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# **DESIGN RAINFALL**

# In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment areaLondonStorm durationD = 5 minReturn periodPeriod = 1 yrRatio 60 min to 2 day rainfall of 5 yr return periodr = 0.440

5-year return period rainfall of 60 minutes duration M5\_60min = **20.0** mm

Increase of rainfall intensity due to global warming  $p_{climate} = 0 \%$ Factor Z1 (Wallingford procedure) Z1 = 0.39

Rainfall for 5min storm with 5 year return period  $M5_5min_i = Z1 \times M5_60min = 7.7 mm$ 

Factor Z2 (Wallingford procedure) Z2 = **0.61** 

Rainfall for 5min storm with 1 year return period  $M1_5min = Z2 \times M5_5min_i = 4.8 \text{ mm}$ Design rainfall intensity  $I_{max} = M1_5min / D = 57.0 \text{ mm/hr}$ 

Maximum surface water runoff

Catchment area  $A_{catch} = 530 \text{ m}^2$ Percentage of area that is impermeable p = 100 %

Maximum surface water runoff  $Q_{max} = A_{catch} \times p \times I_{max} = 8.4 \text{ l/s}$ 



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# **DESIGN RAINFALL**

# In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

5-year return period rainfall of 60 minutes duration M5\_60min = **20.0** mm

Increase of rainfall intensity due to global warming  $p_{climate} = 0 \%$ Factor Z1 (Wallingford procedure) Z1 = 0.39

Rainfall for 5min storm with 5 year return period  $M5_5min_i = Z1 \times M5_60min = 7.7 mm$ 

Factor Z2 (Wallingford procedure) Z2 = **1.46** 

Rainfall for 5min storm with 30 year return period  $M30\_5min = Z2 \times M5\_5min_i = 11.3 \text{ mm}$ Design rainfall intensity  $I_{max} = M30\_5min / D = 135.6 \text{ mm/hr}$ 

Maximum surface water runoff

Catchment area  $A_{catch} = 530 \text{ m}^2$ Percentage of area that is impermeable p = 100 %

Maximum surface water runoff  $Q_{max} = A_{catch} \times p \times I_{max} = 20.0 \text{ l/s}$ 



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# **DESIGN RAINFALL**

# In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment areaLondonStorm durationD = 5 minReturn periodPeriod = 100 yrRatio 60 min to 2 day rainfall of 5 yr return periodr = 0.440

5-year return period rainfall of 60 minutes duration M5\_60min = **20.0** mm

Increase of rainfall intensity due to global warming  $p_{climate} = 0 \%$ Factor Z1 (Wallingford procedure) Z1 = 0.39

Rainfall for 5min storm with 5 year return period  $M5_5min_i = Z1 \times M5_60min = 7.7 mm$ 

Factor Z2 (Wallingford procedure) Z2 = **1.86** 

Rainfall for 5min storm with 100 year return period  $M100\_5min = Z2 \times M5\_5min_i = 14.3 \text{ mm}$ Design rainfall intensity  $I_{max} = M100\_5min / D = 172.2 \text{ mm/hr}$ 

Maximum surface water runoff

Catchment area  $A_{catch} = 530 \text{ m}^2$ Percentage of area that is impermeable p = 100 %

Maximum surface water runoff  $Q_{max} = A_{catch} \times p \times I_{max} = 25.4 \text{ l/s}$ 



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# **DESIGN RAINFALL**

# In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

# Design rainfall intensity

Location of catchment areaLondonStorm durationD = 6 hrReturn periodPeriod = 100 yr

Ratio 60 min to 2 day rainfall of 5 yr return period r = 0.440

5-year return period rainfall of 60 minutes duration M5\_60min = **20.0** mm

Increase of rainfall intensity due to global warming  $p_{climate} = 40 \%$ Factor Z1 (Wallingford procedure) Z1 = 1.53

Rainfall for 6hr storm with 5 year return period  $M5_6hr_i = Z1 \times M5_60min \times (1 + p_{climate}) = 42.8 mm$ 

Factor Z2 (Wallingford procedure) Z2 = **1.87** 

Rainfall for 6hr storm with 100 year return period  $M100\_6hr = Z2 \times M5\_6hr_i = 80.0 \text{ mm}$ Design rainfall intensity  $I_{max} = M100\_6hr / D = 13.3 \text{ mm/hr}$ 

Maximum surface water runoff

Catchment area  $A_{catch} = 530 \text{ m}^2$ Percentage of area that is impermeable p = 100 %

Maximum surface water runoff  $Q_{max} = A_{catch} \times p \times I_{max} = 2.0 \text{ l/s}$ 

Surface water runoff volume Volume = M100\_6hr x Acatch = 42.4 m<sup>3</sup>



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#### **ATTENUATION DESIGN**

#### In accordance with CIRIA publication C753 - The SUDS Manual

Tedds calculation version 1.0.04

# EA\_Defra method

#### Site characteristics

LocationLondonHydrological region6Soil type (Wallingford Procedure W.R.A.P map)2

Standard percentage runoff

Average annual rainfall

5 year return period rainfall of 60 minute duration

M5\_60min = 20.0 mm

Ratio 60-minute to 2 day rainfalls of 5 year return r = 0.44Rainfall intensity increase due to global warming  $p_{climate} = 0\%$ Impervious area req. attenuation storage  $\alpha = 100.0\%$ 

#### **Catchment details**

Subcatchment	Name	Area (ha)	PIMP (%)	Impermeable. area (ha)
1;	SWEC;	0.05;	100.0	0.05;
	Total	0.05;	100.0	0.05;

#### Greenfield runoff rates

Catchment area AREA = **50.00** hectare

Greenfield runoff rate (50 hectare site)  $\frac{Q_{rural}}{Q_{rural}} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.$ 

**76.1** l / s

Estimated site discharges

FSR growth rate (1 year) FSR<sub>1yr</sub> = **0.85** 

Discharge (1 year)  $Q_{1yr} = \overline{Q} \times FSR_{1yr} = 0.1 \text{ l/s}$ 

FSR growth rate (30 year) FSR<sub>30yr</sub> = **2.30** 

Discharge (30 year)  $Q_{30yr} = \overline{Q} \times FSR_{30yr} = 0.2 \text{ l/s}$ 

FSR growth rate (100 year) FSR<sub>100yr</sub> = **3.19** 

Discharge (100 year)  $Q_{100yr} = Q \times FSR_{100yr} = 0.3 \text{ l/s}$ 

Estimated attenuation volume - 1 year

Attenuation storage vol (fig A7.1 - A7.8) Uvol<sub>1yr</sub> = **205.0** m<sup>3</sup> / hectare

Basic storage volume BSV<sub>1yr</sub> = Uvol<sub>1yr</sub> ×  $\alpha$  × A = **10.87** m<sup>3</sup>

FEH rainfall factor (figs A11.1, A6.1.1 - A6.3.4) FF<sub>1yr</sub> = **0.90** Storage volume ratio (fig A8.1 - A8.8) SVR<sub>1yr</sub> = **1.13** 

Adjusted storage volume ASV<sub>1yr</sub> = SVR<sub>1yr</sub> × BSV<sub>1yr</sub> = **12.28** m<sup>3</sup>

Hydrological regional volume ratio (fig A9.1)  $HR_{1yr} = 1.01$ 

Final estimated attenuation storage  $Vol_{1yr} = HR_{1yr} \times ASV_{1yr} = 12.35 \text{ m}^3$ 

Library item: Estimated attenuation output

Greenfield run-off rates

with 40% climate

change allowance.

Estimated attenuation volume - 30 year

Attenuation storage vol (fig A7.1 - A7.8) Uvol<sub>30yr</sub> = **420.0** m<sup>3</sup> / hectare

Basic storage volume BSV<sub>30yr</sub> = Uvol<sub>30yr</sub> ×  $\alpha$  × A = **22.26** m<sup>3</sup>

FEH rainfall factor (figs A11.1, A6.1.1 - A6.3.4)  $FF_{30yr} = 0.80$ 



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Storage volume ratio (fig A8.1 - A8.8) SVR<sub>30yr</sub> = 1.32

Adjusted storage volume  $ASV_{30yr} = SVR_{30yr} \times BSV_{30yr} = 29.36 \text{ m}^3$ 

Hydrological regional volume ratio (fig A9.1)  $HR_{30yr} = 1.01$ 

Final estimated attenuation storage  $Vol_{30yr} = HR_{30yr} \times ASV_{30yr} = 29.74 \text{ m}^3$ 

Library item: Estimated attenuation output

Estimated attenuation volume - 100 year

Attenuation storage vol (fig A7.1 - A7.8) Uvol<sub>100yr</sub> = **525.0** m<sup>3</sup> / hectare

Basic storage volume BSV<sub>100yr</sub> = Uvol<sub>100yr</sub> ×  $\alpha$  × A = **27.83** m<sup>3</sup>

FEH rainfall factor (figs A11.1, A6.1.1 - A6.3.4) FF<sub>100yr</sub> = **0.75** Storage volume ratio (fig A8.1 - A8.8) SVR<sub>100yr</sub> = **1.46** 

Adjusted storage volume  $ASV_{100yr} = SVR_{100yr} \times BSV_{100yr} = 40.61 \text{ m}^3$ 

Hydrological regional volume ratio (fig A9.1)  $HR_{100yr} = 1.02$ 

Final estimated attenuation storage  $Vol_{100yr} = HR_{100yr} \times ASV_{100yr} = 41.49 \text{ m}^3$ 

Library item: Estimated attenuation output

Attenuation storage required

Vol. increase due to head-discharge relationship phydro = 1.25

Maximum attenuation storage required  $V_{req\_max} = Vol_{30yr} \times p_{hydro} = 37.2 \text{ m}^3$ 

Interception storage

Interception rainfall depth  $d_{int} = 0 \text{ mm}$ 

Volume of interception storage required  $V_{int\_req} = 0.8 \times A_{imp} \times d_{int} = 0.00 \text{ m}^3$ 

This is the theoretical attenuation volume required to limit flows to greenfield rates. However, it is not possible to limit flows as low as greenfield rates.

Long term storage

Proportion of paved area draining in to network  $\alpha = 1.0$ Proportion of pervious area draining in to network  $\beta = 0.5$ 

Rainfall depth for 100years, 6 hour event RD = M100\_360 = **60.1** mm

Extra runoff vol of dev.runoff over greenfield runoff  $Vol_{xs} = max(RD \times A \times (PIMP \times \alpha \times 0.8 + ((1 - PIMP) \times \beta \times SPR) - ((1 - PIMP) \times SPR) - ((1$ 

SPR),  $0m^3$ ) = **15.94**  $m^3$ 

Treatment volume

Treatment volume (assume 80% runoff)  $T_{vol} = 0.8 \times A \times 15 \text{mm} \times PIMP = 6.36 \text{ m}^3$ 



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# **ATTENUATION DESIGN**

#### In accordance with CIRIA publication C753 - The SUDS Manual

Tedds calculation version 1.0.04

# EA\_Defra method

#### Site characteristics

LocationLondonHydrological region6Soil type (Wallingford Procedure W.R.A.P map)2

Standard percentage runoff SPR = 0.30Average annual rainfall SAAR = 600 mm
5 year return period rainfall of 60 minute duration M5\_60min = 20.0 mm
Ratio 60-minute to 2 day rainfalls of 5 year return r = 0.44

Rainfall intensity increase due to global warming  $p_{climate} = 40\%$ Impervious area req. attenuation storage  $\alpha = 100.0\%$ 

#### **Catchment details**

	Subcatchment	Name	Area (ha)	PIMP (%)	Impermeable. area (ha)
Ī	1;	SWEC;	0.05;	100.0	0.05;
Ī		Total	0.05;	100.0	0.05;

#### Greenfield runoff rates

Catchment area AREA = **50.00** hectare

Greenfield runoff rate (50 hectare site)  $\frac{Q_{rural}}{Q_{rural}} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{AREA}/1 \text{km}^2)^{0.89} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.00108 \text{m}^3 / \text{s} \times (\text{SAAR}/1 \text{mm})^{1.17} \times \text{SPR}^{2.17} = 0.$ 

**76.1** l / s

Estimated site discharges

FSR growth rate (1 year) FSR<sub>1yr</sub> = 0.85

Discharge (1 year)  $Q_{1yr} = \overline{Q} \times FSR_{1yr} = 0.1 \text{ l/s}$ 

FSR growth rate (30 year) FSR<sub>30yr</sub> = **2.30** 

Discharge (30 year)  $Q_{30yr} = Q \times FSR_{30yr} = 0.2 \text{ l/s}$ 

FSR growth rate (100 year) FSR<sub>100yr</sub> = **3.19** 

Discharge (100 year)  $Q_{100yr} = Q \times FSR_{100yr} = 0.3 \text{ l/s}$ 

Estimated attenuation volume - 1 year

Attenuation storage vol (fig A7.1 - A7.8) Uvol<sub>1yr</sub> = **205.0** m<sup>3</sup> / hectare

Basic storage volume BSV<sub>1yr</sub> = Uvol<sub>1yr</sub> ×  $\alpha$  × A = **10.87** m<sup>3</sup>

FEH rainfall factor (figs A11.1, A6.1.1 - A6.3.4) FF<sub>1yr</sub> = **0.90** Storage volume ratio (fig A8.1 - A8.8) SVR<sub>1yr</sub> = **1.74** 

Adjusted storage volume ASV<sub>1yr</sub> = SVR<sub>1yr</sub> × BSV<sub>1yr</sub> = **18.91** m<sup>3</sup>

Hydrological regional volume ratio (fig A9.1)  $HR_{1yr} = 1.01$ 

Final estimated attenuation storage  $Vol_{1yr} = HR_{1yr} \times ASV_{1yr} = 19.00 \text{ m}^3$ 

Library item: Estimated attenuation output

Estimated attenuation volume - 30 year

Attenuation storage vol (fig A7.1 - A7.8) Uvol<sub>30yr</sub> = **420.0** m<sup>3</sup> / hectare

Basic storage volume BSV<sub>30yr</sub> = Uvol<sub>30yr</sub> ×  $\alpha$  × A = **22.26** m<sup>3</sup>

FEH rainfall factor (figs A11.1, A6.1.1 - A6.3.4)  $FF_{30yr} = 0.80$ 

Greenfield run-off rates with 40% climate change allowance.



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Storage volume ratio (fig A8.1 - A8.8) SVR<sub>30yr</sub> = 1.74

Adjusted storage volume ASV<sub>30yr</sub> = SVR<sub>30yr</sub> × BSV<sub>30yr</sub> = **38.73** m<sup>3</sup>

Hydrological regional volume ratio (fig A9.1)  $HR_{30yr} = 1.01$ 

Final estimated attenuation storage  $Vol_{30yr} = HR_{30yr} \times ASV_{30yr} = 39.23 \text{ m}^3$ 

Library item: Estimated attenuation output

Estimated attenuation volume - 100 year

Attenuation storage vol (fig A7.1 - A7.8) Uvol<sub>100yr</sub> = **525.0** m<sup>3</sup> / hectare

Basic storage volume BSV<sub>100yr</sub> = Uvol<sub>100yr</sub> ×  $\alpha$  × A = **27.83** m<sup>3</sup>

FEH rainfall factor (figs A11.1, A6.1.1 - A6.3.4)  $FF_{100yr} = 0.75$ Storage volume ratio (fig A8.1 - A8.8)  $SVR_{100yr} = 1.74$ 

Adjusted storage volume  $ASV_{100yr} = SVR_{100yr} \times BSV_{100yr} = 48.42 \text{ m}^3$ 

Hydrological regional volume ratio (fig A9.1)  $HR_{100yr} = 1.02$ 

Final estimated attenuation storage  $Vol_{100yr} = HR_{100yr} \times ASV_{100yr} = 49.47 \text{ m}^3$ 

Library item: Estimated attenuation output

Attenuation storage required

Vol. increase due to head-discharge relationship phydro = 1.25

Maximum attenuation storage required  $V_{req\_max} = Vol_{30yr} \times p_{hydro} = 49_0 m^3$ 

Interception storage

Interception rainfall depth  $d_{int} = 0 \text{ mm}$ 

Volume of interception storage required  $V_{int\_req} = 0.8 \times A_{imp} \times d_{int} = 0.00 \text{ m}^3$ 

This is the theoretical attenuation volume required to limit flows to greenfield rates. However, it is not possible to limit flows as low as greenfield rates.

Long term storage

Proportion of paved area draining in to network  $\alpha$  = 1.0 Proportion of pervious area draining in to network  $\beta$  = 0.5

Rainfall depth for 100years, 6 hour event RD = M100\_360 = **80.0** mm

Extra runoff vol of dev.runoff over greenfield runoff  $Vol_{xs} = max(RD \times A \times (PIMP \times \alpha \times 0.8 + ((1 - PIMP) \times \beta \times SPR) - ((1 - PIMP) \times SPR) - ((1$ 

SPR),  $0m^3$ ) = **21.20**  $m^3$ 

Treatment volume

Treatment volume (assume 80% runoff)  $T_{vol} = 0.8 \times A \times 15 \text{mm} \times PIMP = 6.36 \text{ m}^3$ 

www.uksuds.com | Storage estimation tool

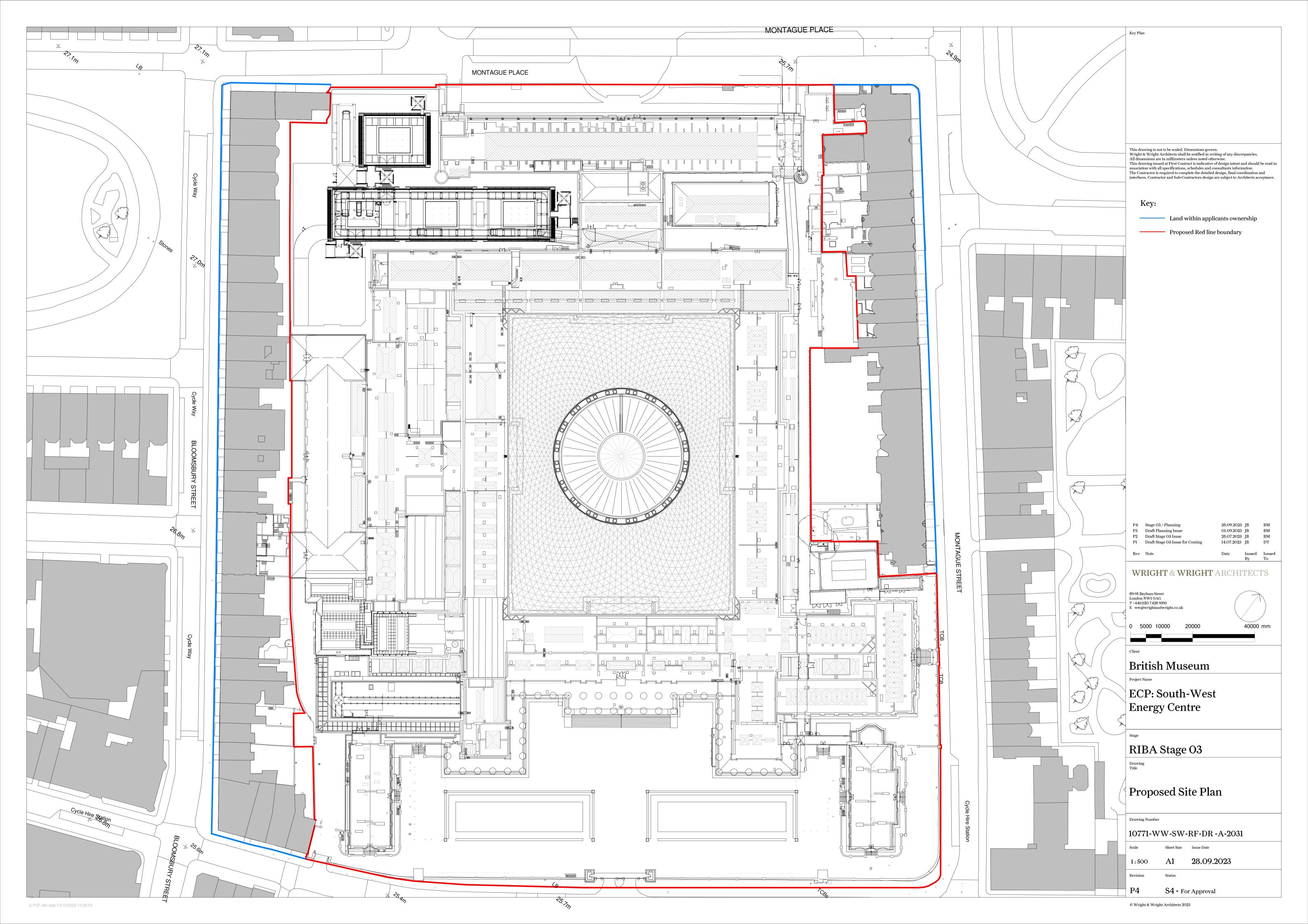
Ca <b>l</b> culated by:	Cara Ma	alcolm	Calculation to	o size the	Site Details	}	
Site name:	British I	Museum – ECP	attenuation t 1:100 year sto climate chan	ank for a orm + 40%	Latitude:	Site	e latitude
Site location:	London		discharge rat		Longitude:	Site longitude	
	n of the sto	age volume requirements th	nat are needed	to meet			
management for developments",	SC030219 (2	h Environment Agency guida 013), the SuDS Manual C753 (	Ciria, 2015) and		Reference:	40	)42322780
design of drainage systems calculate	s. It is recom	r SuDS (Defra, 2015). It is not imended that hydraulic mod n details before finalising th	elling software i	is used to	Date:	Oct 16	2023 15:41
Site charac	cteristi	cs		Metho	odology		
Total site area (h			0.053	esti		IH124	
Significant public	c open sp	ace (ha):	0	Q <sub>BAR</sub> estir	mation method:	Specify Qbar m	nanually
Area positively drained (ha):			0.053	SPR estin	nation method:	Calculate from	n SOIL type
Impermeable area (ha):			0.053	Soil characteristics			
Percentage of d (%):	rained are	a that is impermeable	100	SOIL type		Default	Edited 2
Impervious area drained via infiltration (ha):		0	SPR:			0.3	
Return period for infiltration system design (year):		10	Hvdro	logical			
Impervious area (ha):	drained to	o rainwater harvesting	0	characteristics		Default	Edited
Return period fo (year):	r rainwate	r harvesting system	10		00 yrs 6 hrs:		60
Compliance fact system (%):	tor for rain	water harvesting	66		00 yrs 12 hrs:		103.95
	storage v	olume design (ha):	0.05		conversion factor	·   -	600
Net impermable (ha):	area for s	torage volume design	0.05	SAAR (mn		_	20
Pervious area co	ontribution	n to runoff (%):	0	_ M5-60 Ka	infall Depth (mm):		
			16.	'r' Ratio M	l5-60/M5-2 day:	-	0.4
		ng or infiltration has be		Hydologic	cal region:	-	_
		unoff such that the effe han 50% of the 'area po		0		_	0.85
		and the estimates of (	-		urve factor 1 year:		0.00
		educed accordingly.	ARAH AMA OTHE		urve factor 10 year	-	1.62
				Growth c	urve factor 30 year	a	2.3
Design of Climate cha	ange	1.4		Growth c years:	urve factor 100	-	3.19
allowance t	factor:			Q <sub>BAR</sub> for t	otal site area (l/s):		0.08

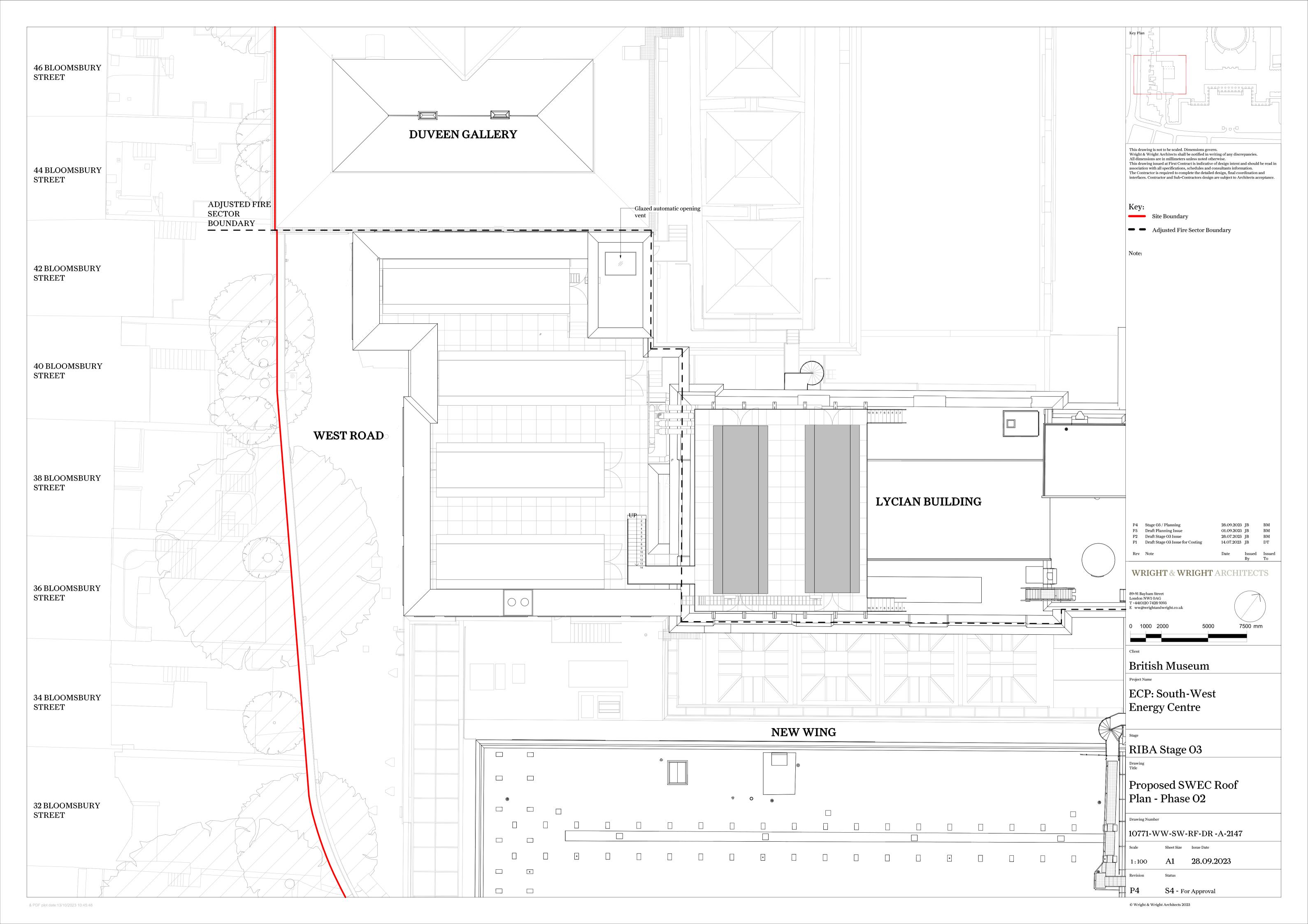
Urban creep allowance factor:	1		Q <sub>BAR</sub> for net site area (I/s):	 0.08
Volume control approach	Flow contro or Qbar	to max of 2 l/s/ha		
Interception rainfall depth (mm):	0			
Minimum flow rate (I/s):	2			

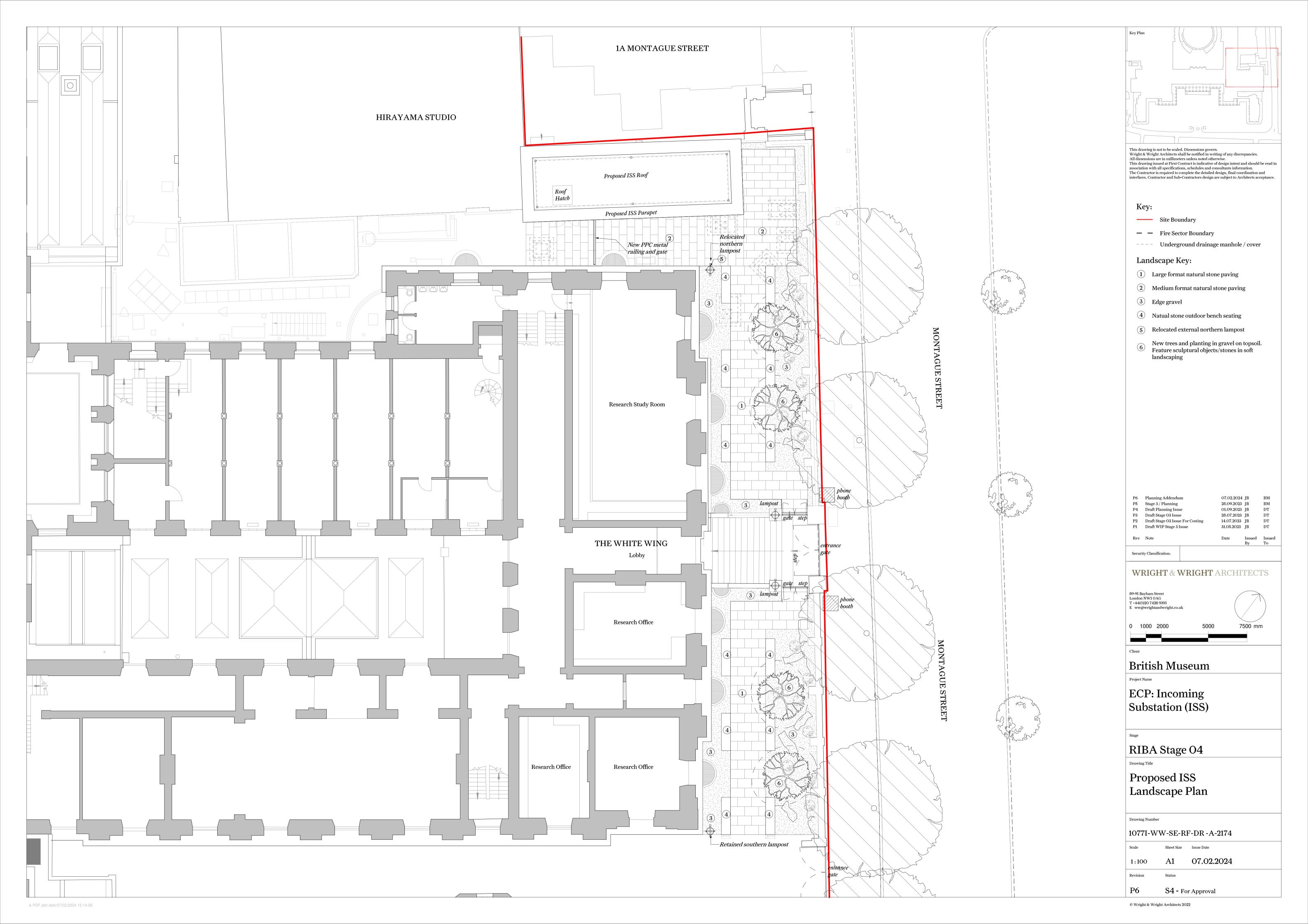
Site discharge rates	Default	Edited	Estimated storage volumes	Default	Edited
1 in 1 year ( <b>l</b> /s):		2	Attenuation storage 1/100 years (m³):		24
1 in 30 years ( <b>I</b> /s):		2	Long term storage 1/100 years (m³):	0	0
1 in 100 year ( <b>l</b> /s):		2	Total storage 1/100 years (m³):		24

This report was produced using the storage estimation tool developed by HRWallingford 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 http://uksuds.com/terms-and-conditions.htm. The outputs from this tool have been used to estimate storage volume requirements. 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 these data in the design or operational characteristics of any drainage scheme.

# Appendix D: Architect's Proposed Layout Drawings







# **Alan Baxter**

**Prepared by** Cara Malcolm **Reviewed by** Lloyd Kershaw **Issued** October 2023

 $T:\1910\1910-041\12\ DTP\ Data\BGD\ Report\ (from\ Stage\ 3\ report)\1910-41\_British\ Museum\ -\ Below\ Ground\ Drainage\ and\ SuDS\ for\ planning\ submission.indd$ 

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