2 Legislation, Planning and Guidance

2.1 Legislation Context

The following is a list of the relevant legislation regarding water resources in the United Kingdom:

The Water Resource Act (1991) as amended (2009);

The Water Act (2014);

The Environment Act (1995);

The Environmental Protection Act (1990);

The Flood and Water Management Act (2010);

The Groundwater (England and Wales) Regulations 2009;

The Anti-Pollution Works Regulations (1999);

The Water Supply (Water Quality) Regulations (2018);

The Control of Pollution (Oil Storage) (England) Regulations (2001);

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017; and

The Environment Damage (Prevention and Remediation) (England) Regulations 2015 (as amended).

2.2 Water Resources Act 1991 (WRA 1991)

The Water Resources Act (WRA) 1991 consolidates previous water legislation in respect of both the quality and quantity of water resources. Under Section 85 of the WRA 1991 it is an offence to cause or knowingly permit polluting matter to enter into "controlled waters", that is rivers, estuaries, coastal waters or groundwater, without permission. Permission is generally obtained as a discharge consent granted by the EA. The EA sets conditions which may control volumes and concentrations of particular substances or impose broader controls on the nature of the effluent. Each consent is based on the river quality objective (RQO) set by the EA for the quality of the stretch of water to which the discharge is made, as well as any relevant standards from EC Directives. The EA may also refuse an application for a discharge consent.

2.3 Policy Context

The management of water resources is governed by a range of legislative guidance set out within international, national and regional policy. This Strategy has been prepared with due regard to all relevant legislation, policy and guidance relating to both foul and surface water drainage.

2.3.1 Planning Policy and Guidance

This Drainage Strategy has been developed in accordance with the following policies and guidelines:

National Planning Policy Framework July 2021

Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire

CIRIA The SuDS Manual C753, 2015

Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code")

Thames Water Local practices to support Code for Adoption Sewerage – Pumping Stations

Oxfordshire County Council Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire (December, 2021);

Oxfordshire County Council Key Design Criteria for Secondary School Sites (undated);

The Cherwell Local Plan 2011 – 2031 (July 2015); and

The Cherwell Local Plan Part 1 Partial Review (September 2020).

2.4 National Policies

2.4.1 National Planning Policy Framework (NPPF)

The NPPF sets out the Government's planning policies for England and provides guidance on its application. Amongst other things, the NPPF seeks to meet the challenge of climate change, flooding and coastal change, including by requiring development proposals to incorporate sustainable urban drainage systems (SuDS) unless inappropriate.

2.4.2 Flooding and Water Management Act 2010

The Flooding and Water Management Act (2010) requires developers to consider SuDS. In all instances developers should aim to reduce the rate of water runoff from sites.

2.4.3 Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire

The Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire assists developers in the guidance of surface water drainage systems and supports Local Planning Authorities in considering drainage proposals for new developments within Oxfordshire.

3 Existing Drainage

3.1 Existing Surface Water Drainage Features

There are two watercourses on the northern and southern extents of the Site respectively. Each has been designated by the EA as a main river.

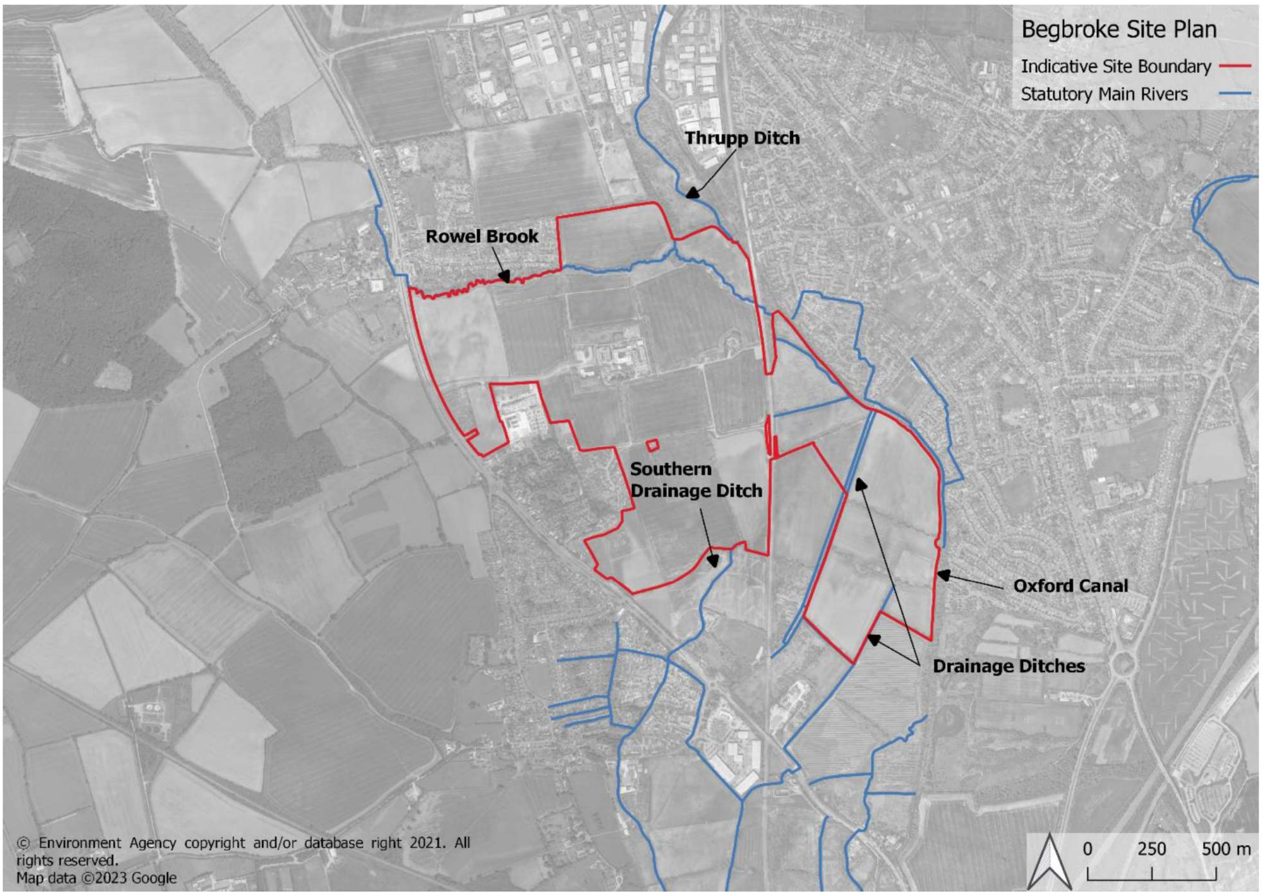


Figure 3—1 Existing Surface Water feature locations

Rowel Brook bounds the northern edge of the Site running west to east before splitting to the north and the south. The northern section continues east to the Oxford Canal. The southern section continues east under the existing railway, through a culvert, then onto the eastern paddocks.

The Southern Drainage Ditch collects overland flow to the south of Sandy Lane before conveying in under the A44 via a culvert then further southwest.

The Oxford Canal is outside of the Site boundary but closely follows the eastern boundary of the Site.

3.2 Existing Foul Drainage Infrastructure

Details of the existing sewer sizes and location of the surrounding network have been taken from Thames Water's (TW) asset plan and compiled by Groundwise in Appendix A. Figure 3—2 – **Existing Foul Water Layout** shows the location of existing TW sewers within the Site, these include five active rising mains and two abandoned sewers. All the sewers crossing the Site will require diversion. An application for the public sewer rising main and sludge main diversions has been made with a Section 185 application in line with Figure 3-3 below and detailed in Appendix F.

Figure 3—2 – Existing Foul Water Layout

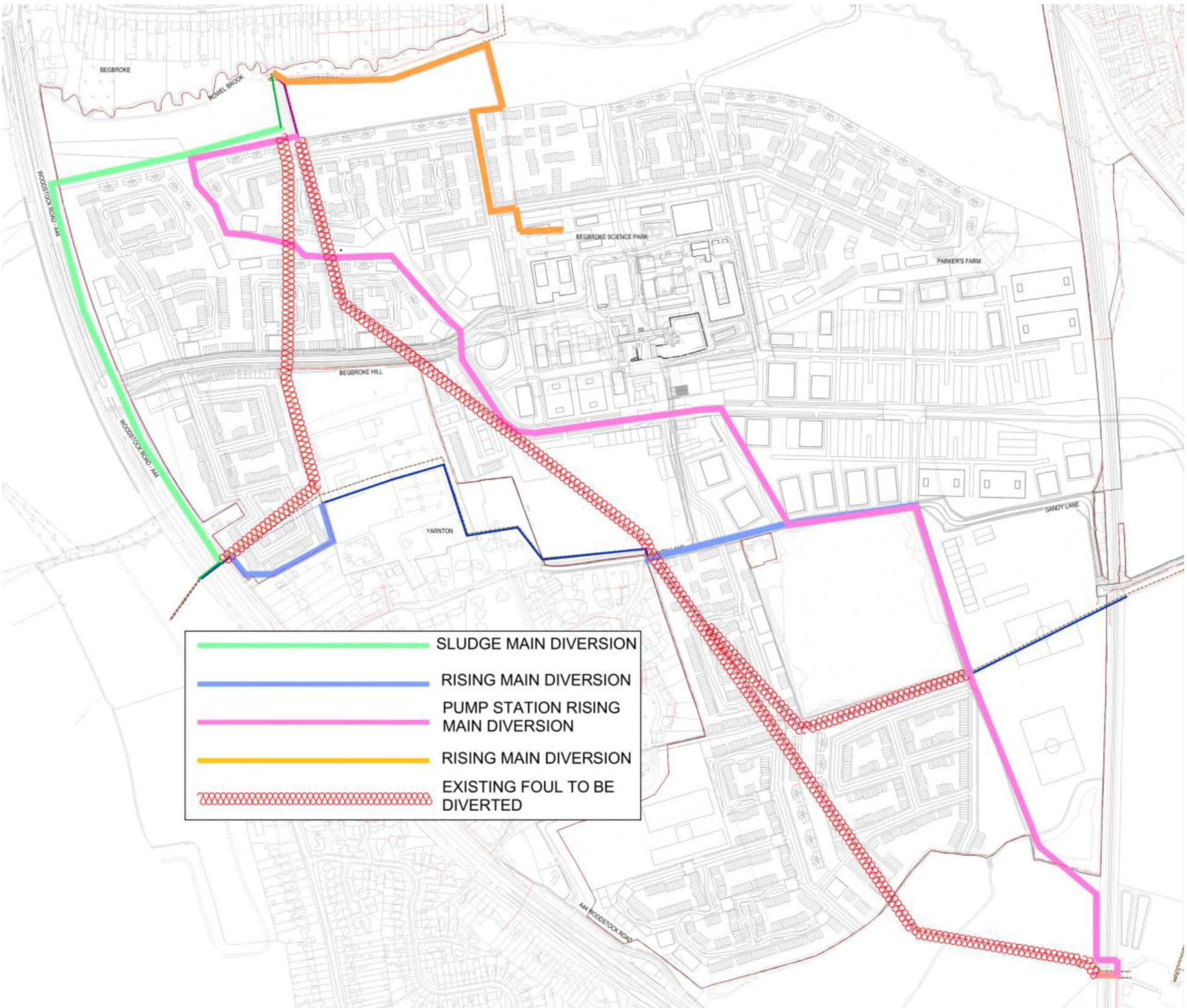


Figure 3—3 Indicative Foul Water Diversion Route Layout

Table 3—1 Foul Water Diversion Schedule

Existing Service Reference	Type of Service	Assumed Size/No. of Ducts/Pipes	Owner	Approx. Length of Diversion / Abandonment (m)
FW_RM_001	Sludge rising main	300mm ID	Thames Water	700m, 175m
FW_RM_002	Foul rising main	280mm OD (400mm under railway @ STP)	Thames Water	2,000m
FW_RM_003	Foul rising main	Unknown	Private	250m
FW_RM_004	Foul rising main	500mm OD	Thames Water	150m
FW_RM_008	Foul rising main	450mm ID	Thames Water	750m
AS_002	Abandoned Sewer	Unknown	Thames Water	750m
AS_003	Abandoned Sewer	Unknown	Thames Water	2,000m

The existing asset information shown in Table 3—1 has been compiled from Thames Water asset plans. Prior to finalising the proposed diversions, a ground penetrating radar (GPR) survey and trial pits will be undertaken to confirm exact locations.

3.3 Site Geology

The Site geology summary is based on information compiled by Hydrock through both desktop and on-Site geotechnical investigations as provided to Buro Happold in November 2022. The report produced by Hydrock is included with this drainage strategy as Appendix B.

3.3.1 Superficial Geology:

River Terrace Deposits (Summertown-Radley Sand and Gravel Member) in the central / northern plateau area of the Site at topographically high areas of the Site.

- These River Terrace Deposits in the higher central areas of the Site are considered suitable for infiltration drainage. Sufficient depth of gravel will be required above the water table. A sufficient thickness of permeable soil is required to allow for soakaways to be designed.

Alluvium in the east of the Site.

- Alluvium soils are considered unsuitable for infiltration drainage due to their high clay content (with low permeability) and the presence of a shallow ground water table.

1st River Terrace Deposits anticipated to underlie the Alluvium in the east and north and south extents of the Site.

- These thinner River Terrace Deposits at the low points of the Site are considered unsuitable for infiltration. The main cause of this is the shallow groundwater table reducing the storage capacity.

3.3.2 Solid Geology:

Oxford Clay Formation; comprising a dark grey mudstone; over

- The high clay content of this strata is considered to make it unsuitable for infiltration drainage, due to its low permeability.

Kellaways Sand Member comprising interbedded silty sand and mudstone; over

Kellaways Clay Member comprising grey mudstone; over

- The high clay content of this strata is considered to make it unsuitable for infiltration drainage, due to its low permeability.

Cornbrash Formation comprising bluish grey limestone weathering to olive or yellowish brown.

The solid strata dip gently towards the south (2° or less).

In designing surface water drainage attenuation areas in the low-lying areas of the Site, consideration has been given to the high ground water table. In these areas it is proposed that these basins be lined, or the design surface lifted to a sufficient level above the ground water level.

A more detailed summary of the geology assessment is included Hydrock's Desktop Study Review and Ground Investigation, Appendix B.

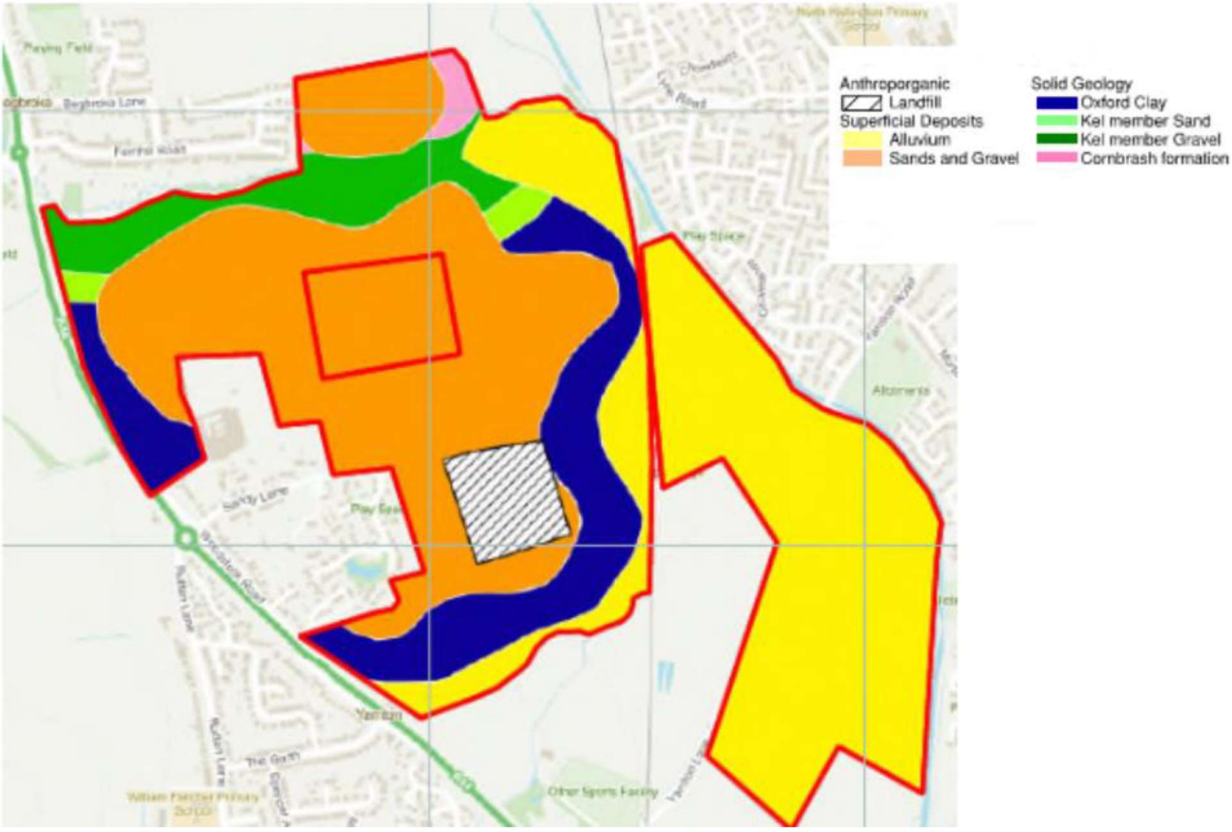


Figure 3—4 Existing Site Geology Layout (Hydrock, Appendix B)

3.3.3 Implications of Geology on Drainage Strategy

As a result of the geology observed at the Site, the drainage strategy outlined in Section 5 has been developed to best utilise areas where surface water infiltration is possible. This means maximising the volume of proposed attenuation features which are located within the 'Sands and Gravel' area highlighted in Figure 3—4. A summary of areas where there is potential for direct infiltration is shown below.

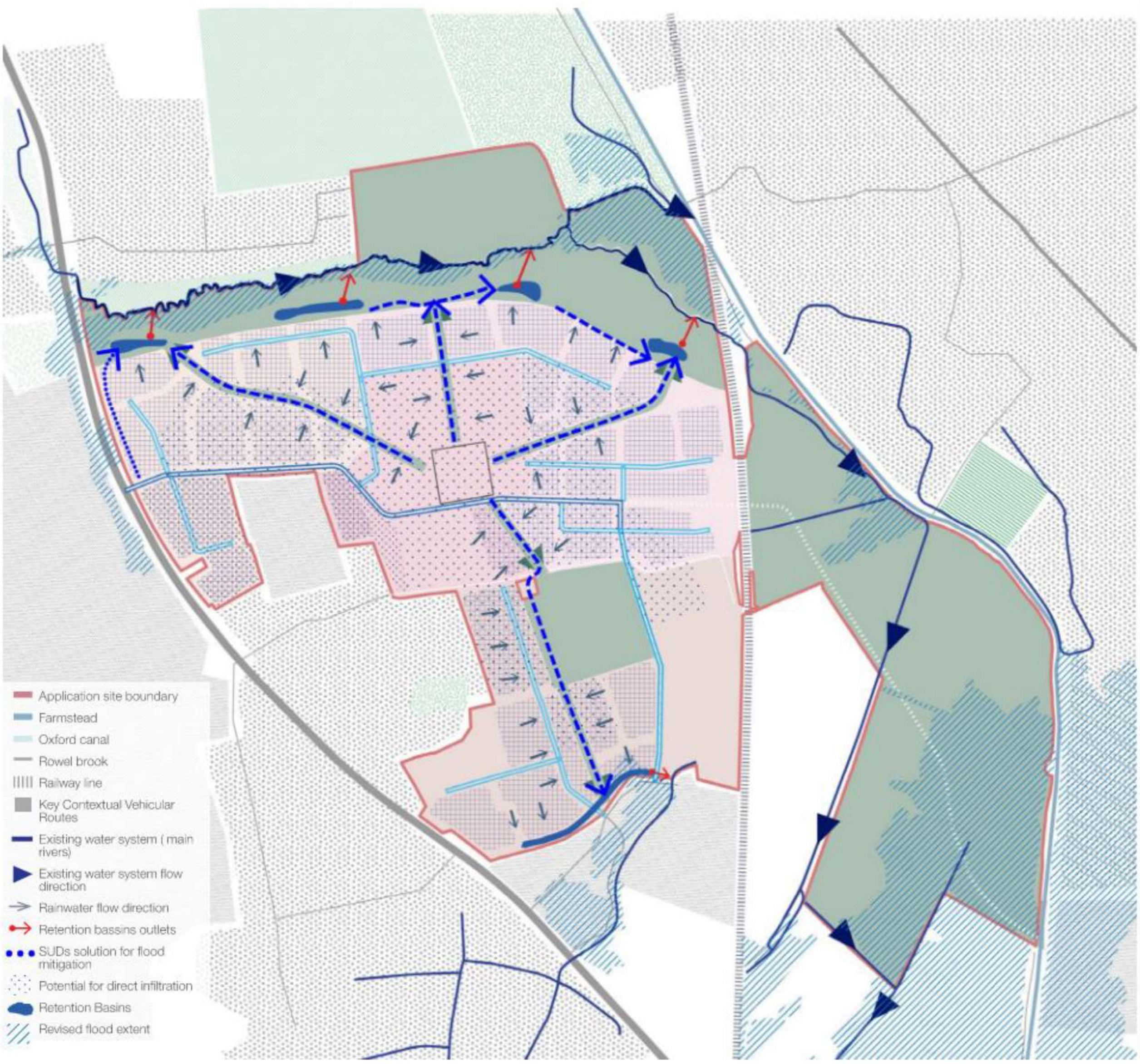


Figure 3—5 Site Wide Drainage Strategy Summary

3.4 Flood Risk Assessment

There are two locations where the Proposed Masterplan overlaps with the baseline flood extents and therefore potentially at risk of flooding without further mitigation. In the NW of the site, a swale has been proposed (Appendix G) which captures, attenuates and diverts overland flows around the development to remove the risk to the development. On the Secondary School Site, regrading has been proposed to ensure no flooding of the school site occurs. Flood storage within the red line boundary to the west of the school site is proposed to provide effective mitigation on a volume-for-volume basis so as to ensure there are no increases in flood risk outside of the red line boundary or to any development on site.

Most of the Site is subject to Very Low surface water flood risk. There are localised areas of ponding on the Site, which are classified as having Medium to High Risk of surface water flooding. These occur around the drainage channels to the south, around the east and southeast of the Site and also on the land adjacent to the Rowel Brook.

The surface water drainage strategy for the Proposed Development will aim to replicate the predevelopment surface water runoff regime. This is achieved by capturing, filtering and harvesting (where possible) surface water as close to source as possible through source control SuDS features. The SuDS hierarchy will be used to design the Site drainage in the most sustainable way. Building upon OUD's vision for sustainable places.

All storm events up to the 1 in 100-year storm event + 40% climate change allowance are proposed to be attenuated on site and discharge from the Site to the proposed outlet at the QBAR rate. The 1 in 1-year storm event will be retained to the corresponding greenfield event. In areas of the Site where the ground conditions allow for it, infiltration is promoted to reduce the volumetric discharge of surface water from the site.

There may be a risk of groundwater flooding in the lower lying areas around the perimeter of the Site due to shallow ground water levels. This has been considered in the design of the surface water drainage strategy with regards to the location and design of attenuation ponds and use of infiltration drainage. The ground water flood risk to the Site is therefore Low.

According to the risk of flooding shown on the EA Reservoirs Map, a portion of the Site, mainly to the east/ south-east, is located within the maximum extent of flooding from reservoirs. The SFRA identifies a residual risk of flooding to the Site from overtopping of the Oxford Canal. It is noted that once the water overtops the canal in a more extreme event, this will have been captured in the fluvial flood modelling and therefore risk mitigated against if required for the development. The overall flood risk from artificial sources is Low and no further mitigation is required.

It is concluded that with the mitigation measures outlined within the Flood Risk Assessment accompanying this report (BEG-BUR-XX-XX-RP-XX-00001-FRA), the Proposed Development is at Low risk of flooding from all sources.

4 Consultation

4.1 Oxford County Council-Local Lead Flood Authority (OCC LLFA)

In developing this strategy Buro Happold have been in consultation with OCC LLFA and the overarching principles and the key engineering constraints have been agreed. Buro Happold has created a outline surface water drainage model based on the initial QBAR runoff rates, which are a conservative flow rate. The existing QBAR runoff rates being used as the basis of design provide the optimal discharge conditions from the Site. These are to be confirmed with the LLFA in a meeting on the 5th of June, 2023. By using this QBAR rate and the proposed illustrative masterplan as a proxy for what the future development will look like, the required attenuation volume for the Site was calculated. Meeting minutes for the Stage 1 and Stage 2 LLFA coordination meetings can be found in Appendix C.

Further meetings will be held with the LLFA when the project enters the detailed design stages to show how the design is meeting the agreed design principles.

4.2 Environment Agency

The EA were contacted in the formation stage of the drainage strategy via email for input. On the 5th of October 2022 the EA advised that they are not the responsible authority for surface water flood risk and that no further consultation is required with them.

4.3 Thames Water

A pre-development application has been lodged with TW (Ref: DS6099943). For connection to TW's foul water network TW have advised that a connection into the existing foul water pumping station on the northern boundary of the Site is not possible, but that there is an opportunity to connect the existing manhole (TW Ref: 4804) upstream of it. This is the current proposed point of connection for the Phase 1 area of development in the north. Phase 2 – 4 is currently proposed to connect through a utility culvert in the southeast of the Site to an existing manhole to the north of Kidlington Lane (Ref: 5402).

For connection to TW's potable water network, point of connection (REF DS6099942) was received on the 08/03/23 and attached as Appendix E.

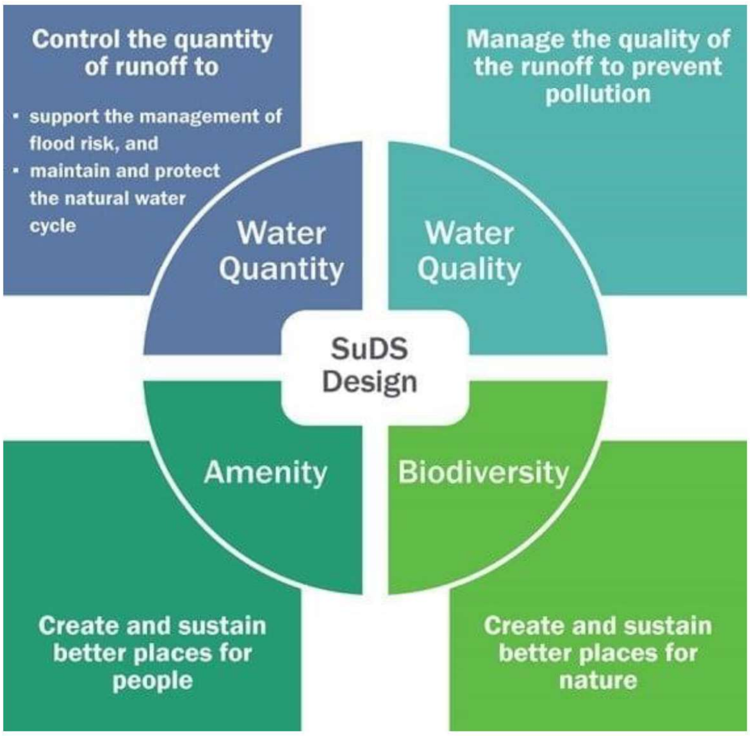
5 Proposed Surface Water Drainage

5.1 Basis of Design

5.1.1 Sustainable Drainage Systems (SuDS) Hierarchy

In developing the surface water strategy for the Proposed Development, the following design hierarchy and principles have been adopted:

1. Store rainwater for later use
2. Use infiltration techniques, such as porous surfaces in non-clay areas
3. Attenuate rainwater in basins or open water features for gradual release
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release
5. Discharge rainwater direct to a watercourse
6. Discharge rainwater to a surface water sewer/drain
7. Discharge rainwater to the combined sewer



The aim should be to discharge surface run off as high up the hierarchy of drainage options as reasonably practicable.

5.1.2 Water Quality

With the above hierarchy in mind, the capture and treatment of surface water within a development is often referred to as a 'treatment train' where water slowly flows from where it falls to a watercourse through a series of features that help treat, store and re-use, convey and provide amenity and biodiversity value. By passing water through several stages of treatment, sediment and other pollutants will be removed more effectively.

5.1.3 Storm Events

All storm events up to the 1 in 100-year storm event + 40% climate change allowance are proposed to be attenuated on site and discharge from the Site to the proposed outlet at the QBAR runoff rate. The 1 in 1-year storm event will be retained to the corresponding greenfield event. In areas of the Site where the ground conditions allow for it, infiltration is promoted to reduce the volumetric discharge of surface water from the Site.

5.2 Site Wide Strategy

The proposed drainage strategy and SUDs infrastructure proposed varies based on two lands uses within the development, residential and commercial. The below flow charts outline the proposed surface water drainage strategy in each instance. In both instances the priority is to prioritise SuDS infrastructure over traditional pit and pipe drainage infrastructure.

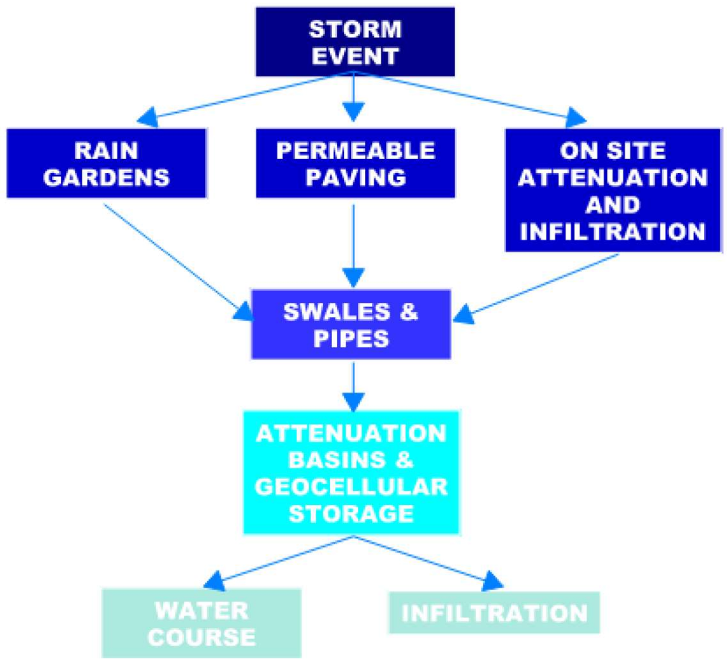


Figure 5—1 Storm events falling on Residential areas

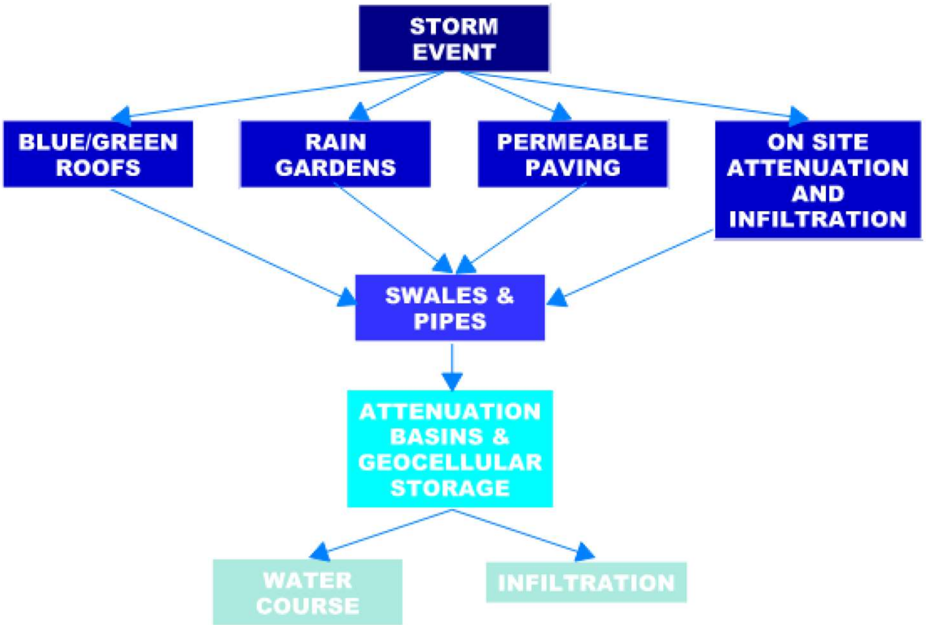


Figure 5—2 Storm events falling on Commercial areas

5.3 Proposed SUDs Features

Table 5—1 Summary of Proposed SUDs Features

	SUDs Feature	Land Type	Source / Site Control	Summary & Benefit
1	Blue/Green Roofs	Commercial	Source	Blue/Green roods restrict the rate that water runs off from a building into storm drains or natural watercourses after a downpour, thus minimising the impact on water quality, biodiversity, and flooding.
2	Rain Gardens	Commercial/ Residential	Site	Rain gardens are small, landscaped depressions that can reduce runoff rates and volumes, whilst providing a form of treatment by filtering the runoff through engineered soils and vegetation.
3	Permeable Paving	Commercial/ Residential	Source	Water is then attenuated in a sub-base aggregate where it is infiltrated and slowly discharged into the next stage within the drainage system.
4	Attenuation Basins	Commercial/ Residential	Site	Dry, landscaped depressions that allow for attenuation, treatment via settling and infiltration of stormwater flows. These basins will only hold water immediately after storm events, prior to it being evaporated and infiltrated. Where the ground conditions permit, these basins will allow infiltration of attenuated flows.

5	Swales	Commercial/ Residential	Site	Linear strips which are vegetated/grassed and can be designed to allow storage of surface water during storm events and infiltration along their length. Since they promote low flow velocities, they are effective in allowing suspended particulates to settle-out thereby removing pollutants from surface water run-off.
6	Geocellular Storage	Commercial/ Residential	Site	Cellular crates that provide an underground storage structure with high void ratio that is suitable for attenuating surface water flows. The flows can be released either into the in-situ ground through infiltration (ground conditions permitting).

5.4 Attenuation Basin Preliminary Sizing

5.4.1 Design Criteria

The surface water attenuation basins should be designed in accordance with The SuDS Manual (C753) guidance produced by CIRIA.

The key design criteria include:

- Upstream pre-treatment to remove sediment and silt loads to prevent long term clogging;
- Maximum depth of water should not exceed 3m in the most extreme design event;
- Retention basins will be designed to store the 1 in 100 year storm event.
- Further detail will be provided at the detailed design stage.

5.4.2 Site Wide Catchments

The outline surface water drainage strategy aims to respect the existing catchments and attenuate surface water close to its source before discharging into the three local watercourses. The assessment carried out is an indicative one based on the information at hand at the time of publishing. It is seen as a reasonable way to gain an understanding of the site conditions at this early stage of design development.

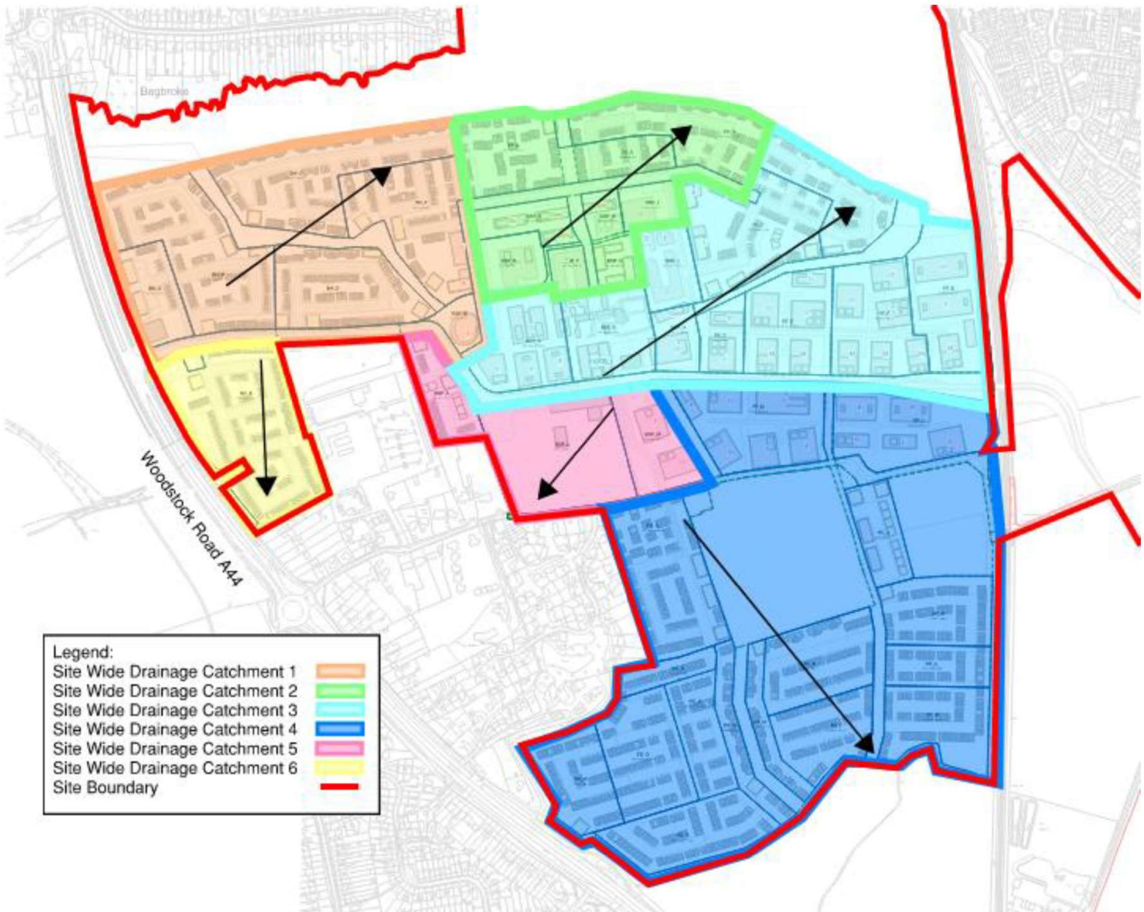


Figure 5—3 Overall Site drainage catchments

5.4.3 Existing Runoff Assessment

5.4.3.1 Runoff Rate Assessment

The existing catchment greenfield runoff and QBAR rates for catchments within the Site have been calculated from the rates shown in flood modelling report carried out by Eden Vale Young Appendix D. This report additionally details how surface water flows from outside of the catchment are captured and directed to the agreed outlets prior to entering the development network.

Table 5—2 Existing Catchment Greenfield Runoff Rate Summary

Existing Catchment	Catchment Area (Ha)	1 in 2 yr (l/s)	1 in 30 yr (l/s)	1 in 100 yr (l/s)	1 in 100 yr +40% CC (l/s)	QBAR (l/s)	Point of Discharge
E1	17	10.5	25.6	34.7	48.5	11.3	Rowel Brook Discharge Point 1 +Infiltration
E2	10	7.3	15.9	21.5	30.2	7.1	Rowel Brook Discharge Point 2
E3	21	25.1	51.6	69.6	97.4	22.6	Rowel Brook Discharge Point 3+Infiltration
E4	38	59.1	137.7	185.4	259.6	59.9	Existing unnamed watercourse (ditch)+Infiltration

E5	6	5.1	12.5	16.9	23.7	5.5	Infiltration
E6	5	3	7.3	9.9	13.8	3.2	Infiltration

*As per LLFA guidance – The discharge rates for all storms up to the 1 in 100-year storm event will be limited to the QBAR rate (or 2l/s/ha whichever is greater) – Given the early stage of design BH is using the more conservative QBAR values above rather than 2l/s/ha, with the understanding that this may change as the design develops.

5.4.3.2 Runoff Volume Assessment

The parameters listed below were used in the design of the drainage strategy:

- Storage volumes calculated based on 1 in 100 + CC storm events, dependent on availability of space to store 1 in 100 + CC either above and/or below ground
- Climate Change: 40% (based on EA current guidance)
    - FEH Rainfall Data
- Factor of Safety for infiltration = 2
- Assumed infiltration rate based on current data = 0.000167m/s (The median value of infiltration rates outlines in Appendix B)
- The current masterplan layout (BEG-HBA-SW-ZZ-SK-A-SK02, received on the 11th May) has been assessed with an estimated percentage of impermeable surface (PIMP%) calculated for each of the sub-catchments within Catchment 1. The PIMP% has been based on 3 No. different land area types – rooves, pavements and green/soft spaces, each carrying different volumetric runoff coefficients. Using the methodology outlined in **Error! Reference source not found.** , the following PIMP% were calculated for each of the 3 sub-catchments within Phase 1:
    - Western Network = 50%
    - Central Network = 50%
    - Eastern Network = 54%.

Table 5—3 PIMP% Calculation Summary

Western Network	Area (ha)	Volumetric Runoff Coefficient	
Roof	1.0	0.95	
Pavement	1.0	0.9	
Permeable	1.7	0[1]	
Total	3.7		
Combined PIMP%	= (1.0*0.95+1.0*0.9+1.7*0)/3.7 = 50%		
Central Network		**Area**	**Volumetric Runoff Coefficient**
• Roof		1.8	0.95
• Pavement		1.7	0.9
• Permeable		3.0	0[1]
Total	6.5		

Combined PIMP%	= (1.8*0.95+1.7*0.9+3.0*0)/6.5 = 50%		
• Eastern Network		Area	Volumetric Runoff Coefficient
Roof		1.6	0.95
Pavement		1.5	0.9
Permeable		2.2	0[1]
Total	5.3		
Combined PIMP%	= (1.6*0.95+1.5*0.9+2.2*0)/5.3 = 54%		
Notes: 1. A volumetric runoff coefficient of 0 has been used for permeable areas based on assessment of the greenfield runoff rate and the fixed runoff equation.			

- Conservative Cv values of 0.89 (Summer) and 1 (Winter) have been used for the attenuation volume assessment outlined in Section **Error! Reference source not found.**.

5.4.4 Required Attenuation Assessment

Table 5—4 Proposed attenuation requirement for 1:100 yr event+40% cc Storm Event

Proposed Catchments	Proposed Catchment Area (ha)	Maximum Allowable Discharge QBAR Rate (l/s)	Required Attenuation Range (m³)
Pr1	17	**11.3**	1254-5701
Pr2	10	**7.1**	738-3353
Pr3	21	**22.6**	1446-7014
Pr4	38	**59.9**	2409-12635
Pr5	6	0 (GeoCell Infiltration proposed)	444-2019
Pr6	5	0 (GeoCell Infiltration proposed)	370-1682

The flood risk assessment BEG-BUR-XX-XX-RP-XX-00001-FRA, document provided as part of this submission details the proposed strategy in capturing and discharging overland flow from the proposed secondary school site. This is to remove flooding from the Site, in line with OCC guidance.

In order to reduce the required size of attenuation features as well as pipe diameters and swale widths within the surface water network, it is proposed that plot developers attenuate flows within their development, to a specified controlled discharge rate. The system aims to ensure that any attenuation required within the plots I kept to a minimum. This could be achieved through the construction of basins within the plots or other measures such as blue roofs being incorporated into building construction within commercial areas.

Considering the results gained from site investigation to date detailed in Appendix B, promoting infiltration is deemed to be advantageous in areas upstream of the catchment outlets. This is where a deeper ground water level and greater achievable infiltration rates are present.

5.5 Proposed Surface Water Drainage Network Layout

5.5.1 Site Wide

The Site wide surface water network will follow the existing site topography and natural flow channels to existing discharge points as far as practically possible. Key features of the Site topography include:

- BSP sits at the highest point of the Site. The surrounding land falls away in all directions towards low points at Rowel Brook, Hallam Land and the Network Rail boundary.
- Sandy Lane forms an east-west topographical ridge which intercepts surface water flowing north-south.

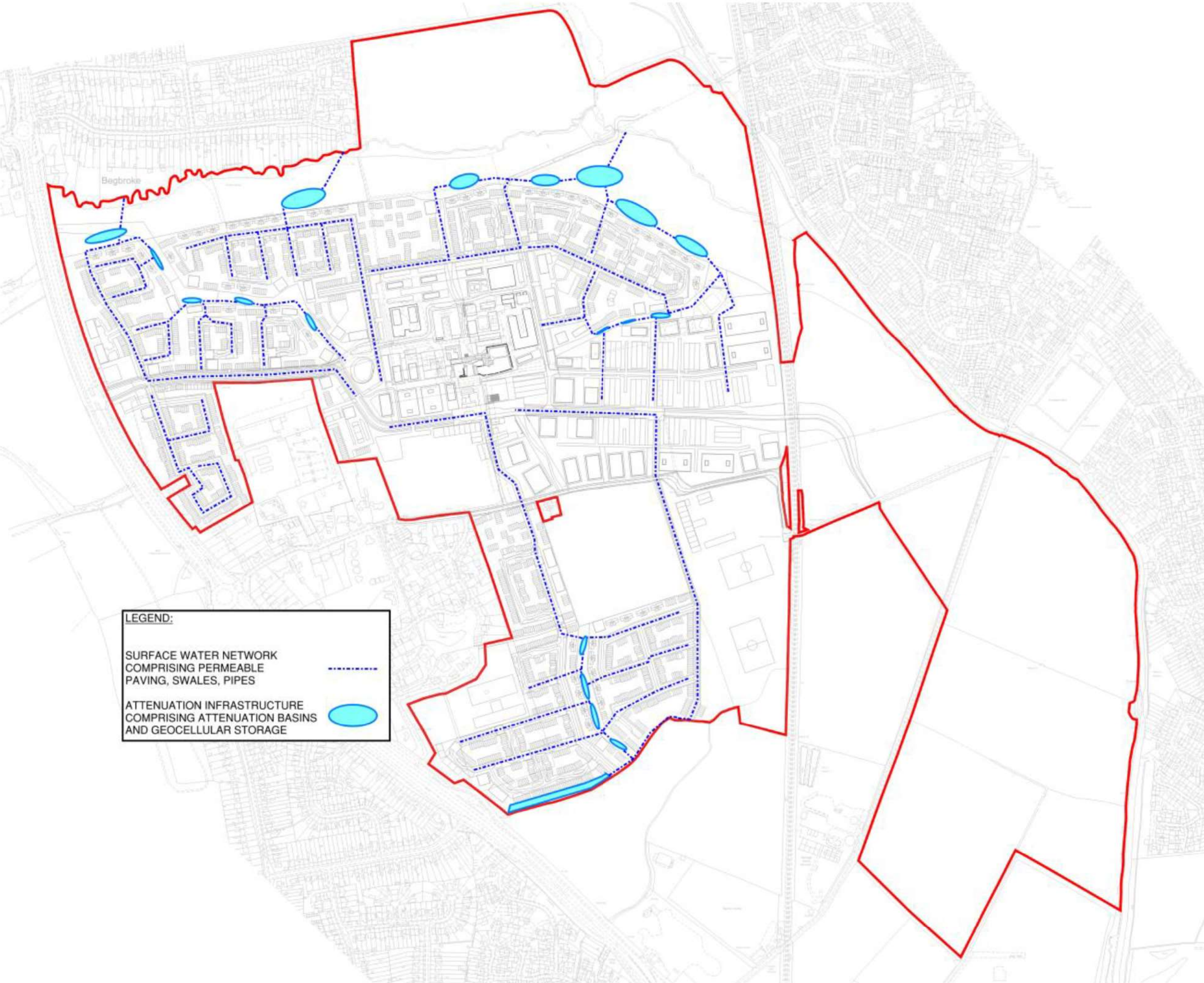


Figure 5—4 Schematic Site Wide Drainage Layout

For the purposes of this assessment, indicative modelling of a surface water network has been carried out for the north-western part of the Site. This corresponds with surface water catchment 1, shown in **Error! Reference source not found.**. It is anticipated that the key concepts of the indicative Catchment 1 surface water design and network would be mirrored across the rest of the Site.

5.5.2 Catchment 1

The illustrative network within the Catchment 1 has been split into 3 sub-networks, with each having varying outfall locations and constraints. The conveyance of surface water through the sub-networks follow the SuDS hierarchy outlined in Section **Error! Reference source not found.** and is briefly summarised below:

5.5.2.1 Western Portion of Catchment 1

The western network collects surface water flows from the western plots, the road catchment within these plots and part of the landscaped corridor ('green spine') bisecting the catchment. From collection through source and site control features outlined in Table 5—1 Summary of Proposed SUDs Features, flows are conveyed via a concrete pipe network into one of 3 No. attenuation basins, located along the northern extent of the development and within the green spine. Infiltration has not been allowed for in the locality of these basins due to a high groundwater table and high clay content of underlying soils. Surface water is attenuated within these basins and then discharged at the controlled rate outline in **Error! Reference source not found.**, via the use of a Hydrobrake or similar flow control device, into Rowel Brook through a proposed DN300 pipe outfall (West Outfall).

5.5.2.2 Central Portion of Catchment 1

The central network collects surface water flows from plots in the elevated middle area of the catchment, Begbroke Hill and the remainder of the green spine not captured by the western catchment. Flows are then conveyed in the same manner as the western network into 5 No. infiltration basins, 2 No. of which include subsurface geocellular storage.

With a moderately deep groundwater table and gravels present in this area of the catchment, it is intended that infiltration to ground be utilised to the full extent possible. Each of the basins and geocellular storage will act to soakaway surface water such that no onwards discharge to Rowel Brook is required from the central network. For redundancy, an emergency overland flow channel has been allowed for connecting the central network into the western network and discharge into Rowel Brook in extreme events (exceeding 1 in 100 year + 40% cc).

5.5.2.3 Eastern Portion of Catchment 1

The eastern network collects surface water flows from eastern plots and the road catchment within these plots. From collection, the flow conveyance methods as described in the western network is mimicked, before discharge 1 No. attenuation basin located near the north east boundary of the Catchment 1 area. Infiltration has not been allowed for in the locality of the eastern network basin due to moderately-high groundwater table and high clay content of underlying soils. Surface water is attenuated within this single basin and then discharged at the controlled rate outlined in **Error! Reference source not found.**, via the use of a Hydrobrake or similar flow control device, into Rowel Brook through a proposed DN300 pipe outfall (East Outfall).

5.5.3 Network Design Criteria

It is proposed that the SWD Strategy will adhere to the following design criteria in accordance with the relevant guidance wherever it is deemed reasonably practicable, an assessment that is ongoing.

5.5.3.1 Peak Flow Control

Limit discharge rates for rainfall events up to and including the 1 in 100-year event (including climate change allowances) to the agreed QBAR rate (or 2l/s/ha whichever is greater) and 1 in 1 year event to the corresponding green field event.

5.5.3.2 Volume Control

Where reasonably practicable, for greenfield runoff development, the runoff volume from the development to any highway drain sewer or surface waterbody in the 1 in 100-year, 6-hour rainfall event should never exceed the greenfield runoff volume for the same event.

5.5.3.3 Flood Risk within the development

Surface water will be confined to the drainage system in a 1 in 30-year (+25% CC) rainfall event.

- The proposed buildings on site will be protected from flooding in the 1 in 100-year (+40% CC) events.

Exceedance in the 1 in 100-year rainfall events is to be managed in exceedance routes that minimise the risks to people and property.

The flood risk assessment carried out by Buro Happold in May 2023 indicated that at maximum flood levels, the 2 No. proposed surface water outfalls would both be submerged by approximately 0.7m of water. These levels have been incorporated into the Microdrainage Surface Water model when assessing the design. The preliminary modelling carried out on the proposed drainage strategy demonstrates that no upstream flooding caused by raised water levels of Rowell Brook.

6 Proposed Foul Water Drainage

6.1 Thames Water Engagement

Thames Water has been consulted on the discharge of the proposed development to the local sewer system. A pre-development enquiry was submitted on the 25th October (TW Ref DS6099943) for a connection based on the load estimation calculated. A follow up in person meeting was held at TW offices on the 30th of January. It is proposed that a connection will be made to the 300mm pipe connecting to the pumping station adjacent to the north west of the Site for the northern area of the Site and a pumping station will be required in the south of the Site to pump to the proposed discharge point south of the Site east of the railway.

The foul water drainage strategy has been developed around the below key proposals:

1. Northern Point of Connection

It is proposed that the north of the Site utilises the existing TW pumping station and rising mains that cross the south from the northwest to the southeast. The north of the Site will connect to TW manhole 4804. These flows will then be conveyed through the existing pump station to the southeast of the Site, where the existing rising main connects to an existing 600mm gravity TW main at TW manhole 5402. Preliminary design of this network suggests that 2 No. pumping stations will be required to achieve connection into TW manhole 4804.

2. Southern Point of Connection

It is proposed that the foul water flows from the south of the Site will connect to the TW network at TW manhole 5402. An initial engagement with TW has occurred regarding the use of the existing utility culvert under the railway. It is anticipated that a minimum of one pumping station will be required to achieve this connection.

6.2 Foul Water Load Estimation

The foul water load estimates are detailed below in Table 6—1.

Table 6—1 Peak Foul Water Flow Estimate by Typology Based on Potable Water Demand

Typology	Units (No.) / Area (m2)	People	Benchmark ***Sewers for Adoption 'The Code' & Urban Drainage – Butler & Davis.***	Average Daily Demand AADD (l/s)	Peaking Factor ***Urban Drainage – Butler & Davis.***	Infiltration	Total Peak Hourly Demand (l/s)
Residential	1800 No.*	NA	0.05 l/s/dwelling	NA	NA	10%	99.00
Faculty (16% of combined area from use schedule)	24,800 m2	NA	0.6 l/s/ha	1.488	6.00	10%	8.928
Commercial (84% of combined area	130,200 m2	NA	0.6 l/s/ha	7.812	6.00	10%	46.872