

**DAME ALICE OWENS SCHOOL
NEW GENERAL TEACHING BLOCK**

DRAINAGE DESIGN PHILOSOPHY

form...function...solution...

PS1499

3rd October 2016



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Document Control

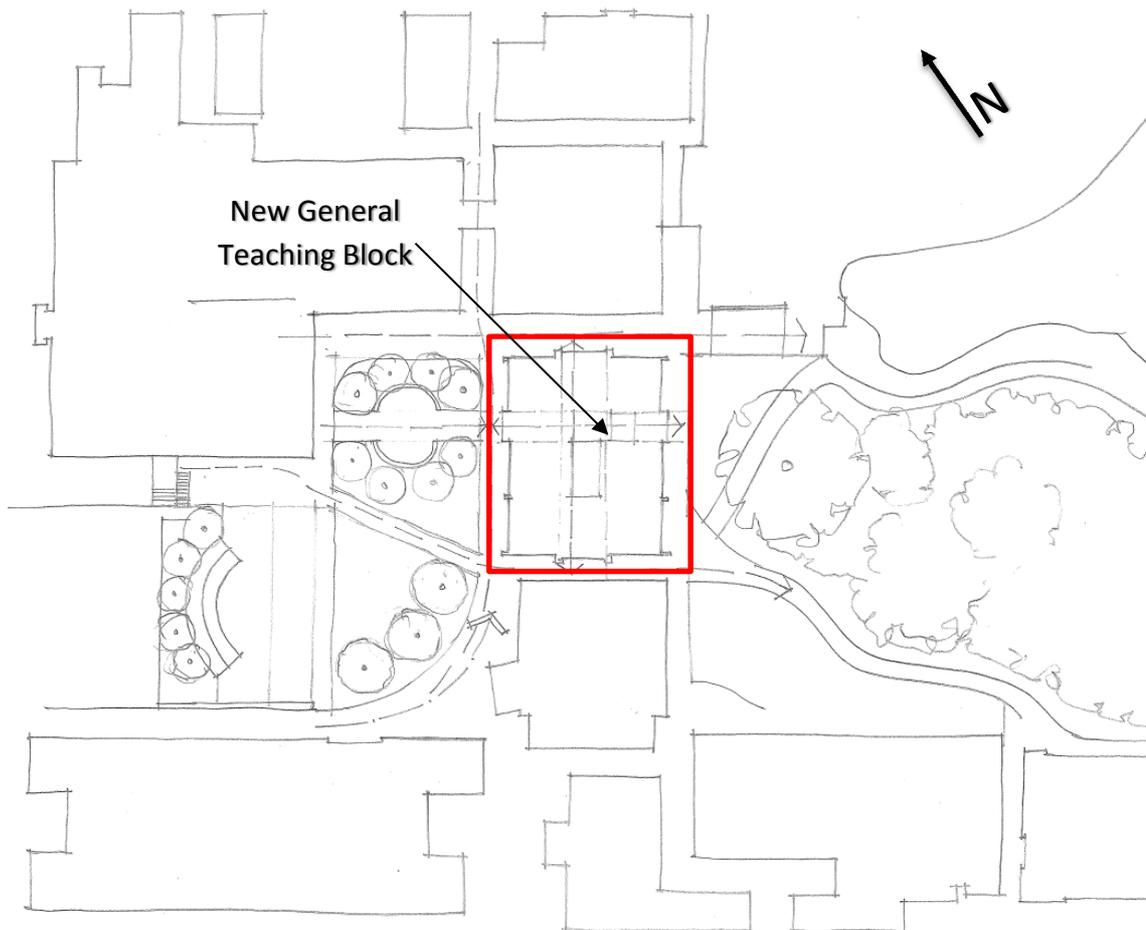
Job Number: PS1499			Document Ref: DAME ALICE OWENS SCHOOL			
Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
First	Preliminary	J Lawson	D Donnellan	J Lawson	D Donnellan	03/10/16

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1.0 INTRODUCTION

- 1.1 This report describes the drainage design philosophy for the proposed new build General Teaching Block at Dame Alice Owens School.
- 1.2 The proposals are for a three storey General Teaching Block along with redeveloped landscaped and hardstanding areas. For the proposed site layout see site plan below.



Site Plan

2.0 DRAINAGE**2.1 Surface Water Drainage****2.1.1 Existing Arrangement**

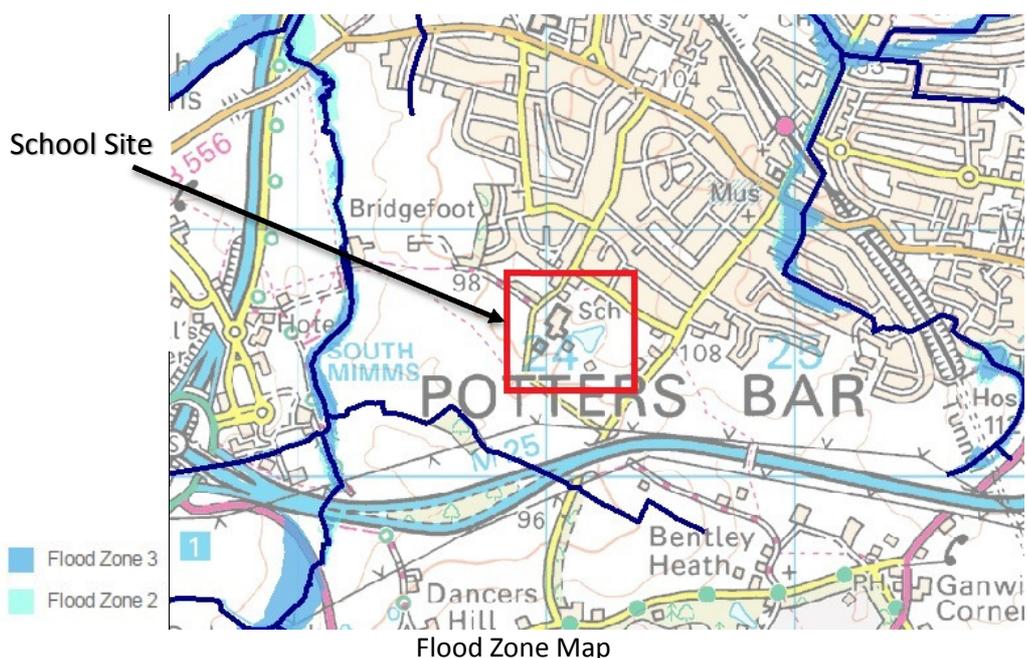
2.1.1.1 The existing surface run-off from the school discharges to a main public surface water sewer running along Sawyers Lane.

2.1.2 Proposed Arrangement

2.1.2.1 Reflecting SUDS requirements, the basis of the drainage proposals is to provide an environmentally sensitive/SUDS drainage arrangement for the proposed development.

2.1.2.2 The on-site surface water system will be designed to accommodate run-off during all events up to and including a 1 in 100 year storm event plus 30% allowance for increases in rainfall intensity due to climate change.

2.1.2.3 The proposed development site has been identified as lying within Flood Zone 1, see Flood Zone Map below, i.e. having low probability of flooding.



2.1.2.4 The proposed development will result in an increase in soft landscaping comprising the use of a green roof on the new general teaching block, and extensive grassed areas.

2.1.2.5 Green Roofs

The provision of a green roof will result in a reduction in total surface water run-off and peak flow. The green roof will act as attenuation with the substrate absorbing the surface water and releasing it over time thus acting as a buffer and evening out the flow after heavy storms.

2.1.2.6 Catchment Areas

Existing Area	Description	Effective Area
Area 1)	Impermeable	Total 2270m ²
Area 2)	Soft Landscaping	Total 1110m ²
TOTAL		3380m²

Proposed Area	Description	Effective Area
Area 1)	Impermeable	
	- Hardstanding	1280m ²
	- Roof	70m ²
		Total 1350m ²
Area 2)	Soft Landscaping	
	- Green Roof	605m ²
	- Soft Landscaping	1425m ²
		Total 2030m ²
TOTAL		3380m²

2.1.2.7 The proposed and existing catchment areas above show that there is a total increase in soft landscaping of 920m² associated with the proposed development.

2.1.2.8 It is proposed to gravity discharge surface drainage associated with the new General Teaching Block and soft landscaping areas into the existing surface water drainage within the site which discharges to the main public surface water sewer along Sawyers Lane. As indicated above the total surface run-off from the proposed development will be less than the existing arrangement and will result in a betterment to the current positively drained system.

2.2 Foul Water Drainage

2.2.1 Existing Arrangement

- 2.2.1.1 Foul discharge from the school is collected within the foul sewer which eventually outflows to a main public foul water sewer along Sawyers Lane.
- 2.2.1.2 It is proposed to gravity discharge foul drainage associated with the new General Teaching Block into the existing foul water drainage which previously served the old science block.
- 2.2.1.4 An additional average foul drainage outflow of 0.31l/s associated with the General Teaching Block will run into the existing foul drainage arrangement on-site and in turn discharge as part of the overall site effluent into the public sewer system. As this system previously served the old science block it will be adequate for the proposed development.

3.0 CONCLUSION

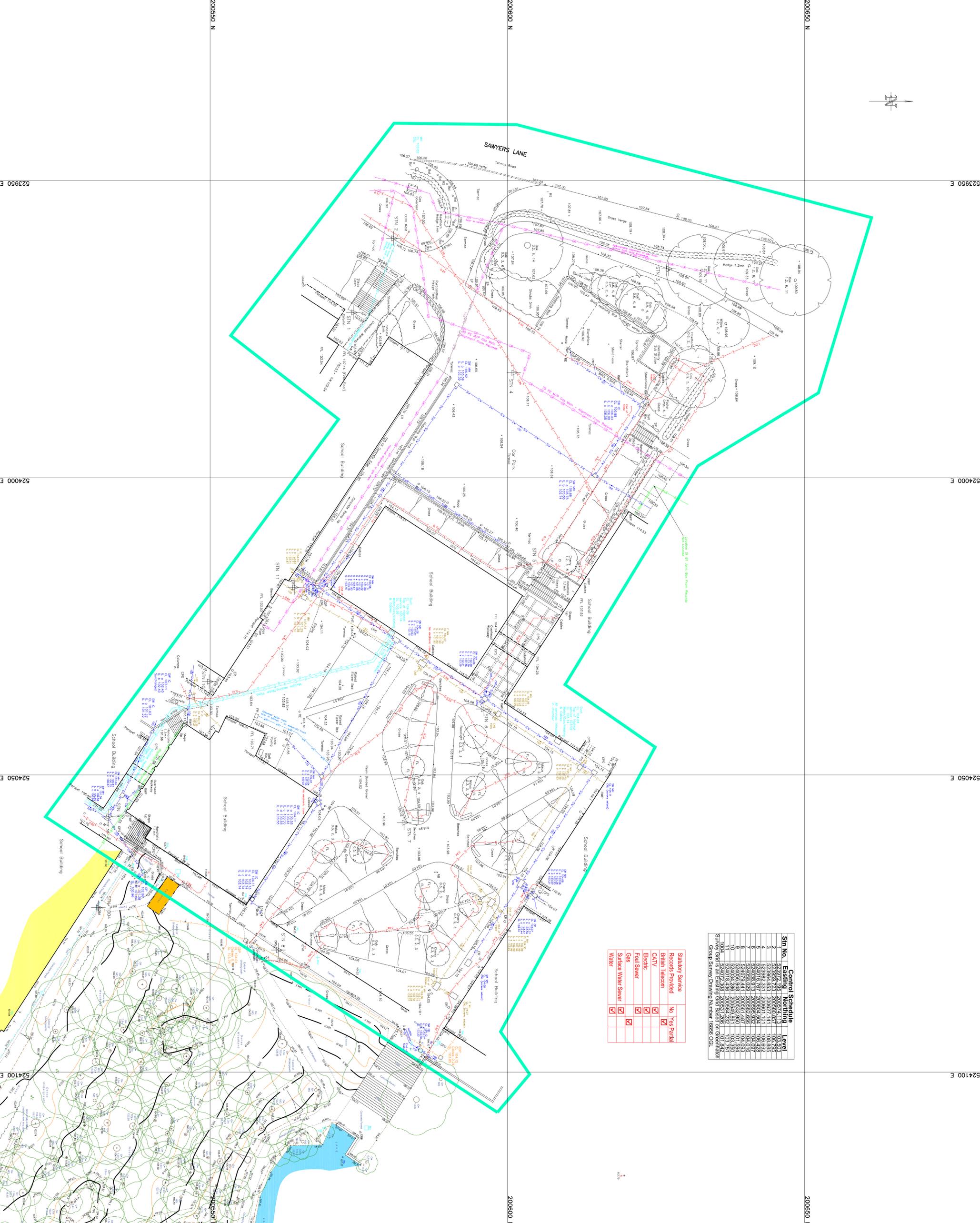
- 3.1 The development at Dame Alice Owens School comprises a new three storey General Teaching Block building along with additional soft landscaping and paved recreation areas.
- 3.2 This drainage design strategy is based on gravity drainage system discharging into the main public sewers.
- 3.3 The proposal for a green roof is in line with the SUDS hierarchy and minimises storm-water run-off from site. We envisage the use of a green roof as a viable and sustainable method of water management on this site.



J Lawson MEng

APPENDIX I

SITE SURVEY by Randell Surveys LLP



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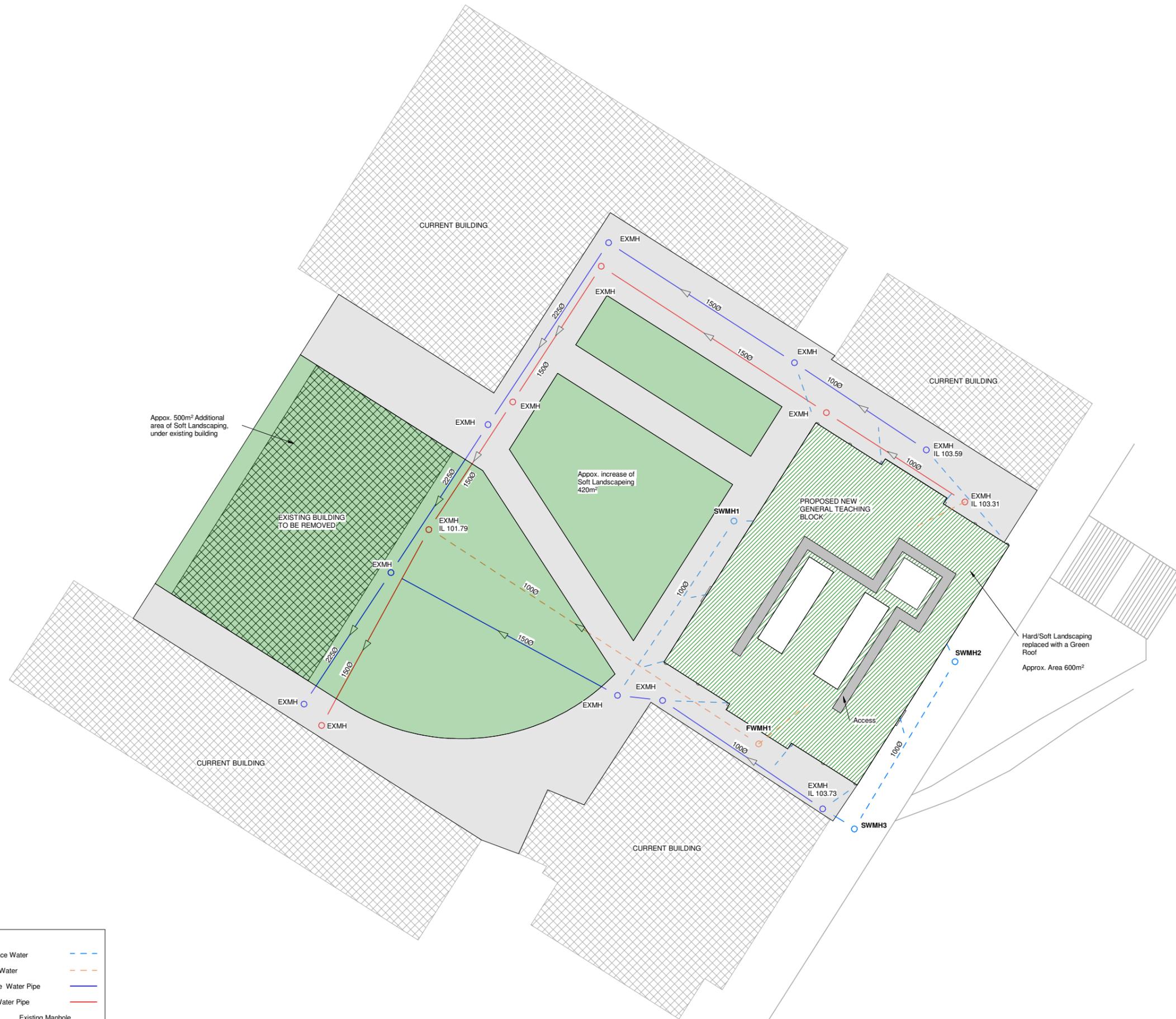
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Water	<input checked="" type="checkbox"/>	<input type="checkbox"/>

ABBREVIATIONS

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APPENDIX II

DRAINAGE SCHEME DRAWINGS



Drainage Scheme
1 : 200

LEGEND	
Proposed Surface Water	---
Proposed Foul Water	- - -
Existing Surface Water Pipe	—
Existing Foul Water Pipe	—
EXMH	Existing Manhole

Notes:
Green roof
Saturated Load= 2.5kPa (w)

- GENERAL NOTES:
1. This drawing is copyright (C) .
 2. This drawing is to be read in conjunction with all relevant drawings and specifications.
 3. This drawing shall not be scaled; use only figured dimensions. All dimensions are shown in millimetres and levels in metres above OS Datum.
 4. Dimensions and conditions shall be verified on site. Any discrepancies between this drawing and site conditions shall be brought to the attention of the Engineer for resolution prior to placing orders or construction.
 5. All work shall comply with the Building Regulations and the requirements of the Local Authority, current Codes of practice and British Standards.
 6. Dimensions indicated thus: *are to be confirmed on site.
 7. For remainder of notes see dig ncPS1499/01

CDM REGULATIONS 2015	
CONSTRUCTION RISKS	
IDENTIFIED HAZARD RELATING TO WORKS	RISK ASSESSMENT & SHEET

Revision Schedule

Revision Number	Revision Description	Revision Date	Issued by

PRELIMINARY

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Unit 5C Church End Little Hadham Herts SG11 9DY
Tel: 01979 771918 info@purestructures.co.uk www.purestructures.co.uk

PROJECT
Dame Alice Owens School, Potters Bar

DRAWING DESCRIPTION
DRAINAGE SCHEME

CLIENT
Barker Associates

SCALE	DATE	DRAWN	CHECKED	DRAWING NO.	REV
1 : 200	SEPT 2016	JL	DD	PS1499 / SK11	

APPENDIX III

DRAINAGE SCHEME CALCULATIONS

JOB No: PS1499
PROJECT: Dame Alice Owens School
REF: SUDS / Drainage

PAGE No: _____ REV: _____
DATE: SEPT 16 13
BY: JL CHKD: DD

Existing catchment area

Total area 3380 m²

- Impermeable 2270 m² (Existing building to be removed + hardstanding)
- Soft landscaping 1110 m²

Proposed catchment area

- Impermeable 1350 m² (Hard standing + non green roof area)
- Soft landscaping 2030 m² (Green roof = 605 m²
Soft landscaping = 1425 m²)

The proposed SUDS Drainage Scheme has a larger ratio of permeable to impermeable surface than existing. Therefore an attenuation tank would not be required for SUDS.

$$\text{Existing Green field run-off} = \underline{\underline{1.86 \text{ L}^3/\text{s}}}$$

$$\text{Proposed Greenfield run-off} = \underline{\underline{0.7 \text{ L}^3/\text{s}}}$$

for Q100 + 30% for climate change

See following spreadsheet for further calc.s

JOB NO:	PS1499
JOB TITLE:	Dame Alice Owens

Rev:	
Date:	SEPT '16

Greenfield Runoff Calculation - Existing

Based Upon The New SuDS Manual C753 and EA/Defra Technical Report W5-074/A

Site Area:	0.23
SAAR	606
Soil Type	4
SPR (See Table)	0.47
Hydrological Area	6

Soil Type	SPR
1	0.1
2	0.3
3	0.37
4	0.47
5	0.53

$$Qbar_{rural} = 1.08 \times AREA^{0.89} \times SAAR^{1.17} \times SPR^{2.17}, m^3/s$$

Use Area = 0.5km² for calculation

where:

Qbar_{rural} is the mean annual flood flow from a rural catchment (approximately 2.3 year return period).

AREA is the area of the catchment in ha.

SAAR is the standard average annual rainfall for the period 1961 to 1990 in mm (SAAR 61-90).

SAAR 61-90, which was analysed from 1961 - 1990 for FEH, is virtually the same and can also be used.

SPR is Standard Percentage Runoff coefficient for the SOIL category.

$$\begin{aligned} Qbar_{rural} &= 1.08 \times 0.2672 \times 1800.91 \times 0.1943 \\ &= 100.979 \text{ l}^3/\text{s for 50ha site} \\ &= \mathbf{2.01958 \text{ l}^3/\text{s/ha}} \end{aligned}$$

From Growth Curves obtained from DEFRA report

Q1	Qbar _{rural} x 0.85	=	1.72	l ³ /s/ha
Q30	Qbar _{rural} x 2.30	=	4.65	l ³ /s/ha
Q100	Qbar _{rural} x 3.11	=	6.28	l ³ /s/ha
Q100 +30%	Qbar _{rural} x 4.07	=	8.21	l ³ /s/ha

For Site Specific Flows

Q1	1.72 x 0.23	=	0.39	l ³ /s
Q30	4.65 x 0.23	=	1.05	l ³ /s
Q100	6.28 x 0.23	=	1.43	l ³ /s
Q100 +30%	8.21 x 0.23	=	1.86	l ³ /s

JOB NO:	PS1499
JOB TITLE:	Dame Alice Owens

Rev:	
Date:	SEPT '16

Greenfield Runoff Calculation - Proposed

Based Upon The New SuDS Manual C753 and EA/Defra Technical Report W5-074/A

Site Area:	0.14
SAAR	606
Soil Type	4
SPR (See Table)	0.47
Hydrological Area	6

Soil Type	SPR
1	0.1
2	0.3
3	0.37
4	0.47
5	0.53

$$Qbar_{rural} = 1.08 \times AREA^{0.89} \times SAAR^{1.17} \times SPR^{2.17}, m^3/s$$

Use Area = 0.5km² for calculation

where:

Qbar_{rural} is the mean annual flood flow from a rural catchment (approximately 2.3 year return period).

AREA is the area of the catchment in ha.

SAAR is the standard average annual rainfall for the period 1961 to 1990 in mm (SAAR 61-90).

SAAR 61-90, which was analysed from 1961 - 1990 for FEH, is virtually the same and can also be used.

SPR is Standard Percentage Runoff coefficient for the SOIL category.

$$\begin{aligned} Qbar_{rural} &= 1.08 \times 0.1683 \times 1800.91 \times 0.1943 \\ &= 63.5867 \text{ l}^3/\text{s for 50ha site} \\ &= \mathbf{1.27173 \text{ l}^3/\text{s/ha}} \end{aligned}$$

From Growth Curves obtained from DEFRA report

Q1	Qbar _{rural} x 0.85	=	1.08	l ³ /s/ha
Q30	Qbar _{rural} x 2.30	=	2.92	l ³ /s/ha
Q100	Qbar _{rural} x 3.11	=	3.96	l ³ /s/ha
Q100 +30%	Qbar _{rural} x 4.07	=	5.17	l ³ /s/ha

For Site Specific Flows

Q1	1.08 x 0.14	=	0.15	l ³ /s
Q30	2.92 x 0.14	=	0.39	l ³ /s
Q100	3.96 x 0.14	=	0.53	l ³ /s
Q100 +30%	5.17 x 0.14	=	0.70	l ³ /s

JOB No: PS1699
PROJECT: DAME ALICE OWENS
REF: Foul Drainage Design

PAGE No: DR/01 REV:
DATE: SEPT 16
BY: JL CHKD: DD

Foul Drainage

Total occupancy \Rightarrow New block \approx 540

Sewerage Loading = 50 L/p/day

Daily flow \Rightarrow $50 \times 540 = 27,000$ L/day

Average flow \Rightarrow $\frac{27000}{24 \times 60 \times 60} = \underline{\underline{0.31}}$ L/sec

Max flow = 5.13 L/s Refer to spreadsheet

use 100 \varnothing min fall 1:80 = 7.02 L/s \approx o.k

Table of Loadings for Sewage Treatment Systems

Per person / activity / day (unless otherwise specified)	FLOW	BOD	Ammonia as N
	(Litres)	(Grams)	
DOMESTIC DWELLINGS			
(Grams)			
Standard residential	150	60	8
Mobile home type caravans with full services	150	60	8
INDUSTRIAL			
Office / Factory without canteen	50	25	5
Office / Factory with canteen	100	38	5
Open industrial site, e.g. construction, quarry, without canteen	60	25	5
*Full-time Day Staff	90	38	5
*Part-time Staff (4 hr shift)	45	25	3
SCHOOLS			
Non-residential with canteen cooking on site	90	38	5
Non-residential without a canteen	50	25	5
Boarding school (i) residents	175	60	8
(ii) day staff (inc. mid-day meal)	90	38	5
HOTELS, PUBS & CLUBS			
Hotel Guests (Prestige hotels)	300	105	12
Hotel Guests (3 rd & 4 th hotels)	250	94	10
Guests (Bedroom only – no meals)	80	50	6
Residential Training/Conference Guest (inclusive all meals)	350	150	15
Non residential Conference Guest	60	25	2.5
Drinkers	12	15	5
Holiday camp chalet resident	227	94	10
Resident Staff	180	75	10
Restaurants - Full Meals - luxury catering	30	38	4
- pre-prepared catering	25	30	2.5
- Snack Bars & bar meals	15	19	2.5
- Function Rooms including buffets	15	19	2.5
- Fast Food i.e. (roadside restaurants)	12	12	2.5
- Fast Food Meal (burger chain and similar)	12	15	4
Students (Accommodation only)	100	60	8
AMENITY SITES			
Toilet Blocks (per use)	10	12	2.5
Toilet (WC) (per use)	10	12	2.5
Toilet (Urinal) (per use)	5	12	2.5
Toilet Blocks in long stay car parks/lorry parks (per use)	10	19	4
Shower (per use)	40	19	2
Golf Club	20	19	5
Local community sports club, e.g. squash, rugby & football	40	25	6
Swimming (where a separate pool exists without an associated sports centre)	10	12	2.5
Health Club/Sports Centre	50	19	4
Tent sites	75	44	8
Caravan Sites - (i) Touring not serviced	100	44	8
(ii) Static not serviced	100	44	8
(iii) Static fully serviced	150	60	8
HOSPITALS & RESIDENTIAL CARE HOMES			
Residential old people / nursing	350	110	13
Small hospitals	450	140	Assess
Large hospitals			Assess individually

*Staff figures also apply to other applications