

Sarum Academy – Drainage Strategy Report



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Morgan Sindall Construction

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1 Introduction

1.1 Purpose of Report

The purpose of this report is to outline the proposed drainage strategy for the Sarum Academy project for Planning Approval. This document is to be read in conjunction with the civil and structural engineering scheme sketches.

1.2 Overview

Sarum Academy, located on Westwood Road on the north-west side of Salisbury, is a Voluntary Controlled Church of England Academy established in 2010. It is part of the Magna Learning Partnership Multi-Academy Trust and provides mainstream education for pupils aged 11 to 19.

The secondary school currently has a capacity for 900 pupils (6FE / 180 PAN), with an additional 250 places in the sixth form. At present, the school operates as a 5FE provision, with just over 750 pupils enrolled, including approximately 90 in the sixth form.

The school is seeking to increase its capacity from 6FE to 10FE, to be delivered in phases as follows:

1. Phase 1
Enabling works in the existing building
2. Phase 2 (8FE expansion)
 - a. Phase 2A – New build science block + Muga pitch
 - b. Phase 2B – Alterations to existing school and curved building
3. Phase 3 – 10FE Expansion (10+ year plan)

A hybrid planning application will be submitted, covering all phases. Detailed design work will be undertaken for the 8FE expansion, with outline proposals provided for the full 10FE provision.

1.3 Proposal

The agreed site wide proposal includes the following:

- A new 2 storey science block
- A link canopy back to the main school building
- An artificial turf athletics pitch marked out with a 200m athletics track.
- A 60m Sprint track.
- A hockey pitch.
- Associated landscape works.
- New car parking to the north field.
- Alterations and reconfiguration to the curved building to form a fitness suite and changing rooms.
- Internal reconfiguration and alterations within the main building to provide an enlarged dining room, conversion of science to form classrooms and a SEN suite of rooms.

The main structural design and works will be for the new two storey science block and for the new link canopy. There will also be amendments to the existing school building with classrooms change use. It is not expected that any major structural works will be carried out to the existing school. However, input may be required if additional services route is required.

Refer to **Appendix B** for the Proposed Site Plans.



1.4 Site Location and history

1.4.1 Site location

Sarum Academy is located off Westwood Road, Salisbury. The site covers an approximate total area of 10.90 hectares (Ha).

The existing use of the site is currently as a secondary and sixth form school. The existing school comprises a combination of buildings, sports pitches, and open fields.

The site is bound by:

- » Greenfield land to the north, beyond which is an extended area of new residential development;
- » Residential area to the east;
- » Forested area and chalk pit to the south; and
- » Arable land to the west.

The main pedestrian and vehicular site access point is from Westwood Road.

The full address and Ordnance Survey grid reference are provided in **Table 1** below, with the site location shown in **Figure 1**.

Table 1. Site Referencing Information

Site Referencing Information	
Site Address	Sarum Academy, Westwood Road, Salisbury, Wiltshire, SP2 9HS
Grid Reference	SU 11604 31859 411604, 131859

Site locations to be used for design criteria:

- Site post code: SP2 9HS
- Site co-ordinates SU116317



Figure 1: Site Location Plan



Figure 2: Site Location Ariel Plan

1.4.2 Existing site

The existing site is an in-use secondary and sixth form school, with expansion into and adjacent Northern green field.

The school was previously extension

1.4.3 Site history

Sarum Academy is a Voluntary Controlled Church of England Academy, established in 2010. It is part of the Magna Learning Partnership Multi-Academy Trust and provides mainstream education for pupils aged 11 to 19.

The secondary school currently has a capacity for 900 pupils (6FE / 180 PAN), with an additional 250 places in the sixth form. At present, the school operates as a 5FE provision, with just over 750 pupils enrolled, including approximately 90 in the sixth form, with the sixth form due to be close in June 2027.

The school is seeking to increase its capacity from 6FE to 10FE, to be delivered in two phases. A hybrid planning application will be submitted, covering both phases. Detailed design work will be undertaken for the 8FE expansion, with outline proposals provided for the full 10FE provision.



1.5 Ground Conditions

1.5.1 Site Ground Conditions

The superficial geology comprises the Clay-with-flints formation which is recorded as sandy clay. The solid geology comprises the Chalk Formation. The historic ground investigation(s) have shown that chalk dissolution features are present on-site, however, these investigations do not cover the footprint of the proposed structure.

It is expected that where will be Some made ground will be encountered under the footprint of the proposed building and Muga pitch due to the demolition of the previous school buildings.

An additional site investigation has been commissioned to specifically investigate ground conditions under the footprint of the proposed building.

Site post code: SP2 9HS

1.5.2 Topography

An up-to-date topography survey is due to be carried out. However, a review of site-specific topographic survey, completed by Brunel Surveys Limited in 2010, indicates that the that the north of the site falls from 102.11 metres Above Ordinance Datum (m AOD) in the northeast to 93.74 m AOD in the west. The topographic survey also shows that the centre of the site falls from 100.02 m AOD in the central region of the site to 96.15 m AOD in the south of the site. For reference, Figure 3 shows the site topography derived from Light Detection and Ranging (LiDAR) data.

Refer to **Appendix A** for the topographical survey.

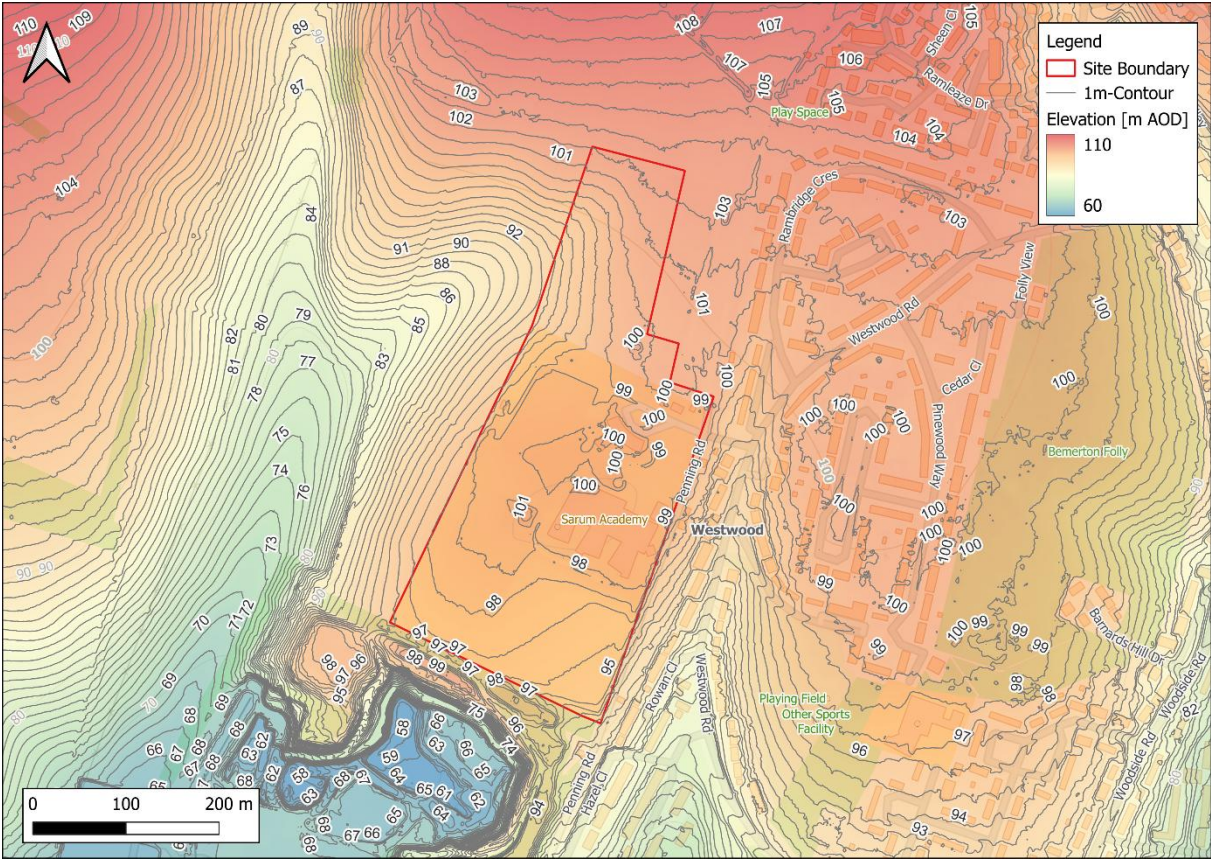


Figure 3: Site Topography

1.5.3 Ground Gas / contamination

The following are potential sources of contamination. No visual signs of contamination have been identified in previous site investigation reports carried out by WYG Environment (document ref: A070001 Interp FINAL) and Geotechnical Engineering Ltd (document ref: 26070).

- Made ground, potentially containing contaminants
- Pesticides and fertilisers associated with arable farming practices
- Fuels oils and hydraulic oils associated with arable farming practices
- Made ground, metals, PAH, and hydrocarbons associated with neighbouring historical gasworks

1.5.4 Soil classification

The site investigation report, WYG-A0700001, recorded that the Head Deposits and White Chalk have an ACEC classification of DS1 AC1.

1.5.5 Ground Water

No groundwater was identified in the historic ground investigations.



1.6 Site constraints

1.6.1 Underground utilities & services

A current utilities & services survey has not currently been carried out. From historic information provided by the Client, discounted drainage routes (both foul and surface water) may be present under the proposed building and other areas of the works.

1.6.2 Site boundaries and adjacent buildings

The proposed building is close to the existing schools main building and single story sixth form building. Site boundaries encompasses the school car park, buildings and playing fields. The site will extend into the North field for the 10FE development, along with potential parking for 8FE (Phase 2A), to be confirmed during Stage 4.

1.6.3 Flood risk and mitigation

Refer to Stantec's Flood Risk Assessment, 75CC13-STN-XX-XX-RP-WENV-0001, for the detailed assessment. A summary from the report for the flood risk and mitigation is below.

A review of the available flood data for the site located at Sarum Academy, Salisbury, has demonstrated that the site is at 'low' risk of flooding from all assessed sources. The mapping does indicate some elevated risk of surface water flooding; however, risk remains confined to isolated topographic depressions beyond the area of proposed development. As such, it is concluded that no additional flood risk mitigation or resilience measures are required for the proposed development.



2 Surface Water Management Strategy

2.1 Existing Surface Water Drainage Network

2.1.1 Existing Public Drainage

Review of Wessex Water’s sewer asset maps confirm that there are no surface or foul water public sewers within the site boundary.

2.1.2 Existing Private Drainage

Review of Arup’s construction record drawings for the existing school indicates that surface water discharge from the site is collected through a series of below ground pipes leading to various infiltration features distributed across the development. These infiltration features include:

- Swales
- Soakaway crates
- Porous car park bays

Surface water from the roof catchment and surrounding hardstanding of the existing school building is conveyed through four separate networks into infiltration swales and soakaway crates. Existing pipes can be seen draining southwards to a long infiltration swale, which spans the length of the school from west to east. An eastern portion of the school’s roof and hardstanding areas drains southward via a separate network that utilises soakaway crates. The soakaway crates are located adjacent to the existing track field as shown Arup’s construction drawings.

The northern catchment of the existing school is drained northwards into two infiltration swales located within the landscaped areas in front of the school. The western portion of the existing sports fitness building, situated on the opposite side of the swales, also discharges into these features, while the eastern portion drains into a series of pipes that convey flows northwards and off-site at the north-east boundary.

Refer to **Appendix C** for the existing drainage layout drawings.

2.2 Run-off Destinations

An appraisal should be undertaken to confirm the most suitable and sustainable method for managing surface water runoff from the development in accordance with the following hierarchy as highlighted in Part H of Building Regulations and the National Planning Policy Framework (NPPF):

- Infiltration to the ground using a sustainable drainage system.
- If this is not feasible, discharge to a watercourse or river; generally, at a controlled rate unless it does not affect flood risk e.g., if to the sea or an estuary.
- Discharge at a controlled rate to a surface water sewer or drain.
- Discharge at a controlled rate to a combined sewer system, with the approval from the Water Authority.

Only if the above have all been investigated and it has been proven that none of these options are suitable, will discharge at a controlled rate to a foul sewer system be considered, with the approval from the Water Authority.

Accordingly, the discharge of surface water run-off has been considered in accordance with the hierarchical approach, as demonstrated within the table below.

As the existing site utilities infiltration, it is considered that infiltration drainage will be feasible to dispose of surface water runoff. Infiltration rates from historic infiltration testing for the site will be used in the design of new infiltration features however it is recommended that new in-situ testing is carried out to confirm the design. Rainwater reuse is also encouraged to collect roof water for reuse across the site.

The superficial geology comprises the Clay-with-flints formation which is recorded as sandy clay. The solid geology comprises the Chalk Formation. The historic ground investigation(s) have shown that chalk dissolution features are present on-site and therefore will be an important factor to consider when infiltrating surface water near to structures. For the purpose of this report, it is assumed that infiltration should be at a maximum offset of 15m from any structure. This is to be confirmed following new ground investigation works for this development.

Table 2. Review of the Drainage Hierarchy		
Method of Discharge	Suitability	Explanation
Interception / Reuse	X	Not in keeping with Client requirements.
Infiltration	✓	Infiltration is considered feasible based on underlying ground conditions.
Surface Water Body	X	This is less preferable option to infiltration.
Surface Water Sewer	X	This is less preferable option to infiltration.
Combined Sewer	X	This is less preferable option to infiltration.

2.3 SuDS Suitability Assessment

The drainage design should adopt the principles of SuDS where appropriate taking into consideration the site context and location. The principals of SuDS are that they should be designed to maximise the opportunities and benefits that can be secured surface water run-off management in terms of quality, quantity, flood risk, and amenity. The implementation and selection of SuDS techniques is largely dependent on the site layout and context. Some SuDS techniques may be more appropriate than others.

The suitability and benefits of the various potential SuDS systems for the proposed development should be considered, which will aim to maximise the 4 pillars of SuDS:

- Water Quantity (Controlling runoff);
- Water Quality (Managing quality of runoff);
- Amenity (Create and sustain better places for people);
- Biodiversity (Create and sustain better places for nature).

The suitability of SuDS components has been assessed as follows:



Table 3. Suitability of SuDS Components			
SuDS Component	Description	Suitability	Explanation
Green roofs	A planted soil layer on the roof of a building: stores water in the soil layer to be absorbed by vegetation. Reduces runoff and treats pollutants.	X	Not proposed.
Rainwater Harvesting	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an over ground or underground tank for treatment and reuse locally.	X	Not in keeping with Client requirements.
Permeable Surfaces	Surfaces that allow water to penetrate into underlying layers to be stored, collected or made to infiltrate to groundwater.	✓	It is proposed to utilise permeable block paving within car parking bays to infiltrate surface water runoff to ground.
Bioretention Area	A vegetated area with gravel and sand layers below designated to channel, filter and cleanse water vertically, to then be stored, collected or made to infiltrate to groundwater.	✓	It is proposed to utilise rain gardens as part of the surface water management train.
Filter Strip	Grassed or planted areas that runoff is allowed to run across to promote infiltration and cleansing.	✓	Linear filter strips can be incorporated within the soft landscape to drain hardstanding areas subject to further discussion with landscape architect.
Soakaway	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	X	Not proposed.
Infiltration Swale	Shallow depressions to convey and filter water. May be 'wet' with above ground attenuation or 'dry' with a gravel layer. Can be made to infiltrate to groundwater.	✓	It is proposed to utilise the existing swale to drain the roof catchment of the future expansion 10FE building (swale denoted as EXSW-01 on drainage strategy drawing 7000).
Hardscape Storage	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	X	Not proposed, as infiltration drainage is feasible.
Pond/ Basin	Store and treat water. Ponds have a level of standing water whereas basins are generally dry. Can be made to infiltrate to groundwater.	✓	It is proposed to remove the existing infiltration basin which the 8FE building will be located and provide a new infiltration basin in the centralised landscape area between the existing school, new 8FE building and existing fitness building.
Wetland	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	X	Not proposed.

Table 3. Suitability of SuDS Components			
SuDS Component	Description	Suitability	Explanation
Underground Storage	Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.	X	Not proposed.

2.4 Water Quality

Consideration must be given both during construction and post-development to ensure that water quality is not negatively impacted.

Table 26.2 of The SuDS Manual identifies the overall pollution hazard indices from the site, as shown below.

Table 4. Pollution Hazards				
Land Use	Hazard Level	TSS	Metal	Hydro-carbons
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (typically commercial / industrial roofs)	Low	0.3	0.2-0.8	0.05
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	Low	0.5	0.4	0.4
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	Medium	0.7	0.6	0.7
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 motorways	High	0.8	0.8	0.9



Table 26.4 of The SuDS Manual, reproduced within the table below, provides various mitigation indices for the various SuDS elements discharging to groundwater, with the mitigation indices associated with the SuDS elements that are included within the proposed development highlighted in 'green'. Based on this, treatment provided by soakaways with upstream catchpits, in addition to raingarden to treat runoff from the external hard area, should be adequate to treat the potential pollutants associated with the proposed land use at the site.

Table 5. Pollution Mitigation Indices for discharge to groundwater				
Characteristics of material overlying the proposed infiltration surface, through which the runoff percolates	TSS	Metals	Hydrocarbons	Present
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential of at least 300mm in depth.	0.6	0.5	0.6	✓
A soil with good contaminant attenuation potential of at least 300mm in depth.	0.4	0.3	0.3	X
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, i.e. graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20mm gravel) underlain by a soil with good contaminant attenuation potential of at least 300mm in depth.	0.4	0.4	0.4	X
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential of at least 300mm in depth.	0.7	0.6	0.7	✓
Bioretention underlain by a soil with good contaminant attenuation potential of at least 300mm in depth.	0.8	0.8	0.8	X
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area. Catch pits will be used upstream of soakaways, which are considered appropriate to treat roof runoff.			

Table 6. Comparison of Mitigation and Pollution indices			
Carpark	TSS	Metals	Hydro-carbons
Pollution Index	0.5	0.4	0.4
Mitigation Index	0.7	0.6	0.7
Net Pollution	-0.2	-0.2	-0.3
Comments	Sufficient pollution mitigation achieved.		

Roofs	TSS	Metals	Hydro-carbons
Pollution Index	0.3	0.2	0.05
Mitigation Index	0.6	0.5	0.6
Net Pollution	-0.3	-0.3	-0.55
Comments	Sufficient pollution mitigation achieved.		

Based on the above tables the water quality criteria of document Ciria C753 - The SuDS Manual is satisfied.

Alternative options for SuDS may also be considered provided that the management train meets or exceeds the water quality requirements.

2.4.1 Quality of Surface Water Run-off: Post Development

In line with the SuDS suitability, the design should seek to provide an appropriate level of water treatment to effectively mitigate the pollution risk associated with the site and not affect the quality of water downstream.

The proposed layout has two primary drivers of pollutant risks to the discharge point. The sources, pollutants and mitigations are as follows:

Carpark

The proposed car park consists of 19 new spaces at 8FE and 41 new spaces at 10FE providing a increase of 60 new spaces, exceeding the Environment Agency Document PPG3 (now withdrawn but considered best practice guidance) guideline of 50 spaces or 800m2 to be considered 'low risk' in terms of pollution and as such mitigation is deemed to be required.

However, as permeable paving will pick up the run-off as well as an effective downstream management train, an interceptor is deemed not to be required as the stone within the sub-base will capture and treat the hydrocarbons.

Gullies

Gullies and drainage channels will be specified with silt traps and catch pits will be incorporated in the drainage system to reduce the risk of silts / salts getting into the surface water network.

It is anticipated that the during construction adequate provisions will be put in place to ensure the existing drainage is protected to prevent material which could have a negative impact on water quality entering the system.

2.4.2 Quality of Surface Water Run-off: During Construction

Some pollution mitigation techniques that are to be considered include:

- Monitoring and managing disposal of site waste. Make sure all waste is correctly dealt with to stop it from spreading.
- Keeping materials such as sand and cement secure. Materials should be located where there isn't risk of them being washed into the drainage system.
- Covering up all drains to prevent waste from ending up in the system.
- Always keep the road and paths to the site clean. This will prevent silt and other pollutants from running off into any bodies of water.
- Properly collect and treat any wastewater that is produced.
- Temporary installation of screens within manholes to capture any debris.



2.5 Design Standards for Surface Water Drainage

The surface water drainage strategy for the new development should aim to deliver a safe, functional, cost effective and, as far as possible, sustainable drainage system (SuDS) which considers the following design principles to ensure:

- That natural drainage features are protected;
- That public health and safety risks are taken into account and managed;
- The constructability of the surface water system;
- The maintainability of the surface water system;
- The long-term economic viability of the system;
- That sustainability issues are taken into account;
- That the information requirements of stakeholders are adequately addressed;
- That the potential value of the surface water system, in enhancing the rural and urban environment is recognized and optimized.

The surface water below ground gravity drainage system is to provide connections from all new rainwater pipes, channels, gullies and road gullies at ground floor level. The locations of the drainage components are to be fully coordinated with all relevant architectural, landscaping and services drawings. All materials and products relating to the below ground drainage system shall be specified in accordance with their intended use and meet all relevant British Standards and BBA accreditations.

In accordance with best practice storm drainage will be designed to the following performance criteria:

1 in 2-year storm return period:	Pipes running under full conditions with no surcharge.
1 in 30-year storm return period:	No flooding.
1 in 100-year storm:	Extreme flooding to be retained on site.

2.6 Proposed Surface Water Drainage Strategy

The below ground surface drainage system will connect all new rainwater pipes, channels and gullies at ground floor level and discharge through a series of pipes and discharge into an infiltration basin located within the central landscaped area of the site. Drainage from the existing school building is proposed to be diverted away from the existing infiltration basin (to be removed) and drained into the new proposed infiltration basin.

Rain chains have been proposed to take run off from the roof of the 8FE building. This will discharge to precast dished channels and then into conveyance swales before entering the infiltration basin. The swales will be lined with an impermeable membrane to prevent infiltration to ground within close proximity of the structure.

Dimensions of the proposed infiltration basin have been designed using soakaway results taken from a ground investigation by WYG Environment at location SA-02. Document reference: A070001. At the time of writing this report, in-situ soakaway results are being undertaken. Confirmation of results required to confirm design.

For the purpose of this design, it is assumed that no infiltration can occur within 15m of any structure. Geotechnical Engineer to confirm.

SuDS will be provided by utilising rain gardens and permeable block paving prior to discharging to the basin. The proposed rain gardens are proposed to take run off from the existing sixth form building.

Grass covered filter trenches have been provided to take run off from the pavement behind the 8FE building and infiltrate to ground. Geotechnical Engineer to confirm feasibility of this proposal due to chalk dissolution risk.

It will be a gravity system without the need for pumping.

Where applicable, the surface water management strategy has incorporated the recommendations of the 'Non-Technical Standards for Sustainable Drainage' and general 'good practice' in terms of providing a Sustainable Drainage System (SuDS) that does not adversely impact flood risk either within the site or beyond the development boundary.

Refer to the appendices for the proposed drainage layout.

Design assumptions to note at this stage:

- Assumed 15m offset from any structure for infiltration due to chalk dissolution risk. Ground investigation report / geo engineer to confirm offset requirements.
- Assumed run off from pavement around 8FE building can infiltrate into ground through filter drain. Geo engineer to confirm.
- Dimension of infiltration basin designed based soakaway results in GI report from WYG environment dated June 2011. Results from new soakaway testing to confirm design.

Refer to **Appendix D** for the Surface Water Drainage Calculations.

Refer to **Appendix E** for the Proposed Drainage Strategy drawings.



3 Foul Water Management Strategy

3.1 Pre-Development Foul Water Arrangements

Review of Arup's construction record drawings for the site indicates that the existing school building is drained via a series of underground pipes that convey flows to the north-east corner of the building. From there, flows travel north along the site boundary through a 150 mm pipe before discharging off-site at the north-eastern corner. The fitness building is also drained via a series of 150 mm underground pipes, which discharge northwards and then off-site at the same location, but as part of a separate network running parallel to the pipework serving the existing school building.

3.2 Post-Development Foul Water Arrangements

To meet the requirement set out within Building Regulations: Approved Document Part H - Drainage and Waste Disposal, any drainage management strategy proposed should adhere to the following foul discharge hierarchy in the following preferential order:

1. Discharge to local foul water sewer network.
2. Discharge to local combined water sewer network
3. Onsite treatment and discharge of foul effluence through drainage field or watercourse
4. Storage of produced effluence and removal offsite

Phase 1 - Science Block (8FE Expansion) & Sixth Form Refurbishment

The below-ground foul drainage system will connect all new soil, waste and ventilating pipes, sanitary appliances and gullies at ground level and discharge into the existing foul drainage serving the existing fitness building.

Foul stacks shown are indicative only at this stage. MEP Engineer to provide foul stack locations at detailed design stage.

Phase 2 – New Building & Sports Facility (10FE Expansion)

The below-ground foul drainage system will connect all new soil, waste and ventilating pipes, sanitary appliances and gullies at ground level and discharge into the existing foul drainage run located at the eastern boundary of the site as it travels north.

Recommendations and notes

Manhole information missing from CCTV survey regarding levels for proposed foul connection. Survey required to confirm invert level of connection / feasibility of design and if existing foul pipe has sufficient capacity.

It is intended that only waste flows considered to be 'Domestic' shall be discharged into the foul drainage system. If the site wishes to discharge 'Trade Effluent' into the foul drainage system, then will be required to make a formal application to the Sewerage Undertaker accordingly.

It is intended that the proposed drainage will be a gravity system without the need for pumping however review of the CCTV survey will be required to confirm.

The design of all foul sewers and lateral drains must conform to BS EN 752, BS EN 16933, Building Regulations 2010 Part H, planning policy and best practice guidelines (such as SSG Appendix C – Design and Construction Guidance) wherever applicable. Sanitary systems within building should be designed in accordance with BS EN 12056-2.

3.3 Post-Development Foul Water Flow Rates

The assessment of the proposed foul flow rates considers both daily average volumes and estimated peak flow rates. Main criteria outlined below:

Table 7. Foul Flow Rate Criteria	
Type	Occupancy
School	389

3.3.1 Peak Onsite Flow Rate

The peak onsite design flow rates have been calculated using the below method:

Method – 'Estimated' F&L Peak

It is widely used practice to estimate the peak flows by concentrating the average daily usage over an 12-hour period (i.e., assuming total daily flows only happen during the day), and applying an additional multiplier.

Therefore: Occupancy x LHD / 43200 x DWF

Table 8.Foul Flow Rate Calculation				
Occupancy	Flow (l/h/d)	Hours	Peak Factor	Peak Flow Rate (l/s)
389	50*	12	6	2.70

* Taken from Flows and Loads Part 4

3.3.2 Peak Onsite Flow Rate

Further assessment will have to be carried out by the offsite consultant to determine the capacity of the indirect connection point and its potential for connection as part of the foul water drainage strategy for the new development.

Any capacity improvements to the sewerage undertakers' network to accommodate new developments will be managed, prioritised, and funded by them from their overall infrastructure charging arrangements



4 Drainage Maintenance

The key elements of the foul and surface water drainage system will require periodic maintenance to prevent failure of the system and/or a reduction in capacity of the networks as a whole and the following matrix therefore sets out the various drainage items to be maintained, identifies who is responsible and the frequency of maintenance. The proposed SuDS features will require maintenance including litter and debris removal, sediment removal, vegetation maintenance and remediation to any damaged structures.

The maintenance requirements will be the responsibility of a private maintenance company. All inspection and maintenance works should take into consideration the implications of 'lone working'. An assessment should be carried out and the risks mitigated accordingly.

Table 9. Proposed Schedule of Maintenance for Below Ground Drainage – Permeable paving		
Permeable Paving – Operation and maintenance requirements in accordance with CIRIA C753 – The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surfaces from adjacent impermeable areas as this area is most likely to collect the most sediment.
	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48 h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually.

Reference should be made to the manufacturer recommendations where applicable.

Table 10. Proposed Schedule of Maintenance for Below Ground Drainage – Swale		
Swale - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Remove litter and debris	Monthly, (or as required).
	Cut grass - to retain 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 infiltration surfaces for ponding, compaction, silt accumulation. Record areas where water is ponding for > 48 hours.	Monthly, or when required.
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half early.
Occasional maintenance	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly.
	Re-seed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area.
Remedial actions	Repair erosion or other damage by re-turfing or reseeded.	As required.
	Relevel 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 11. Proposed Schedule of Maintenance for Below Ground Drainage – Filter Strip

Filter Strip - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Remove litter and debris	Monthly, (or as required).
	Cut grass - to retain 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 filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (e.g. oils).	Monthly (at start, then half yearly).
	Check flow spreader and filter strip surface for evens gradients.	Monthly (at start, then half yearly).
	Inspect gravel flow spreader upstream of filter strip for clogging.	Monthly (at start, then half yearly).
	Inspect silt accumulation rate and establish appropriate removal frequencies.	Monthly (at start, then half yearly).
Occasional maintenance	Re-seed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over > 10% of the filter strip area.
Remedial actions	Repair erosion or other damage by re-turfing or reseed.	As required.
	Relevel 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 12. Proposed Schedule of Maintenance for Below Ground Drainage – Infiltration Basin

Infiltration Basin - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Remove litter and debris	Monthly.
	Cut grass - for spillways and access routes	Monthly (during growing season), or as required.
	Cut grass - meadow grass in and around basin	Half yearly (spring - before nesting season, and autumn).
	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 banksides, structure, pipework etc for evidence of physical damage	Monthly.
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required.
	Check any penstocks and other mechanical devices.	Annually.
	Tidy all dead growth before start of season.	Annually.
	Remove sediment from inlets, outlets and forbay.	Annually (or as required).
Occasional maintenance	Manage wetland plants in outlet pool - where provided.	Annually (as set out in chapter 23 of CIRIA C753).
	Reseed areas of poor vegetation growth.	As required.
	Prune and trim any trees and removed cuttings.	Every 2 years, or as required.
	Remove sediment from inlets, outlets, forbay and main basin when required.	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided).
	Repair erosion or other damage by re-turfing or reseed.	As required.
Remedial actions	Realignment of rip-rap.	As required.
	Repair / rehabilitation of inlets, outlets and overflows.	As required.
	Relevel uneven surfaces and reinstate design levels.	As required.

The following information should be passed to the development operator to ensure that future maintenance is carried out in a safe and proper manner.

A formal review of the risks should be undertaken on an annual basis:

Table 13. Proposed Operational Schedule for Below Ground Drainage		
Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Access to manholes for Inspection and Maintenance.	1. Confined spaces	1. Entry to confined space to be minimised and, where unavoidable, to be carried out by appropriately trained personnel
Removal of silt from outfall	1. Risk to members of the public 2. Open Water	1. Access to hazardous areas by members of the public to be prohibited. 2. To be carried out by appropriately trained personnel
Removal of silt from drainage channel	1. Risk to members of the public	1. Access to hazardous areas by members of the public to be prohibited

Provided that the surface and foul water strategies as set out in this report, are implemented, it is expected that the primary residual failure would be as a result of some form of failure of the site drainage system during the life of the development. Therefore, regular, ongoing maintenance as set out in the Operations and Maintenance Manual, will be required to ensure that the capacity of the system is maintained as designed.



5 Drainage Consents / Planning

Summary of expected consents required:

- Ordinary Watercourse Consent – Not required.
- Sewerage Undertaker Consent – Not required.
- Section 104 / 106 Drainage Adoption – Not required.
- Build Over / Build Near – Not required.

It is anticipated that details of the drainage scheme will need to be approved by Wiltshire Council Lead Local Flood Authority (LLFA) through a formal planning application.

6 Further Investigations

The design is still at an early stage of development, with further design required on all buildings and the site. The following investigations are envisaged to be required in the next design stages to inform the final design:

- Additional footprint specific site investigation for geotechnical and geoenvironmental information, with targeted probing.
- Updated soak away testing for drainage
- Survey of existing foul manhole invert levels to confirm feasibility of proposed foul connection to existing sixth form building drainage.

