ARDENT
CONSULTING ENGINEERS

BLOOR HOMES EASTERN

GREAT WILSEY PARK, HAVERHILL

PARCEL A9 DRAINAGE AND SUDS STRATEGY

REPORT REF.
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November 2025

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1. Introduction

1.1. Ardent Consulting Engineers Limited (ACE) have been commissioned by Bloor Homes Eastern to prepare a detailed foul and surface water drainage strategy in support of the *Reserved Matters Application for Parcel A9* (the Site) at Great Wilsey Park, Haverhill.

1.2. The Reserved Matters Application includes the '*Submission of details under outline planning permission DC/15/2151/OUT – means of access; appearance, landscaping, layout and scale for 95 dwellings (including 42 affordable) (parcel A9); associated internal roads, car parking, , amenity and public open space; pumping station and diversion of overhead HV cable; including application to partially discharge conditions 4; 6; 7; 8; 9; 12; 15; 28; 30; 37; 38; 39; 40; 41, 42; 44; 45 and 46'.*

1.3. A copy of the Architect's Site layout plan is contained within **Appendix A**.

1.4. The Site is located to the north-east of Haverhill, within the County of Suffolk. The Site is bound by the Redrow development (part of Wilsey Park) to the north, and Parcel A14, A15 and E2 of Great Wilsey Park to the south. To the west the Site is bound by woodland and existing residential development fronting Shetland Road.

1.5. The Site falls from west to east towards the existing ordinary watercourse that runs along the eastern boundary of the Site. The highest level is recorded as 89.40m AOD at the north-western corner of the Site and the lowest as 78.43m AOD at the northeastern part of the Site (see Topographic Survey in **Appendix B**).

2. Lead Local Flood Authority Planning Consultation

2.1. Suffolk County Council, as the Lead Local Flood Authority (LLFA), have been consulted on the drainage proposals through meetings leading to the Reserved Matters Application. Records of correspondence with the LLFA are included in **Appendix F**. This technical note summarises the drainage principles agreed with the LLFA, demonstrates compliance with the relevant standards and provides detailed information in support of discharging the relevant planning conditions.

2.2. Below is a summary of the relevant drainage conditions by the LLFA.

Condition 37 – Foul Water Strategy

No phase or reserved matters application shall be commenced until a foul water strategy, including a timetable for implementation, for that particular phase or reserved matters application has been submitted to and approved in writing by the Local Planning Authority. The scheme shall be implemented as specified in the approved scheme and thereafter the scheme shall be managed and maintained in accordance with the approved details.

Ardent Response – The foul drainage strategy and relevant correspondence with the Drainage Authority is detailed in the drawings **Appendix D, G** and **H** of this report.

Planning Condition 38 – SUDs Maintenance & Management

No development shall take place within any phase or reserved matters application until details of the implementation, maintenance and management of the sustainable urban drainage scheme for that particular phase or reserved matters application have been submitted to and approved in writing by the Local Planning Authority. The scheme shall be implemented at such time(s) as may be specified in the approved scheme and thereafter the scheme shall be managed and maintained in accordance with the approved details. Those details shall include:

i. a timetable for its implementation, and

ii. a management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable urban drainage scheme throughout its lifetime.

Ardent Response – The drainage and SuDS maintenance plan is detailed **Section 7** of this report.

3. Consultation with the Drainage Authority

3.1. Anglian Water are the Statutory Drainage Authority responsible for the area where the Site is located. Anglian Water were consulted on the capacity of the existing foul water drainage infrastructure to serve the wider Great Wilsey Park development, and a connection point into their sewers was agreed at Outline Planning stage. As the Site is part of the wider development, the associated foul water flows are to drain via gravity into a recently built sewer extending up to the Site boundary. This existing foul water sewer drains into a Foul Water Pumping Station to the north of the Site.

3.2. The historic Anglian Water's Pre-planning Assessment Report and Addendums are included in **Appendix D** of this report. The approved and signed Section 104 and 106 Agreements with Anglian Water for the foul drainage serving Great Wilsey Park development including the Site are also included in **Appendix D**.

4. Existing Drainage Infrastructure and Geology

Existing Sewers

4.1. The Redrow drawings and the recent as-built drainage survey in **Appendix E** and **Appendix B** respectively, show the recently built foul and surface water sewers in the immediate vicinity of the Site. These sewers serve the previous phases of the Great Wilsey Park development and include provision for a foul drainage connection to serve the Site.

4.2. As shown in the recent as-built drainage survey in **Appendix B**, a 375mm diameter foul sewer has been installed up to Site boundary to serve the Site.

Ordinary Watercourses and Private Drainage

4.3. The topographic survey indicates the presence of an existing unnamed ditch / ordinary watercourse, which runs along the eastern boundary of the Site. This unnamed watercourse is a tributary of the River Stour, located approximately 1km to the west of the Site. This unnamed ordinary watercourse appears to be draining surface water runoff from the Site and agricultural land to the east of the Site.

4.4. Further information on this unnamed watercourse including catchment area and maximum water level for the 1 in 100year storms plus climate change is included in the Brookbanks FRA.

4.5. Hydrosolutions have undertaken a recent hydraulic model of this watercourse including the proposed culverts at the road crossings. Refer to Hydrosolutions report with reference WHS10203 for further details.

Existing Drainage Discharge Rates

4.6. Based on the topographic survey information, it is understood that the surface water runoff from the Site drains overland towards the existing unnamed ditch / ordinary watercourse at an unrestricted rate. The existing peak greenfield runoff rates have been estimated using the IoH 124 method as detailed in the approved FRA and summarised in **Table 4-1** below. A copy of the greenfield runoff rate calculations has been included in **Appendix H**.

Table 4-1: Greenfield Runoff Rates (l/s/ha)

Return Period Event	Runoff Rate per Hectare (l/s/ha)
Q_{bar}	2.84
Q_{1y}	2.47
Q_{2y}	2.53
Q_{30y}	6.82
Q_{100y}	10.11

4.7. The use of the above Qbar greenfield runoff rate for the proposed drainage strategy has been agreed with the LLFA as detailed in the email correspondence dated 12ve November 2025 (see **Appendix F**).

Geology and Hydrology

4.8. A review of the 1:50,000 scale British Geological Survey (BGS) online digital viewer indicates the Site is underlain by the Lowestoft Formation (Diamicton) over Lewes Nodular Chalk Formation.

4.9. The site investigation by Geosphere Environmental (see **Appendix C**) indicates that topsoil was encountered to a maximum depth of 0.45m bgl, underlain by superficial deposits of the Lowestoft Formation (diamicton). Granular deposits were identified within the Lowestoft Formation, ranging in depth between 0.3m bgl and 5.0m bgl. Chalk bedrock was identified in one location (BH03) from 12.5m to a maximum depth of 20m bgl. Groundwater was encountered during the intrusive investigation in 21no exploratory hole locations. However, it is understood that this was in the form of perched water within the cohesive soil strata. Water was recorded at depths between 0.5m bgl and 1.77m bgl during groundwater monitoring.

4.10. DEFRA's Magic Maps indicate that the Site is in an area with Medium groundwater vulnerability.

4.11. DEFRA's Magic Maps indicates the bedrock geology is classified as a Principal Aquifer. This is defined by Environment Agency (EA) as strategically important rock units that have high permeability and water storage capacity and are based on geological mapping provided by BGS.

4.12. DEFRA's Magic Maps indicates that the Site is located within a Source Protection Zone III.

5. Proposed Surface Water Drainage

Planning Policies

5.1. As of April 2015, the LLFA has become a statutory consultee on planning applications for surface water management. As the LLFA, Suffolk County Council are therefore responsible for the approval of surface water drainage systems within new major development. Major development consists of any of the following:

a) the provision of dwelling houses where residential development of 10 or more units; or where the development is to be carried out on a site having an area of 0.5 hectares or more and the number of units is not known;

b) the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or

c) development carried out on a site having an area of 1 hectare or more.

5.2. The NPPF recognises that flood risk and other environmental damage can be managed by minimising the changes in the volume and rate of surface water runoff from development sites and recommends that priority is given to the use of SuDS in new development.

5.3. The Non-Statutory Technical Standards for Sustainable Drainage Systems set out general recommendations to control development runoff, including the requirement to ensure that runoff from the site is not increased by development, and the requirement to manage surface water runoff for events up to the 1 in 100 (1%) Annual Probability event (including an additional allowance for the projected impacts of climate change).

5.4. PPG advises that climate change allowances should be determined with reference to the guidance provided in the EA document 'Flood Risk Assessments: Climate Change Allowances' (released in February 2016, updated in July 2021). As the Site is proposed for uses which have a design life of 60 years an additional allowance on rainfall intensity has been incorporated into the surface water management strategy i.e. a 40% increase in rainfall intensity.

5.5. This drainage strategy has been prepared in accordance with the relevant national, regional and local planning policy and statutory authority guidance including 'Suffolk Flood Risk, Management Strategy, Appendix A, Sustainable Drainage Systems (SuDS): A Local Design Guide'.

Disposal of Surface Water

5.6. The most appropriate method of surface water discharge has been determined based on the hierarchy of surface water disposal set out within 'Suffolk Flood Risk Management Strategy Appendix A', and as described below:

- Rainwater harvesting/Re-use onsite
- Shallow infiltration system (circa 2.0m)
- Gravity discharge to a watercourse
- Gravity discharge to a surface water sewer / highway drain
- Gravity discharge to a combined sewer

Rainwater Harvesting/Re-use onsite

5.7. A large-scale rainwater recycling system for the irrigation of soft landscape is not considered feasible for this Site. Generally, a rainwater recycling system would require additional plantroom/s for the irrigation tanks, pumps, etc. Furthermore, based on experience on other projects, the irrigation system would also use mains water. Due to the nature of the proposed development, it has not been possible to allocate space for plantrooms to serve a large-scale irrigation system. Furthermore, the large-scale irrigation system would be mainly functioning based on water main supply.

Shallow Infiltration System (circa 2.0m)

5.8. The existing ground conditions do not support infiltration as a drainage solution. This is confirmed by the soakage tests undertaken by Geosphere Environmental and included in **Appendix C** of this report.

Gravity Discharge to a Watercourse

5.9. It is proposed that the surface water runoff from the proposed development drains at a controlled/limited rate into the existing unnamed ordinary watercourse that runs along the eastern boundary of the Site.

Gravity Discharge to a Surface Water Sewer / Highway Drain

5.10. There are no existing surface water sewers in the immediate vicinity of the Site. As this is further down the priority list than discharge to a watercourse, this method of discharge has not been considered.

Gravity Discharge to a Combined Sewer

5.11. There are no existing combined sewers in the immediate vicinity of the Site. As this is further down the priority list than discharge to a watercourse, this method of discharge has not been considered.

Discharge Location

5.12. It is proposed that the surface water runoff from new development discharges at a controlled/limited rate into the existing ditch / ordinary watercourse that runs along the eastern boundary of the Site (lowest part of the Site) via a new outfall.

Proposed Surface Water Drainage Catchment Area and Discharge Rate

5.13. The proposed surface water drainage catchment area is detailed in the drainage drawings in **Appendix G** of this report.

5.14. In line with the requirements set in the 'Suffolk Flood Risk Management Strategy Appendix A' and as detailed in the approved FRA, the discharge rate from the Site is to be limited to the Qbar greenfield runoff rate (2.84l/s/ha) for all storms up to and including the 1 in 100years plus Climate Change. As summarised in the **Table 5-1** below, the development will provide up to 71.9% betterment in the surface water discharge rate.

Table 5-1: Surface Water Discharge Rate Comparison (l/s/ha)

Rainfall Event (Year)	Discharge Rate Comparison		
	Greenfield	Post-development	Betterment
1 in 1 year	2.47 l/s/ha	2.84 l/s/ha	-
1 in 2 year	2.53 l/s/ha)	2.84 l/s/ha	-
1 in 30 year	6.82 l/s/ha	2.84 l/s/ha	58.4%
1 in 100 year	10.11 l/s/ha	2.84 l/s/ha	71.9%
1 in 100 year + climate change	-	2.84 l/s/ha	

5.15. An additional 10% of the roof areas has been allowed for in the drainage calculations to accommodate for urban creep.

5.16. **Table 5-2** below summarises the impermeable area allowed for in the drainage assessment. A detailed breakdown of the impermeable/contribution areas is included in the surface water drainage calculations in **Appendix H**.

Table 5-2: Surface Water Drainage Impermeable Area

Surface Water Drainage Catchment Reference	*Total Developable Area (ha)*	*Impermeable Area (ha)*	*10% Urban Creep UC (ha)*	*Impermeable Area with UC (ha)*
Catchment A	3.836	2.243	0.052	2.295

5.17. As noted in **Section 4** the unnamed ordinary watercourse that runs along the eastern boundary of the Site has been modelled by Hydrosolutions to establish the maximum water level for the 1 in 100year storm events including climate change. **Table 5-3** below shows that the proposed surface water outfall is set above the modelled 1 in 100year plus Climate Change maximum water level in the unnamed ordinary watercourse. Therefore, the outfall has not been modelled as surcharged in the drainage calculations presented in **Appendix H**.

Table 5-3: Surface Water Outfall and Ordinary Watercourse Level

Surface Water Outfall Reference	*Approximate Watercourse Bed Level (m AOD)*	*Maximum Water Level in Watercourse for 1 in 100year+CC*	*Outfall Invert Level (m AOD)*
Catchment A Outfall Ref: 1-S52 OUTFALL	76.340m	77.067	78.094m

Climate Change Allowance

5.18. The Environment Agency climate change allowances guidance was updated in May 2022 to include a GIS based 'peak rainfall allowances' map showing the anticipated changes in rainfall intensity based on river management catchment. The anticipated changes in peak rainfall intensity in small catchments (less than 5km²), or urbanised drainage catchments are summarised in **Table 5-4**.

Table 5-4: Climate Change – Peak Rainfall Intensity Allowances, 1 in 30years and 100years Annual Exceedance Rainfall Event (Combined Essex Management Catchment Peak Rainfall Allowances)

Epoch	Central Allowance	Upper End Allowance
2050s	20% (1:30years) 20% (1:100years)	35% (1:30years) 45% (1:100years)
2070s	20% (1:30years) 25% (1:100years)	35% (1:30years) 40% (1:100years)

5.19. A 35% and 40% uplift factors have been incorporated into the design when considering the 1-in-30year and 1-in-100year rainfall event respectively to account for the anticipated increase in rainfall intensity over the development lifetime.

5.20. It should be noted that the 40% Climate Change allowance for the 1 in 100year storms was approved at the Outline Planning stage and since it has been agreed with the LLFA to keep using it for the detailed drainage design (see **Appendix F**).

5.21. *Causeway Flow* design software and *Flood Estimation Handbook (FEH)* point data has been utilised to size the pipework and calculate the storage requirements for the 1 in 2 year, 1 in 30-year, 1 in 30-year + 35% climate change allowance, 1 in 100-year

and 1 in 100-year + 40% climate change allowance events. The results included in **Appendix H** show that the following performance criteria have been met:

- No surcharging during the 1-in-2year rainfall events (with the exception of pipework immediately upstream of the flow control chamber);
- No flooding occurring anywhere on site during the 1-in-30year rainfall events (including +35% climate change); and
- No flooding occurring anywhere on site during the 1-in-100year (including +40% climate change) rainfall events.

Attenuation Storage

5.22. During periods of heavy rainfall, flows will be attenuated in a detention basin and attenuation tank, providing the storage volumes detailed in drainage drawings in **Appendix H** and summarised in **Table 5-5** below.

Table 5-5: Proposed Attenuation Volumes (m³)

Attenuation Structure	*Provided Storage, Excluding Freeboard (m³)*
Basin A	1,075.440
Attenuation Tank A	489.440
TOTAL	**1,564.88**

Exceedance Flows

5.23. If a storm greater than the 1-in-100year (+40% climate change) rainfall event were to occur, the proposed Site drainage could reach its capacity and flooding could occur. In such an event the excess surface water flows would follow the topography of the Site away from the building, towards the proposed Basin and low-lying landscape areas (i.e. public open space). The exceedance flow routes are indicated on the proposed drainage drawing enclosed in **Appendix H**.

6. Sustainable Drainage Systems (SuDS)

Detention Basin

6.1. It is proposed to utilise a detention basin to provide attenuation, water quality treatment, amenity and biodiversity. The hardstanding areas of the development will drain through a basin before discharging at a controlled rate into the unnamed ordinary watercourse that runs along the eastern boundary of the Site. The basin will be vegetated and the soil surface can absorb some runoff and therefore support the prevention of runoff from Site. The principal water quality benefits of vegetated detention basins are associated with the removal of sediment and buoyant materials. In addition, nutrients, heavy metals, toxic materials and oxygen-demanding materials will also be significantly reduced.

Attenuation Tank

6.2. It is proposed to utilise a geo-cellular attenuation tank to provide additional storage. The attenuation provided by the basin described above is limited due to levels constraints. The attenuation tank will be maintained by a Management Company.

Swales

6.3. It is proposed to utilise shallow highway swales with filter drains along the spine road to provide conveyance, biodiversity and the first stage of water quality treatment. The highway swales will be planted with turf or/and planting and will be maintained by the Suffolk County Council Highways. The highway swales will drain into the proposed basin via the piped surface water drainage networks.

6.4. In addition to the highway swale, it is proposed to utilise private shallow swales along communal drives where spatial constraints allow. These private swales will provide conveyance, amenity, biodiversity and the first stage of water quality treatment. The private swales will drain into the proposed basin via the piped surface water drainage networks and will be maintained by a Management Company.

Soft Landscaping

6.5. A range of soft landscaping will be provided on Site. These areas have been shown in the Landscape Architect's drawings in **Appendix A**. Areas of soft landscaping help to reduce runoff rates through interception storage and evapotranspiration. They also help to treat pollutants via filtration through engineered soils.

Compliance with Ciria C753 SuDS Manual

6.6. The Ciria C753 SuDS Manual explains that the primary function of SuDS measures is to protect watercourses from any impact due to the new developments. However, SuDS can also improve the quality of life in a new development and urban spaces by making them more vibrant, visually attractive, sustainable and more resilient to change. The SuDS manual also explains the wider social context of SuDS and how SuDS can deliver high quality drainage while supporting urban areas to cope better with severe rainfall both in the present and future.

6.7. The SuDS manual identifies four main pillars of benefits that proposed SuDS schemes should achieve. The table below demonstrates how the drainage proposals for the Site meet the requirements for each of these.

Table 6-1: SuDS Manual Main Pillars

SuDS Manual Pillar	Proposed Drainage Strategy
Water Quantity: mitigate flood risk & protect natural water cycle through controlling peak runoff rate and total run-off volume.	The surface water discharge from the Site will be limited to 2.84l/s/ha for all storms up to and including 1 in 100years plus Climate Change, offering up to **71.9%** betterment when compared to the existing situation.
Water Quality: manage the quality of the runoff to prevent pollution and ensure runoff from the Site does not compromise the groundwater or surrounding water courses	The surface water runoff from the Site will drain through swales and a basin (up to two stages of treatment). This will provide the required water quality treatment before discharging into the unnamed ordinary watercourse.
Amenity: create and sustain better places for people	Amenity has been provided on Site as detailed in the landscape architects' drawings.
Biodiversity: Create and sustain better places for nature	The proposals for soft landscaped basins will provide biodiversity to the proposed development.

SuDS Management Train

6.8. The SuDS measures proposed are linked in series, and this is commonly known as a SuDS Management Train, (SMT). The SMT ensures that rainwater falling on a Site is

captured, conveyed, stored, intercepted and removed of pollutant correctly and efficiently before it is discharged back into the surrounding water course or network.

6.9. A robust SMT will ensure that the most effective measures are utilised in the correct sequence throughout the site. Table 26.7 in (CIRIA, SuDS Manual 2015) illustrates the effectiveness of each SuDS measure along the SMT. See **Table 6-4** to **6.7** below.

6.10. To ensure that the SuDS measures proposed are sufficient in removing pollutants from the generated run-off, a SuDS pollutant analysis has been carried out. This is performed in conjunction with the guidelines and steps set out in Section 26.7 of CIRIA SuDS Manual (2015).

6.11. The main form of pollutant is from surface water run-off from the roads. Table 26.2 (CIRIA, SuDS Manual 2015) highlights the pollution hazards for different land uses. The pollution hazards on Site are generally 'Medium', 'Low' or 'Very Low'. See **Table 6-2** below.

Table 6-2: Pollution Hazard Indices for Different Land-use Classifications (land-use shaded yellow applicable for the development)

Land-use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	**Very low**	**0.2**	**0.2**	**0.05**
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leachfrom the roof)	0.05
Individual property driveways, residential car parks, low trafficroads (e.g. cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change(e.g. schools, offices) i.e. < 300 traffic movements/day`	**Low**	**0.5**	**0.4**	**0.4**
Commercial yard and delivery areas, non-residential car parkingwith frequent change (e.g. hospitals, retail), all roads exceptlow traffic roads and trunk roads/motorways	**Medium**	**0.7**	**0.6**	**0.7**
Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to	High	0.8	0.8	0.9

industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are tobe delivered, handled, stored, usedor manufactured; industrial sites; trunk roads and motorways				

Table 6-3: Indicative SuDS mitigation indices for discharges to surface waters (SuDS components shaded yellow applicable to this development)

Type of SuDS component	Mitigation indices		
	TSS	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bio Retention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	**0.5**	**0.5**	**0.6**
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Downstream Defender (Proprietary Treatment System*)	0.5	0.4	0.8
*Proprietary treatment systems	These must demonstrate that they can addresseach of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1-year return period event, for inflow concentrations relevant to the contributing drainage area.		

Table 6-4: Indicative SuDS mitigation indices for discharge to surface waters (Total SuDS mitigation index = mitigation index1 + [0.5 x mitigation index2])

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/motorways			
Required mitigation indices			
Source	**TSS**	**Metals**	**Hydrocarbons**
Medium	0.7	0.6	0.7
Mitigation Indices			
Swale and Detention Basin *(Mitigation index 1 + index 2 / 2)*	0.75 (0.5+0.5/2)	0.85 (0.6+0.5/2)	0.90 (0.6+0.6/2)
Total Performance	0.75	0.85	0.90
Check	Criteria Exceeded	Criteria Exceeded	Criteria Exceeded

6.12. **Table 6-4** above details the SuDS mitigation indices / measures for the Primary Roads (Road 1 and Road 2). It is considered that the other access roads will have less than 300no traffic movements a day and their SuDS mitigation indices / measures are detailed in **Table 6-5**.

Table 6-5: Indicative SuDS mitigation indices for discharge to surface waters (Total SuDS mitigation index = mitigation index1 + [0.5 x mitigation index2])

Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day			
Required mitigation indices			
Source	**TSS**	**Metals**	**Hydrocarbons**
Low	0.5	0.4	0.4
Mitigation Indices			
Detention Basin	0.50	0.50	0.6
Total Performance	0.50	0.50	0.60
Check	Criteria Met	Criteria Exceeded	Criteria Exceeded

Table 6-6: Indicative SuDS mitigation indices for discharge to surface waters (Total SuDS mitigation index = mitigation index1 + [0.5 x mitigation index2])

Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day			
Required mitigation indices			
Source	**TSS**	**Metals**	**Hydrocarbons**
Very Low	0.5	0.4	0.4
Mitigation Indices			
Swale and Detention Basin *(Mitigation index 1 + index 2 / 2)*	0.75 (0.5+0.5/2)	0.85 (0.6+0.5/2)	0.90 (0.6+0.6/2)
Total Performance	0.75	0.85	0.90
Check	Criteria Exceeded	Criteria Exceeded	Criteria Exceeded

6.13. **Table 6-6** above details the SuDS mitigation indices / measures for the communal drives that drain via the proposed swales and basin.

Table 6-7: Indicative SuDS mitigation indices for discharge to surface waters (Total SuDS mitigation index = mitigation index1 + [0.5 x mitigation index2])

Residential Roofs			
Required mitigation indices			
Source	**TSS**	**Metals**	**Hydrocarbons**
Very Low	0.2	0.2	0.2
Mitigation Indices			
Detention Basin	0.50	0.50	0.6
Total Performance	0.50	0.50	0.60
Check	Criteria Exceeded	Criteria Exceeded	Criteria Exceeded

6.14. From the above it is clear that the SuDS strategy for the Site is effective in removing pollutants from the surface water runoff.

7. SuDS and Drainage Management and Maintenance Plan

7.1. The proposed SuDS, Drainage Management and Maintenance strategy detailed below is based on the drainage proposals detailed in **Appendix G** of this report. The long-term management of surface water drainage assets, including any SuDS components, is essential to ensure they continue to function to their design standard.

7.2. The surface water drainage and SuDS features would be private. The ongoing management and maintenance of the proposed surface water management systems will be expected to fall under the responsibility of the site management company.

Timetable

7.3. The below is the timetable for the implementation of the private drainage and SuDS features:

- 100% of all drainage will be installed and ready for maintenance by December 2029 (TBC);
- 100% of basin and below ground attenuation tanks will be installed and ready for maintenance by December 2029 (TBC);

Maintenance and Management

7.4. The proposed drainage system (private) consists of catchpits, manholes, hydrobrake manhole, pipes, rainwater downpipes. The proposed SuDS features comprise of an attenuation tank, swales and a basin.

7.5. The private drainage (incl. catchpits, inspection chambers etc) and SuDS (incl. attenuation tank, basin and swales) will be owned by the developer and are to be maintained by a management company (currently unknown), which will be appointed by the developer. The developer shall ensure that the measures outlined below form part of the management company contract details, for the ongoing maintenance of all private drainage and SuDS features on site.

7.6. The adoptable drainage pipes, inspection chambers, manholes, hydrobrake manholes, headwalls and rising mains) are to be maintained by the statutory adopting drainage authority.

7.7. Highway/road gullies, swales, inspections chambers and catchpits maintenance (by the highway/road maintenance authority) will begin at the end of the 12-month maintenance period. During the construction period the developer site management team will inspect and maintain the highway/road gullies and drainage channels. Within the 12-month maintenance period the defects will be assessed by highway/road authority who will instruct the developer to undertake any remedial action.

7.8. The proposed maintenance requirements for each proposed private / adoptable drainage component and SuDS solutions is detailed in **Table 7-1** to **Table 7-2**. These requirements are in line with the recommendations of the CIRIA report C753 "The SuDS Manual, 2015".

7.9. In addition to the information shown below, reference shall be made to the Hydro International maintenance manual for hydrobrakes and Aquacell's Operation and Maintenance Guide (attenuation tank) included in **Appendix H**.

Table 7-1: Maintenance Schedule of Private/Adoptable Drainage

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove sediment and debris from inspection chambers, manholes and catchpits	Annually
	Cleaning of gutters and any filters on downpipes	Annually
	Remove any root ingress	As required
Occasional Maintenance	CCTV survey of drains to check alignment, cracking and joint displacement	10 year intervals

Table 7-2: Maintenance Schedule of Swales

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and surface debris	Monthly (or as required)
	Cut the grass – to retain grass height within specified design range	Monthly (during growing season) or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages and clear if required	Monthly
	Inspect vegetation coverage	Monthly for 6months, quarterly for 2years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth after plant types to better suit conditions if required.	As required or if base soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or re-seeding	As required
	Re-level uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As Required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Table 7-3: Maintenance Schedule of Basin

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and surface debris	Monthly (or as required)
	Cut the grass – public areas	Monthly (during growing season)
	Cut the meadow grass	Half yearly (spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly (at start, then as required)
	Inspect water body for signs of poor water quality	Monthly (May-October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal option	Half yearly
	Check any mechanical device, eg penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay	Every 1-5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment this will only be required rarely, eg every 25-50 years

Remedial actions	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Aerate pond when sign of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As Required
	Repair / rehabilitate inlets, outlets and overflows	As required

Table 7-3: Maintenance Schedule of Attenuation Tank (Geo-cellular Crates)

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas which are not operating correctly (eg inflows, outflow controls etc). If required, take remedial action.	Monthly for 1st 3 months of operation, then annually thereafter.
	Remove debris from the catchment surface and inlets (where it may cause risks to performance) such as leaves blocking gulley's, rain gardens, catchpits etc	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface or filter for blockage by sediment, algae or other matter, remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pretreatment structures and/or internal forebays	Annually or as required
Remedial Actions	Repair/rehabilitate inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	As required
Monitoring	Inspect/check all inlets/outlets/vents etc. to ensure that they are in good condition and operating as designed. If required, take remedial action.	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

8. Foul Water Drainage Strategy

8.1. As detailed in **Section 3** of this report Anglian Water are the Statutory Drainage Authority responsible for the area where the Site is located. Anglian Water were consulted on the capacity of the existing foul water drainage infrastructure to serve the wider Great Wilsey Park development, and a connection point into their sewers was agreed at Outline Planning stage. As the Site is part of the wider development, the associated foul water flows are to drain via gravity into a recently built sewer extending up to the Site boundary. This existing foul water sewer drains into a Foul Water Pumping Station to the north of the Site.

8.2. It is proposed that the Site (95no dwellings) drains by gravity into the 375mm diameter foul water sewer which has been installed up to the northern Site boundary. This foul drainage sewer has been installed to serve the Site and future phases of Great Wilsey Park development consisting of 1336no dwellings, a School and Local Centre.

8.3. The foul water sewers to serve the Site have been sized based on 4000l/dwelling/day in accordance with the '*Design and Construction Guidance for Foul and Surface Water Sewers offered for Adoption, Sewerage Sector Guidance Appendix C'*.

8.4. Due to the topography of the future phases of Great Wilsey Park development including up to 1336no dwellings, a School and Local Centre will drain by gravity into a proposed foul water pumping station positioned within a future phase of Great Wilsey Park development. The foul water flows will then be pumped via 2no rising mains from this future pumping station into the gravity sewers proposed within the Site and drain by gravity into the recently built 375mm diameter sewer at the northern Site boundary.

8.5. In line with the '*Design and Construction Guidance for Foul and Surface Water Sewers offered for Adoption, Sewerage Sector Guidance Appendix C'*, the pumped discharge from the future phases will need to connect via intermediate / receiving manholes and at least 5 metres of appropriately sized gravity sewers.

8.6. At this stage the preliminary foul water flows from the future phases of Great Wilsey Park development are estimated as follows:

Qpeak Residential into the FW Pumping Station = 1336no dwellings x 4000l/dwelling/day / (24x3600)

Qpeak Residential into the FW Pumping Station = 61.85l/s

Qpeak School and Local Centre = 4.03l/s

Qpeak TOTAL into the FW Pumping Station = 61.85l/s+4.03l/s = 65.88l/s

8.7. Advantage Pumping Solutions have undertaken the design of the foul water pumping station which is to serve the future phases of the development and have used a peak flow of 32.94l/s to specify the pumps and rising main.

8.8. Advantage Pumping Solutions propose the use of 2no rising mains, with the smaller diameter rising main being utilised during the earlier stages of the development and the larger one when the majority of the development is built.

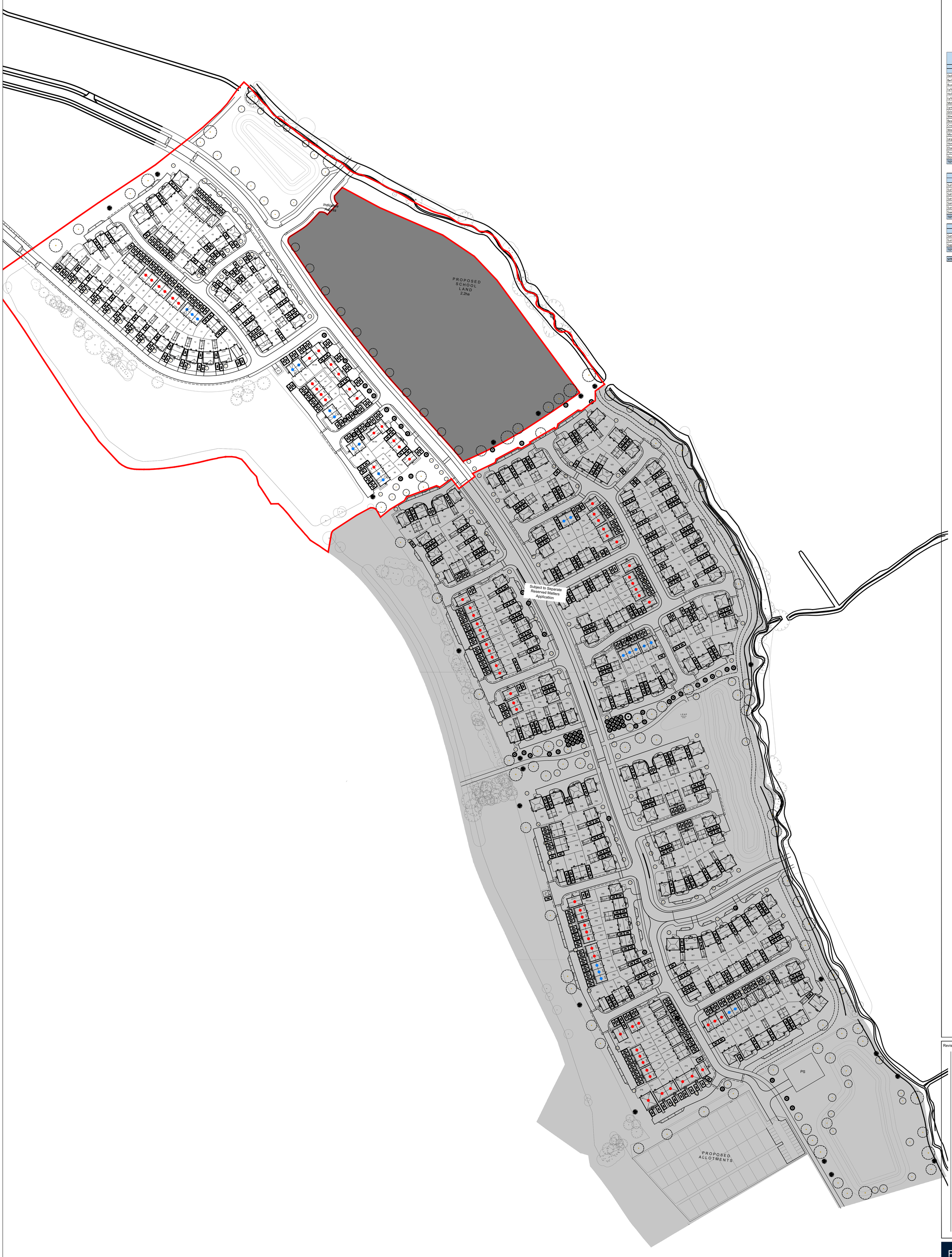
8.9. The gravity foul water sewer proposed within the Site to serve the future phases of Great Wilsey Park development is sized as a 375mm diameter sewer at 1 in 175 gradients.

8.10. A length of proposed raising mains and the intermediate manholes including the connecting gravity sewers to serve the future phases will be implemented as part of Parcel A9 works and will be capped for future use.

8.11. The layout of the foul water sewers and rising mains is detailed in the drainage plan in **Appendix G**.

Appendix A

Site Layout and Landscape Plan



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Notes.

HaverhIll
SCHEDULE OF ACCOMMODATION - Parcel A9

PRIVATE			
Housetype	**Beds**	**Sqft**	**No. of Units**
Dekker	2	766	5
Bellingham	2	950	2
Buxton SD	2	919	8
Lyford SD	3	940	2
Holmston (M4[2])	3	922	2
Lyford	3	940	1
McCall (M4[2])	3	1115	4
Lymington (M4[2])	3	1216	4
Gilstone (M4[2])	3	1216	2
Westbury (M4[2])	3	1311	5
Beely (M4[2])	4	1301	1
Cromer (M4[2])	4	1350	3
Weir (M4[2])	4	1295	2
Modbury (M4[2])	4	1398	2
Leighton (M4[2])	4	1403	2
Horsham (M4[2])	4	1498	4
Elsethorpe (M4[2])	4	1482	1
Portland (M4[2])	4	1553	2
Dover (M4[2])	4	1639	1
TOTALS		**54467**	**53**

AFFORDABLE RENT			
Housetype	**Beds**	**Sqft**	**No. of Units**
Sullivan GF (M4[2])	1	538	5
Sullivan FF	1	647	5
Satterfield GF (M4[2])	2	657	4
Satterfield FF	2	766	4
Sansom (M4[2])	2	850	4
Sutherland (M4[2])	3	1001	7
Swenson (M4[2])	4	1141	2
TOTALS		**24306**	**31**

AFFORDABLE SHARED			
Housetype	**Beds**	**Sqft**	**No. of Units**
Sansom (M4[2])	2	850	2
Sutherland (M4[2])	3	1001	5
Sapsford (M4[2])	3	1031	4
TOTALS		**10829**	**11**

SITE TOTALS	**89602**	**95**

KEY

- Application Boundary
- Affordable Housing - Rented
- Affordable Housing - Shared
- Indicative Tree Locations
  Refer to Landscaping Drawings for exact locations
- 2.2ha School Land (Excluded from RM Submission)

Revision.

Parcels A9, B2
Great Wilsey Park
Haverhill

Planning Layout

DATE: **MAY 25**
SCALE: **1:1000 @ A0**
DRAWN: **RML**
CHECKED: **SPL**

BLOOR HOMES

Drawing No. EA232-PD-002

Great Wilsey Park, Haverhill