

12. Water Resources (including flood risk and drainage)

12.1. Introduction

12.1.1. This chapter of the ES assesses the likely environmental effects of the Proposed Development with respect to flood risk and drainage. This chapter also describes the methods used to assess the effects; the baseline conditions currently existing at the Site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been adopted.

12.1.2. This chapter is supported by the following appendices and/or figures:

- **Figure 12.1** Groundwater Map Extract (JBA, 2023);
- **Appendix 12.1** Flood Risk Assessment;
- **Appendix 12.2** Drainage Management Strategy; and
- **Appendix 12.3** Preliminary Drainage Layout

12.1.3. This chapter, and its associated appendices, is intended to be read as part of the wider Environmental Statement (ES) with particular reference to the introductory chapters (Chapter 1 to Chapter 4), as well as to Chapter 7 (Ecology and Biodiversity).

12.2. Assessment Approach

Methodology

12.2.1. This section of the chapter describes the framework for assessing the Proposed Development site in terms of magnitude of effect, sensitivity of receptors and overall significance of effects. The criteria developed for assessing effects within this chapter will be based on this organization's standard judgements, as noted in **Table 12.1 to 12.3**.

Receptor Sensitivity

12.2.2. The criteria used to assess receptor sensitivity are described in **Table 12.1**.

Table 12.1: Criteria for Determining Receptor Sensitivity

Sensitivity	Criteria
High	The receptor is of high value and/or protected by national or international legislation. The receptor/resource has limited or no ability to absorb change without fundamentally altering its present status/quality. Existing pressures on the receptor may be such that a minor change in the baseline could tip the balance and lead to significant impact.

Water Resources

Moderate	The receptor/resource has moderate capacity to absorb change without significantly altering its present character. Existing pressures on the receptor are such that small impacts will not tip the balance.
Low	The receptor/resource is of low value and/or tolerant of change without detriment to its existing character.
Negligible	The receptor/resource is of very limited value and/or tolerant of change without detriment to its existing character.

Magnitude of Change

- 12.2.3. The criteria used to assess how far an effect deviates from the baseline condition, i.e. the magnitude of change, are described in **Table 12.2**.

Table 12.2: Criteria for Determining Magnitude of Change / Impact

Magnitude	Criteria
Large	An acute and large, short-term change with the potential for long term secondary effects; or a chronic but long-term or permanent change to the baseline conditions. Any effects would be detectable over a large area, and it would mean the Proposed Development is not in accordance with standard policy/legislation.
Medium	A change to the baseline conditions that occurs over the short or long term but does not qualify as a high magnitude as described above. The effects may be contrary to guidance or objectives set by statutory or non-statutory stakeholders.
Small	A measurable but small scale, temporary impact to the water environment with no lasting effects. Any effects are confined to the immediate surroundings of the Proposed Development and although a detectable change has occurred, it is still in line with the relevant policy and guidance.
Negligible	No measurable change against the baseline, where no feasible pathway can be established between the source and the receptor.

Assessment of Significance

- 12.2.4. The significance of a potential effect is derived by considering both the sensitivity of the feature and the magnitude of change, as demonstrated in **Table 12.3**.

Table 12.3: Relevant EIA Scoping Consultation Comments

		Magnitude of change / impact			
		Large	Medium	Small	Negligible
Receptor sensitivity	High	Major	Major	Moderate/Minor	Negligible
	Moderate	Major	Moderate	Minor	Negligible
	Low	Moderate/Minor	Minor	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

12.2.5. Note that moderate and major effects are considered to be 'significant' in EIA terms.

12.2.6. Effects can also be described, for example, as:

- Beneficial or adverse;
- Direct or indirect/secondary;
- Permanent or temporary/reversible;
- Short term (effects that would be of short duration and would occur for up to 2 years);
- Medium term (effects that occur for a period of between 2–10 years);
- Long term (effects that occur for 10 years or more and include permanent effects); and
- Significant (major or moderate) or insignificant (negligible or minor).

Legislative and Policy Framework

Water Resources Act (UK Parliament, 1991) and associated legislation (Water Industry Act and Land Drainage Act)

12.2.7. This legislation consolidates the previous water legislation and sets out the regulations and restrictions that provide protection to the water environment. It also places responsibility for maintaining flows in land drainage on landowners and sets out the powers and duties of the water and sewerage companies, to ensure proper operation of sewage facilities through application of Section Agreements for example.

Environment Act (UK Parliament, 1995)

12.2.8. This legislation establishes the functions, rights, and liabilities of the Environment Agency (EA). The EA was established on 1 April 1996 under the Environment Act 1995. The EA's main aim (as defined in that Act) is to protect or enhance the environment, contributing towards the objective of achieving sustainable development through its role. The EA has statutory responsibilities in relation to the collection and dissemination of environmental information, assessing the environmental impacts of pollution, and promoting and understanding of methods for environmental and flood risk protection and management.

Water Resources

Flood and Water Management Act (UK Parliament, 2010)

- 12.2.9. The legislation makes provisions relating to the water industry, including establishment of the management of potential risks in connection with flooding.

Building Regulations Approved Document H: Drainage and Waste Disposal (MHCLG, 2015)

- 12.2.10. The legislation gives guidance for compliance with the Building Regulations for work carried out in England. It ensures adequate sewerage facilities are in place for correct disposal.

The Water Act (UK Parliament, 2014)

- 12.2.11. This legislation amends the Water Industry Act (1991) and sets out the powers and duties of the water and sewerage companies. It makes provisions about the water industry including main river mapping, records of waterworks, regulation of the water environment, provision of flood insurance, information on internal drainage boards and about Regional Flood and Coastal Committees.

National Planning Policy Framework (MHCLG, 2024)

- 12.2.12. The NPPF provides guidance for local planning authorities and decision-takers about planning applications. The 'meeting the challenge of climate change, flooding and coastal change' section provides policies to encourage development away from areas at highest risk of flooding and guidance to direct Local Authorities to apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property.

Flood Risk and Coastal Change Planning Practice Guidance (MHCLG, 2025)

- 12.2.13. The Flooding and Coastal Change section sets out guidance to ensure inappropriate development in areas at risk of flooding are avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. Minor changes have been made over the years, with the most recent update being in September 2025.

Sustainable Drainage Statement (UK Parliament, 2014)

- 12.2.14. The 2014 Statement produced by the UK Parliament makes arrangement for Local Planning Authorities to consult with Lead Local Flood Authorities (LLFAs) in relation to the surface water runoff management. The Statement also puts focus on the use of Sustainable Drainage Systems for new developments to promote sustainable and appropriate surface water management.

National Standards for Sustainable Drainage Systems (SuDS) (DEFRA, 2025)

- 12.2.15. These standards are intended for application in the design of surface water drainage systems (SuDS) for new infrastructure and development, whether on greenfield or brownfield sites. For new development, it is important that the rate of surface water runoff is reduced at the source and opportunities for infiltration to ground should be maximised; such an approach mimics natural drainage regimes and will reduce the likelihood of flash flooding occurring in local public sewerage and drainage systems.

Local policy and guidanceKnowsley Local Plan: Core Strategy (KMBC, 2016)

- 12.2.16. The adopted development plan for the borough comprises the Knowsley Metropolitan Borough Council (KMBC) Local Plan, which was adopted in 2016. This document sets out the vision, objectives and policies up to the year 2028. The key policies linked to flood risk and drainage are as set out subsequently.

Policy CS8: Green Infrastructure

- 12.2.17. This policy places an emphasis on the delivery of integrated, new green infrastructure for the purpose of mitigation and adaptation to climate change. Methods of delivery in accordance with Policy CS8 include the provision of sustainable drainage systems.

Policy CS19: Design Quality and Accessibility in New Development

- 12.2.18. Places an expectation that the development should be designed in a manner that integrates and supports enhancement to biodiversity, mitigation of flood risk, energy/resource efficiency, and waste recycling requirements.

Policy CS22: Sustainable and Low Carbon Development

- 12.2.19. Sets out the expectation for new development to meet high standards of sustainable design and construction. This includes the management of flood risk through the inclusion of SuDS. It also notes that flood resilient design should be incorporated for both infrastructure and property.

Policy CS24: Managing Flood Risk

- 12.2.20. This is the core policy covering the management of surface water, use of SuDS, and consideration for climate change. Policy CS24 seeks to ensure that new development within Knowsley is directed away from areas at highest risk of flooding and that proposals do not increase flood risk either on site or elsewhere. The policy requires applications to be supported by a site-specific Flood Risk Assessment (where larger than one hectare) and to demonstrate compliance with the sequential approach set out in national policy. Development must be designed to remain safe for its lifetime, taking account of climate change, and should not impede the flow or storage of floodwater.

- 12.2.21. The policy also promotes the incorporation of SuDS to manage surface water runoff at source and replicate natural drainage processes wherever feasible. Proposals are expected to control surface water discharge rates and volumes to greenfield runoff rates, ensure safe exceedance routing, and provide long-term management and maintenance arrangements. Overall, CS24 aligns local planning objectives with national flood risk policy to reduce vulnerability, safeguard people and property, and enhance environmental resilience.

Sustainable Drainage and Surface Water Management Technical Guidance for Developers (KMBC, 2016):

- 12.2.22. This guidance document sets out local expectations for managing surface water in new developments. It requires developers to adopt SuDS wherever possible, controlling runoff to reduce flood risk, improve water quality, and provide biodiversity and amenity benefits. The guidance promotes a hierarchy of discharge options, integration of drainage with site design,

Water Resources

safe management of extreme rainfall, and long-term maintenance arrangements to ensure SuDS operate effectively over the lifetime of the development.

Local Flood Risk Management Strategy (LFRMS) (KMBC, 2017)

- 12.2.23. The KMBC Local Flood Risk Management Strategy (LFRMS) sets out the statutory framework for managing local flood risk within the borough, in accordance with the Flood and Water Management Act 2010.
- 12.2.24. The Strategy focuses on addressing flood risk from surface water, groundwater and ordinary watercourses through improved understanding of risk, partnership working with other risk management authorities, and the integration of sustainable drainage and climate change resilience into new development. It establishes objectives to protect communities, support sustainable growth, enhance emergency preparedness and maintain flood risk infrastructure, and is supported by an action plan to guide delivery and periodic review.

EIA Scoping Process

- 12.2.25. As discussed in Chapter 2, a request for a Scoping Opinion was submitted on behalf of the Applicant to KMBC on 30th January 2025, which set out the proposed scope of assessment (see **Appendix 2.1**). KMBC issued their Scoping Opinion on 27th March 2025 and is summarised in Chapter 2 and included in full at **Appendix 2.2**. At that time, the intention was to submit one planning application for 2 parcels of land, referred to as Phase 2b and Phase 3. However, the planning application, which this ES supports, is now seeking planning permission in relation to Phase 3 only.
- 12.2.26. It is considered that the Scoping Opinion provides relevant information to ensure a robust assessment in relation to the Phase 3 Site and has therefore been used to guide the scope of this chapter and ES as a whole.
- 12.2.27. With regards to flood risk and drainage matters, relevant responses were received from the consultees including the LLFA and the EA, and comments have been addressed accordingly, as follows in **Table 12.4** below.

Table 12.4: Relevant EIA Scoping Consultation Comments

Consultee	Summary of Comment	Response or location within the ES where comments are addressed
Environment Agency	As the Site is located within Source Protection Zone 3, impact on water quality should be scoped into the ES. There are two watercourses within 500m of the Site (tributaries of Fox's Bank Brook to the east and west). Impacts on these should be considered along with foul drainage provision for the Site.	See sections 12.4 and 12.5 of this chapter.

Lead Local Flood Authority	Confirmed that water environment should be scoped into the ES. Water quality and quantity with regard to Big Water should be considered as this is a sensitive water feature to the west of the Site. Baseline condition of Big Water should be determined with regard to how this is fed (surface/groundwater), seasonal variability, and minimum feed to keep feature live. Impact on Big Water regarding the likely drainage strategy is required.	See sections 12.4 and 12.5 of this chapter.
----------------------------	---	---

Limitations to the Assessment

- 12.2.28. The baseline condition for Big Water (Local Wildlife Site 16) is understood to have been set out within Chapter 7 (Ecology and Biodiversity). This chapter will focus on this water feature as a sensitive receptor (downstream network) and thus ensure any adverse effects to water quality and quantity are suitably mitigated.
- 12.2.29. No site walkover has been undertaken; however, the desktop-based studies are informed by topographical surveys to better understand the flood risk and drainage constraints associated with the Proposed Development.
- 12.2.30. The assessment has assumed that the downstream sewer has sufficient capacity to take the foul water flows generated by the Proposed Development. Any offsite, downstream capacity (outside of the control of the developer) is assumed to be dealt with by the relevant asset owners.

12.3. Baseline Conditions

Site Description and Context

- 12.3.1. The baseline conditions relating to hydrology, hydrogeology, flood risk and drainage at the Site have been established through a combination of published information, site surveys and correspondence with various stakeholders. A full list of sources can be found within the supporting Flood Risk Assessment (FRA) and Drainage Management Strategy (DMS), included within **Appendix 12.1, and 12.2**, respectively. The main sources of data considered have, however, been categorized below.

Baseline Survey Information

- 12.3.2. Written consultation was undertaken with KMBC (LLFA), the EA and United Utilities (UU) with regards to flood risk matters that could impact on or constrain development of the Site (sent 8th of May 2025). These discussions identified the scope of work required for the full FRA, and DMS which have been prepared to support this chapter.

Water Resources

Consultations

- 12.3.3. Consultation with the EA confirmed that they hold no record of flooding affecting the Site. The EA also provided Product 4 data, taken from the Logwood Mill Brook modelling study. Review of the data provided confirmed that the Site is not impacted by fluvial flooding from Logwood Mill Brook, which is the nearest Main River as designated by the EA.
- 12.3.4. Consultation with United Utilities (UU) was also undertaken, which confirmed that they do not have modelled flood risk within the vicinity of the Proposed Development.
- 12.3.5. Consultation was also undertaken with KMBC; however, a consultation response is currently outstanding.
- 12.3.6. It should be noted that whilst some of the initial data gathering was undertaken in 2025, the findings remain representative of a 2026 up-to-date baseline. The datasets have been verified to ensure there is no change at the time of submission.

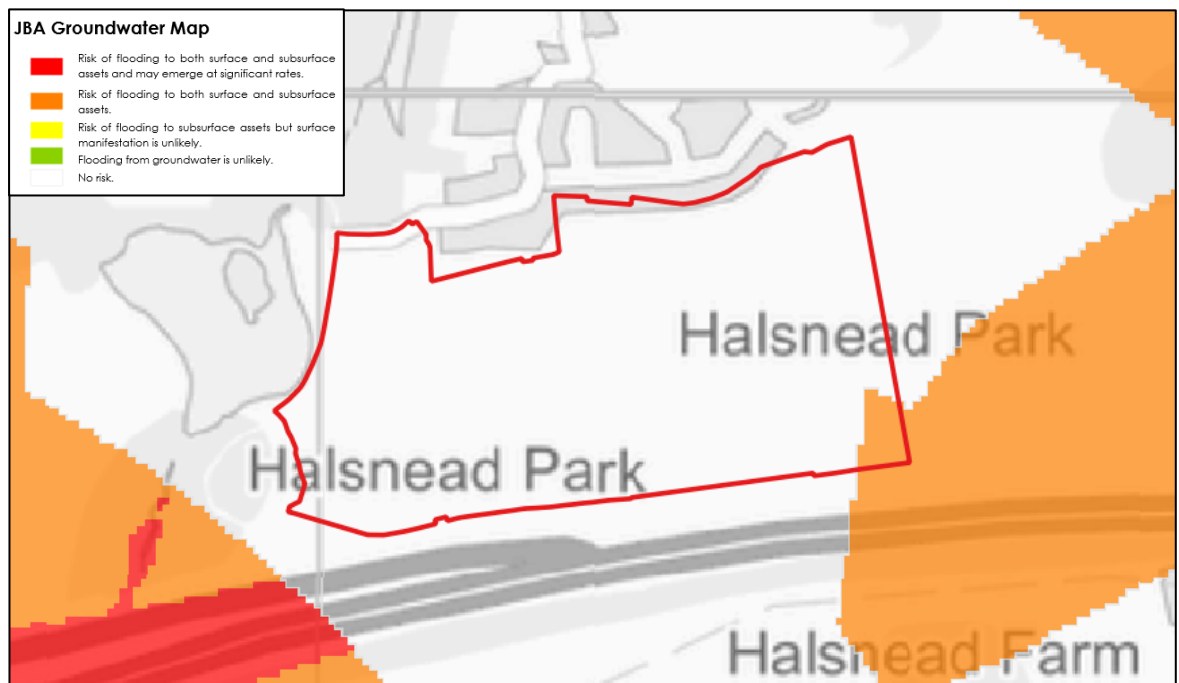
Desk Based Studies

- 12.3.7. Multiple site-specific desktop studies have been carried out in support of this chapter preparation including:
- A Flood Risk Assessment; and
 - A Drainage Management Strategy.
- 12.3.8. The baseline conditions describe the present state of the environment, including the Proposed Development Site and the potential receptors. It forms the evidence base for the impacts arising from the Proposed Development, which are compared and assessed within this chapter. The baseline scenario is assessed with reasonable effect based on the availability of environmental information and scientific knowledge.
- 12.3.9. The Site is centred at National Grid reference 347329 (Easting), 389861 (Northing) and is bound to the north by Halsnead Caravan Park, beyond lies a field and the under construction Land south of Lickers Lane residential scheme (under planning application reference 20/00399/OUT). To the east, the Site is bound by the consented and under construction Fox's Lane residential scheme under planning application reference 20/00417/FUL, beyond which lies Fox's Bank Lane and Blundell's Hill Golf Club. The M62 Motorway bounds the south of the Site, beyond which lies Symmetry Park. To the west, the Site is bound by an area of woodland (with an associated pond known as 'Big Water'), beyond which lies the consented and under construction land north of M62 motorway residential scheme under planning application reference 18/00283/HYB, with Windy Arbor Road and the M62 Motorway further west.
- 12.3.10. The topographic survey identifies levels onsite fall from a high point of 47.02mAOD in the north-eastern corner, down to 33.03mAOD in a low point near the western boundary. Full details of the existing Site location and topography can be reviewed within the supporting FRA (**Appendix 12.1**) and DMS (**Appendix 12.2**).
- 12.3.11. Consultation with the EA and UU was undertaken, and no further record of historic flooding on or near to the Site was identified.
- 12.3.12. The nearest Main Rivers are an unnamed Main River over 400m to the east of the Site, and Logwood Mill Brook located over 800m to the west of the Site. Review of the Flood Map for

Planning, and the data provided by the EA identify that the Site is located wholly within Flood Zone 1, and therefore at low risk of fluvial flooding with regard to both Main Rivers now, and in future because of climate change.

- 12.3.13. In terms of other sources of flood risk, the Site is shown to be at varied risk from surface water. Most of the Site is at 'very low' chance of surface water flooding. There are, however, localized low points onsite along the southern and western boundaries of the Site where the risk varies from 'medium' to 'high'. The mitigation measures proposed within the full FRA and DMS will however cater for the residual flood risks identified, they will ensure the proposals remain safe for their design life, without increasing flood risk elsewhere within the catchment.
- 12.3.14. Regarding groundwater flood risk, the Strategic Flood Risk Assessment (SFRA) shows part of the south-east corner of the Site to be in 'grid code 3', an area where groundwater levels are between 0.025 and 0.5m below the ground surface in the 100-year return period event (refer to **Figure 12.1** below). This zone is described as having risk of groundwater flooding to surface and subsurface assets, and the possibility of groundwater emerging at the surface locally.

Figure 12.1: Groundwater Map Extract – Liverpool City Region Combined Authority SFRA (JBA, 2023)



- 12.3.15. The Drainage Management Strategy (**Appendix 12.2**) has considered the existing runoff regimes across the development Site and in turn identified the most sustainable means of managing both surface water and foul water runoff generated by the proposals. In terms of surface water an existing drainage catchment assessment was undertaken as part of the commissioned works, to understand how the overall Site drains at present so that the proposals can discharge in a similar manner. It is understood that at present, the Site drains toward Big Water, which is located adjacent to the western boundary.
- 12.3.16. In accordance with national and local planning policy, surface water management must be considered for a development of this nature and scale. Surface water discharge options have been assessed in accordance with the sustainable drainage hierarchy, the National Standards for SuDS (DEFRA, 2025) and Building Regulations. Priority must be given to discharge to an

Water Resources

infiltration system where practical, followed by discharge to a watercourse. Finally, where other forms of outlet are not feasible, discharge should be made to a sewer.

- 12.3.17. Based on online datasets, the use of an infiltration-based solution is not likely to offer a suitable surface water management option for all the development proposals, due to cohesive underlying strata and the presence of shallow groundwater. The proposals are to mimic the existing regime and discharge surface water run-off generated by the Proposed Development into Big Water, west of the Site via a new formal connection.
- 12.3.18. In terms of proposed foul water, a new formal connection into the wider Phase 2a scheme is proposed. Given the current ground levels, there will likely be a requirement for a partial pumped foul water solution to serve the Proposed Development.

12.4. Assessment of Likely Significant Effects

- 12.4.1. The construction and operational phases of the Proposed Development have been considered with regards to the likely significant impacts to the water environment (including flood risk and drainage). In this instance there is no demolition stage. The potential changes that may arise due to the Proposed Development include:
- Increase in flood risk due to an increase in impermeable areas;
 - Increase in flood risk associated with the existing downstream watercourse/waterbody network (including Big Water and the western tributary of Logwood Mill Brook);
 - Increase in flood risk associated with shallow groundwater;
 - Detriment to water quality onsite and downstream, due to an increase in suspended sediment contaminants entering the surface water infrastructure; and
 - Increase in foul water flows associated with residential development, and potential impacts to capacity constraints on downstream receptors.

Construction

- 12.4.2. During the construction phase, the key sensitive receptors comprise of the receiving downstream watercourse/waterbody network (inclusive of Big Water), neighbouring development and infrastructure, construction workers, and construction related activities (e.g. excavation).
- 12.4.3. Construction works have the potential to increase both the rate and volume of surface water run-off if not appropriately managed. This can result from compaction of soil (i.e., resulting from working areas and vehicle movements), loss of vegetation, and stockpiling of materials. Without mitigation, this has the potential to cause adverse effects through localised flooding of the Site, and increased flood risk downstream to others (by contributing greater flows to the downstream watercourse/waterbody network).
- 12.4.4. The high sensitivity receptors that may be affected are the downstream watercourse / waterbody network, and neighbouring residential areas, for which the magnitude would be large. The significance of effect would therefore be major adverse (significant) before mitigation. The moderate sensitivity receptor is neighbouring transport infrastructure, for which the magnitude is also considered large, resulting in a major adverse significance of effect (significant). The low

sensitivity receptor is construction workers, for which the magnitude is considered small. This results in a moderate adverse significance of effect (significant).

- 12.4.5. During the construction phase, another potential effect would be sedimentation. This can occur due to soil disturbance, for example during excavation, grading, or Site clearance. Sedimentation can also result from exposed stockpiles, or where runoff is concentrated across impervious areas (e.g. working areas, or where soil compaction has occurred due to vehicle movement). Without mitigation, this can result in adverse effects to the receiving watercourse/waterbody network, and to neighbouring development and infrastructure, resulting from sediment-laden surface water runoff. The effects include increased flood risk downstream due to loss of channel capacity, and a decrease in water quality.
- 12.4.6. The high sensitivity receptors that may be affected are the downstream watercourse / waterbody network, and neighbouring residential areas, for which the magnitude would be large. The significance of effect would therefore be major adverse (significant) before mitigation. The moderate sensitivity receptor is neighbouring transport infrastructure, for which the magnitude is also considered large, resulting in a major adverse significance of effect (significant). The low sensitivity receptor is construction workers, for which the magnitude is considered small. This results in a moderate adverse significance of effect (significant).
- 12.4.7. Pollution also presents a potential effect during the construction phase. This can occur via fuel, chemical and material spillages on the Site. These contaminants could be mobilised via surface water runoff, or via temporary drainage systems and ultimately reach the downstream watercourse/waterbody network which is a sensitive receptor. This would result in adverse effects upon water quality, and ecology before the inclusion of mitigation.
- 12.4.8. The key, high sensitivity receptor that may be affected is the downstream watercourse / waterbody network for which the magnitude would be large. The significance of effect would therefore be major adverse (significant) before mitigation is considered.
- 12.4.9. As noted previously, the Phase 1 Ground Investigation has identified the presence of shallow groundwater onsite. Without suitable mitigation measures, shallow groundwater presents constraints for construction activities, presenting a risk of flooding where this emerges at surface. This can also impact ground stability, increasing the risk of trench collapse, or complications when constructing foundations or excavating for the installation of drainage infrastructure. Dewatering to facilitate construction where shallow groundwater is present can result in erosion, scour, or localised flooding (where rapid or high-volume discharge occurs). This also may mobilise contaminants as groundwater levels fluctuate. There is therefore potential for adverse effects to the downstream watercourse/waterbody network, and construction workers.
- 12.4.10. The key, high sensitivity receptor that may be affected is the downstream watercourse / waterbody network for which the magnitude would be large. The significance of effect would therefore be major adverse (significant) before mitigation is considered. There are also potential adverse effects for construction workers, considered to be of low sensitivity. The magnitude of effect is considered small, resulting in a moderate adverse significance of effect (significant).

Operation

- 12.4.11. During the operational phase, development has the potential to increase flood risk where it alters the existing hydrological response of the site. The replacement of permeable soils and vegetated surfaces with impermeable materials such as buildings, roads and hardstanding reduces infiltration and natural storage, resulting in a greater proportion of rainfall becoming surface runoff. This typically leads to increased peak runoff rates, larger total runoff volumes and

Water Resources

a reduced time of concentration, meaning flows reach receiving watercourses or drainage networks more quickly. The effect can be an elevated risk of on-site surface water flooding and an increased likelihood of downstream flooding due to higher and more rapid discharges, particularly during high-intensity or prolonged rainfall events. Over time, this altered runoff regime can place additional pressure on existing drainage infrastructure and watercourses, increasing flood frequency, depth and extent relative to the baseline condition, where no mitigation is provided.

- 12.4.12. The high sensitivity receptors that may be affected are the downstream watercourse / waterbody network, and neighbouring residential areas, for which the magnitude would be large. The significance of effect would therefore be major adverse (significant) before mitigation. The moderate sensitivity receptors are the neighbouring transport infrastructure, neighbouring UU infrastructure, and future residents / users of the site. The magnitude of effect is large for all moderate receptors, resulting in major adverse significance of effects respectively (significant).
- 12.4.13. During the operational phase, the presence of roads and roofed built form has the potential to adversely affect water quality where surface water runoff is conveyed through the drainage system without treatment. Road surfaces are a notable source of pollutants, including hydrocarbons from fuel and oil leaks, tyre and brake wear particles (which may contain heavy metals and microplastics), suspended solids, and trace metals. In the absence of mitigation or treatment stages within the Sustainable Drainage System (SuDS), runoff from these impermeable surfaces may be discharged directly to receiving watercourses with limited opportunity for sediment settlement, filtration or biological uptake. This can result in elevated concentrations of pollutants entering surface waters, leading to a deterioration in water quality relative to the baseline condition. Over time, the effect of untreated highway and roof runoff conveyed via the drainage network has the potential to adversely affect water quality within the receiving downstream watercourses/waterbodies.
- 12.4.14. The high sensitivity receptors that may be affected are the downstream watercourse / waterbody network, neighbouring residential areas, and future residents / users of the site for which the magnitude would be large. The significance of effect would therefore be major adverse (significant) before mitigation. The moderate sensitivity receptors are the neighbouring transport infrastructure, and the neighbouring UU infrastructure. The magnitude of effect is large for all moderate receptors, resulting in major adverse significance of effects respectively (significant).
- 12.4.15. During operation, shallow groundwater can also limit the effectiveness of SuDS features through ingress, therefore reducing the available capacity to store surface water. In turn, this may result in exceedance from the surface water drainage system proposed. It may also increase the risk of groundwater ingress into buildings, hydrostatic uplift pressures on slabs and buried infrastructure, and long-term damp or maintenance issues without inclusion of appropriate mitigation measures.
- 12.4.16. The key receptors regarding shallow groundwater are the downstream watercourse / waterbody network and future residents / users of the Site, and for both the sensitivity is classified as high. The magnitude of effect is large, and therefore the overall significance of effect is major adverse (significant) before any mitigation measures are considered.

12.5. Mitigation, Enhancement and Residual Effects

Mitigation by Design

- 12.5.1. The appropriate design of levels across the Site, including Finished Floor Levels above external levels, appropriate road and drainage design, incorporating SuDS will all mitigate potential flood risk from a range of sources, both to and from the Proposed Development.
- 12.5.2. The planning proposals have taken an intra-site sequential approach to locating the Proposed Development within the wider Site extents; where practical, locating the more vulnerable elements within areas at least flood risk from the variety of sources, reviewed as part of the full assessment.
- 12.5.3. To ensure that the Proposed Development does not increase flood risk to others, appropriate mitigation in the form of sustainable drainage management has been designed into the proposals with regard to both surface and foul water. To evidence the feasibility of the drainage proposals a Preliminary Drainage Layout has been prepared by Betts Associates, which is presented **Appendix 12.3** for completeness.
- 12.5.4. It is proposed that the runoff from the Site continues to discharge to Big Water. Review of the drainage catchments confirmed that the Site wholly drains to this waterbody as existing. The proposals are to maintain the existing drainage regime, but at a restricted rate of discharge (QBar) to ensure no increase in flood risk upstream nor downstream (now, and in future as result of climate change).
- 12.5.5. The surface water scheme for this will be designed to cater for the run-off generated in the events up to and including the 1 in 100yr return period event with a 45% allowance for climate change. This will mitigate any increase in the volume of runoff generated by an increased impermeable area.
- 12.5.6. In terms of water quality, the proposals are to incorporate polishing swales downstream of the proposed stormwater storage features. In terms of stormwater storage this will be above ground within attenuation basins. If designed appropriately these SuDS features such as those proposed can aid with attenuation and provide added benefits in terms of water quality, biodiversity, and amenity value.
- 12.5.7. As the presence of shallow groundwater has been identified, it is recommended that any sustainable drainage features proposed (swales and attenuation basins) are appropriately lined (clay, or geomembrane) to prevent ingress of groundwater. The specific details of such are to be confirmed at the detailed design stage.

Additional Mitigation

- 12.5.8. All construction works will be designed in accordance with the latest best practice guidelines. Method statements should be agreed with the EA prior to construction to ensure surface runoff quality is managed during the construction phase in compliance with the latest PPG. Contractors undertaking earthworks will develop risk assessments, method statements and a full construction management plan in accordance with standard practice to cover all aspects of their work. This covers works which have the potential to cause physical damage to structures, mobilise large quantities soil / sediments or block open watercourses.
- 12.5.9. A variety of good environmental practices will be implemented in accordance with the EA's Pollution Prevention guidelines and CIRIA 532 Control of Pollution from Construction Sites to

Water Resources

minimise any effects associated with water quality and ecology. A detailed Construction Environment Management Plan (CEMP) will be developed prior to commencement of works, incorporating the methods and measures discussed above. In doing so, all major and moderate effects identified previously would be reduced to negligible during the construction phase.

- 12.5.10. Groundwater monitoring will take place as part of construction activities and excavations. If de-watering is required, then appropriate licences from the EA will be obtained prior to any commencement of works. Management of shallow groundwater in this manner can also be captured within the detailed CEMP.
- 12.5.11. To ensure the inherent mitigation measures proposed are effective for the intended design life of the Proposed Development, a Maintenance and Management Plan should be implemented. This will ensure that the proposed drainage system, inclusive of all SuDS components, continue to operate effectively. This is achieved through regular inspection, maintenance, and where necessary remedial works to prevent blockages or structural failures. These works reduce potential flood risk both on-site, and downstream that could result from poor maintenance. Adverse impacts to water quality are also reduced, as effective management prevents the conveyance of sediment and pollutants in the event of a failure during extreme rainfall events.
- 12.5.12. Detailed drainage design will be required in due course to identify the specific measures to prevent sedimentation. These measures can include catchpits, silt traps, forebays and / or sediments bays as required. Detailed design will be required to confirm the specific product type, number, and location of these features. This will ensure that the downstream watercourses/waterbodies (inclusive of Big Water, and the western tributary of Logwood Mill Brook), neighbouring residential areas/transport infrastructure/sewer infrastructure, and future residents/users are not impacted by increased flood risk, or detriment to water quality as a result of sedimentation or pollution.
- 12.5.13. The mitigation measures proposed to reduce the potential effects, and mechanisms for their implementation are summarised within **Table 12.5**.

Table 12.5: Mitigation

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured		
		By Design	By S.106	By Condition
1	Appropriate level design including: - External levels; - Finished floor levels; and - Road design; To mitigate the risk of flooding to and resulting from the Proposed Development from all sources.			X
2	Intra-site sequential approach to development.	X		
3	Implementation of a sustainable drainage system for the management of surface and foul water.	X		X

4	Proposals to discharge surface water generated by the Proposed Development to Big Water (mimicking the existing drainage regime).	X		X
5	The surface water runoff rate is to be restricted to the greenfield runoff rate, to ensure no increase in flood risk downstream.	X		X
6	Incorporation of SuDS features to provide improvement to water quality, and enhancement to ecology and biodiversity post-development. This is likely to include: - 2no. attenuation basins; and - 2no. swales.	X		X
7	Lining of the SuDS features proposed to mitigate the potential ingress of groundwater when the Proposed Development is operational.	X		X
8	Implementation of a detailed CEMP to mitigate impact during the construction phase, in accordance with best practice.			X
9	Preparation of a Maintenance and Management Plan to ensure that the proposed drainage system remains operational for the design life of the Proposed Development.			X
10	Detailed drainage design.			X

Enhancements

- 12.5.14. The development proposals incorporate a blue-green corridor along the southern boundary of the Site. A blue-green corridor provides multiple environmental, social and economic benefits by integrating water management with landscape and ecological design.
- 12.5.15. This can improve surface water management by conveying and attenuating run-off through swales and basins, thereby reducing downstream flood risk and improving water quality through filtration and sediment settlement.
- 12.5.16. Ecologically, the presence of a blue-green corridor creates and connects habitats, enhancing biodiversity and enabling species movement. Where the attenuation basins and swales are planted accordingly, improvement to water quality can be further enhanced within this space.
- 12.5.17. Socially, the blue-green corridor delivers attractive multifunctional open space, supporting recreation, health and wellbeing, and improving placemaking. Blue-green corridors provide visual amenity, and when coupled with the other benefits as discussed, align with the objectives set out in both national and local planning policy. The provision of a blue-green corridor is anticipated to provide positive effects to high sensitivity receptors, including the downstream watercourses/waterbodies, neighbouring residential areas, and future residents / users of the

Water Resources

Proposed Development. The magnitude is expected to be small, which results in a significance of effect that is moderate beneficial (significant).

Residual Effects

- 12.5.18. During the construction phase the impacts of sedimentation, pollution, increased surface water runoff rates/volumes, and shallow groundwater will be managed through the implementation of a detailed CEMP. This will establish good environmental practices by, for example, including marked working areas, silt traps and other temporary drainage measures. Surface water will be managed via temporary drainage systems, designed to collect and attenuate runoff during excavation and construction activities. Shallow groundwater will also be included, as its presence has been noted within the Phase 1 Ground Investigation Report.
- 12.5.19. The key high sensitivity receptors are the downstream watercourse / waterbody network (including Big Water, and the western tributary of Logwood Mill Brook) and neighbouring residential areas. As the magnitude of effect is negligible, where the mitigation measures discussed are considered, the significance of effect is also negligible (not significant) regarding increased surface water runoff rates / volumes.
- 12.5.20. The moderate sensitivity receptors are neighbouring transport infrastructure, and neighbouring UU infrastructure, and the low sensitivity receptor is construction workers. For all three receptors, the magnitude of effect is classed as negligible with the mitigation measures proposed. The significance of effect is therefore also considered to be negligible (not significant) for all construction phase effects.
- 12.5.21. During the operational phase, the Proposed Development will include a formal sustainable drainage system to manage surface and foul water generated. The incorporation of SuDS features (swales and attenuation basins), along with their part in creating a blue-green corridor will ensure no increase in surface water or volume resulting from the introduction of impermeable areas on the Site.
- 12.5.22. The key high sensitivity receptors are the downstream watercourse / waterbody network (including Big Water, and the western tributary of Logwood Mill Brook), and neighbouring residential areas. As the magnitude of effect is negligible, where the mitigation measures discussed are considered, the significance of effect is also negligible (not significant) regarding increased surface water runoff rates / volumes when the Proposed Development is operational.
- 12.5.23. The moderate sensitivity receptors are neighbouring transport infrastructure, neighbouring UU infrastructure, and future residents / users of the Proposed Development. For all three receptors, the magnitude of effect is classed as negligible (not significant) with the mitigation measures proposed.
- 12.5.24. Potential ingress of shallow groundwater into such features post-development will be managed as part of detailed design, ensuring these are suitably lined. The dwellings proposed will also be safeguarded through appropriate levels design (which can be secured through condition).
- 12.5.25. The key receptors of high sensitivity to shallow groundwater are the downstream watercourse / waterbody network and future residents / users of the Proposed Development. With the mitigation measures proposed above, the magnitude of effect is negligible, resulting in a significance of effect that is also negligible (not significant).
- 12.5.26. Water quality is expected to improve because of the Proposed Development, when considering the mitigation measures that have been designed in. The provision of attenuation basins,

polishing swales within a blue-green corridor (forming a treatment train) is expected to have a positive effect for the downstream watercourse/waterbody network (high sensitivity receptor). This includes Big Water as a direct receptor, and the associated tributary of Logwood Mill Brook indirectly. As the magnitude is small, the overall significance of effect is moderate beneficial (significant) when the Proposed Development is operational.

- 12.5.27. To ensure the inherent mitigation measures proposed are effective for the intended design life of the Proposed Development, a Maintenance and Management Plan is included as additional mitigation. This will ensure that the proposed drainage system, inclusive of all SuDS components, continue to operate effectively. This is achieved through regular inspection, maintenance, and where necessary remedial works to prevent blockage or structural failure. These works reduce potential flood risk both on-site, and downstream that could result from poor maintenance. Adverse impacts to water quality are also reduced, as effective management prevents the conveyance of sediment and pollutants in the event of a failure during extreme rainfall events.
- 12.5.28. Potential high sensitivity receptors in this instance would be the downstream watercourse/waterbody network, and future residents / users of the Site. The additional mitigation of a Maintenance and Management Plan will ensure that the proposed sustainable drainage system will remain operation and effective for the design life of the Proposed Development (and resilient to the impacts of climate change). With mitigation, the magnitude of effect is negligible, and thus the significance of effect is also considered to be negligible (not significant).

12.6. Cumulative and In-Combination Effects

- 12.6.1. This section considers the cumulative effects, as listed in Chapter 2, regarding flood risk and drainage, arising from the Proposed Development in-combination with the cumulative sites. Due to the open space nature of application, there are no in-combination effects anticipated with regard to the following cumulative sites:

- 19/00651/FUL – Disused Railway Line Extending from M62 Motorway Extending North Through Halsnead Park And to Rear of Cronton Avenue, Whiston, Knowsley;
- 20/00578/FUL – Former Site of Cronton Colliery, Cronton Road, Cronton, Knowsley, L35 1QR; and
- 22/00195/KMBC1 – From Fox's Bank Lane Following the Northern Boundary of Agricultural Land South of Penny Lane to Opposite Oak Lodge.

- 12.6.2. Hydrologically, the remaining cumulative sites drain either directly to Logwood Mill Brook, or to its tributaries (to the east, and to the west of the Proposed Development). With regard to the water environment, these features form a key sensitive receptor. In combination with the remaining cumulative sites, the potential adverse effects are detriment to water quality and increased flood risk (due to increased surface water runoff rates and volumes).

Construction

- 12.6.3. Temporary construction activities have the potential to affect drainage pathways with regards to flood risk, water quality, and biodiversity if not appropriately managed. These risks would however be controlled through the implementation of a CEMP, including temporary drainage measures, pollution prevention controls, and phased earthworks. In accordance with the NPPF, there is a requirement to ensure there is no increase in flood risk off-site. The PPG further outlines that this requirement applies to both the construction and operational phases of the

Water Resources

new development. As these mitigation measures are standard requirements in accordance with national planning policy, when considered in-combination with the remaining cumulative sites the significance of effect would be negligible (temporary / short – term). This has been considered as a worst case scenario, where the construction of the Proposed Development and the remaining cumulative sites are brought forward in-parallel.

Operation

- 12.6.4. Uncontrolled run-off from new developments has the potential to increase the flood risk within the catchment area; however, all new developments must conform to the guidance set out in the NPPF and the supporting PPG. The guidance states that surface water runoff should, where possible, improve post-development or at least mimic the pre-development situation (through on-site restriction and attenuation).

- 12.6.5. The Proposed Development is required to conform with current planning guidance and policy to ensure it does not increase flood risk elsewhere. This is proposed to be undertaken, primarily, by incorporating a sustainable drainage management regime to ensure that uncontrolled runoff, which is associated with the newly Proposed Development, does not increase flood risk to the neighbouring developments. Designed in mitigation, in the form of a sustainable surface water drainage strategy, is a requirement of all new development inclusive also of the remaining cumulative sites.

- 12.6.6. In accordance with both local and national planning policy, there is a requirement to ensure that the Proposed Development and the identified cumulative sites restrict surface water discharge to the equivalent greenfield runoff rate (QBar). This approach ensures that post-development peak runoff rates do not exceed the existing, pre-development characteristics of the wider catchment. By limiting discharge in this manner, and providing appropriate on-site attenuation to accommodate rainfall events up to and including the 1 in 100-year event plus climate change allowance, the developments would not result in an increase in peak downstream flows.

- 12.6.7. As the cumulative sites are subject to the same policy and technical requirements, their drainage strategies must similarly control runoff to greenfield rates (or provide betterment where applicable). Consequently, even when considered in-combination, the Proposed Development and cumulative sites would not materially increase flood risk either upstream or downstream, nor would they exacerbate flood risk to neighbouring development, infrastructure, or the receiving watercourse network. On this basis, no significant cumulative increase in flood risk is anticipated to all key sensitive receptors.

- 12.6.8. In accordance with both local and national planning policy, development proposals are required to ensure that there is no deterioration in water quality within receiving watercourses or groundwater bodies. The Proposed Development incorporates SuDS, including conveyance and attenuation features, which provide treatment of surface water runoff prior to discharge. These features are designed in accordance with the SuDS treatment hierarchy to remove sediments and associated pollutants, thereby ensuring that runoff discharged from the Site does not adversely affect the quality of the receiving waterbody.

- 12.6.9. The identified cumulative sites are subject to the same policy and technical requirements and are therefore expected to incorporate comparable water quality treatment measures within their drainage strategies. As such, when considered in-combination, the Proposed Development and cumulative sites would not be anticipated to result in a deterioration of water quality within the downstream watercourse network. On this basis, and assuming policy-compliant drainage design and maintenance, no significant cumulative adverse effect on water quality is predicted.

- 12.6.10. In accordance with the Water Industry Act (1991), the sewerage undertaker (UU) has responsibility for ensuring sufficient capacity within the public sewer network. Should a capacity constraint be identified within the receiving sewer network, as part of the planning process, it is understood that this could be addressed within the next AMP cycle. This applies for the Proposed Development, and the remaining cumulative sites.
- 12.6.11. As sufficient capacity will be available at such a time the Proposed Development and the remaining cumulative sites are brought forward simultaneously, it is understood that the significance of effect would be negligible (direct / medium-term) for the downstream UU sewer infrastructure.

12.7. Summary

Introduction

- 12.7.1. The likely significant effects of the Proposed Development on the water environment have been assessed. This focuses on flood risk and drainage. Email correspondence has been undertaken with the Environment Agency, Knowsley Metropolitan Borough Council, and United Utilities to support the preparation of a Flood Risk Assessment and a Drainage Management Strategy. These documents provide the evidence base for this assessment.

Baseline Conditions

- 12.7.2. Information about flood risk, drainage and groundwater conditions at the Site has been gathered from published mapping, technical studies, Site surveys and consultation with relevant authorities.
- 12.7.3. The Site is located to the south of Halsnead and is surrounded by a mix of existing and under-construction residential development, woodland, a pond known as Big Water to the west, and the M62 motorway to the south. Ground levels fall from the north-east toward the west.
- 12.7.4. Consultation with the EA confirmed there is no recorded history of river flooding affecting the Site. Flood mapping shows the Site is located within Flood Zone 1, meaning it is at low risk of flooding from rivers, including in the future with climate change. The nearest main watercourse is located several hundred metres away and does not pose a flood risk to the Site.
- 12.7.5. In terms of surface water (rainfall) flooding, most of the Site is at very low risk. There are some small low-lying areas along the southern and western boundaries where there is higher potential for temporary ponding during heavy rainfall. Groundwater mapping also indicates that part of the south-eastern corner of the Site may have relatively shallow groundwater levels during extreme rainfall events.
- 12.7.6. Currently, the Site drains naturally toward Big Water, located along the western boundary. Review of the online datasets, and initial ground investigations suggest that infiltration will not offer a viable drainage solution. The presence of shallow groundwater also prevents the use of an infiltration-based surface water drainage solution for the Proposed Development.

Likely Significant Effects

Construction Phase

- 12.7.7. During construction, without mitigation, surface water runoff could be increased due to changes in ground levels, presence of vegetation, and where soils are compacted (and therefore less

Water Resources

permeable) where unmanaged. Construction activities also have the potential adverse effects. This can be as a result of sediment (i.e. from excavation, storage of materials, or soil disturbance) being washed offsite during heavy rainfall events. There is also potential for pollution incidents to occur, for example from spillages of fuel, chemicals or stored materials, without mitigation. These have the potential to cause adverse effects to Big Water, the downstream watercourse network, existing properties, infrastructure, and construction workers.

- 12.7.8. Investigations have identified that groundwater is close to the surface in parts of the Site. During construction, this shallow groundwater could occasionally emerge, potentially causing temporary flooding or affecting the stability of excavations and foundations, without appropriate mitigation. Where groundwater is removed (dewatered) to allow works to proceed, there is a risk of local erosion or temporary increases in water flow, and small changes in groundwater levels could mobilise existing contaminants.
- 12.7.9. If not properly managed, these effects could impact nearby rivers, streams, or ponds, and also create minor risks for construction workers. With appropriate mitigation and standard construction controls, the risks to people on-site are small, while the potential effects on watercourses are more substantial and therefore considered a major effect in the absence of mitigation.

Operation Phase

- 12.7.10. During the operational phase, the main receptors that could be affected are the downstream rivers and streams, neighbouring developments and infrastructure, and people living or using the Site. Most of these are considered highly sensitive, except neighbouring buildings and infrastructure, which are of medium sensitivity.
- 12.7.11. Potential effects, without mitigation, relate to increased flood risk, sedimentation, and pollution. For rivers and streams, and for neighbouring development, the potential flood risk is considered moderate. For future residents and users of the Site, the potential flood risk without mitigation has the potential to be major. Sedimentation and pollution without appropriate mitigation, could also affect the downstream watercourse network, with moderate significance.
- 12.7.12. Shallow groundwater could limit the effectiveness of some SuDS features, reducing the available storage capacity for surface water. This may lead to occasional exceedance of the drainage system and could also increase the risk of groundwater entering buildings or causing pressure on foundations and buried infrastructure. For future residents and users, the significance of these effects is considered major, highlighting the need for careful design and ongoing maintenance.

Mitigation and Enhancement

- 12.7.13. A detailed Construction Environment Management Plan (CEMP) will be developed prior to commencement of works, incorporating a variety of good environmental practices in accordance with the EA's Pollution Prevention guidelines and CIRIA 532 Control of Pollution from Construction Sites.
- 12.7.14. The drainage strategy for the Proposed Development has been designed to reflect the existing drainage situation. Surface water generated by the development will be managed through Sustainable Drainage Systems (SuDS) and will formally be discharged to Big Water at a restricted greenfield runoff rate (QBar). Proposed features include two swales to direct water flow, and two attenuation basins to temporarily store water. These measures are designed to improve water

quality, reduce peak runoff, and manage flow rates. The benefits for the downstream watercourses are considered moderate.

12.7.15. Foul water from the Proposed Development will connect into the existing wider drainage network within the adjacent under construction Phase 2a scheme. Due to existing ground levels, a pumped solution may be required.

12.7.16. Specific mitigation measures include:

- Finished floor levels and site grading designed to manage flood risk across the Site;
- Roads and drainage systems designed to safely manage surface water and foul water;
- Sustainable Drainage Systems (SuDS) incorporated, including swales, attenuation basins, and permeable surfaces, to control runoff, improve water quality, and provide biodiversity and amenity benefits;
- Vulnerable parts of the development located in areas of lowest flood risk;
- Surface water runoff will continue to discharge to Big Water, maintaining the existing drainage pattern but at a controlled rate to avoid increasing flood risk downstream;
- Drainage designed to handle extreme rainfall events, including allowances for climate change;
- SuDS features will include polishing swales downstream of storage areas to improve water quality;
- SuDS features will be lined where shallow groundwater is present to prevent water ingress;
- Good environmental practices implemented during all works to manage runoff, sediment, and pollutants, including following guidance from the EA and CIRIA;
- Groundwater monitoring carried out during Site works; any dewatering will be licensed and carefully managed;
- Maintenance and management plan implemented to ensure all drainage and SuDS features operate effectively over the life of the development;
- Sediment management measures included where required, such as catchpits, silt traps, or forebays, to protect downstream watercourses and water quality; and
- A blue-green corridor incorporated along the southern boundary to convey and attenuate surface water, improve water quality, enhance biodiversity, and provide open space and amenity benefits.

12.7.17. To ensure that the benefits of the Proposed Development in terms of flood risk, water quality and biodiversity are delivered the long-term management of the proposed sustainable drainage system will be set out in a dedicated Maintenance and Management Plan, as part of detailed drainage design.

12.7.18. With the mitigation measures secured, there will be no significant negative residual effects during the construction or operational phase. Water quality within Big Water, and the

Water Resources

downstream watercourse is considered likely to improve and provide a moderate beneficial effect once the Proposed Development is operational as a result of the inclusion of a blue-green corridor, and the sustainable drainage systems proposed.

Conclusion

- 12.7.19. Subject to the implementation of the embedded and additional mitigation measures identified within this chapter, including the restriction of surface water discharge to greenfield runoff rates and incorporation of climate change allowances, no significant adverse residual effects are predicted during either the construction or operational phases of the Proposed Development. The development will not increase flood risk on-site or elsewhere.
- 12.7.20. **Table 12.6** provides a summary of effects, mitigation and residual effects.

Table 12.6: Summary of Effects, Mitigation and Residual Effects

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Construction								
Downstream watercourse / waterbody network	Construction activities lead to increased surface water runoff flooding potential	Temporary Direct	High	Large	National	Major adverse	Detailed Construction Environment Management Plan.	Negligible (not significant)
Neighbouring residential areas		Temporary Indirect	High	Large	National	Major adverse		Negligible (not significant)
Neighbouring transport infrastructure		Temporary Indirect	Moderate	Large	National	Major adverse		Negligible (not significant)
Neighbouring United Utilities infrastructure		Temporary Indirect	Moderate	Large	National	Major adverse		Negligible (not significant)
Construction workers		Temporary Direct	Low	Small	National	Moderate adverse		Negligible (not significant)

Water Resources

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Downstream watercourse / waterbody network	Sedimentation potential – impact on flood risk and water quality	Temporary Direct	High	Large	National	Major adverse	Detailed Construction Environment Management Plan.	Negligible (not significant)
Neighbouring residential areas		Temporary Indirect	High	Large	National	Major adverse		Negligible (not significant)
Neighbouring transport infrastructure		Temporary Indirect	Moderate	Large	National	Major adverse		Negligible (not significant)
Neighbouring United Utilities infrastructure		Temporary Indirect	Moderate	Large	National	Major adverse		Negligible (not significant)
Construction workers		Temporary Direct	Low	Small	National	Moderate adverse		Negligible (not significant)
Downstream watercourse	Pollution potential from plant equipment	Temporary Direct	High	Large	National	Major adverse	Detailed Construction Environment	Negligible (not significant)

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
/ waterbody network	and materials stored and operating on-site – impact on water quality						Management Plan.	
Downstream watercourse / waterbody network	Shallow groundwater – stability of ground, increase in flood risk	Temporary Direct	High	Large	National	Major adverse	Groundwater monitoring; and Detailed Construction Environment Plan.	Negligible (not significant)
Construction workers	through dewatering, mobilisation of contaminants through groundwater level fluctuation	Temporary Direct	Low	Small	National	Moderate adverse		Negligible (not significant)
Operation								
Downstream watercourse	Runoff rates and volumes generated by	Permanent Direct	High	Large	National	Major adverse	SuDS features inc. two swales and	Negligible (not significant)

Water Resources

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
/ waterbody network	new impermeable areas – increase in flood risk downstream						two attenuation basins to form a treatment train;	
Neighbouring residential areas		Permanent Indirect	High	Large	National	Major adverse	Blue-green corridor;	Negligible (not significant)
Neighbouring transport infrastructure		Permanent Indirect	Moderate	Large	National	Major adverse	Maintenance & Management Plan; and	Negligible (not significant)
Neighbouring United Utilities infrastructure		Permanent Indirect	Moderate	Large	National	Major adverse	Detailed drainage design.	Negligible (not significant)
Future residents / users		Permanent Direct	Moderate	Large	National	Major adverse		Negligible (not significant)
Downstream watercourse / waterbody network	Sedimentation potential – impact on flood risk	Permanent Direct	High	Large	National	Major adverse	SuDS features inc. two swales and two	Negligible (not significant)

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Neighbouring residential areas		Permanent Indirect	High	Large	National	Major adverse	attenuation basins to form a treatment train;	Negligible (not significant)
Neighbouring transport infrastructure		Permanent Indirect	Moderate	Large	National	Major adverse	Blue-green corridor;	Negligible (not significant)
Neighbouring United Utilities infrastructure		Permanent Indirect	Moderate	Large	National	Major adverse	Maintenance & Management Plan; and	Negligible (not significant)
Future residents / users		Permanent Direct	High	Large	National	Major adverse	Detailed drainage design.	Negligible (not significant)
Downstream watercourse / waterbody network	Shallow groundwater – ingress into SuDS features	Permanent Direct	High	Large	National	Major adverse	Appropriate lining of SuDS features;	Negligible (not significant)
Future residents / users		Permanent Direct	High	Large	National	Major adverse	Maintenance and Management Plan; and	Negligible (not significant)

Water Resources

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
							Detailed drainage design.	
Downstream watercourse / waterbody network	Pollution – improvement to water quality	Permanent Direct	High	Large	National	Major adverse	SuDS features inc. two swales and two attenuation basins to form a treatment train; Blue-green corridor; Maintenance & Management Plan; and Detailed drainage design	Moderate beneficial (significant)

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Cumulative and In-Combination								
Downstream watercourse / waterbody network	Construction activities lead to increased surface water runoff flooding potential	Temporary Direct	High	Large	National	Major adverse	Detailed Construction Environment Management Plan. Where any significant adverse construction effects are anticipated for a development, this is enforceable through planning conditions.	Negligible (not significant)
Neighbouring residential areas		Temporary Indirect	High	Large	National	Major adverse		Negligible (not significant)
Neighbouring transport infrastructure		Temporary Indirect	Moderate	Large	National	Major adverse		Negligible (not significant)
Neighbouring United Utilities infrastructure		Temporary Indirect	Moderate	Large	National	Major adverse		Negligible (not significant)
Construction workers		Temporary Direct	Low	Small	National	Moderate adverse		Negligible (not significant)

Water Resources

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Downstream watercourse / waterbody network	Runoff	Permanent Direct	High	Large	National	Major adverse	Requirement for all new development to ensure no increased flood risk on, or offsite post-development in accordance with local and national planning policy; Maintenance & Management Plan; and Detailed drainage design.	Negligible (not significant)
Downstream watercourse	Water Quality	Permanent Direct	High	Large	National	Major adverse	Requirement for all new development to improve	Negligible (not significant)

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
/ waterbody network							water quality post-development in accordance with local and national planning policy; Inclusion of SuDS features in accordance with the National Standards for SuDS and the KMBC technical guidance; Maintenance & Management Plan; and Detailed drainage design.	

Water Resources

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Neighbouring United Utilities Infrastructure	Foul Water Capacity Constraints	Permanent Direct	Moderate	Large	National	Major adverse	Provision of sufficient capacity within the public sewer network to support new development to be delivered by United Utilities (AMP Cycle process).	Negligible (not significant)