



ENVIRONMENTAL STATEMENT

VOLUME 2

APPENDIX 12.2 – SUSTAINABLE DRAINAGE STRATEGY

ADVISORY

Trustees of J.P. Milne (DEC'D) Will Trust
Stakehill Industrial Estate
Middleton
Sustainable Drainage Statement

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Trustees of J.P. Milne (DEC'D) Will Trust
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Birmingham
Livery Place, 35 Livery Street, Colmore Business District, Birmingham, B3 2PB
T: 0121 233 3322

Leeds
Whitehall Waterfront, 2 Riverside Way, Leeds
LS1 4EH
T: 0113 233 8000

London
11 Borough High Street
London, SE1 9SE
T: 0207 407 3879

Manchester
11 Portland Street, Manchester, M1 3HU
0161 233 4260

Nottingham
Waterfront House, Station Street, Nottingham NG2 3DQ
T: 0115 924 1100

March 2025

DOCUMENT ISSUE RECORD

Document Number:	233493-BWB-ZZ-XX-T-W-0005_SDS
BWB Reference:	233493-SDS

Revision	Date of Issue	Status	Author:	Checked:	Approved:
P01	13/03/25	S2	Lucy Reeves BSc (Hons) MCIWEM	Chris Dodd BEng(Hons) IEng MICE	Claire Gardner BSc (Hons) MSc MCIWEM C.WEM ACMI fCMgr

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1. INTRODUCTION

- 1.1 A Sustainable Drainage Statement (SDS) sets out the principles of drainage design for a development and summarises the reasoning behind the chosen design. This includes consideration of national and local guidance, justification of specific flow rates, volumes of attenuated storage, as well as the appropriate level of treatment to be provided to surface water runoff.
- 1.2 This SDS has been produced by BWB Consulting on behalf of Trustees of J.P. Milne (DEC'D) Will Trust in respect of an outline planning application for a proposed mixed-use development on land to the north of Stakehill Industrial Estate. The level of detail included is commensurate and subject to the nature of the proposals. Proposed plans are included as **Appendix 1**.
- 1.3 A Flood Risk Assessment (FRA) has been produced for the site (reference: 233493-BWB-ZZ-XX-T-W-0007_FRA) and this SDS accompanies this overarching document.
- 1.4 The site is largely greenfield, comprising agricultural land with several minor agricultural/industrial buildings. The site is located approximately 3.1km north east of Middleton, Rochdale and is bound to the north and east by the A627(M), and to the south and west by Stakehill Lane and Bentley Avenue.
- 1.5 Key site details are provided within **Table 1.1**, with the location of the site illustrated within **Figure 1.1**.

Table 1.1: Site Details

Site Name	Stakehill Industrial Estate
Location	Middleton
NGR (approx.)	SD893084
Application Site Area (ha)	24.9 (approx.)
Development Area (ha)	15.3 (approx.)
Development Type	Residential and Industrial/Commercial
Lead Local Flood Authority	Rochdale Borough Council
Local Planning Authority	Rochdale Borough Council
Environment Agency Area	Greater Manchester, Merseyside and Cheshire
Sewerage Undertaker	United Utilities

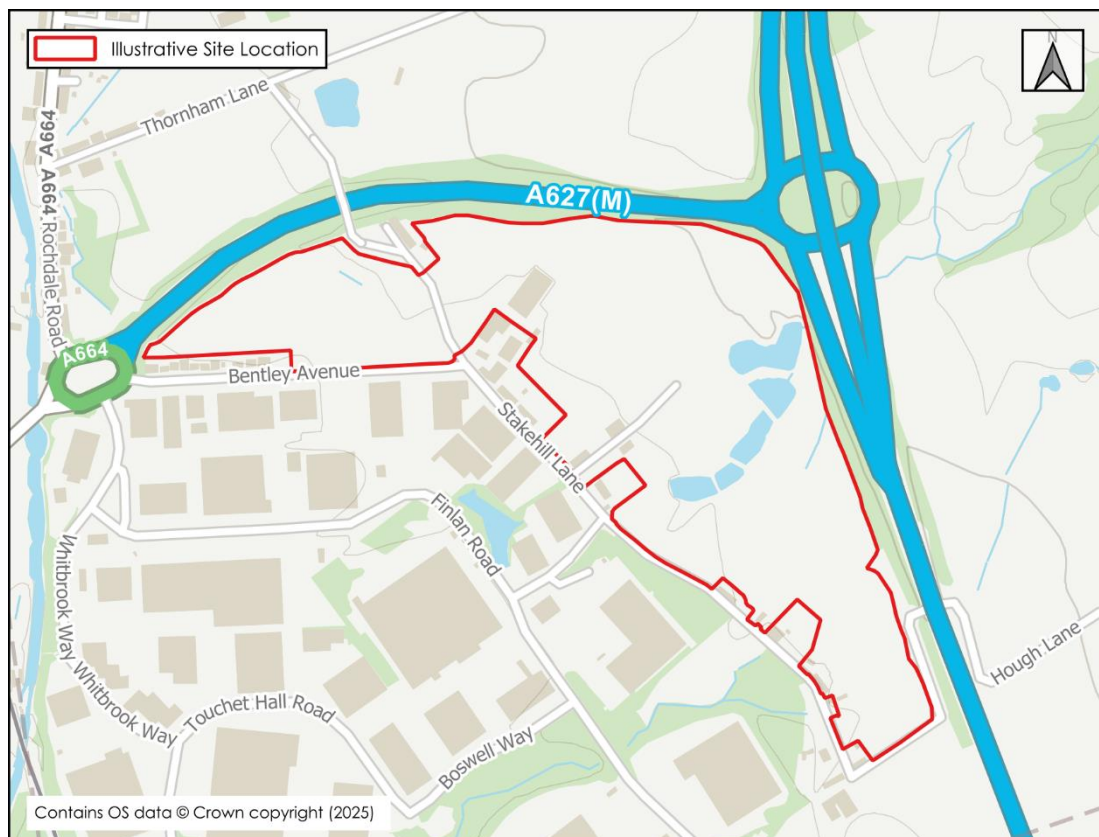


Figure 1.1: Site Location

Sustainable Drainage Guidance

- 1.6 Sustainable Drainage Systems (SuDS) aim to reduce the impact of development by replicating the natural runoff regime in a sustainable, cost effective manner whilst protecting water quality and reducing pollution. The four key objectives of SuDS design are to achieve improvements in water quality, water quantity, amenity provision and biodiversity.
- 1.7 Rochdale Borough Council, in their role as the Lead Local Flood Authority (LLFA), have published the Strategy for Flood Risk Management 2014-2024¹ which notes an objective to:

'Ensure that development and land management do not increase flood risks and contribute to sustainable drainage and the reduction of flood risk'.
- 1.8 The document also notes that SuDS can help to manage pollution and provide opportunities for biodiversity. An appropriate SuDS approach should be introduced based on geology, land use and contamination to ensure drainage is effective and will not increase risks of contamination.
- 1.9 Rochdale Borough Council note on their website that the Flood Hub² has created some pre-application advice about sustainable drainage and provided a Pro-Forma to

¹ Rochdale Borough's Strategy for Flood Risk Management 2014-2024 (Rochdale Borough Council, March 2014)

² <https://thefloodhub.co.uk/planning-development/>

accompany a planning application. It is noted within the advice that developers should incorporate SuDS to manage surface water, and a strategy should set this out. The completed pro-forma is included as **Appendix 2**.

- 1.10 Table 2 from the Environment Agency's (EA) 'Flood risk assessments: climate change allowances'³, included as **Table 1.2**, shows anticipated changes in peak rainfall intensity.

Table 1.2: Irwell Management Catchment Peak Rainfall Allowances

Irwell Management Catchment Allowance	Total Potential Change Anticipated for the '2050s' (Lifetime up to 2060)	Total Potential Change Anticipated for the '2070s' (2061 to 2125)
1 in 30-Year Rainfall Event		
Upper End	35%	40%
Central	25%	30%
1 in 100-Year Rainfall Event		
Upper End	40%	45%
Central	25%	30%

- 1.11 The EA's guidance on peak rainfall intensity climate change allowances states that residential development should be considered to have a minimum lifetime of 100 years and the Planning Practice Guidance⁴ notes that the lifetime of a non-residential development is expected to be at least 75 years. Therefore, the proposed development falls into the 2070s epoch.
- 1.12 Based on the guidance details above, a 45% climate change allowance will be applied to the calculations. It should be noted that the 1 in 30-year event plus 40% climate change will need to be considered at the detailed design stage.
- 1.13 The LLFA do not have any specific SuDS guidance to inform planning applications and in the absence of further information, the Non-Statutory Technical Standards for Sustainable Drainage Systems⁵ as published by DEFRA and The SuDS Manual⁶ have been utilised to inform the strategy.

³ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

⁴ Planning Practice Guidance: <https://www.gov.uk/government/collections/planning-practice-guidance>

⁵ 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems

⁶ The SuDS Manual (CIRIA, 2015)

2. EXISTING CONDITIONS

- 2.1 The general condition of the site, as observed during a site visit by BWB Consulting in March 2024, is shown in **Figure 2.1**.



Figure 2.1: Current Conditions On-Site

- 2.2 A topographical survey of the site is included as **Appendix 3**. The site is shown to generally fall in a south westerly and southerly direction with levels ranging between approximately 155.5m Above Ordnance Datum (AOD) in the north to approximately 129.2m AOD in the west.
- 2.3 United Utilities (UU) sewer records, included as **Appendix 4**, show two 300mm diameter combined sewers to flow in a southerly and north westerly direction along Stakehill Lane. The combined sewers converge within the west of the site before travelling in a south westerly direction through the site as a 225mm diameter combined sewer.
- 2.4 A culverted watercourse is also shown to be located within the west of the site where the head of the system is understood to originate. The watercourse flows south through the site, towards Stakehill Industrial Estate. It is understood that the culverted watercourse is not a United Utilities asset.
- 2.5 A 225mm diameter surface water sewer is shown to be present within Bentley Avenue and flows in a westerly direction towards Stakehill Industrial Estate. A 150mm-300mm diameter surface water sewer is also shown to be located within Stakehill Lane which flows in a south easterly direction towards Stakehill Industrial Estate.
- 2.6 An investigation of the surface water and foul water drainage systems was undertaken by Terrain Surveys in July 2024 and is included as **Appendix 5** (reference: TS24-386). The survey confirmed the presence of the surface water sewers in Bentley Avenue and Stakehill Lane and the combined sewers within the site and Stakehill Lane. A catchpit was identified within the west of the site, along the alignment of the culverted watercourse; however, no further tracing could be undertaken to confirm the alignment of the culverted watercourse.

- 2.7 Several ordinary watercourses are located within the site and the approximate location of these watercourse are shown in **Figure 2.2**. It should be noted that the alignment of the watercourses is approximate based on site visit observations, surface water mapping and OS mapping. The alignment of the watercourses is subject to confirmation following further investigation at the detailed design stage.



Figure 2.2: Approximate Alignment of Local Watercourses

- 2.8 British Geological Survey (BGS) mapping shows the majority of the site to be underlain by Pennine Lower Coal Measures Formation (Mudstone, Siltstone and Sandstone) with bands of Royley Sandstone within the north. Superficial deposits of Till, Devensian (Diamicton) and Glaciofluvial Deposits, Devensian (Sand and Gravel) are expected to be present throughout the site.
- 2.9 Given the greenfield nature of the site, topography and underlying geology, it is likely that the existing drainage regime consists of limited infiltration followed by rapid surface water runoff which will follow existing topography and flow towards the watercourses within the site or surrounding surface water sewers.

Existing Runoff Rates

- 2.10 The Phase I Geo-Environmental Desk Study, an extract of which is included as **Appendix 7**, notes that the majority of the superficial strata is likely to consist of impermeable glacial till deposits. Glacial fluvial deposits may be present within the site but comprise of permeable sands and gravels; however, these are considered to be localised and discontinuous.

- 2.11 The HR Wallingford Greenfield runoff estimation tool⁷ generates a SOIL value of 1 for the site which is typically associated with well drained permeable sandy or loamy soils over highly permeable limestone, chalk, sandstone or related drifts.
- 2.12 Based on the Phase I Geo-Environmental assessment, the SOIL value of 1 is not considered to be representative of site conditions and, therefore, a SOIL value of 3, attributed to mixed areas of permeable and impermeable soils is thought to be more representative of site conditions. A SOIL value of 3 returns a runoff rate of 4.8l/s/ha. Discussions are ongoing with UU and the LLFA to agree a runoff rate which is more reflective of site conditions.
- 2.13 In the absence of ground investigations, and while discussions are ongoing with relevant consultees, an assessment of the existing surface water runoff rates per hectare has been undertaken using FEH and is summarised within **Table 2.1**. Calculations are included within **Appendix 6**. Whilst the drainage strategy is based on the runoff rate outlined in **Table 2.1**, discussions are ongoing with UU and the LLFA to agree a runoff rate which is more reflective of site conditions.
- 2.14 The runoff rates have been estimated using the IH124 method, with appropriate prorated adjustments for a site of less than 50ha, as recommended in Interim Code of Practice for Sustainable Drainage⁸. This was undertaken within Causeway 'Flow' FEH greenfield method, which makes the necessary adjustments for small sites automatically.

Table 2.1: Existing Runoff Rate from the Site per Hectare

Return Period (Yrs.)	Runoff Rate (l/s/ha)
2	2.2
Mean Annual Flow Rate (QBAR)	2.4
30	4.0
100	4.9

Existing Runoff Volume

- 2.15 An assessment of the existing surface water runoff rates from the development area (15.3ha) has been made for a 1 in 100-year, 6 hour storm.
- 2.16 As the existing site is permeable, the runoff volume has been calculated using the Discharge Volume within Causeway 'Flow' to be 4420m³, results are included within **Figure 2.3**.

⁷ <https://www.uksubs.com/tools/members/greenfield-runoff-rate-estimation>

⁸ The National SUDS Working Group (2004), Interim Code of Practice for Sustainable Drainage

<u>Pre-development discharge</u>	
Site Makeup	Greenfield ▾
Greenfield Method	FSR/FEH ▾
Positively Drained Area (ha)	15.300
Soil Index	3 ▾
SPR	0.40
Catchment Wetness Index	125.218
Return Period (years)	100
Climate Change (%)	0
Storm Duration (mins)	360
Betterment (%)	0
	Calc
PR	0.444
Runoff Volume (m³)	4420

Figure 2.3: Greenfield Runoff Volume

3. SURFACE WATER DRAINAGE STRATEGY

- 3.1 The site has an approximate total area of 24.9ha and an approximate development area of 15.3ha. It is assumed that 65% of the residential development area is impermeable and a 10% increase to the proposed residential impermeable area will be applied to account for urban creep. It is assumed that 100% of the industrial/commercial development will be impermeable.
- 3.2 100% of the basin footprints have been included within the impermeable area as rainfall on the open SuDS features will be picked up by the drainage system. The total impermeable area to be used in the attenuation calculations is 12.4ha.
- 3.3 The site has been divided into nine catchments based upon topography and development aspirations. Details of the catchments are shown in **Table 3.1**.

Table 3.1: Catchment Details

Catchment	Development Area (including 100% of the basin footprint) (ha)	Impermeable Area (ha)	Total Impermeable Area + 10% Urban Creep (ha)
1 - Residential	3.1	2.0	2.3
2 - Residential	1.5	0.9	1.1
3 - Residential	4.7	3.0	3.5
4 - Residential	2.2	1.4	1.7
5 - Industrial/Commercial	1.8	1.8	1.8 (urban creep not applicable)
6 - Industrial/Commercial	0.5	0.5	0.5 (urban creep not applicable)
7 - Industrial/Commercial	0.5	0.5	0.5 (urban creep not applicable)
8 - Industrial/Commercial	0.5	0.5	0.5 (urban creep not applicable)
9 - Industrial/Commercial	0.5	0.5	0.5(urban creep not applicable)
Total	15.3	11.1	12.4

Drainage Hierarchy

- 3.4 The Planning Policy Guidance⁹ and the SuDS Manual¹⁰ identify that surface water runoff from a development should be disposed of as high up the following hierarchy as reasonably practicable:
- i. into the ground (infiltration).
 - ii. to a surface water body.
 - iii. to a surface water sewer, highway drain, or another drainage system.
 - iv. to a combined sewer.
- 3.5 The aim of this approach is to manage surface water runoff close to where it falls and mimic natural drainage as closely as possible.
- 3.6 A Phase I Geo-Environmental Desk Study Report was undertaken in 2018 by REFA Consulting Engineers. The report notes that the majority of the superficial strata is likely to consist of impermeable glacial till deposits; glacial fluvial deposits may be present within the site but comprise permeable sands and gravels. However, these are considered to be localised and discontinuous and, therefore, it is unlikely that the adoption of a sustainable drainage system will be feasible on the site.
- 3.7 It is, therefore, considered that infiltration is unlikely to be feasible at the site. As the scheme progresses, it is recommended that infiltration testing in accordance with BRE365 is undertaken. If infiltration is found to be a suitable method of discharging surface water from the development, this strategy should be revised in accordance with the above hierarchy.
- 3.8 Due to the close proximity of watercourses and culverts, it is proposed to discharge surface water from the site to these features. Where no connection to a watercourse is possible, surface water will outfall to the existing public surface water network, in line with existing conditions.
- 3.9 A S106 (Water Industry Act 1991) application should be made to UU for approval prior to the connection being made. As connection to a sewer is shown to be the most preferred option, approval at a restricted rate will be acceptable.

Peak Flow Control

- 3.10 In order to comply with the Non-Statutory Technical Standards for Sustainable Drainage Systems S2-S3¹¹, runoff from greenfield developments should not exceed the equivalent greenfield rates.

⁹ Planning Practice Guidance. <http://planningguidance.planningportal.gov.uk/>.

¹⁰ The SuDS Manual (C753). CIRIA 2015.

¹¹ 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems

- 3.11 To comply with the peak flow control criterion, it is proposed to restrict the discharge rate from the development to the receiving sewer/watercourse at the equivalent greenfield QBAR rate up to the 1 in 100-year plus climate change event. This is summarised within **Table 3.2**.

Table 3.2: Existing & Proposed Runoff Rates

Return Period (Yr.)	Existing Runoff Rate (l/s/ha)	Existing Runoff Rate (15.3ha) (l/s)	Proposed Discharge Rate (l/s)
1	2.2	33.7	36.7
QBAR	2.4	36.7	
30	4.0	61.2	
100	4.9	75.0	
100 + 45%	-	-	

- 3.12 The proposed discharge rate has been pro-rated between the catchments and is detailed within **Table 3.3**.

Table 3.3: Proposed Runoff Rates per Catchment

Catchment	QBAR Greenfield Discharge Rate (l/s)	Proposed QBAR Greenfield Discharge Rate (l/s)
1	7.4	7.4
2	3.6	3.6
3	11.3	11.3
4	5.3	10.8
5	4.3	
6	1.2	
7	1.2	2.0
8	1.2	2.4
9	1.2	

- 3.13 It should be noted that Catchment 4 and 5 outfalls to Catchment 6 via a cascade and Catchment 8 outfalls to Catchment 9 via a cascade and therefore, the proposed runoff rates from these catchments have been restricted to the combined greenfield QBAR rate.

- 3.14 In order to avoid the risk of blockage the runoff rate from Catchment 7 has been increased to 2l/s. The Design and Construction Guidance¹² notes that static flow controls should have a minimum opening size of 100mm where debris can enter the control and, therefore, the minimum runoff rate should be confirmed at detailed design.

Attenuated Storage

- 3.15 As the development proposals require a restricted runoff rate, it will be necessary to provide attenuated storage to balance the excess volume in a safe manner within the site.
- 3.16 The surface water storage should be located within the site in a position where it can receive runoff from the development and discharge from the site by gravity and also is a position where it is hydraulically isolated from any fluvial floodplain or external surface water floodplain/ overland flow route that may be present in the site.
- 3.17 Sufficient storage for events up to the 1 in 100-year storm with an allowance for climate change should be provided, and a 10% allowance should be applied to the current proposed residential development area to allow for urban creep over the lifetime of the development.
- 3.18 After considering the site constraints and development aspirations it is suggested that the necessary surface water storage volume for the industrial/commercial areas is provided within cellular storage tanks and detention basins, and for the residential areas is in a series of detention basins located at the lowest elevation of the site.
- 3.19 For the purpose of this outline assessment, it has been assumed that the basins and underground cellular storage tanks will accommodate all of the necessary storage, but it may be possible to redistribute a portion of the storage within other drainage components during the detailed design of the development (e.g.: in the pipe network, swales, filter drains, etc).
- 3.20 A simulation has been run using Causeway 'Flow' to identify the necessary storage provision. Using a restriction detailed in **Table 3.3**, the volume of attenuated storage required for the development has been calculated for storm events up to the 100 year + 45% storm. The results are summarised in **Table 3.4** and calculations are included as **Appendix 8**.

Table 3.4: Total Outline Attenuated Storage Requirements

Rainfall Method	Critical Storm	Maximum Volume (m ³)
FEH	960 min Winter – 8640 min Winter	14,283
FSR	720 min Winter – 7200 min Winter	13,435

¹² Design and Construction Guidance Appendix C (Water UK, November 2023)

- 3.21 At this outline design stage, it is expected that a minimum of 14,283m³ of attenuated storage will be provided to cater for the maximum anticipated runoff volume for all storm durations up to the 1 in 100-year return period storm, including a 45% climate change allowance and future urban creep for residential development.
- 3.22 It is envisaged that the final required attenuated storage volume will be determined during the detailed design stage, once the development layout and drainage areas are fixed.

Sustainable Drainage Systems

- 3.23 An Illustrative Drainage Strategy is included as **Appendix 9** (drawing reference: 233493-BWB-ZZ-XX-D-W-0002) and demonstrates how the required storage volume can be achieved within the site.
- 3.24 A catchment-based approach will be applied, which will treat and attenuate runoff close to source. Surface water runoff from each catchment will be stored within either an above ground detention basin, landscaped into the public open space, or underground cellular storage.
- 3.25 The detention basins have been modelled with a total depth of 1.4m inclusive of a 400mm freeboard in the 1 in 100-year + 45% climate change event. The basins have been designed to accommodate a maximum water level of 1m during the critical design event.
- 3.26 The underground geo-cellular storage has been modelled within a total depth of between 1.0m and 1.2m with a cover of 1m.
- 3.27 The detention basins should be appropriately planted to provide a primary level of treatment through filtration. It is recommended that the detention basins are enhanced to include low flow channels, variable depths, forebays and pond/permanent water areas, to be agreed and advised during the detailed design.
- 3.28 Further levels of treatment will be provided via swales located throughout the proposed development and permeable paving. Further levels of treatment could also be provided in the form of rain gardens and tree pits. It is envisaged that the treatment stages will be determined during the detailed design stage, once the development layout and drainage areas are fixed.
- 3.29 Where possible, the swales and detention basins should be unlined to allow for any residual infiltration. The viability of having unlined swales and detention basins is subject to groundwater levels within the proposed development site.
- 3.30 Petrol interceptors should be incorporated into the drainage design associated with the industrial/commercial units to manage any hydrocarbons present.
- 3.31 Surface water from the proposed development will discharge at a controlled rate via a vortex flow control.

Water Quality

- 3.32 The impact on the receiving watercourses will be mitigated by discharging the surface water flow through a SuDS management train within the site which is primarily made up of enhanced detention basins and swales.
- 3.33 In accordance with the SuDS Manual a simple index approach to water quality risk management should be undertaken for the proposed development. This will be compiled to provide a comprehensive account of the water quality treatment provided by the proposed surface water drainage system.
- 3.34 The SuDS Manual Mitigation Index will be used to assess the treatment levels proposed in relation to the pollution hazard posed from the proposed land use(s). This methodology is adopted to ensure that surface water flows receive adequate treatment through all areas of the site prior to final outfall.
- 3.35 **Table 3.5** shows the pollution hazard indices for the land use classification(s) that are relevant to the proposed development, as described within Table 26.2 in the SuDS Manual.

Table 3.5: Pollution Hazard Indices for Different Land Use Classifications

Land Use	Pollution Hazard Level	TSS	Metals	Hydrocarbons
<i>Industrial/Commercial</i>				
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Commercial yards and delivery areas, non-residential car parking with frequent change, all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
<i>Residential</i>				
Residential roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change	Low	0.5	0.4	0.4

- 3.36 The SuDS Mitigation Indices that are relevant to the proposed development, as described within table 26.3 of the SuDS Manual, are outlined in **Table 3.6**.

Table 3.6: SuDS Mitigation Indices

Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Swale	0.5	0.6	0.6
Detention Basin	0.5	0.5	0.6
Permeable Paving	0.7	0.6	0.7

- 3.37 The pollution hazard rating and proposed SuDS Mitigation Index for each drainage Catchment is compared within **Table 3.7**. Where more than one SuDS component is proposed, a factor of 0.5 has been applied to the downstream (i.e., secondary and/or tertiary) treatment stages to account for the reduced performance due to reduced inflow concentrations.

Table 3.7: Comparison of Pollution Hazard Rating against Proposed Mitigation Index

Pollution Type	Pollution Hazard Rating*	Proposed Mitigation Index	Sufficient Treatment Provided?
<i>Catchment 1, 2, 3 and 4 (Residential) – Swale and Detention Basin</i>			
TSS	0.5	0.75	✓
Metals	0.4	0.75	✓
Hydrocarbons	0.4	0.9	✓
<i>Catchment 5, 6 and Catchment 8 (Industrial/Commercial and Roads) – Swale and Detention Basin</i>			
TSS	0.7	0.75	✓
Metals	0.6	0.75	✓
Hydrocarbons	0.7	0.9	✓
<i>Catchment 7 (Industrial/Commercial) – Permeable Paving</i>			
TSS	0.7	0.7	✓
Metals	0.6	0.7	✓
Hydrocarbons	0.7	0.7	✓

* Worst-case pollution hazard rating for each use used for each use

- 3.38 Based on the above assessment, the proposed SUDS features provide a suitable level of treatment to surface water prior to discharge from the site.

Residual Risk and Designing for Exceedance

- 3.39 To protect against extreme events in exceedance of the drainage infrastructure, the external levels of the development should be profiled to direct water away from vulnerable infrastructure and towards the nearest drainage point.
- 3.40 In addition to the volume of storage provided within the main attenuation, there will be capacity within upstream swales, pipes and manholes which has not been accounted for at this stage and a further level of redundancy to the network will therefore be provided.
- 3.41 A 400mm freeboard has been provided within the detention basins in the 1 in 100-year + 45% climate change scenario.

4. FOUL WATER DRAINAGE

- 4.1 It is proposed to drain foul water from the proposed development separately to surface water. As the site is currently undeveloped, a new connection will be required. It is, therefore, proposed that foul water from the development will outfall to the existing UU public sewer at the closest connection point available.
- 4.2 The nearest adopted public gravity sewer is the 300mm diameter combined sewers located within the site and Stakehill Lane. A Pre-Development Enquiry was submitted to UU and is included as **Appendix 4**. UU have noted that foul water from the site will be allowed to drain to the public foul water/combined sewer system.
- 4.3 It is expected that a gravity connection to the public sewer network will be achievable for the majority of the site. However, a pumping station is expected to be required for Catchment 1. The foul pumping station should be located in the lowest development area of the catchment to achieve a more efficient gravity connection from the site to the pumping station.
- 4.4 Based on the size of the development, it is anticipated that the pumping station will be a 'Type 3' pumping station as outlined within the Design and Construction Guidance (DCG). Type 3 pumping stations have typical compound dimensions of 8m x 12m and require access via an adoptable highway. Consultation will be required with UU to determine the final dimensions and requirements for emergency storage. Type 3 pumping stations require a 15m easement between the compound's wet well and the nearest habitable dwelling.
- 4.5 To aid with the phasing of the development, it is proposed that three connections are made to the UU combined sewer within Stakehill Lane and Bentley Avenue. The suggested connection points are shown on the Illustrative Drainage Strategy included as **Appendix 9**.
- 4.6 A S106 (Water Industry Act 1991) application should be made to UU for approval prior to a connection being made.

5. MAINTENANCE

- 5.1 The proposed drainage system should be designed in accordance with the DCG and be offered up for adoption to UU. If any parts of the drainage network remain unadopted, or until the point that they are, an appropriate maintenance company should be appointed. Any drainage features within private curtilage will be the responsibility of the homeowner.
- 5.2 Requirements for ongoing maintenance of the drainage network should form part of the Operation and Maintenance manual for the site and should be undertaken by the site management. Any specialist or proprietary products that are specified at detailed design should have a manufacturer specific maintenance regime which should be included within the document.
- 5.3 It is envisaged that the Operation and Maintenance manual will be developed at the detailed design stage, but some examples are included below.
- i. All drainage features should be located in open areas which are readily accessible.
 - ii. Gullies should be inspected and de-silted at least once a year, where necessary.
 - iii. Pipes, manholes and silt traps should be inspected and de-silted at least once a year, where necessary.
 - iv. Permeable paving should be swept a minimum of every 6 months to maintain flow capacity of the joints between blocks.
 - v. The surface water attenuation areas will be predominantly dry, and the base will be seeded with a wildflower grass seed mix that can tolerate wet ground conditions.
 - vi. Regular inspections of the attenuation basin should be undertaken to remove litter/debris, invasive/colonising vegetation and silt build up as necessary. Inlet and outlet structures to be regularly inspected, with remedial work as required to maintain water flows and prevent silt/vegetation build up.
 - vii. Vegetation/grass with the attenuation basin should be maintained appropriately to allow establishment and promote habitat formation, without impeding the operation of the inlet and outlet structure.
 - viii. Flow controls should be inspected every six months, litter/debris and silt build up should be removed as necessary.

6. SUMMARY

- 6.1 This statement and supporting appendices demonstrate that the drainage design for the development will comply with the relevant local and national standards, specifically the hierarchy of discharge, runoff rate and volume criterion.
- 6.2 This SDS is intended to support an outline planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

Table 6.1: Sustainable Drainage Statement Summary

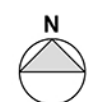
		Existing Site	Proposed Development
Site Area (ha)		24.9	
Impermeable Area (ha)		-	12.4
Outfall Location		Watercourse/Sewer	Watercourse/Sewer
Peak Runoff Rate (l/s/ha)	QBAR	2.4	2.4*
	1 in 30-Year	4.0	
	1 in 100-Year	4.9	
	1 in 100-Year + CC	-	
Volume Control		-	Discharge rate limited to QBAR or 2l/s
Proposed Storage Volume		-	14,283m ³
Flow Control Type		-	Vortex
SuDS Features		-	Permeable Paving Swales Detention Basin
Maintenance Responsibility		-	Management Company/Sewerage Company

* Runoff rate from the site restricted to 2.4l/s/ha or a maximum 2.0l/s to avoid blockage where the pro-rated QBAR greenfield runoff rate is less than 2.0l/s.

- 6.3 It is envisaged that the final drainage strategy will be determined during the detailed design stage, as the development layout is finalised.

APPENDICES

Appendix 1: Illustrative Masterplan



Appendix 2: North West SuDS Pro-Forma

SECTION 1. APPLICATION & DEVELOPMENT DETAILS

Planning Application Reference <i>(if available)</i>	N/A	
State type of planning application <i>i.e. Pre-application, Outline, Full, Hybrid, Reserved Matters*</i> <i>*Information only required if drainage is to be considered as part of reserved matters application</i>	Outline	
Developer(s) Name:	N/A	
Consultant(s) Name:	BWB Consulting Ltd	
Development Address <i>(including postcode)</i>	Stakehill, Middleton, M24 2RY	
Development Grid Reference <i>(Eastings/Northings)</i>	389441 , 408255	
Total Development Site Area (Ha)	15.3ha	
Drained Area (Ha)* of Development	12.4ha (impermeable area)	
Please indicate the flood zone that your development is in. Tick all that apply. <i>Based on the Environment Agency Flood Map for Planning and the relevant Local Authority Strategic Flood Risk Assessment (to identify Flood Zones 3a/3b).</i>	Flood Zone 1 ☒ Flood Zone 2 ☐ Flood Zone 3a ☐ Flood Zone 3b ☐	
What is the surface water risk of the site? Tick all that apply. <i>Based on the Environment Agency Surface Water Flood Map.</i>	High ☒ Medium ☒ Low ☒	
Have you submitted a Site Specific Flood Risk Assessment (FRA)? <i>See separate guidance notes for clarification on when a FRA is required</i>	Yes ☒ No ☐	
Have you submitted a Sustainable Drainage Strategy?	Yes ☒ No ☐	
Does your drainage proposal provide multi-functional benefits via SuDS?	Yes ☒ No ☐	
Expected Lifetime of Development <i>(years)</i> <i>Refer to Planning Practice Guidance "Flood Risk and Coastal Change" Paragraph 026</i>	Residential approx 100yrs Industrial/Commercial approx 75yrs	
Development Type:		State Proposed Number of Units
Greenfield Site Site is wholly undeveloped, and a new drainage system will be installed	☒	314 dwellings and 4 industrial/commercial units
Previously Developed/ Brownfield Site - Site is already developed, and the <u>entirety</u> of the existing surface water drainage system will be used to serve the new development (evidence must be provided to prove existing surface water drainage system is reusable); OR - Where records of the previously developed system are not available so that the hydraulic characteristics of the system cannot be determined or where the drainage system is not in reasonable working order i.e. broken, blocked or no longer operational for other reasons.	☐	
Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 1.	FRA - 233493-BWB-ZZ-XX-T-W-0007 SDS - 233493-BWB-ZZ-XX-T-W-0005	

SECTION 2: IMPERMEABLE AREA AND EXISTING DRAINAGE

	Existing (E)	Proposed (P)	Change (P – E)
State Impermeable Area (Ha)	-	12.4	+12.4
Evidence Required: Plans showing development layout of site with existing and proposed impermeable areas.			☒ Development areas shown on drawing ref: 233493-BWB-ZZ-XX-D-W-0002
Are there existing sewers, watercourses, water bodies, highway drains, soakaways or filter drains on the site?		Yes ☒ No ☐ Don't Know ☐	
Evidence Required: Plan(s) showing existing layout to include all: - Watercourses, open and culverted - Water bodies – ponds, swales etc. - Sewers, including manholes - Highway drains, include manholes, gullies etc. - Infiltration features - soakaways, filter drains etc.		☒ Watercourses and sewers shown on drawing ref: 233493-BWB-ZZ-XX-D-W-0002	
Drainage Design <i>Outline planning applications should be able to demonstrate that a suitable drainage system is achievable.</i> <i>All other type of planning application should provide full details or reference to previous planning application where drainage details have been submitted or approved.</i>			
Select which design approach you are taking to manage water quantity (refer to Section 3.3 SuDS Manual)			
Approach 1 – Volume control / Long Term Storage (Technical Standards S2/3, S4/5) - The attenuated runoff volume for the 1 in 100 year 6 hour event (plus climate change allowance) is limited to the greenfield runoff volume for the 1 in 100 year 6 hour event, with any additional runoff volume utilising long term storage and either infiltrated or released at 2 l/s/ha - The discharge rate for the critical duration 1 in 1 year event is restricted to the 1 in 1 year greenfield runoff rate - The discharge rate for the critical duration 1 in 100 year event (plus climate change allowance) is restricted to the 1 in 100 year greenfield runoff rate			☐
Approach 2 – Qbar (Technical Standards S6) Justification has been provided that the provision of volume control/long term storage is not appropriate and an attenuation only approach is proposed. All events up to the critical duration 1 in 100 year event (plus climate change allowance) are limited to Qbar (1 in 2 year greenfield rate) or 2 l/s/ha, whichever is greater.			☒
Evidence Required: Plans showing: - Existing flow routes and flood risks - Modified flow routes - Contributing and impermeable areas - Current (if any) and proposed 'source control' and 'management train' locations of sustainable drainage components (C753 Chapter 7) - Details of drainage ownership - Details of exceedance routes (Technical Standards S9) - Topographic survey - Locations and number of existing and proposed discharge points			☒

Note consideration should be given to manage surface water from both impermeable and permeable surfaces (including gardens and verges) likely to enter the drainage system.

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 2.

FRA - 233493-BWB-ZZ-XX-T-W-0007
 SDS - 233493-BWB-ZZ-XX-T-W-0005
 Drainage strategy - 233493-BWB-ZZ-XX-D-W-0002

SECTION 3: PEAK RUNOFF RATES – TECHNICAL STANDARDS S2, S3 AND S6 (UNLESS S1 APPLIES)

Rainfall Event	Existing Rate (l/s)	Greenfield Rate (l/s)	Proposed Rate (l/s) <i>Previously developed sites - In line with S3 should be equivalent to Greenfield runoff rates – discuss with LLFA if this is not achievable pre-application</i>
Qbar (Approach 2)	See section 2 paragraphs 2.11 to 2.14 of the SDS 233493-BWB-ZZ-XX-T-W-0005		See section 3 paragraphs 3.10 to 3.14 of the SDS 233493-BWB-ZZ-XX-T-W-0005
1 in 1 Year Event (Approach 1)			
1 in 30 Year Event			
1 in 100 Year Event* (Approach 1)			
* Total discharge at the 1 in 100 year rate should be restricted to the greenfield runoff volume for the 1 in 100 Year 6 hour event with additional volumes (long-term storage volume) released at a rate no greater than 2 l/s/ha where infiltration is not possible. The climate change allowance should only be applied to the proposed rate and not the existing or greenfield rate.			
Evidence Required:			
Methodology used to calculate peak runoff rate clearly stated and justified.			☒
Impermeable areas plan, supported by topographical survey confirming positive drainage.			☒
Hydraulic calculations and details of software used.			☒

State the hydraulic method used in your calculations
 (Refer to Table 24.1 of The SuDS Manual)

FEH

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 3.

SDS 233493-BWB-ZZ-XX-T-W-0005
 Drainage strategy 233493-BWB-ZZ-XX-D-W-0002

SECTION 4: DISCHARGE VOLUME – TECHNICAL STANDARDS S4, S5 AND S6 (UNLESS S1 APPLIES)

Rainfall Event	Existing Volume (m ³)	Greenfield Volume (m ³)	Proposed Volume (m ³)
1 in 100 Year 6 Hour Event (Approach 1)			
Does the below statement apply to your development proposal? Long term storage is not achievable on this site and, in accordance with S6 of the Non Statutory Technical Standards for SuDS, the surface water discharge rates for events up to and including the 1 in 100 year critical event are limited to Qbar (Approach 2)			Yes ☒ No ☐
Evidence Required: Approach to managing the quantity of surface water leaving the site clearly stated and justified Methodology used to calculate discharge volume clearly stated and justified. Hydraulic calculations and details of software used.			☒ ☒ ☒

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 4.	SDS 233493-BWB-ZZ-XX-T-W-0005 Drainage strategy 233493-BWB-ZZ-XX-D-W-0002
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SECTION 5: STORAGE – TECHNICAL STANDARDS S7 AND S8

State climate change allowance used (%)	45%
State housing density (houses per ha)	-
State urban creep allowance used (%)	10% (for proposed residential areas)
Evidence Required: State / used in appropriate industry standard surface water management design software.	☒

State storage volume required (m³) (excluding non-void spaces) <i>Must include an allowance for climate change and urban creep</i>	14,283
Have you incorporated interception into your design? <i>(Refer to Chapter 24 of The SuDS Manual C753)</i> <i>Where possible, infiltration or other techniques are to be used to try and achieve zero discharge to receiving waters for rainfall depths up to 5mm.</i>	Yes ☐ No ☐
Evidence Required: Drainage plans showing location of attenuation and all flow control devices and supporting calculations.	☒

Summarise how storage will be provided for 1 in 30 year event on site. <i>Storage must be designed to ensure that at no flooding occurs onsite in a 1 in 30 year event except in designed areas and no flooding occurs offsite in a 1 in 100 year (plus climate change allowance) event.</i>	Surface water storage provided within detention basins and underground storage, designed up to the 1 in 100-year + CC event. The 1 in 30-year event + CC will be considered at detailed design
Summarise how storage will be provided for 1 in 100 year (plus climate change) event on site. <i>Where storage above the 1 in 30 year rainfall event is provided in designated areas designed to accommodate excess surface water volumes, plans showing storage locations and surface water depths and supported by calculations used in appropriate industry standard surface water management design software. It is important to run a range of duration events to ensure the worst case condition is found for each drainage element on the site</i>	Surface water storage provided within detention basins and underground storage, designed to accommodate up to the 1 in 100-year + CC event
Evidence Required: Plans showing size and location of storage and supporting calculations. Where there is controlled flooding, extents and depths must be indicated.	☒

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 5.	SDS 233493-BWB-ZZ-XX-T-W-0005 Drainage strategy 233493-BWB-ZZ-XX-D-W-0002
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SECTION 6: WATER QUALITY PROTECTION

Contaminated surface water run-off can have negative impacts on the quality of receiving water bodies. The potential level of contamination will influence final the design of an appropriate treatment train as part of your sustainable drainage system.

Is the proposal site known to be or potentially contaminated?	Yes ☐	No ☒
If the site is contaminated, it should be demonstrated that the sustainable drainage system will not increase the risk of pollution to controlled waters through the mobilisation of contaminants and/or creation of new pollution pathways.		

Confirm the Pollution Hazard Level of the proposed development - Tick <u>ALL</u> that apply <i>Refer to Pollution Hazard Indices for different Land Use Classifications in Table 26.2 of The SuDS Manual C753 for further guidance.</i>		
Pollution Hazard Level <i>Tick <u>ALL</u> that apply</i>	Surface water run-off from the proposed development will drain from:	
VERY LOW	☒	Residential roofs
LOW	☒	- Other roofs (typically commercial/industrial roofs) - Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, home-zones and general access roads) - Non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day
MEDIUM	☒	- Commercial yard and delivery areas - Non-residential car parking with frequent change (e.g. hospitals, retail) - All roads except low traffic roads and trunk roads/motorways²
HIGH	☐	- Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites) - Sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured - Industrial sites - Trunk roads and motorways¹

If the development's Pollution Hazard Level is 'Very Low' or 'Low', has the sustainable drainage design been risk assessed and appropriate mitigation measures included?	Yes ☒	No ☐
If the proposed development has a very low or low polluting potential, you should design your sustainable drainage system to include an appropriate treatment train in accordance with The SuDS Manual (C753).		

If the development's Pollution Hazard Level is 'Medium' or 'High', is the application supported by a detailed water quality risk assessment?	To be confirmed at detailed design Yes ☐ No ☒
- If the proposed development has a high polluting potential, a detailed risk assessment <u>will</u> be required to identify an appropriate SuDS treatment train and ensure compliance with Paragraph 170 of the National Planning Policy Framework. - If the proposed development has a medium polluting potential, a detailed risk assessment <u>may</u> be required depending on the nature, scale and location of the development.	

Has pre-application advice on water quality been obtained from the Environment Agency?	Yes ☐	No ☒
If YES, provide details:		

² Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 6.

See section 3 of the SDS
233493-BWB-ZZ-XX-T-W-0005

SECTION 7: DETAILS OF YOUR SUSTAINABLE DRAINAGE SYSTEM

a) Function of your Sustainable Drainage System

Do your proposals store rainwater for later use (as a resource)?	Yes ☐ No ☒
Evidence Required: Please provide a brief sentence in the adjacent white box to describe how this function has been achieved.	To be confirmed at detailed design

Do your proposals promote source control to manage rainfall close to where it falls? (e.g. promoting natural losses through soakage, infiltration and evapotranspiration)	Yes ☒ No ☐
Evidence Required: Please provide a brief sentence in the adjacent white box to describe how this function has been achieved.	Attenuation has been provided within several catchments to manage surface water close to where it falls

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 7a.	SDS 233493-BWB-ZZ-XX-T-W-0005 Drainage Strategy 233493-BWB-ZZ-XX-D-W-0002
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b) Hierarchy of Drainage Options – Planning Practice Guidance

The proposed method of discharge are set out within order of priority. Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.

Proposed method of surface water discharge		Is this proposed?	
Hierarchy Level 1: Into the ground (via infiltration)		Yes ☐ No ☒	
If YES - Evidence Required		If NO – Evidence Required Tick ALL that apply	
☐	A. Completed Infiltration Checklist from The SuDS Manual (C753) Appendix B <i>An editable version of this form is available on SusDrain website.</i>	☐	A. Site investigation to demonstrate that the ground is not free draining. Test results to be provided in accordance with: - The methodology within BRE 365 (2016), OR - Falling head permeability tests BS EN ISO 22282-2: 2012
☐	B. British Geological Survey (BGS) Infiltration SuDS Map	☐	B. NOTE: where an applicant is unable to access a site to undertake testing, e.g. where unable to access a site for an outline application, they can submit a SuDS GeoReport or similar.
☐	C. Infiltration testing to BRE 365 (2016) or falling head permeability tests to BS EN ISO 22282-2: 2012 (optional for outline)	☐	C. Evidence to confirm that infiltration to ground would result in a risk of deterioration to ground water quality. Phase I report suggests geology is unsuitable
☐	'Plan B' sustainable drainage plan and statement of approach with an alternative discharge method, in case infiltration proposals are proven not feasible upon	☐	D. Geotechnical advice from a competent person* which determines that infiltration of water to ground would pose an unacceptable risk of geohazards to the site and/or local area.

	further site specific ground investigation e.g. to consider seasonal variations to groundwater.		<i>*Note: Competent person may include a Chartered Engineer, Chartered Geologists, Registered Ground Engineering Professionals (RoGEP).</i>
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Proposed method of surface water discharge		Is this proposed?	
Hierarchy Level 2: To a surface water body <i>(select type)</i> NOTE: Consent from LLFA or Permit from Environment Agency may be required – refer to guidance		Yes ☒ No ☐ N/A ☐ ☐ Main river ☐ Canal ☒ Ordinary watercourse ☐ Other water body	
If YES - Evidence Required		If NO – Evidence Required Tick ALL that apply	
☒ Surface water body / watercourse survey and report Initial survey undertaken, further investigation may be required	☐ Plan showing nearby watercourses and waterbodies AND ☐ Statement providing justification in your Sustainable Drainage Strategy <i>Note: Where discharge of any element in the hierarchy is discounted, an applicant should provide justification. If the reasoning for discounting a discharge of surface water to watercourse relates to issues associated with third party land or the securing of any other required consent, it may be necessary for the applicant to provide evidence to the local planning authority to support their proposed approach.</i>		

Proposed method of surface water discharge		Is this proposed?	
Hierarchy Level 3: To a surface water sewer or highway drain <i>(select type)</i>		Yes ☒ No ☐ N/A ☐ ☒ Surface water sewer ☐ Highway drain	
If YES - Evidence Required		If NO – Evidence Required Tick ALL that apply	
☐ Written correspondence from Water and Sewerage Company/ Highway Authority regarding proposed connection. Discussions with UU ongoing	☐ Plan showing nearby sewers and highway drains AND ☐ Statement providing justification in your Sustainable Drainage Strategy		

Proposed method of surface water discharge		Is this proposed?	
Hierarchy Level 4: To combined sewer		Yes ☐ No ☒ N/A ☐	
If YES - Evidence Required		If NO – Evidence Required	
☐ Written correspondence from Water and Sewerage Company	N/A		

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 7b.	SDS 233493-BWB-ZZ-XX-T-W-0005 Drainage strategy 233493-BWB-ZZ-XX-D-W-0002
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c) Proposed SuDS Component Types

	Tick ALL that apply				
Within property boundary	☐ Rainwater harvesting	☐ Green/ blue roofs	☒ Pervious pavements [Type: A ☐ B ☐ C ☐	☐ Soakaway	☐ Bio retention systems

	Tick ALL that apply				
Within development site boundary (not property)	☐ Infiltration system [Type: ☐ Surface level ☐ Below ground]		☐ Filter strips	☐ Filter drains	☒ Swales
	☐ Bio retention system	☒ Detention basins	☐ Ponds and wetlands	☐ Attenuation tanks/ Oversized pipes	☐ Other (state below)
	If 'Other' please state:				

Off site (not within the boundary of the proposed development)	Please state:
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I confirm that the above selected components have been designed in accordance with The SuDS Manual (C753).	I confirm ☒
I confirm that the management of flows resulting from rainfall in excess of a 1 in 100 year plus climate change rainfall event, and their exceedance route(s), has been fully considered in order to minimise the risks to people, property (new and existing) and infrastructure.	I confirm ☒ (to also be confirmed at detailed design)

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 7c.	SDS 233493-BWB-ZZ-XX-T-W-0005 Drainage strategy 233493-BWB-ZZ-XX-D-W-0002
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SECTION 8: OPERATION AND MAINTENANCE – TECHNICAL STANDARD S12 AND NATIONAL PLANNING POLICY FRAMEWORK

The applicant is responsible to ensure that ALL components selected in Section 7 can be maintained for the design life of the development. This information is required so the Local Planning Authority can ensure the maintenance and management of the sustainable drainage system. The Local Planning Authority will discuss how this will be secured (e.g. via planning condition or planning obligation).

	Information Provided?
Management Plan	Yes ☐ No ☒
Evidence Required: Plan/ drawing provided to show the position of the different SuDS components with: - Key included to identify any of the adopting bodies that you will be offering your sustainable drainage components for adoption (<i>relates to maintenance and management arrangements below</i>). - Plan/ drawing to identify any areas where certain activities are prohibited, detailing reasons why.	To be confirmed at detailed design ☐
Action plan for accidental pollutant spillages.	☐

	Information Provided?
Maintenance Schedule	Yes ☐ No ☒
Evidence Required: A copy of the maintenance schedule including: Proactive and preventative maintenance Detailing regular, occasional and remedial maintenance activities including recommendations for inspection and monitoring. This should include recommended frequencies, advice on plant/ machinery required and an explanation of the objectives for the maintenance proposed and potential implications of not meeting them. Reactive and corrective maintenance (e.g. product repair and replacement). Including advice on excavations, or similar works, in locations that could affect the SuDS components/ adjacent structures.	To be confirmed at detailed design ☐

	Information Provided?
Maintenance and Management Arrangements	Yes ☐ No ☒
Evidence Required: Evidence of formal agreement with the party responsible for undertaking maintenance. Please select any of the adopting bodies that you will be offering your sustainable drainage components for adoption. Tick all that apply. ☐ Water and Sewerage Company Section 104 agreement (Water Industry Act 1991) ☐ Highway Authority Section 278/38 agreement (Highways Act 1980) ☐ Local Authority Public Open Space [Refer to Local Authority Policy] Please select the arrangement(s) for all non-adopted sustainable drainage components. Tick all that apply. ☐ Management Company ☐ Property Owner (for SuDS components within property boundary only) ☐ Other (please state)	To be confirmed at detailed design ☐

Please list any relevant document and or drawing numbers (including revision reference) to support your answers to Section 8.

DECLARATION AND SUBMISSION

This pro-forma has been completed using evidence from information which has been submitted with the planning application.

The information submitted in the Sustainable Drainage Strategy and site-specific Flood Risk Assessment (FRA), where submitted, is proportionate to the site conditions, flood risks and magnitude of development and I agree that this information can be used as evidence to this sustainable drainage approach.

Submitter Details			
Completed by	Lucy Reeves	Email Address	lucy.reeves@bwbconsulting.com
		Telephone Number(s)	0161 413 3880
Signed off by	Chris Dodd	Accreditation(s) and/or Qualification(s) of Signatory	BEng (Hons) IEng MICE
Date (dd/mm/yyyy)	07.02.25	Company	BWB Consulting Ltd

Client Details			
Name	Trustees of J.P. Milne (DEC'D) Will Trust	Company	

Appendix 3: Topographical Survey



408500N

408400N

408300N

408200N

300080E

300080E

300080E

300080E

300080E

Bottom of Bank

Canopy

Change Of Surface

Dropped Kerb

Fence

Gate

Hedge

Kerb Channel

Kerb Top

Overhead Cable

Road Edge

Sign

Step

Top Of Bank

Topographic Contour (1m Interval)

Topographic Contour (5m Interval)

Track

Vegetation

Verge

Wall Bottom

Wall Top

Water

BOL

BT

CATV

Fire Hydrant

Gas Stop Tap

GY

IC

IC

LP

MH

Post

Safety Valve

Shrub

Sign

TP

Tree

Wall Top

Water Level

WM

WST

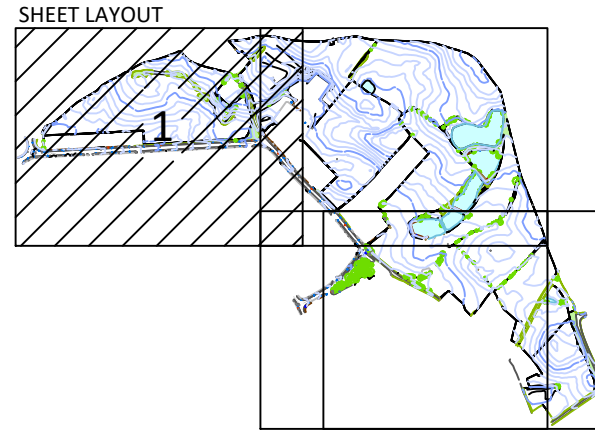
WST

Building

Vegetation

Water

Station	Easting	Northing	Level	Description
PS4	389716.544	408174.451	136.072	Survey nail
PS5	389730.753	408079.088	130.742	Survey nail



NOTES:
Site surveyed to Ordnance Survey OSNet™ GB OS2036(15) through Leica SmartNet.
LBS REF: OS COMPOSITE SURVEY ES-08-2010
Survey updated 10th July 2018 following instruction to survey the woodland area adjacent to Trian Road.

DRAWN BY: MS CHECKED BY: RB

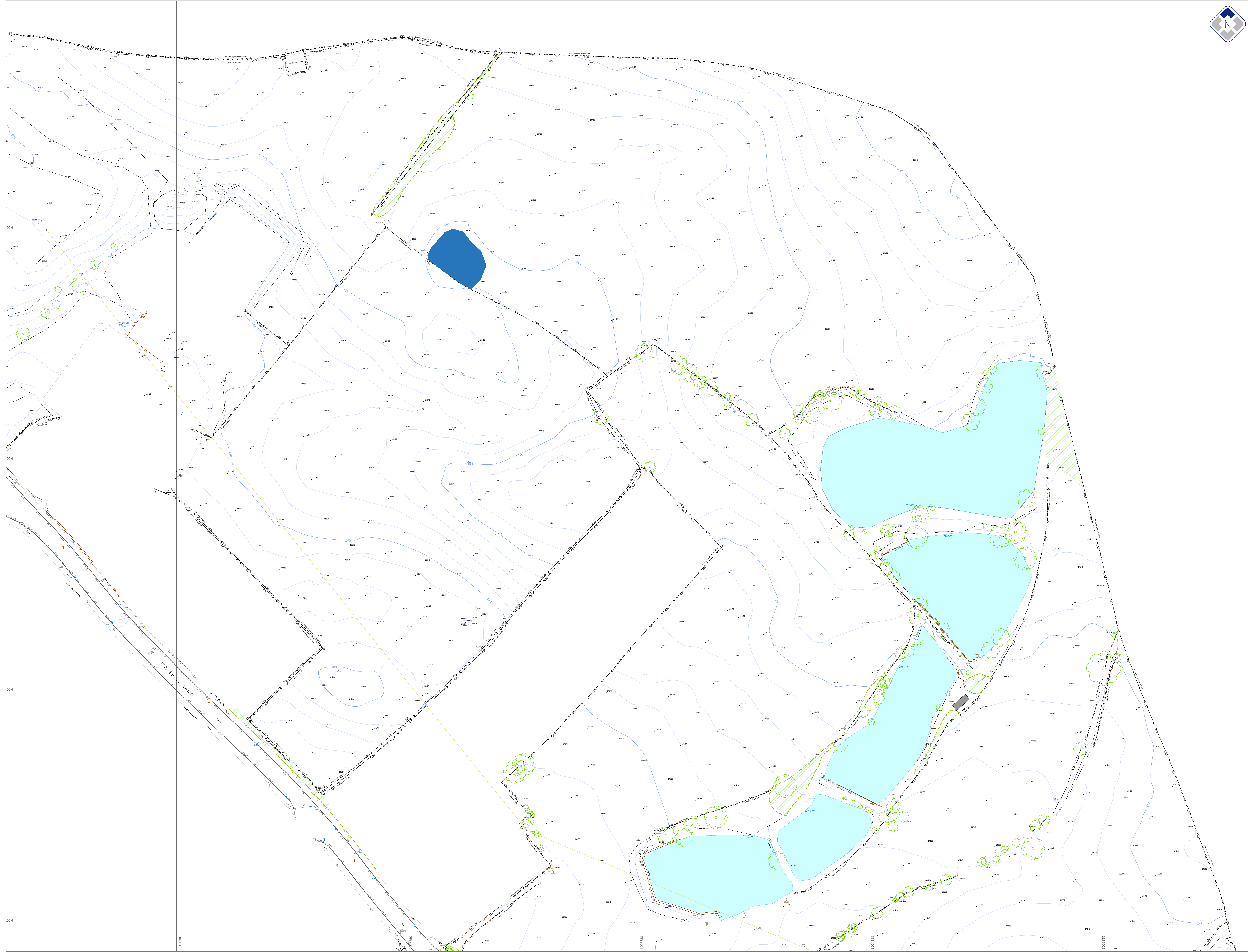
CLIENT:

SITE: STAKEHILL LANE, MIDDLETON

PLAN: TOPOGRAPHIC SURVEY - March 2018 - (Plan 1 of 4)

Scale: 1:500 @ A0 4th April 2018

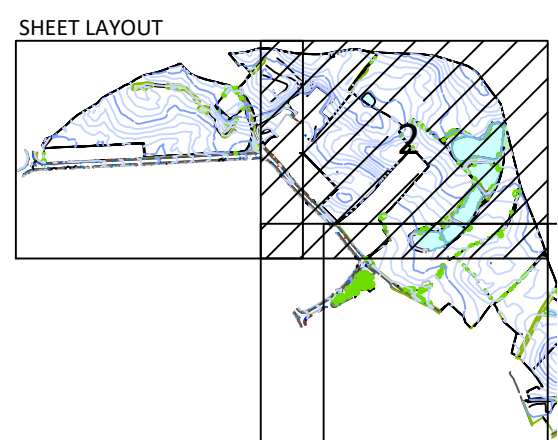
PSS - 052 - 001 - 001.1a



LEGEND

- Bottom of Bank
 - Canopy
 - Change Of Surface
 - Dropped Kerb
 - Fence
 - Gate
 - Hedge
 - Kerb Channel
 - Kerb Top
 - Overhead Cable
 - Road Edge
 - Sign
 - Step
 - Top Of Bank
 - Topographic Contour (1m Intervi
 - Topographic Contour (5m Intervi
 - Track
 - Vegetation
 - Verge
 - Wall Bottom
 - Wall Top
 - Water
- BOL ○ Bollard
BT □ BT Cover
CATV □ CATV
FHT □ Fire Hydrant
GST □ Gas Stop Tap
GY □ Gully
IC □ Inspection Cover
IL □ Invert Level
LP □ Lamp Post
MH □ Manhole Cover
Post □ Post
SV □ Safety Valve
Shrub □ Shrub
Sign □ Sign
TP □ Telegraph Pole
Tree □ Tree
WT □ Wall Top
WL □ Water level
WM □ Water Meter
WST □ Water Stop Tap
- Building
Vegetation
Water

Station	Easting	Northing	Level	Descr
P54	189711.344	408174.451	116.072	Survey
P55	189710.751	408079.098	116.762	Survey



NOTES:
Site surveyed by Ordnance Survey OSNet™ GB
OS0236(15) through Leica SmartNet.
LES ref: OS COMPOSITE SURVEY 25-05-2018
Survey updated 10th July 2018 following instruc
to survey the wooded area adjacent to Trian R.

DRAWN BY: MS CHECKED BY: RB

CLIENT:

SITE: STAKEHILL LANE, MIDDLETON

PLAN: TOPOGRAPHIC SURVEY - March 2018 - (Plan 2 of 4)

Scale: 1:500 @ A0 4th April 2018

PSS - 052 - 001 - 001..



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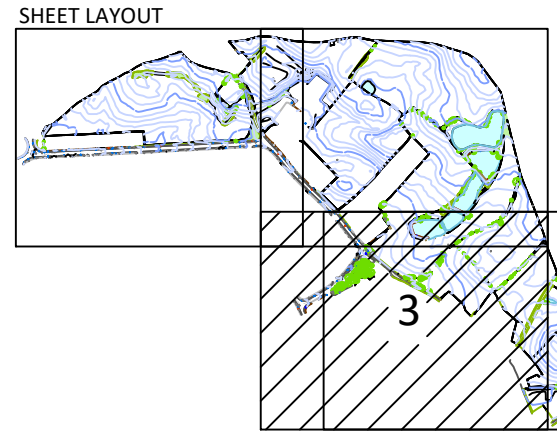
300508E

300508E

LEGEND

- Bottom of Bank
 - Canopy
 - Change Of Surface
 - Dropped Kerb
 - Fence
 - Gate
 - Hedge
 - Kerb Channel
 - Kerb Top
 - Overhead Cable
 - Road Edge
 - Sign
 - Step
 - Top Of Bank
 - Topographic Contour (1m Interval)
 - Topographic Contour (5m Interval)
 - Track
 - Vegetation
 - Verge
 - Wall Bottom
 - Wall Top
 - Water
- BOL ○ Bollard
BT □ BT Cover
CATV □ CATV
CATV □ Fire Hydrant
OST □ Gas Stop Tap
GY □ Gully
IC □ Inspection Cover
IC □ Invert Level
LP □ Lamp Post
MH □ Manhole Cover
Post □ Post
SV □ Safety Valve
Shrub □ Shrub
Sign □ Sign
TP □ Telegraph Pole
Tree □ Tree
WT □ Wall Top
Water Level □ Water level
WM □ Water Meter
WST □ Water Stop Tap
Building □ Building
Vegetation □ Vegetation
Water □ Water

Station	Easting	Northing	Level	Descr
PS4	889716.344	408174.451	1136.072	Survey
PS5	889702.751	408073.098	1130.764	Survey



NOTES:
Site surveyed to Ordnance Survey OSNet™ GB OS0236(1/5) through Leica SmartNet.
LES ref: 005 COMPOSITE SURVEY 22-05-2018
Survey updated 10th July 2018 following instruc to survey the woodland area adjacent to Finlan Rd.

DRAWN BY: MS CHECKED BY: RB

CLIENT:

SITE: STAKEHILL LANE, MIDDLETON

PLAN: TOPOGRAPHIC SURVEY - March 2018 - (Plan 3 of 4)

Scale: 1:500 @ A0 4th April 2018

PSS - 052 - 001 - 001..

Salterton House, 3 Salterton Road, Matlock, Derbyshire, DE4 3LZ
Telephone: 01629 381389
Email: mail@peaksurveyingservices.com
Website: www.peaksurveyingservices.com