9. FLOOD RISK AND DRAINAGE

9.1 INTRODUCTION

9.1.1 This Chapter of the ES assesses the likely significant effects of the Proposed Development with respect to Flood Risk and Drainage and Water Resources.

9.1.2 This Chapter describes the methods used to assess the effects; the baseline conditions currently existing at the Application Site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.

9.1.3 **Appendix 9.1** contains the Flood Risk Assessment and Drainage Strategy which is associated with this ES Chapter.

9.1.4 **Appendix 9.2** contains the Envirocheck© Report which is associated with this ES chapter.

9.2 ASSESSMENT APPROACH

Methodology

9.2.1 Assessment of potential development impacts on flood risk and drainage has been undertaken through a combination of desk-based analysis, qualitative and quantitative impact assessment and consideration of potential impact mitigation requirements.

9.2.2 Potential development effects have been defined by reference to baseline geological, hydrological and hydrogeological assessment and detailed development design proposals. Where necessary, mitigation measures have been defined for any effects considered to be significant with the aim of reducing any residual risk to an acceptable level. The criteria for determining the significance of effects is based upon the following methodology, using the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 10 (HD 45/09)[1] as a guide:

- Assessment of potential receptor sensitivity;
- Assessment of potential magnitude of impact; and
- Determination of potential effect significance.

Assessment of Significance

9.2.3 As summarised in **Tables 9.1**, **9.2** and **9.3** magnitude is considered in relation to the potential impact on the receptor with magnitude defined in a range from Negligible to High and either beneficial or adverse. The receptor sensitivity is defined as Low, Medium or High depending on the specific receptor character and its ability to tolerate change. The significance of the effect is defined in relation to both the magnitude of the impact and receptor significance, it can be beneficial or adverse. If the significance of the potential effect is 'Moderate Adverse' or higher, then mitigation measures may need to be considered.

Table 9.1: Methodology for determining sensitivity

Sensitivity	Examples of Receptor

[1] https://www.standardsforhighways.co.uk/dmrb/

High	WFD Classification – Good or High. Site protected under EU or UK wildlife legislation (SAC, SPA, SSSI, Ramsar Site). European Designated salmonid fishery (or salmonid & cyprinid fishery). Important social or economic uses such as water supply, navigation or mineral extraction. Floodplain or defence protecting 1 or more residential properties or industrial premises from flooding.
Medium	WFD Classification: Moderate. May be designated as a local wildlife Site. May support a small / limited population of protected species. Limited social or economic uses. Floodplain or defence protecting 10 or fewer industrial properties from flooding.
Low	WFD classification – Poor. No nature conservation designations. Low aquatic fauna and flora biodiversity and no protected species. Minimal economic or social uses. Floodplain with limited constraints and a low probability of flooding of residential and industrial properties.

Table 9.2: Methodology for determining impact magnititude

Magnitude of Impact	**Examples of Receptor**
High (adverse)	Loss of Protected Area. Pollution of potable sources of water abstraction. Deterioration of a water body leading to a failure to meet Good Ecological Status (GES) under the WFD and reduction in Class (or prevents the successful implementation of mitigation measures for heavily modified or artificial water bodies). Increase in peak flood level (1% annual probability) >100 mm.
Medium (adverse)	Loss in production of fishery. Discharge of a polluting substance to a watercourse but insufficient to change its water quality status (WFD class) in the long term. No reduction in WFD class, but effect may prevent improvement (if not already at GES) or the successful implementation of mitigation measures for heavily modified or artificial water bodies. Increase in peak flood level (1% annual probability) >50 mm.
Low (adverse)	Noticeable effect on features, or key attributes of features, on the Protected Areas Register. Measurable changes in attribute but of limited size and / or proportion, which does not lead to a reduction in WFD status or failure to improve. Increase in peak flood level (1% annual probability) >10mm.
Negligible	No effect on features, or key attributes of features, on the Protected Areas Register. Discharges to watercourse but no significant loss in quality, fishery

	productivity or biodiversity. No effect on WFD classification or water body target. Negligible change in peak flood level (1% annual probability) <+/- 10 mm.
Beneficial	Improvement on features, or key attributes of features, on the Protected Areas Register. Improvement in fishery production or biodiversity. Improvement in WFD classification or water body target. Reduction in peak flood level (1% annual probability) >+/- 10 mm.

Table 9.3: Significance Matrix

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

9.2.4 In considering the significance of the effect, account is taken of an effect's duration; reversibility and compatibility with relevant environmental policies and standards. Effects can be temporary or permanent. Temporary effects are largely associated with the construction phase and permanent effects are largely associated with the operational phase.

9.2.5 The overall significance of an effect is expressed as negligible, minor, moderate or major based on the definitions below.

- Major: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
- Moderate: These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
- Minor: These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
- Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

9.2.6 For the purpose of this assessment, any effect that is moderate or major is considered to be significant. Any effect that is minor or below is considered not significant.

Legislative and Policy Framework

9.2.7 Legislation and policy specifically relevant to this topic area is outlined below.

National Legislation

9.2.8 The Water Environment (Water Framework Directive (WFD)) (England and Wales) Regulations 2003 implements the WFD[2]. This establishes a framework for community action in the field of water policy. The Water Framework Directive (WFD) seeks to enhance the status of aquatic ecosystems, promotes sustainable water use and contributes to mitigating the effects of flood and drought. It is a requirement of the WFD that member states classify major rivers and their tributaries in terms of their ecological status with reference to biological, chemical and hydro-morphological quality indicators.

9.2.9 The Groundwater (Water Framework Directive) (England and Wales) Regulations 2009[3] and Groundwater (Water Framework Directive) (England) Direction 2014 transpose the Groundwater Daughter Directive. The former addresses the protection of groundwater against pollution caused by certain dangerous substances and places an obligation to prevent pollution of groundwater by substances including hydrocarbons and control the introduction of named metals. The Daughter Directive requirements have been transposed into UK law by the Environmental Permitting (England and Wales) Regulations 2016. The "Daughter Directive" to the WFD establishes specific measures as provided for in the WFD to prevent and control groundwater pollution. It defines criteria for the assessment of good groundwater chemical status

9.2.10 The Flood Risk Regulations (2009)[4] (England, Wales and Scotland) requires the development and update of a series of tools for managing all sources of flood risk, in particular:

- Preliminary flood risk assessments (PFRAs);
- Flood risk and flood hazard maps;
- Flood risk management plans;
- Co-ordination of flood risk management at a strategic level;
- Improved public participation in flood risk management; and
- Co-ordination of flood risk management with the WFD.

9.2.11 The Flood Risk Regulations 2009 was consolidated into the Flood and Water Management Act 2010[5]. The Flood and Water Management Act (2010) (England and Wales) clarifies responsibilities for land drainage and flood risk management and transfers some key responsibilities to local authorities. The Act intends to provide better, more comprehensive management of flood risk for people, homes and businesses. In particular, it encourages the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt Sustainable Drainage Systems (SuDS) for new developments and redevelopments.

9.2.12 The Water Resources Act 1991[6] (and Land Drainage bylaws) (England and Wales) requires the prior written consent of the Environment Agency (EA) for any works or structures in, over, under or within 8 metres of any watercourse designated as a 'Main River'. Main Rivers are classified watercourses under the jurisdiction of the EA. Under Section 85 it is an offence to cause or knowingly permit poisonous, noxious, or polluting matter, or any solid waste matter to enter controlled waters (which include rivers). The consenting regime for discharges to controlled waters is set out in the Environmental Permitting (England and Wales) Regulations 2016[7].

[2] Commission of the European Communities (2000) Directive 2000/60/EC 'The Water Framework Directive'

[3] HMSO (2009) The Groundwater (England and Wales) Regulations

[4] https://www.legislation.gov.uk/uksi/2009/3042/contents/made

[5] https://www.legislation.gov.uk/ukpga/2010/29/contents

[6] https://www.legislation.gov.uk/ukpga/1991/57/contents

[7] https://www.legislation.gov.uk/uksi/2016/1154/contents/made

9.2.13 The Nitrate Pollution Prevention Regulations 2015[8] (England), aims to reduce nitrate concentrations from agriculture entering water systems through measures which include the following:

- A requirement to designate Nitrate Vulnerable Zones (NVZs);
- A requirement to plan nitrogen applications on agricultural land;
- The setting of limits on nitrogen fertiliser applications;
- The establishment of closed periods for spreading; and
- Controls on the application and storage of organic manure.

9.2.14 The EA is responsible for assessing farmers' compliance with measures in NVZs.

9.2.15 The Land Drainage Act 1991[9] (England and Wales) places responsibility for maintaining flows in watercourses on landowners.

National Planning Policy

9.2.16 The revised National Planning Policy Framework (NPPF)[10] was last updated on 20th July 2021 (superseding the original NPPF published in 2012 which superseded the Planning Policy Statement 25 (PPS25)) along with previous updates in 2018 and 2019. It is supported by the National Planning Practice Guidance[11] (NPPG), which is a 'live' document.

9.2.17 The NPPF seeks to ensure that climate change is considered for long term factors such as flood risk, coastal change, water supply and changes to biodiversity and landscape. New development should therefore be planned to avoid increased vulnerability to the range of effects arising from climate change. Where new development is brought forward in areas which are vulnerable to the range of effects arising from climate change, care should be taken to ensure that flood risk can be managed through sustainable adaptation measures.

9.2.18 In relation to flood risk, inappropriate development in areas at high risk of flooding should be avoided by directing development away from areas at the highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere and taking into account the effects of climate change.

9.2.19 NPPF states that a Site-specific Flood Risk Assessment (FRA) is required for the following scenarios:

1. Proposals of 1 hectare or greater in Flood Zone 1;
2. All proposals for new development in Flood Zones 2 and 3;
3. Proposals in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the EA); and
4. Any Proposed Development or change of use to a more vulnerable use, on land in Flood Zone 1 which may be subject to other sources of flooding.

[8] https://www.legislation.gov.uk/uksi/2015/668/contents/made

[9] https://www.legislation.gov.uk/ukpga/1991/59/contents

[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf

[11] https://www.gov.uk/government/collections/planning-practice-guidance

Local Planning Policy

9.2.20 Local policy regarding development is set out in the Cherwell Local Plan[12] (re - adopted December 2016), which contains the following policies relating to flood risk:

Policy ESD 6: Sustainable Flood Risk Management

The Council will manage and reduce flood risk in the District through using a sequential approach to development; locating vulnerable developments in areas at lower risk of flooding. Development proposals will be assessed according to the sequential approach and where necessary the exceptions test as set out in the NPPF and NPPG. Development will only be permitted in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding.

In addition to safeguarding floodplains from development, opportunities will be sought to restore natural river flows and floodplains, increasing their amenity and biodiversity value. Building over or culverting of watercourses should be avoided and the removal of existing culverts will be encouraged.

Existing flood defences will be protected from damaging development and where development is considered appropriate in areas protected by such defences it must allow for the maintenance and management of the defences and be designed to be resilient to flooding.

Site specific flood risk assessments will be required to accompany development proposals in the following situations:

- *All development proposals located in flood zones 2 or 3*
- *Development proposals of 1 hectare or more located in flood zone 1*
- *Development sites located in an area known to have experienced flooding problems*
- *Development sites located within 9m of any watercourses.*

Flood risk assessments should assess all sources of flood risk and demonstrate that:

- *There will be no increase in surface water discharge rates or volumes during storm events up to and including the 1 in 100 year storm event with an allowance for climate change (the design storm event)*
- *Developments will not flood from surface water up to and including the design storm event or any surface water flooding beyond the 1 in 30 year storm event, up to and including the design storm event will be safely contained on site.*

Development should be safe and remain operational (where necessary) and proposals should demonstrate that surface water will be managed effectively on site and that the development will not increase flood risk elsewhere, including sewer flooding.

Policy ESD 7: Sustainable Drainage Systems (SuDS)

All development will be required to use sustainable drainage systems (SuDS) for the management of surface water run-off.

Where site specific Flood Risk Assessments are required in association with development proposals, they should be used to determine how SuDS can be used on particular sites and to design appropriate systems.

[12] https://www.cherwell.gov.uk/downloads/download/45/adopted-cherwell-local-plan-2011-2031-part-1-incorporating-policy-bicester-13-re-adopted-on-19-december-2016

In considering SuDS solutions, the need to protect ground water quality must be taken into account, especially where infiltration techniques are proposed. Where possible, SuDS should seek to reduce flood risk, reduce pollution and provide landscape and wildlife benefits. SuDS will require the approval of Oxfordshire County Council as LLFA and SuDS Approval Body, and proposals must include an agreement on the future management, maintenance and replacement of the SuDS features.

Relevant Guidance

National Standards for Sustainable Drainage Systems (2015)[13]

9.2.21 The National Standards for Sustainable Drainage Systems published by DEFRA set out the technical standards, which are non-statutory, to be utilised in conjunction with the NPPF and associated NPPG.

Non-Statutory Technical Standards for Sustainable Drainage (2015)[14]

9.2.22 LASOO (Local Authority SuDS Officer Organisation) published the Non-Statutory Technical Standards for Sustainable Drainage in 2015, this establishes the principles for considering sustainable drainage at a planning stage to include:

- Layout;
- Density;
- Site Access;
- Topography;
- Ground Conditions; and
- Discharge Destination.

Building Regulations Part H (2015)[15]

9.2.23 Buildings Regulations Part H provide guidance in terms of foul drainage, wastewater treatment systems and cesspools, rainwater drainage, building over sewers, separate systems for surface water and foul waste disposal.

9.2.24 In relation to flood risk, Buildings Regulations Part H sets out a hierarchy of where surface water should discharge. This hierarchy should be followed where practicable and is listed below.

9.2.25 Infrastructure protocol states that a designer should consider the following in order of preference before finalising a surface water design statement for the development:

- Discharge to SuDS devices, e.g. an adequate soakaway or some other adequate infiltration system;
- Discharge to a watercourse or where this is not reasonably practicable; and
- Discharge to a public sewer network.

[13] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/82421/suds-consult-annexa-national-standards-111221.pdf

[14] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

[15] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/442889/BR_PDF_AD_H_2015.pdf

CIRIA SuDS Manual[16]

9.2.26 The CIRIA SuDS Manual, C753 (CIRIA, 2015) provides best practice guidance on the planning, design, construction, operation and maintenance of Sustainable Drainage Systems (SuDS).

Scoping Criteria

9.2.27 A Screening Opinion Application (R22/00385/SO) was submitted to Cherwell District Council and West Northamptonshire Council on 10th February 2022. Their response confirmed the Proposed Development does constitute EIA Development and that an Environmental Statement will be required.

9.2.28 A Scoping Opinion has not been undertaken with the Local Planning Authorities therefore the potential effects considered below are based on professional judgement.

9.2.29 Accordingly, the Flood Risk and Drainage Assessment considers the following potential effects:

- Construction and Operational Phase – Possible surface water pollution;
- Construction and Operational Phase – Effect on surface water attributes, including water quality;
- Operational Phase – Increased on and off-Site surface water flood risk;
- Operational Phase – Impact on the public drainage network (foul and surface water), both in terms of water quality and capacity; and
- Assessment of cumulative impacts where relevant.

9.2.30 The receptors identified at risk include:

- The River Cherwell to the west of the Application Site and the network of drainage ditches within the Application Site;
- Construction Workers; and
- Future Site Users.

Limitations to the Assessment

9.2.31 It is noted that this assessment comprises a desk study only and no sampling or testing of water quality has been undertaken as part of this assessment.

9.2.32 The methodology for assessment of potential flood risk and drainage effects has incorporated the following assumptions:

- That Site access roads and footways would be surfaced with compacted hardcore or similar with tarmac surfacing and therefore assumed to be effectively impermeable;
- Any runoff from waste materials would be collected, contained and prevented from direct entry to local watercourses;
- That all clean roof drainage would be discharged directly to the nearest surface water drainage feature; and
- Analysis of flood extents is reliant on the accuracy of the published EA Flood Map for Planning and EA flood data. No new hydraulic modelling has been undertaken as part of this study.

9.3 BASELINE CONDITIONS

[16] CIRIA (2015) SuDS Manual, C753

9.3.1 This assessment focuses on land within the Application Site boundary. However, a wider area extending up to 1 km from the Application Site has been considered where relevant to the assessment of hydrological effects (for example, where a pathway may exist).

9.3.2 A 1 km study area is considered appropriate for data collection taking into account the nature of the Proposed Development and likely zone of influence on hydrological receptors. Given the landscape surrounding the Application Site, local land use activities and the road network, effects are likely to be relatively contained and effects on receptors located over 1 km from the Application Site are unlikely.

9.3.3 The baseline conditions at the Application Site have been established through a review of the literature and data from publicly available sources, including the EA, British Geological Survey (BGS), Cherwell District Council, West Northamptonshire Council and Oxford County Council.

9.3.4 Further details of baseline conditions can also be found in **Appendix 9.1: Flood Risk Assessment and Drainage Strategy.**

Site Description and Context

9.3.5 The Application Site is predominantly greenfield, comprising fields used for agriculture. An access road is located within the northern extent of the Application Site leading to 'Huscote Farm' - a dwelling / farm yard. The Application Site is bordered by further agricultural land to the north and east, the A422 to the south and the A362 to the west with the M40 beyond.

9.3.6 The Application Site slopes from 155.47 m Above Ordnance Datum (m AOD) in the north-east to 93.30 m AOD in the north-west. The Application Site generally slopes down from east to west. Further detail on the Application Site topography is provided in the Flood Risk Assessment and Drainage Strategy included as **Appendix 9.1.**

Baseline Survey Information

Hydrology

9.3.7 Multiple surface water features are present within the Application Site. A small channel is located in the north-eastern corner of the Site which connects two ponds. Three land drains have been identified within the Application Site, which are located along the north-western Application Site boundary, the access road leading to Huscote Farm and the field boundary to the south of the access road. The land drains flow in a northerly / westerly direction based on local topography. The two land drains which run adjacent to the access road and field boundary to the south of the road are understood to be culverted under the A361.

9.3.8 The River Cherwell is located approximately 250m west of the Application Site. The River Cherwell generally flows in a southerly direction past the Application Site. Further drainage channels and unnamed watercourses are located to the west, north and south of the Application Site. A review of the catchment dynamics indicate that all watercourses / surface water features in a 1 km radius of the Application Site will ultimately drain into the River Cherwell.

9.3.9 The Application Site is not located within an Internal Drainage Board (IDB) district.

Geology

9.3.10 Reference to the British Geological Survey (BGS) online mapping[17] (1:50,000 scale) indicates that no superficial deposits are recorded at the Application Site. The majority of the Application Site is underlain by bedrock deposits of Charmouth Mudstone Formation comprising mudstone. The eastern Application Site boundary is underlain by bedrock deposits of Dyrham Formation consisting of interbedded siltstone and mudstone.

9.3.11 The closest historical BGS borehole record (BGS Ref: SP44SE175) is located in the south-western corner of the Application Site (NGR 447282,241863). The borehole record encountered the following generalised geology:

- Topsoil to a depth of 0.2 m below ground level (bgl);
- Clay between depths of 0.2 to 9.90 m bgl; and
- Limestone between a depth of 4.15 m to a maximum depth of 10 m bgl.

Hydrogeology

9.3.12 The EA classify the Charmouth Mudstone Formation and Dyrham Formation bedrock deposits as Secondary Undifferentiated Aquifers[18] which are defined as *'cases where 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'*.

9.3.13 The above BGS borehole record encountered groundwater at 1.2 m bgl.

9.3.14 No Source Protection Zones are present within the Application Site or within a 1 km radius of the Application Site.

Flood Risk from Rivers or the Sea

9.3.15 The EA's online 'Flood Map for Planning'[19] indicates that the entire Application Site is situated within Flood Zone 1 (Low Probability), meaning that the Application Site is situated in an area that had less than 1 in 1000 annual probability of fluvial flooding (0.1% Annual Exceedance Probability (AEP)).

9.3.16 The River Cherwell is situated below the 94 m AOD contour and 2.30 m below the lowest point of the Application Site. Any out of channel flooding will flow south-westwards away from the Application Site following local topography. The EA's Spatial Flood Defence dataset indicates that there is a flood defence embankment running between the Application Site and the River Cherwell, the defence has a crest level of 76.7 m AOD and a Standard of Protection of up to the 1 in 200 year (0.5% AEP) flood event.

9.3.17 Due to the Application Site's inland location, the Application Site is not considered to be at risk from tidal flooding.

9.3.18 The Application Site is not situated within an EA Flood Warning Area and according to the Cherwell District Council Strategic Flood Risk Assessment (SFRA)[20] and

[17] http://mapapps.bgs.ac.uk/geologyofbritain/home.html

[18] https://magic.defra.gov.uk/

[19] https://flood-map-for-planning.service.gov.uk/

[20] Cherwell District Council (2017) Strategic Flood Risk Assessment

Oxfordshire County Council Preliminary Flood Risk Assessment (PFRA)[21] the Application Site has not been impacted by any historic fluvial flood events.

Surface Water Flood Risk

9.3.19 The EA's Long-Term Flood Risk Map (Surface Water)[22] indicates that the majority of the Application Site is at Very Low (<0.1% annual probability) risk of surface water flooding. An area identified at High risk (>3.3% annual probability) is shown in the south-west of the Application Site which is associated with surface water flooding travelling west through drainage channels within the Application Site and pooling within a topographical low point against the embanked junction of the M40 / the A361.

9.3.20 There are no records of surface water flooding affecting the Application Site.

Surface Water Drainage

9.3.21 A small pond is located in the north-east of the Application Site. Multiple drainage ditches run adjacent to field boundaries within the Application Site. Two 750 mm diameter culverts are present along the western boundary of the Application Site which convey flows transported within the drainage channels to the neighbouring site's drainage system which ultimately discharges to the River Cherwell via an outfall.

9.3.22 No public surface water sewers are located within the Application Site or within the immediate vicinity of the Application Site.

9.3.23 According to the Envirocheck© Report , there are eight active discharge consents to surface water recorded within 1 km of the Application Site, see Table 9.4. Full details of consented discharges to surface water and licensed abstractions from surface water are provided in the Envirocheck datasheet and accompanying maps, included as **Appendix 9.2**.

Table 9.4: Consent Discharges to surface water within 1 km radius of the Application Site

Reference	Distance from Application Site (m)	Owner	Location	Purpose	Receptor
CATM.2704	147	Mr. M.J. & Mrs. V.B. Spiers	Meadow House Nethercote Banbury Oxfordshire Ox17 2bl	Sewage Discharges - Final/Treated Effluent	Land / Watercourse (Blacklocks Hill Ditch)
Npswqd008829	171	Mr David Bannister	Foxdale Nethercote Banbury Oxfordshire Ox17 2bl	Sewage Discharges - Final/Treated Effluent	Watercourse (tributary of River Cherwell)

[21] Oxfordshire County Council (2011) Preliminary Flood Risk Assessment

[22] https://check-long-term-flood-risk.service.gov.uk/map

CAWM.0031	151	Dogs For The Disabled	Kathanna Kennels Blacklock Hill Nethercote Banbury Oxfordshire Ox17 2bs	Sewage Discharges - Final/Treated Effluent	Watercourse (tributary of River Cherwell)
CTWC.3007	260	Tarmac Construction Ltd	Tarmac Construction, M40 Contract, Daventry Rd, Banbury	Sewage Discharges - Final/Treated Effluent	Watercourse (River Cherwell)
Cawm.0195	386	Mr D Bowdler	No 8, Nethercote Banbury Oxfordshire Ox16 8st	Sewage Discharges - Final/Treated Effluent	Watercourse (Nethercote Ditch)
CTWC.2010	421	Mr D Bowdler	New Dwelling, Nethercote, Banbury, Oxon	Sewage Discharges - Final/Treated Effluent	Watercourse (Nethercote Ditch)
CNTM.0345	414	Mr R Neal	The Stables, Nethercote Lane, Nethercote, Banbury, Oxfordshire	Sewage Discharges - Final/Treated Effluent	Watercourse (Nethercote Ditch)
CNTM.0856	803	Faccenda Chicken Ltd	Faccenda Chicken Ltd, Banbury Feed Mill, Wildmere Road, Banbury, Oxon	Trade Effluent	Watercourse (tributary of River Cherwell)

9.3.24 Surface water runoff from the Proposed Development will be managed to ensure that it will not increase the risk of flooding, notably during the operation phase either on or off the Application Site. The surface water drainage mitigation is therefore considered as embedded mitigation in terms of this assessment. The full Drainage Strategy is included as Appendix 9.1.

Water Quality

9.3.25 As part of the Thames River Basin Management Plan[23] (EA, 2016), the River Cherwell (Cropredy to Nell Bridge, Water Body ID: GB106039037310) is classified as having 'Moderate' current ecological quality but failed the most recent chemical testing in 2019.

[23] https://environment.data.gov.uk/catchment-planning/RiverBasinDistrict/6

9.3.26 According to the Envirocheck© Report, three pollution incidents have been recorded within 1 km of the Application Site with a 'significant' or greater impact to water, see **Table 9.5.**

Table 9.5: Pollution Incidents within 1 km of the Application Site with a 'significant' or greater impact to water.

Reference	Distance from Application Site (m)	Location	Incident Date	Receiving Water	Incident Severity
W1930497	365	M40 at Banbury	18/09/1993	Not Given	Significant
THWE1999043304	541	Banbury	10/02/1999	Not Given	Significant
W1890599	964	Banbury	11/01/1989	Not Given	Significant

Groundwater Flood Risk

9.3.27 A BGS borehole record in the south-western corner of the Application Site struck groundwater at 1.2 m bgl.

9.3.28 The Application Site is not within a Groundwater Source Protection Zone.

9.3.29 The Cherwell District Council SFRA indicates that no recorded historic incidents of groundwater flooding have occurred at the Application Site.

Flood Risk from Reservoirs

9.3.30 The EA's Long Term Flood Risk Map (Reservoirs) map shows that the Application Site is not at risk of flooding from reservoirs. The north-western corner of the Application Site boundary is bordered by the extents of a reservoir flood that could occur if there is already flooding from rivers. The EA state that reservoir flooding is extremely unlikely to happen. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975[24] in England, the EA ensure that reservoirs are inspected regularly, and essential safety work is carried out.

Flood Risk from Canals and Sewers

9.3.31 The Oxford Canal is located approximately 625 m west of the Application Site. As described in the Flood risk from rivers or sea section above, an EA embankment flood defence runs between the Application Site and the canal / River Cherwell, therefore there is no associated flood risk to the Application Site.

9.3.32 As the Application Site is currently greenfield, there are no existing public sewers within the Application Site. No records of sewer flooding that can be attributed to

[24] https://www.legislation.gov.uk/ukpga/1975/23/contents

capacity limitations in the public sewer system have been identified within the vicinity of the Application Site.

Ecological Designations

9.3.33 According to Magic Map[25], there are no designated sensitive areas e.g. Special Area of Conservation (SAC), Special Protection Area (SPA) or Site of Special Scientific Interest (SSSI) within 1km of the Application Site.

9.4 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

9.4.1 Given the nature and intended longevity of the Proposed Development's operational life, decommissioning has not been considered relevant as part of this study. Accordingly, the EIA is to focus on the potential likely significant effects of the Proposed Development during construction and operational phases only.

Construction

Effects on Flood Risk and Drainage

Mud and Debris Blockages

9.4.2 There is the potential for mud and debris arising from the construction works to enter the existing surface water / land drainage system, causing blockages and restricting flow. This could result in localised flooding on site, especially after heavy or prolonged rainfall. As the Application Site is at present predominantly agricultural the initial effect is considered to be limited. However, as the phased development of the Application Site progresses and surface water drainage networks are installed this potential construction effect will become an increasing consideration.

9.4.3 The sensitivity of construction workers and equipment to mud and debris blockages is considered to be **Medium**. The potential for mud and debris to block drainage networks is considered to have an effect of **Low Adverse** magnitude on flooding to the Application Site itself and surrounding area which would result in flood risk to construction workers and equipment at the Application Site. The significance of effect is **Moderate Adverse.**

Temporary Increase in Impermeable Area

9.4.4 Temporary increase in impermeable area during construction has the potential to increase flooding both on and off site. Temporary hardstanding or compacted areas could result in rapid surface water runoff to local watercourses or cause an increase in overland flow. As the Application Site is Greenfield at present there is potential for overland flows to be created and for localised flooding to occur. Increased, un-regulated discharges into local watercourses could also increase the risk of flooding downstream.

9.4.5 The effects would be temporary and short term. The sensitivity of construction workers and equipment is considered to be **Medium** with the temporary effects considered to have an effect of **Medium Adverse** magnitude to people working within - and property at - the Application Site as it could occur at a time of high flood risk (e.g. during a large storm event). The significance of effect is **Moderate Adverse.**

[25] https://magic.defra.gov.uk/

Effects on Water Resources

Silt-laden Runoff

9.4.6 During the construction phases of the Proposed Development, there are a number of activities which have the potential to negatively affect the local water environment. Activities such as potential dewatering of excavations, concreting, earthworks, and use of heavy plant can lead to significant quantities of silty runoff that may also be contaminated with oil, fuel and/or other construction materials, all of which have potential to cause pollution of the water environment and negatively affect the ecology it supports. Pollutants could be mobilised to watercourses or infiltrate to ground.

9.4.7 The Proposed Development would involve construction of new internal access roads to the Proposed Development. Access roads are expected to be constructed with compacted self-binding aggregate fill materials. Shallow excavation of vegetation and soils would be necessary for placement of road surfaces. Access roads would form long linear features that, in the event of rainfall, could provide temporary drainage routes for surface water during the construction phase of the development. With the potential for soil erosion and consequent liberation of sediment from shallow road excavations it would be necessary to ensure that pollution prevention measures within the Application Site are adequate to prevent migration of silt to surface watercourses and groundwater bodies.

9.4.8 The sensitivity of surface water and groundwater bodies to silt contamination is considered to be **Medium**. Without mitigation, potential effects are considered of a **Medium** magnitude. The significance of the effect is **Moderate Adverse** on a temporary short-term basis.

Spillages, Leakages and Pollutants

9.4.9 During construction, fuel, hydraulic fluids, solvents, grouts, paints and detergents and other potentially polluting substances will be stored and / or used on the Application Site. Leaks and spillages of these substances could pollute groundwater bodies through infiltration as well as the surface watercourses within the Application Site and those nearby if their use is not carefully controlled and spillages enter existing flow pathways. To allow such substances to enter a watercourse could be in breach of the Water Resources Act 1991, therefore, measures to control the storage, handling and disposal of such substances will need to be in place prior to and during construction. The construction compound locations have not been determined, nor has it been confirmed at this stage whether concrete will be batched off-site. Therefore, it has been assumed that these could be sited next to existing flow pathways,

9.4.10 The sensitivity of surface water and groundwater bodies to spillages, leakages and pollutants is considered to be **Medium**. Without mitigation measures spillages of chemicals/fuel stored and or used on the Application Site could cause short term, temporary effects of a **Medium** magnitude on the River Cherwell and associated watercourses (medium importance). The significance of effect is **Moderate Adverse** on a temporary short-term basis.

Inappropriate Wastewater Disposal from Welfare Facilities

9.4.11 In the absence of nearby public foul water sewers to which foul water from welfare facilities could be connected, a suitably sized self-contained unit will be installed on the Application Site that will be maintained by a specialist Contractor. The sensitivity of surface water to inappropriate wastewater disposal from welfare facilities is considered to be **Medium**. Construction foul water will not be discharged into a

watercourse under any circumstances and therefore the magnitude of impact and significance of this effect is considered to be **Negligible.**

Operation

Effects on Flood Risk and Drainage

Increase in Permanent Impermeable Area

9.4.12 The Proposed Development will increase the permanent impermeable area on the Application Site which will generate increased surface water runoff when compared to the current use of the Application Site. This could potentially increase localised pluvial flooding on the Application Site, as well as increase flood risk to people and property in the immediate surrounding area and downstream.

9.4.13 The sensitivity of people and property is considered **Medium.** Whilst the effects would be temporary and short term, this is considered to have an effect of **Medium Adverse** magnitude to people and property as it could occur at time of high flood risk (e.g. during a large storm event). The significance of effect is **Major Adverse.**

Increase in Discharge to Local Watercourse

9.4.14 An increase in the volume of water discharged to local watercourses has the potential to increase the flood risk to areas downstream of the Proposed Development.

9.4.15 The sensitivity of people and property is considered **Medium.** Whilst the effects would be temporary and short term, this is considered to have an effect of **Medium Adverse** magnitude to people and property (considered to be up to very high importance) occurring at time of high flood risk (e.g. during a large storm event). The significance of effect is **Major Adverse**.

Blockage of Drainage Networks

9.4.16 There is potential for drainage networks to become blocked with debris from run off during the operation of the Application Site. This could cause localised pluvial flooding on the Application Site as well as increase flood risk downstream as a result of increased run off to local watercourses, particularly after heavy or prolonged rainfall.

9.4.17 The sensitivity of surface water is considered to be **Medium**. Whilst the effects would be temporary and short term, this is considered to have an effect of **Medium Adverse** magnitude to future people and property at the Application Site (considered to be up to very high importance and including residents and their homes to be built as part of the Proposed Development) occurring at time of high flood risk (e.g. during a large storm event). The significance of effect is **Major Adverse.**

Summary

9.4.18 During construction there are a number of potential effects on surface water which require mitigation to reduce the residual effect to **Negligible or Minor** which are discussed below. During operation, the risk to the receptors will be mitigated through implementation the embedded drainage discussed further below.

Operation

Effects on Water Resources

Diffuse Pollution Contained in Urban Runoff

9.4.19 The operation of the Proposed Development may negatively effect upon the local water environment. Urban runoff from the Application Site, along with the associated infrastructure, could contain diffuse urban pollutants such as hydrocarbons, heavy metals, and nutrients as well as debris and silt which could ultimately be discharged to the nearby watercourses via surface water runoff or infiltrate to ground. Without mitigation this could have a moderate adverse effect on water quality.

9.4.20 The sensitivity of surface water and groundwater bodies are therefore considered **Medium.** This is considered to have an effect of **Medium Adverse** magnitude on downstream watercourses. The significance of effect is **Moderate Adverse** for the River Cherwell and associated watercourses – including those within the Application Site - which is considered permanent if left unmitigated.

Increase in Highway Routine Runoff

9.4.21 Traffic on existing roads to and from the Application Site will increase as a result of the Proposed Development. Any increase in traffic flows could lead to the introduction of new sources (or changed discharges) of highway runoff into receiving watercourses. Surface water runoff from roads can contain pollutants such as hydrocarbons, heavy metals and inert particulates which can cause chronic pollution of the water environment if allowed to enter watercourses without the appropriate treatment.

9.4.22 Without mitigation this could have a **Low Adverse** effect on water quality, the sensitivity of surface water is therefore considered **Medium.** This is considered to have an effect of **Low Adverse** magnitude on downstream watercourses. The significance of effect is **Minor Adverse** for the River Cherwell and associated watercourses which is considered permanent if left unmitigated.

Increase in Highway Spillage Risk

9.4.23 Spillages of pollutants (e.g. oil) on highways can be transported to watercourses via runoff, where they could impact upon ecological life, or infiltrate to ground.

9.4.24 The receptors at risk are surface watercourses and groundwater bodies which are considered to be of **Medium** Sensitivity. Without mitigation the increase in highway spillage risk is considered to have an effect of a **Low Adverse** magnitude. The significance of effect is **Minor Adverse** which is considered permanent if left unmitigated. Mitigation should form part of the civil engineering design going forward.

Increased Demand on Water Supply

9.4.25 Due to the scale of the Proposed Development there will be an increased demand for water by occupiers. This will lead to increased pressure on local resources. This is not directly considered to be a surface water quality effect, as it is unlikely that water would be sourced from local surface waters, and it is presumed that the Proposed Development would not proceed unless potable water was available from elsewhere. Thames Water should be consulted regarding potable supply to the Proposed Development which should be completed during detailed design. Water consumption for any future Application Site users should be minimised through water efficiency measures.

9.4.26 The receptors at risk are surface water which are considered a **Low** sensitivity. The increased demand on water supply from the Proposed Development is considered to have an effect of **Negligible magnitude** (i.e. to locations where potable water supply is obtained from). The significance of effect is therefore **Negligible.**

Disposal of Surface and Foul Water from the Site

9.4.27 Due to the scale of the Proposed Development there will be a need to dispose of surface water and foul water. As a result, this can lead to increased pressure on the surface water and foul drainage network.

9.4.28 Separate systems of surface water and foul water will be provided on the Application Site as detailed in the Drainage Strategy in **Appendix 9.1.**

9.4.29 Currently the surface water flowpaths and ponding largely infiltrate into the ground and follow the topography of the Application Site to flow westwards through the culverts located along the A361. The surface water drainage system will be designed to maintain current greenfield runoff rates and provide suitable SuDS with appropriate water quality benefits and treatment before discharging surface water to the River Cherwell via the neighbouring site's drainage system, see section 5.0 of **Appendix 9.1** for further detail.

9.4.30 The sensitivity on surface water is therefore considered **Medium.** This is considered to have an effect of **Medium Adverse** magnitude on downstream watercourses. The significance of effect is **Moderate Adverse** for the River Cherwell and associated watercourses which is considered permanent if left unmitigated.

9.4.31 Currently there is no existing foul network on the Application Site or adjacent.

9.4.32 In regard to foul drainage, it is proposed that foul flows are treated by a biodisc treatment plant (or similar) within the Application Site before discharging treated flows to the neighbouring Site's drainage system.

9.4.33 The sensitivity on surface water is therefore considered **Medium**. This is considered to have an effect of **Medium Adverse** magnitude on downstream watercourses. The significance of effect is **Moderate Adverse** for the River Cherwell and associated watercourses which is considered permanent if left unmitigated.

Summary

9.4.34 During construction there are a number of potential effects on surface water which require mitigation to reduce the residual effect to **Negligible** which are discussed below. During operation, the risk to the receptors will be mitigated through implementation of the embedded drainage discussed below.

Table 9.6: Flood Risk and Drainage summary of likely significant effects and receptors at risk if left unmitigated

Likely Significant Effect	Receptor(s)
Construction Phase	
Mud and Debris Blockages	Construction workers and construction equipment
Temporary Increase in Impermeable Area	Construction workers and construction equipment
Operational Phase	
Increase in Permanent Impermeable Area	Flood risk to future people or property at the Application Site and surrounding areas.
Increase in Discharge to Local Watercourses.	Flood risk to future people or property at the Application Site and surrounding areas.

Blockage of Drainage Networks	Flood risk to future people or property at the Application Site and surrounding areas.

Table 9.7: Water Resources summary of likely significant effects and receptors at risk if left unmitigated.

Likely Significant Effect	Receptor(s)
Construction Phase	
Silt-laden Runoff	River Cherwell and watercourses within the Application Site, groundwater bodies
Spillages, Leakages and Pollutants	River Cherwell and watercourses within the Application Site, groundwater bodies
Inappropriate Wastewater Disposal from Welfare Facilities	River Cherwell and watercourses within the Application Site
Operational Phase	
Diffuse Pollution Contained in Urban Runoff	River Cherwell and watercourses within the Application Site, groundwater bodies
Increase in Highway Routine Runoff	River Cherwell and watercourses within the Application Site
Increase in Highway Spillage Risk	River Cherwell and watercourses within the Application Site, groundwater bodies
Increased Demand on Water Supply	Surrounding area
Disposal of Surface and Foul Water from the Site	River Cherwell and watercourses within the Application Site

9.5 MITIGATION AND ENHANCEMENT

Mitigation by Design associated with Flood Risk and Drainage

Permanent Increase in Impermeable Area

9.5.1 Surface water attenuation through the SuDS management train will be provided within surface water attenuation storage in the form of permeable paving, ponds, swales and / or detention basins with discharge controlled by a flow control device, these are subject to determination in the detailed design stage. The SuDS system will be developed as the development proposal develops and designed to the 1 in 100 year + 40% Climate Change event.

9.5.2 A robust SuDS maintenance plan should be produced and followed during the operation of the Application Site to minimise the risk of blockages and maintained for the lifetime of the development (see paragraph 9.5.10).

9.5.3 Following implementation of the proposed mitigation the residual effect is considered to be **Negligible.** The arrangements for adoption should be investigated at an early stage and proposals agreed acceptable by the LPA.

Increase in Discharge to Local Watercourses

9.5.4 Discharge to the River Cherwell via the neighbouring site's drainage network is the proposed method for the discharge of surface water runoff. The management train of a variety of SuDS will be designed appropriately so as not to exacerbate surface water

risk from the Application Site. Suitability of the SuDS components will be determined in the detailed drainage design for the Proposed Development.

9.5.5 Attenuation of the discharge rates will be achieved to equivalent Greenfield runoff rates as calculated in accordance with The SuDS Manual ((C753) CIRIA Guidance). Storage for additional flows up to the 1 in 100 year (+ 40% climate change) return period has also been suggested in suitable SuDS features as part of the Drainage Strategy contained in Appendix 9.1. SuDS will be designed to control run off at source and final discharges rates will be limited to Greenfield runoff rates.

9.5.6 Following implementation of the proposed mitigation the residual effect is considered to be **Negligible.**

Mitigation by Design associated with Water Resources

Diffuse Pollution in Urban Runoff

9.5.7 Generally, the proposed development is likely to have a low to medium pollution risk and so the management train should normally have one or two treatment stages. Generally, two treatment stages for run-off from roads and one treatment stage for run-off from roofs are required, subject to agreement of the approving authority.

9.5.8 Where practical, at detailed design stage it is recommended that runoff from roofs and roads will be directed to permeable SuDS features with contributions being made from permeable pavements, swales and infiltration/detention basins.

9.5.9 Inclusion of detention basins, ponds and/or permeable paving should in general provide sufficient treatment. Where some attenuation is provided in a below ground system, additional treatment may need to be provided by a suitably sized separator.

9.5.10 Future maintenance of the SuDS scheme should pass to a management company. A clear future finance arrangement should be in place for the future maintenance. An overview of possible SuDS features and possible future maintenance are provided in the Drainage Strategy in **Appendix 9.1**

9.5.11 Following the implementation of mitigation measures the residual effect is considered to be **Negligible.**

Increase in Highway Routine Runoff / Spillage Risk

9.5.12 No mitigation required beyond what is proposed in **Chapter 8** Transport. Mitigation may include adaptations to the highway design to include oil interceptors or similar; this would be confirmed at detailed design.

9.5.13 The residual effect is considered **Negligible.**

Disposal of Surface Water and Foul Water from the Application Site

9.5.14 Surface water runoff will be discharged from the Application Site via the neighbouring Site's drainage network to the River Cherwell. The public surface water sewer network will not receive any flows. Surface water runoff generated by the Application Site will be attenuated within SuDS features designed to accommodate flows up to the 1 in 100 year + 40% CC event. Discharge of the flows off the Application Site will be limited to greenfield rates. No pressure will be put on the public surface water sewer network. The design of SuDS features is also considered a sufficient mitigation measure to address the elevated surface water risk in the south-west of the Application

Site. Where necessary reprofiling of the Application Site will also be undertaken to manage the risk.

9.5.15 Foul water generated on the Application Site will be treated by a biodisc treament plant (or similar). Treated flows will be discharged through the same network as surface water, therefore no pressure will be put on the public foul drainage network.

9.5.16 Following the implementation of mitigation measures the residual effect is considered to be **Negligible.**

9.5.17 Mitigation measures are summarised in Table 9.4 below.

Additional Mitigation associated with Flood Risk and Drainage

Mud and Debris Blockages

9.5.18 A temporary drainage network will be installed prior to the commencement of construction and a robust maintenance plan, confirmed through a Construction Environmental Management Plan (CEMP), should be maintained throughout the duration of construction works on the Application Site.

9.5.19 Following the implementation of mitigation measures the residual effect of mud and debris entering the surface water / land drainage system is considered **Negligible.**

Temporary Increase in Impermeable Area

9.5.20 Construction mitigation guidance should be adhered to, for example ensuring that the impermeable area on the Application Site is increased as little as possible and installing a temporary surface water drainage system during construction. This effect should lessen as the Proposed Development progresses and the overall impermeable area increases with surface water drainage networks installed to deal with this effect.

9.5.21 The residual effect, following the implementation of a temporary construction drainage network, is considered to be **Negligible.**

Blockages of Drainage Networks

9.5.22 The drainage system will be designed to good practice standards and the implementation of a robust maintenance plan will aid in ensuring that the risk of flooding as a result of blockages is reduced. A third-party management and maintenance team should be established to maintain the features throughout the lifetime of the Proposed Development.

9.5.23 Following the implementation of mitigation measures the residual effect is considered to be **Negligible.**

Additional Mitigation associated with Water Resources

Silt-laden Runoff

9.5.24 The following mitigation measures can be utilised for silt management and control:

- Works that are likely to generate silt-laden runoff (e.g. earthworks and excavations) will be done preferentially during the drier months of the year;

- A buffer of ideally 10 m should be preserved adjacent to all receptors to ensure that there is a sufficient buffer from the sensitive receptor to the construction stages of development;
- Application Site compounds and stockpiles will be located as far as possible (ideally at least 30 m) away from receptors;
- A drainage system will be developed to prevent silt-laden runoff from entering surface water drains, watercourses and ponds without treatment (e.g. earth bunds, silt fences, straw bales, or proprietary treatment) under any circumstances;
- Earth stockpiles will be seeded as soon as possible, covered with geotextile mats or surrounding by a bund;
- Mud will be controlled at entry and exits to the Application Site using wheel washes and / or road sweepers;
- Tools and plant will be washed out and cleaned in designated areas within Application Site compound where runoff can be isolated for treatment before discharge to watercourse under appropriate consent;
- Debris and other material will be prevented from entering receptors; and
- Construction SuDS (such as temporary attenuation) to be used during construction if necessary

9.5.25 Following the implementation of mitigation measures the residual effect is considered to be **Negligible.**

Spillages and Leaks of Pollutants

9.5.26 To allow chemicals, fuels/oils and other such substances to enter a water body could be in breach of the Water Resources Act 1991. As such measures to control the storage, handling and disposal of these substances will need to be put in place prior to and during construction. The following key mitigation measures relating to the control of spillages and leaks should be included a CEMP.

- Fuel will be stored and used in accordance with the Control of Substances Hazardous to Health Regulations 2002[26], and the Control of Pollution (Oil Storage) (England) Regulations 2001[27];
- Fuel and other potentially polluting chemicals are to be stored in a secure impermeable and bunded area;
- Refuelling of plant to take place off the Application Site if possible, or only in a designated area at the Application Site compound ideally at least 20 m from receptors;
- Any plant / machinery / vehicles will be regularly inspected and maintained to ensure they are in good working order and clean for use in a sensitive environment. This maintenance is to take place off the Application Site if possible or only at designated areas in the Application Site compound;
- All fixed plant used on the Application Site to be self-bunded;
- Mobile plant to be in good working order, kept clean and fitted with drip trays where appropriate;
- An Emergency Response Plan will be prepared and included in the CEMP. Spill kits and oil absorbent material to be carried by mobile plant and located at vulnerable locations on the Application Site. Construction workers will receive spill response training;

[26] https://www.hse.gov.uk/nanotechnology/coshh.htm

[27] https://www.legislation.gov.uk/uksi/2001/2954/contents/made

- The Application Site is to be kept secure to prevent vandalism that could lead to a pollution incident;
- Construction waste / debris are to be prevented from entering any water body;
- Surface water drains on roads, other watercourse crossings or the core scheme compound area will be identified and where there is a risk that silt laden runoff could enter them they will be protected (e.g. covers or sand bags); and
- Concrete wash water will be adequately contained and removed from the Application Site.

9.5.27 Following the implementation of the mitigation measures the residual effect is considered to be **Negligible.**

9.5.28 Mitigation measures are summarised in **Table 9.8** below.

Table 9.8: Mitigation

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured		
		By Design	By S.106	By Condition
	Surface water attenuation in line with the SuDS management train will provided by retention basin; ponds; permeable paving and other SuDS systems as suitable and determined in the detailed scheme, controlled by Hydro-brake flow control devices (or similar) so as not to exacerbate surface water flood risk. SuDS designed to attenuate 1 in 100 year + 40% Climate Change rainfall event and discharge limited to greenfield runoff rates.	X		
	Inclusion of SuDS in the form of detention basins, pond, swale and/or permeable paving to provide treatment to manage diffuse pollution.	X		X
	Install temporary drainage network prior to the commencement of construction and robust maintenance plan should be maintained throughout the duration of construction works on the Application Site.			X
	Drainage system should be designed to good practice standards and a robust maintenance plan should be implemented.	X		X
	Include silt management and control measures in the CEMP.			X
	Ensure measures to control the storage, handling and disposal of pollutants are put in place prior to and during construction included in the			X

	CEMP.			
	Foul water generated on the Application Site will be treated by a biodisc treatment plant (or similar)	X		

Enhancements

9.5.29 No enhancement measures are proposed with regards to flood risk, drainage and water resources.

9.6 CUMULATIVE AND IN-COMBINATION EFFECTS

Cumulative Effects

Land adjacent to M40 Junction 11, Banbury (21/02467/F)

9.6.1 This proposal is for a mixed-use development including a 240- bed hotel, 4 storey office building, roadside services, coffee shop drive-through and petrol filling station with ancillary retail store. The proposal is intended to be determined at an April 2022 Planning Committee. The development was deemed to not need an EIA. This planning application under determination is immediately west to the Application Site. If granted planning permission, it is likely the development will be under construction when the Application Site's development begins.

9.6.2 A Flood Risk Assessment and Surface Water Drainage Strategy was completed in 2021 and confirmed the adjacent Cumulative Site to be in Flood Zone 1 and was at Low risk of flooding from all sources of flood risk. The Drainage Strategy states that SuDS in the form of permeable paving, swales, and geocellular storage have been incorporated to attenuate surface water runoff which will eventually discharge to a drainage channel at a restricted rate. Foul flows will be treated by a commercial treatment plant before being discharged to the same drainage channel.

9.6.3 Overall, both developments will have to work to the same planning policy and ensure that there is no increase in flood risk on or off-site as a result of the schemes so they remains safe for the lifetime of the developments. A CEMP will also be required for this development to ensure there are no adverse impacts on local water resources and water quality. Therefore, the cumulative impact is considered **Negligible.**

In-Combination Effects

9.7 There are considered to be no cumulative effects from inter-topic relationships following respective mitigation that would cumulatively impact the Application Site.

9.8 SUMMARY

Introduction

9.8.1 This Chapter of the ES has assessed the likely significant effects of the Proposed Development with respect to Flood Risk, Drainage and Water Resources, including the methods used to assess the effects; the baseline conditions currently existing at the Application Site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.

Baseline Conditions

9.8.2 Multiple surface water features are present within the Application Site. The topography of the Application Site indicates flows will travel westwards, leaving the Application Site via two culverts located under the A361.

9.8.3 The River Cherwell is located approximately 250 m west of the Application Site. The River Cherwell generally flows in a southerly direction past the Application Site. Further drainage channels and unnamed watercourses are located to the west, north and south of the Application Site. It was considered that all watercourses / surface water features in a 1 km radius of the Application Site will ultimately drain into the River Cherwell.

9.8.4 The River Cherwell is classified as having 'Moderate' ecological quality but failed the most recent round of chemical testing in 2019. It was considered to be of Medium sensitivity.

9.8.5 No superficial deposits are recorded at the Application Site. The majority of the Application Site is underlain by bedrock deposits of Charmouth Mudstone Formation. The eastern boundary is underlain by Dyrham Formation. These were considered to be of Medium sensitivity. .

9.8.6 A historical BGS borehole record in the south-western corner of the Application Site encountered groundwater at 1.2 m below ground level.

9.8.7 No groundwater Source Protection Zones (generally associated with abstraction for drinking water) are present within a 1 km radius of the Application Site.

9.8.8 The Application Site is located in Flood Zone 1, which is considered to be at a low probability of fluvial and tidal flooding.

9.8.9 The majority of the Application Site is at Very Low risk of surface water flooding. An area of elevated risk is shown in the south-western corner of the Site associated with flows travelling across the Site and pooling at the lowest point of the Site against the embanked junction of the M40 / A361.

9.8.10 The Application Site is at Negligible to Low risk from flooding from artificial sources. No public sewers are located within the Application Site.

9.8.11 There are no designated sensitive ecological areas within 1 km of the Application Site into which surface water run-off could flow.

Likely Significant Effects

9.8.12 In summary, the main potential significant effects at the Site revolve around dealing with surface water risk at the Site and the potential for silt laden runoff, spillages, leaks and pollutants during the construction stage and diffuse pollution contained in urban runoff during the operation phase from a water quality / resource perspective. In addition, from a flood risk perspective, the potential significant effects include mud and debris blockages and temporary increases in impermeable areas during the construction phase and the increase in permanent impermeable area and increase in discharge to local watercourses and blockages of drainage networks during the operational phase.

Mitigation and Enhancement

9.8.13 Mitigation includes completion of a Construction Environmental Management Plan which will include details of mitigation measures to prevent adverse impacts occurring to controlled waters and SuDS measures to mitigate the surface water risk. Generally, the proposed development is likely to have a low to medium pollution risk and so the management train should normally have one or two treatment stages to mitigate this. Inclusion of detention basins, ponds and/or permeable paving should in general provide sufficient treatment as well as the attenuation required to maintain greenfield runoff rates. A foul treatment plant will be constructed within the Application Site to treat foul drainage prior to discharge into the local drainage system.

Conclusion

9.8.14 The Proposed Development at the Application Site could be made acceptable with the mitigation measures identified which would ensure there would be no significant residual effects, which is considered acceptable in EIA terms.

9.8.15 **Table 9.9** provides a summary of effects, mitigation and residual effects.

Table 9.9: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Construction								
Construction Workers and Equipment	Mud and Debris Blockages	Temporary	Medium	Low Adverse	Local	Moderate Adverse	A temporary drainage network will be installed prior to the commencement of construction and a robust maintenance plan should be maintained throughout the duration of construction works on Site.	Negligible Effect
Construction Workers and Equipment	Temporary Increase in Impermeable Area	Temporary	Medium	Medium Adverse	Local	Moderate Adverse	Construction mitigation guidance should be adhered to, for example ensuring that Site impermeability is increased as little as possible during construction, thereby lessening as the Proposed Development progresses and the overall impermeable area increases with	Negligible Effect

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
							surface water drainage networks installed to deal with this effect.	
River Cherwell and watercourses within the Application Site and groundwater bodies	Silt Laden Runoff	Temporary	Medium	Medium Adverse	Local	Moderate Adverse	Silt Management Control measures which are included in the CEMP	Negligible Effect
River Cherwell and watercourses within the Application Site and groundwater bodies	Spillages, Leakages and Pollutants	Temporary	Medium	Medium Adverse	Local	Moderate Adverse	Measures to control the storage, handling and disposal of these substances will need to be put in place prior to and during construction included in the Construction Environmental Management Plan	Negligible Effect
River Cherwell and watercourses within the Application Site	Inappropriate Wastewater Disposal from Welfare Facilities	Temporary	Low	Not Applicable	Not Applicable	Negligible	No mitigation Required	Negligible Effect
Operation								

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
River Cherwell / Flood risk to future people or property at the Application Site.	Increase in Permanent Impermeable Area	Permanent	Medium	Medium Adverse	Local/ District	Major Adverse	Surface water attenuation through the SUDS management train will provided by hydro-brake flow control devices (or similar) and surface water attenuation storage will be provided by retention basin; ponds; infiltration basins and other SuDs systems as suitable and determined in the detailed scheme.	Negligible Effect
River Cherwell / Flood risk to future people or property at the Application Site.	Increase in Discharge to Local Watercourses	Permanent	Medium	Medium Adverse	Local/ District	Major Adverse	Discharge to the River Cherwell via the neighbouring Site's drainage network will be controlled through SuDS designed appropriately so as not to exacerbate surface water risk at the Propose Development.	Negligible Effect

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
River Cherwell / Flood risk to future people or property at the Application Site.	Blockage of Drainage Networks	Permanent	Medium	Medium Adverse	Local/ District	Major Adverse	The drainage system will be designed to good practice standards and the implementation of a robust maintenance plan will aid in ensuring that the risk of flooding as a result of blockages is reduced and to maintain the features throughout the lifetime of the Proposed Development.	Negligible Effect
River Cherwell and watercourses within the Application Site and groundwater bodies	Diffuse Pollution Contained in Urban Runoff	Permanent	Medium	Medium Adverse	Local	Moderate Adverse	Inclusion of a detention basin, pond and/or permeable paving should in general provide sufficient treatment. Where attenuation is provided for below ground, additional treatment may need to be provided by a suitably sized	Negligible Effect

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
							separator. Completion of a robust SuDS maintenance plan.	
River Cherwell and watercourses within the Application Site	Increase in Highway Routine Runoff	Permanent	Medium	Low Adverse	Local	Minor Adverse	No mitigation required beyond what is proposed in Chapter 8 Transport	Negligible Effect
River Cherwell and watercourses within the Application Site and groundwater bodies	Increase in Highway Spillage Risk	Permanent	Medium	Low Adverse	Local	Minor Adverse	No mitigation required beyond what is proposed in Chapter 8 Transport	Negligible Effect
Surrounding Area	Increased Demand on Water Supply	Permanent	Low	Not Applicable	Not Applicable	Negligible	No mitigation Required	Negligible Effect
River Cherwell and watercourses within the Application Site	Disposal of Surface and Foul Water from the Application Site	Permanent	Medium	Medium Adverse	Local	Moderate Adverse	Design of SuDS system will ensure surface water is discharged to greenfield rates. Foul flows should be treated on Site before being discharged via the same system as surface water.	Negligible Effect