phase, which gave a high-level summary of the flood risk and drainage aspects of the scheme. Representatives were also available at the public consultation events to answer any questions. This chapter of the ES and the FRA (document reference 6.2.14.1) presents the latest information on flood risk including any necessary mitigation measures. The EA and LLFA have been consulted throughout the assessment, and they have confirmed that</p>

Consultee	ID / Ref	Consultee Comment	Response
			they are comfortable with the flood management strategy.
Elmesthorpe Parish Council		<p><i>'11. Flooding & Drainage Issues</i></p> <p><i>11.1. There is widespread concern amongst residents regarding the likelihood of flooding of the development site, and how any steps taken to alleviate the risk of flooding of the development site will impact on adjoining watercourses.</i></p> <p><i>11.2. A number of residents have advised that the fields off Burbage Common Road are regularly flooded, and we understand the site is known to have a high water table. Accordingly, the Parish Council would question whether this land is an appropriate location for an infrastructure project.</i></p> <p><i>11.3. There are also concerns that issues with drainage locally will be exacerbated once the site becomes a massive area of hard surfacing.</i></p> <p><i>11.4. The Parish Council understands that flood modeling has been undertaken, however certain aspects of the modeling give rise for concern. We are advised that the consultants were unable to gain access to several areas of land to undertake their research and it is therefore assumed that the modeling has included an element of guess work. We also understand that the hydraulic model used was created by the</i></p>	<p>To better understand the existing flood risk of the site and surrounding area, a hydraulic model of the local watercourses was developed in consultation with the LLFA and the EA. The model identified that the Main HNRFI Site is currently at risk of flooding from local surface water runoff, due to the poor permeability of the underlying ground and the restrictive nature of the culverted connections into the downstream watercourses beneath the railway line. An existing flood risk was also identified on Burbage Common, Burbage Common Road, as well as along the watercourse corridor downstream of the Order Limits which includes Bridle Path Road and Elmesthorpe. These areas of flood risk correlate with anecdotal reports of historical flooding.</p> <p>To address the on-site flood risk, new surface water drainage infrastructure is proposed which will store storm water falling on the development within a combination of ponds and tanks. With the rainfall intercepted, the flood risk to</p>

Consultee	ID / Ref	Consultee Comment	Response
		<p><i>consultants with little independent input from other bodies.</i></p> <p><i>11.5. Discussions took place at the public consultation event regarding the impact on the outflow of water to the north west of the site. Residents were advised that there would be a negligible increase in outflow as water was falling on the farmland now anyway. The operation of the tanks under the buildings and the attenuation ponds was described. However, your consultant also stated that following the survey with ground penetrating water radar, two land drains had been identified as not functioning, though the location of the land drains (on or off site) was not disclosed.</i></p> <p><i>The Parish Council would like details of the location of the two malfunctioning land drains so it can be ascertained whether these fall within the development site and therefore will be rectified during the construction phase, or outside the development site and likely to cause ongoing problems. Your consultant further advised that some of the watercourses outside the development site needed attention due to the levels of sediment, and he went on to say that better</i></p>	<p>the Main HNRFI Site will be reduced to an acceptable level and some downstream betterment provided. Detail of the assessment is provided in the FRA (document reference 6.2.14.1).</p> <p>The surface water drainage will be designed to accommodate the 1 in 100-year storm, with additional capacity provided to accommodate future climate change. In storm events above the required design standard (i.e.: above the 1 in 100-year storm including an allowance for climate change) shallow surface water flooding would occur over external areas of the development (such as in car parks and yards). Any pass-on flows out of the site and into the downstream watercourses would be restricted by the capacity of the existing culverts beneath the railway line, as existing. To ensure the long-term performance of the drainage infrastructure, operational and maintenance procedures will be prepared to set out the routine inspection, maintenance, access, remedial actions and monitoring of the separate elements of the surface water drainage system where they</p>

Consultee	ID / Ref	Consultee Comment	Response
		<p><i>maintenance of the brook to the north west of the site was needed. When asked about who would be paying for any improved maintenance in order to facilitate the outflow of water from the development site, your consultant indicated that the cost would be borne by the Environment Agency. The Environment Agency has subsequently advised that they will not be paying for this. Accordingly, the Parish Council is seeking reassurance about whether people who are not involved with this project will bear the cost of any drainage improvement works.</i></p> <p><i>11.6. There are concerns that the attenuation lakes are of insufficient size for the extent of the development proposed, and residents would like to know what will happen once the underground tanks and attenuation ponds fill up during any period of prolonged rain. The Parish Council would also like details of:</i></p> <ul style="list-style-type: none"> <i>• how the levels of water in the underground storage tanks and attenuation ponds are monitored</i> <i>• who will monitor them</i> <i>• how the outflow from the development site is determined at any given time</i> 	<p>are not adopted by a third party. Further detail is provided in the SDS (document reference 6.2.14.2).</p> <p>The stored storm water will be released to the surrounding watercourse network at the equivalent greenfield (pre-development) annual average discharge rate. This will ensure that under normal rainfall conditions there is no increase in the rate of water leaving the site. In larger storm events this will represent a reduction in the peak flow leaving the development, offering downstream betterment. The hydraulic modelling is based upon topographical surveys of the ground, watercourse channels, and hydraulic structures. This has been supplemented with asset data from Network Rail, Leicestershire Highways, National Highways, and Network Rail, as well as aerial LiDAR survey. This is a standard approach for developing hydraulic models. The EA have undertaken a detailed review of the hydraulic model and have confirmed that it is fit for purpose.</p>

Consultee	ID / Ref	Consultee Comment	Response
		<p>• <i>how the attenuation ponds are monitored to ensure that the outflow of water from the development site does not flood the adjoining area.</i></p> <p><i>11.7. The Parish Council would draw your attention to the proximity of the stream to the rear of homes in Bostock Close which takes water from the existing farmland and where we understand the water levels in the stream can already be subject to sudden and dramatic increases during periods of heavy or prolonged rain. The residents are concerned that if the measures proposed to control the outflow of water from the site are insufficient, their homes will be flooded.</i></p> <p><i>11.8. The Parish Council also understands that properties to the south of the Bridle Path Road crossroads are at a low point in the surrounding area. During high rainfall, they already have standing water in their gardens and adjoining fields. The brook to the north of these homes already struggles to cope with high rainfall, and there are concerns that these properties will flood should the development go ahead.</i></p> <p><i>11.9. There are also concerns regarding how the site drainage scheme will feed into the existing drains/sewers in</i></p>	<p>As the Proposed Development will not detrimentally alter the peak flows leaving the site or affect the flood risk in the wider area, there is no requirement for the Proposed Scheme to include watercourse or surface water drainage improvements outside of the DCO boundary.</p> <p>The Lead Local Flood Authority and the Environment Agency have reviewed the FRA (document reference 6.2.14.1), and the proposed mitigation measures and drainage strategy. They have confirmed that they are comfortable with the proposals</p>

Consultee	ID / Ref	Consultee Comment	Response
		<i>Elmesthorpe. The B581 floods close to Wortley Cottages & Bostock Close during heavy rainfall, and there have been occasions in the last five years where the drain covers have lifted in Bostock Close due to the speed/volume of rising water’.</i>	

Section 47 consultation

- 14.8. On the theme of flood risk, Section 47 consultation responses largely related to concern over existing flood risk and drainage conditions within the Main HNRFI Site and the potential for the Proposed Development to have a detrimental impact on flood risk in the surrounding area. There were also a small number of responses relating to the FRA, the impact of the Proposed Development on Burbage Wood and Aston Firs SSSI, the drainage strategy for the Proposed Development and capacity of public sewer network.
- 14.9. These consultation responses have been addressed through this ES Chapter and the accompanying FRA (document reference 6.2.14.1) and SDS (document reference 6.2.14.2). The FRA and proposed mitigation have been reviewed by the LLFA and EA who have not raised any concerns.

Definition of study area

- 14.10. The Study Area is shown in Figure 14.1 (document reference 6.3.14.1).
- 14.11. There are potential other significant receptors that exist beyond the DCO Site, as well as cumulative effects, which are also included within the ES in Chapter 20; *Cumulative and in-combination effects*. These receptors include flood risk and drainage pathways between the DCO Site and potential receptors such as the Thurlaston Brook, River Soar, the sewerage system and groundwater. As such, the assessment covers a 1km buffer that has been applied to the Main HNRFI Site as this is considered to be the area which would have the greatest potential to affect surface water and flood risk outside of the DCO Site.
- 14.12. The EA assesses surface water and groundwater quality at a river catchment level. Therefore, when considering a potential for impact on downstream water quality, the potential for impacts at a river catchment level, rather than limited to a 1km radius, have been considered in this ES chapter.
- 14.13. The negligible impact of the offsite highway and railway works means the majority of the

ES chapter relates to the Main HNRFI Site.

Other Consultation

- 14.14. **2018 and 2019 Informal Consultation:** Informal consultations were undertaken in 2018; a number of responses requested further details on the flood risk at the site and highlighted the importance of adequate drainage measures. This ES chapter and its appendices provide the details requested and set out the drainage strategy for the Proposed Development.
- 14.15. **EA:** The EA was initially consulted in October 2020 to determine what information it held on flood risk for the Study Area. The EA confirmed it does not hold any detailed hydraulic modelling, although it provided some limited hydrometric information and confirmed there are no licenced abstractions of groundwater or surface water.
- 14.16. The EA was further consulted in February 2021 on the proposed modelling approach. A hydraulic modelling method statement was prepared and provided to the EA which set out the intended approach to modelling. The EA has, subsequently, approved the hydraulic modelling.
- 14.17. **Leicestershire County Council (LCC):** LCC, as the LLFA for this area, was consulted in October 2020 to ascertain what information, relevant to flood risk, the Council holds. LCC's response included information on known flooding incidents in and close to the Study Area. It also advised on preferred access maintenance strips for watercourses and ditches. The response confirmed that the LLFA is unable to approve modelling or a modelling methodology. The hydraulic modelling has since been approved by the EA.
- 14.18. **LCC (Highways):** LCC Highways was consulted in March 2021 to determine what information it held on hydraulic structures (culverts and bridges) in the vicinity of the DCO Site. LCC's response included information on the one publicly maintained structure in the Study Area, and this culvert information has been used to inform the hydraulic modelling.
- 14.19. **Local Planning Authorities:** Hinckley and Bosworth Borough Council ('HBBC') and Blaby District Council ('BDC') were consulted to determine what information on flood risk and drainage they hold which may support the assessment. With the exception of Strategic Flood Risk Assessments (SRFAs), neither authority held any information pertinent to the Study Area. Further detail of the SRFAs is provided in the Relevant law, policy and guidance section of this ES chapter.
- 14.20. **Warwickshire County Council:** Warwickshire County Council ('WCC') was consulted in May 2021 in its capacity as a LLFA for its area. The consultation sought to agree the approach for assessing and managing flood risk, as well as requesting any historical flooding information in the Study Area. WCC confirmed that it is content with the proposed approach and that it was unaware of any known flooding issues within the DCO Site.
- 14.21. **Severn Trent Water (STW):** STW was contacted in January 2021 to obtain latest sewer

records and to understand the capacity of the local sewer network to receive flows from the Proposed Development. The Pre-Development Enquiry, included in the SDS (document reference 6.2.14.2), confirmed that STW has previously modelled the Proposed Development and that the results demonstrated insufficient capacity on parts of the network. STW wishes to be kept informed when the HNRFI DCO Application is submitted as this would prioritise and determine how quickly the Main HNRFI Site can be assessed by its Growth Promotions Team to consider options for upgrading the network. The information provided by STW has been used in the preparation of this ES chapter and SDS and Drainage Strategy (document reference: 6.2.14.2).

- 14.22. STW was also consulted in March 2021 to obtain records of existing water mains and to understand the capacity of the network to meet the demand of the Proposed Development. STW confirmed that the Proposed Development could be supplied from an existing trunk main which would include sufficient capacity for construction works.
- 14.23. **National Highways (NH, formally Highways England (HE)):** NH was consulted in October 2020 to determine what information it held on structures crossing beneath the stretch of the M69 in the vicinity of the Main HNRFI Site and A47 Link Road. Details on the surface water drainage for the M69 in the Main HNRFI Site area was also requested. A response from HE was received which provided plans indicating where there may be drainage assets present. Culvert information was also provided with the caveat that the information was indicative only; depths and pipe sizes could not be confirmed. The response also included an outline of HE's requirements prior to any intrusive works. Where suitable, the information provided by HE has been used to inform the hydraulic modelling, FRA and Drainage Strategy for the Main HNRFI Site and A47 Link Road.
- 14.24. **Network Rail:** Network Rail was consulted in March 2021 to determine what information they held on structures crossing beneath the railway in the vicinity of the Main HNRFI Site. Network Rail responded with information on culverts and drainage systems for the Study Area. Where relevant, this information has been used to support the hydraulic modelling, FRA (document reference 6.2.14.1) and SDS (document reference 6.2.14.2).

Assessment of cumulative and in-combination effects

- 14.25. Chapter 20: *Cumulative and in-combination effects* (document reference 6.1.20) sets out the approach to the assessment of cumulative and in-combination affects.
- 14.26. Stage 1 of the approach to cumulative assessment established the Project's Zone Of Influence (ZOI) and Long List of 'other existing development and/or approved development'. Stage 1 identified the following schemes within the Zone of Influence in relation to surface water and flood risk.
- 18/00751/DEEM: Land East of Leicester Road, Sharnford. Construction of crematorium building and formation of associated memorial gardens, roadways, cat parking, footpaths and landscaping.
 - 19/01303/FUL: Rear of Gamekeepers Lodge, Burbage Common Road. Removal of

existing buildings and construction of 1 portal framed light industrial building.

- 22/00309/OUT: Land East of the Common, Barwell. Up to 110 residential units, together with associated access, open space and landscaping.
- STO026: Land West of Stoney Stanton. Strategic Housing and Economic Land Availability Assessment (SHELAA) site for 5,000 dwellings
- ELM008: Land North of the Railway Line, Elmsthorpe. SHELAA Site to 1,100 dwellings.

14.27. Stage 2 of the assessment resulted in the exclusion of the above identified developments from the shortlist of 'other existing development and/or approved development' as the requirement of developments to comply with national and location policies and best practice means there would be no significant cumulative effects. Further detail is provided in the 'Cumulative and in-combination effects' section of this chapter.

Surveys

14.28. A watercourse survey was undertaken to support the hydraulic modelling. Surveys of watercourse cross sections including open channel and structures were undertaken to EA standards by BWB Consulting during April and May 2021. The survey included the watercourses through the A47 Link Road route, as well as the primary watercourses leaving the Main HNRFI Site. Survey was not required in relation to other works.

14.29. Where access was not available during the watercourse survey due to landownership constraints, refusal of permission to access for survey, or vegetation that prevented access, light detection and ranging (LiDAR) data have been used to supplement the survey. Where LiDAR coverage is limited, photogrammetry data, as the next best available dataset, have been used.

14.30. In addition to the above, the assessment has also used a topographical survey of the Main HNRFI Site. This topographical survey included the watercourses within the Main HNRFI Site and has been used to support the hydraulic modelling.

Assessment sources

14.31. The ES chapter has been informed by the following sources of information.

- FRA (document reference 6.2.14.1). The FRA utilised the following information which is also provided as appendices to the FRA report:
 - topographical survey by MK Surveys (2018);
 - watercourse survey by BWB Consulting (2021); and
 - hydraulic flood modelling of the Main HNRFI Site undertaken by BWB Consulting Ltd (2021).

- SDS (document reference 6.2.14.2). The SDS utilised the following information which is also appended to the SDS report:
 - Drainage Strategy;
 - STW Sewer Records;
 - STW Developer Services Enquiries; and
 - Highways England Water Risk Assessment Tool (HEWRAT) Assessment.
- information provided as part of the consultation responses (outlined in 'Consultation' section above); and
- WFD Assessment (document reference 20.1). Undertaken by Environmental Dimension Partnership Ltd (2021).

Assumptions and limitations

- 14.32. The ES chapter, FRA and SDS are based on available data from the EA, STW and British Geological Survey (BGS). The accuracy of this information has not been verified.
- 14.33. The EA Flood Map for Planning does not include all the watercourses in the vicinity of the Main HNRFI Site. As such, hydraulic modelling has been undertaken to fill this data gap and understand the flood risk from all watercourses in the vicinity of the DCO Site. Accessibility issues have meant not all the watercourses in the Study Area have been surveyed.
- 14.34. This assessment utilises the Design Manual for Roads and Bridges ('DMRB') guidance (see paragraph 14.56).

Establishing baseline conditions

- 14.35. The baseline assessment has been undertaken in accordance with DMRB guidance and IEMA guidance on EIA. Baseline characterisation has been established through the FRA and SDS (document reference 6.2.14.1 and document reference 6.2.14.2, respectively) and has comprised desktop study and hydraulic modelling, including:
- review of surface water hydrology, including water features and surface water drainage in the vicinity of the DCO Site based on EA geo-spatial data, location mapping, Ordnance Survey mapping and further topographic surveys carried out on behalf of TSH;
 - identification of existing catchment pressures (e.g., point source and diffuse pollution issues) based on review of the EA's online catchment data explorer;
 - identification of public water supplies within 1 km of the Main HNRFI Site (off-site works would have negligible impact on public water supplies);

- identification of any flood risks, typically associated with fluvial and surface water sources at this location. This has been informed by consultation with the EA as well as further site-specific hydraulic modelling as described in the FRA and Drainage Strategy and its appendices;
- consideration of the hydro-morphological conditions of watercourses, where applicable; and
- review of soil, geological and hydrogeological information as described in more detail in ES Chapter 15: *Geology, soils and contamination land* (document reference 6.1.16).

14.36. The advice entitled Flood Risk Assessments: Climate Change Allowances (EA, 2016, updated 2022) has been used to determine the potential future baseline in terms of fluvial flood risk. This guidance has also been used to inform the surface water drainage designs.

Flood risk assessment

14.37. The hydraulic analysis of the Main HNRFI Site was agreed with the EA and LCC as the main LLFA. Hydraulic modelling reports are provided as appendices to the FRA (document reference 6.2.14.1).

14.38. To assess future flood risks, the hydraulic modelling has made an allowance for climate change of 30% on top of the 100-year river flow.

Determining effect significance

14.39. The significance of potential effects arising from the Proposed Development have been established through a combination of identifying receptor sensitivity and determining the magnitude of potential effects.

14.40. The assessment has considered the construction and operational stages of the Proposed Development over its lifetime, i.e., taking account of the potential influence of climate change on the surface water and flood risk receptors under consideration.

14.41. The sensitivity of the resource was assessed according to the definitions of receptor sensitivity in Table 14.3 using best practice methodologies and considers the quality, rarity and sensitivity of the resource changing.

14.42. Impacts have been described as beneficial or adverse, and the potential magnitude of this impact rated from major to negligible / no change, Table 14.4. The significance of the likely effect was defined using a matrix of the sensitivity and the magnitude of the impact according to Table 14.5. The tables have been based on the published assessment criteria set out in the DMRB guidance.

Table 14.3: Definition of receptor sensitivity

Value / Sensitivity	Criteria	Examples
High	<p>Water environment features with a very high yield, quality or rarity with little potential for substitution.</p> <p>Water resources supporting human health and economic activity at a regional scale.</p> <p>Features with a very high vulnerability to flooding.</p>	<p>Conditions supporting sites with international conservation designations (Special Areas of Conservation, Special Protection Area, Ramsar Site) where the designation is based specifically on the water features.</p> <p>Groundwater resource in Zone 1 of a Source Protection Zone (GSPZ). Principal aquifer providing regionally important resource or supporting a site protected under EC or UK habitat legislation/species protected by EC or UK legislation.</p> <p>Surface water WFD class ‘High’.</p> <p>Land use types defined as ‘Essential Infrastructure’ and ‘Highly Vulnerable’ in the National Planning Policy Framework (NPPF) flood risk vulnerability classification.</p>
Medium	<p>Water environment features with a high yield, quality or rarity with a limited potential for substitution.</p> <p>Water resources supporting human health and economic activity at a local scale.</p> <p>Features with a high vulnerability to flooding.</p>	<p>Conditions supporting sites with national conservation designations (SSSI, National Nature Reserve) where the designation is based specifically on the water features. Species protected under EC or UK habitat legislation.</p> <p>Principal aquifer providing a locally important resource, Groundwater resource in Zone 2 of an SPZ.</p> <p>Surface water WFD class ‘Good’.</p> <p>Land use types defined as ‘More Vulnerable’ in the NPPF flood risk vulnerability classification.</p>
Low	Features with a	Sites with local conservation designations

Value / Sensitivity	Criteria	Examples
	<p>moderate or low yield, quality or rarity with some or good potential for substitution.</p> <p>Water resources supporting human health and economic activity at household/individual business scale.</p> <p>Water resources that do not support human health and are of only limited economic benefit.</p>	<p>(Local Nature Reserves (LNR), County Wildlife Sites) where the designation is based specifically on the water features.</p> <p>Non-reportable or heavily modified WFD river waterbodies. Groundwater outside SPZ.</p> <p>Surface water WFD class 'Moderate' or 'Poor'.</p> <p>Land use types defined as 'Less Vulnerable' or 'Water-compatible' in the NPPF flood risk vulnerability classification.</p>

Table 14.4: Definition of surface water and flood risk magnitude of change

Magnitude	Criteria	Examples
Major (Adverse)	Loss of attribute and/or quality and integrity of the attribute.	<p>Increase in peak flood level (>100mm).</p> <p>Loss of a fishery.</p> <p>Deterioration in surface water ecological or chemical WFD element.</p>
Moderate (Adverse)	Results in effect on integrity of attribute, or loss of part of attribute.	<p>Increase in peak flood level (>50mm).</p> <p>Partial loss of a fishery.</p> <p>Measurable decrease in surface water ecological or chemical WFD quality or flow with potential for deterioration in WFD element status.</p>

Magnitude	Criteria	Examples
Minor (Adverse)	Results in some measurable change in attributes, quality or vulnerability.	Increase in peak flood level (>10mm). Measurable decrease in surface water ecological or chemical WFD quality or flow.
Negligible (Neutral / Not Significant)	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity.	Negligible change in peak flood level (< +/- 10mm). Discharges to watercourse which lead to no change in the feature's integrity.
Minor (Beneficial)	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring.	Creation of additional flood storage and decrease in peak flood level (>10mm). Measurable increase in surface water ecological or chemical quality.
Moderate (Beneficial)	Results in a moderate improvement of attribute quality.	Creation of additional flood storage and decrease in peak flood level (>50mm). Measurable increase in surface water ecological or chemical quality or flow with potential for WFD element status to be improved.
Major (Beneficial)	Results in a major improvement of attribute quality or creation of new feature.	Creation of additional flood storage and decrease in peak flood level (>100mm). Increase in productivity or size of fishery. Improvement in surface water ecological or chemical WFD element.

Table 14.5: Determination of significant effects for the surface water and flood risk

Impact on Receptor	Magnitude of Effect		
	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
Major	Major	Major	Moderate
Moderate	Major	Moderate	Minor
Minor	Moderate	Minor	Negligible
Negligible	Minor	Negligible	Negligible

14.43. For the purpose of undertaking the assessment in accordance with the Infrastructure EIA Regulations 2017, effects determined to be moderate or greater are considered significant in EIA terms.

Identifying likely significant effects

14.44. The assessment of potential effects of the Proposed Development on surface water and flood risk considers the following for both construction and operational phases:

- contamination arising from drainage;
- fluvial flood risk, both in terms of impacts to the Proposed Development and changes to flood risk in the surroundings or to downstream receptors as a result of the Proposed Development;
- changes to the surface water runoff regime and associated downstream flood risks;
- the effects of regular discharge of surface water, during operational use, on the water quality of downstream receiving waterbodies; and
- potential impacts on the demand of the local potable water network and on foul drainage infrastructure.

Demolition and construction

14.45. The identification of potential significant effects during the demolition and construction phase is based on a review of the presence of potential receptors, a qualitative assessment of the sensitivity of the receptor and an assessment of the potential

pathways for impact and magnitude of likely change.

14.46. The assessment of potential impacts and likely effects has, therefore, comprised the following approach:

- identification and establishment of the sensitivity of water resource receptors on the basis of their use, proximity to the Proposed Development, existing quality or resource value;
- consideration of potential ‘contaminant-pathway-receptor’ linkages;
- evaluation of the magnitude of potential changes in water quality and hydrology as a result of the introduction of the Proposed Development;
- consideration of mitigation measures integral to the Proposed Development;
- classification of the significance of likely effects; and
- identification and communication of additional mitigation measures to eliminate or reduce residual effects, where considered necessary.

Operational development

14.47. The same methodology is applied to the identification of potential significant effects during the operational phase. This is also informed by hydraulic modelling (see document reference 6.2.14.1 for more details and results), undertaken in order to assess the flood risk more accurately and to inform the design of the Proposed Development, and associated mitigation strategies, in order to minimise any increase in flood risk to both off-site receptors and to the Proposed Development itself and its potential occupants.

Duration of effect

14.48. Identified impacts can have differing durations. These have been defined as:

- Short-term (temporary): Temporary effects related to a specific construction event of no more than a year’s duration – such as the construction of an individual building or a specific element of infrastructure such as a section of road.
- Medium-term (temporary and permanent): Temporary effects of longer duration, such as those arising over an extended period of construction ranging from one year to the full construction period, envisaged to be ten years.
- Long-term (permanent): Permanent effects arising from the operation of the HNRFI or from the permanent presence or removal of physical features.

RELEVANT LAW, POLICY AND GUIDANCE

14.49. The following summarises planning and environmental legislation, policies and guidance

which are considered relevant to surface water and flood risk in relation to the Proposed Development, and accordingly have been referenced and consulted in the preparation of this ES chapter.

The Water Resources Act (1991)

14.50. The Water Resources Act¹ relates to the control of the water environment. The main aspects of the Act which are relevant to the Proposed Development include provisions concerning land drainage, flood mitigation and controlling discharges to watercourses to prevent water pollution. It also outlines the functions and responsibility of the EA in regulating the water environment.

Flood and Water Management Act (2010)

14.51. The Flood and Water Management Act² takes forward some proposals from the UK government's report *Future Water, Making Space for Water* and the government's Response to Sir Michael Pitt's Review of the summer 2007 floods.

14.52. The Act gives the EA the strategic overview of management of flood risk in England. It gives upper tier local authorities in England responsibility for preparing and putting in place strategies for managing flood risk from groundwater, surface water and ordinary watercourses in their areas.

14.53. Local flood authorities, district councils, internal drainage boards and highways authorities have a duty to aim to contribute towards sustainable development.

National Policy Statement for National Networks (2014)

14.54. The Department of Transport National Policy Statement for National Networks³ sets out the need for, and Government policies for, nationally significant infrastructure rail and road projects for England.

14.55. Paragraphs 5.90-5.115 (related to flood risk) and 5.219-5.231 (related to water quality and resources) include the requirements to:

- 'take into account the potential impacts of climate change';
- ensure that 'potential releases can be adequately regulated under the pollution control framework' and 'the effects of existing sources of pollution in and around the project are not such that the cumulative effects of pollution when the proposed development is added would make that development unacceptable';
- undertake an appropriate assessment of flood risk, in accordance with the requirements of the 'NPPF' in order to 'avoid, limit and reduce the risk of flooding

¹ The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009

² Flood and Water Management Act (2010)

³ National Policy Statement for National Networks, Department for Transport (December 2014)

to the proposed infrastructure and others'; and

- assess potential impacts on water quality, water resources, physical characteristics of the water environment, and water bodies or protected areas under the WFD.

National Planning Policy Framework (2021)

- 14.56. The NPPF⁴ sets out the Government's national policies on different aspects of land use planning, including flood risk. It must be considered in the preparation of local plans and is a material consideration in planning decisions.
- 14.57. The NPPF requires development to be located in areas of lower flood risk where possible and stresses the importance of preventing increases in flood risk to the wider catchment.
- 14.58. The NPPF sets out a sequential, risk-based approach to the location of development, considering all sources of flood risk and the current and future impacts of climate change, so as to avoid, where possible, flood risk to people and property.
- 14.59. The NPPF is accompanied by National Planning Practice Guidance⁵. The PPG relevant to surface water and flood risk is *Flood Risk and Coastal Change*, which sets out the vulnerability and suitability of different land uses to flood risk.

CIRIA Document C753: The SuDS Manual

- 14.60. The CIRIA SuDS Manual⁶ provides guidance regarding planning, design, construction and maintenance of Sustainable Drainage Systems (SuDS) to assist with the effective implementation within both new and existing developments.

Design Manual for Roads and Bridges (Road Drainage and the Water Environment) (2020)

- 14.61. The National Highway's DMRB⁷ gives guidance on the assessment and management of the impacts that road projects may have on the water environment. These include possible impacts on the quality of water bodies and on the existing hydrology of the catchment(s) through which roads pass. The Standard may also be applied to existing roads, where appropriate.

Water Framework Directive (2000)

- 14.62. The WFD⁸ is an important mechanism for assessing and managing the water environment in the European Union (EU), through a six-yearly cycle of planning and

⁴ National Planning Policy Framework, Ministry of Housing, Communities and Local Government (2021)

⁵ National Planning Practice Guidance: Flood Risk and Coastal Change, Ministry of Housing, Communities and Local Government (2014)

⁶ CIRIA C753 The SuDS Manual, B. Woods Ballard, S. Wilson, H. Udale-Clarke, S. Illman, T. Scott, R. Ashley. R. Kellagher (2015)

⁷ Design Manual for Roads and Bridges LA 113 Road Drainage and the Water Environment. Highways England (March 2020)

⁸ Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

implementing measures to protect and improve the water environment. Since the UK left the EU, the EU WFD has been revoked and replaced in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations (2017)⁹.

- 14.63. The assessment and protection of waterbodies is undertaken by implementing River Basin Management Plans (RBMP). In general terms, there is an onus on developers to protect and, if possible, enhance waterbodies close to proposed developments. Eleven River Basin Districts have been identified in England and Wales, of which the Study Area falls within the Humber River Basin District. The Regulations include a requirement for surface water bodies to achieve 'good' status with respect to ecology and water chemistry by 2021. Progress is monitored by the EA in its role as the 'competent authority'. The current plan relevant to the Study Area is the Humber River Basin District River Basin Management Plan 2015 - 2021¹⁰.

LCC Preliminary Flood Risk Assessments (2011)

- 14.64. The LCC Preliminary Flood Risk Assessment (PFRA)¹¹ is an assessment, undertaken by LCC, of floods that have taken place in the past and floods that could take place in the future. It generally considers flooding from surface water runoff, groundwater and ordinary watercourses, and is prepared by a LLFA. The PFRA seeks to assess past and future flood risk and identify areas at significant flood risk.

WCC Preliminary Flood Risk Assessment (2017)

- 14.65. The WCC PFRA¹² is an assessment, undertaken by WCC, of floods that have taken place in the past and floods that could take place in the future. It generally considers flooding from surface water runoff, groundwater and ordinary watercourses, and is prepared by a LLFA. The PFRA seeks to assess past and future flood risk and identify areas at significant flood risk. The PFRA was completed in May 2011 and subsequently reviewed in June 2017¹³.

LCC Local Flood Risk Management Strategy (2015)

- 14.66. The LCC Local Flood Risk Management Strategy (LFRMS)¹⁴ was prepared by LCC to help understand and manage flood risk at a local level. The LFRMS aims to ensure that the knowledge of local flood risk issues is communicated effectively so floods can be better managed. The LFRMS also aims to promote sustainable development and environmental protection.

⁹ UK Statutory Instruments: 2017 No. 4.7: The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

¹⁰ Humber River Basin Management Plan, Environment Agency (2015)

¹¹ Preliminary Flood Risk Assessment, Leicestershire County Council (2011)

¹² Preliminary Flood Risk Assessment, Warwickshire County Council (2011)

¹³ Preliminary Flood Risk Assessment Review, Warwickshire County Council (2017)

¹⁴ Local Flood Risk Management Strategy, Leicestershire County Council (2015)

WCC Local Flood Risk Management Strategy (2016)

14.67. The WCC LFRMS¹⁵ was prepared by WCC to help understand and manage flood risk at a local level. The LFRMS aims to ensure that the knowledge of local flood risk issues is communicated effectively so floods can be better managed. The LFRMS also aims to promote sustainable development and environmental protection.

Interim LLFA Guidance Note: Planning and Development in Leicestershire (2018)

14.68. The LCC LLFA Guidance Note¹⁶ serves as interim LLFA surface water and flood risk guidance prior to completion of more comprehensive guidance. It aims to enable the design and evaluation of SuDS to meet agreed standards and ensure SuDS are maintainable now and in the future.

Leicester City and Leicestershire Strategic Water Cycle Study (2017)

14.69. The Leicester City and Leicestershire Strategic Water Cycle Study¹⁷ considered the cumulative impact of the anticipated overall level of growth within Leicestershire to 2050 on the provision of a clean water supply, the safe disposal of wastewater and protection from flooding. It has considered the implications of development in the potential growth areas to assess if large-scale development within these areas would be viable and sustainable in terms of impacts on the 'water cycle'.

Hinckley and Bosworth Borough, Blaby District and Oadby and Wigston Borough Joint Strategic Flood Risk Assessment (2014)

14.70. A SFRA is a study carried out by one or more local planning authorities to assess the risk to an area from flooding from all sources, now and in the future.

14.71. The Hinckley and Bosworth Borough, Blaby District and Oadby and Wigston Borough Joint SFRA¹⁸ aims to provide an assessment of flood risk from all sources within the three local authority areas. An addendum to the SFRA was published in 2017 which updated the 2014 SFRA based on latest information and guidance.

Leicestershire and Leicester City-wide SFRA (2017)

14.72. The LCC and Leicester City-wide SFRA¹⁹ is a joint SFRA for all local authorities within Leicestershire and Leicester City undertaken to support the Leicestershire Strategic Growth Plan.

¹⁵ Local Flood Risk Management Strategy, Warwickshire County Council (2016)

¹⁶ LLFA Guidance Note: Planning and Development in Leicestershire, Leicestershire County Council (November 2018)

¹⁷ Strategic Water Cycle Study, Leicester City and Leicestershire County Council (2017)

¹⁸ Joint Strategic Flood Risk Assessment, Hinckley and Bosworth Borough, Blaby District, and Oadby and Wigston Borough Councils (2014)

¹⁹ Leicestershire and Leicester City Level 1 Strategic Flood Risk Assessment (Leicestershire Local Planning Authorities and Leicester City Council (2017)

HBBC SFRA (2019 and 2020)

14.73. HBBC has published an update to the Joint SFRA and the Leicestershire and Leicester City SFRA. Whereas the two previous documents covered multiple local authority areas, the update covered the Hinckley and Bosworth area only and is presented in two parts: a Level 1 SFRA completed in 2019²⁰ and a Level 2 SFRA completed in 2020²¹.

Blaby District Local Plan (2013)

14.74. The Blaby Local Plan (Core Strategy)²², prepared by BDC, sets out the vision, objectives, strategy and core policies for the spatial planning of the District up to 2029. The key relevant policies from the Local Plan in relation to surface water and flood risk, comprise of CS21 (Climate Change) and CS22 (Flood Risk Management).

14.75. Amongst other aims, these policies require proposed developments to:

- Minimise the risk of flooding to property, infrastructure and people.
- Minimise vulnerability and provide resilience to climate change and flooding by including adaptations such as appropriate shading and planting, green roofs, SUDS, rain water harvesting and storage, and grey water recycling.
- Be preferentially located in areas at lowest risk of flooding within the District.
- Manage surface water run-off to minimise the net increase in the amount of surface water discharged.

14.76. The Blaby District Local Plan (Delivery) Development Plan Document (DPD)²³ was adopted in February 2019. The Delivery DPD includes site allocations and development management policies and sites alongside the adopted Core Strategy.

Hinckley and Bosworth Local Plan 2006-2026 (2009)

14.77. The Hinckley and Bosworth Local Plan 2006-2026 outlines HBBC's policies for development within the Borough. The Local Plan is made up of a series of documents, of which the Core Strategy DPD²⁴ provides the vision and spatial strategy for the Borough. The Core Strategy was adopted in December 2009 and sets out, that whilst flooding is not a major issue for the Borough, flood mitigation measures, such as sustainable drainage, would need to be incorporated into new developments.

²⁰ Strategic Flood Risk Assessment for Hinckley and Bosworth Borough Council: Final Report, Hinckley and Bosworth Council (July 2019)

²¹ Hinckley and Bosworth Borough Council Level 2 Strategic Flood Risk Assessment: Final Report, Hinckley and Bosworth Borough Council (May 2020)

²² Blaby District Local Plan: Local Plan (Core Strategy) Development Plan Document, Blaby District Council (February 2013)

²³ Blaby District Local Plan: Local Plan (Delivery) Development Plan Document, Blaby District Council (February 2019)

²⁴ Local Plan 2006 – 2026 Adopted Core Strategy, Hinckley and Bosworth Borough Council (December 2009)

14.78. Another document, Site Allocations and Development Management Policies DPD²⁵, adopted in July 2016, includes Policy DM7 'Preventing Pollution and Flooding' which sets out that adverse impacts from pollution and flooding will be prevented by:

- ensuring development proposals will not adversely impact the water quality, ecological value or drainage function of water bodies in the borough.
- Appropriate containment solutions for oils fuels and chemicals are provided.
- The development does not create or exacerbate flooding by being located away from areas of flood risk unless adequately mitigated against in line with National Policy.

14.79. HBBC are currently developing a new Local Plan which will set out land allocations and planning policies for the period 2020 to 2039.

Rugby Local Plan 2011-2031 (2019)

14.80. The Rugby Local Plan 2011-2031²⁶ outlines Rugby Borough Council's strategic policies and detailed development management policies. The key relevant policy from the Local Plan in relation to surface water and flood risk, comprise SDC5: Flood Risk Management. Amongst other aims, this policy requires proposed developments to apply the sequential approach to the location of development, with development steered to areas with the lowest probability of flooding. SDC5 also sets out how applicants will need to demonstrate compliance with the policy by way of a site-specific FRA.

Harborough Local Plan 2011-2031 (2019)

14.81. The Harborough Local Plan 2011-2031²⁷ sets out the vision, objectives, spatial strategy and planning policies for the Harborough district. The key relevant policies from the Local Plan in relation to surface water and flood risk, comprise CC3: Managing Flood Risk and CC4 Sustainable Drainage. Amongst other aims, these policies require new development to take place in areas of lowest risk of flooding, including the potential future risk from climate change. They also set out how development should be subject to a site-specific FRA, where required, and that all major development must incorporate SuDS.

Humber River Basin Management Plan (2015)

14.82. The latest version of the Humber RBMP²⁸, undertaken by Defra and the EA, includes an assessment of river basin characteristics, a review of the impact of human activities, statuses of water bodies and an economic analysis of water use and progress since the

²⁵ Local Plan 2006 – 2026 Site Allocations and Development Management Policies DPD, Hinckley and Bosworth Borough Council (July 2016)

²⁶ Local Plan 2011 – 2031, Rugby Borough Council (June 2019)

²⁷ Local Plan 2011 – 2031, Harborough District Council (April 2019)

²⁸ Humber River Basin District River Basin Management Plan, Defra and Environment Agency (2015)

first plan was published in 2009.

Severn Trent Water: Water Resources Management Plan (2019)

- 14.83. The Water Resource Management Plan, prepared by STW²⁹, is a long-term assessment of the likely demand and supply of potable water within the STW supply region. The document also includes an outline of plans in order to balance supply and demand, whilst meeting environmental obligations and climate change uncertainty.

BASELINE CONDITIONS

- 14.84. The following outlines the existing water resource conditions within the Study Area.

Hydrology

- 14.85. The majority of the Proposed Development is located in the Thurlaston Brook catchment. An unnamed tributary of the Thurlaston Brook, which is referred to here as the 'Thurlaston Brook Tributary', flows eastwards across the route of the proposed A47 Link Road and immediately beyond the railway line to the north of the Main HNRFI Site.
- 14.86. An Unnamed Ordinary Watercourse (UOW) flows north-eastward through the southern portion of the Main HNRFI Site before joining the Thurlaston Brook Tributary just downstream of the railway line. This UOW 'issues' within the Main HNRFI Site itself, rather than being fed by an upstream catchment.
- 14.87. Additionally, several field drainages ditches and small ponds in the Main HNRFI Site discharge into the Thurlaston Brook Tributary.
- 14.88. A tributary of the Soar Brook issues from the south-eastern side of Hinckley. This flows beneath the M69, to the south west of Junction 2, and through the DCO Site for a short length, before turning south-east and flowing away from the DCO Site.
- 14.89. The Thurlaston Brook catchment has a WFD overall water body quality classification of 'Poor' (2019), with an ecological status of 'Poor' and a 'Fail' chemical status. The catchment has an objective of achieving 'Good' overall status by 2027. Agricultural and rural land management, and pollution from waste water are the main issues preventing waters reaching good status. The Soar Brook from Source to Soar catchment has a WFD overall water body classification of 'Moderate' (2019), with an ecological status of 'Moderate' and a 'Fail' chemical status. The catchment has an objective of achieving 'Good' overall status by 2027. Agricultural and rural land management is the main issues preventing waters reaching good status.
- 14.90. The underlying aquifer (Soar – Secondary Combined) has a WFD classification of 'Good' (2019).

²⁹ Water Resource Management Plan, Severn Trent Water (August 2019)

Flood risk

Fluvial

- 14.91. With reference to the EA’s Flood Map for Planning, shown in Figure 14.2 (document reference 6.3.14.2), the majority of the DCO Site lies within Flood Zone 1 (low probability of flooding). Flood Zone 1 is defined in the NPPF as land having a less than 1 in 1,000 annual probability of fluvial or tidal flooding. However, document reference 6.3.14.2 shows a small portion of the Main HNRFI Site adjacent to the northern boundary is located in Flood Zone 3 (high probability of flooding) and Flood Zone 2 (medium probability of flooding). Flood Zone 3 is defined in the NPPF as land having a 1 in 100 or greater annual probability of fluvial flooding, or a 1 in 200 or greater annual probability of tidal flooding. Flood Zone 2 is defined as land having between a 1 in 100 and 1 in 1,000 annual probability of fluvial flooding, or between a 1 in 200 and 1 in 1,000 annual probability of tidal flooding. This flood risk is associated with the Thurlaston Brook Tributary.
- 14.92. The Flood Map for Planning does not take account of watercourses with a catchment area of less than 3km², which is the case of the smaller watercourses within the Main HNRFI Site and in the vicinity of the A47 Link Road and off-site junction enhancements and highway works. As such, the Flood Map for Planning is not considered fully representative of flood risk in these areas.
- 14.93. The Flood Map for Planning shows the A47 Link Road would cross through areas of Flood Zone 2 and Flood Zone 3 associated with the Thurlaston Brook Tributary.
- 14.94. The FRA (document reference 6.2.14.1) includes an assessment of the fluvial flood risk to those offsite highway and railway works where physical changes may be required. This is summarised in Table 14.6 below. Of the proposed works, only one, ‘B6’, has the potential to effect surface water and flood risk. The remaining works are located away from watercourses.

Table 14.6: Offsite highway and railway works – fluvial flood risk

Junction enhancement / off-site work	Flood Zone category
Junction of B581 Station Road / New Road and Hinckley Road, Stoney Stanton (‘B1’), Junction of B4669 Hinckley Road and Stanton Lane, west of Sapcote (‘B2’), B4669 Hinckley Road/ Leicester Road, Sapcote (‘B4’) Stanton Lane / Hinckley Road, south-west of	Flood Zone 1

Junction enhancement / off-site work	Flood Zone category
<p>Stoney Stanton ('B3')</p> <p>Junction of B4114 Coventry Road and B581 Broughton Road at Soar Mill, south-east of Stoney Stanton ('B5'),</p> <p>Junction of B4114 Coventry Road and Croft Road, south-west of Narborough ('B6'),</p> <p>Junction of A47 Normandy Way and A447 Ashby Road, Hinckley ('HB1')</p> <p>Junction of A47 Normandy Way / Leicester Road, the B4668 Leicester Road and The Common, south-east of Barwell ('HB2'),</p> <p>Junction of B4668 and New A47 Link Road, north east of the site access (Access Infrastructure) ('HB3')</p> <p>Cross in Hand roundabout at the junction of the A5 Watling Street, A4303 Coventry Road, B4428 Lutterworth Road and Coal Pit Lane, west of Lutterworth ('H1')</p> <p>Proposed Slip Roads on the A47 link and M69 (north and southbound),</p> <p>M69 signage Junction 1 to Junction 2.</p>	
<p>Junction of B4114 Coventry Road and Croft Road, south-west of Narborough ('B6')</p>	<p>Flood Zone 3</p>

(Numbers in brackets refer to the DCO reference as set-out in Table 3.2, Chapter 3)

- 14.95. Modelling of the Thurlaston Brook Tributary and other key watercourses and ditches inside the Main HNRFI Site has been undertaken to understand any flooding issues associated with these waterbodies. The baseline modelling includes the current day scenario as well as risk associated with climate change. The model and its results are included in the FRA (document reference 6.2.14.1).
- 14.96. The model identified that the existing rail line is raised above flood levels and is at a low risk of flooding from the local watercourses. Similarly, the connection to the railway line from the Main HNRFI Site would also be raised above flood levels to also be a low flood risk. The top of the railway embankment at its lowest point (beneath Station Road) is

320mm, 370mm and 600mm above the 1 in 1000-year, 1 in 100-year plus 60% climate change and 1 in 100-year plus 30% climate change events, respectively.

- 14.97. The FRA concludes that the majority of the land inside the Main HNRFI Site is located outside of the floodplain and is at low risk of flooding. However, there are a few localised areas upstream of the railway line where water can pond, as well as an overland flow route near Burbage Common.
- 14.98. The FRA assesses the floodplain and flood risk from all sources in more detail.

Surface water

- 14.99. Figure 14.3 (document reference 6.3.14.3) of this ES chapter shows the EA’s Flood Risk from Surface Water Map for the DCO Site. This shows the potential flooding which could occur when rainwater does not drain away through the normal drainage systems or soak into the ground.
- 14.100. The mapping identifies the Main HNRFI Site to be predominantly at very low risk of flooding from pluvial sources, with some areas of higher risk associated with the watercourses on the Main HNRFI Site. The pluvial flood risk to the A47 Link Road corridor and the various offsite highway and railway works range from very low to high.
- 14.101. The FRA (document reference 6.2.14.1) includes an assessment of the surface water flood risk to offsite highway and railway works where physical changes may be required. This is summarised in Table 14.7 below. Of the proposed works, only one (Junction of A47 Normandy Way / Leicester Road, the B4668 Leicester Road and The Common, south-east of Barwell) has the potential to affect surface water and flood risk. The remaining works are either located away from surface water bodies and / or involve minor works such as introduction of traffic lights.

Table 14.7: Junction enhancements and off-site works – surface water flood risk

Junction enhancement / off-site work	Surface water risk category
Normandy Way and Ashby Road A47, Junction of B581 Station Road / New Road and Hinckley Road, Stoney Stanton, Junction of B4114 Coventry Road and B581 Broughton Road at Soar Mill, south-east of Stoney Stanton, Junction of A47 Normandy Way / Leicester Road, the B4668 Leicester Road and The Common, south-east of Barwell,	Low

Junction enhancement / off-site work	Surface water risk category
<p>Cross in Hand roundabout at the junction of the A5 Watling Street, A4303 Coventry Road, B4428 Lutterworth Road and Coal Pit Lane, west of Lutterworth,</p> <p>Junction of B4114 Coventry Road and Croft Road, south-west of Narborough,</p> <p>Junction of B4668 and New A47 Link Road, north east of the site access (Access Infrastructure),</p> <p>Proposed Slip Roads on the A47 link and M69 (north and southbound),</p> <p>M69 signage Junction 1 to Junction 2.</p>	
<p>Junction of B4669 Hinckley Road and Stanton Lane, west of Sapcote</p>	<p>Medium</p>
<p>Junction of A47 Normandy Way / Leicester Road, the B4668 Leicester Road and The Common, south-east of Barwell,</p> <p>B4669 Hinckley Road/ Leicester Road, Sapcote,</p>	<p>High</p>

Canals and reservoirs

- 14.102. The nearest canal to the Main HNRFI Site is the Ashby Canal, located over 5km to the west. This distance and the intervening topography are such that the HNRFI is not considered to be at risk from flooding from the canal.
- 14.103. The offsite highway and railway works are located away from any canals and are not considered to be at risk from canal flooding.
- 14.104. Based on EA reservoir inundation mapping, the DCO Site is located entirely outside the area predicted to be at risk in the event of a reservoir failure.

Groundwater

- 14.105. The FRA (document reference 6.2.14.1) concludes that the Main HNRFI Site is underlain predominantly by glacial deposits of the Thrussington Member and Bosworth Clay Member. Localised deposits of Alluvium and the Wolston Sand & Gravel are mapped at the Main HNRFI Site. The bedrock at the Main HNRFI Site is indicated to comprise Mercia

Mudstone.

- 14.106. The EA classifies the Alluvium and the Wolston Sand and Gravel as Secondary A Aquifers, the Bosworth Clay Member as unproductive strata, the Thrusington Member as an undifferentiated Secondary Aquifer, and the Mercia Mudstone and Edwalton Member Mudstone are categorised as a Secondary B Aquifer.
- 14.107. The FRA reports that groundwater was encountered in the Main HNRFI Site in four exploratory positions during fieldwork between 3.10m below ground level (bgl) and 3.90m bgl. Shallow groundwater on the Main HNRFI Site is a product of impeded drainage conditions brought about by the cohesive underlying geology. The cohesive geology means that there is not a significant groundwater reservoir or flow pathway that could be negatively impacted by the Proposed Development.
- 14.108. The FRA also concludes that the offsite highway and railway works are at low risk of groundwater flooding.
- 14.109. The conclusion from the FRA is the DCO Site is at low risk of groundwater flooding due to the depth of groundwater and the low permeability of the underlying strata.

Drainage

- 14.110. The Main HNRFI Site is not served by any existing drainage infrastructure. Rainfall is believed to infiltrate into the ground where geological and hydrogeological conditions allow, and then to runoff at surface level once the infiltration capacity of the ground has been exceeded. Any run-off currently generated would likely be directed to local surface water bodies, and ultimately into the Thurlaston Brook or the River Soar.
- 14.111. The offsite works are to existing highways and railway and are, therefore, served by existing drainage.

Foul water

- 14.112. The Main HNRFI Site is located within STW's sewerage area, although it is not currently served by a public foul water drainage system. Foul water from existing properties within the Main HNRFI Site is understood to currently be disposed to on-site management / disposal systems.
- 14.113. The nearest public foul water sewer connection point to the Main HNRFI Site is a 150mm diameter sewer to the north-east of the nearest part of the Main HNRFI Site. This connects downstream to the Elmesthorpe – Bostock Close Sewage Pumping Station (SPS) and Elmesthorpe – Bostock Close Combined Sewer Overflow (CSO). The SPS pumps foul water to the Wastewater Treatment Works (WwTW) at Stoney Stanton, approximately 3.0km to the east of the Main HNRFI Site. The WwTW discharges treated water to the River Soar, within whose immediate downstream catchment no designated sites of ecological importance were identified, nor any Drinking Water Protected Areas (Surface Water) or Drinking Water Safeguard Zones (Surface Water).

- 14.114. STW have undertaken modelling of the Proposed Development in the past; the results of which demonstrated insufficient capacity at the SPS from additional foul flows. As such, an upgrade to the network would be required.
- 14.115. The proposed A47 Link Road and offsite highway and railway works do not affect any foul water drainage assets.

Potable water supply

- 14.116. The EA classifies the STW region as having a ‘moderate’ degree of water stress.
- 14.117. Potable water is supplied to the area by STW. STW has confirmed that there is a 300 mm trunk main to the northeast of the Main HNRFI Site, running along the B4668. STW confirmed that it can supply the Proposed Development from this existing trunk main.
- 14.118. The proposed A47 Link Road and offsite highway and railway works do not affect any water supply assets.

Designations

- 14.119. Burbage Wood and Ashton Firs, located immediately adjacent to the south-west of the Main HNRFI Site, are designated as both a SSSI and a LNR, on the basis of biological interest. However, the topography of the area is such that land in the Main HNRFI Site slopes, and watercourses flow, away from the SSSI; therefore, surface water and drainage is not expected to have any significant effect on water quality at the SSSI.
- 14.120. There are no other SSSIs within 1km of the DCO Site.
- 14.121. No designated sites of ecological importance were identified in the DCO Site, nor any Drinking Water Protected Areas (Surface Water) or Drinking Water Safeguard Zones (Surface Water).
- 14.122. None of the DCO Site is located in a GSPZ. There are no active abstraction licences listed within 1km of the Main HNRFI Site and there are no discharge consents listed as issuing to groundwater at the Main HNRFI Site or in the surrounding area.

Future baseline

- 14.123. Climate change would lead to increased rainfall intensity and flows within watercourses which may subsequently increase flood risk both within the DCO Site and further downstream. The potential impact of climate change has been considered as part of the FRA (document reference 6.2.14.1).
- 14.124. By the time the Proposed Development is complete (projected to be in 2036) it is assumed that the developments listed in Chapter 20: *Cumulative and in-combination effects* of this ES (document reference 6.1.20) would be in place. However, it is not anticipated that the Proposed Development would have any significant impact upon flood risk, surface water quality and quantity, and foul water. As per the NPPF, Planning Practice Guidance and Non-Statutory Technical Standards for Sustainable Drainage

requires all new developments are upheld to the same standards, so as to not increase risk to third parties and, where possible, make provision for betterment.

Summary of receptors and sensitivity

14.125. The potential receptors and their sensitivity in terms of groundwater, surface water, flood risk and drainage are described below in Table 14.8. Those receptors identified remain valid for both the existing and future situation.

Table 14.8: Potential sensitivity of receptors

Receptor	Type of impact	Sensitivity (value)	Reason for sensitivity
Thurlaston Brook Tributary	Water quality	Low	Overall Poor WFD status
	Flood risk	High	Flood Zone 1, 2 and 3
UOW	Water quality	Low	Overall Poor WFD status
	Flood risk	High	Flood Zone 1, 2 and 3
Soar Brook	Water quality	Low	Overall Moderate WFD status
	Flood risk	High	Flood Zone 1, 2 and 3
Minor watercourses	Water quality	Low	Overall Poor WFD status
	Flood risk	High	Flood Zone 1, 2 and 3
Groundwater	Water quality	Low	Minor aquifer
	Underlying aquifer	Medium	Good WFD status
Construction workers and Main HNRFI Site users	Flood risk	High	Human life

Receptor	Type of impact	Sensitivity (value)	Reason for sensitivity
STW public sewer network	Flood risk / resource availability	Medium	Existing residential, commercial or retail property
STW potable water network	Resource availability	Low	Proposed Development can be supplied by existing Trunk Main

POTENTIAL LIKELY SIGNIFICANT ENVIRONMENTAL EFFECTS OF THE PROPOSALS

14.126. This section provides an assessment of the potential significant environmental impacts of the Proposed Development on the basis of embedded mitigation but without further mitigation. Likely significant effects are those which reach the EIA reporting threshold of moderate effect or above. In the medium term the construction stage may overlap with the operational stage; as such the effects from both stages outlined below may occur. The assessment covers the reasonable worst-case effects of both construction and operational stages. As such, any medium-term overlap of construction and operational stage is encompassed within these worst-case scenarios and is not expected to result in effects more significant than those outlined below. Mitigation measures to address these potential impacts are outlined in the Proposed Mitigation section below.

Construction stage

14.127. The effects associated with the construction phase of the Proposed Development are considered to be direct, temporary and short to medium term duration. The effects, prior to mitigation are outlined below.

Flood risk

14.128. The majority of the DCO Site is located within Flood Zone 1. However, there are some small areas of the Main HNRFI Site and offsite highway work 'B6' within Flood Zone 2 and 3. Therefore, the effect of flood risk (*major magnitude*) in the areas of Flood Zone 2 and 3 on construction workers (*high sensitivity receptor*) is considered to be major adverse, prior to mitigation.

14.129. The following construction activities within the DCO Site could potentially increase flood risk within the Study Area and downstream catchments, prior to mitigation and, therefore, on a precautionary basis, have been identified as likely significant effects:

- Construction works could compromise the 'normal' functioning of existing watercourses, through altering channel geometry, and hence altering flow

characteristics and / or routes.

- The mounding of materials and placement of other structures within areas identified as being at risk of flooding could result in a loss of floodplain storage and / or the alteration of overland flow characteristics and / or routes.

14.130. Small portions of the Main HNRFI Site, and offsite highway work 'B6', as well as downstream catchments are designated as Flood Zone 2 and 3 (*high sensitivity receptor*). As such the significance of the effect of an increase in flood risk (*major magnitude*) to the Main HNRFI site or downstream catchments is considered major adverse, prior to mitigation.

Surface water quantity

14.131. The use of heavy machinery on the DCO Site during the construction phase is likely to result in short term disruption to the rate of infiltration. The movement of construction traffic could also disturb the upper portions of the ground, leading to compaction, altering the degree of surface water infiltration and runoff. A short-term increase in runoff rates (*minor impact magnitude*) may increase the volume and rate of runoff into minor watercourses (*high sensitivity receptor*). The impact is considered to be moderate adverse. The significance of the effect of a short-term reduction in infiltration (*minor impact magnitude*) to the bedrock aquifer (*low sensitivity resource*) is considered to be negligible.

14.132. The effect of the offsite highway works 'HB2' is considered negligible considering the short term, minor nature of the proposed works.

Surface water quality

14.133. Construction activities can lead to the pollution of controlled waters. Activities that might generate impacts include the demolition of existing structures, earth stripping, stockpiling, excavation, construction plant movements and hauls, refuelling, equipment maintenance, storage of materials and chemicals and the generation, storage and disposal of waste materials. Impacts are generally from sediment (soil particles) suspended in runoff, particularly from rainfall during storm events, which can affect water quality, or from pollution by construction materials or fuels.

14.134. Suspended solids are one of the most common causes of water pollution from construction sites. They emanate from excavations, exposed ground or stock piles, plant and wheel washing, build-up of dust and mud on roads, or pumping of contaminated surface waters and groundwater accumulated on the Main HNRFI Site. Extreme rainfall events could exacerbate runoff rates and the mobilisation of suspended solids has the potential to affect ecological habitats, block watercourses and alter flow regimes. Additionally, suspended solids from construction work, particularly from intrusive earthworks for foundations and sewers, could create pathways to local groundwater.

14.135. Diversion of the UOW is proposed as part of the Proposed Development. During construction and prior to vegetation colonisation the diversion of the UOW channel

through the Main HNRFI Site risks exposing loose sediments to the water environment that could become mobilised under high flow conditions and transported into the downstream fluvial environment.

- 14.136. Prior to mitigation, the significance of the effect of runoff containing suspended solids (*moderate impact magnitude*) on the Thurlaston Brook Tributary, UOW and minor watercourses UOW (*low sensitivity receptors*) is considered to be minor adverse. It would also have a minor adverse effect on groundwater (*low sensitivity receptor*) within the DCO Site.
- 14.137. Hydrocarbons have the potential to impact on watercourses and aquatic ecosystems. The significance of the effect of hydrocarbons (*moderate impact magnitude*) on the local watercourses (*low sensitivity receptor*), prior to mitigation, are considered minor adverse.
- 14.138. The uncontrolled release of substances such as solvents, cleaning agents, paints and other chemicals, liquids or solids could lead to further pollution. These could become a hazard if used in the construction process or stored on the DCO Site. These substances can be of high toxicity (*moderate impact magnitude*), thereby having a minor adverse effect on the Thurlaston Brook Tributary, UOW and minor watercourses, and groundwater (*low sensitivity receptors*) prior to mitigation.
- 14.139. Concrete production taking place on the DCO Site or introduced by ready-mix lorries could cause small particulates to settle in the surrounding area. Wastewater from the batching plant or washing down of lorries/mixing areas could cause particulates to runoff into watercourses. Without mitigation, the potential impact of this source of pollutant (*moderate impact magnitude*) on the Thurlaston Brook Tributary, UOW and minor watercourses (*low sensitivity receptors*) is considered a short term minor adverse effect.
- 14.140. The above impacts on surface water quality as a result of decreased runoff quality and the introduction of machinery, vehicles and substances may also lead to decreased quality of groundwater receptors. Without mitigation, the potential impact of these pollutants (*moderate impact magnitude*) on the underlying aquifer (*medium sensitivity receptor*) is considered moderate adverse.

Foul water

- 14.141. There would be increased pressure on the local foul water network due to the temporary presence of construction workers and associated welfare facilities. The demand placed upon the existing public sewer network (*medium sensitivity receptor*) for the construction period is considered to be low (*minor impact magnitude*). The significance of the effect is considered minor adverse due to the medium sensitivity of the receptor and minor magnitude of the effect, prior to mitigation.

Potable water supply

- 14.142. There would be an increased demand on the local water supply because of construction activities and the presence of construction workers.

- 14.143. There are services to existing properties within the Main HNRFI Site which could be re-purposed to provide connections for the construction accommodation and activities in advance of bringing the main connection to site. If necessary, on-site storage can be utilised during the construction period to minimise any short-term connections that may otherwise be necessary.
- 14.144. The main connection to site would cross a culverted waterway and require a directional drill beneath the railway with all other works undertaken to be installed within the public highway. Whilst this does represent an increased capacity on the Severn Trent network this would be provided without any detriment to existing connections or network performance with network reinforcement undertaken as necessary. Where network reinforcement is required the use of PE pipelines would provide a degree of betterment over any existing metallic assets.
- 14.145. The demand placed upon the water supply network (*low sensitivity receptor*) for the construction period is considered to be negligible. The significance of the effect is considered negligible due to the low sensitivity of the receptor and negligible magnitude of the effect.

Operational stage

- 14.146. The effects associated with the operational phase of the Proposed Development are considered to be direct, permanent and medium to long term in length. The effects prior to mitigation are described below.

Flood risk

- 14.147. The Proposed Development includes the reprofiling of the Main HNRFI Site to form two plateaux. To facilitate the reprofiling, the UOW in the Main HNRFI Site would be realigned to flow along the south-eastern boundary within a new channel. The realigned watercourse would flow along a corridor that would be designed to contain the necessary flood flows; this would include an allowance for future climate change. Any necessary culverts would also be designed to convey the necessary flood flows. To ensure the long-term performance of the watercourse and culverts operational and maintenance procedures would be prepared to set out routine inspection, maintenance, and remedial actions in line with land owner riparian responsibilities.
- 14.148. The A47 Link Road crosses a number of small watercourses. The road would be elevated upon an embankment above the floodplain so that it can remain operational during times of flood. Culverts would be provided beneath the road to preserve hydraulic connectivity and convey flood flows into the downstream channels.
- 14.149. Therefore, the Proposed Development designs have taken account of the need to balance flood risk by allowing flood water to move through the Main HNRFI Site in such a way that conveyance is not significantly impeded. Hydraulic modelling has been completed to determine the extent and depth of flooding at the Main HNRFI Site and in its surrounds during a 100 year plus climate change (60% increase in flow) event. Therefore, the effect of flood risk on occupants and Main HNRFI site users of the Main

HNRFI Site is considered to be negligible, as a result of a negligible magnitude effect on a high sensitivity receptor.

Surface water quantity

14.150. The Main HNRFI Site and the A47 Link Road would introduce a significant area of impermeable surfaces onto a currently greenfield area. This has the potential to increase surface water runoff through reduced infiltration which would increase discharge into receiving watercourses such as the Thurlaston Brook Tributary and UOW (*high sensitivity receptors*). This could cause an increase in flood risk (*moderate impact magnitude*). The impact on the Thurlaston Brook Tributary and UOW is considered to be major adverse, without mitigation.

Surface water quality

14.151. Once in use, pollutants associated with run-off from the Main HNRFI Site and the A47 Link Road have the potential to impact detrimentally upon the quality of water (*moderate impact magnitude*) both in the sewer network (*medium sensitivity receptor*) and the Thurlaston Brook Tributary and UOW (*low sensitivity receptors*) from direct runoff. Contamination in the operational phase is most likely to be caused by vehicle usage. The effect on the sewer network is considered to be moderate adverse, and on the Thurlaston Brook Tributary and UOW is considered to be minor adverse, respectively, without mitigation.

Foul water

14.152. There would be increased foul water flows (*minor impact magnitude*) to the local foul water network (*medium sensitivity receptor*) because of the Proposed Development. STW has confirmed network upgrades would be required because of insufficient capacity at the Elmesthorpe – Bostock Close SPS. The significance of the effect is considered minor adverse due to the medium sensitivity of the receptor and minor magnitude of the effect, prior to mitigation.

Potable water supply

14.153. The increase in water demand (*negligible impact magnitude*) as a result of the Proposed Development could lead to an impact on the capacity of the local public water supply (*low sensitivity receptor*). The significance of the effect is considered negligible due to the low sensitivity of the receptor and negligible magnitude of the effect.

Accidents and disasters

14.154. The main disaster, related to surface water and flood risk, that might affect the Main HNRFI Site is a significant flooding event. The hydraulic modelling includes an allowance for climate change, including a high impact climate change scenario, which for the Main HNRFI Site is a 60% increase to the 1 in 100-year fluvial event. The results from the modelling have been used to support the Proposed Development and help inform embedded mitigation measures. Therefore, the vulnerability of the Main HNRFI Site to

a major disaster or accident, following mitigation, is considered negligible.

- 14.155. The drainage strategy for the Proposed Development has been designed to consider climate change. Additionally, reduced rates of discharge from the Main HNRFI Site as a result of the drainage strategy may provide downstream benefits in the form of reduced flood risk. As such, the effect of the development on accidents or disasters is considered negligible, following the inclusion of this embedded mitigation in design.
- 14.156. Further information on major accidents and disasters are covered in ES Chapter 19 (document reference 6.1.19).

PROPOSED MITIGATION

Construction stage

- 14.157. The likelihood of any residual impacts following the implementation of the mitigation measures outlined below is likely to result in negligible effects that are not significant effects for the purposes of this ES assessment.

Flood risk

- 14.158. The DCO Site is predominantly at low risk of flooding from fluvial and pluvial sources with some areas of higher risk near watercourses on the Main HNRFI Site, A47 Link Road corridor and certain offsite highway and railway works, as set out in more detail in the FRA. It is recommended that construction workers, Site managers and Site visitors monitor local weather warnings for heavy rainfall. Good practice guidance on working near watercourses will be followed by construction workers, such as those set out in the Health and Safety Executive's Personal buoyancy equipment on inland and inshore waters guidance (1995).
- 14.159. In addition, Site compound welfare facilities and materials stockpiles would be stored outside of the floodplain.

Surface water quantity and quality

- 14.160. A Construction Environmental Management Plan (CEMP) (document reference 17.1) has been submitted as part of the ES and DCO documentation to outline methods and monitoring requirements to prevent effects on Surface Water and Flood Risk, as a result of the construction phase.
- 14.161. Large areas of topsoil excavated or exposed by construction works and similar materials, including stockpiles, would be covered or contained where possible when not in use.
- 14.162. The diverted UOW would be constructed offline and would include measures to prevent erosion and the mobilisation of sediments, which will be detailed in the CEMP for this phase of works. Appropriate monitoring would also be followed to identify and mitigate any pollution incident.

- 14.163. Wheel washing facilities and regular sweeping would be undertaken to prevent dust build-up and silt on roads. Wheel washing facilities should be in a designated bunded impermeable area and surplus water from washing would be disposed of via the foul water system or treated adequately prior to disposal.
- 14.164. Waste water from concrete production and lorry washing would be limited to a designated bunded impermeable area to prevent contaminated water entering watercourses. Wastewater would be directed to the foul water network or adequately treated prior to disposal.
- 14.165. To avoid infiltration of polluted water from vehicles or accidental spillage, vehicles would be inspected regularly and maintained to reduce the risk of leakages. Vehicle wash-down areas would be at least 10m from any surface waters and located in a designated bunded impermeable area. Any runoff would be treated through oil interceptors prior to discharge.
- 14.166. On-site refuelling would be undertaken in a designated bunded impermeable area to prevent infiltration of contaminated waters.
- 14.167. As is the case for potential surface water pollution, a spillage or pollution incident could affect groundwater quality. Procedures set out in the CEMP are specifically developed in order to reduce the likelihood of such uncontrolled discharge, spillage or pollution incident. If such an event were to occur due to unforeseen circumstances, actions would be undertaken to limit the spread of any spillage and to clear the spillage prior to discharge to ground. Such actions would be detailed in an emergency response plan which would be prepared in accordance with the CEMP.
- 14.168. Storage facilities for oil and fuels would be in suitable above ground tanks. Any tanks storing more than 200 litres of oil would have secondary bunding. Any above ground storage tanks would be located on a designated area of hardstanding.
- 14.169. Where existing infrastructure is proposed to be used during the construction phase it would be fully assessed and where necessary serviced prior to use. It is assumed that the infrastructure is appropriate for the intended use.
- 14.170. Drip trays would be used under vehicles where appropriate to ensure that oil is collected and contained to prevent infiltration of contaminated waters.
- 14.171. Designated pathways would be provided for large vehicles to limit the areas impacted by soil compaction. This would reduce the effect of soil compaction on infiltration and subsequently increased pooling of surface water.

Foul water

- 14.172. STW have been consulted, and have modelled their network, and have indicated a point of connection at Burbage Common Road. Any sewer network upgrades will be provided by STW.

14.173. During the construction period considerations shall be given to the following water conservation measures:

- Additional metering and automatic shut off valves.
- Early hard standing to reduce need for damping down.
- Use of closed loop systems for wheel wash and vehicle cleaning.
- Use of temporary settlement lagoons to allow re-use.
- Additives to dust suppression water to reduce frequency of use.
- On site Silos as opposed to Batch mixing of concrete and mortar

14.174. All buildings on site would be designed in accordance with the prevailing good practice at the time of construction including:

- Comprehensive metering and usage monitoring.
- The use of low or no water sanitary fittings.
- Auto shut off aerating taps and showers.
- Rain water harvesting.
- Grey water harvesting.
- Low water requirement planting.

14.175. Consideration would also be given to the potential for site wide grey water harvesting as the design evolves.

Potable water supply

14.176. STW have confirmed that, in principle, the required capabilities could be provided from the local network. The detailed design application and assessment will be undertaken during the design stage, which will consider both requirements for the construction period and the actual operation of the facility.

Operational stage

14.177. The likelihood or any residual impacts following the implementation of the mitigation measures outlined below is likely to be negligible or minor beneficial in significance.

Flood risk

14.178. Using the baseline model of the Thurlaston Brook Tributary, UOW and minor watercourses, appropriate mitigation would be provided to ensure that no land outside

the Main HNRFI Site would be at an increased risk of fluvial and surface water flooding. Any residual impacts with the implementation of mitigation measures would be minor beneficial in significance due to the general decrease in flows in higher return period events improving the situation off-site.

14.179. An FRA and SDS have been prepared and appended to the ES (see document references 6.2.14.1 and 6.2.14.2) which outline mitigation measures to be taken.

Surface water quantity

14.180. An appropriate drainage strategy including SuDS has been identified to reduce surface water runoff rates and direct any pluvial flow paths towards a positive drainage system. Existing surface water runoff routes are likely to be altered once the Proposed Development is operational and, as such, to prevent an adverse impact on the wider catchment an appropriate drainage strategy is necessary. The concept surface water drainage strategy for the Main HNRFI Site is provided in Figure 14.4 (document reference 6.3.14.4). The concept drainage strategy for the A47 Link Road and M68 Junction 2 are provided in Figures 14.6 and 14.7 (document reference 6.3.14.6 and 6.3.14.7)

14.181. Overall, the Proposed Development would provide a betterment in regard to water quantity control, particularly for the higher return period events (e.g., storm events of heavy rainfall). By restricting the volume generated by the natural catchment of flows leading to the Thurlaston Brook Tributary, UOW and other minor watercourses, the Proposed Development would help to reduce the likelihood and severity of flooding downstream of the Main HNRFI Site and A47 Link Road.

14.182. The offsite highway and railway works might necessitate a small increase in impermeable area and thus a theoretical impact on existing drainage infrastructure. Given the relatively small-scale of many of these, and their location within or adjacent to the existing highway, these works are not likely to have any major impacts on flood risk.

14.183. A new surface water drainage network has been designed and submitted as part of the DCO application (document reference 6.2.14.2). It is acknowledged that a development should aim to achieve greenfield run-off rates wherever feasible and should ensure that surface water run-off is managed as close to its source as possible in line with local policy to:

- store rainwater for later use;
- use infiltration techniques, such as porous surfaces in non-clay area;
- attenuate rainwater in ponds or open water features for gradual release;
- attenuate rainwater by storing in tanks or sealed water features for gradual release;
- discharge rainwater direct to a watercourse;
- discharge rainwater to a surface water sewer/drain; and then

- discharge rainwater to the combined sewer.

14.184. The proposed surface water drainage network seeks to discharge via outfalls to the Thurlaston Brook Tributary under appropriate consent from the EA. This discharge would be at an equivalent greenfield rate and the EA has confirmed that this is likely to be acceptable. The reduction in the rate of surface water discharge from the Main HNRFI Site as a result of the Proposed Development (from an unrestricted and unmanaged rate to an equivalent greenfield rate) would be achieved through use of a range of SuDS techniques. Therefore, the proposed drainage network would act to reduce downstream flood risk through on-site attenuation.

14.185. The impact of the Proposed Development upon surface water quantity following mitigation is considered to be minor beneficial.

Surface water quality

14.186. The Proposed Development's facilities management team would also be responsible for cleaning and maintenance of proposed oil interceptors which would mitigate against the potential impact of contaminated surface runoff entering the drainage system. A maintenance schedule for the proposed SuDS measures would also be prepared such that the effectiveness of the proposed stages of water quality treatment remains for the lifetime of the Proposed Development.

14.187. A WFD Compliance Assessment has been produced to support the ES (document reference 20.1), which assesses the impacts and water quality and quantity in relation to the designated waterbodies potentially affected by the Proposed Development. It identifies mitigation measures that would be incorporated to improve the wider water environment and prevent deterioration in water body status. The WFD concludes that, subject to implementation of mitigation and design principles, the Main HNRFI Site is unlikely to result in a deterioration in the current ecological status of the Thurlaston Brook and Soar Brook catchments or the Soar Secondary Combined ground water body, nor is it likely to compromise progress towards achieving good status.

14.188. The change of use of the Main HNRFI Site would be of benefit due to reduced farming activities which are currently considered a key explanation for the Thurlaston Brook and Soar Brook catchments not reaching Good WFD status.

14.189. The impact of the Proposed Development upon potential contamination of water resources is deemed to be minor beneficial.

Foul water

14.190. Following upgrades to the STW network, the impact of the Proposed Development upon the existing sewerage network is considered negligible. The concept foul water drainage strategy for the Main HNRFI Site is provided in Figure 14.5 (document reference 6.3.14.5).

Potable water

14.191. The increase in water demand as a result of the Proposed Development is unlikely to but could lead to an impact on the capacity of the local public water supply. It is anticipated that any increase in water demand would be reduced as far as possible by the incorporation of appropriate water-saving devices, wherever practicable. The buildings would be designed to maximise water efficiency through low water use sanitary appliances and optimising hot water use in appropriate locations.

LIKELY RESIDUAL ENVIRONMENTAL EFFECTS

14.192. Likely residual significant environmental effects are where the effect is moderate or above.

Construction

14.193. A CEMP has been prepared and submitted with the ES and DCO documentation (document reference 17.1) which sets out methodologies and monitoring requirements to prevent adverse effects on surface water and flood risk. As a result, there would be negligible residual impacts from the Proposed Development during the construction phase, which are not considered to be significant.

14.194. Assuming welfare facilities are appropriately installed and managed at the DCO Site, there would be a negligible residual impact from the construction phase.

14.195. The surface water drainage strategy would also mitigate the impacts of the Proposed Development on groundwater and local watercourses, by directing runoff to appropriately constructed drainage features.

14.196. Subject to appropriate network improvement works, the impact on the foul water network is considered negligible.

Operation

14.197. The profiling of ground levels would direct runoff away from the built development.

14.198. Appropriate management of surface water runoff from the Main HNRFI Site and A47 Link Road would ensure that flood risk is not increased elsewhere.

14.199. These measures would ensure that the Main HNRFI Site and A47 Link Road has a negligible effect on flood risk, which is not considered to be significant.

14.200. Any potential impacts likely to arise as part of the operational phase would be negligible in nature once mitigation has been incorporated into the Proposed Development. There are likely to be minor beneficial effects in the form of a reduced risk of flooding in more extreme events because of reduced rates of discharge from the Main HNRFI Site into local watercourses and as a result of the drainage strategy, as well as the change of use from agricultural which is currently a key issue preventing the Thurlaston and Soar Brook catchments reaching Good WFD status.

CUMULATIVE AND IN-COMBINATION EFFECTS

- 14.201. There are no current existing or permitted schemes that are relevant to, or would represent a significant cumulative impact with, the Proposed Development regarding surface water and flood risk. Any development needs to comply with national and local policies and best practice. They would need to be arranged in a manner to not detrimentally affect the floodplain or increase flood risk in the wider catchment both now and in the future, including for the effect of climate change. Additionally, developments would be subject to similar requirements of national planning policy and best practice to limit surface water runoff, and to manage water efficiently and in a sustainable way, including with regards to climate change.
- 14.202. Therefore, no significant cumulative effects are predicted with the relevant committed developments identified within the longlist set out in Chapter 20: *Cumulative and in-combination effects* (document reference 6.1.20) and, subsequently, no developments were taken forward to the short-list in relation to surface water and flood risk.
- 14.203. Outside of the committed developments, any emerging proposals would adhere to the same principles with regards to reducing flood risk and limiting surface water runoff, therefore it can be considered likely that there would be no cumulative adverse impact from these developments being constructed.
- 14.204. Therefore, the cumulative impact should the existing, permitted or emerging schemes be approved and delivered would be negligible or minor beneficial.

CLIMATE CHANGE

- 14.205. The baseline environment is expected to be at risk of changing due to the impacts of climate change.
- 14.206. Climate change is likely to increase flood levels associated with the Thurlaston Brook, UOW, Soar Brook and other minor watercourses and subsequently, increase risk of flooding both within the DCO Site and downstream. The hydraulic modelling includes an assessment of climate change and mitigation measures proposed based upon the results. With the implementation of mitigation measures, the effect of climate change on the fluvial flood risk to the Proposed Development is considered negligible.
- 14.207. The Main HNRFI Site and A47 Link Road might be at an increased risk of surface water pooling because of increased rainfall. The increase in impermeable surfaces within the Main HNRFI Site would also increase runoff towards the local watercourses. However, the drainage strategy for the Main HNRFI Site has been designed to account for climate change. Additionally, reduced rates of discharge because of the drainage strategy may provide downstream benefits in the form of reduced flood risk. As such, the effect of climate change on surface water flood risk is considered to be negligible or minor

beneficial.

SUMMARY AND CONCLUSIONS

- 14.208. The Surface water and flood risk ES chapter assesses the potential effects of the Proposed Development on surface water and flood risk. It describes the methods used to assess the effects, the baseline conditions currently existing at the DCO Site, the likely significant environmental effects of the Proposed Development and the mitigation measures required to prevent, reduce or offset the potential effects and the residual effects. The assessment has considered both the construction and operational phases of the Proposed Development.
- 14.209. The ES chapter is supported by a FRA, which includes hydraulic modelling (document reference 6.2.14.1), and SDS, which includes a drainage strategy (document reference 6.2.14.2).
- 14.210. Modelling of the Thurlaston Brook Tributary and other key watercourses and ditches inside the Main HNRFI Site has been undertaken to understand any flooding issues associated with these waterbodies. The baseline modelling includes the current scenario as well as risk associated with climate change. The FRA concludes that the majority of the land inside the Main HNRFI Site is located outside of the floodplain and is at low risk of flooding. However, there are a few localised areas upstream of the railway line where water can pond, as well as an overland flow route near Burbage Common.
- 14.211. Surface water mapping identifies the Main HNRFI Site to be predominantly at very low risk of flooding from pluvial sources, with some areas of higher risk associated with the watercourses on the Main HNRFI Site. The pluvial flood risk to the A47 Link Road corridor and the various offsite highway and railway works range from very low to high.
- 14.212. The FRA concludes the site is at low risk from canals, reservoirs and groundwater.
- 14.213. The Main HNRFI Site is located within STW's sewerage area. STW have confirmed a connection can be made at Burbage Common Road. They have also undertaken modelling of the Proposed Development in the past and determined an upgrade to the network would be required.
- 14.214. Potential effects of the Proposed Development include an increase in the volume of surface water runoff post-development prior to mitigation. The surface water drainage strategy would ensure surface water would be managed appropriately to ensure that the rate of surface water arising from the Main HNRFI Site and A47 Link Road is not increased and water quality is not compromised. The drainage strategy takes account of climate change. The minor nature of the off-site highway and railway works mean they would have negligible impact on flood risk and water quality.
- 14.215. Subject to appropriate network improvement works, the impact on the foul water network is considered negligible.

- 14.216. Pollution control methods would supplement the use of SuDS on-site to provide pre-treatment to surface water from higher risk pollution areas such as highways and car parking areas.
- 14.217. The CEMP sets out methodologies and monitoring requirements to prevent adverse effects on surface water and flood risk. As a result, there would be negligible residual impacts from the Proposed Development during the construction phase.
- 14.218. The profiling of ground levels would direct runoff away from the built development.
- 14.219. Any potential impacts likely to arise as part of the operational phase would be negligible in nature once mitigation has been incorporated into the Proposed Development. There are likely to be minor beneficial effects in the form of a reduced risk of flooding in more extreme events because of reduced rates of discharge from the Main HNRFI Site into local watercourses and as a result of the drainage strategy, as well as the change of use from agricultural.
- 14.220. Nearby developments are subject to the same national and local policy, guidance and best practice, with a requirement to not detrimentally affect the floodplain or increase flood risk in the wider catchment both now and in the future, including for the effect of climate change. Additionally, developments are required to limit surface water runoff, and to manage water efficiently and in a sustainable way, including with regards to climate change. Therefore, there are unlikely to be any significant cumulative or in-combination effects requiring mitigation.
- 14.221. Overall, it is considered that potential effects from the construction and operational phases of development would be negligible, or minor beneficial, following the implementation of appropriate mitigation measures.

Table 14.9 - Summary of effects

Description of impact	Inherent mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring
Construction							
Temporary increase in flood risk to construction workers in areas within Flood Zones 2 and 3	-	Major	High	Major adverse (significant EIA effect)	CEMP (document reference 17.1)	Negligible (no significant EIA effect)	-
Temporary increase in flood risk within Main HNRFI Site, offsite highway work 'B6' and downstream catchments as a result of construction works altering flow characteristics /	-	Major	High	Major adverse (significant EIA effect)	CEMP (document reference 17.1)	Negligible (no significant EIA effect)	-

Description of impact	Inherent mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring
routes or through loss of floodplain storage							
Temporary increase in runoff rates to minor watercourses due to construction traffic movement leading to ground compaction and reduced infiltration rates / increased runoff	-	Minor	High	Moderate adverse (significant EIA effect)	CEMP (document reference 17.1)	Negligible (no significant EIA effect)	-
Temporary reduction in infiltration to	-	Minor	Low	Negligible	CEMP (document reference 17.1)	-	-

Description of impact	Inherent mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring
the bedrock aquifer due to construction traffic movement leading to ground compaction and reduced infiltration rates				(no significant EIA effect)			
Temporary pollution of controlled waters from construction activities	-	Moderate	Low	Minor adverse (no significant EIA effect)	CEMP (document reference 17.1)	Negligible (no significant EIA effect)	
Temporary decrease in quality of groundwater receptors from construction activities	-	Moderate	Medium	Moderate adverse (significant EIA effect)	CEMP (document reference 17.1)	Negligible (no significant EIA effect)	

Description of impact	Inherent mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring
Increase pressure on local foul water sewer network due to temporary presence of construction workers	-	Minor	Medium	Minor adverse (no significant EIA effect)	Sewer Network upgrades provided by STW	Negligible (no significant EIA effect)	-
Increased demand on location water supply due to construction activities and temporary presence of construction workers	-	Negligible	Low	Negligible (no significant EIA effect)	-	-	-
Operational							
Increased flood risk as a result of the Proposed	Realignment of the UOW in the Main HNRFI Site along a	Negligible	High	Negligible (no significant EIA effect)	-	-	Routine inspection, maintenance and remedial

Description of impact	Inherent mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring
Development both to site users and downstream receptors	corridor designed to convey flood flows, including an allowance for climate change. Culverts to be designed to convey flood flows						actions in line with riparian owner responsibilities.
Increased surface water runoff through reduced infiltration as a result of introduction of impermeable surfaces on a currently greenfield area, leading to increased discharge into	A drainage strategy, including SuDS has been identified to reduce surface water runoff rates and direct any pluvial flow paths towards a positive drainage system. The drainage	Moderate	High	Minor beneficial (no significant EIA effect)	-	-	-

Description of impact	Inherent mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring
Thurlaston Brook Tributary and UOW.	strategy will lead to a reduced risk of flooding in more extreme events because of reduced rates of discharge from the Main HNRFI Site into local watercourses.						
Contaminated run-off from Main HNRFI Site and the A47 Link Road detrimentally impacting quality of water in the sewer network.	-	Moderate	Medium	Moderate Adverse (significant EIA effect)	Cleaning and maintenance of proposed oil interceptors to mitigate impact of contaminated surface water entering the drainage system	Negligible (no significant EIA effect)	-

Description of impact	Inherent mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring
Contaminated run-off from Main HNRFI Site and the A47 Link Road detrimentally impacting quality of water in the Thurlaston Brook Tributary and UOW.	-	Moderate	Low	Minor Adverse (no significant EIA effect)	Maintenance schedule for SuDS measure to ensure effectiveness of proposed stages of water quality treatment remain for lifetime of the development	Negligible (no significant EIA effect)	-
Change of use from agricultural will lead to improvements in water quality as agricultural uses is a key issuing preventing Thurlaston Brook reaching	-	Minor	High	Minor beneficial (no significant EIA effect)	-	-	-

Description of impact	Inherent mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring
Good WFD status							
Increased foul water flows to sewer network.		Minor	Medium	Minor adverse (no significant EIA effect)	Sewer Network upgrades provided by STW	Negligible (no significant EIA effect)	-
Increase in water demand could impact on capacity of local public water supply	-	Negligible	Low	Negligible (no significant EIA effect)	-	-	-

Table 14.10 – Summary of mitigation

Description of impact	Effect	Mitigation measures adopted as part of the project	Secured by	Responsible party
Increased flood risk as a result of the Proposed Development both to site users and downstream receptors	Negligible	Realignment of the UOW in the Main HNRFI Site along a corridor designed to convey flood flows, including an allowance for	Requirement within the DCO	TSH

Description of impact	Effect	Mitigation measures adopted as part of the project	Secured by	Responsible party
		climate change. Culverts to be designed to convey flood flows		
<p>Increased surface water runoff through reduced infiltration as a result of introduction of impermeable surfaces on a currently greenfield area, leading to increased discharge into Thurlaston Brook Tributary and UOW.</p> <p>Reduced risk of flooding in more extreme events because of reduced rates of discharge from the Main HNRFI Site into local watercourses.</p>	Minor beneficial	Drainage Strategy	Requirement within the DCO	TSH