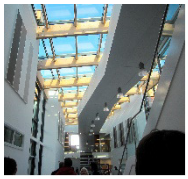

Stakehill,

Middleton

Flood Risk Assessment &

Drainage Strategy

Project number: 3345

Date: May 2018

Revision: 1

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Document Control Sheet

Client: Millson Associates

Project No.: 3345

Project Title: Stakehill, Middleton

Report Title: Flood Risk Assessment & Drainage Strategy

Report Ref: 3345-SHD-00-ZZ-RP-C-0001

Issue: 1

Status: Draft

Control Date: 25th May 2018

Document Revision Record:

Issue	Status	Author	Approved	Date
1	Draft	Eleanor Dale	Paul Graveney	25.05.18

Document Distribution Record:

Issue	Organisation	Quantity
1	MA	1

Scott Hughes Design

Table of Contents

Executive Summary

The proposal is for a mixed-use development with associated access and landscaping on land adjacent to Stakehill Industrial Estate.

The information from the Environment Agency Maps has determined that the site is located within Flood Zone 1, i.e. land defined as having less than a 1 in 1000-year annual probability of flooding in any one year (<0.1%). The total site area is 25ha. Therefore, to address the requirements of the National Planning Policy Framework (NPPF) a Flood Risk Assessment is appropriate.

The site has been assessed against the NPPF 'Sequential Test'. Taking into consideration that the application is for a residential development in Flood Zone 1, Tables 1, 2 & 3 of the NPPF Technical Guidance have been appraised to confirm that the development is 'Appropriate'. The 'Exception Test' is consequently not required.

The underlying geology of the site is comprised of mudstone, siltstone and sandstone. Therefore, soakaways may be a potentially viable SuDS technique, subject to the results of further infiltration testing and groundwater monitoring. There are a number of small watercourses, that form tributaries of Whit Brook, running through the site. Whit Brook also passes through the south of the site.

There is an existing 225mm/300mm diameter United Utilities Surface Water Sewer as well as a 300mm diameter United Utilities Combined Sewer within Stakehill Lane to the west of the development. There is also a 225mm diameter United Utilities Surface Water Sewer within Bentley Avenue.

There is no residual flood risk from the development site to the surrounding district due to the restriction of surface water runoff to greenfield runoff rates prior to discharge into the surrounding watercourses. Given the significant size of the development there are a range of different attenuation options that would be suitable, these are discussed further later in the report. Therefore, the development does not increase the risk of flooding to other adjacent neighbourhoods. Out of chamber or gully flooding for the extreme 100 year plus climate change event may occur within the main development site and is classed as exceedance flows. Flood water from this event will be where possible contained within the main development site and directed away from the buildings to the external hard and soft landscaped areas.

Foul water generated by the development will be discharged into the combined sewers in Stakehill Lane to the west. The foul discharge does not present an increased flood risk to the surrounding district.

1.0 Introduction

1.1 Scott Hughes Design (SHD) has been appointed by Millson Associates to prepare this Flood Risk Assessment to support an outline planning submission for the proposed mixed-use development with associated access, and hard and soft landscaping on land off Stakehill Lane, Middleton. The assessment has been undertaken in line with Section 10 of the 'National Planning Policy Framework' plus the accompanying Technical Guidance on Flood Risk.

1.2 This Flood Risk Assessment (FRA) has been commissioned by Millson Associates and is specific to their interests in the development proposals as described by the Architectural plan in Appendix A. This report may not be assigned.

1.3 The report has been commissioned to identify any flood related issues associated with the proposed development and any likely constraints that could be imposed plus to consider the drainage strategy for it. The following issues have been suggested by the Environment Agency (EA) & Bury, Rochdale and Oldham Strategic Flood Risk Assessment and subsequently addressed within this report:

- Identify available data relating to flood risk at the site.
- Determine whether the site is at risk from flooding from all sources, including from breach or overtopping of any existing flood defences, surface water flooding and/or groundwater flooding.
- Consider the flood risk from all other sources.
- Determine the current surface water drainage regime and assess any potential increase in surface water runoff as a result of the proposed development.
- Discuss Sustainable Drainage Systems (SuDS) as an option for reducing surface water flood risk.
- Devise an appropriate outline surface water drainage strategy (including calculation where appropriate) to deal with any potential increase in surface water runoff and include for climate change.
- Consider the recommendations of the Bury, Rochdale and Oldham Strategic Flood Risk Assessment (SFRA).
- Assess mitigation measures & off-site impacts and define any residual risks.

2.0 Development Description and Location

2.1 Site Location

The site is referenced in Table 1, and a site location map is provided in Appendix A.

Table 1: Site Referencing Information

Item	Brief Description
Site name	Stakehill, Middleton
Site address and location	Land off Stakehill Lane, Middleton, Manchester, M24 2RY
Council Area	Rochdale Borough Council
Approximate Grid Reference	OS: 389286, 408450
General Locality	The proposed development site is approximately 7.4km south of Rochdale town centre.

2.2 Existing site Description

2.2.1 The proposed development site is currently predominantly agricultural land used as pastureland, as well as existing farm buildings. There are 5 waterbodies on the site that form Stakehill Fisheries. The existing site of Stakehill Nurseries is also present on site.

2.2.2 The site is bound to the north and east by the A627(M). Stakehill Lane borders the site to the west, beyond which lies Stakehill Industrial Estate. Hough Lane borders the site to the south, beyond which lies agricultural land.

2.2.3 Figure 1 below identifies the overall site location details. Topographical information indicates that the site slopes to the south and the west. The highest level of approximately 155m AOD is located in the northeast of the site and the lowest level of approximately 130m AOD is located in the west.

Figure 1: Site Location

2.3 Development Proposals

2.3.1 As discussed in the earlier sections, the report is prepared to support a planning application for the proposed mixed-use development on land at Stakehill, Middleton.

2.3.2 The site area is approximately 26.0ha.

2.3.3 The outline Site Layout as indicated in Appendix A provides details of the proposed development intent.

3.0 Planning Policy and Consultation

3.1 Planning Policy Framework

3.1.1 The flood maps provided by the Environment Agency (EA) locate the red line area within Flood Zone 1, i.e. land defined as having an annual probability of fluvial flooding of less than 1 in 1000 in any year (<0.1%). As a requirement of the NPPF (2012), Annex D, the proposed development has to satisfy the requirements of the Sequential Test and where applicable the Exception Test.

3.1.2 Sequential Test:

Under the NPPF (2012), Zone 1 is defined as low probability flood risk. The proposal is for a mixed-use development including industrial, commercial and offices, which in line with Table 2 are classified as 'Less Vulnerable'.

Placing both these criteria into Table 3 (Flood Risk Vulnerability and Flood Zone 'Compatibility'), Less Vulnerable development in Flood Zone 1 determines that 'Development is Appropriate'.

3.1.3 Exception Test:

As the Sequential test is passed, the Exception test is therefore not required.

3.2 Strategic Flood Risk Assessment (SFRA)

3.2.1 SFRA's assess the risk associated with all types of flooding and provide the information required to identify the amount of development permitted in an area; how drainage systems in the area should function and also how risks in vulnerable areas can be reduced and/or mitigated. The NPPF states that regional planning bodies (RPB's) or local planning authorities should prepare SFRA's in consultation with the EA.

3.2.2 In March 2009 JBA Consulting were commissioned by Bury MBC, Rochdale MBC and Oldham MBC to undertake a Level 1 and Level 2 Strategic Flood Risk Assessment. The purpose of the SFRA is to assess and map all known sources of flood risk including fluvial, surface water, sewer, groundwater and all impounded water bodies, taking into account future climate change predictions.

3.2.3 A summary of the main elements from the SFRA are detailed below. The full report can be obtained from the Rochdale Borough Council website.

- SFRA provides a detailed understanding of flood risks across the borough from all sources.
- Bury, Rochdale and Oldham have a number of culverted watercourses; Bury had 12.4km, Rochdale has 14.5km and Oldham has 11.7km.
- Development should aim to deliver greenfield runoff rates on greenfield sites up to a 1 in 100 year storm event, considering climate change.

- Development should be designed so that there is no flooding to the development in a 1 in 30 year event and so that there is no property flooding in a 1 in 100 year plus climate change event.
- For all sites, development proposals should look at opportunities to incorporate SuDS to reduce the risk of surface water flooding.
- All proposed developments must ensure that foul and surface water are kept separate.

3.3 Statutory Authority Correspondence

3.3.1 Mr Stephen McCann, Drainage and Flooding Engineer from Rochdale Borough Council, confirmed that if the ordinary watercourse is relatively large, the Council require a buffer zone of 5m each side from the centreline. If the watercourse is smaller, then the Council require a buffer zone of 3m either side of the centreline.

3.3.2 Mr Neil O'Brien, Developer Engineer from United Utilities, has confirmed in writing that foul water will be allowed to drain to the public combined sewer at an unrestricted rate. Surface water from the site should drain to either soakaway or directly to a watercourse (See Appendix E for further details).

4.0 Definition of Flood Hazard

4.1 Sources of information

The NPPF (2012) requires the developer to consider the impact of runoff generated by the proposed development onto the downstream catchment, and to assess the risk of runoff from the surrounding district impacting on the developments footprint. Further, the report is to consider flood risk from all other sources. The following section defines the flood risk receptors and anticipated flood risk. Section 5 then discusses in further detail the probability of flooding and the likely impacts.

Table 2: Sources of information used in the identification of flood risk

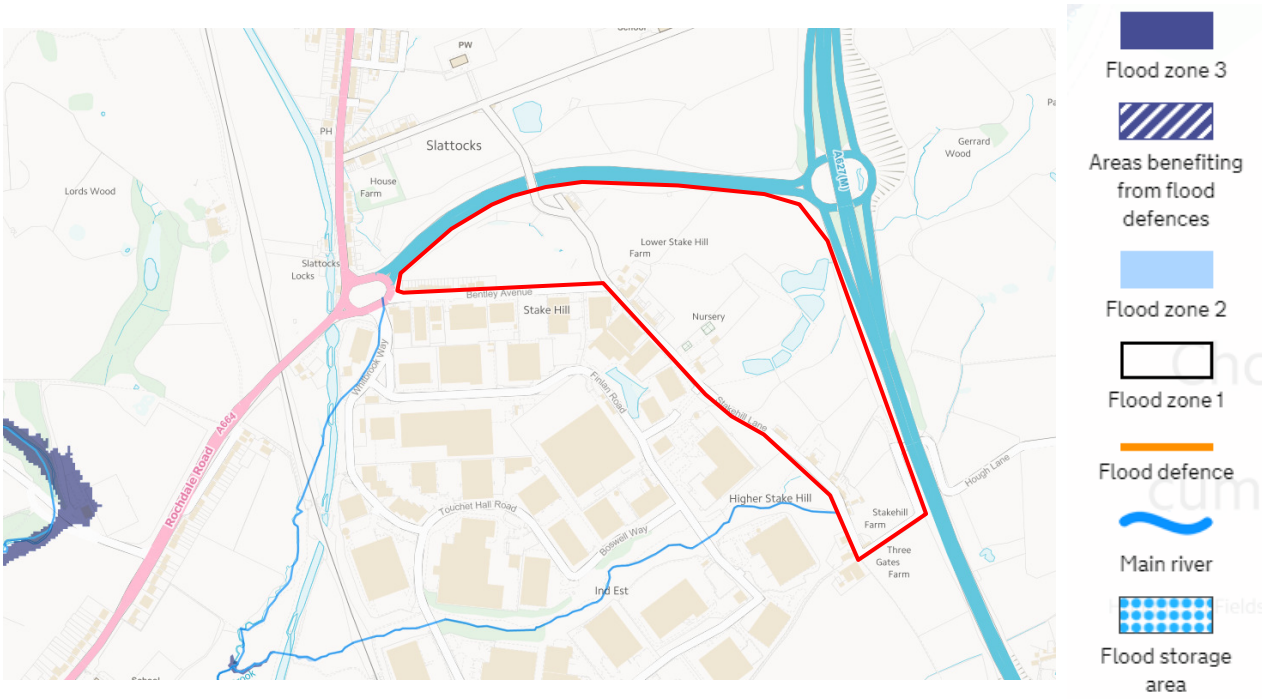
Source of Information	Details
Environment Agency	Indicative Flood Maps
United Utilities	Sewer Records
Historic Maps	From various websites

4.2 Flooding from Rivers (Fluvial)

4.2.1 There are a number of watercourses that pass through the site. There is a culverted watercourse located in the northwest of the site, flowing south into an existing reservoir within Stakehill Industrial Estate to the west. Whit Brook runs through the south of the site, at this point it is classified as an Ordinary Watercourse and does not become a main river until it has exited the site. There are two unnamed watercourse that flow through the centre of the site and connects into Whit Brook to the west of the site. Each of these watercourses will require a 5m easement each side from the centreline, as per correspondence with Rochdale Borough Council.

4.2.2 Figure 2 below locates the red line area on the Environment Agency's indicative floodplain map. It is clear from this that the red line area sits outside of the influence of flood water from any identified water body or river. It is considered therefore that the site lays outside of the active 100-year and extreme event floodplains, thus lying within 'Flood Zone 1 Classification' in accordance with NPPF Guidance, i.e. probability of annual fluvial flooding significantly less than 1 in 1000 in any one year (<0.1%). The risk from fluvial flood water is diminished to acceptable levels, removing the requirement for further investigation and assessment of the fluvial flood regime.

Figure 2 – The EA's Indicative 100-year Floodplain Map

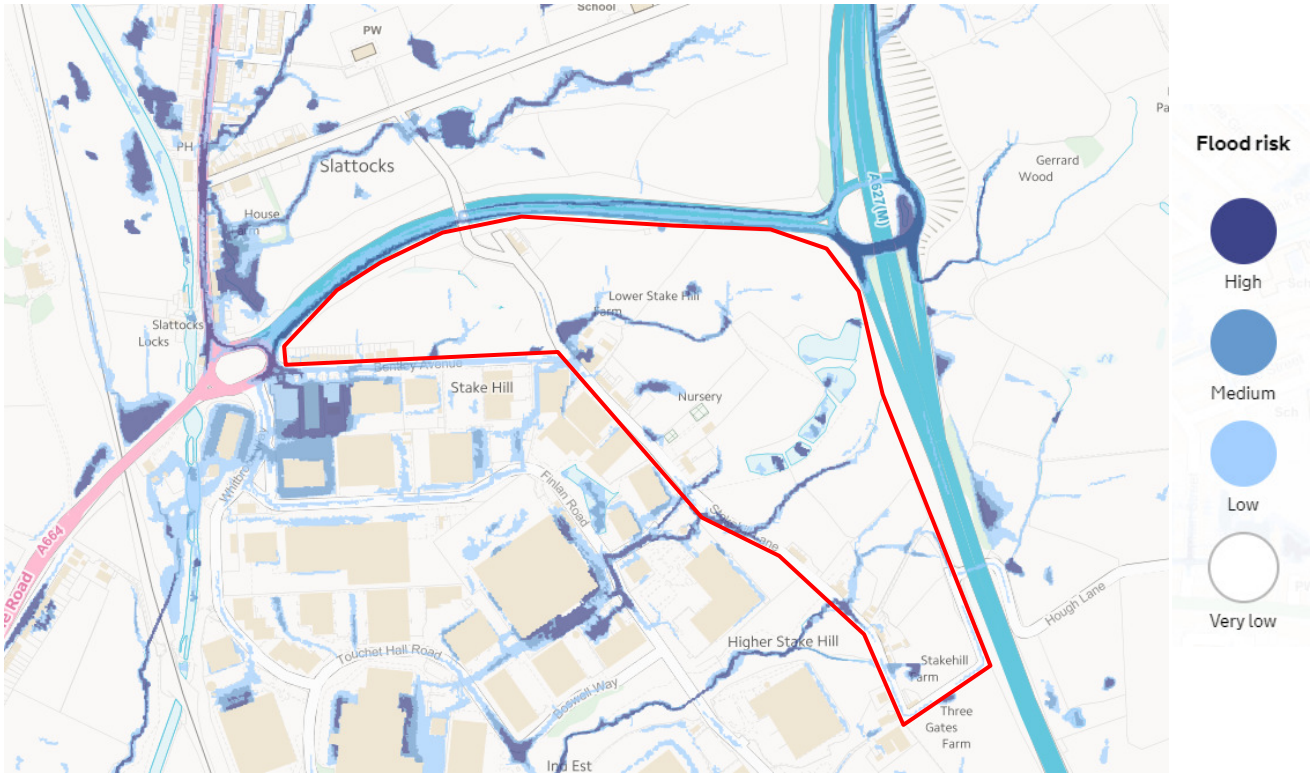


4.3 Flooding From Land (Overland Flow)

4.3.1 The main development site slopes to the west and south. Any surface water runoff from the north and east will be prevented from entering the site by existing highway drainage on the A627(M). Any surface water runoff from the west will be prevented from entering the site by the existing drainage of Stakehill Industrial Estate and the existing highway drainage within Stakehill Lane and Bentley Avenue. As the site slopes to the south and the land continues to slope in this direction off-site, any surface water runoff from the south will be prevented from entering the site due to the difference in levels.

4.3.2 A review of the Environment Agency Surface Water Flood Risk maps indicates that the site is predominantly at low risk of flooding (see Figure 3 below). However, there are areas shown at medium/high risk of surface water flooding. These areas are associated with the onsite watercourses and as these areas will benefit from maintenance easements the risk to the proposed development is low. There is an area in the north of the site that shows a flow route, originating from the centre of the site and highlighted as an area at high risk of flooding. As this flooding originates on the site and it is representing a topographical low point through the site where water is currently able to flow, the proposed levels for the new development will ensure there are no such potential flow paths and the proposed surface water drainage will convey surface water runoff within designated pathways.

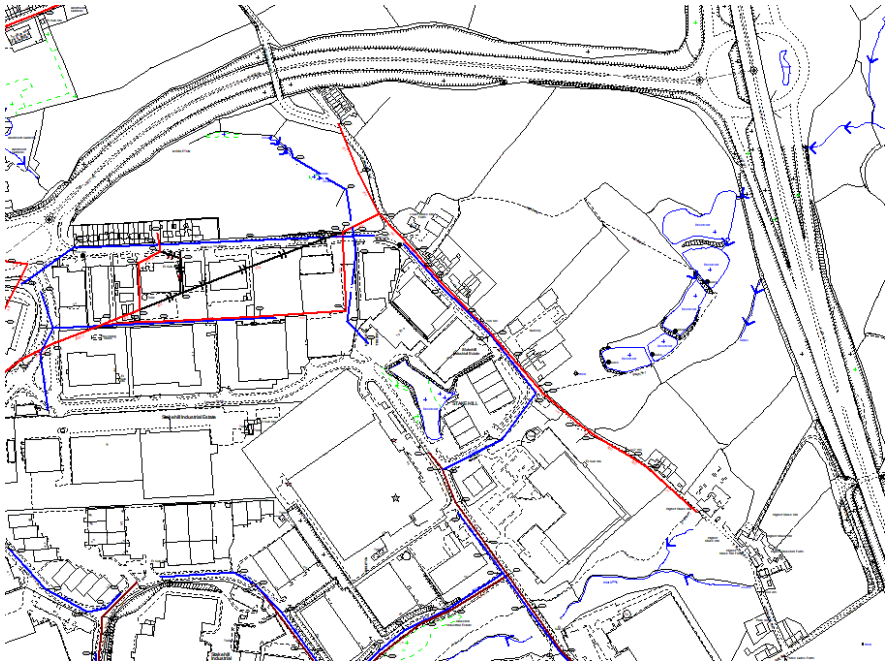
Figure 3 – The EA's Indicative Surface Water Flood Map



4.4 Flooding from Sewers and Private Drainage

4.4.1 The United Utilities (UU) sewer records have been reviewed and confirm that there is a 300mm diameter Combined Sewer and a 225mm/300mm diameter Surface Water Sewer within Stakehill Lane to the west of the site. There is also a 300mm diameter combined sewer that passes through the northwest of the site. An extract of the sewer records is shown in Figure 4 below.

Figure 4 – Extract of United Utilities Sewer Records



4.4.2 The extensive UU adopted drainage network serving the surrounding urban district ensures that the development footprint is protected from the impact of both upstream and downstream runoff. It is speculated that complete protection may well exist beyond a storm event equivalent to the 30-year statistical event. Beyond this projection, there may be a small degree of peripheral 'exceedance' flooding within the highway areas above the sewers. However, this is expected to be localised and restricted to the location of specific manhole covers located outside the development footprint. Thus flood risk to the site from sewers is diminished to acceptable levels.

4.5 Flooding from Groundwater

4.5.1 The site is underlain by Glacial Till (diamicton) and Glaciofluvial Sheet Deposits comprised of sand and gravel. These superficial deposits overlie the Pennine Lowe Coal Measures Formation comprised of mudstone, siltstone and sandstone. There is also a band of Royley Sandstone in the north of the site. The underlying geology of the site is all classified as Secondary A Aquifers which are permeable layers capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers. The development site is not within a groundwater source protection zone.

4.6 Flooding from Artificial Sources

4.6.1 There are five existing waterbodies, these were previously reservoirs. However, they are currently used and managed by Stakehill Fisheries. The Flood Risk from Reservoirs data provided by the EA confirms that the site is at low risk from reservoir flooding.

5.0 Assessment of Flood Risk on the Development Site (Probability)

5.1 Summary

Section 4 has defined the anticipated flood risks from all sources. Table 3 below considers each of the sources and defines in tabular format the Probability of Flood Risk associated to each and the likely impacts.

Below is a table summary of the flood risks associated with the development site.

Table 3 – Flood Risk Summary

Source	Flood Risk	Likely Impacts	Remarks
Tidal	Low	Low	The site is not tidally influenced.
Fluvial (Watercourse)	Low	Low	The site is in Flood Zone 1.
Surface (Overland Flood Flow)	Medium/High	Low	There are no flow routes through the development site and any areas shown as at risk are associated with the onsite watercourses, which will be subject to the required easements, or originate on site and will be intercepted by the new drainage network.
Sewers	Medium	Low	There are existing UU Combined Sewers in the northwest of the site. These will subject to the necessary UU easements.
Groundwater	Low	Low	The site is at low risk of groundwater flooding.
Artificial Sources	Low	Low	The Flood Risk from Reservoirs data provided by the EA confirmed that the site is at low risk.

6.0 Outline Drainage Strategy

6.1 Existing Surface Water Runoff

6.1.1 The existing site is greenfield and has a number of watercourses on the site. Therefore, the existing surface water runoff either infiltrates into the ground or discharges into the existing watercourses which then convey the water to the west. As the site is greenfield, greenfield runoff rates will apply (see Table 4).

Table 4 – Existing Runoff Rates

	Site Area (m^2)	1 year (l/s)	Qbar (l/s)	30 Year (l/s)	100 year (l/s)
Open Land	260,000	160.2	184.2	312.3	383.1

6.2 Geology

6.2.1 The superficial geology of the site is comprised of Glacial Till, containing clays and parcels of Glaciofluvial Sheet Deposits in the northwest, north and south of the site, containing sand and gravel. The bedrock geology is predominantly comprised of the Pennine Lower Coal Measures Formation, containing mudstone, siltstone and sandstone, as well as a bank of Royley Sandstone in the north, containing sandstones.

6.2.2 Given the cohesive nature of the underlying geology, infiltration is unlikely to be a viable option for the discharge of surface water for the majority of the site.

6.3 Sustainable Drainage Systems

6.3.1 SuDS Objectives:

Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed both to manage the environmental risks resulting from the urban runoff and to contribute wherever possible to environmental enhancement. SuDS objectives are therefore to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).

6.3.2 SuDS's Design Themes

A strong design theme is essential if the maximum aesthetic benefits are to be gained from the SuDS approach. At a more local scale the SuDS should link with the individuals plot structure, planting, public open space requirements and amenity areas, gaining multiple benefits from a limited area.

6.3.3 The SuDS Management Train

The 'Management Train Approach' should be central to the surface water drainage strategy of the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

1. **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.

2 **Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).

3. **Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.

4. **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

6.3.4 SuDS Site Constraints

SuDS techniques are suitable for all sites; therefore, an assessment of the existing site is required so that SuDS limitations can be determined.

- Land Use Characteristics: The size and type of the development plot allows a range of source control and site control SuDS devices to be considered both above and below ground.
- Site Characteristics: The cohesive nature of the underlying geology indicates that soakaways are unlikely to be a viable SuDS technique.
- Catchment Characteristics: The site is currently greenfield and greenfield runoff rates will apply.
- Environmental and Amenity Performance: Safety to all future users is paramount when including SuDS within the overall development and so best practice guidance will be incorporated so that these devices blend into the surrounding without the need for significant safety precautions. Maintenance plans will be prepared for all SuDS devices that are included.

6.3.5 SuDS Methods

Tables 5 and 6, below, provide an assessment of various above and below ground SuDS methods that can provide water quality treatment and management of flows to reduce runoff rates and volumes and whether they can be suitably incorporated at this development site. The purpose of this assessment is to set out options to be considered at the planning stage with consideration to time constraints, viability and lifetime maintenance of the development.

Table 5: Surface SuDS Methods

Method	Comment	Suitability for Development
Green Roofs	• Can be used on suitable low rise buildings to provide retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.	*Not suitable*: • Architectural proposals for the development and maintenance issues deem this unsuitable. • Additional costs of installation would have severe effect on viability of the development.
Water Butts	• Plastic tanks placed at the base of rainwater down pipes to collect rainwater runoff from the roof areas.	*Not suitable*: • Water butts are not suitable for commercial/industrial developments.
Rainwater Harvesting	• Rainwater harvesting reduces the total runoff volume from the developed site, and reduces treated water consumption.	*Not Suitable*: • Additional costs of installation would have severe effect on viability of the development. • Running and maintenance costs would not be acceptable to the client or future residents. • The ability to restrict peak flow rates and short-term peak volumes is non-existent where a critical storm event occurs.
Infiltration Options	• Reduces total run off volume from the development.	*Not Suitable*: • The cohesive nature of the underlying geology indicates infiltration is not a viable SuDS technique.

Method	Comment	Suitability for Development
Permeable Surfacing (Infiltration)	• Reduces total run off volume from the development. • Can be used to enhance water quality.	*Not Suitable*: • The cohesive nature of the underlying geology indicates infiltration is not a viable SuDS technique.
Permeable Surfacing (Standard)	• Can be used to enhance quality of runoff water. • Sub-base provides 'source' storage and reduces the volume of storage downstream. • The storage can be created with selection of the stone fill or use of plastic box stems. • Impermeable membrane at base of construction to prevent impact on pavement stability.	*Not Suitable*: • The cohesive nature of the underlying geology indicates infiltration is not a viable SuDS technique.
Swales, basins and ponds	• Provide areas for above ground surface runoff storage. • Swales also allow filtering of particulate matter, improving water quality	*Suitable*: • The significant size of the development may allow for large above ground areas for surface water storage. • Dependent upon final development layout.
Bio-Retention	• Collect and retain run-off to help improve water quality, prior to discharge in piped system on infiltration.	*Suitable*: • The significant size of the development may allow for large above ground areas for surface water storage. • Dependent upon final development layout.

Table 6: Sub-Surface SuDS Methods

Method	Comment	Suitability for Development
Geocellular Storage	• Suitable for sites with insufficient space for basins etc. • Suitable for sites where topography prevents the use of open basins etc. • Can be very effective infiltration devices subject to ground conditions.	*Suitable:* • The use of geocellular attenuation may be possible to retain excess storm water. • Cannot be used in Public Highways or adopted by UU.
Large Diameter Pipes, Culverts or Tanks	• Suitable for sites with insufficient space for basins etc. • Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. • Generally be suitable for adoption by the statutory water company (e.g. United Utilities).	*Suitable:* • The use of oversized pipes may be possible to retain excess storm water. • Used primarily on adopted drainage networks.

6.3.6 SuDS Hierarchal Approach

Based on the SuDS assessment in Tables 5 and 6, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in greater detail below.

Table 7: SuDS Hierarchal Approach

Method	Suitability	Suitability for Development
Infiltration to Ground	No	The cohesive nature of the underlying geology indicates the infiltration is unlikely to be a viable SuDS technique.
Connection to Watercourse	Yes	There are several watercourses on the site.
Connection to Surface Water Sewer	No	There are other suitable options that would take precedent.
Connection to a Combined Sewer	No	There are other suitable options that would take precedent.

6.3.7 SuDS Design Philosophy

The SuDS assessment and hierarchal approach discussed in Tables 5, 6 and 7 above has defined the overall SuDS strategy. Thus, the SuDS philosophy for the main development site is the promotion of Source Control and Site Control techniques, to reduce the risk of both site and downstream flooding.

The following design philosophy is proposed:

- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance to the ground.
- Site control in the form of attenuation ponds and geocellular storage.
- Connections into the surrounding watercourses at greenfield runoff rates.
- Aim to limit where possible the impermeable fraction of development.

6.4 Outline Surface Water Drainage Strategy

6.4.1 The outline strategy is to collect runoff from the roof and external areas and direct it to new below ground surface water drainage networks that will connect into the onsite watercourses via site control attenuation.

6.4.2 The proposed drainage layout for the new development site will be designed in accordance with BS EN 752: 2008 and Building Regulations Part H guidance, i.e. up to the 30-year storm return period criterion and tested for the 1 in 100 year return period including a 20% increase to account for climate change to confirm that there is no flood risk to the buildings.

6.4.3 Flooding can occur on a local scale beyond the 30-year criterion due to runoff exceeding the capacity of the minor system during extreme events and it can only be addressed on a site-specific basis. Sewers for Adoption (SfA) 7th Edition (WRc, 2006) states that developments should be protected against flooding from extreme events (1 in 30 year) and that flood pathways are identified when the drainage system is exceeded.

6.4.4 In the case of this development, exceedance flows will be all those over and above the 30-year design criterion set by Sewers for Adoption guidance. Using storage within the external areas would be achievable and would direct flood water away from the residential buildings, with flows directed back into the surface water drainage network as water levels in the sewers receded. The exceedance flows and volumes can be calculated for the new development drainage layout. In the case of this development and due to the fall across the site, consideration will be given to make sure all water is controlled so that it does not impact on any adjoining properties.

6.4.5 Table 8 below defines the post-development attenuation volumes associated with the site and the method of attenuating (further details can be found on drawing 3345-SHD-00-ZZ-DR-C-0101 in

Appendix C). The volumes identified below are preliminary for this outline assessment and are likely to alter at detailed design stage.

6.4.6 Any future drainage calculations carried out as part of a site-wide drainage strategy or for the development layouts themselves must include the appropriate increase in rainfall to satisfy the future Climate Change allowances.

Table 8: Outline Attenuation Volumes

	New Impermeable Area (m^2)	1 in 30 year attenuation (m^3)	1 in 100 year attenuation + 20% Climate Change Allowance (m^3) (extra over from 30yr retained on the surface)
Zone 1	13400	419.9	654.4
Zone 2	20800	660.7	1034.4
Zone 3	88000	2795.5	4336.8
Zone 4	58400	1896.5	2913.3

6.5 Pollution Control

6.5.1 Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps, French drains with silt traps or by the use of Sustainable Drainage techniques. If appropriate, oil separators in line with Pollution Prevention Guidance 3 (PPG 3) criteria will be provided (it is acknowledged that PPG 3 has been withdrawn, however as no replacement has been released it is still best practice guidance).

6.6 Foul Water Strategy

6.6.1 The outline foul water drainage strategy is to connect into the 300mm diameter Combined Sewers in Stakehill Lane. There would be very limited increase in the foul water discharge rates generated by the new development.

7.0 Management Measures, Off Site Impacts and Residual Risk

7.1 Flood Risk Management Measures

7.1.1 The report has found the main development site to be at low risk of flooding from all sources.

7.1.2 The surface water drainage strategy for the new development site will be to discharge into the onsite watercourses via new surface water drainage networks. The new surface water networks will be designed in line with current British Standard and Sewers for Adoption Guidance up to the 100-year storm return period including an allowance for climate change. Beyond the 30-year criterion out of chamber flooding may occur and flood water will be directed away from the buildings to the external areas, where it will then be directed back into the drainage network as pipe water levels recede.

7.1.3 The use of SuDS in the form of Prevention and Site Control measures, with controlled (restricted) outflow, in line with the required reduction in runoff rates, will help to minimise the flood risk impact to the surrounding sewer networks.

7.1.4 There will be a site management health and safety document prepared in respect of the final development. This will include the required maintenance regime for the on-site drains and drainage facilities such as the channels, gullies, pipes, manholes and all SUDS facilities.

7.1.5 The Management Company will be responsible for site cleanliness, gully emptying and drain cleansing to ensure that the surface water drainage system will always operate at its maximum efficiency.

7.1.6 Should any flooding occur from the new sewers and drains it will be directed away from the buildings to external areas and soft landscaping areas.

7.2 Off Site Impacts

7.2.1 Up to and including the 100-year plus increase in rainfall allowance due to climate change (CC) event, the report has justified that there is no risk of flooding.

7.2.2 The development footprint does not cross or cover any existing or declared future catchment flood defences. Consequently, the Applicant does not propose to augment or compromise any existing catchment defences.

7.2.3 Surface water runoff will reduce from the pre-development regime and utilises SuDS solutions to satisfy the site constraints.

7.2.4 By mimicking the pre-development peak runoff at its point of discharge by the inclusion of SuDS, this will reduce surface water flooding impact onto the downstream sewer network.

7.2.5 As there is no flood displacement or increased rate of runoff as part of this proposal into the adjacent sewers, the proposed development will therefore not increase flood risk in its locality.

7.3 Residual Risk

7.3.1 With careful design of the drainage elements as described above there will be no residual flood-related risks that will remain after the development has been completed.

7.3.2 Flood risk to people and property can be managed but it can never be completely removed; a residual risk remains after flood management or mitigation measures have been put in place. The only known flood related risk that will remain will be the risk of out of manhole flooding within both the existing private and public sewer network beyond the 30 year design criterion. Should exceedance occur, out of chamber flood water will be directed to the external hard standing areas and roads but will not be a flood risk generator.

Appendix A – Architectural Site Layout

Appendix B – Topographical Survey

Appendix C – Scott Hughes Design Drawings

Appendix D – Hydraulic Calculations

Appendix E – Statutory Authority Correspondence