

12. Flood Risk and Drainage

12.1. Introduction

- 12.1.1. This Chapter assesses the effects of the Proposed Development on flood risk and drainage, and the likely significance of such impacts during its construction and operational phases.
- 12.1.2. The chapter addresses the following receptors:
- Surface water (watercourses, reservoirs, lakes, ponds and wetlands);
 - Flood risk;
 - Land drainage; and
 - Infrastructure – wastewater treatment and sewerage
- 12.1.3. The chapter describes the methods used to assess the likely significant effects; the baseline conditions that exist at the Site and within the 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.
- 12.1.4. This chapter is supported by the following appendices:
- Flood Risk and Drainage Assessment, Weetwood, August 2025 (Ref. 6464/FRDA/v1.0/Final/ 2025-08-07) – see **Appendix 12.1**
- 12.1.5. 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**), and the ecology and biodiversity chapter (**Chapter 7**).

12.2. Assessment Approach

Methodology

- 12.2.1. The presence, location and quality of surface water bodies at and within the vicinity of the Site and the risk of flooding from known sources have been assessed utilising Ordnance Survey, Government, Environment Agency (EA) and British Geological Survey (BGS) data and mapping, and the other sources of information listed in **Table 12.4**. The assessment of flood risk has also been informed by a topographic survey of the Site, a drainage survey and LiDAR data.
- 12.2.2. In accordance with national and local planning policy and guidance (as set out in **Table 12.4**), and based upon professional experience and judgement, a package of measures to mitigate flood risk has been developed to ensure that the Proposed Development will be safe from flood risk for its lifetime, taking climate change and the vulnerability of its users into account.
- 12.2.3. A strategy for the management of surface water runoff has also been developed in accordance with planning policy and technical standards and the requirements of the Water Framework Directive (WFD). The strategy has been informed by an assessment of the existing drainage regime at the Site utilising the topographic survey, drainage survey and LiDAR data, in addition to the geology mapping to define the underlying ground conditions. This information has in turn

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been utilised to inform the proposed means of storing and re-using water onsite, prior to the need to dispose of surface water runoff from the Proposed Development

- 12.2.4. To support the planning application, a site-specific Flood Risk and Drainage Assessment (FRDA) report has been prepared and is included as **Appendix 12.1**. The baseline assessment and outcomes of the FRDA have informed this chapter.

Assessment of Significance

- 12.2.5. To define the significance of effects of the Proposed Development on flood risk and drainage, both the sensitivity of the receptor and the magnitude of change have been assessed.
- 12.2.6. The sensitivity definitions for the assessment of the effect significance are detailed in **Table 12.1**.

Table 12.1: Receptor Sensitivity

Sensitivity	Assessment Criteria
High	Receptor with a high quality and rarity, regional or national scale importance and limited potential for substitution/replacement: • Areas located within flood zone 3b or water storage area • NPPF Flood Risk Vulnerability Classification 'Essential Infrastructure' and 'Highly Vulnerable' • Water body of high amenity value, including areas of bathing and water sports are regularly practiced • Protected under UK habitat legislation e.g. Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Ramsar Site • Water body of good or high chemical or ecological status
Medium	Receptor with a medium quality and rarity, local scale importance and limited potential for substitution/replacement. • Areas located within flood zone 2 and 3 • NPPF Flood Risk Vulnerability Classification 'More Vulnerable' • Water body of moderate amenity value, including public parks, boating, footpaths adjacent to watercourses, or watercourses through housing developments/town centres • Water body of nature conservation importance • Water body of moderate ecological status
Low	Receptor with a low quality and rarity, limited local scale importance and reasonable potential for substitution/replacement: • Areas located within flood zone 1 • NPPF Flood Risk Vulnerability Classification 'Less Vulnerable' • Water body of low amenity value • Water body of fail or poor chemical or ecological status
Negligible	Receptor with a negligible quality and rarity, local scale and good potential for substitution/ replacement: • Areas located within flood zone 1 • NPPF Flood Risk Vulnerability Classification 'Water Compatible' • Water body of no amenity value • Water body of fail or poor chemical or ecological status

- 12.2.7. The magnitude of change of effects on an identified receptor is detailed in **Table 12.2**. The magnitude of change is independent of its sensitivity and has been determined by professional judgement with supporting evidence provided in the FRDA report (see **Appendix 12.1**).

Table 12.2: Magnitude of Change Criteria to Flood Risk and Drainage

Magnitude	Definition
High	Significant change in baseline flood risk (spatial extent, temporal duration, flow, water level). Result in major changes to the aquatic environment (e.g. permanent deterioration in flow regime, water quality or habitat) that would result in a permanent change. High risk of flooding to Site and users.
Medium	Moderate change in baseline flood risk (spatial extent, temporal duration, flow, water level). Marginal change to the aquatic environment (e.g. in relation to flow regime, water quality or habitat) that would result in a temporary (but reversible) change. Medium risk of flooding to Site and users.
Low	Nominal change in flood risk (spatial extent, temporal duration, flow water level). Marginal change to the aquatic environment (e.g., in relation to flow regime, water quality or habitat) that would result in a temporary (but reversible) change. Low risk of flooding to Site and users.
Negligible	No measurable change in flood risk (spatial extent, temporal duration, flow, water level). No measurable change to the aquatic environment (e.g. in relation to flow regime, water quality or habitat). No measurable risk to Site and users.

- 12.2.8. The significance of effects has been determined by considering the sensitivity of the identified receptor (see **Table 12.1**) and the magnitude of change (see **Table 12.2**). The effect is defined in accordance with the matrix presented in **Table 12.3**.
- 12.2.9. Based on **Table 12.3**, the effects of the Proposed Development on flood risk and drainage have been defined as either major, moderate, minor or negligible. Only major and moderate effects are considered to be significant in terms of the EIA regulations, these have been highlighted in green in **Table 12.3**.

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Table 12.3: Significance Criteria

Magnitude of Change	Sensitivity of Receptor				
		High	Medium	Low	Negligible
	High	Major	Major	Moderate	Negligible
	Medium	Major	Moderate	Minor to Moderate	Negligible
	Low	Moderate	Minor to Moderate	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Legislative and Policy Framework

12.2.10. In preparing this chapter, a wide range of national legislation and policy guidance documents relevant to the assessment have been considered as listed in **Table 12.4**.

Table 12.4: Relevant Key Legislation, Policies and Guidance Documents

Context	Legislation, Policies and Guidance Documents
National	The Water Environment (Water Framework Directive) (England and Wales) Regulations (2017)
	National Planning Policy Framework (updated 7 February 2025)
	Planning Policy Guidance (updated 14 February 2024)
	Water Industry Act (1991)
	Water Act 2003 (as amended)
	Flood and Water Management Act (2010)
	The Water Environment (Water Framework Directive) (England and Wales) Regulations (2017)
	National Flood and Coastal Erosion Risk Management Strategy for England, Environment Agency (2020)
	Control of Pollution (Oil Storage) (England) Regulations (2001)
	Surface Waters [Dangerous Substances (Classification)] Regulations (1998)
	Control of Substances Hazardous to Health (COSHH) Regulations (2002)
	Environment Act 1995 (as amended)
	Surface Water (River Ecosystem) (Classification) Regulations (1994)
	Land Drainage Act 1991 (as amended)
	Food and Environment Protection Act (1985)
	Making Space for Water – Taking Forward a New Government Strategy for Flood and Coastal Erosion Risk Management in England, DEFRA (2005)

	Non-statutory National Standards for Sustainable Drainage Systems, DEFRA (2025)
	House of Commons Written Statement on Sustainable Drainage Systems (HCWS161) (2014)
	The Building Regulations – Drainage and Waste Disposal, Approved Document H, HM Government (published in 2010, amended 2015)
	TAG Unit A3 Environmental Impact Appraisal, Department for Transport (2014)
	Guidance on the Construction of Sustainable Drainage Systems (C768), CIRIA (2017)
	The SuDS Manual (C753), CIRIA (2015)
	Sustainable Drainage Systems: Hydraulic, Structural and Water Quality Advice (C609), CIRIA (2004)
	Control of Water Pollution from Construction Sites (C532), CIRIA (2001)
	Infiltration Drainage – Manual of Good Practice, CIRIA Report 156 (1996)
	Control of Pollution from Highway Drainage Discharges, CIRIA Report 142 (1994)
	Code of Good Agricultural Practice for the Protection of Water, DEFRA (1998 as amended 2002)
	Guidelines for the use of herbicides on weeds in or near watercourses and lakes, CIRIA (1995)
	Sewerage Sector Guidance Appendix C – Design and Construction Guidance v2.0 (2020)
Local	Knowsley Local Plan Core Strategy, Knowsley Council, January 2016 (inc. Policy CS2, CS22, CS24 and SUE1)
Other Sources of Information	Preliminary Flood Risk Assessment Addendum, Knowsley Council, November 2017;
	Local Flood Risk Management Strategy, Knowsley Council, October 2017;
	Sustainable Drainage & Surface Water Management: Technical Guidance for Developers, Knowsley Council, August 2016;
	Knowsley Local Plan Core Strategy, Knowsley Council, January 2016;
	Level 2 Strategic Flood Risk Assessment, Knowsley Council, October 2012;
	Preliminary Flood Risk Assessment, Knowsley Council, June 2011;
	Level 1 Strategic Flood Risk Assessment, Knowsley Council, June 2009;
	Websites for Government, DEFRA and British Geological Survey

National Legislation and Planning Policy

- 12.2.11. The WFD provides a legal framework for the protection, improvement and sustainable use of inland surface waters, groundwater, transitional waters, and coastal waters across England. The WFD seeks to achieve 'good' ecological, chemical and groundwater quantitative status for all waterbodies.

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- 12.2.12. Under the WFD, development must not result in any deterioration in the status of a waterbody nor compromise the aims of the WFD as set out in the River Basin Management Plans, for which the EA is the 'competent authority'.
- 12.2.13. The Flood and Water Management Act 2010 implements several key recommendations of Sir Michael Pitt's Review of the Summer 2007 floods.
- 12.2.14. The National Planning Policy Framework (NPPF) sets out the government's planning policies for England and how these are expected to be applied.
- 12.2.15. The NPPF guides local planning authorities and decision-takers both in drawing up plans and as a material consideration in determining applications. It includes policies to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk (para. 170 of the NPPF). In exceptional circumstances where new development is necessary in areas at risk of flooding, the policy aims to make it safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall (para. 177 – 181 of the NPPF).
- 12.2.16. The NPPF advocates the use of the risk-based sequential test to steer new development to areas at lowest probability of flooding. It also matches the flood risk vulnerability of a development proposal to appropriate flood zones and provides details on how to include the potential effects of climate change on development.
- 12.2.17. The NPPF states that applications which could affect drainage on or around the Site should incorporate sustainable drainage systems (SuDS) to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity (NPPF para. 182).
- 12.2.18. The NPPF is accompanied by the Planning Policy Guidance (PPG), which provides additional guidance to ensure the effective implementation of the policy set out in the NPPF.

Local Planning Policy

- 12.2.19. Policy CS2: Development Principles of the Knowsley Local Plan Core Strategy (January 2016) states that new development in Knowsley will be expected to support a number of principles, which include (Principle 4) the protection and enhancement of environmental assets by minimising the negative impact upon various elements including flood risk and water quality, ensuring any negative impacts are appropriately mitigated.
- 12.2.20. Policy CS22: Sustainable and Low Carbon Development states that *"New development will be required to meet high standards of sustainable design and construction and minimise carbon emissions. This should be achieved by...i) Managing flood risk, including through the use of [SuDS] and flood resilient design for infrastructure and property..."*.
- 12.2.21. Policy CS24: Managing Flood Risk states that *"New development should preferably be located in areas of low probability of flooding. New development in areas of medium or high flood risk will only be permitted if evidence has been submitted demonstrating that the development could not be practicably located in an area of lower flood risk and if applicable the 'exception test' has been complied with, in accordance with national guidance"*. Policy CS24 sets out the Council's aspirations for assessing flood risk to new development and the measures required to mitigate this, where necessary including the requirements for managing surface water runoff.

- 12.2.22. The Site is identified as 'Safeguarded Land' for residential use within the Knowsley Local Plan Core Strategy (Site Ref. KGBS 6 – Land at Knowsley Village) for which Policy SUE1: Sustainable Urban Extensions and Safeguarded Lane applies.
- 12.2.23. A Level 2 Strategic Flood Risk Assessment (SFRA) was published by Knowsley Council in October 2012 and builds on the findings of the Level 1 SFRA published in June 2009. The purpose of the SFRA is to clarify and refine available flood risk information and to inform the planning decision making processes.

EIA Scoping Process

- 12.2.24. As discussed in **Chapter 2**, a request for a Scoping Opinion was submitted on behalf of the Applicant to Knowsley Metropolitan Borough Council (KMBC) on 26th March 2025, which set out the proposed scope of assessment for the project (see **Appendix 2.1**). KMBC issued their Scoping Opinion on 21 May 2025 and is summarised in **Chapter 2** and included in full at **Appendix 2.2**.
- 12.2.25. With regards to flood risk and drainage matters, relevant responses were received from the consultees including the EA, lead local flood authority (LLFA) and United Utilities (UU) and comments have been addressed accordingly, as follows in **Table 12.5**.

Table 12.5: Relevant EIA Scoping Consultation Comments

Consultee	Summary of Comment	Response or location within the ES where comments are addressed
Knowsley Metropolitan Borough Council (21/05/2025)	The LLFA agree with the proposed scope for flood risk and drainage and request at section 12.4.2 of the scoping report an increase in debris and sediment into local watercourses is also considered.	Addressed within Section 6 of the FRDA report (see Appendix 12.1) and within Chapter 12 of the ES.
United Utilities (16/04/2025)	- Recommend a detail site wide foul and surface water drainage strategy is provided with the planning application, this should assess topography, infiltration potential, all forms of flood risk, existing water features and naturally occurring flow paths. - Noting surface water drainage proposals should follow drainage hierarchy. - Should surface water be unable to infiltrate at this site, UU request that all land that is necessary to facilitate a discharge to a watercourse is fully identified within any future submission. - UU strongly advise the applicant engages with UU at the earliest possible opportunity to identify UU assets which may be impacted by these proposals.	Addressed within Section 5 and Section 6 of the FRDA report (see Appendix 12.1) and within Chapter 12 of the ES.

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	Recommend using pre-development enquiry service to further discuss the proposals. - UU request that the development incorporate water efficiency measures, such as rainwater recycling and water butts.	
Environment Agency (29/04/2025)	No objection.	n/a

Limitations to the Assessment

- 12.2.26. The assessment of the potential effects of the Proposed Developments has been undertaken utilising the best data, methods and scientific knowledge available at the time of preparing this chapter.

12.3. Baseline Conditions

Baseline Survey Information

Surface Water

- 12.3.1. There are a number of surface waterbodies in the vicinity of the Site:
- Croxteth Brook flows north/north-west approximately 850 metres (m) to the west of the Site;
 - OS mapping indicates that the head of Fluker's Brook is located approximately 90 m to the south-west of the Site. Fluker's Brook is subsequently culverted under the M57 before continuing west/north-west and ultimately outfalling to Croxteth Brook;
 - The 2012 SFRA mapping indicates that two drainage ditches flow west approximately 20 m and 110 m to the south of the Site (at their nearest points) and outfall into the head of Fluker's Brook in the vicinity of Knowsley Lane;
 - A watercourse referred to as Ormskirk Road flows west in open channel and culvert approximately 190 m (at its nearest point) to the north of the Site and outfalls to Croxteth Brook;
 - Existing drainage ditches and ponds are present within the two wooded areas, known as Spookies Wood, in the centre of the Site. OS mapping also indicates the presence of a number of drainage ditches and ponds within the locality of the Site; and
 - White Man's Dam is located approximately 800 m to the east of the Site and is owned and maintained by the Earl of Derby's Estate.
- 12.3.2. During a site visit undertaken on 5 February 2025, a pipe outlet was identified to the west of Knowsley Lane, to the north-west of the Site. A CCTV survey of the pipe was undertaken by Invek Surveys in April 2025 (Appendix B of the FRDA report – see **Appendix 12.1**). This proved that the pipe is 300 mm diameter and enters the Site under Knowsley Lane. The pipe was able to be surveyed for 50 m upstream of the headwall. The pipe was in relatively poor condition throughout the length surveyed, with root ingress and joint displacement. The pipe was generally

dry during the survey with no flow except where water was impounded behind blockages or sags/displace joints. This suggests that the pipe is land drainage and not a culverted watercourse.

- 12.3.3. Downstream of Knowsley Lane, the pipe outfalls to an existing drainage ditch within the wooded area to the west referred to as Aker's Pit. The drainage ditch was traced by Invek Surveys and proved that this outfalls to an ordinary watercourse to the west of the M57 via a 600/1050 mm diameter culvert, which in turn ultimately outfalls to Croxteth Brook.
- 12.3.4. The Site is located within the catchment of the "Croxteth/Knowsley Brook" water body (Water Body ID: GB112069060610). The water body has been assessed under the WFD. The current ecological status is 'Moderate', whilst the chemical status is 'Fail'.
- 12.3.5. There are no other WFD defined surface waterbodies within the vicinity of the Site or upon which the Proposed Development would impact.

Flood Risk

Historical Records of Flooding

- 12.3.6. The EA Historic Flood Map indicates that there are no records of flooding at or within the immediate vicinity of the Site.

Flood Risk from Rivers (Fluvial)

- 12.3.7. The EA Flood Map for Planning (Flood Zones 2 and 3) dataset indicates the Site to be located in flood zone 1 (defined as land having a "low probability" of flooding, i.e. a less than 0.1% annual probability). This is reiterated on Figure B2-1 of the 2012 SFRA ("Environment Agency Flood Zones") and Figure F1-4 of the 2009 SFRA ("PPS25 Updated Flood Zones - Knowsley 3").
- 12.3.8. A 1D-2D Flood Modeller-TUFLOW hydraulic model of Croxteth Brook and Fluker's Brook was developed by the EA as part of the Upper Alt Tributaries study (March 2018). This assesses the risk of flooding from Croxteth Brook and Fluker's Brook for the 1.0% and 0.1% annual exceedance probability (AEP) events and the 1.0% AEP event +30%, +35% and +70% climate change.
- 12.3.9. A 1D-2D ESTRY-TUFLOW hydraulic model of Ormskirk Road was also developed by the EA as part of the NW Package 1 Ex-COWS: Ormskirk Road, Knowsley study (March 2015). This assesses the risk of flooding from Ormskirk Road for the 3.3%, 1.0% and 0.1% AEP events and the 1.0% AEP event +20% climate change. Blockage of the existing culvert was also assessed at two locations for the 1.0% AEP event.
- 12.3.10. The modelled flood extents from the modelling studies are provided in Figure 5 and Figure 6 of the FRDA report respectively (see **Appendix 12.1**).
- 12.3.11. The modelled outputs indicate that no flooding of the Site would occur from Croxteth Brook, Fluker's Brook or Ormskirk Road during the aforementioned scenarios.
- 12.3.12. The current EA guidance on climate change allowances advises that for More Vulnerable development, the Central allowance should be used to assess flood risk for the lifetime of the development. The Central allowance for the Alt and Crossens management catchment is +44% (2080s). The modelling outputs from the Upper Alt Tributaries modelling study therefore present a conservative assessment of flood risk to the Site when accounting for climate change and the above conclusion holds.

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- 12.3.13. A +44% increase in peak river flows during a 1.0% AEP event for Ormskirk Road is unlikely to exceed that of the 0.1% AEP event and, as such, this is also not expected to affect the Site. This is reiterated on the Flood Map for Planning (River and Sea without Defences) which accounts for climate change using the Central allowance for the 2080s epoch for river flooding.

Flood Risk from Small Watercourses and Surface Water (Pluvial)

- 12.3.14. As detailed in para. 12.3.1, a number of drainage ditches are present on and within the vicinity of the Site. No modelled information is available for these watercourses. The Long Term Flood Risk (Surface Water) dataset has therefore been used to assess the risk of flooding from these sources and from surface water. The mapping indicates the following:

- The Site is not at risk of flooding from the drainage ditches and ponds within the locality of the Site;
- Ponding of surface water is indicated in several areas across the Site; however, this represents local depressions in the existing topography; and
- Several overland flow routes develop in a Low (1.0% to 0.1% AEP) and Medium (3.3% to 1.0% AEP) risk event. However, the areas of identified risk are relatively confined and form where the natural contours of the land forms a shallow valley where overland flow would be directed to. The maximum flood depth within these areas is typically <0.2 m, with small areas of 0.2 – 0.3 m during a Low risk event when accounting for climate change (between 2040 and 2060).

- 12.3.15. It is concluded that the Site is at a Very Low risk of flooding from small watercourses and is at a Very Low to Medium risk of surface water flooding.

Flood Risk from Reservoirs, Canals and Other Water Impounding Structures

- 12.3.16. LiDAR data indicates that ground levels around the perimeter of White Man's Dam are in the region of 64.5 – 65.0 m Above Ordnance Datum (AOD). Levels subsequently rise to circa. 67.0 m AOD before falling to the west; however, levels are lower to the south-west of the lake. White Man's Dam is therefore unlikely to pose a direct risk from overtopping to the east of the Site.

- 12.3.17. The Long Term Flood Risk (Reservoirs) dataset indicates that the Site is not at risk of flooding from such sources, except for a small area in the south-west, which appears to be associated with a failure of the southern tip of White Man's Dam. However, all large reservoirs are regularly inspected by reservoir panel engineers with essential safety work carried out as required. As detailed on the gov.uk website, reservoir flooding is therefore extremely unlikely to occur.

- 12.3.18. There are no canals or other water impounding structures located within the immediate vicinity of the Site.

- 12.3.19. It is concluded that the Site is at a Low risk of flooding from reservoirs and is not at risk of flooding from canals and other water impounding structures.

Flood Risk from Groundwater

- 12.3.20. The JBA Groundwater Flood Risk Indicator map indicates that groundwater levels at the Site may be <0.025 m below ground level (bgl) (defined as High risk) during a 1.0% AEP groundwater flood event.

- 12.3.21. A preliminary geoenvironmental investigation has been undertaken by Lithos, including 4 no. trial pits across the Site in April 2025. The trial pits were dug to a depth of 1.8 – 2.2 m bgl and the records state that groundwater was not apparent during excavation.
- 12.3.22. Due to the topography of the Site and surrounding area, any groundwater emerging at the surface would be expected to be directed east, away from the areas of Proposed Development and the Site, towards Knowsley Lane, Fluker's Brook and Croxteth Brook. As such, this would not be expected to accumulate to any significant depth at the Site itself.
- 12.3.23. It is concluded that the Site is at a Medium risk of flooding from groundwater.

Land Drainage

- 12.3.24. The Site currently comprises multiple parcels of arable agricultural land. As such, no formal drainage is expected to be present.
- 12.3.25. According to the Soilscape soils dataset produced by the Cranfield Soil and AgriFood Institute, soil conditions at the Site and within the surrounding area are described as slowly permeable seasonally wet loamy and clayey soils.
- 12.3.26. Soakaway testing was undertaken by Lithos in the 4 no. trial pits across the Site in April 2025 in accordance with BRE365. The soakaway testing records are presented in Appendix D of the FRDA report (see **Appendix 12.1**). Despite running each test for up to 3 hours, drainage rates were not sufficient to allow calculation of infiltration rates.
- 12.3.27. Given the topography and ground conditions at the Site, surface water runoff would currently be expected to slowly infiltrate where conditions allow and flow overland towards Knowsley Lane.

Infrastructure – Wastewater Treatment and Sewerage

- 12.3.28. An extract of the public sewer records obtained from UU is provided in Appendix E of the FRDA report (see **Appendix 12.1**). This indicates that the following wastewater assets are present within/adjacent to the Site boundary:
- A 225 mm diameter public foul sewer and 150 mm private surface water sewer cross the Site in the north-east, between Parklands and Berry Hill Avenue.
 - A 225 mm diameter public foul sewer and 225 mm public surface water sewer are located to the north of the Site boundary in Home Farm Road.

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12.4. Assessment of Likely Significant Effects

Sensitive Receptors

- 12.4.1. **Table 12.6** lists the identified environmental receptors and their assessed sensitivity using the criteria presented in **Table 12.1** as guidance.

Table 12.6: Sensitive Receptors

Impact	Receptor / Receiving Environment	Description of Effect	Sensitivity Value
Surface water <i>Water quality</i>	Croxteth Brook	Pollution risk	Medium
	Fluker's Brook	Pollution risk	Medium
	Ormskirk Road	Pollution risk	Medium
	Existing drainage ditches	Pollution risk	Low
	Existing ponds	Pollution risk	Low
Flood risk and land drainage	Croxteth Brook	Flood risk	Medium
	Fluker's Brook	Flood risk	Medium
	Ormskirk Road	Flood risk	Medium
	Existing drainage ditches	Flood risk, and surface water runoff rates and volumes	Low
	Existing ponds	Flood risk	Low
	White Man's Dam	Flood risk	Medium
	Site workers and local residents (Construction phase)	Flood risk	High
	New residents and existing local residents (Operational phase)	Flood risk	High
Infrastructure <i>Wastewater treatment and sewerage</i>	Wastewater infrastructure	Service continuity; increase in loading	Medium

ConstructionSurface Water

- 12.4.2. During construction there will be a number of activities which could potentially reduce surface water quality without mitigation i.e. the use of appropriate construction methods/management. These include:

- Materials handling, storage, stockpiling, spillage and disposal;

- Earthworks involving manipulation of ground levels and re-engineering of existing made ground if/as necessary;
- Excavation and foundation construction within the Site and site preparation;
- Installation of temporary and permanent infrastructure and roads;
- Installation of temporary site accommodation and sanitary facilities;
- Construction of proposed buildings;
- Construction of surface water sewers;
- Construction / installation of surface water attenuation features;
- Formation of landscaping; and
- Movement and use of static and mobile plant/construction vehicles.

12.4.3. Construction activities may lead to the disturbance and mobilisation of physical contaminants (i.e. dust, sediments and muds). During periods of heavy rainfall, vehicle movements resulting in damage to soil structure may generate increased sedimentation within surface water runoff. In addition, during periods of dry, windy weather, wind-blown dusts may be generated by the excavation of soils.

12.4.4. These activities may result in sediments directly or indirectly entering surface water features, thereby affecting the physical, chemical and biological quality of the surface water receptors in the surrounding area.

12.4.5. Contaminants, spilled contaminants and suspended sediments have the potential to affect surface water bodies via surface runoff.

12.4.6. Construction activities such as ground excavation or piling may create new pollutant pathways from the surface to the underlying aquifer.

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12.4.7. Potential ponding of surface water and accidental runoff to the surrounding area may occur whilst the surface water drainage system is being constructed.

12.4.8. Soil compaction on Site may also increase on and off-site flood risk.

Infrastructure – Wastewater Treatment and Sewerage

12.4.9. The existing public sewerage infrastructure could be affected during construction of the new foul sewer connections from the Site.

Summary

12.4.10. The likely effects of the Proposed Development during construction, without mitigation are summarised in **Table 12.7**.

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Table 12.7: Summary of Effects During Construction Phase (Without Mitigation)

Receptor / Receiving Environment	Description of Effect	Sensitivity Value	Magnitude of Effect	Significance of Effects
Croxteth Brook	Pollution and flood risk	Medium	Medium	Moderate Adverse
Fluker's Brook	Pollution and flood risk	Medium	Medium	Moderate Adverse
Ormskirk Road	Pollution and flood risk	Medium	Medium	Moderate Adverse
Existing drainage ditches	Pollution and flood risk	Low	High	Moderate Adverse
Existing ponds	Pollution and flood risk	Low	High	Moderate Adverse
White Man's Dam	Flood risk	Medium	Low	Minor to Moderate Adverse
Site workers and local residents	Flood risk	High	Low	Moderate Adverse
Infrastructure <i>Wastewater treatment and sewerage</i>	Service continuity	Medium	Medium	Moderate Adverse

Operation

Surface Water

12.4.11. The increase in impermeable area and traffic arising from the Proposed Development could potentially increase the risk of contamination of surface runoff due to spillage of contaminants and from flushing of pollutants from the impermeable surfaces.

12.4.12. Contaminated surface runoff could enter local surface water bodies.

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12.4.13. Any development or raising of ground levels within areas considered to be at risk of flooding has the potential to increase flood risk to people, property and elsewhere in the local catchment by displacing floodwaters and flood storage during times of flooding.

12.4.14. If unattenuated, the increase in the extent of impermeable area at the Site would increase the rate of surface water runoff and total runoff volumes to the surrounding area and in turn the level of flood risk.

12.4.15. The large number of people living/visiting/working at the Site has the potential to increase the risk of existing surface waterbodies becoming blocked due to a build-up of debris, tipping of rubbish etc, leading to a change in flood flow dynamics and an increase in flood risk.

Infrastructure – Wastewater Treatment and Sewerage

- 12.4.16. Foul water from the developed site could pollute receptor watercourses.

Summary

- 12.4.17. The likely effects of the Proposed Development during operation, without mitigation are summarised in **Table 12.8**.

Table 12.8: Summary of Effects During Operation Phase (Without Mitigation)

Receptor / Receiving Environment	Description of Effect	Sensitivity Value	Magnitude of Effect	Significance of Effects
Croxteth Brook	Pollution and flood risk	Medium	Medium	Moderate Adverse
Fluker's Brook	Pollution and flood risk	Medium	Medium	Moderate Adverse
Ormskirk Road	Pollution and flood risk	Medium	Medium	Moderate Adverse
Existing drainage ditches	Pollution and flood risk	Low	High	Moderate Adverse
Existing ponds	Pollution and flood risk	Low	High	Moderate Adverse
White Man's Dam	Flood risk	Medium	Medium	Moderate Adverse
New residents and existing local residents	Flood risk	High	Low	Moderate Adverse
Infrastructure <i>Wastewater treatment and sewerage</i>	Increase in loading	Medium	Medium	Moderate Adverse

12.5. Mitigation, Enhancement and Residual Effects

Mitigation by Design

- 12.5.1. The Site is assessed to be at risk of flooding from surface water and groundwater and at a negligible / low risk of flooding from all other identified sources.
- 12.5.2. The risk of flooding will be mitigated through the implementation of the following measures, which will be incorporated within the design of the Proposed Development:
- Finished floor levels to be raised at least 0.15 m above adjacent ground levels following any reprofiling of the Site, with ground levels sloping down from the dwellings.
 - Localised low spots within the Site topography where ponding of surface water is indicated to be retained within proposed landscaped areas. Where this is not feasible the

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Site will be reprofiled accordingly to remove such depressions, thus eliminating any significant risk of surface water flooding in these areas.

- Existing surface water overland flow paths originating off-site managed through the design of the Site.

12.5.3. An outline surface water drainage strategy is presented in Section 6 of the FRDA report (see **Appendix 12.1**). The design principles of the strategy comprise the following:

- The demand for non-potable water within the Proposed Development is considered to be low. As such, the use of rainwater harvesting has been discounted.
- Infiltration testing undertaken by Lithos in April 2025 indicates that soakaways will not provide a suitable drainage solution for surface water runoff. Due to the nature of the underlying ground which has cohesive clay soils infiltration tests did not indicate any soakage potential and rates could not be calculated.
- Surface water runoff will therefore be directed to the existing culvert under Knowsley Lane in the north-west of the Site, which flows into the existing drainage ditch within the wooded area to the west referred to as Aker's Pit, which then discharges to an ordinary watercourse and ultimately Croxteth Brook.
- Peak discharge rates will be restricted to the QMED greenfield runoff rate post development.
- Attenuation storage will be provided to store surface water runoff generated across roofs and hardstanding and has been sized to store the 1.0% AEP event including a 45% increase in rainfall intensity to allow for climate change in accordance with Government guidance.
- SuDS components will be used as part of the surface water drainage strategy in order to provide the necessary surface water attenuation required to restrict runoff rates from the proposed impermeable areas. SuDS are designed both to manage the environmental risks resulting from urban runoff and to contribute wherever possible to environmental enhancement. Therefore, SuDS objectives are to minimise the effects from a development on the quantity and quality of runoff, and maximise amenity and biodiversity opportunities. The use of SuDS within the Proposed Development will reduce pollutant concentrations in stormwater, thus protecting the quality of the receiving waterbody and will also act as a direct buffer for accidental spills by preventing a direct discharge of high concentrations of pollutants to the receiving waterbody.

12.5.4. The pipe network, designed in accordance with Design and Construction Guidance, may be offered for adoption by UU.

12.5.5. SuDS elements within the curtilage of residential dwellings would be the responsibility of the owner of the property and SuDS in open spaces may be maintained by a management company.

12.5.6. A preliminary drainage layout is provided in Appendix G of the FRDA report (see **Appendix 12.1**).

12.5.7. Under the Water Industry Act (1991), developers have a right to connect foul water flows from new developments to public sewer. The Act places a general duty on sewerage undertakers to provide the additional capacity that may be required to accommodate additional flows and loads arising from new domestic development.

12.5.8. UU has advised, by way of a pre-planning sewerage enquiry response (Appendix F of the FRDA report – see **Appendix 12.1**), that there is existing capacity in the local foul sewerage network to receive and treat domestic foul water from the Proposed Development and that foul water can discharge without restriction into the 900 mm diameter combined sewer in Knowsley Lane North.

12.5.9. A 3.0 m easement is required either side of the public foul sewer and private surface water sewer in the north-east of the Site.

Additional Mitigation.

Construction

12.5.10. Potential effects on the water environment through the construction phase would be managed by a range of operational, control and monitoring measures that would act to mitigate the potential effects on surface water, flood risk, land drainage and infrastructure (wastewater treatment and sewerage).

12.5.11. As a matter of course the following would occur; note the principal contractor may use alternative procedures compliant with their own environmental management system. However, the broad approach and content would as a minimum be comparable to the following:

- A Construction Environmental Management Plan (CEMP) or equivalent would be prepared, submitted by the principal contractor and agreed with the local planning authority. The CEMP will set out the methods, including the minimum requirements as agreed between the construction contractor and the local planning authority, by which construction will be managed to avoid, minimise and mitigate any adverse effects on the water environment. The CEMP should cover: Site security; Fuel oil storage, bunding, delivery and use; How both minor and major spillage will be dealt with; Containment of silt/soil contaminated runoff; Disposal of contaminated drainage, including water pumped from excavations; and Site induction for workforce highlighting pollution prevention and awareness;
- All construction works would be designed in accordance with the latest relevant guidelines;
- Contractors undertaking earthworks would develop risk assessments and method statements covering all aspects of their work that have the potential to cause physical damage to structures (e.g. sewerage infrastructure), mobilise large quantities of soil/sediments or block open watercourses. Earth moving operations would be undertaken in accordance with BS 6031: 2009 Code of Practice for Earthworks. These would be incorporated within the CEMP;
- Works affecting soils would follow good practice guides for handling soils which would provide guidance on the use, management and movement of soil on Site;
- Good practice guidance on erosion and pollution control would be followed, e.g. CIRIA Environmental Good Practice on Site (C650) and Control of Water Pollution from Construction Sites (C532);
- The principal contractor would avoid the storage of plant, machinery fuel or materials (including soil stockpiles) alongside watercourses unless unavoidable. Construction works

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should be programmed as far as is practicable to minimise soil handling and temporary soil storage; and

- The refuelling of plant, storage of fuels and chemicals and overnight storage of mobile plant would be within the designated contractor's compound areas. The compounds would contain appropriate facilities for the storage of fuels and chemicals i.e. bunded and locked storage containers, and would also be equipped with spill kits.

12.5.12. The adoption of best practice construction methods and construction management processes would significantly mitigate many of the identified potential environmental effects of the construction phase of the Proposed Development.

12.5.13. Surface water runoff during the construction phase will be carefully controlled with temporary drainage, including pollution prevention control.

12.5.14. Foul water from temporary staff welfare facilities would be contained within sealed storage vessels and disposed of off-site to minimise the risk of surface water contamination. Welfare facilities would only be used for the disposal of domestic wastewater.

Operation

12.5.15. No further mitigation, enhancement or compensation, over and above the 'mitigation by design' detailed in para. 12.5.1 to 12.5.9 is deemed to be necessary for the operational phase.

Table 12.9: 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	Operational, control and monitoring measures including a CEMP.			X
2	Finished floor levels raised at least 0.15 m above adjacent ground levels, with ground levels sloping down from dwellings	X		X
3	Localised low spots within the Site topography where ponding of surface water is indicated to be retained within proposed landscaped areas. Where this is not feasible the Site reprofiled accordingly to remove such depressions.	X		X
4	Existing surface water overland flow paths originating off-site managed through the design of the Site.	X		X
5	Implementation of a surface water drainage strategy, including SuDS.	X		X

Residual Effects

Construction

- 12.5.16. The potential effects on the water environment during the construction phase of the Proposed Development will be managed through a range of control and monitoring measures that would act to mitigate the potential effects on surface water, flood risk, land drainage and infrastructure (wastewater treatment and sewerage).
- 12.5.17. The adoption of best practice construction methods and construction management processes will mitigate the potential environmental effects of the construction phase of the Proposed Development and therefore the Proposed Development will have a **Negligible** residual effect on all identified receptors (surface water, flood risk, land drainage and infrastructure (wastewater treatment and sewerage)).

Operation

- 12.5.18. The implementation of the flood risk mitigation measures and an appropriately designed surface water drainage scheme, including the storage and controlled release of surface water at a peak rate that is significantly less than existing will provide betterment in respect of surface water quality and flood risk.
- 12.5.19. The Proposed Development therefore has the potential to have a **Minor Beneficial** effect on surface water quality and flood risk to the existing drainage ditch to which it is proposed to discharge surface water runoff, with a **Negligible** residual effect on the wider water environment.

12.6. Cumulative and In-Combination Effects

- 12.6.1. **Chapter 2** details the schemes to be considered in the assessment of cumulative effects.
- 12.6.2. In accordance with the NPPF and the supporting PPG, the planning application for any committed or pending developments within the vicinity of the Site should be accompanied by a site-specific FRA and / or DA. This should include appropriate flood risk mitigation measures and an outline surface water drainage strategy demonstrating how runoff will be managed so as not to increase flood risk elsewhere over the lifetime of the development (i.e. taking climate change into account), with betterment provided where possible. Appropriate mitigation should also be incorporated into the construction and operational phases of the committed schemes to ensure that surface water runoff is not contaminated and adversely affected.
- 12.6.3. Details of the mitigation measures would subsequently need to be approved in writing by the local planning authority (or other relevant body) prior to the construction of all approved schemes.
- 12.6.4. Recognising the above, the schemes would be expected to have a Negligible effect on surface water, flood risk, land drainage and infrastructure (wastewater treatment and sewerage) even if all developments are operational. In turn, this would be expected to have a Negligible effect on the Proposed Development.

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12.7. Summary

Introduction

- 12.7.1. The Flood Risk and Drainage chapter provides an assessment of the potential significant environmental effects associated with the Proposed Development in relation to surface water, flood risk, land drainage and infrastructure (wastewater treatment and sewerage).

Baseline Conditions

- 12.7.2. An assessment of the baseline conditions at the existing site and within the surrounding area has been undertaken, including a desktop study, a site specific Flood Risk and Drainage Assessment (FRDA) (including an outline surface water drainage strategy) and consultation with relevant bodies. Receptors of potential environmental effects from the Proposed Development have been identified, with the effects assessed, where required mitigation measures proposed and the residual effects have been identified and evaluated.
- 12.7.3. Croxteth Brook is located approximately 850 m to the west of the Site. The head of Fluker's Brook is located approximately 90 m to the south-west of the Site and a watercourse referred to as Ormskirk Road located approximately 190 m to the north of the Site, with both ultimately outfalling to Croxteth Brook.
- 12.7.4. Existing drainage ditches and ponds are present within the two wooded areas, known as Spookies Wood, in the centre of the Site. Ordnance Survey mapping also indicates the presence of a number of drainage ditches and ponds within the locality of the Site. White Man's Dam is located approximately 800 m to the east of the Site.
- 12.7.5. The Site is located within the catchment of the "Croxteth/Knowsley Brook" water body. The water body has been assessed under the Water Framework Directive. The current ecological status is 'Moderate', whilst the chemical status is 'Fail'.
- 12.7.6. The Environment Agency (EA) Flood Map for Planning (Flood Zones 2 and 3) dataset indicates the Site to be located in flood zone 1 and the Flood Map for Planning (River and Sea without Defences) dataset indicates that the Site is not at risk of fluvial flooding when accounting for climate change.
- 12.7.7. The Long Term Flood Risk (Surface Water) dataset indicates that the Site is not at risk of flooding from the drainage ditches and ponds within the locality. Ponding of surface water is indicated in several areas across the Site representing local depressions in the existing topography, and several overland flow routes develop in a Low and Medium risk event; however, the areas of identified risk are relatively confined.
- 12.7.8. The Long Term Flood Risk (Reservoirs) dataset indicates that the Site is not at risk of flooding from such sources, except for a small area in the south-west, which appears to be associated with a failure of the southern tip of White Man's Dam.
- 12.7.9. There are no canals or other water impounding structures located within the immediate vicinity of the Site.
- 12.7.10. The JBA Groundwater Flood Risk Indicator map indicates that groundwater levels at the Site may be <0.025 m below ground level (defined as High risk) during a 1.0% AEP groundwater flood event. However, due to the topography of the Site and surrounding area, any groundwater emerging at the surface would be expected to be directed east, away from the areas of Proposed

Development and the Site, towards Knowsley Lane, Fluker's Brook and Croxteth Brook. As such, this would not be expected to accumulate to any significant depth at the Site itself.

- 12.7.11. The Site currently comprises greenfield land. As such, no formal drainage is expected to be present. Soil conditions at the Site and within the surrounding area are described as slowly permeable seasonally wet loamy and clayey soils. Drainage rates were not sufficient to allow calculation of infiltration rates during soakaway testing undertaken by Lithos in April 2025. Given the topography and ground conditions at the Site, surface water runoff would currently be expected to slowly infiltrate where conditions allow and flow overland towards Knowsley Lane.
- 12.7.12. An extract of the public sewer records obtained from UU indicate that a 225 mm diameter public foul sewer and 150 mm private surface water sewer cross the Site in the north-east, between Parklands and Berry Hill Avenue. A 225 mm diameter public foul sewer and 225 mm public surface water sewer are located to the north of the Site boundary in Home Farm Road.

Likely Significant Effects

- 12.7.13. Receptors of potential environmental effects from the Proposed Development have been identified and include Croxteth Brook, Fluker's Brook, Ormskirk Brook, existing drainage ditches and ponds, White Man's Dam, site workers (construction phase), new residents (operation phase) and existing local residents, and infrastructure (wastewater treatment and sewerage).
- 12.7.14. The effects of the Proposed Development on the identified receptors during the construction and operational phases have been assessed and could reduce surface water quality, increase flood risk and increase foul water discharges to the public sewer network. This has the potential to have a **Moderate Adverse** effect on the water environment, without mitigation.

Mitigation and Enhancement

- 12.7.15. Mitigation by design includes implementation of a surface water strategy (including the incorporation of sustainable drainage systems), raising finished floor levels to cater for event exceedance, reprofiling of the Site to remove existing depressions, thus eliminating any significant risk of surface water flooding and managing existing surface water overland flow paths originating off-site.
- 12.7.16. Potential effects on the water environment through the construction phase would be managed by a range of operational, control and monitoring measures that would act to mitigate the potential effects on surface water, flood risk, land drainage and infrastructure (wastewater treatment and sewerage), including the implementation of a Construction Environmental Management Plan (CEMP).
- 12.7.17. UU has advised that there is existing capacity in the local foul sewerage network to receive and treat domestic foul water from the Proposed Development.
- 12.7.18. The residual effect on the water environment during the construction phase of the Proposed Development as a result of the measures implemented through the CEMP is considered to be **Negligible**.
- 12.7.19. With the implementation of the flood risk mitigation measures and an appropriately designed surface water drainage scheme, including the storage and controlled release of surface water at a peak rate that is significantly less than existing will provide betterment in respect of flood risk. The Proposed Development therefore has the potential to have a **Minor Beneficial** effect on

Flood Risk and Drainage

surface water quality and flood risk to the existing drainage ditch to which it is proposed to discharge surface water runoff, with a **Negligible** residual effect on the wider water environment.

Conclusion

- 12.7.20. The identified mitigation measures will result in a residual significance of environmental effects on the water environment which is assessed to be **Negligible with a Minor Beneficial effect** in respect of the quality of surface water and reduced flood risk to the existing drainage ditch to which it is proposed to discharge surface water runoff, with a **Negligible** residual effect on the wider water environment.
- 12.7.21. **Table 12.8** provides a summary of effects, mitigation and residual effects.

Table 12.10: 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								
Croxteth Brook	Pollution and flood risk	Temporary / Indirect	Medium	Medium	Borough	Moderate Adverse	Operational, control and monitoring measures including a CEMP.	Negligible
Fluker's Brook	Pollution and flood risk	Temporary / Indirect	Medium	Medium	Borough	Moderate Adverse		Negligible
Ormskirk Road	Pollution and flood risk	Temporary / Indirect	Medium	Medium	Borough	Moderate Adverse		Negligible
Existing drainage ditches	Pollution and flood risk	Temporary / Direct	Low	High	Local	Moderate Adverse		Negligible
Existing ponds	Pollution and flood risk	Temporary / Direct	Low	High	Local	Moderate Adverse		Negligible
White Man's Dam	Flood risk	Temporary / Indirect	Medium	Low	Local	Minor to Moderate Adverse		Negligible
Site workers and local residents	Flood risk	Temporary / Indirect	High	Low	United Kingdom	Moderate Adverse		Negligible
Infrastructure Wastewater treatment and sewerage	Service continuity	Temporary / Direct	Medium	Medium	Regional	Moderate Adverse		Negligible

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Operation								
Croxteth Brook	Pollution and flood risk	Permanent / Indirect	Medium	Medium	Borough	Moderate Adverse	Flood risk mitigation measures. Surface water drainage strategy including SuDS.	Negligible
Fluker's Brook	Pollution and flood risk	Permanent / Indirect	Medium	Medium	Borough	Moderate Adverse		Negligible
Ormskirk Road	Pollution and flood risk	Permanent / Indirect	Medium	Medium	Borough	Moderate Adverse		Negligible
Existing drainage ditches	Pollution and flood risk	Permanent / Direct	Low	High	Local	Moderate Adverse		Minor Beneficial
Existing ponds	Pollution and flood risk	Permanent / Direct	Low	High	Local	Moderate Adverse		Negligible
White Man's Dam	Flood risk	Permanent / Indirect	Medium	Medium	Local	Moderate Adverse		Negligible
New residents and existing local residents	Flood risk	Permanent / Indirect	High	Low	United Kingdom	Moderate Adverse		Negligible
Infrastructure Wastewater treatment and sewerage	Increase in loading	Permanent / Direct	Medium	Medium	Regional	Moderate Adverse		Negligible