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DRAINAGE AND SUDS STRATEGY

**Spencers Wood Primary School, Land at Fullbrook Lane
and Hyde End Lane, Three Mile Cross**

Report Title: Drainage and SUDS Strategy for Spencers Wood Primary School, Land at Fullbrook Lane and Hyde End Lane, Three Mile Cross

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This document must only be treated as a draft unless it has been signed by the originators and approved by a director.

<i>Revision</i>	<i>V03</i>
Date	13/11/2024
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EXECUTIVE SUMMARY

This Drainage Assessment reviews the existing drainage arrangement at the application site and proposes a surface water drainage strategy in line with Local Authority and Lead Local Flood Authority (LLFA) guidance.

The site is located at Spencers Wood Primary School, Land at Fullbrook Lane and Hyde End Lane, Three Mile Cross.

The proposed development comprises the construction of a new primary school and associated external works.

Flooding

An overview of flooding has been completed with the sources of flooding assessed and proposed mitigation measures listed in the table below.

Source	Risk Category (after mitigation)	Comments
Fluvial (Rivers and Sea)	Very Low	Site within flood zone 1
Coastal and tidal	Negligible	Not near coast or tidal waterbody
Groundwater	Low	Proposed finished floor levels are 150mm above external ground levels and natural topography reduces risk.
Surface water	Low	Low due to natural topography and presence of surface water drainage and falls away from the site
Sewers	Low	Low due to natural topography and presence of surface water drainage and falls away from the site
Reservoirs	Very Low	Reservoir at low danger of failure

Surface Water Drainage

It is proposed to discharge surface water to the TW sewer in the street. Discharge will be restricted to no greater than 2l/s. Attenuation will be provided in the paving subbase. Total storage volume is designed to ensure there is no flow off site in all storms up to the 100 year +40% storm event.

A 10% allowance for urban creep has been included within the calculations.

Maintenance/management of all onsite drainage infrastructure has been considered within a separate maintenance plan appended to this report. This will be updated through the development process.

Overall, the proposals provide a high level of water treatment, runoff reduction and flooding protection for the proposed development and are in accordance with all requirements of the Lead Local Flood Authority (LLFA).

Foul Drainage

It is proposed to discharge the foul drainage from the site into the existing Thames Water sewer.

1 INTRODUCTION

1.1 Background

1.1.1 Jomas was commissioned to undertake a Drainage Assessment for the proposed development of land located at Spencers Wood Primary School, Land at Fullbrook Lane and Hyde End Lane, Three Mile Cross.

1.1.2 The proposed development comprises the construction of a new primary school and associated external works.

1.1.3 This Drainage Assessment has been produced in support of a planning application and should be read in conjunction with the other planning documents.

2 SITE DESCRIPTION

2.1.1 The site is located at Spencers Wood Primary School, Land at Fullbrook Lane and Hyde End Lane, Three Mile Cross.

2.1.2 The total site is approximately 10570 square metres. Pre-development, the site is greenfield. Post development, the impermeable area will increase to 69% (7247 square metres).

2.1.3 The site location information is as follows:

- Nearest Postcode: RG7 1DF

2.2 Topography

2.2.1 The topographic survey plan is provided in appendix B. The site is generally rectangular in shape with a gentle fall towards the street corner.

3 DESIGN PRINCIPLES AND POLICY REQUIREMENTS

3.1.1 Since April 2015, Lead Local Flood Authorities (LLFA's) have become a statutory consultee on surface water drainage for many planning applications. For this site, the following is considered to be the required level of detail required for planning approval:

3.1.2 Report to be prepared in accordance with the National Planning Policy Framework (NPPF), the accompanying Planning Practice Guidance (PPG), Local Authority and Lead Local Flood Authority (LLFA) guidance and Strategic Flood Risk Assessments.

3.2 General Principles for Flooding

3.2.1 The National Planning Policy Framework (NPPF) states that when determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where informed by a site-specific FRA. This assessment is required for:

"Proposals of 1 hectare (ha) or greater in Flood Zone 1, all new development (including minor development and change of use) in Flood Zones 2 and 3 and an area within Flood Zone 1, which has critical drainage problems as notified to the local planning authority by the Environment Agency (EA)."

3.2.2 In accordance with the Planning Practice Guidance (PPG), which supports the NPPF, the objectives of this FRA are to establish:

- *Whether a proposed development is likely to be affected by current or future flooding from any source;*
- *Whether it will increase flood risk elsewhere;*
- *Whether the measures proposed to deal with these effects and risks are appropriate.*

3.3 General Principles for Surface Water Drainage

3.3.1 The DEFRA Sustainable Drainage Systems Non-Statutory Technical Standards for Sustainable Drainage Systems, the Local Authority Flood Risk Management Strategy, Level 2 Strategic Flood Risk Assessment and the Local Flood Risk Management Strategy require sustainable drainage systems in all development to reduce surface water runoff and provide water treatment on site. This includes but is not limited to addressing the following issues in order of preference:

- Store rainwater for later use.
- Use infiltration techniques, such as porous surfaces in non-clay areas.
- Attenuate rainwater in ponds or open water features for gradual release.

- Attenuate rainwater by storing in tanks or sealed water features for gradual release.
- Discharge rainwater direct to a watercourse.
- Discharge rainwater to a surface water sewer/drain.
- Discharge rainwater to the combined sewer.

3.3.2 Consideration must be given to the direction of water flow across the site and where this may be dispersed and incorporating any features that will help reduce surface water run-off. All developments should follow the drainage hierarchy and aim to infiltrate surface water where possible or achieve greenfield run off with at least a 50% reduction in surface water discharge and this needs to be demonstrated as part of the planning submission.

4 FLOODING INFORMATION

4.1 Flood Risk from Rivers (Fluvial)

4.1.1 As the site is within Flood Zone 1, there is a low risk of fluvial flooding to the site.

4.1.2 Based on the above, the risk of flooding from rivers is considered very low.

4.2 Coastal and Tidal Flood Risk

4.2.1 The site is located inland and is not near any tidally influenced watercourses; therefore, there is negligible risk of flooding from this source.

4.3 Geology and Hydrogeology

4.3.1 Groundwater flooding occurs when the water table rises to the surface and is most likely to occur in low-lying areas underlain by permeable rocks.

4.3.2 The British Geological Survey (BGS) and Aquifer Maps on the MAGIC map identifies the area as follows:

Bedrock – London Clay Formation - Clay, silt and sand. Sedimentary bedrock formed between 56 and 47.8 million years ago during the Palaeogene period.

Superficial Drift – River Terrace Deposits, 3 - Sand and gravel. Sedimentary superficial deposit formed between 2.588 million years ago and the present during the Quaternary period.

Other – Drinking Water safeguard zone

4.3.3 As the ground is impermeable, the site is considered to be at Low risk of groundwater flooding. This will be further mitigated by raising the floor level of the building and maintaining overland flow paths around the site.

4.4 Surface Water Flood Risk (Overland Flows)

4.4.1 Surface water flooding occurs when the rainwater does not drain away through the normal drainage system or infiltrate the ground, but instead lies on or flows over the ground.

4.4.2 The EA produced a Risk of Flooding from Surface Water Map in December 2013. The maps were produced using 'direct rainfall' modelling. Although they consider local drainage capacity, non-surface water influences such as rivers, seas or groundwater are not considered. The map is based on LIDAR topographic data which is not suitable for site specific assessment and therefore, where available, topographic survey data should be used to provide a more accurate understanding of potential flow paths.

4.4.3 The map shows the entire country within four different risk categories, defined below in Table 1.

Table 1: EA Surface Water Flood Risk Categories

Risk Category	Definition
High	Each year, there is a chance of flooding of greater than 1 in 30 (3.3%)
Medium	Each year, there is a chance of flooding of between 1 in 30 (3.3%) and 1 in 100 (1%)
Low	Each year, there is a chance of flooding of between 1 in 100 (1%) and 1 in 1000 (0.1%)
Very Low	Each year, there is a chance of flooding of less than 1 in 1000 (0.1%)

- 4.4.4 An extract of the map, provided below, shows that the site is generally at very low risk of surface water flooding. While there are some areas at low risk of flooding, these are proposed parking and green areas

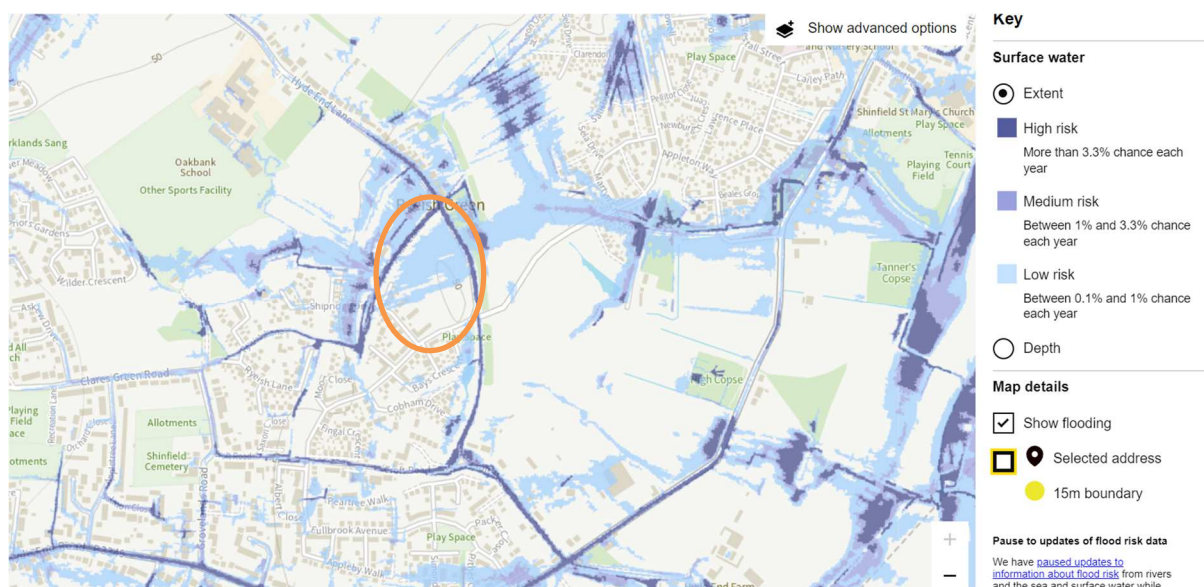


Figure 1: EA Flood Risk from Surface Water Map

- 4.4.5 Proposed floor levels will be raised above the existing ground to ensure the risk of flooding is minimised, and overland flow paths are maintained through the site to ensure free flow of water.
- 4.4.6 Based on the EA's mapping, historical data and local topography, risk of surface water flooding to the site is considered to be Low.

4.5 Sewer/Drainage Flood Risk

4.5.1 Sewer flooding is often caused by excess surface water entering the drainage system when there is insufficient sewer capacity to cope with this excess water, but also due to 'one off' events such as blockages.

4.5.2 Thames Water is the statutory undertaker for the local public sewer network. The nearest sewers to the site are located in the street frontage.

4.5.3 As these sewers are at a lower level than the site, the risk of flooding is low. A review of the local PFRA does not identify any flooding incidents at or near to the site.

4.5.4 On the basis there is considered to be a Low risk of sewer flooding to the site.

4.6 Reservoir Flood Risk

4.6.1 The EA has produced a Reservoir Flood Map that shows that the site is at low risk from reservoir flooding. This map indicates very low risk of reservoir flooding at this site.

4.6.2 It should be emphasised that the risk of flooding from reservoir breach is very small since the EA is the enforcement authority for the Reservoirs Act (1975) and all large raised reservoirs are inspected and supervised by reservoir panel engineers.

4.6.3 On the basis there is considered to be a very low risk of reservoir flooding to the site.

4.7 Summary of risk levels

4.7.1 Post-development, the risk of flooding is summarised below.

Table 2: Flood Risk Categories

Source	Risk Category
Fluvial (Rivers and Sea)	Very low
Coastal and tidal	Negligible
Groundwater	Low
Surface water	Low
Sewers	Low
Reservoirs	Very low

5 SITE DRAINAGE INFORMATION

5.1.1 The DEFRA Sustainable Drainage Systems Non-Statutory Technical Standards for Sustainable Drainage Systems (March, 2015) states that the following options must be considered for disposal of surface water runoff in order of preference:

- Discharge to ground
- Discharge to a surface water body
- Discharge to a surface water sewer
- Discharge to a combined sewer

5.1 Discharge to Ground

5.1.1 The potential for surface water to discharge to ground has been assessed through a review of the likely ground conditions and possible infiltration structures.

5.1.2 The British Geological Survey (BGS) mapping detailed in the flooding section above confirm that the site is underlain by impermeable clay. While it is noted that the superficial geology may be permeable there are local surface water sewers which indicates the ground is unlikely to be suitable for infiltration.

5.1.3 Based on the above it is not possible to discharge to ground.

5.2 Discharge to Surface Water Body

5.2.1 There are no suitable surface water bodies near to the site that can be used for surface water discharge.

5.3 Discharge to Surface Water Sewer/Combined Sewer

5.3.1 Discharge to the public sewer network should only be considered once all other options for draining surface water from the site have been exhausted.

5.3.2 As there are sewers adjacent to the site, these will be used for discharge of surface water.

5.4 Sustainable Drainage Systems (SuDS)

5.4.1 To maximise the potential use of SuDS at the site, a review has been undertaken as shown in Table 3 in accordance with the SuDS Hierarchy. This review highlights the components referenced in the SuDS Hierarchy and provides recommendations on whether the components could be incorporated into the development.

Table 3: SuDS Selection Based on the SuDS Hierarchy

Component	Recommendation
Green/Blue roofs	Whilst the use of green and blue roofs provides additional environmental benefits such as enhanced aesthetics and ecology, its exposure to wind and orientation must be considered. Access to undertake the construction and maintenance easily and safely is also a high priority. If feasible, depending on the roof design, a green/blue roof will provide water quality, biodiversity and aesthetic benefits to the site. Additionally, the green/blue roof/s will offer some attenuation for run-off, reducing volumes of run-off and in higher frequency events (i.e. 1in2 year storms) will result in no run-off for the building. There is an area of green roof proposed.
Basins and Ponds	Ponds and attenuation basins can provide overland storage of surface water whilst also providing additional biodiversity and aesthetic/amenity value. There are no open areas on the site which are suitable for basins or ponds.
Filter Strips and Swales	Swales are linear vegetated drainage features, which provide overland conveyance and storage of surface water whilst trapping sediments and hydrocarbons within run-off. They also create biodiverse areas for planting and habitat. Swales are not considered suitable for this site.
Infiltration Devices	Infiltration devices are unlikely to be suitable for the main drainage system due to the impermeable nature of the existing ground. Infiltration is unlikely to be possible for this site.
Permeable Paving	Whilst incorporating attenuation storage, permeable paving also provides treatment through filtration of silt (and attached pollutants), settlement and retention of solids, adsorption of pollutants and biodegradation of organic pollutants, including petrol and diesel. There is extensive tanked permeable paving proposed.
Tanked Systems	This is the least sustainable option in terms of the SuDS Hierarchy. However, the use of tanked systems would still be of benefit compared to traditional drainage systems as it does allow run-off to be slowed down to an acceptable discharge rate. There are no tanks proposed.

6 SURFACE WATER DRAINAGE DESIGN

6.1 Site Areas

6.1.1 The development area currently comprises a greenfield site with a new school proposed. The existing and proposed areas are summarised below.

Table 4: Site Areas

Parameter	Existing (m2)	Existing (%)	Proposed (m2)	Proposed (%)
Impermeable area	0	0	7247	69
Permeable area	10570	100	3323	31
Total area	10570	100	10570	100

6.1.2 It is assumed that the surface water runoff from the site currently discharges into the sewers in the street or infiltrates into the ground.

6.2 Design Considerations

6.2.1 Consideration has been given to the following when calculating the proposed impermeable areas.

- The 2013 EA 'Rainfall Run-off Management for Developments' Report (SC030219) states that urban creep, the process of gradually increasing impermeable area within an urban area (through paving soft landscaped surfaces and constructed outbuildings etc), is an acknowledged issue. To include an allowance for urban creep, the impermeable area used in the drainage calculations has been increased by 10% in accordance with the recommendation made in SC030219.

6.2.2 The climate change allowance used in the Drainage Strategy is in line with updated EA guidance values published in February 2016 for increased rainfall intensities by 2115.

6.3 Greenfield Run-Off Rates

6.3.1 The greenfield run off rates have been calculated using the Wallingford method. Calculations are provided in Appendix C and summarised in the table below.

6.3.2 The discharge rates for the existing and proposed site are summarised below.

Table 5: Existing Run-off Rates

Parameter	Greenfield Discharge (l/s)	Proposed Discharge Total (l/s)
QBAR	2.35	NA

1075 - Spencers Wood Primary School**Permeable area calculation****25-Oct-24****D01**

Total Site area	m2
------------------------	-----------

10570

Permeable Softworks	m2	Percentage %
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SL1 - Native Boundary Planting	349.9	3%
SL2 - Other Boundary/Structure Planting	286.4	3%
SL3 - Ornamental Planting	70.8	1%
SL4 - Sensory Planting	231.7	2%
SL5 - Wildflower Meadow	82.1	1%
SL6 - Biodiverse Roof planting	161.8	2%
RG1 - Rain Garden Planting	131.5	1%
Hedgerows	73.2	1%

Total Permeable Softworks	1387.4	13%
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Permeable Hardworks	m2	Percentage %
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P1 - Permeable Asphalt Surface	1091.9	10%
P3 - PCC Block Paving	648.9	6%
P4 - Play Bark	194.4	2%

Total Permeable Hardworks	1935.2	18%
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Total Permeable area with the site	3322.6
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Percentage of Permeable area within the site	31%
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1 year	2.00	1.6
30 year	5.41	1.7
100 year	7.5	1.8
100 year +40%	NA	2

6.3.3 Site discharge should be as close to the greenfield rates as possible.

6.4 Attenuation

6.4.1 There is an area of green roof proposed, for the purposes of this report, it is assumed this does not provide any attenuation.

6.4.2 For the surface water drainage system, discharge will be restricted to no greater than 2l/s for the site. Total storage volume of 630 cubic metres will be stored in the permeable paving subbase. This caters for the 100 year +40% storm event.

6.4.3 Discharge will be to the existing Thames Water sewer in the street. Approval for the connection and discharge rate will be obtained from TW prior to construction.

6.4.4 Calculations and design drawings are provided in Appendix B.

6.5 Consents, Offsite Works and Diversions

6.5.1 The proposed surface water drainage strategy is accommodated entirely on site.

6.5.2 Consent will be required for the foul discharge to the sewer.

6.6 Maintenance

6.6.1 A SuDS maintenance plan has been prepared to outline the management of the potential SuDS features. The maintenance plan is provided in Appendix D.

6.7 Exceedance Flooding and Overland Flow

6.7.1 The drainage system has been designed to cater for the 1 in 100 year + 40% climate change storm. ie in this storm event all surface water will be collected on site and slowly released. Thus, the overland flow route for the site drainage will only be in use in the event of drainage network failure, storms in excess of the 1 in 100 year + 40% climate change storm or flows from offsite flowing through the site. See Appendix B for overland flow plan.

6.8 Foul Drainage

6.8.1 Foul drainage will discharge to the existing sewer in the street. A Sewer connection application will be submitted for approval.

7 DRAINAGE DURING CONSTRUCTION

7.1 Construction Run-off Management

7.1.1 Installing the surface water and foul drainage system, whilst managing temporary run-off, are key aspects of the construction works involved in any development. The information provided below is in accordance with the 'C698 Site handbook for the construction of SUDS' (CIRIA, 2007).

7.1.2 Please note that the measures recommended below are recommendations only and need to be confirmed at the construction stage by the client and the contractor.

7.2 Management of Construction (Including Drainage)

7.2.1 Drainage is typically an early activity in the construction stage of a development, taking form during the earthworks phase. However, final construction i.e. piped drainage system connections to the SuDS devices, should not take place until the end of site development work, unless a robust strategy for silt-removal is implemented prior to occupation of the site.

7.2.2 A plan for the management of construction (including phasing of works, details of any offsite works etc.) cannot be provided at this early stage, as construction work plans are not yet known. However, the following key points are general construction issues associated with SuDS which will be addressed when these plans are complete:

- Silt-laden waters from construction sites represent a common form of waterborne pollution;
- These silt-laden waters cannot enter SUDS drainage systems unless specifically designed to accept this as it can clog the systems and pollute receiving waters. Therefore, piped drainage systems should not be connected to the attenuation SuDS devices until the late stages of construction.
- Any gullies and piped systems should be capped off during construction and fully jetted and cleaned prior to connection to the attenuation SuDS devices.

7.3 Temporary Drainage During Construction

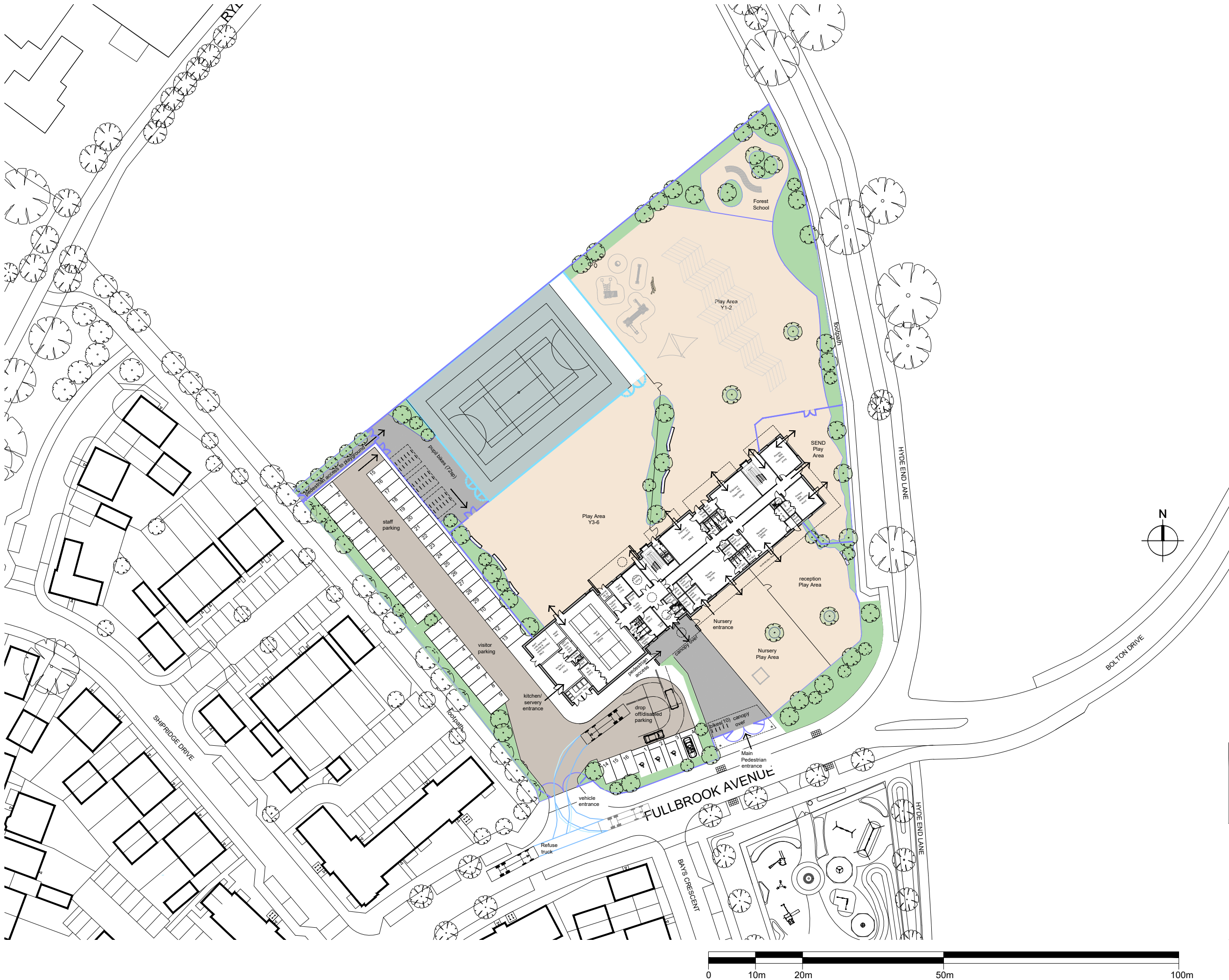
7.3.1 The three principal aspects of drainage control during construction are trapping sediment, conveying run-off, and controlling run-off.

7.3.2 Sediment traps and barriers can include basin traps and sediment fences (with any necessary boundary controls). The principal basins are to be installed after the construction site is accessed. Sediment fences and barriers will then be installed as needed during grading.

7.3.3 Conveyance of run-off can be achieved through small ditches/stream, storm drains, channels and sloped drains with sufficient inlet/outlet protection.

- 7.3.4 Slope stability needs to be considered when using any channels to convey run-off across the site into any basins etc.
- 7.3.5 Run-off control measures will need to be implemented in order not overwhelm the temporary system and cause flooding issues. Run-off rates from the site will be managed so they are no greater than pre-development or in keeping with the best practice guidance to minimise risk of blockage. Any additional conveyance measures are to be installed as needed during grading.
- 7.3.6 Run-off control to include provision of perimeter ditches or appropriate levels grading to direct any water from the construction site to remain on site.
- 7.3.7 Any necessary surface stabilisation measures are to be applied immediately on all disturbed areas where construction work is either delayed or incomplete.
- 7.3.8 Maintenance inspections are to be performed weekly, and maintenance repairs to be made immediately after periods of rainfall.
- 7.4 Protection of Drainage Infrastructure during Construction**
 - 7.4.1 All drainage infrastructure should be protected from damage by construction traffic and heavy machinery through the implementation of measures such as protective barriers, and storing construction materials away from the drainage infrastructure.

APPENDIX A: PROPOSED DEVELOPMENT DETAILS



DRAWING NOTES

1. filename: PROP site plan.dwg

2. Do not scale from this drawing in either paper or digital form. Use figured dimensions only. Detailed site survey to be carried out to establish tolerances. Figured dimensions are in mm. All dimensions shall be verified on site before proceeding with the work. The architect shall be notified of any discrepancies.

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REVISIONS

REV	DATE	STATUS
D08	25.10.24	S3

Changes since last issue:

- Minor amendments to landscape design

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NC	RSS1075	S3	D08

PROJECT	ORIGIN	VOLUME	LEVEL	TYPE	ROLE	NUMBER
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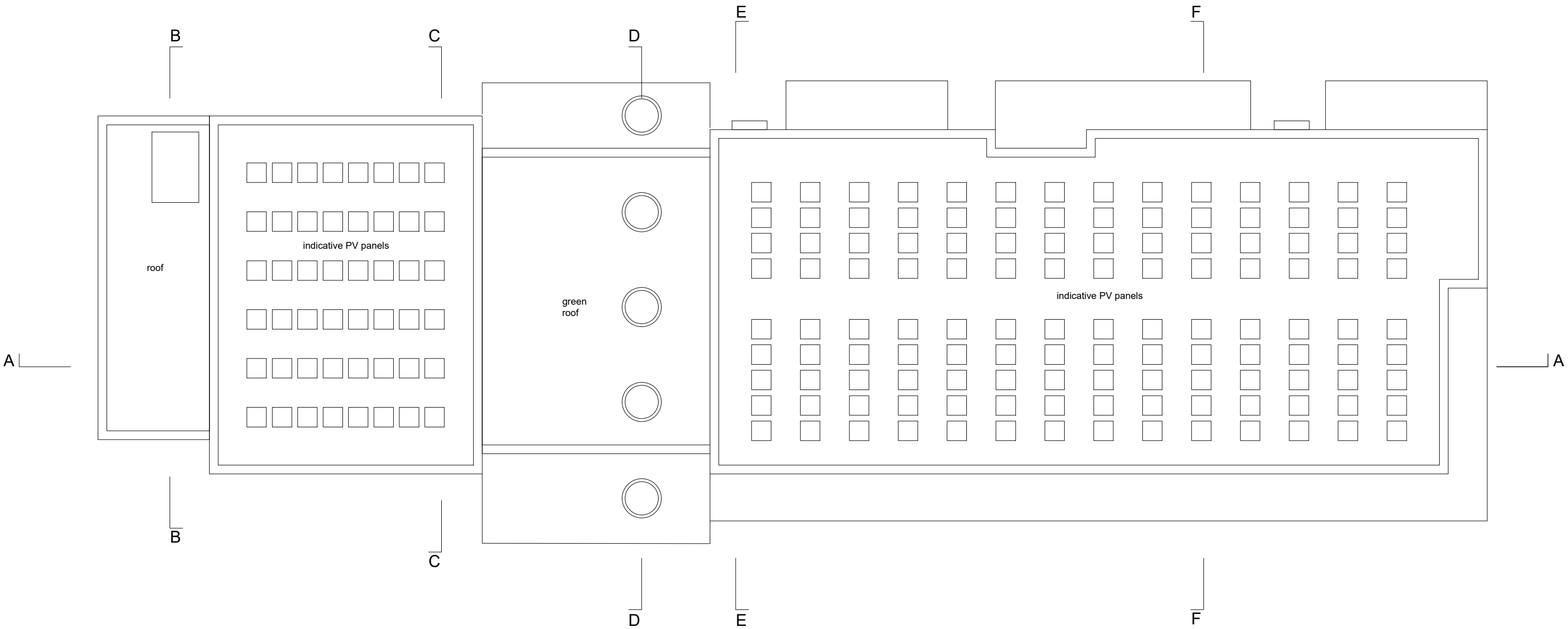
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SPW	_ RSS	_ 00	_ ZZ	_ DR	_ A	_ 0502



DRAWING NOTES

1. filename: PROP PLAN RF.dwg
2. Do not scale this drawing in either paper or digital form. Use figured dimensions only. Detailed site survey to be carried out to establish tolerances. Figured dimensions are in mm. All dimensions shall be verified on site before proceeding with the work. The architect shall be notified of any discrepancies.
3. This drawing has been produced for sole use on this project and is not intended for use by any other person or for any other purpose. © Copyright RSS (U.K.)
4. All printed copies should be made at 100% of the original page size. Use scale bars, where included, to check that the drawing has been printed to the intended scale as identified in the drawing title block.
5. This drawing is not intended for construction unless specifically described as such.

REVISIONS

REV	DATE	STATUS
-	-	-
Changes since last issue:		
-		

28 NAVIGATION ROAD LONDON E3 3TG
T : 020 7739 8945
E : rss@rssa.co.uk

rivingtonstreetstudio

job title SPENCERS WOOD PRIMARY SCHOOL

drawing title PROPOSED ROOF PLAN

drawn by	job no.	suitability	revision
SM	RSS1075	S3	D01
scale	1:200@A3		

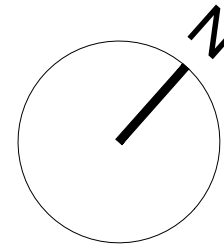
PROJECT	ORIGIN.	VOLUME	LEVEL	TYPE	ROLE	NUMBER
SPW	RSS	00	RF	DR	A	1212



- SOFTWORKS KEY**
- SL1 NATIVE BOUNDARY PLANTING
 - SL2 OTHER BOUNDARY PLANTING / STRUCTURE PLANTING
 - SL3 ORNAMENTAL PLANTING
 - SL4 SENSORY PLANTING
 - SL5 WILDFLOWER MEADOW
 - SL6 BIODIVERSE ROOF PLANTING
 - RG1 RAIN GARDEN PLANTING
 - HEDGEROWS
 - PROPOSED TREES

- HARDWORKS KEY (PERMEABLE SURFACING)**
- P1 PERMEABLE ASPHALT SURFACE
Tarmac: Ultraporous permeable macadam surface.
www.tarmac.com - or equivalent
 - P3 PCC BLOCK PAVING - TO CAR PARKING BAYS
210 x 140 x 60mm
Brett Alpha Flow aggregate paving. Colour: Autumn Gold.
www.brettlandscaping.co.uk - or equivalent
 - P4 PLAY BARK
Fine play bark Minimum 75mm depth, 18-35mm particle size.
FSC Certified Source: BS EN 4790:1987 Fire Tested
www.cpa-horticulture.co.uk - or equivalent

GENERAL NOTES:
1. ALL DIMENSIONS AND LEVELS SHALL BE CHECKED ON SITE PRIOR TO CONSTRUCTION WORK COMMENCING.
2. ALL LANDSCAPE DRAWINGS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS AND ARCHITECTS DRAWINGS AND SPECIFICATIONS.
3. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH THE LANDSCAPE SPECIFICATION.
4. ANY DISCREPANCY CONCERNING THE DRAWINGS SHOULD BE REFERRED TO THE CA IMMEDIATELY.
5. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
6. ALL LEVELS IN METRES.
7. DO NOT SCALE OFF THIS DRAWING.
8. EXISTING SERVICE ALIGNMENTS SHALL BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION WORK COMMENCING.
9. HATCHES DO NOT INDICATE LAYING PATTERN, REFER TO SPECIFICATION AND DETAILS FOR REQUIREMENTS.



Revisions		
Rev	Date	Description
P01	05.07.2024	First Issue
P02	19.07.2024	General amendments
P03	10.09.2024	General amendments. Rain gardens added.
P04	22.10.2024	General amendments

49 Canonbie Road, London SE23 3AQ
07371 696 601 info@me-landscape.com



Project	Spencers Wood Primary School		
Drawing	Landscape Softworks Plan		
Drawing No.	XXXX-MEL-XX-ZZ-DR-L-0200	Scale	1:250@A1
Drawn	AS	Checked	ML
Status	S4	Date	05.07.2024
Rev	P04		

APPENDIX B: DRAINAGE DRAWINGS AND CALCULATIONS

Calculated by:	andrew wallace
Site name:	Spencers Wood
Site location:	School

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.39883° N
Longitude:	0.95899° W
Reference:	378235659
Date:	Jul 09 2024 15:07

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.532
-----------------------	-------

Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	649	649
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default

Edited

Q_{BAR} (l/s):	2.35	2.35
1 in 1 year (l/s):	2	2
1 in 30 years (l/s):	5.41	5.41
1 in 100 year (l/s):	7.5	7.5
1 in 200 years (l/s):	8.79	8.79

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

0100@1:100-

Summer Pipe - Diameter and fall

0100@1:100-

Perforated Pipe - Diameter and fall

0100@1:100-

Manhole type - SMH surface Water

0100@1:100-

Manhole type - SMH surface Water

0100@1:100-

Manhole type - SMH surface Water

0100@1:100-

Manhole type - SMH surface Water

0100@1:100-

Surface Water Polypropylene Inspection Chamber (PPIC)

0100@1:100-

Rain Water Pipe

0100@1:100-

Foul Pipe - Diameter and fall

0100@1:100-

Manhole type - FMH Foul Water

0100@1:100-

Manhole type - FMH Foul Water

0100@1:100-

Manhole type - FMH Foul Water

0100@1:100-

Manhole type - FMH Foul Water

0100@1:100-

Foul Polypropylene Inspection Chamber (PPIC)

0100@1:100-

Sewer Vent Pipe/Stub Stack/Foul Outlet

0100@1:100-

Sewer Vent Pipe/Stub Stack/Foul Outlet

0100@1:100-

Sewer Vent Pipe/Stub Stack/Foul Outlet

0100@1:100-

Sewer Vent Pipe/Stub Stack/Foul Outlet

0100@1:100-

Combined Polypropylene Inspection Chamber (PPIC)

0100@1:100-

Permeable Paving - see detail

0100@1:100-

Permeable Asphalt - see detail

0100@1:100-

Permeable Asphalt - see detail

0100@1:100-

Permeable Asphalt - see detail

0100@1:100-

Proposed Level

0100@1:100-

Finished Floor Level

0100@1:100-

Finished Basement Level

0100@1:100-

EXTERNAL WORKS KEY

0100@1:100-

18.30+

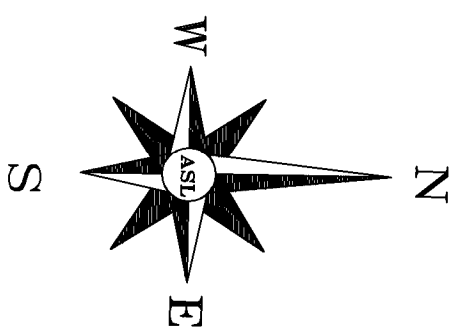
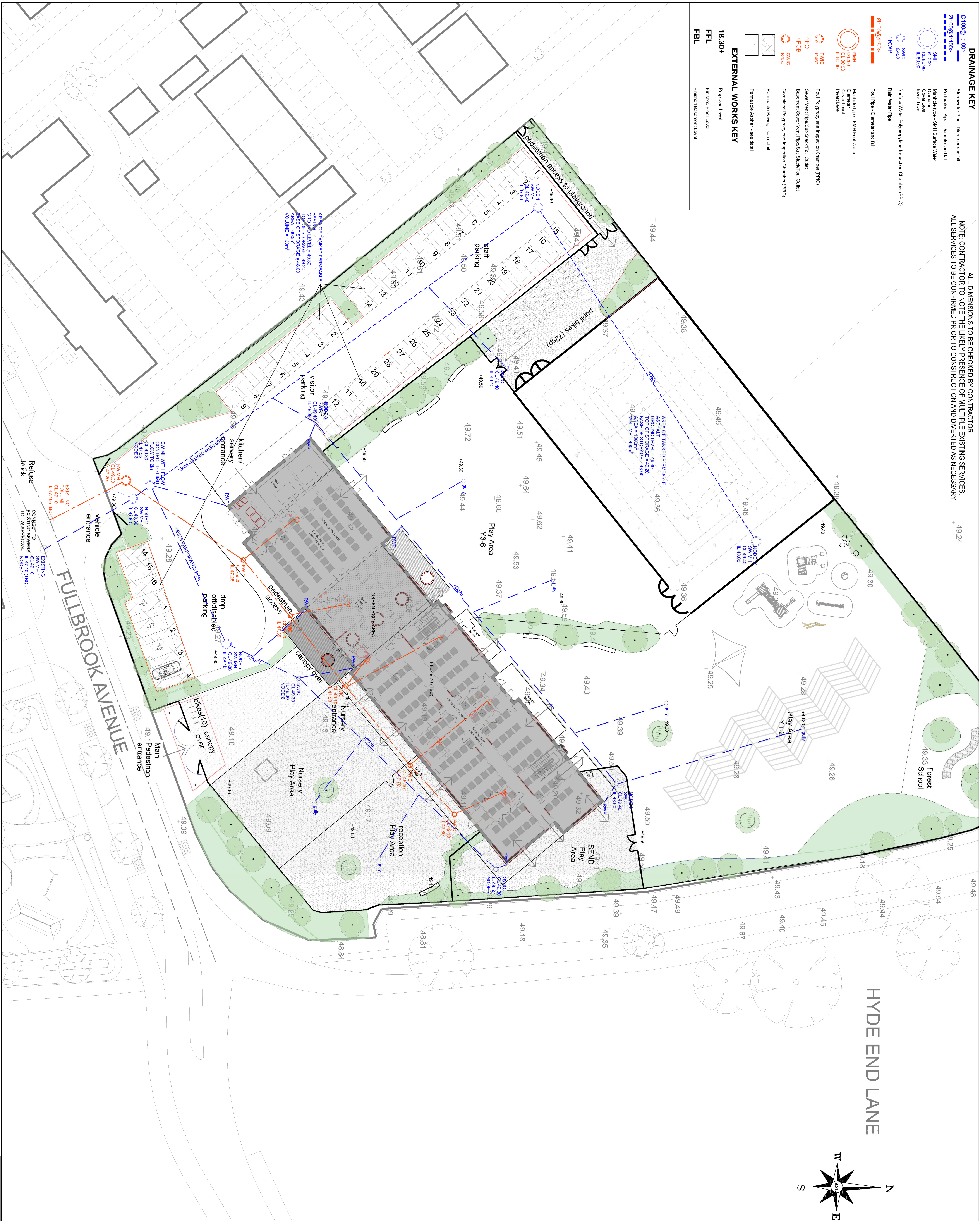
0100@1:100-

FFL

0100@1:100-

FBL

ALL DIMENSIONS TO BE CHECKED BY CONTRACTOR
NOTE: CONTRACTOR TO NOTE THE LIKELY PRESENCE OF MULTIPLE EXISTING SERVICES.
ALL SERVICES TO BE CONFIRMED PRIOR TO CONSTRUCTION AND DIVERTED AS NECESSARY



- Job No. P5937J3010 Rev.
- DRAINAGE NOTES

1. THIS DRAWING IS FOR PLANNING ONLY AND IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT SERIES DESIGN DRAWINGS, SPECIFICATIONS AND DOCUMENTATION.

2. CONSTRUCTION TO BE IN ACCORDANCE WITH ALL BRITISH AND EUROPEAN STANDARDS AND BUILDING REGULATIONS.

3. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS IN METRES ABOVE LOCAL DATUM.

4. ANY DISCREPANCIES IN THE DETAILS SHOWN ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY PRIOR TO CONSTRUCTION.

5. ALL EXISTING SERVICES ARE TO BE LOCATED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND NOTIFIED TO THE ENGINEER IMMEDIATELY OF ANY CONFLICT WITH THE PROPOSED WORKS.

6. THE GENERAL SPECIFICATION OF MATERIALS AND WORKMANSHIPS FOR THE CONSTRUCTION OF THE ACCESS ROAD, FOOTPATHS AND OTHER AREAS OF HARDSTANDING HIGHWAY WORKS VOLUME 1 SPECIFICATION OF HIGHWAY WORKS (SHW) PUBLISHED BY THE STATIONARY OFFICE.

7. ALL LEVELS SHOWN ARE ASSUMED ONLY AND SUBJECT TO SURVEY AND DETAILED DESIGN.

8. ALL DRAINAGE DESIGN IS INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN.

9. NODE NUMBERS REFER TO DRAINAGE MODEL.

10. UNLESS NOTED OTHERWISE, PIPES TO BE:
FOUL PIPES UNDER BUILDING #1000/40,
FOUL PIPES EXTERNAL #1000/80,
SURFACE WATER PIPES #1000/100

Notes.

Copyright of this plan is held by Jomas Associates Ltd. No responsibility is taken for amendments by others. Do not scale from copies or PDFs. Key dimensions to be checked by engineer before major structural works commence on site.

1. This survey has been computed and drawn about O S National Grid.
2. All levels are in metres and relate to O S National Datum by GPS measurements.
3. This survey was measured for a scale of 1:100, any subsequent enlargements should be verified on site.

Amendments

Rev	Date	By	Chkd
01	12.11.24	AW	AW
02	13.11.24	AW	AW

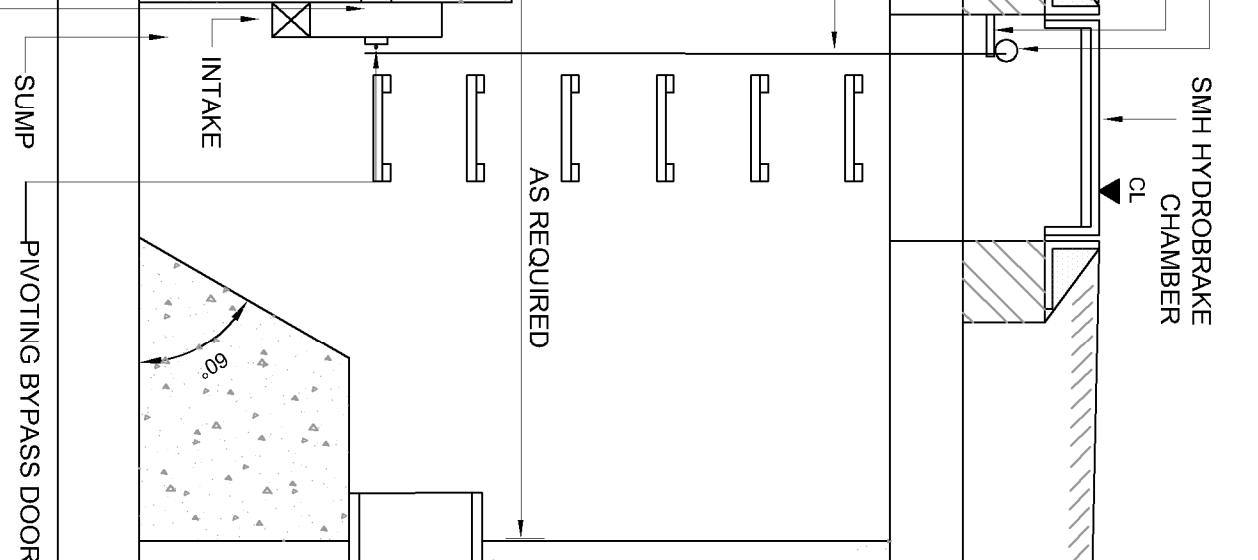
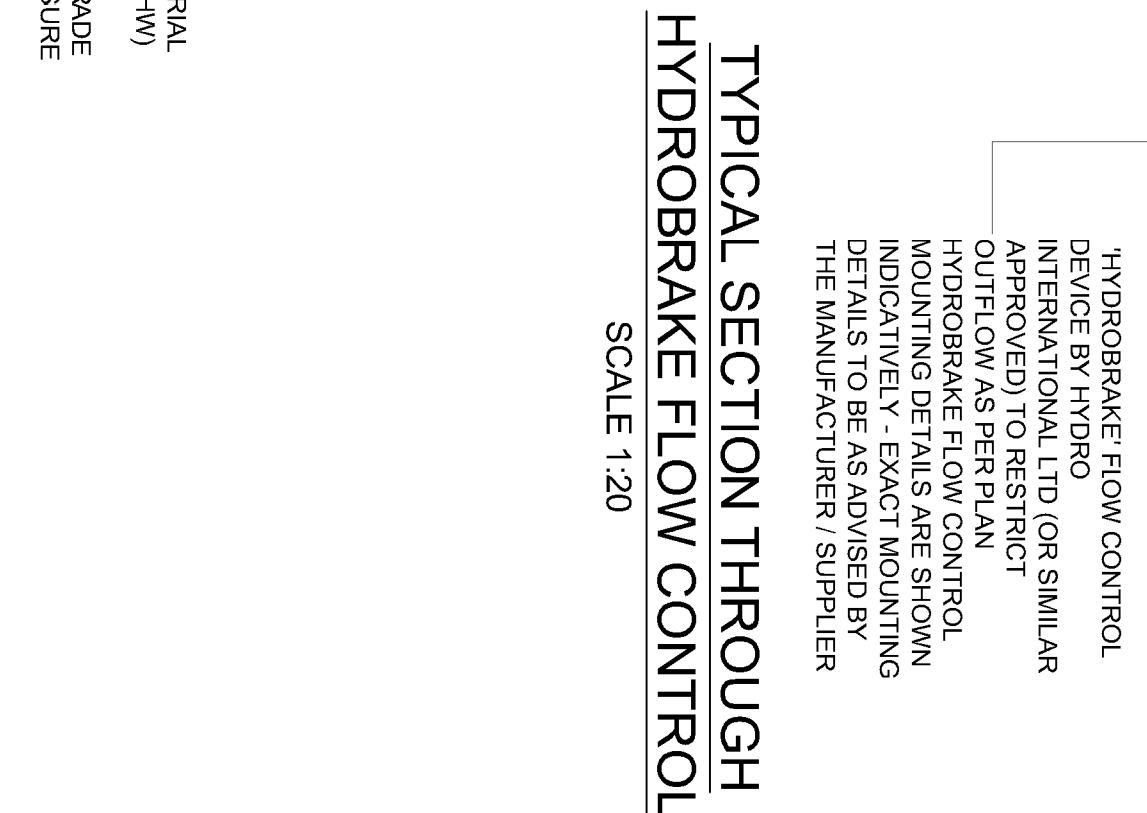
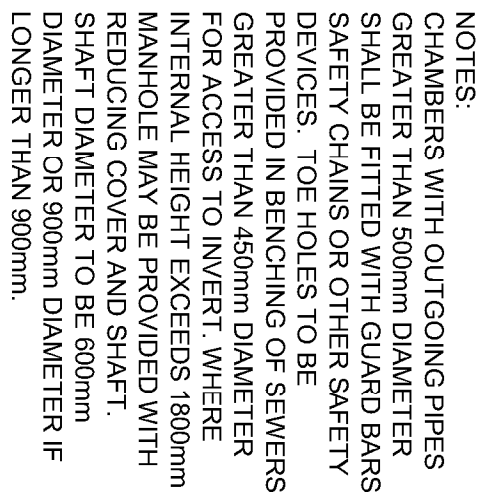
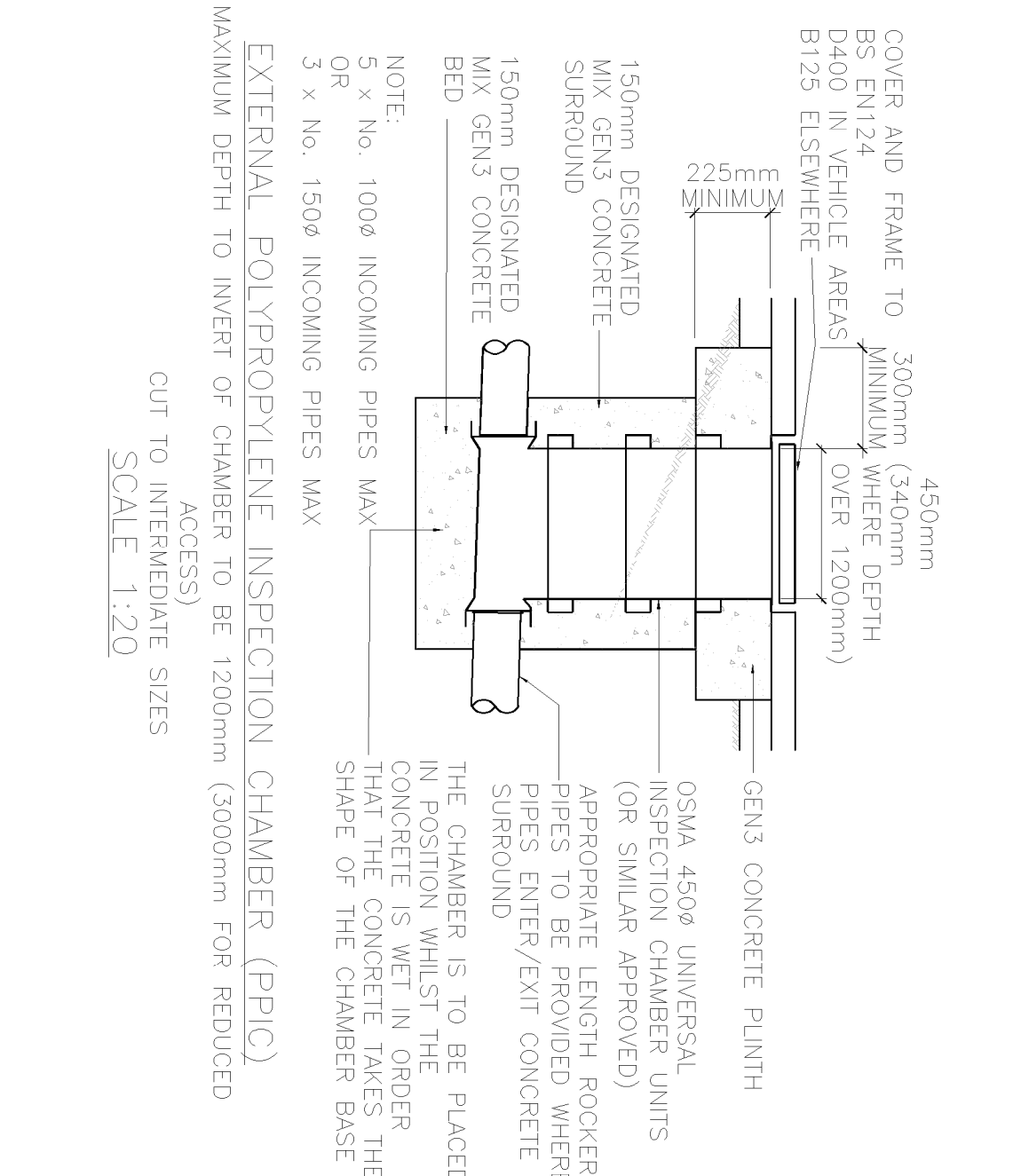
JOMAS
ENGINEERING
Jomas Associates Ltd.
Unit 24 Saturn Complex,
Salisbury Road,
Uxbridge, UB8 2RZ

Client
Rivington Street Studio

Project
Spencers Wood Primary School,
Land at Fulbrook Lane and Hyde
End Lane, Three Mile Cross

Drawing
Proposed Drainage Plan

Dwg no.	Checked	Surveyor
C01	AW	NA
Date	10.07.24	Scale 1:250 @ A1
Job No.	P5937J3010	Rev. 02
Grid	Contours	Level Datum



ROCKER PIPE *
LENGTH
500mm-750mm
750mm-1000mm
1200mm

[illegible]

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	10	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	0.600
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1			49.100	1200	100.000	100.000	1.700
2			49.300	1200	97.000	108.000	1.800
3	0.100	2.00	49.300	1200	96.000	110.000	1.750
4	0.050	2.00	49.400	1200	70.000	181.000	1.600
5	0.050	2.00	49.300	450	125.000	115.000	1.200
6	0.150	2.00	49.300	450	135.000	120.000	1.000
7	0.100	2.00	49.300	450	175.000	130.000	0.800
8	0.180	2.00	49.400	450	110.000	135.000	1.400
9	0.050	2.00	49.400	450	172.000	145.000	0.800
10	0.100	2.00	49.400	1200	100.000	190.000	1.400

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.003	2	1	8.544	0.600	47.500	47.400	0.100	85.4	150	3.60	50.0
1.002	3	2	2.236	0.600	47.550	47.500	0.050	44.7	150	3.47	50.0
1.001	4	3	75.611	0.600	47.800	47.550	0.250	302.4	450	3.44	50.0
3.002	5	3	29.428	0.600	48.100	47.550	0.550	53.5	375	2.82	50.0
3.001	6	5	11.180	0.600	48.300	48.100	0.200	55.9	375	2.62	50.0
3.000	7	6	41.231	0.600	48.500	48.300	0.200	206.2	375	2.55	50.0
2.000	9	8	62.801	0.600	48.600	48.000	0.600	104.7	375	2.59	50.0
2.001	8	3	28.653	0.600	48.000	47.550	0.450	63.7	375	2.80	50.0
1.000	10	4	31.321	0.600	48.000	47.800	0.200	156.6	375	2.36	50.0

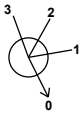
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.003	1.088	19.2	105.7	1.650	1.550	0.780	0.0	150	1.108
1.002	1.508	26.7	105.7	1.600	1.650	0.780	0.0	150	1.537
1.001	1.163	185.0	20.3	1.150	1.300	0.150	0.0	100	0.774
3.002	2.481	274.1	40.7	0.825	1.375	0.300	0.0	97	1.800
3.001	2.427	268.1	33.9	0.625	0.825	0.250	0.0	89	1.678
3.000	1.258	138.9	13.6	0.425	0.625	0.100	0.0	79	0.809
2.000	1.770	195.5	6.8	0.425	1.025	0.050	0.0	47	0.840
2.001	2.273	251.1	31.2	1.025	1.375	0.230	0.0	88	1.564
1.000	1.445	159.6	13.6	1.025	1.225	0.100	0.0	73	0.890

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.003	8.544	85.4	150	Circular	49.300	47.500	1.650	49.100	47.400	1.550
1.002	2.236	44.7	150	Circular	49.300	47.550	1.600	49.300	47.500	1.650
1.001	75.611	302.4	450	Circular	49.400	47.800	1.150	49.300	47.550	1.300
3.002	29.428	53.5	375	Circular	49.300	48.100	0.825	49.300	47.550	1.375
3.001	11.180	55.9	375	Circular	49.300	48.300	0.625	49.300	48.100	0.825
3.000	41.231	206.2	375	Circular	49.300	48.500	0.425	49.300	48.300	0.625
2.000	62.801	104.7	375	Circular	49.400	48.600	0.425	49.400	48.000	1.025
2.001	28.653	63.7	375	Circular	49.400	48.000	1.025	49.300	47.550	1.375
1.000	31.321	156.6	375	Circular	49.400	48.000	1.025	49.400	47.800	1.225

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.003	2	1200	Manhole	Adoptable	1	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	4	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
3.002	5	450	Manhole	Adoptable	3	1200	Manhole	Adoptable
3.001	6	450	Manhole	Adoptable	5	450	Manhole	Adoptable
3.000	7	450	Manhole	Adoptable	6	450	Manhole	Adoptable
2.000	9	450	Manhole	Adoptable	8	450	Manhole	Adoptable
2.001	8	450	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.000	10	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	100.000	100.000	49.100	1.700	1200		1	1.003	47.400	150
2	97.000	108.000	49.300	1.800	1200		1	1.002	47.500	150
3	96.000	110.000	49.300	1.750	1200		0	1.003	47.500	150
							1	3.002	47.550	375
							2	2.001	47.550	375
							3	1.001	47.550	450
						0	1.002	47.550	150	
4	70.000	181.000	49.400	1.600	1200		1	1.000	47.800	375
							0	1.001	47.800	450
5	125.000	115.000	49.300	1.200	450		1	3.001	48.100	375
							0	3.002	48.100	375
6	135.000	120.000	49.300	1.000	450		1	3.000	48.300	375
							0	3.001	48.300	375
7	175.000	130.000	49.300	0.800	450					
							0	3.000	48.500	375
8	110.000	135.000	49.400	1.400	450		1	2.000	48.000	375
							0	2.001	48.000	375
9	172.000	145.000	49.400	0.800	450					
							0	2.000	48.600	375
10	100.000	190.000	49.400	1.400	1200					
							0	1.000	48.000	375

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m³/ha)	5.0
Ratio-R	0.400	Starting Level (m)	
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
10	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node 3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	47.550	Product Number	CTL-SHE-0060-2000-1600-2000
Design Depth (m)	1.600	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	600.0	0.0	1.200	600.0	0.0	1.201	0.1	0.0

Node 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1000.0	0.0	1.200	1000.0	0.0	1.201	0.1	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991
1 year 15 minute winter	76.857	30.991
1 year 30 minute summer	71.439	20.215
1 year 30 minute winter	50.133	20.215
1 year 60 minute summer	48.435	12.800
1 year 60 minute winter	32.179	12.800
1 year 120 minute summer	30.053	7.942
1 year 120 minute winter	19.966	7.942
1 year 180 minute summer	23.233	5.979
1 year 180 minute winter	15.102	5.979
1 year 240 minute summer	18.475	4.882
1 year 240 minute winter	12.274	4.882
1 year 360 minute summer	14.169	3.646
1 year 360 minute winter	9.210	3.646

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 480 minute summer	11.185	2.956
1 year 480 minute winter	7.431	2.956
1 year 600 minute summer	9.182	2.511
1 year 600 minute winter	6.274	2.511
1 year 720 minute summer	8.203	2.199
1 year 720 minute winter	5.513	2.199
1 year 960 minute summer	6.768	1.782
1 year 960 minute winter	4.483	1.782
1 year 1440 minute summer	4.949	1.326
1 year 1440 minute winter	3.326	1.326
1 year 2160 minute summer	3.574	0.988
1 year 2160 minute winter	2.462	0.988
1 year 2880 minute summer	2.986	0.800
1 year 2880 minute winter	2.007	0.800
1 year 4320 minute summer	2.276	0.595
1 year 4320 minute winter	1.499	0.595
1 year 5760 minute summer	1.885	0.483
1 year 5760 minute winter	1.220	0.483
1 year 7200 minute summer	1.609	0.410
1 year 7200 minute winter	1.038	0.410
1 year 8640 minute summer	1.409	0.359
1 year 8640 minute winter	0.910	0.359
1 year 10080 minute summer	1.260	0.322
1 year 10080 minute winter	0.813	0.322
10 year 15 minute summer	211.819	59.937
10 year 15 minute winter	148.645	59.937
10 year 30 minute summer	136.831	38.718
10 year 30 minute winter	96.022	38.718
10 year 60 minute summer	90.826	24.003
10 year 60 minute winter	60.342	24.003
10 year 120 minute summer	54.899	14.508
10 year 120 minute winter	36.474	14.508
10 year 180 minute summer	41.666	10.722
10 year 180 minute winter	27.084	10.722
10 year 240 minute summer	32.645	8.627
10 year 240 minute winter	21.689	8.627
10 year 360 minute summer	24.632	6.339
10 year 360 minute winter	16.012	6.339
10 year 480 minute summer	19.260	5.090
10 year 480 minute winter	12.796	5.090
10 year 600 minute summer	15.690	4.291
10 year 600 minute winter	10.720	4.291
10 year 720 minute summer	13.925	3.732
10 year 720 minute winter	9.358	3.732
10 year 960 minute summer	11.365	2.993
10 year 960 minute winter	7.528	2.993
10 year 1440 minute summer	8.174	2.191
10 year 1440 minute winter	5.493	2.191
10 year 2160 minute summer	5.799	1.603
10 year 2160 minute winter	3.996	1.603
10 year 2880 minute summer	4.788	1.283
10 year 2880 minute winter	3.218	1.283

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year 4320 minute summer	3.587	0.938
10 year 4320 minute winter	2.362	0.938
10 year 5760 minute summer	2.932	0.751
10 year 5760 minute winter	1.898	0.751
10 year 7200 minute summer	2.475	0.631
10 year 7200 minute winter	1.597	0.631
10 year 8640 minute summer	2.148	0.548
10 year 8640 minute winter	1.387	0.548
10 year 10080 minute summer	1.906	0.486
10 year 10080 minute winter	1.230	0.486
30 year 15 minute summer	268.706	76.035
30 year 15 minute winter	188.566	76.035
30 year 30 minute summer	174.929	49.499
30 year 30 minute winter	122.757	49.499
30 year 60 minute summer	116.589	30.811
30 year 60 minute winter	77.459	30.811
30 year 120 minute summer	70.438	18.615
30 year 120 minute winter	46.797	18.615
30 year 180 minute summer	53.298	13.715
30 year 180 minute winter	34.645	13.715
30 year 240 minute summer	41.604	10.995
30 year 240 minute winter	27.641	10.995
30 year 360 minute summer	31.221	8.034
30 year 360 minute winter	20.295	8.034
30 year 480 minute summer	24.324	6.428
30 year 480 minute winter	16.160	6.428
30 year 600 minute summer	19.756	5.404
30 year 600 minute winter	13.498	5.404
30 year 720 minute summer	17.490	4.687
30 year 720 minute winter	11.754	4.687
30 year 960 minute summer	14.215	3.743
30 year 960 minute winter	9.416	3.743
30 year 1440 minute summer	10.161	2.723
30 year 1440 minute winter	6.829	2.723
30 year 2160 minute summer	7.160	1.979
30 year 2160 minute winter	4.933	1.979
30 year 2880 minute summer	5.883	1.577
30 year 2880 minute winter	3.953	1.577
30 year 4320 minute summer	4.374	1.143
30 year 4320 minute winter	2.880	1.143
30 year 5760 minute summer	3.554	0.910
30 year 5760 minute winter	2.301	0.910
30 year 7200 minute summer	2.987	0.762
30 year 7200 minute winter	1.928	0.762
30 year 8640 minute summer	2.583	0.659
30 year 8640 minute winter	1.667	0.659
30 year 10080 minute summer	2.284	0.583
30 year 10080 minute winter	1.474	0.583
100 year 15 minute summer	348.738	98.681
100 year 15 minute winter	244.728	98.681
100 year 30 minute summer	228.965	64.789
100 year 30 minute winter	160.677	64.789

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year 60 minute summer	153.288	40.510
100 year 60 minute winter	101.841	40.510
100 year 120 minute summer	92.562	24.461
100 year 120 minute winter	61.496	24.461
100 year 180 minute summer	69.806	17.964
100 year 180 minute winter	45.376	17.964
100 year 240 minute summer	54.269	14.342
100 year 240 minute winter	36.055	14.342
100 year 360 minute summer	40.484	10.418
100 year 360 minute winter	26.315	10.418
100 year 480 minute summer	31.414	8.302
100 year 480 minute winter	20.871	8.302
100 year 600 minute summer	25.431	6.956
100 year 600 minute winter	17.376	6.956
100 year 720 minute summer	22.452	6.017
100 year 720 minute winter	15.089	6.017
100 year 960 minute summer	18.166	4.784
100 year 960 minute winter	12.033	4.784
100 year 1440 minute summer	12.896	3.456
100 year 1440 minute winter	8.667	3.456
100 year 2160 minute summer	9.021	2.493
100 year 2160 minute winter	6.216	2.493
100 year 2880 minute summer	7.371	1.975
100 year 2880 minute winter	4.954	1.975
100 year 4320 minute summer	5.435	1.421
100 year 4320 minute winter	3.579	1.421
100 year 5760 minute summer	4.390	1.124
100 year 5760 minute winter	2.841	1.124
100 year 7200 minute summer	3.670	0.936
100 year 7200 minute winter	2.368	0.936
100 year 8640 minute summer	3.160	0.806
100 year 8640 minute winter	2.039	0.806
100 year 10080 minute summer	2.784	0.710
100 year 10080 minute winter	1.797	0.710
100 year +40% CC 15 minute summer	488.233	138.153
100 year +40% CC 15 minute winter	342.620	138.153
100 year +40% CC 30 minute summer	320.551	90.705
100 year +40% CC 30 minute winter	224.948	90.705
100 year +40% CC 60 minute summer	214.603	56.713
100 year +40% CC 60 minute winter	142.577	56.713
100 year +40% CC 120 minute summer	129.587	34.246
100 year +40% CC 120 minute winter	86.094	34.246
100 year +40% CC 180 minute summer	97.729	25.149
100 year +40% CC 180 minute winter	63.526	25.149
100 year +40% CC 240 minute summer	75.977	20.078
100 year +40% CC 240 minute winter	50.477	20.078
100 year +40% CC 360 minute summer	56.677	14.585
100 year +40% CC 360 minute winter	36.841	14.585
100 year +40% CC 480 minute summer	43.979	11.622
100 year +40% CC 480 minute winter	29.219	11.622
100 year +40% CC 600 minute summer	35.604	9.738
100 year +40% CC 600 minute winter	24.327	9.738

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 720 minute summer	31.433	8.424
100 year +40% CC 720 minute winter	21.125	8.424
100 year +40% CC 960 minute summer	25.432	6.697
100 year +40% CC 960 minute winter	16.847	6.697
100 year +40% CC 1440 minute summer	18.055	4.839
100 year +40% CC 1440 minute winter	12.134	4.839
100 year +40% CC 2160 minute summer	12.630	3.490
100 year +40% CC 2160 minute winter	8.702	3.490
100 year +40% CC 2880 minute summer	10.319	2.766
100 year +40% CC 2880 minute winter	6.935	2.766
100 year +40% CC 4320 minute summer	7.609	1.989
100 year +40% CC 4320 minute winter	5.011	1.989
100 year +40% CC 5760 minute summer	6.145	1.573
100 year +40% CC 5760 minute winter	3.978	1.573
100 year +40% CC 7200 minute summer	5.137	1.311
100 year +40% CC 7200 minute winter	3.316	1.311
100 year +40% CC 8640 minute summer	4.424	1.129
100 year +40% CC 8640 minute winter	2.855	1.129
100 year +40% CC 10080 minute summer	3.897	0.994
100 year +40% CC 10080 minute winter	2.515	0.994

Results for 1 year Critical Storm Duration. Lowest mass balance: 97.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	1	40	47.428	0.028	1.5	0.0000	0.0000	OK
4320 minute summer	2	1920	47.529	0.029	1.5	0.0330	0.0000	OK
480 minute winter	3	472	48.196	0.646	10.6	36.2995	0.0000	SURCHARGED
480 minute winter	4	472	48.196	0.396	7.3	59.4800	0.0000	OK
15 minute summer	5	9	48.214	0.114	56.2	0.0417	0.0000	OK
15 minute summer	6	9	48.416	0.116	46.7	0.1057	0.0000	OK
15 minute summer	7	9	48.592	0.092	18.7	0.0719	0.0000	OK
480 minute winter	8	472	48.196	0.196	4.0	0.1573	0.0000	OK
15 minute summer	9	9	48.655	0.055	9.4	0.0258	0.0000	OK
480 minute winter	10	472	48.196	0.196	1.7	0.2917	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
4320 minute summer	2	1.003	1	1.5	0.638	0.078	0.0202	239.8
480 minute winter	3	Hydro-Brake®	2	1.5				
480 minute winter	4	1.001	3	-4.9	0.053	-0.026	11.5768	
15 minute summer	5	3.002	3	56.1	0.750	0.205	2.0373	
15 minute summer	6	3.001	5	46.8	1.636	0.175	0.3198	
15 minute summer	7	3.000	6	18.7	0.753	0.135	1.0286	
480 minute winter	8	2.001	3	3.7	0.233	0.015	2.4152	
15 minute summer	9	2.000	8	9.2	0.546	0.047	1.0831	
480 minute winter	10	1.000	4	1.6	0.242	0.010	2.6400	

Results for 10 year Critical Storm Duration. Lowest mass balance: 97.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	1	930	47.429	0.029	1.5	0.0000	0.0000	OK
960 minute winter	2	930	47.529	0.029	1.5	0.0333	0.0000	OK
960 minute winter	3	930	48.428	0.878	10.6	78.2901	0.0000	SURCHARGED
960 minute winter	4	930	48.428	0.628	7.4	129.2130	0.0000	SURCHARGED
960 minute winter	5	915	48.428	0.328	6.6	0.1202	0.0000	OK
15 minute summer	6	9	48.473	0.173	90.5	0.1569	0.0000	OK
15 minute summer	7	9	48.629	0.129	36.2	0.1010	0.0000	OK
960 minute winter	8	930	48.428	0.428	4.1	0.3429	0.0000	SURCHARGED
15 minute summer	9	9	48.676	0.076	18.1	0.0358	0.0000	OK
960 minute winter	10	930	48.428	0.428	1.8	0.6361	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	2	1.003	1	1.5	0.641	0.079	0.0203	100.7
960 minute winter	3	Hydro-Brake®	2	1.5				
960 minute winter	4	1.001	3	-4.8	0.049	-0.026	11.9801	
960 minute winter	5	3.002	3	5.1	0.166	0.019	3.1263	
15 minute summer	6	3.001	5	91.0	1.914	0.339	0.5316	
15 minute summer	7	3.000	6	36.4	0.879	0.262	1.7108	
960 minute winter	8	2.001	3	3.7	0.126	0.015	3.1603	
15 minute summer	9	2.000	8	17.9	0.658	0.092	1.7448	
960 minute winter	10	1.000	4	1.6	0.238	0.010	3.4546	

Results for 30 year Critical Storm Duration. Lowest mass balance: 97.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	1	945	47.430	0.030	1.6	0.0000	0.0000	OK
960 minute winter	2	945	47.530	0.030	1.6	0.0344	0.0000	OK
960 minute winter	3	945	48.571	1.021	14.4	104.4024	0.0000	SURCHARGED
960 minute winter	4	945	48.571	0.771	9.2	172.5875	0.0000	SURCHARGED
960 minute winter	5	945	48.571	0.471	12.7	0.1730	0.0000	SURCHARGED
960 minute winter	6	945	48.571	0.271	8.8	0.2468	0.0000	OK
15 minute summer	7	9	48.646	0.146	45.9	0.1148	0.0000	OK
960 minute winter	8	945	48.571	0.571	5.1	0.4583	0.0000	SURCHARGED
15 minute summer	9	9	48.685	0.085	22.9	0.0403	0.0000	OK
960 minute winter	10	945	48.571	0.571	2.2	0.8504	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	2	1.003	1	1.6	0.653	0.085	0.0214	105.3
960 minute winter	3	Hydro-Brake®	2	1.6				
960 minute winter	4	1.001	3	-6.1	0.060	-0.033	11.9801	
960 minute winter	5	3.002	3	8.9	0.161	0.032	3.2458	
960 minute winter	6	3.001	5	11.8	0.839	0.044	1.0942	
15 minute summer	7	3.000	6	46.2	0.918	0.333	2.0790	
960 minute winter	8	2.001	3	4.6	0.107	0.018	3.1603	
15 minute summer	9	2.000	8	22.8	0.664	0.117	2.2713	
960 minute winter	10	1.000	4	2.0	0.247	0.013	3.4546	

Results for 100 year Critical Storm Duration. Lowest mass balance: 97.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	1	1410	47.431	0.031	1.8	0.0000	0.0000	OK
1440 minute winter	2	1410	47.532	0.032	1.8	0.0359	0.0000	OK
1440 minute winter	3	1410	48.773	1.223	13.4	141.0158	0.0000	SURCHARGED
1440 minute winter	4	1410	48.773	0.973	8.3	233.3914	0.0000	SURCHARGED
1440 minute winter	5	1410	48.773	0.673	5.8	0.2471	0.0000	SURCHARGED
1440 minute winter	6	1410	48.773	0.473	5.0	0.4302	0.0000	SURCHARGED
1440 minute winter	7	1410	48.773	0.273	2.0	0.2143	0.0000	OK
1440 minute winter	8	1410	48.773	0.773	4.6	0.6202	0.0000	SURCHARGED
1440 minute winter	9	1410	48.773	0.173	1.0	0.0818	0.0000	OK
1440 minute winter	10	1410	48.773	0.773	2.0	1.1507	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	2	1.003	1	1.8	0.668	0.092	0.0226	153.6
1440 minute winter	3	Hydro-Brake®	2	1.8				
1440 minute winter	4	1.001	3	-5.4	0.043	-0.029	11.9801	
1440 minute winter	5	3.002	3	7.1	0.102	0.026	3.2458	
1440 minute winter	6	3.001	5	4.8	0.767	0.018	1.2331	
1440 minute winter	7	3.000	6	2.0	0.412	0.014	4.0479	
1440 minute winter	8	2.001	3	4.4	0.084	0.018	3.1603	
1440 minute winter	9	2.000	8	1.0	0.185	0.005	5.0256	
1440 minute winter	10	1.000	4	2.0	0.246	0.012	3.4546	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 97.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	1	1410	47.433	0.033	2.0	0.0000	0.0000	OK
1440 minute winter	2	1410	47.534	0.034	2.0	0.0385	0.0000	OK
1440 minute winter	3	1410	49.194	1.644	16.7	217.2522	0.0000	FLOOD RISK
1440 minute winter	4	1410	49.194	1.394	12.0	360.0037	0.0000	FLOOD RISK
1440 minute winter	5	1410	49.192	1.092	12.8	0.4009	0.0000	FLOOD RISK
2160 minute winter	6	2100	49.192	0.892	4.8	0.8111	0.0000	FLOOD RISK
1440 minute winter	7	1350	49.191	0.691	2.8	0.5421	0.0000	FLOOD RISK
1440 minute winter	8	1410	49.194	1.194	6.5	0.9574	0.0000	FLOOD RISK
1440 minute winter	9	1410	49.194	0.594	1.4	0.2804	0.0000	FLOOD RISK
1440 minute winter	10	1410	49.194	1.194	2.8	1.7760	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	2	1.003	1	2.0	0.694	0.105	0.0249	167.8
1440 minute winter	3	Hydro-Brake®	2	2.0				
1440 minute winter	4	1.001	3	-7.8	-0.050	-0.042	11.9801	
1440 minute winter	5	3.002	3	7.7	0.101	0.028	3.2458	
2160 minute winter	6	3.001	5	5.9	0.704	0.022	1.2331	
1440 minute winter	7	3.000	6	2.7	0.424	0.019	4.5477	
1440 minute winter	8	2.001	3	6.2	0.078	0.025	3.1603	
1440 minute winter	9	2.000	8	1.4	0.211	0.007	6.9268	
1440 minute winter	10	1.000	4	2.7	0.248	0.017	3.4546	

APPENDIX C: DRAINAGE MAINTENANCE PLAN

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DRAINAGE MAINTENANCE PLAN

**Spencers Wood Primary School, Land at Fullbrook Lane and
Hyde End Lane, Three Mile Cross**

Report Title: Drainage and SUDS Maintenance Plan for Spencers Wood Primary School, Land at Fullbrook Lane and Hyde End Lane, Three Mile Cross

Report Status: Final

Job No: P5937J3010

Date: July 2024

Control: Previous Release

Version	Date	Issued By
V1.0	10/07/2024	A Wallace

Prepared by: **JOMAS ASSOCIATES LTD**

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1.1 General

1.1.1 Sustainable Drainage Systems (SuDS) are an environmentally friendly approach to managing rainfall. SuDS techniques use landscape features to deal with surface water with the aim to:

- Control the flow, volume and frequency of water leaving a development.
- Prevent pollution by intercepting silt and cleaning runoff from hard surfaces.
- Provide attractive surroundings for the community.

1.1.2 The surface water drainage strategy for this development utilises tanked permeable paving as the main SUDS features. The following sections provides a brief description of these features and outlines the maintenance programme that should be adopted.

1.2 Cleaning of the Drainage System

1.2.1 Drainage systems should be inspected at regular intervals and where necessary, thoroughly cleaned out at the same time. Any defects discovered should be made good.

1.2.2 The following operations should be carried out during the periodic cleaning of a drainage system.

Table 1: Drainage Maintenance

Product Type	Period	Responsibility	Maintenance Methods
Silt Trap	As necessary and before wet season	Maintenance Company	• Sediment and debris that accumulated during summer needs to be removed before the wet season. • Inspect and clean out routinely prior to inlet pipework to minimise debris reaching the tank. • Conduct inspections more frequently during the wet season for the area where sediment or trash accumulates more often. Clean and repair as needed.
Standard Manholes/ Inspection Chambers	As necessary	Maintenance Company	• Remove and clean any soil and vegetation that covers the manhole cover to prevent blockage of the drainage system at the manhole. • Renew/replace any damaged/missing bolts and damaged/missing manhole covers.
Drainage Pipes	Six monthly interval	Maintenance Company	• Inspect underground drainage pipes to ensure that the distribution pipework arrangement is operational and free from blockages. If required, take remedial action.

Product Type	Period	Responsibility	Maintenance Methods
Permeable Paving	As required	Maintenance Company	Inspect the roof after any precipitation to ensure no displacement of any debris onto the surface.
	As Required	Maintenance Company	Inspect the paving after any precipitation to ensure no displacement of any organic matter onto the surface of the pavement.
	Six monthly	Maintenance Company	Agitate (e.g. brush, vacuum, etc.) the block paving to ensure no vegetation of any sort is allowed to grow and develop in the joints (where may affect performance).
	Winter	Maintenance Company	De-icing may be used without causing significant detrimental effects towards the permeable pavement's performance. When used carefully, the use of these chlorides will not result in an increase in the chloride levels in the local ground.
Flow Control	Annually and after large storms	Maintenance Company	- Remove sediment from pre-treatment structures - Debris removal from catchment surface - Inspection/check of all inlets to ensure that they are in good condition and operating as designed. - Renew and replace any damaged/missing items.

1.3 Sketches and Plans

1.3.1 The locations of the above features can be found by examining Drawing P5937J3010-C01

1.4 Maintenance Checklist

1.4.1 As well as the above checklist, the below Inspection Regime should be completed on a 6 monthly basis and the above inspection checklist table updated as required.

Inspection date

	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date Completed
General inspection items								
Is there any evidence of erosion, channelling, ponding (where not desirable) or other poor hydraulic performance?								
Is there any evidence of accidental spillages, oils, poor water quality, odours or nuisance insects?								
Have any health and safety risks been identified to either the public or maintenance operatives?								
Is there any deterioration in the surface of permeable or porous surfaces (eg rutting, spreading of blocks or signs of ponding water)?								

Silt/sediment accumulation								
Is there any sediment accumulation at inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)? If yes, state depth (mm) and extent. Is removal required?								
Is surface clogging visible (potentially problematic where water has to soak into the underlying construction or ground (eg underdrained swale or infiltration basin)?								
Does permeable or porous surfacing require sweeping to remove silt?								

System blockages and litter build-up								
Is there evidence of litter accumulation in the system?								
Is there any evidence of any other clogging or blockage of								
Vegetation								
Is the vegetation condition satisfactory (density, weed								
Does any part of the system require weeding, pruning or mowing? (Check against maintenance frequency stated in approved design.)								
Is there any evidence of invasive species becoming								
Infrastructure								
Are any check dams or weirs in good condition?								
Is there evidence of any accidental damage to the system (eg wheel ruts?)								
Is there any evidence of cross connections or other unauthorised inflows?								
Is there any evidence of tampering with the flow controls?								
Are there any other matters that could affect the performance of the system in relation to the design objectives for hydraulic, water quality, biodiversity and visual aspects? (Specify.)								
Other observations								
Information appended (eg photos)								
Suitability of current maintenance regime								
Continue as current maintenance								
Increase								
Decrease								

Next inspection

Proposed date for next
inspection

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