

The West Midlands Rail Freight Interchange Order 201X
ES - Vol 1 - Chapter 16: Water Environment and Flood Risk
Regulation 5(2)(a)
Ramboll - July 2018

16 Water Environment and Flood Risk

Introduction

- 16.1 This chapter of the ES assesses the likely significant environmental effects of the Proposed Development on the water environment. In particular, this chapter describes the relevant legislation and water environment policy context; the methods used for assessment and details of the criteria used to determine significance; the baseline water environment conditions at and surrounding the Site; the potential impacts and effects as a result of the Proposed Development; any mitigation or control measures required to reduce or eliminate adverse effects; and the subsequent residual effects and likely significant effects associated with the Proposed Development.
- 16.2 This chapter is accompanied by the following technical appendices presented within ES Volume 2:
- Technical Appendix 16.1: Flood Risk Assessment (FRA);
 - Technical Appendix 16.2: Water Framework Directive (WFD) Assessment; and
 - Technical Appendix 16.3: Drainage Strategy.
- 16.3 This chapter is written by Ramboll.

Legislation and Policy Context

International Legislation and Policy

- 16.4 The European Union Water Framework Directive (WFD) (2000/60/EC) is enacted in England through River Basin Management Plans (RBMP). The country is divided into river basin districts and the plan for each district is reviewed and renewed on a six year cycle, the first of which ended in 2015.
- 16.5 River Basin Management Plans require that water quality and the pressures on water quality within main rivers, estuaries, coastal waters, reservoirs and groundwater are monitored. At the end of each cycle, each body of water is monitored for its chemical and biological quality and the Environment Agency (EA) assess the potential for improvements to be incorporated within the next cycle.
- 16.6 Watercourses that are designated as 'heavily modified', due to substantial changes to the hydromorphological status of the watercourse caused by human activity, have a maximum overall status target of 'good potential', whereas natural watercourses can be expected to achieve 'high' status.

National Legislation and Policy

National Policy Statement for National Networks, December 2014¹

- 16.7 Paragraphs 5.90 to 5.115 of the National Policy Statement for National Networks² (the 'NPS') details policy in relation to flood risk.
- 16.8 Paragraphs 5.90 to 5.97 detail the requirements for FRAs to accompany applications. These sections refer to the requirements of the National Planning Policy Framework (NPPF)², and

state that an FRA is required to accompany all applications for development that is either situated within Flood Zones 2 or 3, situated in Flood Zone 1 but greater than 1 ha in size, or situated in an area identified by the Local Planning Authority to be within a critical drainage area. FRAs are required to assess all forms of flooding to and from the development site and detail how flood risk will be managed as part of the development, taking into consideration the predicted effects of climate change. Paragraph 5.96 also identifies the need to consult with the EA, as well as other relevant flood risk management bodies, as part of the application process.

- 16.9 Paragraphs 5.98 to 5.104 of the NPS detail the requirements to manage flood risk as part of new development and state that in addition to an appropriate FRA, the sequential test is to be applied as part of the development site selection process, in line with the requirements of the NPPF. Paragraph 5.100 details the need for drainage systems to be approved as part of development consent and the requirement to comply with the Flood and Water Management Act 2010³, which states that consideration should be given to the use of Sustainable Drainage Systems (SuDS) where appropriate.
- 16.10 Further detail regarding the application of the sequential test and, where applicable, the exception test, is provided in paragraphs 5.105 to 5.09, stating that development should be directed to areas at low risk of flooding in the first instance.
- 16.11 Further detail regarding the consideration of SuDS as part of new drainage systems is provided in paragraphs 5.110 to 5.115, stating the need to mitigate surface water flood risk and manage the impact of the natural water cycle to people, property and ecosystems.

National Planning Policy Framework, 2012

- 16.12 Further information regarding the flood risk policies detailed in the NPS is provided in Section 10 the NPPF, particularly in relation to the application of the sequential and exception test. Technical guidance on assessing flood risk and development suitability is provided in the National Planning Practice Guidance (2014)⁴, as detailed in the following section.
- 16.13 With relevance to water quality, Section 11 of the NPPF (Conserving and Enhancing the Natural Environment) states that the planning system should contribute to and enhance the local environment, in part by preventing both new and existing development from being put at unacceptable risk or from being adversely affected by unacceptable levels of water pollution.

National Planning Practice Guidance, 2014

- 16.14 The National Planning Practice Guidance (2014) section entitled "*Flood Risk and Coastal Change*" details technical guidance on how to assess risks associated with flooding and coastal change during the planning process. This includes details regarding both for individual development site FRAs and wider Local Plan flood risk policy and the preparation of Strategic Flood Risk Assessments (SFRA).

Water Resources Act 1991 (Amendment) Regulations 2009⁵

- 16.15 The Water Resources Act introduced or consolidated regulations concerning water quality, pollution and flooding.
- 16.16 The Act assigns the EA as the governing body for all matters concerning controlled waters and gives them legal powers to prosecute for offences.

¹ Department for Communities and Local Government. National Policy Statement for National Networks. [Online] 2014. [Cited: 23rd Dec 2016]

² Department for Communities and Local Government. National Planning Policy Framework. [Online] 2012. [Cited: 23rd Dec 2016]

³ Flood and Water Management Act 2010 [2010]

⁴ Department for Communities and Local Government National Planning Practice Guidance. [Online] 2014. [Cited 23rd Dec 2016]

⁵ Water Resources Act 1991 (Amendment) Regulations 2009 [2009]

16.17 Under the Water Resources Act it is an offence to 'knowingly permit poisonous, noxious or polluting matter or any solid waste to enter controlled waters'. Controlled waters include all groundwater, watercourses, reservoirs/lakes/lochs and coastal waters to the UK offshore territorial limit (within 3 miles).

Climate Change Allowances 2016⁶

16.18 As of the 19th February 2016, the EA have introduced new policy regarding the required climate change allowances to be taken into account for fluvial and surface water design flows for new development.

Sustainable Drainage Systems: Non-Statutory Technical Standards⁷

16.19 Section 3 of the non-statutory technical standards sets out that the peak runoff rate from a Proposed Development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge prior to development for that event.

CIRIA 753: The SuDS Manual⁸

16.20 CIRIA 753: The SuDS Manual provides best practice guidance on the planning, design, construction and maintenance of SuDS to facilitate their effective implementation within development.

Regional Policy

16.21 There are no relevant, adopted regional policies that direct the assessment of water quality away from the approach outlined in the national and local policies set out here. However, of note, as the Lead Local Flood Authority (LLFA), Staffordshire County Council (SCC) are responsible for approving surface water drainage strategies for new development within Staffordshire. SCC have prepared a Local Flood Risk Management Strategy⁹ (LFRMS) which sets out their requirements for managing flood risk. Part 1 of the LFRMS details the council's roles and responsibilities regarding flood risk management and Part 2 details the council's policies and procedures.

Local Policy

South Staffordshire Core Strategy DPD, 2012¹⁰

16.22 The South Staffordshire Core Development Plan Document (DPD) (December 2012) outlines the council's development policies to protect open countryside and greenfield land. This includes a policy on water quality (EQ7) under Core Policy 3: Sustainable Development and Climate Change. This aims to ensure that new development does not have a detrimental impact on water quality either through surface water runoff, groundwater or wastewater treatment.

South Staffordshire Strategic Flood Risk Assessment 2014¹¹

16.23 The South Staffordshire, Cannock Chase, Lichfield and Stafford SFRA (June 2014) provides information regarding flood risk within the area from all sources, and details the council's flood risk policy. This includes various flood maps for the study area.

South Staffordshire Surface Water Management Plan¹²

16.24 The South Staffordshire Phase 1 Surface Water Management Plan (SWMP) (July 2010) details historic and current surface water flood risk in the area and the council's policies to manage surface water in the future. South Staffordshire also have a Phase 2 SWMP prepared specifically for Penkridge Village.

South Staffordshire Climate Change Strategy 2008¹³

16.25 The South Staffordshire Climate Change Strategy (2008) details the council's policies to manage climate change in the future for various development sectors.

Assessment Methodology

Baseline Characterisation

16.26 A desk based review of available information was undertaken to establish the baseline conditions for the Site and its immediate surroundings. In addition to the policy documentation detailed above, this also included the following:

- A Flood Risk Assessment for the Proposed Development by Ramboll (Technical Appendix 16.1);
- A Water Framework Directive (WFD) Assessment for the Proposed Development by Ramboll (Technical Appendix 16.2);
- A topographical survey of the Site by Greenhatch Group (Drawing Reference: 23228__T_F1, March 2016);
- The EA indicative flood risk maps and detailed flood modelling data and flood mapping for the Site¹⁴; and
- British Geological Survey (BGS) maps¹⁵.

16.27 A number of site visits have been undertaken and observations from these site visits have been utilised within this chapter.

Assessment Methodology

Scope of the Assessment

16.28 This section summarises the methodology used to assess the likely significant environmental effects of the Proposed Development on the water environment.

Spatial Scope

16.29 This assessment considers effects on receptors within the Site as well as potential effects on off-site receptors, depending on their sensitivity and vicinity to the Site. A development of this scale is unlikely to have widespread effects on a main river at catchment scale. On this basis the closest water features to the Site have been identified as the primary receptors, limited to a maximum search radius of 2km, which is considered appropriate for this assessment.

Temporal Scope

16.30 The assessment considers a time period from the present day through the demolition phase, the phased construction and operational phase and, once the Proposed Development is complete, the operational and the decommissioning phase.

⁶ Environment Agency Climate Change Allowances [Online] 2016. [Cited: 23rd Dec 2016]

⁷ Sustainable Drainage Systems: Non-Statutory Technical Standards [Online] [Cited 23rd Dec 2016]

⁸ CIRIA, CIRIA 753: The SuDS Manual [Online] 2016 [Cited: 23rd Dec 2016]

⁹ Staffordshire County Council Local Flood Risk Management Strategy. [Online]. [Cited 19th January 2017]

¹⁰ South Staffordshire Core Strategy Development Plan Document, [Online] December 2012 [Cited 23rd Dec 2016]

¹¹ South Staffordshire Strategic Flood Risk Assessment [Online] 2014 [Cited: 23rd Dec 2016]

¹² South Staffordshire Surface Water Management [Online] Plan 2010 [Cited: 23rd Dec 2016]

¹³ South Staffordshire Climate Change Strategy [Online] 2008 [Cited: 23rd Dec 2016]

¹⁴ Environment Agency, "Flood Map for Planning," 2016. [Online] [Cited 17th January 2017]

¹⁵ British Geological Society, "Geology of Britain Viewer," 2016. [Online] [Cites 17th January 2017]

Technical Scope

- 16.31 The assessment will consider the potential effects of the Proposed Development on the water environment. This includes:
- flood risk from all sources, both to the Site and to downstream receptors;
 - changes in water quality;
 - impact upon water supply; and
 - impact upon sewer network capacity.
- 16.32 Effects on groundwater are assessed within Chapter 11: *Ground Conditions* of this ES. Scoping was undertaken in conjunction with the other disciplines included within the EIA and this chapter has been prepared based on the Scoping Opinion and the responses received by the Secretary of State and statutory consultees. Further detail regarding the Scoping Opinion and responses is provided later in this chapter.
- 16.33 The Proposed Development has the potential to affect water quality within surface water bodies during demolition and construction or operation or by affecting changes to water quality variables such as temperature, base flow, sediment loads and turbidity, organic matter, pH and biological/chemical oxygen demand.
- 16.34 The Proposed Development has the potential to effect local hydrology and the volumes and direction of surface water runoff. The baseline hydrological features of the area include catchments, site topography and surface water flow paths. The assessment will focus on how the demolition and construction, and, operational phases of the Proposed Development might change these baseline features.
- 16.35 The Proposed Development has the potential to affect both the flood risk and hydrological regime at the Site and flood risk to downstream receptors. Assessment of flood risk within the chapter is based on the findings of the accompanying FRA Report (ES Volume 2: Technical Appendix 16.1) and the proposed surface water Drainage Strategy for the Site included as Technical Appendix 16.3.
- 16.36 The following information sources were used to establish the effects that the Proposed Development might have on the water environment:
- The Proposed Development Surface Water Drainage Strategy Plan by Waldeck Consulting (Report Reference 1516-0425-WDK-SI-RP-D-002 Rev 03, March 2018) (Technical Appendix 16.3); and
 - The Outline Demolition and Construction Environmental Management Plan (ODCEMP) for the Proposed Development (Technical Appendix 2.3).

Consultation

- 16.37 As part of the FRA, Ramboll have obtained Environment Agency (EA) detailed flood maps and flood modelling data for the Site. The EA detailed flood data is included within the FRA Appendices.
- 16.38 Consultation has also taken place with statutory consultees with regard to the Site hydrology, flood risk and water resources as part of the scoping consultation.
- 16.39 A summary of the response to the scoping report with regard to the water environment is shown in Table 16.1 below:

Stakeholder	Summary	Comment
Staffordshire County Council (SCC)	As LLFA, SCC request the drainage strategy to be developed in line with their planning requirements.	Included as Technical Appendix 16.3
Environment Agency	Confirm requirements for FRA in line with NPS and NPPF requirements to accompany DCO application.	Addressed within the FRA included as Appendix 16.1
Canal and River Trust	Staffordshire and Worcestershire Canal and Hatherton Canal to be assessed as a potential sensitive receptor as part of the EIA.	Addressed in this chapter.
Highways England	Request receipt of potential residual impacts relating to flood risk and surface water runoff following completion of FRA.	Addressed in this chapter.
Severn Trent Water	Request that surface water flows from the Proposed Development are discharged off-site via alternative means to connection to the Severn Trent Water sewerage network, e.g. to adjacent watercourses; request to confirm foul flow rates from the Site to the public sewer network as part of the planning application process.	To be confirmed post-consent (as a DCO Requirement)

Method of Assessment

- 16.40 The methodology for assessing the effect on the water environment is as follows:
- Establishment of the baseline conditions, identification and description of watercourses and standing water bodies, hydrogeology, geology, topography and existing utilities at the Site, including sewerage and water supply infrastructure;
 - Establishment of potential sensitive receptors both within the baseline water environment (existing situation) and future potential receptors as a result of the Proposed Development in relation to the water environment;
 - Determination of the sensitivity of each receptor identified;
 - Assessment of the effects from the demolition and construction and operational phases of the Proposed Development on the identified sensitive receptors;
 - Identification of any necessary mitigation measures, if required; and
 - Reference to the findings of the FRA (which has been carried out in accordance with NPS and NPPF guidance) and WFD Assessment to assess the effects of flood risk to the Site.
- 16.41 The demolition and construction phase of the Proposed Development will be phased, with some parts of the Site beginning operation while other parts remain under construction. With regard to this assessment, all activity relating to the construction of the Proposed Development, including the indicative phased construction stages, are considered under the *demolition and construction phase* assessment. Similarly, all aspects relating to the operation of the Proposed Development, including the indicative phased operational stages, are considered under the *operational phase* assessment. All assumptions relating to the phased construction and operation are discussed under *Design Strategy* below.
- 16.42 The mitigation requirements for both the construction and demolition and operational phases of the Proposed Development have been established on the basis that the measures discussed under *Design Strategy* have already been taken into consideration.

Significance Criteria

- 16.43 Impact assessment refers to the change that is predicted to take place to the existing condition of the environment as a result of the Proposed Development. The resultant effect is then identified.
- 16.44 The significance of an effect is generally determined as the combination of the sensitivity and/or value of the affected environmental receptor and the predicted extent and/or magnitude of the impact or change. The assessment of significance can rely on complex interactions and ultimately relies on professional judgement, although comparing the extent of the effect with criteria and standards specific to each environmental topic can guide this judgement. Details of criteria specific to this assessment, are defined in Table 16.2 and Table 16.3. Table 16.4 outlines the significance matrix of effects.

Receptor Sensitivity/Value

- 16.45 The sensitivity of the receptor is dependent on a number of factors such as legislation and policy protecting that receptor; the ability of the receptor to absorb changes to the environment without significant effects on the function, services or health of that receptor; the uniqueness or rarity of that receptor either on a local, regional or national/international scale; and existing pressures on the receptor from other sources and its current quality.
- 16.46 It is important to note that a receptor can be equally sensitive to change if its status or current quality is low and hence it may not be resilient to environmental changes; or of very good status or quality in which case it may be resilient but also of very high value as a resource. This highlights the need for professional judgement in each case rather than an absolute application of fixed criteria.
- 16.47 Table 16.2 below defines the criteria for each receptor sensitivity/ value with regards to water quality, flood risk and surface water receptors.

Table 16.2: Sensitivity/ Value of water quality, flood risk and surface waters receptors	
Receptor Sensitivity/ Value	Description
Very High	<p>The receptor is of very high value.</p> <ul style="list-style-type: none"> The receptor is protected by national or international legislation and any change to the baseline conditions would be subject to stringent control. The receptor either has no ability to absorb change without its status, quality or value being affected, either through the effects of existing pressures or through its very high baseline quality. Existing pressures on the receptor are at or above carrying capacity and any change could lead to significant environmental harm, loss of life, major damage or economic loss to property.
High	<p>The receptor is of high value.</p> <ul style="list-style-type: none"> The receptor is protected by national or international legislation and any change to the baseline conditions would be subject to stringent control. The receptor either has limited or no ability to absorb change without its status, quality or value being affected, either through the effects of existing pressures or through its very high baseline quality.

Table 16.2: Sensitivity/ Value of water quality, flood risk and surface waters receptors	
	<ul style="list-style-type: none"> Existing pressures on the receptor may be such that a small change in the baseline conditions could tip the balance and lead to significant environmental harm, harm to life and economic loss of property.
Medium	<p>The receptor may have some value and may be afforded protection by regional or local legislation or policy or be of some value to stakeholders.</p> <ul style="list-style-type: none"> The receptor has moderate ability to absorb change without its status, quality or value being affected. Existing pressures on the receptor are such that small effects will not tip the balance, or cause harm to life or economic loss of property.
Low	<p>The receptor is of limited value or rarity.</p> <ul style="list-style-type: none"> The receptor is resilient and can absorb significant change to the baseline conditions without effects to its status or value.

Impact Magnitude

- 16.48 Magnitude can be described as the level of change against the baseline conditions. Also included within the assessment of magnitude are the likelihood of whether an effect will occur and the spatial or temporal spread of such an effect. For an effect to occur in relation to water quality, a pathway must be established between the source pollutant/activity to the receptor.
- 16.49 Table 16.3 below defines the criteria for each magnitude of impact with regard to water quality, flood risk and surface water receptors.

Table 16.3: Impact Magnitude on baseline water quality, flood risk and surface water receptors	
Magnitude of Impact	Description
High	<p>The Proposed Development would cause a major change to existing environmental conditions, and WFD status.</p> <ul style="list-style-type: none"> Either an acute and severe short-term change with the potential for long term secondary impacts; or a chronic but long term/permanent change to the baseline conditions. Impacts may be detectable over a large area. Activities that would cause a clear breach or fail of statutory policy or legislation. Major negative changes to WFD status.
Medium	<p>The Proposed Development would cause a noticeable change to existing environmental conditions, and WFD status.</p> <ul style="list-style-type: none"> A change to the baseline conditions that can occur over the short or long term. The impact may be contrary to guidance or objectives set by statutory or non-statutory stakeholders.
Low	<p>The Proposed Development would cause a small change to existing environmental conditions, and WFD status.</p> <ul style="list-style-type: none"> A measurable but temporary or small-scale effect to the water environment with no lasting effects.

Table 16.3: Impact Magnitude on baseline water quality, flood risk and surface water receptors	
	<ul style="list-style-type: none"> Impacts are confined to the immediate surroundings of the Proposed Development. Although a detectable change has occurred, it is in line with the relevant policy and guidance.
Negligible	<p>The Proposed Development would cause no discernible change to existing environmental conditions, and WFD status.</p> <ul style="list-style-type: none"> No measurable change against the baseline. No feasible pathway can be established. No change to WFD status.

Character

16.50 The Character of the impact is also described as either:

- Adverse, neutral or beneficial;
- Temporary or permanent; and
- Direct, indirect or secondary.

Significance of Effects on Water, Flood Risk & Surface Waters

16.51 The significance of an effect is assessed as a factor of magnitude versus sensitivity, and assigned a category of major, moderate, minor or negligible. A matrix is provided in Table 16.4 below to indicate how the significance of an effect is assessed; significant effects in the context of the EIA Regulations are bolded.

Table 16.4: Effect Significance Matrix for Water, Flood Risk and Surface Waters				
Receptor Sensitivity/ Value	Impact Magnitude			
	High	Medium	Low	Negligible
Very High	Major	Major	Moderate	minor
High	Major	Moderate	Minor	Negligible
Medium	Moderate	minor	Negligible	Negligible
Low	minor	Negligible	Negligible	Negligible

16.52 Effects are considered to be significant when the resultant significance of effect is found to be either Moderate or Major.

16.53 Therefore, mitigation measures will need to be considered where an adverse effect is Moderate or Major but may also be prescribed for Minor effects where appropriate (e.g. where a Minor significant effect is reached from a Moderate magnitude effect versus Low sensitivity receptor). Effects are re-assessed post-mitigation with the aim that Major or Moderate effects are reduced to Minor, Negligible or, where possible, enhanced further.

Assumptions and Limitations

16.54 The findings and opinions in the report are based upon information derived from a variety of information sources. Ramboll believe these information sources to be reliable.

Baseline Conditions

Current Baseline

16.55 This section summarises the characteristics of the existing water environment conditions of the Site and the surrounding area. This includes the site setting in relation to watercourses and surface water features, the geological setting and hydrogeological setting (as they relate to the water environment – more detail on these items is presented in Chapter 11: *Ground Conditions* of this ES), water resources and flood risk.

Water Environment

16.56 The water environment is illustrated in Figure 3 included within Technical Appendices 16.1 and 16.2.

16.57 The Staffordshire and Worcestershire Canal passes along the southern and south-eastern boundary of the Site, in a broadly east-west direction, before turning north to pass through the Site in a broadly north-east direction. A second canal, Hatherton Canal, joins with the Staffordshire and Worcestershire Canal approximately 350m south-east of the Site boundary.

16.58 Two canal feeder reservoirs, Calf Heath Reservoir and Gailey Reservoir, are situated immediately adjacent to and approximately 500m north-east of the north-eastern Site boundary. These are both linked to the Staffordshire and Worcestershire Canal via a partially culverted watercourse situated partly within the Site, along the northern Site boundary, as well as to Hatherton Canal via a partially culverted watercourse to the east and south east of the Site.

16.59 The Staffordshire and Worcestershire Canal is classified within the WFD Assessment as an artificial water body and does not comply with the requirements of the WFD, classified as being of moderate quality. Hatherton Canal is considered to be of similar quality under the WFD assessment.

16.60 The River Penk is situated approximately 1km south-west of the Site at its closest point, although it is generally situated approximately 1.5km to the west of the Site, and flows broadly in south-north direction. An unnamed drainage watercourse passes through the Site, beginning in the north-west part of the Site and flowing broadly in a north-west direction to join with the River Penk approximately 1.5km north-west of the Site.

16.61 Saredon Brook is situated approximately 350m to the south of the Site and flows in a broadly east-west direction. It joins with the River Penk approximately 1km south-west of the Site.

16.62 In addition to this, several land drains, drainage ditches and ponds are present within and adjacent to the Site. Almost all field boundaries within the Site comprise a hedgerow and associated ditch, some of which hold water seasonally. The Surface Water Drainage Report for the Proposed Development, included in Technical Appendix 16.3, identifies 8 separate surface water catchments across the Site, with 3 discharging to the River Penk, 3 discharging to the Staffordshire and Worcestershire Canal and 2 understood to collect runoff via a series of ditches prior to a combination of infiltration and evaporation.

16.63 The River Penk is the largest tributary of the River Sow, for which the confluence is located at Stafford to the north, approximately 17km downstream of the Site. The Sow is a tributary to the River Trent, and joins the Trent at Great Haywood / Shugborough, approximately 24km downstream of the Site.

16.64 The ecological quality of the River Penk currently is not in compliance with the WFD, having a classification of less than 'good', attributable to overall poor ecological quality. Mitigation measures proposed by the EA are scheduled to begin in 2020.

16.65 Saredon Brook is classified under the WFD as being a heavily modified water body (HMWB), most likely associated with its use for flood protection and changes from its natural state caused by passage through an urban area. It too does not comply with the requirements of

the WFD and is classified as being of moderate quality. Mitigation measures proposed by the EA are also proposed to begin in 2020.

16.66 The water environment is described in further detail with regards to the ecological value of watercourses in the WFD Assessment, included in Technical Appendix 16.2.

Geology and Hydrology

16.67 The Site is underlain by Wildmoor Sandstone Formation bedrock and superficial deposits comprising Devensian sands and gravels.

16.68 Definitions for the aquifer types are provided below based on those provided by the EA website:

- Principal Aquifer: "layers of rock or drift deposits that have high intergranular and/ or fracture permeability – meaning they usually provide a high level of water storage. They may support water and/ or river base flow on a strategic scale."
- Secondary A aquifer: "permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers."
- Secondary B aquifer: "predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers."
- Secondary 'undifferentiated' aquifer: "it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type."

16.69 The EA maps show the Site to be underlain by a Principal Aquifer associated with the bedrock formation; and a Secondary A aquifer associated with the superficial deposits.

16.70 The EA has developed Groundwater Source Protection Zones (GSPZ) to assist in assessing the risk to groundwater supplies taken from an abstraction point. Definitions for the SPZ types are provided below based on those provided by the EA website:

- Inner zone (Zone 1): "Defined as the 50 day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres."
- Outer zone (Zone 2): "Defined by a 400 day travel time from a point below the water table. The previous methodology gave an option to define SPZ2 as the minimum recharge area required to support 25 per cent of the protected yield. This option is no longer available in defining new SPZs and instead this zone has a minimum radius of 250 or 500 metres around the source, depending on the size of the abstraction."
- Total catchment (Zone 3): "Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. In confined aquifers, the source catchment may be displaced some distance from the source. For heavily exploited aquifers, the final Source Catchment Protection Zone can be defined as the whole aquifer recharge area where the ratio of groundwater abstraction to aquifer recharge (average recharge multiplied by outcrop area) is >0.75 . There is still the need to define individual source protection areas to assist operators in catchment management."
- Special interest (Zone 4): "A fourth zone SPZ4 or 'Zone of Special Interest' was previously defined for some sources. SPZ4 usually represented a surface water catchment which drains into the aquifer feeding the groundwater supply (i.e. catchment draining to a disappearing stream). In the future this zone will be incorporated into one of the other zones, SPZ 1, 2 or 3, whichever is appropriate in the particular case, or become a safeguard zone."

16.71 The majority of the Site is situated within a Total Catchment (Zone 3) GSPZ, aside from the north-western part of the Site, which is situated within an Outer Zone (Zone 2) GSPZ.

16.72 Overall the geology/hydrogeology underlying the Site indicates high permeability and high sensitivity to environmental change and pollution.

Flood Risk

16.73 Flood risk is considered in full within the FRA report, however a brief summary is provided below.

16.74 According to the EA indicative flood maps, the Site is situated within Flood Zone 1, at less than a 0.1% (1 in 1000 annual probability of tidal/ fluvial flooding). Therefore tidal and fluvial flood risk to the Site is considered to be low.

16.75 The EA maps show that some parts of the Site may be susceptible to surface water flooding in discreet areas, although the vast majority of the Site is considered to be at low risk of surface water flooding.

16.76 A small part of the northern boundary of the Site is shown to be at risk of Reservoir flooding, although this is considered to be a very low risk due to the statutory requirements for management and monitoring of reservoirs.

Sewerage Infrastructure

16.77 The topographical and utilities survey data does not identify any public sewerage infrastructure within the Site, aside from highways drainage infrastructure serving the A449 and Straight Mile Road. It is considered most likely that surface water flows from existing properties within the Site discharge via private drainage infrastructure either to surface water bodies or to ground and that foul flows discharge to private treatment facilities.

Water Supply Infrastructure

16.78 The utilities survey information identifies water supply infrastructure within the Site, serving existing properties, broadly to the north-east, north-west and south of the Site.

Water Resources

16.79 There is one surface water abstraction source situated immediately adjacent to the south-east Site boundary and the Staffordshire and Worcestershire Canal. The location of this abstraction source is shown in Figure 3 of Technical Appendices 16.1 and 16.2. There are a further 10 surface water abstraction sources within 2km of the Site.

16.80 There is one groundwater abstraction source situated within the Site, adjacent to the railway line and a second groundwater abstraction source situated close to the Site, approximately 50m from the southern-eastern boundary. The location of these abstraction sources is shown in Figure 3 of Technical Appendices 16.1 and 16.2. There are five other groundwater abstraction sources within 2km of the Site.

16.81 The majority of abstraction licences within the catchments relate to use for agricultural irrigation but also include potable water supply and industrial uses. A full list of surface water and groundwater abstraction licences within and within close proximity of the Site and their purpose is provided within Chapter 11: Ground Conditions of this ES.

Designations

16.82 The Four Ashes Pit Site of Special Scientific Interest (SSSI) lies approximately 135 m south-east of the Site boundary, between the railway line and the A449 Stafford Road and immediately south of Station Road. The potential effect of the Proposed Development relating to this SSSI is addressed within Chapter 11: Ground Conditions of this ES. The SSSI is designated for its geological features only. The Drainage Strategy (included as Technical Appendix 16.3) demonstrates that drainage discharges from the Site will not be directed towards the Four Ashes Pit SSSI and is therefore not considered as a sensitive receptor within the Water Environment chapter.

Sensitive receptors

Existing Sensitive Receptors

- 16.83 The baseline section confirms the following sensitive receptors that may be affected by the Proposed Development:
- Site users such as canal users and people crossing the existing public rights of way, assessed to be of high sensitivity to both flood risk and water quality changes due to the ability of human receptors to absorb change;
 - The River Penk, Saredon Brook and tributaries, assessed to be of high sensitivity to both flood risk and water quality changes due to protection afforded by national and international legislation;
 - Downstream receptors, including people and property, assessed to be of high sensitivity to both flood risk and water quality changes due to the ability of human receptors to absorb change;
 - Staffordshire and Worcestershire Canal and Hatherton Canal, assessed to be of high sensitivity to both flood risk water quality changes due to protection afforded by national and international legislation;
 - Calf Heath and Gailey Reservoirs, assessed to be of high sensitivity to both flood risk water quality changes due to protection afforded by national legislation;
 - All surface water drainage ditches and land drains within and adjacent to the Site, assessed to be of medium sensitivity to both flood risk and water quality changes due to their ability to absorb change;
 - Ponds on or within the vicinity of the Site, assessed to be of medium sensitivity to water quality changes due to their ability to absorb change;
 - Existing potable water supplies, assessed to be of high sensitivity to changes in supply due to the ability of the water network to absorb change. Given that the network is able to be repaired and sections replaced, non-potable water supply infrastructure is considered to be of medium sensitivity to infrastructure damage; and
 - Sewerage Infrastructure, including public sewers, assessed to be of medium sensitivity to changes in demand due to the ability of the network to absorb change. Given that the network is able to be repaired and sections replaced, sewerage infrastructure is also considered to be of medium sensitivity to infrastructure damage.

Future Sensitive Receptors

- 16.84 Future sensitive receptors introduced to the Site by the Proposed Development, would include:
- Construction workers during the construction phase of the Proposed Development, assessed to be of high sensitivity due to the ability of human receptors to absorb change;
 - Site occupants during the operation of the Proposed Development, assessed to be of high sensitivity due to the ability of human receptors to absorb change; and
 - Buildings and infrastructure associated with the Proposed Development, assessed to be of medium sensitivity; due to their ability to absorb change.

Design Strategy

- 16.85 As part of the Proposed Development, a surface water Drainage Strategy for the Site has been prepared by Waldeck Consulting. This is detailed in the Surface Water Drainage Report included in Technical Appendix 16.3. A summary of this strategy is provided below.
- 16.86 Due to the presence of made ground, combined with shallow groundwater and the underlying groundwater Source Protection Zone designations across the Site, infiltration of surface water runoff to ground is not considered to be appropriate as part of the Proposed Development. It is therefore proposed to drain areas of hardstanding within the Site to both the River Penk

and the Staffordshire and Worcestershire Canal, in line with the existing drainage regime at the Site.

- 16.87 Surface water drainage across the Site is to be divided into four catchment areas, summarised as follows:
- Catchment A: Drains the majority of the Site area including Development Zones A2, A3, A4(a-b) and A5(a-b). Discharges to an existing ditch to the west of the A449, which then discharges to the River Penk. This catchment includes an inverted syphon to facilitate crossing of the West Coast Mainline (WCML);
 - Catchment B: Drains the rail terminal area to the south of Gravelly Way (Development Zone A1). Discharges to an existing ditch to the west of the A449, which then discharges to the River Penk;
 - Catchment C: Drains part of Development Zones A7(a,b,c). Discharges to an existing ditch via a pumped outlet which then discharges to the Staffordshire and Worcestershire Canal; and
 - Catchment D: Drains Development Zone A6 and part of Development Zones A7(a,b,c). Discharges directly to the Staffordshire and Worcestershire Canal via a pumped outlet. The volume and rate of discharge proposed, and the detailed outfall arrangement, are to be agreed by the Canal & River Trust through their Code of Practice application process, but it has been agreed to date that a peak discharge rate of 60 litres/second will not be exceeded (well below the equivalent greenfield rate for this catchment).
- 16.88 The drainage catchments across the Site are designed such that the proportion of the Site discharging to each watercourse is in line with the existing catchments present across the Site.
- 16.89 Surface water flows are to be conveyed to outfalls via a combination of pipe networks, swales, detention ponds and drainage ditches.
- 16.90 It is proposed to restrict runoff rates within the Site to greenfield rates, in line with the existing drainage regime at the Site, although it is noted that the rate of discharge for outfall D, discharging to the Staffordshire and Worcestershire Canal has been restricted further in order to meet a maximum discharge rate of 60 litres/second agreed with the Canal & River Trust.
- 16.91 Attenuation storage is to be provided for up to the 1-in-100 year storm, including allowances for the predicted effects of climate change (40%). Attenuation storage is proposed in the form of detention ponds as well as conveyance swales. The use of these Sustainable Drainage Systems (SuDS) as part of the proposed Drainage Strategy for the Site will also provide water quality treatment in line with CIRIA 753 requirements.
- 16.92 The development lifetime for warehouse buildings is understood to be 25 years. In accordance with the EA Climate Change guidance issued in February 2016, for developments with a lifespan up to the years 2070-2115, the 'upper end' climate change allowance is 40% and the 'central' climate change allowance is 20%. The Climate Change Guidance states that for "less vulnerable" development situated within Flood Zone 1, the impact of both the "upper end" and "central" climate change allowances should be assessed over the lifetime of the Proposed Development. The Drainage Strategy calculations provided by Waldeck Consulting include a climate change allowance of 40% has been applied to rainfall intensities over the lifetime of the Proposed Development.
- 16.93 In line with the existing situation, the drainage infrastructure serving the sections of highway within the Site boundary will remain separate from the proposed drainage regime serving the Site itself.
- 16.94 An Outline Demolition and Construction Environmental Management Plan (ODCEMP, ES Technical Appendix 2.3) has been prepared to accompany the ES and the requirements agreed as part of this will be implemented to ensure that good site practice is followed at all times. This includes standard pollution mitigation measures compliant with EA Guidance, such as oil interceptors and silt traps, along with a temporary drainage system to manage overland flows.

The measures in the ODCEMP include temporary drainage infrastructure to control surface water runoff and foul drainage, including oil interceptors to provide water treatment.

- 16.95 The construction of the Proposed Development is to be phased, with parts of the Site beginning the operational stage while others remain at construction stage. For the parts of the Site which will be operational prior to completion of the Proposed Development, surface water drainage provision will be in place for these sections prior to commencement of operations and therefore, there will be continuation of surface water and flood risk management from the construction stage through to completion.

Potential Effects

Demolition and Construction

- 16.96 The potential significant environmental effects which may result during the demolition and construction phase of the Proposed Development are outlined below for each identified sensitive receptor.
- 16.97 Typical pollutants from construction sites include suspended solids, oils and hydrocarbons, cement and concrete products, heavy metals and metalloids, bentonite, dust and solvents/paints. Sources of these pollutants can include excavations, stockpiles, plant and wheel washing, fuel storage tanks, general plant use and maintenance, and accidents and spillages.

Site Users

- 16.98 The following potential significant effects have been identified relating to Site users, such as canal and footpath users, during the construction and demolition phase of the Proposed Development:
- Risk of increased surface water flood risk to the Site and Site occupants as a result of increased surface water runoff within the site due to construction activity.
- 16.99 This would constitute an adverse, temporary and indirect effect.
- 16.100 On the basis that the ODCEMP is implemented on Site throughout the demolition and construction phase of the project, the magnitude of impact is considered to be negligible and therefore the significance of effect is considered to be **negligible**.

Flood Risk - Downstream Receptors

- 16.101 The following potential significant environmental effects relating to downstream receptors, including people and property, have been identified during the construction and demolition phase of the Proposed Development:
- Risk of increased surface water flood risk to downstream receptors, including people and property, as a result of increased surface water runoff within the Site due to construction activity.
- 16.102 These would constitute an adverse, temporary and indirect effect.
- 16.103 On the basis that the ODCEMP is implemented on Site throughout the demolition and construction phase of the project, the magnitude of impact is considered to be negligible and therefore the significance of effect is considered to be **negligible**.

Construction Workers

- 16.104 The following potential significant environmental effects have been identified relating to construction workers during the construction and demolition phase of the Proposed Development:
- Risk that surface water pollution from construction areas may adversely affect construction workers present on-site.

16.105 This would constitute an adverse, temporary and direct effect.

- 16.106 On the basis that the ODCEMP is implemented on Site throughout the demolition and construction phase of the project, the magnitude of impact is considered to be negligible and therefore the significance of effect is considered to be **negligible**.

The River Penk, Saredon Brook and tributaries

- 16.107 The following potential significant environmental effects relating to the River Penk, Saredon Brook and tributaries have been identified during the construction and demolition phase of the Proposed Development:
- Risk of increased surface water flood risk as a result of increased surface water runoff within the Site due to construction activity;
 - Risk of surface water pollution impacting upon water quality as a result of from silt-laden runoff and release of sediment into watercourses as a result of construction activities;
 - Risk of surface water pollution from accidental spills of fuels and chemicals and other wastes during general construction activity;
 - Risk of surface water pollution from mobilisation of existing contaminants, if applicable; and
 - Risk that surface water pollution from construction areas may adversely affect water quality and WFD status of watercourses and water bodies.

16.108 These would constitute adverse, temporary and indirect effects.

- 16.109 On the basis that the requirements of the ODCEMP are implemented on Site throughout the demolition and construction phase of the project, the magnitude of impact is considered to be negligible and therefore the significance of effect is considered to be **negligible**.

Surface water drainage ditches and land drains within and adjacent to the Site

- 16.110 The following potential significant environmental effects relating to surface water drainage ditches and land drains within and adjacent to the Site have been identified during the construction and demolition phase of the Proposed Development:
- Risk of increased surface water flood risk as a result of increased surface water runoff within the Site due to construction activity;
 - Risk of surface water pollution from silt-laden runoff and release of sediment into watercourses as a result of construction activities;
 - Risk of surface water pollution from accidental spills of fuels and chemicals and other wastes during general construction activity;
 - Risk of surface water pollution from mobilisation of existing contaminants, if applicable;
 - Risk that surface water pollution from construction areas may adversely affect water quality; and
 - Risk of physical damage to the banks and beds of watercourses as a result of construction activity.

16.111 These would constitute adverse, temporary and direct or indirect effects.

- 16.112 On the basis that the requirements of the ODCEMP are implemented on Site throughout the demolition and construction phase of the project, the magnitude of impact is considered to be negligible and therefore the significance of effect is considered to be **negligible**.

Ponds on or within the vicinity of the Site

- 16.113 The following potential significant environmental effects relating to pond structures have been identified during the construction and demolition phase of the Proposed Development:
- Risk of surface water pollution from silt-laden runoff and release of sediment into watercourses as a result of construction activities;

- Risk of surface water pollution from accidental spills of fuels and chemicals and other wastes during general construction activity;
- Risk of surface water pollution from mobilisation of existing contaminants, if applicable;
- Risk that surface water pollution from construction areas may adversely affect water quality; and
- Risk of physical damage to any ponds to be retained as part of the Proposed Development as a result of construction activity.

16.114 These would constitute adverse, temporary or permanent and direct or indirect effects.

16.115 On the basis that the requirements of the ODCEMP are implemented on Site throughout the demolition and construction phase of the project, the magnitude of impact is considered to be negligible and therefore the significance of effect is considered to be **negligible**.

Staffordshire and Worcestershire Canal and Hatherton Canal

16.116 The following potential significant environmental effects relating to the Staffordshire and Worcestershire Canal and the Hatherton Canal have been identified during the construction and demolition phase of the Proposed Development:

- Risk of surface water pollution from silt-laden runoff and accidental spills of fuels and chemicals and other wastes during general construction activity; and
- Risk of surface water pollution from mobilisation of existing contaminants, if applicable.

16.117 These would constitute adverse, temporary and indirect effects.

16.118 On the basis that the requirements of the ODCEMP are implemented on Site throughout the demolition and construction phase of the project, the magnitude of impact is considered to be negligible and therefore the significance of effect is considered to be **negligible**.

Calf Heath and Gailey Reservoirs

16.119 The following potential significant environmental effects relating to Calf Heath and Gailey Reservoirs have been identified during the construction and demolition phase of the Proposed Development:

- Risk of surface water pollution from silt-laden runoff and release of sediment into watercourses as a result of construction activities;
- Risk of surface water pollution from accidental spills of fuels and chemicals and other wastes during general construction activity;
- Risk of surface water pollution from mobilisation of existing contaminants, if applicable; and
- Risk that surface water pollution from construction areas may adversely affect water quality and WFD status of watercourses and water bodies.

16.120 These would constitute adverse, temporary and indirect effects.

16.121 On the basis that the requirements of the ODCEMP are implemented on Site throughout the demolition and construction phase of the project, the magnitude of impact is considered to be negligible and therefore the significance of effect is considered to be **negligible**.

Water Supply

16.122 The following potential significant environmental effects relating to potable and non-potable water supplies have been identified during the construction and demolition phase of the Proposed Development:

- Risk of impact upon local water supply due to construction processes and the risk of damage to supply infrastructure.

16.123 These would constitute adverse, temporary and direct effects.

16.124 On the basis that the requirements of the ODCEMP are implemented on Site throughout the demolition and construction phase of the project, the magnitude of impact is considered to be negligible and therefore the significance of effect is considered to be **negligible**.

Sewerage Infrastructure

16.125 The following potential significant environmental effects relating to sewerage infrastructure have been identified during the construction and demolition phase of the Proposed Development:

- Risk of increased surface water sewer flood risk as a result of increased surface water runoff within the site due to construction activity; Risk of damage to sewerage infrastructure, both foul and surface water, due to construction processes;
- Risk of pollution from silt-laden runoff and release of sediment into surface water sewers as a result of construction activities; and
- Risk of pollution of surface water sewers from accidental spills of fuels and chemicals and other wastes during general construction activity.

16.126 These would constitute adverse, temporary and direct effects.

16.127 On the basis that the requirements of the ODCEMP are implemented on Site throughout the demolition and construction phase of the project, the magnitude of impact is considered to be negligible and therefore the significance of effect is considered to be **negligible**.

Operational Development

16.128 The potential significant environmental effects which may result during the operational phase of the Proposed Development are outlined below for each identified sensitive receptor.

Site Users

16.129 The following potential significant effects have been identified relating to Site users, such as canal and footpath users, during the operational phase of the Proposed Development:

- Risk of increased surface water flood risk to the Site and site occupants due to increases in surface water runoff, resulting in damage and economic losses. This may arise due to increases in impermeable area on Greenfield land and the predicted effects of climate change.

16.130 This would constitute an adverse, permanent and direct effect.

16.131 The Drainage Strategy limits peak surface water discharge at the new outlet from catchment D to the Staffordshire and Worcestershire canal to 60 litres/second in agreement with the Canal & River Trust. For the existing outfall at Catchment C, peak flows have been limited to greenfield rates and therefore will not increase peak flows to the Staffordshire and Worcestershire Canal. Based on the above, the magnitude of impact to Site users as a result of increases in surface water runoff has been assessed to be negligible and the significance of effect considered to be **negligible**.

Site Occupants

16.132 The following potential significant environmental effects relating to site occupants have been identified during the operational phase of the Proposed Development:

- Risk of increased surface water flood risk to the Site and site occupants due to increases in surface water runoff, resulting in damage and economic losses. This may arise due to increases in impermeable area on Greenfield land and the predicted effects of climate change.

16.133 This would constitute an adverse, permanent and direct effect.

16.134 On the basis that surface water runoff volumes will be managed within the Site, as described in the Drainage Strategy (Technical Appendix 16.3), the magnitude of impact to Site

occupants as a result of increases in surface water runoff has been assessed to be negligible and the significance of effect considered to be **negligible**.

Flood Risk - Downstream Receptors

16.135 The following potential significant environmental effects relating to downstream receptors, including people and property, have been identified during the operational phase of the Proposed Development:

- Risk of increased surface water flood risk to downstream receptors, including people and property due to increases in surface water runoff, resulting in damage and economic losses. This may arise due to increases in impermeable area on Greenfield land and the predicted effects of climate change.

16.136 This would constitute an adverse, permanent and direct or indirect effect.

16.137 As described in the Drainage Strategy (Technical Appendix 16.3), it is proposed to restrict surface water flows leaving the Site to greenfield rates for catchments A, B and C and provide attenuation storage for surface water within the Site as part of the proposed Drainage Strategy for the Proposed Development, including an allowance for climate change. For catchment D a reduction in comparison to greenfield rates will be achieved, although the proposed outfall to the Staffordshire and Worcestershire Canal will be new. The Drainage Strategy limits peak surface water discharge at the new outlet from catchment D to the Staffordshire and Worcestershire canal to 60 litres/second in agreement with the Canal & River Trust. Based on the above, the magnitude of impact to downstream receptors as a result of increases in surface water runoff has been assessed to be negligible and the significance of effect considered to be **negligible**.

Flood Risk - Proposed Development Buildings and Infrastructure

16.138 The following potential significant environmental effects relating to Proposed Development buildings and other associated infrastructure have been identified during the operational phase of the Proposed Development:

- Risk of increased surface water flood risk to the Site and site occupants due to increases in surface water runoff, resulting in damage and economic losses. This may arise due to increases in impermeable area on Greenfield land and the predicted effects of climate change.

16.139 This would constitute an adverse, permanent and direct effect.

16.140 On the basis that surface water runoff volumes will be managed within the Site, as described in the Drainage Strategy (Technical Appendix 16.3), the magnitude of impact to buildings and infrastructure within the site as a result of increases in surface water runoff has been assessed to be negligible and the significance of effect considered to be **negligible**.

The River Penk, Saredon Brook and tributaries

16.141 The following potential significant environmental effects relating to the River Penk, Saredon Brook and tributaries have been identified during the operational phase of the Proposed Development:

- Risk that surface water pollution from processes at the Site during operation of the completed Proposed Development may adversely affect water quality and WFD status of watercourses and water bodies; and
- Risk of increased flood risk due to increases in surface water runoff.

16.142 These would constitute adverse, permanent and indirect effects.

16.143 As described in the Drainage Strategy (Technical Appendix 16.3), it is proposed to restrict surface water flows leaving the Site to greenfield rates for catchments A, B and C and provide attenuation storage for surface water within the Site as part of the proposed drainage strategy for the Proposed Development, including an allowance for climate change. based on the above, the magnitude of impact to the River Penk, Saredon Brook and tributaries as a result

of increases in surface water runoff has been assessed to be negligible and the significance of effect considered to be **negligible**.

16.144 On the basis of the water treatment measures including comprehensive SUDS infrastructure and pollution control measures such as oil interceptors described within the Drainage Strategy for the Site, and the conclusions reached within the WFD assessment (Technical Appendix 16.2), the magnitude of impact to the River Penk, Saredon Brook and tributaries due to the risk of surface water pollution from processes at the Site has been assessed to be negligible and the significance of effect considered to be **negligible**.

Surface water drainage ditches and land drains within and adjacent to the Site

16.145 Some of the existing drainage ditch network will be removed as part of the Proposed Development, and instead runoff directed to the proposed surface water drainage infrastructure to be incorporated into the Site. However, some ditches will be retained, with surface water runoff discharging off-site via these watercourses.

16.146 Therefore the following potential significant environmental effects have been identified during the operational phase of the Proposed Development relating to surface water drainage ditches and land drains within and adjacent to the Site that are to be retained following the Proposed Development:

- Risk that surface water pollution from processes at the Site during operation of the completed Proposed Development may adversely affect water quality and WFD status of watercourses and water bodies; and
- Risk of increased surface water flood risk due to increases in surface water runoff.

16.147 These would constitute an adverse, permanent and direct or indirect effect.

16.148 On the basis of the Drainage Strategy described under *Design Strategy*, the magnitude of impact to retained surface water drainage ditches and land drains within and adjacent to the Site as a result of increases in surface water runoff has been assessed to be low and the significance of effect considered to be **minor adverse**.

16.149 On the basis of the measures including comprehensive SUDS infrastructure and pollution control measures such as oil interceptors described in the Drainage Strategy for the Site, the magnitude of impact to retained surface water drainage ditches and land drains within and adjacent to the Site due to the risk of surface water pollution from the completed development has been assessed to be negligible and the significance of effect considered to be **negligible**.

Ponds on or within the vicinity of the Site

16.150 The following potential significant environmental effects relating to pond structures have been identified during the operational phase of the Proposed Development:

- Risk that surface water pollution from processes at the Site during operation of the completed Proposed Development may adversely affect water quality of ponds within the Site.

16.151 This would constitute an adverse, temporary or permanent and direct effect.

16.152 On the basis of the water treatment measures included within the Drainage Strategy for the Site, such as the use of swales and detention ponds, there will be no pathway by which pollutants will enter the ponds via surface water flow. Therefore, the magnitude of impact to ponds within and adjacent to the Site due to the risk of surface water pollution from processes at the Site has been assessed to be negligible and the significance of effect considered to be **negligible**.

Staffordshire and Worcestershire Canal and Hatherton Canal

16.153 The following potential significant environmental effects relating to the Staffordshire and Worcestershire Canal and the Hatherton Canal have been identified during the operational phase of the Proposed Development:

- Risk that surface water pollution from processes at the Site during operation of the completed Proposed Development may adversely affect water quality.

16.154 This would constitute an adverse, permanent and indirect effect.

16.155 Water treatment measures are included within the Drainage Strategy for the Site, including the use of swales and detention ponds and the use of three-stage treatment. This will ensure that pollutants arising from activity within the Site do not enter the canal network. Therefore, the magnitude of impact to Staffordshire and Worcestershire Canal and the Hatherton Canal due to the risk of surface water pollution from processes at the Site has been assessed to be negligible and the significance of effect considered to be **negligible**.

Calf Heath and Gailey Reservoirs

16.156 The following potential significant environmental effects relating to Calf Heath and Gailey Reservoirs have been identified during the operational phase of the Proposed Development:

- Risk that surface water pollution from processes at the Site during operation of the completed Proposed Development may adversely affect water quality and WFD status of the reservoirs.

16.157 This would constitute an adverse, permanent and indirect effect.

16.158 The Canal & River Trust have identified the need for access to the Calf Heath reservoir west dam to remain following development, to ensure inspection of the dam for leaks as well as planned silt removal and regular vegetation management. On the basis that this access is maintained, to ensure the reservoirs are able to continue to operate satisfactorily, combined with the inclusion of the water treatment measures identified within the drainage strategy for the Site, there will be no pathway connecting surface water within the Site and the reservoirs. Therefore, the magnitude of impact to Calf Heath and Gailey Reservoirs due to the risk of surface water pollution from processes at the Site has been assessed to be negligible and the significance of effect considered to be **negligible**.

Water Supply

16.159 The following potential significant environmental effects relating to potable and non-potable water supplies have been identified during the operational phase of the Proposed Development:

- Risk of impact upon local water supply due to the requirements of the Proposed Development during the operational phase.

16.160 This would constitute an adverse, permanent and direct effect.

16.161 Water supply will be negotiated and agreed with Severn Trent. On this basis it is assumed that were the scheme to gain consent, an adequate water supply would be secured through commercial agreements. On this basis, the risk of impact is considered to be negligible and the significance of effect considered to be **negligible**.

Sewerage Infrastructure

16.162 The following potential significant environmental effects relating to sewerage infrastructure, including the public sewer network, have been identified during the operational phase of the Proposed Development:

- Risk of impact upon local capacity within the foul drainage network due to discharge of wastewater from the Site to the public sewer network.

16.163 This would constitute an adverse, permanent and direct effect.

16.164 The proposed Foul Drainage Strategy shows that the design utilises two new connections to the public sewer. It is anticipated that some reinforcement of the existing network will be required, in particular the existing rising main which runs between Calf Heath and the Four Ashes Sewerage Treatment Works, which will take foul drainage from the majority of the Proposed Development. Discussions are currently ongoing with Severn Trent to confirm available capacity and agree any necessary infrastructure changes, and this will be secured through commercial arrangements. On this basis it is assumed that were the scheme to gain consent, adequate provision of sewerage infrastructure for the Proposed Development would be provided. On this basis, the risk of impact is considered to be negligible and the significance of effect considered to be **negligible**.

Mitigation and Residual Effects

16.165 The key objective of mitigation is to avoid, offset or reduce any significant adverse environmental effects of the Proposed Development. During the demolition and construction phase, mitigation can be carried out through management of Site procedures and the mitigation strategy should be informed by the options of avoidance, reduction, compensation or enhancement. During operation, mitigation measures are about managing residual risks.

Demolition and Construction

16.166 On the basis that the ODCEMP described under *Design Strategy* is followed throughout the demolition and construction phase of the Proposed Development, no further mitigation measures are required during the demolition and construction phase and there are no significant environmental effects.

Operational Development

16.167 In accordance with the Drainage Strategy (ES Technical Appendix 16.3) and the Flood Risk Assessment (ES Technical Appendix 16.1), there will be no increase in flood risk to water environment receptors as a result of the Proposed Development. The Drainage Strategy and Flood Risk Assessment will inform the flood mitigation principles of the surface water drainage scheme as secured by the draft DCO Requirements at Schedule 2 of the draft DCO.

16.168 The Drainage Strategy and the Water Framework Directive Assessment (ES Technical 16.2) also include measures to ensure that there is no increase in surface water pollution as a result of processes on Site. The Drainage Strategy and Water Framework Directive Assessment will inform the surface water pollution mitigation principles of the surface water drainage scheme as secured by the draft DCO Requirements at Schedule 2 of the draft DCO.

16.169 Considering the foul water drainage scheme to be produced, as secured by the draft DCO Requirements at Schedule 2 of the draft DCO, due to the nature of the Proposed Development, it is anticipated that the proposals will have a negligible impact upon local water supply and sewer network capacities.

16.170 Therefore, on the basis of the above, all residual effects with regard to the water environment are considered to be minor or negligible and no further mitigation measures are required.

Summary of Residual Effects

16.171 Table 16.5 provides a tabulated summary of the outcomes of the assessment of the environmental effects on the water environment of the Proposed Development.

Table 16.5: Summary of Residual Effects							
Receptor	Description of Residual Effect	Nature of Residual Effect*					
		Significance**	+	D	P	R	St M t Lt
Construction							
Site users	Increase in surface water flood risk	Negligible	-	I	T	R	S t
Downstream Receptors	Increase in surface water flood risk	Negligible	-	I	T	R	S t
Construction Workers	Increase in surface water flood risk; adverse impact of surface water pollution	Negligible	-	D	T	R	S t
The River Penk, Saredon Brook & Tributaries	Increase in surface water flood risk; surface water pollution	Negligible	-	I	T	R	S t
Surface water drainage ditches & land drains	Increase in surface water flood risk; surface water pollution	Negligible	-	D /I	T	R	S t
Ponds	Surface water pollution; physical damage to pond structures	Negligible	-	D /I	P /T	R	S t
Staffordshire and Worcestershire Canal & Hatherton Canal	Surface water pollution	Negligible	-	I	T	R	S t
Calf Heath & Gailey Reservoirs	Surface water pollution	Negligible	-	I	T	R	S t
Water Supply	Impact upon local supply; damage to infrastructure	Negligible	-	D	T	R	S t
Sewerage Infrastructure	Damage to infrastructure; surface water pollution, increase in surface water flood risk	Negligible	-	D	T	R	S t
Completed Development							
Site users	Increase in surface water flood risk	Negligible	-	P	D	R	M t
Downstream Receptors	Increase in surface water flood risk	Negligible	-	P	D	R	M t
Site Occupants	Increase in surface water flood risk	Negligible	-	P	D	R	M t

Table 16.5: Summary of Residual Effects							
Proposed Development buildings & infrastructure	Increase in surface water flood risk	Negligible	-	P	D	R	M t
The River Penk, Saredon Brook & Tributaries	Increase in surface water flood risk; risk of surface water pollution	Negligible	-	P	I	R	M t
Surface water drainage ditches & land drains	Increase in surface water flood risk; risk of surface water pollution	Negligible	-	P	D /I	R	M t
Ponds	Risk of surface water pollution	Negligible	-	P	D	R	M t
Staffordshire and Worcestershire Canal & Hatherton Canal	Risk of surface water pollution	Negligible	-	P	I	R	M t
Calf Heath & Gailey Reservoirs	Risk of surface water pollution	Negligible	-	P	I	R	M t
Water Supply	Impact upon local supply	Negligible	-	P	D	R	M t
Sewerage Infrastructure	Impact upon local network capacity	Negligible	-	P	D	R	M t

Notes:

* - = Adverse/ + = Beneficial; D = Direct/ I = Indirect; P = Permanent/ T = Temporary; R=Reversible/ IR= Irreversible; St- Short term/ Mt –Medium term/ Lt –Long term.

**Negligible/Minor/Moderate/Major

Likely Significant Environmental Effects

16.172 On the basis that the design assumptions detailed above are incorporated into the Proposed Development, there are no significant environmental effects identified for the scheme in relation to the water environment.

Decommissioning

16.173 The Proposed Development is expected to be operational indefinitely, as long as it is viable and fit for purpose.

16.174 In the long term, it may likely to be re-developed or adapted on a piecemeal basis as operator requirements change and new occupiers move to the Site. Any such piecemeal redevelopments would be expected to be undertaken in accordance with current and future legislation and guidance in relation to flood risk and water pollution and would be subject to separate planning applications and planning requirements and conditions.

16.175 On this basis the potential effects on the water environment for decommissioning are considered to be negligible.

Cumulative Effects

16.176 In line with the requirements of the Scoping Response, all other development schemes identified for inclusion as part of the cumulative effects assessment that lie within 2km of the Site have been assessed with regard to the cumulative effect on the water environment. These are as follows:

- Bericote Development;
- Saredon South Quarry; and
- Calf Heath Quarry.

Demolition and Construction

16.177 The construction of the scheme on the Bericote Development will be complete before the Proposed Development commences construction, so no cumulative effects are likely.

16.178 Calf Heath Quarry is currently operational, however should DCO consent be granted, no further minerals will be excavated within the Site including the new minerals allocation. The existing minerals infrastructure will be removed. As the quarry is regulated under an Environmental Permit removal of the existing minerals infrastructure at Calf Heath Quarry would be expected to employ stringent mitigation measures similar to those that would be implemented during construction of the Proposed Development. It is anticipated that the current quarry workings would be left open, thereby minimising the need to rework materials during the earthworks stage of the Proposed Development, and this has been taken into account in the cut/fill models for the Proposed Development and in the baseline established for this ES. As such, it is not anticipated that there will be any cumulative effects.

16.179 On the basis that, in accordance with good practice, a Construction Environmental Management Plan is implemented for Saredon South Quarry throughout the construction process, the potential cumulative effect on the water environment is considered to be negligible. This will need to include standard pollution mitigation measures compliant with EA and CIRIA Guidance, such as oil interceptors and silt traps, along with a temporary drainage system to manage overland flows.

Completed Development

16.180 In line with SSDC / SCC planning policy, where applicable, new drainage infrastructure for the Bericote Development and Saredon South Quarry will be incorporated to restrict surface water runoff and control water quality as appropriate. On this basis the potential effects on the water environment for the operational phases of the potential developments identified are assessed to be negligible.

16.181 Calf Heath Quarry will no longer be in operation once the Proposed Development is complete, so there will be no cumulative effects.