12. WATER QUALITY AND HYDROLOGY

12.1 Introduction

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

12.2 Scope of Assessment

The Proposed Development has made only very minor changes to the water dependent / associated elements of the Consented Development. The Proposed Development makes no change to the use of water during the power generation process, and there will be no changes to the way in which water will be managed during construction of the Proposed Development. The only design change that has specific implications for the water environment is the amendment to the footprint of the proposed surface water attenuation basin in the east of the Site. This amendment is however simply aesthetic; the storage capacity of the basin (volume) remains unchanged as does the way in which it will function. The Flood Risk Assessment (FRA) and drainage strategy presented with the Consented Development (and provided in **Appendix 12.1**) therefore remain valid and only minor, non-material updates to the baseline and assessment have been made.

12.3 Assessment Methodology and Significance Criteria

12.3.1 Baseline Data

This assessment has been undertaken in accordance with current Government guidance on EIA (Ref 12.1) and has involved review of the following sources of baseline data:

- review of a Landmark Envirocheck® Report (refer to **Appendix 13.1**) for the Site and a 2 km radius; providing data on surface water and groundwater discharges and abstractions, river quality, baseline hydrogeology, groundwater vulnerability and pollution incidents;
- review of a Drainage and Water Enquiry report for the Site obtained from Geodesys (refer to **Appendix E** of **Appendix 12.1**);
- review of Environment Agency data records on groundwater Source Protection Zones (SPZ), chemical and biological river quality, ecological status, groundwater quantity and quality and the location of indicative floodplain (www.environment-agency.gov.uk);
- review of the local Council policies to identify specific plans and policies relating to the protection of the aquatic environment;
- review of the Anglian River Basin Management Plan (RBMP) 2015 (Ref 12.2) and associated information, where relevant; and
- pre-application consultation with the Environment Agency, included in **Appendix 12.1**.

The assessment methodology has been largely desk-based, with the exception of a Site visit at the outset of the project. Recent data on local river quality has been acquired from the Environment Agency; therefore, no additional water sampling was considered necessary.

12.3.2 Assessment and Evaluation of Effects

The assessment of effects has involved the following general approach:

- the sensitivity or importance of aquatic receptors has been established on the basis of their use, proximity to the Site, existing quality or resource value and consideration of potential pollutant pathways (refer to **Table 12.1**);

- evaluation of the significance of the potential changes in water quantity and quality and assessment of the sensitivity of the resource to the predicted changes (refer to **Table 12.2**));
- the potential effects have been classified as neutral, adverse or beneficial and given a significance of minor, moderate or substantial based on the matrix in **Table 12.3**; and
- where the predicted effects are considered to be significant, mitigation measures have been incorporated to eliminate or reduce the effects to an acceptable level.

Any residual effects (post mitigation) are discussed in the final subsection of this chapter.

Table 12.1 Definition of Receptor Sensitivity

Receptor Sensitivity	Receptor Type	Sensitivity Details
High	Surface Water	■ WFD classification of 'High' or 'Good' ■ EC designated salmonid water
	Groundwater	■ Principal Aquifer ■ Groundwater SPZ Zone 1
	Flood Risk	■ Flood Zone 3a or 3b (high flood risk) ■ Critical drainage or flood storage areas
	Water Resources and Infrastructure	■ Area of major known water stress/foul sewerage capacity issues ■ Shallow groundwater table/local abstractions
Medium	Surface Water	■ WFD classification of 'Moderate' ■ EC designated cyprinid water
	Groundwater	■ Secondary A or B Aquifer ■ Groundwater SPZs Zone II or III ■ Areas of potential historic contamination
	Flood Risk	■ Flood Zone 2 (medium flood risk) ■ Problem (but not critical) drainage area
	Water Resources and Infrastructure	■ Area of known water stress/foul sewerage capacity issues ■ Shallow groundwater table/no significant local abstractions
Low	Surface Water	■ WFD classification of 'Poor' or 'Bad'
	Groundwater	■ Unproductive Strata, i.e. Non Aquifer ■ Not located on groundwater SPZ
	Flood Risk	■ Flood Zone 1 (low flood risk)
	Water Resources and Infrastructure	■ Area of no known water stress/foul sewerage capacity issues ■ No issues with groundwater table

Table 12.2 Definition of Impact Magnitude

Impact Magnitude	Definition
High	Change is likely to cause a permanent or long-term adverse or beneficial effect on the integrity or value of the receptor. Significant adverse or beneficial change in surface water or groundwater quality conditions from the baseline situation. Substantial increase or decrease in flood risk, water demand or foul drainage requirements at the regional level.
Medium	Change is likely to cause a medium-term adverse or beneficial effect on the integrity or value of the receptor. Moderate change in surface water or groundwater quality conditions from the baseline situation. Moderate increase or decrease in flood risk, water demand or foul drainage requirements at the local level.

Impact Magnitude	Definition
Low	Change is likely to cause a short-term adverse or beneficial effect on the integrity or value of the receptor. Minor change in surface water or groundwater quality conditions from the baseline situation. Minor increase or decrease in flood risk, water demand or foul drainage requirements at the site level.
Negligible	Change is likely to cause a very short-term adverse or beneficial effect on the integrity or value of the receptor. Imperceptible change in surface water or groundwater quality conditions from the baseline situation. No change in flood risk, water demand or foul drainage requirements.

Table 12.3 Derivation of Effect Significance

		Receptor Sensitivity		
		High	**Medium**	**Low**
Magnitude of Impact	**High**	Substantial – significant	Moderate/Substantial – significant	Moderate/Minor – significant
	Medium	Moderate/Substantial –significant	Moderate/Minor – significant	Minor not significant
	Low	Moderate/Minor – significant	Minor – not significant	Minor/Negligible – not significant
	Negligible	Minor – not significant	Minor/Negligible – not significant	Negligible – not significant

12.4 Legislation, Planning Policy and Guidance

The aim of water legislation and policy in England is to protect both public health and the environment by maintaining and improving the quality of natural waters. These include surface water bodies (e.g. rivers, streams, lakes, ponds) and groundwater.

The Department of the Environment, Food and Rural Affairs (DEFRA) is responsible for all aspects of water policy in England. Management and enforcement of water policy is the responsibility of the Environment Agency.

12.4.1 Legislation

A summary of key relevant UK water legislation is provided below:

- Environmental Protection Act (1990): sets out a range of provisions for environmental protection, including integrated pollution control for dangerous substances;
- Water Resources Act (1991): consolidated previous water legislation with regard to both the quality and quantity of water resources;
- Water Industry Act (1991): consolidated previous legislation relating to water supply and the provision of sewerage services;
- Environment Act (1995): established a new body (the Environment Agency) with responsibility for environmental protection and enforcement of legislation. This Act introduced measures to enhance protection of the environment including further powers for the prevention of water pollution;
- Anti-Pollution Works Regulations (1999): provides powers to the Environment Agency to stop any activity (e.g. construction) that is giving or is likely to give rise to environmental pollution or to adequately enforce pollution control measures;

- Control of Pollution (Oil Storage) (England) Regulations 2001 SI 2954: Imposes general requirements for preventing pollution of controlled waters from oil storage, particularly fixed tanks or mobile bowsers. Makes contravention a criminal offence;
- Water Act (2003): extends the provisions of the Water Resources Act (1991) and the Environment Act (1995) with regard to abstractions and discharges, water conservation and pollution control;
- Water Environment (Water Framework Directive) (England and Wales) Regulations (2003): requires the development and implementation of a new strategic framework for the management of the water environment and establishes a common approach to protecting and settling environmental objectives for groundwater and surface waters; and
- Flood and Water Management Act (2010): makes provisions about the management of risks in connection with flooding and coastal erosion.

12.4.2 National Planning Policy

The principles of the NPPF (2018) (Ref 12.3) relevant to water resources and flood risk are provided in Section 10 'Meeting the challenge of climate change, flooding and coastal change' and Section 11 'Conserving and enhancing the natural environment'. The principles included in the NPPF, combined with the associated Planning Practice Guidance (PPG), form the national level policy.

12.4.3 Local Planning Policy

12.4.3.1 North Northamptonshire Minerals & Waste Local Plan (2017)

Policy 18 of the Minerals and Waste Local Plan (2017) (Ref 12.4) states that *"Proposals for minerals and waste development must demonstrate that the following matters have been considered and addressed… impacts on flood risk as well as the flow and quantity of surface and groundwater"*.

12.4.3.2 Part 1 Local Plan: North Northamptonshire Joint Core Strategy (2016)

Policy 5 of the Part 1 Local Plan (Ref 12.5) relates to water resources, environment and flood risk management and requires development to avoid high and medium risk flood risk areas (advocating a sequential approach), development should be designed to incorporate Sustainable Drainage Systems wherever practicable and following any identified mitigation, development should not lead to a deterioration of the quality of a waterbody.

12.5 Baseline Conditions (Non-material change from the 2016 ES)

12.5.1 Introduction

As described in Section 12.2, the Proposed Development does not introduce any new water dependant elements which would be considered as a material change to the previous assessment. As such, the baseline conditions section has only been updated to reflect minor changes in data availability since the initial project. This includes a review of the Environment Agency catchment data explorer to provide updates WFD information, flood zone information and Envirocheck data. All previously reviewed data sources have been reviewed, but have not resulted in a material change to the baseline.

12.5.2 Surface Water Quality

The closest surface watercourse to the Site is the Northern Stream, a main river and tributary of Willow Brook, which is located adjacent to the northern boundary of the Site. The Northern Stream rises in Corby, flowing eastwards past the Site to Deene Lake where is joins the Southern Stream, the outflow of the lake forming Willow Brook (Ref 12.6). The catchment upstream of the Site is highly urbanised and a number of flood storage reservoirs have been built along the Northern Stream.

Environment Agency records indicate that there are three water quality monitoring points along the Northern Stream. Water Framework Directive (WFD) data indicate the Northern Stream has an overall WFD status of “Moderate”. The WFD status encompasses chemical, biological and ecological elements. The current ecological status for the Northern Stream is moderate with the objective to achieve good status by 2027. The chemical status is currently described as good.

There are no surface water abstractions within 2 km of the Site. There is one surface water discharge consent approximately 999 m north of the Site into the Gretton brook. There were nine reported pollution incidents to controlled waters and 2 water impact incidents on the substantiated pollution incident register (refer to Landmark Envirocheck); however, none of these relate specifically to the Site nor are they considered to have directly affected it.

There is one British Geological Survey (BGS) Recorded Landfill Site approximately 8 m to the north of the Site. This has been classified as a potential threat to surface water by BGS. The Environment Agency records identify that the deposited waste at this landfill site was inert and industrial waste.

As a result of the Northern Stream’s ‘moderate’ WFD status and close proximity, the hydrology of the Site is considered to be of Medium sensitivity.

12.5.3 Hydrogeology and Groundwater Quality

In accordance with the current Environment Agency guidance on Groundwater Protection “The Environment Agency’s approach to groundwater protection February 2018 Version 1.2 (Ref 12.7), the underlying bedrock, Northampton Sand Formation, is classified as Secondary A Aquifer. There are no superficial deposits recorded at the Site.

The Environment Agency classifies Secondary Aquifers as ‘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’.

The Babtie Site Remediation Report (March 2002) (refer to **Appendix B of Appendix 12.1**) confirms that there are limited remains of the Northampton Sand aquifer within the immediate vicinity of the site due to previous mining activities. This is overlain by reworked boulder clay identified as up to a depth of 19 m which has a low permeability. Test results have indicated that there is a low potential for the vertical migration of compounds into any underlying water-bearing strata due to the reworked fill preventing lateral and vertical migration. Natural groundwater levels are within or below the remaining Northampton Sand with limited perched groundwater existing in the infill.

There are no discharge consents to ground or groundwater within 2 km of the Site. Environment Agency data on local groundwater chemical quality shows that groundwater around the Site was of ‘good’ quality in 2016.

There is one record of a pollution incident to controlled waters involving groundwater. This incident occurred on 19th June 1992 approximately 715 m west of the Site. The incident was classified as Category 3 – Minor Incident by the Environment Agency and it is not anticipated to have directly affected the Site.

There are no licensed groundwater abstractions reported within a 2 km radius of the Site; furthermore the closest SPZ is more than 2 km from the Site.

As previously mentioned, there is one BGS Recorded Landfill Site approximately 8 m to the north of the Site. This has been classified as a threat to groundwater by BGS (see previous comments).

Based upon the above information, the hydrogeology of the Site is considered to be of Low to Medium sensitivity.

12.5.4 Flood Risk

The Environment Agency’s flood map for planning for the area (**Appendix A of Appendix 12.1**) shows that the Site is located entirely within Flood Zone 1 (low risk). This flood zone relates to land

that has an annual probability of flooding of less than 0.1% and is considered to be appropriate for all types of development (as set out in Table 3 of the NPPF Technical Guidance[1]).

Based on a review of the Corby SFRA no other recorded sources of flooding, i.e. from sewers, groundwater or reservoir, have been identified for the Site.

The risk of flooding at the Site from rivers is therefore considered to be Low.

12.5.5 Groundwater Resources

The Site is located in the Nene Mid Lower Jurassic Unit within the Environment Agency's Anglian River Basin District (Ref 12.8) which is one of the driest in the UK, as rainfall levels are a third below the national average. Current Environment Agency assessments show that groundwater is heavily utilised over much of the river basin district and that, in these areas, groundwater quality and quantity are important issues.

The Environment Agency's data on groundwater quantity in the Corby area (i.e. the availability of the groundwater resource) is currently reported to be 'good'. The predicted status of groundwater quantity in 2015 is also reported to be 'good'.

As a result of the 'good' groundwater quantity classification, the water resources for the Site are considered to be of Low sensitivity

12.6 Identification and the Evaluation of Key Effects (No material change to the 2016 ES)

12.6.1 Potential Construction Effects

The following construction phase processes have been identified as having the potential for significant effects on water quality and hydrology:

- potential remobilisation of contamination during construction;
- potential surface water and/or groundwater contamination from general construction activities; and
- potential interruption of groundwater flows, giving rise to an elevated risk of groundwater flooding and/or effect on baseflow to local water bodies

12.6.2 Potential for Remobilisation of Contamination during Construction

When the Site was redeveloped for its current use, a series of remediation works were undertaken for an industrial/commercial end use of open storage. Remediation included the re-grading of the Site with validation samples taken of the surface soils to confirm soil concentrations were below the acceptable thresholds (refer to **Appendix 13.3**). The perched groundwater on site was undisturbed and is therefore confined on Site and may still contain high levels of contaminants, see Chapter 13 (Soils, Geology and Contaminated Land).

The impact of the remobilisation of contamination during construction is considered to be Medium to High. Prior to mitigation, the effect significance of contamination arising from general construction activities is considered to be Moderate Adverse both for surface water and groundwater

12.6.3 Contamination Arising from General Construction Drainage

The operation of construction vehicles and general construction activities give rise to the potential for surface runoff to become contaminated with hydrocarbons, silt or other construction materials. This may in turn lead to a contamination event should Site drainage be allowed to enter surface

watercourses or the ground untreated. The sensitive receptor in this instance is the North Stream, located immediately north of the site.

Depending on meteorological conditions, excavations may require dewatering (of accumulated rainfall or runoff) during construction. In such circumstances, as stated in Chapter 6 (Development Programme and Construction), the construction contractor will provide provision for the treatment of such waters, including settlement and oil interceptor facilities, before being safely dispossessed of, either to mains sewer, of surface water. Referring to **Table 12.2**, the impact magnitude of contamination arising from general construction activities is considered to be Low. Prior to mitigation, the effect significance of contamination arising from general construction activities is considered to be Minor Adverse

12.6.4 Potential Groundwater Interruption during Construction

The excavation or piling of the foundations for the Proposed Development will not encounter the underlying groundwater in the Northampton Sand Formation as this is reported to have been mined from the Site and is no longer present. However, the reworked boulder clay used as fill material is known to have potentially contaminated isolated pockets of perched groundwater (see Chapter 13 Soils, Geology and Contaminated Land).

The effect magnitude of groundwater interruption arising as a result of the Proposed Development is considered to be Low. The effect significance, prior to mitigation, is Minor Adverse.

12.6.5 Potential Operational Effects

There are four potentially significant effects on water quality and hydrology during operation of the Proposed Development:

- external flood risk and the control of surface water runoff taking climate change predictions into account;
- potential contamination of local surface waters or groundwater from routine Site drainage or accidental spillages;
- water demand and the effect of the availability of local water resources; and
- foul drainage demand and the effect on local surface waters or groundwater.

12.6.6 External Flood Risk and Site Drainage

The Environment Agency's flood map for planning shows that the Site lies entirely within Flood Zone 1 (low risk). Land within Flood Zone 1 is classed in the NPPF as having 'little or no flood risk', with an annual probability of flooding of less than 0.1%.

Surface runoff from the Proposed Development will need to provide an overall betterment on climate change corrected runoff rates compared with the existing situation, to comply with the NPPF. The FRA for the Proposed Development is included as **Appendix 12.1**. The Proposed Development will give rise to a decrease in surface water discharge compared to the current land use and will therefore provide a betterment.

Therefore, the impact magnitude is considered to be Medium Beneficial. Based on a Low receptor sensitivity, the impact significance of flood risk and surface water runoff arising as a result of the Proposed Development is considered to be Minor Beneficial

12.6.7 Contamination of Surface Water or Groundwater from Routine Site Drainage and/or Accidental Releases

The Proposed Development could have the potential to contaminate surface or groundwater from a number of sources, namely waste stored on Site, process chemicals stored on Site and HGV

manoeuvring areas. It is considered that most of these areas will be under cover and therefore the risk of contamination to surface water or groundwater will be significantly reduced.

The effect magnitude is considered to be Low. Prior to mitigation, the risk of contamination of surface water or groundwater from routine Site drainage is considered to be Minor Adverse.

12.6.8 Water Demand

The existing land use at the Site has no water demand, being an area used for car storage. Under normal operating circumstances, there will be a relatively minor increase in water demand as a result of the Proposed Development. This will be associated with the inclusion of ancillary office space within the Site. Once water has been converted to steam and passed through the turbine and electricity has been generated, an air-cooled condenser (ACC) will be used to convert low grade steam exhausted from the turbine, back into liquid which will then be recycled back into the boilers. This process, along with roof top rain water harvesting will significantly reduce water usage through the process. The technical specification for the facility states an approximate water demand of 40 m^3 per day for process use. However, it is understood that the process use of water is significantly less than this, as there are no losses from the process system other than from items such steam traps and domestic supply; the actual daily water demand is likely to be in the order of 20 m^3.

The requirement for potable water is minimal and, therefore, it is anticipated that the Site could connect to the potable water network to the southeast of the Site on Shelton Road, subject to agreement with Anglian Water (refer to **Appendix E** of **Appendix 12.1**).

The magnitude of water demand from the Proposed Development is considered to be Low. Prior to mitigation, the increase in water demand arising from the Proposed Development is Minor Adverse.

12.6.9 Foul Drainage

The existing land use at the Site does not currently require foul drainage as there are no buildings present. The requirement for foul drainage is only for domestic effluent, which could discharge to the public foul sewer present along the eastern boundary of the Site, subject to agreement with Anglian Water (refer to **Appendix E** of **Appendix 12.1**).

The additional loading on the foul sewer network is anticipated to have a Low effect magnitude. Prior to mitigation, the increase in foul drainage demand arising from the Proposed Development is considered to be Minor Adverse

12.7 Cumulative Effects

All committed major developments in the area surrounding Corby will have to satisfy the requirements for the control of surface runoff within the NPPF PPG, i.e. the provision of a betterment in runoff rates post-development. Therefore, the cumulative effect of other local developments should result in a net beneficial effect through reducing overall flood risk in the area.

In terms of water quality, new or committed developments will also have to incorporate appropriate pollution control measures to protect the underlying groundwater and/or local surface waters through planning conditions enforced by the Local Authority and/or discharge consents enforced by the Environment Agency.

The cumulative effects of new development on water resources and foul drainage provision are managed at the regional level by the appropriate water companies in consultation with statutory bodies such as the Council and Environment Agency. The cumulative effect of increases in mains water and foul drainage demand have to be offset by sustainable design and water efficiency measures and infrastructure contributions for sewage treatment works, where necessary. These measures should collectively ensure that the cumulative effects on regional water resources and treatment performance are controlled to an acceptable level.

As presented in Section 3.6, three developments have been identified that have the potential to result in cumulative effects will the Proposed Scheme.

12.7.1.1 Priors Hall Mixed Use Development

The Priors Hall Mixed Use Development is currently under construction and will cover an area of upto14ha once complete. The planning application for the development includes a drainage strategy which demonstrates how the increase in surface water runoff from the additional impermeable areas and additional foul sewage will be managed.

The strategy proposes to manage surface water via a small number of attenuation balancing lakes, which do not infiltrate, but will reduce discharge to the North and South Streams to greenfield runoff rates of 2 litres per second per hectare.

Anglian Water have confirmed that the existing drainage infrastructure Corby and Weldon has no spare capacity to serve the proposed Priors Hall development, as this has not been catered for in the Local Plan. They have advised that the development foul water drainage should be disposed of by a new terminal pumping station, discharging directly to Corby Sewage Treatment Works.

Assuming that the completed development incorporates all elements of the outlined strategy, there should be no cumulative impact on drainage to the Northern Stream from this development.

12.7.1.2 Stamford Road renewable fuel production and recycling facility

The Stamford Road renewable fuel production and recycling facility is located approximately 2.5km south of the site of the Proposed Development, within the catchment of the Southern Stream. As this is located within a separate catchment, the water related receptors are unlikely to overlap across the projects, and as such the potential for there to be cumulative effects is considered unlikely.

12.7.1.3 Rockingham Speedway

The development of the Rockingham Speedway is the closest development to the Proposed Development. Located approximately 400m north of the Proposed Development, adjacent to the left bank of the North Stream. There are not anticipated to be any cumulative impacts from this development.

Therefore, Negligible cumulative effects are predicted as a result of the Proposed Development in combination with the identified committed developments.

12.8 Mitigation (No change from the 2016 ES)

The following subsections set out the mitigation measures that have been designed to eliminate or reduce to an acceptable level any significant environmental effects identified.

12.8.1 Potential for Remobilisation of Contamination during Construction

In order to verify contamination conditions, a comprehensive intrusive investigation will be undertaken prior to construction. The investigation will include an assessment of land gas conditions at the site, with gas monitoring undertaken over an appropriate period of time, as well as infiltration rates and general contamination status to inform the detailed drainage design and confirmation of groundwater levels. The findings of the investigation will be reported to the Local Authority and a strategy for dealing with any contamination and/or ground gas identified will be prepared and agreed with the Local Authority. It is considered that it will be possible to eliminate or minimise all significant pollutant linkages to an acceptable level with appropriate remediation and control measures.

The residual risk of contamination arising from general construction activities, following adoption of the mitigation measures detailed above, is therefore considered to be Negligible.

12.8.2 Contamination Arising from General Construction Activities

In line with the CEMP the following activities will be undertaken following best practice techniques in order to ensure that the water environment is protected throughout the construction phase.

Construction vehicles will be properly maintained to reduce the risk of hydrocarbon contamination and will only be active when required. Construction materials will be stored, handled and managed with due regard to the sensitivity of the local aquatic environment and thus the risk of accidental spillage or release will be minimised.

In accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref 12.9), any tanks storing more than 200 litres of oil will have secondary bunding. Bunding will be specified having a minimum capacity of “not less than 110% of the container's storage capacity or, if there is more than one container within the system, of not less than 110% of the largest container's storage capacity or 25% of their aggregate storage capacity, whichever is the greater.” Above ground storage tanks will be located on a designated area of hardstanding. No underground storage tanks will be used during the construction period. Storage of liquids such as degreasers, solvents, lubricants and paints will be in segregated, bunded enclosures.

Ponded water from excavations will be pumped into temporary (baffled) holding tanks within the Site to remove suspended sediment before discharge to ground. If oil is observed in the water from the excavation sites, it will be diverted through temporary oil interceptors prior to being discharged. Dewatering activities may require a temporary abstraction licence and this would need to be discussed with the Environment Agency prior to commencement of construction works; however given the observed depth of groundwater, excavations are not expected to require significant levels of dewatering apart from accumulated rainfall.

Where required, interceptors will be regularly inspected, cleaned and maintained. Full records will be kept of inspections, maintenance works and measures undertaken to sustain equipment performance. These provisions should ensure no significant impacts occur on water quality. The use of settlement facilities will aid the removal of any contaminated particulate material that might be derived from construction materials.

The construction drainage system will be designed and managed to comply with BS6031:198 “The British Standard Code of Practice for Earthworks”, which details methods that should be considered for the general control of drainage on construction sites. Further advice is contained within the British Standard Code of Practice for Foundations (BS8004, 1986).

These mitigation measures will be incorporated into a Construction Environment Management Plan (CEMP), which will set out measures for the control of Site drainage, reducing the risk of accidental spillages and the storage and handling of materials.

The residual risk of contamination arising from general construction activities, following adoption of the mitigation measures detailed above, is therefore considered to be Negligible

12.8.3 Potential Groundwater Impacts during Construction

Despite the requirement for deep piles as part of the Proposed Development, the effects on groundwater flow and potential for groundwater flooding arising from the construction of building foundations are considered to be negligible given that groundwater is located at a depth of at least 19 metres below ground level and groundwater resources are not exploited significantly in the area.

The findings of the intrusive Site investigation will determine whether contamination is present in the perched groundwater. A strategy for dealing with any contamination will be prepared and agreed with the Local Authority and Environment Agency. It is considered that it will be possible to eliminate or minimise any significant pollution linkages to an acceptable level with appropriate remediation and control measures.

The residual risk of potential groundwater impacts arising from construction, following implementation of mitigation measures detailed above, is therefore considered to be Negligible.

12.8.4 Operational Flood Risk and Site Drainage

The Site is not considered to be at a significant risk of flooding as detailed in the FRA (refer to **Appendix 12.1**). However, there is a requirement to reduce the rate of surface water runoff in accordance with the NPPF.

It has been concluded that the preferred drainage strategy for the Site is to attenuate runoff in non-infiltration swales and a detention basin prior to discharge to the surface water sewer as per the current arrangement. The existing 100 year runoff rate is 620.9 l/s; therefore, attenuation will be provided to control runoff to 80% of this rate (i.e. 496.7 l/s) for all events up to and including the 100 year plus 20% climate change rainfall event.

A basic simulation was provided in the planning application for the Consented Development and is included in the FRA. This simulation, produced in MicroDrainage (see **Appendix F** of **Appendix 12.1**), indicated that a non-infiltration pond or basin with a surface area of 1,143 m^2 at a depth of 1 m with 1:3 side slopes is enough to control a range of rainfall scenarios on-site. The proposed non-infiltration basin contains the required volume as well as an additional freeboard allowance of 100 mm. The Proposed Development retains the non-infiltration pond in the site layout. Although the surface area of the pond has been adjusted such that it is slightly smaller, the pond has been made deeper (to 1.6m) such that it accommodates the same volume of rainwater as previously, such that the findings of the modelling still stand.

Additional storage could be provided by dual purpose non-infiltration swales used for conveyance. This is considered feasible around the areas designated for landscaping and would provide the betterment in runoff rates required by the NPPF, associated Environment Agency standing advice.

The residual effect of flood risk and surface water management during operation, following adoption of the mitigation measures detailed above, is therefore considered to be Minor Beneficial.

12.8.5 Pollution Control for Routine Site Drainage

Clean runoff from the roof of the building will be routed directly to the attenuation system and runoff originating from areas of hardstanding and car parking on the Site will be routed to the attenuation system via silt traps and oil interceptors.

All waste will be stored within the building, in order to deal with odour issues and, for this reason, any surface water runoff is unlikely to come into contact with waste stored on the Site. All chemicals used in the process will be stored in appropriately bunded tanks and the risk of contamination from this source is therefore deemed to be low.

The residual risk of contamination arising from routine site drainage, following adoption of the mitigation measures detailed above, is therefore considered to be Negligible.

12.8.6 Water Demand

The water demand of the Proposed Development is considered to be relatively minor as reuse and recycling measures will be implemented to minimise the potential effect on the demand for mains water supply. Rainwater harvesting will be used to provide process water and, as such, mains water will only be required when the rainwater tanks are empty. A reduction of 50% in demand may be achieved by re-use and recycling techniques.

The residual effect on water demand arising from Site operation, following adoption of the mitigation measures detailed above, is therefore considered to be Negligible to Minor Adverse.

12.8.7 Foul Drainage

The foul drainage requirements are minor and result from domestic uses only; as such, it is anticipated that there will not be a considerable increase in the loading of the local sewer network. Consultation will be undertaken with Anglian Water to confirm the outcome of capacity studies.

Should the capacity studies establish that upgrading of the existing sewage treatment works and relevant infrastructure is necessary, then a contribution will need to be provided by the developer to ensure these works take place.

The residual effect of foul drainage demand arising from the Proposed Development, following adoption of the mitigation measures detailed above, is therefore considered to be Negligible.

12.9 Residual Effects (No material change from the 2016 ES)

The overall residual effect of the Development on water quality and hydrology is predicted to be Negligible. The residual effects showing the pre-mitigation and post-mitigation significance for each identified potential effect are summarised in **Table 12.4**.

There are no predicted adverse residual effects as all issues of significance are considered to have been reduced to a negligible or minor beneficial effect through the design of mitigation measures, as discussed above.

Table 12.4 Residual Effects

Phase	Description	Pre-mitigation significance	Post-mitigation significance
Construction	Potential remobilisation of contamination during construction	Moderate Adverse	Negligible
	Contamination arising from general construction drainage	Minor Adverse	Negligible
	Potential groundwater impacts during construction	Minor Adverse	Negligible
Completed Development	External flood risk and site drainage	Minor Beneficial	Minor Beneficial
	Contamination of surface water or groundwater from routine site drainage	Minor Adverse	Negligible
	Increased water demand	Minor Adverse	Negligible to Minor Adverse
	Foul Drainage	Minor Adverse	Negligible

12.10 Differences from the Consented Development

As stated in section 12.2, the changes made to the design of the Proposed Development do not result in material changes to the effects of the Proposed Development on the water environment. All effects of the Proposed Development on the water environment are identical to those presented in the 2016 ES for the Consented Development.

12.11 Summary

An assessment has been undertaken of the likely significant effects of the Proposed Development on water quality and hydrology. An FRA has been undertaken and this is included as **Appendix 12.1**.

An assessment of the baseline conditions of the Site has been undertaken and is summarised as follows:

- located in Flood Zone 1 (low risk);
- no surface water or groundwater abstractions within 2 km of the Site;
- the closest surface watercourse is the Willow Brook North Arm located adjacent to the northern boundary of the Site; and
- the underlying bedrock geology of Northampton Sand Formation has been extensively quarried and is present only in a limited capacity beneath the Site. Approximately 19 m of fill is present below the Site.

There are three potentially significant effects on water resources during the construction period of the Proposed Development:

- the potential remobilisation of contamination during construction;
- surface water and/or groundwater contamination from general construction activities; and
- interruption of groundwater flows, giving rise to an elevated risk of groundwater flooding and effects on baseflow to local water bodies.

There are four potentially significant effects on water resources during operation of the Proposed Development:

- external flood risk and the control of surface water runoff taking climate change predictions into account;
- potential contamination of local surface waters or groundwater from routine Site drainage;
- water demand and the effect of the availability of local water resources; and
- foul drainage demand and the effect on local surface waters or groundwater.

Mitigation measures will be implemented to ensure that the overall residual effect on the water environment during the construction and operational phases will be Negligible.

12.12 References

Ref 12.1 Department for Communities and Local Government. (2014).Guidance – Environmental Impact Assessment. [Online]. [Accessed 20th November]. Available from: http://planningguidance.planningportal.gov.uk/blog/guidance/environmental-impact-assessment/

Ref 12.2. Anglian River Basin Management Plan (RBMP) 2015 https://www.gov.uk/government/publications/anglian-river-basin-district-river-basin-management-plan

Ref 12.3 Ministry of Housing, Communities and Local Government (2018) National Planning Policy Framework.

Ref 12.4 Northamptonshire County Council (2017) Northamptonshire Minerals and Waste Local Plan

Ref 12.5 North Northamptonshire Joint Planning Unit (2016) North Northamptonshire Joint Core Strategy 2011 – 2031

Ref 12.6 Willow Brook Operational Catchment (2018) EA Catchment Data Explorer

Ref 12.7 The Environment Agency's approach to groundwater protection v1.2 (2018)

Ref 12.8 Nene Mid Lower Jurassic Unit Overview (2016) EA Catchment Data Explorer