

DRAINAGE & SuDS STRATEGY

for a

**NURSERY SCHOOL EXTENSION
GORSEFIELD PRIMARY, RADCLIFFE**

for



LANCASTER MALONEY MARTIN

Quality Management

Job No	15170		
Project	Nursery Extension, Gorsefield Primary school		
Location	Robertson St, Radcliffe, Manchester M26 4DW		
Title	Drainage & SuDS Strategy		
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Sustainable Drainage Systems (SuDS) Assessment

SuDS Objectives

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

SuDS Design Themes

- 1.1.2 The 'Management Train Approach' should be central to the surface water drainage strategy of the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:
- i. **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.
 - ii. **Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
 - iii. **Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.
 - iv. **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

SuDS Site Constraints

- 1.3.1 SuDS techniques are suitable for all sites; therefore an assessment of the existing site is required so that SuDS limitations can be determined.
- **Land Use Characteristics:** The size and type of development enables the potential range of source control and site control SuDS devices to be considered below ground only.
 - **Site Characteristics:** A site-specific Phase 2 intrusive investigation has been carried out at the site. Findings from a single trial pit soakaway test and review of the overall ground condition has determined that infiltration techniques would not be suitable.
 - **Catchment Characteristics:** The site is currently classed for drainage purposes as 'Brownfield' and the discharge rate from the site will need to reduce from the existing brownfield runoff rates.
 - **Environmental and Amenity Performance:** The inclusion of SuDS within the overall development is a key driver in providing both amenity and habitat

creation. All types of SUDs will be considered and blended into the landscaping zone, if possible. Safety to all future users is paramount and so best practice guidance will be incorporated so that these devices blend into the surrounding without the need for significant safety precautions. Maintenance plans will be prepared for all SuDS devices that are included.

1.3.2 *SuDS Methods*

- 1.3.2.1** Figure 1 and 2 on the following pages provide an assessment of various above and below ground SuDS methods that can provide water quality treatment and management of flows to reduce runoff rates and volumes and whether they can be suitably incorporated at this development site. The purpose of this assessment is to set out options to be considered at the planning stage with consideration to time constraints, viability and lifetime maintenance of the proposed extension.

Method	Comment	Suitability for Development
Green Roofs	Can be used on suitable low-rise buildings to provide retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.	<u>Not Suitable:</u> Not suitable due to the limited area of available roof.
Water Butts	Plastic tanks placed at the base of rainwater down pipes to collect rainwater runoff from the roof areas.	<u>Not Suitable:</u> Not appropriate for a childrens nursery on safety grounds
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site and reduces treated water consumption.	<u>Not Suitable:</u> - Additional costs of installation would have severe effect on viability of the development. - Running and maintenance costs would not be acceptable to our client. - The ability to restrict peak flow rates and short-term peak volumes is non-existent where a critical storm event occurs.
Infiltration Options	Reduces total run off volume from the development.	<u>Not Suitable:</u> Trial pit excavations have confirmed that that the underlying soils would not be suitable for infiltration options.
Permeable Surfacing (Infiltration)	- Reduces total run off volume from the development. - Can be used to enhance water quality.	<u>Not Suitable:</u> Trial pit excavations have confirmed that that the underlying soils would not be suitable for infiltration options and there is no external paving
Permeable Surfacing (Standard)	- Can be used to enhance quality of runoff water. - Sub-base provides 'source' storage and reduces the volume of storage downstream. - The storage can be created with selection of the stone fill or plastic box stems. - Impermeable membrane at base of construction to prevent impact on pavement stability.	<u>Not Suitable:</u> Due to the lack of external paving, permeable paving is discounted.

Swales, basins and ponds	• Provide areas for above ground surface runoff storage. • Swales also allow filtering of particulate matter, improving water quality	<u>Not suitable:</u> • No space available in the site for any of these features to be incorporated.
Bio-Retention	• Collect and retain run-off to help improve water quality, prior to discharge in piped system on infiltration.	<u>Not suitable:</u> • Space constraints on site do not permit large above ground areas for flood storage. • No scope to reduce development area due to site viability. • Infiltration options not viable.

Figure 1 Surface SuDS Methods

Method	Comment	Suitability for Development
Geocellular Storage	• Suitable for sites with insufficient space for basins etc. • Suitable for sites where topography prevents the use of open basins etc.	<u>Suitable:</u> • Sized to suit detailed design and drainage layout.
Large Diameter Pipes, Culverts or Tanks	• Suitable for sites with insufficient space for basins etc. • Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. • Generally be suitable for adoption by the statutory water company (e.g. United Utilities)	<u>Not Suitable:</u> • More suited for larger developments where the drainage is to be adopted by United Utilities.

Figure 2 Sub-Surface SuDS Methods

1.3.3 SuDS Hierarchal Approach

1.3.3.1 Based on the SuDS assessment in Figure 3, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in greater detail below:

Method	Suitability	Suitability for Development
Infiltration to Ground	No	Assessment of local ground conditions has confirmed that the underlying ground is not suitable for infiltration.
Connection to Watercourse	No	There is no watercourse in close proximity to the site.
Connection to Surface Water Sewer	Yes	Connection to the surface water sewer via the existing connection is possible at restricted rates.
Connection to Combined Water Sewer	No	Higher options are possible.

Figure 3 SuDS Hierarchal Approach

1.3.4 SuDS Design Philosophy

1.3.4.1 SuDS assessment and hierarchal approach discussed in Figure 1, 2 and 3 above has defined the overall SuDS strategy. Thus, the SuDS philosophy for the development site is the promotion of Site Control techniques with discharge to the surface water sewer at restricted rates.

1.3.4.2 The following design philosophy is proposed:

- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance to the existing drainage infrastructure.
- Reduce the impermeable fraction of the post development area.
- Geocellular attenuation tanks to retain the peak flows.

1.4 Outline Surface Water Drainage Strategy

- 5.7.1 The general principal of the surface water drainage strategy is to collect the runoff from the roof of the new extension and direct it to new RWPs that will drop into the existing surface water network. This will outfall to the surface water sewer passing through the site at a controlled rate, to be agreed with UU but assumed to be 2l/s. Due to this reduced rate, attenuation will take the form of below ground geocellular crates.
- 1.4.1 The proposed private drainage layout for the new extension will be designed in accordance with BS EN 752: 2017 and Building Regulations Part H guidance. This is to indicate no flooding for up to the 30-year storm event.
- 1.4.2 A hydraulic model has been simulated to represent the final detailed design of the surface water drainage scheme. Figure 4 below defines the peak flow rates from this model. The peak attenuation volume for the 100 year plus 40% climate change is 2m³.

Return Period Event	Peak Flow Rate
1 yr	2.0 l/s
30 yr	2.0 l/s
100 yr + 30% CC	2.0 l/s

Figure 4 Existing Brownfield Runoff Rate

- 1.4.3 The model also confirms no flooding will occur for the 100 year + 40% climate change storm event. Further details on the Drainage Strategy Plan in Appendix A and the drainage calculations in Appendix B.

1.5 Maintenance

The long-term maintenance of the new drainage and SuDS infrastructure will be with the owner of the development in line with best practice guidance. Annual inspections will need to be carried out and clearing of gullies, catchpits and tanks constructed.

Typically the maintenance regime will be in line with Figure 5 below.

<u>Future Maintenance of the Drainage System</u>			
Responsibility	Feature	Maintenance	Frequency
Owner / Occupier	Rainwater gutters, downpipes and above ground drainage.	Regular maintenance and inspections.	Ad-hoc sweeping and emptying of silt and debris required. Annual visual inspections to check for damage/leaks.
	Geocellular Infiltration / Attenuation Tanks	Regular maintenance / removal of blockages and debris.	Annual inspection and following significant rainfall events.
	Pipes, sewers, manholes	Regular maintenance / removal of blockages and debris.	Annual inspection and removal of silts if required.

Figure 5 Outline Management and Maintenance Strategy

1.6 Foul Water Drainage

1.6.1 Foul drainage is as existing. No additional foul drainage is proposed.



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1. Design Criteria

Parameter	Value
Impermeable Area	36 m ²
Runoff Coefficient (C)	1.00
Design Storm	1 in 100 year +40% Climate Change
Allowable Discharge	2.0 l/s
Drainage Standard	Building Regulations Part H & Non-Statutory Technical Standards for SuDS

2. Design Runoff

For preliminary design in Greater Manchester, an effective rainfall depth of **55 mm** is assumed.

Runoff volume:

$$V = A \times R \times C$$

Where:

- Area = 36 m²
- Rainfall = 0.055 m
- Runoff coefficient = 1.0

Therefore:

$$V = 36 \times 0.055 = 1.98 \text{ m}^3$$

Total runoff volume = 1.98 m³

3. Storage Requirement

With the discharge restricted to **2 l/s**, less water leaves the system during the critical storm than with a 5 l/s restriction, so additional attenuation is required.

For a 36 m² impermeable catchment, a preliminary storage allowance of approximately **1.2 m³** is appropriate, subject to hydraulic verification using FEH22 rainfall.



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4. Proposed Attenuation Tank

Proposed geocellular crate dimensions:

- Length = **2.00 m**
- Width = **1.00 m**
- Height = **0.65 m**

Gross volume:

$$V = lwh$$

$$V = 4 \times 3 \times 2 = 24$$

l
 l
 w
 w
 h
 h

$$l = 4h = 2w = 3$$

$$2.00 \times 1.00 \times 0.65 = 1.30 \text{ m}^3$$

Assuming a **95% void ratio**:

Effective storage

$$1.30 \times 0.95 = 1.24 \text{ m}^3$$

Storage Provided

1.24 m³

5. Flow Control

Install:

- Flow control chamber
- Hydro-Brake or equivalent vortex flow control
- Maximum discharge **2.0 l/s**
- 100 mm outlet pipe
- Catchpit upstream
- Inspection chamber
- Geotextile membrane around attenuation crates



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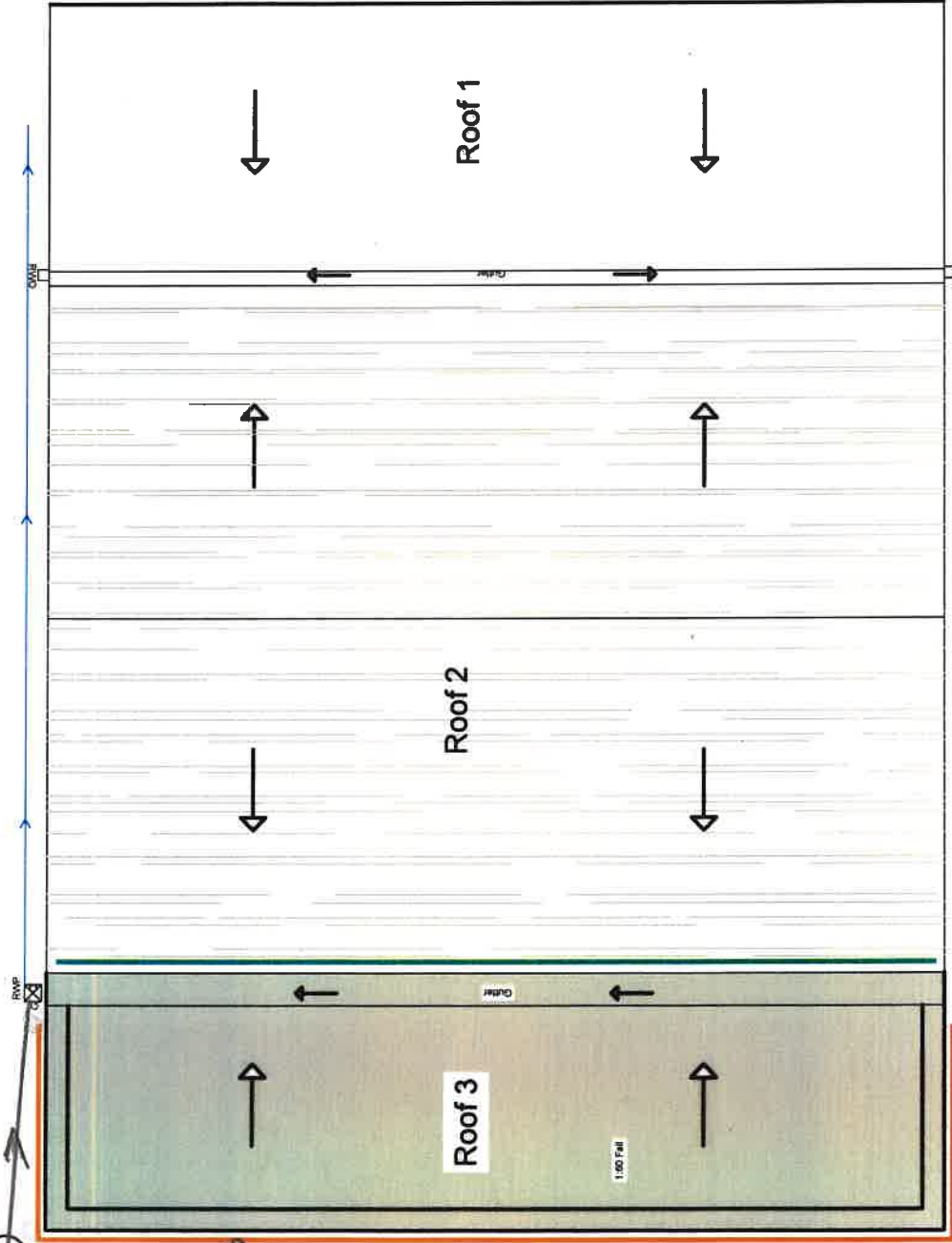
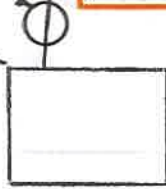
6. Compliance Summary

Item	Result
Impermeable Area	36 m ²
Allowable Discharge	2.0 l/s
Design Storm	1 in 100 year +40% CC
Estimated Storage Required	≈1.2 m ³ (preliminary)
Storage Provided	1.24 m³
Tank Size	2.0 × 1.0 × 0.65 m
Void Ratio	95%
Design Status	Suitable for preliminary Building Control submission

Wavin Aquacell alternative tank
 2.0 x 1.5 x 0.4 dp

Manhole with
 flow control to
 22/5

This is the existing gully to Roof 2.
 38m² of Roof 3 will drain into the existing combine system on site according to United Utilities own
 drawings. This is only an increase of 31m³ of water per annum from calculation.
 There is no new foul water drainage connections on site.
 There is no new connections to the main public sewer.
 Direction of drains as shown



Proposed Roof Plan
 1:50 @A1